

BEN Series

Compact, universal voltage type with built-in amplifier

■ Features

- Small and universal voltage type.
- Easy installation with LED indicators on product.
- Able to set the operation mode by switch.
(Light ON/Dark ON)
- Able to check the operation status by stable LED indicator and output LED indicator.
- Built-in IC photo diode for ambient light and electrical noise.



(MS-2)

(MS-4)

*MS-4 is optional

! Please read "Caution for your safety" in operation manual before using.



■ Specifications

● AC/DC power, Relay contact output

| Model | BEN10M-TFR | BEN5M-MFR | BEN3M-PFR | BEN300-DFR |
|-------------------------|---|--|--|--|
| Sensing type | Transmitted beam | Retroreflective (Standard type) | Retroreflective (with polarizing filter) | Diffuse reflective |
| Sensing distance | 10m | (*1) 0.1 ~ 5m | (*1) 0.1 ~ 3m | (*2) 500mm |
| Sensin target | Opaque materials of Min. ϕ 16mm | Opaque materials of Min. ϕ 60mm | | Transparent, Translucent, Opaque materials |
| Hysteresis | ————— | | | Max. 20% at rated setting distance |
| Response time | Max. 20ms | | | |
| Power supply | 24-240VAC \pm 10% 50/60Hz, 24-240VDC \pm 10% (Ripple P-P:Max. 10%) | | | |
| Power consumption | Max. 3VA | | | |
| Light source | Infrared LED(modulated) | | Red LED (Modulated : 660nm) | Infrared LED(modulated) |
| Sensitivity adjustment | ————— | Adjustable VR | | |
| Operation mode | Light ON or Dark ON mode selectable by switch | | | |
| Control output | Relay contact output (Contact capacity : 30VDC 3A resistive load, 250VAC 3A resistive load, Relay contact composition : 1c) | | | |
| Relay life cycle | Mechanically : Min. 50,000,000, Electrically : Min. 100,000 | | | |
| Light receiving element | Built-in IC type photo diode | | | |
| Indicator | Operation indicator : Orange, Stable indicator : Green (The orange lamp on Emitter of transmitted beam type is for power indication) | | | |
| Connection | Outgoing cable | | | |
| Insulation resistance | Min. 20M Ω (at 500VDC) | | | |
| Noise strength | \pm 1000V the square wave noise (pulse width:1 μ s) by the noise simulator | | | |
| Dielectric strength | 1000VAC 50/60Hz for 1minute | | | |
| Vibration | Mechanical | 1.5mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours | | |
| | Malfuction | 1.5mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 10 minutes | | |
| Shock | Mechanical | 500m/s ² (50G) in X, Y, Z directions for 3 times | | |
| | Malfuction | 100m/s ² (10G) in X, Y, Z directions for 3 times | | |
| Ambient illumination | Sunlight : Max. 11,000lx, Incandescent lamp : Max. 3,000lx | | | |
| Ambient temperature | -20 ~ +65 $^{\circ}$ C (at non-freezing status), Storage: -25 ~ +70 $^{\circ}$ C | | | |
| Ambient humidity | 35 ~ 85%RH, Storage : 35 ~ 85%RH | | | |
| Material | Case : ABS, Lens cover : Acrylic, Lens : Acrylic | | | |
| Protection | IP65 (IEC standard) | | | |
| Cable | ϕ 6.0mm, 5P, Length : 2m | | | |
| Accessory | Individual | ————— | Reflector (MS-2) | ————— |
| | Common | Adjustment driver, Fixing bracket, Bolts/Nuts | | |
| Unit weight | Approx. 354g | Approx. 208g | | Approx. 195g |

*(*1) Sensing distance of retroreflective type is against MS-2 it shows settable range between reflector and photo sensor and it is able to detect a target within under 0.1m.

*(*2) It is for Non-glossy white paper(100 \times 100mm).

Universal Voltage Type with Built-in Amplifier

●DC power, Solid state output

| Model | BEN10M-TDT | BEN5M-MDT | BEN3M-PDT | BEN500-DDT |
|-------------------------|--|---|--|--|
| Sensing type | Transmitted beam | Retroreflective | Retroreflective (with polarizing filter) | Diffuse reflective |
| Sensing distance | 10m | (★1) 0.1 ~ 5m | (★1) 0.1 ~ 3m | (★2) 500mm |
| Sensing target | Opaque materials of Min. ϕ 16mm | Opaque materials of Min. ϕ 60mm | | Transparent, Translucent, Opaque materials |
| Hysteresis | _____ | | | Max. 20% at sensing distance |
| Response time | Max. 1ms | | | |
| Power supply | 12-24VDC \pm 10% (Ripple P-P : Max. 10%) | | | |
| Current consumption | Max. 40mA | | | |
| Light source | Infrared LED(modulated) | | Red LED (modulated, 660nm) | Infrared LED(modulated) |
| Sensitivity adjustment | _____ | Adjustable VR | | |
| Operation mode | Light ON or Dark ON selectable by switch | | | |
| Control output | ●NPN/PNP output simultaneously • NPN open collector output \Rightarrow Load voltage:Max. 30VDC, Load current:Max. 200mA, Residual voltage:Max. 1V • PNP open collector output \Rightarrow Output voltage:Min. (Power supply-2.5)V, Load current:Max. 200mA | | | |
| Protection circuit | Reverse polarity protection, Short-circuit protection | | | |
| Light receiving element | Built-in IC type photo diode | | | |
| Indicator | Operation indicator : Orange, Stable indicator : Green (The orange lamp on Emitter of transmitted beam type is for power indication) | | | |
| Connection | Outgoing cable | | | |
| Insulation resistance | Min. 20M Ω (at 500VDC) | | | |
| Noise strength | \pm 240V the square wave noise (pulse width:1 μ s) by the noise simulator | | | |
| Dielectric strength | 1000VAC 50/60Hz for 1minute | | | |
| Vibration | 1.5mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours | | | |
| Shock | 500m/s ² (50G) in X, Y, Z directions for 3 times | | | |
| Ambient illumination | Sunlight : Max. 11,000lx, Incandescent lamp : Max. 3,000lx | | | |
| Ambient temperature | -20 ~ +55 $^{\circ}$ C (at non-freezing status), Storage : -25 ~ +70 $^{\circ}$ C | | | |
| Ambient humidity | 35 ~ 85%RH, Storage : 35 ~ 85%RH | | | |
| Protection | IP65 (IEC standard) | | | |
| Material | Case : ABS, Lens cover : Acrylic | | | |
| Cable | ϕ 6.0mm, 4P, Length : 2m | | | |
| Accessory | Individual | _____ | Reflector (MS-2) | _____ |
| | Common | Adjustment driver, Fixing bracket, Bolts/Nuts | | |
| Approval | CE | | | |
| Unit weight | Approx. 342g | Approx. 200g | | Approx. 187g |

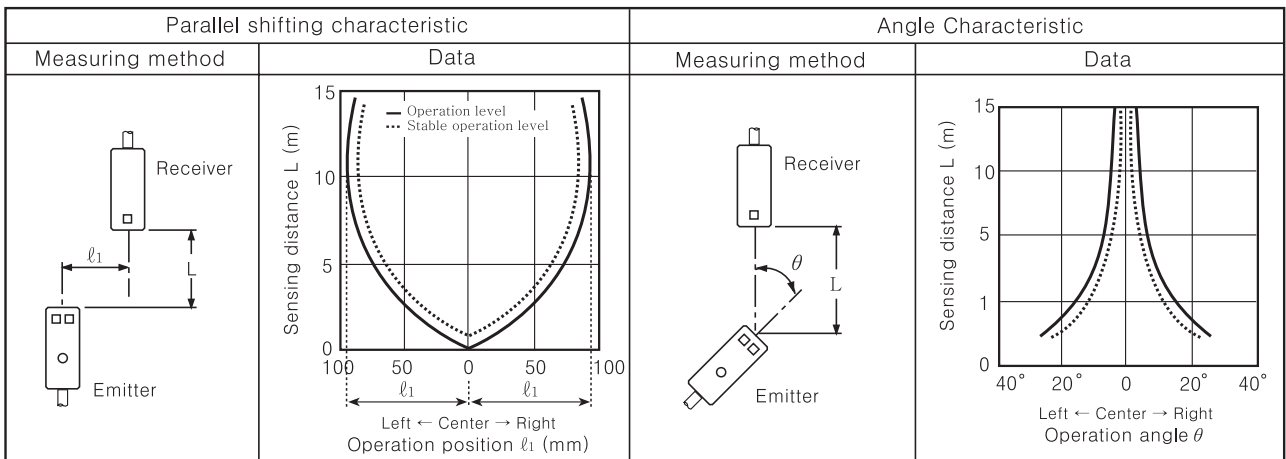
※ (★1) Sensing distance of retroreflective type is against MS-2, it shows settable range between reflector and photo sensor and it is able to detect a target within under 0.1m.

※ (★2) It is for Non-glossy white paper (100 \times 100mm).

■ Feature data

○ Transmitted beam

● BEN10M-TFR ● BEN10M-TDT



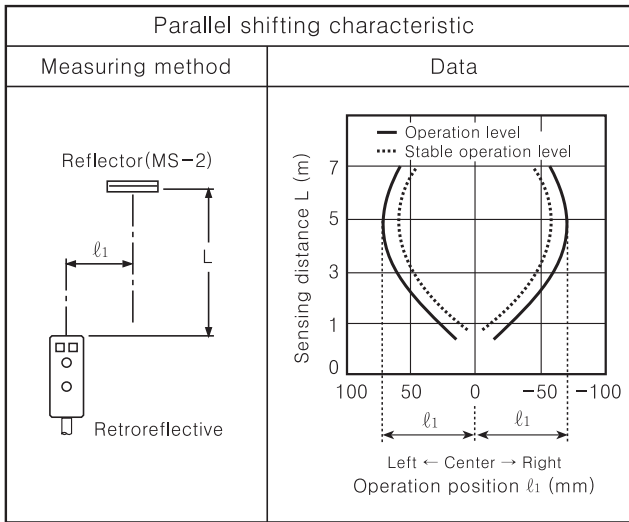
(A) Counter
(B) Timer
(C) Temp. controller
(D) Power controller
(E) Panel meter
(F) Tacho/Speed/Pulse meter
(G) Display unit
(H) Sensor controller
(I) Switching power supply
(J) Proximity sensor
(K) Photo electric sensor
(L) Pressure sensor
(M) Rotary encoder
(N) Stepping motor & Driver & Controller
(O) Graphic panel
(P) Production stoppage models & replacement

BEN Series

Feature data

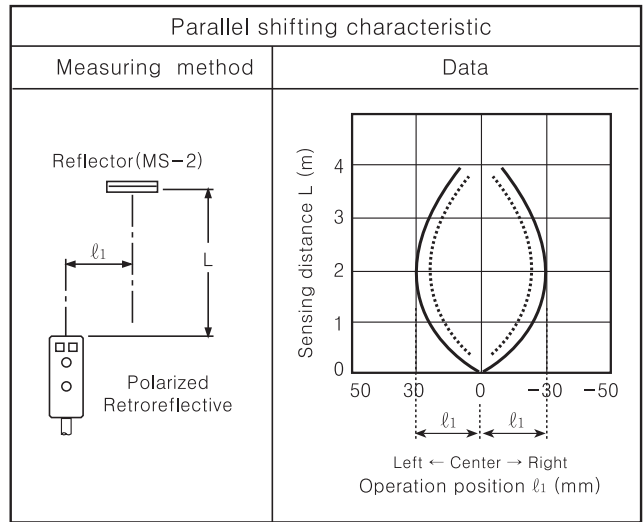
Retroreflective

●BEN5M-MFR ●BEN5M-MDT

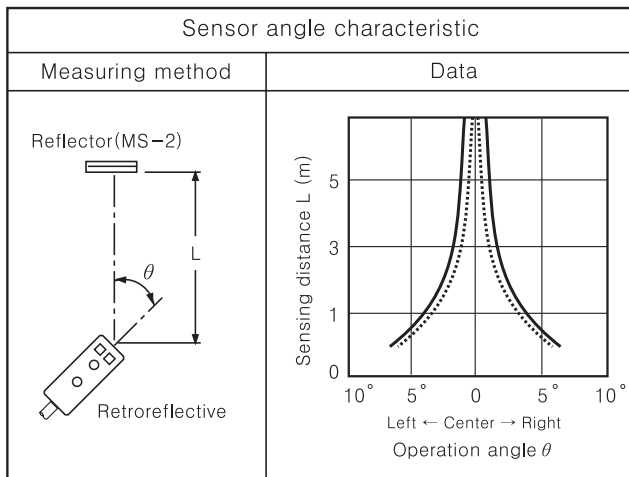


Polarized retroreflective

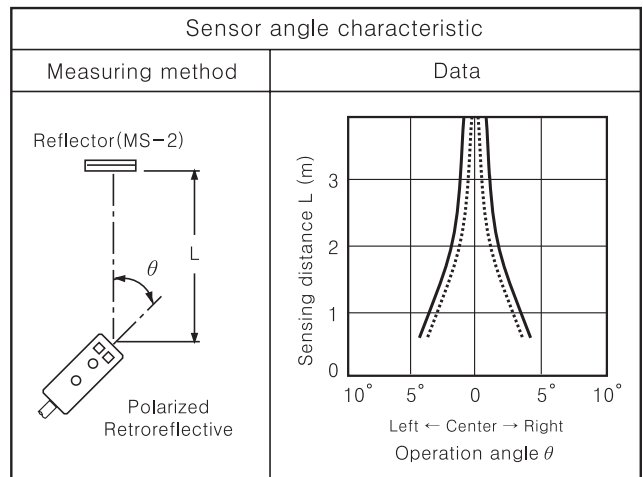
●BEN3M-PFR ●BEN3M-PDT



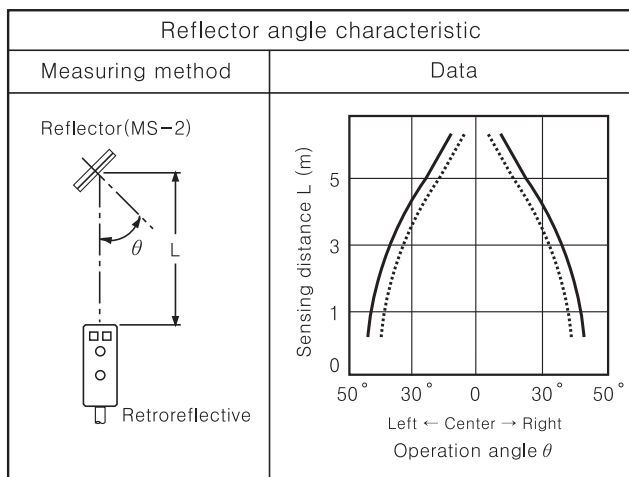
●BEN5M-MFR ●BEN5M-MDT



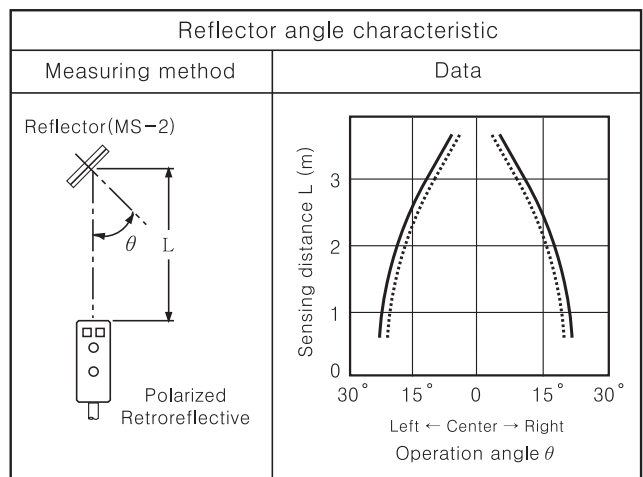
●BEN3M-PFR ●BEN3M-PDT



●BEN5M-MFR ●BEN5M-MDT



●BEN3M-PFR ●BEN3M-PDT

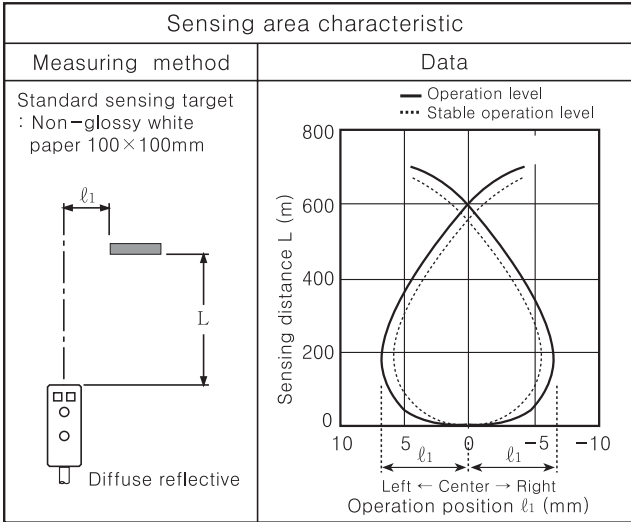


Universal Voltage Type with Built-in Amplifier

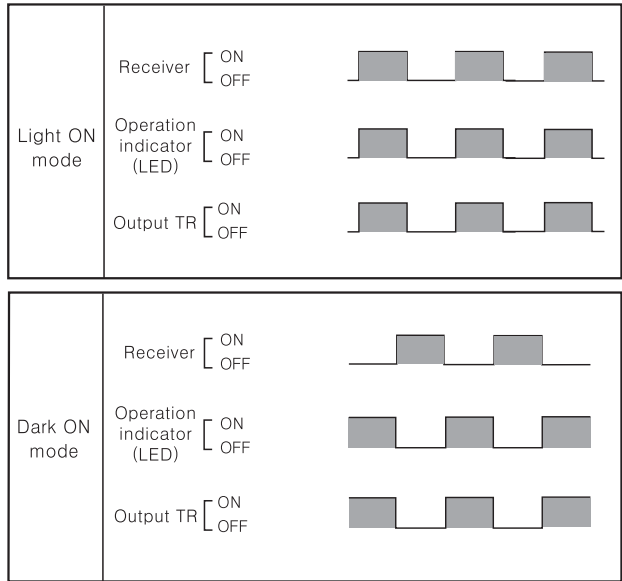
Feature data

● Diffuse reflective

● BEN300-DFR ● BEN300-DDT

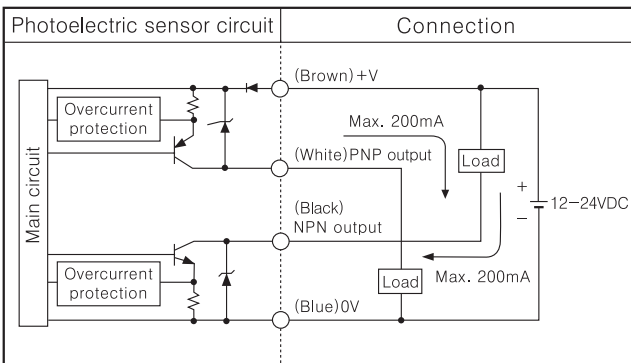


Operation mode

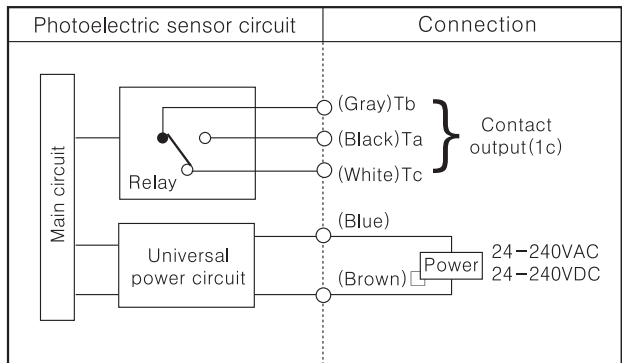


Control output diagram

● DC voltage (NPN/PNP 2 output)



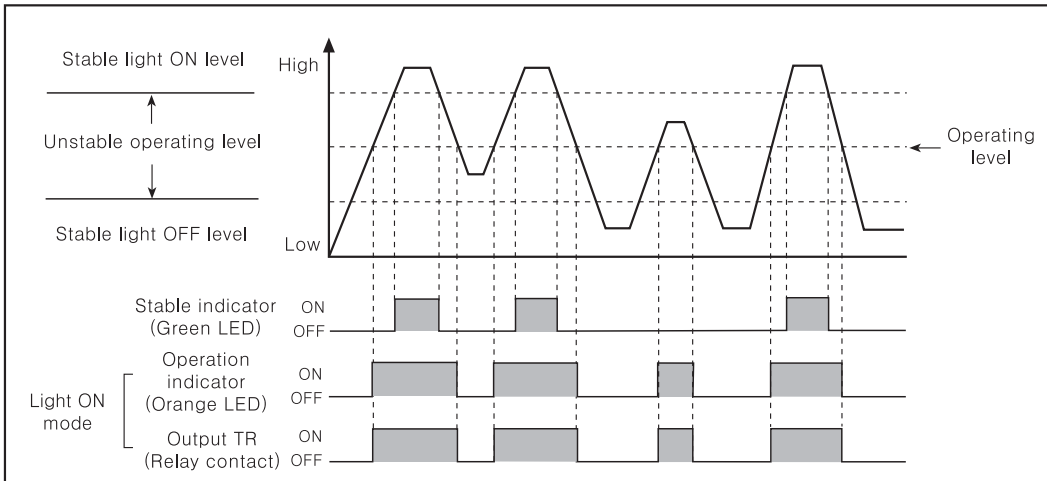
● Universal voltage (Relay contact output)



※ In case of product with the output protection device, if terminals of control output are short circuited or overcurrent condition is existed, the control output will turn off due to protection circuit.

Operation mode and timing chart

● Light ON mode



※ The waveform of output TR and operation indicator are the state of operation for Light ON mode, but in case of Dark ON mode, it operates as reverse against Light ON mode.

(A) Counter

(B) Timer

(C) Temp. controller

(D) Power controller

(E) Panel meter

(F) Tacho/Speed/Pulse meter

(G) Display unit

(H) Sensor controller

(I) Switching power supply

(J) Proximity sensor

(K) Photo electric sensor

(L) Pressure sensor

(M) Rotary encoder

(N) Stepping motor & Driver & Controller

(O) Graphic panel

(P) Production stoppage models & replacement

BEN Series

Connections

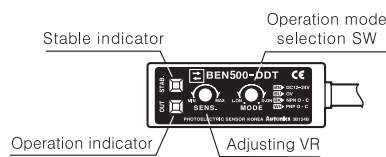
| Transmitted beam | | Retroreflective | Diffuse reflective |
|---|--|--|--------------------|
| <ul style="list-style-type: none"> ●BEN10M-TFR1 ●BEN10M-TFR2 <p>24-240VAC 24-240VDC (Brown) (Blue) Tc Ta Tb</p> | <ul style="list-style-type: none"> ●BEN5M-MFR/BEN3M-PFR (with polarizing filter) <p>24-240VAC 24-240VDC (Brown) (Blue) Tc Ta Tb</p> | <ul style="list-style-type: none"> ●BEN500-DFR <p>24-240VAC 24-240VDC (Brown) (Blue) Tc Ta Tb</p> | |
| <ul style="list-style-type: none"> ●BEN10M-TDT1 ●BEN10M-TDT2 <p>12-24VDC (Brown) (Blue) + - PNP (NPN)</p> | <ul style="list-style-type: none"> ●BEN5M-MDT/BEN3M-PDT (with polarizing filter) <p>12-24VDC (Brown) (Blue) + - PNP (NPN)</p> | <ul style="list-style-type: none"> ●BEN500-DDT <p>12-24VDC (Brown) (Blue) + - PNP (NPN)</p> | |

※ Unused line must be insulated.

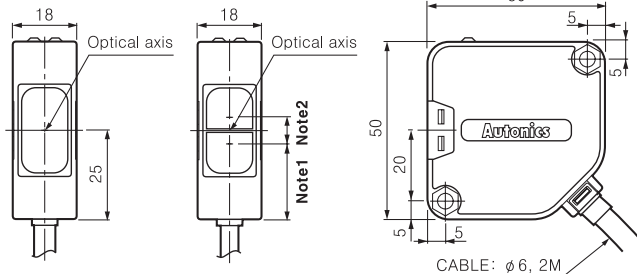
Dimensions

(Unit:mm)

Product

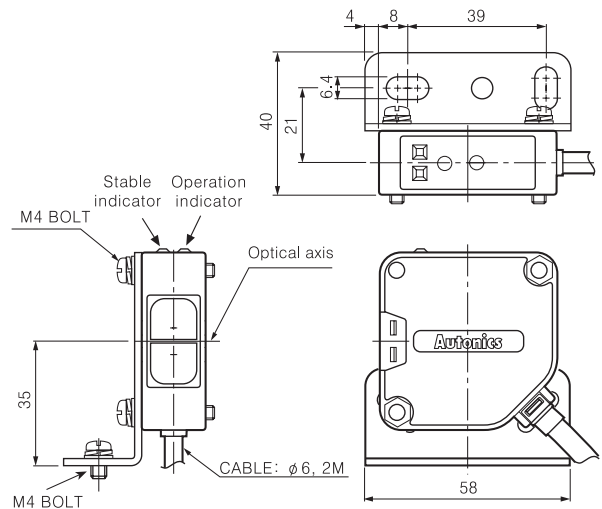


- Transmitted beam
- Retroreflective
- Diffuse reflective



※ Note1) Retroreflective : 21.25mm, Diffuse reflective : 20.25mm
Note2) Retroreflective : 7.5mm, Diffuse reflective : 9.5mm

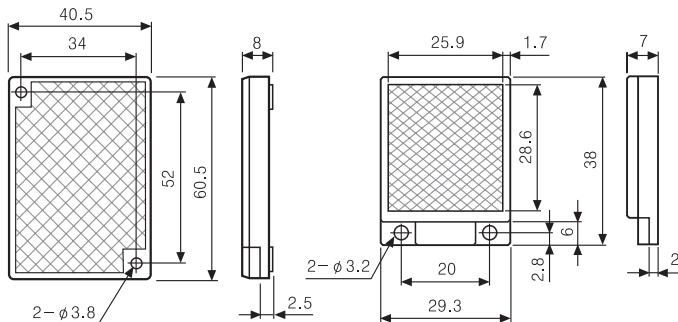
Mounting a bracket



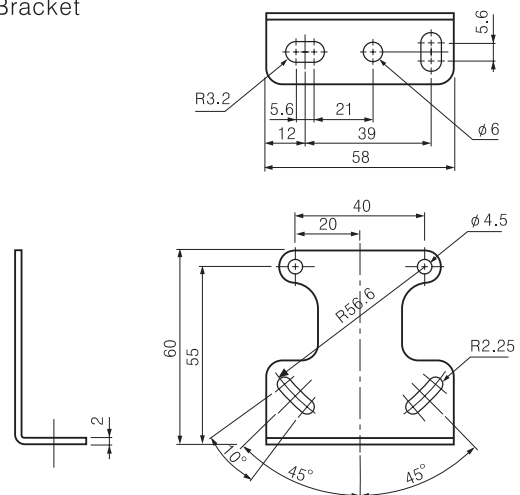
Reflector

<MS-2 >

<MS-4 >



Bracket

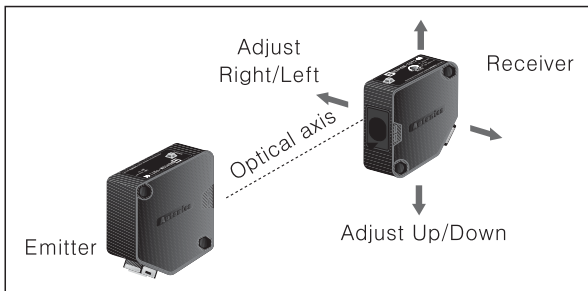


Universal Voltage Type with Built-in Amplifier

■ Mounting and sensitivity adjustment

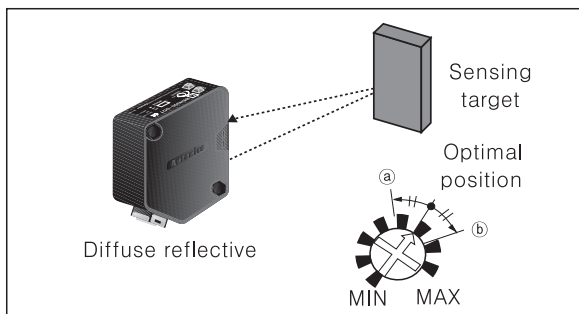
◎ Transmitted beam type

1. Supply the power to the photoelectric sensor, after set the emitter and the receiver facing each other.
 2. Set the receiver in the middle of the operation range of indicator adjusting the receiver or the emitter right and left, up and down.
 3. Adjust up and down direction as the same.
 4. After adjustment, check the stability of operation putting the object at the optical axis.
- ※If the sensing target is translucent body or smaller than $\phi 16\text{mm}$, it can be missed by sensor cause light passed.



◎ Diffuse reflective type

1. Adjust sensitivity regarding the effectiveness of behind object or mounting side.
 2. Set the target at a position to be detected by the beam, then turn the adjuster until position ① in the middle of the operation range of indicator from min. position of the adjuster.
 3. Take the target out of the sensing area, then turn the adjuster until position ② where the indicator turns on. If the indicator does not turn on, Max. position is position ③.
 4. Set the adjuster at the middle of two switching position ①, ②.
- ※The sensing distance indicated on specification chart is against $100 \times 100\text{mm}$ of non-glossy white paper. Be sure that it can be different by size, surface and gloss of target.

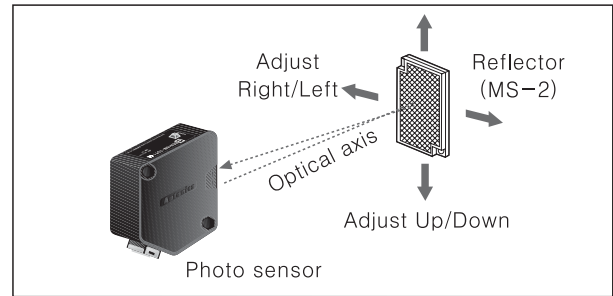


◎ Retroreflective type

1. Supply the power, after set the photoelectric sensor and the reflector (MS-2) facing each other.
2. Set the Photoelectric sensor in the middle of the position in the middle of the operation range of indicator adjusting the reflector or the sensor right and left, up and down.

3. Adjust up and down direction as the same.

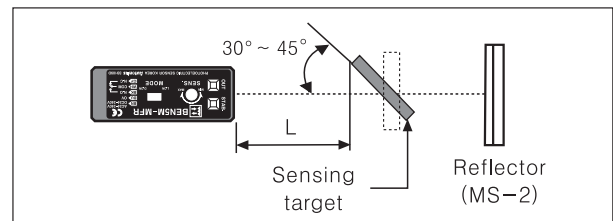
4. After adjustment, check the stability of operation putting the object at the optical axis.



※If use more than 2 photoelectric sensors in parallel, the space between 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 photoelectric sensor or the surface of target should be installed at an angle of $30^\circ \sim 45^\circ$ against optical axis. (When detecting target with high reflectance near by, photoelectric sensing with the polarizing filter should be used.)

※Sensitivity adjustment : Please see the diffuse reflective type.

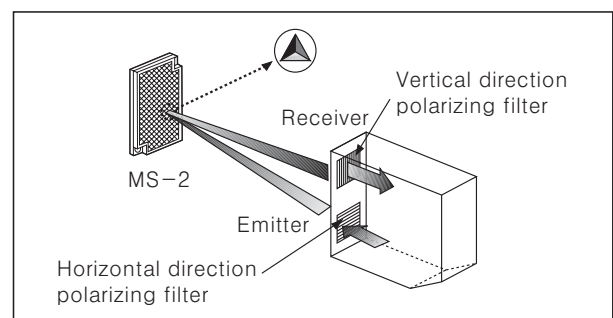


※If the mounting place is too small, please use MS-4 instead of MS-2 for same sensing distance.



◎ Retroreflective type (With polarizing filter)

The light passed through the polarizing filter of emitter reaches to MS-2 converting as horizontal direction, it reaches to photodetector through the filter of receiver converting as vertical by MS-2 function. Even it can detect normal mirror.



(A) Counter

(B) Timer

(C) Temp. controller

(D) Power controller

(E) Panel meter

(F) Tacho/Speed/Pulse meter

(G) Display unit

(H) Sensor controller

(I) Switching power supply

(J) Proximity sensor

(K) Photo electric sensor

(L) Pressure sensor

(M) Rotary encoder

(N) Stepping motor & Driver & Controller

(O) Graphic panel

(P) Production stoppage models & replacement