Autonics

PHOTOELECTRIC SENSOR
BX SERIES
M A N U A L

CE

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, when it requires. 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. **When wire connection, screw 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 □ – TP

Control output	P	PNP open collector output
	T	Built in timer function
		NPN open collector output
Appearances	1	Emitter
	2	Receiver
		Single body type(Emiter and Receiver)
Output	R	Relay output
	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

※The above specifications are changeable without notice anytime.

▣ Specification(DC power)

Type		DC power, Solid state output							
		NPN output type				PNP output type			
		Through-beam	Retroreflective(*1)		Diffuse reflective	Through beam	Retroreflective(*1)		Diffuse reflective
Model	Standard type	**BX15M-TDT**	**BX5M-MDT**	**BX3M-PDT**(With polarizing filter)	**BX700-DDT**	**BX15M-TDT-P**	**BX5M-MDT-P**	**BX3M-PDT-P**(With polarizing filter)	**BX700-DDT-P**
	Built-in Timer	**BX15M-TDT-T**	**BX5M-MDT-T**	**BX3M-PDT-T**(With polarizing filter)	**BX700-DDT-T**	**BX15M-TDT-TP**	**BX5M-MDT-TP**	**BX3M-PDT-TP**(With polarizing filter)	**BX700-DDT-TP**
Detecting distance		15m	0.1 to 5m (MS-2 mirror)	0.1 to 2m (MS-2 mirror) 0.1 to 3m (MS-3 mirror)	700mm(200×200mm non-glossy white paper)	15m	0.1 to 5m (MS-2 mirror)	0.1 to 2m(MS-2 mirror) 0.1 to 3m(MS-3 mirror)	700mm(200×200mm non-glossy white paper)
Detecting target		Opaque materials of Min. ø15mm	Opaque materials of Min. ø60mm		Transparent, Translucent, Opaque material	Opaque materials of Min. ø15mm	Opaque materials of Min. ø60mm		Transparent, Translucent, Opaque material
Hysteresis		————	————		Max. 20% at rated setting distance	————	————		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			Max. 40mA	Max. 30mA		
Light source		Infrared LED(Modulated)	Red LED(Modulated:660nm)		Infrared LED(Modulated)		Red LED(Modulated:660nm)		Infrared LED(Modulated)
Sensitivity		Adjustable by VR							
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 output ☞ 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							
		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, Self-diagnosis indicator : Green LED							
Connection		Terminal connection							
Insulation resistance		Min. 20MΩ(500VDC)							
Noise strength		±240V the square wave noise(pulse width:1㎲) by the noise simulator							
Dielectric strength		1,000VAC 50/60Hz for 1minute							
Vibration		1.5mm amplitude at frequency of 10 to 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		Operating : -20 to +65℃(non-freezing condition), Storage : -25 to +70℃							
Ambient humidity		35 to 85%RH, Storage : 35 to 85%RH							
Ambient protection		IP66(IEC specification)							
Material		Case : ABS, Lens cover : PC, Lens : Acryl							
Accessory	Individual	————	Mirror(MS-2)	Mirror(MS-3)	————	————	Mirror(MS-2)	Mirror(MS-3)	————
	Common	Driver, Mounting bracket, Bolts/nuts							
Weight		TDT : Approx. 183g, TDT-T : Approx. 188g	MDT : Approx. 110g, MDT-T : Approx. 115g	PDT : Approx. 114g, PDT-T : Approx. 119g	DDT : Approx. 95g, DDT-T : Approx. 100g	TDT-P : Approx. 183g, TDT-TP : Approx. 188g	MDT-P : Approx. 110g, MDT-TP : Approx. 115g	PDT-P : Approx. 114g, PDT-TP : Approx. 119g	DDT-P : Approx. 95g, DDT-TP : Approx. 100g
Approval		CE							

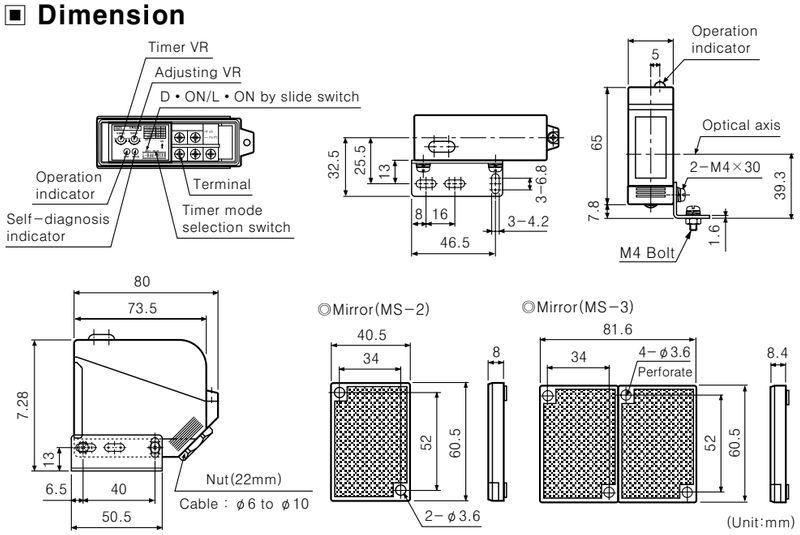
※(*1)The sensing range and the sensing object of the retroreflective sensor are specified with using the MS-2(MS-3) reflector. The sensing ranges of the retroreflective sensor in the above table are indentified as the possible setting ranges of the MS-2(MS-3) reflector. The sensor can detect on object under 0.1m apart.

▣ Specification(Free power)

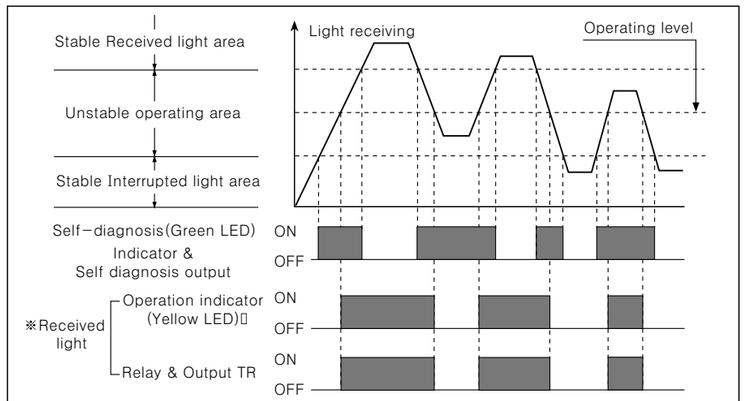
Type		Free power, Relay contact output			
		Through-beam	Retroreflective		Diffuse reflective
Model	Standard type	**BX15M-TFR**	**BX5M-MFR**	**BX3M-PFR**(With polarizing filter)	**BX700-DFR**
	Built-in Timer	**BX15M-TFR-T**	**BX5M-MFR-T**	**BX3M-PFR-T**(With polarizing filter)	**BX700-DFR-T**
Detecting distance		15m	0.1 to 5m(MS-2)	0.1 to 2m(MS-2), 0.1 to 3m(MS-3)	700mm(200×200mm non-glossy white paper)
Detecting target		Opaque materials of Min. ø15mm	Opaque materials of Min. ø60mm		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%)			
Power consumption		Max. 3VA			
Light source		Infrared LED(Modulated)		Red LED(Modulated:660nm)	Infrared LED(Modulated)
Sensitivity		Adjustable by VR			
Operation mode		Selectable Light ON or Dark ON by slide switch			
Control output		• Relay contact output ☞ Relay contact capacity : 30VDC 3A at resistive load, 250VAC 3A at resistive load Relay contact composition: 1c(SPDT)			
Self-diagnosis output		Green LED indicator			
		Green LED turns on at unstable operation			
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, Self-diagnosis indicator : Green LED			
Connection		Terminal connection			
Insulation resistance		Min. 20MΩ(500VDC)			
Insulation type(*2)		□			
Noise strength		±1,000V the square wave noise(pulse width:1㎲) by the noise simulator			
Dielectric strength		1,500VAC 50/60Hz for 1minute			
Impulse voltage withstand		1kV(Generator:1.2/50㎲, Source impedence:500Ω, Source energy:0.5J)			
Vibration	Mechanical	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours			
	Malfuntion	1.5mm amplitude at frequency of 10 to 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		Operating : -20 to +65℃(non-freezing condition), Storage : -25 to +70℃			
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	————	Mirror(MS-2)	Mirror(MS-3)	————
	Common	Driver, Mounting bracket, Bolts/nuts			
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
Approval		CE			

※(*1)The sensing range and the sensing object of the retroreflective sensor are specified with using the MS-2(MS-3) reflector. The sensing ranges of the retroreflective sensor in the above table are indentified as the possible setting ranges of the MS-2(MS-3) reflector. The sensor can detect on object under 0.1m apart.
※(*2)"□" Mark indicated that equipment protected throughout by double insulation or reinforced insulation.

▣ Dimension

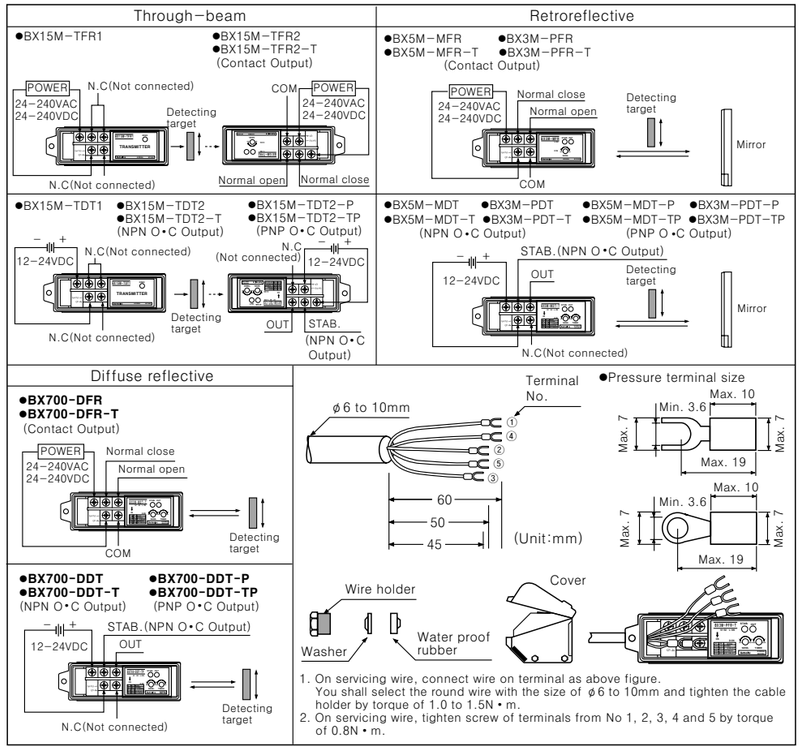


▣ Operation mode



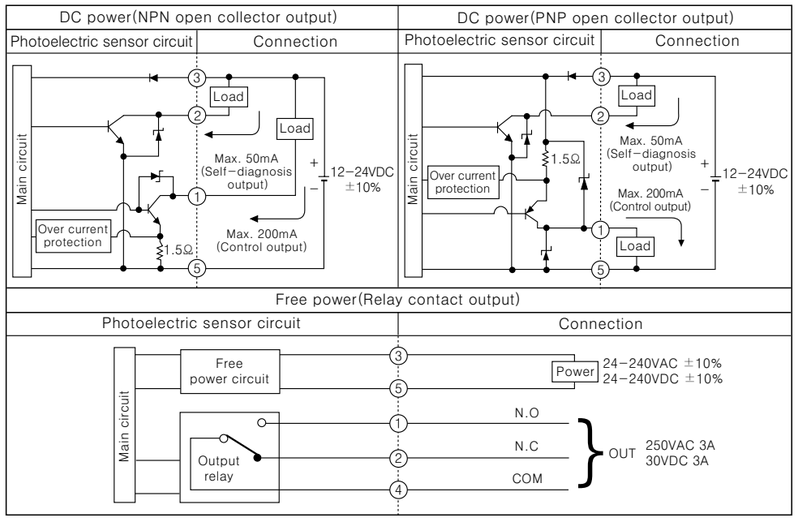
※Operation for Dark ON mode is opposed to above chart indication for Light ON mode.
※To prevent from the misoperation, output of units keeps the state of OFF for 0.5sec. after power ON.
※If the control output terminal is short-circuit or over current than the rated current flows in the unit, the sensor does not operate normally by protection circuit.

▣ Connection



1. On servicing wire, connect wire on terminal as above figure. You shall select the round wire with the size of ø6 to 10mm and tighten the cable holder by torque of 1.0 to 1.5N • m.
2. On servicing wire, tighten screw of terminals from No 1, 2, 3, 4 and 5 by torque of 0.8N • m.

▣ Control output circuit diagram



▣ Timer mode

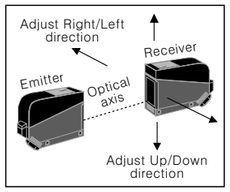
Timer mode	SW position SW1	SW position SW2	Status of detection / Operation mode	Received light / Interrupted light
Normal Mode	ON	ON	Light ON	ON / OFF
			Dark ON	ON / OFF
One Shot Delay Mode	ON	OFF	Light ON	ON / OFF
			Dark ON	ON / OFF
ON Delay Mode	OFF	ON	Light ON	ON / OFF
			Dark ON	ON / OFF
OFF Delay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

※T : Time set by timer VR.

▣ Mounting & Adjustment

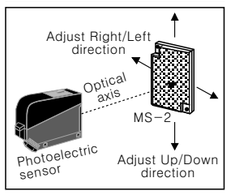
◎Through-Beam type

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 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.



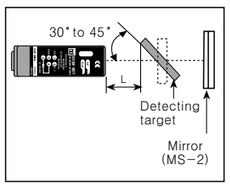
◎Retroreflective type

1. Supply the power to the photoelectric sensor, after setting the photoelectric 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 photoelectric sensor or the surface of target should be installed at an angle of 30° to 45° 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.



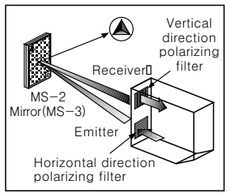
◎Retroreflective type(With polarizing filter)

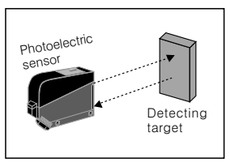
When the beam passes through polarizing filter from emitter, it will be converted as horizontal transverse beam and reaches to mirror MS-2(MS-3), afterwards it is converted by mirror function as vertical beam and reaches to receiver through polarizing filter. Even it can detect normal mirror.

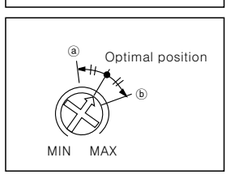


◎Diffuse reflective type

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 ⓐ position where indicator(Yellow LED) is ON and self-diagnosis indicator (Green LED) is OFF.
3. If turn volume 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 point ⓐ, ⓑ.
   ※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 200×200mm of non-glossy white paper, may be changed by the size of the target, reflectance of the target.

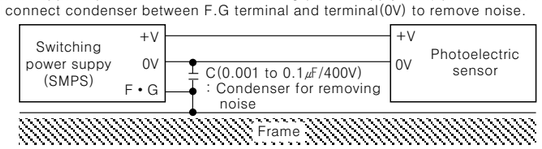






▣ Caution for using

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 escape 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 wire the photoelectric sensor with high voltage line, power line in the same conduit, it may cause malfunction or mechanical trouble. Therefore please wire seperately or use different conduit.
6. Avoid installing the unit as following place.
   Corrosive gas, oil or dust, strong flux, noise, sunny, strong alkali, acid.
7. In case of connecting inductive load as DC relay at load, use shielded cable, 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 screw bolt with 0.3N • m to 0.5N • 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.

▣ Main products

- COUNTER
- TIMER
- TEMPERATURE CONTROLLER
- PANEL METER
- TACHOMETER
- LINE SPEED METER
- DISPLAY UNIT
- PROXIMITY SWITCH
- PHOTOELECTRIC SENSOR
- FIBER OPTIC SENSOR
- PRESSURE SENSOR
- ROTARY ENCODER
- SENSOR CONTROLLER
- POWER CONTROLLER
- STEPPING MOTOR & DRIVER & CONTROLLER

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NO20020618-EP-E-08-0090E