TAKEX

FIBER SENSOR
(Amplifier unit)

F71 SERIES Instruction Manual

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OUTLINE CE

- This product is an amplifier, for a fiber sensor, that uses a fiber optic unit as the detection part. By connecting DC power (DC12V to 24V), an open collector output can be obtained.
- This is an ultra thin type and therefore it does not need a large space even when more than two units are installed close to each other. In addition to this, an eight turn sensitivity adjustment is used, which enables fine setting by looking directly at the indicator.
- Using the optical transfer technology for the first time in the industry, the Anti Mutual Interference function for up to 8 units and the turbo function are built in.

SPECIFICATIONS

Model	NPN output	Cable	F71R	F71G	F71B	F71W
		Connector	F71R-J	F71G-J	F71B-J	F71W-J
	PNP output	Cable	F71RPN	F71GPN	F71BPN	F71WPN
		Connector	F71RPN-J	F71GPN-J	F71BPN-J	F71WPN-J
Power supply			12–24VDC ±10%, Ripple 10% or less			
Current consumption		NPN output	35mA or less			
		PNP output	40mA or less			
Output mode	Control output(*)	NPN output	Open collector output / Rating: Sink current 100mA (30VDC) or less / Residual voltage: 1V or less			
		PNP output	Open collector output / Rating: Source current 100mA (30VDC) or less / Residual voltage: 1V or less			
	Stability output(*)	NPN output	Open collector output / Rating: Sink current 100mA (30VDC) or less / Residual voltage: 1V or less			
		PNP output	Open collector output / Rating: Source current 100mA (30VDC) or less / Residual voltage: 1V or less			
Operating mode			Light-ON/Dark-ON Selectable			
	Timer		ON-delay / OFF-delay / disabled selectable (by switch) Delay time: about 40 ms fixed			
Response time			With switch at 4 (turbo function disabled): 250 µs or less With switch at 8 (turbo function enabled): 500 µs or less			
Light source (wavelength)			Red LED (680nm)	Green LED (525nm)	Blue LED (470nm)	White LED
Indicator			Operation indicator: orange LED Stability (STB) indicator: green LED			
Volume (VR)			SENS:sensitivity adjustment volume (8-turn without stopper equipped with indicator)			
Switch (SW)			* Light ON/ Dark ON selector switch: L.ON for Light ON, D.ON for Dark ON. * Timer selector switch: NOR, for ON/OFF operation, ON.D for on delay (40ms), OFF.D for off delay (40ms). * Mutual Interference prevention / turbo mode selector switch (common) 8: Mutual Interference prevention for up to 8 units, turbo function enabled 4: Mutual Interference prevention for up to 4 units, turbo function disabled			
Mutual Interference prevention			Provided			
Short circuit protection			Provided			
Material			Polycarbonate			
Connection	Cable type		Attached cable (outer diameter: 4.8mm) 0.2mm², 4 cores, 2m			
	Connector type		M8 connector			
Weight			Cable type: approx. 80g (including cables and mounting bracket): M8 connector type:approx. 25g			
Accessory			Mounting bracket, screwdriver for adjustment, light shielding sticker (excluding H type), instruction manual			

(*) Detection starts 0.5 seconds after power-up.
If the load and this sensor use different power sources, be sure to turn on the sensor first.

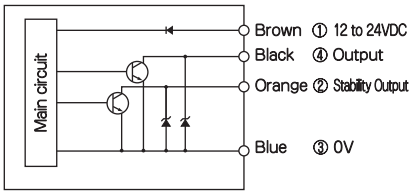
AMBIENT CONDITIONS

- Ambient light : Tungsten lamp ···· Withstands 10,000 l x (Max)
  : Sun light ···· Withstands 20,000 l x (Max)
- Ambient temperature ···· 1-3 adjacent units in operation: −25℃ to +55℃, 4-10 adjacent units in operation: −25℃ to +50℃, 11-16 adjacent units in operation: −25℃ to +45℃ Storage : −40℃ to +70℃ (non-freezing)
- Ambient humidity ···· 35~85%RH (non-condensing)
- Protective structure ···· I P40
- Noise ···· Power supply line: 500V, Cycle: 10ms, Pulse duration: 1 µs Radiation: 1kV, Cycle: 10ms, Pulse duration: 1 µs (with noise simulator)
- Vibration ···· 10-55Hz, 1.5mm double amplitude, 2 hours each in 3 direction
- Shock ···· 100m/s², 3 times each in 3 directions
- Dielectric withstanding ···· 1,000VAC for 1 minute
- Insulation resistance ···· 500VDC, 20MΩ or more

OUTPUT CIRCUIT & WIRING

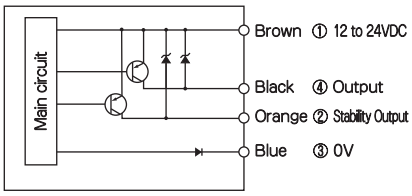
Connector Pin. No.

NPN output



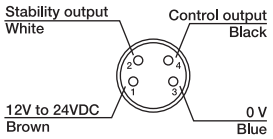
- Loaded short circuit or over-lord shuts off the output transistor.
- Turn the power back on after checking the loaded condition.

PNP output

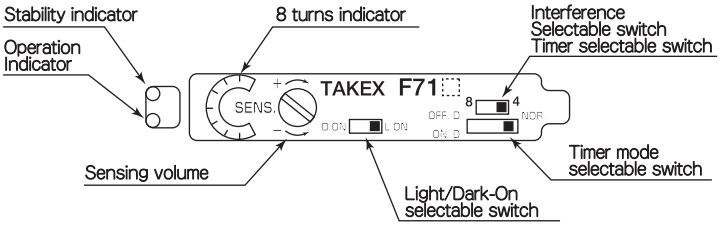


● M8 connector type (−J) pin arrangement

F71"−J"



PANEL AND OPERATION



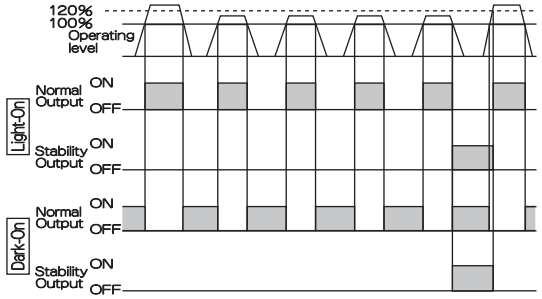
SENS. : 8 turns sensitivity adjustment volume
L.ON/D.ON : Light/Dark-On selectable switch
4/8 : Interference Selectable switch
: Turbo Function Selectable switch
NOR./ON.D/OFF.D : Timer mode selectable switch
NOR. side: On/Off operating
ON.D side: On-Delay operating (40ms)
OFF.D side: Off-Delay operating (40ms)

Operation indicator: It lights when output transistor becomes ON.
Stability indicator: It lights when the light quantity of receiver has 120% sufficient margin.

※ Interference/Turbo mode selectable switch
8 side: 8 unit do not interfere (Turbo:ON)
(Response time:500 µs)
4 side: 4 unit do not interfere (Turbo:OFF)
(Response time:250 µs)

STABILITY OUTPUT

- This is used for an initial check of environmental changes and level reduction during operation.
- If the amount of received light exceeds the operation level but does not reach 120% (no stability) and this happens 4 times consecutively, the control output will go low (OFF) at light ON operation.
  Also, the stability indicator flashes at the same time the stability output operates. When stability returns, the Stability Output will be OFF, and the stability indicator will be ON continuously (normal ON) not flashing.
  When the stability output (orange cable or white cable) is not used, take the insulation processing of the cable.



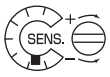
ADJUSTMENT

Light-on operation using a reflection type fiber unit :

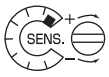
① Set the sensing volume control to the MIN position and place the object at the detection point.
② Gradually turn the sensing volume control in the clockwise direction until you find the point (A) at which light reception is obtained.
③ Remove the object and set the sensing volume control to the MAX position. Gradually turn the sensing volume control further in the counterclockwise direction until you find the point (B) at which light interruption is obtained. (If the light reception is not obtained, the MAX position is defined as point (B).)
④ The ideal sensitivity level is obtained at an intermediate point between (A) and (B). Set the volume control to this intermediate point.

Light-on operation using a through-beam type fiber unit :

① Set the sensing volume control to the MAX position.
② Make sure the OP.L(orange) and STB.(green) indicators are lit when the object is not inserted. (If the STB.(green) indicator is not lit, the setting distance may be excessive, or the light axis may be misaligned. Check them.)
③ Gradually turn the sensing volume control in the counterclockwise direction until you find the point (A) at which the light interruption is obtained.
④ Set up the object and gradually turn the sensing volume control in the clockwise direction until you find the point (B) at which light reception is obtained. (If the light reception condition is not obtained, the MAX position is defined as point (B).)
⑤ The ideal sensitivity level is obtained at an intermediate point between (A) and (B). Set the volume control to this intermediate point.



Point A =1.5



Point B =7.5

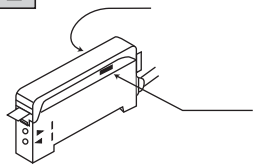
Ideal sensitivity =4.5

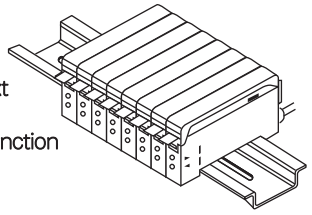
TURBO FUNCTION

When the turbo mode changeover switch is set to "8", the turbo function will operate. When the turbo function operates, the response time will be 500 µ sec, but the detection distance will be increased by approx.30% from when the turbo function is OFF("4").

ANTI MUTUAL INTERFERENCE

● This product has an Anti Mutual interference function that uses optical transfer. For the optical transfer there is a window on the side of the unit which is the optical path. There are transmitter and receiver windows. Therefore, install the units on a DIN rail and match the transfer windows of the amplifier units next to each other, as shown in the drawing, in order to ensure the function of the Anti Mutual Interference.





Interference selectable switch

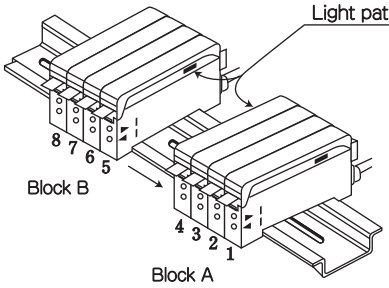
8 ⇨■ 4 4 unit do not interfere (Response time : 250 µ s)

8 ■⇦ 4 8 unit do not interfere (Response time : 500 µ s)

HOW TO PREVENT BLOCKING THE LIGHT PATH

● A light path cover (included) is used between amplifier units per block when many sensors are used with the Anti Mutual interference function. Also, use the cover when there is the possibility of strong external light coming into the transfer window.

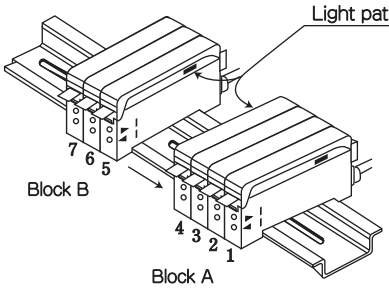
(Usage example 1)
When using 8 sensors (Take 4 units for Block A, another 4 for B)



● 4 units of the Block A do not interfere each other
● Changeover SW= 4 (Response time=250µs)
● 4 units of the Block B do not interfere each other
● Changeover SW= 4 (Response time=250µs)

◆ Put light path cover on each transfer window of the 4th and 5th units.
◆ After putting on the light path covers, slide them and let them stick.
◆ Caution : Block A and Block B will interfere with each other.

(Usage example 2)
When using 7 sensors (Take 4 units for Block A, another 3 for B)



● 4 units of the Block A do not interfere each other
● Changeover SW= 4 (Response time=250µs)
● 3 units of the Block B do not interfere each other
● Changeover SW= 8 (Response time=500µs)

◆ Put light path cover on each transfer window of the 4th and 5th units.
◆ After putting on the light path covers, side them and let them stick.
◆ Caution : Block A and Block B will interfere with each other.

(Usage example 3)
When using 10 sensors
(Separate 8 units for block A and the other 2 units for block B)

● 8 units of the Block A do not interfere each other
● Selectable switch= 8 (Response time 500 µs, Turbo function On)
● 2 units of the Block B do not interfere each other
● Selectable switch= 8 (Response time 500 µs, Turbo function On)

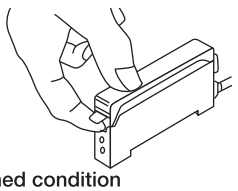
◆ Attach a blinding seal to each transfer window of the 8th and 9th units.
◆ Slide the units to let them close by after attached the seals.
◆ Note : The units of Block A interfere with the units of Block B.

※ If the changeover switch is set to "4" and "8" within each block, the anti mutual interference function will not work. Unify the changeover switch settings in each block to "4" or "8".

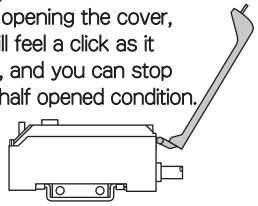
INSTALLATION AND USAGE OF THE AMPLIFIER UNIT

How to install the case cover of the amplifier unit

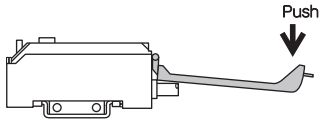
◉ How to open the case cover
• Pull up the tab of the case cover holding the front part of the case cover.
• Pulling up only the tab of the case cover forcefully may damage the case cover. Make sure to hold the front part of the case cover when pulling up the tab.



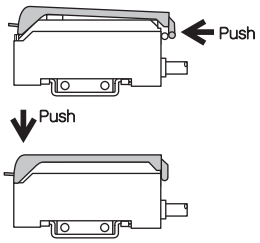
Half opened condition
When opening the cover, you will feel a click as it opens, and you can stop in the half opened condition.



Full opened condition
Push the edge of the cover when opened fully, and the cover will be released.



◉ How to install case cover



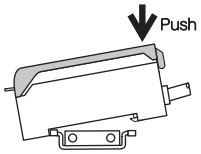
• Put the cover on the amplifier unit as shown in the drawing, and push the hinge.

• Press the front part of cover after pushing the hinge. Confirm the fixing of the cover.

Installation of the amplifier unit onto the DIN rail and the installation bracket

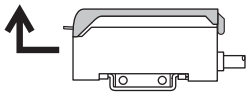
◉ Installation

Hook the front hook of the amplifier unit onto the rail (or the installation bracket) and hold the rear part of the amplifier unit.

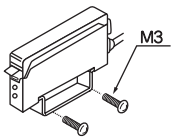


◉ Unhook

Pushing the amplifier unit towards the front, pull and raise the front, and unhook the front hook.



Side installation of the amplifier unit

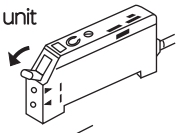


Fasten with screws by using the attached installation bracket.
Tightening torque must not exceed 0.8N·m.

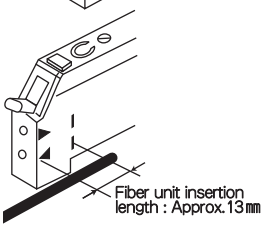
INSTALLATION AND USAGE OF THE FIBER UNIT

◉ Installation of the fiber unit onto the amplifier unit

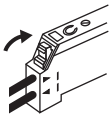
① Push down the one touch lock lever.



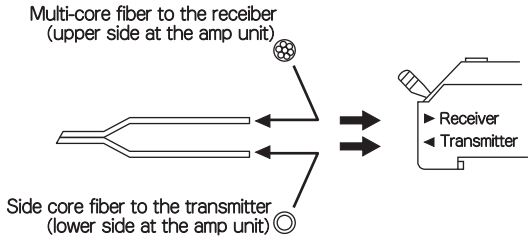
② Push in until the fiber all the way. There are some marks on the side of the case showing the insertion length to avoid mistakes when inserting the fiber unit. Use them as a gauge.



③ Raise the one touch lock lever.

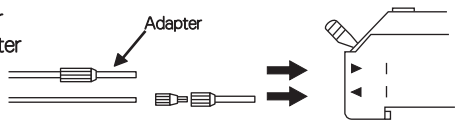


◉ Connection or the coaxial reflection fiber to the amp.unit.



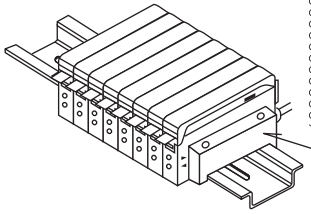
◉ Installation of the small diameter unit onto the amplifier unit

• When installing the small diameter fiber unit, use the adapter included in the fiber unit.



ENSURE CORRECT USAGE

● When using more than 2 amplifier units, use "DIN rail" for the installation. In this case, note that the operational ambient temperature changes. Fix both edges of the amplifier units by sandwiching with end units (option).



Ambient temperature
(In case of using plural sensors)
1–3 pcs : −25℃～+55℃
4–10 pcs : −25℃～+50℃
11–16 pcs : −25℃～+45℃

● Be sure to turn off power before performing wiring. Extension cable from the amp.unit must be 0.3mm^2 or more gauge and up to 100m long.

● Do not run the amp.unit wiring in parallel with a power line or high voltage line. Do not house the amp.unit wiring in a condit in which other cable(s) is running. These consideration are to avoid misoperation due to induced noise, hum and the like.

● Check power line so that the voltage matches the rated voltage.

● Connect the frame ground (F.G) terminal of the switching regulator to the ground.

● In case of using this product as UL approved equipment, use UL Class 2 power supply which is limited the current (2A) in accordance with the lead wire size of the sensor.

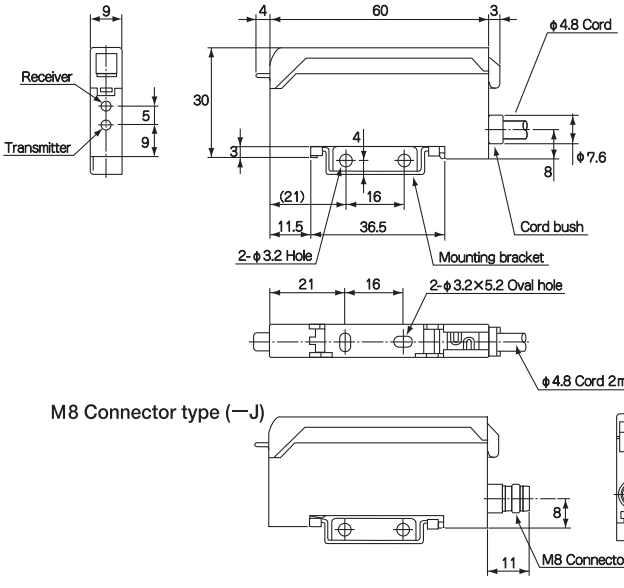
● Do not start using it in the transitional state just after the power is applied.

● Avoid using the unit in steamy or dusty places or in a place where water or rain can be splashed on it.

● Do not use outside or in a place when external light can shine directly on the receiver.

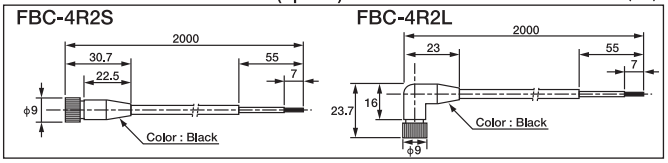
DIMENSIONS (㎜)

Cable Type



M8 Connector type (—J)

● Cable with M8 connector (option) (㎜)



● This sensor is designed to detect a specific object. It is not provided with control functions for prevention of injuries or accidents in itself.
● Takex will not held responsible for any damage or loss incurred due to accidents, faulty installation, abuse, misuse, improper maintenance or acts of God including lightning surge.
● Specifications and dimensions may be subject to change without notice.