Autonics

Photoelectric Sensor
BX SERIES

INSTRUCTION MANUAL

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **Warning** Failure to follow these instructions may result in serious injury or death.
⚠ **Caution** Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in fire, personal injury, or economic loss.
2. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in electric shock or fire.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in electric shock or fire.
4. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.

⚠ Caution

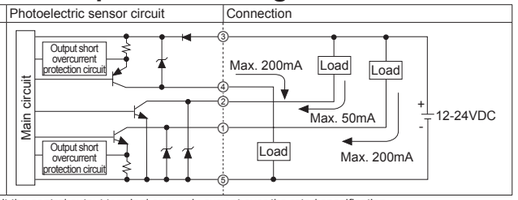
1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in electric shock or fire.
3. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
4. **Do not use a load over the range of rated relay specification.**
   Failure to follow this instruction may result in insulation failure, contact melt, contact failure, relay broken, or fire.

■ Ordering Information

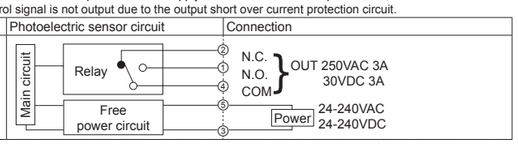
BX 15M – T D T □ – T

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(Transistor)
Power supply	**F**	Free power
	D	DC power
Sensing type	**T**	Through beam
	M	Retroreflective
	P	Retroreflective with polarizing filter
	D	Diffuse reflective
Sensinging distance	**M**	Unit: m
		Unit: mm
Item	**BX**	Photoelectric sensor series

■ Control Output Circuit Diagram

Item	Photoelectric sensor circuit	Connection
NPN/PNP 2 output (DC power)		

※If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the output short over current protection circuit.

Item	Photoelectric sensor circuit	Connection
Relay contact (Free power)		

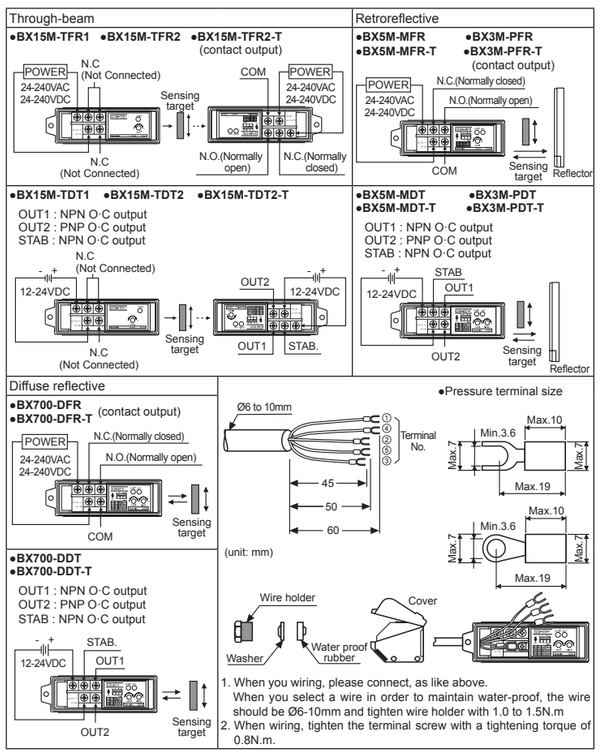
※The product is not equipped with the output short over current protection circuit. If short-circuit the control output terminal or supply current over the rated specification, it may result in product damage.
※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

■ 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**
Sensing distance		15m	0.1 to 5m (reflector MS-2)※1	0.1 to 2m (reflector MS-2), 0.1 to 3m (reflector MS-3)※1	700mm※2	15m	0.1 to 5m (reflector MS-2)※1	0.1 to 2m (reflector MS-2), 0.1 to 3m (reflector MS-3)※1	700mm※2
Sensing 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
Hysteresis		—			Max. 20% at sensing distance	—			Max. 20% at sensing 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				—			
Current consumption		—				Max. 50mA			
Light source		Infrared LED (850nm)		Red LED (660nm)	Infrared LED (940nm)	Infrared LED (850nm)		Red LED (660nm)	Infrared LED (940nm)
Sensitivity		Sensitivity adjuster							
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. 1VDC⎓, PNP : max. 2.5VDC			
Self-diagnosis output		Green LED indicator				NPN open collector output • Load voltage: max. 30VDC⎓ • Load current: max. 50mA • Residual voltage: max. 1VDC⎓ (load current: 50mA), max. 0.4VDC (load current: 16mA)			
		Green LED turns on at unstable operation				Green LED turns on at unstable operation and output (transistor output) turns on			
Protection circuit		Reverse polarity protection circuit, output short overcurrent protection circuit							
Timer function		• Selectable ON Delay, OFF Delay, One Shot Delay by slide switch • Delay Time: 0.1 to 5sec (timer adjuster)							
Indication		Operation indicator: yellow LED, stable indicator: green LED							
Connection		Outgoing cable							
Insulation resistance		Min. 20MΩ (at 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/s² (approx. 50G) in X, Y, Z directions for 3 times							
	Malfunction	100m/s² (approx. 10G) in X, Y, Z directions for 3 times							
Environ-ment	Ambient illumination	Sunlight: max. 11,000lx, incandescent lamp: max. 3,000lx (receiver illumination)							
	Ambient temperature	-20 to 55℃, storage: -25 to 70℃							
	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	—	Reflector (MS-2)	Reflector (MS-3)	—	—	Reflector (MS-2)	Reflector (MS-3)	—
	Common	Adjustment screwdriver, mounting bracket, Z bolt: 2, washer: 2, Ø6 waterproof rubber: 2, Ø10 waterproof rubber: 2	Adjustment screwdriver, mounting bracket, Z bolt: 1, washer: 1, Ø6 waterproof rubber: 1, Ø10 waterproof rubber: 1			Adjustment screwdriver, mounting bracket, Z bolt: 2, washer: 2, Ø6 waterproof rubber: 2, Ø10 waterproof rubber: 2	Adjustment screwdriver, mounting bracket, Z bolt: 1, washer: 1, Ø6 waterproof rubber: 1, Ø10 waterproof rubber: 1		
Approval		CE							
Unit weight		TFR : approx. 225g, TFR-T : approx. 226g	MFR : approx. 130g, MFR-T : approx. 131g	PFR : approx. 148g, PFR-T : approx. 149g	DFR : approx. 115g, DFR-T : approx. 116g	TDT : approx. 211g, TDT-T : approx. 212g	MDT : approx. 123g, MDT-T : approx. 124g	PDT : approx. 141g, PDT-T : approx. 142g	DDT : approx. 116g, DDT-T : approx. 117g

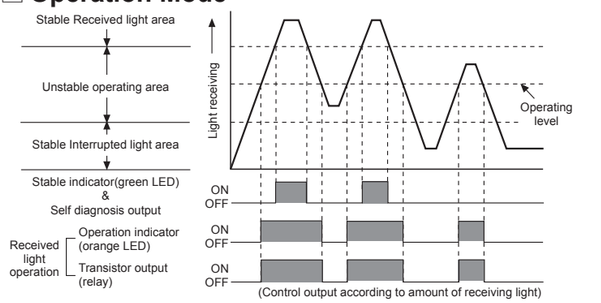
※1: The sensing range of the retroreflective sensor is the possible setting ranges of the reflector. An object can be sensed, altough the distance betwwen sensor and terget is shorter than 0.1m.
※2: Non-glossy white paper 200×200mm.
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

■ Connections



1. When you wiring, please connect, as like above.
   When you select a wire in order to maintain water-proof, the wire should be Ø6-10mm and tighten wire holder with 1.0 to 1.5N.m
2. When wiring, tighten the terminal screw with a tightening torque of 0.8N.m.

■ Operation Mode



The waveform of "Operation indicator" and "Transistor output" is for Light ON, it is operated conversely for Dark ON.

■ Timer Mode

Timer mode	SW position SW1	SW position SW2	Status of sensing / 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 Dwelay Mode	OFF	OFF	Light ON	ON / OFF
			Dark ON	ON / OFF

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

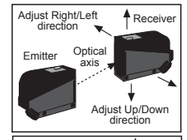
■ Mounting and Adjustment

Use the product with the protective cover in the place.
Failure to follow this instruction may result in electric shock.
When extending wire, use AWG20 cable or over within 100m.
When using photoelectric sensors closely over two units, it may result in malfunction due to mutual interference.
When installing the product, tighten the wire holder with a tightening torque of 1.0 to 1.5N·m.
When installing the cover, tighten the screw with a tightening torque of 0.3 to 0.5 N·m.

◎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 senses the target.

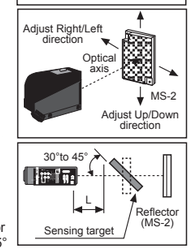
※If the sensing target is translucent body or smaller than Ø16mm, it might not sense the target cause light passed.
※Sensitivity adjustment:Please see the diffuse reflective type.



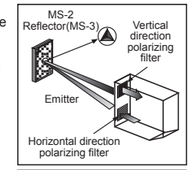
◎Retroreflective type

1. Supply the power to the photoelectric sensor, after setting the photo sensor and the reflector (MS-2) in face to face.
2. Set the photoelectric sensor in the position which indicator turns on, as adjusting the reflector or the sensor right and left, up and down.
3. Fix both units tightly after checking that the units sense 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 sensing target with high reflectance near by, photo sensor with the polarizing filter should be used.)
※Sensitivity adjustment: Please see the diffuse reflective type.



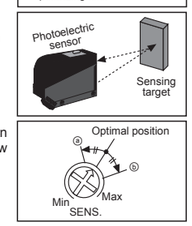
◎Retroreflective type (with polarizing filter)
When the beam passes through polarizing filter from emitter, it will be converted as horizontal transverse beam and reaches to reflector MS-2 (MS-3), afterwards it is converted by reflector function as vertical beam and reaches to receiver through polarizing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



◎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 to the existence of the reflective material in background.
2. Set the target at sensing 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 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 ⓑ.]
4. 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 indicato (yellow LED) will be opposite.
※The sensing 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.



■ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
2. When connecting a DC relay or other inductive load to the output, remove surge by using diodes or varistors.
3. Use the product, 0.5 sec after supplying power.
   When using separate power supply for the sensor and load, supply power to sensor first.
4. 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
5. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
6. When using switching mode power supply to supply the power, ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
7. When using sensor with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground F.G. terminal of the equipment.
8. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation category II

■ Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connectors/Sockets
- Switching Mode Power Supplies
- Control Switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper Motors/Drivers/Motion Controllers
- Graphic/Logic Panels
- Field Network Devices
- Laser Marking System (Fiber, CO_2, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

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