INST.No.INE-508-P0

CHINO

IR-E Series
Scanning Radiation Thermometer
(Detector Unit, Accessories)
Instruction Manual

INSTRUCTIONS

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

This manual should be provided to the person who actually uses this product.

CHINO

Preface

Thank you for purchasing the IR-E series scanning radiation thermometer.
Read this manual carefully to ensure that you use this product correctly and safely.

Request to Installation contractor/distributors

Provide this manual to the person who actually uses this product.

Request to Person who uses this product

Correctly use this thermometer according to this manual.
This manual is required for maintenance of this product, too. Store it until this unit is disposed.
Should any unclear points arisen or any technical assistance be required, contact your sales agent of CHINO Corporation.

Notices

1. The contents of this manual are subject to change without notice.
2. Should any defects in bookbinding such as paging disorder, pages missing, etc., or any suspicious points, errors or omissions in the contents be found, contact your nearest agent of CHINO Corporation.
3. The intellectual property rights of this manual belong to us.
   Do not disclose the contents of this manual, in part or in whole, to a third person without our permission.

■Important Operational Instructions ⚠

For using this thermometer correctly and safely, make sure to observe the following safety instructions before attempting to operate or store it.

1. Working conditions and environment

- The working temperature range of this thermometer is 0 to 50°C. (No dew condensation)
- Avoid using this thermometer in environments where dusts, fine particles, corrosive gas exist.
- This thermometer is a precision instrument. Avoid using in places with widely varied ambient temperature, high humidity, places close to strong electricity circuits, and places with mechanical vibration and shock.

2. Storage

- For storing this thermometer, avoid places with high temperature and humidity.
- When this thermometer has any trouble, do not disassemble it by yourself but contact your nearest sales agent/distributor of CHINO Corporation.

3. Symbols used in this manual

The following symbols are used depending on important degrees of warnings/cautions to operate this thermometer safely and to avoid malfunctions or unexpected situation.

Important degree	Symbols	Contents
1	⚠	This symbol is indicated with a title for an explanation with Warning.
2	Warning	Indicates important information that must be observed to avoid the risk of fire or electric shock or other dangers that may result in serious personal injury or death, or damage to this product.
3	Caution	Indicates important information that must be observed to avoid the risk of personal injury or malfunctions of this product.
4	Remarks	Indicates supplementary information that the operator is recommended to understand.
5	Reference	Indicates supplementary information or a reference to an operation.

■Warnings and Cautions ⚠

◆ Please observe the following safety precautions fully to use this product correctly.

In addition, please read this manual carefully and store it in a readily accessible location for future reference.

The ⃠ mark indicates actions that are prohibited during operation.

⚠ **Warning** (May cause death or serious personal injury)	
⚠	Do not operate this thermometer in places where flammable or volatile gas exists. It is very dangerous to use this thermometer under such environment. ⃠
⚠	To prevent electrical shock, make sure to turn off the power source before the power connection work. ⃠
⚠	Should this thermometer be damaged, or any smoke or unusual odor be emitted, do not use it. It may result in the risk of fire. Turn off power immediately and contact your nearest sales agent of CHINO Corporation. ⃠
⚠	Repairing or modification of this thermometer may result in failure and also be danger. Never attempt to repair or modify this thermometer. ⃠

⚠ **Caution** (May cause personal injury or property damage)	
⚠	Avoid using in places with widely varied ambient temperature, high humidity, places close to strong electricity circuits, and places with mechanical vibration and shock.
⚠	For using this thermometer safely, comply with the descriptions and handling instructions in this manual. Failure to comply with the descriptions and instructions may result in damage to or functional decline of this thermometer or damage to the equipment.

CONTENTS

1. Introduction

1.1 General

The IR-E series scanning radiation thermometer, having a rotary mirror built in the detector unit, is designed to measure unidirectional temperature patterns of an object without contact and performs the temperature measurement of 50°C to 1200°C.
The IR-E series consists of the detector unit (Model IR-E) and the high-speed display/processing unit (Model IR-EPG), and exclusive accessories of the protective case and the air-purge hood for the detector unit are added as needed.
The detector unit measures the thermal radiation energy from a measuring area by scanning measuring positions optically by the rotary mirror, and converts the measured temperature into an electric signal that is transmitted to the high-speed display/processing unit with an exclusive connecting cable.
The connecting cable is shipped with the length specified, but the cable length can be changed within 200m without any effect to functions.
The high-speed display/processing unit performs indication/recording and analog output of the measured temperature after arithmetic processing such as emissivity compensation, linearization, signal modulation, etc. on the temperature pattern signal transmitted from the detector unit.
2 kinds of connection types of a connector connection and a terminal connection are available on the detector unit. The connection type of your detector unit has been selected by your ordering specification.
This manual describes operations and configurations of the detector unit, the protective case (Model IR-ZEPW), and the air-purge hood (Model IR-ZEAH). Confirm the name and model of the instrument you purchased and read corresponding paragraphs in this manual.
A separate manual is prepared for handling/operation of the high-speed display/processing unit, read it along with this manual.

1.2 Model code

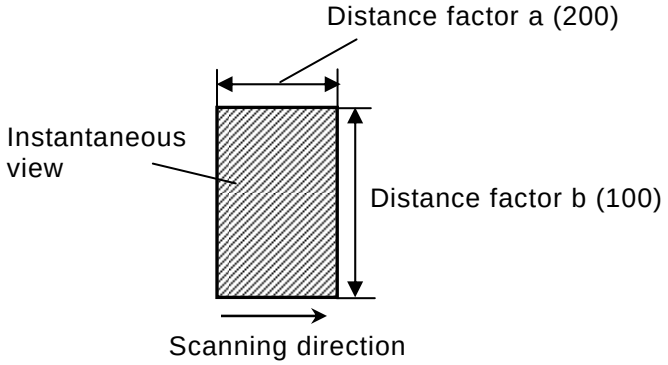
Detector unit

IR-E□□

- Distance factor (a×b)
  - 0 : 50 (50× 50)
  - 1 : 100 (100×100)
  - 2 : 200 (200×100)
- Connection type
  - T : Terminal connection
  - C : Connector connection

Caution

The term of the distance factor indicates one side of the scanning direction. For the instantaneous view, refer to the following figure.



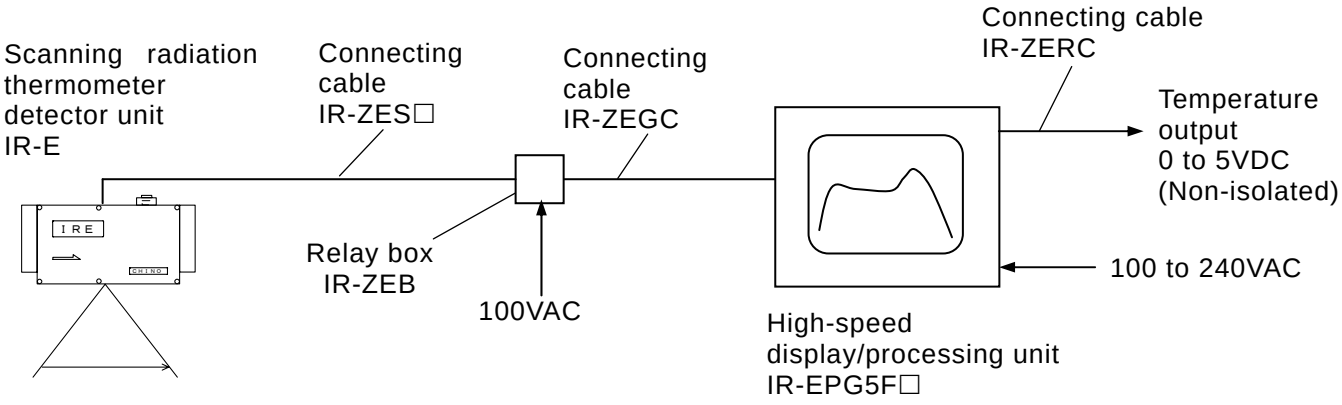
★ The term of the distance factor is the "distance factor a".
The numbers shown in parentheses are for the distance factor of 200.

1.3 Measurement ranges

50 ~ 300°C, 100 ~400°C, 200 ~ 600°C, 300 ~ 800°C, 400 ~ 1000°C, 500 ~ 1100°C,
600 ~ 1200°C

2. Configuration

The IR-E series scanning radiation thermometer consists basically of the detector unit, the relay box and the high-speed display/processing unit. Unidirectional temperature patterns, trend graphs and thermal images are displayed on the high-speed display/processing unit.
The scanning radiation thermometer detector unit (Model IR-E) and the relay box (Model IR-ZEB) are connected with the exclusive connecting cable (Model IR-ZEST or IR-ZESC). The connecting cable has been shipped with the length specified, but the cable length can be changed within 200m without any effect to functions.
For the scanning radiation thermometer detector unit, in addition to the detector unit, the protective case (Model IR-ZEPW) for housing the detector unit in the temperature measurement at a site under such hostile environment as high temperature, high humidity, smoke, dust, oily smoke, etc. and the air-purge hood (Model: IR-ZEAH) for clearing the optical path are prepared as accessories.

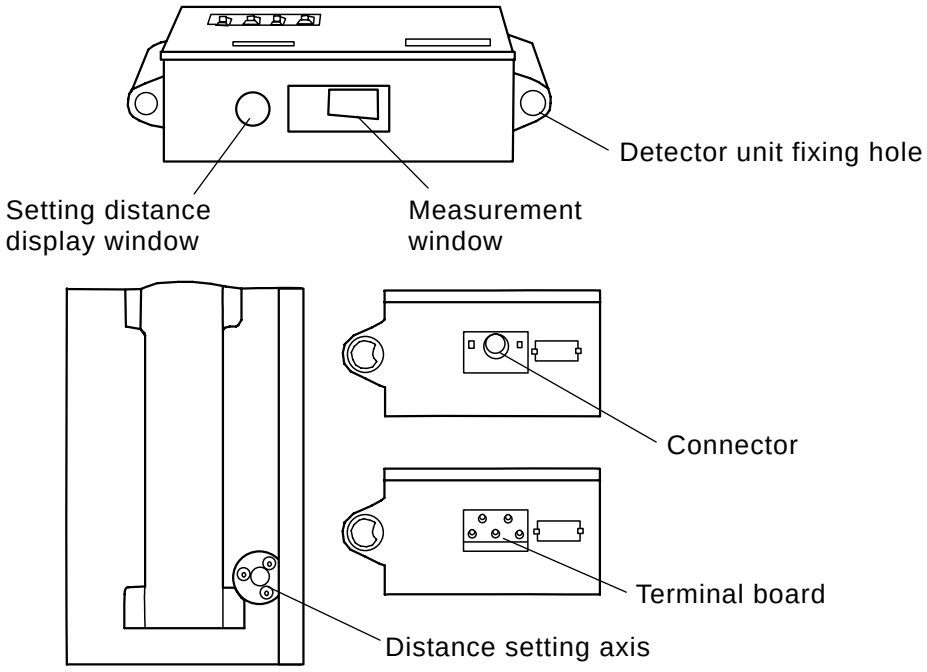


3. Detector unit

The detector unit is a single-color narrow-band radiation thermometer using the detecting element of PbSe (4.0μm measuring wavelength). Its drive power is supplied from the relay box. By scanning the measuring area optically by the hexahedron rotary mirror, it measures unidirectional temperature patterns of an object and transmits the measured temperature as the electric signal of 0 to 1mADC to the relay box.
In the relay box, the electric signal of 0 to 1mADC is converted to 0 to 5VDC that is transmitted to the high-speed display/processing unit.
It measures temperature with the wide scanning angle of 50° and the high scanning speed is as fast as 50 times/second.
2 kinds of connection types of the connector connection and the terminal connection are available. The connection type of your detector unit has been selected by your ordering specification.

3.1 Names and functions of parts

Names	Functions
Detector unit	Functions of an optical system, electric circuits, etc. required for a detector unit are built-in.
Measurement window	This window is for taking the radiant energy from a measuring area into the detector unit. It is required to always keep it clean.
Distance setting axis	This axis is for bringing the detector unit into focus on a measuring area. While looking through a setting distance display window, turn this axis with a flathead screwdriver to adjust the measurement distance on a marker.
Setting distance display window	The measurement distance set by the distance setting can be confirmed.
Connector (For connector connection type)	This connector is for the connecting cable between the detector unit and the relay box.
Terminal board (For terminal connection type)	This terminal board is for the connecting cable between the detector unit and the relay box.
Detector unit fixing hole	This hole is for fixing the detector unit in place. With 2 pieces of M20 bolts, fix the unit to a mounting angle, a mounting plate, etc. When the protective case is used, fix the unit by inserting 2 guide supports through the fixing holes.

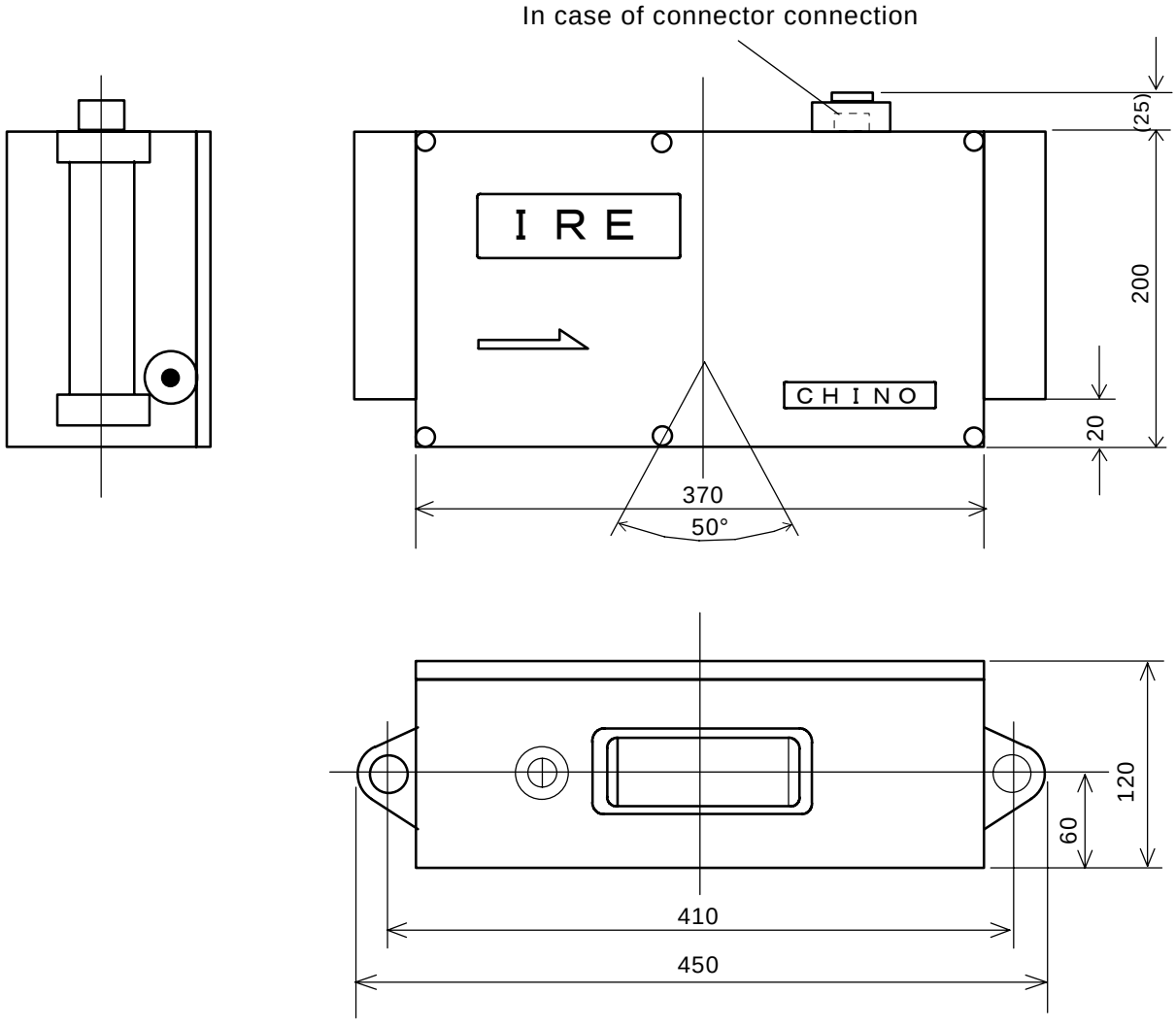


3. Detector unit

3.2 Installation

The external and mounting dimensions are shown below. Fix the detector unit with 2 pieces of M20 bolts to a fixing plate like a mounting angle, a mounting plate, etc. so that the measurement window is parallel to a measuring area and is positioned with the center line of a measuring area.
The measurement distance of the detector unit can be arbitrarily changed in 0.5 to 10m. When the installation is completed, perform the distance setting by turning the distance setting axis.
When the protective case and the air-purge hood are used, refer to the paragraphs shown below.

- Protective case • • • Refer to [4.1 Protective case Model: IR-ZEPW].
- Air-purge hood • • • Refer to [4.2 Air-purge hood Model: IR-ZEAH].



Unit: mm

3. Detector unit

3.3 Precautions for installation

(1) Vibration and impacts

The detector unit is designed to withstand the vibration of 29.4m/s^2 (3G), but vibration or impacts reduce the liability of the detector unit in the long term and cause an unstable measurement by the position movement of a measuring area.

When vibration is intense especially, it is effective to insert cushion materials like a rubber board between the detector unit and a fixing stand.

(2) Induction

The detector unit is designed for anti-induction but install it as far as possible from induction heating equipment or power lines.

(3) Working temperature and humidity

The working temperature of the detector unit is 0 to 50°C. When the ambient temperature is higher than 50°C or reflection from a measuring area or hot air is strong, use the protective case for cooling the detector unit by water.

When the ambient temperature does not exceed but closely reaches to 50°C, it is recommended to cool the detector unit by water for maintaining of its reliability.

In addition, control humidity in environment as low as possible. High humidity absorbs and scatters thermal radiation in the optical path.

(4) Optical path

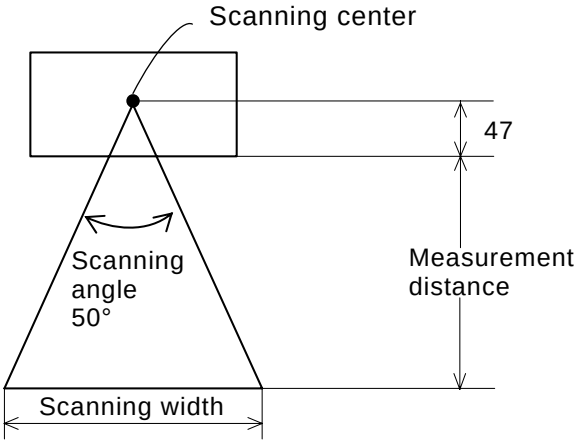
Select a place where water-drops, dust, smoke, steam, etc. do not enter between the detector unit and a measuring area.

If such place cannot be selected and the affection by existence of such substances cannot be ignored, purge such substance with air or other arrangements are necessary.

(5) Measurement distance

The measurement distance of the detector unit can be arbitrarily changed in 0.5 to 10m but, since the scanning angle is constant, the scanning width of a measuring area becomes large as the measurement distance becomes large.

Allow for a margin of the scanning width in consideration of fluctuation of a measuring area, displacement of the optical path, etc.



Scanning width = 2 X (Measurement distance + 47) • tan25°

3. Detector unit

3.4 Layout of connecting cables

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

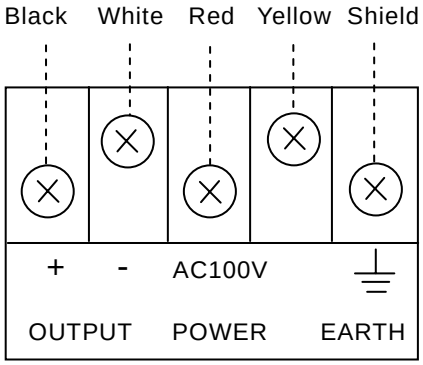
Caution

(1) Separate the cables from induction heating equipment 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) Avoid laying the cables at a place in high temperature more than 70°C.
(5) For laying the cable permanently, protect them with conduits, etc.
The outside diameter of the connector attached to the cables is about ø23mm.

3.5 Connections

(1) Connections of terminal connection type

By removing the terminal board cover on the upper side of the detector unit, 5 pieces of terminals are arranged as shown in the right figure.
Connect wires of the connecting cable to each terminal.
Since the wires of the connecting cable are identified by colors, connect them as shown in the right figure.



Caution

The terminal board is exclusively used for connection with the relay box. Do not connect a power line, etc.

Remarks

The power for the detector unit is supplied from the relay box through the connecting cable.

(2) Connection of connector connection type

The connection is completed by coupling the connector of the connecting cable to the connector on the upper side of the detector unit.

- For the coupling, position key slits of both connectors and push the cable connector, and turn the detachable ring clockwise until it is locked.
- For decoupling, turn the detachable ring counterclockwise for unlocking and pull the cable connector.

3.6 Operation

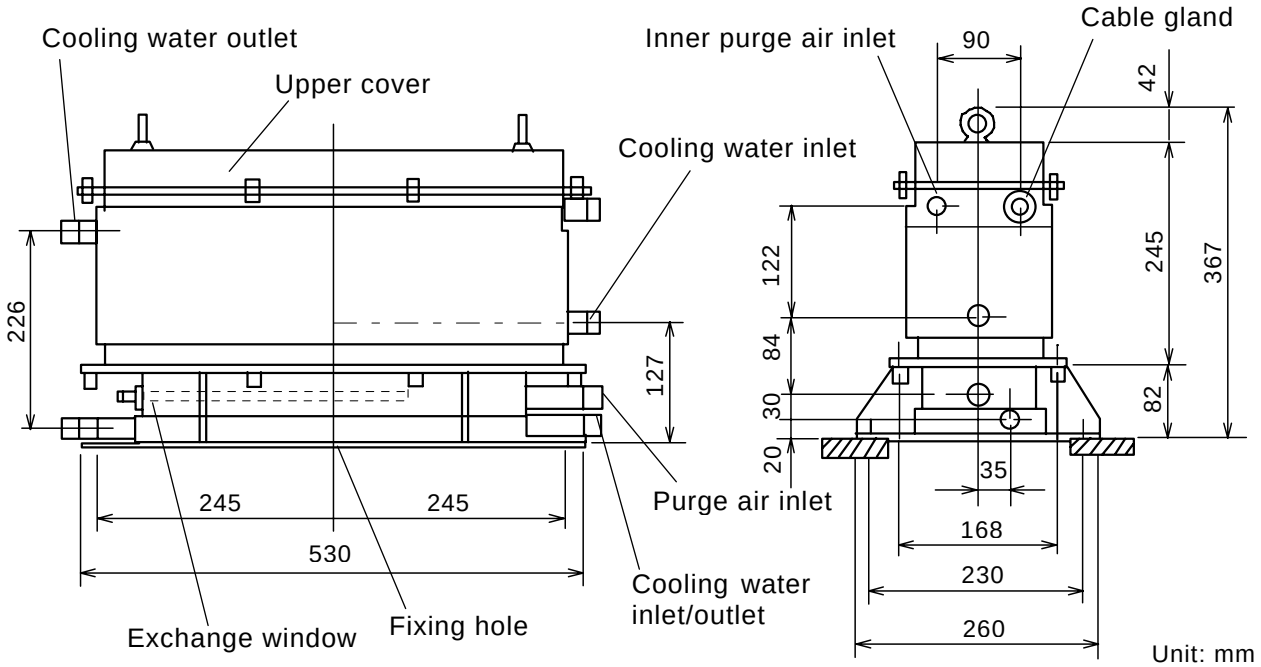
Since the drive power is supplied to the detector unit from the relay box, when the relay box is turned on, the detector unit automatically becomes ready to measure.
However, when the protective case and/or the air-purge hood are used, confirm that cooling water and/or purge air are supplied in advance.
By starting up the software of the high-speed display/processing unit and then clicking the measurement start button, the detector unit is put into operation.

4. Accessories

4.1 Protective case Model: IR-ZEPW

When the detector unit is placed under such hostile environment as high temperature, high humidity, smoke, dust, oily smoke, etc., this protective case is used for housing the detector unit.
At the cooling-water inlet/outlet and the purge air inlet, R1/2 screws are used.

Names	Functions
Upper cover	Remove this cover to take or wire to the detector unit. The detector unit is fixed to the protective case with 8 pieces of M12 bolts.
Cable gland	It is used to pull in the connecting cable between the detector unit and the relay box. With water-proof bushing
Inner purge air inlet	This air inlet is for keeping dust, steam, etc. from entering into the detector unit by blowing air. The connection is by R1/2 screw. Use clean air.
Purge air inlet	This air inlet is for keeping dust, steam, etc. from adhering to the exchange window. The connection is by R1/2 screw. Use clean air.
Exchange window	This dust-proof glass is for the measurement window of the detector unit. If the glass becomes dirty, it will become a cause of an indication error. Since the glass is detachable, clean it if necessary.
Cooling water inlet/outlet	These are water inlet and outlet of cooling water and the connection is by R1/2 screw. The inlet and outlet at the lower side can be used reversely.
Fixing hole	This hole is for fixing the protective case to a mounting stand (prepared by you). Fix the protective case with 6 pieces of M16 bolts.



Cooling water	Pressure	0.3MPa max
	Flow	1 ~ 5ℓ/min
	Temperature	Lower than 40°C at the outlet
Purge air	Air	Clean air
	Pressure	0.5MPa max
	Flow	10 ~ 60Nℓ/min

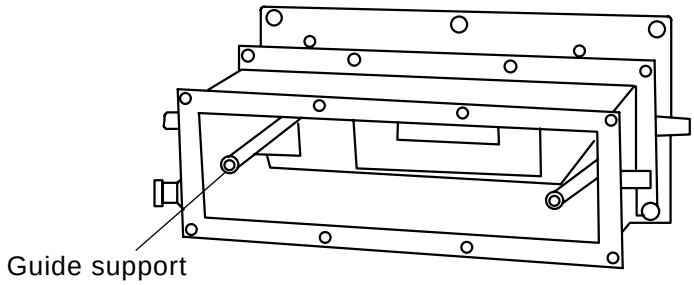
4. Accessories

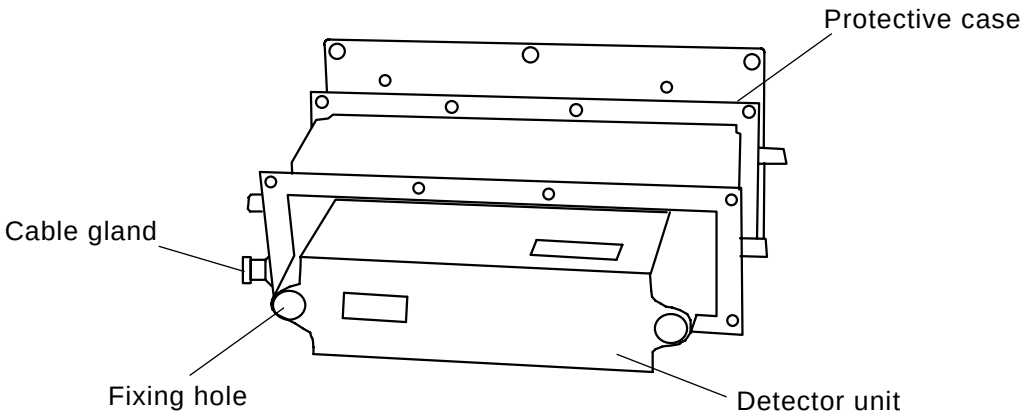
4.1.1 Installation

Fix the protective case with 6 pieces of M16 bolts to a mounting stand (prepared by you) so that the protective case is parallel to a measuring area and the center of the protective case is positioned with the center line of a measuring area.

4.1.2 Housing the detector unit

(1) Perform the distance setting before housing the detector unit in the protective case.
(2) Remove the upper cover of the protective case.
(3) Insert the detector unit until it contacts the bottom of the protective case while sliding the fixing holes of the detector unit along with the guide supports, and then fix the detector unit with 2 pieces of M20 bolts. In this case, insert the detector unit keeping it as parallel as possible.
Be careful that it will have galling if the detector unit is put by force.
(4) Perform connections by drawing the connecting cord through the cable gland.
(5) By mounting the upper cover, the housing of the detector unit is completed.

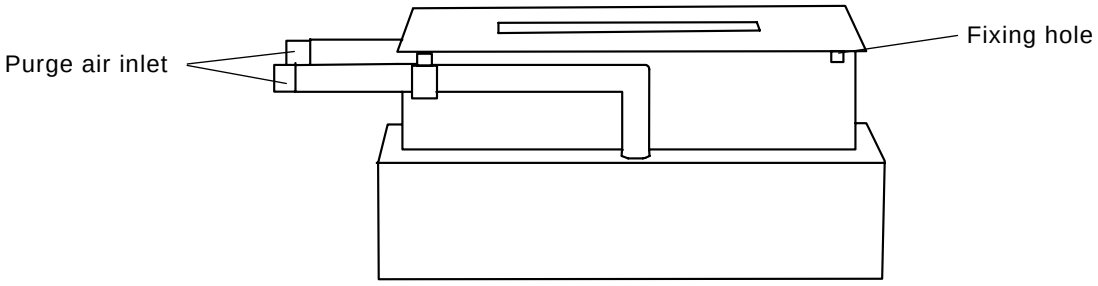




4. Accessories

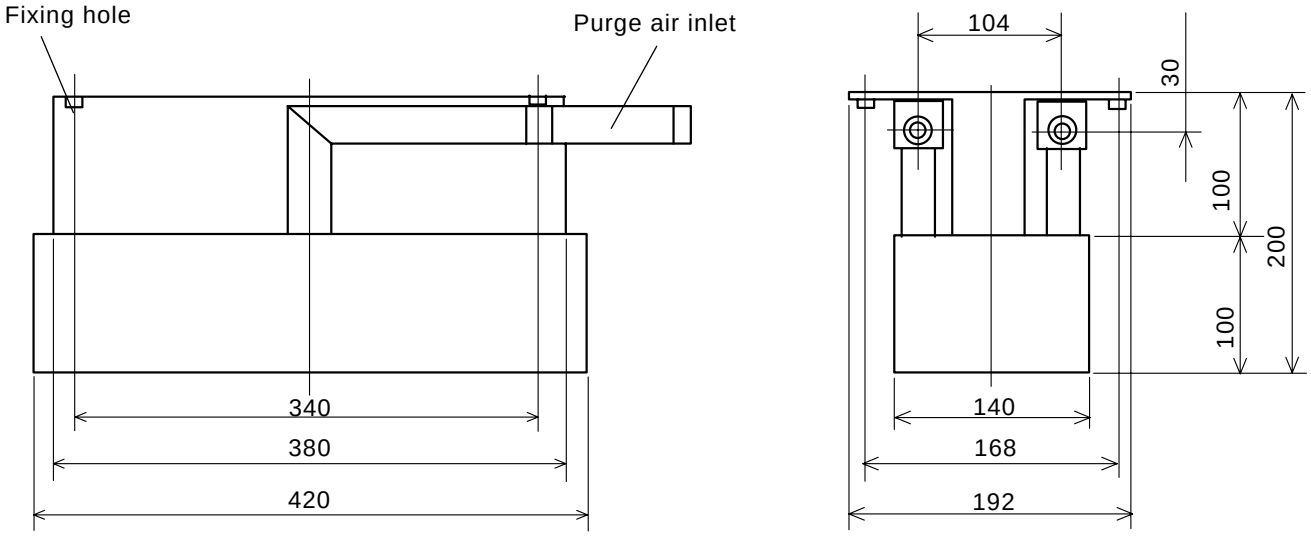
4.2 Air-purge hood Model: IR-ZEAH

When water-drops, dust, smoke, steam, etc. between the detector unit and a measuring area exist and the affection by existence of such substances cannot be ignored, this hood is used to purge such substance with air. This hood is used in combination with the protective case and fixed on the lower side (reverse side of the upper cover) of the protective case with 4 pieces of M12 bolts.



Names	Functions
Purge air inlet	This air inlet is for blowing air to clear the optical path. The connection is by R3/4 screw (2 places).
Fixing hole	This hole is for fixing the air-purge hood to the protective case. Fix the air-purge hood with 4 pieces of M12 bolts.
Material	Stainless steel
Weight	About 8 kg
Purge air	Air: Clean air Pressure: 0.5MPa max Flow: 200 to 800Nℓ/min Connection: R3/4

・External dimensions



Unit: mm

5. Maintenance

5.1 Periodical maintenance

Check the followings periodically or if required.

- Cleaning of optical components
  Cleaning of optical components of this trace thermometer is regularly required. If the cover glass or the lens is splotched, remove it with a blower for cameras. If the splotch cannot be removed with the blower, wipe the cover glass or the lens gently with a cotton ball or gauze soaked in alcohol.
- Connections and wirings
  Check all connections and wirings.

(1) Cleaning of optical parts	Pay attention to always keep such optical parts as the measurement window of the detector unit and the exchange window of the protective case clean. If dirt or loss of transparency is present, wipe off it with gauze, etc. It is effective to impregnate the gauze with alcohol, ether or their mixture of equal amount.
(2) Looseness of the detector unit	Confirm that the mounting portion of the detector unit is firmly fixed.
(3) Looseness of cable connections and connectors	Confirm that terminal screws and connectors of the detector unit, the relay box, the high-speed display/processing unit, receiving instruments, etc. have no looseness.
(4) Volume and temperature of cooling water	When water-cooling is executed, confirm that the volume of the cooling water is sufficient and the temperature of the cooling water outlet does not exceed 40°C.
(5) Purge air	When air purging is executed, confirm the volume, pressure, clearness, etc. of the air supplied.
(6) Checking receiving instruments	When such receiving instruments as recorders and controllers, and/or final control equipment are used together, check these units, too.

5.2 Trouble shooting

For a trouble occurred, checks the followings and take remedial steps by referring to the corresponding items in this manual.

1. No indication or low indication

(1) Are the connecting cables connected correctly? Check if there is any break in the cable.
(2) Is the power voltage in the allowable range?
(3) Does a measuring area cover the sight of the detector unit?
(4) Is the temperature of a measuring area within the measurement range of the detector unit?
(The actual temperature may lower than the measuring range.)
(5) Is the optical path of the detector unit clear? Also, are the measurement window of the detector unit and the exchange window of the protective case clean?
(6) Is the emissivity compensation setting on the high-speed display/processing unit correct?
(7) Is the surface temperature of the detector unit less than 50°C?
(8) Check if the ambient temperature of the detector unit has been low and the optical system has been dewed.

2. High indication

(1) Is the temperature of a measuring area within the measurement range?
(The actual temperature may higher than the measuring range.)
(2) Is the emissivity compensation setting on the high-speed display/processing unit correct?
(3) Check if the heat radiation from an external hot substance is reflected at a measuring area or the detector unit.

5. Maintenance

3. Fluctuated indication

(1) Is the detector unit fixed firmly and not vibrated?
(2) Are the connectors of the connecting cables connected firmly? Check if there is partial disconnection in the connector.
(3) Are the terminal screws on the terminal board tightened firmly?
(4) Check if there is partial disconnection in the connecting cable.
(5) Is the power voltage in the allowable range?
(6) Check if there is such disturbance as fume, etc. in the optical path.
(7) Check if the temperature of a measuring area fluctuates.
(8) Check if the emissivity of a measuring area fluctuates. (In case of moving objects especially)

Despite the above inspections, when a cause does not become clear, inform your nearest CHINO's agent/distributor of the state and phenomena of equipment. At this time, do not touch internal mechanisms/circuits by hands.

6. Specifications

Scanning system	Linear optical scanning (Optical axis scanning by rotary mirror)
Detecting element	Cooling type PbSe
Measurement wavelength	4.0μm
Scanning angle	50°
Scanning speed	50 times/second
Measuring system	Narrow-band radiation thermometer
Accuracy rating	Less than 400°C・・・±4°C 400°C or more・・・±1.0% of measured value (at ε≒1 and reference operating condition)
Resolution	Less than 400°C・・・2°C, 400°C or more・・・3°C
Measurement distance	0.5 ~ 10m
Instantaneous view (mm□)	Measurement distance (mm)/Distance factor
Response speed	120μs (Scanning speed 50 times, Distance factor 200 or more) 200μs (Scanning speed 50 times, Distance factor 50 or more) At 95% indication
Output signal	Superimposed signal of photometric brightness pattern + scanning synchronous signal Photometric brightness pattern signal level・・・0 to 1mADC
Load resistance	0 to 5kΩ
Working temperature range	0 to 50°C 0 to 120°C (in case of using the protective case and water cooling)
Power supply	100VAC 50Hz/60Hz
Allowable voltage fluctuation	90 to 110% of rated value
Power consumption	About 40VA
Allowable vibration	29.4m/s^2 (3G) or less (continuous)
Connection type	Terminal connection or connector connection
Connecting cable length	Maximum 200m (exclusive cable)
Case	Aluminum casting
Weight	About 12kg

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