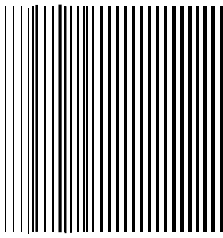


The logo for CHINO, featuring the word "CHINO" in a bold, white, sans-serif font with a black outline, set against a dark gray rectangular background.

IR-HA Series
PORTABLE RADIATION
THERMOMETER

Model: IR-HAI
IR-HAS
IR-HAQ



INSTRUCTIONS

Always keep this instruction with the unit.

Please be sure to deliver these instructions
with the unit to the end user.

CHINO

PREFACE/ Request and notices

Thank you for purchasing IR-HASeries Portable Radiation Thermometer.
Please read this instruction manual for using this thermometer correctly, safely and also preventing troubles in advance.

Request to designers, instrument controllers, and sale agents

Make sure to deliver this instruction manual to the operator of this thermometer.

Request to the operator of the thermometer

Follow this instruction manual and use the thermometer correctly.

This instruction manual is necessary for maintenance, too.

Keep this manual with due care until this thermometer is discarded.

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

NOTE

1. The descriptions of this manual are subject to change without notice.
2. If a question has arisen or if an omission was found in this manual, please contact your nearest CHINO's sales agent or your dealer.
3. Copy right of this instruction manual belongs to CHINO Corporation. All or part of this instruction manual shall not be released to the third party.

Trademark

•SD Memory Card is the trademark of Panasonic Corporation, SanDisk Corporation in USA, and TOSHIBA CORPORATION.

Important explanation

To use this instrument correctly and safely, make sure to observe following safety precautions.

1 Precondition for use

★For key operation, make sure to push the button until it makes "blip" sound.(Except for a few operation)


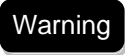
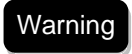

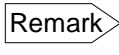

- The thermometer is designed as a handheld type. Use a tripod or universal head for long term or fixed mounting measurement.
- The working temperature range of this product is 0 to 50°C. (No dew condensation)
- Do not use the thermometer in dusty places, etc. Remove the dust after using it.
(Refer to "10.1 Cleaning of Objective Lens" for objective lens cleaning and "10.2 Cleaning of External LCD and Eyepiece Cover" for external LCD and eyepiece cover cleaning.)
- Be careful not to give vibration or impact to the thermometer
- For preventing the consumption of the batteries, make sure to remove the batteries when it is not used.

2 Storage

- Do not store the thermometer in hot and humid places. Make sure to store the thermometer with the lens cap. It is recommend to stores the thermometer in room temperature with desiccant (silica gel etc.).
- Do not leave the thermometer in extreme high ambient temperature such as beside a rear window or inside of a trunk of cars. The thermometer may have trouble
- When the thermometer is not used for 2 weeks or more, take out the batteries from it.
Otherwise, the thermometer may be damaged by liquid leakage of the batteries.
- For failures of the thermometer, don't overhaul it by yourself, and contact your sales agent of CHINO Corporation.

3 Symbols 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 indicated with a title for an explanation with 
2		Indicates important information that must be observed to avoid blindness (or other dangers that may result in serious personal injury or death,) or damage to this product.
3		Indicates important information that must be observed to avoid the risk of personal injury or malfunctions of this product.
4		Indicates supplementary information that the operator is recommended to understand.
5		Indicates supplementary information or a reference to an operation.

4 Disposal

●When you discard this product, please obey the regulation of each local government.

[How To Remove The Lithium Battery For Purpose of Discarding]

Warning

Make sure to turn off the thermometer when the lithium battery is removed.

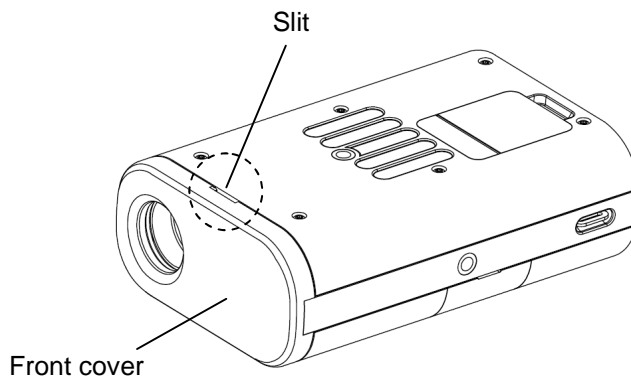
Caution

Do not remove the lithium battery by yourself except when the thermometer is discarded because it may cause breakage or any trouble of the thermometer.

◆How To Remove the Lithium Battery

1) To Remove The Front Cover

- ①Turn off the thermometer.
- ②Put something hard like a coin to the slit of front cover to remove the cover.

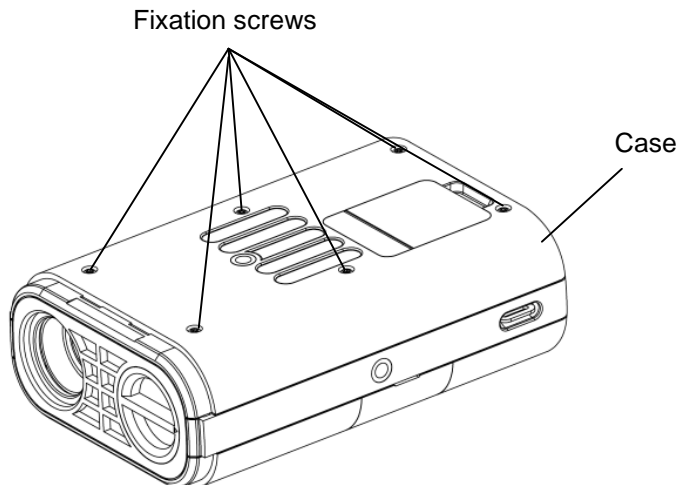


Caution

Do not remove the front cover with your bare hands. Removing it by your bare hands may injure your fingers and nails. Be sure to use something hard such as a coin to remove it.

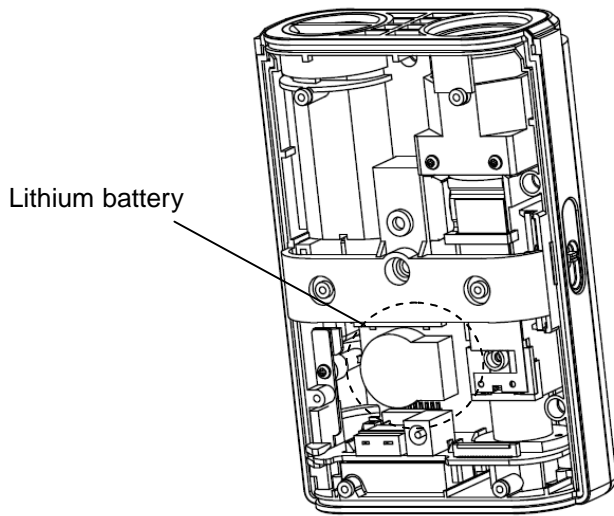
2) To Remove The Case

- ①Take off the 6 fixation screws from the case.
- ②Lift the case and remove it.

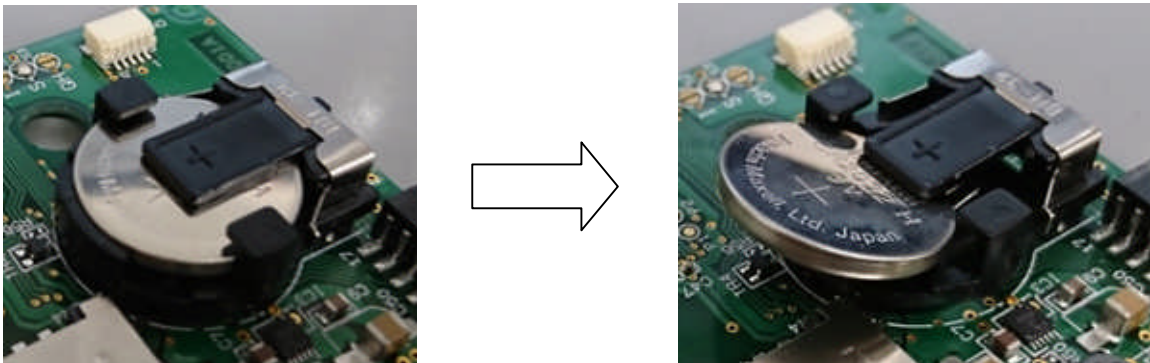


3) To Remove The Lithium Battery

① Make sure where the lithium battery is mounted.



② Using an insulated tool with a thin end, remove the lithium battery from the battery holder.












Caution







- 1) Some parts of this thermometer contain toxic chemical substances, whose amount is, however, less than defined by RoHS.
- 2) When you discard the thermometer, hire a professional for disposal of it.
Or, discard the thermometer by yourself, following the regulation of the local government.
- 3) As a lithium battery is used in this thermometer, request a professional to dispose of the battery.
- 4) Please sort packing materials of the thermometer, i.e., boxes, plastic bags, buffer, stickers, etc., according to the trash regulation of the local government, to promote recycling.

Warning and attention for the security

◆ To use this product, make sure to observe following matters and use it correctly.
 In addition, keep this instruction manual carefully in the place that you can reach at anytime.

 shows an act of the prohibition.

 Warning (May cause death or serious injury)	
	Don't operate this thermometer in places where combustible or volatile gas exists. It is extremely dangerous to use the thermometer in such environment. 
	Don't use the thermometer if it is broken, smoking or abnormal order is detected. These may cause fire. 
	Disassembling or modifying this thermometer may not only cause failure but also be dangerous to you. Disassembling or modifying this thermometer is prohibited. 
	If it is broken, smoking or abnormal order is detected, turn off the power supply immediately and contact your sales agent of CHINO Corporation.

 Caution (May cause injury or physical damage)	
	Avoid using in the places where; temperature changes widely, humidity is high, close to heavy electric circuit, inductive interference is large, static electricity or magnetic field exists, and mechanical vibration and impact exist. Also avoid using under the atmosphere where dust and particles exist, corrosive gas exists and electric noise or static electricity exists and easily to interrupt.
	To protect eyes and detecting element, never to see the sun through the finder of the thermometer. 
	For the measurement of an object exceeding 1500°C, make sure to turn the beam attenuation filter switch "ON (attenuation side)" for protecting your eyes. When you feel glare on the measurement of an objects lower than 1500°C, turn the beam attenuation filter switch "ON (attenuation side)".
	To use the thermometer safely, strictly observe the contents described in this instruction manual. If the contents of this instruction manual are not complied, damage to the thermometer, functional decline or damage to a system may occur.

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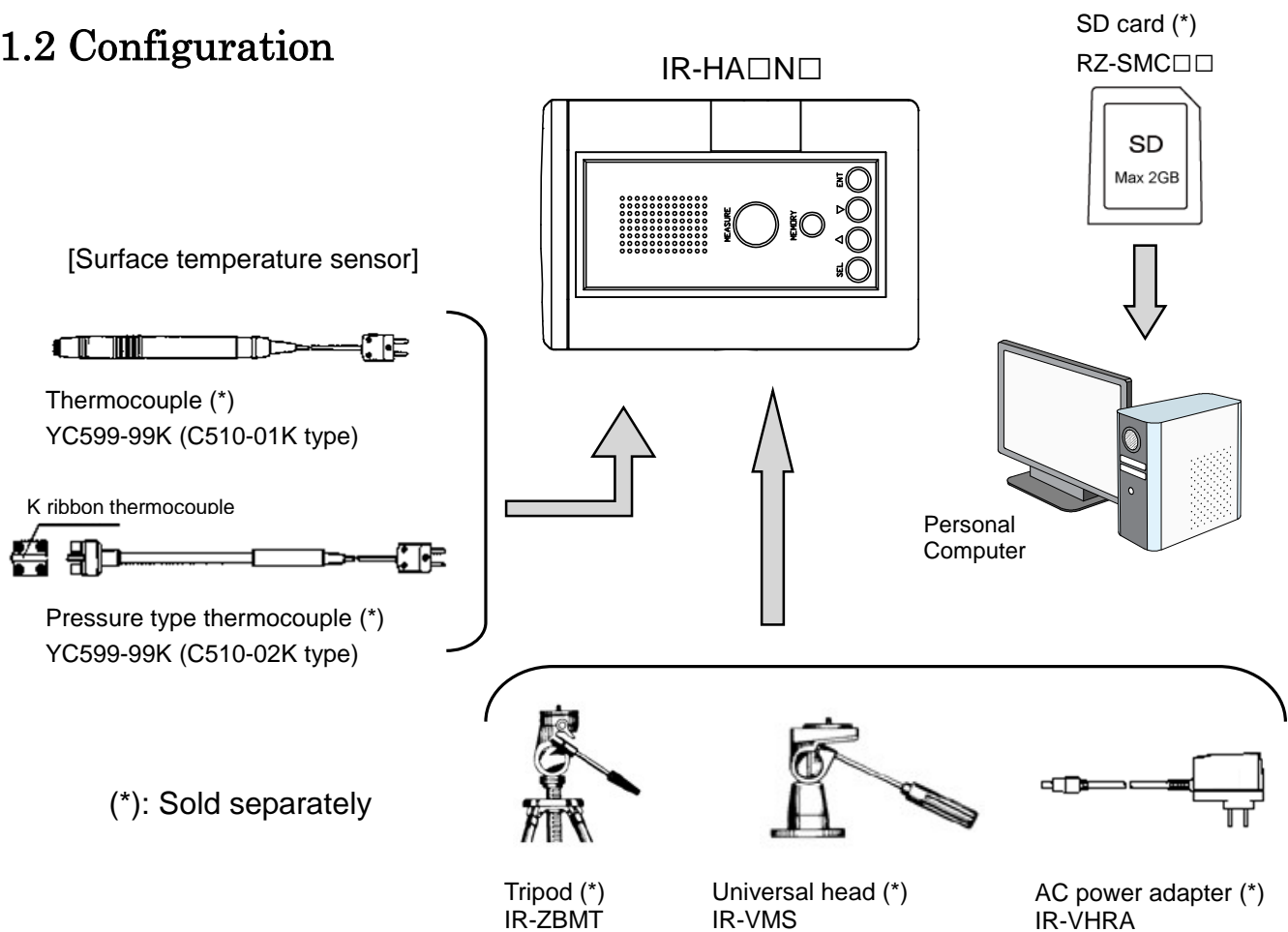
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1. Introduction

1.1 General

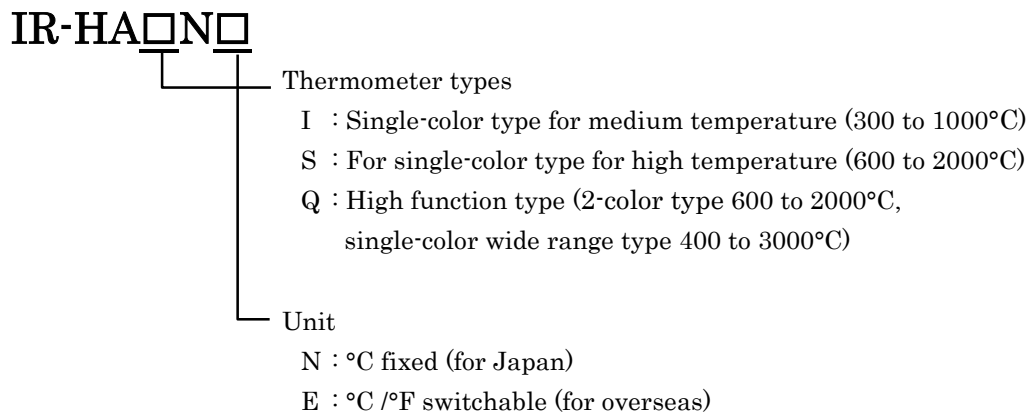
IR-HA series is small and light weight portable radiation thermometer equipped with well-lighted viewfinder. Direct viewfinder realizes measurement of an article with small diameter from a distance. Digital indication is available in the viewfinder, so measured value can be seen while checking an object. From device selection IR-HAQ which is high function type equipped with both "2-color type+single-color wide range type", single-color, medium temperature type IR-HAI, and single-color, high temperature type IR-HAS, user can choose the device which meet their application.

1.2 Configuration



2. Model and Attachments

2.1 Model

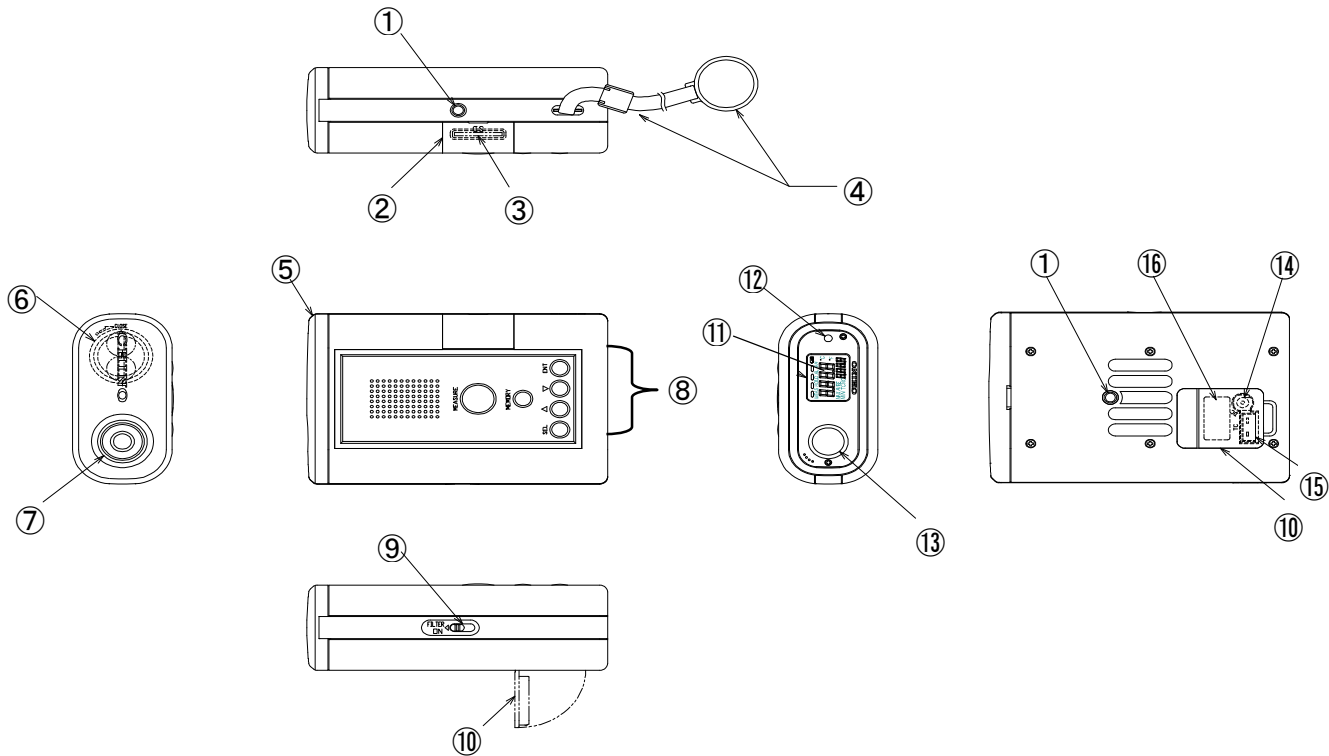


2.2 Attachments

Name	Quantity
Alkaline AA (UM-3) battery	2
Instruction manual	1

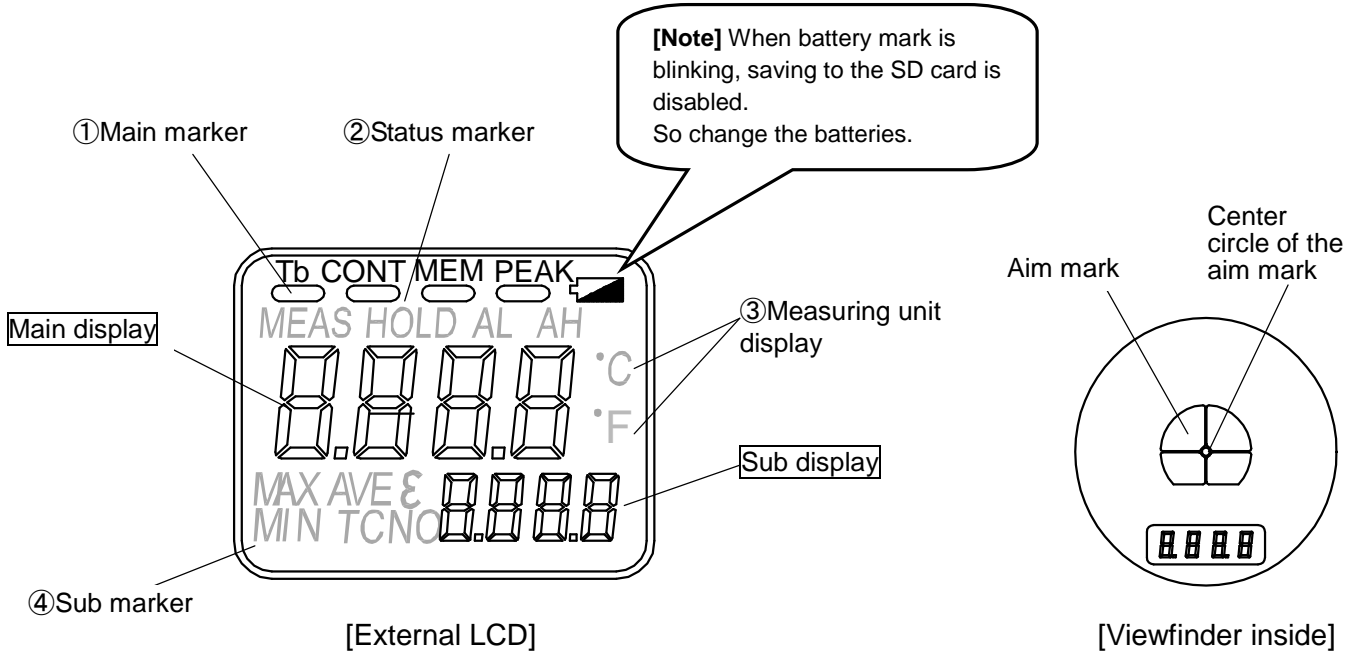
3. Names and Functions of Component parts





3.1 Names and Functions of Component parts



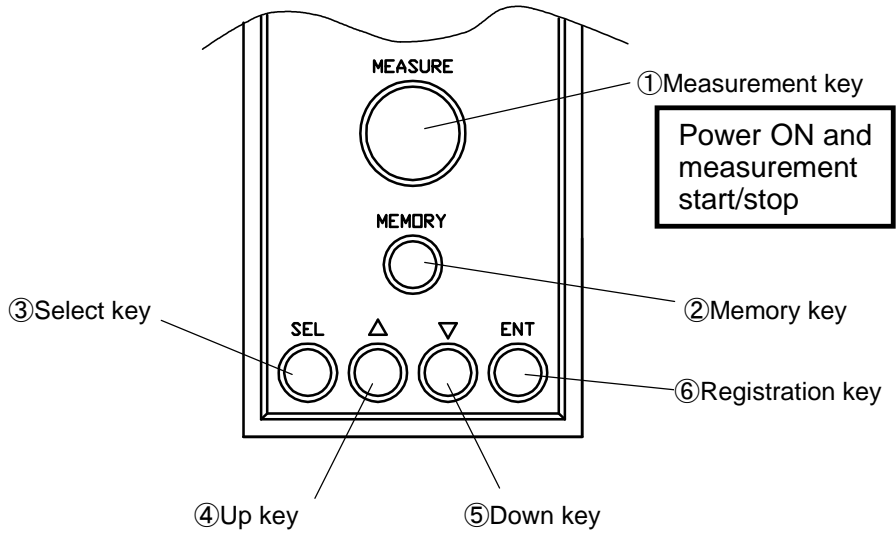
Name	Function
① Tripod fixing screw	1/4-20UNC, depth 5mm screw hole for mounting tripod.
② SD card connector cover	Cover for SD card slot.
③ SD card slot	SD card (Sold separately: Max 2GB) insertion slot.
④ Lens cap/ Strap	Cap for protecting objecting lens. It comes with strap.
⑤ Front cover	Put it on/take it off at changing batteries.
⑥ Battery cover	Battery (AA/UM-3) change can be done by taking front cover off then turn battery cover counterclockwise to take off the cover.
⑦ Objective lens	Effective diameter is $\phi 20\text{mm}$.
⑧ Operation key	Keys to switch each mode, select and set various parameters.
⑨ Beam attenuation filter switch	A switch whether or not to turn ON beam attenuation filter (attenuation side). Refer to "4.5 Cautions on Measurement" and make sure to turn the switch ON <u>when measuring high temperature object, or when you feel bright light to protect your eyes.</u>
⑩ Connector cover	Cover to protect the connector. To attach a connector, peel back the cover from the bottom and put to the designated connector.
⑪ External LCD	Displays temperature measured value and parameter.
⑫ Backlight sensor	Detect the surrounding brightness. When it is dark, it turns ON backlight on the external LCD for visibly display.
⑬ Viewfinder	There is an aim mark when you see through the viewfinder. Aline the center of the circle to the center of the measuring object to measure.
⑭ DC power supply jack	DC power supply jack to connect AC power adaptor sold separately.
⑮ Thermocouple input connector (K-thermocouple)	A connector to connect thermocouple.
⑯ Nameplate	A nameplate to indicate name of the IR-HA series model, serial number, and measuring range. For inquiry, make sure to give us the information on the nameplate.

3.2 External Display Marker and Viewfinder Inside



Name	Marker	Function	Indication in this manual
①Main marker	Tb	Not used.	"Tb"
	CONT	"  under main marker "CONT" is lit at continuous measuring mode.	"CONT"
	MEM	"  under main marker "MEM" is lit at memory input mode.	"MEM"
	PEAK	"  under main marker "PEAK" is lit when "PAEK" is selected at signal modulation selection.	"PEAK"
		It blinks when it is low battery.	"Low battery"
②Status marker	MEAS	It lights at measuring.	"MEAS"
	HOLD	It lights at hold.	"HOLD"
	AL	It lights at lower limit temperature alarm activation.	"AL"
	AH	It lights at higher limit temperature alarm activation.	"AH"
③Measurement unit display	°C	It lights at Celsius temperature display.	"°C"
	°F	It lights at Fahrenheit temperature display.	" °F "
④Sub marker	MAX	The highest temperature is displayed on sub display.	"MAX"
	MIN	The lowest temperature is displayed on sub display.	"MIN"
	AVE	Average temperature (600 points moving average value) is displayed on sub display.	"AVE"
	TC	If thermocouple temperature is selected, thermocouple measured temperature data is displayed on sub display. "oFF" is displayed if OFF (no thermocouple measurement) is selected.	"TC"
	ε (εr)	It lights when sub display is displaying emissivity (ratio). ε (emissivity) is lit for single-color type and εr (emissivity ratio) is lit for 2-color type.	"ε" or "εr"
	NO	Memory data registration number. It lights only at memory input mode.	"NO"

3.3 Operation Key

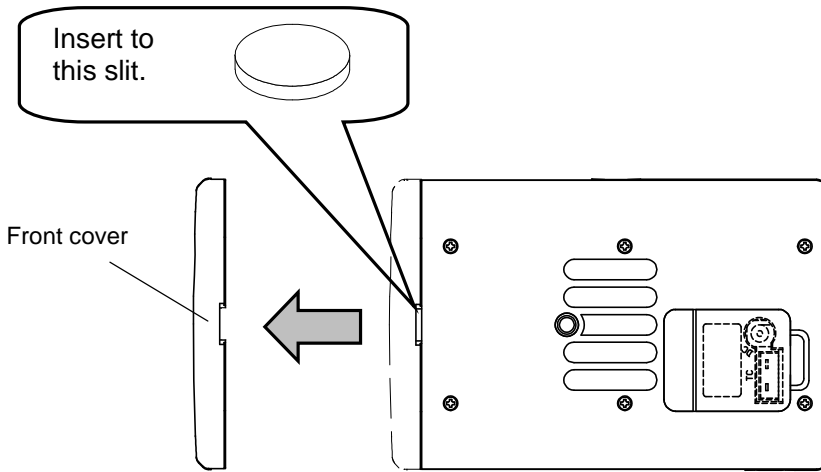


Name	Function	Indication in this manual
①Measurement key	Turns ON power supply and starts/stops measurement. Power supply is automatically turned OFF if no key operation is done for 30sec.under "HOLD" status.	MEASURE
②Memory key	It switches normal or continuous measuring mode to memory input mode, or memory input mode to normal or continuous measuring mode.	MEMORY
③Select key	At measuring, it switches data markers to display on sub display and at selecting/setting parameter, it switches selection/setting items of sub display.	SEL
④Up key	At selecting parameter, it selects an item.	▲
⑤Down key	At setting parameter, it changes numeric value of registered digit.	▼
⑥Registration key	At selecting parameter, it is used to register selecting item. At setting parameter, it is used to register set value/changing value. At manual mode, it is used to save the data at that point. It is not used at interval memory mode.	ENT

4. Preparation for Measurement

4.1 Loading batteries

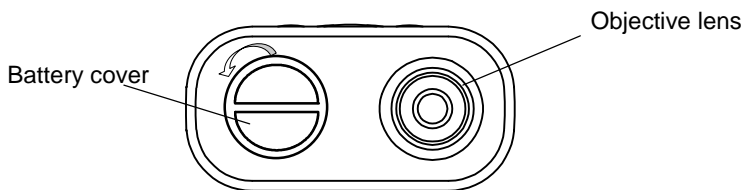
1) Put something hard like a coin to the slit of front cover to remove the cover.



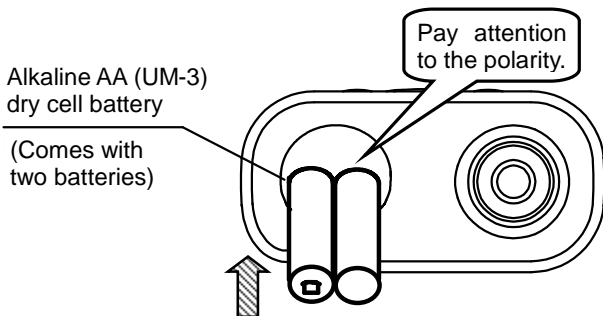
Caution

Do not remove the front cover with your bare hands. Removing it by your bare hands may injure your fingers and nails. Be sure to use something hard such as a coin to remove it.

2) Turn battery cover counterclockwise to open.




3) Load dry cell batteries.



Caution

[Battery Life]

- When the batteries are close to their end of life, low battery indication on the main marker "  " blinks, so change them to new AA (UM-3) batteries.

[Note for Battery Change]

- Change two batteries at the same time.
- Pay attention to the polarities of the batteries and load tem.

Reference

Rechargeable battery and manganese dioxide battery can be used.

4.2 About SD Card

Caution

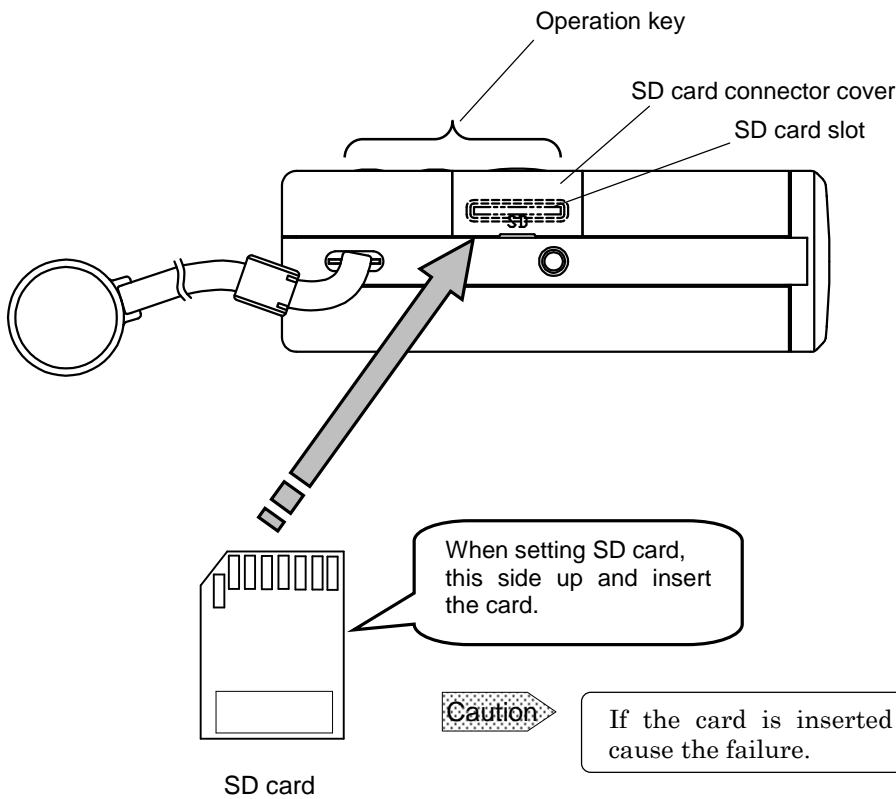
- Operation under SD card other than our recommended item is not guaranteed.
- Maximum capacity is 2GB, so 2GB or more can not be used.
- If SD card is formatted (initialized) by PC etc., the card may not work properly. Refer to "6.13 SD Card Data Initialization" for format and follow the procedure.
- Remove and insert SD card when the power supply is turned OFF.
- Do not turn OFF the power supply of the radiation thermometer while it is accessing SD card.
- If battery voltage is low, it can not access to the SD card. Change the battery.
- If memory function is used when the SD card is not inserted, "Er51" is displayed.
- If the SD card is protected by write protection, "LoCK" is displayed when saving the data.

4.3 Inserting SD Card

Warning

Be sure to remove and insert SD card when the power supply is turned OFF.

- ◆ Open SD card connector cover and insert SD card.



Reference

To remove the SD card, push the SD card lightly and pull out the card when the tip of the card comes out from the "SD card slot".

4.4 Date/Time Setting at Initial Start-up

◆ Display to set Date/Time appears by turning ON the power supply by holding down **MEASURE** key.

Remark

If no key operation has done for 30sec., power supply is automatically turned OFF.

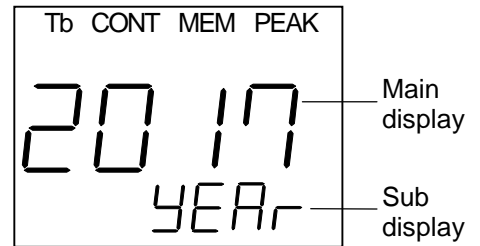
1) Set "Year" by **▲** key or **▼** key.

Register by **ENT** key.

Caution

If year setting is changed, date setting becomes "1" automatically, so change the date setting as well.

[Year setting]



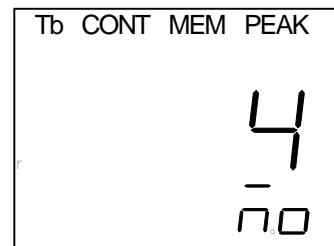
2) Push **SEL** key to move to "Month" setting.

Select from 01 to 12 by **▲** key or **▼** key and register by **ENT** key.

Caution

If month setting is changed, date setting becomes "1" automatically, so change the date setting as well.

[Month setting]



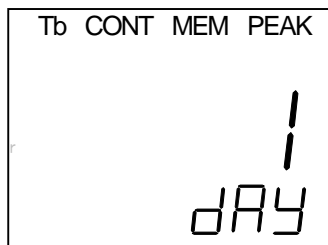
3) Push **SEL** key to move to "Date" setting.

Select from 01 to 31* by **▲** key or **▼** key and register by **ENT** key.

Caution

- If year or month setting is changed, next setting becomes "1" automatically.
- Number of days differs by each month.

[Date setting]



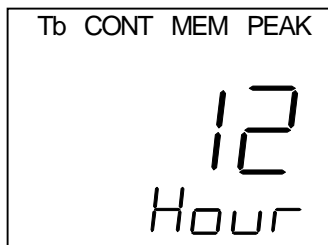
4) Push **SEL** key to move to "Hour" setting.

Select from 00 to 23 by **▲** key or **▼** key and register by **ENT** key.

Remark

Setting range is 0 to 23.

[Time setting]



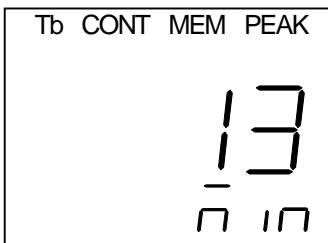
5) Push **SEL** key to move to "Minute" setting.

Select from 01 to 59 by **▲** key or **▼** key and register by **ENT** key.

Remark

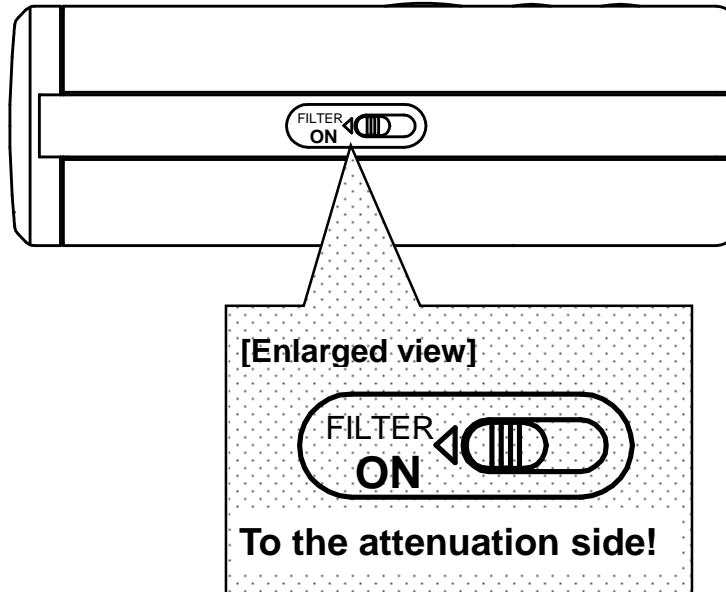
Setting range is 0 to 59.

[Minute setting]



4.5 Cautions on Measurement

- ◆ To protect the eyes, make sure to turn "ON (attenuation side)" beam attenuation filter switch if measuring 1500°C or more.



Warning

Never sight the objective lens of the thermometer to the sunlight directly for protecting your eyes and a detecting element.

Warning

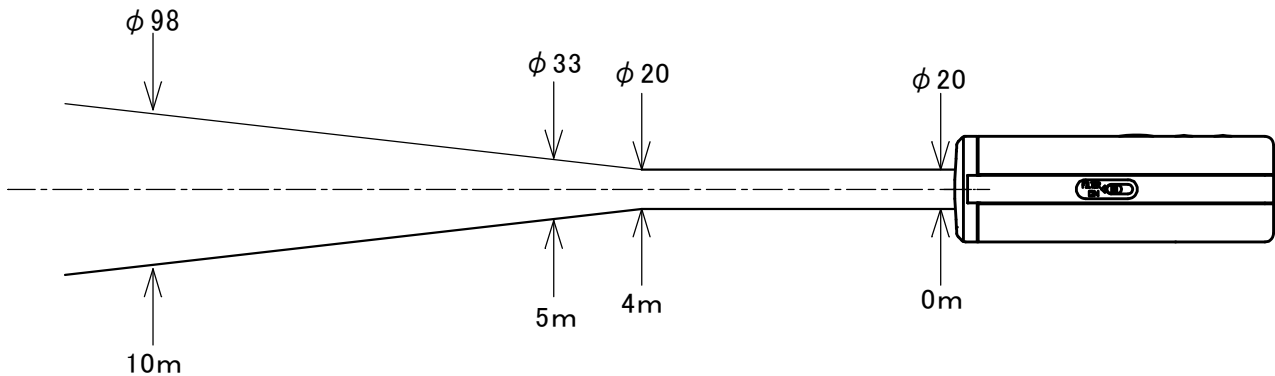
- For the measurement of an object exceeding 1500°C, make sure to turn the beam attenuation filter switch "ON (attenuation side)" for protecting your eyes.
- When you feel glare on the measurement of an objects lower than 1500°C, turn the beam attenuation filter switch "ON (attenuation side)".

Caution

- Light path
Be careful not to introduce water drops, dust particles, smoke, steam, or other foreign substances into the light path between the object measured and the objective lens of the thermometer.
- Interference causing high indication
Be careful not to apply the direct sunlight, light of an incandescent lamp, flame or other thermal radiation to the object measured and the objective lens of the thermometer.

4.6 Measuring Distance and Measuring Diameter

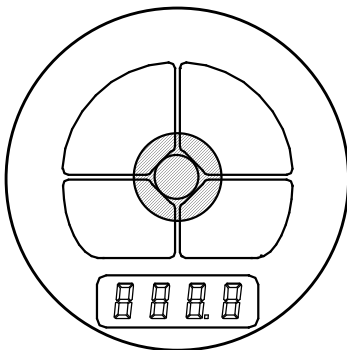
The relation of measuring distance and measuring diameter is shown below.



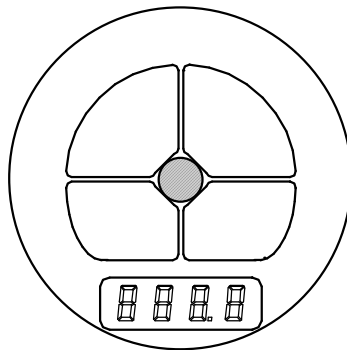
4.7 Targeting

For the accurate temperature measurement, it is necessary to target at an object correctly.

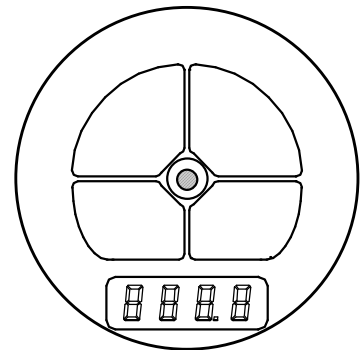
The following figures (1), (2), and (3) show the correct targeting based on the relation of the measuring distance and the measuring diameter



(1) The measurement distance 4m or less



(2) The measurement distance 4m



(3) The measurement distance 4m or more

(1) For the measurement distance 4m or less.

Measurement diameter becomes "larger" than the targeting mark.

(2) For the measurement distance 4m.

The measurement diameter and the inner side of the targeting mark are almost "same".

(3) For the measurement distance 4m or more.

Measurement diameter becomes "smaller" than the targeting mark.

5. Emissivity (ratio) Setting

Caution

Emissivity (ratio) setting can not be done while in memory input mode.
For canceling memory input mode, push **MEMORY** key to turn off "●" under main marker

Remark

If no key operation has done for 30sec. while in "HOLD" state, power supply is turned OFF automatically.

5.1 Emissivity (ratio) Setting

If the emissivity (ration) of the object to be measured is low, displayed temperature indicates lower than the actual measured temperature, so it is necessary for the emissivity (ratio) to be compensated. Following procedure shows how to set emissivity (ratio) compensation according to the measuring object for accurate measurement of the thermometer.

1) Turn ON the power by holding down **MEASURE** key.

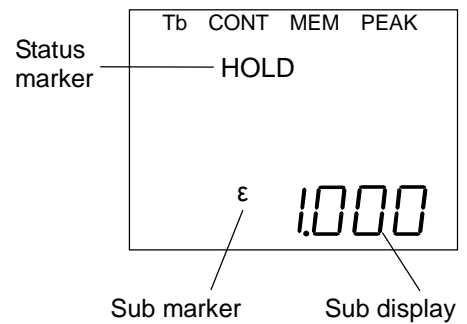
Release **MEASURE** key to display status marker "HOLD".

2) Push **SEL** key several times while in the "HOLD" status and display "ε" on the sub marker ("er" for 2-color type).

3) Push **▲** key or **▼** key to change numeric value on the sub display.

4) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[Emissivity (ratio) setting]



Remark

- Setting range single-color: 1.900 to 0.100
2-color: 1.200 to 0.800 (0.001 step)
- Setting of factory default is 1.000.

Reference

- If the emissivity of the object measured is known, set its value.
- If the emissivity is unknown, measure the temperature of the object by thermocouple then compare them and change emissivity to display the same value. For emissivity of typical substance, refer to "13. Emissivity Table".

5.2 Auto Emmissivity Setting by Thermocouple

The thermometer has a function of contact type thermometer using K thermocouple.

Furthermore, the emissivity of the thermometer can be automatically set by assuming the contact temperature measured by the thermocouple as a true temperature.

For turning "on" thermocouple measurement (thermocouple measurement enable), execute the setting according to the section "6.6 Thermocouple Measurement Selection".

1) Turn ON the power by holding down **MEASURE** key.

Release **MEASURE** key to display status marker "HOLD".

2) Peel the connector cover and connect the thermocouple.

Caution

Pay attention to the thermocouple position and connect it properly.

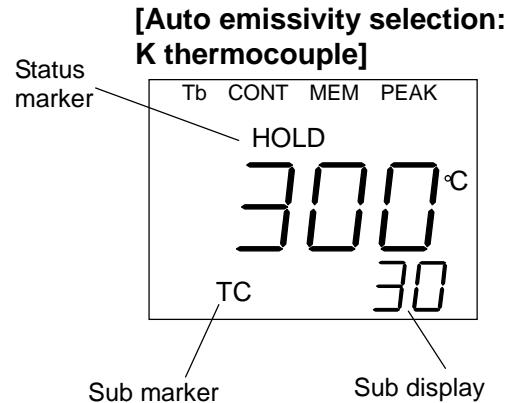
3) Push **SEL** key several times while in "HOLD" status and display sub marker "TC".

4) Attach the tip of thermocouple to the object to be measured then push **MEASURE** key to take measurements by the thermometer and by the thermocouple simultaneously. Temperature measured by the thermocouple is indicated on the sub display.

*There are two types of measuring mode. Refer to "7.1 Standard Measuring Mode" and "7.2 Continuous Measuring Mode".

5) Emissivity is set automatically, after the measurement, by pushing **ENT** key while in the "HOLD" status,

6) By pushing **SEL** key several times to display sub marker "e", you can check the set emissivity.



Reference

Measuring range of the thermocouple is
 300 to 800°C (IR-HAI)
 600 to 800°C (IR-HAS)
 Single-color: 400 to 800°C, 2-color: 600 to 800°C (IR-HAQ)

Remark

Thermocouple input setting of factory default is "oFF" (thermocouple measurement disable).

Caution

If "on" (thermocouple measurement enable) is set, but the thermocouple is not connected, "oFL" is displayed on the sub display.

6. Setting Mode

◆ Set each parameter

1) Turn ON the power by holding down **MEASURE** key.

2) Start setting mode by holding down **SEL** key while in the "HOLD" status.

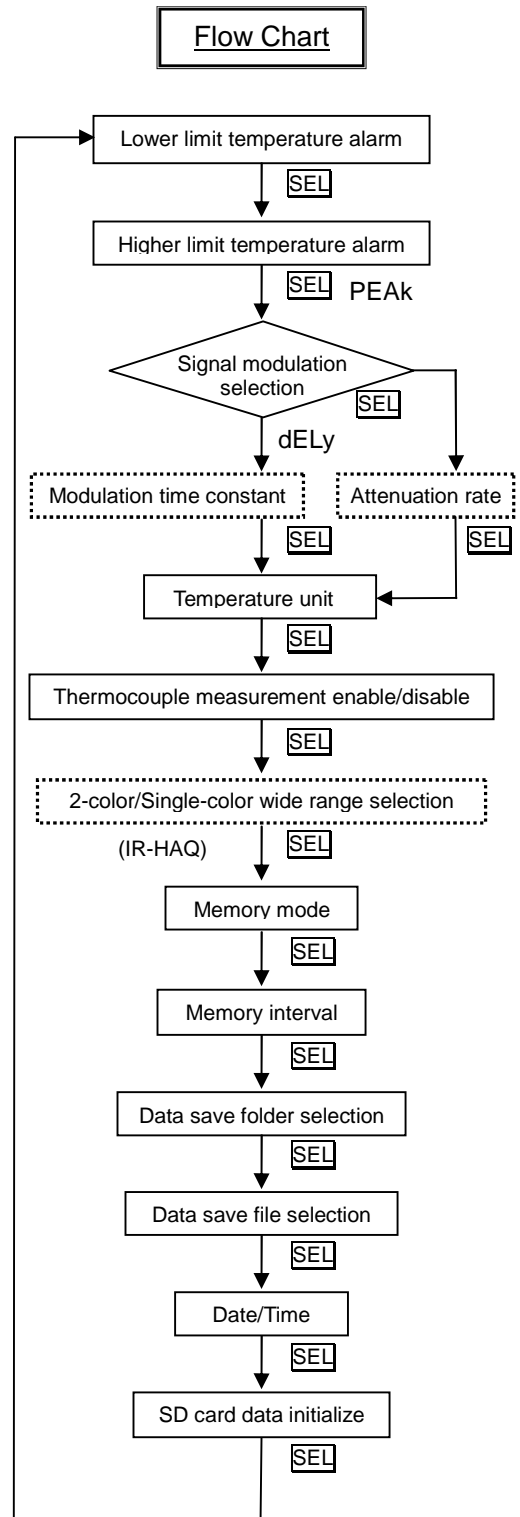
Status flow is shown on the right.

For each setting and selection, refer to the individual sections.

Remark

By holding down **SEL** key or no key operation is taken for 1 minute, it returns to the measuring mode.

*Items enclosed by may not be displayed depending on the setting.



6.1 Lower Limit Temperature Alarm Setting

This setting is for a judgment of lower limit temperature alarm during measurement.

When the alarm is judged, status marker "AL" (lower temperature alarm) is lit and buzzer rings.

If "oFF" is selected, neither the alarm judgment nor the buzzer are activated.

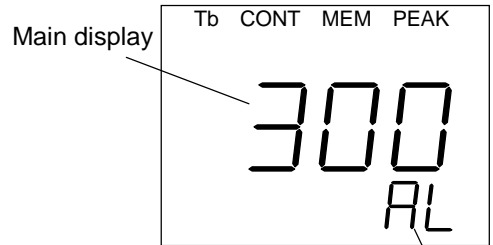
1) Hold down **[SEL]** key while in the "HOLD" status to make it to the setting mode.

Push **[SEL]** key several times to display "AL" on the sub display.

2) Push **[▲]** key or **[▼]** key to set OFF or numeric value.

3) Blinking stops by pushing **[ENT]** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[Lower limit temperature alarm setting display]



Reference

- Setting temperature range is oFF or following numeric values.
300 to 1000°C (IR-HAD) 600 to 2000°C (IR-HAS)
400 to 3000°C (IR-HAQ)
- Default setting is "oFF".

Caution

<How to reset once set lower limit temperature alarm to "oFF">

- 1) Hold down **[SEL]** key to display "AL" on the sub display.
- 2) By changing displayed numeric value according to above **Reference** setting temperature range with operation key (**[▲]** key, **[▼]** key or **[ENT]** key) to be below lower limit temperature value, "oFF" is displayed.

(Lower limit temperature value is IR-HAI: 299°C or lower, IR-HAS: 599°C or lower, IR-HAQ: 399°C or lower)
- 3) By pushing **[ENT]** key in this status, blinking stops and "oFF" is displayed and registration is completed.

6.2 Higher Limit Temperature Alarm

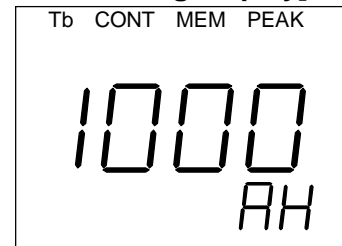
This setting is for a judgment of higher limit temperature alarm during measurement.

When the alarm is judged, status marker "AH" (higher temperature alarm) is lit and buzzer rings.

If "oFF" is selected, neither the alarm judgment nor the buzzer are activated.

- 1) From setting mode display, push **[SEL]** key several times to display "AH" on the sub marker.
- 2) Push **[▲]** key or **[▼]** key to set OFF or numeric value.
- 3) Blinking stops by pushing **[ENT]** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[Higher limit temperature alarm setting display]



Reference

- Setting temperature range is oFF or following numeric values.
300 to 1000°C (IR-HAI) 600 to 2000°C (IR-HAS)
400 to 3000°C (IR-HAQ)
- Default setting is "oFF".

Caution

<How to reset once set higher limit temperature alarm to "oFF">

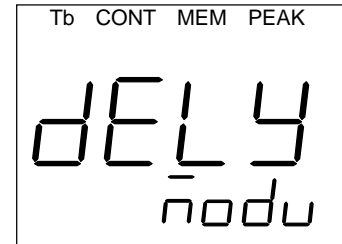
- 1) Hold down **[SEL]** key to display "AL" on the sub display.
- 2) By changing displayed numeric value according to above **Reference** setting temperature range with operation key (**[▲]** key, **[▼]** key or **[ENT]** key) to be below lower limit temperature value, "oFF" is displayed.
(Lower limit temperature value is IR-HAI: 299°C or higher, IR-HAS: 599°C or higher, IR-HAQ: 399°C or higher)
- 3) By pushing **[ENT]** key in this status, blinking stops and "oFF" is displayed and registration is completed.

6.3 Signal Modulation Selection

This setting is used to extract nothing else than average value and maximum value continuously from the measurement signal (original signal).

- 1) From setting mode display, push **SEL** key several times to display "modu" on the sub display.
- 2) Push **△** key or **▽** key to select signal modulation.
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[Signal modulation selection display]



dELy	It displays the value based on the first order lag of modulation degree set at "6.4.1 Modulation time constant setting".
PEAk	It displays the value based on the original signal if temperature is rising. If the temperature is dropping, the value set at attenuation rate setting (refer to the section 6.4.2) is displayed.

Remark

Setting of factory default is "dELy".

6.4 Modulation Degree Setting

If "dELy" is selected in signal modulation selection, degree of first order lag can be adjusted by setting modulation time constant.

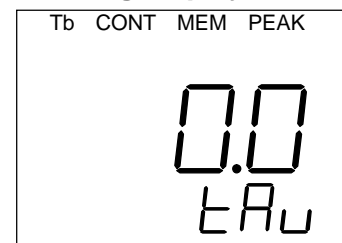
If "PEAk" in signal modulation selection, signal attenuation degree after tracing peak can be set.

6.4.1 Modulation Time Constant

(This is only valid if "dELy" is selected for signal modulation)

- 1) From setting mode display, push **SEL** key several times to display "tAu" on the sub display.
- 2) Numeric value on the main display blinks in the order of 0.0→0.2→0.5→1.0 (sec) when **△** key is pushed and 0.0→1.0→0.5→0.2 (sec) when **▽** key is pushed.
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[Modulation degree setting display]



Remark

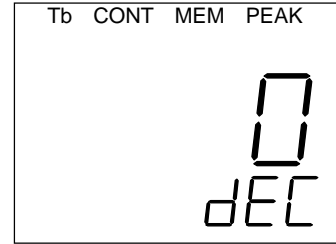
Setting of factory default is "0.0"sec. (Displayed value is based on the original signal without any modulation).

6.4.2 Attenuation Rate Setting

(This is only valid if "PEAK" is selected for signal modulation)

- 1) From setting mode display, push **SEL** key several times to display "dEC" on the sub display.
- 2) Numeric value on the main display blinks in the order of 0→2→5→10(°C/sec) when **△** key is pushed and 0→10→5→2(°C/sec) when **▽** key is pushed.
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[Attenuation rate setting display]



Remark

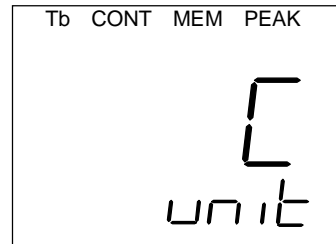
Setting of factory default is "0"°C/sec (Hold the highest temperature at measuring (HOLD)).

6.5 Temperature Unit Selection

Select °C or °F for measuring temperature unit.

- 1) From setting mode display, push **SEL** key several times to display "unit" on the sub display.
- 2) Push **△** key or **▽** key to select "C (°C)" or "F (°F)".
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[Temperature Unit selection display]



Remark

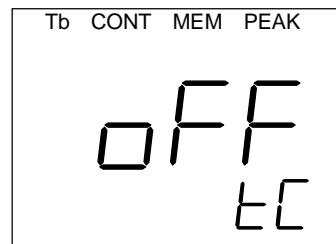
Setting of factory default is " C (°C)".

6.6 Thermocouple Measurement Selection

This setting is used to perform measurement with K thermocouple, sold separately (refer to "11.1 Thermocouple").

- 1) From setting mode display, push **SEL** key several times to display "tC" on the sub display.
- 2) Push **△** key or **▽** key to select whether or not to perform thermocouple measurement.
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[Thermocouple measurement selection display]



Remark

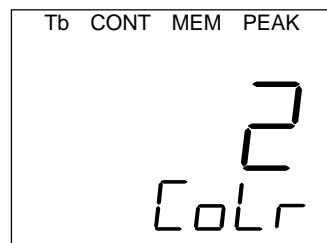
Setting of factory default is "oFF" (No thermocouple measurement).

6.7 2-color type/Single-color wide range type Selection (*High Function Type IR-HAQ)

This setting is used on high function type IR-HAQ to select to use as 2-color type or single-color wide type.

- 1) From setting mode display, push **SEL** key several times to display "CoLr" on the sub display.
- 2) Push **△** key or **▽** key to select 2-color type or single-color wide range type. Single-color wide range type is set if "1" is selected and 2-color type is set if "2" is selected.
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[2-color type/single-color wide range type selection display]



Remark ▶

Setting of factory default is "2" (2-color type).

6.8 Memory Mode Selection

This setting is used to select data saving method, manual memory mode or interval memory in memory input mode.

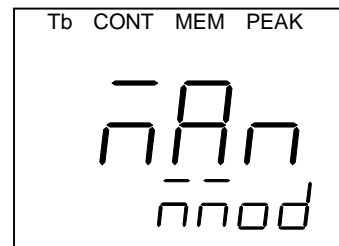
mAn	Manual memory mode: Measured data is saved when ENT key is pushed.
int	Interval memory mode: Measured data is saved by every set interval.

Reference

This setting is only valid at memory input mode. (Refer to "8.2.1 Saving in Manual Memory Mode" or "8.2.2 Saving in Interval Memory Mode".)

- 1) From setting mode display, push **SEL** key several times to display "mmod" on the sub display.
- 2) Push **▲** key or **▼** key to select memory mode.
- 3) Blinking stops by pushing **ENT** key and the registration is completed.

[Memory mode selection display]



Remark

Setting of factory default is "mAn" (manual memory mode).

6.9 Memory Interval Setting

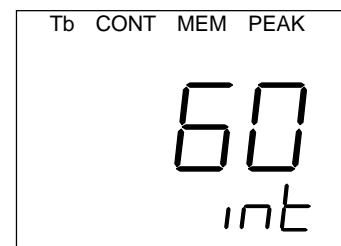
This setting is used to set saving interval (sec.) of measured data on interval memory mode.

Reference

This setting is valid if interval memory is selected at memory input mode. (Refer to "8.2.2 Saving in Interval Memory Mode")

- 1) From setting mode display, push **SEL** key several times to display "int" on the sub display.
- 2) Push **▲** key or **▼** key to change numeric value.
- 3) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[Memory interval setting display]



Remark

- Setting range is 1 to 7200sec.
- Default setting is "60"sec.

6.10 Data Save Folder Selection

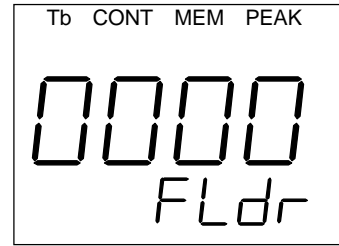
This setting is used to select data saving folder.

- 1) From setting mode display, push **SEL** key several times to display "FLdr" on the sub display.
- 2) Push **△** key or **▽** key to select saving folder.
- 3) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

Remark ▶

- Setting range is 0000 to 9999.
- Default setting is "0000".

[Data save folder selection display]



6.11 Data Save File Selection

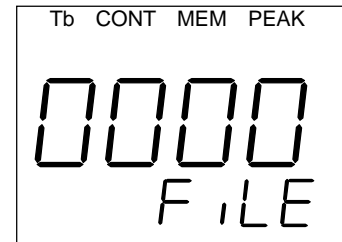
This setting is used to select data saving file.

- 1) From setting mode display, push **SEL** key several times to display "FiLE" on the sub display.
- 2) Push **△** key or **▽** key to select saving file.
- 3) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

Remark ▶

- Setting range is 0000 to 9999.
- Default setting is "0000".

[Data save file selection display]



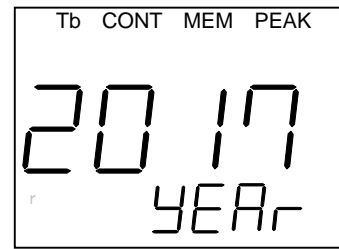
6.12 Date/Time Setting

*If this is not set at initial start-up, the setting is available to set afterward.

This setting is used to set date/time of this thermometer.

- 1) From setting mode display, push **SEL** key several times to display "YEAr" on the sub display.
- 2) Push **▲** key or **▼** key to change 'year'.
- 3) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place. Registration is completed by pushing **ENT** key once again.
- 4) Set 'month' "Mo"→'day' "dAy"→'hour' "Hour"→'minute' "Min" as well.

[Date/Time setting display]



Remark

• Default setting is 'year': "2016", 'month': "1", 'day': "1", 'hour': "0" and 'minute': "0".

Caution

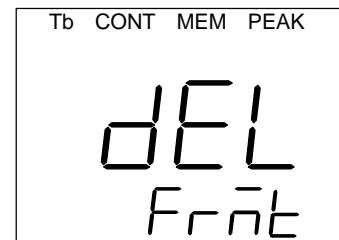
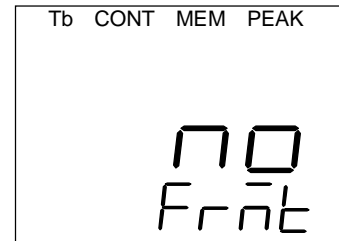
If date/time set is initialized at power ON, it may be a result of low built-in lithium battery. Contact your nearest sales agent of CHINO Corporation or your dealer.

6.13 SD Card Data Initialization

This setting is used to initialize data saved in the SD card when all those data becomes unnecessary or data exceeds 9999 and it displays 'over' then saving becomes no longer available.

- 1) From setting mode display, push **SEL** key several times to display "FrMt" on the sub display.
- 2) "no" is displayed on the main display at this point. By push **▲** key or **▼** key, "no"←→"yES" indication blinks in the order.
- 3) To initialize all saved data, select "yES" (delete) and push **ENT** key. It displays "dEL" for a moment and then displays "no".
*If there is no data to delete, it displays "non" for a moment and then displays "no".
- 4) Now all the data is initialized.
- 5) If not initializing, select "no" (not delete) and push **ENT** key. "no" stops blinking and displays "no" again.
- 6) To end setting mode, push and hold **SEL** key for about 2 sec.

[SD card data initialization display]



Remark

Setting of factory default is "no" (Not initialize).

7. Measuring Mode

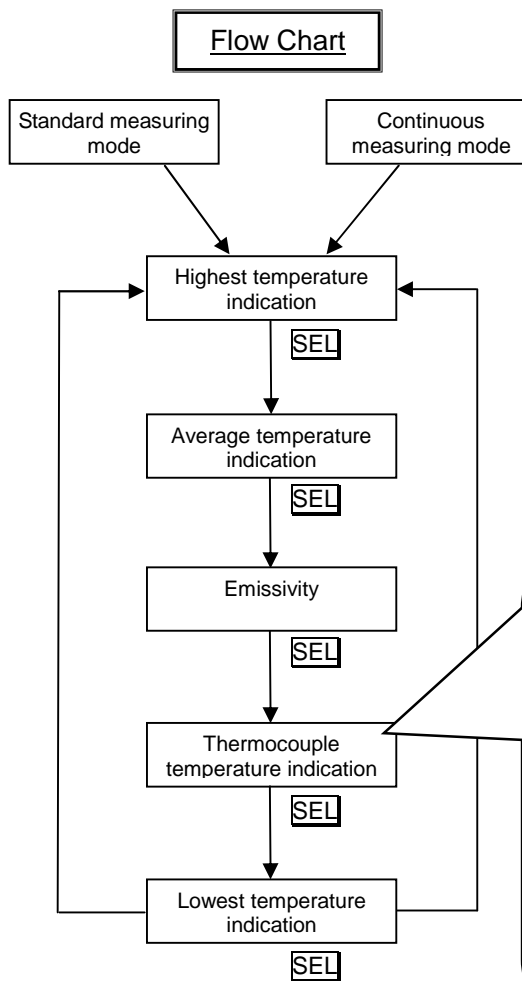
◆ There are two types of measuring method.

[Standard measuring mode] ···· This mode is for portable measurement.

[Continuous measuring mode] ··· This mode is for continuous measurement which this thermometer is fixed and measuring for a long time at same location.
 "●" under main marker "CONT" is lit.

Status flow is shown below.

For measuring method, refer to the individual sections.



◆ **Setting Method**
 Start the thermometer by pushing key and push and hold **MEASURE** key while power OFF.
 * under main marker "CONT" **lights**.

◆ **Canceling Method**
 Start the thermometer by pushing key and push and hold **MEASURE** key while power OFF.
 * under main marker "CONT" **turns OFF**.

[In the case thermocouple measurement is set to "on"]
 Push **SEL** key while "HOLD" status to display sub marker TC.
 Thermocouple measurement temperature data is displayed on the sub display:
 · "oFL" is displayed at 1220°C or more
 · "uFL" is displayed at -50°C or less
 * "oFL" is displayed if thermocouple is not connected.
*Accuracy is not guaranteed for 800°C to 1220°C.

Warning

Never directly sight the objective lens of the thermometer to the sunlight for protecting your eyes and a detecting element.

Warning

- For the measurement of an object exceeding 1500°C, make sure to turn the beam attenuation filter switch "ON (attenuation side)" for protecting your eyes.
 - When you feel glare on the measurement of an objects lower than 1500°C, turn the beam attenuation filter switch "ON (attenuation side)".
- (Refer to "4.5 Cautions on Measurement")

Remark

If no key operation has done for 30sec. while in "HOLD" state, power supply is turned OFF automatically.

7.1 Standard Measuring Mode

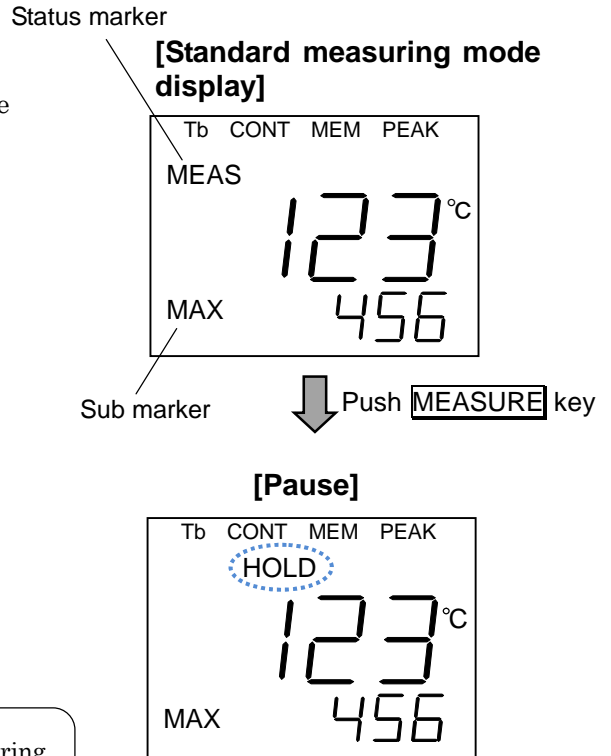
- 1) Sight through the viewfinder and match the center circle of the targeting circle to the center of object measured.
- 2) Turn ON the power by holding down **MEASURE** key.
- 3) Start measurement by pushing **MEASURE** key. Status marker "MEAS" lights and temperature is displayed on the main display.

Measurement continues while holding down on the key.



- 4) When **MEASURE** key is released, status marker "MEAS" turned OFF and status marker "HOLD" lights, measurement is paused and holds measured value.
- 5) By pushing **SEL** key, the sub marker switches "MAX" (highest temperature)→"AVE" (average temperature)→"TC" (thermocouple temperature) → "MIN" (lowest temperature) and each values can be displayed.

Remark

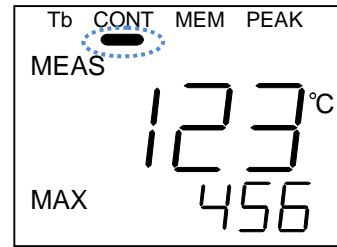
If the measured value is +21°C or more of measuring range higher limit, "oFL" is displayed, and -20°C or less of measuring range lower limit, "uFL" is displayed.



7.2 Continuous Measuring Mode

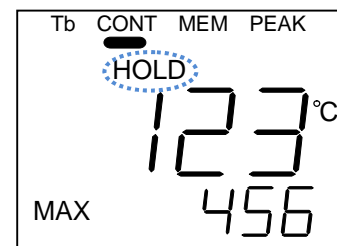
- 1) Start the thermometer by pushing  key and push and hold **MEASURE** key while power OFF.
- 2) " " under main marker "CONT" lights and it becomes continuous measuring mode.
- 3) Sight through the viewfinder and match the center circle of the targeting circle to the center of object measured.
- 4) Start measurement by pushing **MEASURE** key.
At this point, status marker "HOLD" turned OFF and status marker "MEAS" lights and continuous measuring starts.
- 5) When **MEASURE** key is pushed again, measurement is paused and holds measured value. At this point, status marker "HOLD" lights.
- 6) By pushing **SEL** key, the sub marker switches "MAX" (highest temperature) → "AVE" (average temperature) → "TC" (thermocouple temperature) → "MIN" (lowest temperature) and each values can be displayed.

[Continuous measuring display]





↓ Push **MEASURE** key

[Pause]



[Continuous measuring mode canceling method]

Start the thermometer by pushing  key and push and hold **MEASURE** key while power OFF. Continuous measuring mode is canceled and measurement is switched to standard measuring mode.

*Check that  under main marker "CONT" is **turned OFF**.

Remark

If the measured value is +21°C or more of measuring range higher limit, "oFL" is displayed, and -20°C or less of measuring range lower limit, "uFL" is displayed.

Caution

Continuous measuring mode consumes battery power quickly so it is recommended to use an accessory AC adopter (model: IR-VHRA) sold separately for the measurement.

8. Memory Input Mode (Display/Saving Data)

◆ This is a function of display/saving data.

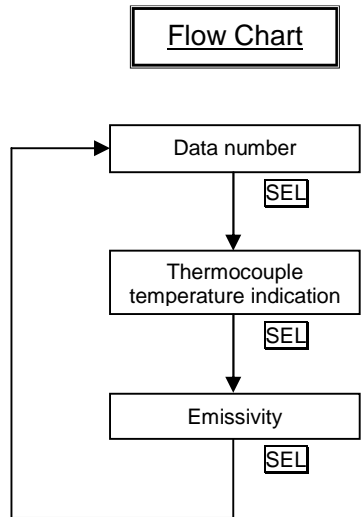
- 1) Turn ON the power by holding down **MEASURE** key
- 2) Push **MEMORY** key on standard measuring mode or continuous measuring mode under "HOLD" status to start memory input mode.
 "■" under main marker "MEM" is lit.

Status flow is shown on the right.
 For each setting and selection, refer to the individual sections.

Remark

- Push **MEMORY** key to end memory input mode. It returns to standard measuring mode or continuous measuring mode.
- It returns to setting mode by pushing and holding **SEL** key.
- If no key operation has done for 30sec., power supply is turned OFF automatically.

Flow Chart

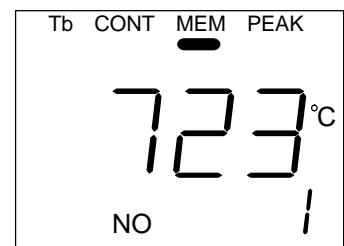


8.1 Data Display

This setting is used to display data already saved (data number, thermocouple temperature, and emissivity).

- 1) By push **MEMORY** key on standard measuring mode or continuous measuring mode under "HOLD" status to make it to the memory input mode. "■" under main marker "MEM" is lit.
- 2) Sub marker "NO" is displayed.
- 3) Push **△** key or **▽** key to select data number to display.
- 4) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and data is displayed.
- 5) By pushing **SEL** key, the main marker switches "TC" (thermocouple temperature indication)→"ε" (emissivity). Perform procedure 3) to 4) likewise to display thermocouple temperature and data of emissivity.

[Data number/thermocouple temperature/emissivity data display]



Reference

"no" is displayed if there is no registered data.

8.2 Data Save

◆ There are two types of data saving method. *Refer to "6.8 Memory Mode Selection" for memory mode settings.

[Manual memory mode] Measured data is saved at the time when **[ENT]** key is pushed.

[Interval memory mode] Measured data is saved at every set interval time.

Caution

- If you are about to save when the number of the file is exceeded, "OVER" is displayed on the sub display for a moment.
- If number of the file is exceeding, "■■■" under main marker "MEN" blinks.

Remark

- Measured data is saved in a file or a folder selected at setting mode.
(Refer to "6.10 Data Save Folder Selection" and "6.11 Data Save File Selection ")

Remark

- By pushing **[SEL]** key under the status of data is saved, sub marker "TC" and on the sub display currently measuring thermocouple temperature are displayed. Furthermore, by pushing **[SEL]** key to display sub marker "ε, emissivity (ratio) is displayed on the sub display. Emissivity displayed at this point is one set at "5. Emissivity (ratio) Setting". (If the setting has not done, factory default setting 1.000 is displayed.)
- To change emissivity (ratio) setting, make it to the "HOLD" status and set according to "5. Emissivity (ratio) Setting".
- Emissivity (ratio) set here is emissivity (ratio) of data number from this time forth. To change emissivity (ratio) from this time forward, reset it by this method.

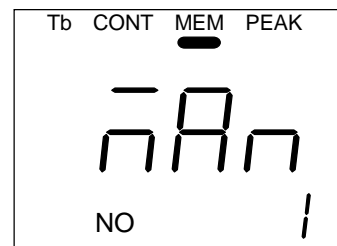
8.2.1 Manual Memory Mode Saving

*If the memory mode setting is not "mAn" (manual memory mode), refer to "6.8 Memory Mode Selection" and change memory mode to "mAn".

"mAn" is displayed only for a moment when **[MEMORY]** key is pushed.

- 1) By push **[MEMORY]** key on standard measuring mode or c continuous measuring mode under "HOLD" status to make it to the memory input mode. "■■■" under main marker "MEM" is lit.
- 2) Start measurement by pushing **[MEASURE]** key.
Measuring method is a set measuring mode ("Standard measuring mode" or "Continuous measuring mode").
- 3) Follow the procedure below for the saving method.

[Manual memory mode display]



◆ Saving at standard measuring mode: Temperature data, thermocouple temperature data, and emissivity set value at that point are saved when **[ENT]** key is pushed under the measuring status while **[MEASURE]** key is kept push and hold, or under pause while **[MEASURE]** key is released.

When "Str" is displayed on the sub display for a moment and when the data is saved, data registration number becomes next number.

◆ Saving at continuous measuring mode: Temperature data, thermocouple temperature data, and emissivity set value at that point are saved when **[ENT]** key is pushed under the continuous measuring status while **[MEASURE]** key is pushed.

When "Str" is displayed on the sub display for a moment and when the data is saved, data registration number becomes next number.

8.2.2 Interval Memory Mode Saving

*If the memory mode setting is not "int" (interval memory mode), refer to "6.8 Memory Mode Selection" and change memory mode to "int".

- 1) By push **MEMORY** key on standard measuring mode or continuous measuring mode under "HOLD" status to make it to the memory input mode. "MEM" under main marker "MEM" is lit.
- 2) Start measurement by pushing **MEASURE** key. Measuring method is a set measuring mode ("Standard measuring mode" or "Continuous measuring mode").
- 3) Follow the procedure below for the saving method.

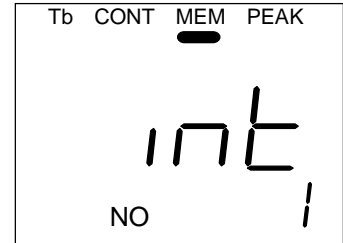


◆ Saving at standard measuring mode: Temperature data, thermocouple temperature data, and emissivity set value are saved at preset interval under the measuring status when **MEASURE** key is pushed. Each time, "Str" is displayed on the sub display for a moment and when the data is saved, data registration number becomes next number.

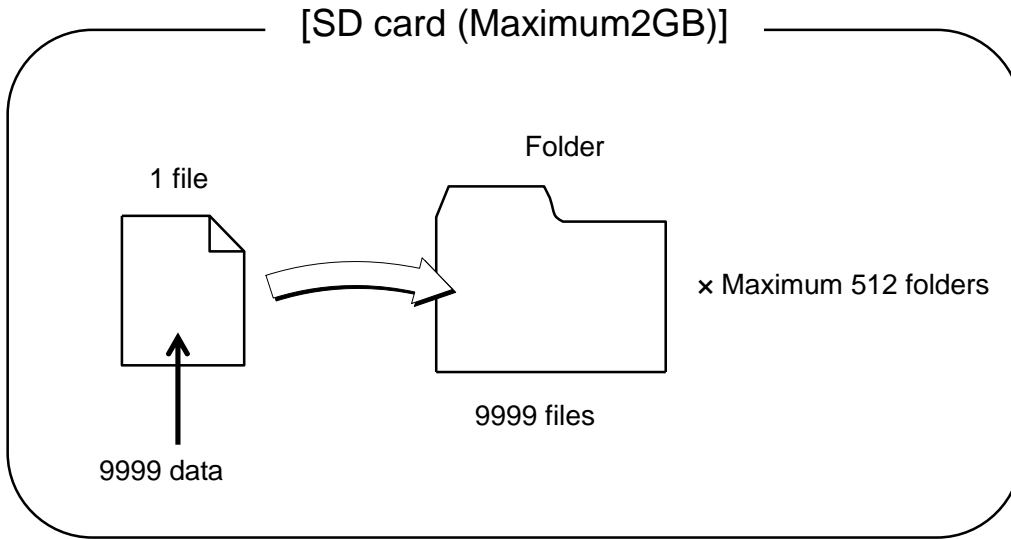
◆ Saving at continuous measuring mode: Temperature data, thermocouple temperature data, and emissivity set value are saved at preset interval under the continuous measuring status when **MEASURE** key is pushed. When "Str" is displayed on the sub display for a moment and when the data is saved, data registration number becomes next number.

"int" is displayed only for a moment when **MEMORY** key is pushed.

[Interval memory mode display]



8.3 Data File and Folder



Remark

· For one file, in the order from 1 to 9999 data can be saved.

Caution

- Measured data is saved in a folder or a file set at setting mode.
- Past data is not available to be overwritten.
- If saving data exceeds 9999 data by continuous measurement etc, a new file will be created. New file name will be "0000-01.csv" and forth until "0000-99.csv" saving is available continuously. When saving data of "0000-99.csv" exceeds 9999 data, 'over' is displayed and continuous saving becomes unavailable. Furthermore, data saved in "0000-00.csv" is not available to be replayed by the radiation thermometer. To replay the data, use PC etc.
- If saved csv file is edited by PC etc., files may not be recognized by the thermometer.
- Number of the file to be saved in the SD card is limited. So try not to save the files other than measured data.
- If data can not be saved in the SD card although there is enough free space in the card, it may be a result of far too many files in the card. Delete some files or move some data to PC.

8.4 File Saving Format

File Saving Format

Field	Data number				Date/Time										Status				Emissivity				Radiation temp.				Thermocouple temp.				CR	LR															
Data string	1	2	3	4	,	2	0	1	7	/	0	1	/	2	3	?	1	2	:	3	4	:	5	6	,	0	1	3	0	,	1	.	0	0	0	,	?	?	5	0	,	?	?	6	1	¥r	¥n
Number of character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

* ? is for single byte space.

Description

	Remarks
Data number	???1 to 9999
Date/Time	yyyy/mm/dd?hh:mm:ss
Status	□□□□ (1)(2)(3)(4) (1)Radiation temperature status information 0: All clear 1: Overflow (OFL) 2: Underflow (UFL) 3: Abnormal thermometer (2)Unit information 0: °C (3)Thermocouple status information 0: All clear 1: Overflow (OFL) 2: Underflow (UFL) 3: OFF (4)Spare (fixed to 0)
Emissivity	0.100 to 1.900
Radiation temp.	*Save "9999" if radiation thermometer status information is overflow/underflow.
Thermocouple temp.	*Save "9999" if radiation thermometer status information is overflow/underflow/OFF.

9. Zero/Span Adjustment Mode

◆ By measuring scale lower limit (zero side) and higher limit (span side) with your black body furnace and input black body furnace temperature, this function performs zero/span adjustment.

Caution

- Be sure to prepare a black body furnace and a reference radiation thermometer.
- If those instruments can not be provided, do not perform zero/span adjustment.
- Check that emissivity (ratio) is 1.000 then perform the adjustment.

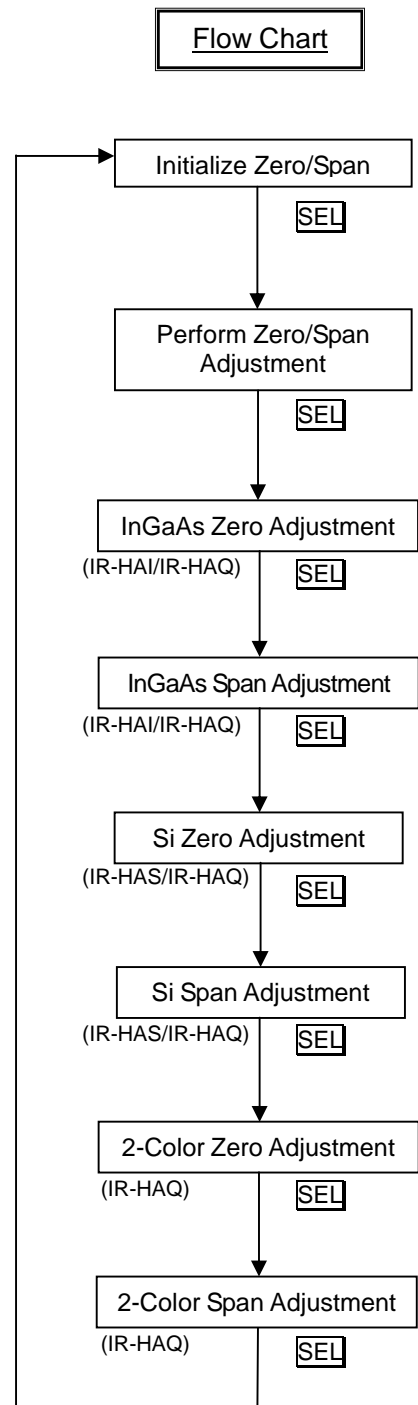
• Start zero/span adjustment by push and holding **√** key, **ENT** key, and **MEASURE** key at the same time while power OFF.

Status flow is shown on the right.

For each setting and selection, refer to the individual sections.







Remark

If no key operation has done for 30sec., power supply is turned OFF automatically.

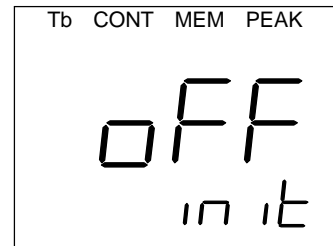


9.1 Initialize Zero/Span Adjustment

This setting is used to initialize zero/span adjustment values.

- 1) Start zero/span adjustment by push and holding  key,  key, and  key at the same time while power OFF.
- 2) Display "init" on the sub display.
- 3) Push  key or  key to select "on (initialize)" or "oFF (not initialize)".
- 4) Registration is completed by pushing  key.

[Initialize Zero/Span Adjustment display]



Remark

- "Init" is display while initializing and key operation is disabled until initialization completes.
- Setting of factory default is "oFF".





Caution

If "on" is selected, all zero/span adjustment values are initialized and return to factory default.

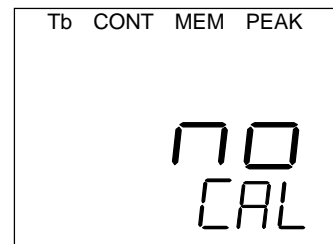
9.2 Perform Zero/Span Adjustment

Performs zero/span adjustment.

Zero/span adjustment result is reflected to the measured value if "yES" is set.

- 1) From zero/span adjustment mode display, push  key several times to display "CAL" on the sub display.
- 2) Push  key or  key to select "yES (perform)" or "no (not perform)".
- 3) Registration is completed by pushing  key.

[Zero/Span adjustment display]



Caution

If "on" is selected, zero/span adjustment result is not reflected to the measured value.

Remark

- Setting of factory default is "no".

9.3 InGaAs Zero Adjustment (*IR-HAI or IR-HAQ)

Performs InGaAs zero adjustment.

Collimate the thermometer and sight the black body furnace to input the temperature of the furnace.

[InGaAs zero adjustment display]



- 1) From zero/span adjustment mode display, push **[SEL]** key several times to display "inGZ" on the sub display.
- 2) Push **[▲]** key or **[▼]** key to change numeric value.
- 3) Blinking stops by pushing **[ENT]** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

Remark

- Setting range is 0 to 9999.
- Setting of factory default for IR-HAI and IR-HAQ is 300 and 400.

Caution

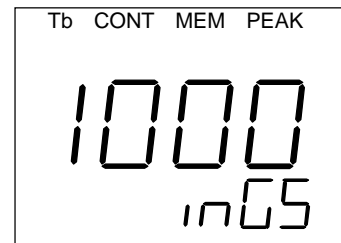
At setting, if zero adjustment value (input temperature or measured temperature) exceeds span adjustment value (input temperature or measured temperature), setting becomes disabled and displays 'Er6'.

9.4 InGaAs Span Adjustment(*IR-HAI or IR-HAQ)

Performs InGaAs span adjustment.

Collimate the thermometer and sight the black body furnace to input the temperature of the furnace.

[InGaAs span adjustment display]



- 1) From zero/span adjustment mode display, push **[SEL]** key several times to display "inGS" on the sub display.
- 2) Push **[▲]** key or **[▼]** key to change numeric value.
- 3) Blinking stops by pushing **[ENT]** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

Remark

- Setting range is 0 to 9999.
- Setting of factory default for IR-HAI and IR-HAQ is 1000 and 600.

Caution

At setting, if span adjustment value (input temperature or measured temperature) is below span adjustment value (input temperature or measured temperature), setting becomes disabled and displays 'Er6'.

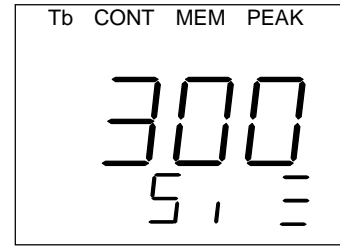
9.5 Si Zero Adjustment (*IR-HAS or IR-HAQ)

Performs Si zero adjustment.

Collimate the thermometer and sight the black body furnace to input the temperature of the furnace.

- 1) From zero/span adjustment mode display, push **[SEL]** key several times to display "Si Z" on the sub display.
- 2) Push **[▲]** key or **[▼]** key to change numeric value.
- 3) Blinking stops by pushing **[ENT]** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[Si zero adjustment display]



Remark

- Setting range is 0 to 9999.
- Setting of factory default for IR-HAS and IR-HAQ is both 600.

Caution

At setting, if zero adjustment value (input temperature or measured temperature) exceeds span adjustment value (input temperature or measured temperature), setting becomes disabled and displays 'Er6'.

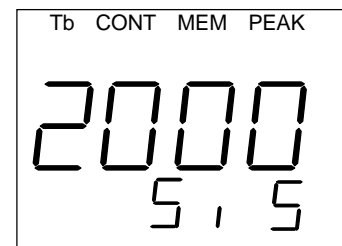
9.6 Si Span Adjustment (*IR-HAS or IR-HAQ)

Performs Si span adjustment.

Collimate the thermometer and sight the black body furnace to input the temperature of the furnace.

- 1) From zero/span adjustment mode display, push **[SEL]** key several times to display "Si S" on the sub display.
- 2) Push **[▲]** key or **[▼]** key to change numeric value.
- 3) Blinking stops by pushing **[ENT]** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[Si span adjustment display]



Remark

- Setting range is 0 to 9999.
- Setting of factory default for IR-HAS and IR-HAQ is 2000 and 3000.

Caution

At setting, if span adjustment value (input temperature or measured temperature) is below span adjustment value (input temperature or measured temperature), setting becomes disabled and displays 'Er6'.

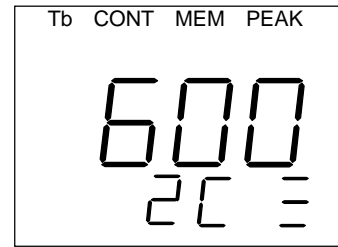
9.7 2-Color Zero Adjustment (*IR-HAQ)

Performs 2-color adjustment.

Collimate the thermometer and sight the black body furnace to input the temperature of the furnace.

- 1) From zero/span adjustment mode display, push **SEL** key several times to display "2C Z" on the sub display.
- 2) Push **▲** key or **▼** key to change numeric value.
- 3) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[2-color adjustment display]



Remark

- Setting range is 0 to 9999.
- Setting of factory default is 600.

Caution

At setting, if zero adjustment value (input temperature or measured temperature) exceeds span adjustment value (input temperature or measured temperature), setting becomes disabled and displays 'Er6'.

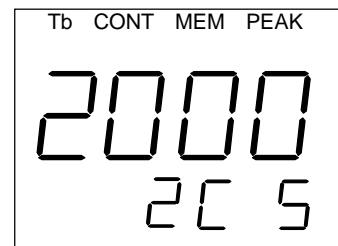
9.8 2-Color Span Adjustment (*IR-HAQ)

Performs 2-color adjustment.

Collimate the thermometer and sight the black body furnace to input the temperature of the furnace.

- 1) From zero/span adjustment mode display, push **SEL** key several times to display "2C S" on the sub display.
- 2) Push **▲** key or **▼** key to change numeric value.
- 3) Blinking stops by pushing **ENT** key and the blinking digit moves its position from lower place to the higher place and the registration is completed.

[2-color adjustment display]



Remark

- Setting range is 0 to 9999.
- Setting of factory default is "2000".

Caution

At setting, if span adjustment value (input temperature or measured temperature) is below span adjustment value (input temperature or measured temperature), setting becomes disabled and displays 'Er6'.

10. Maintenance and Inspection

10.1 Cleaning of Objective Lens





Wipe the objective lens periodically with a soft cloth for accurate measurement.

10.2 Cleaning of External LCD and Eyepiece Cover



Wipe the external LCD and eyepiece cover periodically with a soft cloth for clear view.

10.3 Self-Diagnostic Function

This thermometer has self-diagnostic function and displays following indications at abnormality. Check the contents and take countermeasure.

	Error Display (Main Display)	Contents	Alarm	Countermeasure
Main Display (Thermometer)		Higher limit over range (The object temperature exceeds the measuring range of the thermometer)	Status marker AH lights and the buzzer turned "on". *1	Isn't the emissivity set too low? Set the correct emissivity by referring "5.1 Emissivity (ratio) Setting" and "13. Emissivity Table".
		Lower limit under range The object temperature is no more than the measuring range of the thermometer)	Status marker AL lights and the buzzer turned "on". *1	Isn't the emissivity set too high? Set the correct emissivity by referring "5.1 Emissivity (ratio) Setting" and "13. Emissivity Table".
		Abnormal ambient temperature (The thermometer is placed in the environment other than its working temperature: 0°C or lower, and 50°C or higher)	Only "Er1" is displayed.	Use the thermometer within the working temperature range 0 to 50°C.
	*2 	E²PROM data broken (For some reason, data ROM is broken and that causes broken memory data, temperature data, and adjustment data)	Only "Er4" is displayed.	Re-adjustment is necessary. Send the thermometer to us. (Memory data and adjustment data are initialized.)

10.4 Overflow/Underflow Display

	Error Display (Sub Display)	Contents	Alarm	Countermeasure
Sub Display (TC temperature)		Higher limit over range (Thermocouple is disconnected or, (Object) temperature measured by the thermocouple exceeds 1220°C)	Only "OFL" is displayed.	· If "OFL" is displayed in room temperature, it means the thermocouple is broken. Replace it. · If "OFL" is displayed while measuring, it means the thermocouple is in the temperature 1220°C or higher. The thermocouple may get broken. Stop measuring by the thermocouple immediately.
		Lower limit under range ((Object) temperature measured by the thermocouple is below -50°C)	Only "UFL" is displayed.	· The object temperature exceeds the lower limit measuring range of the thermocouple. It may deteriorate the thermocouple. Stop the measuring by the thermocouple immediately.

*1 This is not output, if alarm value is set to "oFF".

*2 This is displayed at power ON or while displaying memory data.

11. Accessories

11.1 Thermocouple

The thermometer can be used as a surface thermometer by connecting a K-thermocouple (sold separately). Connect the thermocouple by inserting its connector to the connector inside the connector cover. Refer to the figure of "3.1 Names and Functions of Component parts" for the location of thermocouple input connector.

Name	Model	Specification
Thermocouple	C510-01K	K-thermocouple, maximum 500°C, response time about 1.8 sec.
Thermocouple for high temperature	C510-02K	K-thermocouple, maximum 800°C, response time about 4 sec.

11.2 AC Power Adoptor (Model: IR-VHRA)

This is used when using this thermometer by AC power supply. For connection, insert the plug of the adapter into the DC power jack inside the connector cover. Refer to the figure of "3.1 Names and Functions of Component parts" for the location of the DC power jack.

Reference

·Specifications: input voltage 100 to 240V AC, output voltage 5V DC

Warning

- Makes sure to use the AC adaptor in the rage of 100 to 240V AC.
- Do not touch the AC adaptor or an electrical outlet with wet hands. It may cause electric shock, fire or damage.
- Do not wet the AC adaptor. It may cause fire.
- Wipe the dust on the AC adaptor. It may cause fire.

Caution

·Make sure to turn OFF the thermometer to connect the AC adaptor.

11.3 Tripod (Model: IR-ZBMT)

This is used for long term measurement or for fixing the thermometer for measurement. Use tripod fixing screw in the bottom to mount to the universal head.

11.4 Universal head (Model: IR-VMS)

This is used by placing between the tripod and the thermometer for adjustment of its direction and title or for fixing.

11.5 SD card (Model: RZ-SMC□□)

Operation of SD card other than our recommended product is not guaranteed. Capacity of the SD card is maximum 2GB and 2GB or more can no be used with this thermometer.

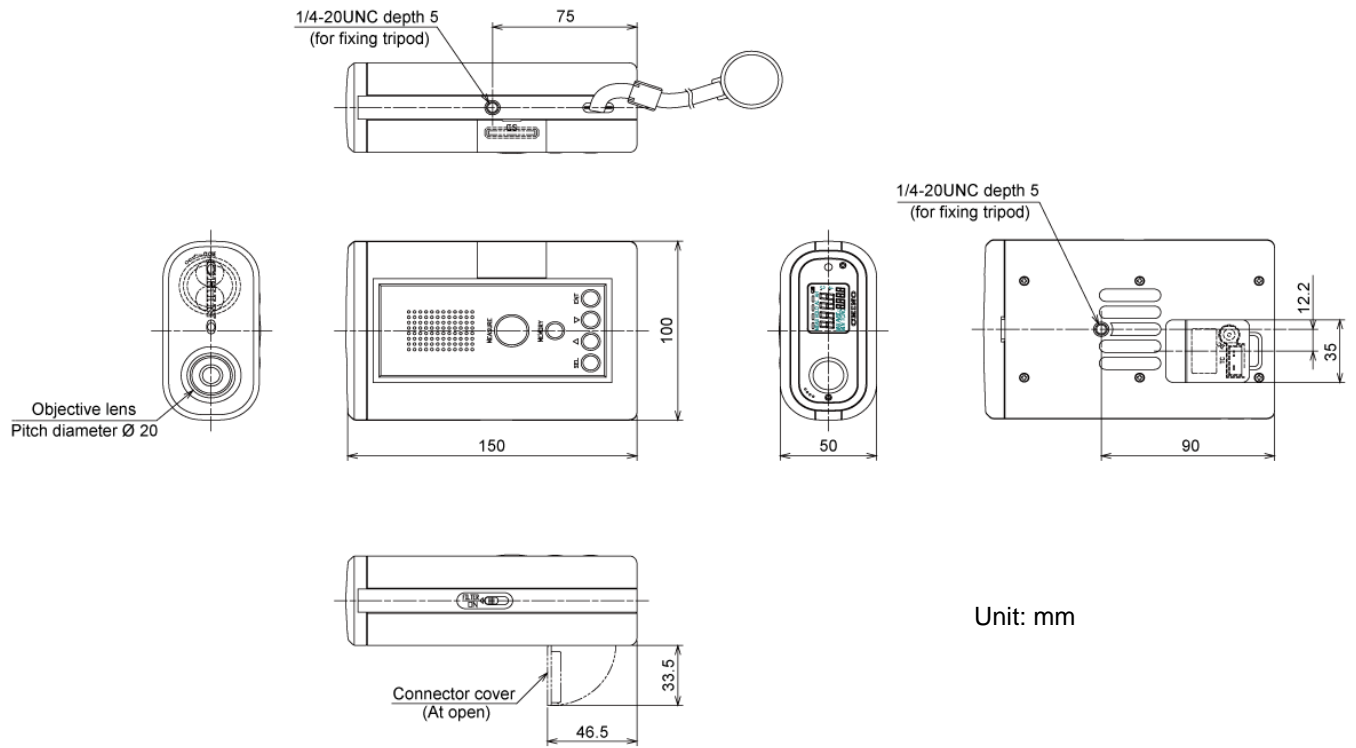
12. Specifications

12.1 Specifications

Type	Single-color type for medium temperature	Single-color type for high temperature	High function type (2-color type+single-color wide rang type)
Model	IR-HAIN□	IR-HASN□	IR-HAQN□
Measuring System	Narrow band radiation thermometer		
Detecting Element	InGaAs	Si	Si/InGaAs
Measuring Wavelength	1.55μm	0.9μm	0.9/1.55μm
Measuring Range	300 to 1000°C	600 to 2000°C	600 to 2000°C (2-color) 400 to 3000°C (Single-color)
Accuracy Rating*	±6°C	Below 1000°C: ±6°C 1000 or higher, below 1500°C : ±0.6% of measured value 1500°C or higher : ±1.2% of measured value	Below 1000°C: ±6°C 1000 or higher, below 1500°C : ±0.6% of measured value 1500 or higher, below 2000°C : ±1.2% of measured value 2000°C or higher : ±2.4% of measured value
Reproducibility	±1°C		
Resolution	1°C		
Response Time	0.2s		
Emissivity (ratio) Correction	Emissivity correction: 1.900 to 0.100, Emissivity ratio correction: 1.2 to 0.8		
Mathematics	Maximum value, Minimum value, Average value		
Signal Modulation	Delay, Peak		
Display System	LCD digital 4 digit (External display and viewfinder inside display)		
Data Memory Media	SD card (Max 2GB)		
Memory Data	1 File maximum 9999 data (Number of maximum folder: 512, 1 folder maximum file number: 9999)		
Optical System	Fixed focus lens type		
Measuring Distance and Diameter	Measuring distance 4000mm or less: Measuring diameter Φ20mm Measuring distance 4000mm or more: Measuring diameter $\Phi(0.013 \times (\text{Measuring distance} - 4000) + 20)$ mm		
Targeting System	Direct viewing finder		
Lens Diameter	Φ20mm		
Thermocouple Input	K-thermocouple: - 50 to 800°C, Accuracy rating: ±2°C (in 23°C±5°C)		
Other Functions	Auto power OFF, LCD backlight, continuous measuring, battery check, higher/lower limit alarm		
Key Switch	6 switches (MEASURE, MEMORY, SEL, ▼, ▲, ENT)		
Working Temperature Range	0 to 50°C		
Power Supply	Two AA (UM-3) dry cell batteries (rechargeable battery can be used), or AC power adaptor (sold separately)		
Case Material and Color	Polycarbonate (heat resistant resin is used for a part), white, gray		
Weight	About 450g (thermometer only)		
CE marking	EN61326-1 Class A		

*At $\epsilon=1.0$, reference operating condition: 23°C±5°C, relative humidity: 35 to 75%RH

12.2 External Dimensions



13. Emissivity Table

The emissivity are values determined by the material of object, profile of its surface, surface roughness, oxidized or not, measuring temperature, measuring wavelength and other factors. They are represented by the thermal radiation ratio " ϵ " when a black body furnace at the same temperature is measured in the same wavelength band.

The emissivity " ϵ " is generally known by a value at the wavelength of $0.65\mu\text{m}$ when an optical pyrometer is used. The emissivity changes according to the above factors even in case of the same material. Please use the following table as a reference.

13.1 Emissivity Table

13.1.1 Emissivity ($\lambda=0.65\mu\text{m}$)

Metal	Emissivity		Oxide	Emissivity
	Solid	Liquid		
Zinc	0.42	—	Alumel*	0.87
Alumel	0.37	—	Chromel*	0.87
Aluminum	0.17	0.12	Constantan*	0.84
Antimony	0.32	—	Ceramics	0.25 to 0.5
Iridium	0.30	—	Cast iron*	0.70
Yttrium	0.35	0.35	55Fe. 37.5Cr. 7.5Al*	0.78
Uranium	0.54	0.34	70Fe. 23Cr. 5Al. 2Co*	0.75
Gold	0.14	0.22	80Ni. 20Cr*	0.90
Silver	0.07	0.07	60Ni. 24Fe. 16Cr*	0.83
Chromium	0.34	0.39	Stainless steel*	0.85
Chromel P	0.35	—	Aluminum oxide	0.22 to 0.4
Cobalt	0.36	0.37	Yttrium oxide	0.60
Constantan	0.35	—	Uranium oxide	0.30
Zirconium	0.32	0.30	Cobalt oxide	0.75
Mercury	—	0.23	Columbium oxide	0.55 to 0.71
Tin	0.18	—	Zirconium oxide	0.18 to 0.43
Carbon	0.8 to 0.9	—	Tin oxide	0.32 to 0.60
Tungsten	0.43	—	Cerium oxide	0.58 to 0.82
Tantalum	0.49	—	Titanium oxide	0.50
Cast iron	0.37	0.40	Iron oxide	0.63 to 0.98
Titanium	0.63	0.65	Copper oxide	0.60 to 0.80
Iron	0.35	0.37	Thorium oxide	0.20 to 0.57
Copper	0.10	0.15	Vanadium oxide	0.70
Thorium	0.54	0.34	Beryllium oxide	0.07 to 0.37
Nickel	0.36	0.37	Magnesium oxide	0.10 to 0.43
80Ni. 20Cr	0.35	—		
60Ni. 24Fe. 16Cr	0.36	—	*Oxidized on surface	
Platinum	0.30	0.38		
90Pt. 10Rh	0.27	—		
Palladium	0.33	0.38		
Vanadium	0.35	0.35		
Bismuth	0.29	—		
Beryllium	0.61	0.61		
Manganese	0.59	0.59		
Molybdenum	0.37	0.40		
Rhodium	0.24	0.30		

13.1.2 Emissivity ($\lambda=0.9\mu\text{m}$)

Metal	Emissivity
Aluminum	0.10 to 0.23
Gold	0.015 to 0.02
Chrome	0.36
Cobalt	0.28 to 0.30
Iron	0.33 to 0.36
Copper	0.03 to 0.06
Tungsten	0.38 to 0.42
Titanium	0.50 to 0.62
Nickel	0.26 to 0.35
Platinum	0.25 to 0.30
Molybdenum	0.28 to 0.36

Alloy	Emissivity
Inconel X	0.40 to 0.60
Inconel 600	0.28
Inconel 617	0.29
Inconel	0.85 to 0.93
Incoloy 800	0.29
Kanthal	0.80 to 0.90
Stainless steel	0.30
Hastelloy X	0.30

Semi conductor	Emissivity
Silicon	0.69 to 0.71
Germanium	0.60
Gallium arsenic	0.68

Ceramics	Emissivity
Silicon carbide	0.80 to 0.83
Titanium carbide	0.47 to 0.50
Silicon nitride	0.89 to 0.90

Others	Emissivity
Carbon pigment	0.90 to 0.95
Graphite	0.87 to 0.92

13.1.3 Emissivity ($\lambda=1.55\mu\text{m}$)

Metal	Emissivity
Aluminum	0.09 to 0.40
Chrome	0.34 to 0.80
Cobalt	0.28 to 0.65
Copper	0.05 to 0.80
Gold	0.02
Steel plate	0.30 to 0.85
Lead	0.28 to 0.65
Magnesium	0.24 to 0.75
Molybdenum	0.25 to 0.80
Nickel	0.25 to 0.85
Palladium	0.23
Platinum	0.22
Rhodium	0.18
Silver	0.04 to 0.10
Tantalum	0.20 to 0.80
Tin	0.28 to 0.60
Titanium	0.50 to 0.80
Tungsten	0.30
Zinc	0.32 to 0.55

Alloy	Emissivity
Brass	0.18 to 0.70
Chromel, Alumel	0.30 to 0.80
Constantan, Manganin	0.22 to 0.60
Incone	0.30 to 0.85
Monel	0.22 to 0.70
Nickel Chrome	0.28 to 0.85

Ceramics	Emissivity
Alumina ceramics	0.30
Red brick	0.80
White brick	0.35
Silicon brick	0.60
Sillimanite brick	0.60
Ceramics	0.50

Others	Emissivity
Asbestos (plate, sheet, fabric)	0.90
Asphal	0.85
Carbo	0.85
Graphite	0.80
Soot	0.95
Cement, Concrete	0.70
Cloth	0.80

14. Start-up Option

14.1 Start-up Option

The following operation modes are available by the key combinations at the start up.

Key Operation	Mode	Remarks
Push MEASURE key only	Standard measuring or Continuous measuring	Measurement with the same measuring mode as the last start-up
Push △ key while pushing MEASURE key	Standard measuring	_____
Push ▽ key while pushing MEASURE key	Continuous measuring	" ● " under main marker "CONT" lights
Push ▽ key, ENT key, and MEASURE key at the same time	Zero/Span adjustment mode	If it is start-up by only MEASURE key at next start-up, it will be standard measuring or continuous measuring.

14.2 Table of Display

The displays indicated on the external LCD are classified as three types.

Mode	Outline
Measuring mode	Push MEASURE key to perform measurement. Emissivity setting and automatic calculation of emissivity is available at holding standard/continuous measuring display.
Setting mode	Displays and sets measurement parameter. By pushing and holding SEL key in standard/continuous measuring mode or memory input mode, it shifts to setting mode. In any setting mode, push and hold SEL key or not operating any key for about one minute, it becomes measuring mode or memory input mode.
Memory input mode	Memory number setting, displaying memory data, and saving memory data is available. By pushing MEMORY key at standard/continuous measuring mode, it becomes memory input mode and lights "MEM". By pushing MEMORY key again, it returns to standard/continuous measuring mode.
Zero/Span adjustment mode	Performs zero/span adjustment using black body furnace. If no key operation has done for 30sec., power supply is turned OFF automatically.

15. List of Parameters

Name	Parameter Name	Sub display	Setting range	Initial value	Section of this manual
Emissivity (ratio)	Emissivity (ratio) setting	_____	Single-color: 1.900 to 0.100 2-color: 1.200 to 0.800	1.000	5.1
	Lower limit temperature alarm	AL	"oFF" or 300 to 1000°C (IR-HAD) 600 to 2000°C (IR-HAS) 400 to 3000°C (IR-HAQH)	oFF	6.1
Higher limit temperature alarm	AH	6.2			
Setting mode	Signal modulation*1	Modu	dELy/PEAk	dELy	6.3
	Modulation time constant	tAu	0.0, 0.2, 0.5, 1.0sec.	0.0sec.	6.4.1
	Attenuation Rate	dEC	0, 2, 5, 10°C/sec.	0°C/sec.	6.4.2
	Measuring unit selection	unit	C, F	C	6.5
	Thermocouple measurement	tC	oFF/on	oFF	6.6
	2-color type/Single-color wide range type*2	CoLr	2, 1	2	6.7
	Memory mode	mmod	mAn/int	mAn	6.8
	Memory interval	int	1 to 7200sec.	60sec.	6.9
	Data saving folder	FLdr	0000 to 9999	0000	6.10
	Data saving file	FiLE	0000 to 9999	0000	6.11
	Date/Time	yEAr	2016 to 2099	2016	6.12
		mo	1 to 12	1	
		dAy	1 to 31	1	
		Hour	0 to 23	0	
	min	0 to 59	0		
SD card data initialization	Frmt	no/yES	no	6.13	
Zero • Span adjustment mode	Initialize zero/span adjustment	init	oFF/on	oFF	9.1
	Perform zero/span adjustment	CAL	no/yES	no	9.2
	InGaAS zero adjustment	InGZ	0 to 9999	300 (IR-HAD) 400 (IR-HAQH)	9.3
	InGaAS span adjustment	InGS	0 to 9999	1000 (IR-HAD) 600 (IR-HAQH)	9.4
	Si zero adjustment	Si Z	0 to 9999	600 (IR-HAS, IR-HAQH)	9.5
	Si span adjustment	Si S	0 to 9999	2000 (IR-HAS) 3000 (IR-HAQH)	9.6
	2-color zero adjustment	2C Z	0 to 9999	600 (IR-HAQH)	9.7
	2-color span adjustment	2C S	0 to 9999	2000 (IR-HAQH)	9.8

*1: The parameters of modulation ratio selection differ by the signal modulation mode.

Refer to "6.3 Single Modulation Selection" for details.

*2: 2-color/single-color wide selection is displayed in Model IR-HAQ only

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