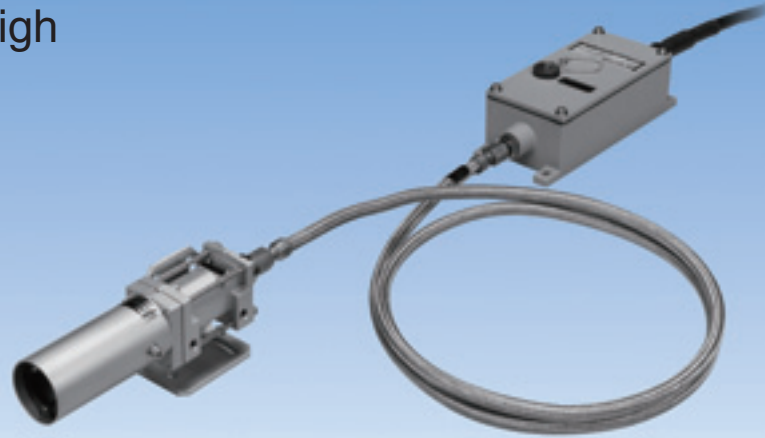


Sensitivity adjustment unnecessary: auto sensing  
One sensor covers a wide range of temperatures from low to high



FD-A300P is a series of optical fiber-type hot metal detection photo sensor (HMD) that directly detect infrared energy emitted from heated material (steel products, etc.).

Equipped with a controller that employs an 8-bit microcomputer, this intelligent hot metal detection sensor integrates various functions.

## Features

- Sensitivity adjustment unnecessary: auto sensing mode  
Auto sensing mode automatically adjusts the operation level based on the received light intensity at detection of heated material and manual mode that allows manual setting of operation level are available.
- One sensor for a wide range of temperatures  
Two different ranges for low and high temperatures can be switched with external signal and support low and high temperatures.
- Numerical indication of received light intensity convenient for operation level setting  
Received light intensity at detection of heated material is represented in value between 0.1 and 10.0 for arbitrary setting of output operation level.  
Broad dynamic range of amplifier allows numerical expression of wide range of temperatures of heated materials in analog quantity, which, unlike the conventional HMD sensitivity adjustment, facilitates setting of operation level in concrete figures.
- Recall function: received light intensity detected in the past viewable  
Maximum received light intensity of heated material detected is stored to allow viewing during non-detection.  
Eight most recent maximum received light intensities of heated materials are stored to allow viewing of previous received light intensities in figures by selecting a mode.

# FD-A300P

## Ordering Guide

The FD-A300P Series does not have set model Nos. Order by specifying the individual model Nos. of components. Models marked with \* compose a set shown on the previous page.

### Example

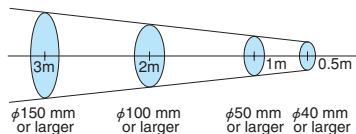
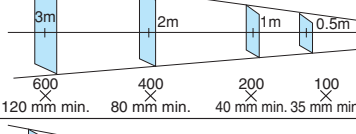
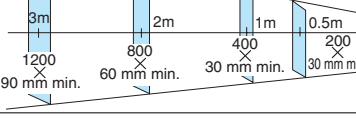
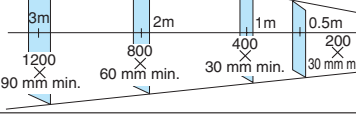
For ordering sensor with the following properties:

- Temperature of detection object: 600 °C or higher
- Mini power relay output
- Fiber length: 2 m
- Standard-view- Compact, lightweight Airless hood

Component	Model	Quantity
Hood	F38A	1
Optical head	OHA	1
Fiber	FG2	1
Amplifier	FD-A300P	1

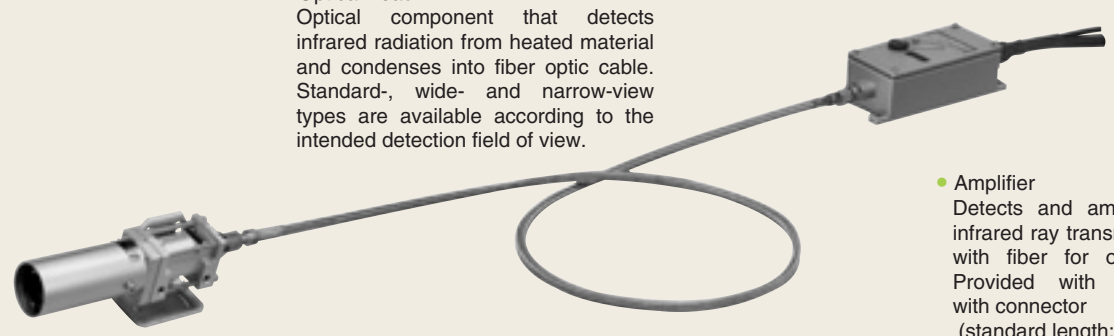
## [Optical head]

- The standard and wide types have different optical systems. Detection field of view characteristics (Typical example)

	Field of view	Model
Standard type		OHA ※
		
Wide type		OHW2
		

- Narrow-view optical head  
See P.491 for details.

## Configuration




- Optical head**  
Optical component that detects infrared radiation from heated material and condenses into fiber optic cable. Standard-, wide- and narrow-view types are available according to the intended detection field of view.
- Amplifier**  
Detects and amplifies infrared ray transmitted with fiber for output. Provided with cable with connector (standard length: 2 m).
- Hood**  
Provided for prevention of soiling of optical head lens or protection from disturbing light. Choice between airless and air purge hoods is available.
- Fiber optic cable**  
Light guide that transmits infrared ray captured with optical head into amplifier. Flexible tube with stainless steel braid is used as covering.

## [Hood]

Type	Length	Model	Applicable optical head	
Airless hood	Standard-view	120mm	F38A ※	OHA
		200mm	F38A-02	
		300mm	F38A-03	
		400mm	F38A-04	
		500mm	F38A-05	
Airless hood	Wide-view	200mm	F38W	OHW1 OHW2
		200mm	F38W	OHW1 OHW2
Air purge hood	Standard-view	200mm	F38PC-02	OHA
		300mm	F38PC-03	
		400mm	F38PC-04	
		500mm	F38PC-05	
	Wide-view	—	302W	OHW1 OHW2

## [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] Appearance common to all models

Control output type	Model
Mini power relay output	FD-A300P ※
Reed relay output	FD-A300PH
Solid-state output	FD-A300PC
Photo-MOS relay output	FD-A300PM

# FD-A300P

## Rating/Performance/Specification/Environmental Specification

Output specification				
Model	FD-A300P	FD-A300PH	FD-A300PC	FD-A300PM
Output type	Mini power relay output	Relay output	Solid-state output	Photo-MOS relay output
Control output				
ON-OFF control				
Operation mode	Light-ON/Dark-ON selector switch provided (DIP switch) Default setting: Light-ON (output activated when light received)			
Rating	Transfer contact MAX 5A 250V AC (Resistance load)	Transfer contact MAX 0.5A 48V DC (Resistance load)	MAX 0.5A 250V AC/DC (Resistance load)	MAX 0.1A 100V AC/DC (Resistance load)
*1) Response time	About 15ms (17ms)	About 5ms (7ms)	About 5ms (7ms)	About 4ms (6ms)
STB output				
*2) Rating	a contact 5A 250V AC max. (Resistance load)			
General specification				
Valid lens diameter	28mm DIA (OHA)			
Power Supply	100 - 220V AC +10%, -15% 50/60Hz			
Power consumption	10W max.			
Connection	with Connector cable 2m (CVV1.25mm <sup>2</sup> )			
Ambient temperature	Optical head, Fiber: -25 to +200°C Amplifier: -25 +50°C (Non-freezing)			
Storage temperature range	-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				
Temperature range selection input: omitted				
Dielectric withstanding				
Between power supply and case: 1500VAC for 1 minute				
Between output and case: 1500VAC for 1 minute				
Unless, Reed relay output: AC1000V for 1 minute				
Between power supply and output: 1500VAC for 1 minute				
Unless, Reed relay output: AC1000V for 1 minute				
Temperature range selection input: omitted				
Vibration	10-55 Hz / 1.5 mm amplitude / 2 hours each in 3 direction			
Shock	500 m/s <sup>2</sup> / 3 times each in 3 directions			
Protective structure	IP66			
Weight				
Optical head	Basic type (OHA): 680g Wide type (OHW1/OHW2): About 1300g			
Airless hood	F38A: about 240g F38A-02: about 340g F38A-03: about 430g	F38A-04: about 550g F38A-05: about 650g F38W: about 600g		
Air purge hood	F38PC-02: about 240g F38PC-03: about 300g F38PC-04: about 370g	F38PC-05: about 440g 302W: about 600g		
Fiber	FG2: about 0.7kg FG3: about 0.9kg FG4: about 1.1kg	FG5 : about 1.3kg FG7 : about 1.6kg FG10: about 2.1kg	FG15: about 3.1kg FG10: about 4.1kg FG30: about 6.1kg	
Amplifier	About 1.5kg			

## Amplifier Major Specification

Light-sensitive element	Ge photodiode
Sensitivity wavelength	0.8~1.8μm
HMD function	Auto sensing mode (automatic setting of operation level) Manual mode (automatic setting of operation level)
Detecting temperature range	2 ranges: low temperature and high temperature ranges (selectable with external input)
Auxiliary function	- Succeed sensing function/STB function/Initial check function/Recall function
Indication	- Output indicator (OP.L): red LED / STB indicator (STB): green LED - Received light intensity display: 3-digit figure
Received light intensity scale range	0.1-10.0 (in increments of 0.1)
Operation level setting range	Auto sensing mode: 1.0-8.0 (in increments of 0.1) / Manual mode: 1.0-9.0 (in increments of 0.1)

\*1) Response speed is for operation level setting at [received light intensity -2.0]. With extremely low operation level setting with reference to received light intensity, the response time for deactivation becomes longer. Values in parentheses show response times for deactivation with operation level setting of [1.0] against received light intensity [10.0].

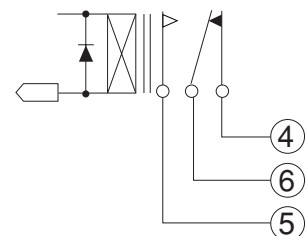
\*2) STB output is mini power relay for all models regardless of detection output type.

## Input/Output Circuit and Connection

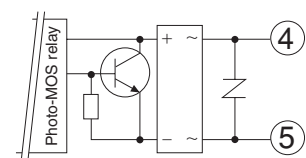
### Control output

Model FD-A300P

Model FD-A300PH

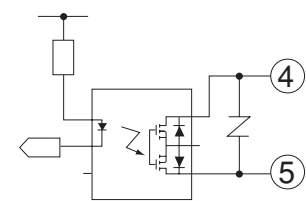


Model FD-A300PC



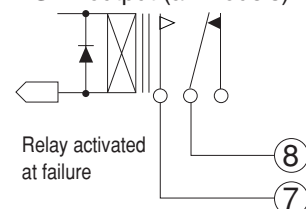
Saturation voltage: 3 V max.

Model FD-A300PM



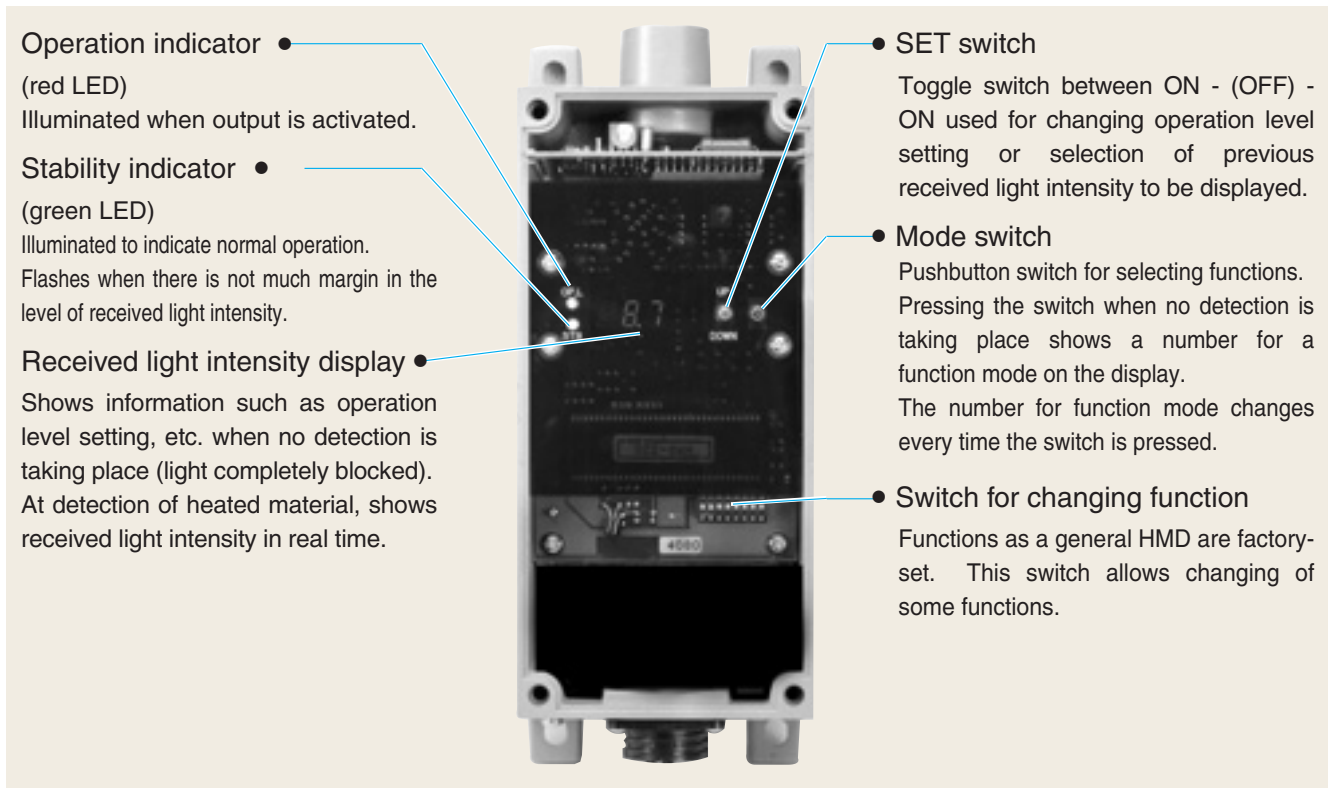
Saturation voltage: 1 V max.

### STB output (all models)



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 (with case lid removed)



## Lowest Detectable Temperature

### Select between two (high and low) temperature ranges by mode setting

Low temperature range	350~ 800°C
High temperature range	490~1300°C

Guidelines are given below for the temperature of a detection object larger than the detecting field of view with optical head (OHA) and fiber optic cable (FG2) used for detection.

### Guidelines for minimum temperature of detected object

The minimum temperature depends on the length of the fiber optic cable used or detecting field of view of the optical head. Temperatures shown in this table are for heated material larger than the field of view. If the material is smaller than the field of view, the lowest detectable temperature is increased. The guidelines are for the minimum temperatures of detection objects and include margins of about 4 times as much as the inherent performance. For detailed data, see "Minimum Detectable Object and Lowest Detectable Temperature."

Fiber length	Low temperature range		Low temperature range	
	Optical head		Optical head	
	Standard-view model OHA	Wide-view model OHW1/OHW2	Standard-view model OHA	Wide-view model OHW1/OHW2
2m	350 °C min.	415 °C min.	490 °C min.	590 °C min.
3m	356 °C min.	430 °C min.	510 °C min.	610 °C min.
4m	375 °C min.	445 °C min.	525 °C min.	625 °C min.
5m	385 °C min.	450 °C min.	540 °C min.	635 °C min.
7m	400 °C min.	475 °C min.	560 °C min.	660 °C min.
10m	445 °C min.	520 °C min.	610 °C min.	725 °C min.
15m	480 °C min.	555 °C min.	655 °C min.	775 °C min.
20m	500 °C min.	580 °C min.	680 °C min.	800 °C min.
30m	530 °C min.	610 °C min.	720 °C min.	850 °C min.

# FD-A300P

## Convenient High Performance and Various Functions

HMD function in 2 modes and auxiliary function in 4 modes provided in addition to auto sensing mode, eliminating need for sensitivity adjustment

### HMD modes

#### Mode0 auto sensing mode

- Automatically sets the operation level according to the received light intensity at detection of heated material. Factory setting for the operation level is 1.0. Once any heated material is detected, the received light intensity data at that point is used as the basis for automatic setting of the next activation level and deactivation level.
- This operation takes place every time heated material is detected.

#### Mode1 manual mode

- HMD operation with the operation level fixed.
- The operation level can be manually adjusted at will. The set operation level is stored, which remains applied even after power-up.

### Auxiliary function modes

#### Mode2

- Operation level setting mode for high temperature range (H)
- The sensor temperature ranges may be switched with external input for selection between low temperature detection and high temperature detection. This sets the operation level for the high temperature range regardless of the currently active temperature range.

#### Mode3

- Operation level setting mode for low temperature range (L)
- As with Mode 2, this sets the operation level for the low temperature range regardless of the currently active temperature range.

#### Mode4 (recall function)

- Displays the previous maximum data for received light intensity.
- The current maximum value of the received light intensity is stored at every activation and deactivation.
- Up to 8 data may be stored.

#### Mode5

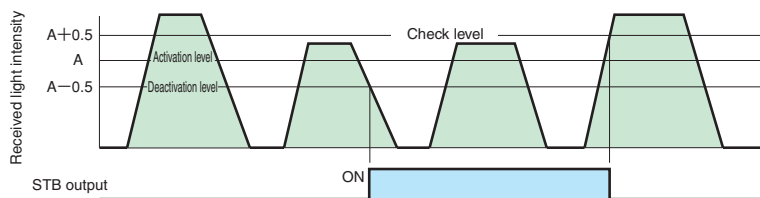
- Mode that helps identify the cause of any STB output.

## STB detection function

Gives an alert for any abnormality found in the received light intensity level with the STB output and flashing of the lamp.

Selection of **Mode5** enables detection of received light level error in 3 patterns:

**STB 1** : Insufficient margin of received light intensity at detection with reference to operation (activation) level



The check level for STB 1 is set at a level 0.5 or 1.0 higher than the activation level (A).

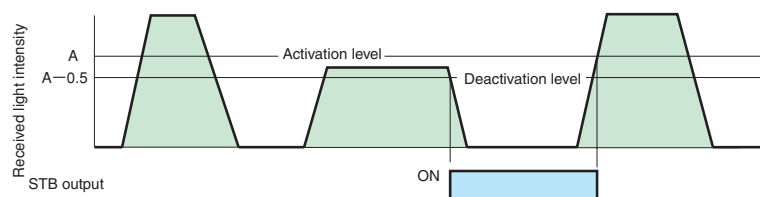
Activation level (A) ≤ 5.0: Check level = A + 0.5

Activation level (A) > 5.0: Check level = A + 1.0

Alert is given when the detection object has passed and the received light intensity detected at deactivation is equal to or lower than the check level.

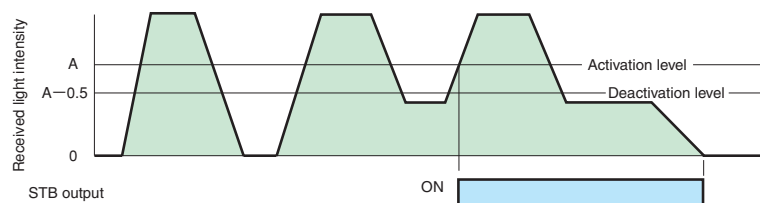
This alert output is reset when the received light intensity exceeds the check level.

**STB2** : Heated material passed but not detected due to excessively high activation level setting



Signal is output when the received light intensity at non-detection is 0.1 or higher.

**STB3** : Light not fully blocked even with no heated material (light blocking state)

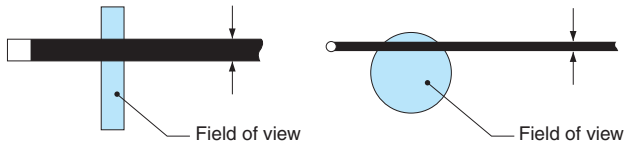


# FD-A300P

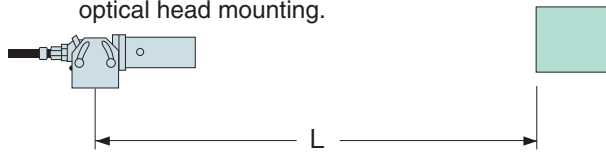
## Minimum Detectable Object and Lowest Detectable Temperature

The graphs below may be used to find the relationship between the diameter of a detection object and its lowest detectable temperature.

- The minimum detectable object diameter means the width of a round or square bar or board with a length equal to or more than the field of view that may be detected at any point in the field of view.



- Detecting distance means the distance between the surface of a detection object and the center of the optical head mounting.



- Using graphs

The graphs show data for a detecting distance of 1 m. For a detecting distance other than 1 m, use the following formula to find the coefficient  $K$  and multiply the reading on the Y-axis of the graph (detection object diameter) by the coefficient  $[K]$ .

Coefficient  $K = L + (0.6 - 0.6 \times L)$  ( $L =$  detecting distance (m))

Example: for detecting distance of 50 cm ( $L = 0.5$ )

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

The coefficient is 0.8. Multiply this by Y-axis reading of the graph (detection object diameter):  $50 \times 0.8 = 40$

This means that the point for detection object diameter 50 mm must be regarded as the point for diameter 40 mm.

Multiply other values by the coefficient above in the same way and complete the replaced Y-axis scale.

For detection with (OHW1/OHW2) used as optical head and detecting distance of 1 m or shorter

Use the distance as the coefficient.

Example: for detection using OHW1 and distance 0.7 m

In this case, the coefficient is 0.7.

Multiply the Y-axis readings of the graph by 0.7 to complete the replaced Y-axis scale.

The point for detection object diameter 200 must be regarded as the point for diameter 140.

For detecting distance of 1 m or longer (with any optical head model)

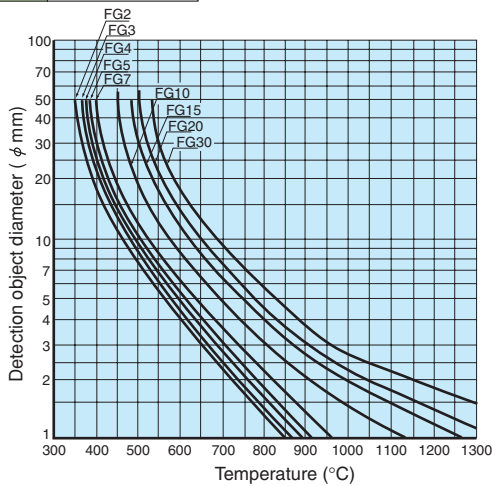
Use the distance as the coefficient.

Example: for detecting distance 2.5 m

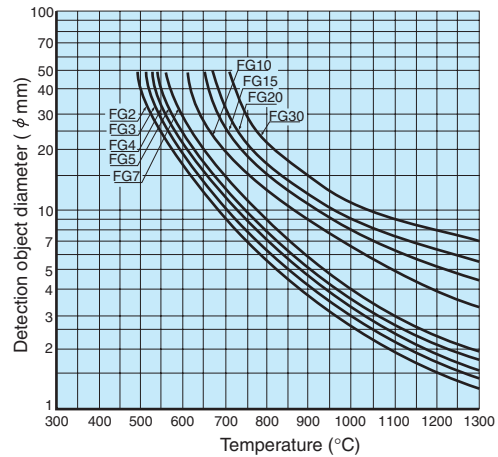
In this case, the coefficient is 2.5.

Multiply the Y-axis readings of the graph by 2.5 to complete the replaced Y-axis scale.

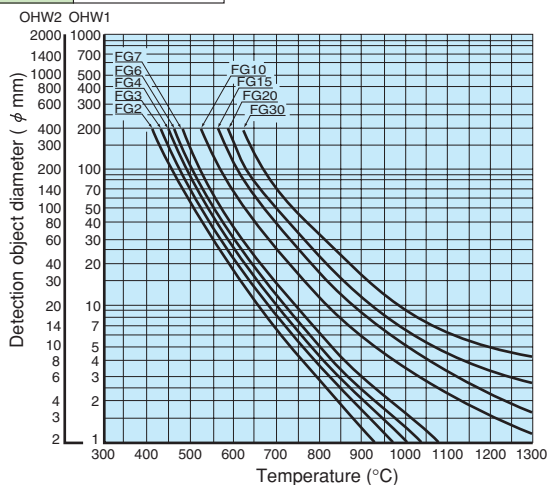
Temperature range	L
Optical head	OHA



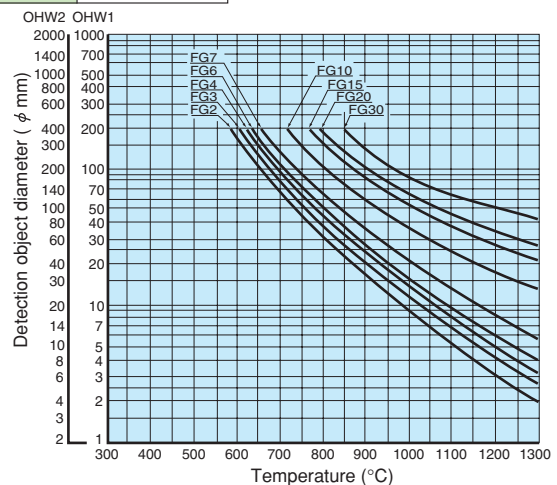
Temperature range	H
Optical head	OHA



Temperature range	L
Optical head	OHW1/OHW2



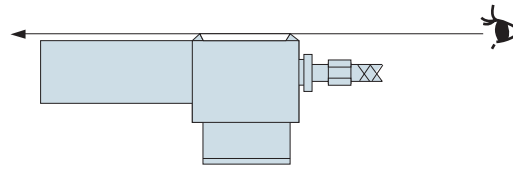
Temperature range	H
Optical head	OHW1/OHW2



# FD-A300P

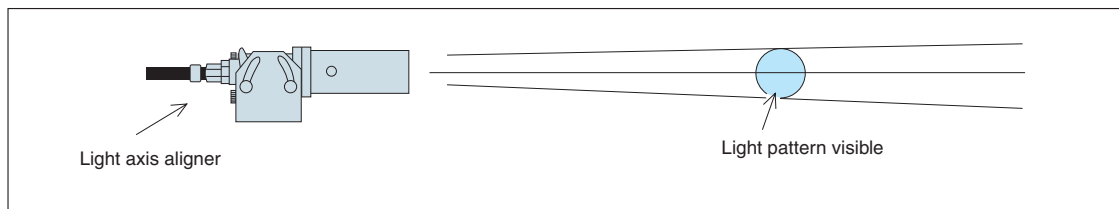
## Light Axis Alignment

- Alignment with optical sight  
Use the optical sight provided on the optical head.



- Alignment with Light axis aligner (optional)  
Mount an Light axis aligner containing a halogen lamp on the optical head and radiate the light beam pattern through the lens surface.

The projected beam pattern shows the detection field of view, which allows more accurate field adjustment.



Product name : Light axis aligner for fiber optic sensor

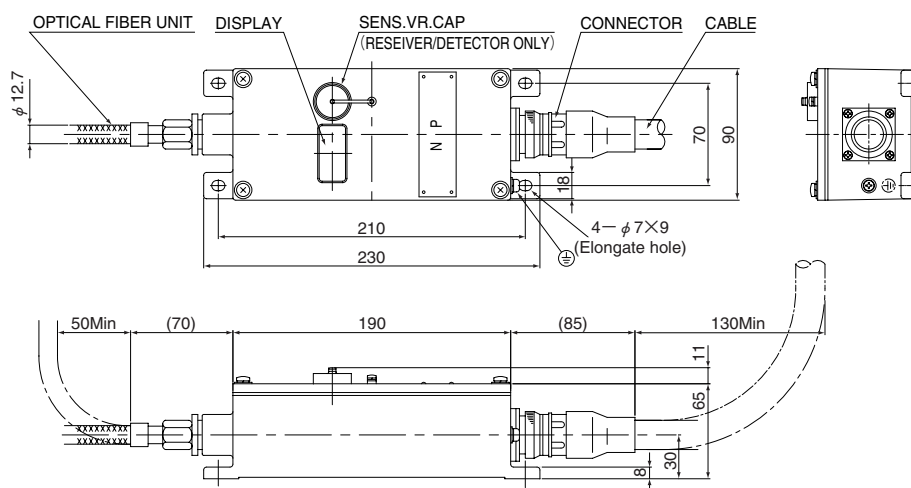
Model : OHF-CL/CLP

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

## Dimensions (in mm)

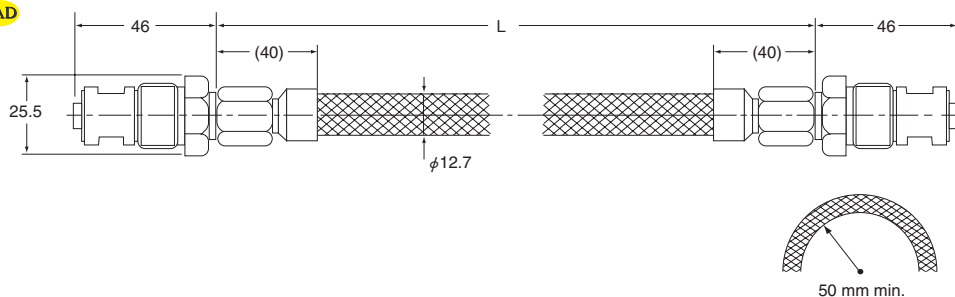
### Amplifier

CAD



### Fiber

CAD

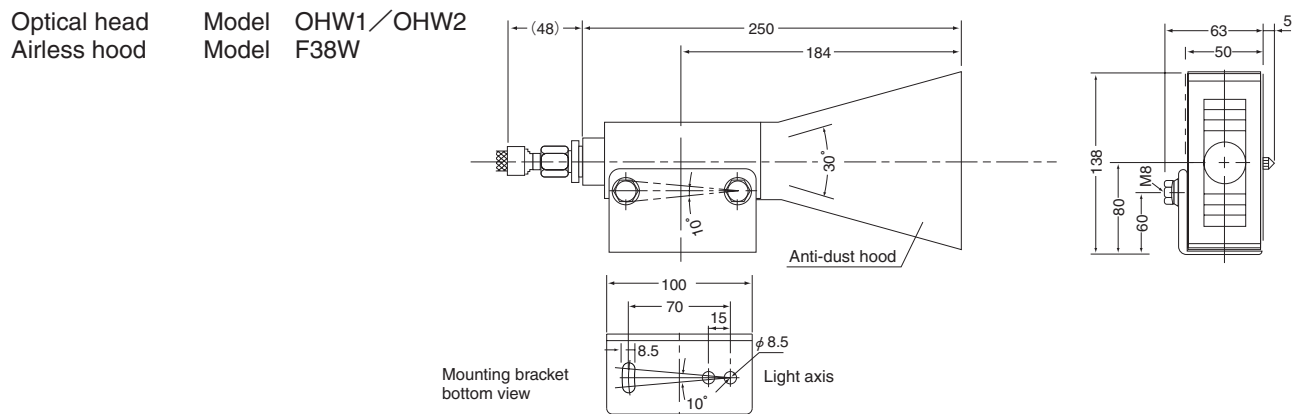
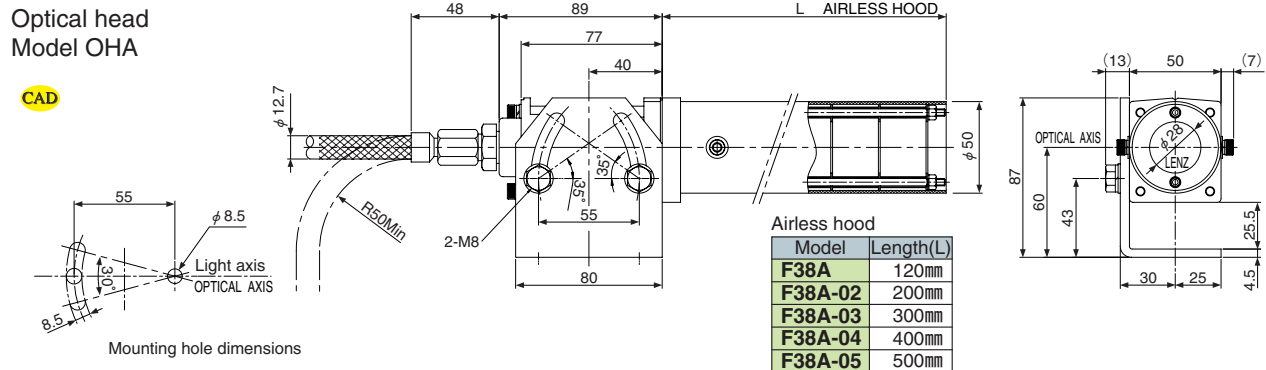


Model	Length(L)
FG2	2m
FG3	3m
FG4	4m
FG5	5m
FG7	7m
FG10	10m
FG20	20m
FG30	30m

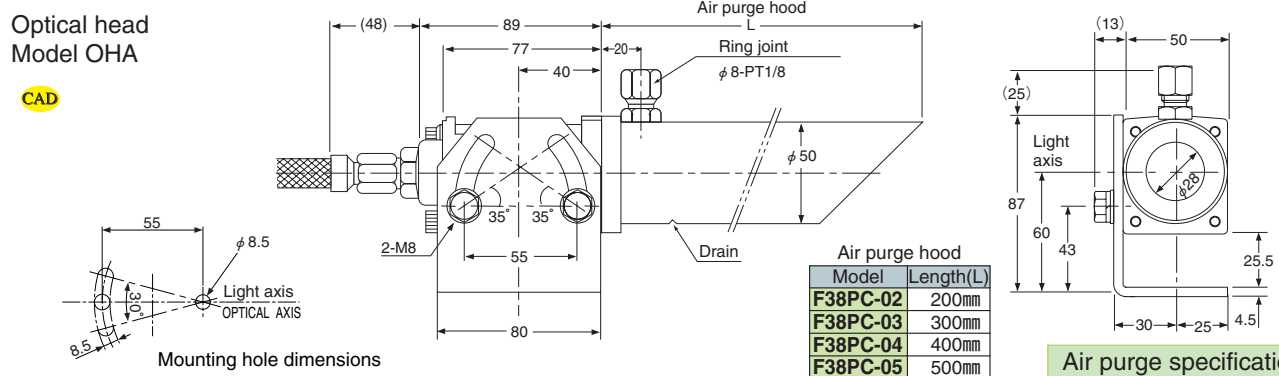
# FD-A300P

## Dimensions (in mm; example combinations of hood and applicable optical head)

### Example of combination of Airless hood and optical head



### Example of combination of Airless hood and optical head



**Air purge specification**  
 Flow rate ...200 l/min  
 Withstand pressure ...0.98MPa

