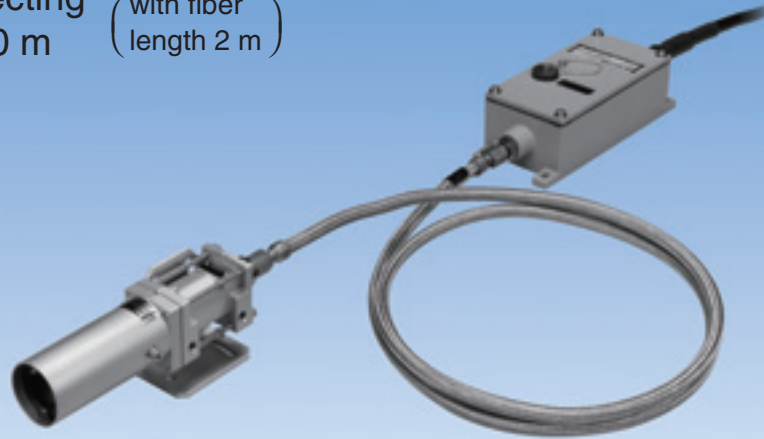


Self-check feature provided

Within detecting distance 40 m (with fiber length 2 m)



Transmitter and receiver as a set; dimensions same for both

The sensor is composed of an optical head and amplifier connected with a fiber optic cable.

This allows installation of the detecting head that contains no electronic components at a high-temperature location and of the amplifier containing electronic components at a remote location.

■ Features

- No cooling required
The optical head that comprises the detecting part integrating hood and optical lens and fiber have no electronic component, which allows use in ambient temperature of up to 200 °C without cooling.
- 5-point level indicator
Received light intensity is indicated at 5 levels, offering easy checking of stability and light axis alignment.
- Self-check feature integrated
Transmitter outputs alarm signals if light emission stops due to failure, etc. Receiver outputs alarm signal (SAFETY ALARM) when there is not much margin in the received light intensity level at detection due to light axis misalignment, soiling of lens, etc.
- Excellent durability
Reliable design provides robustness and resistance to heat and corrosion.
- Different hoods available
Attachable airless hood that requires no air purging in ordinary installation such as horizontal and angled downward installation and air purge hood for comparatively dusty locations.

Ordering Guide

Fiber type CMDs do not have set model Nos. Order by specifying the individual model Nos. of components.

- Example


For ordering sensor with the following properties:

- Detecting distance: up to 40 m
- Relay output
- Fiber length: 2 m
- Compact, lightweight Airless hood

Product name		Model	Quantity
Amplifier	Transmitter	FTL10A	1
	Receiver	FTR10A	1
Optical head		OHA	2
Fiber		FG2	2
Hood		F38A	2

For combination of models marked with*

[Fiber optic cable]

Length	Model	Appearance (Typical example)
2m	FG2 *	
3m	FG3	
4m	FG4	
5m	FG5	
7m	FG7	
10m	FG10	
15m	FG15	
20m	FG20	
30m	FG30	

[Amplifier]

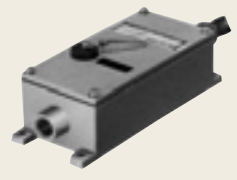

Type	Model	Appearance (Typical example)	
Transmitter amplifier	FTL10A *		
Receiver amplifier	Mini power relay output		FTR10A *
	Relay output		FTR10AH
	Solid-state output		FTR10AC



Photo: amplifier for receiver

[Optical head] For transmitter/receiver

Model	Appearance
OHA *	

Note: This product is not compatible with the existing airless hood or air purge hood. Spacer model OHA-12 is available for users of existing hoods.

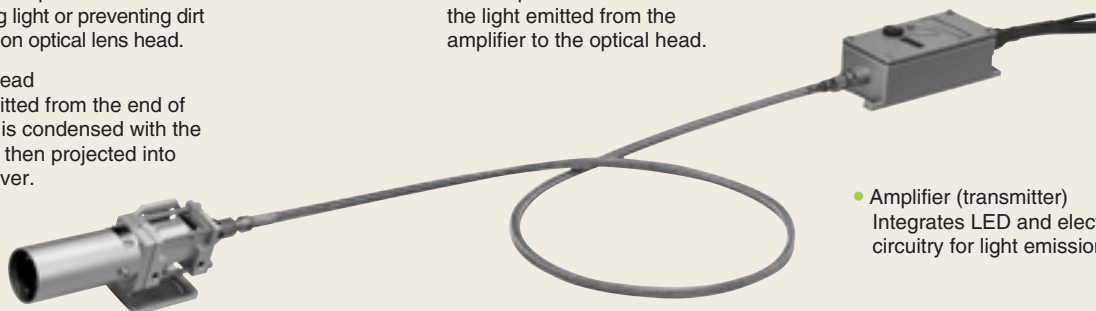
[Hood]

Type	Length	Model/shape	Appearance (Typical example)
Airless hood	120mm	F38A *	
	200mm	F38A-02	
	300mm	F38A-03	
	400mm	F38A-04	
	500mm	F38A-05	
Air purge hood	200mm	F38PC-02	
	300mm	F38PC-03	
	400mm	F38PC-04	
	500mm	F38PC-05	

Configuration

- Hood
Provided for protection from disturbing light or preventing dirt deposits on optical lens head.
- Optical head
Light emitted from the end of the fiber is condensed with the lens and then projected into the receiver.

- Fiber optic cable
Glass optical fiber that directs the light emitted from the amplifier to the optical head.



- Amplifier (transmitter)
Integrates LED and electronic circuitry for light emission.

- Amplifier (receiver)
Converts the light transmitted through fiber optic cable with the light-sensitive element into electric signals for control output (mini power relay output, reed relay output or Solid-state output) via electronic circuitry.

Components for transmitter and receiver are the same except for amplifiers.

FT10A

Rating/Performance/Specification/Environmental Specification

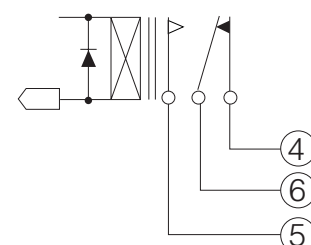
Output specification		FTL10A		
Monitor output (operation)	Power	ON		
	Monitor	Abnormal		
Rating	Output	Normal	Contact output 5A 250V AC max. (Resistance load)	
	Output	OPEN		
Receiver model		FTR10A	FTR10AH	FTR10AC
Output type		Mini power relay output	Relay output	Solid-state output
Control output		ON-OFF operation (Light-ON)		
Rating	Transfer contact	5 A 250 VAC max. (resistance load)	0.5 A 48 VDC max. (resistance load)	0.5 A 250 VAC/DC max. (resistance load)
	Response time	15ms max.	5ms max.	3ms max.
Safety Alarm output	Power	ON		
	Monitor	Abnormal		
Rating	Output	ON (L)	a contact	
	Output	OFF (H)	5A 250VAC max. (resistance load)	
General specification				
Detecting distance		Fiber length 2m: 40 m max. 5m: 30 m max. 10m: 20 m max.		
Valid lens diameter		28 mm		
Smallest detectable object		28 mm diameter		
Power Supply		100-220 VAC +10%/-15% 50/60Hz		
Power consumption		Transmitter: 10 W max.; receiver: 10 W max.		
Connection		with Connector cord 2m (CVV1.25mm ²)		
Ambient temperature		Optical head, Fiber: -25 to +200°C Amplifier: -25 +55°C (Non-freezing)		
Storage temperature		-40 to +70°C (Non-condensing)		
Ambient humidity		35 to 85%RH Max. (Non-condensing)		
Fiber-optic unit allowable bending radius		50mm		
Insulation resistance		Between power supply and case: 500 VDC, 20 MΩ or higher		
		Between output and case: 500 VDC, 20 MΩ or higher		
		Between power supply and output: 500 VDC, 20 MΩ or higher		
Dielectric withstanding		Between power supply and case: 1500VAC for 1 minute		
		Between output and case: 1500VAC for 1 minute (between reed relay outputs: 1,000 VAC for 1 minute)		
		Between power supply and output: 1500VAC for 1 minute (between reed relay outputs: 1,000 VAC for 1 minute)		
Vibration		10-55 Hz / 0.75 mm amplitude / 2 hours each in 3 direction		
Shock		500 m/s ² / 3 times each in 3 directions		
Protective structure				
Mass	Optical head	OHA: About 680g		
	Airless hood	F38A: about 240g	F38A-03: about 430g	
		F38A-04: about 550g	F38A-05: about 650g	
	Air purge hood	F38PC-02: about 240g	F38PC-03: about 300g	
		F38PC-04: about 370g	F38PC-05: about 440g	
Fiber	FG2 : about 0.7kg FG5 : about 1.3kg FG15: about 3.1kg	FG3 : about 0.9g FG7 : about 1.6g FG20: about 4.1g	FG4 : about 1.1kg FG10: about 2.1kg FG30: about 6.1kg	
Amplifier	Transmitter: about 1.5 kg; receiver: about 1.5 kg			

Input/Output Circuit and Connection

- Control output

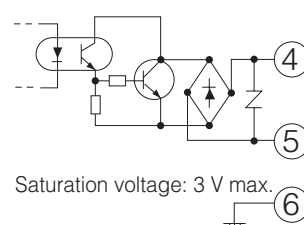
Model FTR10A

Model FTR10AH



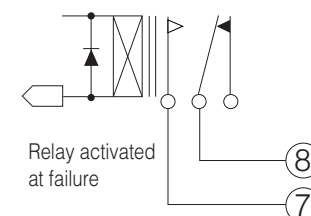
Relay activated at light reception

Model FTR10AC



Saturation voltage: 3 V max.

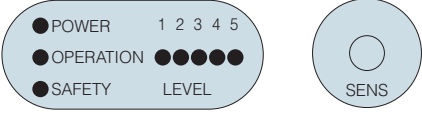
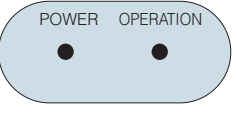
- SAFETY ALARM OUTPUT (all models)



Relay activated at failure

When connecting an inductive load such as relay as the load, be sure to use diode, surge absorber, etc. for protection of output transistor from back electromotive force.

Amplifier panel layout

Transmitter	Receiver
<ul style="list-style-type: none"> Light emission monitor Used to determine if the transmitter is functioning normally. An amplifier for monitoring is integrated in the sensor, which monitors the radiation from the LED used as the light source and outputs alarm signal (OPERATION error output) if the emission stops. The alert output relay is normally at ON state. 	
<ul style="list-style-type: none"> Power Illuminated at power-up. 	<p>POWER Illuminated at power-up</p>
<ul style="list-style-type: none"> OPERATION Illuminated when the transmitter is normally functioning and goes out when it stops functioning. 	<p>OPERATION Operation indicator: illuminated when control output is activated.</p>
	<p>SAFETY Stability check (stability operation) indicator: Green indicator is illuminated to indicate stable operation. When there is not much margin in the received light intensity level, SAFETY ALARM output is activated and the indicator starts flashing.</p>
	<p>LEVEL Received light intensity is shown with a 5-point indicator.</p>
	<p>SENS SAFETY LEVEL adjustment volume Volume for adjustment of the SAFETY LEVEL and LEVEL INDICATOR illumination level.</p>

Control Output and Stability Check Feature

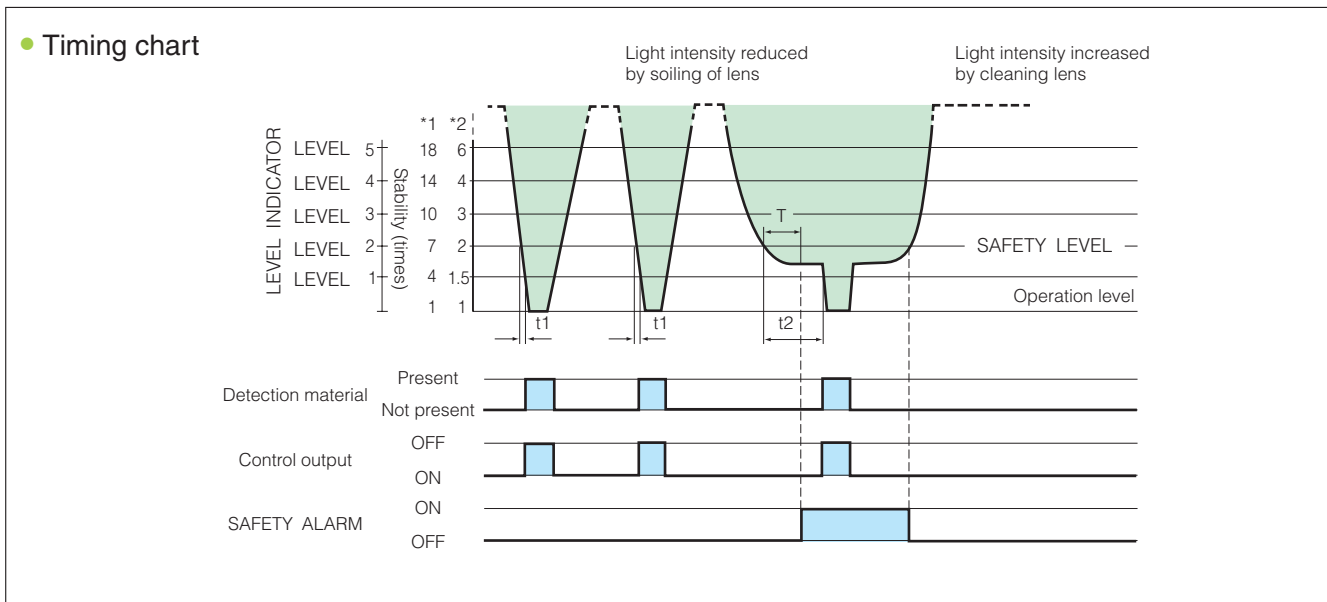
Control output: Relay is activated when the light from the transmitter is detected by the receiver for output.

Relay is deactivated when the light from the transmitter is blocked by the detection object.

Stability check feature (SAFETY ALARM output)

Operation: The light intensity level at light reception is observed and an alarm signal is output when the light intensity is equal to or below the SAFETY LEVEL due to soiling of lens or light axis misalignment, etc.

The SAFETY LEVEL is variable between 2 and 4 times as much as the operation level. The output is reset when the received light intensity exceeds the SAFETY LEVEL.



SAFETY ALARM operation: Timing is started when the received light intensity level is reduced to below the SAFETY LEVEL, which is reset when operation output is activated. SAFETY ALARM signal is output if this duration is longer than a certain duration T.

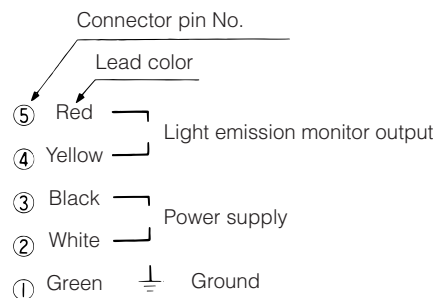
For example, the duration t_1 between the reduction of the received light intensity level under the SAFETY LEVEL and the output activation at material detection is shorter than the duration T and the ALARM is not output. With soiled lens or misaligned light axis, duration t_2 during which the light intensity is under the SAFETY LEVEL is longer (always under the check level at light reception), which is regarded as no margin in received light intensity level. (The duration T for SAFETY LEVEL check is set at about 2 minutes in the above example.)

The SAFETY LEVEL and LEVELs on the level indicator (received light intensity) are adjustable with the volume. *1 indicates the stability at "MIN" on SENS scale and *2 indicates the stability at "MAX" on SENS scale.

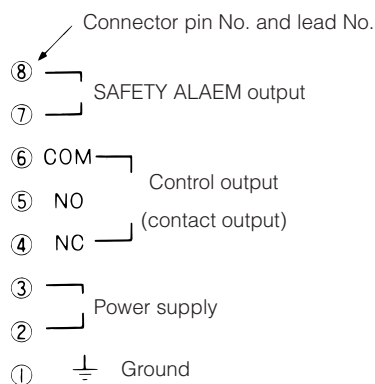
FT10A

Connection

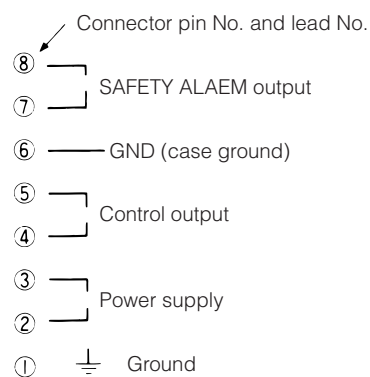
Transmitter: FTL10A



Receiver: FTR10A (Mini power relay output) FTR10AH (Relay output)



Receiver: FTR10AC (Solid-state output type)



Received Light Intensity Level Characteristics (Typical example)

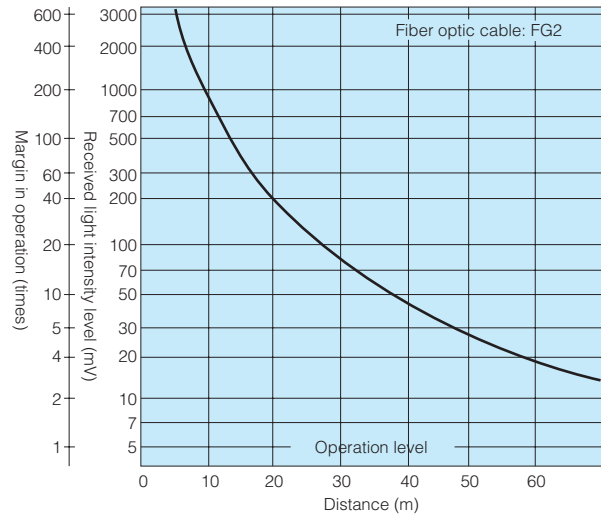
The data shows margin in operation against detecting distance with fiber optic cable FG2 (length 2 m) used for both transmitter and receiver. For other fiber models, find the data based on the transmission factor of the fiber.

When fiber optic cable FG2 (length 2 m) is used for both transmitter and receiver, the graphs directly shows the data and the margin in operation at detecting distance of 10 m is about 180 times.

When fiber optic cable FG10 (length 10 m) is used for both transmitter and receiver, the transmission factor is:
 $0.7 \times 0.7 = 0.49$.

Using this to find the margin in operation at detecting distance of 10 m with FG10 used for both transmitter and receiver,

$$180 \text{ (times)} \times 0.49 = 88.2 \text{ (times)}$$



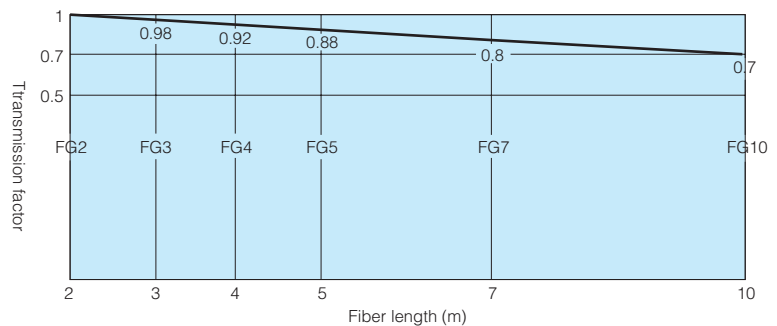
Fiber Transmission Factor Characteristics (Typical example)

The figure shows relative transmission factor with reference to fiber optic cable FG2 as 1.

The transmission factor of FG10 is 70% of that of FG2.

When FG10 (10 m length) is used for both transmitter and receiver, the transmission factor is:

$$0.7 \times 0.7 = 0.49$$



Directional Characteristics (Typical example)

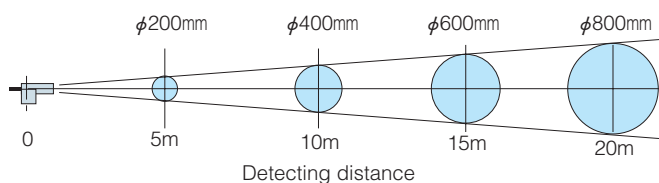
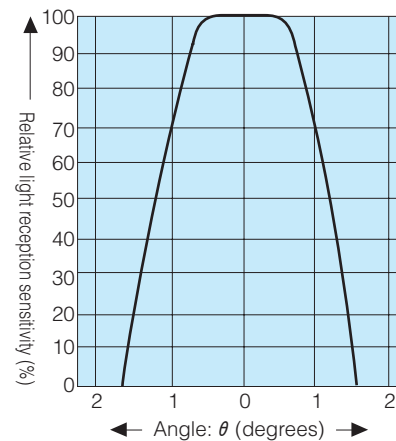
The graph shows the spread of transmitter light beam and receiver angle of aperture.

For the spread of transmitter light beam, the maximum angle of aperture is ± 1.7 degrees, which translates to a spread of about $\phi 600$ mm at 10 m.

The sides of this spread do not have enough light intensity and are not practical. To find a practical beam spread, consider relative light reception sensitivity of 50% or higher.

The angle of aperture for relative light reception sensitivity 50% is ± 1.2 degrees.

This means that practical light beam spread is about $\phi 400$ mm at detecting distance 10 m.



FT10A

Light Axis Alignment

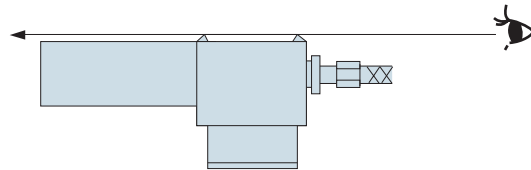
Align the light axis so that all LEDs are illuminated while checking with the 5-point level indicator on the receiver.

At the maximum sensitivity (SENS MAX), LEVEL 5 indicator is illuminated at the margin of 6 times but this does not mean that the light axis is perfectly aligned.

Although the distance and atmosphere may have some effect, as a general rule, align the light axis with the sensitivity at SENS MIN so that the LEVEL 5 indicator is illuminated for operation with the maximum margin (this makes the margin more than 18 times).

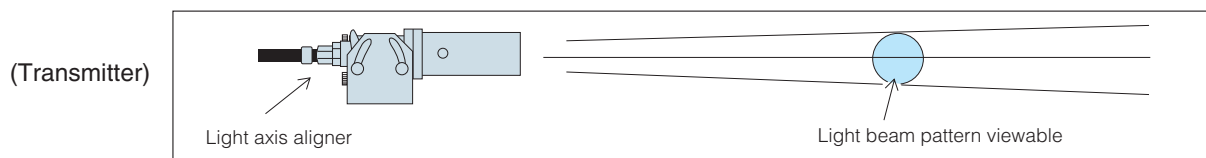
Alignment with optical sight

Use the optical sight provided on the optical head.



Alignment with Light axis aligner (optional)

Mount an Light axis aligner on the optical head and radiate the light beam pattern through the transmitter lens. More accurate field adjustment may be made based on the projected beam pattern.



- Two types are available depending on light source
(Halogen lamp type)

Light axis aligner
Model OHF-CL
Power supply unit
Model OHF-CLP
Halogen lamp (spare)
Model OHF-L5

- (Red semiconductor laser type)

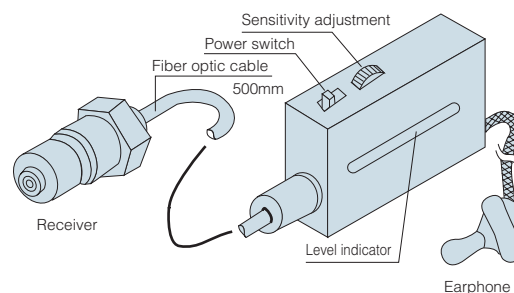
Class 2
Light axis aligner
Model OHF-LD
Power supply unit
Model OHF-LDP

Receiver for Light axis alignment (optional)

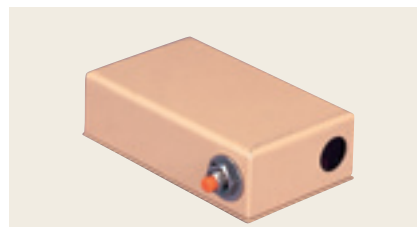
Used for light axis alignment of receiver of fiber type CMD.

Mount on the optical head of the receiver and check the received light intensity with the volume of sound from the earphone and the LED level indicator.

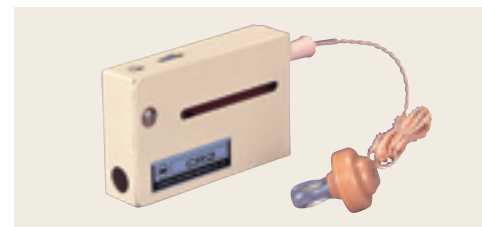
Model OHF-CR



Checker (optional)



Model CL1 (transmitter)
Portable transmitter used for checking the operation of the receiver.

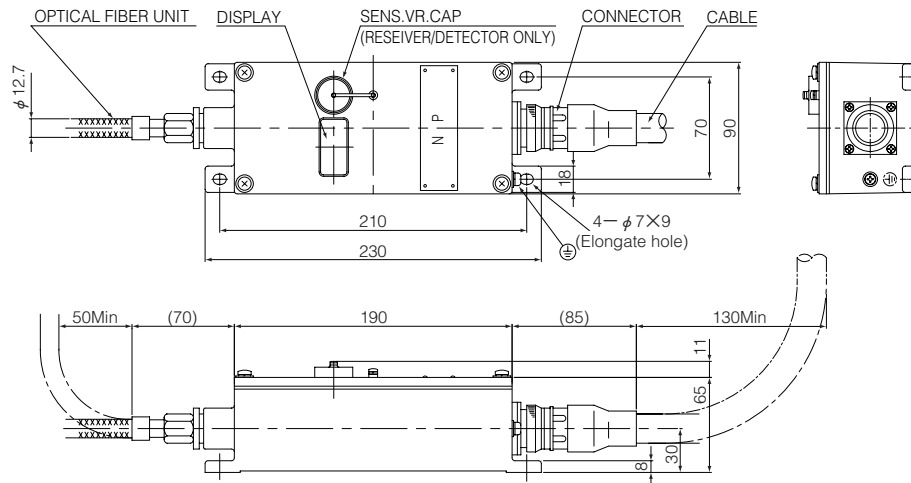


Model CR2 (with indicator)
Portable receiver for checking the transmitter and light axis alignment of position of light emitted from the transmitter while listening to the sound.

Dimensions (in mm)

Amplifier

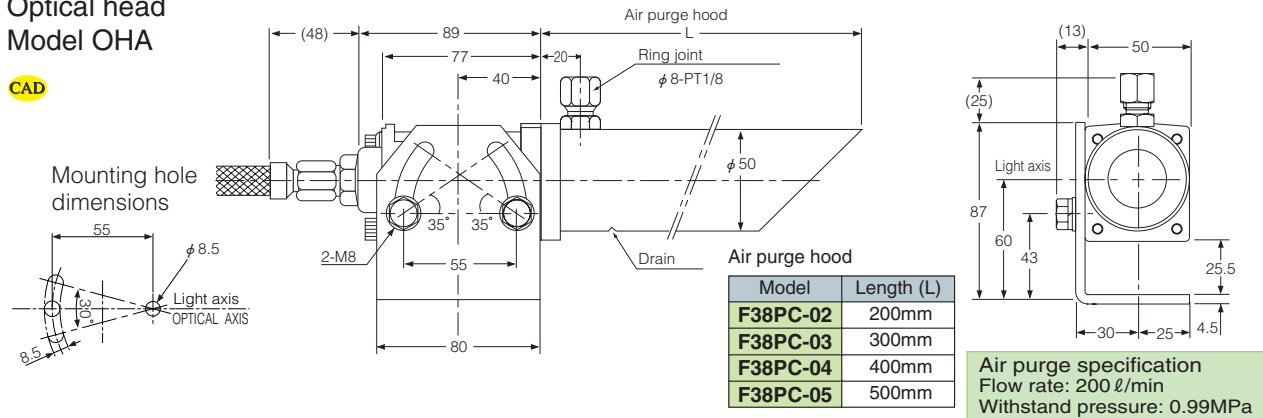
CAD



Example of combination of air purge hood and optical head

Optical head Model OHA

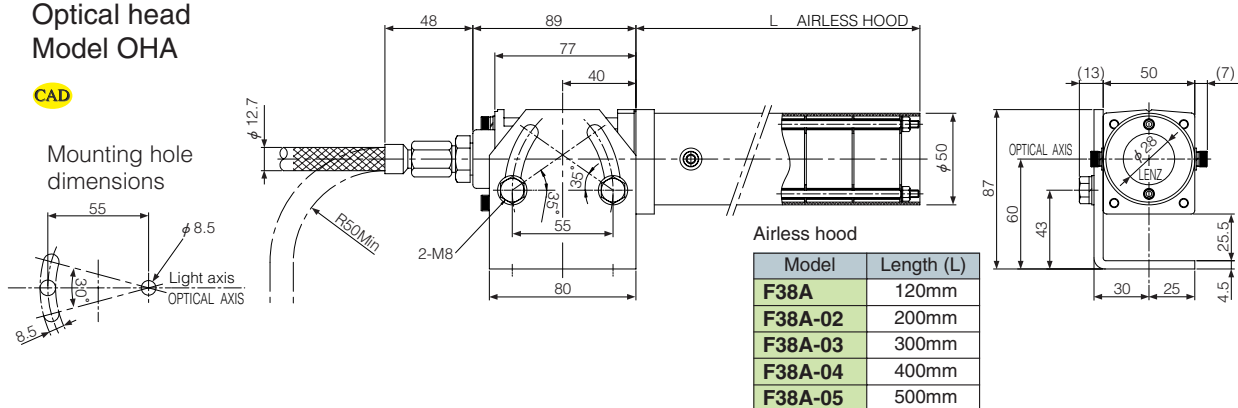
CAD



Example of combination of Airless hood and optical head

Optical head Model OHA

CAD



Fiber

CAD

