Autonics

# PHOTOELECTRIC SENSOR
# BR SERIES
## INSTRUCTION MANUAL

Cable type | Connector type | Reflector (MS-2) | Reflective tape (MST Series)

Thank you very much for selecting Autonics products.
**For your safety, please read the following before using.**

## ■ Safety Considerations

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

※Safety considerations are categorized as follows.
**⚠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 property damage.

※The symbols used on the product and instruction manual represent the following
⚠ symbol represents caution due to special circumstances in which hazards may occur.

### ⚠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, fire, or economic loss.

### ⚠Caution

1. **Do not use the unit outdoors.**
   Failure to follow this instruction may result in shorten the life cycle of the unit or malfunction. Use the unit indoors only. Do not use the unit outdoors, where it may be affected out external environmental factors. (e.g. rain, dust, frost, sunlight, condensation, etc.)
2. **Do not use the unit where flammable or explosive gas, humidity, direct sunlight, radiant heat may be present.**
   Failure to follow this instruction may result in fire or explosion.
3. **Do not use loads beyond the rated voltage range. Do not supply AC power.**
   Failure to follow these instructions may result in product damage.
4. **Check the polarity of the power before wiring the unit.**
   Failure to follow this instruction may result in product damage.
5. **Do not use the unit where heavy vibration or impact may be present.**
   Failure to follow this instruction may result in product damage.
6. **Do not use water or oil-based detergent when cleaning the unit.**
   Failure to follow this instruction may result in fire.

## ■ Ordering information

BR P 100 – T D T □ □ □ – C – P

| | | |
|---|---|---|
| Control output | No-mark | NPN open collector output |
| | P | PNP open collector output |
| Connection type | No-mark | Cable type |
| | C | Connector type |
| Emitter/Receiver | No-mark | Single body type |
| | 1 | Emitter |
| | 2 | Receiver |
| Operation mode | No-mark | Light ON/Dark ON switching |
| | L | Light ON |
| | D | Dark ON |
| Optic properties | No-mark | Standard type |
| | N | Narrow beam reflective type |
| Output | T | Transistor output |
| Power supply | D | DC power |
| Sensing type | T | Through-beam type |
| | D | Diffuse reflective type |
| | M | Retroreflective type |
| Sensing distance | No-mark | Unit: mm |
| | M | Unit: m |
| Case material | No-mark | Metal |
| | P | Plastic |
| Item | BR | Photoelectric sensor series |

※□: This information is intended for product management of through-beam type.
It is not required when ordering a model.

## ■ Operation mode

| Operation mode | Light ON | Dark ON |
|---|---|---|
| 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 transistor output will be held OFF for 0.5 sec. after supplied power in order to prevent malfunction of this photoelectric sensor(except through-beam type).
※If the control output terminal is short-circuited or flows beyond the rated current, the control signal will not be output normally due to protection circuit.

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

## ■ Specifications

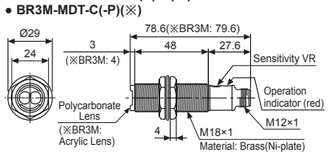
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | NPN open collector output | BRP100-DDT(-C) | BR100-DDT(-C) | BRP400-DDT(-C) | BR400-DDT(-C) | BRP200-DDTN(-C) | BR200-DDTN(-C) | BRP3M-MDT(-C) | BR3M-MDT(-C) | BR4M-TDTD(-C) | BR20M-TDTD(-C) | BR4M-TDTL(-C) | BR20M-TDTL(-C) |
| | PNP open collector output | BRP100-DDT(-C)-P | BR100-DDT(-C)-P | BRP400-DDT(-C)-P | BR400-DDT(-C)-P | BRP200-DDTN(-C)-P | BR200-DDTN(-C)-P | BRP3M-MDT(-C)-P | BR3M-MDT(-C)-P | BR4M-TDTD(-C)-P | BR20M-TDTD(-C)-P | BR4M-TDTL(-C)-P | BR20M-TDTL(-C)-P |
| Case | | Plastic | Metal | Plastic | Metal | Plastic | Metal | Plastic | Metal | Metal | | | |
| Sensing type | | Diffuse reflective | | | | Narrow beam reflective | | Retroreflective | | Through-beam | | | |
| Sensing distance | | 100mm※1 | | 400mm※2 | | 200mm※2 | | 0.1 to 3m※3 | | 4m | 20m | 4m | 20m |
| Sensing target | | Translucent, Opaque materials | | | | | | Opaque materials of min. Ø60mm | | Opaque materials of min. Ø15mm | | | |
| Hysteresis | | Max. 20% at rated setting distance | | | | | | — | | | | | |
| Response time | | Max. 1ms | | | | | | | | | | | |
| Power supply | | 12-24VDC ±10% (Ripple P-P: Max. 10%) | | | | | | | | | | | |
| Current consumption | | Max. 45mA | | | | | | | | | | | |
| Light source | | Infrared LED (940nm) | | Infrared LED (850nm) | | | | Red LED (660nm) | | Infrared LED (850nm) | | | |
| Sensitivity adjustment | | Built-in the adjustment VR | | | | | | | | Fixed | | | |
| Operation mode | | Selectable Light ON or Dark ON by control cable (White) | | | | | | | | Dark ON | | Light ON | |
| Control output | | NPN or PNP open collector output<br>• Load voltage: Max. 30VDC • Load current: Max. 200mA<br>• Residual voltage - NPN: Max. 1V, PNP : Max. 2.5V | | | | | | | | | | | |
| Protection circuit | | Reverse polarity protection circuit, Output short-circuit protection circuit | | | | | | | | | | | |
| Indicator | | Operation indicator: red LED, Power indicator: red LED (only for emitter of through-beam type) | | | | | | | | | | | |
| Insulation resistance | | Min. 20MΩ (at 500VDC megger) | | | | | | | | | | | |
| Noise resistance | | ±240V the square wave noise (pulse width: 1μs) by the noise simulator | | | | | | | | | | | |
| Dielectric strength | | 1,000VAC 50/60Hz for 1 minute | | | | | | | | | | | |
| Vibration | | 1.5mm amplitude at frequency of 10 to 55Hz (for 1 min.) in each of X, Y, Z directions for 2 hours | | | | | | | | | | | |
| Shock | | 500m/s² (approx. 50G) in each X, Y, Z directions for 3 times | | | | | | | | | | | |
| Environment | Ambient illumination | Sunlight: Max. 11,000lx, Incandescent lamp: Max. 3,000lx (Receiver illumination) | | | | | | | | | | | |
| | Ambient temp. | -10 to 60℃, Storage: -25 to 75℃ | | | | | | | | | | | |
| | Ambient humi. | 35 to 85%RH, Storage: 35 to 85%RH | | | | | | | | | | | |
| Protection | | IP66 (IEC standard) (BR20M Series: IP67) | | | | | | | | | | | |
| Material | | • Case - BRP: Polyamide(Black)<br>BR: Brass, Ni-plate<br>• Sensing part - Polycarbonate Lens | | | | | | • Case - BRP3M: Polyamide (Black) BR3M: Brass,Ni-plate<br>• Sensing part - Acrylic Lens | | • Case - Brass, Ni-plate<br>• Sensing part - BR4M: Glass Lens, BR20M: Polycarbonate Lens | | | |
| Cable | | Ø5mm, 4-wire, Length: 2m (Emitter of through-beam type: Ø5mm, 2-wire, Length: 2m / Receiver: Ø5mm, 3-wire, Length: 2m) (AWG22, Core diameter: 0.08mm, Number of cores: 60, Insulator diameter: Ø1.25mm) | | | | | | | | | | | |
| Accessory | Individual | VR adjustment driver | | | | | | VR adjustment driver, Reflector (MS-2) | | — | | | |
| | Common | • BR: Fixing Nuts, Washer • BRP: Fixing Nuts | | | | | | | | | | | |
| Approval | | CE | | | | | | | | | | | |
| Weight※4 | | • BRP: Approx. 140g (approx. 100g) • BR: Approx. 160g (approx. 120g)<br>• BRP-C: Approx. 70g (approx. 30g) • BR-C: Approx. 90g (approx. 50g) | | | | | | | | • BR: Approx. 340g (approx. 300g)<br>• BR-C: Approx. 150g (approx. 110g) | | | |

※1: Non-glossy white paper 50×50mm ※2: Non-glossy white paper 100×100mm.
※3: The sensing distance is specified with using the MS-2 reflector. Sensing distance is the setting range of the reflector. The sensor can detect under 0.1m. When using reflective tapes, the reflectivity will vary by the size of the tape. Please refer to the catalog or website.
※4: The weight is with packaging and the weight in parentheses is only unit weight.
※Tightening torque for connector is 0.39 to 0.49N·m.
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

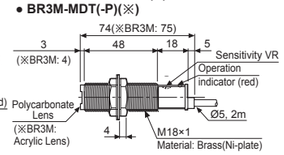
## ■ Dimensions

(unit: mm)

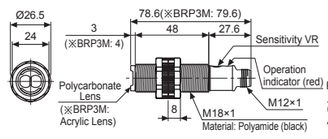
● **BR100/200/400-DDT(N)-C(-P)**
● **BR3M-MDT-C(-P)(※)**



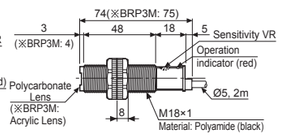

● **BR100/200/400-DDT(N)-P**
● **BR3M-MDT(-P)(※)**



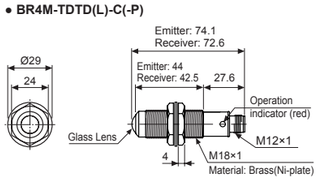

● **BRP100/200/400-DDT(N)-C(-P)**
● **BRP3M-MDT-C(-P)(※)**



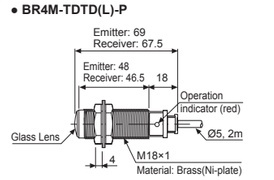

● **BRP100/200/400-DDT(N)-P**
● **BRP3M-MDT(-P)(※)**



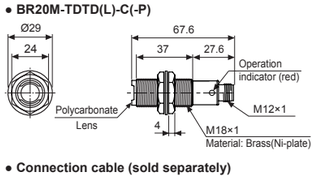

● **BR4M-TDTD(L)-C(-P)**



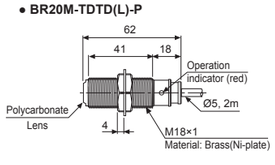

● **BR4M-TDTD(L)-P**




● **BR20M-TDTD(L)-C(-P)**

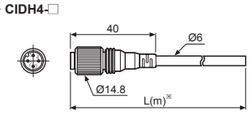



● **BR20M-TDTD(L)-P**

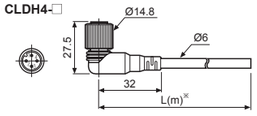



● **Connection cable (sold separately)**

● **CIDH4-□**

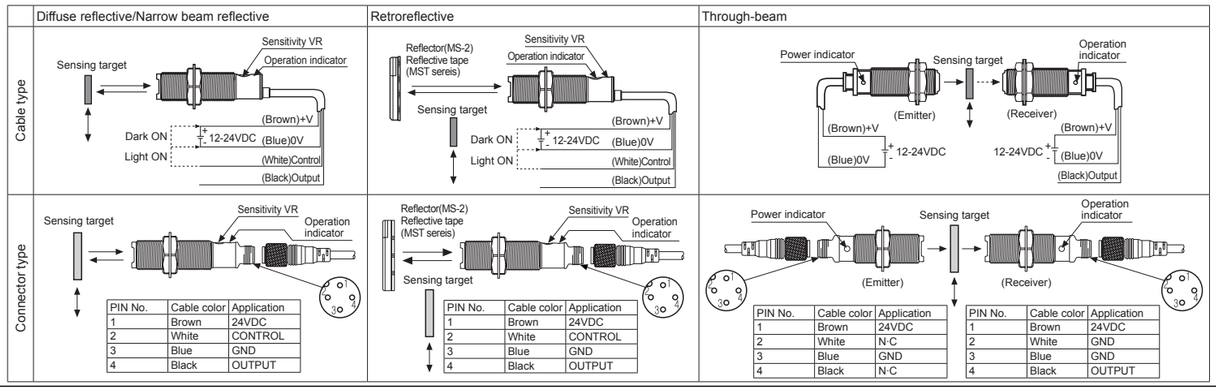



● **CLDH4-□**

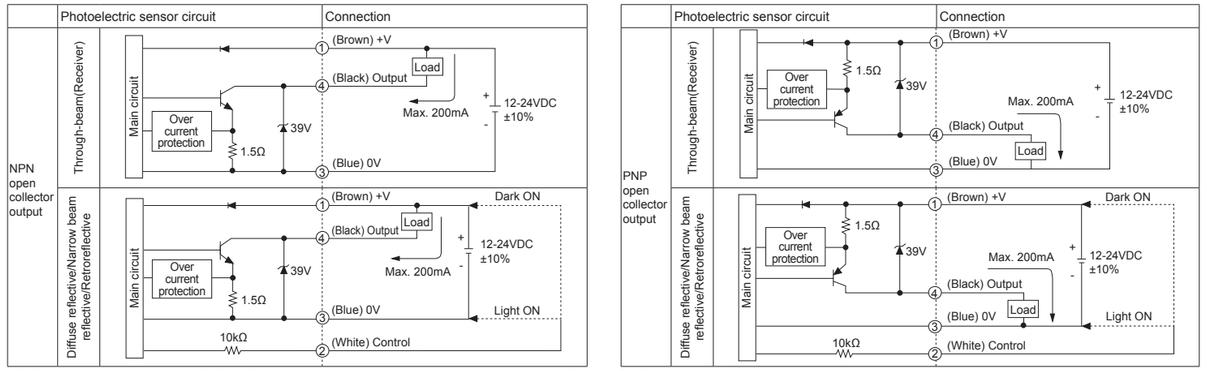



※Specification of Connector Cable: Ø6mm, 4-wire, Length: 2m/3m/5m/7m
(AWG22, core diameter: 0.08mm, number of cores: 60, insulator out diameter: Ø1.25mm)

## ■ Connections




## ■ Control output circuit diagram




※Before using this unit, select Light ON/Dark ON with control cable. (Light ON: Connect control cable with 0V/Dark ON: Connect control cable with +V)
※Control cable is only for Diffuse reflective/Narrow beam reflective/Retroreflective type.

## ■ Installation and sensitivity adjustment

Please supply the power to the sensor, after setting the emitter and the receiver in face to face, and then adjust an optical axis and the sensitivity as follow;

◎ **Diffuse reflective/Narrow beam reflective type**
1. The sensitivity should be adjusted depending on a sensing target or mounting place.
2. Set the target at a position to be detected by the beam, then turn the Sensitivity VR until position ⓐ where the operation indicator turns ON from min. position of the Sensitivity VR.
3. Take the target out of the sensing area, then turn the Sensitivity VR until position ⓑ where the operation indicator turns ON. If the indicator dose not turn ON, max. position is ⓑ.
4. Set the Sensitivity VR at the center of two switching position ⓐ, ⓑ.

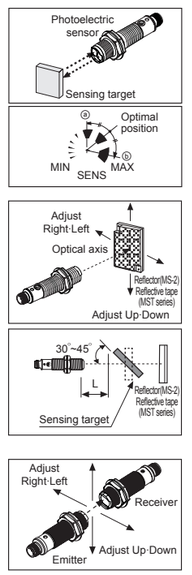
※The sensing distance indicated on specification chart is for 100×100mm or 50×50mm of non-glossy white paper. Be sure that it can be different by size, surface and gloss of target.

◎ **Retroreflective type**
1. Supply the power to the photoelectric sensor, after setting the photoelectric sensor and the reflector (MS-2) or reflective tape face to face.
2. Set the photoelectric sensor in the position which indicator turns on, by adjusting the reflector or the sensor right and left, up and down.
3. Fix both units tightly after checking that the unit detects the target.

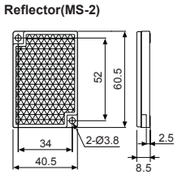
※If using more than 2 photoelectric sensors in parallel, the space among them should be more than 30cm.
※If reflectance of target is higher than non-glossy white paper, it might cause malfunction by reflection from the target when the target is near to photoelectric sensor. Therefore put enough space 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 sed.)
※Sensitivity adjustment: Please see the diffuse reflective/narrow beam reflective type.

◎ **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.

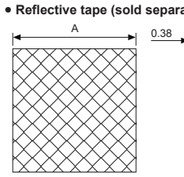
※If the sensing target is translucent body or smaller than Ø15mm, it can be missed by sensor because light penetrate it.




● **Reflector(MS-2)**



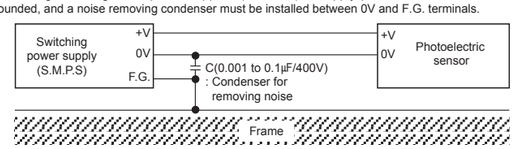

● **Reflective tape (sold separately)**




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

## ■ Caution for using

1. Use a visor or a hood so that excessive light (e.g. sunlight, spotlight) does not directly enter into the inclination angle of the sensor.
2. The sensor may malfunction under fluorescent lighting. Please use a visor if necessary.
3. When more than 2 sets of Through-beam type sensor are used closely, it might cause interference each other. Be sure to put enough space between them in order to avoid malfunction.
4. When more than 2 sets of diffuse reflective beam type or narrow beam reflective type are installed adjacently, it can occur malfunction by light beam from the other target. So it must be installed at an enough interval.
5. If the sensor is installed directly on a flat surface, the reflection off the surface may cause malfunction. Make sure there is enough space between the sensor and the surface.
6. If the sensor is wired with a high voltage line or power line, it may cause product damage or malfunction. Use separate wiring or a dedicated conduit.
7. Avoid installation in places where dust or corrosion may be present, as it may cause product malfunction.
8. When connecting a DC relay or other inductive load to the output, remove power surge by using diodes or varistors.
9. Please use short cables for wiring the sensors. Power surge from extended wiring may cause product malfunction.
10. When the lens is stained by foreign substances, clean the lens lightly with dry cloth. Do not use chemical or organic solvents.
11. When using switching mode power supplies (S.M.P.S.) to supply power, the F.G. terminal must be grounded, and a noise removing condenser must be installed between 0V and F.G. terminals.




12. This unit may be used in the following environments.
①Indoor. ②Altitude up to 2,000m
③Pollution degree 3 ④Installation category II

※**Failure to follow these instructions 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, $Co_2$, 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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