

# 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.
- ⚠ Caution: Injury or danger may occur under special conditions.
- Warning**
- 1. In case of using this unit with machinery(Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.  
It may cause a fire, human injury or damage to property.
- 2. Do not disassemble and modify this unit.  
If needs, please contact us.  
It may cause electric shock and cause a fire.
- 3. Do not connect a terminal when power on.  
It may cause electric shock.

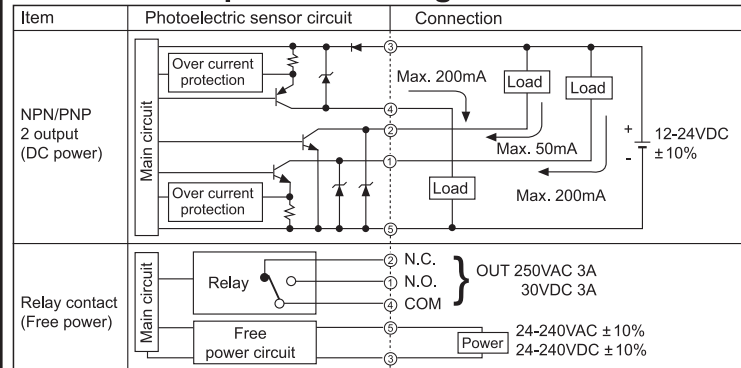
### Caution

- 1. This unit shall not be used outdoors.  
It might shorten the life cycle of the product or give an electric shock. Use this product inside only. Do not use the product outdoors or location subject to temperatures or humidity outside. (Ex: rain, dirty, frost, sunlight, condensation, etc.)
- 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 Nm 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 cause electric shock or fire.

### Ordering information

BX	15M	-	T	D	T	-	T
Item	Control output						
Item	Appearances						
Item	Output						
Item	Power supply						
Item	Sensing type						
Item	Sensing distance						
Item	Photoelectric sensor series						

### Control output circuit diagram



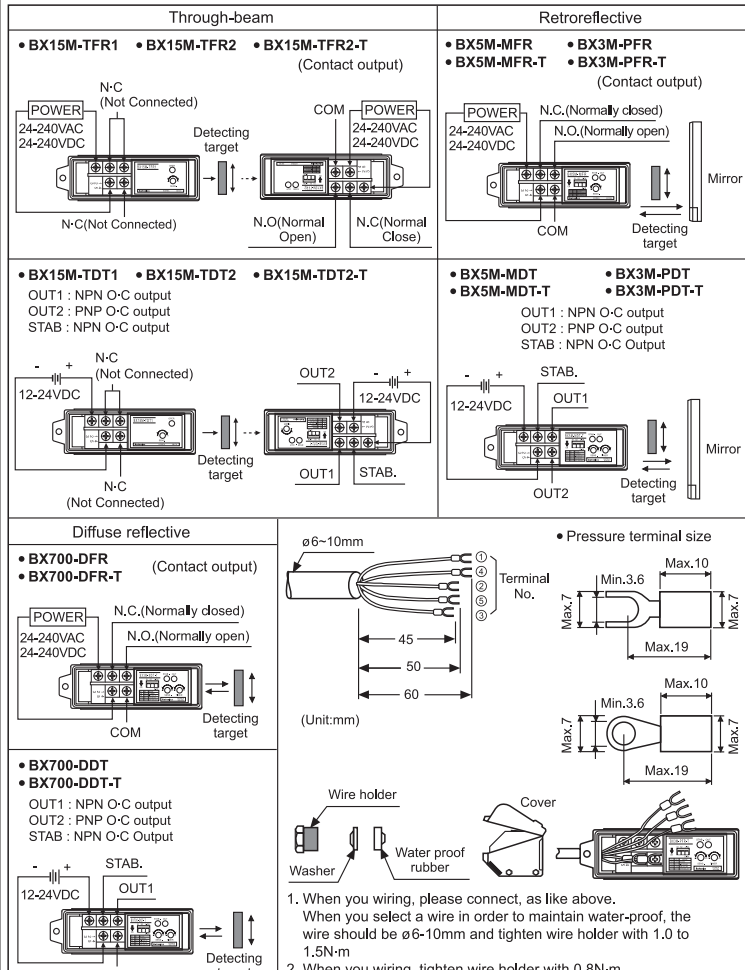
※The above specifications are subject to change and some models may be discontinued without notice.

### Specifications

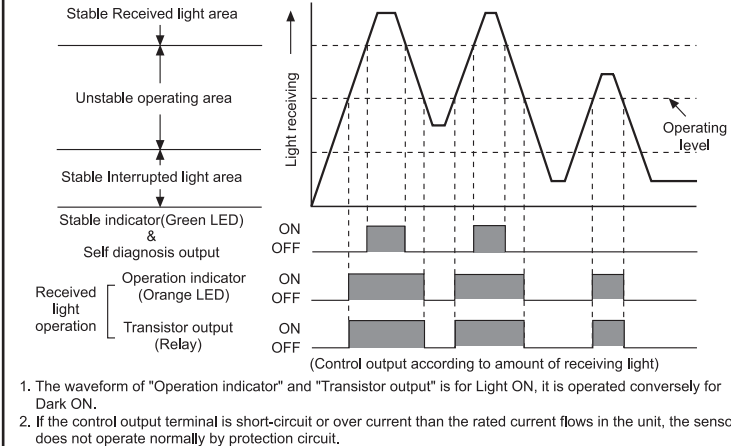
Type	Free power, Relay contact output				DC power, Solid state output			
	Through-beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective	Through-beam	Retroreflective	Retroreflective (with polarizing filter)	Diffuse reflective
Model	Standard type Built-in Timer	BX15M-TFR BX5M-MFR	BX3M-PFR BX3M-PFR-T	BX700-DFR BX700-DFR-T	BX15M-TDT BX15M-TDT-T	BX5M-MDT BX5M-MDT-T	BX3M-PDT BX3M-PDT-T	BX700-DDT 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. ø15mm	Opaque materials of Min. ø60mm	Translucent, Opaque materials	Opaque materials of Min. ø15mm	Opaque materials of Min. ø60mm	Translucent, Opaque materials	Translucent, Opaque materials	Translucent, Opaque materials
Hysteresis	Max. 20% at detecting distance				Max. 20% at detecting distance			
Response time	Max. 20ms				Max. 1ms			
Power supply	24-240VAC ±10% 50/60Hz, 24-240VDC ±10%(Ripple P-P: Max. 10%)				12-24VDC ±10%(Ripple P-P: Max. 10%)			
Power consumption	Max. 3VA				Max. 50mA			
Current consumption	Max. 50mA				Max. 50mA			
Light source	Infrared LED(850nm)	Red LED(660nm)	Infrared LED(940nm)	Infrared LED(850nm)	Red LED(660nm)	Infrared LED(940nm)	Infrared LED(850nm)	Infrared LED(940nm)
Sensitivity	Adjustable VR							
Operation mode	Selectable Light ON or Dark ON by switch							
Control output	Relay contact output • Relay contact capacity: 30VDC 3A at resistive load, 250VAC 3A at resistive load • Relay contact composition:1c				NPN or PNP open collector output • Load voltage: Max. 30VDC • Load current: Max. 200mA • Residual voltage - NPN: Max. 1V, PNP : Max. 2.5V			
Self-diagnosis output	Green LED indicator Green LED turns on at unstable operation				NPN open collector output • Load voltage: Max. 30VDC • Load current: Max. 50mA • Residual voltage: Max. 1V(load current: 50mA), Max. 0.4V(load current: 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. 20MΩ (500VDC megger)							
Insulation type	Double or strong insulation (Mark: □, △, Dielectric voltage between the measured input and the power: 1.5kV)							
Noise strength	±1000V the square wave noise(pulse width: 1μs) by the noise simulator				±240V the square wave noise(pulse width: 1μs) by the noise simulator			
Dielectric strength	1500VAC 50/60Hz for 1minute							
Vibration	Mechanical: 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	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							
Environment	Ambient illumination: Sunlight: Max. 11,000lx, Incandescent lamp: Max. 3,000lx(Receiver illumination) Ambient temperature: -20 to 55°C, Storage: -25 to 70°C Ambient humidity: 35 to 85%RH, Storage: 35 to 85%RH							
Protection	IP66(IEC standard)							
Material	• Case, Lens cover: PC • Sensing part: Acryl							
Accessory	Individual	Mirror(MS-2)	Mirror(MS-3)		Mirror(MS-2)	Mirror(MS-3)		
Approval	Common VR adjustment driver, Mounting bracket, Bolts/nuts							
Unit weight	TFR : Approx. 225g, MFR-T : Approx. 226g	MFR : Approx. 130g, PFR-T : Approx. 131g	PFR : Approx. 148g, DFR-T : Approx. 149g	DFR : Approx. 115g, TDT-T : Approx. 212g	TDT : Approx. 211g, MDT-T : Approx. 124g	PDT : Approx. 141g, PDT-T : Approx. 142g	PDT : Approx. 116g, PDT-T : Approx. 117g	

※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.  
※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.

### Connections



### Operation mode



### Timer mode

Timer mode	SW position		Status of detection	Received light	Interrupted light
	SW1	SW2			
Normal Mode	ON	ON	Light ON	ON	OFF
			Dark ON	ON	OFF
One Shot Delay Mode	ON	OFF	Light ON	ON	OFF
			Dark ON	ON	OFF
ON Delay Mode	OFF	ON	Light ON	ON	OFF
			Dark ON	ON	OFF
OFF Delay Mode	OFF	OFF	Light ON	ON	OFF
			Dark ON	ON	OFF

### Mounting & Adjustment

- **Through-Beam type**
  - Supply the power to the photoelectric sensor, after setting the emitter and the receiver in face to face.
  - Set the receiver in center of position where indicator turns on, as adjusting the receiver or the emitter right and left, up and down.
  - Fix both units up tightly after checking that the units detects the target.  
※If the detecting target is translucent body or smaller than ø16mm, it might not detect the target cause light passed.  
※Sensitivity adjustment: Please see the diffuse reflective type.
- **Retroreflective type**
  - Supply the power to the photoelectric sensor, after setting the photo sensor and the mirror(MS-2) in face to face.
  - Set the photoelectric sensor in the position which indicator turns on, as adjusting the mirror or the sensor right and left, up and down.
  - 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**
  - 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.
  - Set the target at detecting position and turn sensitivity volume from minimum sensitivity position slowly, confirm ⊙ position where indicator(Yellow LED) is ON and self-diagnosis indicator(Green LED) is OFF.
  - 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 ⊙. [When self-diagnosis indicator(Green LED) and operation indicator(Yellow LED) are OFF, the Max. sensitivity position will be ⊙.]
  - Set the adjuster at the center of two switching point ⊙, ⊙.  
※Above sensitivity adjustment is when it is the state of Light ON. If it is the state of Dark ON, operation indicator (Yellow LED) will be opposite.  
※The detecting distance indicated on specification chart is against 200×200mm of non-glossy white paper, may be changed by the size of the target, reflectance of the target.

### Caution for using

- Intercept a strong source of light as like sunlight, spotlight within inclination angle range of photoelectric sensor.
  - 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.
  - 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.
  - 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.
  - 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.
  - Avoid installing the unit where corrosive gas, oil or dust, strong flux, noise, sunny, strong, alkali, and acid are exist.
  - In case of connecting inductive load as DC relay at load, use diode and varistor in order to remove noise.
  - The photoelectric sensor cable shall be used as short as possible, because it may cause malfunction by noise through the cable.
  - 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.
  - When wire connection, the wire should be over than AWG No. 20 and length should be under than 100m.
  - Be sure to tight bolt with 0.3N-m to 0.5N-m torque.
  - 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.
  - Installation environment  
⊙ shall be used indoor ⊙Altitude max. 2,000m ⊙Pollution degree 2 ⊙Installation category II
- ※It may cause malfunction if above instructions are not followed.

### Major products

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- Pressure sensors
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