

Autonics

Push Button Type Photo Micro Sensor

BS5-P SERIES

INSTRUCTION MANUAL



Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.

※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow these instructions may result in serious injury or death.

⚠ Caution Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **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.

2. **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.

3. **Do not disassemble or modify the unit.**

Failure to follow this instruction may result in fire.

4. **Do not connect, repair, or inspect the unit while connected to a power source.**

Failure to follow this instruction may result in fire.

5. **Check 'Connections' before wiring.**

Failure to follow this instruction may result in fire.

⚠ Caution

1. **Use the unit within the rated specifications.**

Failure to follow this instruction may result in fire or product damage.

2. **Use dry cloth to clean the unit, and do not use water or organic solvent.**

Failure to follow this instruction may result in fire.

■ Model

Model	Operation range	Appearance	Connection	Operation	Control output
BS5-P1ML	0 to 5mm	Push button type	Cable type (1m)	Light ON (Output OFF when button is pushed)	NPN open collector output
BS5-P1ML-P				PNP open collector output	
BS5-P1MD				Dark ON (Output ON when button is pushed)	NPN open collector output
BS5-P1MD-P				PNP open collector output	

■ Operation Mode

Operation mode	Light ON (Output OFF when button is pushed)	Dark ON (Output ON when button is pushed)
Button position	Pushed Raised	Pushed Raised
Receiver operation	Received light Interrupted light	Received light Interrupted light
Operation indicator (red LED)	ON OFF	ON OFF
Transistor output	ON OFF	ON OFF

※The above specifications are subject to change and some models may be discontinued without notice.

※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

■ Specifications

Model	NPN open collector output PNP open collector output	BS5-P1ML BS5-P1ML-P	BS5-P1MD BS5-P1MD-P
Operation method ^{※1}	Push button type		
Stop position	5.0±0.4mm		
Button operation ^{※2}	Output switching position	4.0±0.5mm	
	Operation limit position	Below 0mm	
Operation load ^{※3}	Max. 3N (max. 0.3kgf)		
Power supply	12-24VDC±10% (ripple P-P: max. 10%)		
Current consumption	Max. 35mA		
Light source	Infrared LED (940nm)		
Operation mode	Light ON (Output OFF when button is pushed)	Dark ON (Output ON when button is pushed)	
Control output	NPN or PNP open collector output		Load voltage: Max. 26.4VDC±
			Load current: Max. 50mA
			Residual voltage: Max. 1VDC±
External input ^{※4}	NPN output	Emitter OFF: short at 0V or max. 0.25VDC± (outflow current max. 30mA)	
	PNP output	Emitter ON: open (leakage current max. 0.4mA)	
Response	Under 1ms		
Protection circuit	Reverse polarity protection, output short over current protection circuit		
Indicator	Operation indicator: red LED		
Insulation resistance	Over 20MΩ (at 250VDC megger)		
Noise immunity	±240V of square wave noise (pulse width: 1 μs) from the noise simulator		
Dielectric strength	1,000VAC at 50/60Hz for 1 min		
Vibration	1.5mm amplitude at 10 to 55Hz frequency in each X, Y, Z direction for 2 hours		
Shock	500m/s ² (approx. 50G) in each X, Y, Z direction for 3 times		
Mechanical life cycle	Min. 5,000,000 operations (1 operation = stop position - operation limit position - stop position)		
Environment	Ambient illuminance	Fluorescent lamp: max. 1,000lx (receiver illuminance)	
	Ambient temperature	-20 to 55°C, storage: -25 to 70°C	
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH	
Protection structure	IP40 (IEC standard)		
Material	Case: Polycarbonate + Glass fiber, Button: Polyoxymethylene		
Cable	Ø3mm, 4-wire, 1m (AWG 28, core diameter: 0.08mm, no. of core wires: 19, insulator diameter: Ø0.88mm)		
Approval	CE		
Weight ^{※5}	Approx. 50g (approx. 30g)		

※1: Detection occurs when the button is pushed and the light source is blocked.

※2: Stop position: position of the button without any applied pressure

Output switching position: position where the output switches ON/OFF

Operation limit position: position of the button when fully pushed

Stop position

Operation limit position

Output switching position: 4.0±0.5mm

Operation limit position

Operation limit position

Operation limit position

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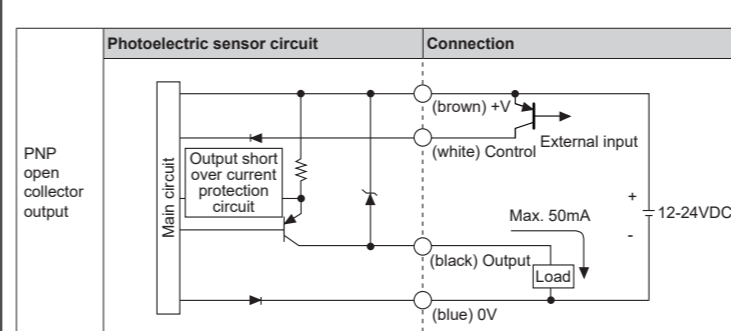
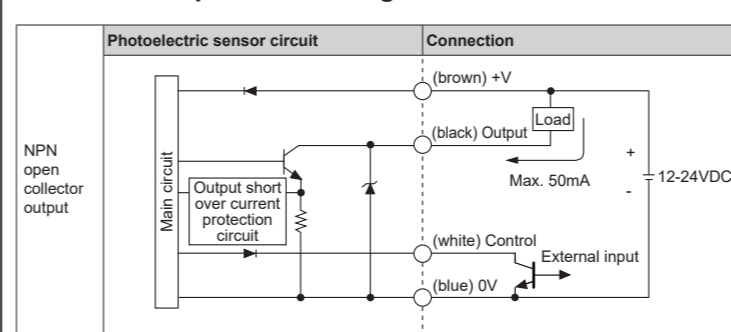
Operation limit position

Operation limit position

Operation limit position

Operation limit position

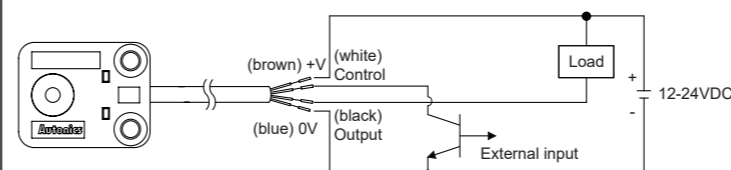
■ Control Output Circuit Diagram



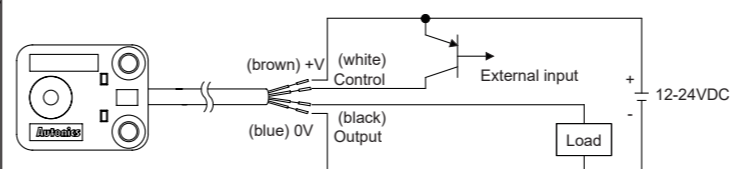
※If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the output short over current protection circuit

■ Connections

●NPN open collector output



●PNP open collector output



■ Cautions during Use

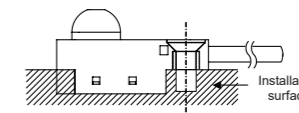
1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
2. When connecting a DC relay or other inductive load to the output, remove surge by using diodes or varistors.
3. Use the product, 0.1 sec after supplying power. When using separate power supply for the sensor and load, supply power to sensor first.
4. 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
5. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
6. When using switching mode power supply to supply the power, ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
7. When using sensor with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground F.G. terminal of the equipment.
8. This unit may be used in the following environments.
 - ① Indoors (in the environment condition rated in 'Specifications')
 - ② Altitude max. 2,000m
 - ③ Pollution degree 2
 - ④ Installation category II

■ Installation

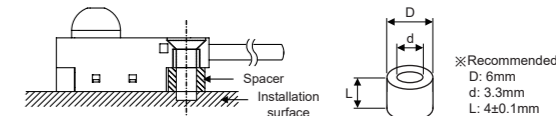
When installing the product, tighten the screw with a tightening torque of 0.59N·m. Do not pull the cable with a tensile strength of 30N or over. It may result in fire due to the broken wire.

Installation methods differ depending on the installation surface.

- 1) Installation on non-flush surface
Install the sensor after fitting the sensor in the opening as shown in the figure below.



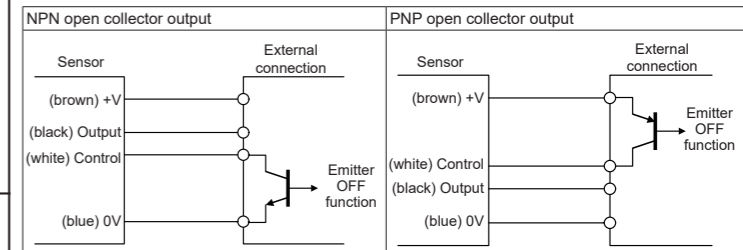
- 2) Installation on flush surface
Insert a spacer between the installation surface and the mounting surface of the sensor as shown in the figure below.



■ Functions

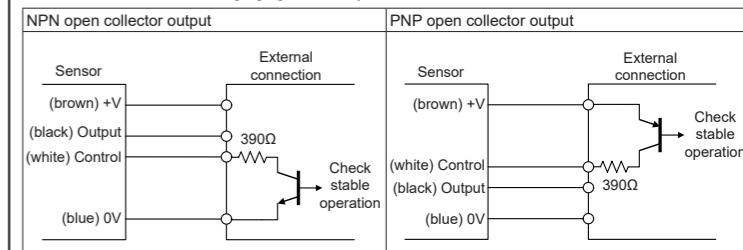
●Emitter OFF function

The emitter LED can be turned ON/OFF without pushing the button, to test for stable operation of the receiver.



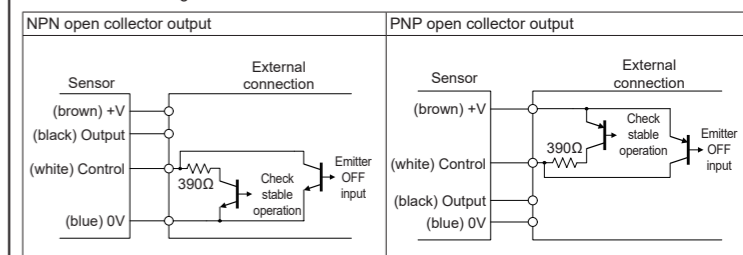
●Check stable operation function

Reduces the LED intensity by approximately 20% while button is not pushed, and check that the receiver is still receiving light (same transistor ON status as at 100%) This ensures that sensor will not malfunction due to changing light intensity.



●Simultaneous use of emitter OFF and check stable operation function

Follow the circuit diagram below:



※When using the emitter OFF function and check stable operation function simultaneously, the transistor used should be able to open and close 50mA/10V and resistance should be over 1/8W. Failure may cause product damage.

※When emitter OFF function and stable operation check function is not used, insulate the control (white) wire. Otherwise, it may result in product damage.

■ Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connector/Sockets
- Switching Mode Power Supplies
- Control Switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper Motors/Drivers/Motion Controllers
- Graphic/Logic Panels
- Field Network Devices
- Laser Marking System (Fiber, Co., Nd:Yag)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometers/Pulse (Rate) Meters
- Display Units
- Sensor Controllers