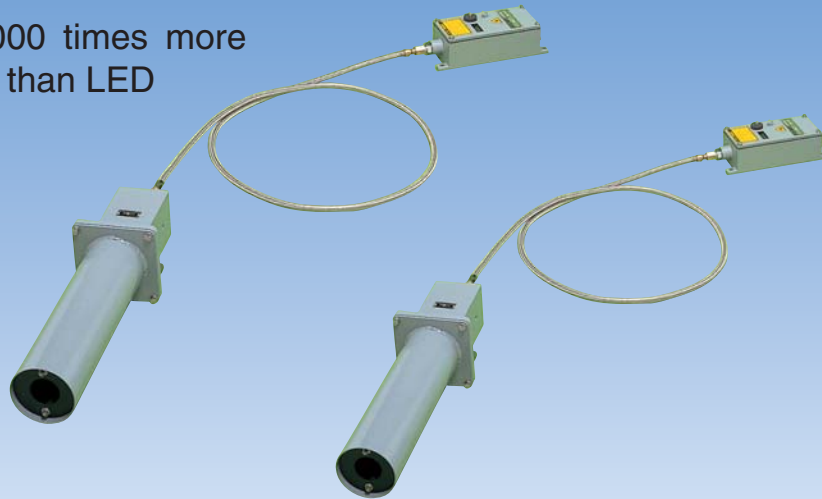


### High-powered Laser sensor

Over 3,000 times more powerful than LED



For basic information about semiconductor laser, see P540)

#### Features

- High-powered output 90 W (FTL44A)  
Laser diode of optical output 90 W is used as the light source, over 3,000 times as high-powered as LED type (of Takex). The output of model FTL441A is 10 W.
- No cooling required  
Supports ambient temperature of up to 200°C without cooling.
- Detector with superb durability  
Fiber covered with flexible tube with stainless steel braid for robustness and resistance to heat and corrosion.
- Self-check feature integrated (SAFETY feature)  
The transmitter is provided with light emission monitor circuit, which outputs alarm signal (SAFETY ALARM) when light emission stops due to failure, etc. The receiver is provided with a stability check feature, which constantly checks the received light intensity at light reception and outputs error signal (SAFETY ALARM) when there is not much margin in the received light intensity level due to soiling of lens, light axis misalignment, etc.
- 5-point level indicator  
Received light intensity is shown with 5 LEDs, offering easy viewing of stability and facilitating light axis alignment.

#### Notes on Safety

- Laser emission warning lamp  
The transmitter panel of the standard model is provided with power and light emission indicators to indicate that laser beam is emitted while power indicator or both indicators are illuminated.
- Do not attempt to look into the laser beam emitter or touch the beam.
- Take measures to prevent any unexpected specular reflection of laser beam caused by mirror-like detection object or mirror-like object crossing the route of the laser beam.
- Do not direct light to human body or use the sensor to detect people.
- Take safety measures according to the operation manual.



## Ordering Guide

The FT44A 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
  - Optical power 90 W
  - Mini power relay output
  - Fiber length : 2 m
  - Airless hood

| Component    |             | Model         | Quantity |
|--------------|-------------|---------------|----------|
| Amplifier    | Transmitter | <b>FTL44A</b> | 1        |
|              | Receiver    | <b>FTR44A</b> | 1        |
| Optical head |             | <b>OH2</b>    | 2        |
| Fiber        |             | <b>FG2</b>    | 2        |
| Hood         |             | <b>F70N</b>   | 2        |

## [Optical head]

| Model           | Compatible hood             | Appearance   |
|-----------------|-----------------------------|--|
| <b>OH2</b><br>※ | F70N<br>700L series         |  (High-powered) |
| <b>OHA</b>      | F38A series<br>F38PC series |  (Standard)    |

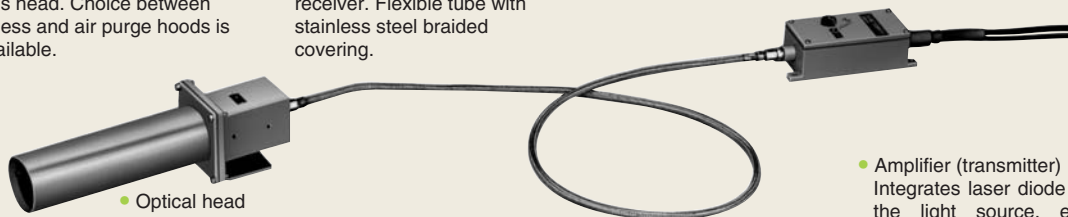
## [Fiber]

| Length | Model        | Appearance (Typical example)  |
|--------|--------------|---|
| 2m     | <b>FG2</b> ※ |  |
| 3m     | <b>FG3</b>   |   |
| 4m     | <b>FG4</b>   |   |
| 5m     | <b>FG5</b>   |   |
| 7m     | <b>FG7</b>   |   |
| 10m    | <b>FG10</b>  |   |
| 15m    | <b>FG15</b>  |   |
| 20m    | <b>FG20</b>  |   |
| 30m    | <b>FG30</b>  |   |

## Configuration

- Hood  
Prevent dirt deposits on optical lens head. Choice between airless and air purge hoods is available.
- Fiber optic cable  
Light guide for transmitter/receiver. Flexible tube with stainless steel braided covering.
- Optical head  
Optical unit for securing the detection light axis for transmitter/receiver. Standard and high-powered types (margin in operation tenfold) are available.

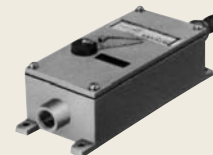
Components for transmitter and receiver are the same except for amplifiers.







- Amplifier (transmitter)  
Integrates laser diode used as the light source, electronic circuitry for transmission, etc.
- Amplifier (receiver)  
Converts the light transmitted through fiber optic cable with (light-sensitive element) into electric signals for control output (mini power relay output, reed relay output or Solid-state output) via electronic circuitry.

## [Amplifier]

| Type                  | Model                   | Appearance (Typical example) |
|-----------------------|-------------------------|------------------------------|
| Transmitter amplifier | 90W type                | <b>FTL44A</b> ※              |
|                       | 10W type                | <b>FTL441A</b>               |
| Receiver amplifier    | Mini power relay output | <b>FTR44A</b> ※              |
|                       | Relay output            | <b>FTR44AH</b>               |
|                       | Solid-state output      | <b>FTR44AC</b>               |



## [Hood]

| Type              | Length            | Model/shape (Typical example)   | Compatible optical head   |                 |
|-------------------|-------------------|---|---|-----------------|
| Airless hood      | Standard type     |    | <b>OHA</b>  |                 |
|                   |                   | 120mm   |   | <b>F38A</b>     |
|                   |                   | 200mm   |   | <b>F38A-02</b>  |
|                   |                   | 300mm   |   | <b>F38A-03</b>  |
|                   |                   | 400mm   |   | <b>F38A-04</b>  |
|                   | 500mm             | <b>F38A-05</b>  |   |                 |
| High-powered type |                   |   | <b>OH2</b>  |                 |
|                   |                   | <b>F70N</b> ※   |   |                 |
| Air purge hood    | Standard type     |  | <b>OHA</b>  |                 |
|                   |                   | 200mm   |   | <b>F38PC-02</b> |
|                   |                   | 300mm   |   | <b>F38PC-03</b> |
|                   |                   | 400mm   |   | <b>F38PC-04</b> |
|                   |                   | 500mm   |   | <b>F38PC-05</b> |
|                   | High-powered type |   |  | <b>OH2</b>      |
|                   |                   | 200mm   | <b>702L</b>   |                 |
|                   |                   | 300mm   | <b>703L</b>   |                 |
|                   |                   | 400mm   | <b>704L</b>   |                 |
|                   |                   | 500mm   | <b>705L</b>   |                 |

# FT44A

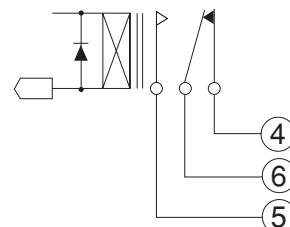
## Rating/Performance/Specification/Environmental Specification

| Output specification                      |  | FTL44A · FTL441A   |   |  |
|---|--|--|---|--|
| Transmitter model                         |  |  |   |  |
|   |  |  |   |  |
| Rating                                    | Contact output 5A 250V AC max. (Resistance load)   |  |   |  |
| Receiver model                            | <b>FTR44A</b>  | <b>FTR44AH</b>   | <b>FTR44AC</b>  |  |
| Output mode                               | Mini power relay output  | Relay output   | Solid-state output  |  |
| Control output                            | ON-OFF operation (Light-ON)  |  |   |  |
| Rating                                    | Transfer contact<br>5 A 250 VAC max.<br>(resistance load)  | Transfer contact<br>0.5 A 48 VDC max.<br>(resistance load)   | 0.5 A 250 VAC/DC<br>(resistance load)                         |  |
| Response time                             | 25 ms max.   | 12 ms max.   | 10 ms max.  |  |
| Safety Alarm output                       |  |  |   |  |
|   | Rating   | a contact<br>5A 250VAC max. (resistance load)                |   |  |
| General specification                     |  |  |   |  |
| Light source                              | FTL44A: semiconductor laser 904 nm, 90 W max. JIS C 6802 Class 1M<br>FTL441A: semiconductor laser 904 nm, 10 W max. JIS C 6802 Class 1)  |  |   |  |
| Detecting distance                        | 50 m max.  |  |   |  |
| Valid lens diameter                       | Optical head OHA: 28 mm<br>Optical head OH2: 56 mm   |  |   |  |
| Smallest detectable object                | Optical head OHA: 30 mm<br>Optical head OH2: 60 mm   |  |   |  |
| Power Supply                              | 100-220 VAC rated voltage -20%/+10%, 50/60 Hz  |  |   |  |
| Power consumption                         | Transmitter: 10 W max.; receiver: 10 W max.  |  |   |  |
| Connection                                | with Connector cable 2m (CVV 0.75mm <sup>2</sup> )   |  |   |  |
| Ambient temperature                       | Optical head, Fiber: -25 to +200°C<br>Amplifier: -25 +55°C (Non-freezing)  |  |   |  |
| Storage temperature                       | -40 to +70°C (Non-condensing)  |  |   |  |
| Ambient humidity                          | 35 to 85%RH (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)<br>Between power supply and output: 1500VAC for 1 minute (between reed relay outputs: 1,000 VAC for 1 minute) |  |   |  |
| 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   |  |   |  |
| Mass                                      | Optical head   | OHC: About 680g / OH <sup>2</sup> : About 2.5kg              |   |  |
|   | Airless hood   | F38S : about 240g  | F38S-03 : about 430g  |  |
|   |  | F38S-04 : about 550g   | F38S-05 : about 650g<br>F70N : about 1.8kg                    |  |
|   | Air purge hood   | F38PC-02 : about 240g  | F38PC-03 : about 300g   |  |
|   |  | F38PC-04 : about 370g<br>703L : about 3.3kg                  | F38PC-05 : about 440g   |  |
| Fiber                                     | FG2 : about 0.7kg<br>FG5 : about 1.3kg<br>FG15 : about 3.1kg   | FG3 : about 0.9kg<br>FG7 : about 1.6kg<br>FG20 : about 4.1kg | FG4 : about 1.1kg<br>FG10 : about 2.1kg<br>FG30 : about 6.1kg |  |
| Amplifier                                 | Transmitter: about 1.5 kg; receiver: about 1.5 kg  |  |   |  |

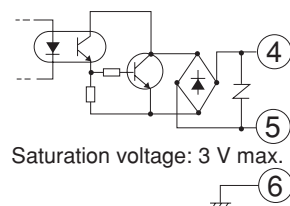
## Input/Output

### Circuit and Connection

- Control output  
Model FTR44A  
Model FTR44AH

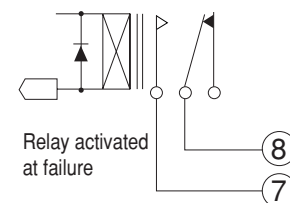


Model FTR44AC



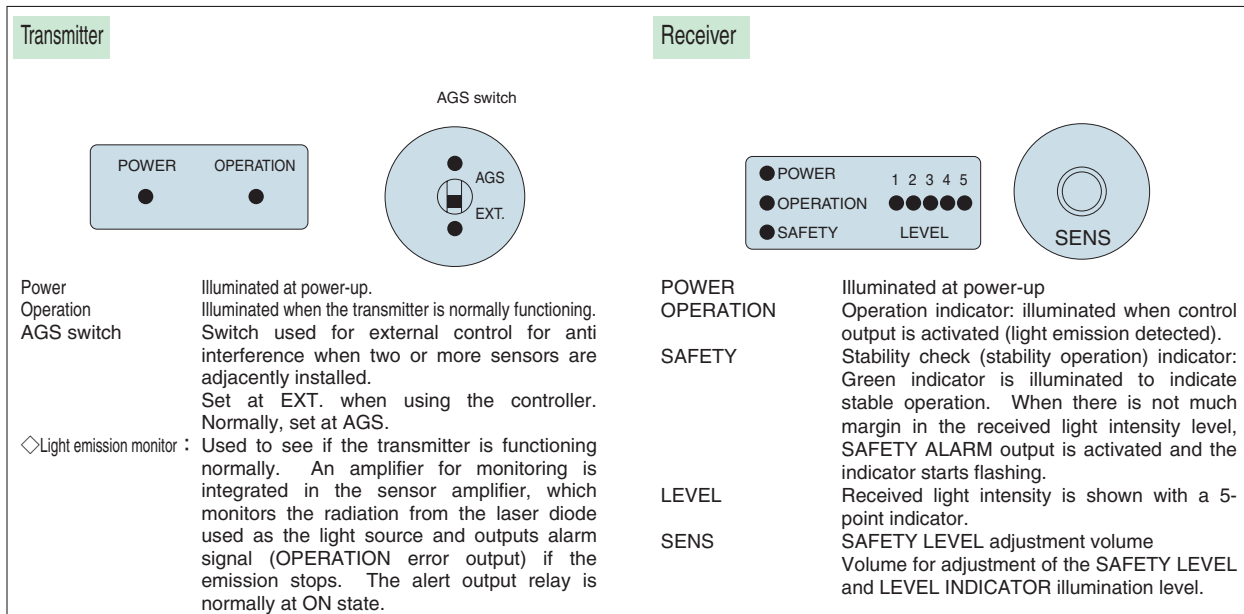
Saturation voltage: 3 V max.

- SAFETY ALARM OUTPUT  
(all models)



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

## Amplifier panel layout

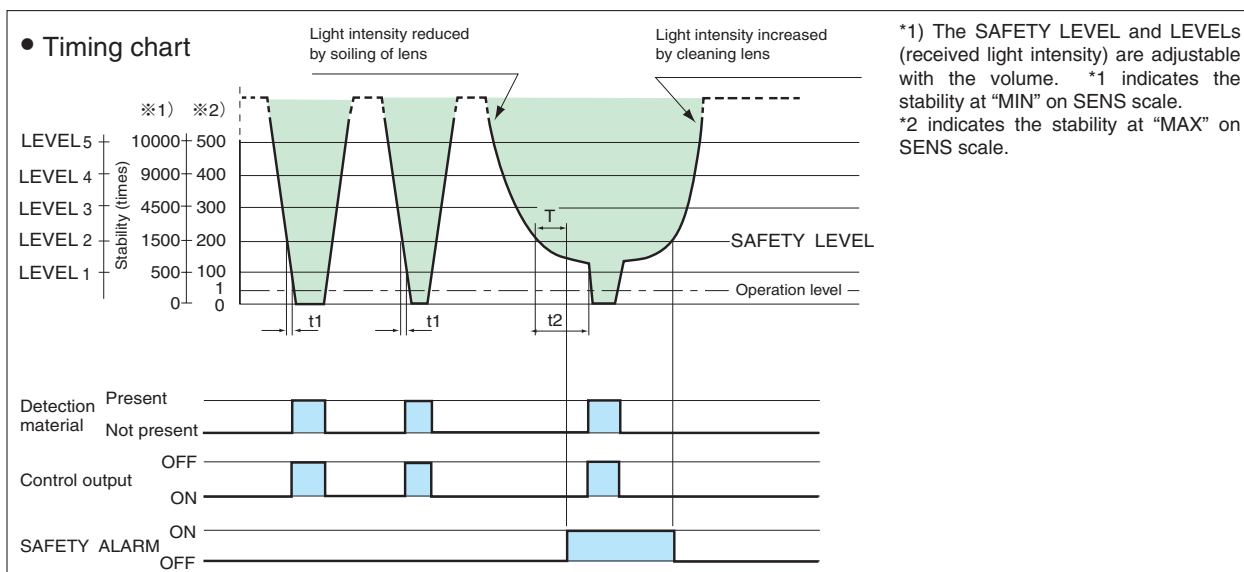


## Control Output and Stability Check Feature

**Control output :** Relay is activated when the light from the transmitter is detected by the output receiver.  
 Relay is deactivated when the light from the transmitter is blocked by the detected object.

**Stability check feature (SAFETY ALARM output)**

**Operation :** The light intensity level (stability) 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 dirt deposits on lens or light axis misalignment, etc.  
 The SAFETY LEVEL is variable between 200 and 1,500 times as much as the operation level. The output is reset when the received light intensity exceeds the SAFETY LEVEL.



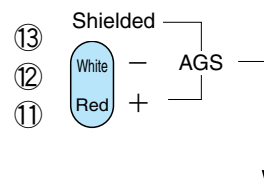
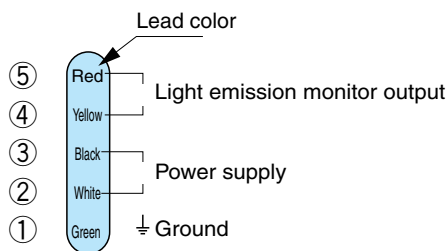
**SAFETY ALARM operation :** The duration between the reduction of the received light intensity level under the SAFETY LEVEL and the control output activation is calculated and, if this duration is longer than a certain duration T, the SAFETY ALARM is output.

For example, the duration t1 between the reduction of the received light intensity level under the SAFETY LEVEL and the control 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 t2 during which the light intensity is under the SAFETY LEVEL is longer, 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.)

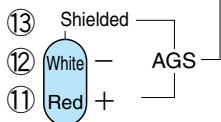
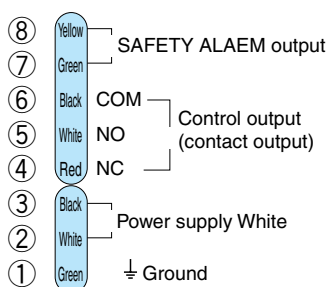
# FT44A

## Connection

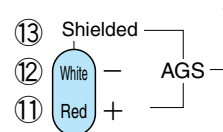
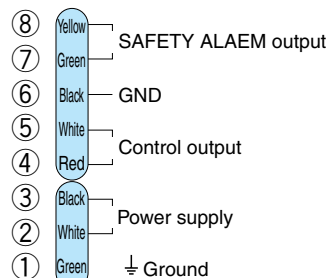
### Transmitter



### Mini power relay output type Relay output type



### Solid-state output type: FTR44AC



When the leads are extended (100-300 m), stray capacitance between leads may cause rush current.

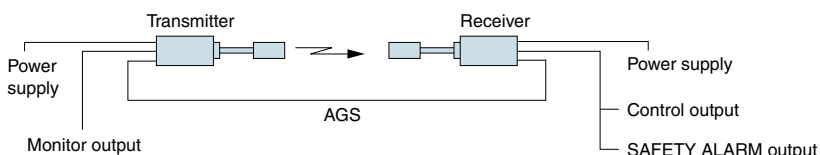
If this poses any problem, provide a resistor (10-50 Ω) in series with the contact.

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.

## AGS

The AGS terminals on the transmitter and receiver can be used in the following three ways:

### 1) Detection power increase



When the AGS terminals are connected with each other, a synchronization signal is sent out from the transmitter, which is detected with the AGS circuit in the receiver, and the sensitivity (amplifier gain) is automatically increased to about double that before the connection of AGS. This provides high power.

The synchronous rectifier circuit is activated at the same time, which increases resistance to noise for even higher reliability. This feature is effective for use in situations such as hampered light transmission due to smoke or vapor or environment subject to electric noise.

### 2) Prevention of interference

When two or more sensors are adjacently installed, light from the neighboring transmitter reaches the receiver even if the object blocks the light beam, this causes faulty operation. To prevent this situation, connect the AGS to an external controller to externally synchronize the transmitter emission and receiver gating.

This also automatically increases the receiver sensitivity and activates the synchronous rectifier circuit.

For details about the scanning controller, see "LSC Series."

### 3) Normal operation without connecting AGS

Connection of AGS provides advantages as described above. However, leaving the AGS unconnected has no effect on operation in ordinary environment and the sensor may be used as an ordinary photo sensor.

## Optical Head Power Characteristics (Typical example)

Different models of optical head (OHA and OH2) have different levels of power. The same optical head model may generate different levels of power depending on whether it is used for transmitter or receiver. This is due to the difference of power density depending on the effective lens diameter or spread of light beam.

The table on the right shows power levels with reference to the power 100 with OH2 used as the optical heads for both transmitter and receiver.

| Optical head |          | Relative power<br>(with OH2 as 100) |
|--------------|----------|-------------------------------------|
| Transmitter  | Receiver |                                     |
| OH2          | OH2      | 100                                 |
| OH2          | OHA      | 35                                  |
| OHA          | OH2      | 25                                  |
| OHA          | OHA      | 9                                   |

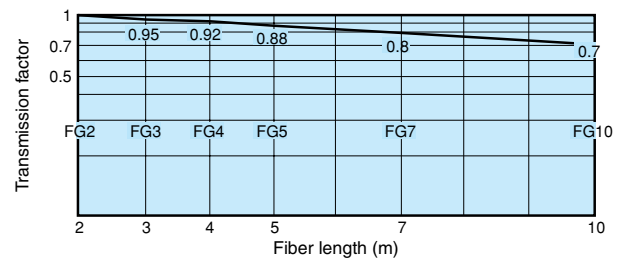
## Fiber Transmission Factor Characteristics (Typical example)

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:

$$0.7 \times 0.7 = 0.49$$



## Received Light Intensity Level Characteristics (Typical example)

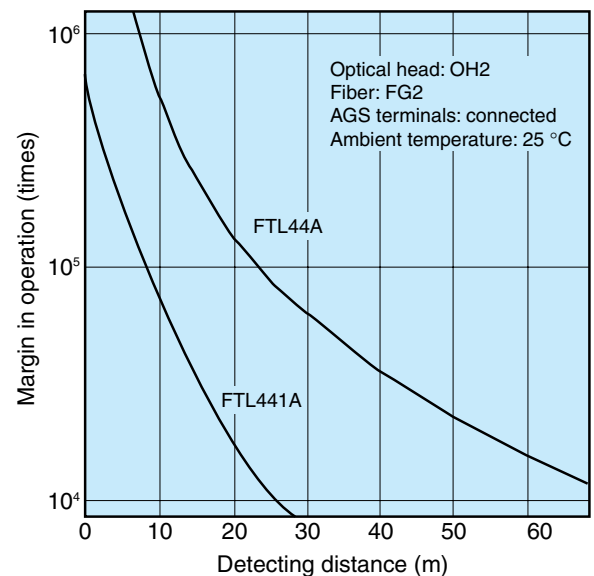
The data shows margin in operation against detecting distance with fiber optic cable FG2 (length 2 m) and optical head OH2 used for both transmitter and receiver. For other fiber and optical head models, find the data based on the transmission factor of the fiber and power of the optical head.

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 20 m is about 130,000 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 20 m with FG10 used for both transmitter and receiver,

$$130,000 \text{ (times)} \times 0.49 = 60,000 \text{ (times)}$$



## Light axis alignment

See P. 520.

Do not attempt to visually align (with optical sight) the axis when laser beam is emitted.

# FT44A

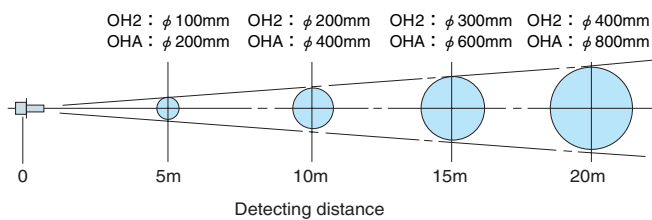
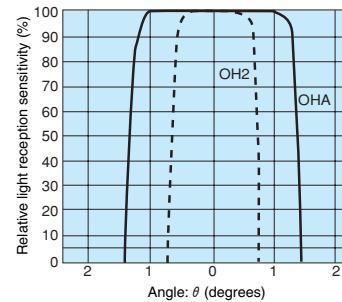
## Directional Characteristics

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  $\pm 1.7$  degrees, which translates to a spread of about 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.

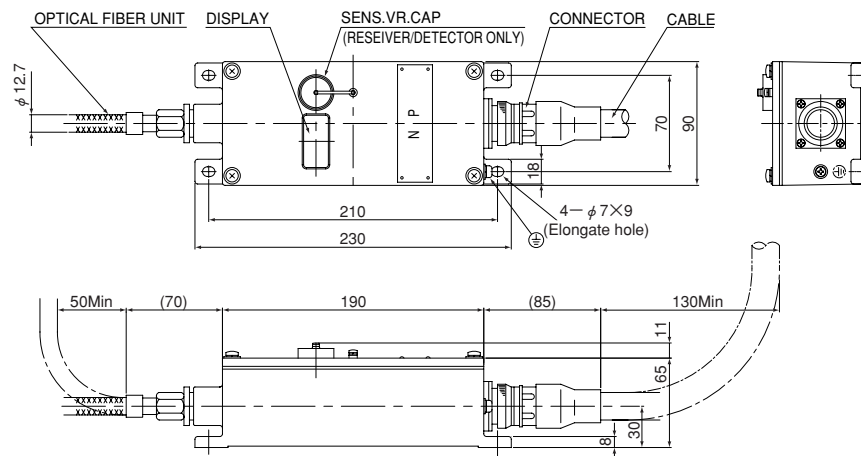
The angle of aperture for relative light reception sensitivity 50% is  $\pm 1.2$  degrees, which means that practical light beam spread is about  $\phi 400$  mm at detecting distance 10 m.



## Dimensions (in mm)

### Amplifier

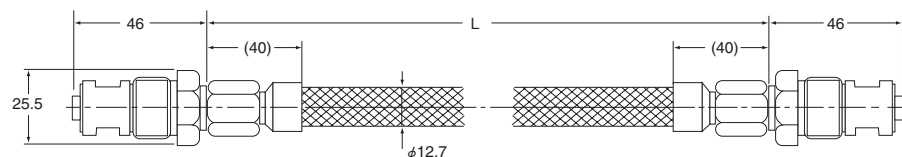
CAD



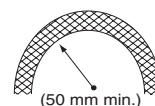
### Fiber

CAD

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



(Allowable bending radius)



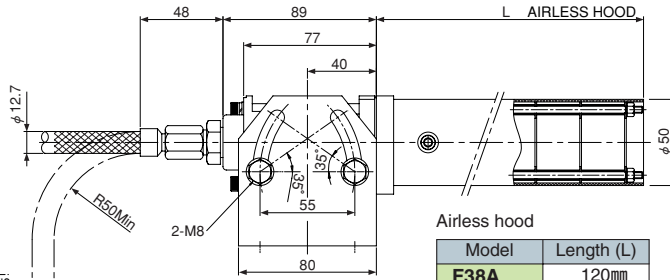
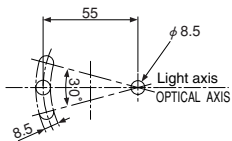
## Dimensions (in mm)

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

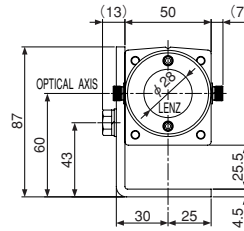
Optical head  
Model OHA

CAD

Mounting hole  
dimensions



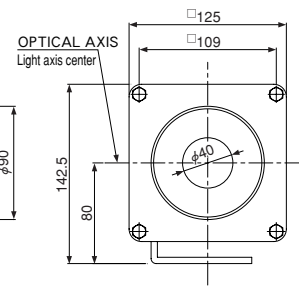
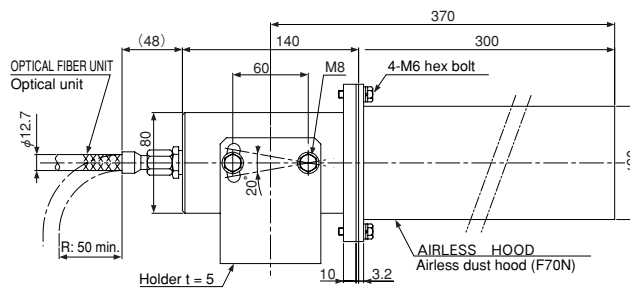
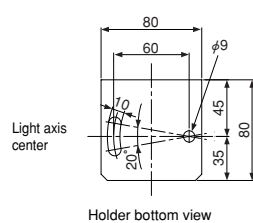
| Model   | Length (L) |
|---------|------------|
| F38A    | 120mm      |
| F38A-02 | 200mm      |
| F38A-03 | 300mm      |
| F38A-04 | 400mm      |
| F38A-05 | 500mm      |



Optical head Model OH2  
Airless hood Model F70N

CAD

Mounting bracket bottom view

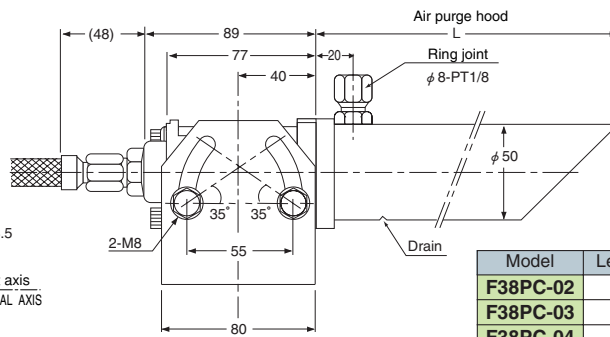
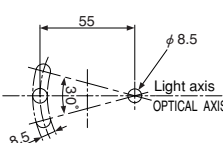


### Example of combination of air purge hood and optical head

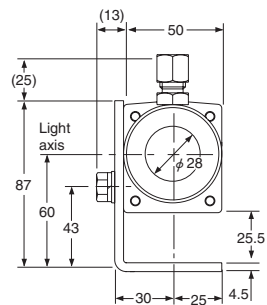
Optical head Model OHA

CAD

Mounting hole  
dimensions



| Model    | Length (L) |
|----------|------------|
| F38PC-02 | 200mm      |
| F38PC-03 | 300mm      |
| F38PC-04 | 400mm      |
| F38PC-05 | 500mm      |

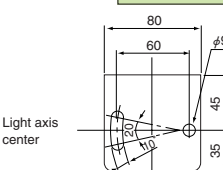


Optical head Model OH2

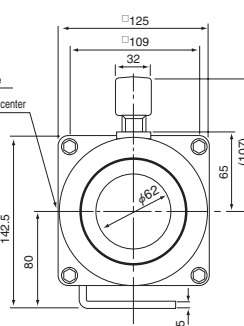
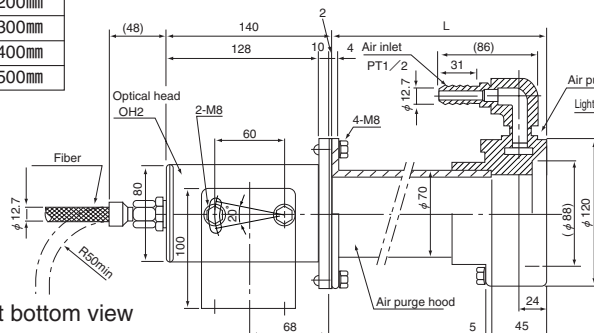
CAD

Air purge hood

| Model | Length (L) |
|-------|------------|
| 702L  | 200mm      |
| 703L  | 300mm      |
| 704L  | 400mm      |
| 705L  | 500mm      |



Mounting bracket bottom view

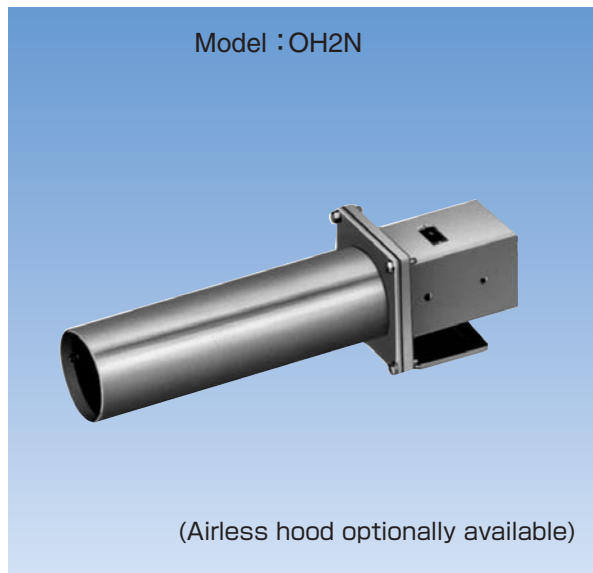


Air purge specification  
Flow rate...200 l/min  
Withstand pressure...0.98MPa



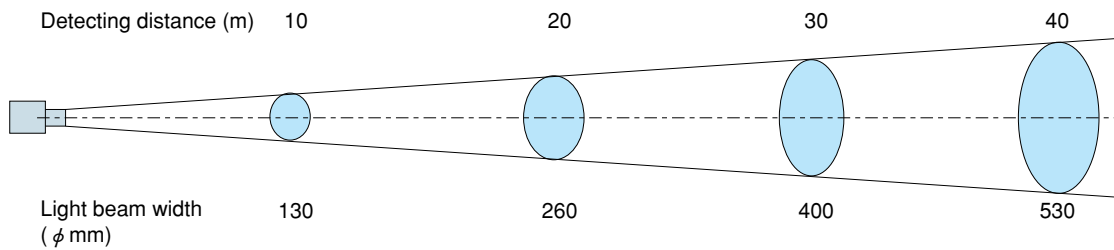
# Optical head

Optical head for FT44A series



- **Greatly increased power**  
About fivefold enhancement (compared with Takex OH2)
- **Narrow-view achieved**  
Light beam width and view reduced to about 60%
- **Easily replaceable**  
Readily replaceable where OH2 was not powerful enough

## Detecting distance and Light Beam Width



## Dimensions (in mm: with Airless hood and fiber attached)

