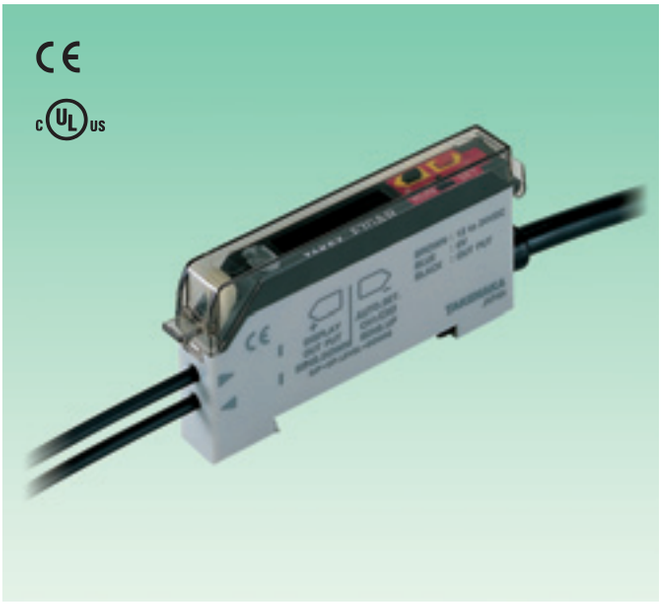
F70A series

Digital display
Fiber optic sensors



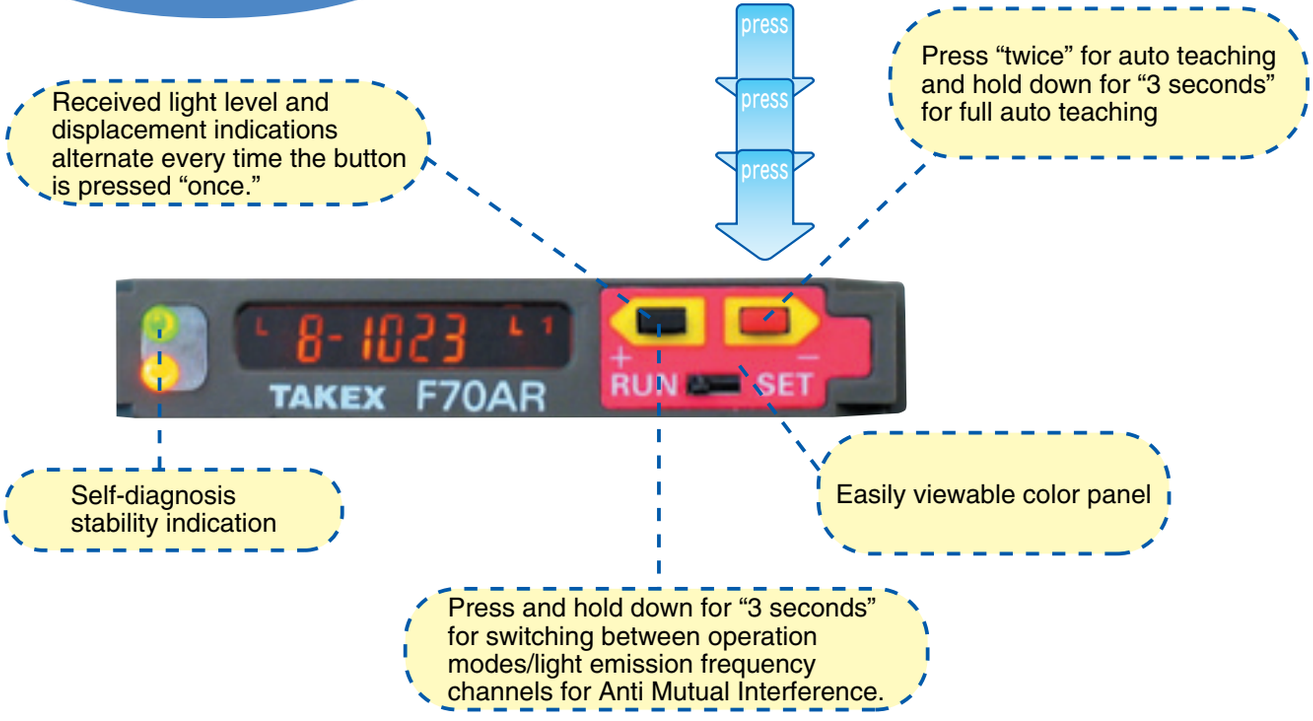
- Digital indication of sensing information
- Simple operation for setting functions
- Direct reading of stablility level is available along with received light level and displace-ment indications
- LCD with backlight for ease of reading
- Various convenient functions provided
  - Full auto/auto teaching
  - Anti Mutual Interference
  - Manual sensitivity setting
  - Off-delay timer

Variation

Type	Model		Light source	Output mode
	NPN output	PNP output		
Digital display general-purpose type	**F70AR**	**F70ARPN**	Red LED	Open collector (NPN/PNP)
	F70AG	**F70AGPN**	Green LED	
	F70AB	**F70ABPN**	Blue LED	
	F70AW	**F70AWPN**	White LED	

Simple operation

Simple operation featured



2 types of received light level indication

Level indication mode

The level of received light is indicated in 4-digit number.
Min. = 0 / Max. = 1023

Position on the electronic volume: 8

The sensitivity position on the electronic volume and the current received light level are displayed.

There may be an error of ± 1-2 between the value on the LCD and the actual value.

Displacement indication mode

The example above shows that the current receive light level is -123 with reference to the activation level.

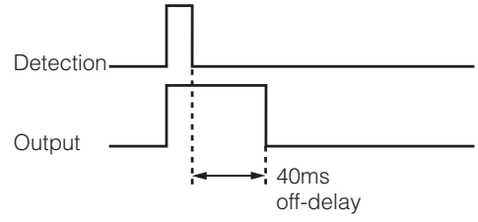
The level of received light is indicated in positive or negative value with reference to the activation level.

The activation level is taken as the reference (± 0) and the level of received light with work used is indicated as a deviation from the reference in a positive or negative value.

Enhanced teaching features (sensitivity setting)

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

Secure detection of an instantaneous signal is ensured with the off-delay timer



A small object moving at a high speed can be securely detected, thus allowing for a wider range of input conditions for the connected devices.

F70A・F70series

Type

• Amplifier (main unit)

Type	Model		Light source	Output mode	Connection
	NPN output	PNP output			
Digital display general-purpose type	**F70AR**	**F70ARPN**	Red LED	Open collector (NPN/PNP)	Permanently attached cord [M8 connector type also available]
	F70AG	**F70AGPN**	Green LED		
	F70AB	**F70ABPN**	Blue LED		
	F70AW	**F70AWPN**	White LED		
Digital display high-speed type	**F70R**	**F70RPN**	Red LED		
	F70G	**F70GPN**	Green LED		
	F70B	**F70BPN**	Blue LED		
	F70W	**F70WPN**	White LED		

• Fiber optic cable

For different types of fiber optic cables, see pp. 59-.

• M8 connector type

M8 connector connection type is separately available for all models, which is identified by “-J” following the model number. “-JE” and “-JS” are available depending on the input/output specification.

For connector specifications, see p. 23.

<Type of cords with M8 connector>

・Model：FBC-4R2S (equipped with straight M8 connector and 2-m cord)

・Model：FBC-4R2L (equipped with angled M8 connector and 2-m cord)

End unit

• Optional parts

Type	Model	Description
End unit	**FA7EU**	DIN rail mounting stopper
Mounting bracket*	**AC-BF2**	Amplifier unit mounting bracket

*Accessory

Rating/Performance/Specification

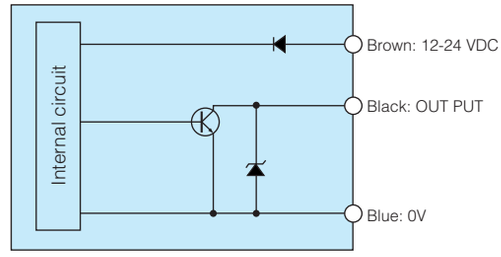
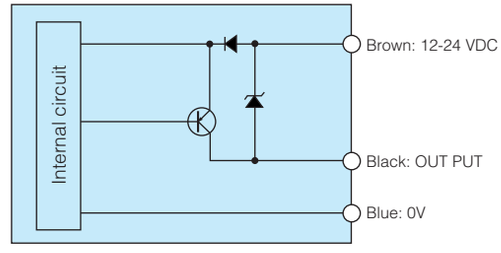
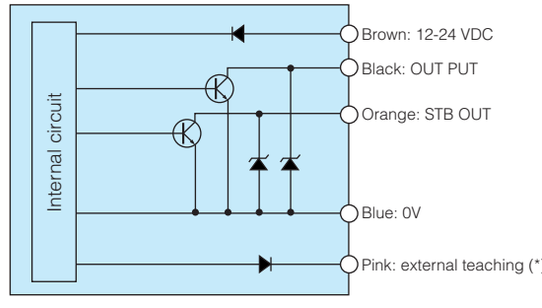
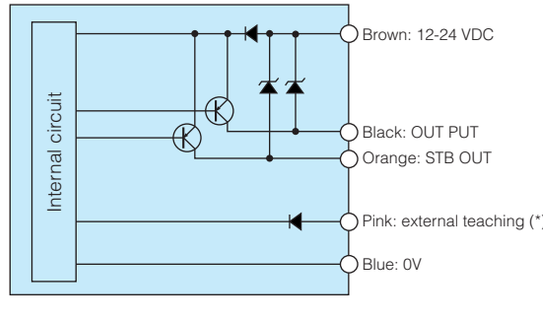
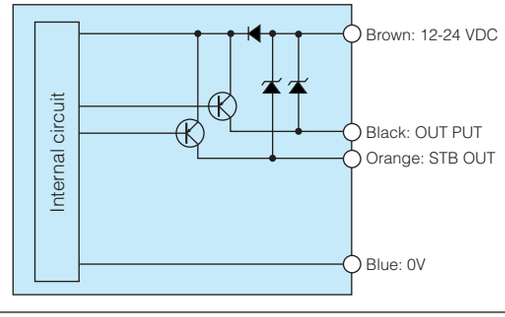
Rating/performance	Model	NPN type	**F70AR**	**F70AG**	**F70AB**	**F70AW**	**F70R**	**F70G**	**F70B**	**F70W**
		PNP type	**F70ARPN**	**F70AGPN**	**F70ABPN**	**F70AWPN**	**F70RPN**	**F70GPN**	**F70BPN**	**F70WPN**
	Power supply		12-24V DC ±10% / Ripple 10% max.							
	Current consumption	NPN type	39 mA max.							
		PNP type	50 mA max.							
	Output mode	Control output (*) NPN type	Open collector output / Rating: sink current 100 mA (30 VDC max.) / Residual voltage: 1 V or less							
		Control output (*) PNP type	Open collector output / Rating: source current 100 mA (30 VDC max.) / Residual voltage: 2 V or less							
		Stability output (*) NPN type	————				Open collector output / Rating: sink current 50 mA (30 VDC max.) / Residual voltage: 1 V or less			
		Stability output (*) PNP type					Open collector output / Rating: source current 50 mA (30 VDC max.) / Residual voltage: 2 V or less			
	Operation mode		Light-ON/Dark-ON selectable							
	Timer		Off delay/disabled selectable Delay time: 40 ms fixed				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: 600 μs max. Light emission frequency channel 2: 700 μs max.				Light emission frequency channel 1: 500 μs max. Light emission frequency channel 2: 600 μs max.			
Specification	Light source (wavelength)		Red LED (660mm)	Green LED (525mm)	Blue LED (470mm)	White LED	Red LED (660mm)	Green LED (525mm)	Blue LED (470mm)	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/SET				2 set buttons / Mode selector switch: RUN/SELECT/MODE			
	Sensitivity setting		Full auto teaching / Auto teaching							
	Sensitivity setting input		Set button input				Set button input/external input			
	Sensitivity adjustment function		Provided (manual sensitivity adjustment)							
	Functions		• Anti Mutual Interference feature • Short circuit protection feature				• Sensor function: AUTO/TEACH/LOCK • Auxiliary function: S for manual adjustment of sensitivity and activation level H for manual hysteresis setting V for displacement indication and absolute value indication modes • Anti Mutual Interference feature • Self-diagnosis feature • Short circuit protection feature			
	Material		Polycarbonate							
	Connection		Permanently attached cord (outer dimension: dia. 4.8) 0.2sq. 3 core 2 m length				Permanently attached cord (outer dimension: dia. 4.8) 0.2sq. 5 core 2 m length			
			For M8 connector specifications, see p. 23.							
	Mass		Approx. 80 g (including 2-m cord and mounting bracket)							
	Accessory		Mounting bracket / Operation manual							

(*) Avoid the transient condition (0.5 seconds) immediately after power-up for output.

Environmental Specification

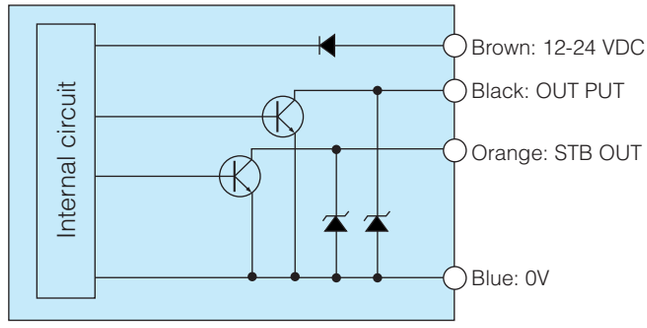
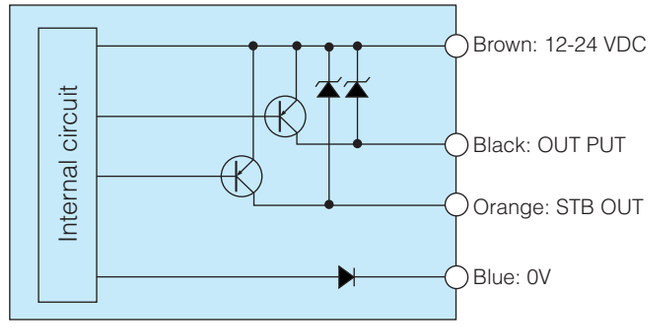
Environment	Ambient light	Incandescent lamp: 10,000 lx / Sunlight: 20,000 lx
	Ambient temperature	1-3 adjacent units in operation: −25 - +55 °C 4-10 adjacent units in operation: −25 - +50 °C 11-16 adjacent units in operation: −25 - +45 °C Storage: −40 - +70 °C (non-freezing)
	Ambient humidity	35-85%RH (non-condensing)
	Protective structure	IP40
	Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction
	Shock	500 m/s² / 3 times each in 3 directions

Input/Output Circuit and Connection

Model	Output circuit diagram
NPN output type **F70AR** **F70ABK** **F70AG** **F70AWK** **F70AB** **F70AW** **F70ARK** **F70AGK**	
PNP output type **F70ARPN** **F70ABKPN** **F70AGPN** **F70AWKPN** **F70ABPN** **F70AWPN** **F70ARKPN** **F70AGKPN**	
NPN output type **F70R** **F70G** **F70B** **F70W**	
PNP output type **F70RPN** **F70GPN** **F70BPN** **F70WPN**	
PNP output type **F70RKPN** **F70GKPN** **F70BKPN** **F70WKPN**	

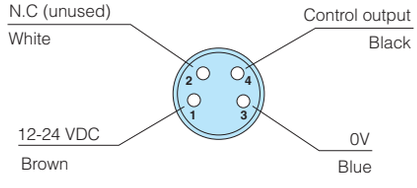
(*) When not using external teaching, cut the pink lead at the base or connect it to the positive terminal (for NPN type) or 0V (PNP type) of the power supply.

Input/Output Circuit and Connection

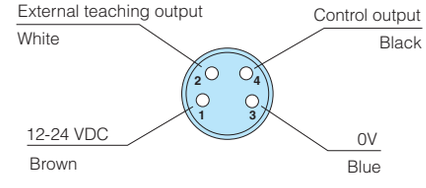
Model	Output circuit diagram
NPN output type **F70RK** **F71R** **F71RK** **F70GK** **F71G** **F71GK** **F70BK** **F71B** **F71BK** **F70WK** **F71W** **F71WK** **F71RH** **F71RHK** **F71GH** **F71GHK** **F71BH** **F71BHK** **F71WH** **F71WHK**	
PNP output type **F71RPN** **F71RKPN** **F71GPN** **F71GKPN** **F71BPN** **F71BKPN** **F71WPN** **F71WKPN** **F71RHPN** **F71RHKPN** **F71GHPN** **F71GHKPN** **F71BHPN** **F71BHKPN** **F71WHPN** **F71WHKPN**	

M8 Connector Type IO Specification/Pin Arrangement/Lead Colors

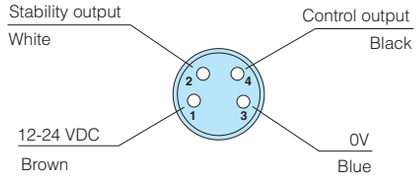
F70A" −J"



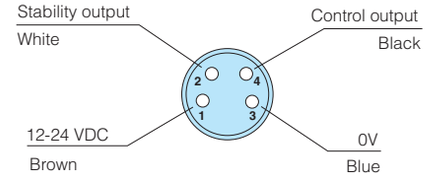
F70" −JE"



F71" −J"

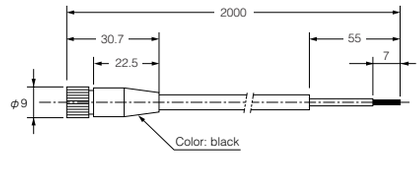


F70" −JS"

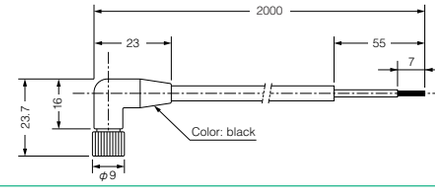


- Dimensions of cord with M8 connector (optional) (in mm)

FBC-4R2S (straight)



FBC-4R2L (angled)



Common to F70A/F70/F71 Series

For Correct Use

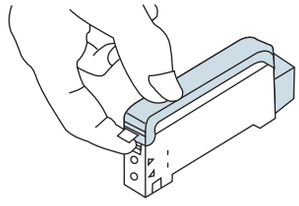
Be sure to follow the instructions in the operation manual provided for correct use of the product.

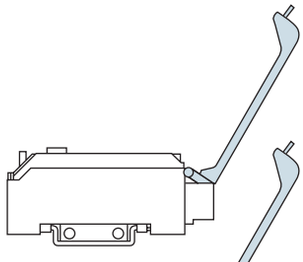
Handling of amplifier case cover

①Opening the case cover

While pressing down the front part of the case cover, lift the cover by pulling up the tab.

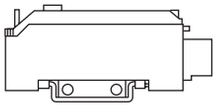
Just roughly pulling the case cover tab for opening may damage the cover. Be sure to press the front part of the cover when pulling the tab.





The cover opens up to the connector on the back and stays at the half-opened position.

Pulling at the hinge with the cover half open allows removal of the cover.

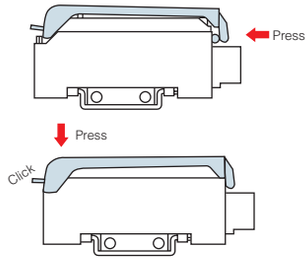


Cover removed

②Attaching the cover

Put the case cover on the amplifier as shown on the figure on the right and push in at the hinge.

Press down the front part of the cover until it clicks and make sure that the tab is hooked.

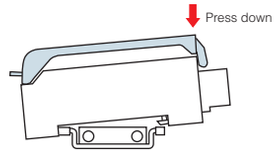


Attaching amplifier on DIN rail or mounting bracket

The mounting bracket is optional.
The amplifier cannot be side-mounted with a mounting bracket used.

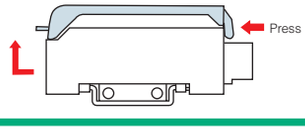
①Attachment

Put the front hook of the amplifier on the rail (or mounting bracket) and press down the back of the amplifier.



②Detachment

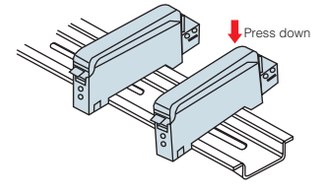
While pressing the amplifier forward, lift the front part and detach the front hook.



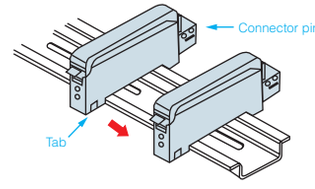
Attachment of amplifiers for joined use

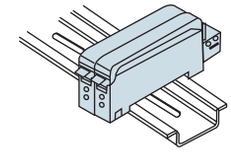
When using two or more amplifiers by joining them together, be sure to use a DIN rail for mounting.
Up to 16 units can be joined for use.
Be sure to cut the power supply before attempting to join or separate units.

①Mount one amplifier at a time on the DIN rail while keeping a certain space between amplifiers.

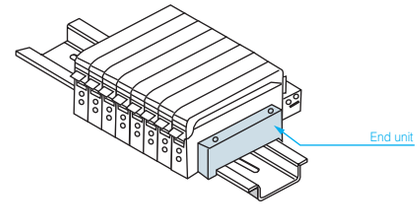


②Slide the amplifiers so that the tabs on the front and the connector pins on the back are respectively joined together.





③To prevent the connections from coming loose due to vibration, etc., attach end units (optional) on the ends of the group of amplifiers to secure them.



④To detach the amplifiers, follow the steps in reverse order and remove one amplifier at a time.

Removing the amplifiers as they are joined together without sliding may damage the amplifiers.

Common to F70A/F70/F71 Series

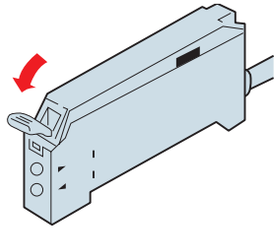
For Correct Use

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

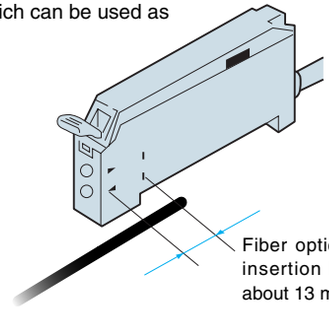
Attachment of fiber optic cable

Attachment to amplifier

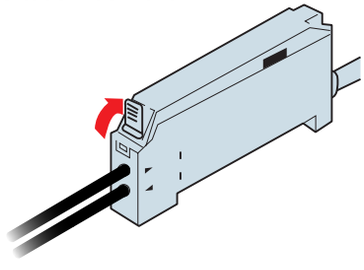
1. Open the case cover and press down the single-touch lock lever.



2. Insert the fiber optic cable all the way until it stops.
   To prevent inadequate insertion of a fiber optic cable, marks to indicate the insertion length are provided on the case side, which can be used as gauges.

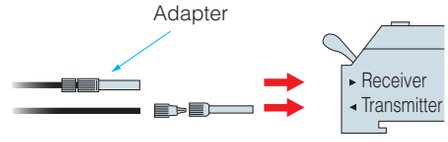


3. Lift the single-touch lock lever.



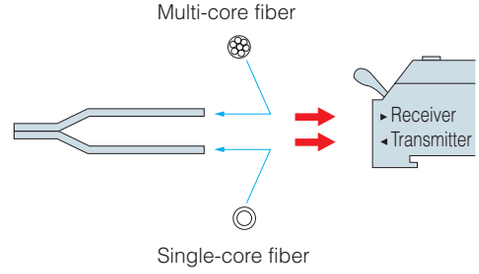
Attachment of small-diameter fiber optic cable

When attaching a small-diameter fiber optic cable, use the adapter that comes with the fiber optic cable.



Attachment of coaxial reflective fiber optic cable

Attach the multi-core fiber to the receiver and single-core fiber to the transmitter.



Notes on usage

- When using two or more amplifiers joined together, be sure to use a DIN rail for mounting.
  Different ambient temperatures apply according to the number of joined amplifiers.

No. of amplifiers	Ambient temperature
1-3	−25 - +55 ºC
4-10	−25 - +50 ºC
11-16	−25 - +45 ºC

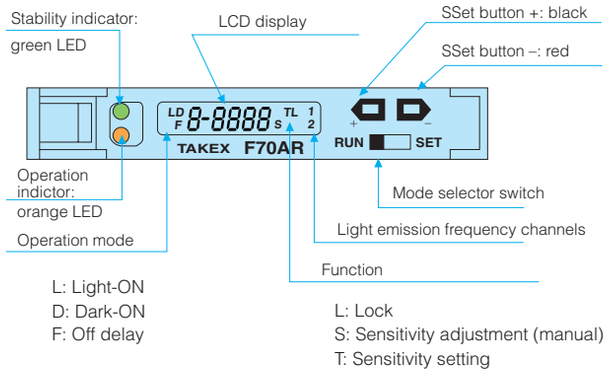
- Be sure to turn off the power supply before wiring.
- To extend the cord, use wires of at least 0.3 mm² and limit the length to within 100 m.
- Using the same conduit for the amplifier wiring and power transmission or high-voltage lines may cause faulty operation or damage due to noise. Be sure to route them separately.
- Make sure that the power fluctuation is within an allowable range so that the power input will not exceed the rating.
- When using a commercially-available switching regulator, use the frame ground or ground terminal.
- For output, avoid the transient condition (0.5 seconds) immediately after power-up.
- Do not use the sensor in a place subject to steam, large amount of dust or direct exposure to water or oil.
- Do not use the sensor outdoors or in a place subject to direct disturbing light on the light receiving surface.
- Use of a reflective-type fiber optic cable at the maximum sensitivity may cause inadequate light blocking. Be sure to use a work for sensitivity setting.

F70A Series

For Correct Use

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

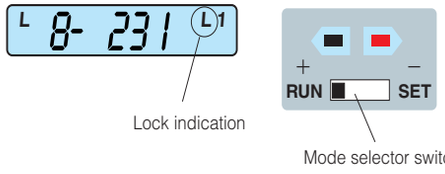
Part names

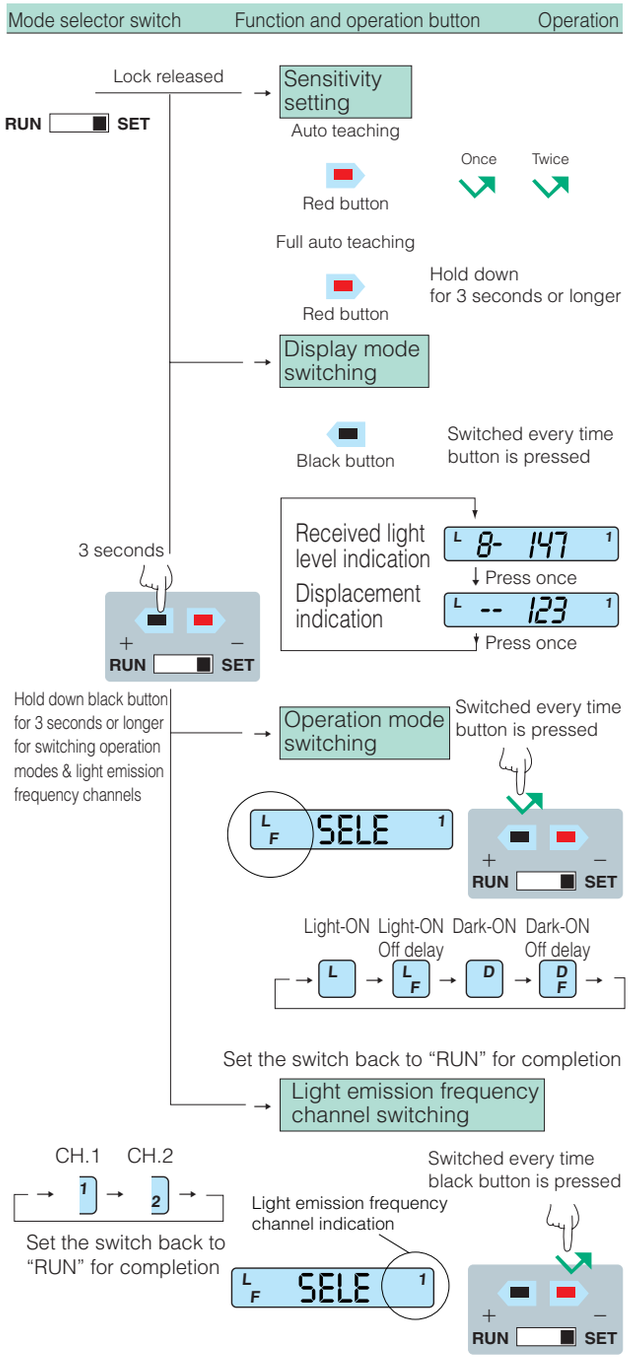


Operation

Mode selector switch

This switch should be set to RUN for normal object detection, which enables the lock mode and disables all operations on the sensor.
Setting the mode selector switch to SET releases the lock, which allows operations on the sensor.





For Correct Use

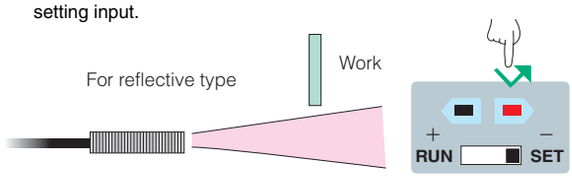
Be sure to follow the instructions in the operation manual provided for correct use of the product.

Sensitivity setting (teaching)

Set the operation mode selector switch from RUN to SET.
The lock is released and the sensor enters the sensitivity setting ready state.

Sensitivity setting using stationary work — auto teaching

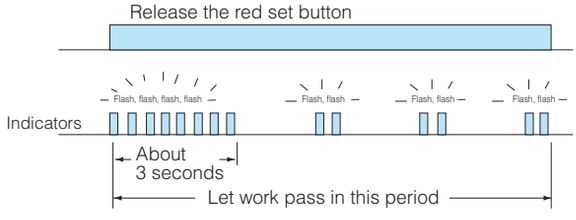
1. With no work placed, press the red set button and release it. The indicator flashes, showing that the sensor is ready for the next setting input.



2. Place the work in a given position and press the red set button. The indicator stops flashing, showing that sensitivity setting is complete.

Sensitivity setting using moving work — full auto teaching

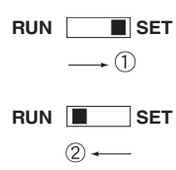
1. Press and hold down the red set button. The orange and green indicators start flashing alternately and the flashing becomes slower after about 3 seconds.
2. Let the work pass while holding down the red set button.
3. When the passing of the work and the slow flashing of the indicators have been confirmed, release the set button.



Interference between sensors prevents correct sensitivity setting. For correct sensitivity setting, make sure that there is no interference of light by blocking the light from either of the sensors or removing the fiber optic cable from either of the amplifiers.

Manual adjustment of activation level

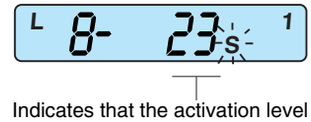
Sensor operation can be monitored while adjusting the activation level, which allows setting of the optimum operation level.



After setting the switch from RUN to SET (1), set it back to RUN (2).

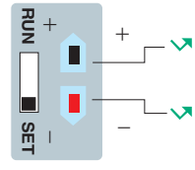
The lock is released and the sensor enters the sensitivity adjustment mode.

For received light indication mode



Indicates that the activation level is “23.”

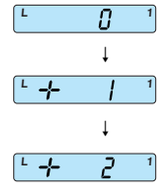
“S” flashes to indicate that the sensitivity can be adjusted.



Activation level raised every time button is pressed = SENS DOWN

Activation level lowered every time button is pressed = SENS UP

For displacement indication mode



Before adjustment, activation level of “0” is shown.

The number is increased (decreased) every time the black (red) set button is pressed.

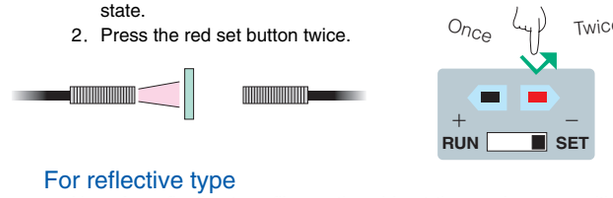
Sensitivity adjustment completed

The mode automatically switches back to the lock mode about 10 seconds after the sensitivity adjustment has been completed.

Maximum sensitivity setting: Press the red set button twice with the light blocked.

For through-beam type

1. Block the light beam with a work, etc. to make the light blocking state.
2. Press the red set button twice.

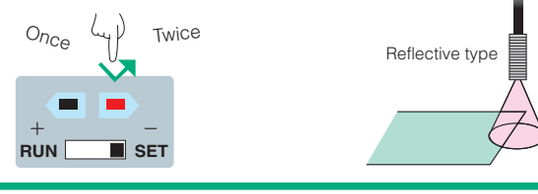


For reflective type

Use of a reflective-type fiber optic cable at the maximum sensitivity may cause inadequate light blocking. Be sure to use a work for sensitivity setting.

Work positioning setting

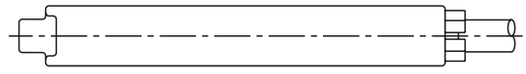
1. Place the work at the desired position.
2. With the work kept in place, press the red set button twice.

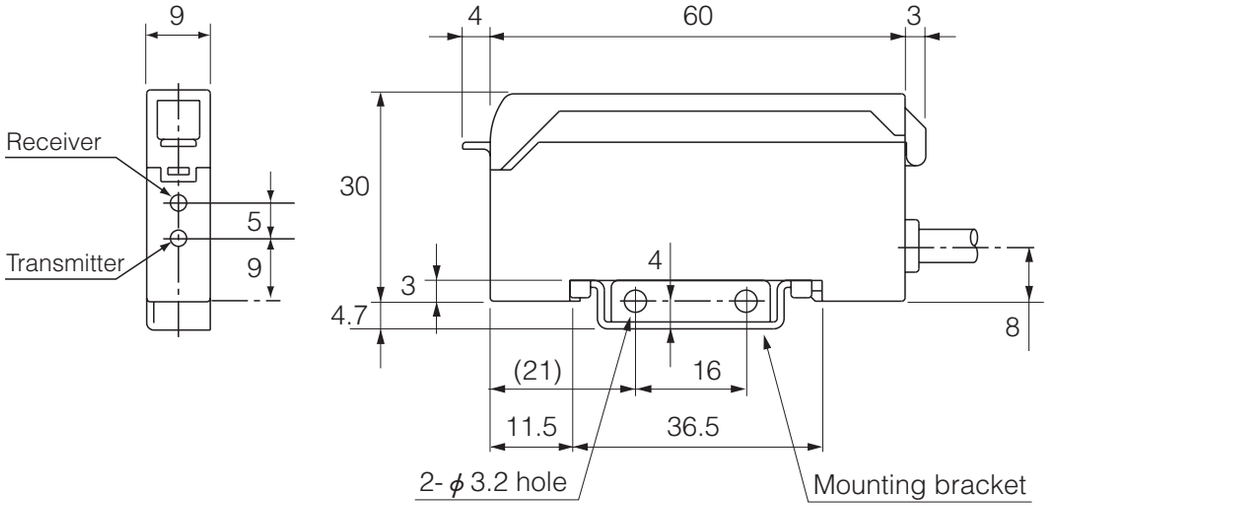


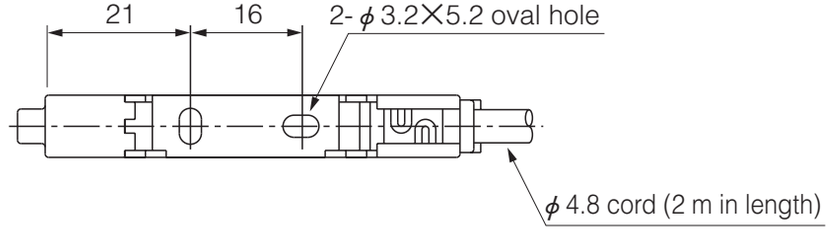
Cord-Connected Type

Dimensions (in mm)

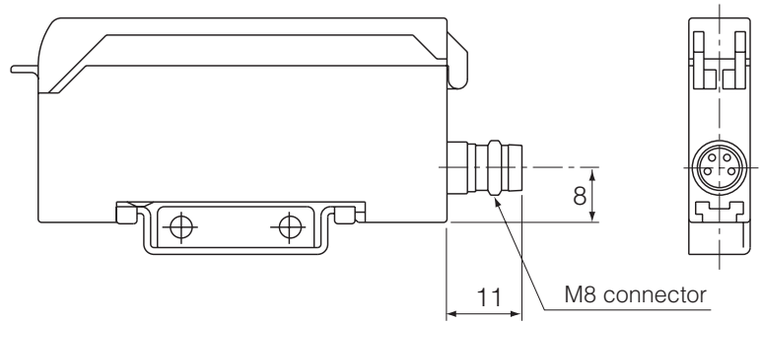
Amplifier
F70A/F70 Series
F 71 Series
(Common)







M8 connector type



(For dimensions of connector cords, see p. 23.)

For dimensions of fiber optic cables, see pp. 67-.