

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.

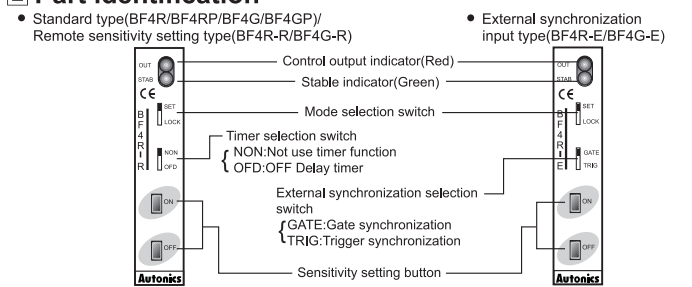
Warning

- 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. Please contact us if it is required. It may cause electric shock or a fire.

Caution

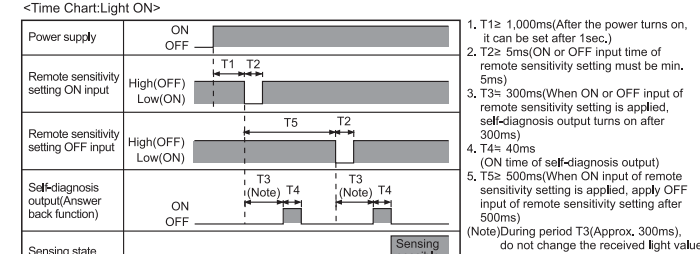
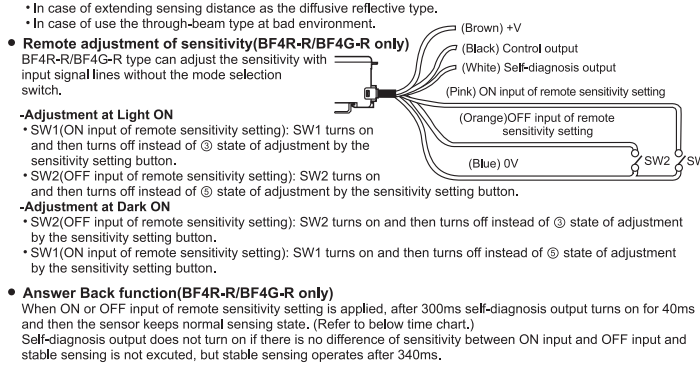
- This unit shall not be used outdoors. It might shorten the life cycle of the product or cause electric shock. Use this product inside only. Do not use the product outdoors or location subject to temperatures or humidity outside. (Ex: rain, dirt, frost, sunlight, condensation, etc.)
- Do not use this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

Part identification



Function

- Sensitivity adjustment**
- Adjustment by the sensitivity setting button (All models)**
- Light ON**
 - 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)
 - The 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 (Diffuse reflective type)**
 - Most of adjustments except ③ & ④ are same as Light ON mode.
 - Press ON button without the sensing target. (③ state)
 - Press OFF button with the sensing target. (④ state)
 - Light ON: The control output turns on at light ON state and turns off at light OFF state.
 - Dark ON: The control output turns off 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: 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: 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.
- Application**
 - In case of extending sensing distance as the diffusive reflective type.
 - In case of using the through-beam type at bad environment.
- Remote adjustment of sensitivity (BF4R-R/BF4G-R only)**
 - BF4R-R/BF4G-R type can adjust the sensitivity with input signal lines without the mode selection switch.
 - Adjustment at Light ON**
 - 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.
 - 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.
 - Adjustment at Dark ON**
 - 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.
 - 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.
- 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 sensitivity between ON input and OFF input and stable sensing is not executed, but stable sensing operates after 340ms.



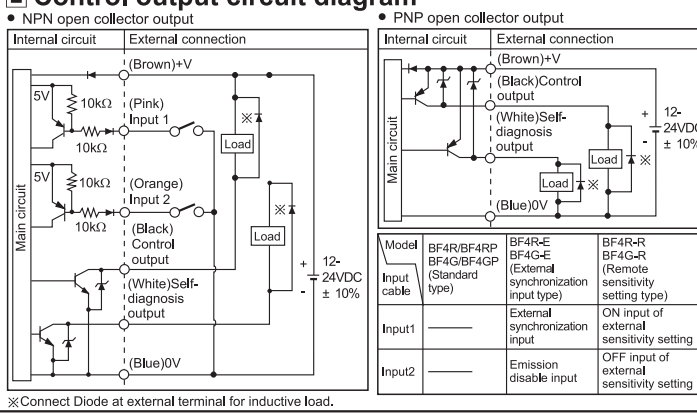
- Interference prevention function (All models)**
 - BF4 series have a built-in interference prevention function, two fiber optic cables can be mounted very closely by setting different transmission frequencies.
- Interference prevention function (Operation of dual frequency mode)**
 - First sensor-FREQ.1 (Response time: max. 0.5ms)
 - Second sensor-FREQ.2 (Response time: max. 0.7ms)
- Release interference prevention function (Operation of normal mode)-Response time: Max. 0.5ms**
 - Set the mode selection switch to SET.
 - Press ON, OFF SW for 2sec. at the same time.
 - The STAB indicator flickers continuously.
 - Press ON button.
 - The STAB indicator turns off.
 - Set the mode selection switch to LOCK.
 - In case of using interference prevention function, hysteresis & response time will be longer than normal mode operation.

Specifications

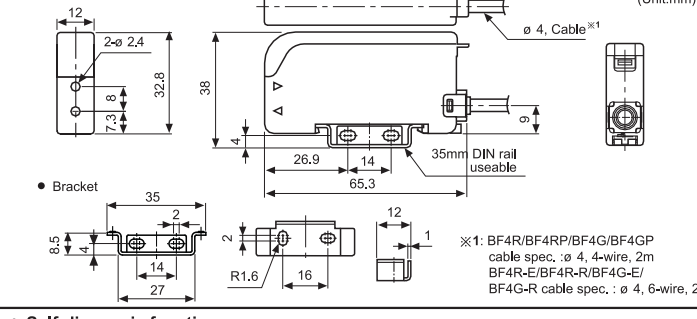
Type	Standard type	External synchronization input type	Remote sensitivity setting type
Model	Red light source: BF4RP Green light source: BF4GP	BF4R BF4G	BF4R-E BF4G-E
Power voltage	12-24VDC ± 10% (Ripple P-P: Max. 10%)		
Current consumption	Max. 45mA		
Control output	PNP open collector output NPN open collector output • Load voltage: Max. 30VDC • Load current: 100mA • Residual voltage - NPN: Max. 1V (load current: 100mA) / PNP: Max. 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 voltage: Max. 30VDC • Load current: 50mA • Residual voltage - NPN: Max. 1V (load current: 16mA) / PNP: Max. 2.5V		
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*1	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*1	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 (Receiver illumination)		
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 ² (50G) X, Y, Z directions for 3 times		
Environment	-10 to 50°C, Storage: -20 to 70°C		
Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH		
Material	Case: Heat-resistant ABS, Cover: Polycarbonate		
Cable	φ 4mm, 4-wire, Length: 2m (AWG22, Core diameter: 0.08mm, Number of cores: 60, Insulator diameter: φ 1.25mm) φ 4mm, 6-wire, Length: 2m (AWG24, Core diameter: 0.08mm, Number of cores: 40, Insulator diameter: φ 1mm)		
Accessory	Mounting bracket, Bolts/nuts		
Approval	CE		
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.

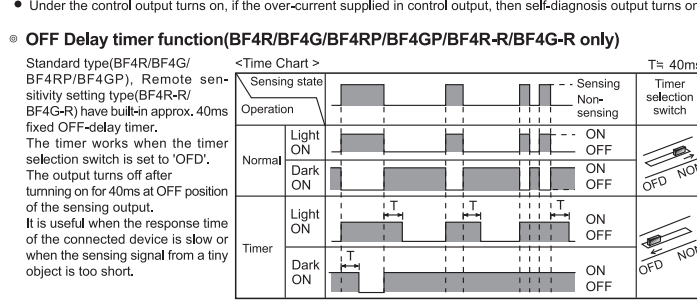
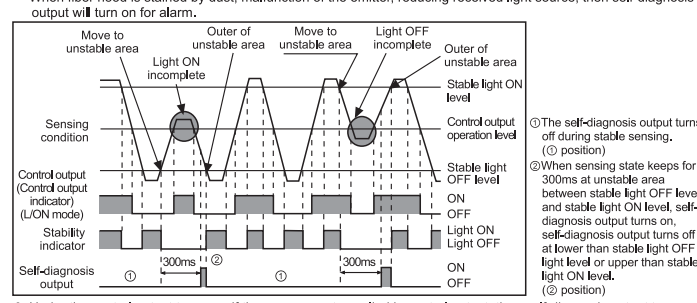
Control output circuit diagram



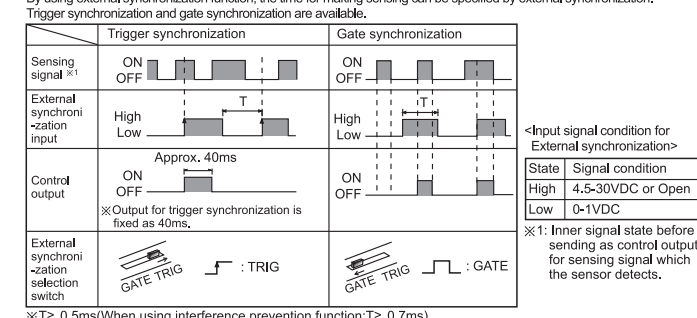
Dimensions



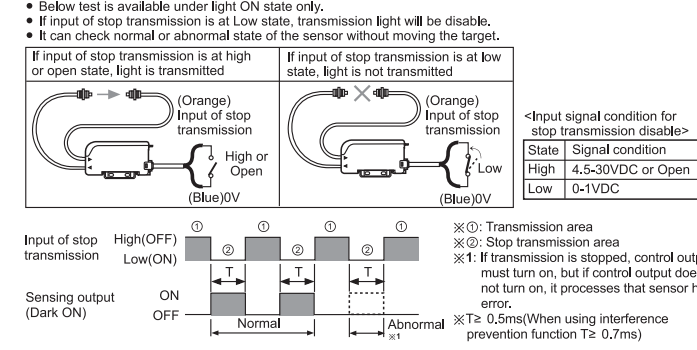
Self-diagnosis function



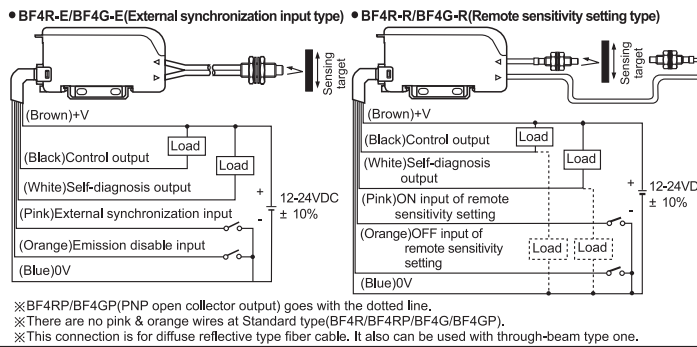
External synchronization input function (BF4R-E/BF4G-E only)



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

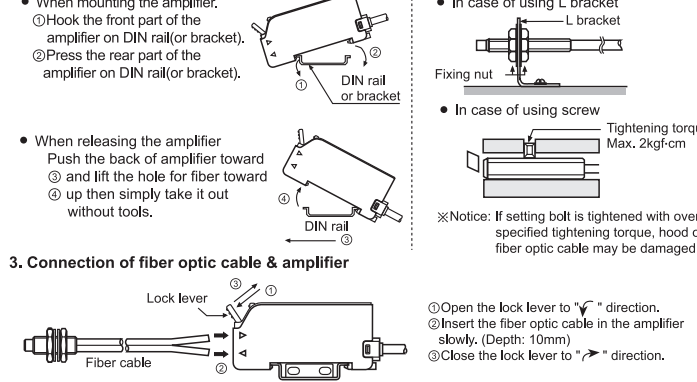


Connection

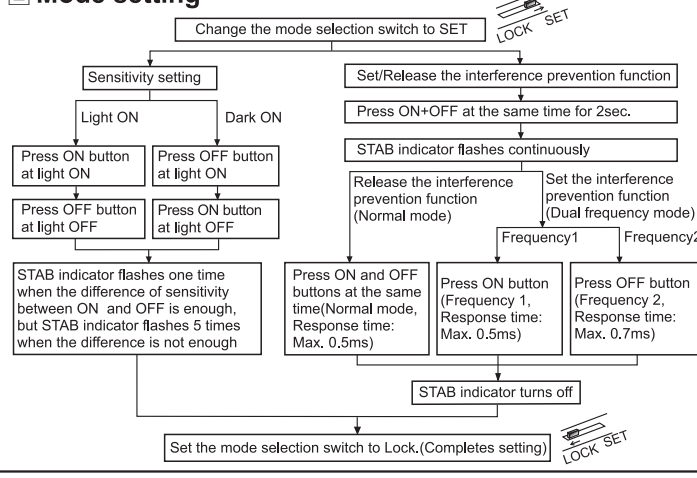


*BF4R/BF4G (PNP open collector output) goes with the dotted line.
*There are no pink & orange wires at Standard type (BF4R/BF4RP/BF4G/BF4GP).
*This connection is for diffuse reflective type fiber cable. It also can be used with through-beam type one.

Installations



Mode setting



Fiber optic cable model

Fiber optic cable model name (All models)	Model	Allowable band radius	Min. sensing object	Sensing distance (mm)	Dimension (Unit:mm)
FD-310-05	15R	φ 0.5	150	12	2000
FD-320-05	30R	φ 1	500	3	2000
FD-330-05	15R	φ 0.03	40	12	2000
FD-340-05	30R	φ 0.03	120	3	2000

Accessories

Model	Dimension	Features
FTH-310	M3X0.5	Fiber optic cable protection pipe (Shock, Vibration, Cable cut)
FTH-410	M4X0.7	
FDH-610	M6X0.75	

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, acid, 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

- Photoelectric sensors
- Fiber optic sensors
- Door sensors
- Door side sensors
- Area sensors
- Proximity sensors
- Pressure sensors
- Rotary encoders
- Connector/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, CO₂, Nd:YAG)
- Laser welding/soldering system
- Temperature controllers
- Temperature/Humidity transducers
- SRP/Power controllers
- Counters
- Timers
- Panel meters
- Tachometer/Pulse (Rate) meters
- Sensor controllers

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