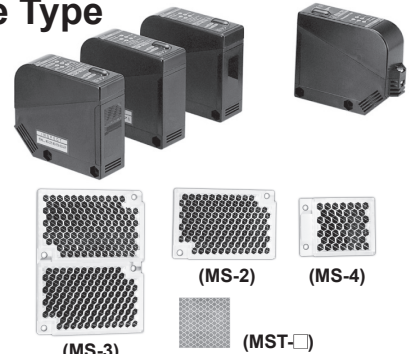


Terminal Type and Long Sensing Distance Type

■ Features

- Sensitivity adjuster
- Timer function: ON Delay, OFF Delay, One-shot Delay
- NPN/PNP open collector output (DC power type)
- Self-diagnosis function (green LED turns on in stable level)
- Wide power supply range: Universal 24-240VDC/24-240VAC
- Protection structure IP66 (IEC standard)

⚠ Please read "Safety Considerations" in the instruction manual before using.



※MS-4, MST-□ is sold separately.

■ Specifications

◎ Free power type, Relay contact output type

| Model | Standard type | BX15M-TFR | BX5M-MFR | BX3M-PFR | BX700-DFR |
|------------------------|---------------|---|--|---|------------------------------------|
| | With Timer | BX15M-TFR-T | BX5M-MFR-T | BX3M-PFR-T | BX700-DFR-T |
| Sensing type | | Through-beam | Retroreflective (standard type) | Retroreflective (built-in polarizing filter) | Diffuse reflective |
| Sensing distance | | 15m | 0.1 to 5m (reflector MS-2) ^{※1} | 0.1 to 2m (reflector MS-2), 0.1 to 3m (reflector MS-3) ^{※1} | 700mm ^{※2} |
| Sensing target | | Opaque materials of Min. Ø15mm | Opaque materials of Min. Ø60mm | | Translucent, opaque material |
| Hysteresis | | — | | | Max. 20% at rated setting distance |
| Response time | | Max. 20ms | | | |
| Power supply | | 24-240VAC~±10% 50/60Hz, 24-240VDC=±10% (ripple P-P: max. 10%) | | | |
| Power consumption | | Max. 3VA | | | |
| Light source | | Infrared LED (850nm) | | Red LED (660nm) | Infrared LED (940nm) |
| Sensitivity adjustment | | Sensitivity adjuster | | | |
| Operation mode | | Light ON/Dark ON operation mode switch | | | |
| Control output | | Relay contact output (contact capacity: 30VDC= 3A, 250VAC~ 3A at resistive load, contact composition: 1c) ^{※3} | | | |
| Relay life cycle | | Mechanically: min. 50,000,000, electrically: min. 100,000 | | | |
| Self-diagnosis output | | Self-diagnosis indicator (green LED) turns on at stable operation | | | |
| Timer function | | Selectable ON delay, OFF delay, one shot delay by slide switch [delay time: 0.1 to 5 sec (timer adjuster)] | | | |
| Indicator | | Operation indicator: yellow LED, self-diagnosis indicator: green LED | | | |
| Connection | | Terminal connection | | | |
| Insulation resistance | | Over 20MΩ (at 500VDC megger) | | | |
| Insulation type | | Double or strong insulation (mark: □, dielectric voltage between the measured input and the power: 1.5kV) | | | |
| Noise immunity | | ±1,000V the square wave noise (pulse width: 1μs) by the noise simulator | | | |
| Dielectric strength | | 1500VAC 50/60Hz for 1 minute | | | |
| Vibration | Mechanical | 1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours | | | |
| | Malfunction | 1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 minutes | | | |
| Shock | Mechanical | 500m/s ² (approx. 50G) in each X, Y, Z direction for 3 times | | | |
| | Malfunction | 100m/s ² (approx. 10G) in each X, Y, Z direction for 3 times | | | |
| Environment | Ambient illu. | Sunlight: max. 11,000lx, incandescent lamp: max. 3,000lx (receiver illumination) | | | |
| | Ambient temp. | -20 to 55°C, storage: -25 to 70°C | | | |
| | Ambient humi. | 35 to 85%RH, storage: 35 to 85%RH | | | |
| Protection structure | | IP66 (IEC standard) | | | |
| Material | | Case, lens cover: polycarbonate, sensing part: acrylic, bracket, bolt, nut: steel chromium molybdenum | | | |
| Accessory | Individual | — | Reflector (MS-2) | Reflector (MS-3) | — |
| | Common | Adjustment screwdriver, mounting bracket, Z bolt: 2, washer: 2, Ø6 waterproof rubber: 2, Ø10 waterproof rubber: 2 | | Adjustment screwdriver, mounting bracket, Z bolt: 1, washer: 1, Ø6 waterproof rubber :1, Ø10 waterproof rubber: 1 | |
| Approval | | CE | | | |
| Unit weight | | TFR: approx. 225g | MFR: approx. 130g | PFR: approx. 148g | DFR: approx. 115g |
| | | TFR-T: approx. 226g | MFR-T: approx. 131g | PFR-T: approx. 149g | DFR-T: approx. 116g |

※1: The sensing distance of the retroreflective type sensor is possible setting range between reflector and sensor. A target object can be sensed in 0.1m distance. When using reflective tapes, the reflectivity will vary by the size of the tape. Please refer to the "■ Reflectivity by Reflective Tape Model" table before using the tapes.

※2: Non-glossy white paper 200×200mm.

※3: Relay contact output of 1a type is option.

※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

(H) Rotary Encoders

(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

BX Series

■ Specifications

◎ DC power type, Solid state output type

| Model | Standard type | BX15M-TDT | BX5M-MDT | BX3M-PDT | BX700-DDT |
|------------------------|--|---|--|--|--|
| | With Timer | BX15M-TDT-T | BX5M-MDT-T | BX3M-PDT-T | BX700-DDT-T |
| Sensing type | Through-beam | | Retroreflective (standard type) | Retroreflective (built-in polarizing filter) | Diffuse reflective |
| Sensing distance | 15m | | 0.1 to 5m (reflector MS-2) ^{※1} | 0.1 to 2m (reflector MS-2), 0.1 to 3m (reflector MS-3) ^{※1} | 700mm ^{※2} |
| Sensing target | Opaque materials of Min. Ø15mm | | Opaque materials of Min. Ø60mm | | Translucent, opaque material |
| Hysteresis | — | | | | Max. 20% at rated setting distance |
| Response time | Max. 1ms | | | | |
| Power supply | 12-24VDC \pm 10% (ripple P-P: max. 10%) | | | | |
| Current consumption | Max. 50mA | | | | |
| Light source | Infrared LED (850nm) | | | Red LED (660nm) | Infrared LED (940nm) |
| Sensitivity adjustment | Sensitivity adjuster | | | | |
| Operation mode | Light ON/Dark ON operation mode switch | | | | |
| Control output | NPN or PNP open collector output ●Load voltage: max. 30VDC \pm ●Load current: max. 200mA ●Residual voltage - NPN: max. 1VDC \pm , PNP: max. 2.5VDC | | | | |
| Self-diagnosis output | NPN open collector output (green LED turns on at stable operation and output (transistor output) turns on) ●Load voltage: max. 30VDC \pm ●Load current: max. 50mA ●Residual voltage - max. 1VDC \pm (50mA), max. 0.4VDC(16mA) | | | | |
| Protection circuit | Reverse polarity protection circuit, output short overcurrent protection circuit | | | | |
| Timer function | Selectable ON delay, OFF delay, one shot delay by slide switch [delay time: 0.1 to 5 sec (timer adjuster)] | | | | |
| Indicator | Operation indicator: yellow LED, Self-diagnosis indicator: green LED | | | | |
| Connection | Terminal connection | | | | |
| Insulation resistance | Over 20MΩ (at 500VDC megger) | | | | |
| Noise immunity | \pm 240V the square wave noise (pulse width: 1μs) by the noise simulator | | | | |
| Dielectric strength | 1500VAC 50/60Hz for 1 minute | | | | |
| Vibration | Mechanical | 1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours | | | |
| | Malfunction | 1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 minutes | | | |
| Shock | Mechanical | 500m/s ² (approx. 50G) in each X, Y, Z direction for 3 times | | | |
| | Malfunction | 100m/s ² (approx. 10G) in each X, Y, Z direction for 3 times | | | |
| Environment | Ambient illu. | Sunlight: max. 11,000lx, incandescent lamp: max. 3,000lx (receiver illumination) | | | |
| | Ambient temp. | -20 to 55°C, storage: -25 to 70°C | | | |
| | Ambient humi. | 35 to 85%RH, storage: 35 to 85%RH | | | |
| Protection structure | IP66 (IEC standard) | | | | |
| Material | Case, lens cover: polycarbonate, sensing part: acrylic, bracket, bolt, nut: steel chromium molybdenum | | | | |
| Accessory | Individual | — | Reflector (MS-2) | Reflector (MS-3) | — |
| | Common | Adjustment screwdriver, mounting bracket, Z bolt: 2, washer: 2, Ø6 waterproof rubber: 2, Ø10 waterproof rubber: 2 | | | |
| Approval | CE | | | | |
| Unit weight | TDT: approx. 211g TDT-T: approx. 212g | | MDT: approx. 123g MDT-T: approx. 124g | | PDT: approx. 141g PDT-T: approx. 142g |
| | | | | | DDT: approx. 116g DDT-T: approx. 117g |

※1: The sensing distance of the retroreflective type sensor is possible setting range between reflector and sensor. A target object can be sensed in 0.1m distance. When using reflective tapes, the reflectivity will vary by the size of the tape. Please refer to the "■ Reflectivity by Reflective Tape Model" table before using the tapes.

※2: Non-glossy white paper 200×200mm.

※ The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

Long Sensing, Amplifier Built-in Type with Universal Voltage (terminal)

Feature Data

Through-beam type

- BX15M-TFR / BX15M-TFR-T
- BX15M-TDT / BX15M-TDT-T

Diffuse reflective type

- BX700-DFR / BX700-DFR-T
- BX700-DDT / BX700-DDT-T

| Parallel shifting characteristic | | Angle Characteristic | | Sensing area | |
|----------------------------------|------|----------------------|------|------------------|------|
| Measuring method | Data | Measuring method | Data | Measuring method | Data |
| | | | | | |

Retroreflective type

- BX5M-MFR / BX5M-MFR-T
- BX5M-MDT / BX5M-MDT-T

| Parallel shifting characteristic | | Angle Characteristic | | Reflector angle characteristic | |
|----------------------------------|------|----------------------|------|--------------------------------|------|
| Measuring method | Data | Measuring method | Data | Measuring method | Data |
| | | | | | |

Retroreflective type (Built-in polarizing filter)

- BX3M-PFR / BX3M-PFR-T
- BX3M-PDT / BX3M-PDT-T

| Parallel shifting characteristic | | Sensor angle characteristic | | Reflector angle characteristic | |
|----------------------------------|------|-----------------------------|------|--------------------------------|------|
| Measuring method | Data | Measuring method | Data | Measuring method | Data |
| | | | | | |

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

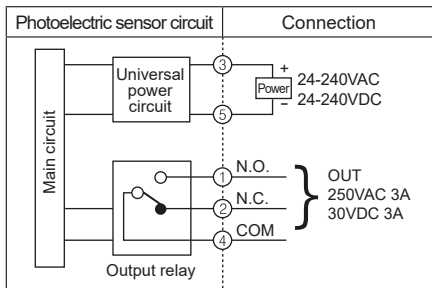
(H) Rotary Encoders

(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

BX Series

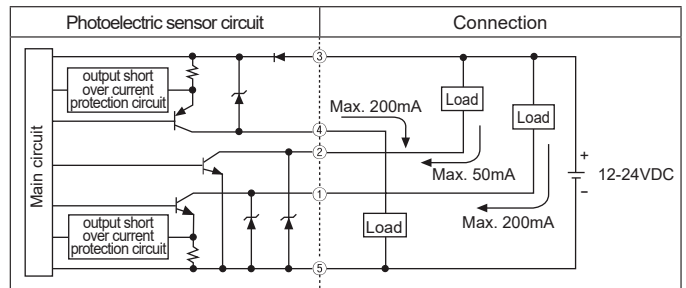
Control Output Diagram

Free power type (Relay contact output)



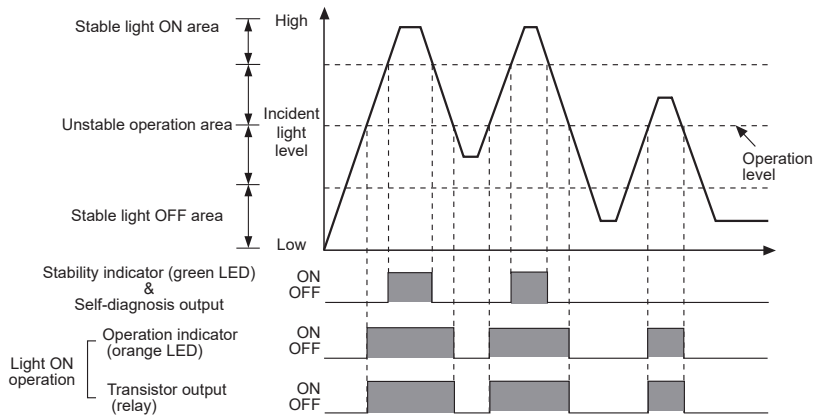
※The product is not equipped with the output short over current protection circuit. If short-circuit the control output terminal or supply current over the rated specification, it may result in product damage.

DC power type (NPN/PNP open collector simultaneous output)



※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.

Operation Timing Diagram



※The waveforms of "Operation indicator" and "Transistor output" are for Light ON operation. They are opposite operation for Dark ON operation.

Timer Mode

| Timer mode | Switch position | | Status of light | Received light | Interrupted light |
|----------------|-----------------|-----|-----------------|----------------|--------------------------|
| | S1 | S2 | | | |
| Normal | ON | ON | Light ON | ON | [ON pulse] |
| | | | Dark ON | OFF | [OFF pulse] |
| One-shot Delay | ON | OFF | Light ON | ON | [ON pulse with delay T] |
| | | | Dark ON | OFF | [OFF pulse with delay T] |
| ON Delay | OFF | ON | Light ON | ON | [ON pulse with delay T] |
| | | | Dark ON | OFF | [OFF pulse with delay T] |
| OFF Delay | OFF | OFF | Light ON | ON | [ON pulse with delay T] |
| | | | Dark ON | OFF | [OFF pulse with delay T] |

※T: Time can be set by the timer adjuster.

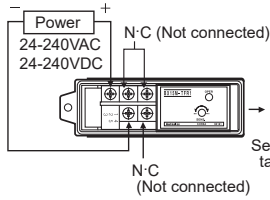
※Conversion to other timer modes is applied after a former mode is finished.

Long Sensing, Amplifier Built-in Type with Universal Voltage (terminal)

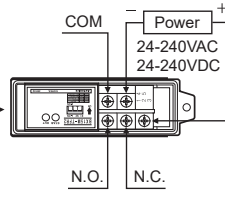
■ Connections

◎ Through-beam type

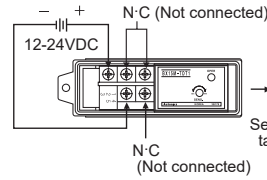
● BX15M-TFR1



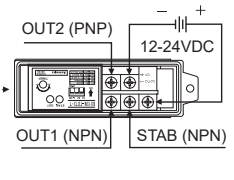
● BX15M-TFR2 BX15M-TFR2-T



● BX15M-TDT1



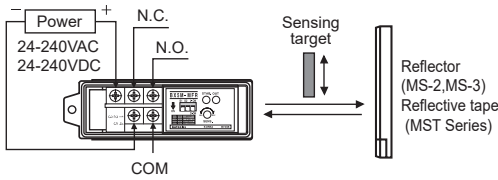
● BX15M-TDT2 BX15M-TDT2-T



◎ Retroreflective type / Retroreflective type with polarizing filter

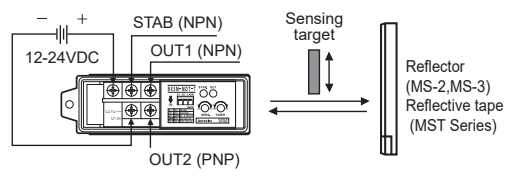
● BX5M-MFR, BX5M-MFR-T (standard type)

● BX3M-PFR, BX3M-PFR-T (built-in polarizing filter)



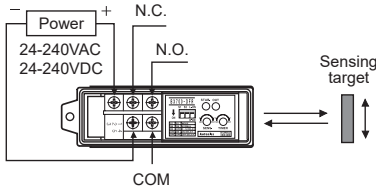
● BX5M-MDT, BX5M-MDT-T (standard type)

● BX3M-PDT, BX3M-PDT-T (built-in polarizing filter)

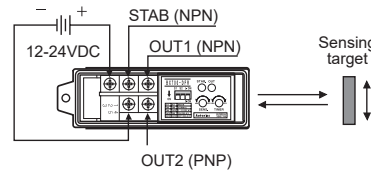


◎ Diffuse reflective type

● BX700-DFR, BX700-DFR-T

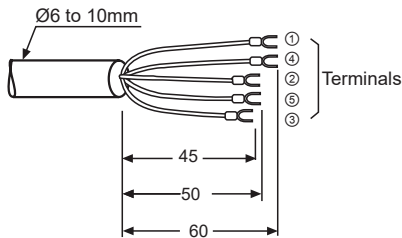


● BX700-DDT, BX700-DDT-T

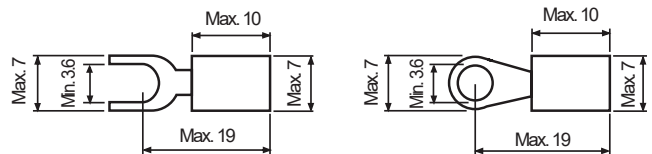


◎ Cable

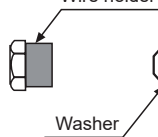
(unit: mm)



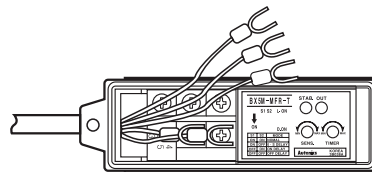
● Terminal size



Wire holder



Cover



※ To connect the wires on the terminal, following as above figures.

※ Select the round wire with the size of Ø6 to 10mm for the waterproof and tighten the cable holder by torque of 1.0 to 1.5N·m.

※ When wiring, tighten the terminal screw with a tightening torque of 0.8N·m.

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

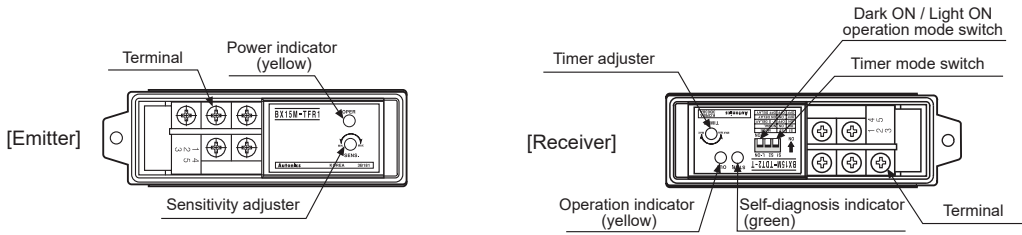
(H) Rotary Encoders

(I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

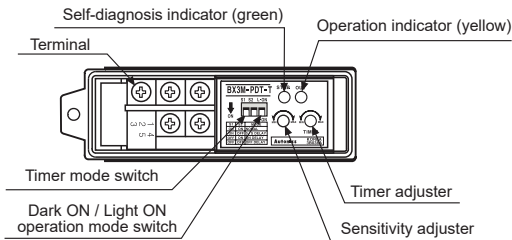
BX Series

■ Front Panel Identification

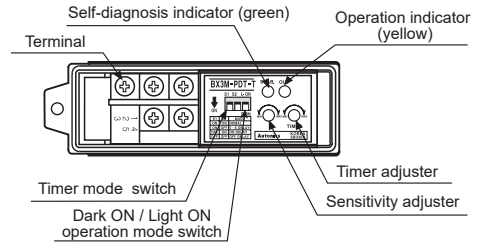
◎ Through-beam type



◎ Retroreflective type (Standard type, Built-in polarizing filter)



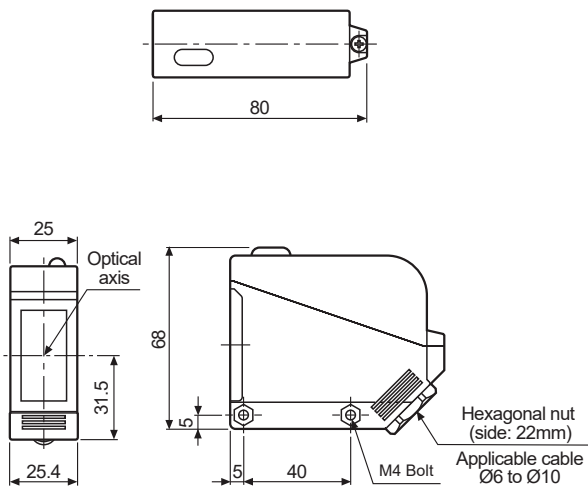
◎ Diffuse reflective type



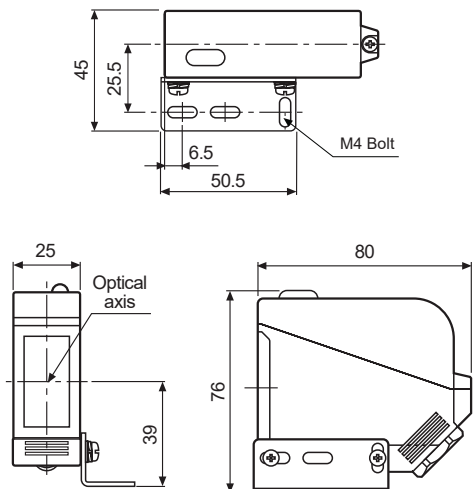
※There are no timer mode switch and the timer adjuster in no timer function type.

■ Dimensions

(unit: mm)



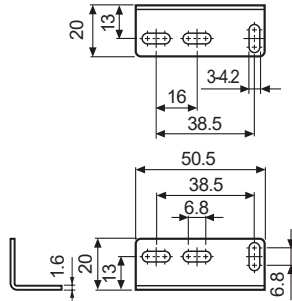
● Connect the bracket



Long Sensing, Amplifier Built-in Type with Universal Voltage (terminal)

■ Dimensions

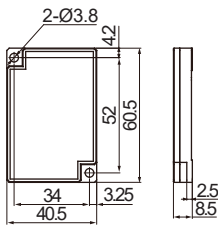
● Bracket



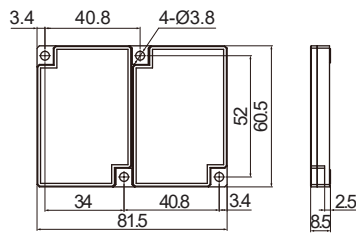
(unit: mm)

● Reflector

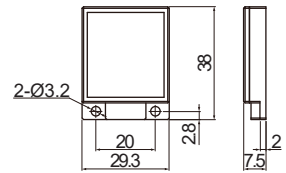
• MS-2



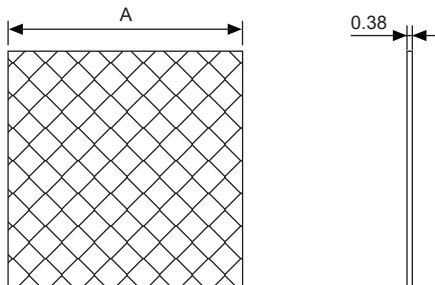
• MS-3



• MS-4 (sold separately)



● Reflective tape (sold separately)



(unit: mm)

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

■ Mounting and Sensitivity Adjustment

Use the product with the protective cover in the place.

Failure to follow this instruction may result in electric shock.

When extending wire, use AWG20 cable or over within 100m.

When using photoelectric sensors closely over two units, it may result in malfunction due to mutual interference.

When installing the product, tighten the wire holder with a tightening torque of 1.0 to 1.5N·m.

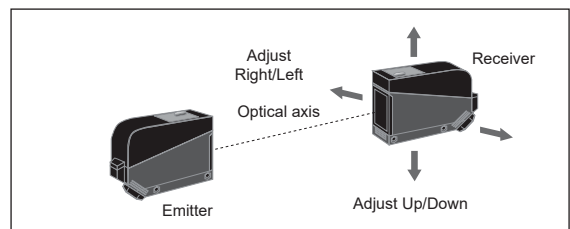
When installing the cover, tighten the screw with a tightening torque of 0.3 to 0.5 N·m.

◎ Through-beam type

1. Supply the power to the photoelectric sensor, after setting the emitter and the receiver facing each other.
2. Set the receiver in center of position in the middle of the operation range of indicator by adjusting the receiver or the emitter right and left, up and down.
3. After the adjustment, check the stability of operation by putting the object at the optical axis.

※If the sensing target is translucent body or smaller than Ø15mm, it can be missed by sensor because light penetrate it.

※Sensitivity adjustment: Refer to the diffuse reflective type's.



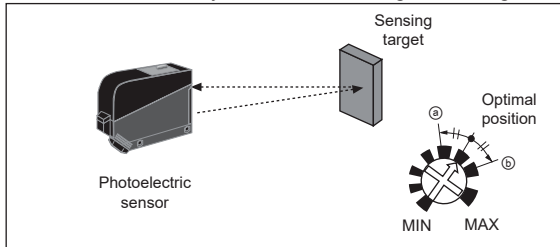
| SENSORS |
|----------------|
| CONTROLLERS |
| MOTION DEVICES |
| SOFTWARE |

| |
|--|
| (A) Photoelectric Sensors |
| (B) Fiber Optic Sensors |
| (C) LIDAR |
| (D) Door/Area Sensors |
| (E) Vision Sensors |
| (F) Proximity Sensors |
| (G) Pressure Sensors |
| (H) Rotary Encoders |
| (I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets |

BX Series

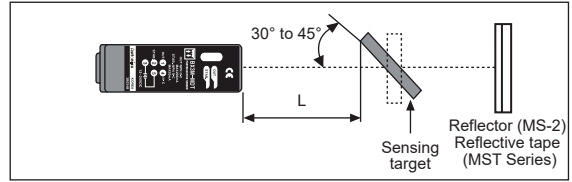
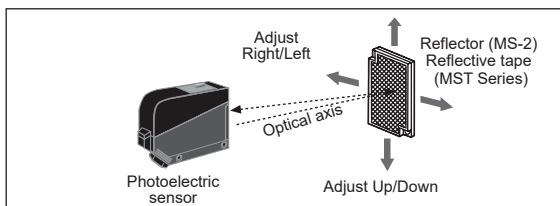
◎ Diffuse reflective type

1. The sensitivity should be adjusted depending on a sensing target or mounting place.
 2. Set the sensing target at a position to be sensed by the beam, then turn the sensitivity adjuster from the min. position of the sensitivity adjuster to the position ㉑ where the operation indicator (yellow LED) turns ON. (The self-diagnosis indicator (green LED) is in OFF status.)
 3. The operation indicator turns OFF, when the sensing target is removed from the position ㉑. Without the sensing target, turn the sensitivity adjuster from the position ㉑ to position ㉒ where the operation indicator (yellow LED) turns ON. (If the operation indicator does not turn ON, max. position of the sensitivity adjuster is ㉒.)
 4. Set the sensitivity adjuster at the center of two switching position ㉑, ㉒.
- ※Above sensitivity adjustment is for Light ON mode. If it is for Dark ON mode, operation indicator (yellow LED) operates opposite.
- ※The sensing distance indicated on specification chart is for 200×200mm of non-glossy white paper. Be sure that it can be different by size, surface and gloss of target.

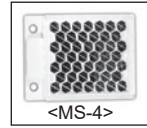


◎ Retroreflective type

1. Supply the power to the photoelectric sensor, after setting the photoelectric sensor and the reflector or reflective tape face to face.
 2. Set the photoelectric sensor in the position which indicator turns on, by adjusting the reflector (or reflective tape) or the sensor right and left, up and down.
 3. Fix both units tightly after checking that the unit detects the target.
- ※If using more than 2 photoelectric sensors in parallel, the space among them should be more than 30cm.
- ※If reflectance of target is higher than non-glossy white paper, it might cause malfunction by reflection from the target when the target is near to photoelectric sensor. Therefore put enough space between the target and the photoelectric sensor or the surface of the target should be installed at angle of 30° to 45° against optical axis. (When a sensing target with high reflectance near by, photoelectric sensing with the polarizing filter should be used.)
- ※Sensitivity adjustment: Refer to the diffuse reflective type's.

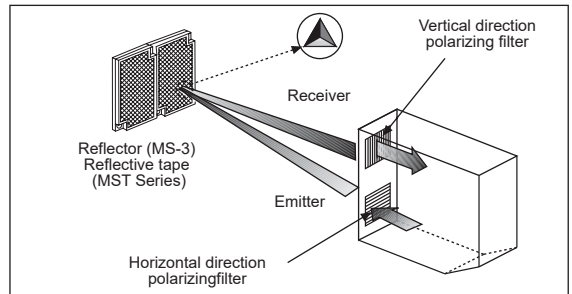


- ※If the mounting place is too narrow, please use MS-4 instead of MS-2.
- ※Please use reflective tape (MST Series) for where a reflector is not installed.



◎ Retroreflective type (Built-in polarizing filter)

The light passed through the polarizing filter of the emitter reaches to the MS-3 reflector or reflective tape converting as horizontal direction. It reaches to the receiver element of polarizing filter converting as vertical by the MS-3 reflector or reflective tape. Therefore, this type can also detect reflective mirror.



- ※Please use reflective tape (MST Series) for where a reflector is not installed.

■ Reflectivity by Reflective Tape Model

| Model | Standard | Built-in polarizing filter |
|-----------------------|----------|----------------------------|
| MST-50-10 (50×50mm) | 90% | 30% |
| MST-100-5 (100×100mm) | 100% | 40% |
| MST-200-2 (200×200mm) | 110% | 60% |

- ※This reflectivity is based on the reflector (MS-2).
- ※Reflectivity may vary depending on usage environment and installation conditions.
- The sensing distance and minimum sensing target size increase as the size of the tape increases. Please check the reflectivity before using reflective tapes.
- ※For using reflective tape, installation distance should be min. 20mm.