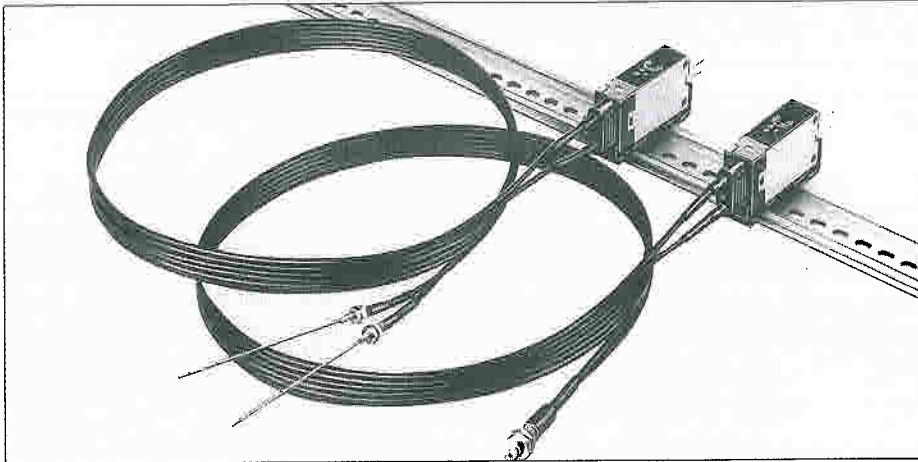




HEAT RESISTANT GLASS FIBER UP TO 200°C +392°F

Components for advanced technology

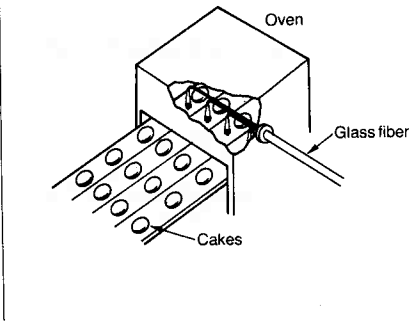
MQ-F Glass Fibers



1. Heat resistant glass fiber

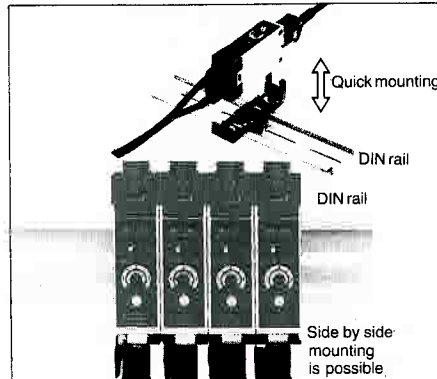
Heat resistant type with a wide range of -40°C to $+200^{\circ}\text{C}$ -40°F to 392°F . Its superiority will be proven for detection in the heat treatment process in the food industry, the soldering process in the electronics industry and so on.

- Detection of cakes just after the oven.

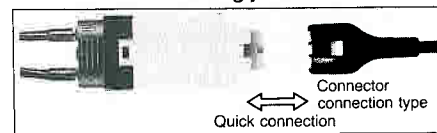


2. High serviceability

- Mountable on the DIN rail. Side by side mounting with labor-saving is possible.



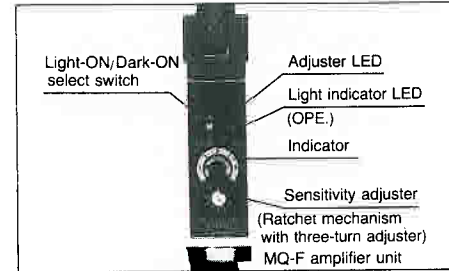
- The connector terminal structure facilitates a fast wiring job.



3. Ratchet mechanism with the three-turn adjuster (equipped with the indicator)

- The three-turn adjuster allows fine adjustment of the sensing distance.

- The ratchet mechanism prevents the adjuster from breakage caused by excessive turning.
- Equipped with the indicator which is visible at a glance. Temporary setting of the detectable distance is possible.
- The adjuster LED equipped facilitates setting of the sensing distance.



4. The Light-ON and Dark-ON modes are quickly switched. (equipped with the switch)

5. High speed detection at 0.5 ms (Red LED type)

The detection is possible to 1,000 times per s. In addition, the green LED type operates at 500 times per s for high speed devices.

6. Common use for operational voltages of 12 to 24 V

Widely applicable over a range of 9.6 V to 30 V DC.

APPLICATIONS

Detection of passage of food container just after the heat treatment process and cakes just after the oven, detection of parts on the PC board just after passing the soldering bath, and prevention of breakage of the metallic dies in the injection moulding machine (detection of moulding chips).

COMBINATION LIST

1. MQ-F Fiber Units and MQ-F Amplifier Units • These units are available as separate units and may be combined as desired.

Type	Detection system	Appearance	Fiber unit Part No.	Stainless sleeve provided No. in () represents sleeve length	Max. sensing distance (cm inch)	Cable length: 2 m 2.2 yards Combination Amplifier unit (Light-ON/Dark-ON switchable)
Glass fiber	Thru-beam type	Standard	MQ-FH12-02 	MQ-FHS12-02 	1.5 3.5 5 10 12 .591 1.378 1.969 3.937 4.724	MQ-FA1-DC12-24V (with connector) MQ-FA2-DC12-24V (with cabled connector) (Infrared LED) With base mountable on DIN rail
	Diffuse reflective type		MQ-FHD5-02 	MQ-FHSD5-02 	5 cm 1.969 inches	

2. MQ-F Fiber Attachment

Product name	Part No.	Description	Applicable fiber
MQ-FLE Lens attachment 	MQ-FLE (2 pcs as a set)	• The detectable distance is extended to 5 times. (When two pcs. are used.) 	MQ-F12-02 MQ-F10-C02 MQ-FH12-02
MQ-FSV Side view attachment 	MQ-FSV (2 pcs as a set)	• Space saving—Fibers are used in the parallel state. (When two pcs. are used.) 	

PRODUCT TYPE

1. MQ-F Amplifier Unit

Applicable fiber	Projector element	Operation type	Assembly with connector	Assembly with cabled connector (2 m 2.2 yards)
			Part No.	Part No.
Glass fiber	Infrared LED	Light-ON/Dark-ON common type (Selectable with switch)	MQ-FA1-12-24VDC	MQ-FA2-12-24VDC

Note: The base mountable on DIN rail is attached.

2. MQ-F Fiber Unit

Type	Detection method	Appearance	Max. sensing distance	Fiber length	Part No.
				No. in () represents sleeve length	
Glass fiber	Thru-beam type	Standard	12 cm 4.724 inches	2 m 2.2 yards	MQ-FH12-02
		Standard (with sleeve)	12 cm 4.724 inches	2 m (9 cm) 2.2 yards (3.543 inches)	MQ-FHS12-02
	Diffuse reflective type	Standard	5 cm 1.969 inches	2 m 2.2 yards	MQ-FHD5-02
		Standard (with sleeve)	5 cm 1.969 inches	2 m (9 cm) 2.2 yards (3.543 inches)	MQ-FHSD5-02

Note: The fiber plug is attached.

3. Accessories

Product name	Specifications	Applicable fiber	Part No.
MQ-FLE lens attachment	The detectable distance is multiplied to about 5 times (two pcs. used.)	MQ-F12-02 MQ-F10-C02 MQ-FH12-02	MQ-FSV
MQ-FSV side view attachment	The optical axis is turned at a right angle (two pcs. used.)		
MC connector (three terminals)	Dust protective cover	MQ-F amplifier unit, ME photoelectric sensor	AN53810
MC cabled connector (3-core cord)	Cable length: 2 m 78.74 inches, with dust protective cover	MQ-F amplifier unit, ME photoelectric sensor	AN53813

Note: Connector or cabled connector is attached on the amplifier unit.

RATINGS AND PERFORMANCE OUTLINE

1. Ratings

Item	Description	
Operation side	Rated operational voltage	12 to 24 V DC
	Rated current consumption	Max. 35 mA (excluding the load)
Load side	Output current capacity	Max. 100 mA

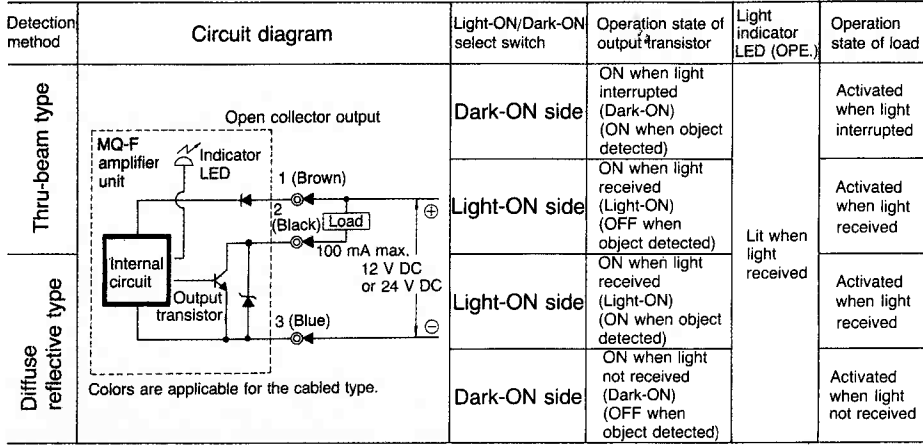
2. Performance

Fiber type	Glass fiber	
	Thru-beam type	Diffuse reflectance type
Detection method	MQ-FH12-02, MQ-FHS12-02 (with sleeve)	MQ-FHD5-02, MQ-FHSD5-02 (with sleeve)
Fiber unit	MQ-FA1-DC12-24V (with connector), MQ-FA2-DC12-24V (with cabled connector)	
Amplifier unit	MQ-FA1-DC12-24V (with connector), MQ-FA2-DC12-24V (with cabled connector)	
Projector element	Infrared LED	
Operation mode	Light-ON/Dark-ON (selectable with the main body switch)	
Standard target	2 mm .079 inch dia. metallic mat black color	White paper 3×3 cm 1.181×1.181 inches
Minimum target	1 mm .039 inch dia. nontransparent object	0.1 mm .004 inch dia. copper element wire
Detectable target	Opaque material	Translucent or opaque material
Operating voltage range	9.6 to 30 V DC (including the ripple P-P)	
Max. sensing distance ²	12 cm 4.724 inches	5 cm 1.969 inches
Operational angle	10° to 90°	
Hysteresis ²	—	
Detection speed	1,000 times/s	
indicator	Light indicator LED (OPE.) (red), Adjuster LED (red)	
Insulation resistance (initial)	20 MΩ or more between input/output terminal and external (at 500 V DC)	
Dielectric strength (initial)	500 V AC for 1 min between input/output terminal and external	
Vibration resistance and malfunction vibration	10 to 55 Hz (1 cycle/min), double amplitude 1.5 mm .059 inch (2 h on 3 axes)	
Shock resistance and malfunction vibration	100 G (6 times on 3 axes)	
Environmental illumination	Incandescent lamp: Max. 3,000 lux; sunlight: Max. 10,000 lux	
Ambient temperature	Amplifier	-25°C to +55°C -13°F to +131°F
	Fiber	-40°C to +200°C -40°F to +392°F
Ambient humidity	Max. 85% RH	
Protective construction	Amplifier: Plastic case, dust-protective construction (equivalent to IEC IP50) Fiber tip: Immersion-proof type (equivalent to IEC IP67)	
Fiber material	Glass fiber, teflon sheathed, with sleeve or stainless tipped sleeve	
Bending allowance of fiber unit	25 mm .984 inch	

Notes: 1. Unless otherwise specified, the measurement conditions comprise rated operating voltage, power supply by battery, 20°C 68°F ambient temperature, standard target and 200 lux or less illumination on the receiver surface.

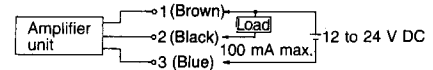
2. For the diffuse reflective type, the max. sensing distance and hysteresis are based on the standard target, and the detectable distance may vary depending on the material, color and size of a target.

OUTPUT CIRCUIT DIAGRAM (Light-ON/Dark-ON switchable)



WIRING DIAGRAM

MQ-F amplifier unit

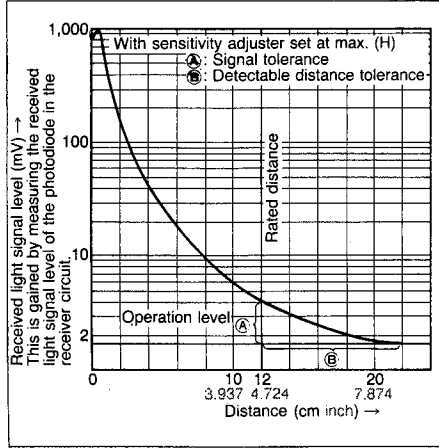


Note: The colors are applicable for the set with cabled connector.

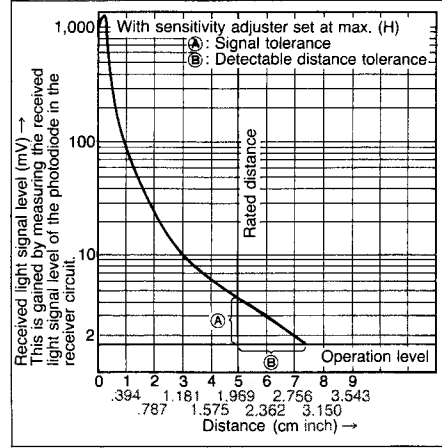
DATA

1. Characteristics of light level received vs distance

MQ-FA amplifier unit
(MQ-FH12-02) (MQ-FHS12-02)
Fiber unit (Thru-beam type: 12 cm 4.724 inch)

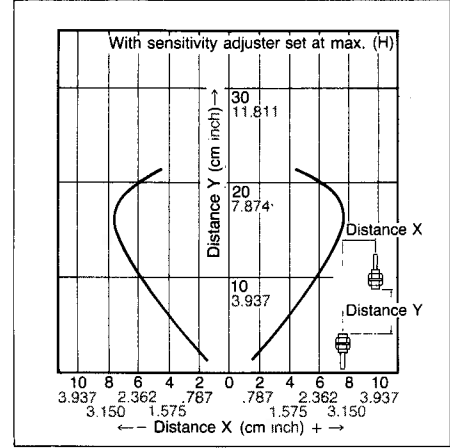


MQ-FAG amplifier unit
(MQ-FHD5-02) (MQ-FHSD5-02)
Fiber unit (Diffuse reflective type: 5 cm 1.969 inch)

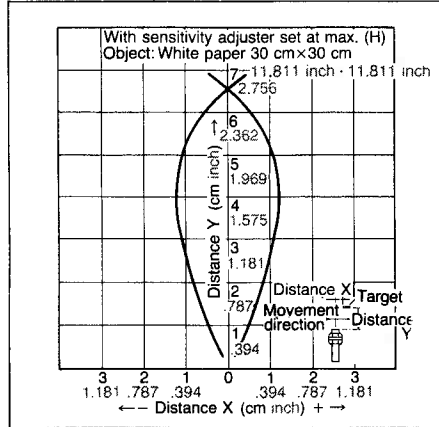


2. Operation range characteristics

MQ-FA amplifier unit
(MQ-FH12-02) (MQ-FHS12-02)
Fiber unit (Thru-beam type: 12 cm 4.724 inch)



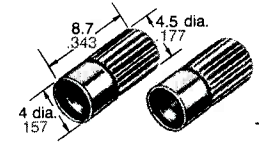
MQ-FA amplifier unit
(MQ-FHD5-02) (MQ-FHSD5-02)
Fiber unit (Diffuse reflective type: 5 cm 1.969 inch)



MQ-F FIBER ATTACHMENTS

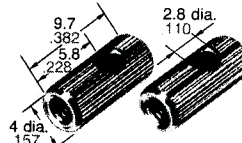
1. Appearance

MQ-FLE Lens Attachment



Two pcs. as a set

MQ-FSV Side View Attachment



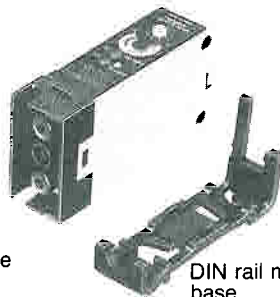
Two pcs. as a set

2. Performance

Attachment	MQ-FLE Lens Attachment	MQ-FSV Side View Attachment
Applicable fiber unit	MQ-FH12-02	MQ-FH12-02
Rated setting distance	1 m 39.37 inches	12 cm 4.724 inches
Detectable object	Opaque: 4 mm .157 inch dia. or more	Opaque: 3 mm .118 inch dia. or more
Operational angle	5° to 40°	20° to 60°
Ambient temperature	-40°C to +200°C -40°F to +392°F (when combined with glass fiber)	
Ambient humidity	Max. 85% RH	

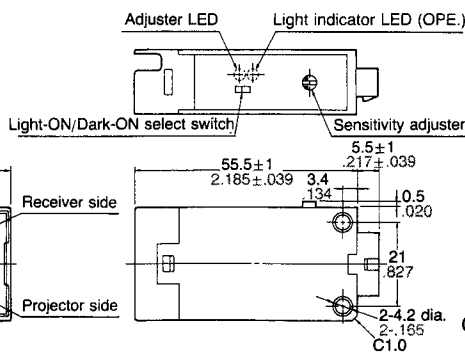
AMPLIFIER UNIT DIMENSIONS

MQ-FA Amplifier unit



※ Equipped with the base mountable on DIN rail.

DIN rail mountable base



General tolerance: ±0.5 ±0.020

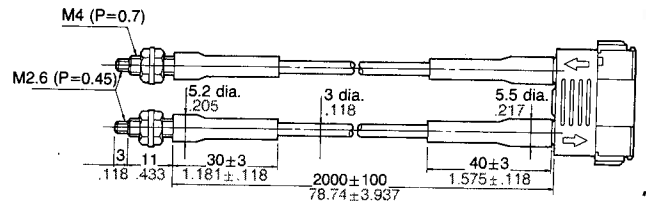
GLASS FIBER DIMENSIONS

mm inch

MQ-FH12-02 Fiber Unit
(Thru-beam type)



※ Equipped with fiber plug

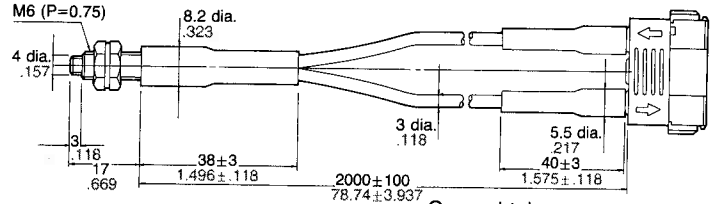


General tolerance: $\pm 0.5 \pm .020$

MQ-FHD5-02 Fiber Unit
(Diffuse reflective type)



※ Equipped with fiber plug

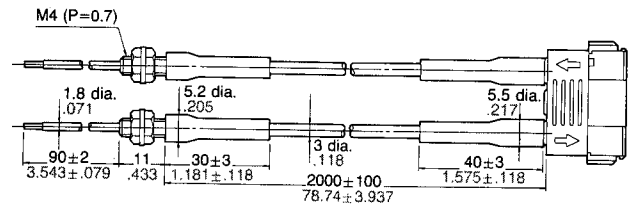


General tolerance: $\pm 0.5 \pm .020$

MQ-FHS12-02 Fiber Unit
(Thru-beam type with stainless sleeve)

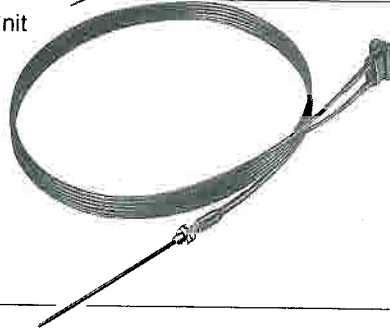


※ Equipped with fiber plug

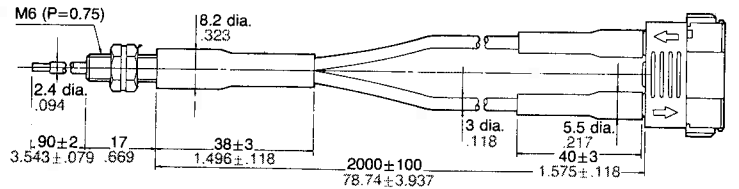


General tolerance: $\pm 0.5 \pm .020$

MQ-FHSD5-02 Fiber Unit
(Diffuse reflective type with stainless sleeve)



※ Equipped with fiber plug



General tolerance: $\pm 0.5 \pm .020$

CAUTIONS

1. Sensitivity adjustment for the thru-beam type

- 1) Swing the projector and receiver fiber units to left and right, and up and down so as to position the light indicator LED (OPE.) at the center in the lightening range, and then secure them. At this time, confirm that the adjuster LED is lit.
- 2) Adjusting the sensitivity makes possible detection of translucent and opaque targets. For opaque targets, the adjuster is turned to the maximum position (H), to increase the distance tolerance.

Note: If the adjuster LED goes out during operation, it is an alarm signal that detection does not work. Readjust and check sensitivity.

2. Sensitivity adjustment for the diffuse reflective type

- 1) Facing the detection face of the fiber unit in the detection direction, temporarily fasten it.
- 2) Under the condition that no detectable object exists, gradually turn the sensitivity adjuster counterclockwise from the maximum position (H) to find the position

- where the light indicator LED (OPE.) goes out. When the LED goes out if the adjuster is in the max. position, select the H position.
- 3) Place a detectable target in the detection position, and further turn the sensitivity adjuster counterclockwise to find the position where the light indicator LED (OPE.) goes out.
- 4) Set the adjuster at the middle point between the positions selected in steps 2) and 3).
- 5) Securely fasten the head of the fiber unit.

During fastening, take care to secure it to an extent that it is not displaced when vibration or shock is applied.

Notes:

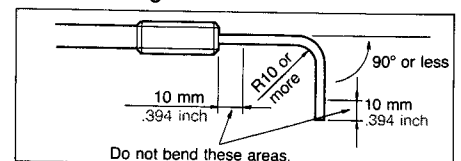
1. Since the sensing distance depends on the material, color, size, shape and direction of targets, and the environmental conditions, check it using an actual target. Since the transmission factor also varies depending on the bending angle of the optical fiber, avoid the operation near the limit of the operation but operate it within two thirds of the limit

distance.

2. If the adjuster LED does not come on in step 4), reposition the detection face and repeat the procedure of step 1) to step 4) or isolate an external cause such as variation of the ambient temperature or position variation of an object to detect.

3. Bending of stainless sleeve

- 1) Keep the bending curvature 10 mm .394 inch radius or more.
- 2) Smoothly bend the sleeve using a round rod of 20 mm .787 inch diameter.
- 3) The sleeve can not be bent within 10 mm .394 inch from the tip or the root. Moreover, the bending angle shall be within 90 degrees.

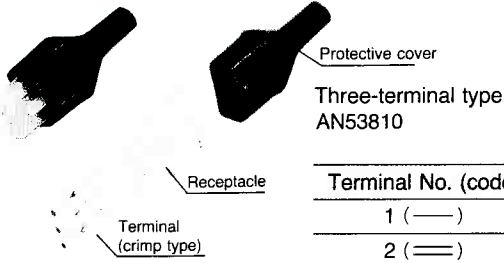


※ For the ambient conditions, wiring and operation of the fiber unit, refer to the cautions for operation (page 43).

MQ-F COMMON ITEMS

Accessories

MC connector



Terminal No. (code)	Description
1 (—)	⊕ terminal
2 (=)	● terminal
3 (≡)	⊖ terminal

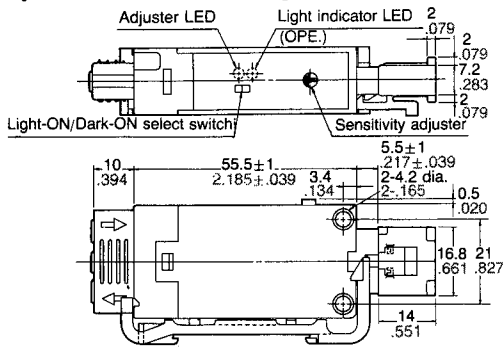
Connector with MC cabled connector
(Cable length: 2 m 2.2 yard)



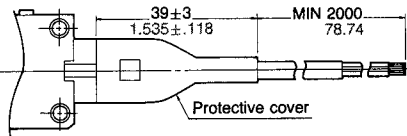
Terminal No. (Color code)	Description
1 (Brown)	⊕ terminal
2 (Black)	● terminal
3 (Blue)	⊖ terminal

Amplifier Mounting

mm inch



* The DIN rail mountable base and connector are attached on the amplifier unit, and the fiber plug is attached on the fiber unit respectively.

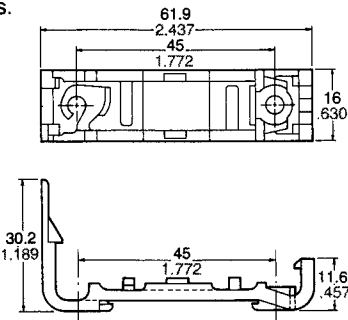


General tolerance: $\pm 1 \pm .039$

Accessory Attached Dimensions

• Direct mounting on the chassis

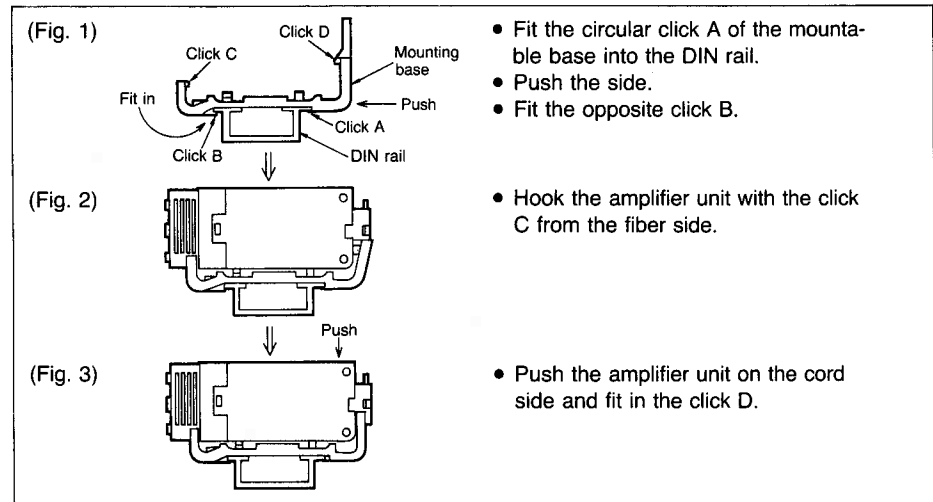
- When using the DIN rail mountable base, use two M4 pan head screws. (Keep in mind that the hex. recessed cap bolts can not be used as the mounting fasteners.)
- For the screw pitch, see the following view. (Pitch: 45 mm 1.772 inches)
- To fasten the amplifier main body, use M4 screws on the flat surface and combine the screw with the plain or spring washer, and tighten the screw to a torque of 10 kg-cm or less.



• Mounting on the DIN rail

- Use the 35 mm 1.378 inches wide DIN rail (DIN EN5002).

- Mount the unit as shown below.



- Fit the circular click A of the mountable base into the DIN rail.
- Push the side.
- Fit the opposite click B.

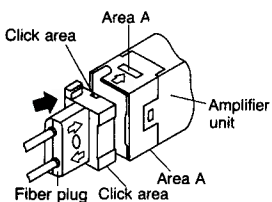
- Hook the amplifier unit with the click C from the fiber side.

- Push the amplifier unit on the cord side and fit in the click D.

Notes: 1. To remove the amplifier unit, bend the click D of the mountable base toward outside.
2. When vertically mounting the DIN rail, face the fiber side upward.

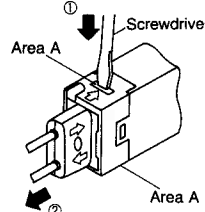
Attachment and Detachment of Fiber Plug

• To attach the fiber plug on the fiber plug



Push the fiber plug in the arrow direction as far as the upper and lower clicks of the fiber plug are securely engaged on the upper and lower areas A of the amplifier unit.

• To detach the fiber plug from the amplifier unit



Lightly push the upper and lower areas A of the amplifier unit with a screwdriver or similar to disengage the click area of the fiber plug. Then, pull out the fiber plug. Note: Take care not to excessively push the area A, or the click area of the fiber plug will be sometimes broken.

CAUTIONS

1. Environmental conditions

• Amplifier unit

- 1) The ambient temperature shall be kept within a range of -25°C to $+55^{\circ}\text{C}$ -13°F to 131°F .
- 2) The operational voltage shall be kept within a range from 9.6 V to 30 V DC (including ripple P-P).
- 3) Since the internal circuit may be broken when the external surge voltage exceeds 500 V (single polarity full wave voltage of $\pm(1.20 \times 50) \mu\text{s}$), the surge absorbing element should be used.

• Fiber unit

- 1) The ambient illuminance shall be 3,000 lux or less at the receiver under an incandescent lamp, and 10,000 lux or less at the receiver under sunlight.
- 2) The unit shall not be used at the site where much steam, dust or corrosive gas is suspended, water or oil splashes directly over the unit, or organic solvent adheres to the unit.

2. Wiring

• Amplifier unit

- 1) Since improper wiring results in breakage of the internal circuit, check the wiring before turning on the power supply.

- 2) The load relays rated at 12 V DC or 24 V DC shall be used.

Since the voltage applied to the load relay is determined by subtracting the internal voltage drop (max. 1.2 V) from the photoelectric sensor operating voltage, care shall be taken for the voltage fluctuation.

- 3) Keep in mind that the output area is broken if a load of 100 mA or more is connected.
- 4) Keep in mind that the induction noises cause malfunction and breakage if the wiring to the photoelectric sensor runs with the high voltage cables and the power cable.
- 5) When crimping the terminals, use the following tool made by Molex.

Crimping	Insertion	Pulling-out
JHTR1719C	J5800-001	J5800-002

Here, the terminal is 5005 TL made by Molex and the receptacle is 5025-03R1.

- 6) When extending the cable, use a cable of 0.3 mm^2 ($.00047 \text{ in}^2$) or more and limit its length within 100 m 91.4 yards.
- 7) When connecting the receptacle to the plug of the photoelectric sensor, properly connect them and securely push in the plug as far as the lock mechanism is activated. The construction to prevent reverse connection is provided.

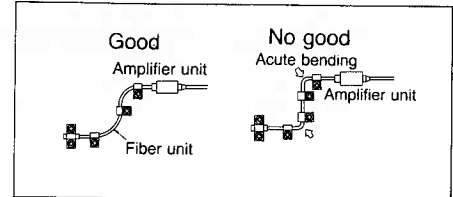
To remove the receptacle, release the lock mechanism and pull out the plug with the receptacle held by hand.

- 8) It is recommended to attach an auxiliary dust protective cover to the receptacle.

- 9) When the commercially available switching regulator is used, ground FG (frame ground terminal) and G (ground terminal). Otherwise, the switching noise of power supply may sometimes cause malfunction. In this case, care shall be taken.

3. Handling of the fiber unit.

- 1) The fiber unit shall be securely equipped on the amplifier.
- 2) Do not tighten with an excessive strength. Apply a torque of 8 kg-cm or less for tightening.
- 3) Do not apply a pulling force of 3 kg or more to the fiber unit.
- 4) Make the bending curvature of the fiber as large as possible. If the curvature is small, the transmission factor is reduced. So, check this during actual operation. (The curvature shall be R25 mm or more.)
- 5) Largely bend the fiber and do not bent it at the root.



- 6) Do not compress the fiber or apply a load to it.

