Autonics

Digital Fiber Optic Sensor
BF5 SERIES [Single Display]

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.

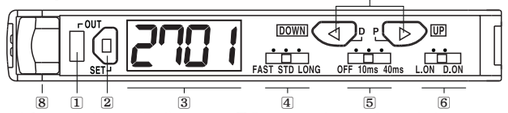
⚠ Warning

1. **In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is required to install fail-safe device, or contact us.**
   It may cause a fire, human injury or property loss.
2. **Do not disassemble the case. Please contact us if it is required.**
   It may cause an electric shock or a fire.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It might shorten the life cycle of the product or give an electric shock.
2. **Do not use this unit where inflammable or explosive gas exists.**
   It may cause a fire or an explosion.
3. **Please observe the rated specifications.**
   It may shorten the life cycle of the product.
4. **Do not apply over-rated voltage or AC power.**
   It may cause product damage.
5. **Wire properly after checking the power polarity.**
   It may cause product damage.
6. **Do not use this unit where severe shock or vibration exists.**
   It may cause product damage.
7. **In cleaning unit, do not use water or an oil-based detergent and use dry towels.**
   It may cause an electric shock or a fire.

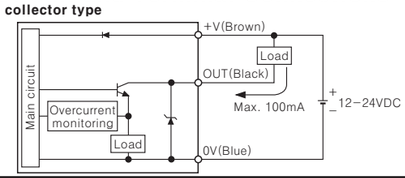
▣ Front part identification



① **Control Output indicator (Red)**
Used to indicate control output provided by comparing SV and actual incident light level.
② **Sensitivity setting key**
Used to execute each operation and to set sensing sensitivity.
③ **PV/SV display part (4 digit, Red, 7 segments)**
Used to indicate incident light level / SV and parameters
④ **Response time setting switch**
FAST, STD, LONG
⑤ **Timer setting switch**
Used to select OFF Delay time.(OFF, 10ms, 40ms)
⑥ **Operation mode setting switch**
Used to select Light ON / Dark ON.
⑦ **Up/Down key**
Used to up/down setting values / to enter into each mode / to fine-tune sensitivity.
⑧ **Lock lever**

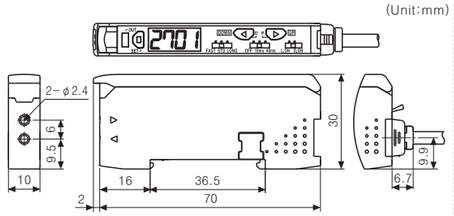
▣ I / O Circuit and Terminal Connections

◎**NPN Open collector type**

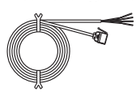


▣ Dimensions

(Unit:mm)



◎**Accessories**
●Connector type wire



●Side connector

※**The above specifications are subject to change without notice.**

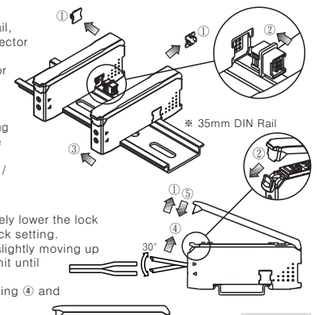
▣ Specifications

Display type	**Single Display type**
Model	**BF5R-S1-N**
Light source	Red LED(660nm) ☞ Pulse modulated light
Power supply	12 – 24VDC ±10%
Current consumption	Max. 50mA
Control output	NPN Open collector(Sink Current :Max. 100mA, Applied Voltage:Max. 24V, Residual voltge:Max. 1V)
Protection circuit	Reverse polarity protection, Overcurrent protection, Surge absorption
Response time	Fast:150㎲, STD:500㎲, Long:4 ms
Display	●Incident light level /SV : Red, 4 digit, 7Segment, ●Main output indicator : Red LED
Display function	Incident light level / SV display [4000/10000 resolution], Percentage display, Peak / Bottom value display, Normal / Reversed display
Sensitivity setting	Auto tuning mode
Mutual interference prevention	Max. 8 unit sets (Automatically set regardless of response time)
Timer	OFF, 10ms off delay timer, 40ms off delay timer
Ambient illumination	Incandescent lamp : Max. 3000ℓx, Sunlight : Max. 11000ℓx
Ambient temperature	−10 ~ 50℃
Ambient humidity	35% RH ~ 85% RH
Insulation resistance	Min. 20MΩ(at 500VDC mega)
Dielectric strength	1000VAC 50/60Hz for 1 min.
Vibration resistance	1.5 mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 2 hours
Shock	500m/s² (Approx. 50G) in X, Y, Z directions for 3 times
Protection	IP40(IEC Standard)
Material	ppt
Fiber cable Tightening torque	Min. 2kgf
Accessories	Connector type wire(φ4, 3P, 2m), Side connector
Unit weight	20g

▣ Installations

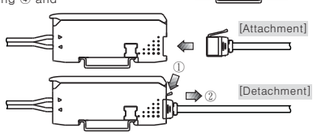
◎**Amplifier unit Mounting**
●Attachment : Hang up the backside holder on DIN rail and press the unit toward the DIN rail.
●Detachment: Slide the back part of the unit and lift up the unit as shown in the figure ① and ②.

◎**Amplifier unit connection**
●After mounting one amplifier unit on DIN rail, remove the side cover and insert unit connector as shown in the figure ① and ②.
●Connect another unit through the connector as shown in the figure ③.
※Make sure that connections between unit case and connectors have made correctly. Improper connection may cause malfunctioning of channel setting and mutual interference prevention functions.
※Do not supply the power while connecting / disconnecting amplifier units.

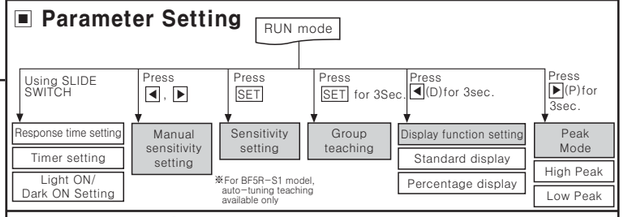


◎**Fiber cable connection**
●Lift up the protective cover ① and completely lower the lock lever to the direction of ② to release the lock setting.
●Insert the cable to the direction of ③ with slightly moving up and down 15 °,and gently press into the unit until the cable is completely connected.
●Place up the lock lever to lock the lock setting ④ and close the protective cover ⑤.

◎**Amplifier unit connector connection**
●Insert the connector into the amplifier unit until it clicks into right position.
●When removing the connector, pull out the connector with pressing the lever downside.

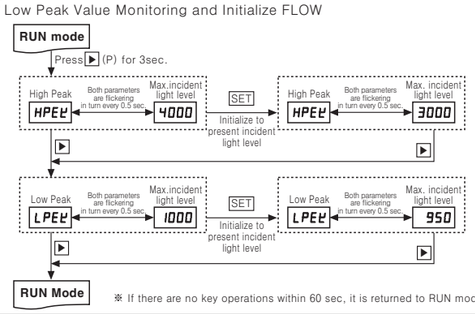


▣ Parameter Setting



▣ High Peak / Low Peak Function

High / Low Peak Value Monitoring and Initialize FLOW

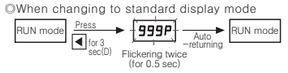


▣ Function

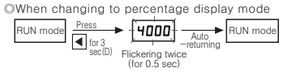
◎**Response Time Setting**
Use front slide switch to set response time.
●Fast mode: 150㎲
●Standard mode: 500㎲
●Long distance mode: 4 ms

◎**Display function (Factory mode: Standard display)**
A function to select incident light level display on display part.
●Standard Mode Display Range: 0 - 4000 (0 - 9999, in case of long distance mode)
●Percentage Mode Display Range: 0P - 999P (No decimal point displayed)

◎When changing to standard display mode

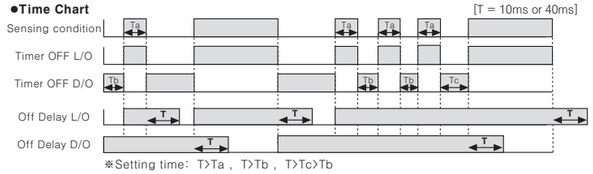


◎When changing to percentage display mode



◎**Timer function**
※As for BF5R-S1-N type, off delay mode is provided only. Select setting time (Off / 10ms / 40ms) using front slide switch.

●**Time Chart** [T = 10ms or 40ms]



※Setting time: T>Ta , T>Tb , T>Tc>Tb

◎**Light ON / Dark ON Switching Function**
A function to set Light ON – control output is ON when incident light level is higher than setting value and Dark ON – control output is ON when incident light level is lower than setting value.
BF5R-S1-N(Single Display type) use front slide switch to set each mode.

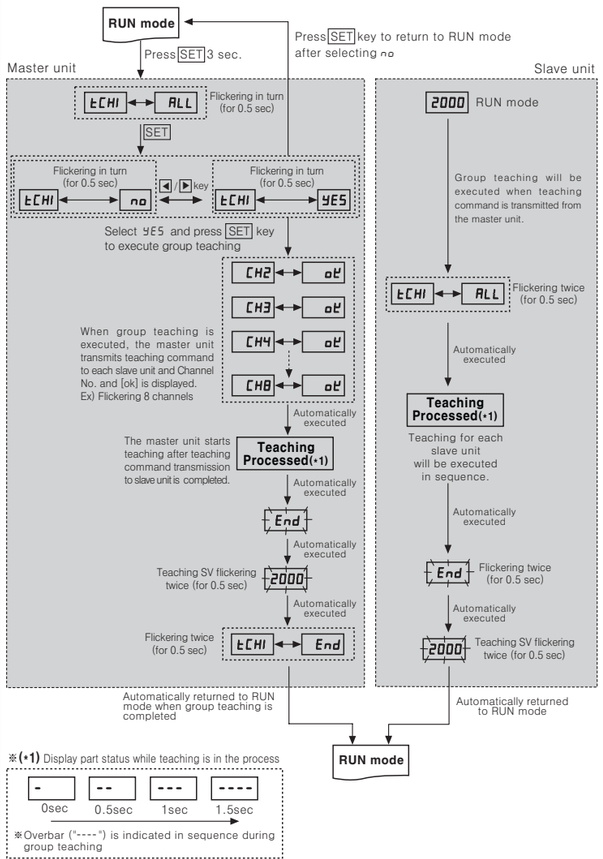
◎**Amplifier units connection using side connector**
In case multiple amplifier units are connected, the power supply for one unit will feed all connected units.

◎**Auto channel setting function**
●The channel for each amplifier unit – connected by side connector – is automatically set in a certain direction (→) as soon as power is supplied. Channel number is increasing one by one.
●Auto set channel number can be checked only when initial power is supplied (Not possible to check afterwards).
●Channel range : 1~32
※**Note that auto set channel cannot be changed and the channel No. of each amplifier unit is not saved in case of power OFF.**

◎**Mutual Interference Prevention Function**
A function to set different light receiving time for each amplifier unit in case of adjacent fiber cable installations in order to prevent mutual interference occurring. (Set automatically when power is turned ON.)
※Mutual interference function is allowed up to maximum 8 amplifier units regardless of the unit mode and response time.

▣ Group teaching

A function to set the sensitivity of slave amplifier units according to the command of master amplifier unit(certain amplifier unit) in a successive and collective way.



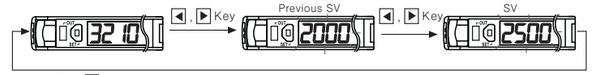
※(•1) Display part status while teaching is in the process

※Overbar ("---") is indicated in sequence during group teaching

▣ Sensitivity Setting Mode

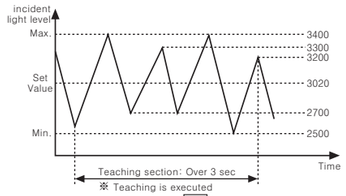
※There are two methods available for sensitivity setting - manual /teaching sensitivity setting. Select the method most suitable for your application.

◎**Manual sensitivity setting (Fine-tuning)**
●Used when manually setting sensitivity
●Used to fine-tune the sensitivity after teaching.
●Incident light level is still displayed during SV setting.

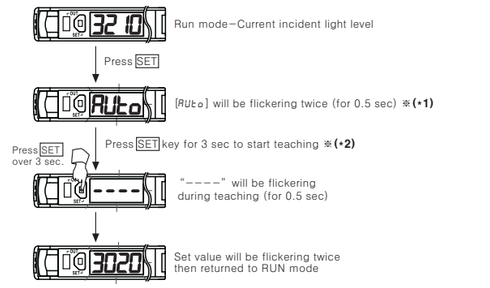


①Press ◀ or ▶ key once in RUN mode, then previous SV will be flickering twice (0.5 sec).
②Press ◀ and ▶ key to set the value.
③If there is no additional key input for 3 sec after completing setting, newly set value will be flickering twice (0.5 sec cycle) and automatically returned to RUN mode.

◎**Teaching sensitivity setting-Auto tuning teaching**
●For BF5R-S1 model, teaching sensitivity setting mode is fixed to auto-tuning teaching.
※Suitable when incident light level of sensing object is not stable or when sensing fast moving objects.
※One of teaching modes that sets the sensitivity using average value of incident light level within a certain time period.



$$\text{Set Value} = \frac{P1+P2+\cdots+Pn-1+Pn}{n}$$



●In case incident light level is received under 10DIGIT while teaching, [ErrL] will be flickering twice and return to RUN mode with previous SV retained.
※(•1) Press ▶ key to return to RUN mode without teaching
※(•2) Press the key over 3 sec in order to get more reliable teaching value

▣ Error code

Error code	Cause	Countermeasure
ErrL	In case incident light level is below the min. range when teaching	Increase the incident light level above min. range.
Err	In case overcurrent inflow occurs into output circuit.	Remove overcurrent due to overload.
Erb	●In case Slave is failed to execute Master's instructions due to unstable communication line connection during Group Copy / Load / Save / Teaching. ●In case other communication errors occur	●Check amplifier unit's connection again. ●Check circuit and hardware around side connector.

▣ Caution for using

1. In case power is supplied from switching power supply, ensure that the frame ground (F • G) terminal of the power supply is connected to an actual ground and connect a condenser for noise removal between 0V and F • G terminal.
2. Avoid using the unit where dust exists or corrosion causing environments. It may cause product malfunction.
3. Do not start operating during initial power supplying time (3 sec.).
4. In case moving the unit from cold outside to a indoor room, start operating after removing moisture.
5. Do not wire high voltage / power source line and unit together. It may cause product damage or malfunction due to noise.
6. Do not use the unit outdoor or anywhere exposed to direct extraneous light.
   In case of max. sensitivity setting, there might exist slight sensing distance difference due to each feature deviation.

▣ Major products

■ Proximity sensors
■ Photoelectric sensors
■ Area sensors
■ Fiber optic sensors
■ Door/Door side sensors
■ Pressure sensors
■ Counters
■ Timers
■ Rotary encoders
■ Display units
■ Power controllers
■ Sensor controllers
■ Panel meters
■ Graphic/Logic panels
■ Temperature controllers
■ Tachometer/Pulse(Rate) meters
■ Temperature/Humidity transducers
■ Switching power supplies
■ Stepping motors/drivers/motion controllers
■ Field network devices
■ Laser marking system(CO_2, Nd:YAG)
■ Laser welding/soldering system

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