

Front/Side Mount Photoelectric Sensors



BH Series PRODUCT MANUAL

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

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

Features

- Easy front (M18 nut) and side (M3 bolt/nut) installation
- NPN open collector / PNP open collector simultaneous output
- Sensing distance: Through-beam type 20 m / Polarized retroreflective type 4 m / Diffuse reflective type 1 m, 300 mm
- Small size: W 14 × H 34.5 × L 28 mm
- M.S.R. (Mirror Surface Rejection) function prevents malfunction from reflective objects such as metals or mirrors (polarized retroreflective type)
- Built-in sensitivity adjuster
- Light ON/Dark ON selectable by switch
- Operation indicator (red), stability indicator (green)
- Reverse power protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam type)
- IP67 protection rating (IEC standard)

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.
- When connecting an inductive load such as DC relay or solenoid valve to the output, remove surge by using diodes or varistors.
- Use the product after 0.5 sec of the power input.
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 switching mode power supply (SMPS), ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove 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 (UL Type 1 Enclosure)
 - Altitude max. 2,000 m
 - Pollution degree 3
 - Installation category II

Product Components

| Sensing type | Through-beam | Polarized retroreflective | Diffuse reflective |
|-----------------------------|-----------------------------|---------------------------|--------------------|
| Product components | Product, instruction manual | | |
| Reflector | - | MS-2A | - |
| Adjustment screwdriver | × 1 | × 1 | × 1 |
| M18 fixing nut / Fixing cap | × 2 | × 1 | × 1 |
| Bracket | × 2 | × 1 | × 1 |
| M3 bolt / nut | × 4 | × 2 | × 2 |

Ordering Information

This is only for reference, the actual product does not support all combinations. For selecting the specified model, follow the Autonics website.

BH ① - ② ③ ④ ⑤

① Sensing distance

Number: Sensing distance (unit: mm)
Number+M: Sensing distance (unit: m)

② Sensing type

T: Through-beam
P: Polarized retroreflective
D: Diffuse reflective

③ Power supply

D: 12 - 24 VDC

④ Output

T: Solid state (transistor)

⑤ Emitter/Receiver

No mark: Integrated type
1: Emitter
2: Receiver

Sold Separately

- Reflector: MS Series
- Retroreflective tape: MST Series

Cautions during Installation

- Be sure to install this product by following the usage environment, location, and specified ratings. Consider the listed conditions below.
 - Installation environment and background (reflected light)
 - Sensing distance and sensing target
 - Direction of target's movement
 - Characteristic curves
- When installing multiple sensors closely, it may result in malfunction due to mutual interference.
- For installation, tighten the screw with a torque of 0.5 N m. Mount the brackets correctly to prevent the twisting of the sensor's optical axis.
- Do not impact with a hard object or bend the cable excessively. That could decrease the product's water resistance.
- Use this product after the test. Check whether the indicator works appropriately for the positions of the detectable object.

| Through-beam | Reflector Reflective | Reflective |
|---|---|---|
| | | |
| Emitter - Receiver: Install to face each other | Sensor - Reflector: At least 0.1 m apart, install to face each other (parallel with the sensing side of the unit) | Sensor - Sensing target: Install to face each other (parallel with the sensing side of the unit) |

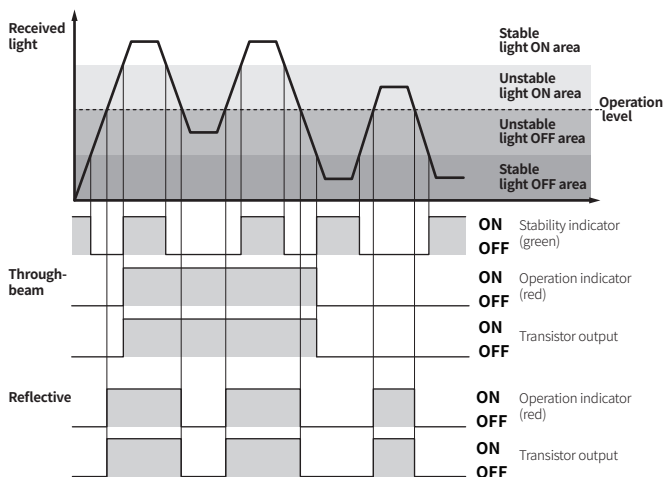
Setting Operation Mode

- Be sure to set the mode before power-on.
- Use the offered adjustment screwdriver. Do NOT turn with excessive force to prevent product damage.
- In case of through-beam type, the operation mode switch is on the receiver.

| L: Light ON mode | D: Dark ON mode |
|------------------|-----------------|
| | |

Operation Timing Chart and Indicators

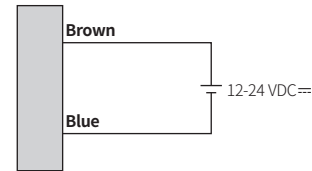
■ Light ON mode



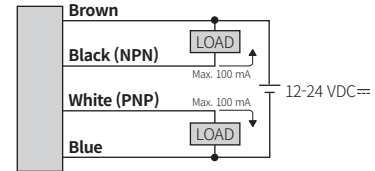
- In Dark ON mode, the waveforms are reversed.
- Operation indicator and transistor output differ from the sensing method.

Connections

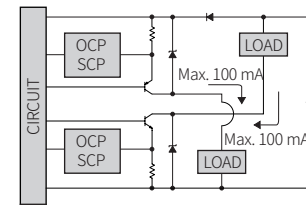
■ Emitter



■ Receiver, Polarized retroreflective, Diffuse reflective type



Circuit



- 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.

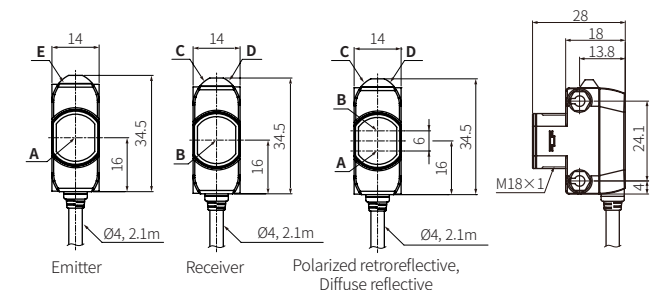
Sensitivity Adjustment

- Set the adjuster for stable Light ON area, minimizing the effect of the installation environment.
- Use the offered adjustment screwdriver. Do NOT turn with excessive force to prevent product damage.
- The steps below are based on Light ON mode.

| STEP | Status | Description |
|------|-------------|---|
| 01 | Received | Turn the adjuster from MIN (-) to MAX (+) sensitivity and check the position (A) where the operation indicator activates under the light ON area. |
| 02 | Interrupted | Turn the adjuster from (A) to MAX (+) and check the position (B) where the operation indicator activates under the light OFF area. If the operation indicator does NOT activate at the MAX (+, maximum sensitivity): MAX = (B). |
| 03 | - | Set the adjuster at the mid position between (A) and (B) for optimal sensitivity. |

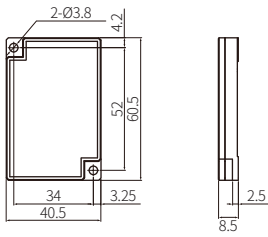
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.

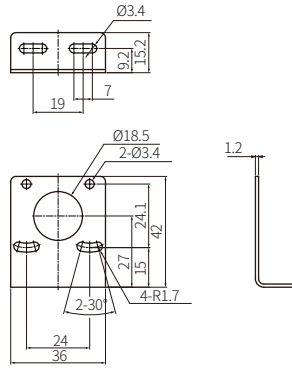


| | | | |
|----------|---------------------------|----------|-----------------------------|
| A | Optical axis of emitter | D | Stability indicator (green) |
| B | Optical axis of receiver | E | Power indicator (green) |
| C | Operation indicator (red) | | |

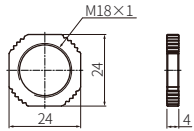
■ Reflector (MS-2A)



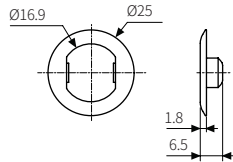
■ Bracket



■ M18 fixing nut



■ Fixing cap



Specifications

| Model | BH20M-TDT | BH4M-PDT | BH□-DDT | |
|--------------------------------|---|---------------------------|---------------------------|---------------------|
| Sensing type | Through-beam | Polarized retroreflective | Diffuse reflective | |
| Sensing distance | 20 m | 4 m ⁽⁰¹⁾ | 300 mm ⁽⁰²⁾ | 1 m ⁽⁰³⁾ |
| Sensing target | Opaque materials | Opaque materials | - | |
| Min. sensing target | ≥ Ø 20 mm | ≥ Ø 75 mm | - | |
| Hysteresis | - | - | ≤ 20% of sensing distance | |
| Response time | ≤ 1 ms | | | |
| Light source | Red | Red | Red | Infrared |
| Peak emission wavelength | 660 nm | 660 nm | 660 nm | 850 nm |
| Sensitivity adjustment | YES (Adjuster) | YES (Adjuster) | YES (Adjuster) | |
| Mutual interference prevention | - | YES | YES | |
| Operation mode | Light ON mode - Dark ON mode selectable (Adjuster) | | | |
| Indicator | Operation indicator (red), stability indicator (green), power indicator (green) ⁽⁰⁴⁾ | | | |
| Approval | CE, RoHS, ENEC, ERE | CE, RoHS, ENEC, ERE | CE, RoHS, ENEC, ERE | |
| Unit weight (packaged) | ≈ 120 g (≈ 190 g) | ≈ 60 g (≈ 140 g) | ≈ 60 g (≈ 130 g) | |

01) Reflector (MS-2A)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 300 × 300 mm

04) Only for the emitter

| | |
|--------------------------------|---|
| Power supply | 12-24 VDC± ±10% (ripple P-P: ≤ 10%) |
| Current consumption | It depends on the sensing type |
| Through-beam | Emitter: ≤ 20 mA, receiver: ≤ 20 mA |
| Polarized retroreflective | ≤ 30 mA |
| Diffuse reflective (300 mm) | ≤ 30 mA |
| Diffuse reflective (1 m) | ≤ 35 mA |
| Control output | NPN open collector - PNP open collector simultaneous output |
| Load voltage | ≤ 26.4 VDC± |
| Load current | ≤ 100 mA |
| Residual voltage | NPN: ≤ 1 VDC±, PNP: ≤ 2.5 VDC± |
| Protection circuit | Reverse power protection circuit, output short overcurrent protection circuit |
| Insulation resistance | ≥ 20 MΩ (500 VDC± megger) |
| Dielectric strength | Between the charging part and the case: 1,000 VAC~ 50/60 Hz for 1 min |
| Vibration | 1.5 mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 2 hours |
| Shock | 500 m/s ² (≈ 50 G) in each X, Y, Z direction for 3 times |
| Ambient illuminance (receiver) | Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx |
| Ambient temperature | -25 to 55 °C, storage: -40 to 70 °C ⁽⁰¹⁾ (no freezing or condensation) |
| Ambient humidity | 35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation) |
| Protection rating | IP67 (IEC standard) |
| Connection | Cable type |
| Cable spec. | Ø 4 mm, 4-wire (Emitter: 2-wire), 2.1 m |
| Wire spec. | AWG24 (0.08 mm, 40-core), insulator outer diameter: Ø 1.03 mm |
| Material | Case: PC, CAP: PC, sensing part: PMMA |

01) UL approved ambient temperature 40°C

Sold Separately: Reflector MS Series

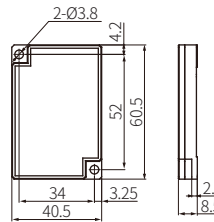
| Appearance | Size (W × H) | Reflectance | Sensing type | Model |
|------------|----------------|----------------------|---------------------------|-------|
| | 40.5 × 60.5 mm | Typical reflectivity | Retroreflective | MS-2 |
| | | Typical reflectivity | Polarized retroreflective | MS-2A |
| | | High reflectivity | Polarized retroreflective | MS-2S |
| | 81.5 × 60.5 mm | Typical reflectivity | Retroreflective | MS-3 |
| | | High reflectivity | Polarized retroreflective | MS-3S |
| | 29.3 × 38 mm | Typical reflectivity | Retroreflective | MS-4 |
| | 15.4 × 24 mm | Typical reflectivity | Retroreflective | MS-5 |
| | 13.7 × 23 mm | Typical reflectivity | Retroreflective | MS-6 |

- Material: PMMA / ABS (front part / rear part)
- Installation: Bolt mounting

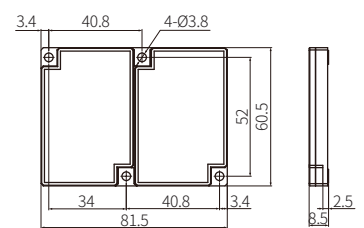
■ Dimensions

(Unit: mm)

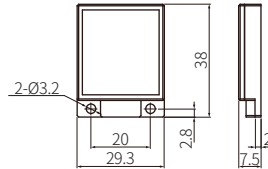
MS-2□



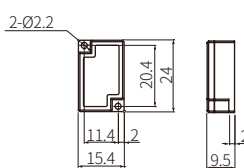
MS-3□



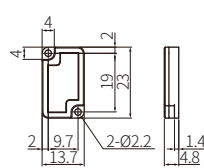
MS-4



MS-5




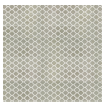

MS-6



■ Cautions during Installation

- Select a reflector size that is suitable for the installation space and operating environment of the sensors.
- In general, a bigger size of the reflector results in a longer sensing distance.
- Reflectors with high reflectivity increase the sensing distance compared to typical reflectors.
- The reflectance may vary depending on the operating environment for the sensors.

Sold Separately: Retroreflective Tape MST Series

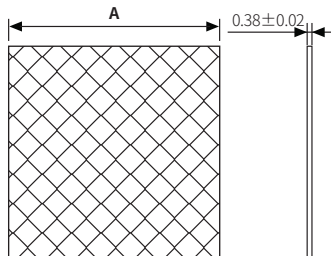
| Appearance | Size (W × H) | Approval | Packaged unit | Sensing type | Model |
|---|--------------|----------|---------------|--|-----------|
|  | 50 × 50 mm | ERC | 10 | • Retroreflective • Polarized retroreflective | MST-50-10 |
|  | 100 × 100 mm | ERC | 5 | • Retroreflective • Polarized retroreflective | MST-100-5 |
|  | 200 × 200 mm | ERC | 2 | • Retroreflective • Polarized retroreflective | MST-200-2 |

- Material: PMMA / PC / Acrylic (surface film / prism layer / adhesive layer)
- Ambient temperature: -35 to 65 °C (temperature for adhesion: 10 to 30 °C)
- Installation: Tape cutting (installation distance: ≥ 20 mm)

Reflectance of MST Series

| Series | Sensing type | MST-50-10 | MST-100-5 | MST-200-2 |
|------------------------------|---------------------------|-----------|-----------|-----------|
| BTS | Retroreflective | 95% | 100% | 100% |
| BM | | 70% | 110% | 170% |
| BMS | | 90% | 120% | 190% |
| BEN | | 90% | 130% | 140% |
| BX | | 90% | 100% | 110% |
| BJ | Polarized retroreflective | 40% | 60% | 100% |
| BJR | | 35% | 45% | 55% |
| BJX | | 35% | 45% | 55% |
| BH | | 60% | 80% | 140% |
| BEN | | 70% | 90% | 120% |
| BX | | 30% | 40% | 60% |
| BRQ | | 40% | 50% | 80% |
| BRQP (plastic material type) | | 40% | 80% | 85% |
| BRQPS (side sensing type) | | 25% | 30% | 35% |

Dimensions



(Unit: mm)

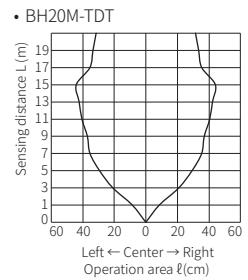
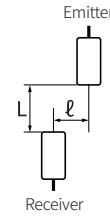
| Model | A |
|-----------|-------|
| MST-50-10 | □ 50 |
| MST-100-5 | □ 100 |
| MST-200-2 | □ 200 |

Cautions during Installation

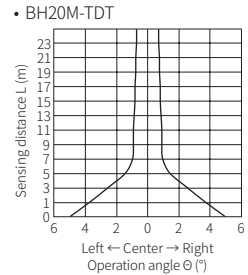
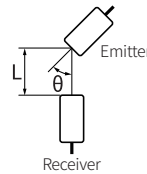
- Select a retroreflective tape that is suitable for the installation space and operating environment of the sensors.
- In general, a bigger size of retroreflective tape results in a longer sensing distance.
- Be sure to check the reflectance of the MST series for proper use.
- The reflectance may vary depending on the operating environment for the sensors.
- Before applying the tape, clean the adhesive side of the reflective tape with a dry cloth.
- Do not press or damage the surface of the retroreflective tape.
- Regularly clean the tape to maintain optimal performance, using only neutral detergents. Do not use chemical solvents.

Characteristic Curves: Through-beam Type

Sensing area

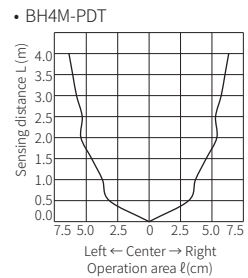
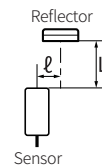


Emitter angle

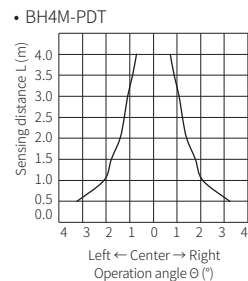
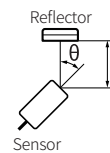


Characteristic Curves: Polarized Retroreflective Type

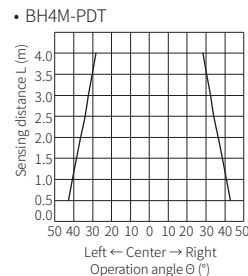
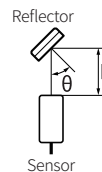
Sensing area



Sensor angle

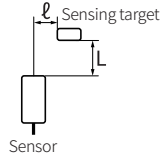


Reflector angle

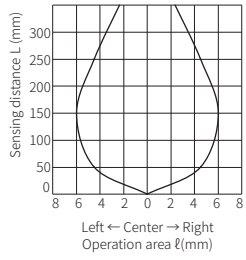


Characteristic Curves: Diffuse Reflective Type

■ Sensing area



• BH300-DDT



• BH1M-DDT

