

# Autonics FIBER OPTIC SENSOR BF4 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.

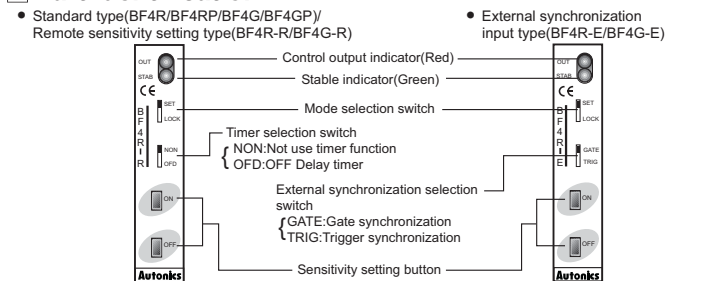
## Warning

- 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.
- Do not disassemble and modify this unit. If needs, please contact us. It may cause an electric shock and cause a fire.

## Caution

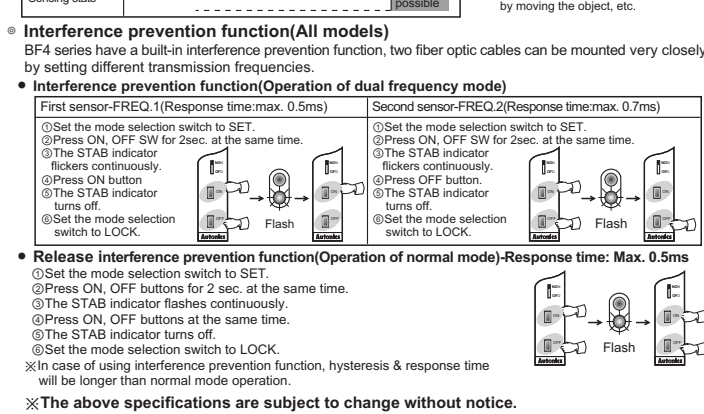
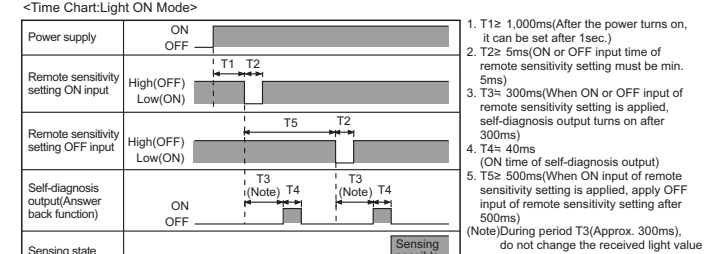
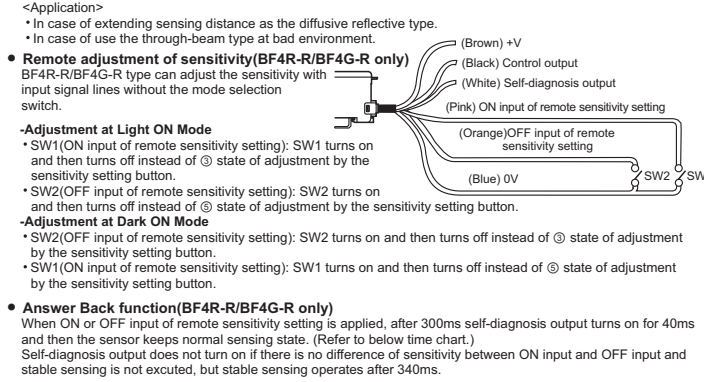
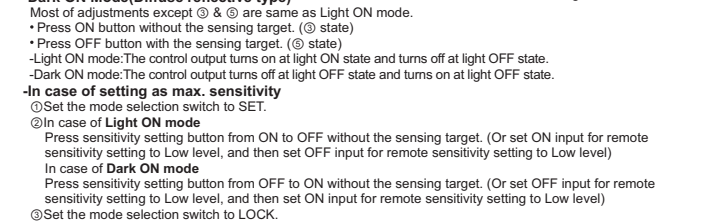
- This unit shall not be used outdoors. It might shorten the life cycle of the product or give an electric shock. Use this product inside only. Do not use the product outdoors or location subject to temperatures or humidity outside. (Ex: rain, dirt, frost, sunlight, condensation, etc.)
- Do not use this unit in place where there is flammable or explosive gas. It may cause a fire or explosion.
- Please observe the rated voltage and do not supply AC power. It may result in damage to this unit.
- Please check the polarity of power and wrong wiring. It may result in damage to this unit.
- Do not use this unit in place where there is vibration or impact. It may result in damage to this unit.
- In cleaning the unit, do not use water or an oil-based detergent. It may cause an electric shock and cause a fire.

## Part identification



## Function

- Sensitivity adjustment**
  - Adjustment by the sensitivity setting button (All models)
    - Light ON Mode**
      - Mount the fiber optic cable within sensing distance.
      - Change the mode selection switch to SET.
      - Press ON button in state of installed the sensing target. (Press ON button without the sensing target for the through-beam type)
      - Light ON
      - Stable indicator (STAB) flashes at ON state. (Check the target position)
      - Press OFF button without the sensing target. (Press OFF button in state of installed the sensing target for the through-beam type)
      - Dark ON
    - Dark ON Mode (Diffuse reflective type)**
      - Most of adjustments except ③ & ④ are same as Light ON mode.
      - Press ON button without the sensing target. (ON state)
      - Press OFF button with the sensing target. (OFF state)
      - Light ON mode: The control output turns on at light ON state and turns off at light OFF state.
      - Dark ON mode: The control output turns on at light OFF state and turns on at light OFF state.
  - In case of setting as max. sensitivity**
    - Set the mode selection switch to SET.
    - In case of Light ON mode: Press sensitivity setting button from ON to OFF without the sensing target. (Or set ON input for remote sensitivity setting to Low level, and then set OFF input for remote sensitivity setting to Low level)
    - In case of Dark ON mode: Press sensitivity setting button from OFF to ON without the sensing target. (Or set OFF input for remote sensitivity setting to Low level, and then set ON input for remote sensitivity setting to Low level)
    - Set the mode selection switch to LOCK.
- Remote adjustment of sensitivity (BF4R-R/BF4G-R only)**
  - Adjustment at Light ON Mode: SW1 (ON input of remote sensitivity setting): SW1 turns on and then turns off instead of ③ state of adjustment by the sensitivity setting button.
  - Adjustment at Dark ON Mode: SW2 (OFF input of remote sensitivity setting): SW2 turns on and then turns off instead of ④ state of adjustment by the sensitivity setting button.
- Answer Back function (BF4R-R/BF4G-R only)**
  - When ON or OFF input of remote sensitivity setting is applied, after 300ms self-diagnosis output turns on for 40ms and then the sensor keeps normal sensing state. (Refer to below time chart.)
  - Self-diagnosis output does not turn on if there is no difference of sensing between ON input and OFF input and stable sensing is not executed, but stable sensing operates after 340ms.

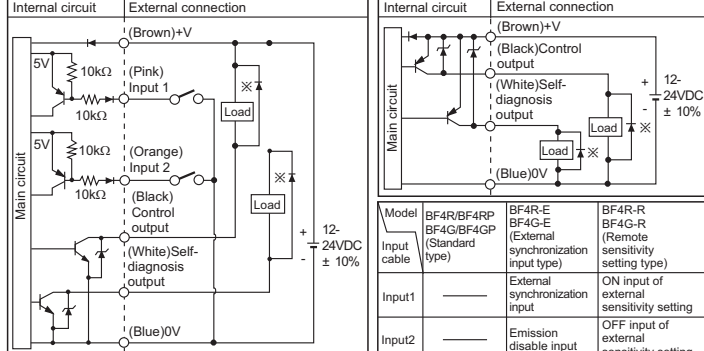


## Specifications

Type	Standard type	External synchronization input type	Remote sensitivity setting type	Standard type
Model	Red light source BF4R Green light source BF4G	BF4R-E BF4G-E	BF4R-R BF4G-R	BF4RP BF4GP
Power voltage	12-24VDC ± 10%, Ripple p-p: Max. 10%			
Current consumption	Max. 45mA			
Control output	NPN open collector output Load current: Min. 100mA, Applied voltage: Max. 30VDC Residual voltage: Max. 1V (at 100mA load current), Max. 0.4V (at 16mA load current)		PNP open collector output Load current: Min. 100mA, Applied voltage: Max. 30VDC Output voltage: Min. power supply -2.5V	
Self-diagnosis output	ON state under unstable sensing (When the target stays for 300ms in unstable area) or ON state when control output short-circuited		Load current: Min. 50mA, Applied voltage: Max. 30VDC Residual voltage: Max. 1V (at 50mA load current), Max. 0.4V (at 16mA load current)	
Operation mode	Selectable by the sensitivity setting button ON/OFF in front of this unit			
Protection circuit	Short-circuit protection, Reverse polarity protection circuit			
Light source	Red LED/Green LED (Modulated)			
Response time <sup>1)</sup>	Max. 0.5ms			
Control output indicator (OUT)	Red LED			
Stable indicator (STAB)	Green LED flashes when the target stays in stable sensing area			
Input of stop transmission function	Built in		—	
External synchronization function	Built in (Gate/Trigger)		—	
Remote sensitivity setting function	—		Built in	
Interference prevention function <sup>1)</sup>	Built-in selectable FREQ.1 or FREQ.2 by ON/OFF button			
Timer function (Selectable)	OFF delay timer (Approx. 40ms fixed)		OFF delay timer (Approx. 40ms fixed)	
Ambient illumination	Sunlight : Max. 11,000lx, Incandescent lamp : Max. 3,000lx			
Noise strength	± 240V the square wave noise (pulse width: 1µs) by the noise simulator			
Dielectric strength	1,000VAC 50/60Hz for 1 minute			
Insulation resistance	Min. 20MΩ (at 500VDC megger)			
Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours			
Shock	500m/s <sup>2</sup> (50G) X, Y, Z directions for 3 times			
Environment	Ambient temperature: -10 to 50°C, Storage: -20 to 70°C			
Material	Ambient humidity: 35 to 85%RH, Storage: 35 to 85%RH			
Cable	Case : Heat-resistant ABS, Case cover : Polycarbonate		—	
Accessory	Mounting bracket, Bolts/nuts			
Weight	Approx. 65g			

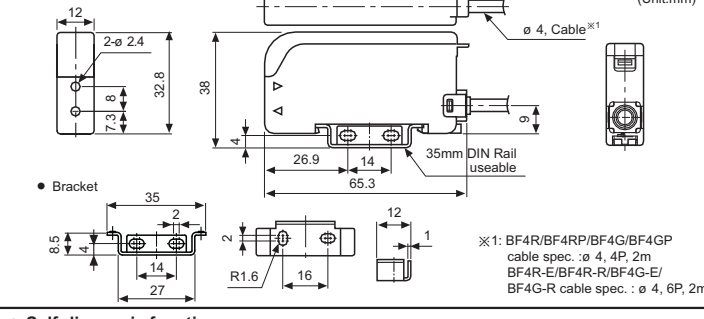
※1: Frequency 1 (Normal mode): Max. 0.5ms, Frequency 2: Max. 0.7ms  
※The temperature or humidity mentioned in Environment indicates a non freezing or condensation environment.

## Control output circuit diagram

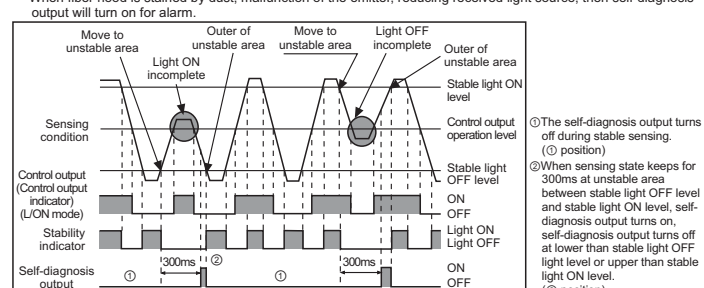


※Connect Diode at external terminal for inductive load.

## Dimensions

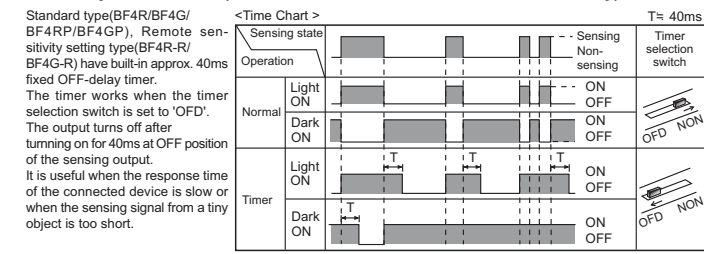


## Self-diagnosis function

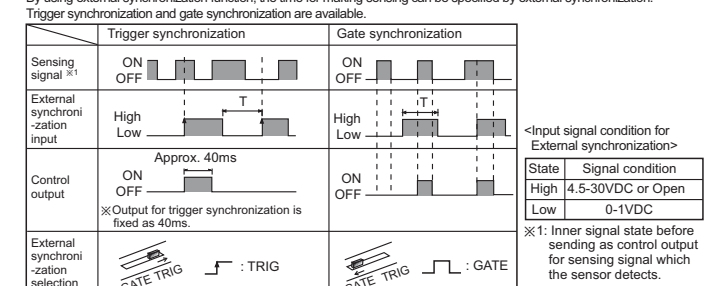


Under the control output turns on, if the over-current supplied in control output, then self-diagnosis output turns on.

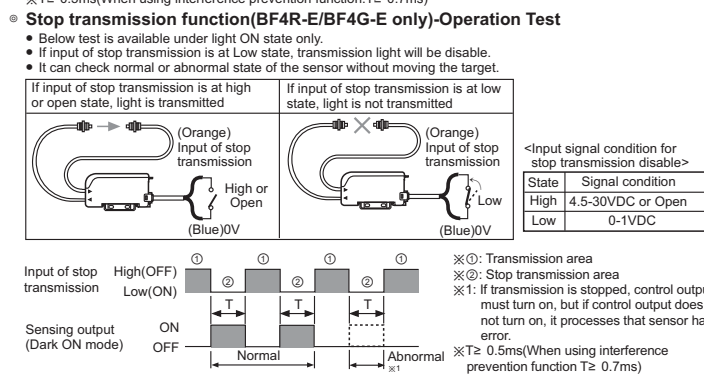
## OFF Delay timer function (BF4R/BF4G/BF4RP/BF4GP/BF4R-R/BF4G-R only)



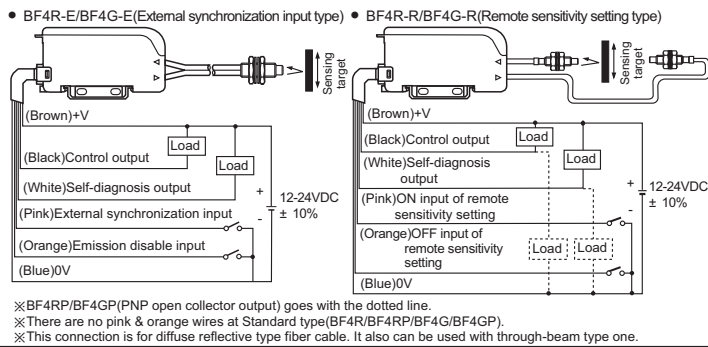
## External synchronization input function (BF4R-E/BF4G-E only)



## Stop transmission function (BF4R-E/BF4G-E only) - Operation Test

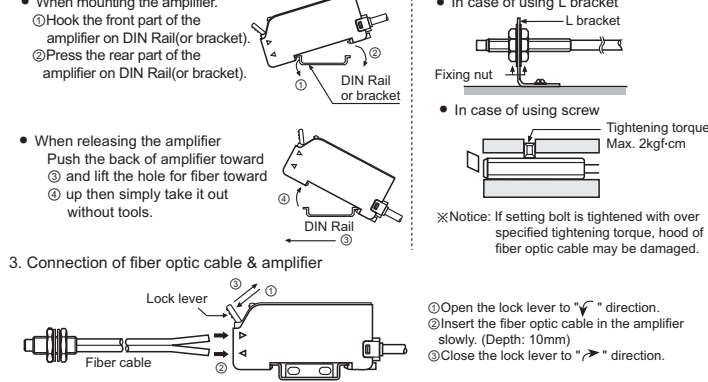


## Connection

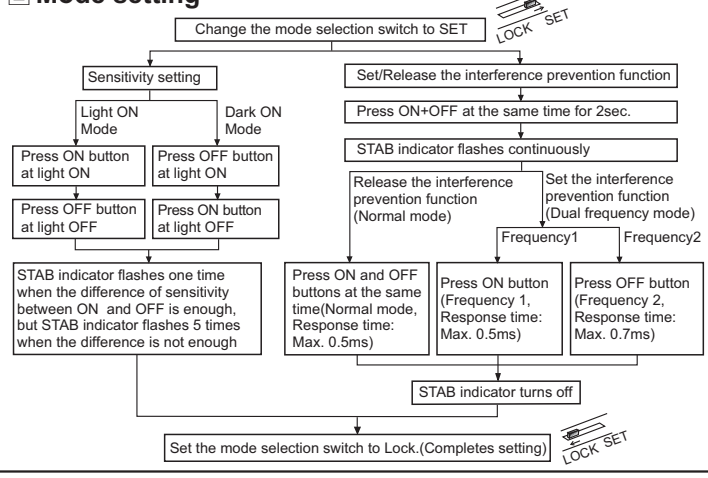


※BF4RP/BF4GP (PNP open collector output) goes with the dotted line.  
※There are no pink & orange wires at Standard type (BF4R/BF4RP/BF4G/BF4GP).  
※This connection is for diffuse reflective type fiber cable. It also can be used with through-beam type one.

## Installations



## Mode setting



## Fiber optic cable model

Sensing type	Model	Allowable band radius	Min. sensing object	Sensing distance (mm)	Dimension (Unit:mm)
Through-beam type	FT-320-05	15R	φ 0.5	150	Adapter: 12, 2000; M3X0.5, φ 1
	FT-420-10	30R	φ 1	500	Adapter: 12, 2000; M4X0.7, φ 2.2
Diffuse reflective type	FD-320-05	15R	φ 0.03	40	Adapter: 12, 2000; M3X0.5, 2-φ 1
	FD-620-10	30R	φ 0.03	120	Adapter: 12, 2000; M6X0.75, 2-φ 2.2

※Specification of other models is indicated in total catalogue.  
※Adapter marked fiber optic cable should be used with adapter.  
※Above sensing distance is for red light. (Green light : 10% of distance of red light)

## Accessories

Model	Dimension (Unit:mm)	Features
FTH-310	M3X0.5, φ 6, 12, 1000, φ 6, φ 3	Fiber optic cable protection pipe (Shock, Vibration, Cable cut)
FTH-410	M4X0.7, φ 7, 12, 1000, φ 7, φ 4	
FDH-610	M6X0.75, φ 9, 11, 1000, φ 8, φ 5.5	

## Caution for using

- Do not scratch the section of fiber optic cable.
- Intercept a strong source of light as like sunlight, spotlight within inclination angle range of photoelectric sensor.
- Do not apply a strong tensile force to fiber optic cable.
- In case of installing the fiber optic cable, be sure not to curve the fiber optic cable over tolerance that mentioned in total catalog.
- When wire the fiber optic 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 there is severe corrosive gas, or dust, etc.
- In case of connecting inductive load such as DC relay at load, use shielded cable, diode and varistor in order to remove noise.
- The amplifier cable shall be used shortly, because it may cause malfunction by surge through the long cable.
- When it is stained by dirt at a detecting part of the fiber optic cable, please clean the sensing part with dry cloth softly. But do not use an organic materials such as alkali, chromic acid.
- When the unit is supplied by switching power supply unit, as a power source, please earth Frame Ground (F.G.) terminal, and connect condenser between 0V and F.G. terminals to remove noise.
- Installation environment
  - It shall be used indoor
  - Altitude Max. 2,000m
  - Pollution Degree 2
  - Installation Category III

## Major products

- Proximity sensors
- Area sensors
- Door/Door side sensors
- Counters
- Rotary encoders
- Power controllers
- Panel meters
- Temperature controllers
- Tachometer/Pulse(Rate) meters
- Temperature/Humidity transducers
- Switching power supplies
- Stepping motors/drivers/motion controllers
- Field network devices
- Laser marking system(CO<sub>2</sub>, Nd:YAG)
- Laser welding/soldering system
- Photoelectric sensors
- Fiber optic sensors
- Pressure sensors
- Timers
- Display units
- Sensor controllers
- Graphic/Logic panels

**Autonics Corporation**  
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