TAKEX

OPTICAL FIBER TYPE HOT METAL DETECTOR [HMD]

INSTRUCTION MANUAL

MODEL FD300A SERIES
FD600A SERIES

- Be sure to follow the instructions of this manual for correct use of the product.
- The guarantee period is one year after the delivery.
- If any defect is found during the guarantee period, Takex will repair or replace the defective product.
- 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.

TAKENAKA ELECTRONIC INDUSTRIAL CO.,LTD.

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INSTRUCTION MANUAL

MODEL FD300A SERIES
FD600A SERIES

Contents

1. Outline

- This photoelectric sensor (HMD: Hot Metal Detector) is a radiation detector designed to directly detect infrared rays emitted from a hot object (steel) and generates ON/OFF output.
- Heat resistant and high transmittance optical fiber is adopted.
- Three models of different output types are available; Mini power relay, high speed signal relay and solid state output, which are selectable according to required response time or load connected.

2. Features

■ No cooling required

Hood, optical head and fiber unit consist of optical parts and fiber glass, and includes no electrical parts. Cooling is not necessary up to 200℃ ambient temperature.

■ Highly durable fiber cable

The sheath of the optical fiber cable is flexible stainless steel blades with high heat and corrosion resistance.

■ Wide range of power supply

100 to 220 VAC is adaptable.

■ Self-check function

The sensor operation can be checked by an external signal input. Excess gain check function which monitors the light intensity level is also available. A Safety alarm output is issued when the received light intensity has not enough margin due to deviation of the optical axis alignment or soiling of the lens, or when the sensor receives unwanted light income due to reflection or recedual heat.

■ 5 point level indicator

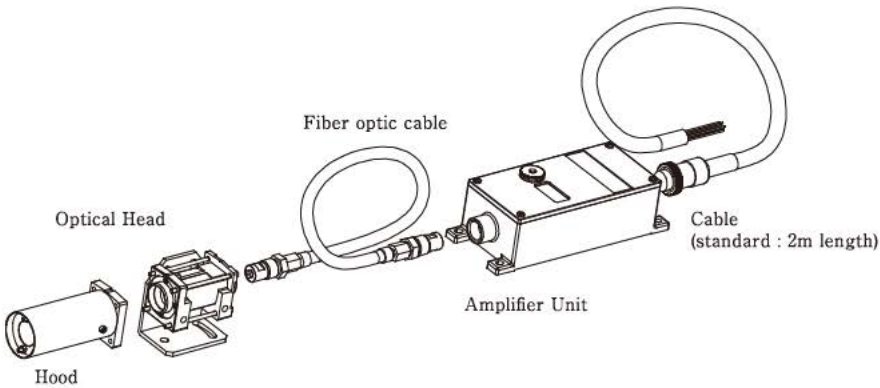
Received light intensity is displayed in five stages by LEDs.

■ Various detection field of view

Standard (ϕ50㎜/m), two narrow types (ϕ23㎜/m and ϕ11㎜/m) and two wide types (200×40㎜/m and 400×30㎜/m) are available.

3 . Parts description

This product consists of an optical head, hood, fiber optic cable and amplifier unit.



■ Optical head

The optical head detects infrared-rays radiated from a heated object and focuses it into the fiber optic cable. Standard view, narrow view and wide view types are available.

■ Hood

The hood prevents lens of the optical head from staining.
An airless hood and air-purge hood are available.

■ Fiber optic cable

The fiber optic cable transmits the infrared rays detected by the optical head to the amplifier.
The cable is armored by flexible tube with stainless blade.

■ Amplifier

The amplifier detects and amplifies the infrared rays transmitted through the fiber cable, and generates an output.

4． Specifications

Unit			Model	Remark
Amplifier unit	For detecting middle/high temperature		FD600A	Mini power relay output
			FD600AH	Signal relay output
			FD600AC	Solid state output
	For detecting low temperature		FD300A	Mini power relay output
			FD300AH	Signal relay output
			FD300AC	Solid state output
Optical head			OHA	Standard
			OHAN	Narrow view
			OHAN10	
			OHW1	Wide view
			OHW2	
Hood	Airless hood	For OHA OHAN OHAN10	F38A	Compact and light weight type. 120㎜ in length
			F38A-02	200㎜ in length
			F38A-03	300㎜ in length
			F38A-04	400㎜ in length
			F38A-05	500㎜ in length
		For OHW1/OHW2	F38W	For OHW1/OHW2 only
	Air-purge hood	For OHA OHAN OHAN10	F38PC-02	200㎜ in length
			F38PC-03	300㎜ in length
			F38PC-04	400㎜ in length
			F38PC-05	500㎜ in length
		For OHW1/OHW2	302W	For OHW1/OHW2 only
Fiber optic cable			FG2	2 m in length
			FG3	3 m in length
			FG4	4 m in length
			FG5	5 m in length
			FG7	7 m in length
			FG10	10m in length
			FG15	15m in length
			FG20	20m in length
			FG30	30m in length

■ Detectable material temperature (Fe : Emissivity $\varepsilon = 0.8$)

Model	Fiber optic cable length	Optical head		
		OHA Standard type	OHAN, OHAN10 Narrow view type	OHW1, OHW2 Wide view type
FD300A	2 m	360℃ or more	490℃ or more	425℃ or more
	3 m	375℃ or more	510℃ or more	440℃ or more
	4 m	385℃ or more	525℃ or more	460℃ or more
	5 m	395℃ or more	540℃ or more	465℃ or more
	7 m	415℃ or more	560℃ or more	485℃ or more
	10 m	455℃ or more	610℃ or more	530℃ or more
	15 m	490℃ or more	650℃ or more	570℃ or more
	20 m	510℃ or more	680℃ or more	595℃ or more
	30 m	540℃ or more	720℃ or more	625℃ or more
FD600A	2 m	580℃ or more	750℃ or more	660℃ or more
	3 m	580℃ or more	750℃ or more	660℃ or more
	4 m	585℃ or more	755℃ or more	665℃ or more
	5 m	585℃ or more	760℃ or more	670℃ or more
	7 m	590℃ or more	770℃ or more	675℃ or more
	10 m	595℃ or more	775℃ or more	680℃ or more
	15 m	610℃ or more	790℃ or more	695℃ or more
	20 m	620℃ or more	820℃ or more	710℃ or more
	30 m	650℃ or more	860℃ or more	740℃ or more

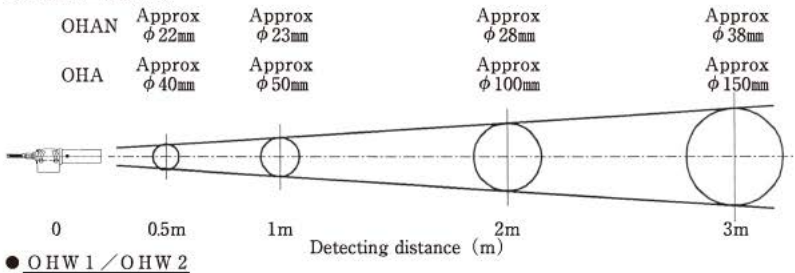
- These are general indications of minimum temperature for detectable objects bigger than the detection field of view when using a combination of the optical head and fiber cable mentioned above.

- These detection temperatures change by the emissivity of the object.
  Please refer to the table as a guidance.

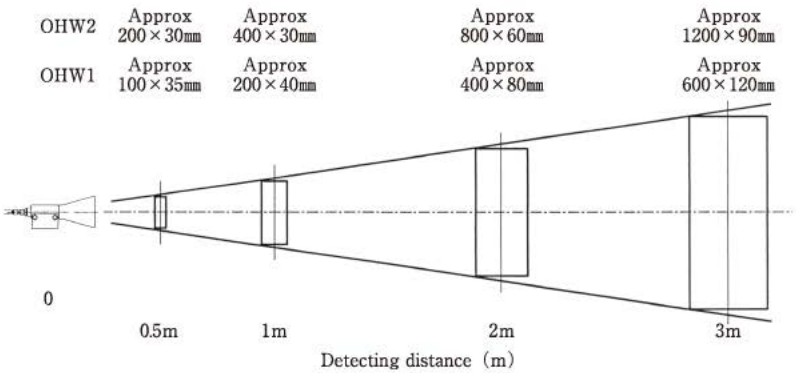
■ Detecting field of view

	Standard	Narrow		Wide	
	OHA	OHAN	OHAN10	OHW1	OHW2
Detecting distance 0.5m	Approx. φ40mm	Approx. φ22mm	Approx. φ15mm	Approx.100×35mm	Approx.200×30mm
Detecting distance 1 m	Approx. φ50mm	Approx. φ23mm	Approx. φ11mm	Approx.200×40mm	Approx.400×30mm
Detecting distance 2 m	Approx. φ100mm	Approx. φ28mm	Approx. φ48mm	Approx.400×80mm	Approx.800×60mm
Detecting distance 3 m	Approx. φ150mm	Approx. φ38mm	Approx. φ82mm	Approx.600×120mm	Approx.1200×90mm

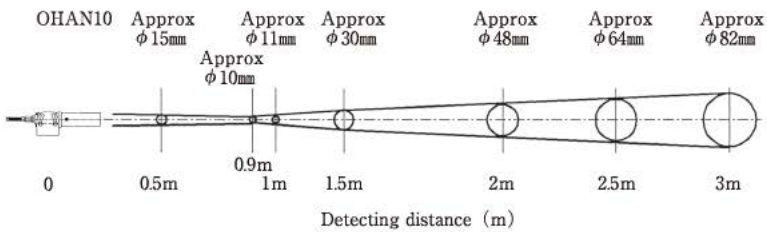
● OHA、OHAN



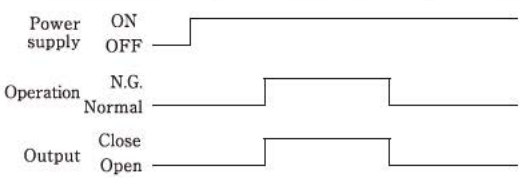
● OHW1／OHW2



● OHAN10



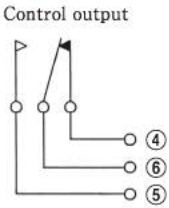
■ Outputs

Model		FD300A FD600A	FD300AH FD600AH	FD300AC FD600AC
Output mode		Mini power relay output	Signal relay output	Solid state output
Control output		ON－OFF Control (Light on) output		
	Rating	1c 250 VAC 5A or less (Resistive load)	1c 48 VDC 0.5A or less (Resistive load)	250 VAC/DC 0.5A or less (Resistive load)
	Response time	15 ms or less	5 ms or less	3 ms or less
Safety alarm output 1c : Mini power relay				
	Rating	1a Contact, Max. 5A 250 VAC or less (Resistive load)		

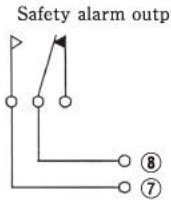
* Mini power relay : Panasonic ST1-DC24V
* Signal relay : Panasonic TN2-L-24V

■ Output circuit diagram

Mini power -Relay output : FD300A / FD600A
Signal relay output : FD300AH / FD600AH

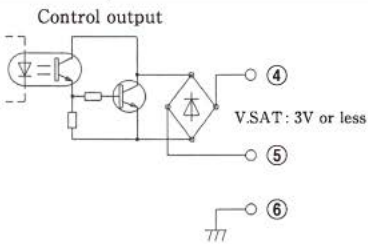


Relay ON at detection

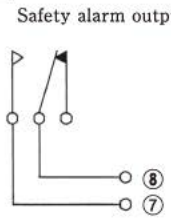


Relay ON at failure

Solid state output : FD300AC / FD600AC



Transistor output ON at detection



Relay ON at failure

When connecting an inductive load such as a relay, be sure to use diode, surge absorber, etc. to protect the output transistor against back electromotive force.

■ Specifications

Effective lens diameter		28㎜ in diameter (OHA, OHAN, OHAN10)
Power supply		100 to 220VAC, −15% to +10% 50/60Hz
Power consumption		10W or less
Connection		Connector type 2m cable (CVV 1 .25㎟)
Ambient temperature		Optical head / Optical fiber cable : −25 to +200℃ Amplifier unit : −25 to +50℃ (no freezing)
Storage temperature		−40 to +70℃ (with no condensation and no freezing)
Relative humidity		35 to 85%RH (with no condensation)
Allowable bending radius of fiber optic cable		50㎜
Insulation resistance		Power supply to case : 20MΩ or more at 500VDC
		Output to case : 20MΩ or more at 500VDC
		Power supply to output : 20MΩ or more at 500VDC
		Operation check input : Excluded
Dielectric strength		Between power supply and case : 1500VAC, for 1 minute
		Between output and case : 1500VAC, for 1 minute (Between reed relay and output : 1000VAC, for 1minute)
		Between power supply and output : 1500VAC, for 1 minute (Between reed relay and output : 1000VAC, for 1 minute)
		Operation check input : Excluded
Vibration resistance		10 to 55Hz, Double amplitude 1.5㎜, 2 hour in X, Y and Z directions
Shock resistance		500 m/s², 3 times in X, Y and Z directions
Protective structure		I P66
Weight	Optical head	Standard (OHA) : Approx. 680g Narrowness (OHAN) : Approx. 840g Narrowness (OHAN10) : Approx. 860g Wide (W1/W2) : Approx. 1300g
	Airless hood	F38A : Approx. 240g F38A−02 : Approx. 330g F38A−03 : Approx. 430g F38A−04 : Approx. 550g F38A−05 : Approx. 650g F38W : Approx. 600g
	Air-purge hood	F38PC−02 : Approx. 240g F38PC−03 : Approx. 300g F38PC−04 : Approx. 370g F38PC−05 : Approx. 440g 302W : Approx. 600g
	Fiber optic cable FG series	FG2 : Approx. 0.7kg FG3 : Approx. 0.9kg FG4 : Approx. 1.1kg FG5 : Approx. 1.3kg FG7 : Approx. 1.6kg FG10 : Approx. 2.1kg FG15 : Approx. 3.1kg FG20 : Approx. 4.1kg FG20 : Approx. 6.1kg
	Amplifier unit	Approx. 1.5kg

■ Air-purge specification − When air-purge hood is used

Flow volume: 200 ℓ／min.

Withstand pressure: 1 MPa

5 . Operation

■ Control output

Output is generated when detecting infrared radiation from heated material.

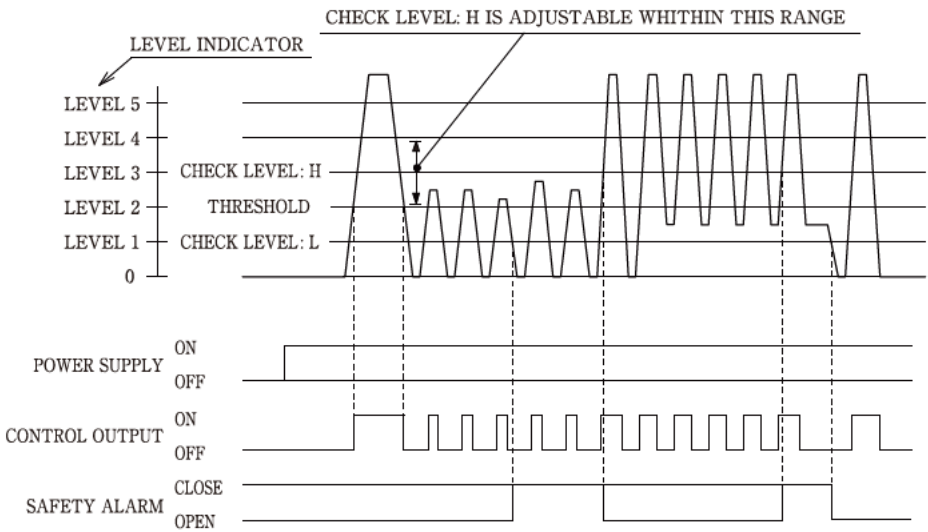
■ Excess gain check function (Safety alarm output)

When there have been seven consecutive detections with received light intensity less than double the threshold (check level: H) or seven consecutive light receptions with received light intensity less than the threshold but more than 1/2 of the threshold (check level: L), an safety alarm is output to notify of unstable detection.

This CHECK LEVEL : H is variable within 50% by the internal check level adjustment volume.

This alarm output is automatically reset when the stable detection condition is restored.

The timing chart below shows variation of received light intensity level at each passage of heated material and output condition.

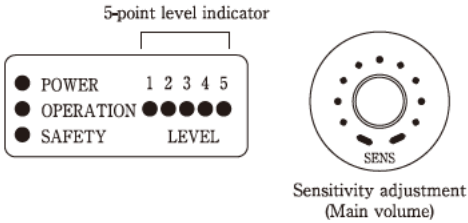


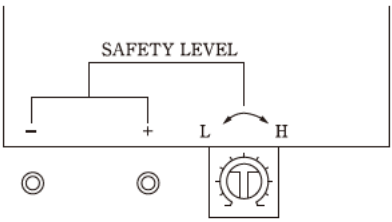
* The above chart does not show an actual case. Actually seven consecutive unstable activations or deactivations generate the safety alarm output.

■ Operation check function

The simulated light source in the detector is turned ON by an external signal to check the operation.

6 . Panel description





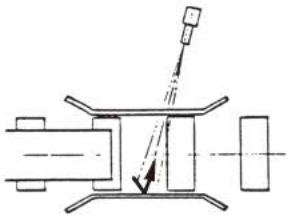
POWER	Lights when power is supplied.
OPERATION	Operation indicator: Lights when control output is issued.
SAFETY	Excess gain check function (Stability indicator) Safety alarm output is issued and the LED flashes when detection is not stable.
LEVEL	Received light level is indicated by 5-point level indicator.
	LEVEL 1 1/2 of the threshold LEVEL 2 The threshold LEVEL 3 2 times of the threshold (±50% variable) — Lights LEVEL 4 3 times of the threshold LEVEL 5 4 times of the threshold
SENS	Sensitivity adjustment volume Main volume and Sub volume are available. Only main volume can be rotated externally.
SAFETY LEVEL	Check level adjustment volume (*1)

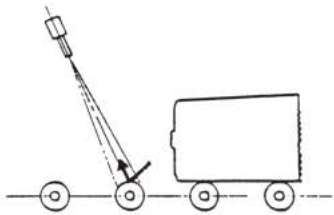
*1 The volume does not come out externally.
Remove the enclosure cover and then make adjustment.
Refer to 10－2 Sensitivity adjustment and 10－3 Check level adjustment.

7 . Mounting position

■ Pay attention to reflected lights.

When a detecting object (heated material) is large-sized and has high-temperature, the sensor may generate on output even though the heated object is out of the detection field of view because radiation light is reflected on a roller, a manipulator or a guide of line side as the heated material is coming closer.



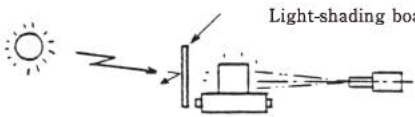


It depends on the condition of the reflecting face, type of heated materials or mounting postion of the sensor, however the large-sized ingot or slab may generate unwanted reflection which is equivalent to the infrared light radiaded from 500 to 700℃ heated materials.
In such sites, install the sensor so that the reflecting face of a roller, etc. is outside of its detection field.

■ External light

Visible light is filtered out, however do not install the sensor in a place where sunlight or incandescent light directly goes into the sensor or its reflected light enters the sensor.
Interrupt the light by a light-shading board (iron plate, etc.) if unavoidable.
(ex. When mounting position is fixed.)

Ex. 1)



Light-shading board (In this case, note that the sensor should not be affected by the reflection of infrared emission from the heated material)

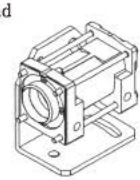
Ex. 2) Influence of external light may be reduced when the sensor aims the target from the above.

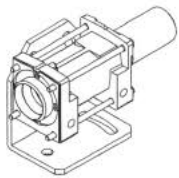
8 . Assembling / Installation

■ Packed components

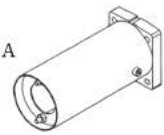
The product consists of 4 components.
Check the quantity of these components.

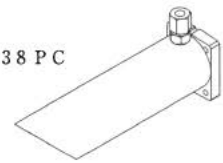
1 . Optical head

OHA 

OHAN 

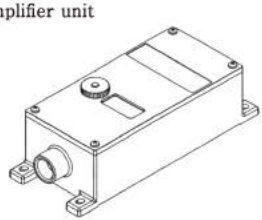
2 . Hood (Hood is attached to optical head in some case.)

F 38 A 

F 38 PC 

3 . Fiber optic cable 

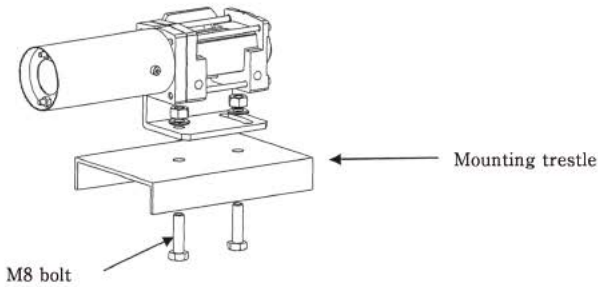
4 . Amplifier

Amplifier unit 

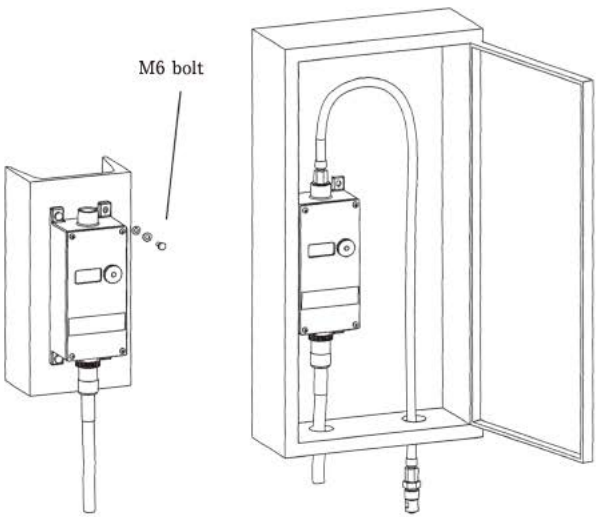
Protective cap is applied on each connector of the optical head and the amplifier unit.
Protective cap is also applied to the both end of the fiber optic cable.
The optical head or the fiber optic cable is a part of optical system, and the performance of which is significantly affected by flaw or dust, etc. Careful handling is required and the protective caps should not be removed until installation.
The protective caps, when removed, should be kept for maintenance.

■ Installation

Prepare a mounting trestle free from vibration. Secure the optical head unit with two M8 bolts.
(The M8 bolts, nuts and washers should be prepared seperately.)



Install the amplifier unit in a place with normal temperature and free from radiation light from heated materials.
Enclose the unit in a dust-proof box in a place where is subject to scale or water scattering.
Use a wrench to tighten and fix the optical fiber unit firmly.
(Tightening torque should be 10N·m or less.)



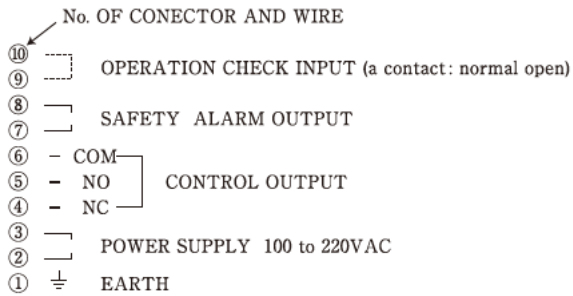
(The M6 bolts, nuts and washers should be propared seperately.)

9 . Wiring

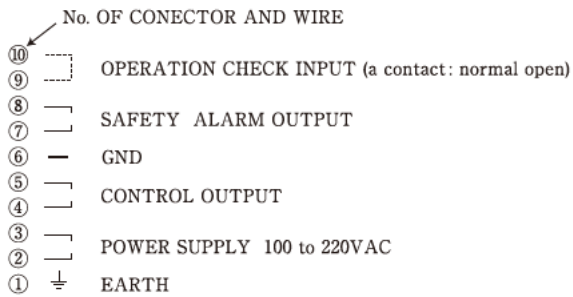
■ Power supply is 100VAC to 220VAC

- Old type of the model may have a specific voltage for the power supply. Make sure the operating voltage on the product label before use.
- When extending the cable, use a terminal box for connection and the wiring should be installed seperately for heavy and light electric circuit. For instance, power supply circuit is classified in heavy electric circuit and operation check circuit is classified in light electric circuit.

◇ MINI POWER RELAY : FD300A, FD600A
SIGNAL RELAY : FD300AH, FD600AH



◇ SOLID STATE OUTPUT : FD300AC, FD600AC



When connecting an inductive load such as a relay as a load, be sure to use diode, surge absorber, etc. to protect the output transistor against back electromotive force. When using long cables (100 to 300m) for the safety alarm output or control output, inrush current may be produced by the floating capacitance between the cables. Insert a resistor (10 to 50 ohms) in series with the contact.

■ Frame earth

Connect earth line to the earth screw (M4) on the side of connector.
Frame earth is not necessary when the earth cable ① is grounded.

10. Adjustment

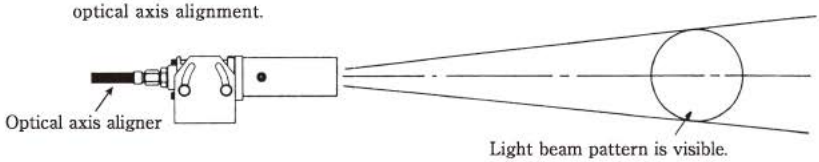
10−1 Optical axis alignment

◇ Alignment with optical sight

Use the optical sight provided on the optical head.

◇ Alignment with optical axis aligner (optional)

Two types are available (halogen lamp/red semiconductor laser). Mount the aligner on the optical head. The halogen type projects the light beam pattern through the lens. The projected beam pattern shows the detection field of view, which allows accurate optical axis alignment.



The red laser type projects a narrow beam spot, which can be used as a guide for optical axis alignment.

<Halogen lamp>		<Red semiconductor laser>	
Optical axis adjuster	: OHF−CL	Safety class 2	
Power unit	: OHF−CLP	Optical axis adjuster	: OHF−LD
Halogen lamp (spare)	: OHF−L5	Power unit	: OHF−LDP

10−2 Sensitivity adjustment

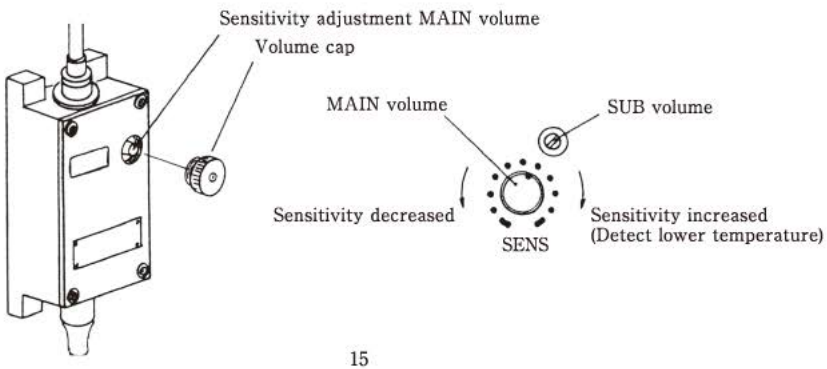
Two types of volume (MAIN volume and SUB volume) are available for sensitivity adjustment. Maximum sensitivity is the factory setting. Use the MAIN volume for normal adjustment.

◇ MAIN volume

1. MAIN volume is placed inside of the volume cap. MAIN volume can be adjusted by fingers.
2. Sensitivity will be reduced to approx. 1/50 of the maximum level when MAIN volume is turned counterclockwise to the minimum end.

◇ SUB volume

1. Use SUB volume when sensitivity can't be reduced enough by MAIN volume due to high temperature of a detecting object.
2. SUB volume can be adjusted by a minus screw driver after enclosure cover detached.
3. Sensitivity will be decreased to approx. 1/50 when SUB volume is turned counterclockwise to the minimum end.
   Therefore, sensitivity can be reduced down to 1/2500 of the maximum level by using both the MAIN and the SUB volume.

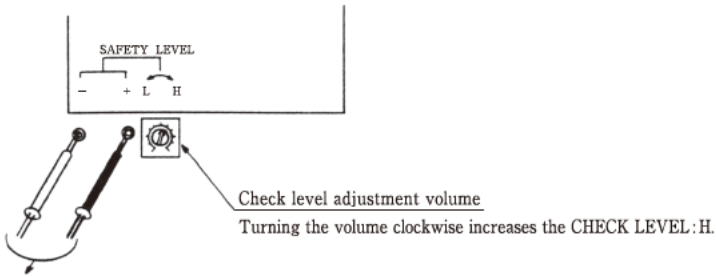


10－3 CHECK LEVEL adjustment for excess gain check

Refer to 5. Operation for excess gain check feature.

Check level adjustment volume is placed inside the amplifier unit. Remove the cover before the adjustment.

◇ CHECK LEVEL : H is set at two times (5V) of the operation level (2.5V) as the factory setting. CHECK LEVEL : H is adjustable between a range from approx. 2.7V to 7.3V.



Set a tester at voltage range (10VDC) and connect it to + and － terminals

11. Inspection

◆ Carry out the following inspection periodically.

1. Optical axis check
   Check the detection field of view by using the optical sight on the optical head. (Refer to 10-1 Optical axis alignment.)
2. Operation check
   Make sure that the sensor is activated by operation check input (short between terminal 9 and 10).
3. Lens surface cleaning
   Take the hood off by removing 4 bolts (M5), then carefully clean the lens.
4. When Safety alarm output is issued;
   Safety indicator (green) will flash when safety alarm output is issued. If Level 1 indicator lights without any detecting object, sunlight or the radiant light from the other line may enter the sensor as an external disturbance. Reduce sensitivity by the volume or take some external light remedy (refer to 7. Mounting position) in this case. When safety alarm output is issued with Level indicators completely OFF, the receiving light amount is not sufficient.
   It may be caused by low temperature of detecting object, soil on lens, or poor alignment of optical axis.

12. Precautions

— Power supply is 100VAC to 220VAC. Old type of this model may have a specific voltage for the power supply. Please confirm the voltage printed on the product label on the amplifier unit.

— Attention in case of using SIGNAL RELAY OUTPUT model (FD300AH, FD600AH)
When using long (100 to 300m) cables, inrush current may be produced by the floating capacity between cables. Insert a resistor (10 to 50Ω) in series with the contact.

— Attention in case of using SOLID STATE OUTPUT model (FD300AC, FD600AC)
When connecting an inductive load such as a relay as a load, be sure to use diode, surge absorber, etc. to protect the output transistor against back electromotive force.

— Be careful to handle the fiber optic cable and its connecting portion.

■ Note the following points when the fiber optic cable is removed from the optical head unit or the amplifier unit for installation or maintenance.

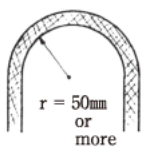
◇ The fiber optic cable is used to transmit the detected light. So, protect the ends of the fiber cable by using the attached protective cap, vinyl tape, etc. to prevent damages.
◇ Also use the attached protective cap, vinyl tape, etc to the connecting parts of the optical head unit and the amplifier unit to protect from being contaminated with scale, dust, etc.

■ Be sure to tighten the fiber cable glands (nuts) by using a wrench.
Incomplete tightening may cause incorrect detecting operation.
(Tightning torque should be 10N·m or less)

■ O-ring
O-ring is applied on the both end of the fiber optic cable. Spare O-ring is attached to the fiber cable.

■ Correct handling of fiber optic cable

Do not bend it excessively.
Glass fibers (optical fibers) are inside the cable.
If the cable is bent with small diameter, it may be damaged.
Keep allowable bending radius.



Do not pull, or twist
Do not apply forcible pull or twist. Keep a suitable slack.

Do not allow the fiber optic cable to move.
Fix the cable when in use.
The fiber optic cable consists of about 1500 glass fiber strands ($\phi 50\mu m$) in a bundle.
If the cable is moved frequently, the optical fiber strands rub each other and may break.

— Various data
The numerical values descrived on each characteristic are representative values of the products sampling from a certain allotment. These do not warrant specific values of specification or performance. Please make use of the values as a reference.

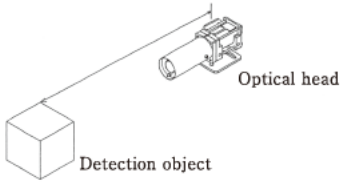
13. Technical data

Minimum detectable object and lowest detectable temperature

The detectable object diameter and its lowest detectable temperature can be found out from the graph on the following page.

■ The minimum detectable object diameter means the width of a round or square bar or a sheet with a length equal to or longer than the detection field of view that can be detected in any position in the detection field.

■ Detection distance is the distance from the surface of a detection object to the center of the optical head unit.



Using graphs

The graphs shows data for a detection distance of 1m

Example Amplifier unit : FD300A
Optical head : OHA
Fiber unit : FG10
Detecting object : 10㎜ dia., round bar

In this case, min. detectable temperature 590℃ can be obtained from the graph 1.

For a detection distance less than 1m, use the following formula to find a "coefficient" and multiply the coefficient (K) by the reading on the Y-axis (figure of the detection object diameter).

[OHA] is used for optical head, and the detection distance is 1m or shorter

Coefficient K = L + (0.6 − 0.6 × L) L = Detection distance (m)

(Example) For a detection distance of 50cm, L = 0.5

K = 0.5 + (0.6 − 0.6 × 0.5) = 0.8

Therefore, coefficient = 0.8

Multiple this by the reading on Y-axis (figure of the detection object diameter)

50 × 0.8 = 40

This means the point of 50㎜ of the detection object diameter will be regarded as 40㎜ on the graph.

Multiply the above coefficient by the other figures to complete the replaced on Y-axis scale.

[OHW1] is used for optical head, and the detection distance is 1m or shorter

Regard the distance as the coefficient.

(Example) When OHW-1 is used and detection distance is 0.7m, Coefficient is 0.7.

Therefore multiply the readings on Y-axis by 0.7 to complete the replaced on Y-axis scale.

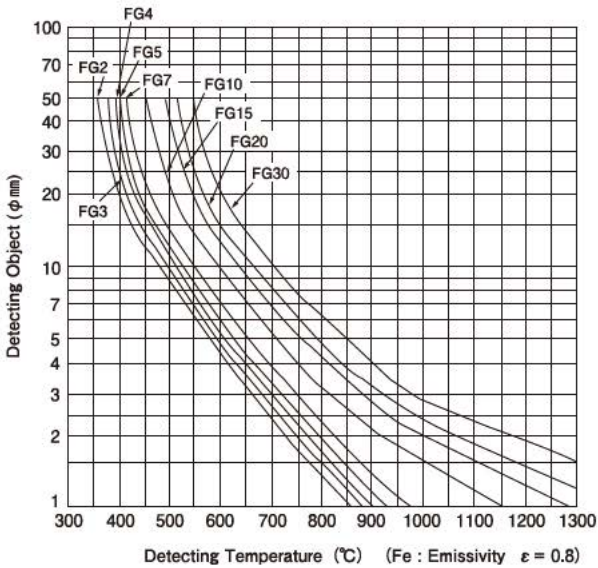
When the detection distance is 1m or longer (for all optical heads)

Regard the distance as the coefficient.

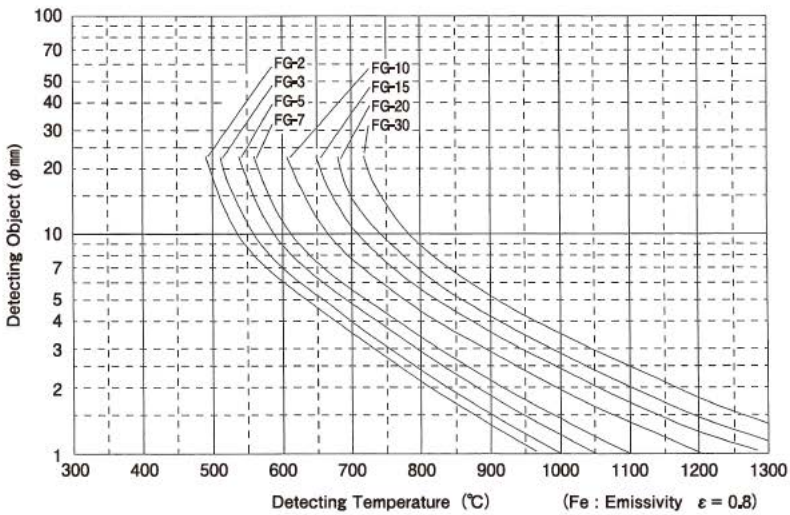
(Example) When detection distance is 2.5m, Coefficient is 2.5.

Therefore multiply the readings on Y-axis by 2.5 to complete the replaced on Y-axis scale.

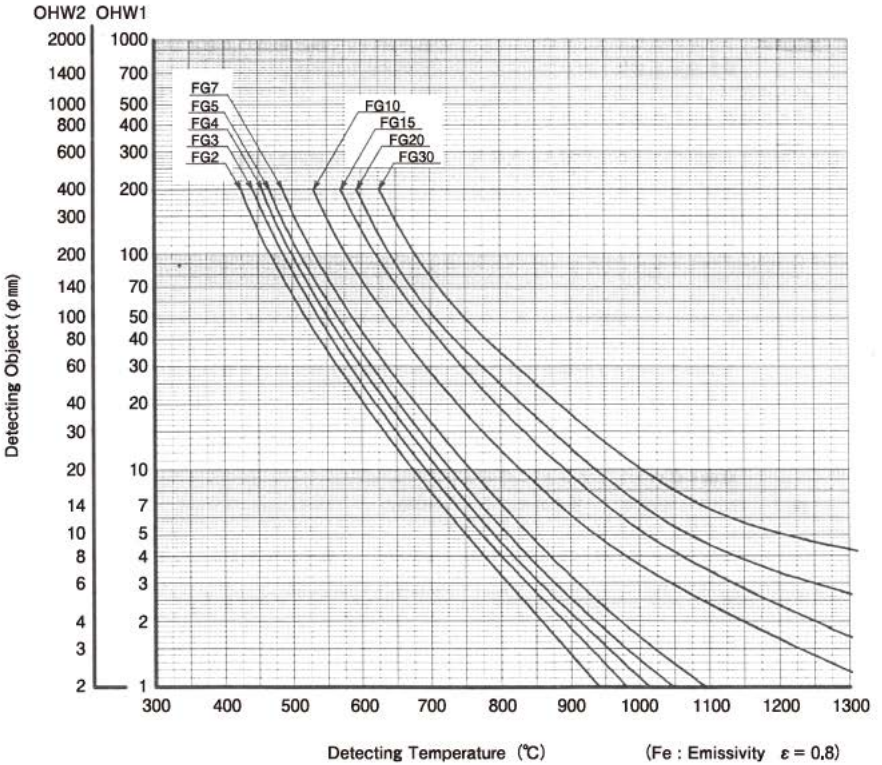
Graph 1 : Amplifier unit : FD300A Optical head : OHA [Typical]



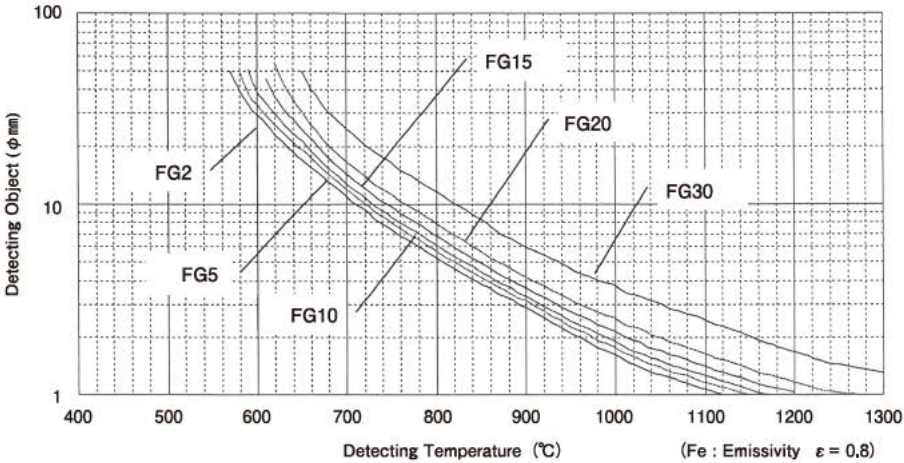
Graph 2 : Amplifier unit : FD300A Optical head : OHAN/OHAN10 [Typical]



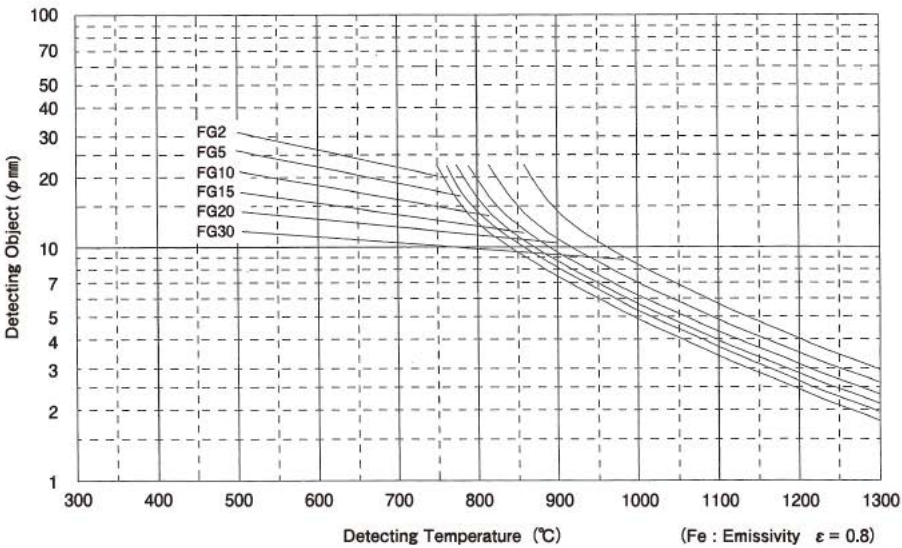
Graph 3 : Amplifier unit : FD300A Optical head : OHW1/OHW2 [Typical]



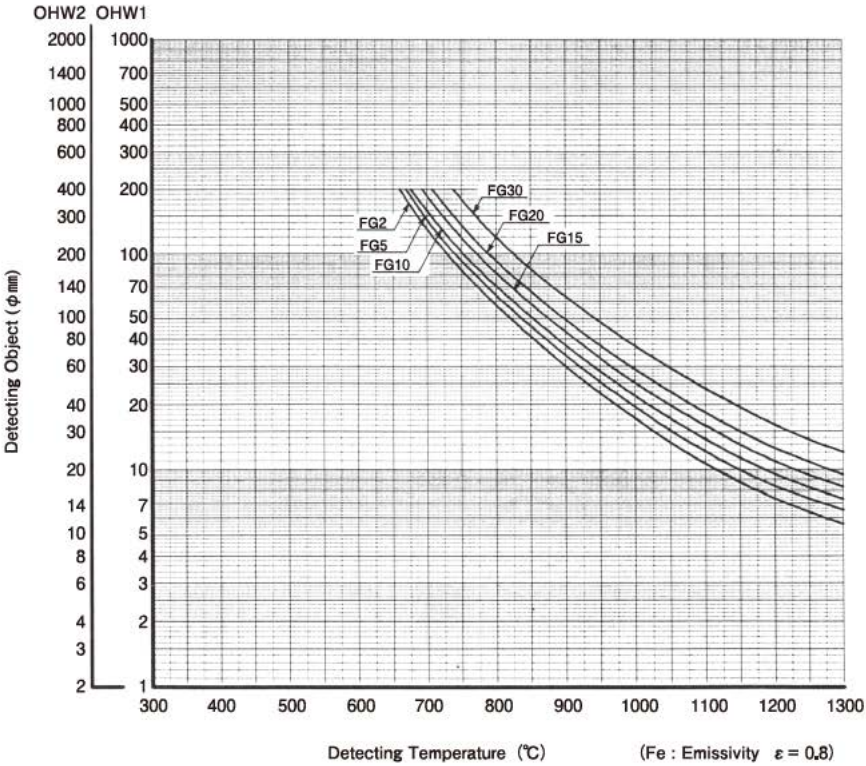
Graph 4 : Amplifier unit : FD600A Optical head : OHA [Typical]



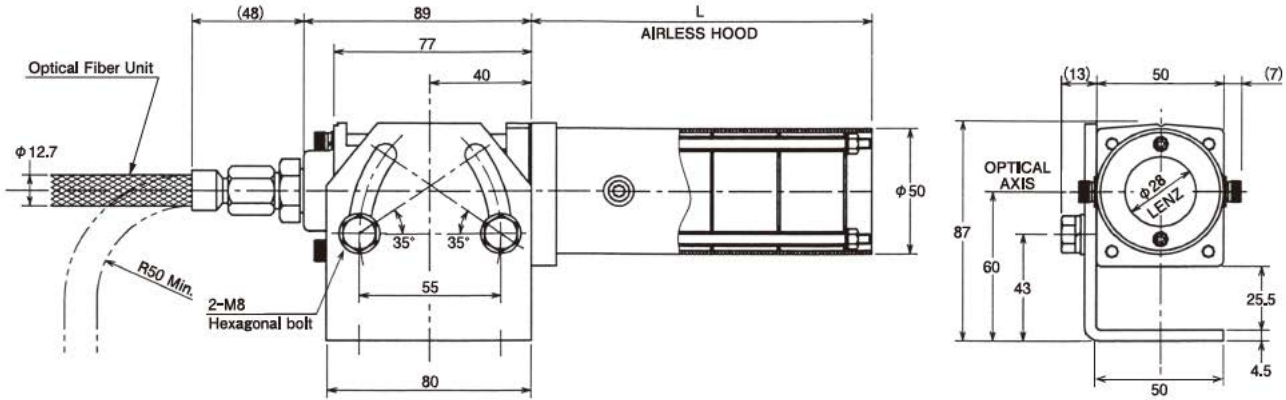
Graph 5 : Amplifier unit : FD600A Optical head : OHAN/OHAN10 [Typical]

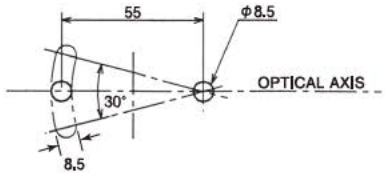


Graph 6 : Amplifier unit : FD600A Optical head : OHW1/OHW2 [Typical]



□ AIRLESS HOOD : F38A (in mm)
OPTICAL HEAD : OHA



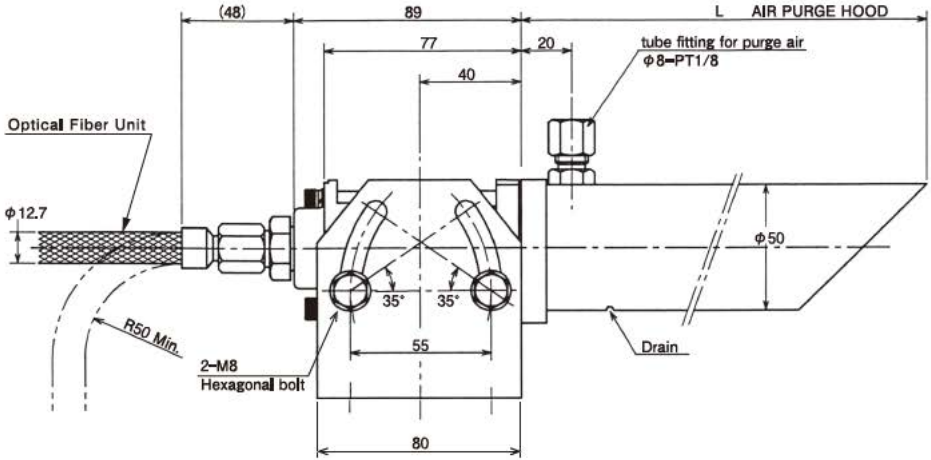


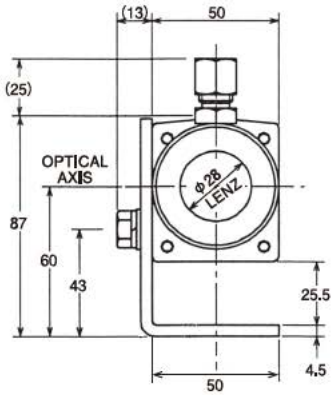
Mounting bracket

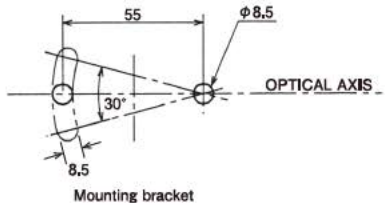
AIRLESS HOOD

Type	L (mm)
F38A	120
F38A—02	200
F38A—03	300
F38A—04	400
F38A—05	500

□ AIR PURGE HOOD : F38PC—** (in mm)
OPTICAL HEAD : OHA





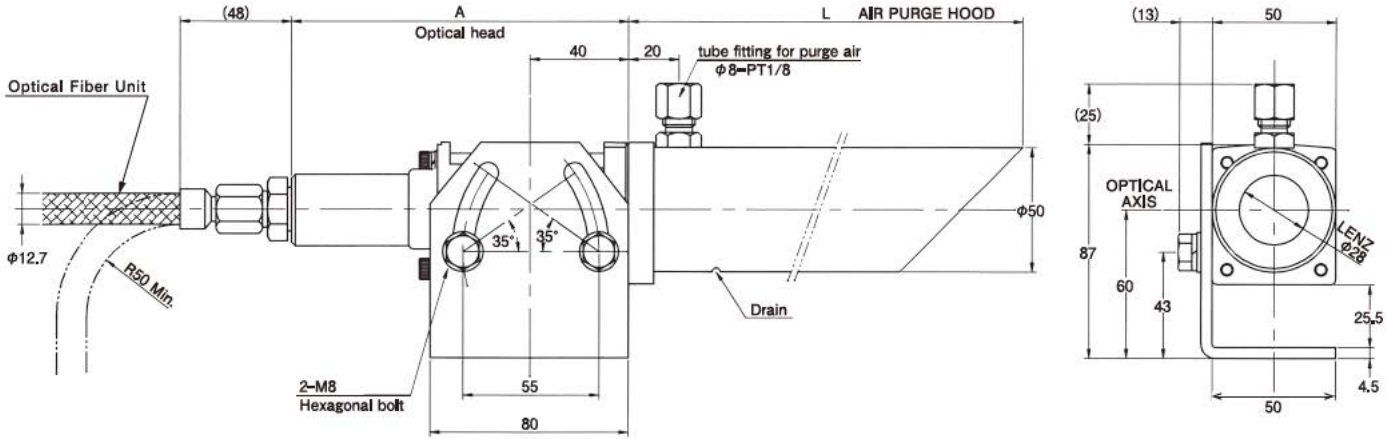


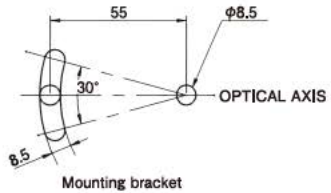
AIR PURGE HOOD

Type	L (mm)
F38PC—02	200
F38PC—03	300
F38PC—04	400
F38PC—05	500

AIR PURGE
QUANTITY : 200 ℓ /min
PRESSURE : 1 MPa

□ AIR PURGE HOOD : F38PC (in mm)
OPTICAL HEAD : OHAN/OHAN10





OPTICAL HEAD

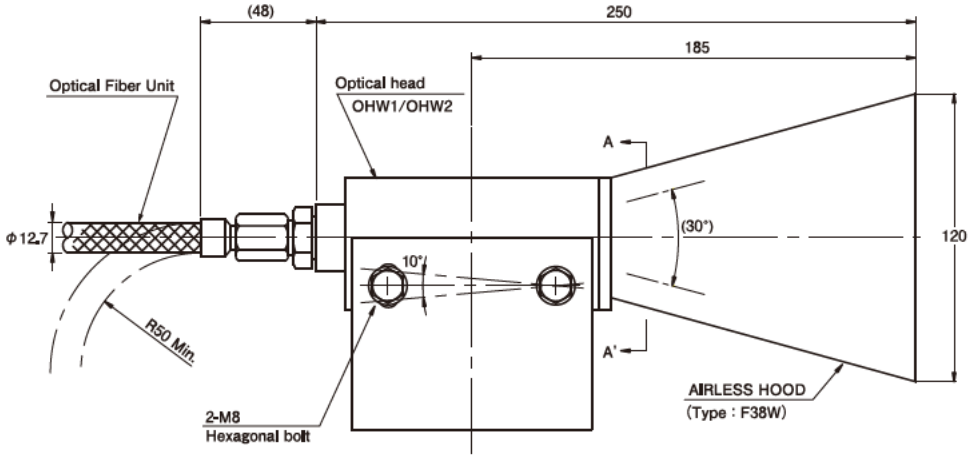
Type	A (mm)
OHAN	136
OHAN10	142

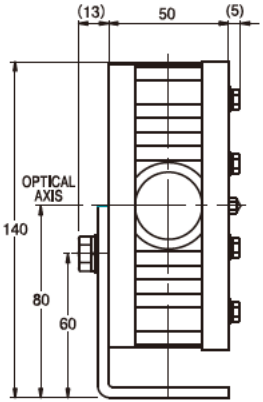
AIR PURGE HOOD

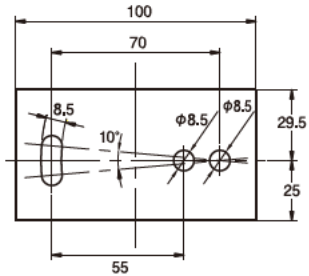
Type	L (mm)
F38PC—02	200
F38PC—03	300
F38PC—04	400
F38PC—05	500

AIR PURGE
QUANTITY : 200 ℓ /min
PRESSURE : 1 MPa

□ AIRLESS HOOD : F38W (in mm)
OPTICAL HEAD : OHW1/OHW2

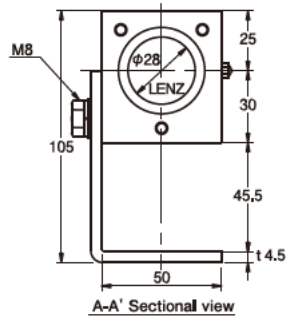






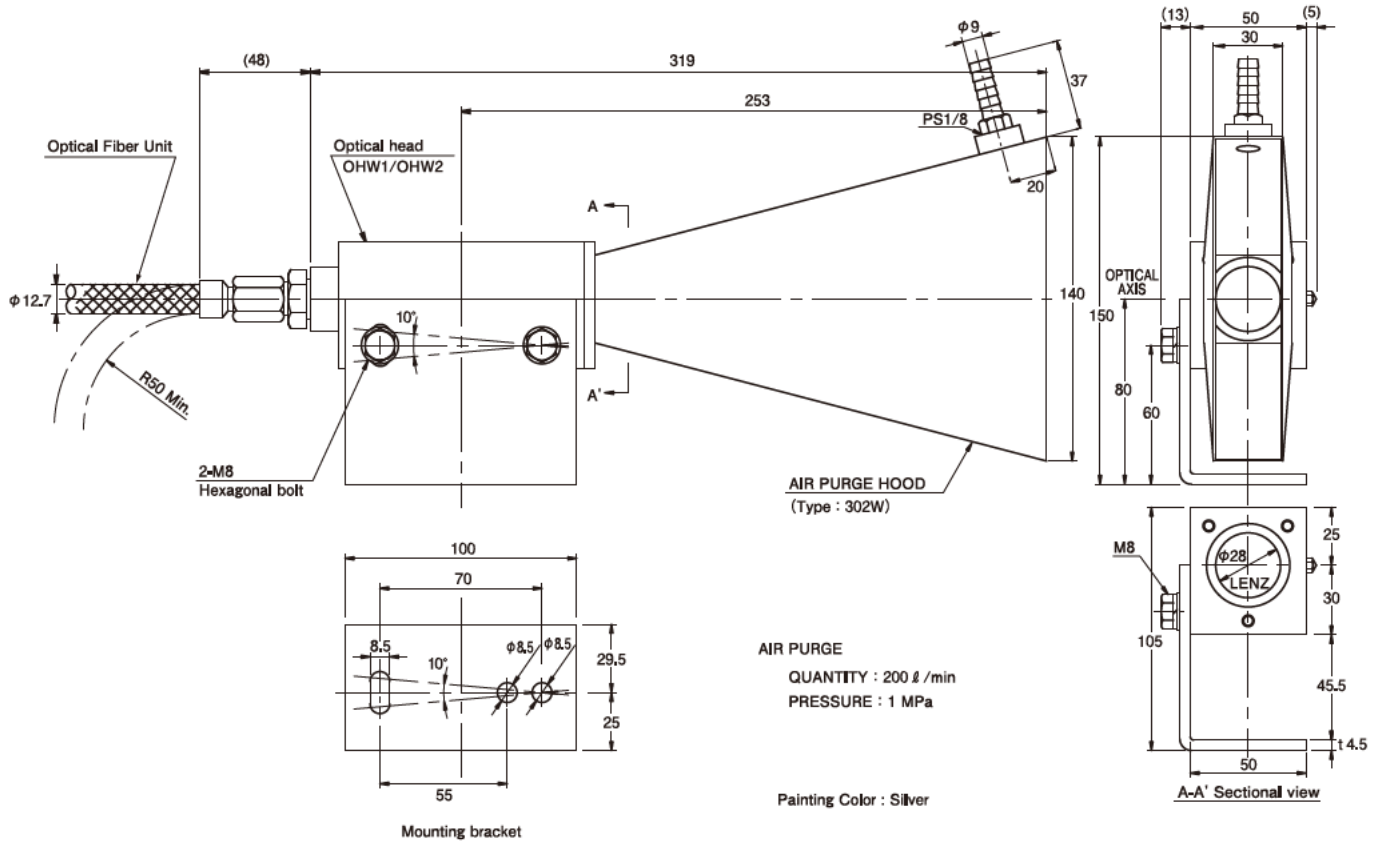
Mounting bracket

Painting Color : Silver

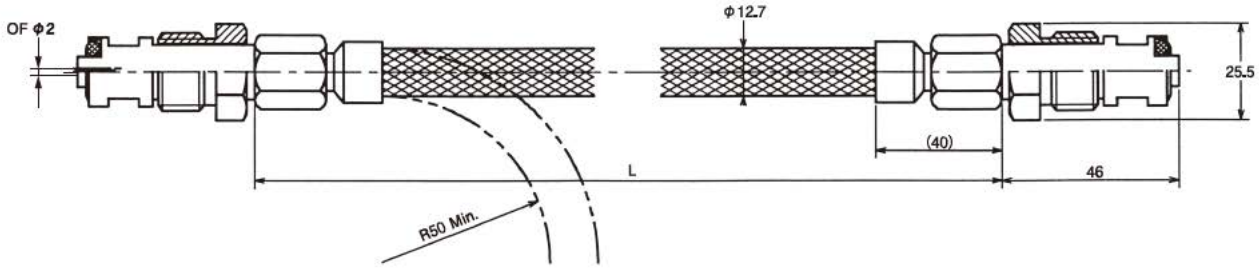


A-A' Sectional view

□ AIR PURGE HOOD : 302W (in mm)
OPTICAL HEAD : OHW1/OHW2

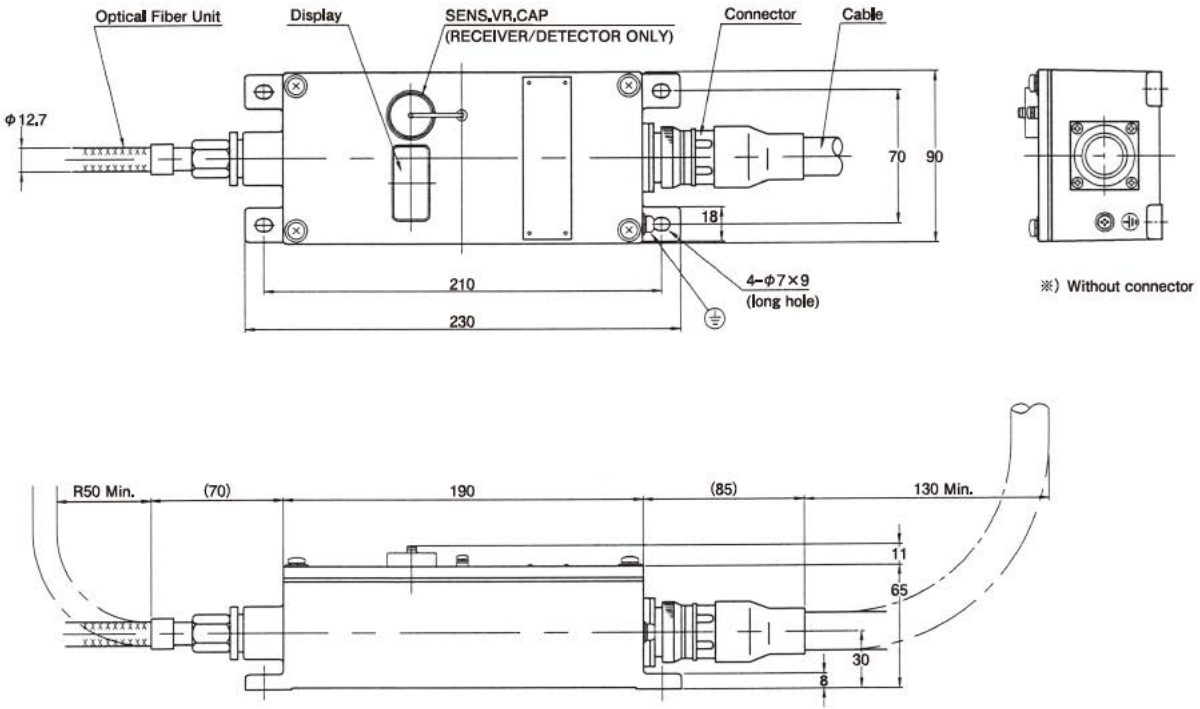


□ OPTICAL FIBER UNIT (in mm)

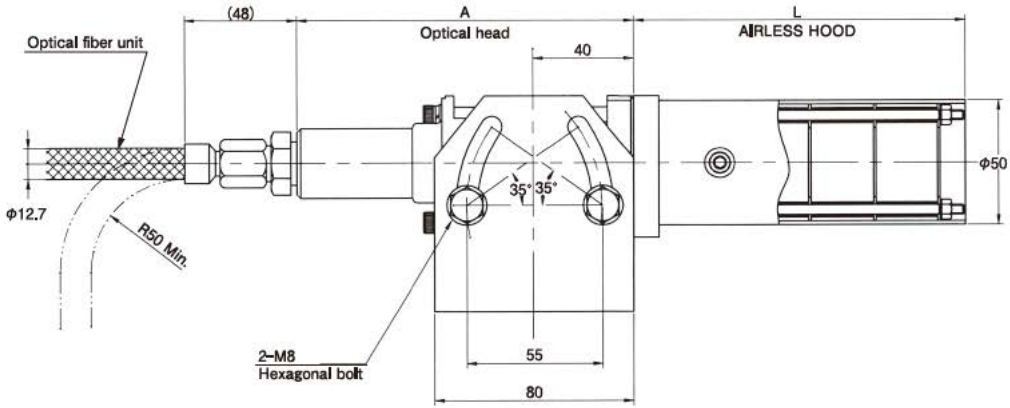


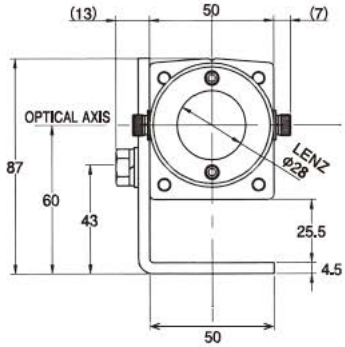
Type	L (m)
FG2	2
FG3	3
FG4	4
FG5	5
FG7	7
FG10	10
FG15	15
FG20	20
FG30	30

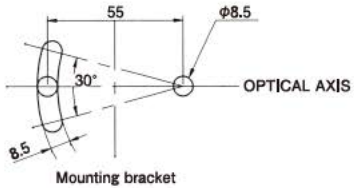
□ AMPLIFIER UNIT (in mm)



□ AIRLESS HOOD : F38A (in ㎜)
OPTICAL HEAD : OHAN / OHAN10







OPTICAL HEAD

Type	A (㎜)
OHAN	136
OHAN10	142

AIRLESS HOOD

Type	L (㎜)
F38A	120
F38A−02	200
F38A−03	300
F38A−04	400
F38A−05	500

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