



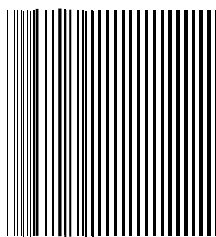
**IM Series**  
**Infrared Multiple-constituents Analyzer**

**Fiber Optic Moisture Meter/Detector Unit**

**Model: IRMA21**

**IRMA22**

**Instruction Manual**



# INSTRUCTIONS

Store this manual in a readily accessible location for future reference.

This manual should be provided to the end user.

## Introduction

Thank you for purchasing the IM series infrared constituents analyzer [Fiber optic moisture meter / Detector unit IRMA21□□, IRMA22□□].

Read this manual carefully to ensure that you use this product correctly and safely.

### ◆ Regarding this manual

- (1) This manual should be provided to the end user.
- (2) Read this manual carefully to gain a thorough understanding of how to operate this product before starting operation.
- (3) This manual describes the functions and maintenance of this product. Store it in a readily accessible location for future reference.
- (4) If you have unclear points or need technical assistance, please contact your sales agent of CHINO Corporation.

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## Notices

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1. The contents of this manual are subject to change without notice.
2. Every effort has been made to ensure that the details of this manual are accurate. However, should any errors be found or important information be omitted, please contact your nearest agent of CHINO Corporation.
3. Under absolutely no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without permission.

# Important Operational Instructions




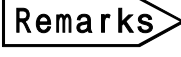

Be sure to read the following safety instructions before this product is installed, operated or stored.

## 1. Working conditions and environment

- 1) This product is installed with the mounting screw holes (four M8 screw holes) on its top surface. Refer to [3. Installation] and fix the detector unit firmly.
- 2) Do not place this product on a desk or the like. This product may fall, causing this product to malfunction or causing serious injury of personnel.
- 3) Do not use this product in a location where volatile, corrosive or flammable gas is present, or in a location where moisture, chemical or seawater is splashed.


## 2. Symbols used in this manual















The following symbols are used depending on important degrees of warnings/cautions for using this product safely and for avoiding malfunctions or unexpected situations.









Important degree	Symbols	Contents
1		This symbol is indicated with a title for an explanation with <b>Warning</b>
2		For avoiding the risk of a fire or electric shock or other dangers that may result in serious injury or death of personnel or malfunctions/damage to this product
3		For avoiding the risk of injury or physical damage to this product
4		Important information that must be read carefully
5		Supplementary information that users are advised to read.

# Warnings and Cautions







Please observe the following safety precautions fully for using this product correctly. In addition, please read this manual carefully and store it in a readily accessible location for future reference.

The  mark indicates prohibited operations.

 <b>Warning (May cause death or serious injury of personnel)</b>	
	<b>Do not operate this product in a location where flammable or volatile gas is present.</b> The use of this product in such environment may result in the risk of explosion. 
	<b>If this product emits any smoke, abnormal noise or unusual odor, immediately turn off power.</b> Do not continue to use this product as it may result in the risk of fire or electric shock. Turn off the power source to this product and contact your nearest sales agent of CHINO Corporation. Do not repair this product yourself as it may be dangerous. 
	<b>Never touch the internal parts of this product.</b> If you touch the inside of this product, it may result in injury of personnel by electric circuits or a moving part Even when you open the case of this product for maintenance works, never touch the internal parts. 
	<b>Do not attempt to repair or modify this product.</b> Repairing or modification must be carried out by service personnel authorized by CHINO Corporation. If you repair or modify this product yourself, it may not fulfill this product's functions, or it may result in the risk of electric shock or damage to this product. 
	<b>Do not touch, with wet hands, the power supply terminals or plugs of the power cord.</b> If you touch, with wet hands, the power supply terminals or plugs of the power cord, it may result in the risk of electric shock. 
	<b>If you notice something suspicious, immediately turn off power.</b> If the temperature of the power cord or other cable is high abnormally, turn off the power source to this product immediately and contact your nearest sales agent of CHINO Corporation. 
	<b>Confirm the grounding.</b> For avoiding the risk of electric shock, before supplying the power to this product, make sure to confirm that the power terminals and the protective ground terminal have been wired correctly and reliably.

 <b>Caution (May cause injury of personnel or physical damage to this product )</b>	
	<b>Confirm the specifications (Model code) of this product.</b> Before using this product, check that the model code shown in the serial number plate matches your order.
	<b>Separate precautionary safety measures before using this product are recommended.</b> When this product is used in equipment that need security measures, provide separate safety measures with the equipment, responding to phenomena resulting from erroneous operations or malfunctions of this product or malfunctions of related instruments, before using this product.
	<b>Use crimp type lugs for termination of wires.</b> For avoiding dropping-out or short-circuit of wires, use crimp type lugs for their termination.
	<b>Confirm the power to this product.</b> Before supplying the power to this product, make sure to confirm that the power voltage matches the rated voltage to this product and that the power terminals and the protective ground terminal have been wired correctly and reliably.
	<b>Do not continue to use this product remaining malfunctioned.</b> Do not continue to use this product remaining malfunctioned as it may result in the risk of fire or electric shock. Contact your nearest sales agent of CHINO Corporation for repairing. 
	<b>Comply with the descriptions in this manual.</b> Comply with the descriptions and handling instructions in this manual to ensure that you use this product correctly and safely. If you fail to comply with the descriptions and instructions for using this product, it may result in damage to or functional decline of this product or damage to the equipment.

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# 1. Introduction

## 1.1 General

The IM series infrared multiple-constituents analyzer [Fiber optic moisture meter/detector unit IRMA2100/IRMA2200] is a fiber optic on-line moisture meter using the principles of infrared absorption by moisture. This moisture meter is configured with a detector unit, a fiber optics, an operator interface/display unit and accessories.

The detector unit is provided with 99 built-in calibration curves and outputs a linear analog signal proportional to moisture content of a sampled material.

As the stand alone detector unit provides function keys, digital displays and a digital signal for communication, it can be operated on its own or with a personal computer.

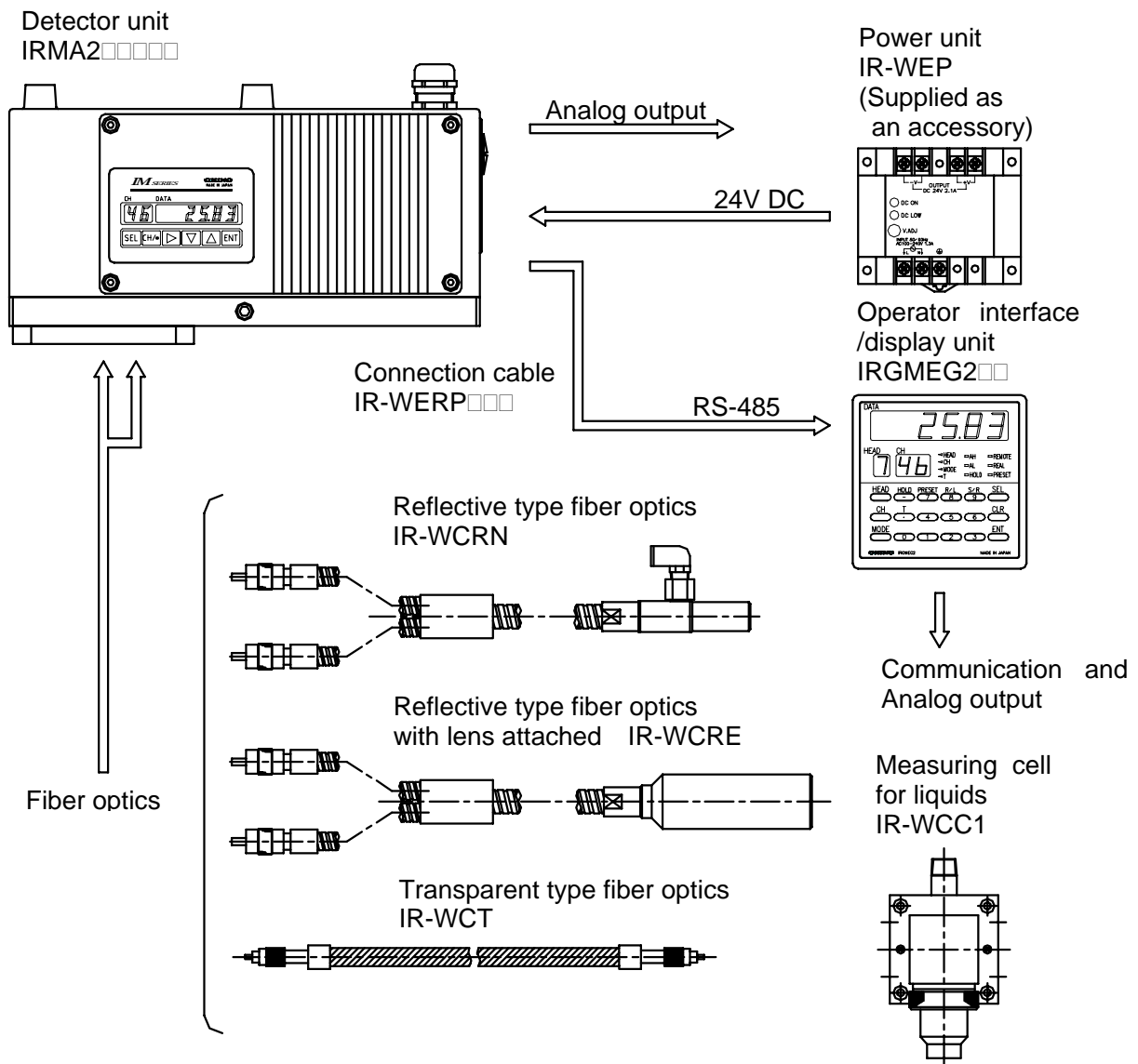
Two kinds of fiber optics, reflective type and transparent type, are available. The reflective type fiber optics is for moisture measurement in powders or sheets and the transparent type fiber optics is for liquids by combining with a measuring cell for liquids.

The operator interface/display unit can communicate with up to nine (9) detector units, and displays the moisture content value digitally as well as accessing to various parameters of the detector unit.

Accessories including cables, connecting the detector unit to the operator interface/display unit or to the power unit, and the output checker plate for your own calibration are available. This manual describes about the detector unit, the fiber optics (reflective and transparent types), the measuring cell for liquids and accessories.

The instruction manual is separately available for the operator interface/display unit.

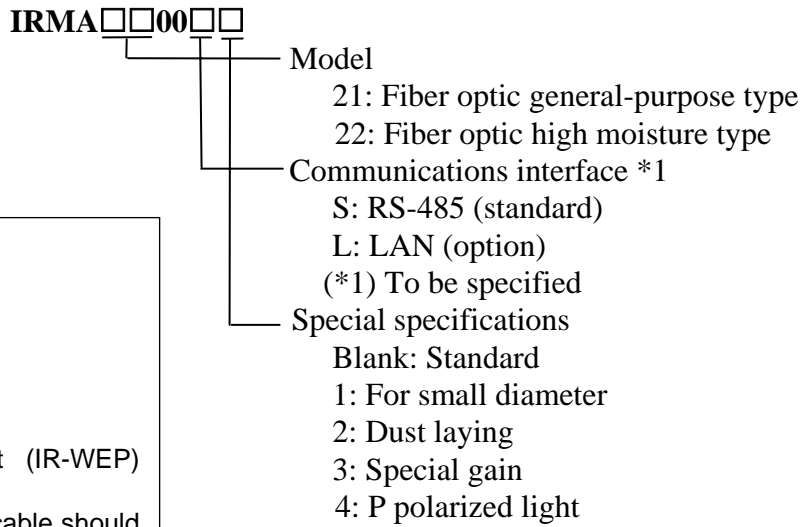
## 1.2 Configuration



## 2. Models and accessories

### 2.1 Models

#### 2.1.1 Detector unit



IEC61326 + A1 + A2  
 Emission class A  
 Immunity Annex A  
 Confirming condition  
 (1) The power unit (IR-WEP) should be used.  
 (2) The connection cable should be used indoor and its length should be 30m or shorter.

#### 2.1.2 Accessories

Name	Model
Reflective type fiber optics	IR-WCRN□□□
Output checker plate for reflective type fiber optics	IR-WCRNB (For reflective type fiber optics)
Reflective type fiber optics with lens attached	IR-WCRE□□□
Output checker plate for reflective type fiber optics with lens attached	IR-WCREB (For reflective type fiber optics with lens attached)
Measuring cell for liquids	IR-WCC1
Transparent type fiber optics	IR-WCT□□
Connection cable	IR-WERP□□□
Mounting adapter	IR-WED1
Relay box	IR-WEE□

### 2.2 Attachments

Name	Quantity	Remarks
Power unit	1 set	IR-WEP (Omron S82K-05024)
Fuse	2 pieces	SB10 (Nagasawa)
Flathead screwdriver	1 piece	For connection to the terminal board
Hexagon wrench (3mm width across flats)	1 piece	For removing/attaching the terminal cover or the display panel cover
Metal cable gland	2 pieces	MS-SC13.5 (LAPP)
Ferrite core	2 pieces	MSF10KEX (Morimiya)
Instruction manual	1 copy	This document
Instruction manual for communications	1 copy	Separate manual "IM series IRMA/IR-GMEG2 Communications"



### 3. Installation

(Refer to [5. Names and functions].)

#### 3.1 Settings of dipswitches

**Remarks**

Set the internal dipswitches before the settings of the detector unit.

##### 3.1.1 Connection of the detector unit and the operator interface/display unit

It is not required to change the settings of the internal dipswitches of the detector unit.

**Reference**

The above has been set as the default settings at shipment.

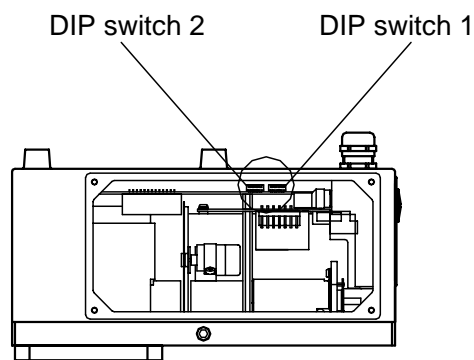
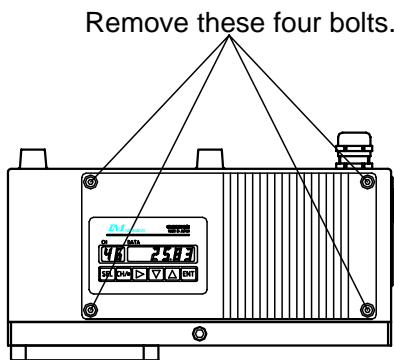
##### 3.1.2 Connection of the detector unit and a personal computer

The setting of the dipswitch 2 in the detector unit is required.

- (1) Remove the display panel cover by loosening four pieces of the M4 hexagon socket cap screw fixing it.
- (2) As the display panel cover is connected with internal components by cables, remove it carefully.
- (3) Set No.3 of the dipswitch 2 to ON (upper side).

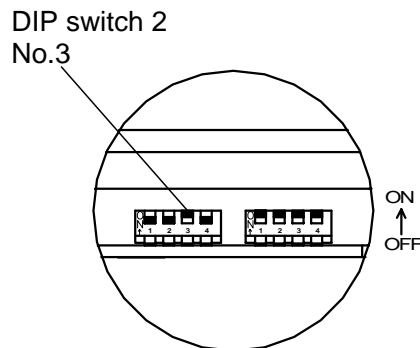
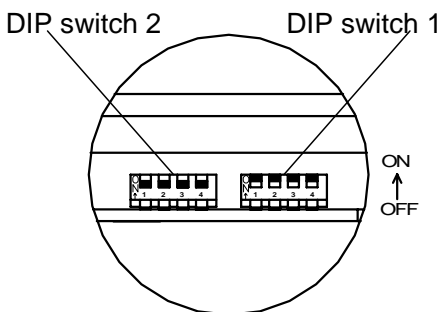
**Warning**

Make sure to turn off the power source to this unit before removing the display cover.



For connection of the detector and the operator interface/display unit (default settings at shipment)

For connection of the detector and a personal computer



**Caution**

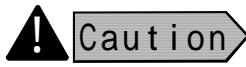
Do not change the settings of the dipswitch 1.

### 3. Installation

(Refer to [5. Names and functions].)

#### 3.2 Installation of reflective type fiber optics

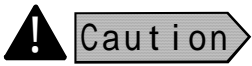
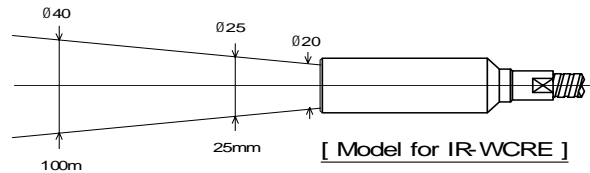
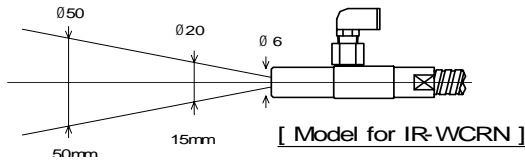
There are two types of reflective type fiber optics. One is “Without lens attached (IR-WCRN)” and the other is “With lens attached (IR-WCRE)”.



**Caution**

Place the tip of fiber optics with the following measurement distance from an object.

- Reflective type fiber optics 15 to 50mm
- Reflective type fiber optics with lens attached 25 to 100mm



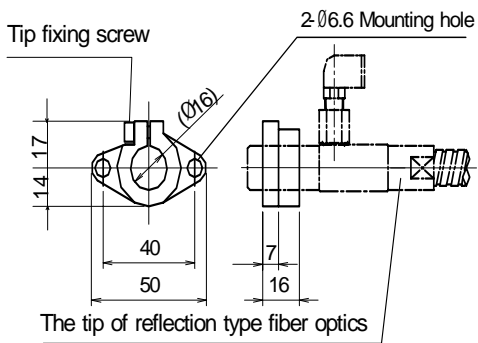
**Caution**

Fix the fiber optics with appropriate metal tools at several places for avoiding affect with vibrations, etc. Make sure not to bend the fiber optics below its minimum bending radius (100R).

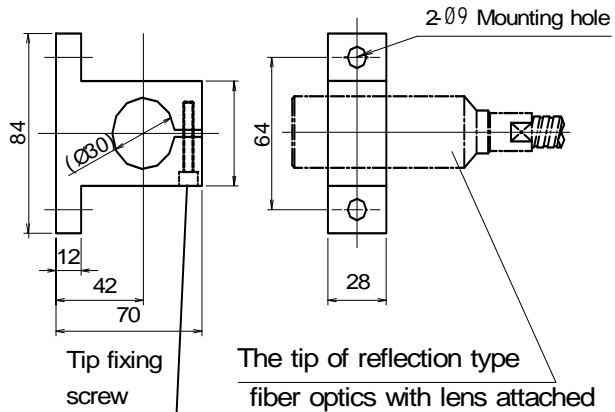
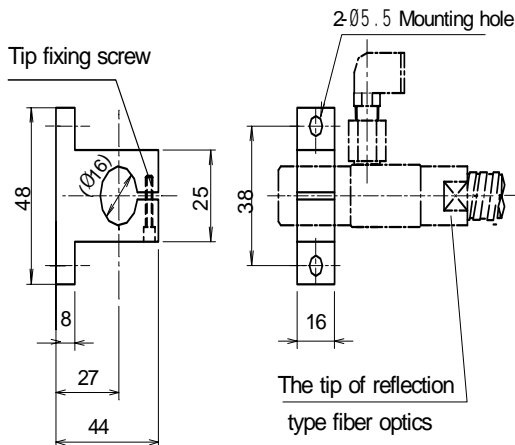
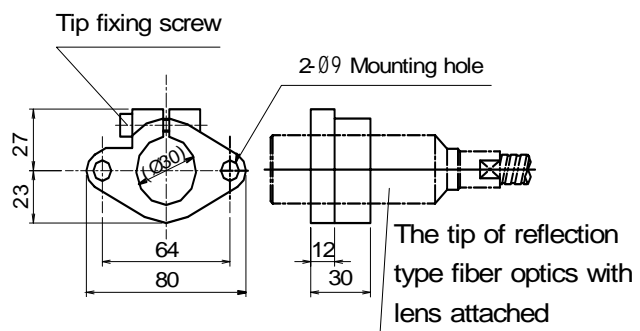
#### 3.2.1 Installation of tip part

Set an attached holder to the installation place first. Insert the tip of fiber optics into the hole of the holder and fix it by tightening the tip fixing screw. Two types of holders, horizontal mounting type and flange type, are attached.

(1) Reflection type fiber optics



(2) Reflection type fiber optics with lens attached



### 3. Installation

(Refer to [5. Names and functions].)

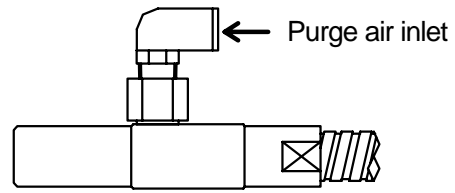
#### 3.2.2 Air purge (Only IR-WCRN)

When the air purging is required, supply dry air, not containing oil, dust, etc., from a purge air inlet. Connect a nylon tube of  $\phi 6\text{mm}$  in outer diameter and  $\phi 4\text{mm}$  in inner diameter to the purge air inlet.

[The tube inlet is PL6-01M (Nihon Pisco). When the reflection type fiber optics is used in ambient temperature more than  $60^{\circ}\text{C}$ , remove the nylon tube inlet and pipe to the screw hole of RC1/8 directly.]

Purge air flow: 5 to 20NI/min

Purge air pressure: 200kPa (2kgf/cm<sup>2</sup>) or lower

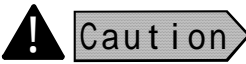


Purge air flow: 5 to 20NI/min

Purge air pressure: 200kPa (2kgf/cm<sup>2</sup>) or lower

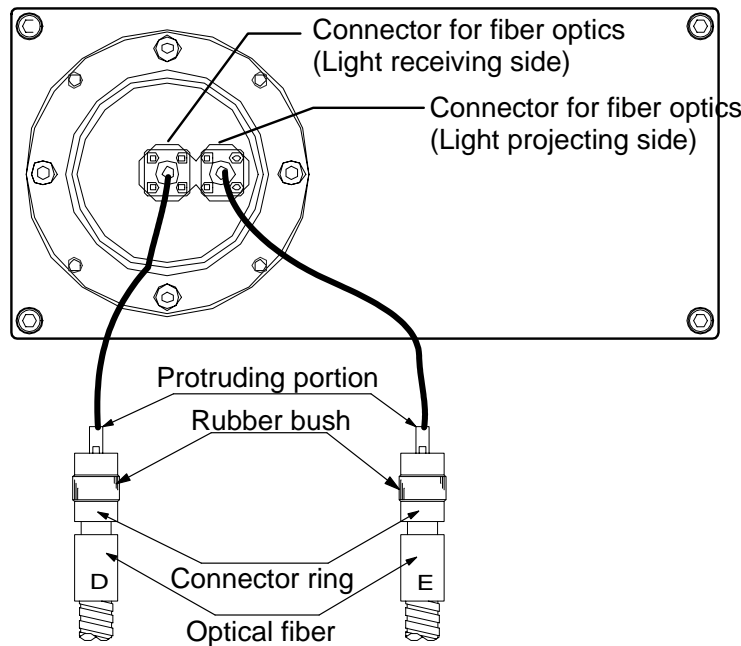
#### 3.2.3 Connections with detector unit

Connect the side being separated into two parts of light projecting side and light receiving side with the fiber optics connectors of the detector unit.



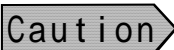
**Caution**

The fiber optics consists of “Light projecting side (E)” and “Light receiving side (D)” and each side is marked for identification.



D: Connector to light receiving side

E: Connector to light projecting side



Connect the D side of the fiber optics to the light receiving side of the detector unit and the E side to the light projecting side.

#### 3.2.4 Optical path

Select a place where water drops, dust particles, smoke, water steam, etc. will not enter between the tip of fiber optics and an object. If these substances cannot be prevented and their influences are negligible, purge them with air, or other remedial measure is necessary.

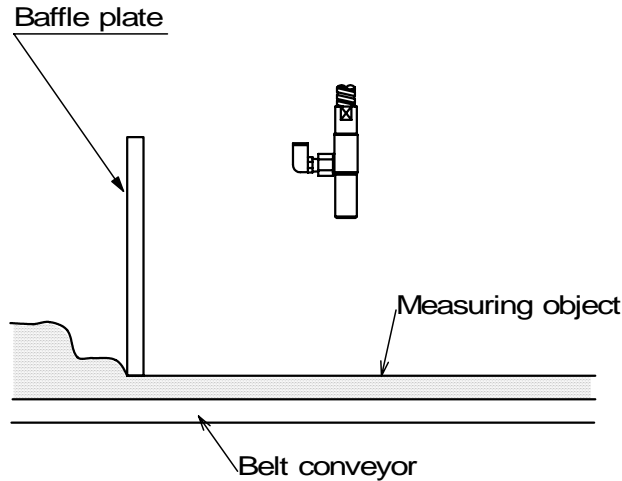
If direct current light like the natural light, which does not change its intensity momentarily, comes to an object, it does not cause any disturbance in measurement, but alternate current light like as electric bulb, flame, etc., causes disturbance. Further, strong light such as direct sunlight also causes disturbance. In such cases, it is necessary to shade the disturbing light to prevent it from direct shining on an object.

**3. Installation**

*(Refer to [5. Names and functions].)*

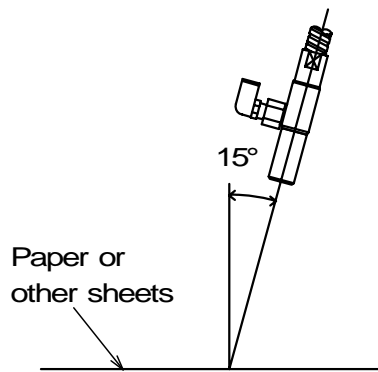
**3.2.5 Measuring place (for objects of pulverized or granular substance)**

For installation of the tip of fiber optics on on-line, select a place where the components(moisture etc.) difference is small between the surface and the inside of an object, like as at a hopper outlet or just behind the conveyor belt transfer place. If such a place cannot be selected, face the inside to the surface by using a baffle plate during measurement as shown in the figure.



**3.2.6 For the objects in sheet such as paper, etc.**

Tilt the tip of fiber optics by 15° from the vertical face as shown in the figure.



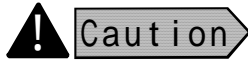
### 3. Installation

(Refer to [5. Names and functions].)

### 3.3 Installation of transparent type fiber optics

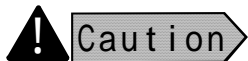
#### 3.3.1 Installation of measuring cell for liquids

Install a measuring cell to flow a sample liquid from down (marking IN) to up (marking OUT). Connect with the fiber optics between the detector unit and the measuring cell. Make sure to connect the light projecting side and the light receiving side of the fiber optics to the correct sides of the detector unit and the measuring cell.



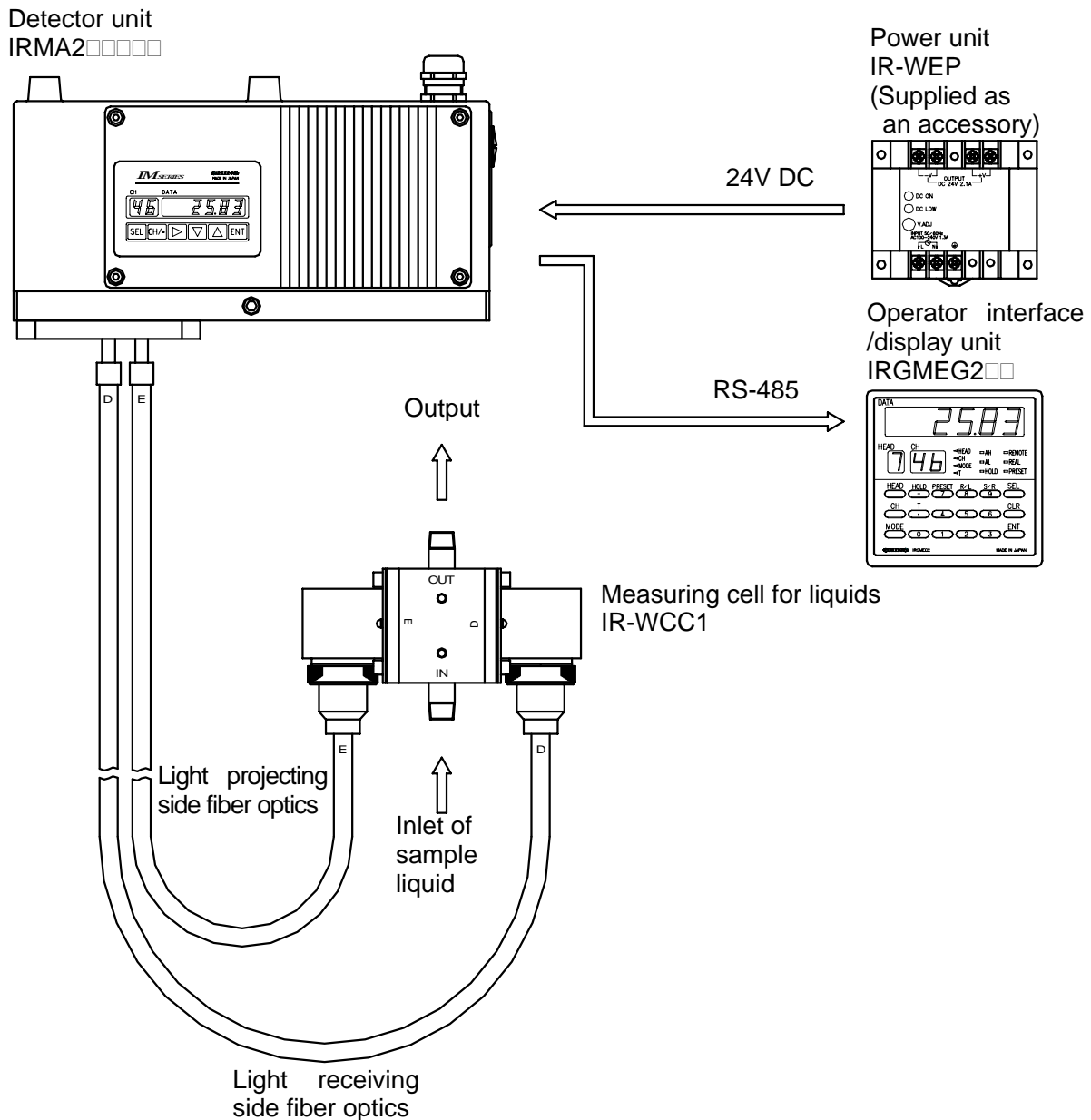
**Caution**

The fiber optics consists of “Light receiving side (D)”and “Light projecting side (E)”and each side is marked for identification. The measuring cell is marked with “D” and “E” for the fiber optics, too. For the installation of the measuring cell, make sure to match the markings each other.



**Caution**

Fix the fiber optics with appropriate metal tools at several places for avoiding affect with vibrations, etc. Make sure not to bend the fiber optics below its minimum bending radius (250R).



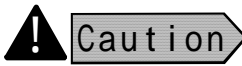
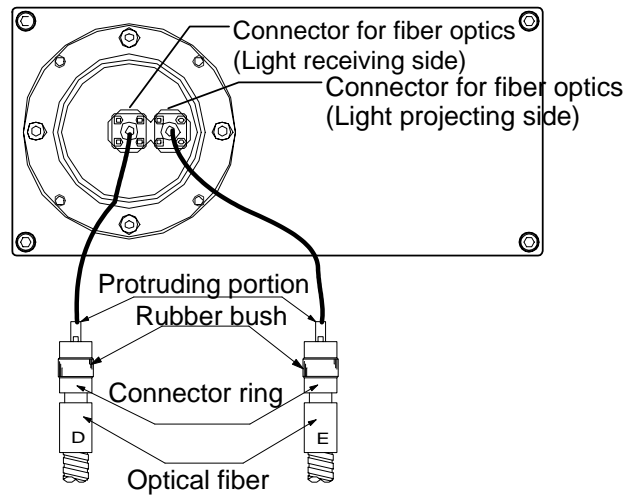
### 3. Installation

(Refer to [5. Names and functions].)

#### 3.3.2 Connection with detector unit and measuring cell

Connect the serial number indication side of the fiber optics to the detector side. Connect the company name (CHINO) indication side of the fiber optics to the measuring cell.

As the rubber bush is attached to the measuring cell, connect the fiber optics to the measuring cell through it.



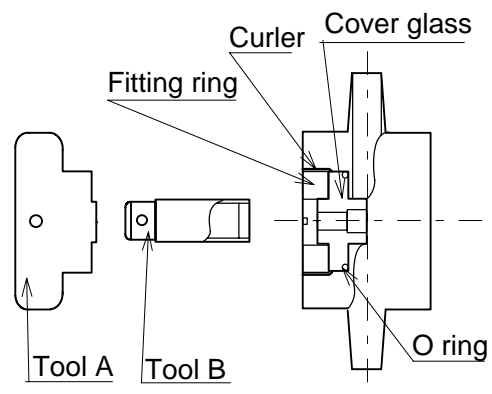
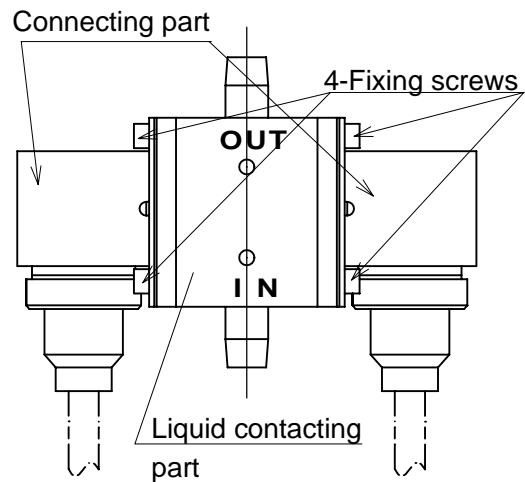
#### Caution

The fiber optics consists of “Light receiving side (D)” and “Light projecting side (E)” and each side is marked for identification. The measuring cell is marked with “D” and “E” for the fiber optics, too. For the installation of the measuring cell, make sure to match the markings each other.

#### 3.3.3 Disassemble cleaning

For accurate measurements, recommend periodical cleaning of the cover glass in a liquid contacting part of the measuring cell.

- 1) Remove the fiber optics (both of light projecting side and light receiving side), from the measuring cell.
- 2) Next, remove 4 screws fixing a connecting part and remove the connecting part from the liquid-contacting part.
- 3) Remove a fitting ring by using the tool A. Then after screwing the tool B into the cover glass, pull out the cover glass from the liquid-contacting part.
- 4) Wipe off dirt on the glass surface with a gauze, etc.
- 5) Confirm that an O ring is inserted in liquid-contacting part and push in the cover glass to the liquid-contacting part.
- 6) Match the positions of D and E characters of the connecting part and the liquid contacting part, and fix the connecting part.
- 7) After the cleaning of the cover glass, make sure to re-calibrate the detector unit.

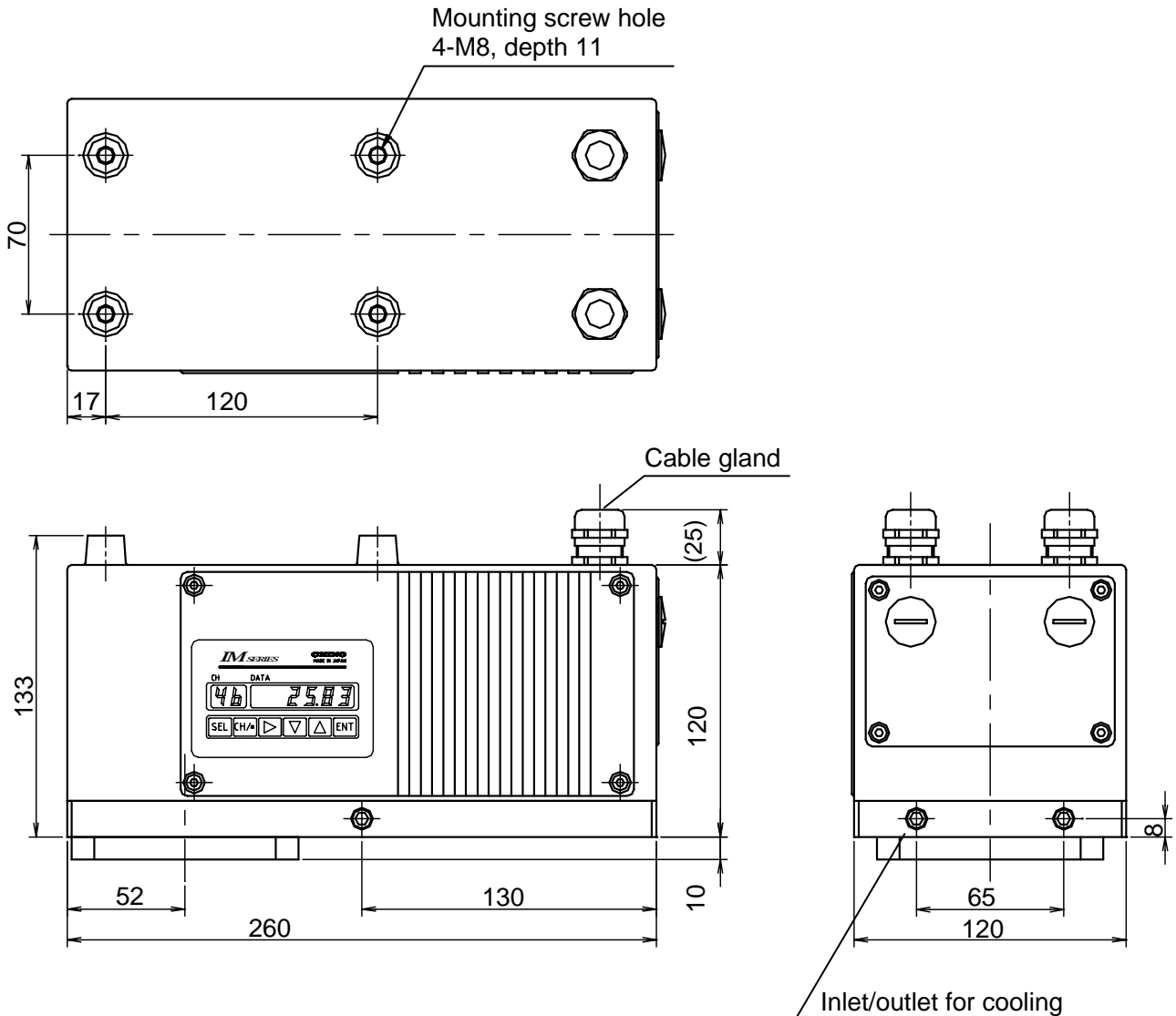


### 3. Installation

(Refer to [5. Names and functions].)

#### 3.4 Installation

This detector unit is for wall-mounting. Fix it to a wall or the like by 4 pieces of M8 screws by using 4 mounting holes on this detector unit. The external and mounting dimensions are shown in the following figures.



**Caution**

**Mechanical vibrations and impacts**

To install this detector unit, select a location where mechanical vibrations or impacts are minimal.

**Caution**

**Magnetic disturbances**

This detector unit is designed to withstand magnetic disturbances. However, install it as far away from induction heating oscillators or power lines as possible.

**Caution**

**Working temperature and humidity**

The working temperature of 10 to 30°C is ideal for this detector unit. The low working humidity is preferable. The high humid environment may result in measuring errors due to dew condensation by temperature change.

## 4. Connections



### 4.1 Layout of connection cable

**Caution**

For connection of cables, be careful of the following points.

- (1) Separate the cables from induction heating oscillator and power lines.
- (2) Keep the cables free of deposit of water, oil, etc.
- (3) Don't bend the cables extremely or apply any excessive force to them.
- (4) For permanent layout, protect the cables with conduits, etc.

#### For conformance to CE

- (1) Change 2 pieces of the resin cable glands (standard) to the supplied metallic cable glands.
- (2) Attach the supplied ferrite cores to cables. You are required to attach one ferrite core to one cable at a place as close to the cable gland.

### 4.2 Single-detector connections

The internal terminal board is accessible by removing the terminal board cover of the detector. Lead in cables through the upper cable glands, and connect them to respective terminals.

Lead in the exclusive cable IR-WERP (φ10mm outer diameter) through the cable gland 1.

Lead in cables for signal, etc. through the cable gland 2.

**Reference**

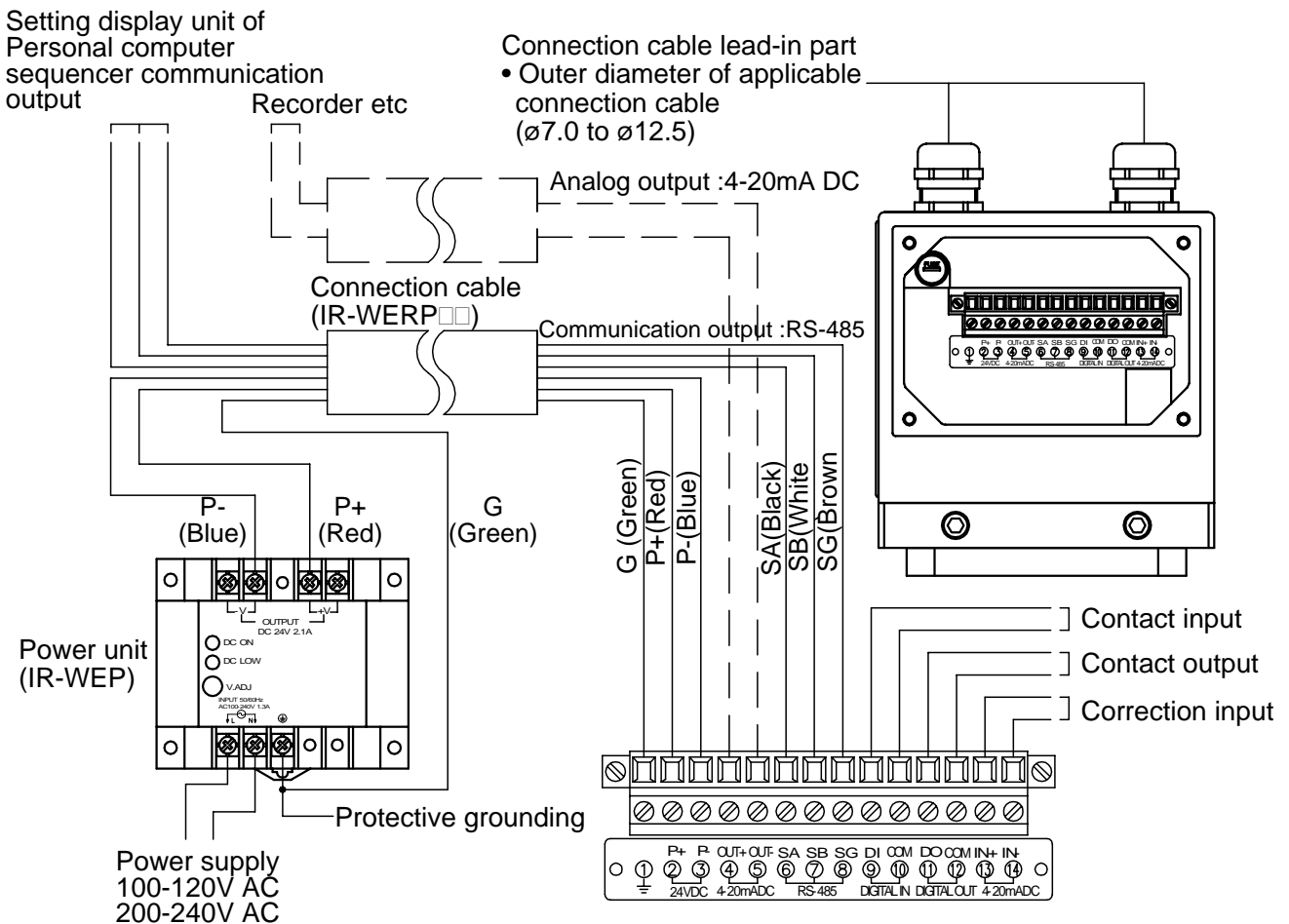
Use the cables with the outer diameter of φ7.0 to 12.5mm for the connections.

**Warning**

For avoiding the risk of electric shock, make sure to turn off the power source to this unit before wiring to the power terminals.

**Caution**

Use cables suiting to the applicable outer diameter of the cable gland; otherwise waterproofing of the detector may deteriorate. Tighten the cable glands with the nuts and fix the terminal board cover securely after wiring.






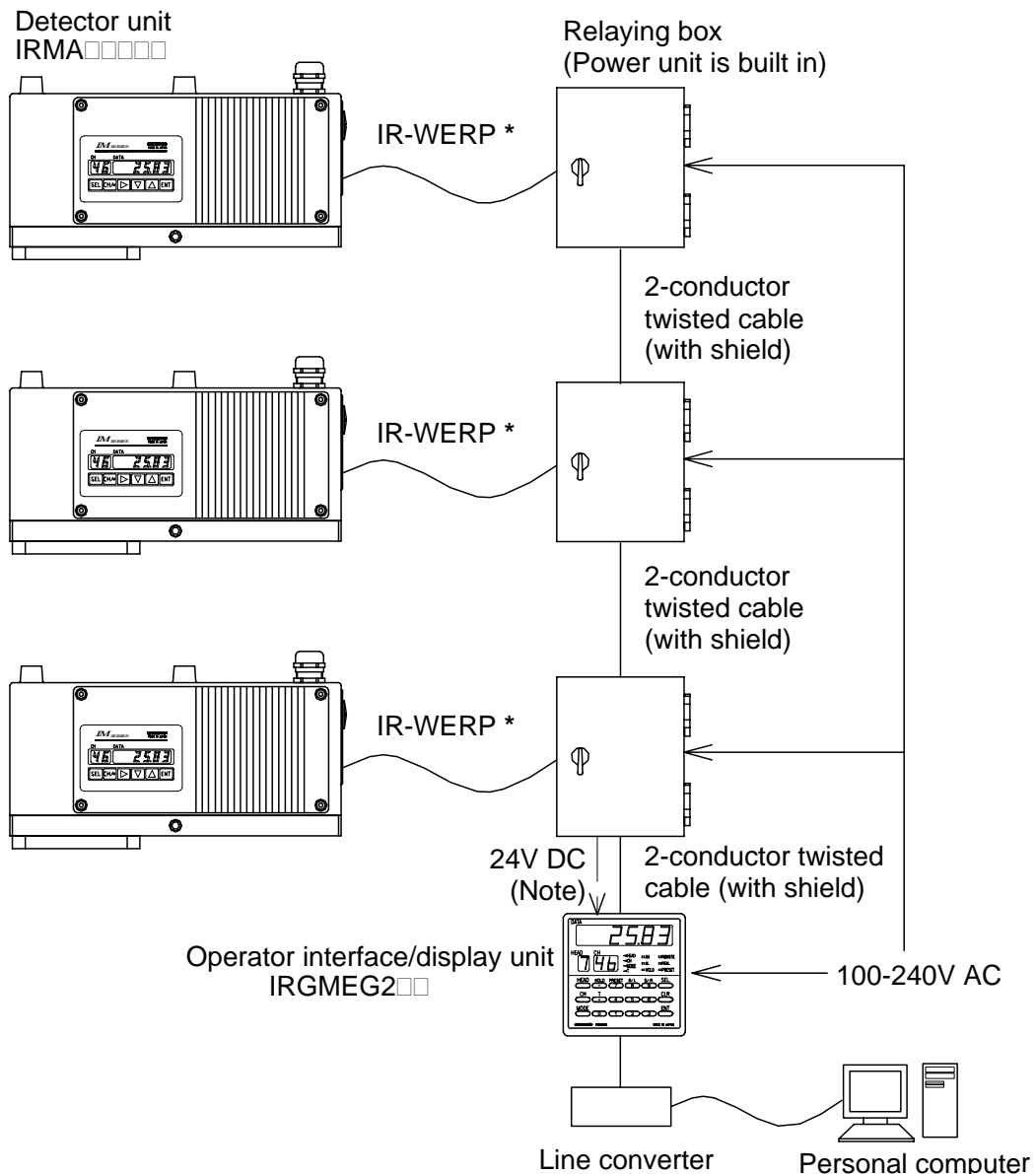
# 4. Connections

## 4.3 Multiple-detectors connections


By using the operator interface/display unit, you can connect the detector unit up to 9 sets. Two wiring methods are available. One is wiring through a relaying box (IR-WEE□) and the other is without the relaying box (IR-WEE□).

 **Caution** For both wiring methods, before connecting with the operator interface/display unit or before turning on the power to the operator interface/display unit, set the detector unit numbers not to overlap them. Refer to [6.2 Setting of detector unit number] for the details.

### 4.3.1 Connections through relaying box



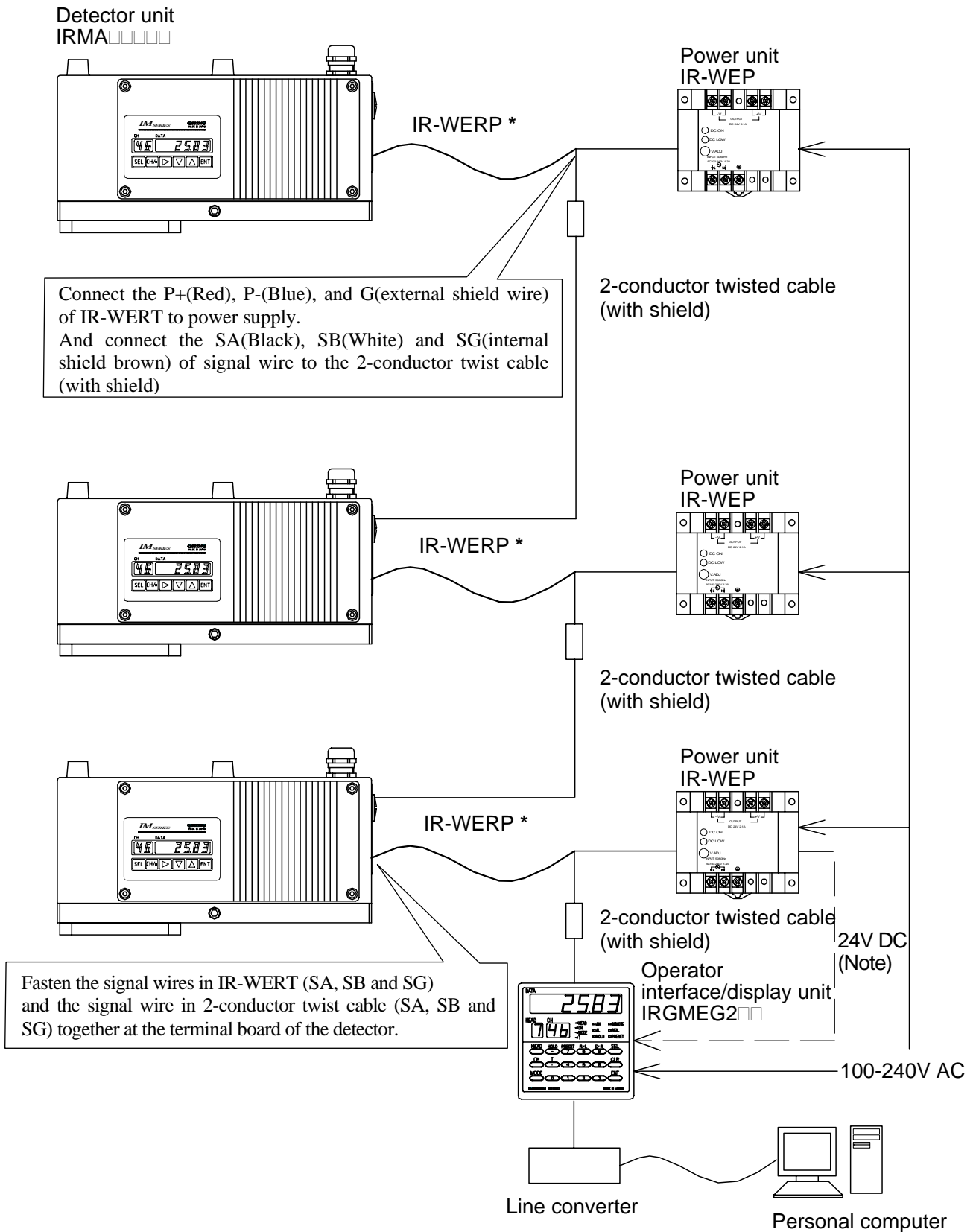
(Note) 24V DC at CE marking

 **Caution**

1. The length of exclusive cable (IR-WERT \* mark) should be within 10m or shorter and shorten it as much as possible.
2. For wiring to the relay box, refer to “Instruction manual of relay box”.

# 4. Connections

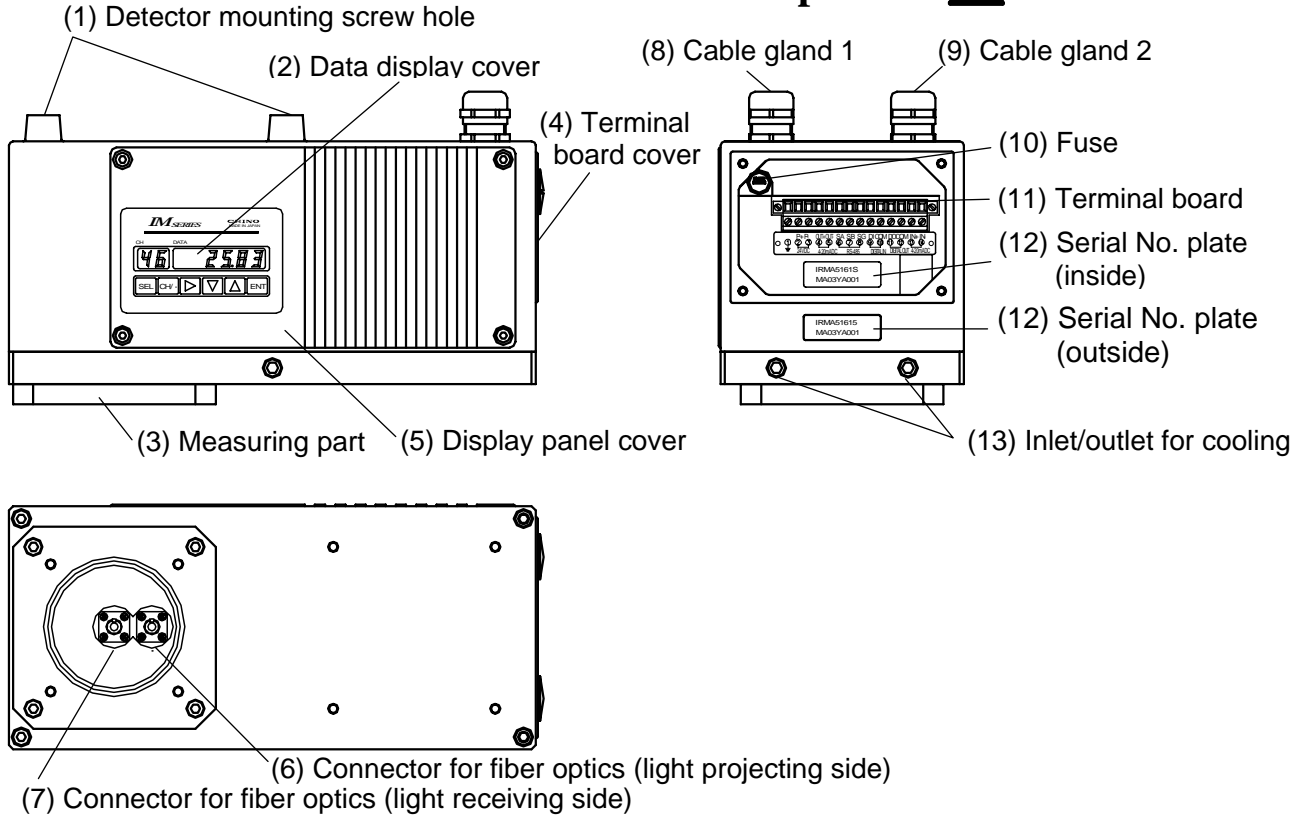
## 4.3.2 Connections without relaying box



(Note) 24V DC at CE marking

## 5. Names and Functions

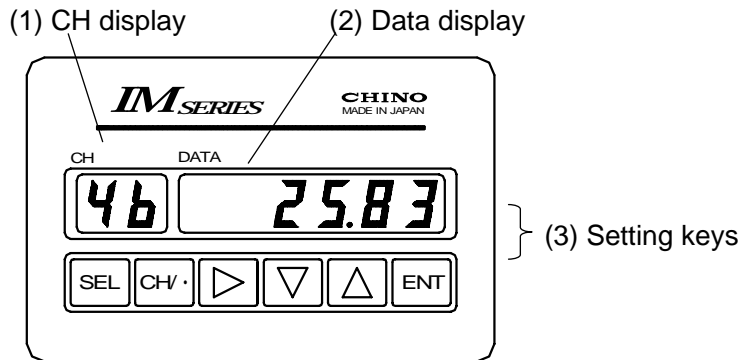
### 5.1 Names and functions of detector unit components



Names	Functions
(1) Detector mounting screw holes	Four M8 screw holes (11mm in depth) for fixing the detector unit to a mounting plate, etc.
(2) Data display window	Displays calibration curve numbers, measured values, etc.
(3) Measuring part	The optical assembly, the detector element and the electric circuits are built in.
(4) Terminal board cover	It is fixed with four M4 hexagon socket cap screws and removed for writing. The terminal board and the fuse are built in. The serial number plate showing the model number is pasted on the lower side.
(5) Display panel cover	It is fixed with four M4 hexagon socket cap screws. The lamp, the motor and the power supply board, which are consumables, are built in. For the replacement of these parts, refer to [9. Inspection and maintenance 9.4.2-9.4.4].
(6) Connector for light projecting side	Connector for the light projecting side of the fiber optics
(7) Connector for light receiving side	Connector for the light receiving side of the fiber optics
(8) Cable gland 1	It is for leading in connection cables. The outer diameter of its applicable connection cable is $\phi 8.5$ to 10.5mm. For leading in the connection cable, take off the rubber sealing this cable gland. Lead in the exclusive cable IR-WERP through this cable gland.
(9) Cable gland 2	It is for leading in connection cables for signals, etc. The outer diameter of its applicable connection cable is $\phi 8.5$ to 10.5mm. For leading in the connection cable, take off the rubber sealing this cable gland.
(10) Fuse	The fuse (10A in capacity) is fitted on the fuse holder.
(11) Terminal board	This internal terminal board for wiring of connection cables is accessible by opening the terminal board cover.
(12) Serial number plate	Two serial number plates indicating the model number and the serial number of this detector unit are pasted on the inside and outside of the unit.
(13) Inlet/outlet for cooling	These inlet and outlet are for water or air used to cool this detector unit. The nominal diameter of the inlet and outlet is R1/8.

## 5. Names and Functions

### 5.2 Names and functions of data display parts



Names	Functions
(1) CH display	Displays a calibration curve number in measurement mode and a parameter item in setting mode.
(2) Data display	Displays a measured value in the measurement mode and a parameter in the setting mode.
(3) Setting keys	<p><b>SEL</b> For entering into the setting mode and switching a setting screen</p> <p><b>CH/.</b> For setting a calibration curve number in the measurement mode and for entering a decimal point in the setting mode; When the key is pressed again, the decimal point disappears.</p> <p> For entering into a parameter setting in the setting mode and changing the digit of the parameter</p> <p> For changing the parameter in the setting mode</p> <p> For changing the parameter in the setting mode</p> <p><b>ENT</b> For storing the parameter in the setting mode</p>

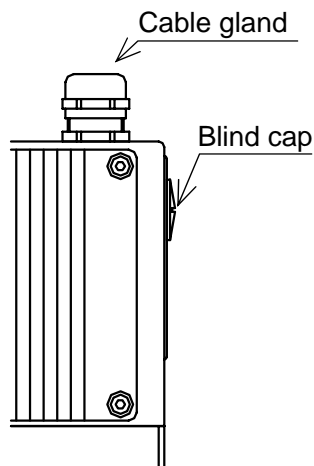
### 5.3 Terminal portion

The mounting direction of the cable gland is selectable in the following two kinds. Make sure to use the blind cap to cover the place not mounting the cable gland.

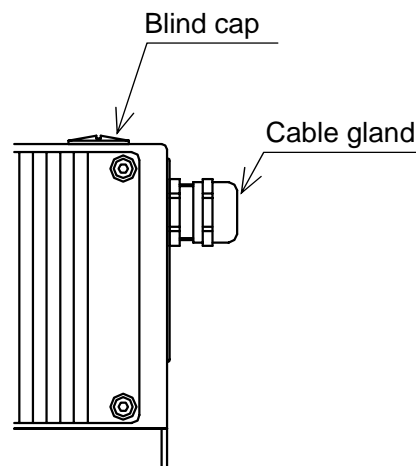
(1) Vertical direction of the connection cable: Default direction at shipment

(2) Horizontal direction of the connection cable: It is effective when there is no space above this detector unit.

(1) Connection cable – Vertical direction



(2) Connection cable – Horizontal direction



## 6. Operation

### 6.1 Confirmation before operation

Check the following two points before turning on the power supply.

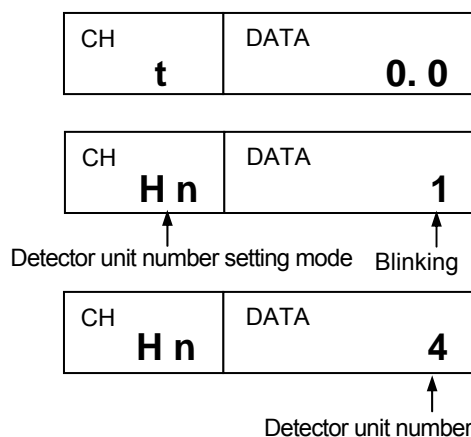
- 1) Have the dipswitches been set? (Refer to [3.1 Settings of dipswitches].)
- 2) Are connections correct? (Refer to [4. Connections])

### 6.2 Settings of detector unit number

Detector unit numbers are for identifying each detector unit when multiple detector units are connected to the operator interface/display unit. (Refer to [4.3 Multiple-detectors connections]). Set the detector unit numbers before connecting the operator interface/display unit.

**Reference** → The default number of the detector unit at shipment is “1”.  
For using it with a number other than 1, set the detector unit number by following order.

- 1) Enter into the operation condition setting mode by pressing **SEL** key and **ENT** key simultaneously for 2 seconds.
- 2) Press **SEL** key 4 times to display “Hn” in the CH display.
- 3) Press **▶** key. A numeric blinks for entering a detector unit number.
- 4) Change the numeric by **▲** key, **▼** key or **▶** key.  
Press **▲** key to increase the numeric.  
Press **▼** key to decrease the numeric.  
Press **▶** key to shift the blinking digit.
- 5) Press **ENT** key. The numeric stops blinking and the detector unit number is stored.
- 6) Press **SEL** key for 2 seconds. The mode returns to the measurement mode.



**Reference** → The settings shown in the next paragraph can also be done via the operator interface/display unit (sold separately).  
Refer to the separate manual for the operator interface/display unit.

### 6.3 Settings of calibration curve data

**Remarks** → The settings shown in the next paragraph can also be done via the detector unit or the operator interface/display unit (sold separately).

The output characteristic of this detector unit depends upon measuring objects. It may also change according to the process conditions and sample moisture measuring conditions.  
Therefore, it is necessary for accurate moisture measurements to perform a sample test of the object and obtain the correlation (This is called as calibration curve.) between the moisture value (%H<sub>2</sub>O) obtained by a drying method or other measuring methods and the absorbance “x” measured by this detector unit.

**Reference** → This paragraph describes the setting method for calibration curve data, assuming that calibration curves have been already created. When the calibration curves have not been created yet, refer to [7. Creating method of calibration curves].

## 6. Operation

### 6.3.1 Data for setting

The followings are the setting data for calibration curve.

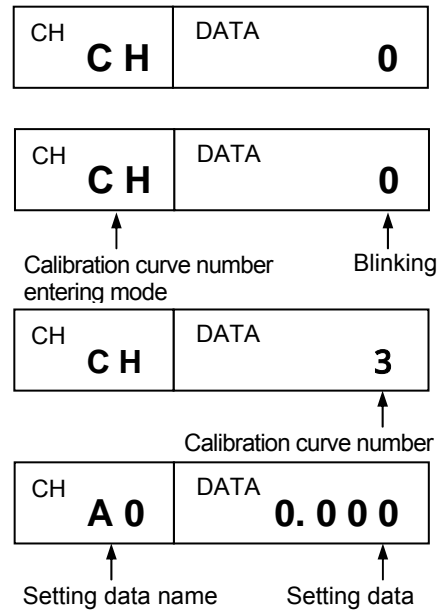
Setting data name	Display	Setting range of data	Default value	Remarks	
(1) Calibration curve No.	CH	1 to 99	1		
(2) Polynomial coefficient	$a_0$	A0	0 to $\pm 9999.9$	0.0000	Effective numeric: 5 digits
	$a_1$	A1	0 to $\pm 9999.9$	1.0000	Effective numeric: 5 digits
	$a_2$	A2	0 to $\pm 9999.9$	0.0000	Effective numeric: 5 digits
	$a_3$	A3	0 to $\pm 9999.9$	0.0000	Effective numeric: 5 digits
(3) Correction expression coefficient	$b_0$	b0	0 to $\pm 9999.9$	0.0000	Effective numeric: 5 digits
	$b_1$	b1	0 to $\pm 9999.9$	1.0000	Effective numeric: 5 digits
	$b_2$	b2	0 to $\pm 9999.9$	0.0000	Effective numeric: 5 digits
(4) Low limit moisture output	Lo	0 to 9999.9	0.00	Specify the number of decimal places.	
	High limit moisture output	Hi	0 to 9999.9	100.00	Specify the number of decimal places.
(5) Low limit moisture alarm	AL	0 to 9999.9	0.00	Specify the number of decimal places.	
	High limit moisture alarm	AH	0 to 9999.9	100.00	Specify the number of decimal places.
(6) Preset moisture	PS	0 to 9999.9	0.00	Specify the number of decimal places.	
(7) Water absorbance	Ab	0 to $\pm 9999.9$	0.00	Effective numeric: 5 digits	

Data name	Function
(1) Calibration curve No.	An optional number from 1 to 99 can be designated as the calibration curve. Ordinary It is designated sequentially from "1".
(2) Polynomial coefficient " $a_0$ to $a_3$ "	Assume that the calibration curve is represented by the third-degree or lower-degree polynomial of $y = a_3x^3 + a_2x^2 + a_1x + a_0$ , where, "y" is the moisture content (%H <sub>2</sub> O) and "x" is the absorbance ("CHO" data of this detector unit).
(3) Correction expression coefficient " $b_0$ to $b_2$ "	These coefficients are provided for the quadratic expression correction (zero and span correction) with reference to the moisture content "y". Assuming that the moisture content after the correction be "Y", we obtain " $Y = b_2y^2 + b_1y + b_0$ ".
(4) Low limit moisture output /High limit moisture output	These specify moisture contents at a low limit output and a high limit output on the analog output scaling. The output is scaled to 4mA at the low limit moisture content and 20mA at the high limit moisture content.
(5) Low limit moisture alarm /High limit moisture alarm	The low limit alarm is activated when the measured value is lower than the low limit alarm setpoint of moisture content and the high limit alarm is activated when the measured value is higher than the high limit alarm setpoint of moisture content. Use the operator interface/display unit when the alarm outputs are required.
(6) Preset moisture	By turning on the preset output by key operations or through communications, the moisture content being set as a preset value is displayed and outputted, regardless of the measured value.
(7) Water absorbance	Decide the water absorbance to compute the surface water ratio for measuring the moisture content of sands, etc. [This setting is only enable when the surface water ratio computation shown in (11) of "6.4.1 Setting data" is set to ON.] The relation between the measured moisture content (%: mass basis moisture content), the surface water ratio (%) and the water absorbance (%) is; <ul style="list-style-type: none"> <li>Surface water ratio = (Moisture content – Water absorbance) / (1 + (Water absorbance / 100))</li> </ul>

## 6. Operation

### 6.3.2 Settings of calibration curve data

- 1) Press **[SEL]** key for 2 seconds to enter into the calibration curve setting mode “CH”.
- 2) Press **[▶]** key. A numeric blinks for entering a calibration curve number.
- 3) Change the numeric by **[▲]** key, **[▼]** key or **[▶]** key.  
 Press **[▲]** key to increase the numeric.  
 Press **[▼]** key to decrease the numeric.  
 Press **[▶]** key to shift the blinking digit.
- 4) Press **[ENT]** key. The numeric stops blinking and the calibration curve number is stored.
- 5) Press **[SEL]** key to enter into the setting mode “A0” for polynomial coefficient  $a_0$ .
- 6) Enter into a numeric setting mode by pressing **[▶]** key. Change the numeric by **[▲]** key or **[▼]** key and store it by pressing **[ENT]** key. For entering a decimal point, press **[CH/•]** key at the blinking digit.
- 7) Press **[SEL]** key to enter into the next data setting mode.
- 8) Repeat the above procedure from 2) to 7) to set all data.
- 9) After the above setting procedure is completed, return to the measurement mode by pressing **[SEL]** key for 2 seconds. The automatic return is made if no key is pressed for one minute.



### 6.3.3 Correction of calibration curve

#### Remarks

The settings shown in the next paragraph can also be done via the operator interface/display unit (sold separately).

If the actual moisture content does not correspond with the moisture content on the calibration curve being preset due to the difference of one-line and off-line, or other causes, correct it by the correction coefficients  $b_0$ ,  $b_1$  and  $b_2$  in [6.3 Settings of calibration curve data]. These coefficients are provided for secondary expression correction against the measured value “y”. Assuming that the measured value after correction be “Y”, we obtain,

$$Y = b_2y^2 + b_1y + b_0$$

Usually, the shift correction is done with  $b_0$  only. ( $b_1 = 1$ ,  $b_2 = 0$ )

#### Remarks

[Example]

When the measured moisture content before correction is 15 (%H<sub>2</sub>O) and the actual moisture content is 13 (%H<sub>2</sub>O), “-2%H<sub>2</sub>O should be set.

( $b_2 = 0$ ,  $b_1 = 1$ ,  $b_2 = -2$ )

## 6. Operation

### 6.4 Settings of operating conditions

Set the operating conditions including time constant and hold function.

#### Remarks

The settings shown in the next paragraph can also be done via the operator interface/display unit (sold separately).

#### 6.4.1 Setting data

Set the following data in the operating condition setting mode.

Setting data name	Display	Setting range of data	Default value	Remarks
(1) Time constant	t	0.0 to 99.9	0.2	Unit: Seconds
(2) Hold ON/OFF	Hd	ON, OFF	OFF	
(3) Preset output ON/OFF	PS	ON, OFF	OFF	
(4) Decimal place in display	dt	0 to 4	1	
(5) Contact output: Selection of contact output enabled/disabled and output items	do	none ALArM Error	nonE	NonE: Non. ALArM: High and low alarms Error: Self-diagnosed error
(6) Contact input: Selection of contact input enabled/disabled and input items	di	none HoLd PrSEt SMt.rL	nonE	NonE: Non HoLd: Hold PrSEt: Preset SMt.rL: Smoothing/real
(7) Detector number	Hn	1 to 9 1 to 247 1 to 31 *1	1	Operator interface/display MODBUS RTU mode *1 This is NOT used with this detector unit.
(8) Communications protocol	Pt	Rtu Priv *2	Rtu	Rtu: MODBUS RTU mode Priv:*2 This is NOT used with this detector unit.
(9) Communications speed	SP	9600, 19200	9600	
Parity	P	nonE odd EVEN	EVEn	nonE: None parity odd: Odd parity EVEn: Even parity
Data length	d	7, 8	8	These parameters are for the private protocol "Priv" in the above [(7) Communications protocol] and are NOT used with this detector unit.
Stop bit length	Sb	1, 2	1	
BCC enabled/disabled	bC	ON, OFF	OFF	
(10) Sample temperature correction ON/OFF	St	ON, OFF	OFF	
The following settings can be done at "ON".				
·Correction input scaling L	tL	-999 to 999	0	
·Correction input scaling H	tH	-999 to 999	100	
(11) Surface water ratio computation ON/OFF	Sd	ON, OFF	OFF	
(12) Engineering mode	Eng			
The following settings can be done by pressing [ENT].				
Processing mode 1: Weight $\alpha 1$	1A	0 to 1.000	0.500	0.5: 3-wavelength processing 0 or 1: 2-wavelength processing
Processing mode 1: Calibration constant k1	1K	0 to $\pm 9.9999$	1.0000	



## 6. Operation

### 6.4.1-1) Descriptions of setting data

Setting data name	Description
(1) Time constant	If the measured value fluctuates noticeably, the signal can be set to be dull by delaying the response of this unit. The smoothing time (equivalent to the time constant of analog instruments) can be set in 0.1-second increment.
(2) Hold ON/OFF	By setting it to ON, the measured value is held. At the same time, the analog output will also be held.
(3) Preset output ON/OFF	By turning on the preset output, this unit displays the preset value and the analog output becomes the value corresponding to the preset value.
(4) Decimal place in display	For the settings of displayed data
(5) Contact output: Selection of contact output enabled/disabled and output items	Select whether the contact output is enabled or disabled, and select the output item. (1) NonE: Disabled (2) ALArM: High and low alarms by the analog output or the contact output for the calibration curve number being set (3) Error: It is outputted when an abnormality is detected by the self-diagnosis function shown in [9.2 Self-diagnosis function].
(6) Contact input: Selection of contact input enabled/disabled and output items	Select whether the contact input is enabled or disabled, and select the output item. (1) NonE: Disabled (2) HoLd: The analog signal is held by the latest value. (Holding by the signal H) (3) PrSEt: The analog signal is set to the fixed value of 4-20mA. (Fixing by the signal H) (4) SMt.rL: Switching of Smoothing or Real (Real by signal H)
(7) Detector number	This is a number for identifying each detector for the connection of multiple detectors. This setting has been completed in [6.2 Setting of detector number].
(8) Protocol	Rtu: MODBUS RTU protocol Priv: Private protocol - *This is NOT used with this detector unit.
(9) Communications speed, Parity, Data length, Stop bit length, BCC enabled/disabled  *1: Skip this setting	When this detector unit is connected with the setting display unit, skip these settings. These are for communications with a personal computer, a sequencer or other similar devices. Set them corresponding to a master unit. • Communications speed: Select 9600 or 19200bps. • Parity: Select None, Even or Odd. • Data length*1: As the data length of the MODBUS RTU mode is fixed to 8 bits. • Stop bit length*1: As the stop bit length of the MODBUS RTU mode is automatically set with the setting of the parity. (In case of the parity, EVEN or odd:1 bit, In case of none parity:2 bits) • BCC enabled/disabled: [Note]This is NOT used with this detector unit.
(10) Sample temperature correction ON/OFF	When calibration curves change by sample temperatures, this function enables to change the calibration curve to the other one by measuring the sample temperature. For the input of the sample temperature, a radiation thermometer or a temperature/voltage converter with the output of 4 to 20mADC can be used. When the sample temperature correction is set to ON, the following settings are required. • Correction input scaling L, Correction input scaling H These are used for scaling of 4 to 20mA correction input.
(11) Surface water ratio computation ON/OFF	For the computation of the moisture content of sands, etc., select the surface water coefficient computation is enabled or disabled. Set it to ON for enabling.
(12) Engineering mode	(1) Weight $\alpha 1$ : The 3-wavelength processing or 2-wavelength processing can be switched by changing of the setting of the weight $\alpha 1$ . When $\alpha 1$ is set to 0.5, the processing becomes the 3-wavelength processing that is the ratio processing of three (3) wavelengths. When $\alpha 1$ is set to 0 or 1, the processing becomes the 2-wavelength processing. ( $\alpha 1$ : 1 - the ratio processing of $\lambda 1$ and $\lambda 2$ , $\alpha 1$ : 0 - the ratio processing of $\lambda 2$ and $\lambda 3$ ) (2) Calibration constant K1 : This is the value obtained in [6.5 Calibration] and has been stored automatically.

## 6. Operation

### 6.4.2 Procedure for setting operation conditions

- 1) Press **SEL** key and **ENT** key simultaneously for 2 seconds to enter into the operation condition setting mode.
- 2) Press **▶** key. A numeric blinks for entering a setting data.
- 3) Change the numeric by **▲** key, **▼** key or **▶** key.  
 Press **▲** key to increase the numeric.  
 Press **▼** key to decrease the numeric.  
 Press **▶** key to shift the blinking digit.  
 For entering the decimal point, press **CH/.** key at the blinking digit.
- 4) Press **ENT** key. The numeric blinking stops and the data is stored.
- 5) Press **SEL** key to enter into the setting mode of the next setting data. Repeat the above procedures from 2) to 4) to set all setting data except the engineering mode.

CH	t	DATA	0.0
----	---	------	-----

Setting data name

CH	t	DATA	0.0
----	---	------	-----

Blinking

CH	H d	DATA	ON
----	-----	------	----

Next setting data name

Blinking

### 6.4.3 Setting data in the engineering mode

- 1) For the setting of the [Weight  $\alpha 1$ ] and the [Calibration constant k1] in the engineering mode, press **SEL** key several times to enter into the engineering mode “Eng” shown right.
- 2) Press **ENT** key in this engineering mode to enter into the setting mode “1A” of the weight  $\alpha 1$ .
- 3) Change the numeric by **▲** key, **▼** key or **▶** key.  
 Press **▲** key to increase the numeric.  
 Press **▼** key to decrease the numeric.  
 Press **▶** key to shift the blinking digit.  
 For entering the decimal point, press **CH/.** key at the blinking digit.
- 4) Press **ENT** key to store the weight  $\alpha 1$ .
- 5) Then press **SEL** key to enter into the setting mode “1k” of the calibration constant K1.
- 6) Change the numeric by **▲** key, **▼** key or **▶** key.  
 Press **▲** key to increase the numeric.  
 Press **▼** key to decrease the numeric.  
 Press **▶** key to shift the blinking digit.  
 For entering the decimal point, press **CH/.** key at the blinking digit.
- 7) Press **ENT** key to store the calibration constant K1.
- 8) Then press **SEL** key to display “2A”, “2K”, “3A” and “3K” and skip them.

CH		DATA	Eng
----	--	------	-----

Engineering mode

Press **ENT** key.

CH	1 A	DATA	0.500
----	-----	------	-------

Weight  $\alpha 1$  setting mode

Press **ENT** key.

Press **SEL** key.

CH	1 K	DATA	1.000
----	-----	------	-------

Calibration constant K1 setting mode

## 6. Operation

### 6.5 Calibration (Absorbance display mode settings)

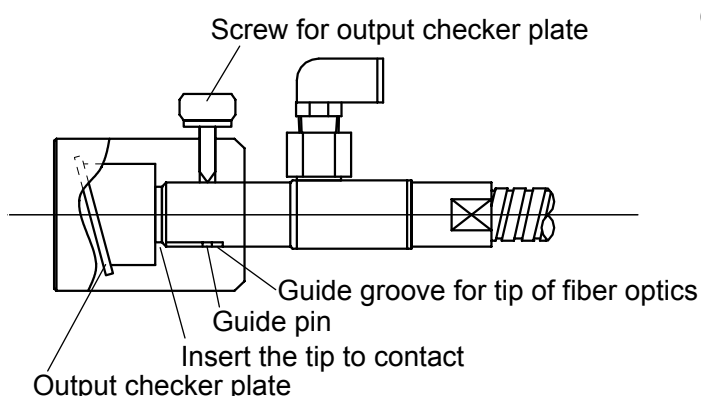
For using this detector unit accurately, the periodical calibration (once in three months) is recommended.

The calibration is executed by using the output checker plate.

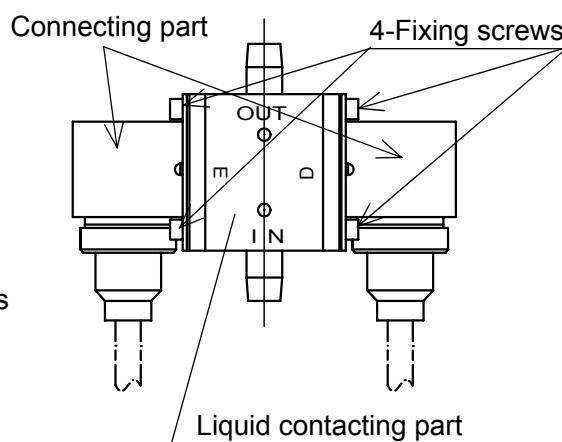
**Remarks** → Supply the power to this detector unit for one hour or longer before calibration.

**Remarks** → For the reflective type fiber optics, place the output checker plate at the tip of the fiber optics to see the plate.

**Remarks** → For the transparent type fiber optics, disassemble the measuring cell to be empty.



[Reflective type fiber optics]

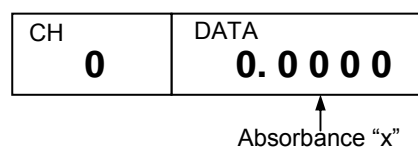
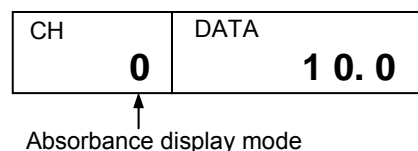
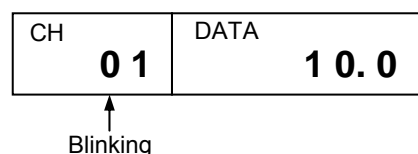


[Transparent type fiber optics]

#### 6.5.1 Absorbance display mode settings

By the following procedure, enter into the absorbance display mode by setting the calibration curve number to "0".

- 1) Press **CH/** key. The numeric at the calibration curve number display "CH" blinks for entering the calibration curve number.
- 2) Press **▶** key for entering a numeric.
- 3) Set the numeric to "0".
- 4) Press **ENT** key. The numeric stops blinking and "0" is displayed.



#### 6.5.2 Calibration

- 1) Execute the calibration by pressing three keys of **SEL**, **▽** and **ENT** simultaneously.  
When the displayed absorbance "x" is within  $0.0000 \pm 0.0010$ , the calibration is completed.
- 2) By pressing **CH/** Key, the numeric in the "CH" column blinks. Set the last calibration curve number to return to the measurement mode.

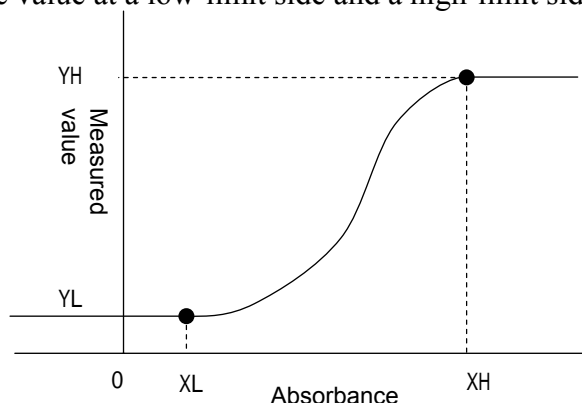
## 6. Operation

### 6.6 Settings of calibration curve output limit values

The measured value can be limited by an absorbance value at a low-limit side and a high-limit side.

When the absorbance becomes less than the absorbance low-limit value, the measured value is fixed to YL as shown right.

Also, when the absorbance becomes more than the absorbance high-limit value, the measured value is fixed to YH.



#### 6.6.1 Setting data of calibration curve output limit values

Set the following data for the calibration curve output limit values.

	Setting data name	Display	Setting range of data	Default value	Remarks
(1)	Calibration curve number	CH	1 to 99	1	
(2)	Output limit processing enabled/disabled	LM	OFF, ON	OFF	0: OFF, 1: ON
(3)	Low-limit absorbance value	XL	0 to ±9999.9	0.0000	Effective numeric: 5 digits
	Low-limit measured value	YL	0 to ±9999.9	0.0000	Effective numeric: 5 digits
(4)	High-limit absorbance value	XH	0 to ±9999.9	9.9999	Effective numeric: 5 digits
	Low-limit measured value	YH	0 to ±9999.9	9999.9	Effective numeric: 5 digits

Setting data name	Description
(1) Calibration curve number	Any calibration curve number in 1 to 99 can be specified, but it is normally specified from 1 sequentially.
(2) Output limit processing enabled/disabled	Set the output limit processing enabled or disabled. When ON (enabled) is set, the measured value is outputted corresponding to the setting limit values. When OFF (disabled) is set, the measured value is outputted corresponding to the calibration curve data.
(3) Low-limit absorbance value XL Low-limit measured value YL	Enter data to limit the output of the measured value at the low-limit side.
(4) High-limit absorbance value XH High-limit measured value YH	Enter data to limit the output of the measured value at the high-limit side.

## 6. Operation

### 6.6.2 Setting method of calibration curve output limit values

#### 6.6.2-1 Settings of calibration curve number (CH)

1) Press **[SEL]** key and **[CH/]** key simultaneously for 2 seconds to display "CH" at the calibration curve number display for entering the calibration curve number setting mode for the calibration curve output limit value.

CH	DATA
<b>CH</b>	<b>1</b>

↑  
Calibration curve number setting for calibration curve output limit value

↑  
Calibration curve number

2) Set the calibration curve number.

**[ ] [ ] [ENT]**

#### 6.6.2-2 Settings of output limit processing enabled/disabled (LM)

1) Press **[SEL]** key to enter the output limit processing enabled/disabled setting mode.

Press **[▶]** key to enter the setting data.

Change the setting data by **[▲]** key, **[▼]** key, or **[▶]** key

Press **[ENT]** key to store the setting data.

CH	DATA
<b>LM</b>	<b>OFF</b>

↑  
Setting data name (Number of data)

↑  
Setting data

#### 6.6.2-3 Settings of low-limit absorbance value (XL) and low-limit measured value (YL)

1) After the above setting, press **[SEL]** key to enter the low-limit absorbance value XL setting mode.

Press **[▶]** key to enter the setting data.

Change the setting data by **[▲]** key, **[▼]** key, or **[▶]** key

Press **[ENT]** key to store the setting data.

CH	DATA
<b>XL</b>	<b>0.0</b>

2) After the above setting, press **[SEL]** key to enter the low-limit measured value YL setting mode.

Press **[▶]** key to enter the setting data.

Change the setting data by **[▲]** key, **[▼]** key, or **[▶]** key

Press **[ENT]** key to store the setting data.

CH	DATA
<b>XL</b>	<b>0.0</b>

#### 6.6.2-4 Settings of low-limit absorbance value (XH) and low-limit measured value (YH)

1) After the above setting, press **[SEL]** key to enter the low-limit absorbance value XH setting mode.

Press **[▶]** key to enter the setting data.

Change the setting data by **[▲]** key, **[▼]** key, or **[▶]** key

Press **[ENT]** key to store the setting data.

CH	DATA
<b>XH</b>	<b>1.000</b>

2) After the above setting, press **[SEL]** key to enter the low-limit measured value YH setting mode.

Press **[▶]** key to enter the setting data.

Change the setting data by **[▲]** key, **[▼]** key, or **[▶]** key

Press **[ENT]** key to store the setting data.

CH	DATA
<b>YH</b>	<b>50.0</b>

#### 6.6.2-5 Settings of output limit values to other calibration curve numbers

1) After the above setting (6.6.2-1 to 6.6.2-4), press **[SEL]** key to return to the calibration curve number setting mode.

Enter other calibration curve number for setting output limit values.

Repeat the above setting (6.6.2-1 to 6.6.2-4) for setting output limit values to other calibration curve numbers.

#### Remarks

After the above setting procedure is completed, return to the measurement mode by pressing **[SEL]** key for 2 seconds. The automatic return is made if no key is pressed for one minute.

## 7. Creating method of calibration curves

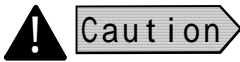
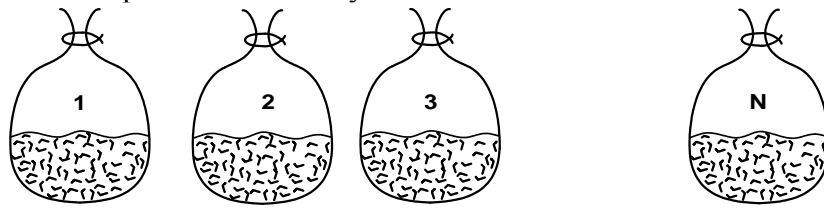
The output characteristics of the moisture meter depend upon the measuring objects. Also, the output characteristics may also change according to the process conditions and moisture measurement conditions of samples for certain measuring objects.

Therefore, for accurate measurement of moisture, it is necessary to carry out the sample tests of each measuring object in advance and obtain the relative relation (this is called as calibration curve) between the moisture value (%H<sub>2</sub>O) obtained by the drying method or other measuring methods and the absorbance "x" measured by the moisture meter This chapter describes the measurement of the moisture value by the drying method. However, the method of creation of the calibration curves is same even if the moisture value is measured by the Karl Fischer method or other methods.

### 7.1 Sample preparation

#### 7.1.1 Powder or granular

- (1) Take a sample of about 2 to 4 liters from the measuring object.
- (2) Dry up the sample up to the absolute dry condition by a dryer. Particularly be careful with the heating temperature so as not to denature the sample.
- (3) Divide the dry sample every 100 to 200cc into 5 to 6 samples separately, although it is recommendable to divide the sample into many samples.
- (4) Add water to these 5 to 6 samples bit by bit so that the moisture values of each sample divides the measuring range almost evenly.
- (5) Stir each sample with water addition sufficiently, and put it into a polyethylene bag and seal it tightly. Leave each sample for about 2 days until its moisture is stabilized.



**Caution**

If a sample cannot be heated or if it is hardened by adding water and thus can't be measured, adjust the moisture correspondingly according to the procedure in case of a paper shown in Para. [7.1.2]

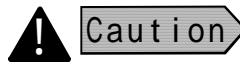
#### 7.1.2 Paper (sheet)

- (1) Cut a sample to have a size of about 100 x 100mm by using a cutter or the like. (Number of samples: 9 sheets)
- (2) Divide nine sheets of the sample into 3 groups with 3 sheets in each group. Adjust the moisture of each group under the following conditions.

**Drying:** Leave the samples in a desiccator containing silica gel for 2 days. In case of papers, the moisture content becomes about 4% H<sub>2</sub>O.

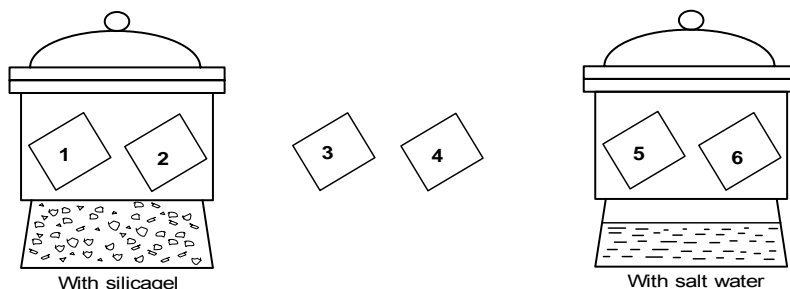
**In the air:** Leave the samples in an indoor atmosphere.  
In case of papers, the moisture content becomes about 7% H<sub>2</sub>O in summer or about 5% H<sub>2</sub>O in winter.

**Moistening:** Leave the samples in a desiccator containing salt water for 2 days.  
In case of papers, the moisture becomes 8 to 9% H<sub>2</sub>O usually or maximum about 11% H<sub>2</sub>O.



**Caution**

Wear clean gloves when handing samples so as not to touch them by naked hands directly. It is convenient for you to mark the samples for identifying its front and back surfaces and its flow direction.



## 7. Creating method of calibration curves

### 7.1.3 Liquid

- (1) Prepare 500 to 1000cc of sample dried nearly up to the lower limit moisture of the measuring range.
- (2) Prepare 5 to 10 containers (with lid) of 100 to 200cc capacity and put the above sample till the containers are full.
- (3) Add water to these 5 to 10 samples bit by bit so that the moisture values of each sample divides the measuring range almost evenly.
- (4) Stir each sample with water addition sufficiently, and put a lid on the container tightly.

#### Caution

If a sample is with strong moisture absorption and low moisture less than few % is required, even if water is not added, the moisture of the sample may reach to its level by absorption of moisture only.

## 7.2 Sample measurement

Be careful with the following cautions during measurement.

- (1) Before measurement, warming-up of this detector more than 1 hour is required.
- (2) Place a sample at the same position as in actual measurement, set the calibration curve number to 0, and read the display (absorbance "x").
- (3) Perform the measurement rapidly.
- (4) A visible light is irradiated from the detector unit. Confirm that the sample covers the measurement area completely.

### 7.2.1 Powder or granular

- (1) Prepare the trays (Diameter 100 to 150mm, Depth about 20mm) by the same quantity as the measuring sample quantity.
- (2) Weigh the weight  $W_0$  of each tray.
- (3) Spread the sample being sealed in the polyethylene bag on the tray it till the surface becomes flat and the bottom cannot be seen.
- (4) Put the tray at the measuring position, set the calibration curve number to 0, and read the display (absorbance "x"). If the measured value cannot be read easily, delay the response by the smoothing function.
- (5) Stir the sample rapidly with a spoon and measure it again. Repeat this measurement 2 or 3 times per sample.
- (6) Weigh the weight  $W_1$  of the tray together with the sample.
- (7) Perform the same measurement sequentially about all samples.
- (8) Put each sample together with its tray into a dryer, and dry it out to be the absolute dry condition (for longer than 2 hours at 105 to 110°C usually).
- (9) Cool down the sample after drying, and weigh the weight  $w_2$  of each tray together with the sample.
- (10) Record the measured value in the following table every measurement, and obtain the moisture value by the following formula.

$$\frac{w_1 - w_2}{w_1 - w_0} \times 100 (\% \text{H}_2\text{O})$$

No.	Absorbance "x"	$W_0$	$W_1$	$W_2$	Moisture content (% $\text{H}_2\text{O}$ )
1	x1				y1
2	x2				y2
3	x3				y3
:	:				:
N	xn				y4

## 7. Creating method of calibration curves

### 7.2.2 Paper (Sheet substance)

- (1) Weigh the weight  $w_1$  of a sample before measurement.
- (2) Hold the sample by a paper holder, put it by tilting at  $15^\circ$  to the measuring position, set the calibration curve number to 0, and read its display (absorbance "x"). In this case, match its front and back surfaces and flow direction of the samples.
- (3) Weigh the weight  $w_2$  of the sample after measurement. Perform the measurement from (1) to (3) as quickly as possible.
- (4) Perform the same measurement sequentially for all samples.
- (5) Put each sample into a dryer, and dry it out to be the absolute dry condition (for longer than 2 hours at  $105^\circ\text{C}$  usually by using paper stand).
- (6) Cool down all samples in a desiccator containing silica gel after drying.
- (7) Weigh the weight  $w_3$  of each sample.
- (8) Record the measured value in the following table every measurement, and obtain the moisture value by the following formula.

$$\frac{(w_1+w_2)/2-w_3}{(w_1+w_2)} \times 100 (\% \text{H}_2\text{O})$$

No.	Absorbance "x"	W <sub>0</sub>	W <sub>1</sub>	W <sub>2</sub>	Moisture content (%H <sub>2</sub> O)
1	x1				y1
2	x2				y2
3	x3				y3
:	:				:
N	xn				y4

### 7.2.3 Liquid

Execute the measurement in order from the object of low moisture to the object of high moisture.

- (1) Put a sample into the measuring cell, set the calibration curve number to 0, and read the display (absorbance "x").  
If the measured value cannot be read easily, delay the response by the smoothing function.
- (2) With the Karl Fischer method or other methods, measure moisture value of the sample put in the measuring cell.
- (3) Repeat the above measurements of 1) and 2) for 2 or 3 times per sample.
- (4) Record the measured value of all samples by the same measuring procedure in the following table, and obtain the average value.

No.	Absorbance "x"				Moisture content (%H <sub>2</sub> O)
	1	2	3	Average	
1				x1	y1
2				x2	y2
3				x3	y3
:				:	:
N				xn	y4

**Caution**

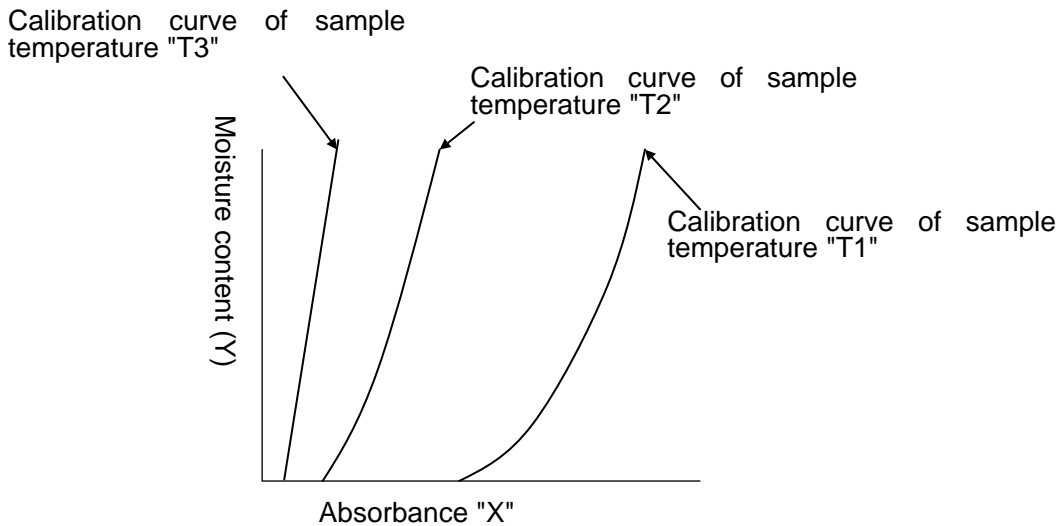
- (1) For taking out a sample from a container, shake the container well to uniform the moisture in the container and then take the sample out.
- (2) When the next sample is measured, throw away the sample already contained completely and wash the measurement cell for two or three times for the next measurement.



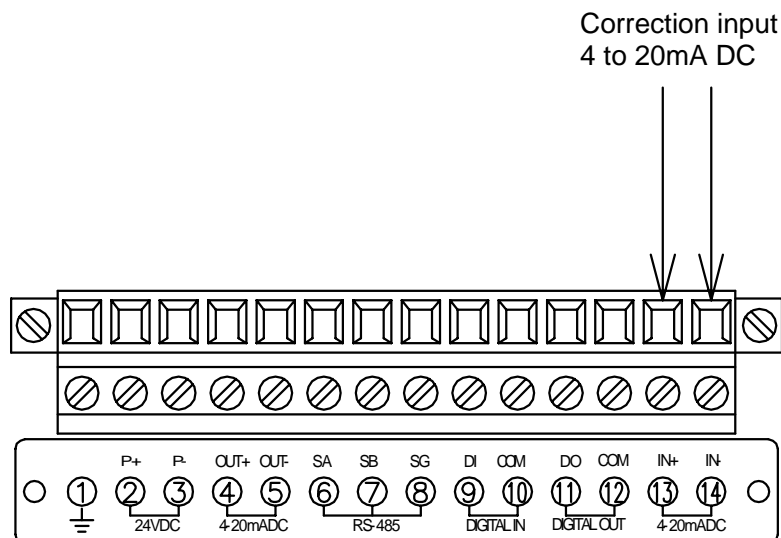
## 8. Correction function by sample temperature from external input

### 8.1 General

When a calibration curve changes at the sample temperature  $T_s$ , this function enables to change the calibration curve to other one at this sample temperature. For the input of the sample temperature, a radiation thermometer or a temperature/voltage converter with the output of 4 to 20mADC can be used. By utilizing this function, 10 calibration curves in one group (9 curves only in the group 10) are changed with the sample temperature  $T_s$ . Since 99 calibration curves can be stored, up to 10 groups can be set.



### 8.2 Wiring of detector unit



## 8. Correction function by sample temperature from external input

### 8.3 Setting of correction enabled/disabled by sample temperature

Execute this setting to either the detector unit or the operator interface/display unit. When the correction is disabled, the operation is normal which means the calibration curve is not changed according to the sample temperature. When it is enabled, the calibration curve is changed with the sample temperature.

#### 8.3.1 Setting at the detector unit

(1) Press **[SEL]** key and **[ENT]** key simultaneously for 2 seconds to enter into the operating condition setting mode.

(2) Press **[SEL]** key several times to enter into the correction enabled/disabled setting mode (St).

CH	DATA
<b>S t</b>	<b>OFF</b>

(3) Select the correction enabled or disabled.

**[▶] [▼] [ENT]** (OFF) Correction OFF (disabled)

**[▶] [▼] [ENT]** (ON) Correction ON (enabled)

\* For the setting of the sample temperature scaling as the next step, skip (4) and step to (2) of [8.4 Setting of sample temperature scaling (8.4.1 Setting at the detector unit)].

(4) Press **[SEL]** key for 2 seconds. The mode returns the measurement mode.

#### 8.3.2 Setting at the operator interface/display unit

(1) Set the calibration curve number to 0.

**[CH] [0] [ENT]**

(2) Enter into the correction enabled/ disabled setting mode (St).

**[MODE] [1] [9] [ENT]**

(3) Select the correction enabled or disabled.

**[0] [ENT]** (OFF)

Correction OFF (disabled)

**[1] [ENT]** (ON)

Correction ON (enabled)

\* For the setting of sample temperature scaling as the next step, skip (4) and step to (2) of [8.4 Setting of sample temperature scaling (8.4.2)].

(4) Return the calibration curve number to the original one.

### 8.4 Setting of sample temperature scaling (Only 4 to 20mA DC)

When a radiation thermometer or a thermoelectric converter is used, it is necessary to match the temperature range of its 4 to 20mADC output and the temperature range of 4 to 20mADC input of this detector unit.

Carry out scaling by either the detector unit or the operator interface/display unit, following the procedure shown below.

#### 8.4.1 Setting at the detector unit

(1) Press **[SEL]** key and **[ENT]** key simultaneously for 2 seconds to enter into the operating condition setting mode.

(2) Press **[SEL]** key several times to enter into the sample temperature scaling low limit (tL) setting mode.

CH	DATA
<b>t L</b>	<b>0.0</b>

(3) Set the sample temperature scaling low limit (tL). (Setting range: -999.9 to 999.9)

(4) Press **[SEL]** key once to enter into the sample temperature scaling high limit (tH) setting mode.

(5) Set the sample temperature scaling high limit (tH). (Setting range: -999.9 to 999.9)

#### 8.4.2 Setting at the operator interface/display unit

(1) Set the calibration curve number to 0.

**[CH] [0] [ENT]**

(2) Enter into the sample temperature scaling setting mode

**[MODE] [2] [1] [ENT]**

(3) Set the sample temperature scaling low limit (tL). (Setting range: -999.9 to 999.9)

(4) Press **[SEL]** key once to enter into the sample temperature scaling high limit (tH) setting mode.

(5) Set the sample temperature scaling high limit (tH). (Setting range: -999.9 to 999.9)

## 8. Correction function by sample temperature from external input

### 8.5 Setting of sample temperature

The key operation for this setting is common on the detector unit and the operator interface/display unit.

(1) Press **[SEL]** key for 2 seconds to enter into the calibration curve setting mode.

CH <b>t S</b>	DATA <b>9 9 9 . 9</b>
---------------	-----------------------

(2) Press **[SEL]** key several times to enter into the sample temperature setting mode (tS).

(3) Set the sample temperature. ( Setting range: -999.9 to 999.9 )

### 8.6 Setting of calibration curve data

(1) Specify a group for calibration curve number to be used.

The groups are from 1 to 10 and each one corresponds to the following calibration curve numbers respectively.

Group 1: Calibration curve number 1 to 10	Group 6: Calibration curve number 51 to 60
Group 2: Calibration curve number 11 to 20	Group 7: Calibration curve number 61 to 70
Group 3: Calibration curve number 21 to 30	Group 8: Calibration curve number 71 to 80
Group 4: Calibration curve number 31 to 40	Group 9: Calibration curve number 81 to 90
Group 5: Calibration curve number 41 to 50	Group 10: Calibration curve number 91 to 99

(2) Example: Select the group 1.

Set the following calibration curve at the sample low limit temperature T1 to the calibration curve No. 1.

$$y = a3x^3 + a2x^2 + a1x + a0$$

Only the calibration curve by polynomial expression can be used.

Further, set the sample temperature T1. For its setting, refer to [8.5 Setting of sample temperature].

(3) Set the calibration curves at the sample temperature Ti (i = 2 to 10) to the calibration curve numbers 2 to 10.

However, Ti should fulfill the following expression.

$$T1 \text{ (Sample low limit temperature)} \leq T2 \leq \dots \leq T9 \leq T10 \text{ (Sample high limit temperature)}$$

(4) Enter 999.9 at the Ti, which is not used. Be careful that, if this value is not entered, a calibration curve not used is computed as a data.

\* The default of the sample temperature Ti is 999.9.

(5) For the correction expression coefficients b1 and b0 and the constants (low limit range, high limit range, low limit alarm, high limit alarm and preset value), use the values for the first calibration curve number in a group.

Group 1: Calibration curve number 1	Group 6: Calibration curve number 51
Group 2: Calibration curve number 11	Group 7: Calibration curve number 61
Group 3: Calibration curve number 21	Group 8: Calibration curve number 71
Group 4: Calibration curve number 31	Group 9: Calibration curve number 81
Group 5: Calibration curve number 41	Group 10: Calibration curve number 91

## 8. Correction function by sample temperature from external input

### 8.7 Measurement

- (1) When the correction by sample temperature ON (enable) is selected and one calibration curve number in a group is set, the calibration curve number changes automatically corresponding to sample temperature.

For example, when the sample temperature  $T_s$  fulfills the following expression, the calibration curve number becomes “i”.

$$T_1 \leq \dots \leq T_i \leq T_s < T_{i+1} \leq \dots \leq T_{10}$$

- (2) However, the measured value  $Y$  is not the measured value  $T_1$  on the calibration curve No. “i”. The measured value  $Y$  becomes the following value interpolated from the measured value  $Y_i$  and the measured value  $Y_{i+1}$  on the calibration curve No. “i+1”.

$$Y = (Y_{i+1} - Y_i) \times \frac{T_s - T_i}{T_{i+1} - T_i} + Y_i$$

- (3) When the sample temperature  $T_s$  is lower than the sample temperature of the first calibration curve number in the group or when it is higher than the sample temperature of the last calibration curve number, the following error display appears.

However, the calibration curve, of which sample temperature is set as 999.9, is ignored.

- \* For the sample temperature lower than the sample temperature of the first calibration curve number in the group ..... Er15 (Sample temperature too low)
- \* For the sample temperature higher than the sample temperature of the first calibration curve number in the group ..... Er14 (Sample temperature too high)

### 8.8 Display of sample temperature

#### 8.8.1 Display at the detector unit

- (1) Set the calibration curve number to 0.

**CH** **0** **ENT**

- (2) Press **Δ** key for 2 seconds to display the sample temperature.

- (3) For canceling of the sample temperature display, press **SEL** key for 2 seconds or press **CH** key for 2 seconds

#### 8.8.2 Display at the setting display unit

- (1) Set the calibration curve number to 0.

**CH** **0** **ENT**

- (2) For displaying the sample temperature

**MODE** **2** **0** **ENT**

- (3) For canceling of the sample temperature display, press **SEL** key for 2 seconds or press **CH** key for 2 seconds

## 9. Inspection and maintenance

### 9.1 Periodical inspection

The following inspections are required periodically.

#### (1) Cleaning of the tip of the fiber optics (For the reflective type fiber optics)

Keep the tip of the fiber optics clean all times.

Wipe off dirt and flogging with gauze or the like.

If the gauze is dipped in alcohol, it is more effective.

#### (2) Disassemble cleaning of the measuring cell (For the transparent type fiber optics)

The regular cleaning of the cover glass in a liquid-contacting part of the measuring cell is required by disassembling the measuring cell.

#### (3) Installation

Check the detector unit is installed firmly.

#### (4) Connections

Check the connections to the terminals of the detector unit, the operator interface/display unit, a receiving instrument or other instruments are fixed completely.

#### (5) Supplied air for air purge

Check the supplied air flow, air pressure, and cleanness of air before starting air purge.

#### (6) Calibration

The regular calibration once in 3 months is recommended by using the output checking plate (Model IR-WCRNB or IR-WCREB: sold separately).

### 9.2 Self-diagnosis function

Error message for abnormal operation is displayed by the self-diagnosis function.

The same error message is displayed in the detector unit and the operator interface/display unit.

Error No.	Item	Contents	Measures	Alarm output*
----	High limit over range	Measured value is higher than the displayed range.	Check the calibration curve data. Check output by the output checker plate.	—
----	Low limit over range	Measured value is lower than the displayed range.	Check the calibration curve data. Check output by the output checker plate.	—
Er01	Nonvolatile memory abnormal	Writing to or reading from the nonvolatile memory is disabled.	Need to return the detector unit to CHINO.	○
Er03	Motor rotation abnormal	The motor stops or rotates abnormally.	Replace the motor.	○
Er06	Computation error	Overflow happened in computation	Check output by the output checker plate.	○
Er07	Element temperature abnormal	The element temperature is abnormal.	Need to return the detector unit to CHINO.	○
Er12	Ambient temperature too high	The ambient temperature of the detector unit is too high	Lower the ambient temperature.	—
Er13	Ambient temperature too low	The ambient temperature of the detector unit is too low	Raise the ambient temperature.	—
Er14	Sample temperature too high	The sample temperature is higher than the correction range	Widen the correction range.	—
Er15	Sample temperature too low	The sample temperature is lower than the correction range	Widen the correction range.	—
Er16	Sample low reflection	The reflection rate of the sample is low or the lamp is damaged.	Close the distance to the sample. If the lamp is damaged, replace it.	—
Er17	Sample high reflection	The reflection rate of the sample is high.	Incline or extend the distance to sample	—
Er20	Calibration curve insufficient for Sample temperature correction	The number of sample temperature correction calibration curves is insufficient.	Set the two or more calibration curve of sample temperature	—

**(Note)** For the items filled with ○ in the self-diagnosed abnormality, an alarm output for self-diagnosed abnormality is activated from the detector unit and the operator interface/display unit.

## ***9. Inspection and maintenance***

### **9.3 Measures against troubles not included in self-diagnosis**

If a trouble occurred, take remedial measures referring to the corresponding items of this manual after checking the following points. For the troubles of display unit, refer to the separate instruction manual the operator interface/display unit.

#### **9.3.1 No display appears in the detector unit.**

- (1) Is the power supply normal?
- (2) Is the fuse normal?
- (3) Are cables connected completely?
- (4) Are connectors connecting the display panel cover and the internal CPU board connected securely?
- (5) Turn off the power once and then turn on it.
- (6) If the trouble cannot be repaired by the above check, the power unit in the detector may be defective.

#### **9.3.2 Measured value remains unchanged.**

- (1) Is HOLD set to OFF?
- (2) Is PRESET set to OFF?
- (3) Are the calibration curve data correct?
- (4) Is the sample liquid flowing in the measuring cell? (For the transparent type fiber optics)
- (5) Turn off the power once and then turn on it.
- (6) Check if the display at the calibration curve number 0 changes.

#### **9.3.3 Measured value fluctuates.**

- (1) Is the measuring surface flat? (For the reflective type fiber optics)
- (2) Is the measuring position correct? Make sure that the detector unit does not measure a bottom face like as a belt conveyor. (For the reflective type fiber optics)
- (3) Make sure that the disturbance light does not radiate onto the measuring surface. (For the reflective type fiber optics)
- (4) Make sure that bubbles do not generate in the sample liquid. (For the transparent type fiber optics)
- (5) Is the fiber optics fixed firmly? Make sure to fix it at a place without any vibration.
- (6) Is the smoothing time proper? Certain smoothing time is necessary for stable measurement.
- (7) Make sure that any noise source does not exist around the detector unit or connection cables.
- (8) By using the output checker plate, check if the display at the calibration curve number 0 fluctuate. (For the reflective type fiber optics)
- (9) With the measuring cell emptied, check if the display at the calibration curve number 0 fluctuates. (For the transparent type fiber optics)
- (10) If the display fluctuates in (8) or (9), clear RAM. If the trouble is not recovered yet, send back it to CHINO for repair.
- (11) Make sure that the fiber optics is not disconnected. If disconnected, replace it with a new one.

#### **9.3.4 Measured value is slightly higher than or lower than the actual value.**

- (1) Is the calibration curve number correct?
- (2) Are the calibration curve data correct?
- (3) Are HOLD and PRESET set to ON?
- (4) Is the measuring position correct? (For the reflective type fiber optics)
- (5) Is the top of the fiber optics clean and not losing transparency? (For the reflective type fiber optics)
- (6) Is the sample liquid flowing in the measuring cell? (For the transparent type fiber optics)
- (7) Correct the calibration curve. (Refer to [6.3.3 Correction of calibration curve].)

## 9. Inspection and maintenance

### 9.4 Maintenance parts

#### 9.4.1 List of maintenance parts

The replacing intervals are reference values. They vary according to the working condition.

Article name	Quantity	Replacing interval	Remarks
Lamp (with rubber sheet)	1	5 years	
Motor (with connector)	1	3 years	
Power board	1	5 years	3 years when the ambient temperature is 40°C or higher
Fuse	2		Supplied as an accessory

#### Warning

For replacing maintenance parts, make sure to turn off the power source to this detector unit.

#### 9.4.2 Replacement of lamp

#### Warning

For replacing the lamp, make sure to turn off the power source to this detector unit.

- Turn off the power source to this detector unit.
- Loosen four M4 hexagon socket cap screws fixing the display panel cover and open the display panel cover slightly.

#### Caution

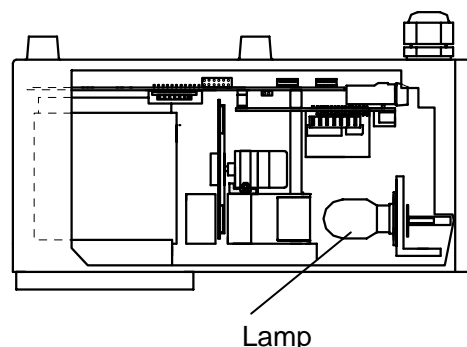
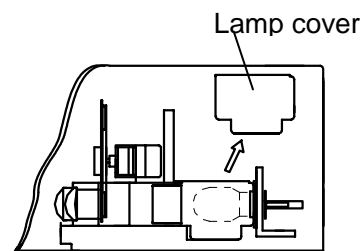
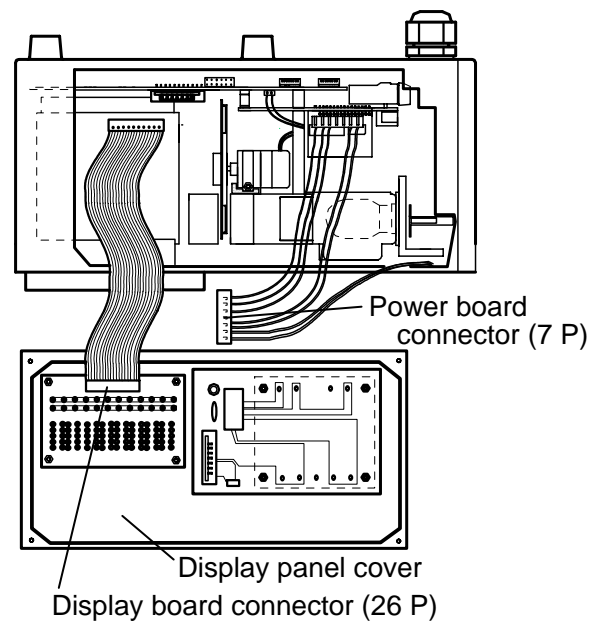
As the display panel cover is connected with internal components by cables, carefully remove the cover not to scratch the cables.

- Disconnect the cable connector (26 pins) at the display board and the connector (7 pins) at the power board, and then remove the display panel cover from this unit.
- Loosen M3 pan screws fixing the lamp cover, and remove the lamp cover upward.
- Turn the lamp bulb counterclockwise viewed from the filament side about 30 degree, and pull the lamp from the socket.  
(If the lamp is not turned easily, turn the lamp bulb by wrapping the rubber sheet, which is attached to the new lamp for replacement, around it.)

#### Caution

As the lamp becomes hot after energization, replace it after cooling it enough.

- Insert the new lamp to the back of the socket by aligning the crena position of its flange and turn it clockwise viewed from the filament side about 30 degree.
- Mount the lamp cover, and then mount the display panel cover (including the connection of 2 connectors). The replacement of the lamp is completed.



## 9. Inspection and maintenance

### 9.4.3 Replacement of motor

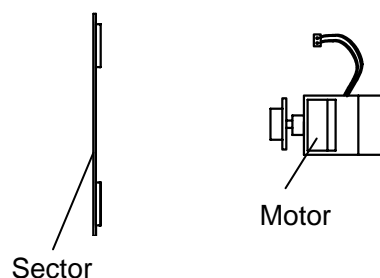
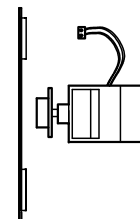
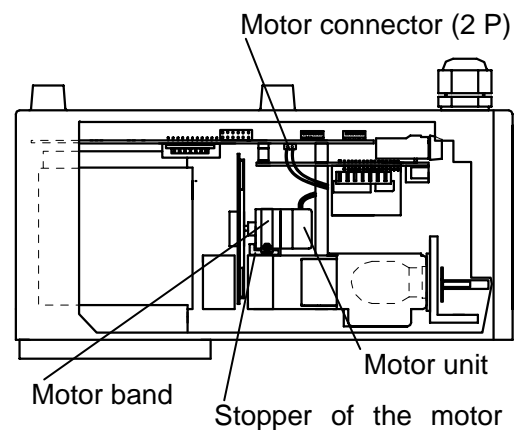
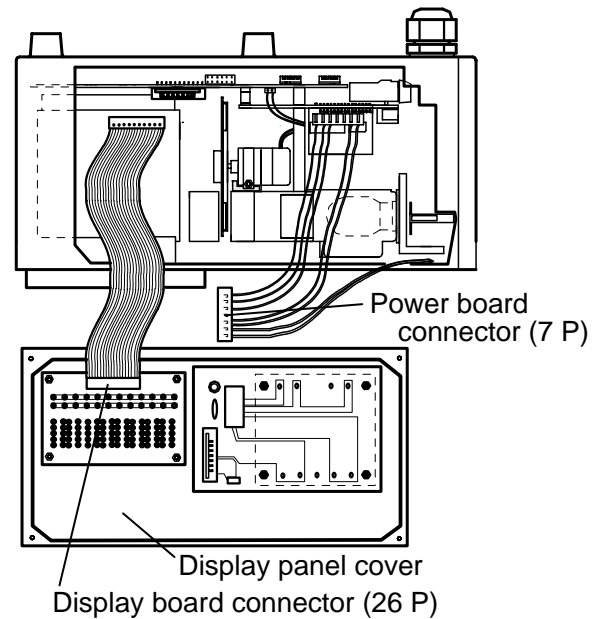
**Warning** For replacing the motor, make sure to turn off the power source to this detector unit.

- (1) Turn off the power source to this detector unit.
- (2) Loosen four M4 hexagon socket cap screws fixing the display panel cover and open the display panel cover slightly.

**Caution** As the display panel cover is connected with internal components by cables, carefully remove the cover not to scratch the cables.

- (3) Disconnect the cable connector (26 pins) at the display board and the connector (7 pins) at the power board, and then remove the display panel cover from this unit completely.
- (4) Remove the motor connector (2 pins).
- (5) Loosen the screws (M3 pan screw) fixing the motor band for the motor and remove the motor by pulling the motor band upward while pressing the motor.
- (6) Make the motor unit stand as shown in the figure and hold the sector lightly. Remove 4 pieces of M2 screws and separate the sector from the motor.
- (7) Make the new motor stand, too, and mount it to the sector. Note that the sector has front and rear sides.
- (8) Place the motor unit to make the top of the motor touch the stopper of the motor mounting base, cover the motor with the motor band, and then fix the motor band with the fixing screws for fixing the motor.
- (9) Connect the motor connector, and then mount the display panel cover (including the connection of 2 connectors). The replacement of the motor is completed.

**Caution** Never scratch the optical filter attached to the sector during replacement.





## 9. Inspection and maintenance

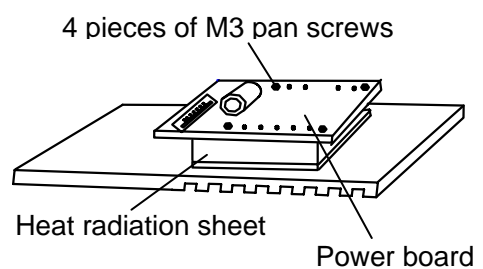
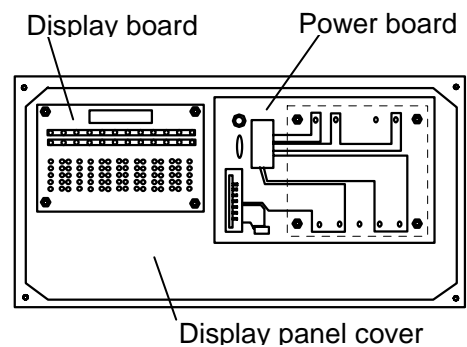
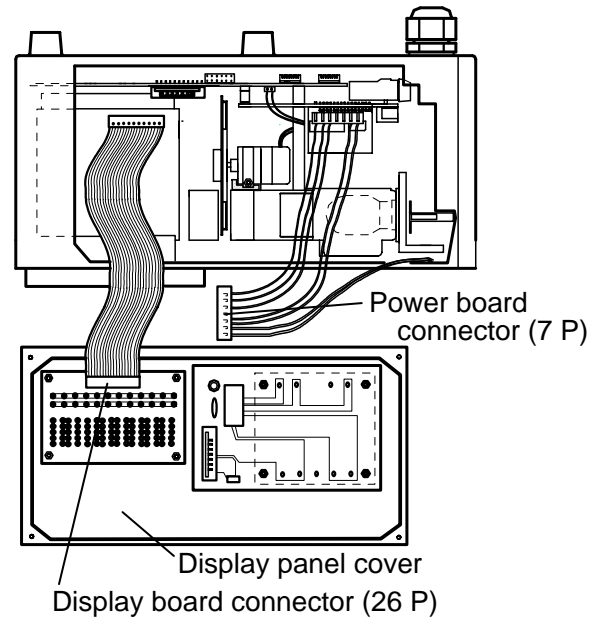
### 9.4.4 Replacement of power board

**Warning** For replacing the power board, make sure to turn off the power source to this detector unit.

- (1) Turn off the power source to this detector unit.
- (2) Loosen four M4 hexagon socket cap screws fixing the display panel cover and open the display panel cover slightly.

**Caution** As the display panel cover is connected with internal components by cables, carefully remove the cover not to scratch the cables.

- (3) Disconnect the cable connector (26 pins) at the display board and the connector (7 pins) at the power board, and then remove the display panel cover from this unit completely.
- (4) Remove the power board by loosening 4 pieces of M3 pan screws fixing it. At the same time, replace the heat radiation sheet (about 60mm<sup>2</sup>, 0.5mm thickness), which is slipped with the power board, with a new heat radiation sheet.
- (5) Fix the new power board, while slipping the new heat radiation sheet, with 4 pieces of M3 pan screws.
- (6) Connect the cable connector (26 pins) at the display board and the connector (7 pins) at the power board, and then fix the display panel cover. The replacement of the power board is completed.

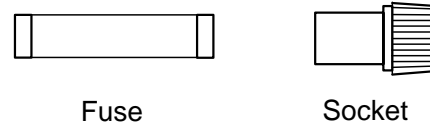
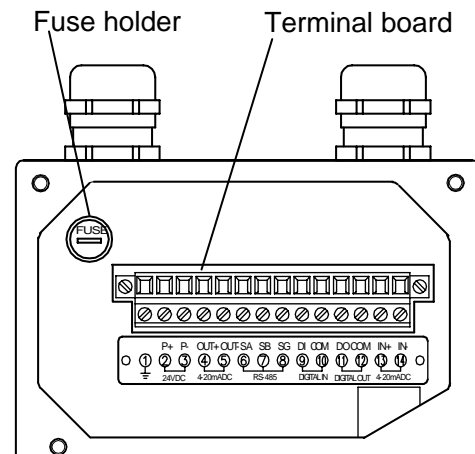


## 9. Inspection and maintenance

### 9.4.5 Replacement of fuse

**Warning** For replacing the fuse, make sure to turn off the power source to this detector unit.

- (1) Turn off the power source to this detector unit.
  - (2) Loosen four M4 hexagon socket cap screws fixing the terminal board cover and remove the terminal board cover.
  - (3) Push the fuse a little with a flathead screwdriver and turn it counterclockwise about 90 degrees.
  - (4) Pull out the fuse forward.
  - (5) Insert the new fuse to the back of the socket and turn it clockwise for mounting.
  - (6) Mount the terminal board cover.
- The replacement of the fuse is completed.



### 9.5 Ram clearing

If the abnormal condition of this unit is not recovered by all means, initialization of the RAM is required.

**Caution** For initializing the RAM, make sure to turn off the power source to this unit. As the stored contents of the RAM are initialized, record the calibration curve data, etc. before initialization.

#### 9.5.1 Ram clearing

- (1) Turn on the power by pressing **SEL** key and  key simultaneously.
- (2) The contents of the RAM will be initialized. Set the calibration curve data, etc. again.

## 10. Specifications

### 10.1 Detector unit: IRMA21□□□, IRMA22□□□

Model	IRMA2100, IRMA2200
Measuring system	Infrared reflection type 3-wavelength system
Lamp	Tungsten-filament lamp
Measurement distance	Ref. to [3.2 Installation of reflective type fiber optics] (The tip of fiber optics can be placed at 15 to 100mm from an object.)
Measurement area	Ref. to [3.2 Installation of reflective type fiber optics]
Reproducibility	With the output checker plate Detector unit output absorbance “x”): Within $\pm 0.003$ (Under same ambient temperature and the humidity) The above reproducibility is specified with the output checker plate and it is different from the reproducibility in the actual measurement.
Stability under the EMC test environment	Detector unit output absorbance “x”): Within $\pm 0.01$
Output signal	Analog signal: 4-20mADC and $\pm 0.2\%$ of full scale (Load resistance: 500 $\Omega$ or less)
Communication output	RS-485 (MODBUS) ... Standard Ethernet (LAN) ... Option One of the above outputs is to be specified.
Output update cycle	28ms.
Display	Data: LED 5 digits, Calibration curve number, others: LED 2 digits
Setting	By keys or through communication.
Processing function	3-wavelength ratio processing and multiple regression processing
Number of calibration curve	99 (maximum)
Calibration curve	First to third-order polynomial and multiple regression With calibration curve correction (First to second order correction)
Smoothing operation	0 to 99.9 seconds
Calibration	The calibration is enabled by the output checker plate.
Detector number setting	For the multiple-detector-units connection, detector unit numbers can be specified by key operation.
CH. No. setting	The channel numbers for the calibration curves can be specified by key operation.
Self-diagnosis function	Contact and communication output at self-diagnosed abnormality
Correction input function	Correction of measured data with an external 4-20mADC input (one input) (Sample temperature correction, others)
External Di/o	Di (contact input): One function selected from the preset, the data hold or the real/smooth switching functions can be inputted by the contact input. Do (contact output): One function selected from the self-diagnosis function (1 Form B) or the high/low alarms (1 Form A) can be outputted.
Working temperature range	0 to 50°C [The cooling by air is necessary if the working temperature is higher than 45°C. The dry air (30°C or lower) for instrumentation is to be used.]
Power voltage	24VDC [The power voltage is supplied from the power unit IR-WEP (attached as an accessory). Power to the power unit: 100 to 240VAC, 50/60Hz]
Permissible voltage fluctuation	18 to 30VDC (For products conforming to CE: Within 24VDC $\pm 10\%$ )
Power consumption	Approx. 36VA (maximum)
Connection	Fiber optics ... Connector connection Power and signal lines ... Terminal connection
Case	Aluminum drip-proof structure (IEC529, IP65)
Weight	Approx. 4.3kg
Installation method	Bolt suspension method with 4 pieces of M8 bolts

## 10. Specifications

### 10.2 Fiber optics

#### 10.2.1 Reflective type fiber optics IR-WCRN

Measurement diameter and distance	φ20/15mm to φ50/50mm
Fiber length	1.5m standard (maximum 10m )
Minimum bending radius	R100mm
Working temperature range	0 to 150°C
Fiber protection	Stainless steel corrugated tube
Purged airflow	5 to 20NI/min
Accessories	Horizontal mounting holder, flange holder

#### 10.2.2 Output checker plate IR-WCRNB for the reflective type fiber optics

It is mounted at the tip of the fiber optics and is used for checking the output from the detector unit on site.

#### 10.2.3 Reflective type fiber optics with lens attached IR-WCRE

Measurement diameter and distance	φ25/25mm to φ40/100mm
Fiber length	1.5m standard (maximum 10m)
Minimum bending radius	R100mm
Working temperature range	0 to 150°C
Fiber protection	Stainless steel corrugated tube
Air purge	Not provided
Accessories	Horizontal installation holder, flange holder

#### 10.2.4 Output checker plate for the reflective type fiber optics with lens IR-WCREB

It is mounted at the tip of the fiber optics and is used for checking the output from the detector unit on site.

#### 10.2.5 Measuring Cell for liquid IR-WCC1

Pipe diameter	R (PT) 1/4
Material	SUS316
Measuring liquid temperature	0 to 100°C
Measuring liquid pressure	Max. 3.9MPa (40kgf/cm <sup>2</sup> )

#### 10.2.6 Transparent type fiber optics IR-WCT

Fiber length	2m standard (maximum 20m)
Working temperature range	0 to 150°C
Fiber protection	Stainless steel corrugated tube (Covered by Teflon tube)
Minimum bending radius	R250mm

## 10. Specifications

### 10.3 Accessories

#### 10.3.1 Power unit (conforming to CE) IR-WEP

The power of 24VDC is supplied to the detector unit. This unit is supplied with the detector unit as an accessory.

Output voltage	24VDC
Output current	2.1A
Working temperature range	-10 to 50°C
Power supply	100 to 240VAC (universal power supply), 47 to 450Hz
Allowable voltage fluctuation	85 to 264V AC
Power consumption	Approx. 160VA (maximum)
Case	Resin
Mounting	Wall mounting type (DIN rail mounting)
Weight	Approx. 380g

#### 10.3.2 Connection cable IR-WERP

It is the exclusive cable for the connection of the detector unit to the operator interface/display unit or the power unit.

Structure	4-core cable (with double shield)
Outside diameter	φ10.5mm
Length	Maximum 200m
Connection	Both ends tips

#### 10.3.3 Installation adaptor IR-WED1

This adaptor is used to replace an IR-M series moisture meter, which has already been installed, with the IM series infrared multiple constituent analyzer without any change of the installation place.

Material	Aluminum
Weight	About 0.8kg

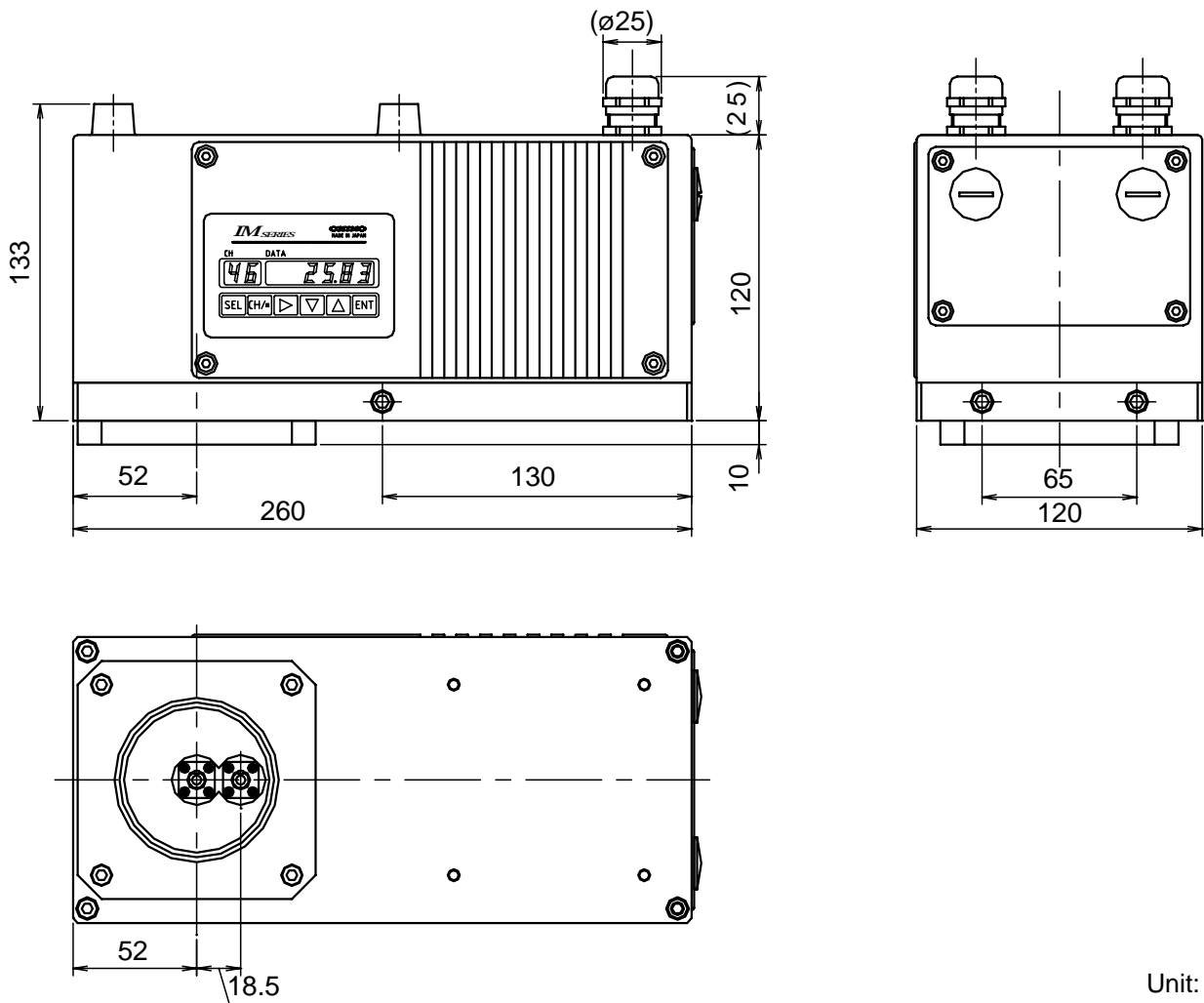
#### 10.3.4 Relaying box IR-WEE□

This relaying box is used as a relaying terminal for the multiple-detector-units connection and a power unit is built in. The steel case and the SUS case are available. The SUS case is the splash-proof construction.

	IR-WEE1	IR-WEE2
Working temperature range	0 to 50°C	0 to 50°C
Case	Steel	SUS304
Color	5Y7/1 (light beige)	-
Weight	Approx. 4kg (including the power unit)	Approx. 4kg (including the power unit)

# 11. Outside dimensions

## 11.1 Detector unit IRMA2□□□□□

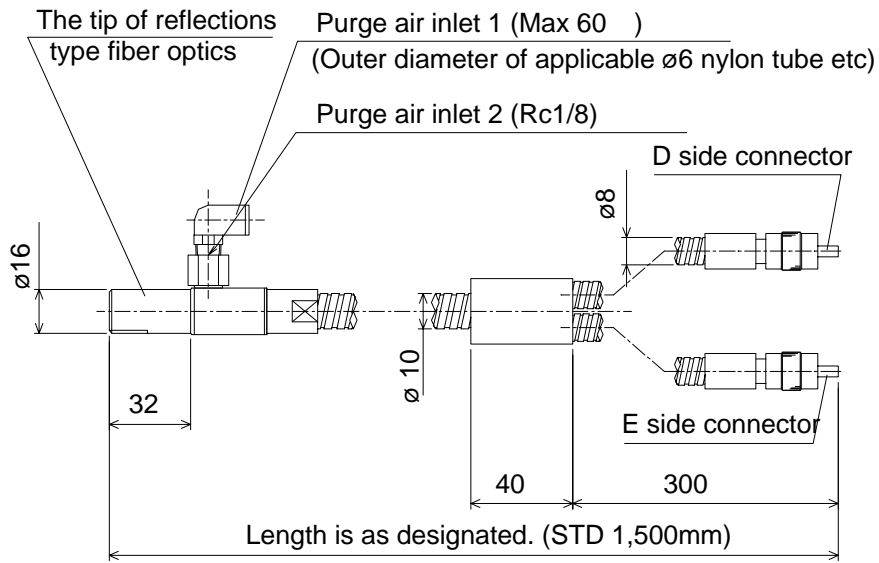


Unit: mm

# 11. Outside dimensions

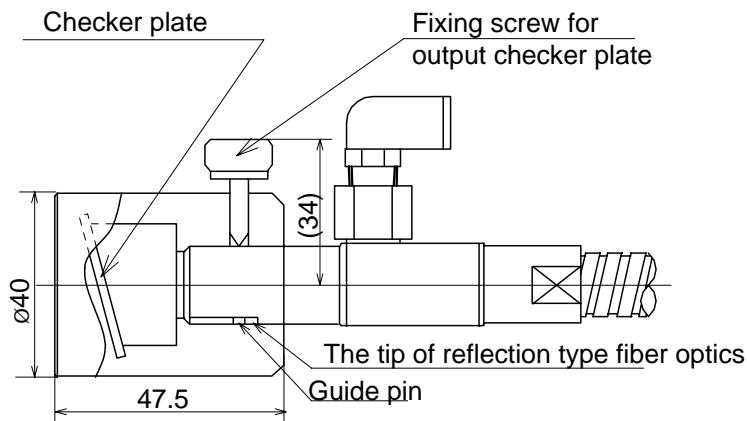
## 11.2 Fiber optics

### 11.2.1 Reflection type fiber optics IR-WCRN



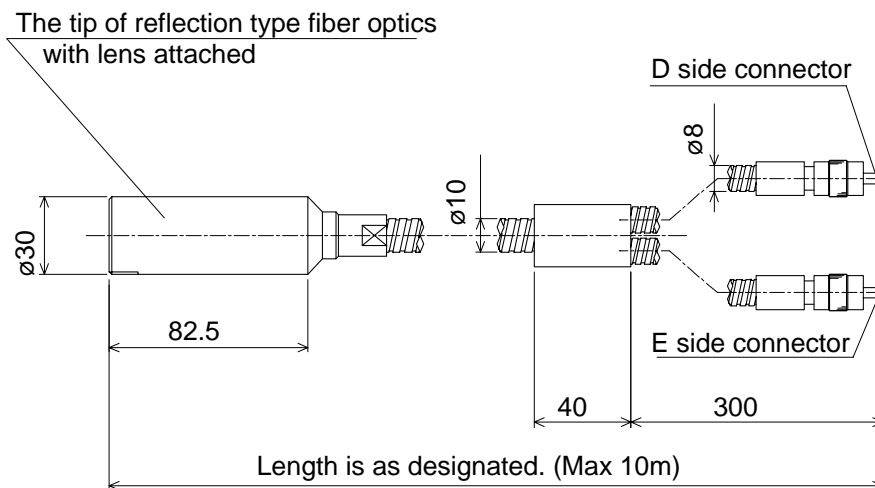
Unit: mm

### 11.2.2 Output checker plate for reflection type fiber optics IR-WCRNB



Unit: mm

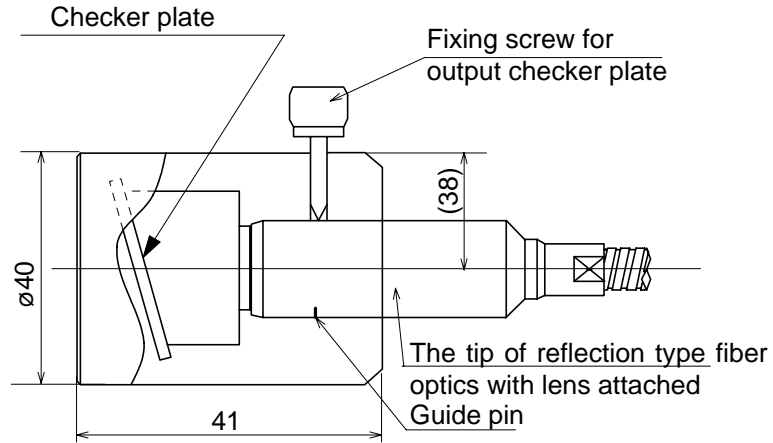
### 11.2.3 Reflection type fiber optics with lens attached IR-WCRE



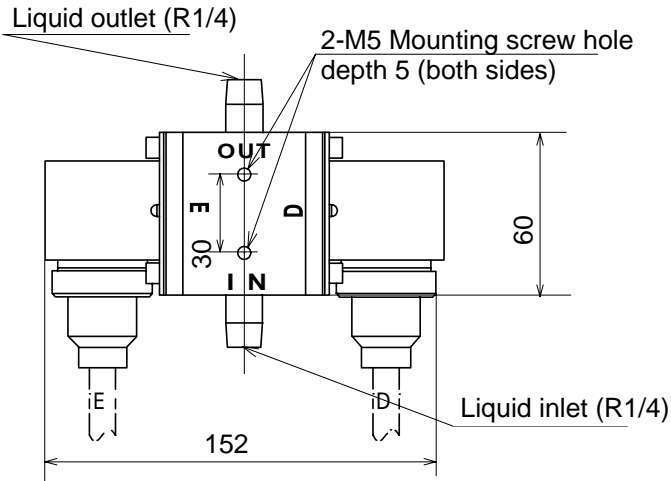
Unit: mm

# 11. Outside dimensions

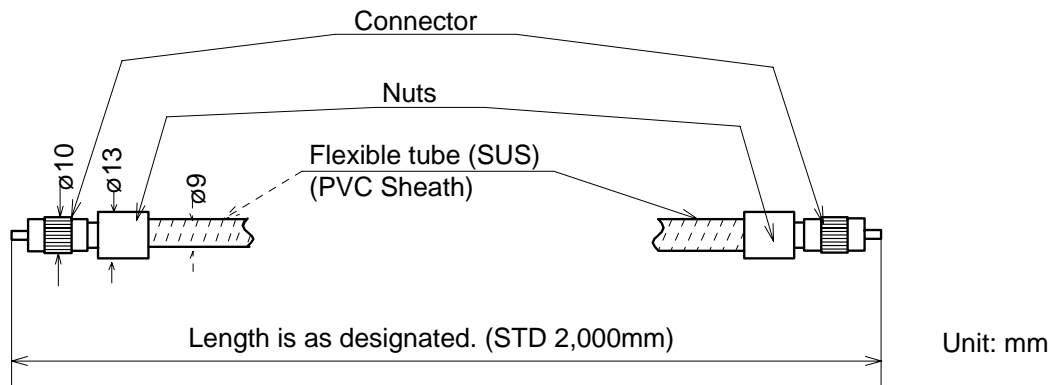
## 11.2.4 Output checker plate for reflection type fiber optics with lens attached IR-WCREB



## 11.2.5 Measuring cell for liquid IR-WCC1



## 11.2.6 Transparent type fiber optics IR-WCT

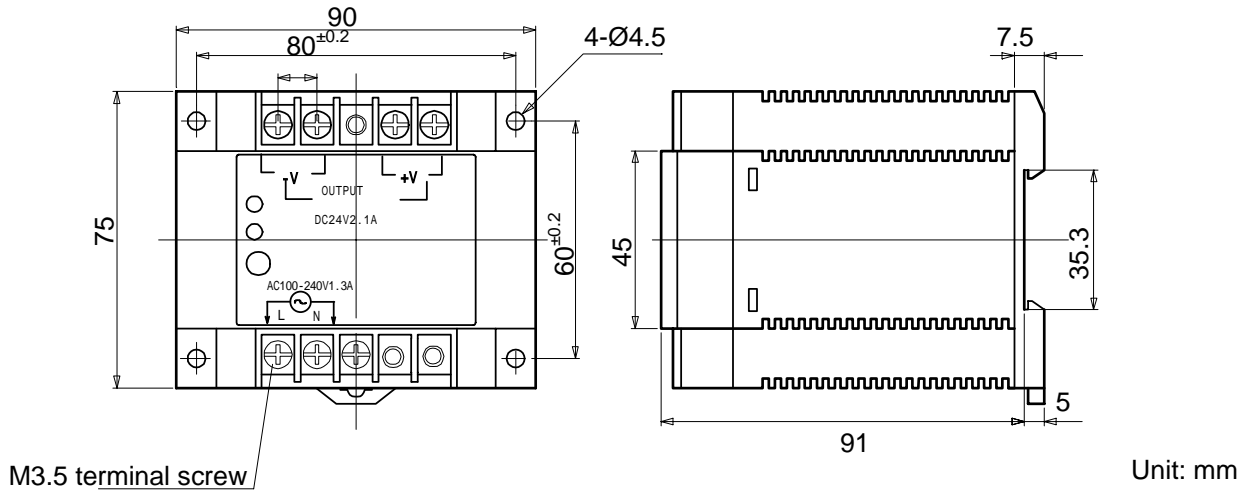




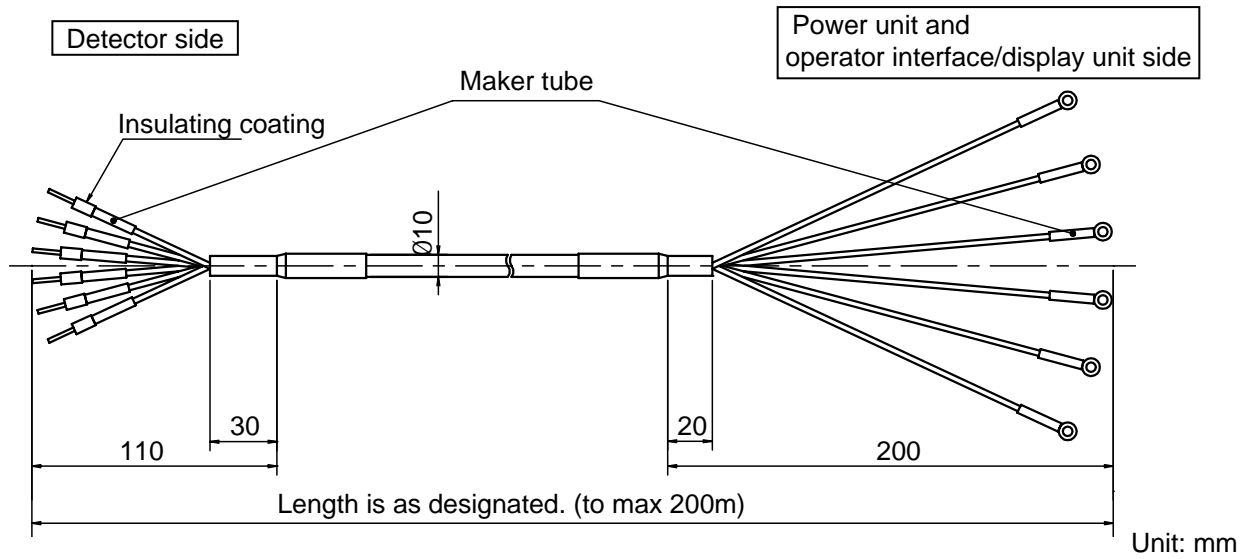
# 11. Outside dimensions

## 11.3 Accessories

### 11.3.1 Power unit (conforming to CE) IR-WEP

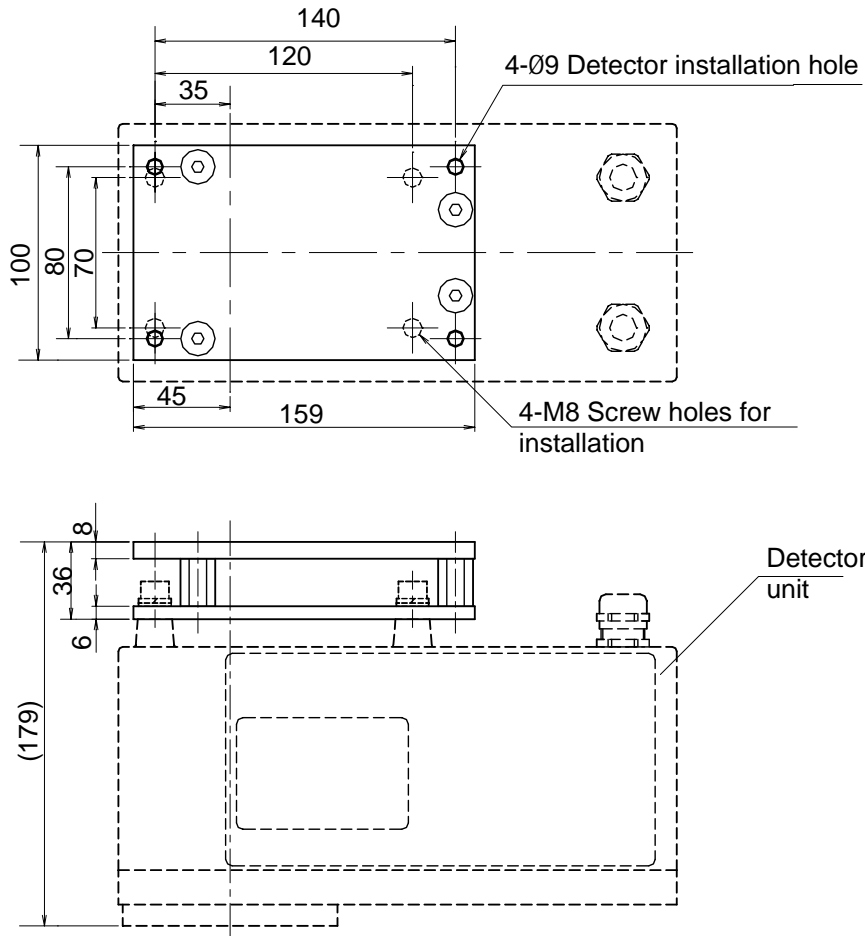


### 11.3.2 Connection cable IR-WERT



# 11. Outside dimensions

## 11.3.3 Installation adaptor IR-WED1



Unit: mm

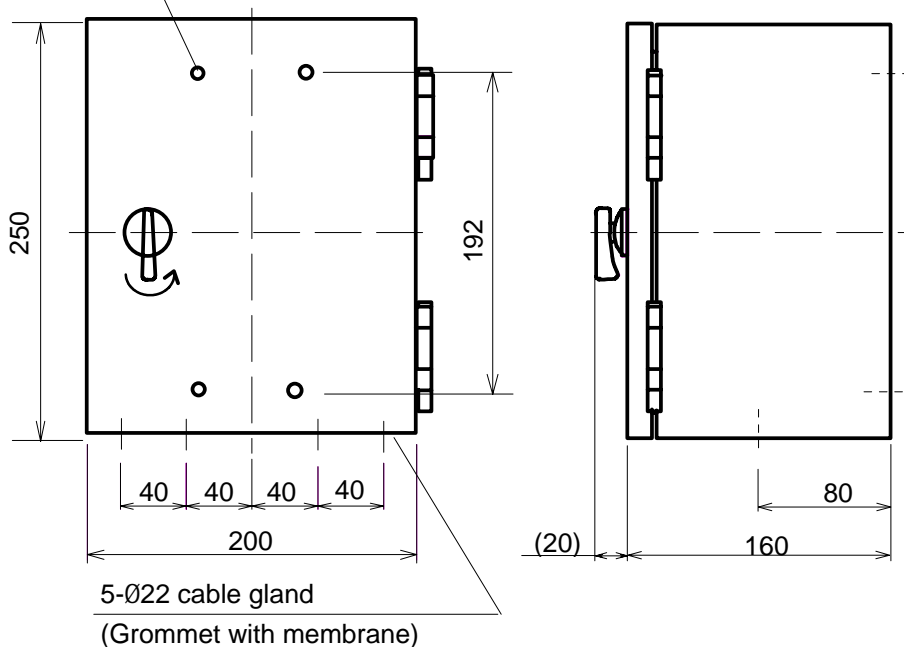
# 11. Outside dimensions

## 11.3.4 Relaying box IR-WEE□

### 11.3.4-1) IR-WEE1:Steel

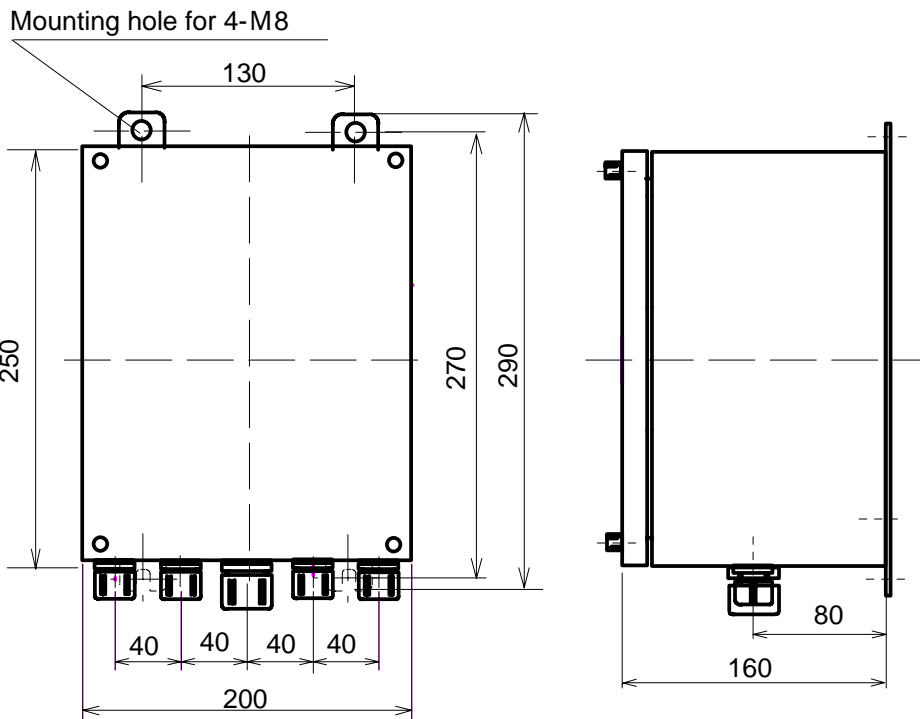
4-Ø8 (installation hole)

(Open the door and install.)



Unit: mm

### 11.3.4-2) IR-WEE2:SUS



Unit: mm

# CHINO

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**CHINO CORPORATION**

32-8, KUMANO-CHO, ITABASHI-KU, TOKYO 173-8632

Telephone: +81-3-3956-2171

Facsimile: +81-3-3956-0915

Web site <http://www.chino.co.jp/>

