Terminal type photoelectric sensor for long distance

▣Features

- ●Built-in sensitivity adjuster
- ●Timer : ON Delay, OFF Delay, One-shot Delay
- ●NPN/PNP open collector output(DC power type)
- ●Self-diagnosis function
  (Green LED is lighted in stable level.)
- ●Reverse power polarity and overcurrent
- ●Power supply :
  Universal 24-240VDC/24-240VAC
- ●IP66 rated waterproof structure(IEC standard))

※MS-4 is sold separately.

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

CE

▣Specifications

●Universal voltage 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		Transmitted beam	Retroreflective(Standard type)	Retroreflective(polarizing filter)	Diffuse reflective
Sensing distance		15m	(*1) 0.1 ~ 5m(MS-2)	(*2) 0.1 ~ 3m(MS-3)	(*3) 700mm
Sensing target		Opaque materials of Min. ϕ15mm	Opaque materials of Min. ϕ60mm		Transparent, 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%)			
Current consumption		Max. 3VA			
Light source		Infrared LED(Modulated)		Red LED(Modulated:660nm)	Infrared LED(Modulated)
Sensitivity adjustment		Adjuster			
Operation mode		Selectable Light ON or Dark ON by slide switch			
Control output		Relay contact output ☞ Contact capacity : 30VDC 3A, 250VAC 3A at resistive load, Contact composition: 1c(SPDT)			
Relay life cycle		Mechanically : Min. 50,000,000, Electrically : Min. 100,000			
Self-diagnosis output		Green LED turns on at unstable operation			
Timer function		Selectable ON Delay, OFF Delay, One Shot Delay by slide switch [Delay Time : 0.1 ~ 5sec(VR adjustable)]			
Indicator		Operation indicator : Yellow LED, Self-diagnosis indicator : Green LED			
Connection		Terminal connection			
Insulation resistance		Min. 20MΩ(at 500VDC mega)			
Insulation type		Double insulation			
Noise strength		±1,000V the square wave noise(pulse width:1㎲) by the noise simulator			
Dielectric strength		1500VAC 50/60Hz for 1minute			
Impulse dielectric strength		1kV(Generator : 1.2/50㎲, Source impedence : 500Ω, Source energy : 0.5J)			
Vibration	Mechanical	1.5mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours			
	Malfuntion	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			
	Malfuntion	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			
Protection		IP66(IEC standard)			
Material		Case : ABS, Lens : Acrylic			
Accessory	Individual	———	Reflector(MS-2)	Reflector(MS-3)	———
	Common	Adjustment driver, Fixing bracket, Bolts/Nuts			
Approval		CE			
Unit weight		TFR : Approx. 198g, TFR-T : Approx. 203g	MFR : Approx. 126g, MFR-T : Approx. 131g	PFR : Approx. 130g, PFR-T : Approx. 134g	DFR : Approx. 110g, DFR-T : Approx. 115g

※**(*1)**It is same when MS-4 is used and it is able to detect under 0.1m.
※**(*2)**MS-2 is used, sensing distance will be 0.1~2m, it is able to detect under 0.1m.
※**(*3)**It is for Non-glossy white paper(200×200mm)

▣Specifications

●DC power type

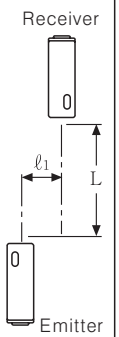
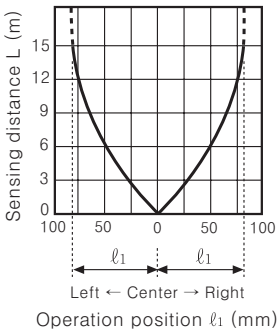
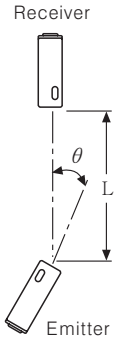
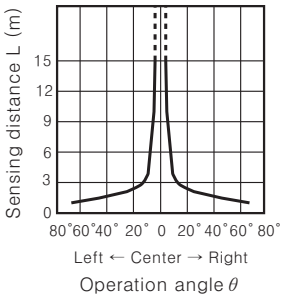
Model		BX15M-TDT	BX5M-MDT	BX3M-PDT	BX700-DDT
	With Timer	BX15M-TDT-T	BX5M-MDT-T	BX3M-PDT-T	BX700-DDT-T
Sensing type		Transmitted beam	Retroreflective (Standard type)	Retroreflective (Polarizing filter)	Diffuse reflective
Sensing distance		15m	**(*1)** 0.1 ~ 5m(MS-2)	**(*2)** 0.1 ~ 3m(MS-3)	**(*3)** 700mm
Sensing target		Opaque materials of Min. ϕ15mm	Opaque materials of Min. ϕ60mm	Opaque materials of Min. ϕ60mm	Transparent, Translucent, Opaque material
Hysteresis		———	———	———	Max. 20% at rated setting distance
Response time		Max. 1ms			
Power supply		12-24VDC ±10% (Ripple P-P:Max. 10%)			
Current consumption		Max. 40mA	Max. 30mA		
Light source		Infrared LED(Modulated)		Infrared LED(Modulated)	Infrared LED(Modulated)
Sensitivity adjustment		Adjuster			
Operation mode		Selectable Light ON or Dark ON by slide switch			
Control output		• NPN open collector output ☞ Load voltage : Max. 30VDC, Load current : Max. 200mA, Residual voltage : Max. 1V at 200mA, Max. 0.4V at 16mA • PNP open collector output(Yellow LED) ☞ Output voltage : Min. power supply-2.5V, Load current : Max. 200mA			
Self-diagnosis output		NPN open collector output ☞ Load voltage : Max. 30VDC, Load current : Max. 50mA, Residual voltage : Max. 1V at 50mA, Max. 0.4V at 16mA			
Protection circuit		Reverse polarity protection, Overload & short circuit pretection			
Timer function		Selectable ON Delay, OFF Delay, One Shot Delay by slide switch [Delay Time : 0.1 ~ 5sec(VR adjustable)]			
Indicator		Operation indicator : Yellow LED, Self-diagnosis indicator : Green LED			
Connection		Terminal connection			
Insulation resistance		Min. 20MΩ (at 500VDC mega)			
Noise strength		±240V the square wave noise(pulse width:1㎲) 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 ~ +65℃ (at non-freezing status), Storage : -25 ~ +70℃			
Ambient humidity		35 ~ 85%RH, Storage : 35 ~ 85%RH			
Protection		IP66(IEC standard)			
Material		Case : ABS, Lens cover : Acrylic, Lens : Acryl			
Accessory	Individual	———	Reflector(MS-2)	Reflector(MS-3)	———
	Common	Adjustment driver, Fixing bracket, Bolts/Nuts			
Approval		CE			
Unit weight		Approx. 212g	Approx. 124g	Approx. 142g	Approx. 117g

※**(*1)**It is same when MS-4 is used and it is able to detect under 0.1m.
※**(*2)**MS-2 is used, sensing distance will be 0.1~2m, it is able to detect under 0.1m.
※**(*3)**It is for Non-glossy white paper(200×200mm).

▣Feature data

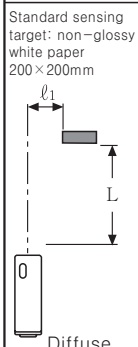
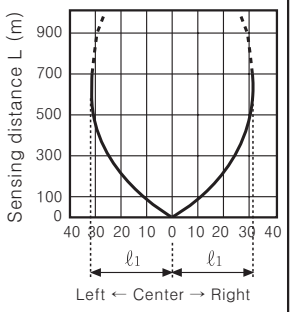
◎Transmitted beam

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

Parallel shifting characteristic		Angle Characteristic	
Measuring method	Data	Measuring method	Data
			

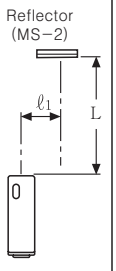
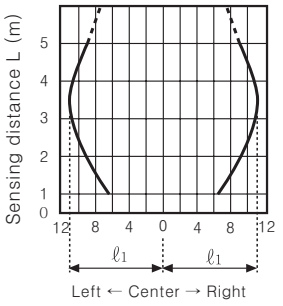
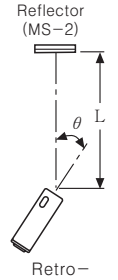
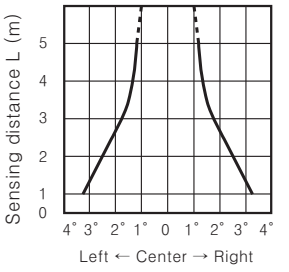
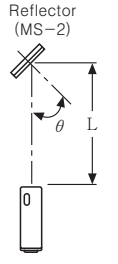
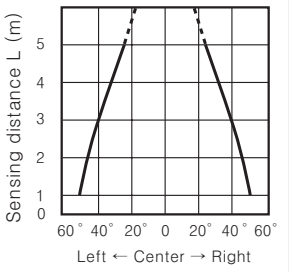
◎Diffuse reflective

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

Sensing area	
Measuring method	Data
	

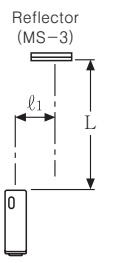
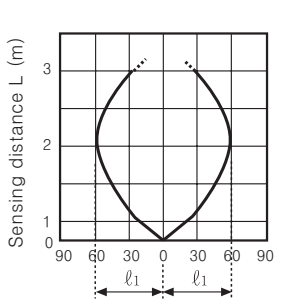
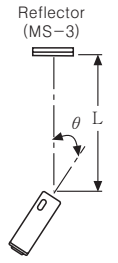
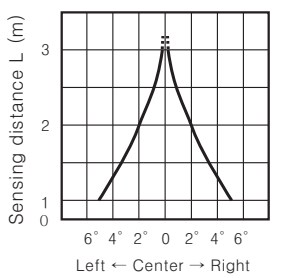
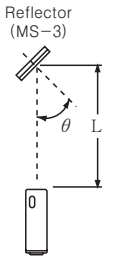
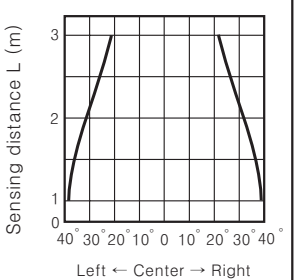
◎Retroreflective

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

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

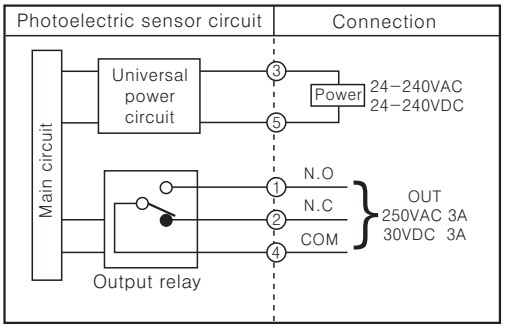
◎Polarized retroreflective

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

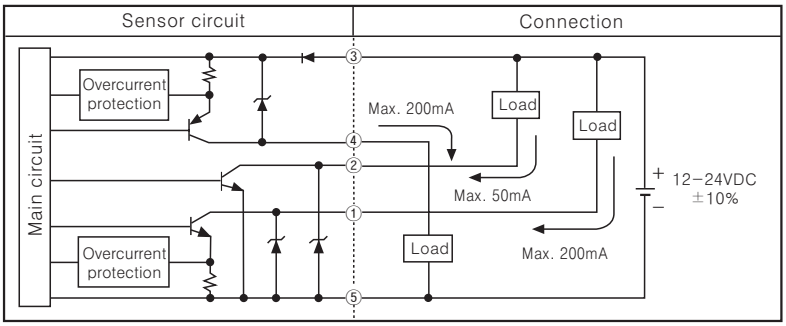
Parallel shifting characteristic		Sensor angle characteristic		Reflector angle characteristic	
Measuring method	Data	Measuring method	Data	Measuring method	Data
					

▣Control output diagram

◎Universal voltage



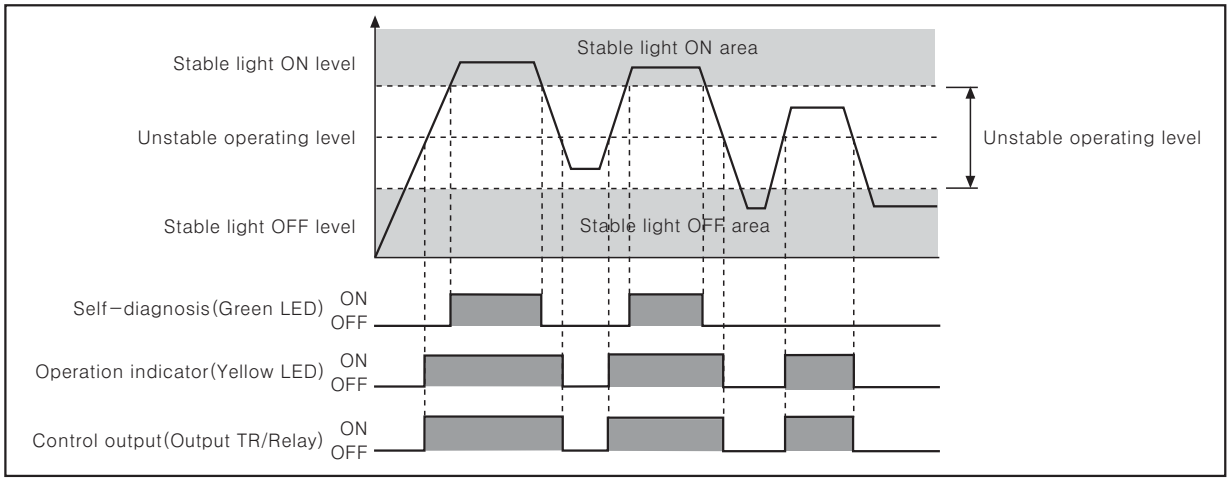
◎DC voltage



※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 diagram

●Light ON mode



※Operation for Dark ON mode is opposed to above chart indication for Light ON mode.
※To prevent from the misoperation, output of units keeps the state of OFF for 0.5sec. after power ON.

▣Timer mode

Timer mode	Switch position S1	Switch position S2	Status of light / Operation mode	
NORMAL MODE	ON	ON	Light ON	ON / OFF
			Dark ON	OUT (Control output) ON / OFF
ONE SHOT DELAY MODE	ON	OFF	Light ON	OUT (Control output) ON / OFF, T
			Dark ON	OUT (Control output) ON / OFF, T
ON DELAY MODE	OFF	ON	Light ON	OUT (Control output) ON / OFF, T
			Dark ON	OUT (Control output) ON / OFF, T
OFF DELAY MODE	OFF	OFF	Light ON	OUT (Control output) ON / OFF, T
			Dark ON	OUT (Control output) ON / OFF, T

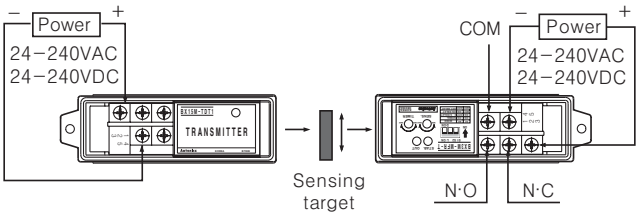
※T : Time set by timer adjuster.

▣Connections

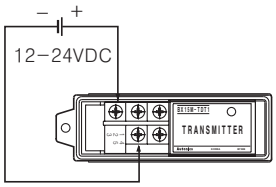
◎Transmitted beam

●BX15M−TFR1

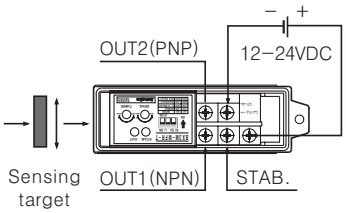
●BX15M−TFR 2,
BX15M−TFR−T2



●BX15M−TDT1

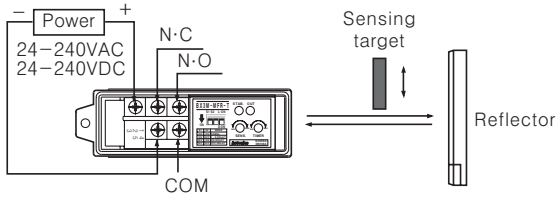


●BX15M−TDT2,
BX15M−TDT−T2

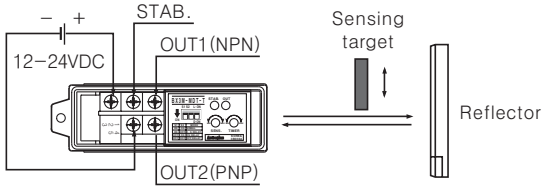


◎Retroreflective / Retroreflective with polarizing filter

●BX5M−MFR, BX5M−MFR−T
●BX3M−PFR, BX3M−PFR−T

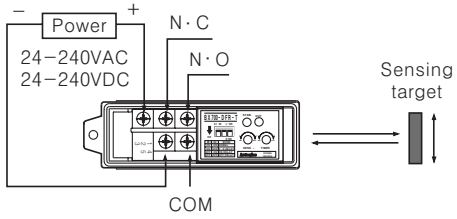


●BX5M−MDT, BX5M−MDT−T
●BX3M−PDT, BX3M−PDT−T

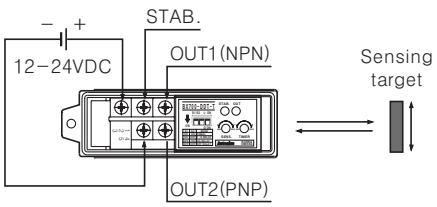


◎Diffuse reflective

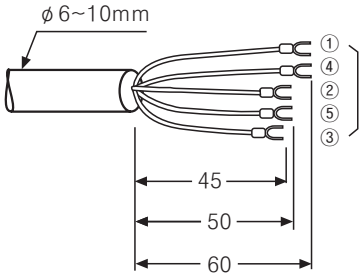
●BX700−DFR, BX700−DFR−T



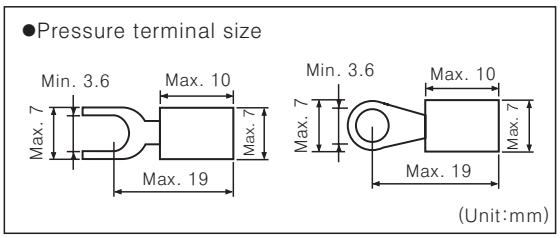
●BX700−DDT, BX700−DDT−T

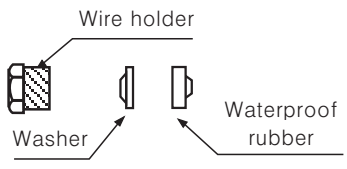


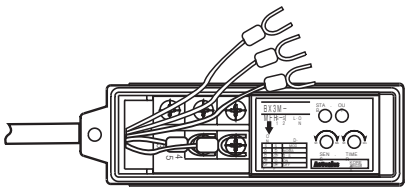
◎Cable



●Pressure terminal size



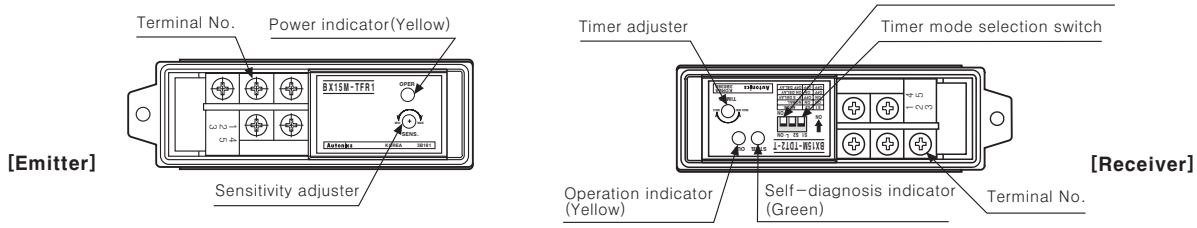




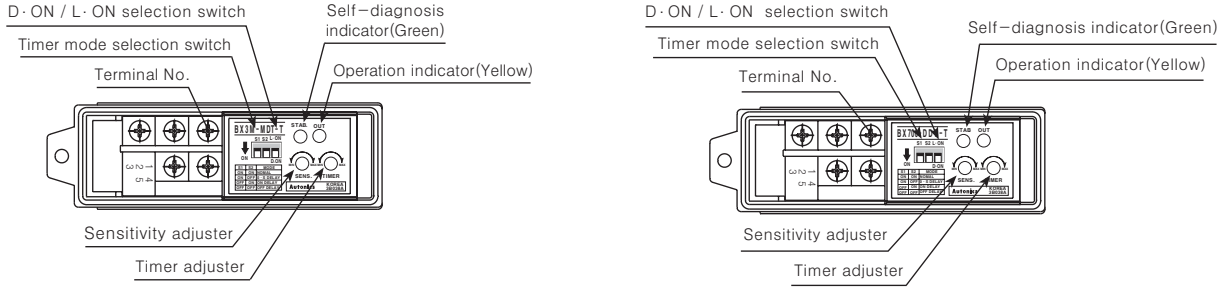
※On servicing wire, connect wire on terminal as above figure.
※Select the round wire with the size of ϕ6 ~10mm for the waterproof and tighten the cable holder by torque of 1.0 to 1.5N • m.
※On servicing wire, tighten screw of terminals by torque of 0.8N • m.
※On mounting the cover, tighten the cover nut by torque of 0.3~0.5N • m.

▣Front panel identification

◎Transmitted beam



◎Retroreflective / Retroreflective with polarizing filter ◎Diffuse reflective

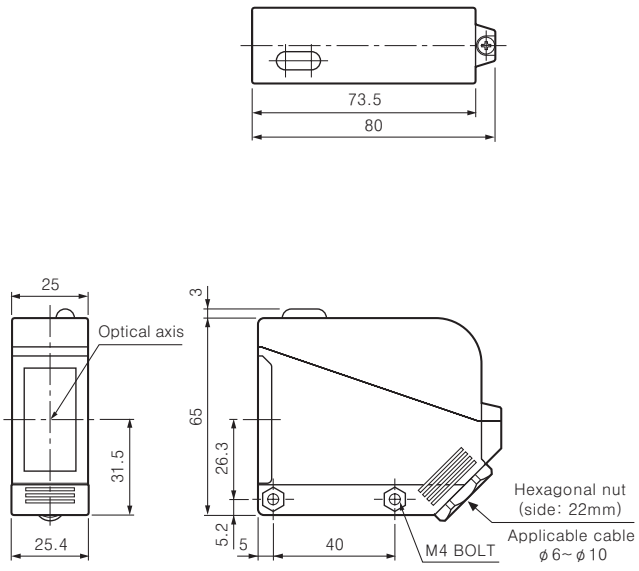


※There are no Timer mode selection switch and Timer adjuster in type without Timer function.

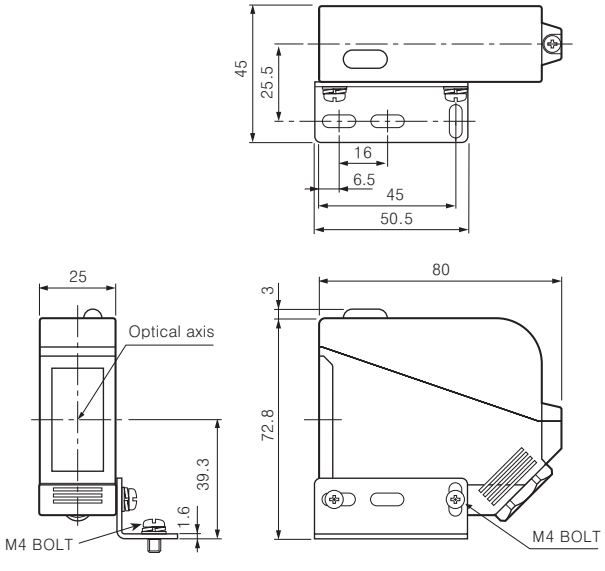
▣Dimensions

(Unit:mm)

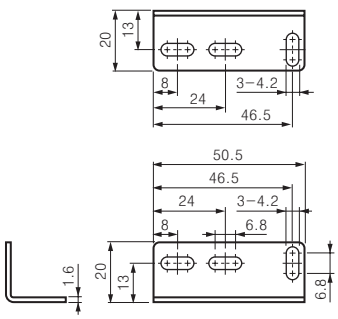
●Product



●Bracket

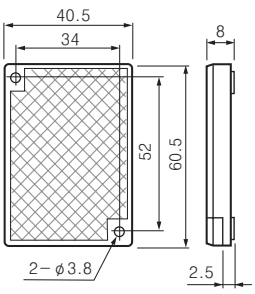


●Bracket

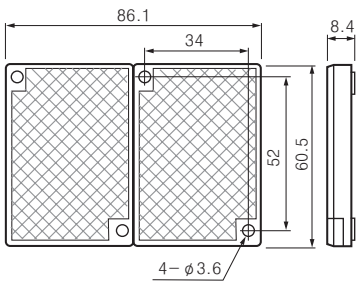


●Reflector

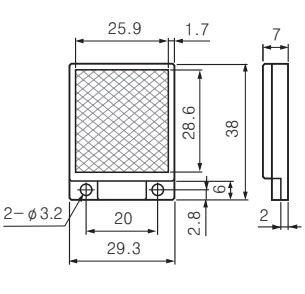
• MS-2



• MS-3



• MS-4



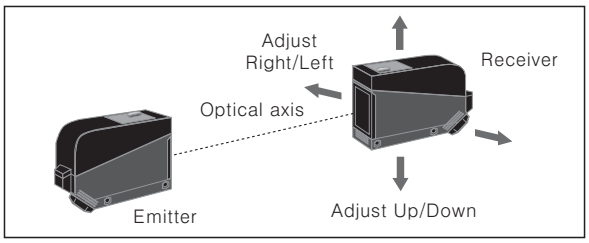
▣Mounting and sensitivity adjustment

◎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 center of position 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 ϕ15mm, it can be missed by sensor cause light penetrate it.

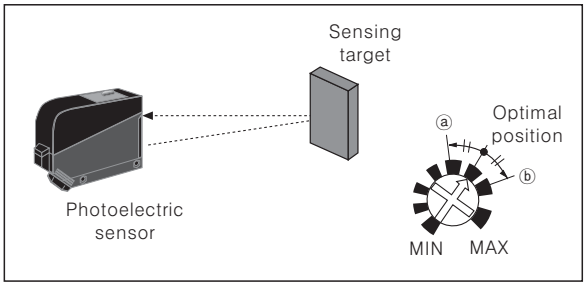
※Sensitivity adjustment : Please see the diffuse reflective type.



◎Diffuse reflective type

1. The sensitivity should be adjusted depending on a sensing target or mountin place.
2. Set the target at a position and turn sensitivity adjuster from minimum sensitivity position slowly, confirm position ⓐ in the middle of the operation range of indicator and self diagnosis indicator(Green LED) is OFF.
3. If turn adjuster higher slowly in state of removed target, the operation indicator(Yellow LED) will be OFF and self diagnosis indicator(Green LEd) will be ON. Confirm this position as ⓑ.
   [When self diagnosis indicator(Green LED) and operation indicator(Yellow LED) are OFF, the Max. sensitivity position will be ⓑ.]
4. Set the adjuster at the center of two switching position ⓐ, ⓑ.

※Above sensitivity adjustment is when it is the state of Light ON mode. If it is the state of Dark ON mode, operation indicator(Yellow LED) will be opposite.

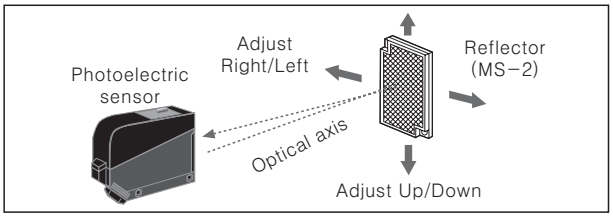


※The sensing distance indicated on specification chart is against 200×200mm of non-glossy white paper. Be sure that it can be different by size, surface and gloss of target.

◎Retroreflective type

1. Supply the power to the photoelectric sensor, after set the photoelectric sensor and the reflector(MS-2) facing each other.
2. Set the photoelectric sensor 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.

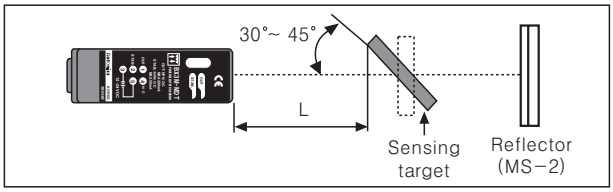
※If use more than 2 photoelectric sensors in parallel, the space between them should be more than 30cm.



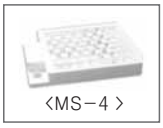
※If use more than 2 photoelectric sensors in parallel, the space between them should be more than 30cm.

※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 photo 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 sensor with the polarizing filter should be used.)

※Sensitivity adjustment : Please refer to 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-3 converting as horizontal direction, it reaches to photodetector through the filter of receiver converting as vertical by MS-3 function. Even it can detect normal mirror.