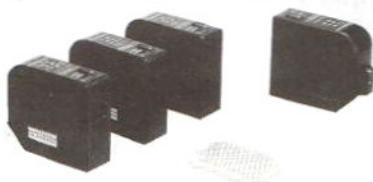


Autonics**PHOTOELECTRIC SENSOR
BX SERIES****M A N U A L**

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

■ Caution for your safety

※ Please keep these instructions and review them before using this unit.

※ Please observe the cautions that follow:

⚠ Warning Serious injury may result if instructions are not followed.

⚠ Caution Product may be damaged, or injury may result if instructions are not followed.

※ The following is an explanation of the symbols used in the operation manual.

⚠ Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machineries (Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it requires installing fail-safe device, or contact us for information on type required.**

It may result in serious damage, fire or human injury.

2. **Do not disassemble and modify this unit.**

If needs, please contact us.

It may give an electric shock and cause a fire.

3. **Do not connect a terminal when power on.**

It may give an electric shock.

⚠ Caution

1. **This unit shall not be used outdoors.**

It might shorten the life cycle of the product or give an electric shock.

2. **This unit must be used when the protection cover is installed.**

It may shorten the life cycle of this unit. It may give electric shock.

3. **Please observe specification rating.**

It might shorten the life cycle of the product and cause a fire.

4. **For wire connection, screw a bolt on terminal block with 0.8 N · m strength.**

It may cause a fire.

5. **Do not use this unit in place where there are big vibration.**

It may cause a fire.

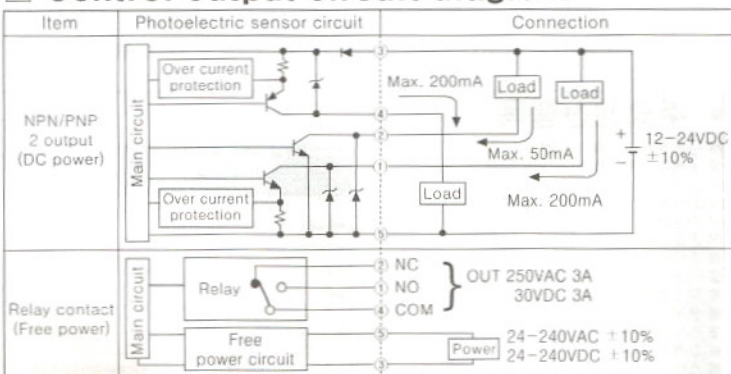
6. **In cleaning the unit, do not use water or an oil-based detergent.**

It may give an electric shock and cause a fire.

■ Ordering information

BX 15M - T D T □ - T

Control output	T	Built in timer function
		NPN/PNP 2 output (DC power)
Appearances	1	Emitter
	2	Receiver
		Single body type
Output	R	Contact output (Relay)
	T	Solid-state output (TR)
Power supply	F	Free power
	D	DC power
Detecting type	T	Through beam
	M	Retroreflective
	P	Retroreflective with polarizing filter
	D	Diffuse reflective
Detecting distance	M	Unit: m
		Unit: mm
Photoelectric sensor	BX	Series name

■ Control output circuit diagram

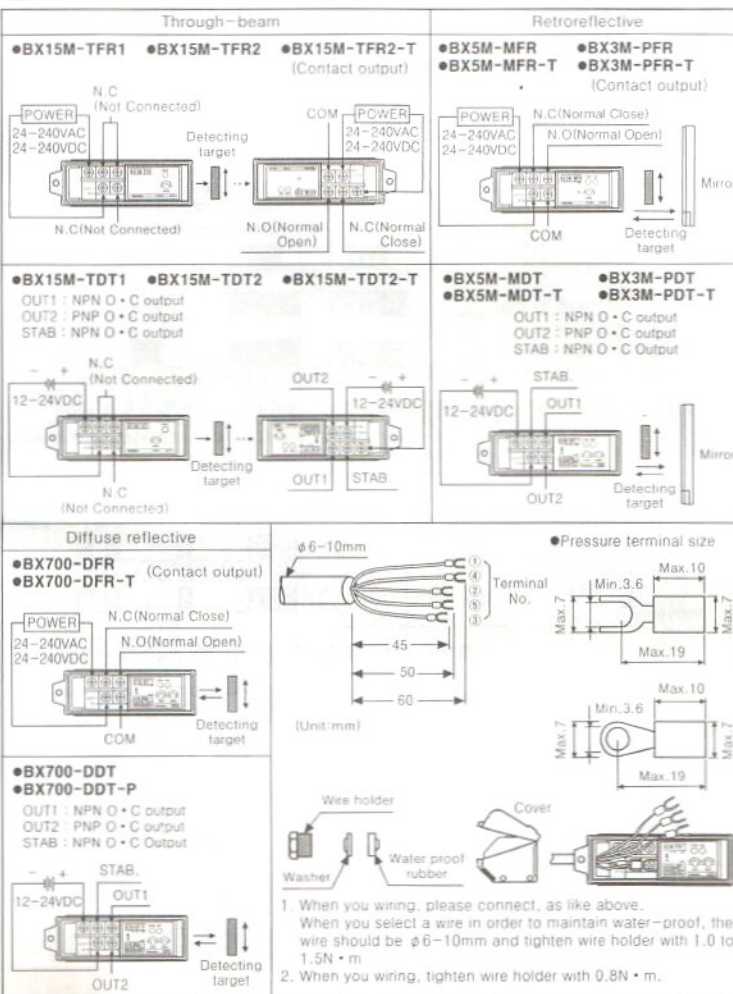
※ The above specifications are changeable at anytime without notice.

■ Specifications

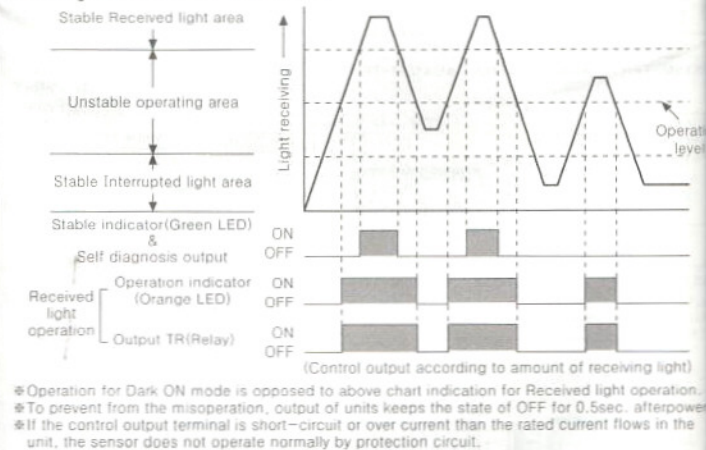
Type		Free power, Relay contact output				DC power, Solid state output			
		Through-beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective	Through-beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective
Model	Standard type	BX15M-TFR	BX5M-MFR	BX3M-PFR	BX700-DFR	BX15M-TDT	BX5M-MDT	BX3M-PDT	BX700-DDT
	Built-in Timer	BX15M-TFR-T	BX5M-MFR-T	BX3M-PFR-T	BX700-DFR-T	BX15M-TDT-T	BX5M-MDT-T	BX3M-PDT-T	BX700-DDT-T
Detecting distance		15m	0.1~5m(Mirror MS-2)	0.1~2m(Mirror MS-2), 0.1~3m(Mirror MS-3)	700mm(200×200mm non-glossy white paper)	15m	0.1~5m(Mirror MS-2)	0.1~2m(Mirror MS-2), 0.1~3m(Mirror MS-3)	700mm(200×200mm non-glossy white paper)
Detecting target		Opaque materials of Min. ϕ 15mm	Opaque materials of Min. ϕ 60mm		Transparent, Translucent, Opaque materials	Opaque materials of Min. ϕ 15mm	Opaque materials of Min. ϕ 60mm		Transparent, Translucent, Opaque materials
Hysteresis						Max. 20% at detecting distance			
Response time		Max. 20ms				Max. 1ms			
Power supply		24~240VAC \pm 10% 50/60Hz, 24~240VDC \pm 10%(Ripple P-P:Max. 10%)				12~24VDC \pm 10%(Ripple P-P:Max. 10%)			
Power consumption		Max. 3VA				Max. 50mA			
Current consumption									
Light source		Infrared LED(modulated)	Red LED (modulated:660nm)		Infrared LED(modulated)	Infrared LED(modulated)	Red LED (modulated:660nm)		Infrared LED(modulated)
Sensitivity		Adjustable VR							
Operation mode		Selectable Light ON or Dark ON by switch							
Control output		●Relay contact output \rightarrow Relay contact capacity:30VDC 3A at resistive load, 250VAC 3A at resistive load Relay contact composition:1c				●NPN/PNP 2 output ●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-2.5V), Load current:Max. 200mA			
Self-diagnosis output		Green LED indicator Green LED turns on at unstable operation				●NPN open collector output \rightarrow Load voltage:Max. 30VDC, Load current:Max. 50mA, Residual voltage:Max. 1V at 50mA, Max. 0.4V at 16mA Green LED turns on at unstable operation and output(transistor output) turns on			
Protection circuit		Reverse polarity protection, Short-circuit protection							
Timer function		●Selectable ON Delay, OFF Delay, One Shot Delay by slide switch ●Delay Time:0.1 to 5sec(VR adjustable)							
Indication		Operation indicator:Yellow LED, Stable indicator:Green LED							
Connection		Outgoing cable							
Insulation resistance		Min. 20M Ω (500VDC)							
Insulation type		(•2)							
Noise strength		\pm 1000V the square wave noise(pulse width:1 μ s) by the noise simulator				\pm 240V the square wave noise(pulse width:1 μ s) by the noise simulator			
Dielectric strength		1500VAC 50/60Hz for 1minute							
Vibration		1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours							
Malfunction		1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 10 minutes							
Shock		500m/s ² (50G) in X, Y, Z directions for 3 times							
Malfunction		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		Operating: -20 to +55°C(non-freezing condition), Storage: -25 to +70°C							
Ambient humidity		35 to 85%RH, Storage: 35 to 85%RH							
Protection		IP66(IEC specification)							
Material		Case: ABS, Lens cover: PC, Lens: Acryl							
Accessory		Individual Common		Mirror(MS-2)	Mirror(MS-3)		Mirror(MS-2)	Mirror(MS-3)	
Weight		Driver, Mounting bracket, Bolts/nuts							
		TFR: Approx. 225g, MFR-T: Approx. 226g	MFR: Approx. 130g, PFR-T: Approx. 131g	PFR: Approx. 148g, DFR-T: Approx. 149g	DFR: Approx. 115g, PFR-T: Approx. 116g	TDT: Approx. 211g, PDT-T: Approx. 212g	MDT: Approx. 123g, PDT-T: Approx. 124g	PDT: Approx. 141g, PDT-T: Approx. 142g	PDT: Approx. 116g, PDT-T: Approx. 117g

• (•1) The sensing range and the sensing object of the retroreflective sensor are specified with using the MS-2 reflector. The sensing ranges of the retroreflective sensor in the above table are identified as the possible setting ranges of the MS-2 reflector. The sensor can detect on object under 0.1m apart.
 • (•2) Mark indicated that equipment protected throughout by double insulation or reinforced insulation.
 • Relay contact output 1a type is optional.

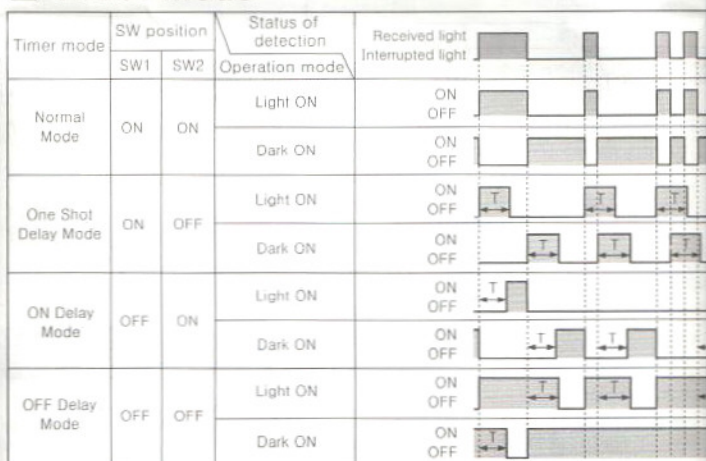
■ Connections



■ Operation mode



■ Timer mode

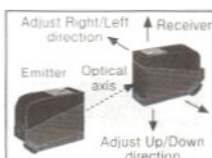


* T: Time set by timer VR.
 * Conversion to another mode of timer modes will be applied after a former mode is finished.

■ Mounting & Adjustment

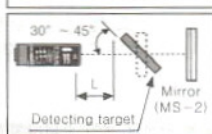
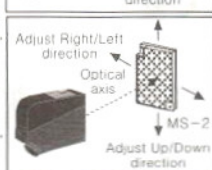
● Through-Beam type

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 up tightly after checking that the units detect the target.
- *If the detecting target is translucent body or smaller than $\phi 16\text{mm}$, it might not detect the target cause light passed.
- *Sensitivity adjustment: Please see the diffuse reflective type.



● Retroreflective type

1. Supply the power to the photoelectric sensor, after setting the photo sensor 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 units detect the target.
- *If use more than 2 photo 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 photo sensor or the surface of target should be installed at an angle of 30° to 45° against optical axis. (When detecting target with high reflectance near by, photo sensor with the polarizing filter should be used.)
- *Sensitivity adjustment : Please see the diffuse reflective type.



● Retroreflective type(With polarizing filter)

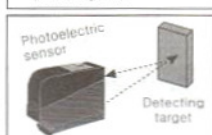
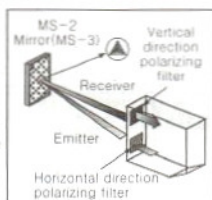
When the beam passes through polarizing filter from emitter, it will be converted as horizontal transverse beam and reaches to mirror MS-2(MS-3), afterwards it is converted by mirror function as vertical beam and reaches to receiver through polarizing filter. Even it can detect normal mirror.

● Diffuse reflective type

1. Even though the diffuse reflective type is set at Max. sensitive position, the sensitivity of the sensor must be adjusted according the existence of the reflective material in background.
2. Set the target at detecting position and turn sensitivity volume from minimum sensitivity position slowly, confirm
 - a) position where indicator(Yellow LED) is ON and self-diagnosis indicator(Green LED) is OFF.
3. If turning volume higher slowly when a target is removed, the operation indicator(Yellow LED) will be OFF and self-diagnosis indicator(Green LED) will be ON. Confirm this position as b). (When self-diagnosis indicator(Green LED) and operation indicator(Yellow LED) are OFF, the Max. sensitivity position will be b).]
4. Set the adjuster at the center of two switching point a), b).

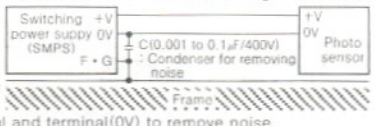
*Above sensitivity adjustment is when it is the state of Light ON mode. If it is the state of Dark ON mode, operation indicator(Yellow LED) will be opposite.

*The detecting distance indicated on specification chart is against $200 \times 200\text{mm}$ of non-glossy white paper, may be changed by the size of the target, reflectance of the target.



■ Caution for using

1. Intercept a strong source of light as like sunlight, spotlight within inclination angle range of photoelectric sensor.
2. When it is used more than 2 sets of Through-beam type, it can be occurred mutual interference by emitter beam. In this case, please change position of the emitter and the receiver of the other in order to prevent mutual interference.
3. When more than 2 sets of diffuse reflection types are installed adjacently, it may cause malfunction by light beam from the other target. So it must be installed at an enough interval.
4. When the photoelectric sensor is installed on a flat part that has high reflectance, it can be occurred malfunction by light beam from a flat part. The sensor must be installed as proper interval between the photoelectric sensor and a flat part.
5. When wiring the photoelectric sensor with high voltage line, power line in the same conduit, it may cause malfunction or mechanical trouble. Therefore please wire separately or use different conduit.
6. Avoid installing the unit where corrosive gas, oil or dust, strong flux, noise, sunny, strong, alkali, and acid are exist.
7. In case of connecting inductive load as DC relay at load, use diode and varistor in order to remove noise.
8. The photoelectric sensor cable shall be used as short as possible, because it may cause malfunction by noise through the cable.
9. When it is stained by dirt at lens, please clean the lens with dry cloth, but don't use an organic materials such as alkali, acid, chromic acid.
10. When wire connection, the wire should be over than AWG No. 20 and length should be under than 100m.
11. Be sure to tight bolt with $0.3\text{N} \cdot \text{m}$ to $0.5\text{N} \cdot \text{m}$ torque.
12. When the unit is supplied power source from switching power supply unit, please earth Frame ground(F.G) terminal, and connect condenser between F.G terminal and terminal(0V) to remove noise.



*It may cause malfunction if above instructions are not followed.

■ Major products

- PROXIMITY SENSOR ■ PHOTOELECTRIC SENSOR
- AREA SENSOR ■ FIBER OPTIC SENSOR
- DOOR/DOOR SIDE SENSOR
- PRESSURE SENSOR ■ ROTARY ENCODER
- SENSOR CONTROLLER
- SWITCHING POWER SUPPLY
- TEMPERATURE CONTROLLER
- TEMPERATURE/HUMIDITY TRANSDUCER
- POWER CONTROLLER ■ RECORDER
- TACHOMETER/PULSE(RATE) METER
- PANEL METER ■ INDICATOR
- SIGNAL CONVERTER ■ COUNTER
- TIMER ■ DISPLAY UNIT
- GRAPHIC PANEL
- STEPPING MOTOR & DRIVER
- & MOTION CONTROLLER

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