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)
- ●Status and output LED indication
- ●Built-in IC photo diode for ambient light and electrical noise.

※MS-4 is sold separately.

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

CE

▣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) 300mm
Sensin target		Opaque materials of Min. ϕ16mm	Opaque materials of Min. ϕ60mm		Transparent, Translucent, Opaque materials
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. 4VA			
Light source		Infrared LED(modulated)		Red LED (Modulated : 660nm)	Infrared LED(modulated)
Sensitivity adjustment		————	Adjuster		
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. 20MΩ (at 500VDC mega)			
Noise strength		±1,000V the square wave noise(pulse width:1㎲) 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/s² (50G) in X, Y, Z directions for 3 times			
	Malfunction	100m/s² (10G) in X, Y, Z directions for 3 times			
Ambient illumination		Sunlight : Max. 11,000ℓx, Incandescent lamp : Max. 3,000ℓx			
Ambient temperature		-20 ~ +65℃(at non-freezing status), Storage:-25 ~ +70℃			
Ambient humidity		35 ~ 85%RH, Storage : 35 ~ 85%RH			
Material		Case : ABS, Lens cover : Acrylic, Lens : Acrylic			
Protection		IP50(IEC standard)			
Cable		ϕ6.0mm, 5P, Length : 2m			
Accessory	Individual	————	Reflector(MS-2), Adjustment driver		Adjustment driver
	Common	Fixing bracket, Bolts, Nuts			
Unit weight		Approx. 354g	Approx. 208g		Approx. 195g

※**(*1)**It is mounting distance between sensor and reflector MS-2 and it is same when MS-4 is used. It is detectable under 0.1m.
※**(*2)** It is for Non-glossy white paper(100×100mm).

●DC power, Solid state output

Model		BEN10M-TDT	BEN5M-MDT	BEN3M-PDT	BEN300-DDT
Sensing type		Transmitted beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective
Sensing distance		10m	(*1) 0.1 ~ 5m	(*1) 0.1 ~ 3m	(*2) 300mm
Sensing target		Opaque materials of Min. ϕ16mm	Opaque materials of Min. ϕ60mm		Transparent, Translucent, Opaque materials
Hysteresis		————			Max. 20% at sensing distance
Response time		Max. 1ms			
Power supply		12-24VDC ±10%(Ripple P-P : Max. 10%)			
Current consumption		Max. 40mA			
Light source		Infrared LED(modulated)		Red LED (modulated, 660nm)	Infrared LED(modulated)
Sensitivity adjustment		————	Adjuster		
Operation mode		Light ON or Dark ON selectable by switch			
Control output		●NPN/PNP output simultaneously • NPN open collector output ☞ Load voltage:Max. 30VDC, Load current:Max. 200mA, Residual voltage:Max. 1V • PNP open collector output ☞ 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 indicator)			
Connection		Outgoing cable			
Insulation resistance		Min. 20MΩ(at 500VDC mega)			
Noise strength		±240V the square wave noise(pulse width:1μs) 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/s² (50G) in X, Y, Z directions for 3 times			
Ambient illumination		Sunlight : Max. 11,000ℓx, Incandescent lamp : Max. 3,000ℓx			
Ambient temperature		-20 ~ +55℃(at non-freezing status), Storage : -25 ~ +70℃			
Ambient humidity		35 ~ 85%RH, Storage : 35 ~ 85%RH			
Protection		IP50(IEC standard)			
Material		Case : ABS, Lens cover : Acrylic, Lens : Acrylic			
Cable		ϕ6.0mm, 4P, Length : 2m			
Accessory	Individual	————	Reflector(MS-2), Adjustment driver		Adjustment driver
	Common	Fixing bracket, Bolts, Nuts			
Approval		CE			
Unit weight		Approx. 342g	Approx. 200g		Approx. 187g

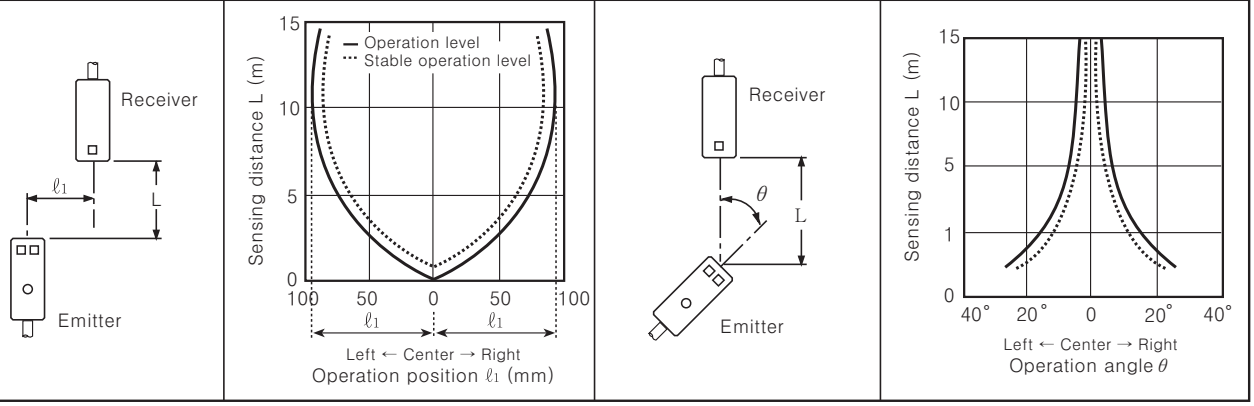
※(*1)It is mounting distance between sensor and reflector MS-2 and it is same when MS-4 is used. It is detectable under 0.1m.
※(*2)It is for Non-glossy white paper(100×100mm).

▣Feature data

◎Transmitted beam

●BEN10M-TFR ●BEN10M-TDT

Parallel shifting characteristic		Angle Characteristic	
Measuring method	Data	Measuring method	Data

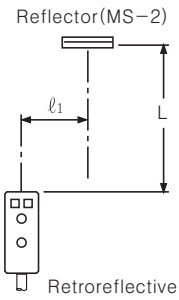
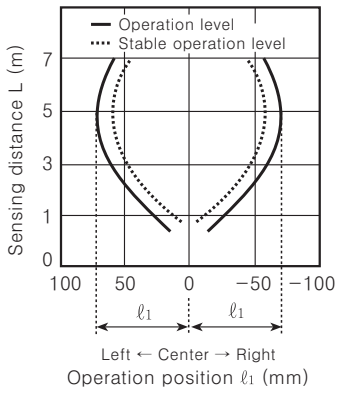


▣Feature data

◎Retroreflective

●BEN5M-MFR ●BEN5M-MDT

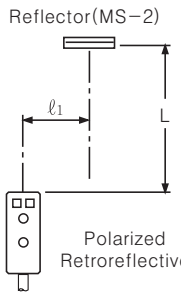
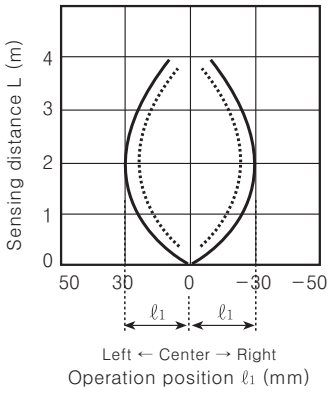
Parallel shifting characteristic

Measuring method	Data
	

◎Polarized retroreflective

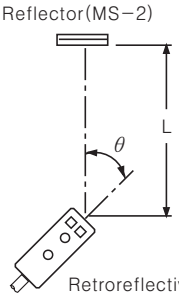
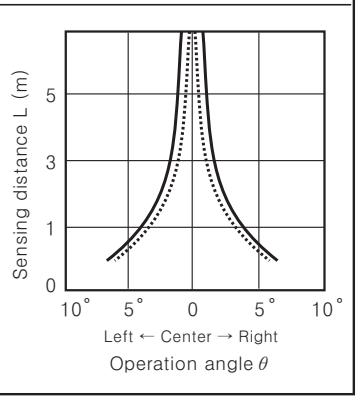
●BEN3M-PFR ●BEN3M-PDT

Parallel shifting characteristic

Measuring method	Data
	

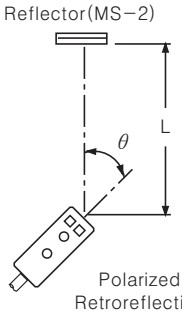
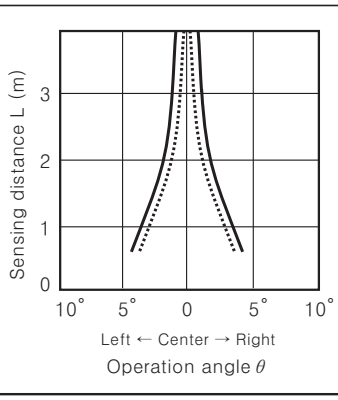
●BEN5M-MFR ●BEN5M-MDT

Sensor angle characteristic

Measuring method	Data
	

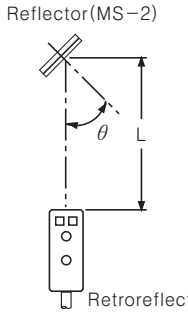
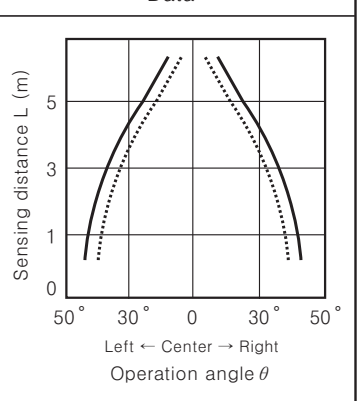
●BEN3M-PFR ●BEN3M-PDT

Sensor angle characteristic

Measuring method	Data
	

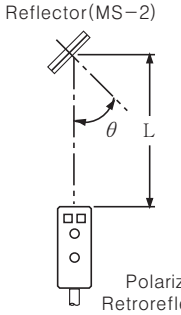
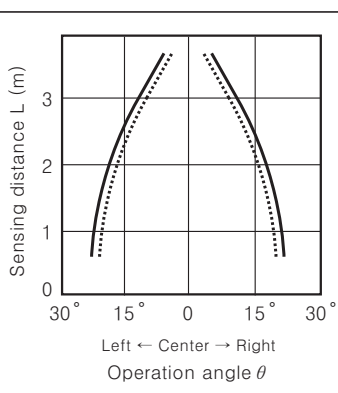
●BEN5M-MFR ●BEN5M-MDT

Reflector angle characteristic

Measuring method	Data
	

●BEN3M-PFR ●BEN3M-PDT

Reflector angle characteristic

Measuring method	Data
	

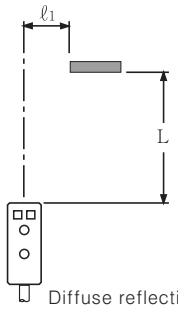
▣Feature data

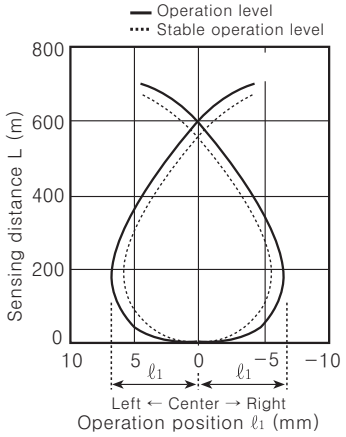
◎Diffuse reflective

●BEN300-DFR ●BEN300-DDT

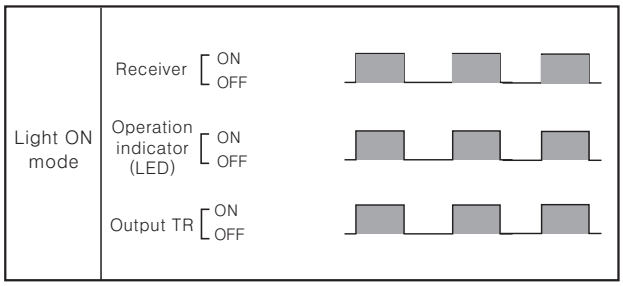
Sensing area characteristic

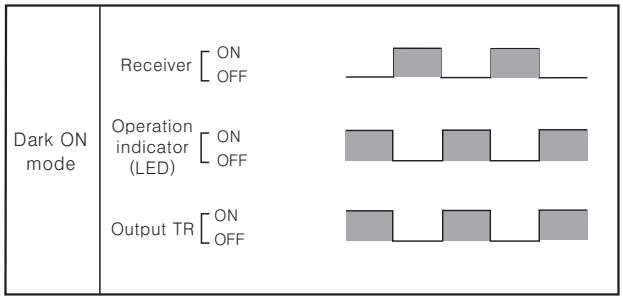
Measuring method	Data
Standard sensing target : Non-glossy white paper 100×100mm	Operation level / Stable operation level





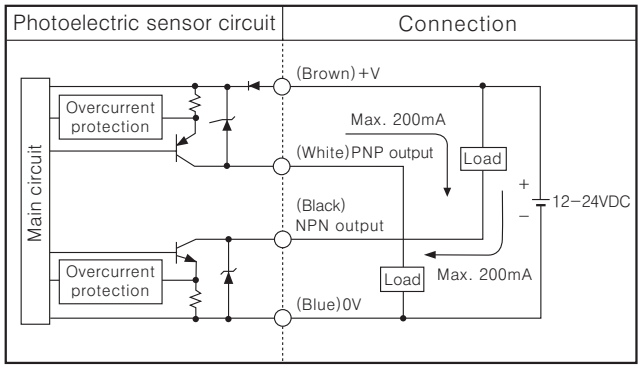
▣Operation mode



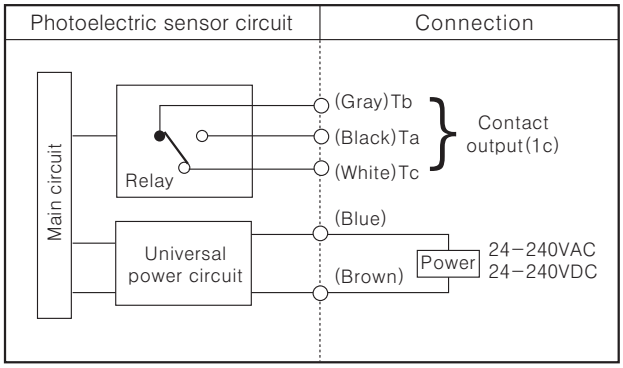


▣Control output diagram

●DC voltage(NPN/PNP synchronous output)



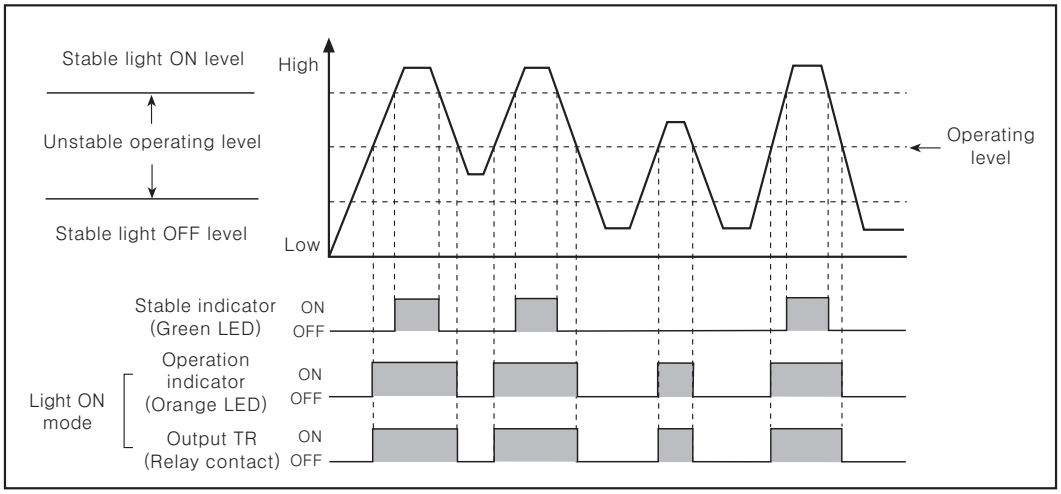
●Universal voltage(Relay contact output)



※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

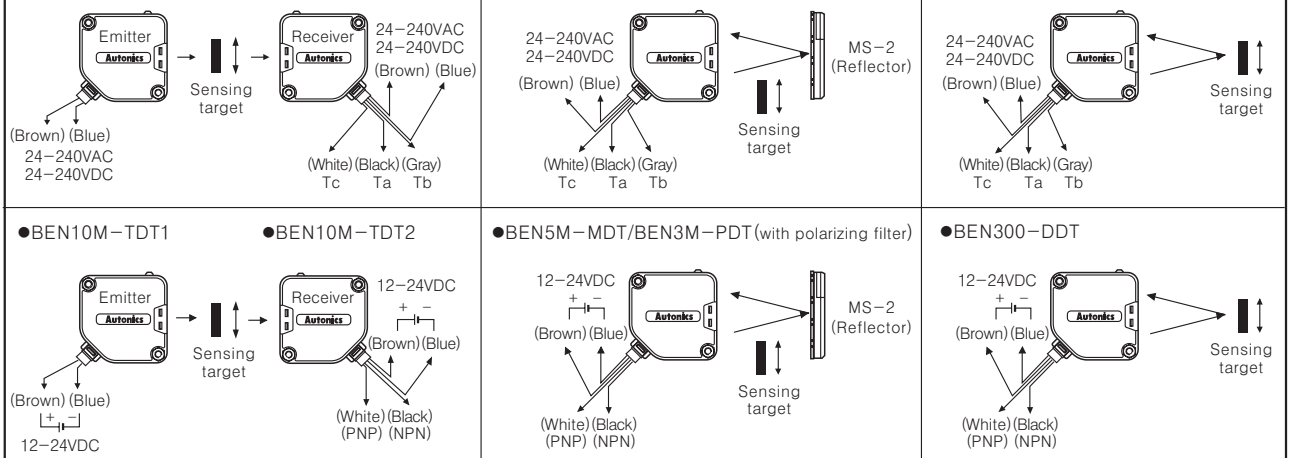
●Light ON mode



※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.

▣Connections

Transmitted beam	Retroreflective	Diffuse reflective
●BEN10M-TFR1 ●BEN10M-TFR2	●BEN5M-MFR/BEN3M-PFR(with polarizing filter)	●BEN300-DFR
●BEN10M-TDT1 ●BEN10M-TDT2	●BEN5M-MDT/BEN3M-PDT(with polarizing filter)	●BEN300-DDT

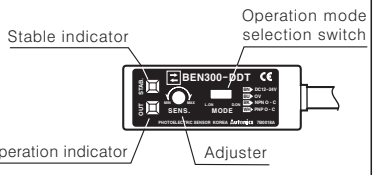


※Unused line must be insulated.

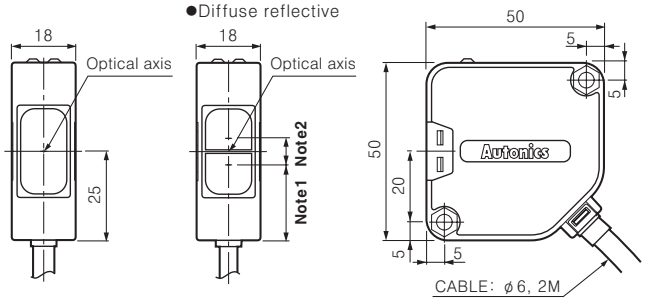
▣ Dimensions

(Unit:mm)

●Product

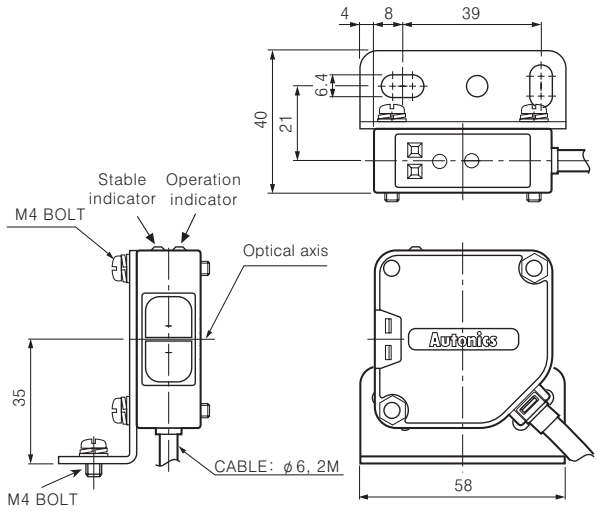


●Transmitted beam ●Retroreflective ●Diffuse reflective



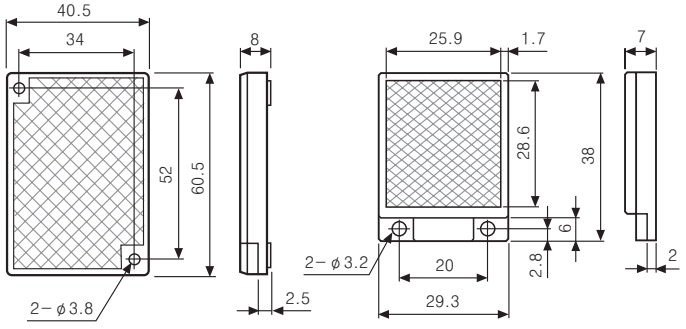
※Note1)Retroreflective : 21.25mm, Diffuse reflective : 20.25mm
Note2)Retroreflective : 7.5mm, Diffuse reflective : 9.5mm

●Bracket

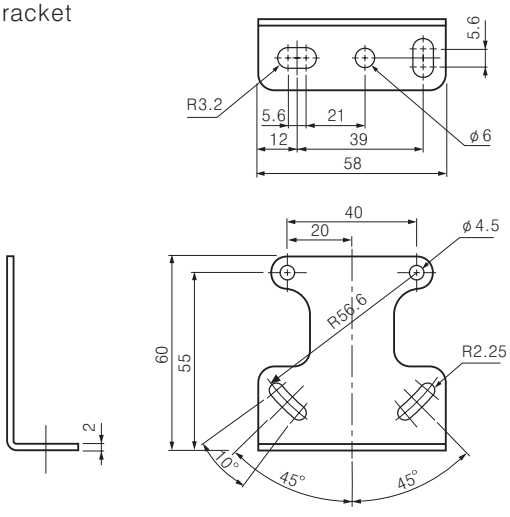


●Reflector

〈MS-2〉 〈MS-4〉



●Bracket

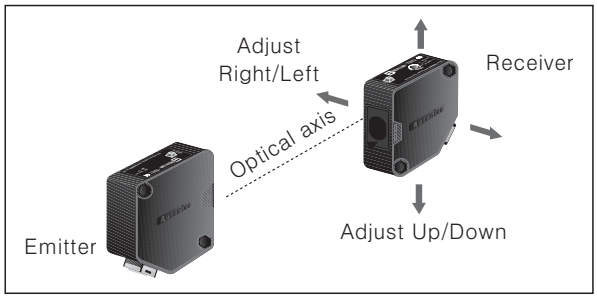


▣Mounting and sensitivity adjustment

◎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.

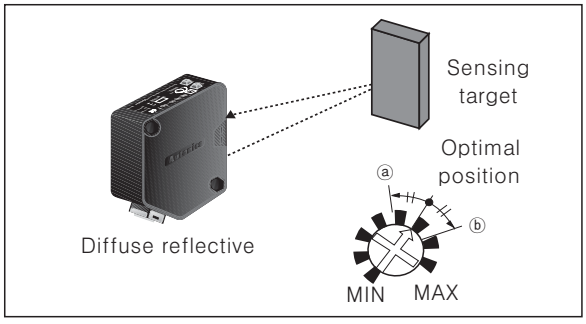
※If the sensing target is translucent body or smaller than φ16mm, it can be missed by sensor cause light passed.



◎Diffuse reflective type

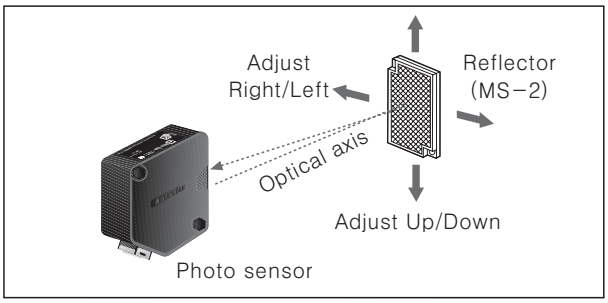
1. Adjust sensitivity regarding the effectiveness of behind object or mounting side.
2. Set the target at a position to be detected by the beam, then turn the adjuster until position ⓐ in the middle of the operation range of indicator from min. position of the adjuster.
3. Take the target out of the sensing area, then turn the adjuster until position ⓑ where the indicator turns on. If the indicator does not turn on, Max. position is position ⓑ.
4. Set the adjuster at the middle of two switching position ⓐ, ⓑ.

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



◎Retroreflective type

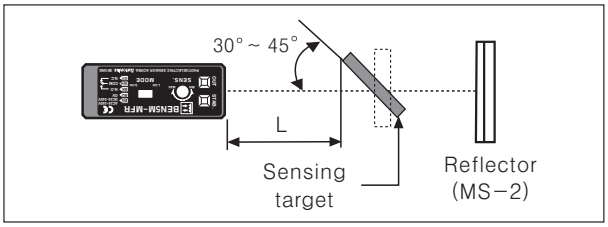
1. Supply the power, after set the photoelectric sensor and the reflector(MS-2) facing each other.
2. Set the Photoelectric sensor in the middle of the position in the middle of the operation range of indicator adjusting the reflector or the sensor right and left, up and down.
3. Adjust up and down direction 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 thr 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 °~45 °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.