TAKEX

OPTICAL FIBER HMD

INSTRUCTION MANUAL

MODEL FD-A310C SERIES

- Use it properly in accordance with the instruction manual and the delivery specification.
- Keep an instruction manual carefully.
- Approve the specification of this product and a contour dimension because it may be changed to the one without the notice.
- The guarantee period of this product is one year after the delivery.
- When a problem by out responsibility arises in the quarantee period of this product. It lets me do only the repair of the part of the problem or the exchange of the problem product.
- Each our product doesn't have a control function such as the prevention of disasters and the prevention of the accident as a product's own function.
- Approve it because our company isn't responsible for the damages due to the disaster if it occurred in the one related to the machine which these products were used for, the accident, and so on and others.

TAKENAKA ELECTRONIC INDUSTRIAL CO.,LTD.

OPTICAL FIBER TYPE HMD

Instruction Manual

FD-A310C Series

Please read before usage.

CONTENTS

PRODUCT LIST

Product Name	Model No.	Notes :
Amplifier Unit	FD−A310C	Relay output
	FD−A310CM	Photo MOS relay output
Optical Head	OHC	
	OHA	Standard view
	OHAN	Parallel view
Hood	F38A-**	Airless
	F38PC-**	Air purge
Optical Fiber Unit	GT205AD	Length : 0.5m
	GT21AD	1m
	GT22AD	2m
	GT23AD	3m
	GT25AD	5m
	GT27AD	7m
	GT210AD	10m
Adaptor for OHA/OHAN	FT101-AD2	

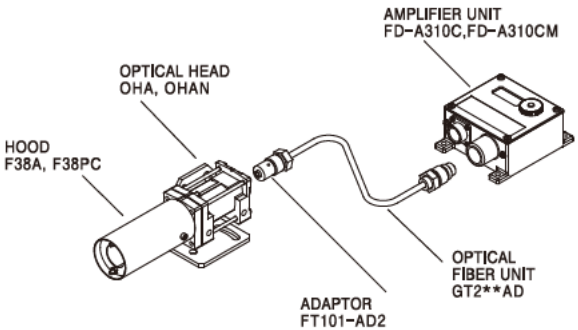
1 OUTLINE

This photoelectric sensor is an optical fiber type hot metal detector (HMD), which directly detects infrared radiation emitted from a hot object (ex. heated steel) and then generates an output.

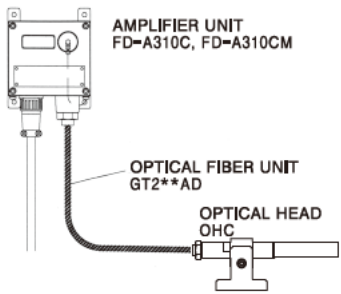
The unit adopts a glass fiber of high heat-resistant with excellent transparency. Detected infrared radiation is transferred to the amplifier via the glass fiber and amplified, and a signal is generated.

There are 2 models of different output : mini power relay output and photo mos relay output to control AC/DC power supply. The output type can be selected according to the load requirements.

2 PARTS DESCRIPTION



Combination with OHA or OHAN



Combination with OHC

■ OPTICAL HEAD

The optical head detects infrared radiation from the hot material and focuses it onto the optical fiber unit, All models are equipped with hood. OHC, OHA and OHAN are available.

■ OPTICAL FIBER UNIT

The optical fiber unit is a light guide to transmit the infrared light, detected by the optical head unit to the amplifier unit. It is armored with stainless steel blade fitted flexible tube.

FT101-AD2 adaptor is required to connect with OHA or OHAN optical head.

■ AMPLIFIER UNIT

The amplifier unit detects the infrared light transmitted by the optical fiber unit, amplifies it, and generates an ON/OFF output, 2m cable with connector is attached.

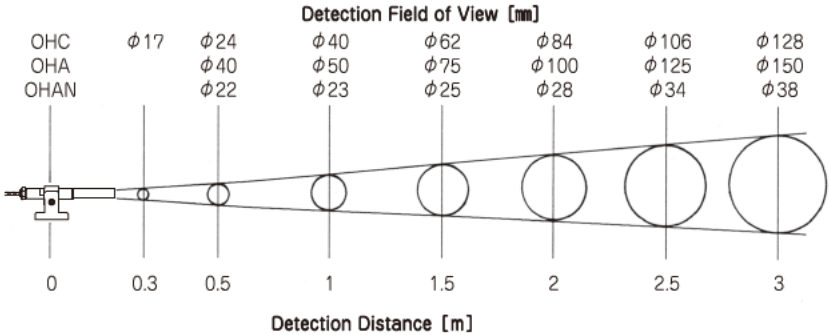
3 PRODUCT SPECIFICATIONS

■ DETECTION TEMPERATURE [Typicl example, Fe: Emissivity 0.8]

Optical Fiber Unit		GT205AD	GT21AD	GT22AD	GT23AD	GT25AD	GT27AD	GT210AD
Lowest Detection Temperature *1)	OHC	320℃	330℃	350℃	370℃	390℃	410℃	430℃
	OHA	320℃	330℃	350℃	370℃	390℃	410℃	430℃
	OHAN	450℃	460℃	480℃	500℃	530℃	550℃	600℃

*1) These detection temperatures differs according to the emissivity of the object.
Use the sensor to detect objects of these temperatures or more.
When the heated material is smaller the detection field of view, the detected temparature will be higher. Refer to the "Data" section for further details.

■ DETECTION FIELD OF VIEW



■ OUTPUT SPECIFICATIONS

Model		FD-A310C	FD-A310CM
Output mode		Relay Output	Photo Mos Relay Output
Control output		ON-OFF control Light ON / Dark ON selectable	
	Rating	1c MAX 5A 250V AC (Resistance Load)	1a MAX 0.5A MAX 80mA 250V AC.DC (Resistance Load) Saturation Voltage : 1V or less
Response time		Approx. 10ms	Approx. 5ms

■ SPECIFICATIONS OF THE AMPLIFIER UNIT

Sensitivity Wave Length	0.8 to 1.8 μm
Sensitivity adjustment	Sensitivity can be adjusted in 10 levels. (Multi-turn potentiometer)
Display LED Indicators	Power [P.L] Operation [OP.L] Received light level 3 digit display

■ GENERAL SPECIFICATIONS OF AMPLIFIER UNIT

Power supply	100 to 220VAC +10%, −15%, 50/60Hz	
Power consumption	5W or less	
Connection Method	Connector type leaded 2m cable (0.75㎟× 5 cores, Outer dia 10.5㎜)	
Ambient temperature	−25 to +50℃ (No condensation)	
Storage temperature	−40 to +70℃ (No condensation)	
Ambient humidity	35 to 85%RH	
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
Dielectric strength	Power supply to Case :	1500VAC 1 min.
	Output to Case :	1500VAC 1 min.
	Power supply to Output :	1500VAC 1min.
Vibration-resistance	10 to 55Hz Single amplitude 1.5㎜ 2 hours each in X.Y.Z directions	
Shock resistance	500 m/s² Three times each in X.Y.Z direcitons	
Protective Construction	I P 5 4	
Weight	Approx. 950g (Including connector cable)	

■ SPECIFICATIONS OF OPTICAL FIBER UNIT

Model

GT 2 ＊＊AD
└ Length 05 : 0.5m, 2 : 2m

Ambient temperature	−25 to +200℃ (No condensation)	
Ambient humidity	35 to 85%RH	
Protective Construction	I P 6 7	
Weight	GT205AD : Approx. 90g GT22AD : Approx. 200g GT25AD : Approx. 420g GT210AD : Approx. 780g	GT21AD : Approx. 125g GT23AD : Approx. 275g GT27AD : Approx. 570g

■ SPECIFICATIONS OF OPTICAL HEAD

Model	OHC	OHA	OHAN
Ambient temperature	−25 to +200℃ (No condensation)		
Ambient humidity	35 to 85%RH		
Protective Construction	I P 6 7	I P 6 6	
Weight	Approx. 380g	Approx. 680g	Approx. 840g

4 OPERATION

■ DISPLAY PANEL

P.L Power indicator : Lights when the power is applied.

OP.L Operation indicator : Lights when the control output is generated.

LEVEL Receiving light level indicator : Received light level is displayed by the 3-point level indicator.

- LEVEL **1** Operation level.
- LEVEL **2** 2 times of the operation level.
- LEVEL **3** 5 times of the operation level.

■ SENS (Sensitivity adjustment)

Sensitivity can be set in 10 levels. The sensitivity level number (0 to 9) is displayed in the window. The level can be changed by rotating the multi-turn potentiometer. The whole number should be displayed in the window. If not, the sensitivity may become unstable.

■ Dark ON / Light ON selectable switch

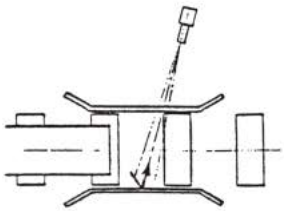
D When interrupting the light (there is no heated material), output is ON. D■ L

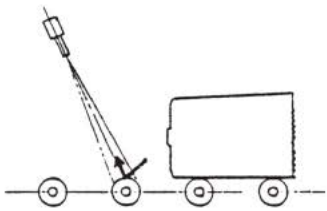
L When receiving the light (detecting heated material), output is ON. D ■L

5 MOUNTING POSITION

■ PAY ATTENTION TO REFLECTED LIGHT.

When the detection material (hot material) is large and has a high temperature, radiated light may be reflected by the rollers, the guides on the line sides, etc., which may cause the detector to operate even when the hot material is outside of the detection view.





Although this depends on the condition of the reflection surface, the type of the hot material and the mounting position of the detector. Large ingots or slabs may cause a reflection equivalent to hot material of 500 to 700℃.

In this case, mount the detector so that the reflection surface of rollers are outside of the detection view.

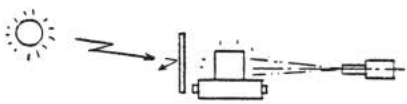
■ EXTERNAL LIGHT

Although visible light is completely cut off, avoid positions where direct or reflected sunlight or light from incandescent lamps, etc. may enter the detector.

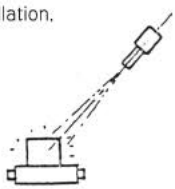
When such position can not be avoided, shielding plates (ex. steel plates) should be used to cut off external light.

— Example —

1) Shield board to block sunlight.



2) With this kind of looking down installation, the infruence of the external light will be reduced.

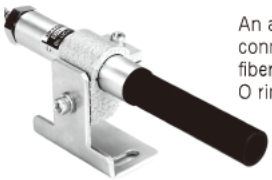


6 ASSEMBLY and INSTALLATION

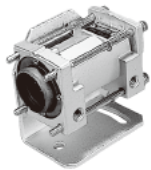
■ PACKED COMPONENTS

The product is consists of the following four components.
Check the quantity of the components first.

1. OPTICAL HEAD OHC **OHA** **OHAN**



An adapter set to connect the optical fiber unit and a spare O ring are attached.



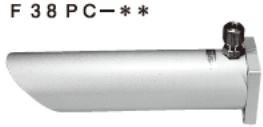
※ FT101-AD2 adapter for the optical head is required. (sold seperately)

2. OPTICAL FIBER UNIT **GT2**＊＊**AD**

3. HOOD

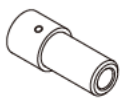
F38A—＊＊

F38PC—＊＊



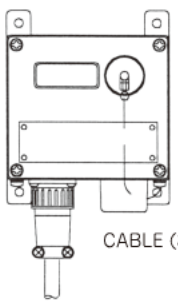
4. ADAPTOR

FT101—AD2



Note : Required for OHA and OHAN

5. AMPLIFIER UNIT



CABLE (Standard Type : 2m)

Caps are applied for protection to each optical fiber connections of the optical head unit and the amplifier unit. Also protection caps are applied to both the ends of the optical fiber unit.

The performance of the optical head unit and the optical fiber unit will be badly affected by flaws, dust, etc.

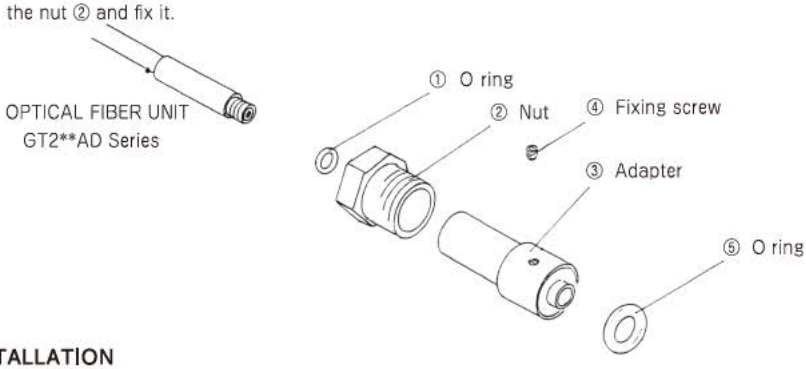
Do not remove the protection caps until the units are to be connected. The protection caps, when removed, must be kept because they will be needed for maintenance.

■ ASSEMBLY

The optical fiber unit has an amplifier unit side and an optical head side.

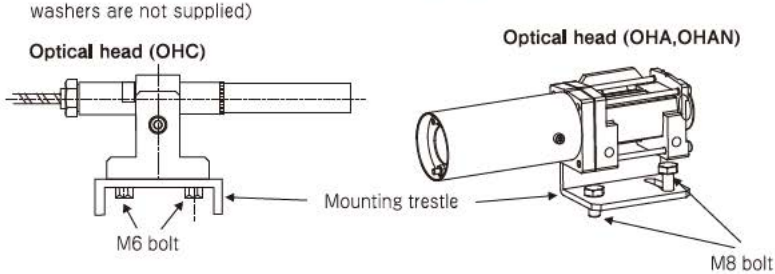
An optic adapter kit FT101-AD2 is attached to OHC optical head.
Seperately prepare the kit when OHA or OHAN is used
Install the optic adapter kit to the fiber unit as follows :

1) Mount the small O ring ① to the screw part of the fiber unit.
2) Mount the nut ② and the adapter ③ in this order.
3) Screw the adapter ③ into the optical fiber unit and fix with the fixing screw ④.
Set it so that the top ends of the optical fiber unit and the adapter met on the surface.
4) Mount the O ring ⑤, insert into the optical fiber unit into the optical head, then tighten the nut ② and fix it.



■ INSTALLATION

Prepare a mounting trestle free from vibration.
Fix the optical head unit with two bolts as shown below. (The M6/M8 bolts, nuts and washers are not supplied)



Install the amplifier unit a place with room temperature and free from radiant light from the hot material.
If it is installed unavoidably in a place with water or scale splashing, put the unit in a box to protect against such disturbances.

7 WIRING

■ CONNECTOR

※ The power supply is from 100 to 220VAC.

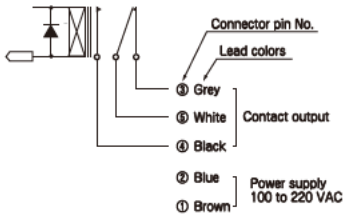
※ In case of connection to the extension cable, please use a terminal box for connection. Use separate cables for power and output.

◇ Relay output type : FD-A310C

Connector pin No. and the lead colors

⑤ White – COM
④ Black – NO
③ Grey – NC
Contact output

② Blue –
① Brown –
Power supply 100 to 220VAC

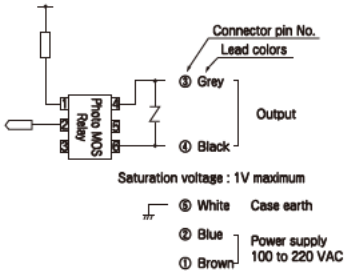


◇ Photo MOS Relay output tupe : FD-A310CM

Connector pin No. and the lead colors

⑤ White – Case earth
④ Black –
③ Grey –
Output

② Blue –
① Brown –
Power supply 100 to 220VAC



■ FRAME EARTH

Connect the earth wire to the earth screw (M4) on the side of the connector.

8 ADJUSTMENT

8–1 OPTICAL AXIS ADJUSTMENT

◇ Adjustment by Optical Adjuster (Adjuster available as an option)

A light patten is directed through the lens by fitting an optical adjuster that has a halogen lamp in the optical head (OHF-CL/OHF-CLP)

As the light pattern matches the detection field of view, accurate optical adjustment can be made.

8–2 SENSITIVITY ADJUSTMENT : The sensitivity can be adjusted in 10 steps.

When rotating the multi-turn potentiometer, the sensitivity figures will be displayed in the window.

As for the sensitivity (detection temperature) at each position, refer to the "Data" section.

On the display, 9 is the maximum and 0 is the minimum sensitivities.

9 The maximum sensitivity : Low temperature heated material can be detected.
⋮
0 The minimum sensitivity : Use when the temperature of the detection object is high.

Note : Set the potentiometer so that the whole number is displayed in the window. If not, the senstivity will not be adjusted correctly.

9 INSPECTION

◆ Implement a regular inspection as follows :

1. Optical axis Check
2. Lens surface cleaning

Remove the hood by turning it counterclockwise then the lens will be exposed.
Wipe the lens clean with a soft cloth.
Put the hood back in its place and tighten the fixing ring.

10 NOTES

— Be careful with handling the optical fiber unit and its connections.

■ Note the following when having removed the optical fiber unit from the optical head unit or the amplifier unit for installation or repair.

- The optical fiber unit is used to transmit detected light and its ends must always be protected from being damaged. Use attached protection caps or vinyl tape to protect the ends.
- Also use protection caps or vinyl tape to prevent scale or dust, etc. from coming into the optical fiber connection end of the optical head or the amplifier unit.

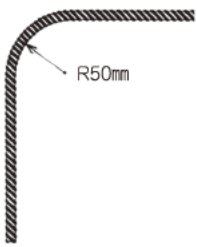
■ Be sure to tighten the tightening glands (nuts) for optical fiber unit connection by using a spanner. Incomplete tightening and slackness will cause false detection.

■ An O ring is used in the connection part of the optical fiber unit.
An O ring is used at the end surface of the optical fiber unit. Although it does not fall off easily while being used, a spare O ring is attached in the fiber unit.

■ Correct handling of optical fiber unit.

Do not bend excessively

Glass fiber is used inside the optical fiber unit. If the optical fiber unit is bent with an excessively small diameter, it may be damaged. Keep the allowable bending diameter.



Do not pull or twist

Do not apply a forcible pull or twist, and keep a suitable amount of slack.

Do not move

Fix optical fiber unit firmly when using. The fiber unit contains 1,500 optical fibers which has a diameter of 50㎛ tied up in a bundle. If unnecessarily moved or vibrated, the optical fibers may be worn out.

11 DATA

Minimum Detection Object Diameter and Minimum Detection Temperature

The minimum detection object diameter and its temperature can be worked out from the four graphs on the following pages.

■ The minimum detection object diameter means the width of the cylinder, square bar, or board, etc. that is longer than the field of view and can be detected in any position within the detection field of view.

■ The detection distance is the distance from the surface of the detection object to the center of the optical head installation.

HOW TO USE THE GRAPHS

The graphs 1.2 are drawn with a Detection distance = 1m.

Example Optical fiber unit : GT25AD Optical head : OHC
Detecting object : 10 dia., steel pipe Detecting distance : 1m
Minmum detecting temperature will be 480℃ from GPAPH-2, In case of OHA it will be 510℃

When the detection distance is 1m or less, work out the coefficient by the following method and multiply the coefficient [K] by the figure on the Y axis (= the figure of the detection object diameter).

When the detection distance is less than 1m.

Coefficient $K = L + (0.6 - 0.6 \times L)$ L = Detection Distance m

Example When the detection distance is 0.5m, L = 0.5

$K = 0.5 + (0.6 - 0.6 \times 0.5) = 0.8$ Therefore, Coefficient = 0.8

Multiply this figure by the figure on Y axis (= the figure of the detection object diameter).

$50 \times 0.8 = 40$

This means that the position of 50 of the detection object diameter will be displaced with 40 in the graph.

In the same way, multiply the above coefficient by the other figures and complete the figures on the Y axis.

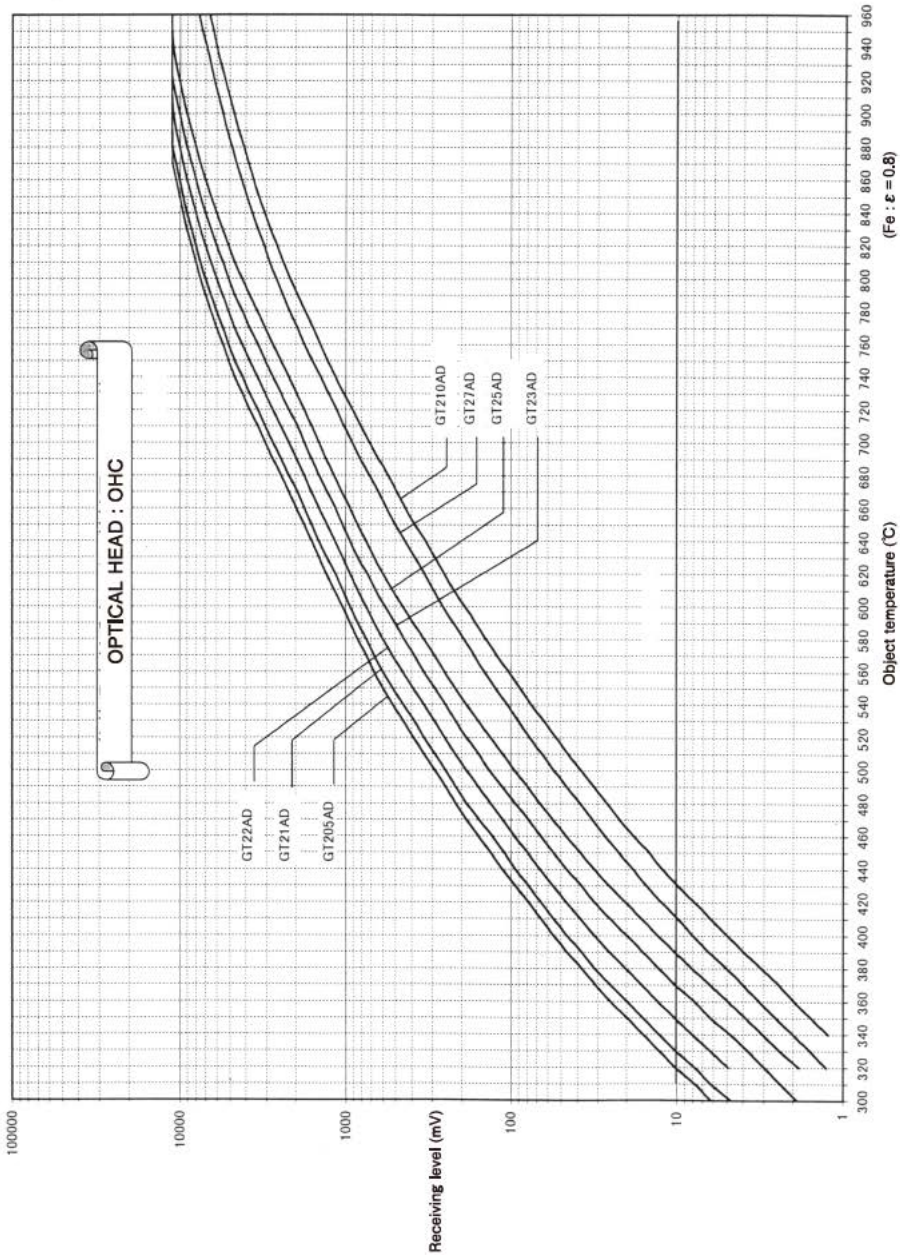
When the detection distance is 1m or more.

Take a distance for Coefficient.

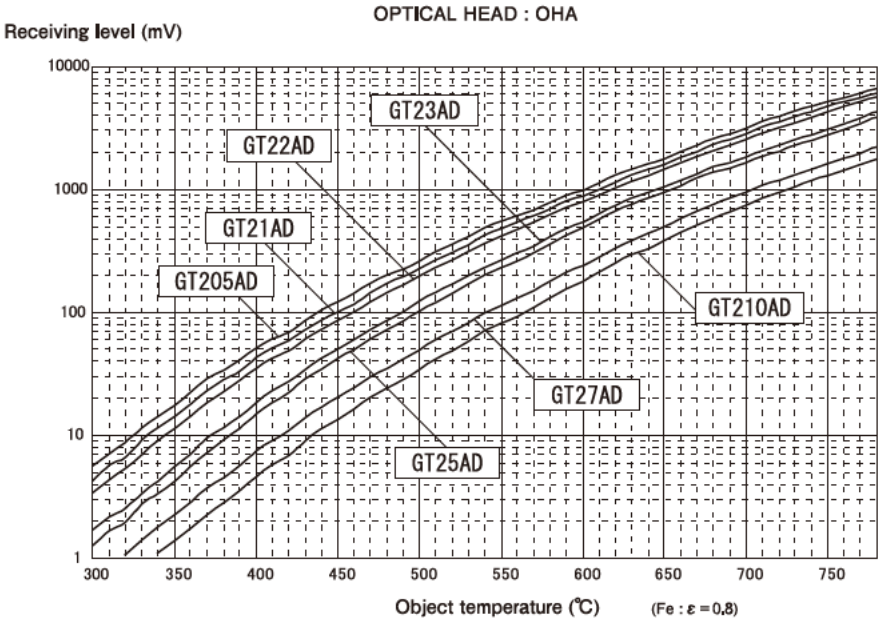
Example When the detection distance is 2.5m, the coefficient will be 2.5

Therefore, multiply figures on the Y axis of the graph and complete figures on the Y axis.

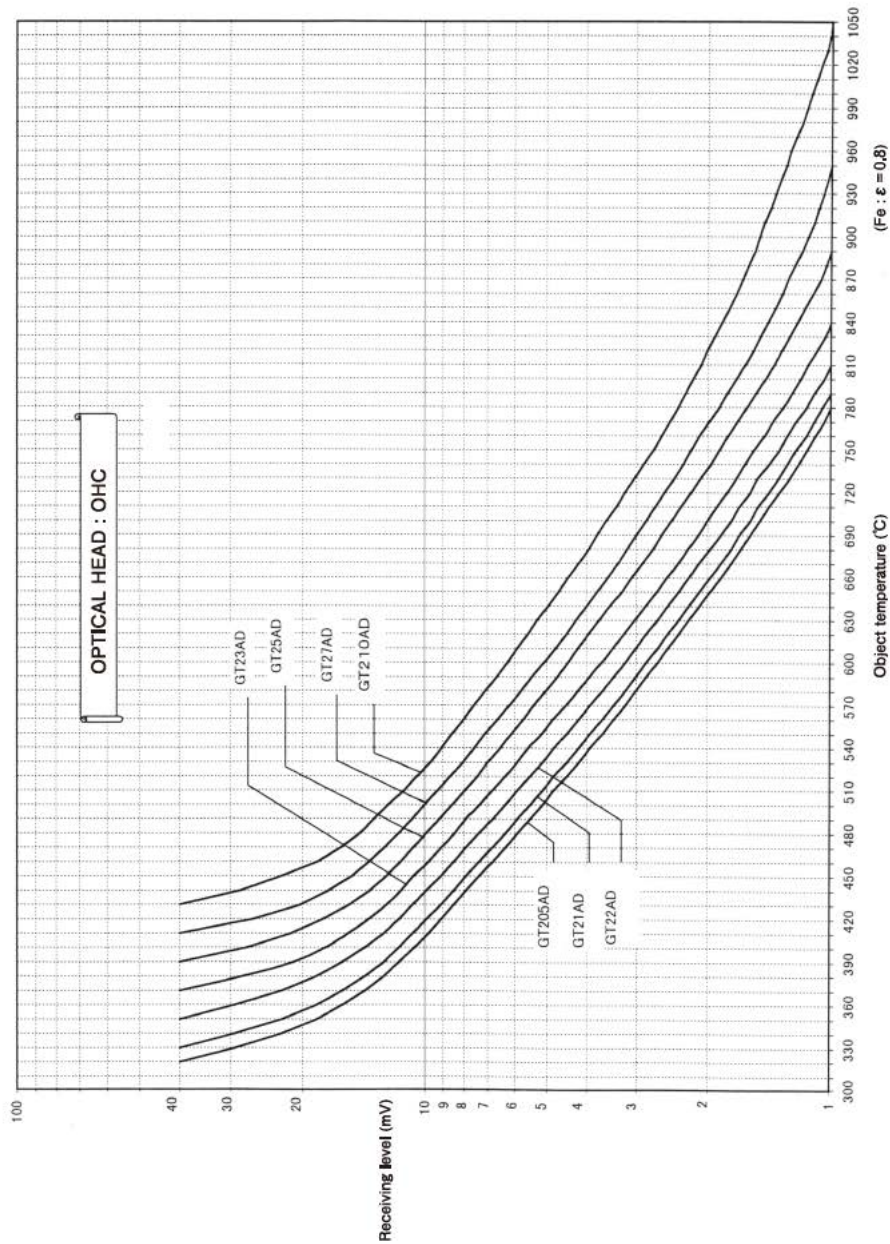
GRAPH 1	RECEIVING LIGHT LEVEL CHARACTERISTICS Optical Head : OHC Detecting distance : 1m	(Typical example)



GRAPH 1	RECEIVING LIGHT LEVEL CHARACTERISTICS Optical Head : OHA Detecting distance : 1m	(Typical example)

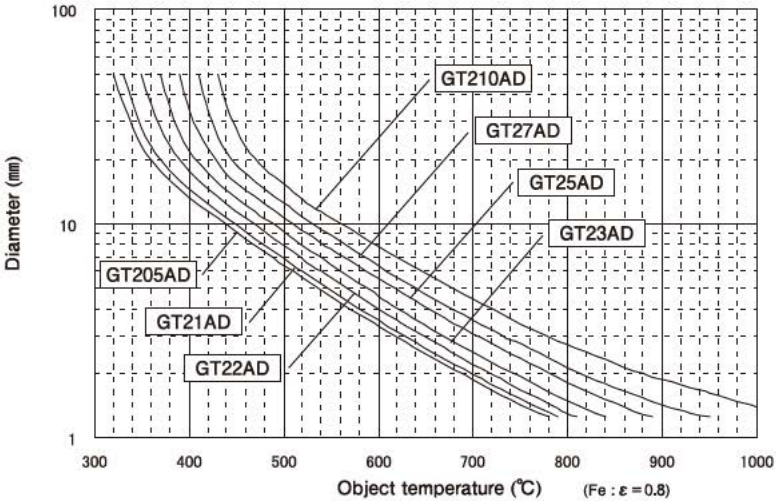


GRAPH 2	MINIMUM DETECTING OBJECT CHARACTERISTICS Optical Head : OHC Detecting distance : 1m	(Typical example)

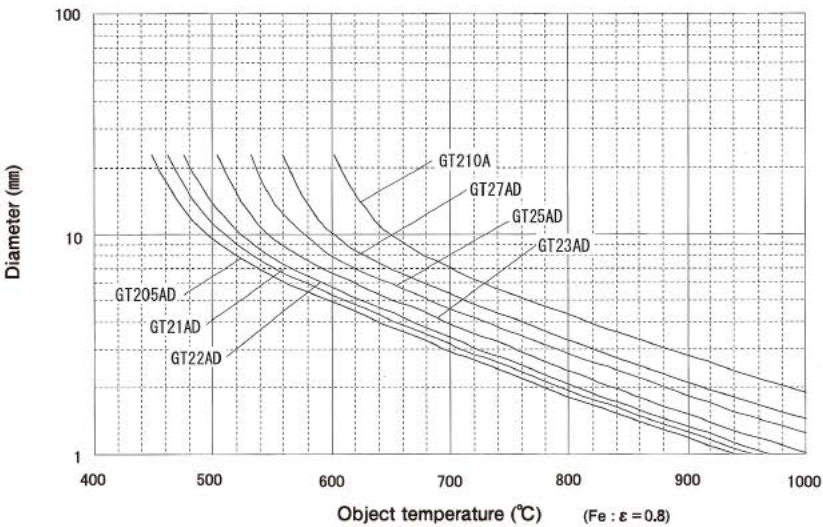


GRAPH 2	MINIMUM DETECTING OBJECT CHARACTERISTICS Optical Head : OHA/OHAN Detecting distance : 1m	(Typical example)

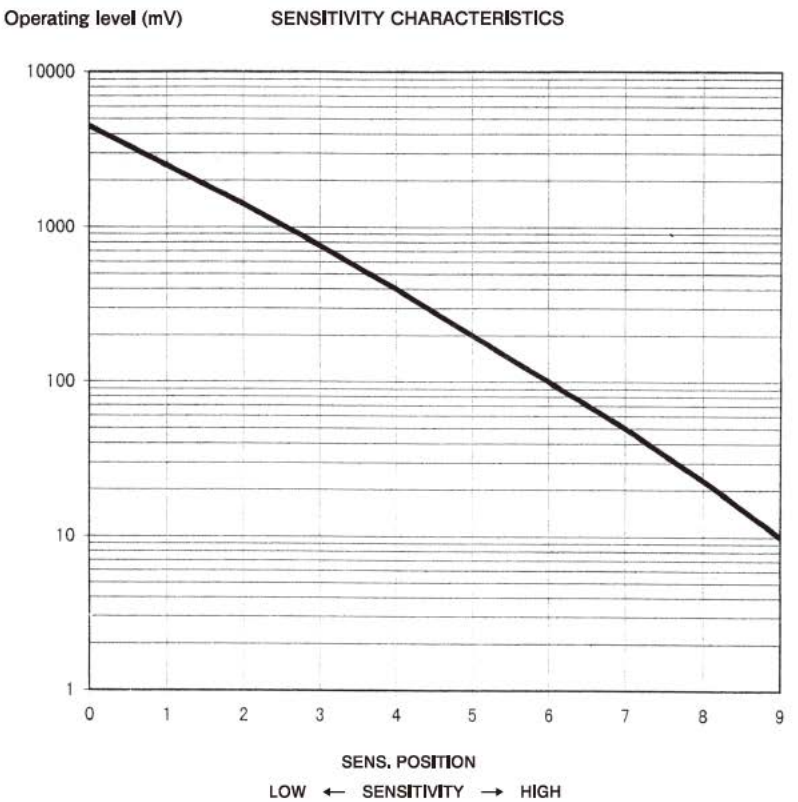
OPTICAL HEAD : OHA



OPTICAL HEAD : OHAN

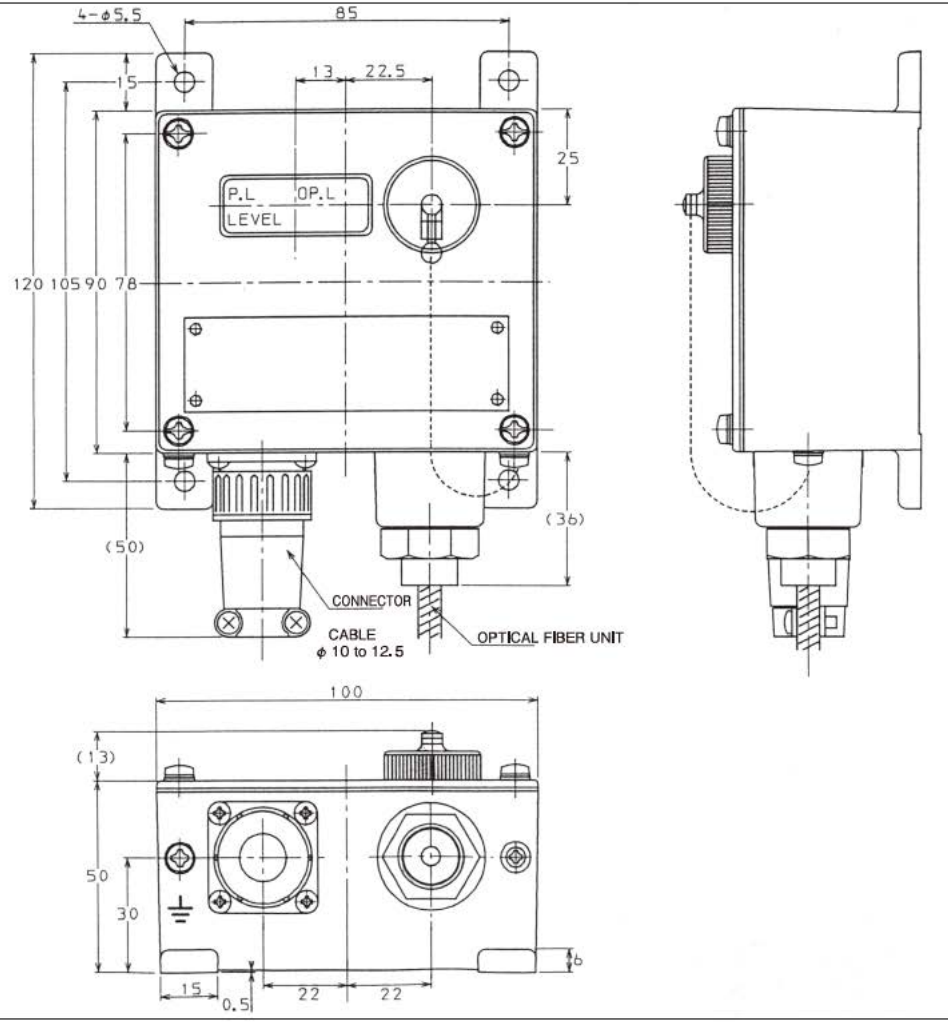


GRAPH 3	SENSITIVITY CHARACTERISTICS



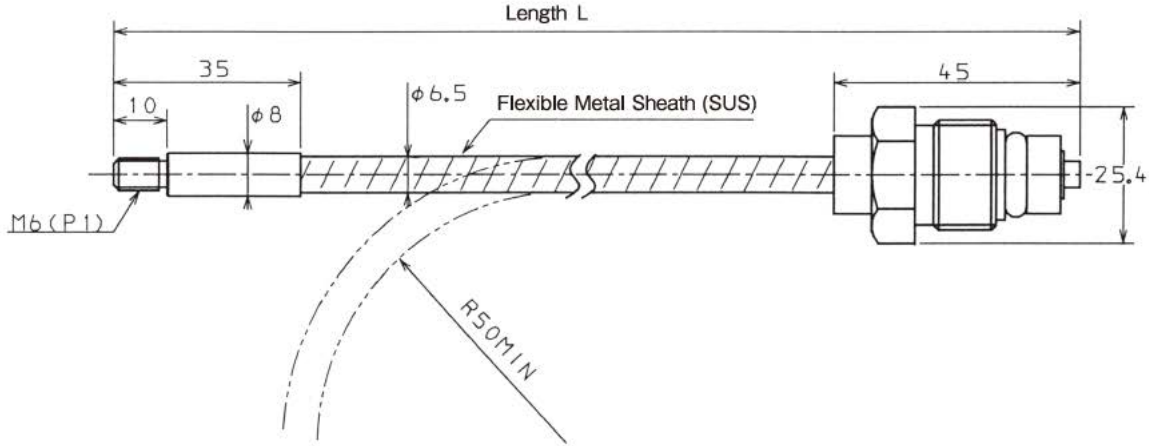
AMPLIFIER UNIT

(unit : mm)



OPTICAL FIBER UNIT

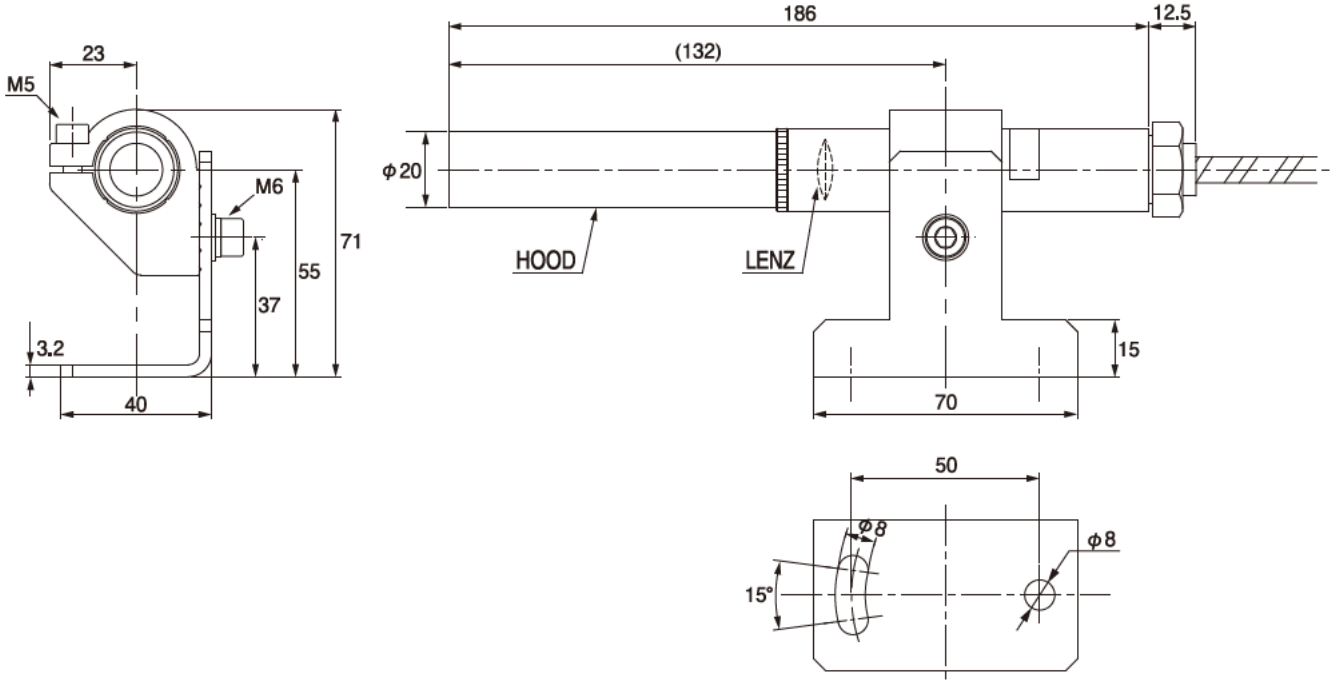
(unit : mm)



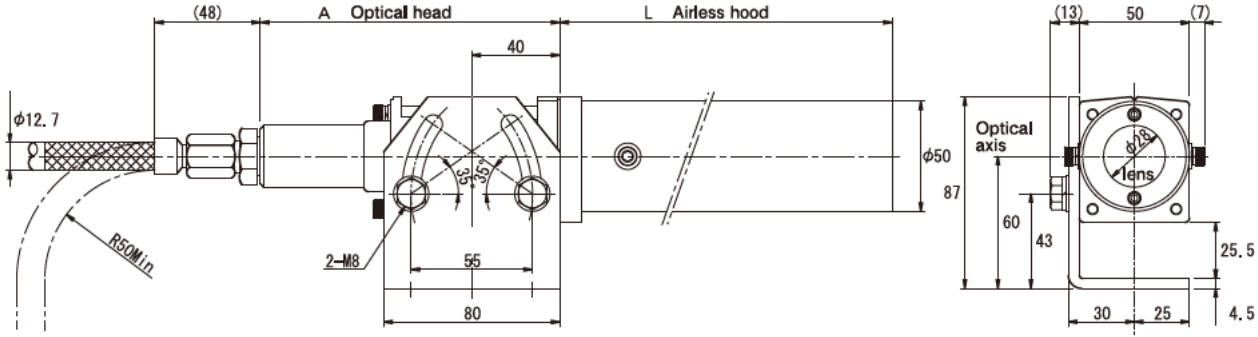
MODEL	LENGTH L (m)
GT205AD	0.5
GT21AD	1
GT22AD	2
GT23AD	3
GT25AD	5
GT27AD	7
GT210AD	10

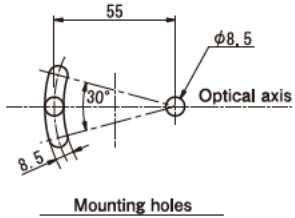
OPTICAL HEAD OHC

(unit : mm)



OPTICAL HEAD OHA
AIRLESS HOOD
(unit : mm)





Mounting holes

Optical head

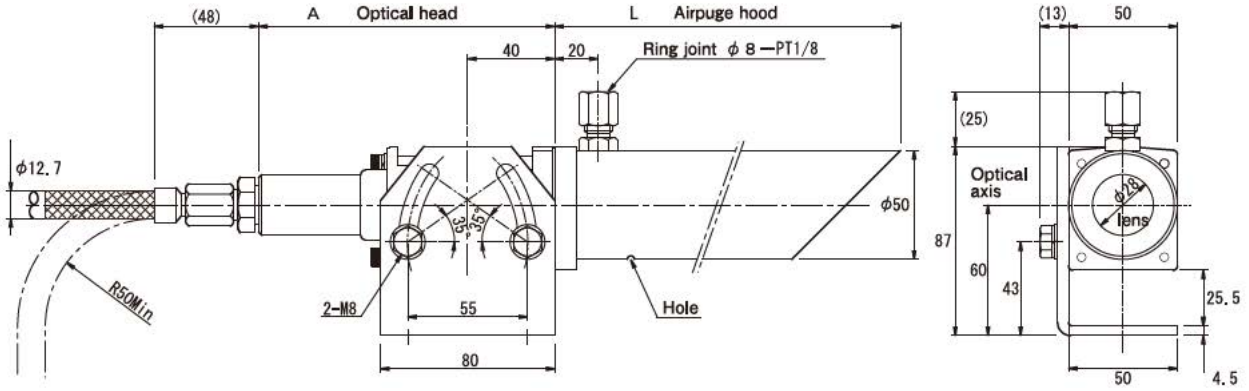
Model	A mm
OHAN	136
OHAN10	142

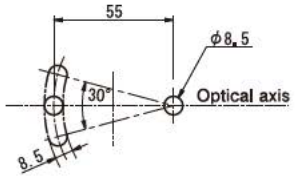
Airless hood

Model	L mm
F38A	120
F38A-02	200
F38A-03	300
F38A-04	400
F38A-05	500

Optical head : OHA
Airless hood : F38A-**
Optical fiber unit : FG**

OPTICAL HEAD OHA
AIRPUGE HOOD
(unit : mm)





Mounting holes

Optical head

Model	A mm
OHAN	136
OHAN10	142

Airpuge hood

Model	L mm
F38PC-02	200
F38PC-03	300
F38PC-04	400
F38PC-05	500

Optical head : OHA
Airpuge hood : F38PC-**
Optical fiber unit : FG**

TAKENAKA ELECTRONIC INDUSTRIAL CO.,LTD.

Head office : 25-22 Higashino Kitainoue-cho, Yamashina-ku, Kyoto, 607-8141, Japan
Telephone : +81-75-581-7111
Fax : +81-75-581-7118

ABH-HS-0010-3(2019-02)