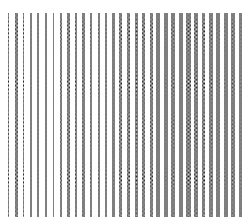


CHINO

IR-ESCF2□□ Series

**LOW TEMPERATURE SCANNING
RADIATION THERMOMETER**



INSTRUCTIONS

Always keep this instruction manual with the unit.

Please be sure to deliver this instruction manual
with the unit to the end user.

CHINO

Request and Notices

Please read this instruction manual for using the “ Low temperature Scanning radiation thermometer IR-ESCF2□□” correctly and safely.

◆Request to the operator of the thermometer

This instruction manual describes the maintenance of the thermometer, too.

Keep this instruction manual with the thermometer.

If you have unclear points or need technical assistance, please contact your sales agent of CHINO Corporation.

Notice

1. The information in this manual is subject to change without notice and does not represent a commitment on the part of CHINO Corporation.
2. No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose other than the purchaser's personal use without permission of CHINO Corporation.
3. CHINO Corporation shall not be liable for any operation results.

Preface

To use the “Low temperature Scanning radiation thermometer IR-ESCF2□□” correctly and safely, please keep the following safety measures for the operation and storage of the thermometer.

1.Working conditions and environment




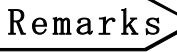
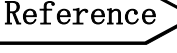
- The working temperature range of the thermometer is 0 to 50°C.(No dew condensation)
- Do not use the thermometer in dusty places, etc. Remove the dust after using it.
- Be careful not to give vibration or impact to the thermometer.
Mount the thermometer by keeping it as far as possible from an inductive oscillator or electric power line.

2.Storage

- Do not store the thermometer in hot and humid places.
- Although connector department is protected by boots etc, it becomes the cause of malfunction when an external force increases. Especially please handle and please pay attention.
- When the thermometer has any trouble, please contact to CHINO’s sales agent.








3.Symbol in this instruction manual







The symbols shown below are used depending on important degrees for using the thermometer safely and avoiding unexpected situations.

Important degree	Symbols	Contents
1		This symbol is attached to a title for the sentence with the Warning .
2		For avoiding dangerous accidents (may cause death or serious injury) like as electrical shock, fires, or troubles/damages of the thermometer.
3		For avoiding injury or in physical damage to the thermometer.
4		For items that you should know as a supplement for this instruction manual.
5		For items that are convenient as a supplement for this instruction manual.

Warnings and Cautions

Please use the “Low temperature Scanning radiation thermometer IR-ESCF2□□” correctly by keeping the following items. In addition, please read this instruction manual carefully and keep it at the place where you can access easily.

	Warning (May cause death or serious injury)	
	Never operate the thermometer in places where combustible or volatile gas is existed. It is extremely dangerous to use the thermometer in such environment.	
	Please turn off the power supply of the source of supply without fail before the connection to the power supply, due to electric shock prevention.	
	Please do not use it, in the case that the thermometer damage and also smoke and nasty smell do. It becomes the cause of a fire. Turn off the power supply right away in the case that there are smoke and nasty smell, damage. And please contact to CHINO's sales agent.	

	Caution (May cause injury or physical damage)	
	Mount the thermometer by keeping it as far as possible from an inductive heating oscillator or electric power line.	
	Never take the thermometer apart or convert it. These may cause trouble and danger.	
	Keep the [items] and handling methods described in this instruction manual. When the thermometer is used without keeping them, the thermometer may be damaged or not be functioned perfectly, or may damage other equipment.	

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1. Introduction

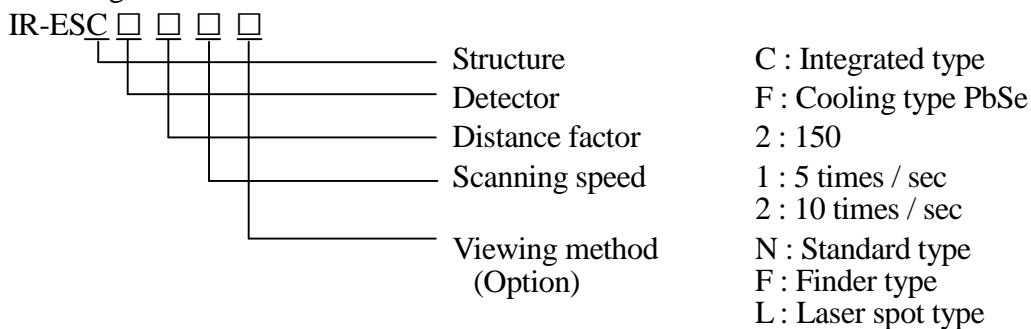
1.1 General

Low temperature Scanning radiation thermometer IR-ESCF2□□ series is designed to measure unidirectional temperature patterns of a moving object or revolving object. It became low cost and high performance. IR-ESCF2□□ consists basically of the scanning unit, control unit with indication(personal computer) and various kind of connecting cables.

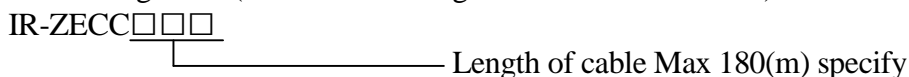
2. Model and Configuration

2.1 Model

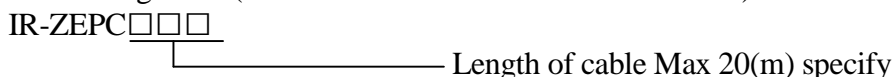
● Scanning unit



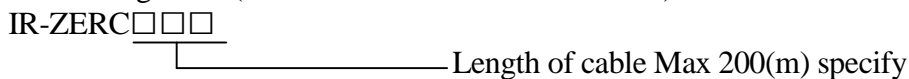
● Connecting cable (Between scanning unit and terminal board)



● Connecting cable (Between terminal board and control unit)



● Connecting cable (Between control unit and recorder)



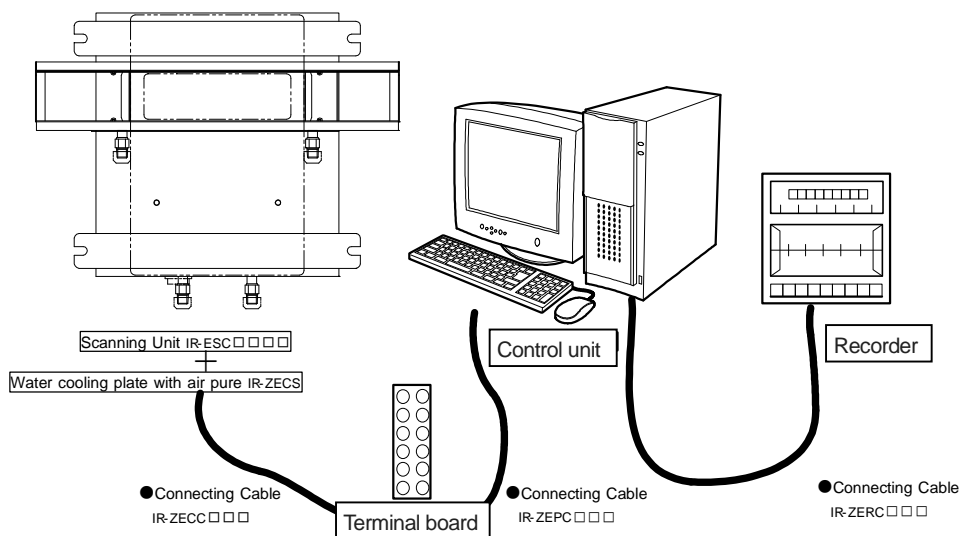
● Water cooling plate with air purge

IR-ZECS

Reference

Terminal board with doesn't come with IR-ESC. Prepare at customer side, please.
Fitted screw : M3.5 12P

2.2 Configuration



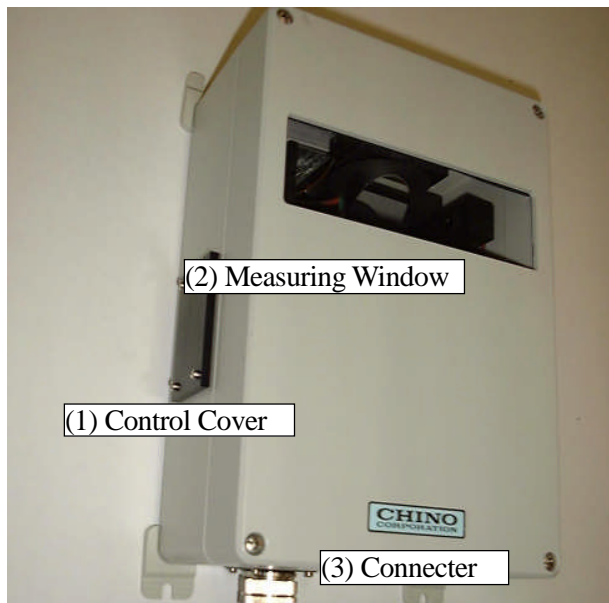
Reference

When use water cooling plate with air purge (IR-ZECS), read the instruction manual of "Water cooling plate with air purge".

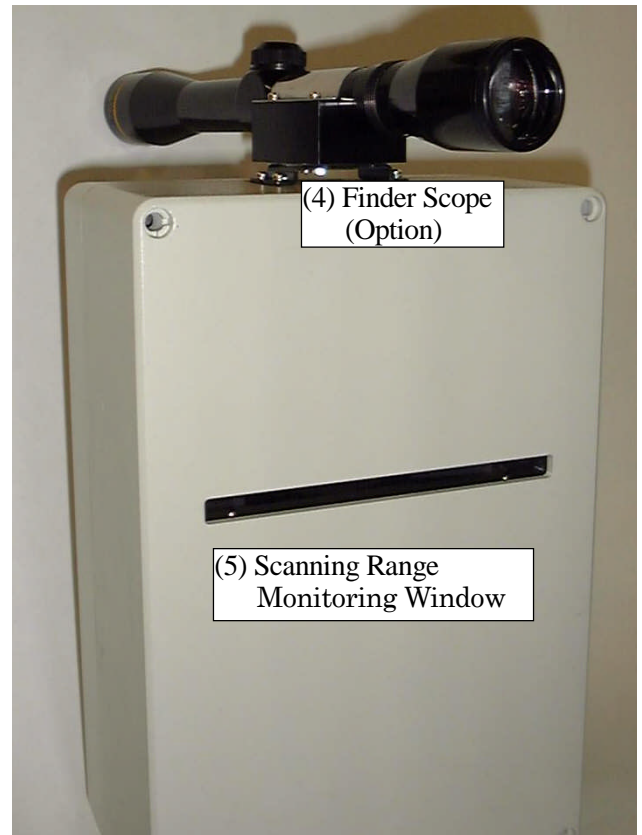
3. Name and function of each parts

3.1 Scanning unit IR-ESCF2□□ Front-side & Back-side

[Picture from Front-Side]



[Picture from Back-Side]



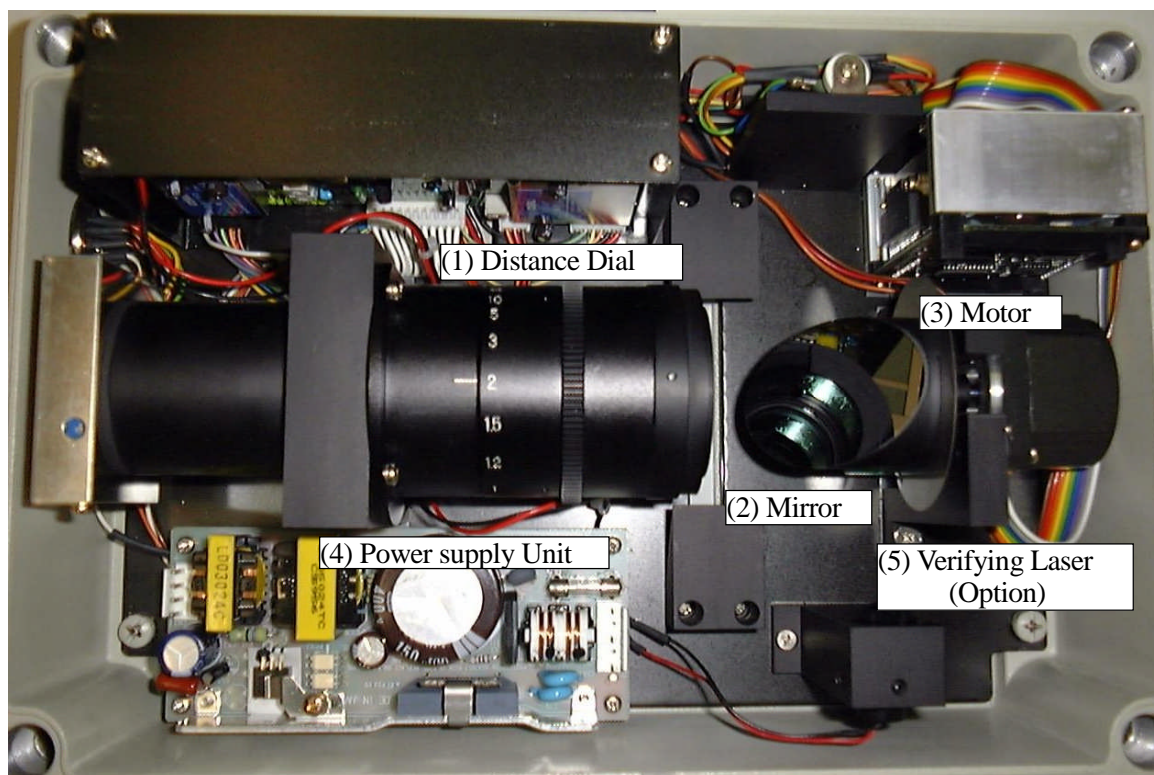
Name of parts	Functions
(1) Control Cover	Protection cover of control unit such as leaser switch that determines the view, radical ratio shifting switch, radical setting digital switch, etc... Control cover is held with 4 M3 screws. If there is any setting change on verifying Laser switch, Radical Ratio shifting switch, Radical Ratio setting digital switch, etc, take the control cover off and make a change.
(2) Measuring Window	A window for inputting radical energy of measuring face detection unit. It need to be kept in clean.
(3) Connector	Connection for connecting cable for between scanning unit and terminal board, IR-ZECC□□□
(4) Finder Scope	A scope to assess the scanning range visually. (Optional)
(5) Scanning Range Monitoring Window	A window to see the scanning range.

3. Name and function of each parts

3.2 Scanning unit IR-ESCF2□□ Inside

Scanning unit upper cover is held with M6 screws.

In order to make a setting change on parameters and verify, take upper cover of the Scanning unit.



Name of part	Functions
(1) Distance Dial	Adjusting dial for distance of scanning unit and measuring object. Under understanding of “Distance between Scanning Unit and Measuring Object”, adjust the distance <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;"> Reference → Measuring distance can be adjusted in 0.5m or larger at your recognized setting </div>
(2) Mirror	Mirror for measuring radical thermal energy from measuring objects
(3) Motor	Motor for spinning mirror Measuring reflecting energy level from measuring object while it is scanning the measuring object by spinning mirror. (maintenance parts)
(4) Power supply Unit	Power supply unit to provide power to scanning unit. (maintenance parts)
(5) Verifying Laser	Laser for verifying the Scanning Range. (Optional component)

3. Name and function of each parts

3.3 Scanning unit IR-ESC Inside of control cover

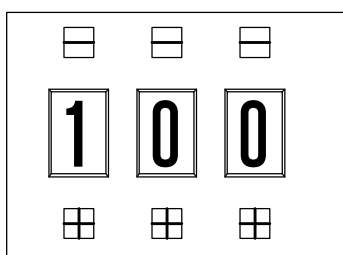
Scanning Unit Side Control Cover is held with 4 M3 Screws.
In order to make a setting change, take the control cover off and make the change.

3.3.1 (1) Select switch for emissivity

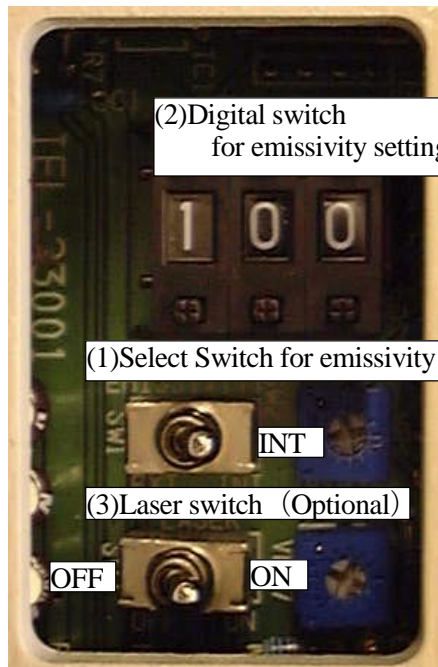
A switch for radical ratio setting whether setting by external input signal or radical ration setting digital switch internal located in a control cover.

3.3.2 (2) Digital switch for emissivity setting

When you have (1) “Select Switch for emissivity” to “INT”, the digital switch that allow you to change radical ratio.



Push the button or button by chip of a Ball-pen Set the emissivity.



3.3.3 (3) Laser switch (Optional)

ON-OFF Switch for Verifying Laser
Refer to “4.3.3 Laser Manual Verifying” for more details

3.3.4 Setting radical ratio from in side of scanning unit (Setting by radical ratio setting digital switch)

When you have (1) “Select Switch for emissivity to “INT”, the digital switch that allow you to change radical ratio.

Reference

You can set radical ratio setting by radical ratio setting digital switch up to 2 decimal points.(Setting Example: When you set the digital switch “057”, the radical ratio is 0.57)

Remarks

Radical ratio setting range is from 0.10 to 1.99.
You are able to change the display of the most left number “0 to 9”; however, if the number is larger than 1, the number would be recognized as 1.
(Ex. When you set “3.62”, it would be calculated as 1.62.)

4. Installation

4.1 Measuring distance

Measuring distance can be changed within the range of 0.5 to ∞m with your recognized procedure.

Before you set this scanning Unit, please measure the distance between the scanning unit and the measuring object. Then use the distance dial in the scanning unit to adjust it accordingly.



Reference

Turn the distance dial toward you to set 0.5m.
Turn the distance dial back forward against you to set ∞m.

Remarks

You can adjust measuring distance within 0.5 to ∞ m range.
However, the scanning angle stays in the same, more you set the distance longer the scanning range gets wider on the measuring object.

4.2 Scanning span

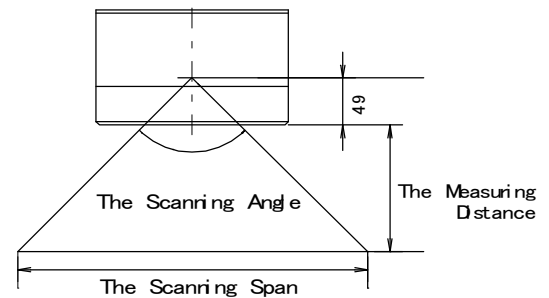
Scanning span is determined by the measuring distance and the scanning angle

Please refer this following formula to calculate the scanning range and measuring distance for your installation.

$$\text{Scanning Span} = 2 (49 + \text{Measuring Distance}) \tan \frac{\text{Scanning Angle}}{2}$$

Unit :mm

[Surface figure]



4.3 Procedure of visual verifying scanning range

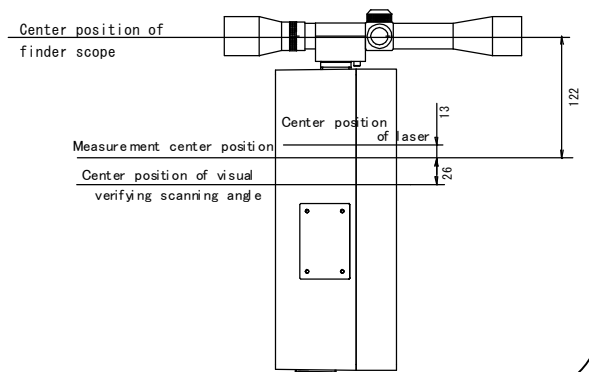
There are three ways of visual verifying: “Scanning range verifying window”, “Finder scope verifying (Optional) function”, and “Laser style verifying (Optional) function”. (Refer “3.1 Scanning Unit IR-ESC Front-side and Back-side) For more details, please refer the adequate category of “4.3.1 Scanning range Verifying window manual”, “4.3.2 Finder scope Verifying Manual”, or “4.3.3 Laser Verifying Manual” of your purchased systems.

Caution

Following these 3 verifying procedures are only references.

Because the real light collection part is a mirror, there is some difference between visual verifying procedure and the mirror distance (vertical direction)

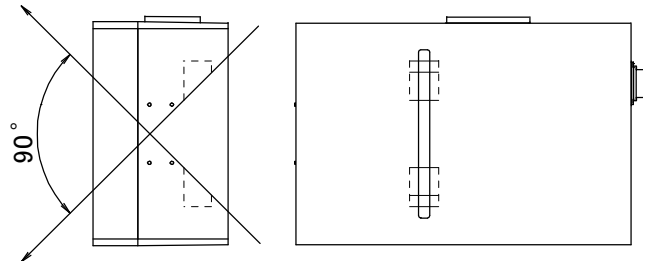
Please refer the right side picture and install the scanning unit including the distance difference after you figure out the distance of the measuring object and Scanning unit by one of these three measuring ways



4. Installation

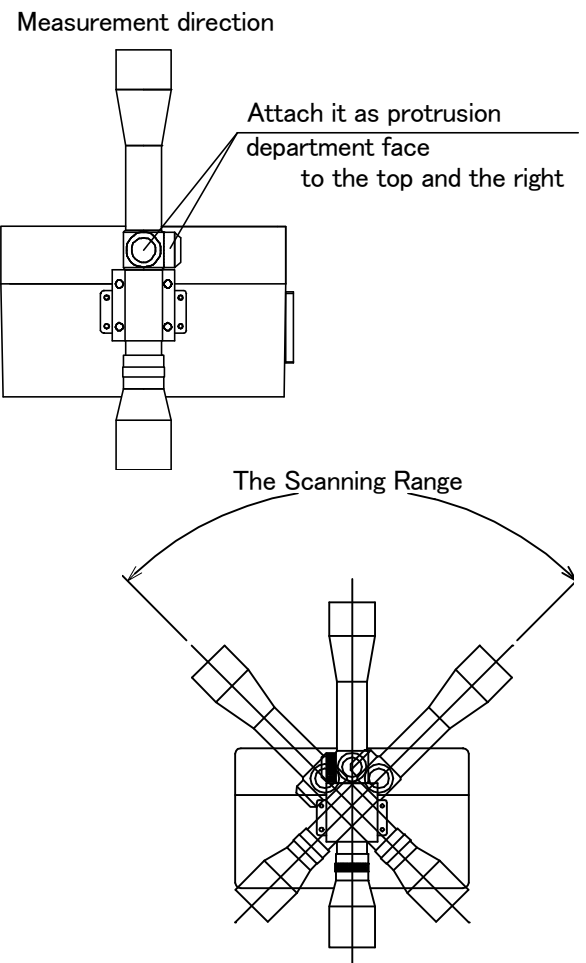
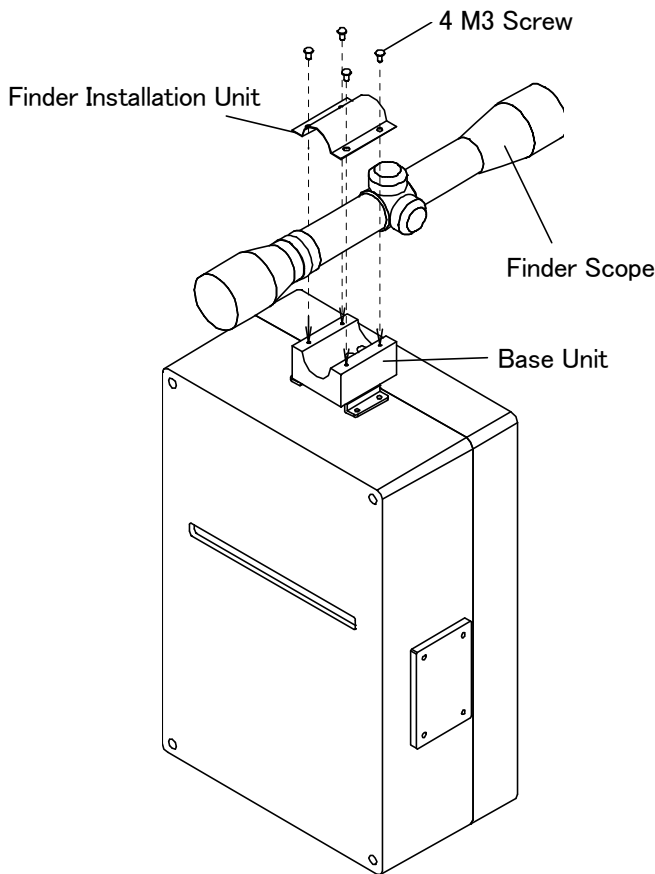
4.3.1 Scanning range verifying window

You can verify the scanning range from the scanning range verify window on the backside of scanning unit as it follows (Refer "3.1 Scanning Unit IR-ESC Front & Back-side) Between the extended line of right and left bricks is scanning range.



4.3.2 Finder scope (Optional) verifying manual

If you have purchased an optional finder scope IR-ESCF2□ F, you can do visual verify with this application. (Refer "3.1 Scanning Unit IR-ESC Front/Back-side)
 "Base Unit" and "Finder Installation Unit" are mounted on upper scanning unit. "Finder" is in a separate packing. Install the finder Scope as this picture below:



Remarks

Once the Base Unit of the fixation removes it in the Scanning unit appear part, the readjustment is necessary. Please never remove it.

4.3.3 Laser (Optional) verifying manual

If you have purchased an optional laser IR-ESCF□□L, you can do visual verify with the laser verifier installed in it. (Refer "3.1 Scanning Unit IR-ESC Front/Back-side)
 Open side control cover on the scanning unit, and turn on the visual verifying laser switch.
 Locus of the laser is the scanning range.

4. Installation

4.4 Scanning unit installation

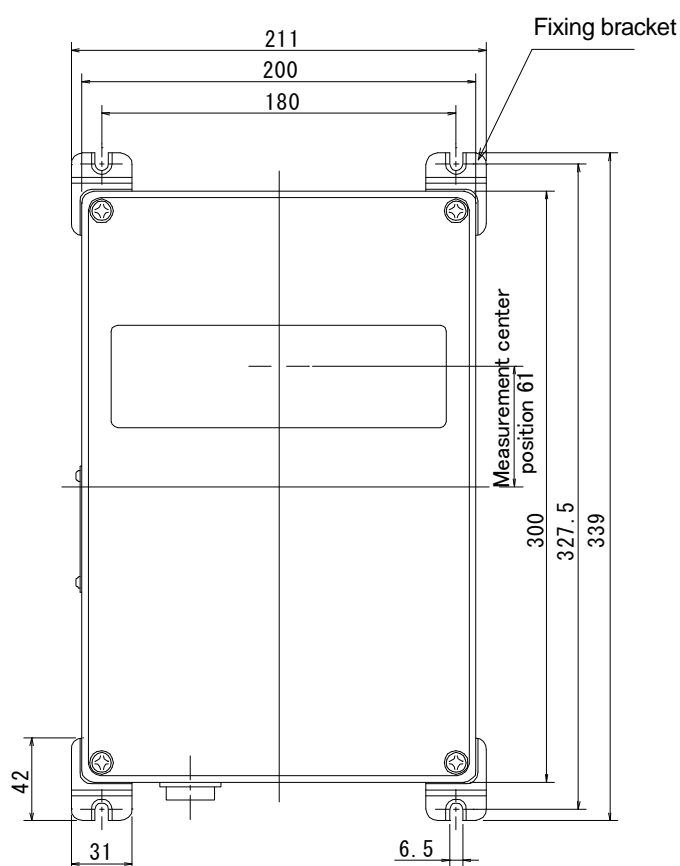
The Scanning unit has 4 holes for installation of the main.(Refer “3.1 Scanning Unit IR-ESC□□□□ (3) at front and back side) Set on a installing board with 4 M6 bolts.

Remarks

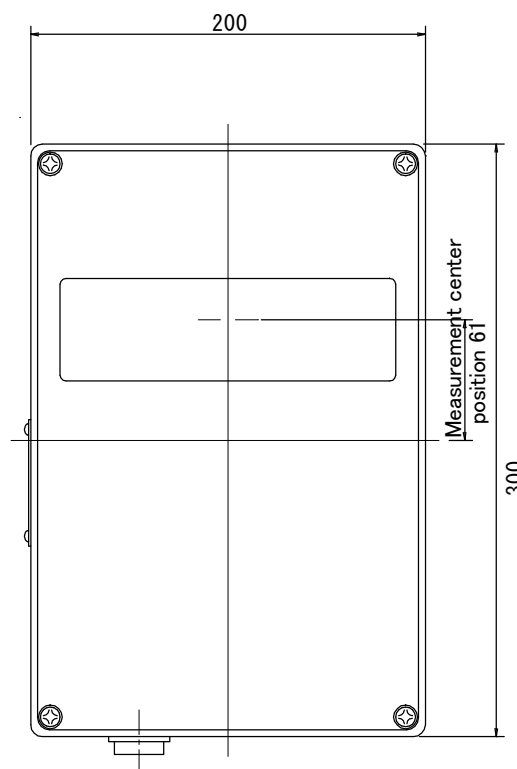
- Read the separate instruction manual “Water cooling plate with air purge”, when you use the water cooling plate with air purge IR-ZECS.
- When installing it in the protection case, remove a fixing bracket.

<Scanning unit external dimensions>

● With a fixing bracket



● Without fixing brackets



Caution

Please avoid installing in any places with this following place list.

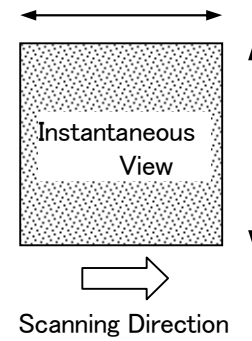
- Dusty, filthy, or volatile gas is existed.
- Surrounding area temperature is over 50°C, or lower than 0°C
- Temperature change of surrounding air is sharp, or high humidity places
- Near high voltage cables or strong leading interruption existing places
- Mechanical vibration existing places or any physical shock existing places.

4. Installation

4.5 Measuring scan range

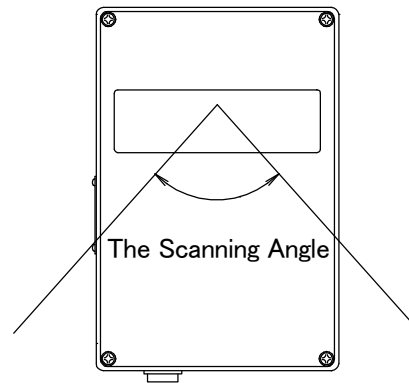
- The measuring scan range “d” will be determined by the distance coefficient and the measuring distance.
- Please refer the formula below to adjust the measuring distance.

$$d = \frac{\text{Measuring Distance}}{\text{Distance Factor (150)}}$$



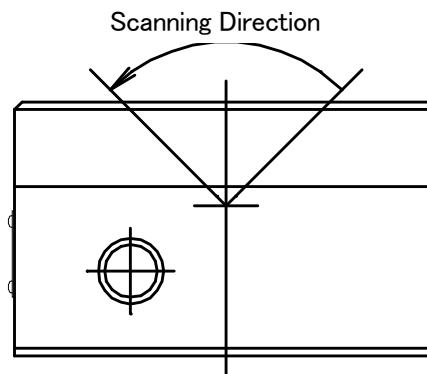
4.6 Scanning angle

- Scanning Angle is fixed (90 degree standard)
- Asymmetric from the center.



4.7 Scanning direction

- Scanning direction is left to right facing to the measuring object.



Remarks

To prevent increasing temperature, please follow this following procedures counter to your measuring condition.

[When the measuring object and scanning unit are close together and the measuring object is big and high in temperature]

- Separate the scanning unit within the range of measuring range and measuring distance have adequate balance.

If there is no clearance to give some separation, put a shading light board or apply water cooling plate with air purge between the scanning unit and a measuring object.

[When the Measuring Object is High in Temperature and there is Any Effects from Evaporation]

- Install the scanning unit with some angle instead installing straight above the measuring object. Or, apply an water cooling plate with air purge.

5. Connections



Warning

To prevent electric shock, please make sure AC power supply is “OFF” before you work on the connection.

5.1 Connection of connector

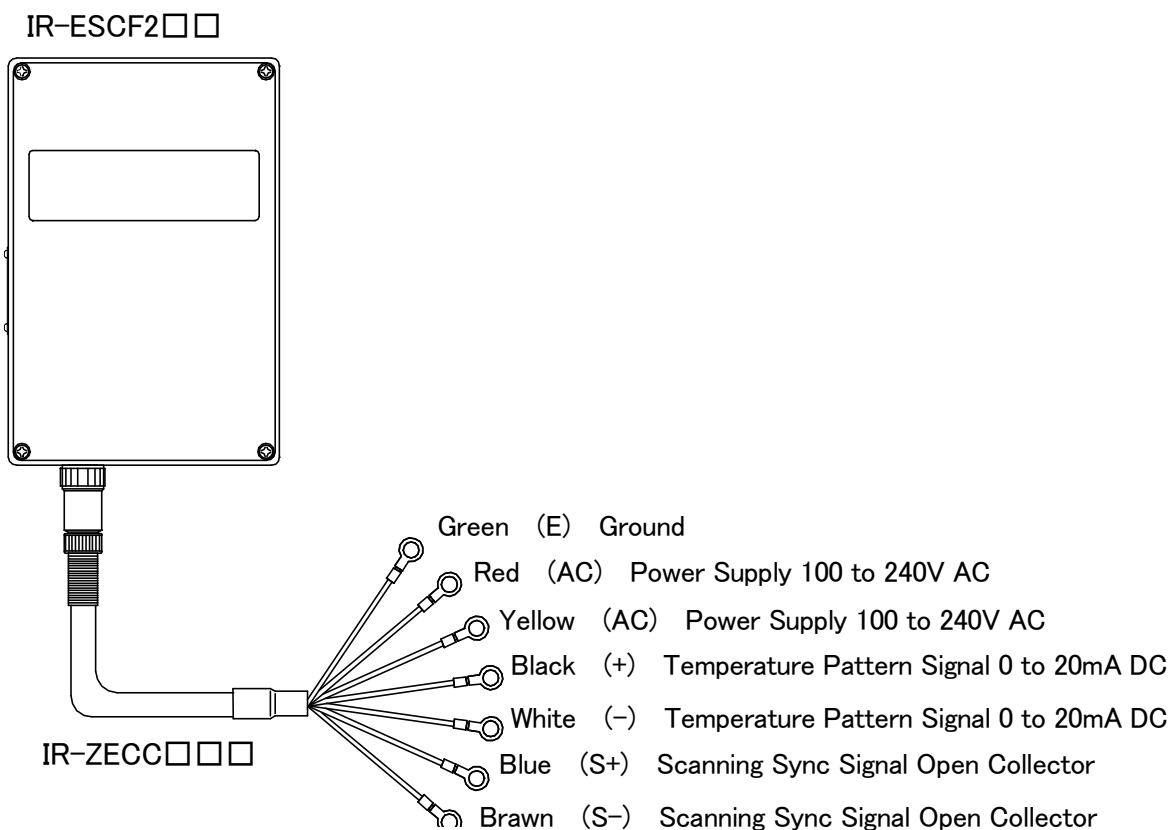
Connect the connector of IR-ZECC cable to the connector of Low temperature scanning radiation thermometer IR-ESCF2□□.

- 1) To connect, push the ON / OFF ring into the connector ditch and turn it to clock wise until it is locked.
- 2) To disconnect, turn the ON / OFF ring opposite direction to clock wise to unlock, then pull the connector out.



5.2 Connection to the terminal board

Please connect each Wire end to wire end base.



Reference

Please obtain a terminal board at the customer side
(Applicable screw : M3.5)

Reference

Please refer the manual “Kiln Shell temperature Monitoring System Connections ”for the Kiln System.

6. Operation

6.1 Operational preparation

Reference

Please make sure all these followings before you operate the system.

- 1) Scanning Unit is installed certainly.(Refer"4.4 Scanning Unit Installation")
- 2) Scanning Unit and Connection cable IR-ZECC□□□ have been adequately treated and closed the end completely. (Refer "5.1 Connection to connector")
- 3) Connection cable IR-ZECC□□□'s each wire end has been attached on the terminal board correctly. (Refer"5.2 Connection to the terminal board")
- 4) If the distance of the scanning unit and the measuring object counters to the number of distance dial. (Refer "4.1 Measuring Distance")
- 5) If the scanning Unit Scanning Range has been set adequately. (Refer "4.3 Procedure of Visual Verifying Scanning Range")
- 6) If the Radial Ratio setting is correct. (Refer "3.3.1 Select Switch for emissivity " and "3.3.2 Digital Switch for emissivity setting" and "3.3.4 Setting for emissivity in side scanning unit" and "3.3.5 Setting for emissivity outside of scanning unit")
- 7) If there are enough water and air , when you use the Air Purge Water Cooling Board (Refer Separate Manual-- "Air Purge Water Cooling Board Operating Manual")

Again please confirm 1) to 7) before you operate the system.

Remarks

If you know the radial ration, you set the ratio.
If you do not know the radial ratio, aim to get the same ratio with a measured number by thermocouple . Please refer "3.3.1 Select Switch for emissivity " and "3.3.2 Digital Switch for emissivity setting" and "3.3.4 Setting for emissivity in side scanning unit" and "3.3.5 Setting for emissivity outside of scanning unit" to figure the ratio, then adjust the radial ratio.

6.2 Operation

Caution

Please keep the power supply voltage within 100 to 240V AC

It will start operating immediately when you supply a power supply (100 to 240V AC) into the scanning unit.

7. Maintenance

7.1 Regular bases maintenance

Check the followings periodically or as occasional calls.

- 1) Looseness of cable connections and connectors
 ...Check if the cable connections for the Low temperature scanning unit IR-ESCF2□□ and the terminal board, or connectors are not loosen.
- 2) Cleaning of measuring window
 ...Always keep clean the measuring window of Low temperature scanning unit IR-ESCF2□□

7.2 Troubleshooting

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

7.2.1 No indication or low indication

Check point		Remedy
1	Is the power switch of scanning unit Off ?	Turn the power switch to ON.
2	Is the power voltage correct?	Supply the scanning unit to the proper power voltage.
3	Is the temperature of measuring object within the measuring range of scanning unit? (Is the actual temperature low?)	Fix the scanning unit to a place where it can scan the measuring object within its scanning range
4	Is the emissivity compensation (ϵ ADJUST) ratio of the scanning unit correct?	Set the correct emissivity compensation (ϵ ADJUST) ratio. (See “3.3.1 Emissivity selection switch” and “3.3.2 Digital switch for emissivity setting”).
5	Is the measuring window of scanning unit clean?	Clean it by a soft cloth impregnating alcohol. .
6	Is the optical path of scanning unit secured?	Secure the optical path of scanning unit. (See “4.3 Procedure of visual scanning range”).
7	Is not the power supply unit malfunctioning with some conditions? (Is not the motor stopping?)	Remove the connectors (pick and raise upward) of ON2 (Refer to “7.4.1 Power supply units exchange”). Check the 1 st pin of CN2(-) and the 4 th pin of CN2(+) by tester, and please confirm whether 24V DC is output.
8	Is not the motor stopping? (In the case that the power supply unit is acting normally with the confirmation of the above (7) clause)	If the motor is stopping the motor is during malfunction. Please exchange motor (Refer to “7.4.2 Motor exchange.”)

7.2.2 High indication

Check point		Remedy
1	Is the emissivity compensation (ϵ ADJUST) ratio of the scanning unit correct?	Set the correct emissivity compensation (ϵ ADJUST) ratio. (See “3.3.1 Emissivity selection switch” and “3.3.2 Digital switch for emissivity setting”).
2	Is the measuring object exposed to thermal radiation reflected from an external hot substance?	Choose a place not being reflected.

7.2.3 Indication fluctuated

Check point		Remedy
1	Is the scanning unit vibrated?	Avoid to fix it to a place vibrated.
2	Is the power voltage correct?	Connect the scanning unit to the proper power voltage.
3	Is the optical path of scanning unit in vapor?	Purge vapor by air.
4	Is the temperature of measuring object fluctuated?	Set the correct emissivity compensation (ϵ ADJUST) ratio. (See “3.3.1 Emissivity selection switch” and “3.3.2 Digital switch for emissivity setting”).
5	Is the emissivity of measuring object varied?	

7. Maintenance

7.3 List of maintenance parts

Reference

Life Cycle varies depends on the operational condition.

Items	Number	Life Cycle	Others
Power Supply Unit	1	5 years	3 years of life cycle of its operated at 40°C or over.
Motor (Connector Included)	1	3 years	

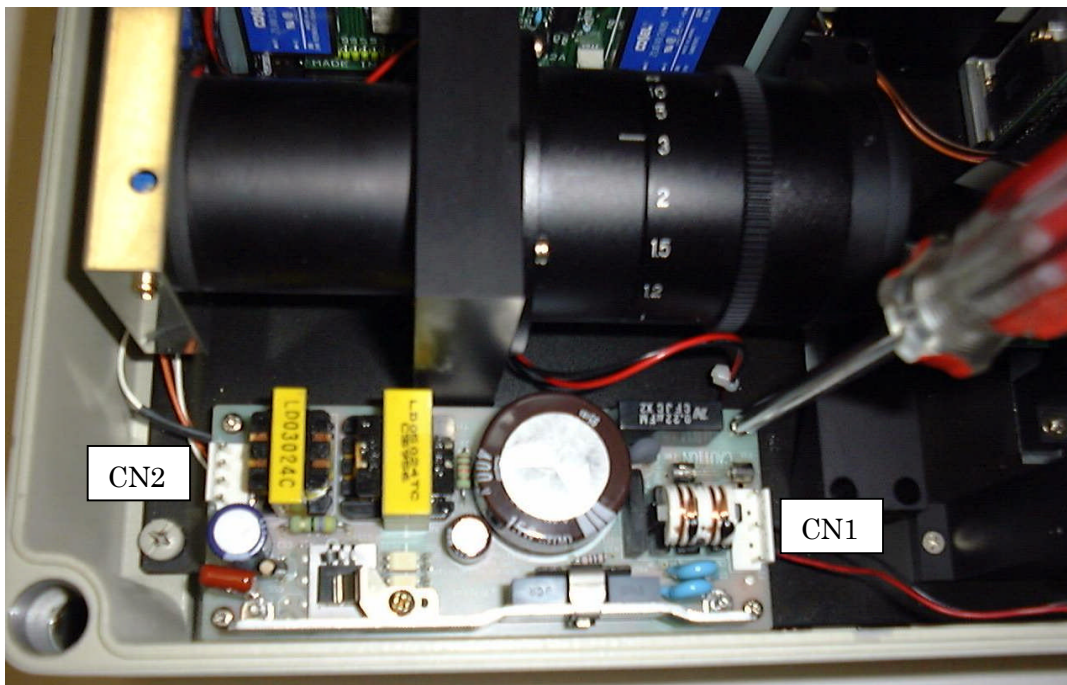
7.4 Exchange of maintenance parts

7.4.1 Exchange of power supply unit

Warning

To prevent electric shock, please make sure the AC power supply is “OFF” before you exchange on the power supply unit.

- 1) Turn AC power supply off for the Scanning Unit
- 2) Take connectors off from 2 places that is connecting the power supply unit.
- 3) Loose up 4 screws hold the power supply unit.
- 4) Install the exchanging power source unit.
- 5) Install connectors on 2 places.
- 6) Make sure if the motor spins when you turn power on to the scanning unit.



Caution

Please install the side has 3-pin connector on the power supply unit CN1 to the motor side, and t has side has 4-pin connector on the power supply unit CN2 to external unit on the Low temperature scanning unit IR-ESCF2□□.

7. Maintenance

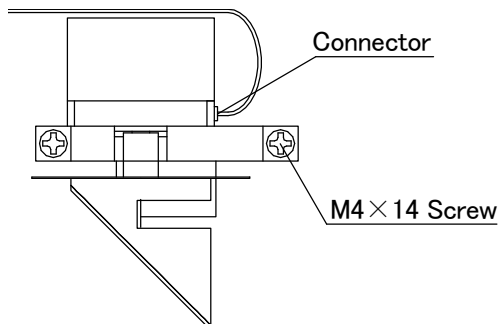
7.4.2 Motor exchange



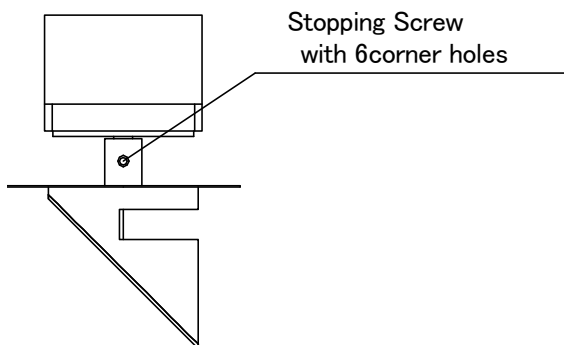
Warning

To prevent electric shock, please make sure the AC power supply is “OFF” before you work Exchange on the motor.

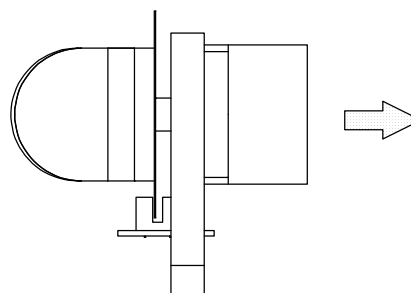
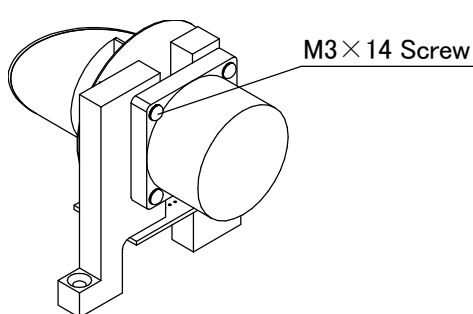
- 1) Turn AC power supply off for the Low temperature scanning unit IR-ESCF2□□.
- 2) Take connector off from a motor.
- 3) Loosen up 2 screws (M4 × 14) that hold up the motor installing board.



- 4) Loosen up 2 screws (stopping screw with 6 corner holes) that hold up the motor installing board.



- 5) Loosen up 4 screws (M3 × 14) hold the motor on the motor installation board.



Raise the motor toward arrow

- 6) Install the exchanging motor.
- 7) Install the connector that has been closed the end with the motor.
- 8) Make sure if the motor spins then you turn power on to the scanning unit.

Caution

Please do not take the synchronous board from the motor installation board because adjustment will be required every time you take it off. Also when you exchange the Synchronous board, please be careful not to bend the board and others.
To prevent electric shock, please make sure the electric power source is “OFF” before you work on the wire.

8. Specification

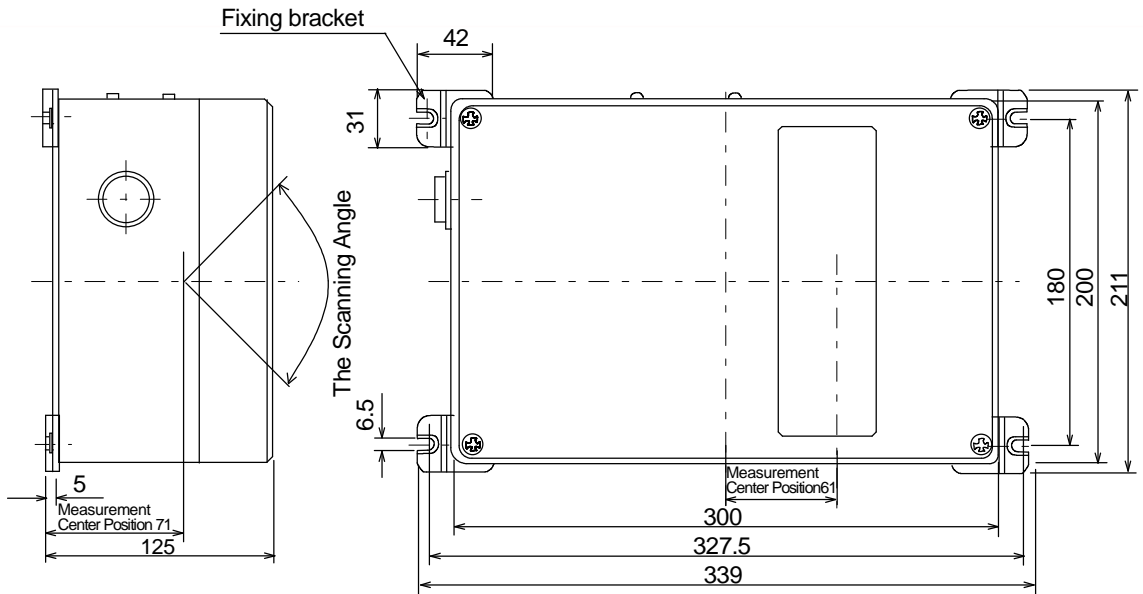
8.1 Scanning radiation thermometer IR-ESCF2□□ specification

ITEMS	CONTENTS
Scanning system	Optical axis scanning by rotary mirror, concentrate by lens
Detector type	Cooling type PbSe
Scanning angle	90°
Scanning speed	5 times/s 10 times/s
Measuring system	Narrow band radiation thermometer
Temperature, range	100 to 600°C
Accuracy	Below 400°C···±4°C Above 400°C···±1.0% of measuring value (provided $\varepsilon \doteq 1$, $23 \pm 5^\circ\text{C}$ at ambient temperature)
Resolution	Below 400°C···about 3°C Above 400°C···about 2°C
Repeatability	2°C
Temp. drift	0.2°C/°C
Emissivity compensation	1.99 to 0.10
Measuring distance	0.5m to ∞
Measuring diameter	Measuring distance(L)/Distance factor(150)
Response time	0.5ms (90% response)
Procedure of visual verifying	Scanning Range verifying window Finder scope verifying···(Optional) Laser verifying···(Optional)
Signal processing	(1) Temperature pattern signal 0 to 20mA DC (load resistance : less than 500 Ω) (2) Scanning sync signal Open collector Load voltage 35V DC Maximum load current 10mA DC
External emissivity setting	4 to 20mA DC
Ambient temperature	0 to 50°C
Power supply	100-240V AC
Allowable voltage	+10% to 15% of rated value
Power consumption	About 40VA
Connection method	Connector type
Length of cable	Max 200(m) specify
Casing material	Aluminum die casting
External dimension, weight	300W × 200H × 120Dmm, About 6.5kg

9. External Dimension

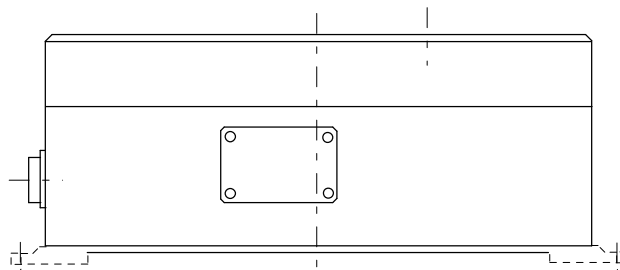
9.1 Scanning unit IR-ESCF2□□

● With a fixing bracket



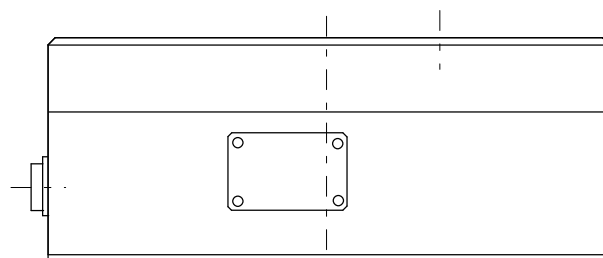
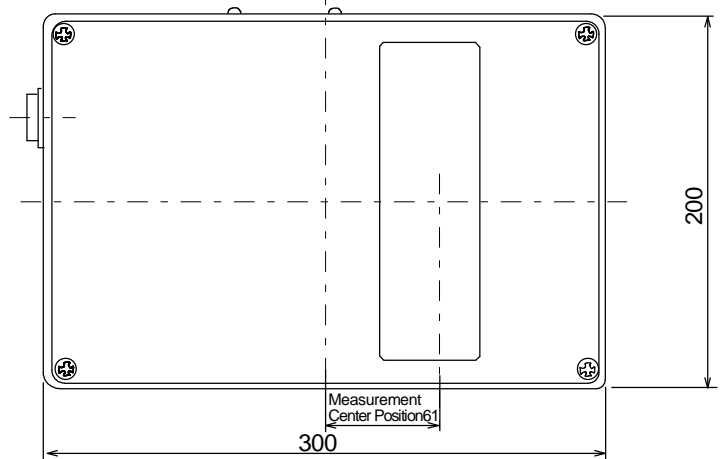
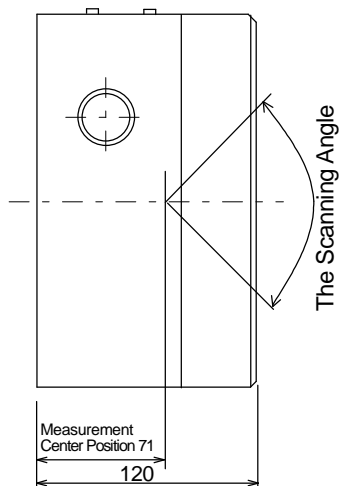
Remarks

- When installing it in the protection case, remove a fixing bracket.



Unit : mm

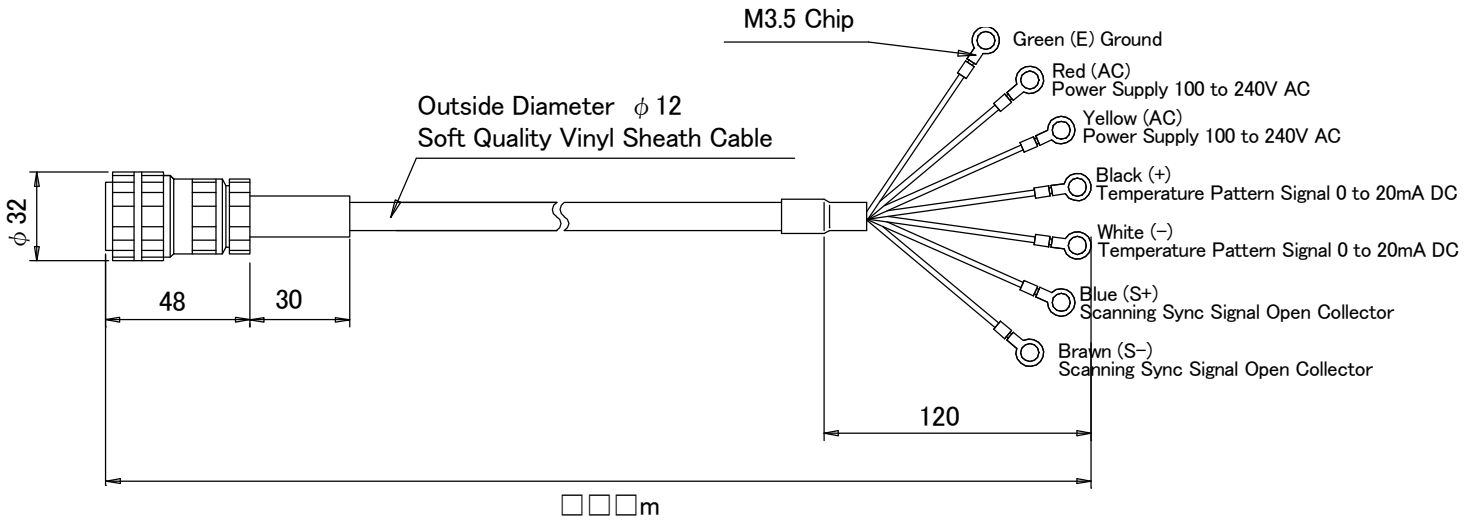
● Without fixing brackets



Unit : mm

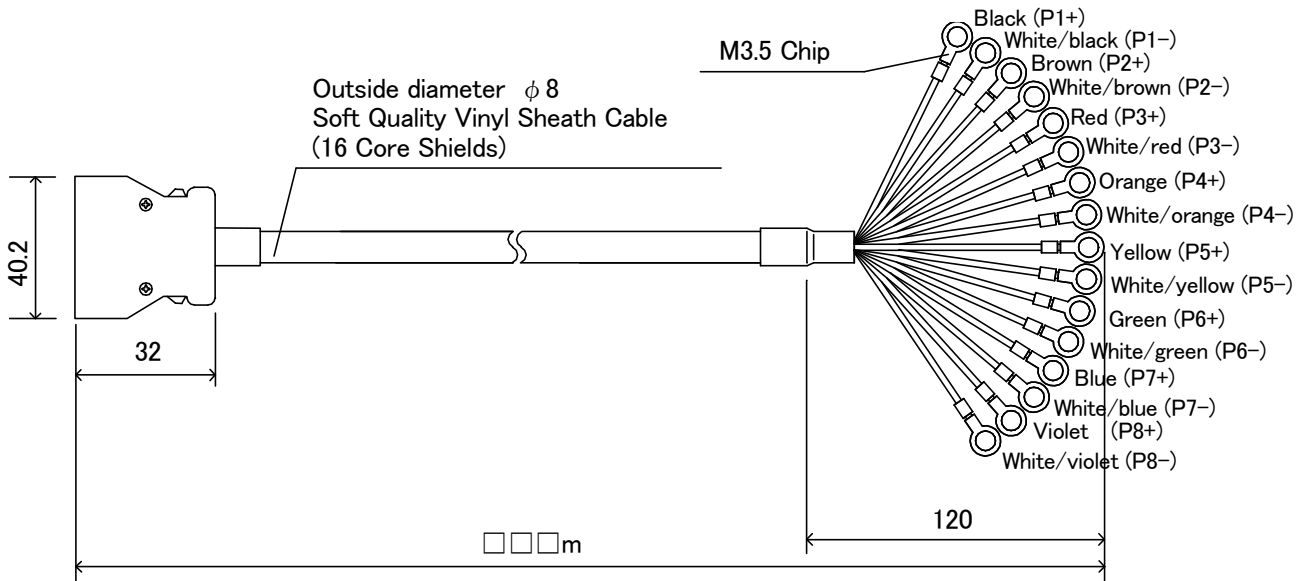
9. External Dimension

9.2 Connecting cable IR-ZECC□□□



Unit : mm

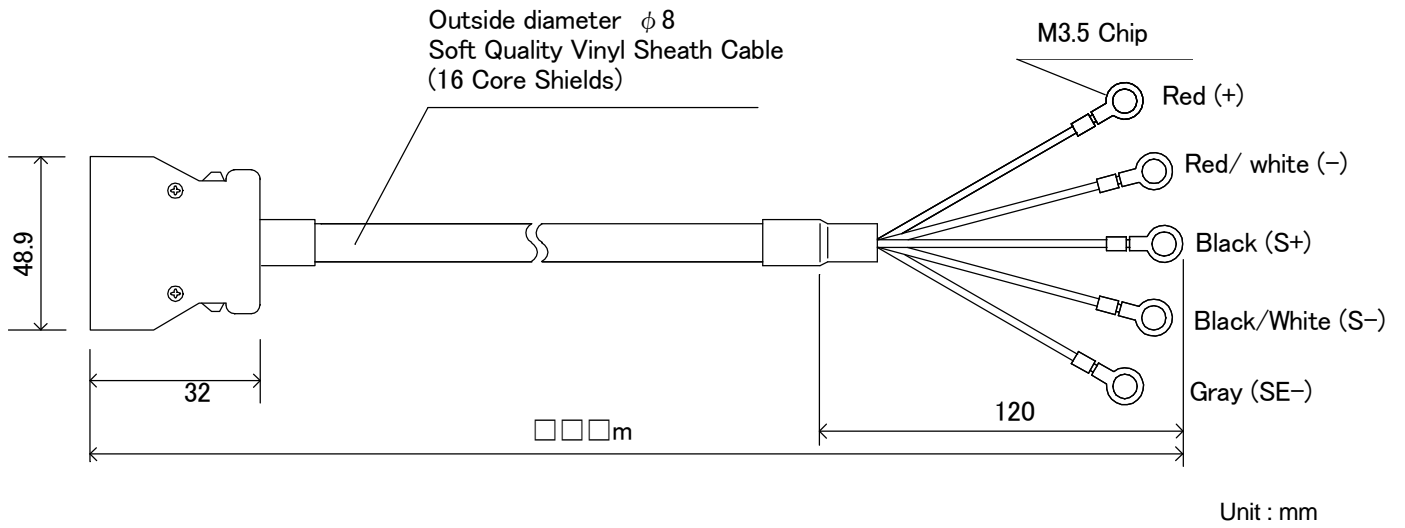
9.3 Connecting cable IR-ZERC□□□



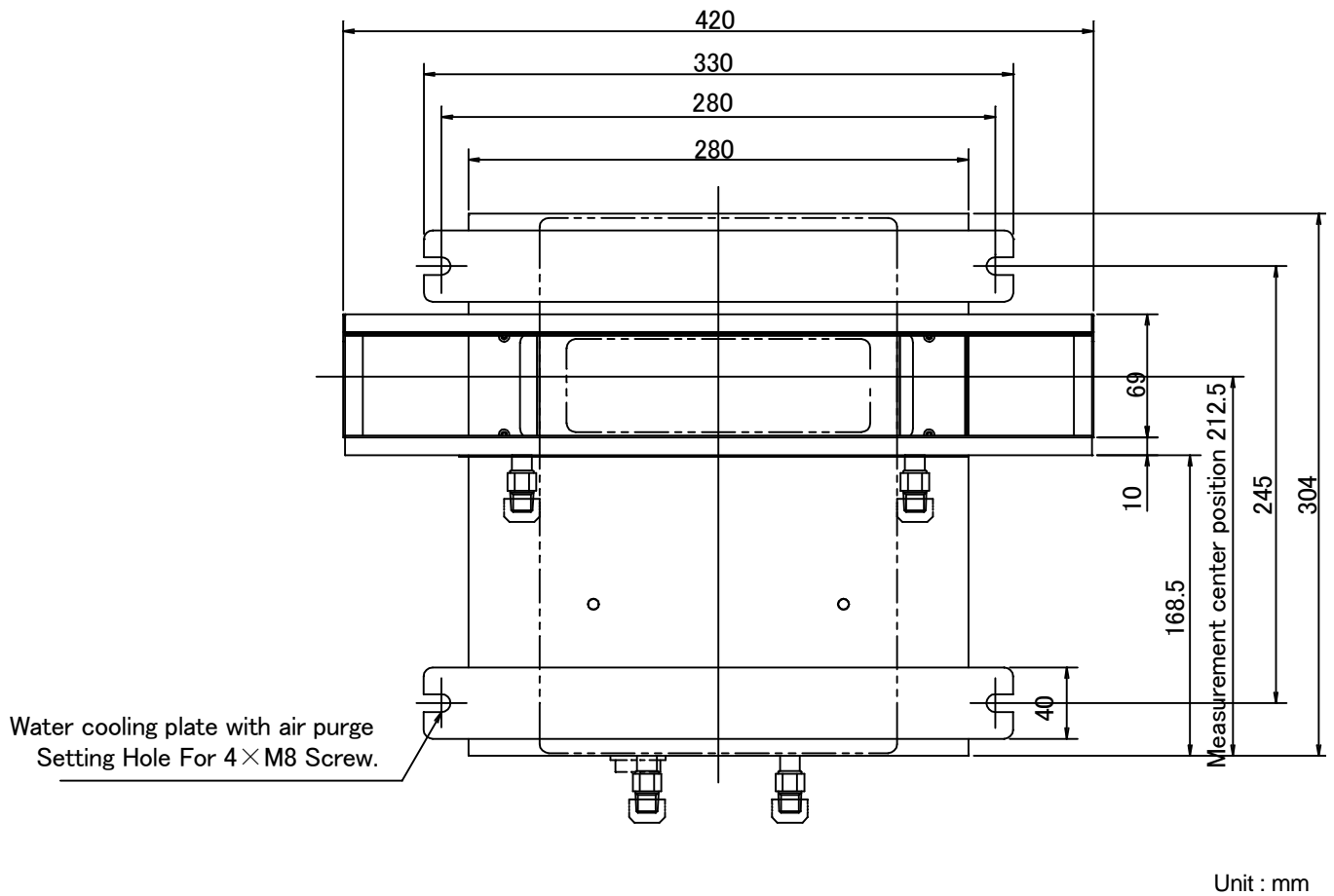
Unit : mm

9. External Dimension

9.4 Connecting cable IR-ZEPC□□□



9.5 Water cooling plate with air purge IR-ZECS



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