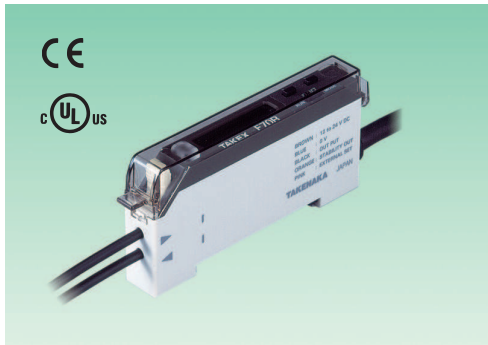


F70 Series

Digital display
Fiber optic sensors



- Digital indication of sensing information
- Various advanced functions provide for optimum use of the sensor
- Unparalleled “high resolution” allows highly accurate detection
- Readily visible backlight LCD

Type

- Amplifier unit (main unit)

Type	Model		Light source	Output mode	Connection
	NPN output	PNP output			
Digital display general purpose	F70R	F70RPN	Red LED	Open collector output	Cable type
	F70G	F70GPN	Green LED		
	F70B	F70BPN	Blue LED		
	F70W	F70WPN	White LED		
	F70R-JE	F70RPN-JE	Red LED		
	F70G-JE	F70GPN-JE	Green LED		M8 connector
	F70G-JS	F70GPN-JS			
	F70B-JE	F70BPN-JE	Blue LED		
	F70B-JS	F70BPN-JS			
	F70W-JE	F70WPN-JE	White LED		

- The M8 connector is different as below, depending on specifications of input and output.
 - When the external teaching input is on and the stability output is off: -JE
 - When the external teaching input is off and the stability output is on: -JS

Fiber optic cable

For types of fiber optic cable, see page 67 and after.

Optional parts

Type	Model	Description
Cable with M8 connector	FBC-4R2S	Straight type M8 connector, 2m
	FBC-4R2L	Angle type M8 connector, 2m
End unit	FA7EU	DIN rail mounting stopper
Mounting bracket (accessory)	AC-BF2	Amplifier unit mounting bracket

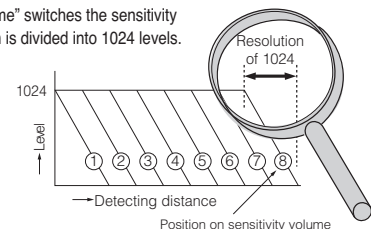
Excellent detection performance

Built-in high resolution provides highly accurate detection

Wide dynamic range and high resolution are achieved

High resolution is maintained even with a wide dynamic range. The electronic volume feature ensures compatibility between a wide dynamic range and high resolution.

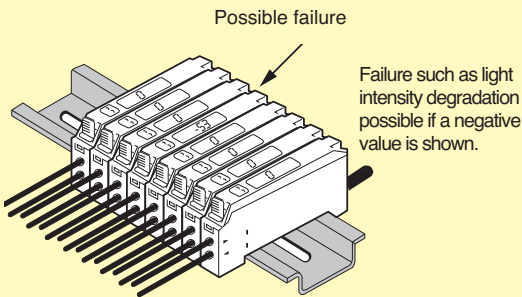
The “electronic volume” switches the sensitivity range, each of which is divided into 1024 levels.



Display functions

Gap indication function

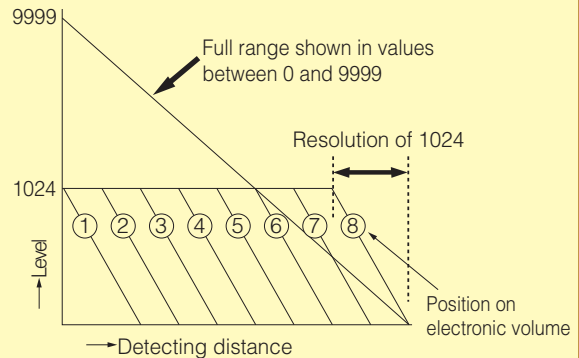
All amplifiers should show "0" with no work.



The value for a deviation (positive or negative) of received light level from the original level is shown at the time of detection, which allows easier management of the whole system.

Absolute value indication function

Received light level indication with a linear scale.



If the received light level at light blocking is 10 and the S/N level at light reception is 6000, the S/N ratio is calculated as 600 times.

Enhanced teaching features (sensitivity setting) -- Supporting high resolution

- **Full auto teaching**
Simply pressing the button allows easy teaching of an object moving at a high speed. The teach hold feature allows indication of the maximum and minimum data.
- **Auto teaching**
2-point teaching "with" and "without" the work allows the detection of slight level differences such as the thickness of a piece of work and the presence of a film.
- **Positioning teaching**
This feature is ideal for high accuracy positioning that requires accurate determination of a detecting point.
- **Maximum sensitivity setting**
For applications requiring a "maximum" sensitivity setting such as the detection of work with a through beam type fiber optic cable. The incorporated extra powerful light would allow use in an adverse environment.
- **Manual setting**
Arbitrary manual increase and decrease of a set-point level allows level setting while checking the operation.

Auto sensing function compensates for adverse environment

The level of received light is constantly monitored and fluctuation is detected and automatically adjusts the activation/deactivation level. Stable detection at optimum sensitivity is ensured even if the received light level frequently fluctuates due to dust or water drops.

Manual hysteresis setting feature

The hysteresis can be arbitrarily set according to the application, allowing setting of a small hysteresis for severe, high accuracy detection and a large hysteresis for detection of large variation and prevention of chattering.

Timer functions

On delay, off delay and on off delay timer functions are provided, which allows for a wide range of detecting and input conditions from the connected devices. The delay time setting is variable between: 10 ms, 20 ms, 40 ms, 60 ms, 80 ms, 100 ms and 120 ms.

Teach hold function

The sensor has the ability to hold instantaneous data for an object moving at a high rate of speed during full auto teaching. This data is displayed when the teaching has been completed.



(Data for light reception is 325 and for light blocking 120.)

F70

Rating/Performance/Specification

Model	NPN	F70R	F70G	F70B	F70W	F70R-JE	F70G-JE	F70G-JS	F70B-JE	F70B-JS	F70W-JE
	PNP	F70RPN	F70GPN	F70BPN	F70WPN	F70RPN-JE	F70GPN-JE	F70GPN-JS	F70BPN-JE	F70BPN-JS	F70WPN-JE
Power supply		12 - 24VDC \pm 10% / Ripple 10% or less									
Current consumption	NPN output	39 mA or less									
	PNP output	50 mA or less									
Output mode	Control output (*)	NPN output	Open collector output / Rating: Sink current 100 mA (30 VDC) or less / Residual voltage: 1 V or less								
		PNP output	Open collector output / Rating: Source current 100 mA (30 VDC) or less / Residual voltage: 2 V or less								
	Stability output (*)	NPN output	Open collector output / Rating: Sink current 50 mA (30 VDC) or less / Residual voltage: 1 V or less								
		PNP output	Open collector output / Rating: Source current 50 mA (30 VDC) or less / Residual voltage: 2 V or less								
Operation mode		Light ON/Dark ON selectable									
Timer		On delay/off delay/on off delay/disabled selectable Delay time: selectable between 10, 20, 40, 60, 80, 100 and 120 ms / Default: 40 ms									
Response time		Light emission frequency channel 1: 500 μ s or less Light emission frequency channel 2: 600 μ s or less									
Light source (wavelength)		Red LED (680nm)	Green LED (525nm)	Blue LED (470nm)	White LED	Red LED (680nm)	Green LED (525nm)	Green LED (525nm)	Blue LED (470nm)	Blue LED (470nm)	White LED
Indicator		Operation indicator: orange LED / Stability (STB) indicator: green LED									
Display		LCD display with backlight									
Switch		2 set buttons / Mode selector switch: RUN/SELECT/MODE									
Sensitivity setting		Full auto teaching / Auto teaching									
Sensitivity setting input		Set button input/external input									
Sensitivity adjustment function		Provided (manual sensitivity adjustment)									
Functions		<ul style="list-style-type: none"> • Sensor function: AUTO/TEACH/LOCK • Auxiliary function: <ul style="list-style-type: none"> S for manual adjustment of sensitivity and activation level H for manual hysteresis setting V for gap indication and absolute value indication modes • Mutual Interference prevention feature • Self-diagnosis feature • Short circuit protection feature 									
Material		Polycarbonate									
Conecion		Attached cable (outer diameter: 4.8mm) 0.2mm ² , 5 cores, 2m					M8 connector				
Weight		Cable type: approx. 80 g (including cables and mounting bracket); M8 connector type: approx. 25g									
Accessory		Mounting bracket / Operation manual									

(*) Detection can start when more than 0.5 seconds has passed after power up. If the load and this sensor use different power sources, be sure to turn on the sensor first.

Environmental Specification

Ambient light	Incandescent lamp: 10,000 lx / Sunlight: 20,000 lx
Ambient temperature	1-3 adjacent units in operation: -25 - +55 °C
	4-10 adjacent units in operation: -25 - +50 °C
	11-16 adjacent units in operation: -25 - +45 °C Storage: -40 - +70 °C (non-freezing)
Ambient humidity	35 - 85%RH (non-condensing)
Protective structure	IP40
Vibration	10 - 55 Hz / 1.5 mm double amplitude / 2 hours each in 3 direction
Shock	500 m/s ² / 3 times each in 3 directions
Dielectric withstanding	1000 VAC for 1 minute
Insulation resistance	500 DVC, 20M Ω or more

Input/Output Circuit and Connection

Model	Output circuit diagram	Model	Output circuit diagram
NPN output F70R F70G F70B F70W		PNP output F70RPN F70GPN F70BPN F70WPN	

* When not using external teaching, cut the pink cable at the foot or connect it to the positive terminal (NPN output) or 0V (PNP output). In the condition of load short-circuit or overload, the output transistor turns off. Check the load condition before restarting.

M8 Connector Type Input/Output Specification, Pin Assignment and Lead Colors

F70R-JE F70G-JE F70B-JE F70W-JE		F70G-JS F70B-JS	
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Dimensions (in mm)

Amplifier unit (cable type) F70 ●Accessory: mounting bracket ●Material: SUS CAD	M8 connector type ●Accessory: mounting bracket ●Material: SUS 	
End unit (optional parts) Model FA7EU CAD	Mounting bracket (accessory) Model AC-BF2 ●Material: SUS CAD	Cable with M8 connector (optional parts) FBC-4R2L (Straight type) FBC-4R2L (Angled type)

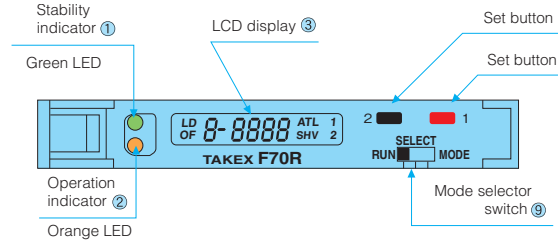
For dimensions of fiber optic cables, see page 75 and after.

F70

For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

Part names



③.....LCD display

Shows the status and functions of the sensor including operation mode and received light level.

Operation mode ④ Position on the electronic volume ⑤
8-step indication: 1, 2,...8

Received light level ⑥ Light emission frequency channel ⑧

Function ⑦

Sensor function Auxiliary function

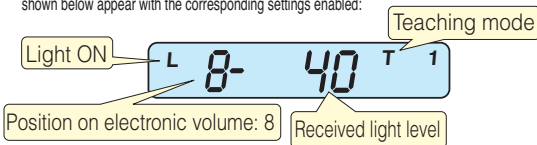
A: Auto sense S: Manual adjustment of sensitivity and activation level
T: Teaching H: Manual hysteresis (deactivation level) setting
L: Lock V: Gap indication and absolute value indication

L: Light ON
D: Dark ON
O: On delay
F: Off delay

- ①.....Stability indicator
- ②.....Operation indicator
- ③.....LCD display
- ④.....Operation mode
- ⑤.....Position on electronic volume
- ⑥.....Received light level
- ⑦.....Function
- ⑧.....Light emission frequency channel
- ⑨.....Mode selector switch

Initial (factory) setting

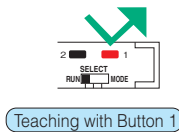
When a fiber optic sensor has been mounted and power supplied for the first time, indications as shown below appear with the corresponding settings enabled:



Simple setting for immediate use

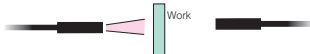
(For reflective type)

- 1) Press Button 1 once with no work present. The orange and green indicators flash.
- 2) With the work in place, press Button 1 once again.



(For through beam type)

- 1) Block the light beam with the object, etc. to set the light blocking state.
- 2) Press Button 1 twice. The setting is complete.



Note

Use of a reflective type fiber optic cable at the maximum sensitivity may cause inadequate light blocking. Be sure work is present for auto or full auto teaching.

Operation

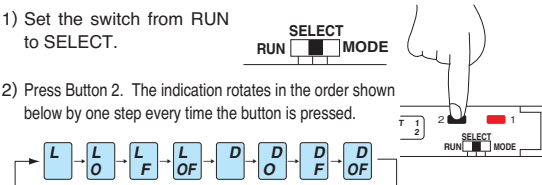
● Mode selector switch

- RUN** **SELECT** **MODE**
- Sensor function**
Functions as an ordinary sensor.
- SELECT** **RUN** **MODE**
- Select function**
* Selection of Light ON/Dark ON and timer operation.
* Selection of sensor function.
* Selection of auxiliary function.
- RUN** **SELECT** **MODE**
- Mode function**
* Sensitivity setting (teaching) in the lock mode
* Activates the auxiliary function selected in [SELECT]

● Operation mode setting

Select between Light ON and Dark ON and timer operations.

- 1) Set the switch from RUN to SELECT.
- 2) Press Button 2. The indication rotates in the order shown below by one step every time the button is pressed.



Indication	Output operation	Timer operation
L	Light ON	None
LO	Light ON	On delay
LF	Light ON	Off delay
LOF	Light ON	On/Off delay
D	Dark ON	None
DO	Dark ON	On delay
DF	Dark ON	Off delay
DOF	Dark ON	On/Off delay

- 3) Select a desired mode and set the switch back to RUN, which enables the selected operation mode.

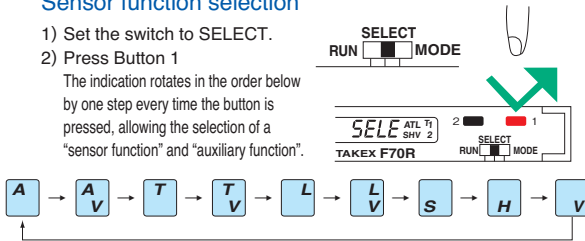
For Correct Use

Be sure to follow the instructions in the operation manual provided for correct use of the product.

Sensor function/auxiliary function setting

Sensor function selection

- 1) Set the switch to SELECT.
- 2) Press Button 1
The indication rotates in the order below by one step every time the button is pressed, allowing the selection of a "sensor function" and "auxiliary function".



- 3) Select a function and set the switch back to [RUN].
The function selection is stored in the memory.

Sensor function

A: Auto sense mode — Constantly monitors the level of received light and, if any variation is found, the on/off level is automatically adjusted.

T: Teaching mode — Allows sensitivity setting. The setting method options include "auto teaching," "full auto teaching" and "external signal."

L: Lock mode — Prohibits sensitivity setting.

AV, TV, LV: Gap indication mode — The received light intensity with the work used is indicated in positive or negative value (gap) with reference to the level of received light at the time of teaching.

Auxiliary function selection

Auxiliary function

S: Allows adjustment of the "sensitivity" and "activation level" already set.

H: Allows adjustment of the hysteresis (deactivation level).

V: Indicates the absolute value.

- Select one of these functions and set the switch to [MODE], which enables the auxiliary function selected.

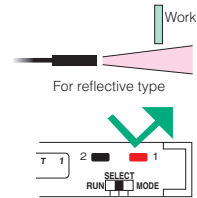
LCD display

- The received light intensity displayed on the LCD shows an average value for a certain period of time and may contain an error of $\pm 1-2$.
- When the Manual interference prevention feature is enabled, the received light intensity indication on the LCD may show an incorrect value. For correct indication, eliminate the interference by blocking the light causing the interference or cutting of the power supply to the sensor causing the interference and read the value.

Sensitivity setting (teaching)

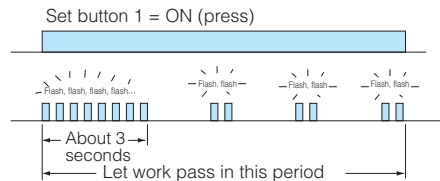
Auto teaching (with stationary object)

- 1) Press Button 1 with no work placed and release the button. The indicator flashes, showing that the sensor is ready for the next teaching input.
- 2) With the work in place, press Button 1 once and release it. The indicator stops flashing, showing that sensitivity setting is complete.



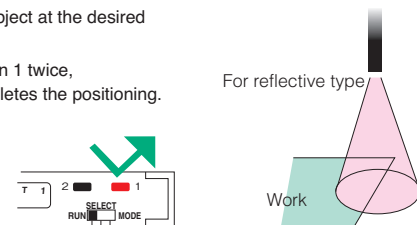
Full auto teaching (with moving object)

- 1) Press and hold down Button 1 for 3 seconds or longer. The orange and green indicators start flashing alternately and the flashing becomes slower a little later.
- 2) Let the work pass while holding down Button 1.
- 3) When the passing of work and the slow flashing of indicators have been confirmed, release Button 1.



Positioning teaching

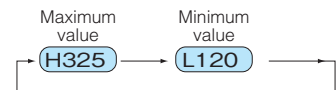
- 1) Place the object at the desired position.
- 2) Press Button 1 twice, which completes the positioning.



Teach hold function

Holds momentary data during full auto teaching.

Releasing Button 1 shows the maximum and minimum data during teaching (the maximum and minimum values are alternately shown for about 3 seconds).



This hold function is not available with the external teaching function.