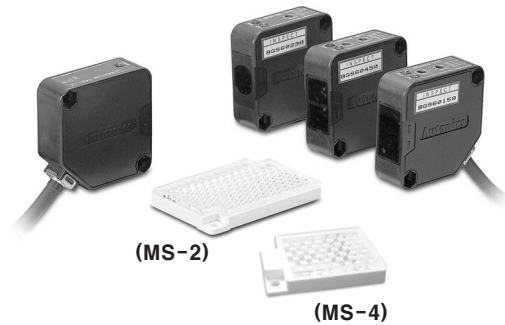


# BEN Series

## ■ Features

- This model has been developed from BE series.
- 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 stability LED indicator and output LED indicator.
- Built in IC photo diode which is very resistant to ambient light and electrical noise.



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



※MS-4 is optional

## ■ Specifications

### ● AC/DC power, Relay contact output

Model	BEN10M-TFR	BEN5M-MFR	BEN3M-PFR	BEN500-DFR
Type	Through-beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective
Detecting distance	10m	(*1) 0.1 ~ 5m	(*1) 0.1 ~ 3m	(*2) 500mm
Detecting target	Opaque materials of Min. $\phi$ 16mm	Opaque materials of Min. $\phi$ 60mm		Transparent, Translucent, Opaque materials
Hysteresis	—————			Max. 20% at detecting 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	Selectable Light ON or Dark ON 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			
Indication	Operation indicator : Orange, Stable indicator : Green (The orange lamp on Emitter of through-beam type is for power indication)			
Connection	Outgoing cable			
Insulation resistance	Min. 20M $\Omega$ (at 500VDC)			
Noise strength	$\pm$ 1000V the square wave noise(pulse width:1 $\mu$ 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		
	Malfunction	1.5mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 10 minutes		
Shock	Mechanical	500m/s <sup>2</sup> (50G) in X, Y, Z directions for 3 times		
	Malfunction	100m/s <sup>2</sup> (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 specification)			
Cable	$\phi$ 6.0mm, 5P, Length : 2m			
Accessory	Individual	—————	Mirror(MS-2)	—————
	Common	Adjustment driver, Mounting bracket, Bolts/Nuts		
Weight	Approx. 354g	Approx. 208g		Approx. 195g

※(\*1) Detecting distance of retroreflective type is against MS-2 and detecting distance shows settable range between mirror and photo sensor. And enable to detect a target within under 0.1m.

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

# AC/DC Middle Size Housing Type

## ●DC power, Solid state output

Model	BEN10M-TDT	BEN5M-MDT	BEN3M-PDT	BEN500-DDT
Type	Through-beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective
Detecting distance	10m	(+1) 0.1 ~ 5m	(+1) 0.1 ~ 3m	(+2) 500mm
Detecting target	Opaque materials of Min. $\phi$ 16mm	Opaque materials of Min. $\phi$ 60mm		Transparent, Translucent, Opaque materials
Hysteresis	—————			Max. 20% at detecting 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	Selectable Light ON or Dark ON by switch			
Control output	<ul style="list-style-type: none"> <li>●NPN/PNP 2 output</li> <li>• NPN open collector output <math>\Rightarrow</math> Load voltage : Max. 30VDC, Load current : Max. 200mA, Residual voltage : Max. 1V</li> <li>• PNP open collector output <math>\Rightarrow</math> Output voltage : Min. (Power supply-2.5)V, Load current : Max. 200mA</li> </ul>			
Protection circuit	Reverse polarity protection, Short-circuit protection			
Light receiving element	Built-in IC type photo diode			
Indication	Operation indicator : Orange, Stable indicator : Green (The orange lamp on Emitter of through-beam type is for power indication)			
Connection	Outgoing cable			
Insulation resistance	Min. 20M $\Omega$ (at 500VDC)			
Noise strength	$\pm$ 240V the square wave noise (pulse width:1 $\mu$ 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 <sup>2</sup> (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 specification)			
Material	Case : ABS, Lens cover : Acrylic, Lens : Acrylic			
Cable	$\phi$ 6.0mm, 4P, Length : 2m			
Accessory	Individual	—————	Mirror (MS-2)	—————
	Common	Adjustment driver, Mounting bracket, Bolts/Nuts		
Approval	<b>CE</b>			
Weight	Approx. 342g	Approx. 200g		Approx. 187g

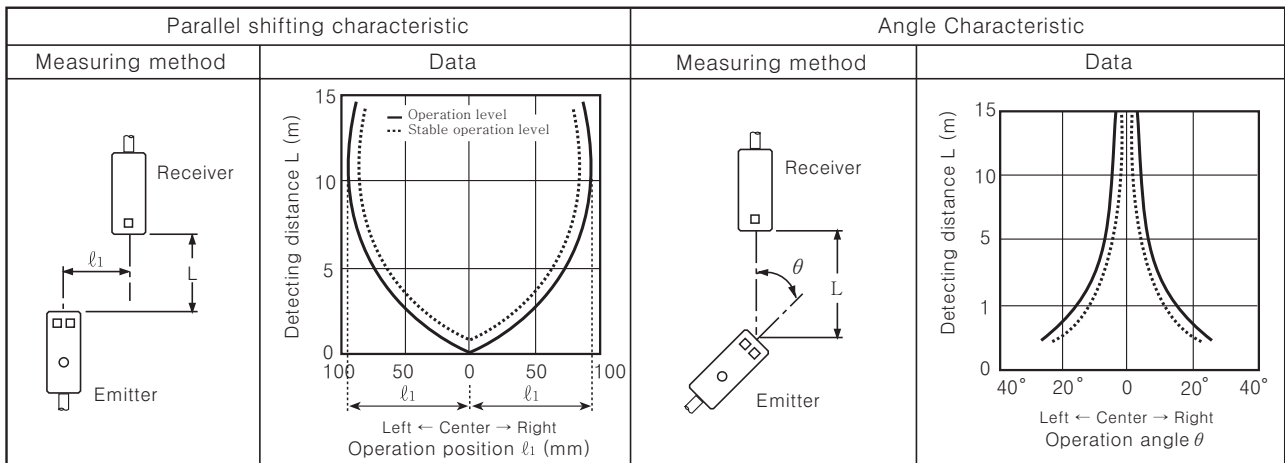
\* (+1) Detecting distance of retroreflective type is against MS-2 and detecting distance shows settable range between mirror and photo sensor. And enable to detect a target within under 0.1m.

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

## ■Characteristic

### ◎Through-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) Proximity sensor

(J) Photo electric sensor

(K) Pressure sensor

(L) Rotary encoder

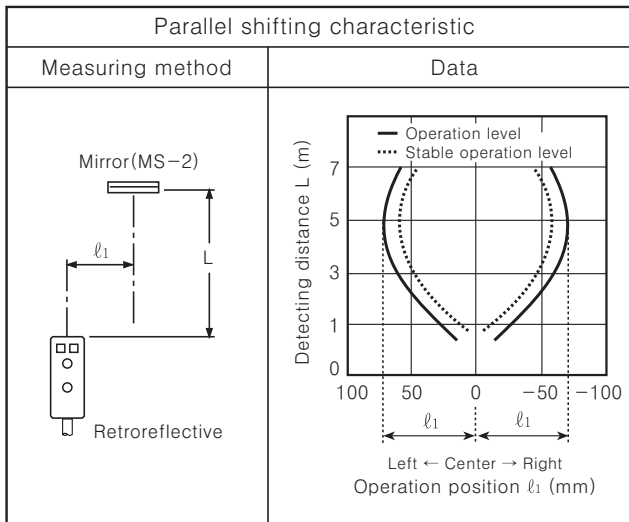
(M) 5-Phase stepping motor & Driver & Controller

# BEN Series

## ■ Characteristic

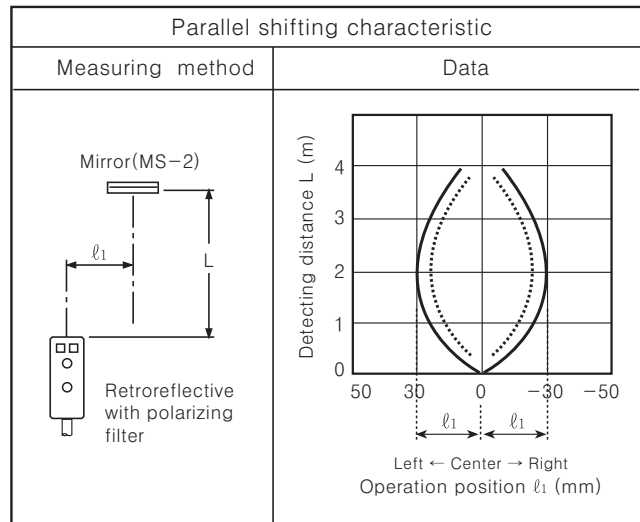
### ◎ Retroreflective

● BEN5M-MFR ● BEN5M-MDT

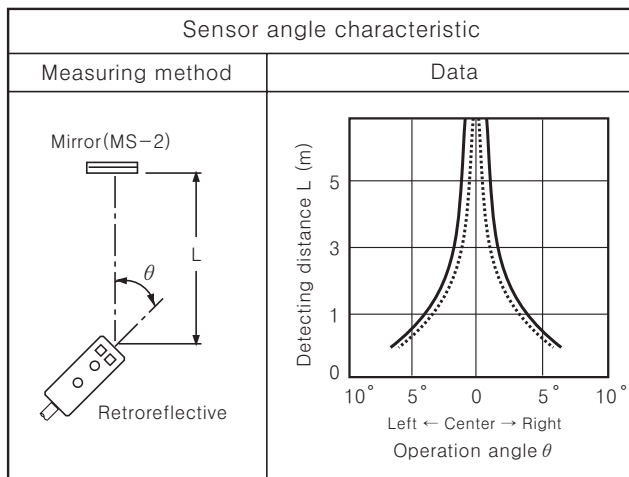


### ◎ Retroreflective with polarizing filter

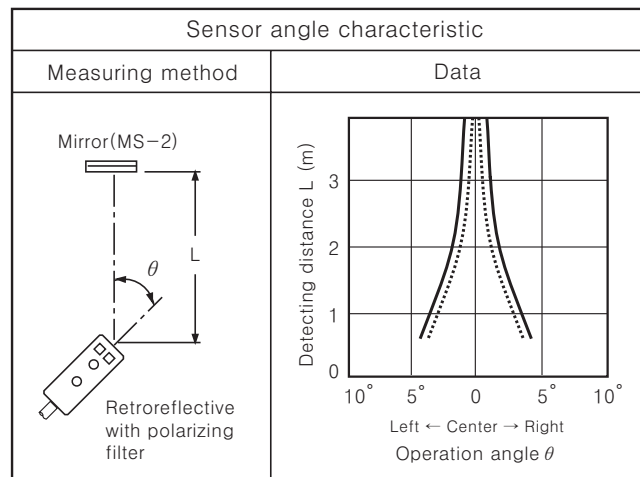
● BEN3M-PFR ● BEN3M-PDT



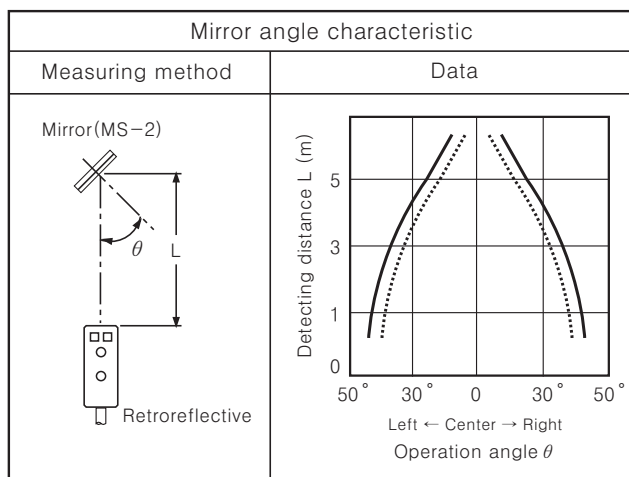
● BEN5M-MFR ● BEN5M-MDT



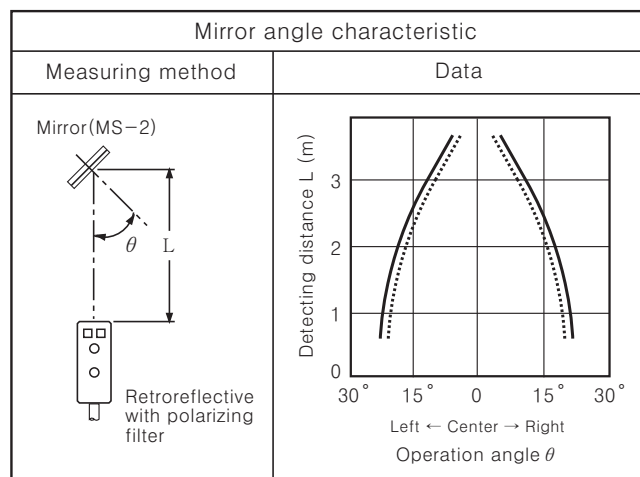
● BEN3M-PFR ● BEN3M-PDT



● BEN5M-MFR ● BEN5M-MDT



● BEN3M-PFR ● BEN3M-PDT

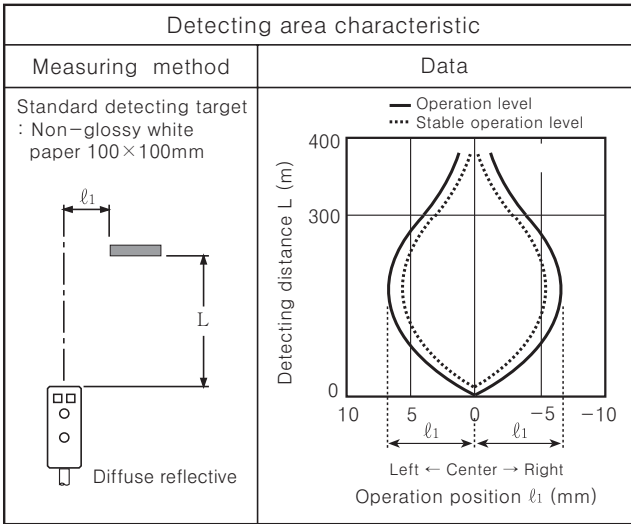


# AC/DC Middle Size Housing Type

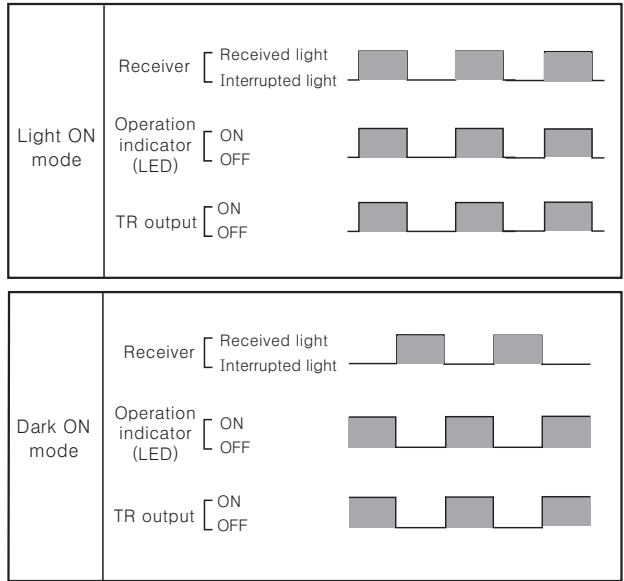
## Characteristic

○ Diffuse reflective

● BEN500-DFR ● BEN500-DDT

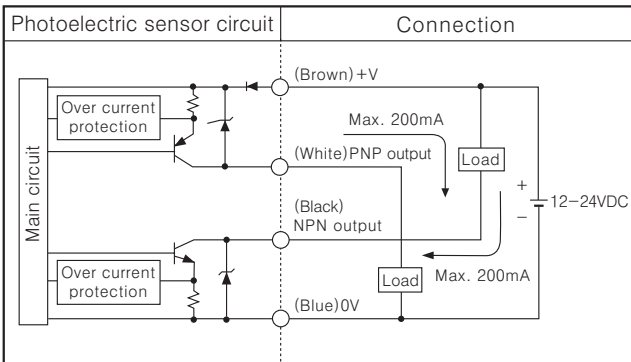


## Operation mode

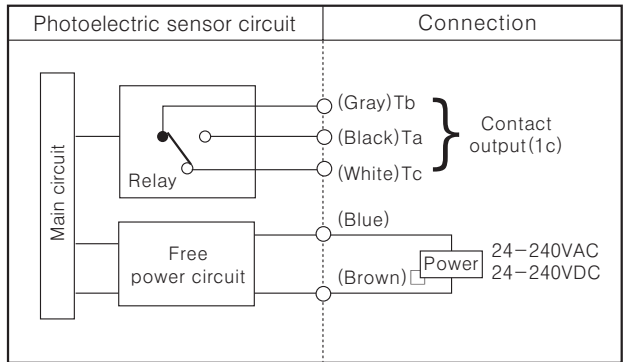


## Control output diagram

● DC power (NPN/PNP 2 output)



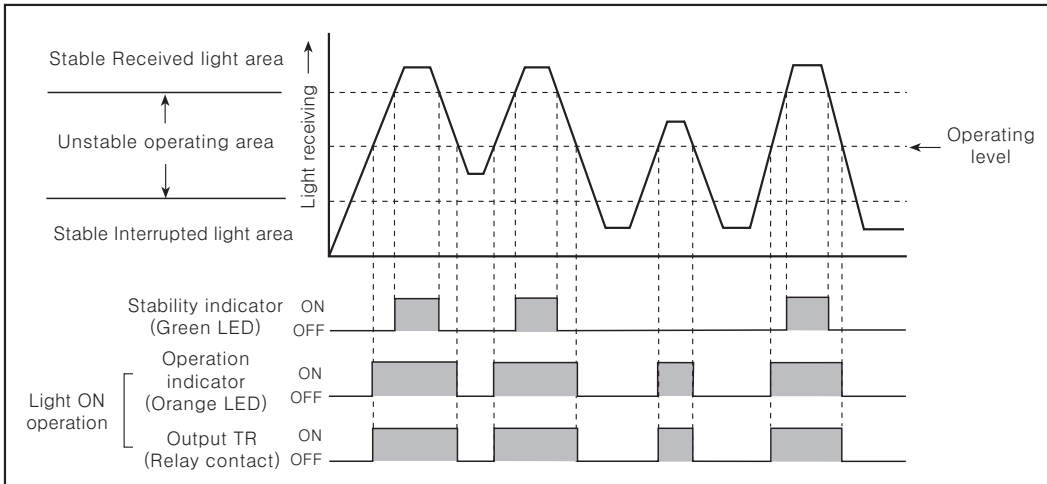
● Free power (Relay contact)



※ In case of product with the output protection device, if terminals of control output are short circuited or if over current condition exists, 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 is opposite operation 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) Proximity sensor

(J) Photo electric sensor

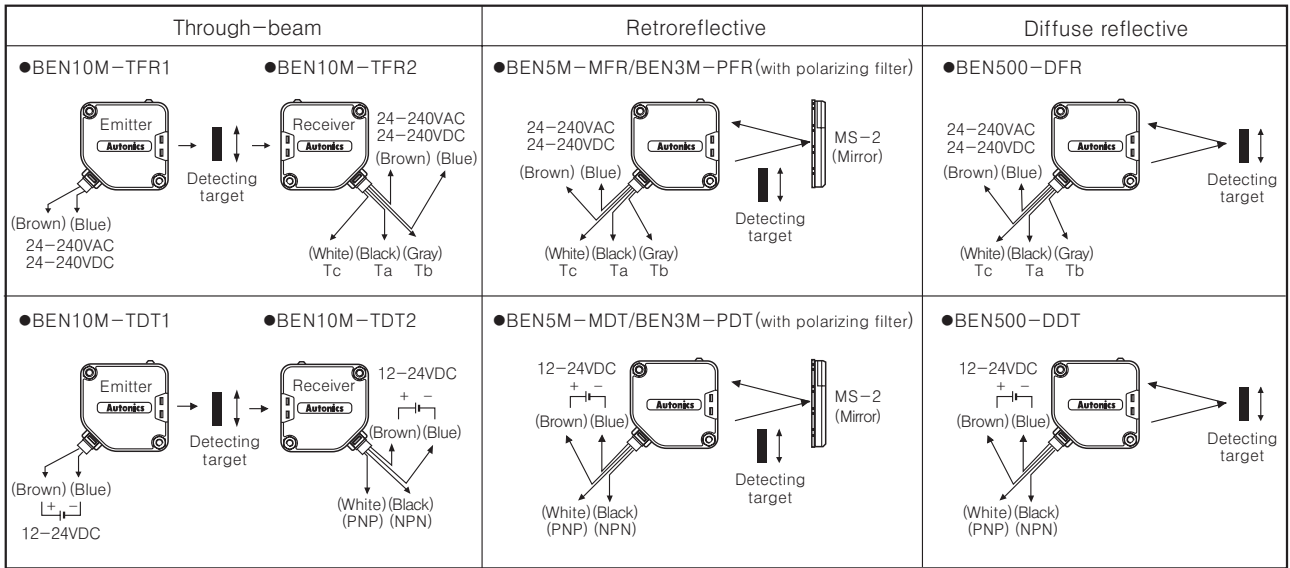
(K) Pressure sensor

(L) Rotary encoder

(M) 5-Phase stepping motor & Driver & Controller

# BEN Series

## Connections

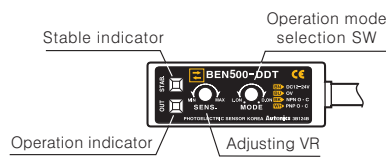


\* Unused must be insulated.

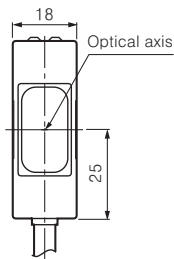
## Dimensions

Unit:mm

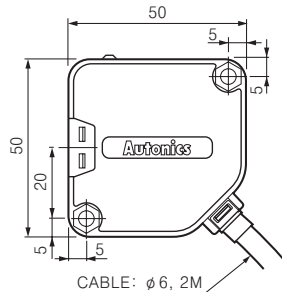
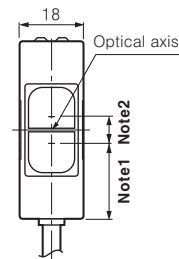
### Product



### Through-beam

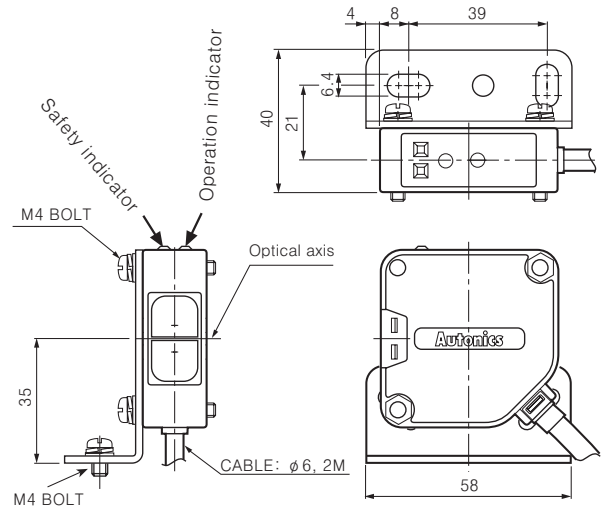


### Retroreflective Diffuse reflective



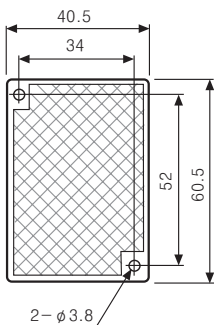
\*Note1) Retroreflective : 21.25mm, Diffuse reflective : 20.25mm  
Note2) Retroreflective : 7.5mm, Diffuse reflective : 9.5mm

### Mounting a bracket

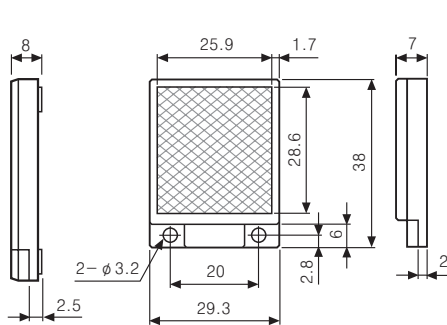


### Mirror (MS-2)

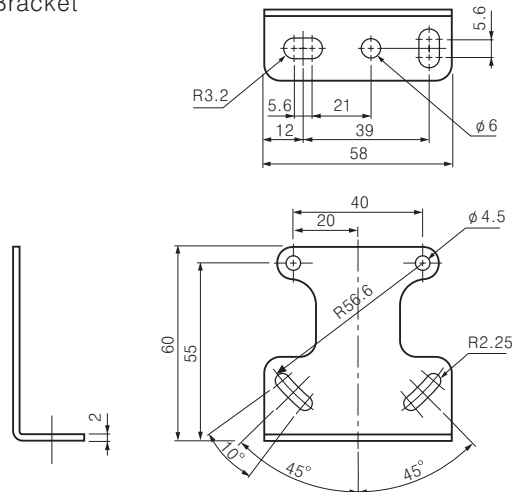
<MS-2 >



<MS-4 >



### Bracket

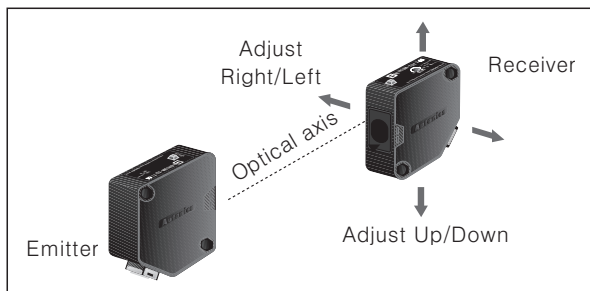


# AC/DC Middle Size Housing Type

## ■ Mounting & Adjustment

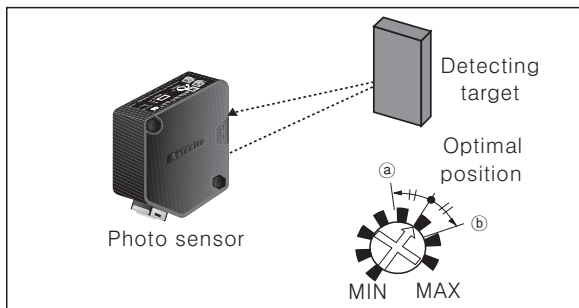
### ◎ Through-beam type

1. Supply the power to the photoelectric sensor, after setting the emitter and the receiver in face to face.
  2. Set the receiver in center of position where indicator turns on, as adjusting the receiver or the emitter right and left, up and down.
  3. Fix both units tightly after checking that the unit detects the target.
- ※ If the detecting target is translucent body or smaller than  $\phi 16\text{mm}$ , it may not detect the target cause light passed.



### ◎ Retroreflective type

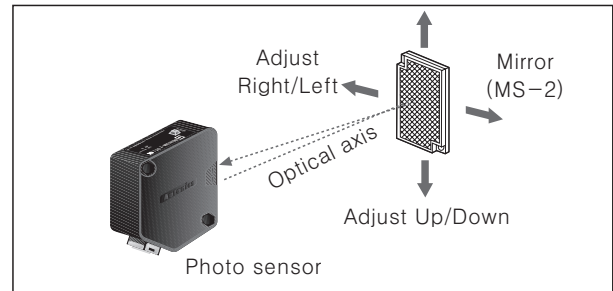
1. Even though the diffuse reflective type is set at Max. sensitive position, the sensitivity of the sensor must be adjusted according to the existence of the reflective material background.
  2. Set the target at a position to be detected by the beam, then turn the adjuster until point (a) where the indicator turns on from min. position of the adjuster.
  3. Take the target out of the sensing area, then turn the adjuster until point (b) where the indicator turns on. If the indicator does not turn on, Max. position is point (b).
  4. Set the adjuster at the center of two switching point (a), (b).
- ※ The detecting 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.



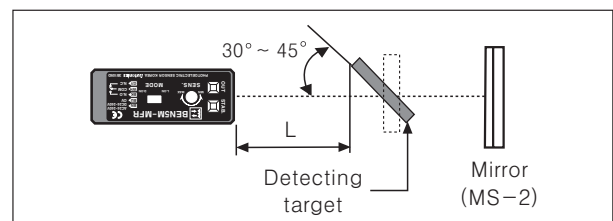
### ◎ Diffuse reflective type

1. Supply the power to the photoelectric sensor, after setting the emitter and the mirror (MS-2) in face to face.
2. Set the Photoelectric sensor in the position which indicator turns on, as adjusting the mirror or the sensor right and left, up and down.

3. Fix both units tightly after checking that the unit detects the target.



- ※ If use more than 2 photoelectric sensor 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 detect target with high reflectance near by, photoelectric sensor with the polarizing filter should be used.)
- ※ Sensitivity adjustment : Please see the diffuse reflective type.

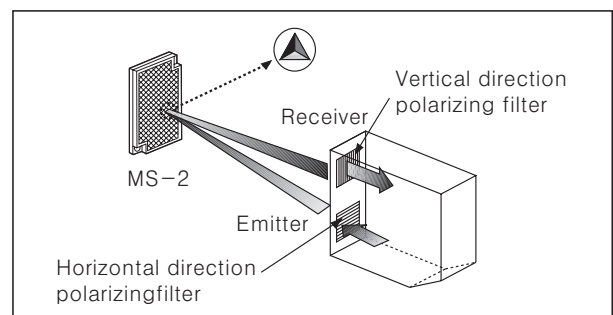


- ※ If the installing place is too small, please use MS-4 instead of MS-2. It makes same detecting distance.



### ◎ Retroreflective type (With polarizing filter)

When the passes through polarizing filter from emitter, it will be converted as horizontal transverse beam and reaches to mirror MS-2 afterwards it is converted by mirror function as vertical beam and reaches to receiver through polarizing filter. 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) Proximity sensor

(J) Photo electric sensor

(K) Pressure sensor

(L) Rotary encoder

(M) 5-Phase stepping motor & Driver & Controller