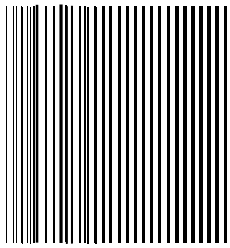


CHINO

IR-FA Series

Fiber Type Radiation
Thermometer

Model : IR-FAI,IR-FAS,IR-FAQH,
IR-FAQI,IR-FAQS



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 thermometer 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.

Notices

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 thermometer correctly and safely, please keep the following safety measures for the operation and storage of the thermometer.

The thermometer has been calibrated with a fiber optic assembly consisted of a fiber optics and a lens assembly. Connect the correct fiber optic assembly to the thermometer.
(Ref. [3.1.1 Thermometer view] and [3.3 Fiber optics])

The fiber optics has a direction of the thermometer side and the lens assembly side, and the thermometer has been calibrated with the correct directional fiber optics. If you connect the fiber optics with the opposite direction to the thermometer, you will have an indication error.
(Ref. [3.3 Fiber optics])

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. Install the thermometer as far as possible from an inductive oscillator or electric power line.
- The fiber optics is consisted of the single-core quartz fiber and the sheath. Two kinds of the sheath are available.
- The maximum working temperature of the fiber optic assembly is 150°C.

2. Storage


- Do not store the thermometer in hot and humid places.
- Two types of the fiber optics are available, one is the single-core quarts optical fiber covered by a heat-resistant sheath with glass wool over braided, and the other is the single-core quarts optical fiber covered by a heat-resistant material with the glass wool over braided and, and further covered by flexible metal tube sheath. For the storage of the fiber optics, keep it with the bending radius larger than the allowable value (R: about 100mm).
- Make sure to connects the optical connectors of the fiber optics to the optical connectors of the thermometer and the lens assembly with the proper key slit position. Don't crack the fiber optics sheath or make it dirty. (Ref. [4.3 Cautions on installation/maintenance of fiber optics])
- 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 attached to a title for the sentence with 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		Information that we suggest to read carefully.
5		Information that you can use as a reference.




Warnings and Cautions

◆ Please use the thermometer 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.
 The  mark indicates prohibited operations.



 Warning (May cause death or serious injury)		
	Don't use the fiber optic assembly in places over 150 °C.	
	Don't operate the thermometer in places where combustible or volatile gas is existed. It is extremely dangerous to use the thermometer in such environment.	
	When connecting power to the power terminals, make sure that all mains is turned off to prevent an electric shock.	
	Don't use the thermometer if it was broken, smoking or nasty smelling. These may cause fire. For such abnormal condition, turn off the power switch at once and contact your sales agent of CHINO Corporation.	
	Laser may damage your eyes. Don't stare into a laser beam. Make sure to target the laser when you want the decide the center of the measuring object only and to go off it after the center of the measuring object is decided.	
	Never take the thermometer apart or convert it. These may cause trouble and danger.	

 Caution (May cause injury or physical damage)		
	The thermometer has been calibrated with the fiber optic assembly. When you use several thermometers, make sure that the combination of the thermometer and the fiber optic assembly is correct. (Ref. [3.1.1 Thermometer view] and [3.3 Fiber optics])	
	The maximum working temperature of the fiber optic assembly is 150°C. Use it under this maximum working temperature. (Ref. [3.2 Fiber optics assembly])	
	Be careful not to give vibration or impact to the thermometer. Install the thermometer by keeping it as far as possible from an inductive oscillator or electric power line.	
	Avoid the unnecessary detachment and attachment of the fiber optics. Make sure not to tension the fiber optics or bend its joint to the optical connector. (Strong tension or too bending the fiber optics may cause damage of the optical fiber.)	
	The fiber optics can be bent but make sure to use it with the bending radius larger than its allowable value (R: about 100mm). (Ref to [4.3 Cautions on installation/maintenance of fiber optics])	
	When connecting the optical connectors of the fiber optics to the optical connectors of the thermometer and the lens assembly, make sure to turn them with your hand. (Don't turn them by using a tool like as pliers.)	
	Don't overhaul or modify the thermometer. These may cause trouble and danger.	
	Read the entire contents in this instruction manual to have the thermometer function perfectly.	

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Laser Safety

This Model is certified as a class laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance standard according to the Radiation Control for Health and Safety Act of 1968. This means that this Model does not produce hazardous laser radiation.

CDRH Regulation

The Center for Devices and Radiological Health (CDRH) for the U.S. Food and Drug Administration implement regulations for laser products August 2, 1976. These regulations apply to laser products manufactures from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Note: Make sure to read the items with the mark of the articles of  are included.

1. Introduction

1.1 General

In the IR-FA series fiber optic radiation thermometers, four kinds of models, single color type Models IR-FAI and IR-FAS and two-color type model IR-FAQ and IR-FAQI, and IR-FAQH, and IR-FAQS are available.

The thermometer, the fiber optics, and the lens assembly are connected through optical connectors. The radiation energy collected through the lens is transmitted to the element through the optical fiber and is converted into an electrical signal. The element output is digitally converted and processed through emissivity compensation, linearizer, and modulation. The standardized final output is 4 to 20mA DC.

Functional keys make programming or selection of emissivity, signal modulation and alarm function easy.

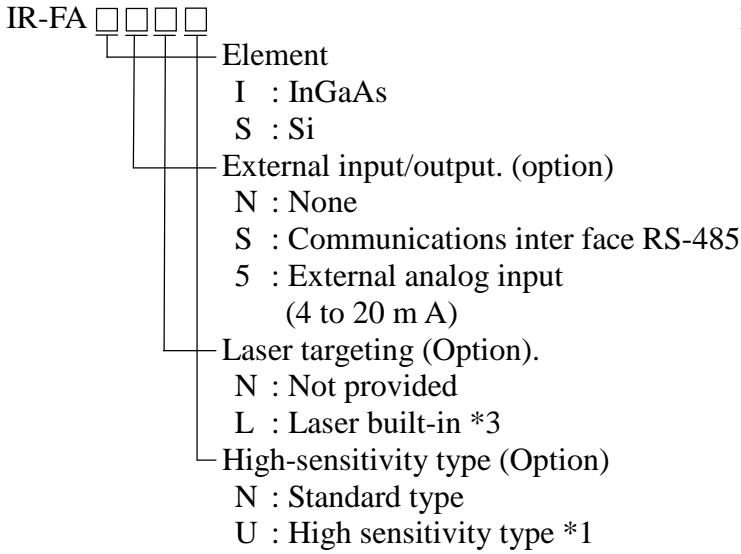
Two types of the lens assembly are available, a universal type, and the lens assembly with a viewfinder.

An air purge case is available for the universal type lens assembly.

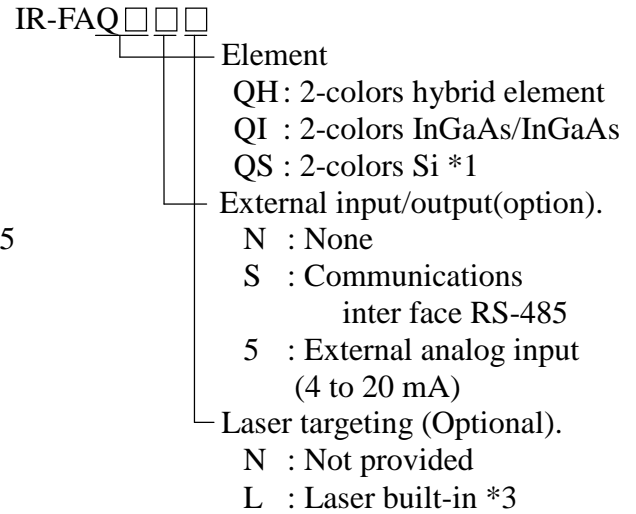
2. Model

2.1 Model

●Single-color type thermometer *2



●Two-colors type thermometer *2

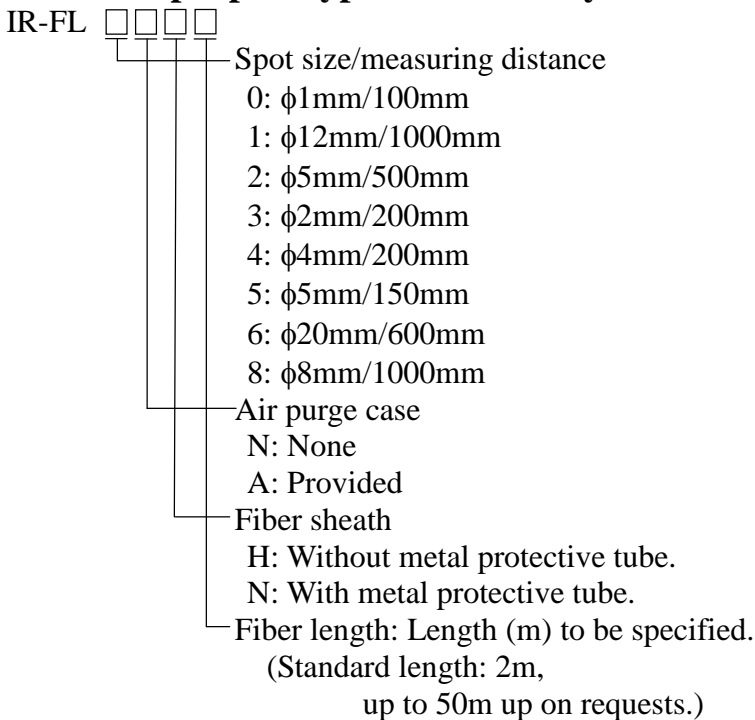


*1: Out of CE marking.

*2: Cable length is less than 30m in room.

*3: When the lens assembly with a viewfinder is used, the laser spotting unit or the laser targeting function on the main unit can not be used along with it.

●General-purpose type lens assembly



●Lens assembly with a viewfinder

IR-FF1 (ϕ 5at500)		IR-FF2 (ϕ 4at370)	
Measuring distance	Measuring diameter	Measuring distance	Measuring diameter
L1: 400	D1: ϕ 7	L1: 270	D1: ϕ 7
L2: 500	D2: ϕ 5	L2: 370	D2: ϕ 4
L3: 600	D3: ϕ 9	L3: 470	D3: ϕ 9

IR-FF3 (ϕ 10at1000)	
Measuring distance	Measuring diameter
L1 : 800	D1 : ϕ 11
L1 : 1000	D1 : ϕ 10
L3 : 1200	D1 : ϕ 15

(Ref [9.3 Fiber optics])

CE -marking
EN61326-1 ClassA

2.2 Standard temperature range

●Single-color type

Model	Measuring range	Lens assembly
IR-FAI	150 to 450°C* 200 to 700°C 250 to 1000°C 300 to 1300°C	IR-FL5 IR-FL6
	250 to 1000°C 300 to 1300°C 350 to 1600°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL8
IR-FAS	400 to 900°C* 500 to 1200°C 600 to 1800°C 700 to 2400°C	IR-FL5 IR-FL6
	600 to 1800°C 700 to 2400°C 800 to 3000°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL8

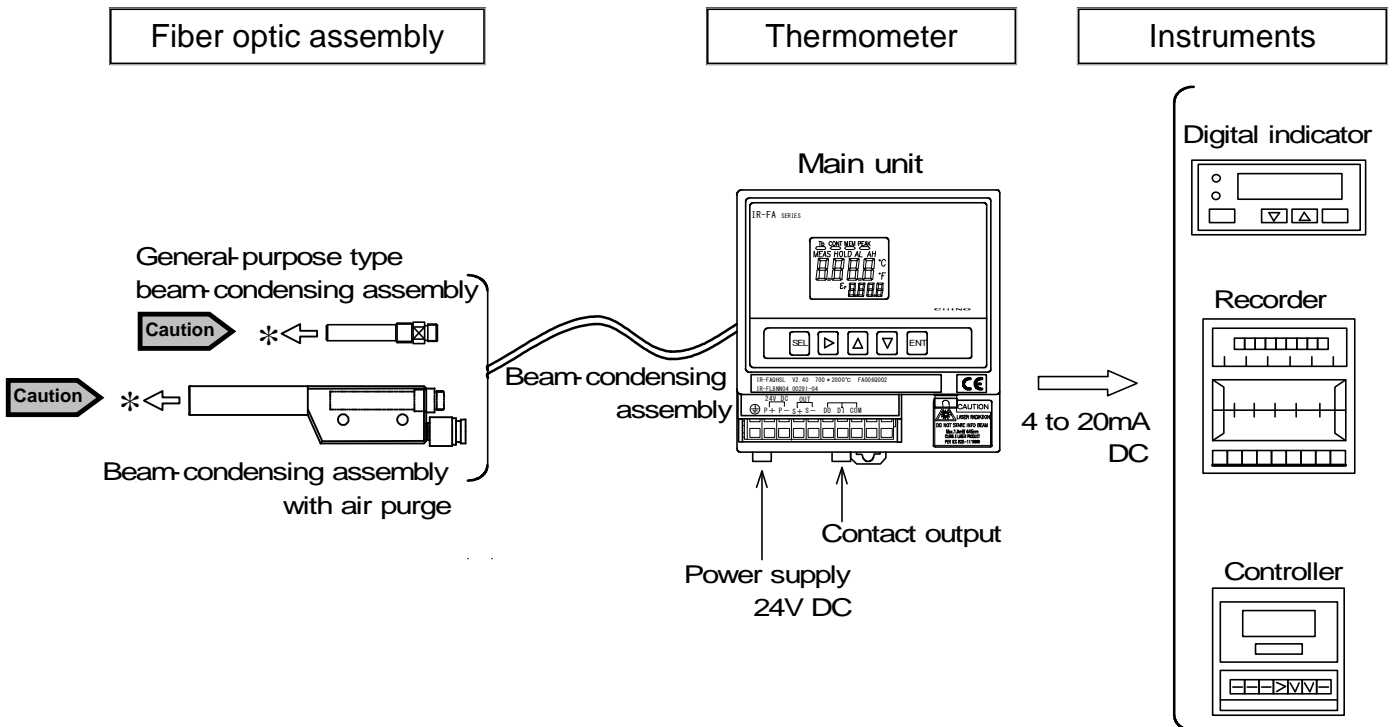
*Mark is for model IR-FA□NU only.
(Optional laser targeting is not available.)

●Two-colors type

Model	Measuring range	Lens assembly
IR-FAQH	600 to 1500°C	IR-FL0,IR-FL1
	700 to 2000°C	IR-FL2,IR-FL3
	800 to 2400°C	IR-FL4,IR-FL5
	1000 to 3000°C	IR-FL6,IR-FL8
IR-FAQI	300 to 1200°C 400 to 1500°C	IR-FL5 IR-FL6
	400 to 1500°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4
	450 to 1500°C	IR-FL8
IR-FAQS	800~1600°C 1000~2000°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL5, IR-FL6
	850~1600°C 1000~2000°C	IR-FL8

*Mark is excluded from CE marking

2.3 System configuration



Caution Please do so that laser is lighted only at the time of the confirmation of the measurement position.

Caution In illumination condition (*) of the laser light is irradiated from the place. Please never look it.

3. Names and functions of component parts

3.1 Thermometer

The thermometer consists of a (1) Digital display, (2) Function keys, (3) Optical connector, (4) Input/Output terminals, and (5) DIN rail stopper.

The output signal from the thermometer is 4mA to 20mA DC and isolated.

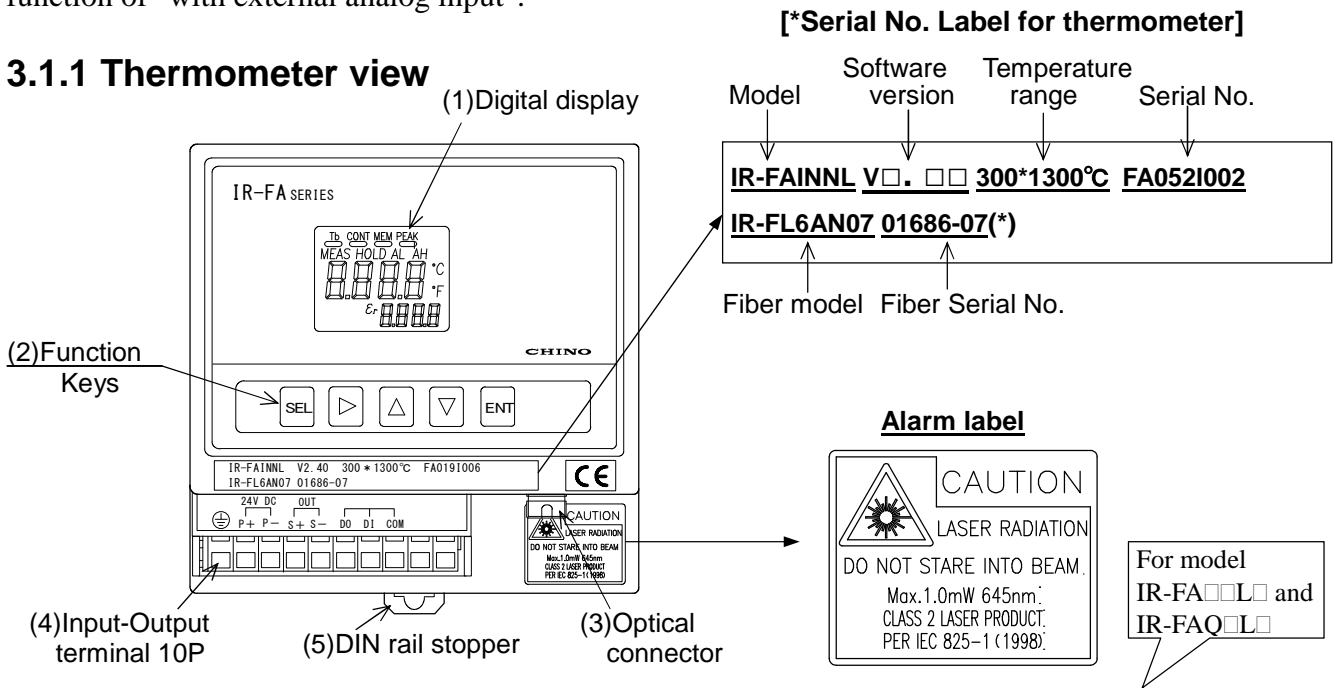
Error alarm higher or lower is available by a contact output.

You can reset “peak hold” or “sample hold” by a contact input.


The emissivity is set by the function keys and displayed digitally.

The emissivity remote setting and the automatic emissivity processing are available by an optional function of "with external analog input".

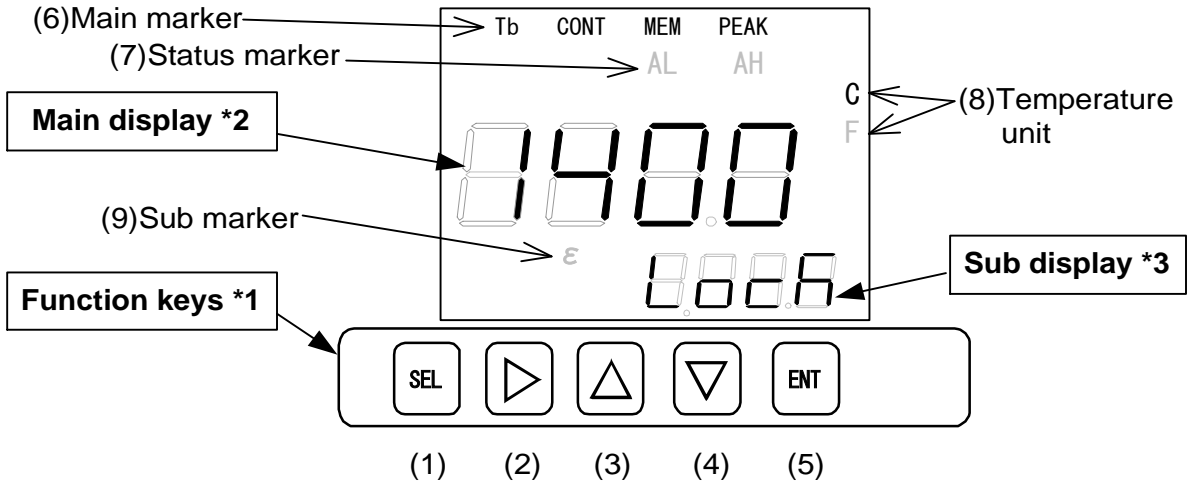
3.1.1 Thermometer view



* This label indicates the serial number of the fiber optic assembly to be combined. Use the fiber optic assembly with the same serial number. (Ref. [3.3 Fiber optics])

(1)Digital display	Main display:4-digit LCD. Sub display: 4-digit LCD. Status markers: Alarm display. Sub markers: Status display. Temperature unit: °C or °F	Ref. to [3.1.2 Function key and Digital display.], [3.1.4 Markers.]
(2)Function keys	 These five keys are used for the program of parameters.	Ref. to [3.1.3 Function keys] Ref. to [6.Operation]
(3)Optical connector	The optical connector is for the connection with the optic assembly.	Ref. [5.1.1 Connection of fiber optic assembly to thermometer.]
(4)Input-Output terminal 10P	The input/output terminals are for wiring 24V DC power supply, ground, output signal, contact input/output, and options.	Ref. [5.1 Connections and wirings]
(5)DIN rail stopper	DIN rail stopper is used to mount the thermometer to a DIN rail or to mount the thermometer by a mounting plate.	Ref. [4.1.3 Installation/removal.]

3.1.2 Function key and digital display



3.1.3 Functions keys*1

Keys	Functions	Indications
(1): Select key	Used to select a parameter menu in the operating mode or the engineering mode.	
(2): Next key	Used to select a parameter in the parameter selection mode or to shift a digit for numeric entries to the right in the parameters programming mode.	
(3): Up key (4): Down key	Used to select a parameter in the parameter selection mode or to scroll numeric characters in the parameters programming mode.	
(5): Entry key	Used to store the selected or programmed parameter.	

3.1.4 Markers

Main display*2 :Displays the measured value in the measurement mode, or a parameter in the parameter selection or programming mode.

Sub display*3 :Displays the parameter menu selected by **SEL** key in the measurement mode, or a parameter menu in the parameter selection or programming mode.

Names	Markers	Major functions	Indications
(6) Main marker	Tb	Not used	“Tb”
	CONT	Not used	“CONT”
	MEM	Not used	“MEM”
	PEAK	Not used	“PEAK”
(7) Status marker	AL	Will light when the low alarm is activated.	“AL”
	AH	Will light when the high alarm is activated.	“AH”
(8) Temperature unit	C	Will light when a temperature is displayed in Celsius.	“C”
	F	Will light when a temperature is displayed in Fahrenheit.	“F”
(9) Sub marker	ε(εr)	Will light when the sub display shows an emissivity (emissivity ratio). ε (emissivity) is for single-color type and εr(emissivity ratio) is for two colors type.	“ε” or “εr”

3.2 Fiber optics assembly

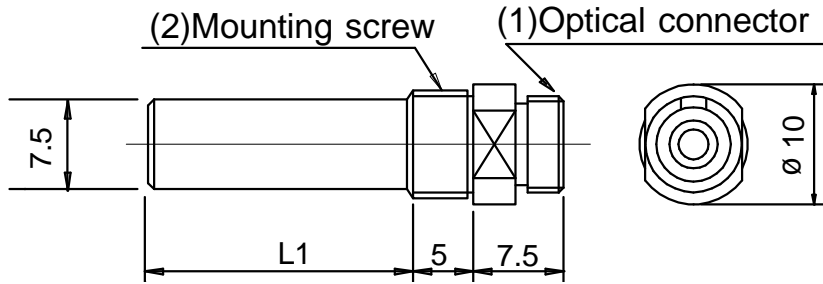
Warning

The maximum working temperature of the fiber optics assembly is 150°C.
Don't use it in places higher than 150°C.

3.2.1 General-purpose type lens assembly (Model :IR- FL□N□□□)

- (1) Optical connector: Used to connect the fiber optics.
- (2) Mounting screw: Used to directly mount the lens assembly to an air purge case or other units.

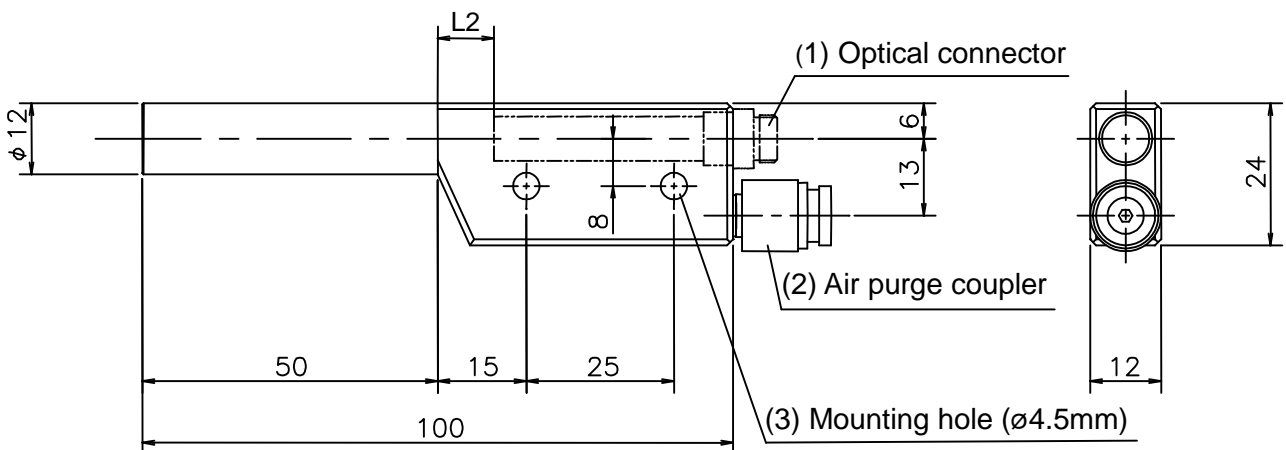
Lens assembly type	0,1,2,3	4	5	6	8
L1	35	15	10	10.5	45



3.2.2 Lens assembly with air purge case (Model :IR- FL□A□□□)

- (1) Optical connector: Used to connect with the fiber optics.
- (2) Air purge coupler: Used to purge dust particles in front of the lens by air.
- (3) Mounting hole (ø4.5mm): Used to fix the case by using 2 pieces of M4 screws.

Lens assembly type	0,1,2,3	4	5	6	8
L2	10	30	35	34.5	0



Caution

For mounting the lens assembly with the air purge case, connect the fiber optics after mounting the air purge case.
For removing, disconnect the fiber optics and then remove the air purge case.
If the air purge case being connected with the fiber optics is mounted or removed, the fiber optics may be damaged by the weight of the air purge case.

3.3 Fiber optics

Reference

The fiber optics has a direction of the thermometer side and the lens assembly side, and the thermometer has been calibrated with the correct directional fiber optics. If you connect the fiber optics with the opposite direction to the thermometer, you will have an indication error. By referring to the [Labels and direction of fiber optics] shown below, connect the fiber optics with the proper direction.

Caution

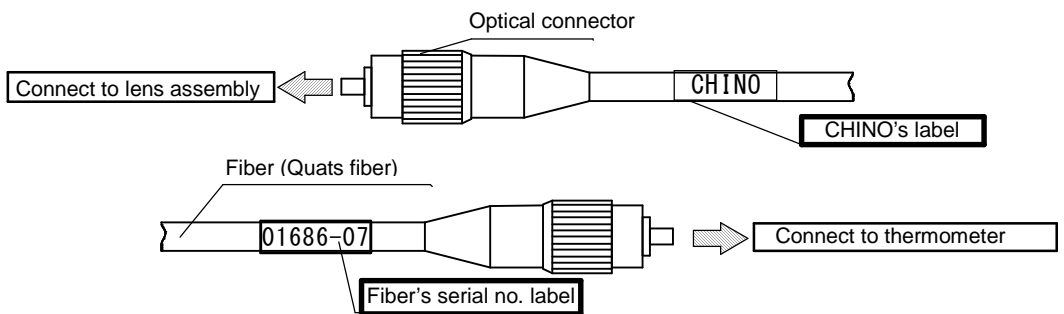
CHINO label side: Connect to the lens assembly
 Fiber optics serial no. label side: Connect to the thermometer

The fiber optics is consisted of the single-core quartz fiber and two optical connectors at both ends. Two types of the sheath are available (Ref. [9.3 Fiber optics] in [9. General specifications])

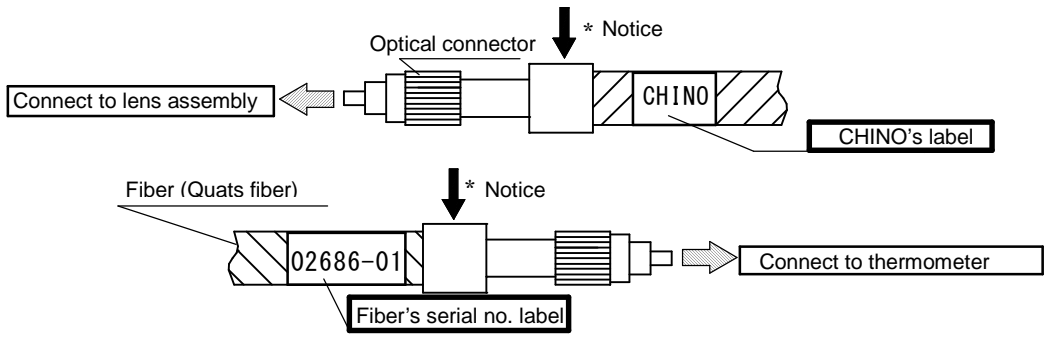
- 1) Fiber optics covered by heat-resistive material with glass wool over braided. The maximum working temperature is 150°C.
 (Model: IR-FL□□H□□)
- 2) Fiber optics covered by heat-resistive material with glass wool over braided, and further covered by metal flexible tube sheath. The maximum working temperature is 150°C.
 (Model: IR-FL□□N□□)

[Labels and direction of fiber optics]

[IR-FL□□H□□ : Without metal protective tube]



[IR-FL□□N□□ : Without metal protective tube]



Caution

When adding strong power to the neighborhood of an arrow mark, fiber optics is damaged. Don't add the strong power of 40 N over.

Warning

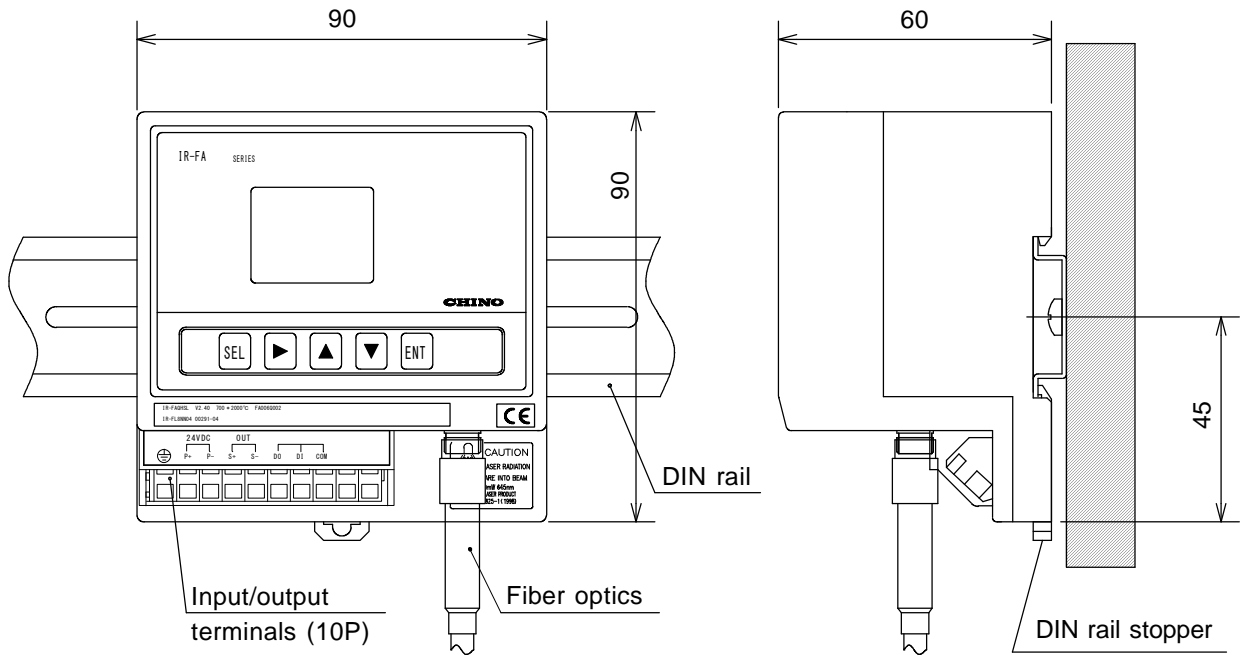
The maximum working temperature of the fiber optic assembly is 150°C. Don't use it in places higher than 150°C.

4. Installation

4.1 Installation of thermometer

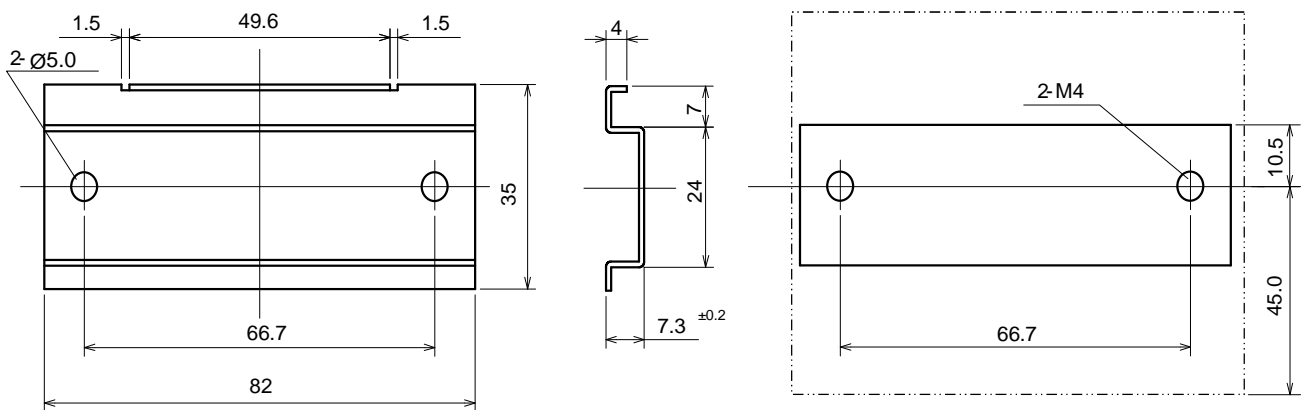
Install the thermometer to place the fiber optics downward.
 However, the installation is optional on the performance of the thermometer.

4.1.1 Using DIN rail



4.1.2 Using mounting plate

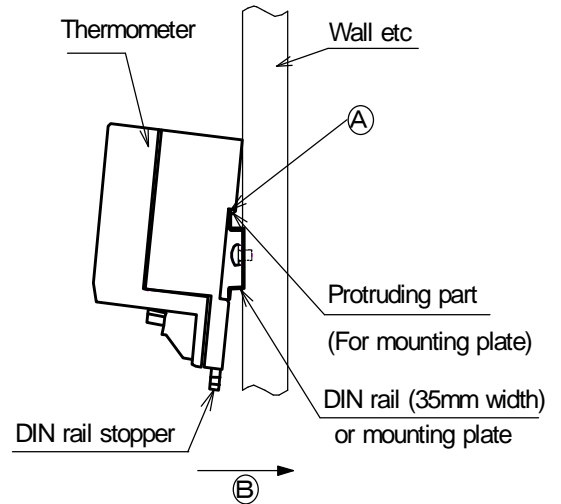
Fix the main unit securely by using two M4 screws.



4.1.3 Installation/removal

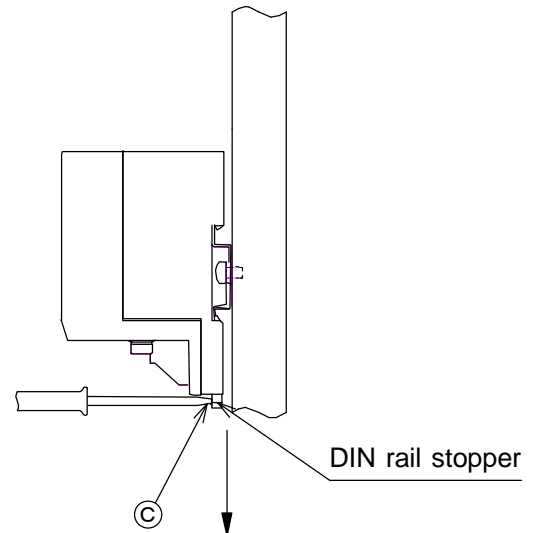
4.1.3-1 Installation

- 1) Fix a DIN rail or the mounting plate on the wall.
(Fix the mounting plate with the protruding part upward.)
- 2) Pull the DIN rail stopper downward.
- 3) Hook the (A) of the thermometer to the upper side of the DIN rail, and push the thermometer toward to (B).
- 4) Raise the DIN rail stopper upward with minus driver to complete the installation of the thermometer.



4.1.3-2 Removal

- 1) Remove the thermometer by pulling the DIN rail stopper downward with plugging the minus driver into the (C).



Caution

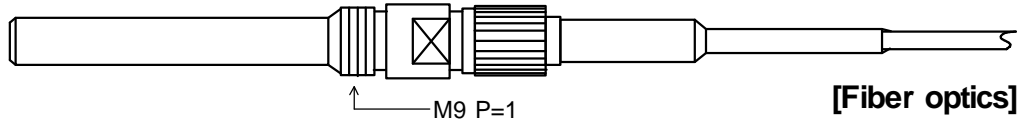
Don't use the thermometer in the following places.

- 1) Dusty place or a corrosive gas atmosphere.
- 2) Places where noisy and static electric are existed.
- 3) Places where the ambient temperature is higher than 50°C or lower than 0°C.
- 4) Places where the ambient temperature changes abruptly, or high humid places.
- 5) Places where an inductive oscillator or electric power line are existed near side.
- 6) Places where there are mechanical vibrations and impacts.
- 7) Places where combustible or volatile gas is existed.

4.2 Installation of lens assembly

4.2.1 General-purpose type lens assembly

The lens assembly is a screw mounting type. For its easy installation, adjust its view field to an object (Ref. [4.2.3 Spot size and measuring distance]) and then make a screw hole (M9, P=1) on an equipment to be installed.

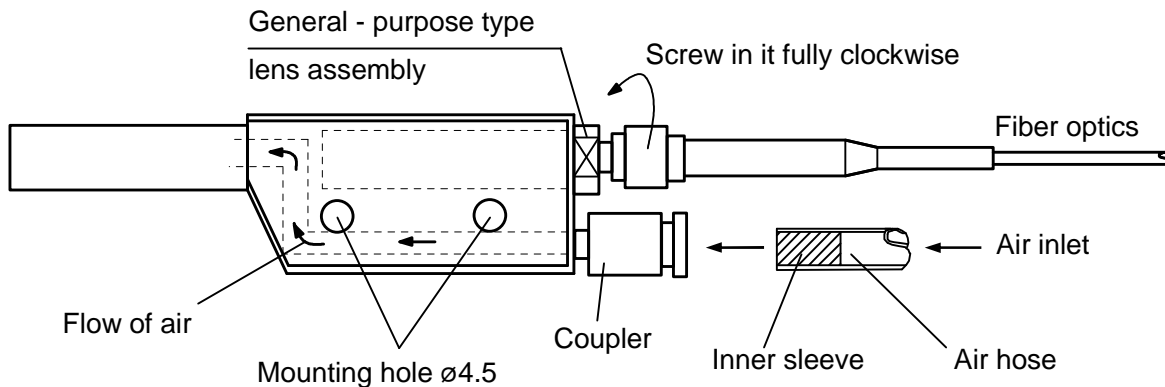


4.2.2 Lens assembly with air purge case

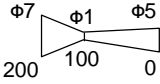
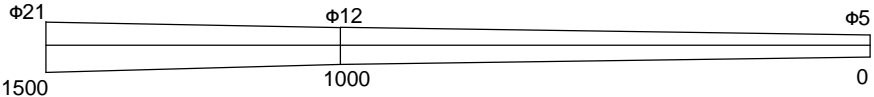
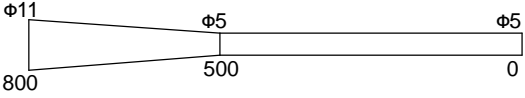
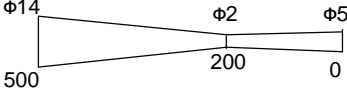
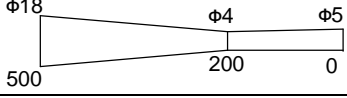
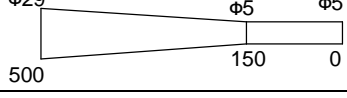
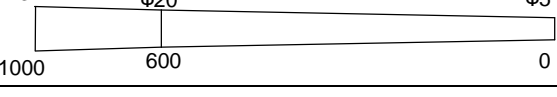

Caution

For mounting the lens assembly with the air purge case, connect the fiber optics after mounting the air purge case. For removing, disconnect the fiber optics and then remove the air purge case. If the air purge case being connected with the fiber optics is mounted or removed, the fiber optics may be damaged by the weight of the air purge case.

For the installation of the air purge case, adjust its view field to an object (Ref. [4.2.3 Spot size and measuring distance]) and then fix it to an equipment to be installed or a suitable mounting angle firmly by using two M4 screws. A coupler consisted of a socket and a cap nut is attached with the air purge case. An air hose coupler is attached with the air purge case. Mounting an inner sleeve to the air hose of 6mm outside diameter and 4mm inside diameter. Insert the air hose to the coupler. Use clean air of 1 to 5 NI/min for the purge air.



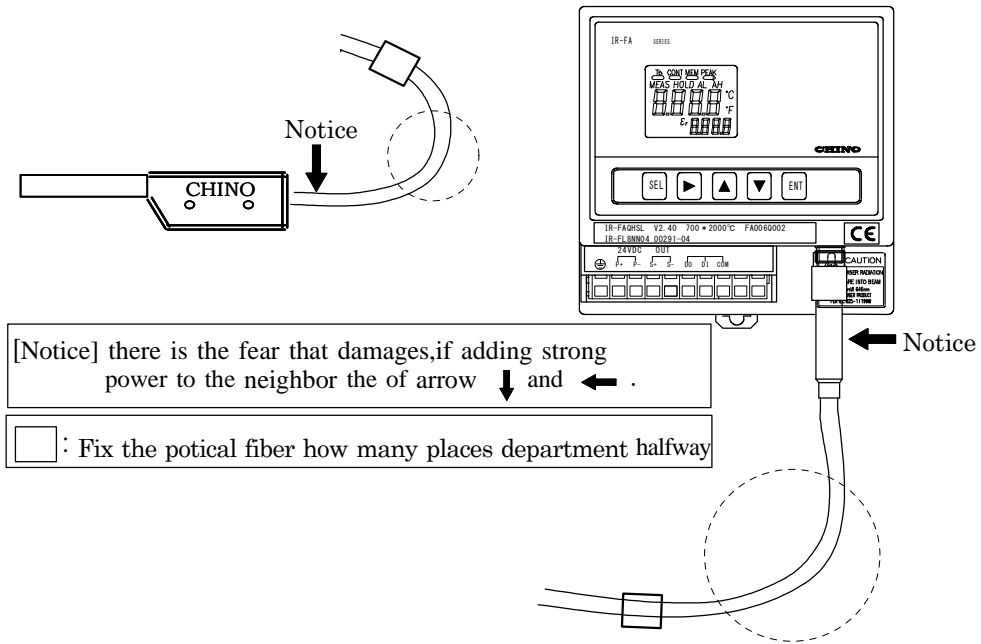
4.2.3 Spot size and measuring distance
(General-purpose type lens assembly, Lens assembly with air purge case)

Thermometer	Lens assembly	Spot size and measuring distance
IR- FAI IR- FAS IR-FAQH IR-FAQI IR-FAQS	IR-FL0	
	IR-FL1	
	IR-FL2	
	IR-FL3	
	IR-FL4	
	IR-FL5	
	IR-FL6	
	IR-FL8	

4.3 Cautions on installation/maintenance of fiber optics

Caution

The allowable bending radius of the fiber optics is about 100mm. The optical fiber may be damaged if it is bent smaller than the radius of 100mm. Especially, be careful that its joint part to the lens assembly or the thermometer may be easily bent.



Caution

For connecting the fiber assembly to the thermometer, align the pin of the optical connector of the fiber optic assembly with the key slit of the optical connector of the thermometer, and then push the fiber optic assembly. Confirm that the pin is placed in the key slit by lightly turning the metal part of the fiber optic assembly and them fix the fiber optic assembly to the optical connector of the thermometer by turning the hexagon cap nut by hand. (Ref.[5.1 Connections/Wirings].) Don't damage the fiber optics edge face or make it dirty.

Caution

Don't use the fiber optics through water or oil.

Warning

Be careful that the maximum working temperature of the fiber optics assembly is 150°C.

Caution

When connecting the optical connectors of the fiber optics to the optical connectors of the thermometer and the lens assembly, make sure to connect them by turning with your hand. Don't turn them by using a tool like as pliers to prevent their damage.

4.4 Confirmation of view field

The lens assembly has no viewfinder. If an object is small, there is a possibility of the lack of the view field. Therefore it is necessary to confirm the view field to avoid the measurement error.

Warning

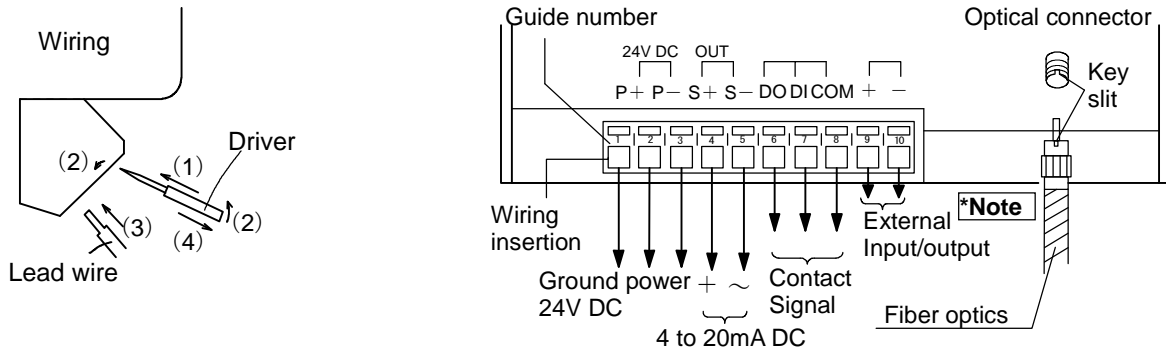
Laser may damage your eyes. Don't stare into a laser beam.

Remarks

- Confirmation method of view field**
- (1) With the object heated up, move the lens assembly in all directions slightly to confirm the indicated temperature value will not change largely. (On the condition that the view field is lacked, the indicated temperature value will change largely if the view field is slightly moved. However, for Model IR-FAQH with two-color processing, this method cannot be applied because the indicated temperature value may not change largely.
 - (2) Confirm the view field by using a laser targeting function (option). As the laser is targeted to an object through the fiber optics assembly, it is very easy to confirm the view field.

5. Connections and wirings

5.1 Connections and wirings



- (1) Insert a driver to the concave part at the upper side of the terminal board.
- (2) Lift the driver shank up and push up the metal hook with the tip of the driver.
- (3) Insert a lead wire to the opening of the lower side of the terminal board.
- (4) The lead wire is fixed by removing the driver.

Caution When connecting the optical connector of the fiber optics assembly to the optical connector of the thermometer, make sure to turn it with your hand. (Don't turn it by using a tool like as pliers.)

***Note** For Models IR-FA□S□□ and IR-FAQ□S (Reference to the separate instruction manual). [Communications interface for IR-FA].

5.1.1 Connections of fiber optics assembly to thermometer

Caution The thermometer has been calibrated with the fiber optic assembly. Connect the correct fiber optics assembly to the thermometer (Ref. [3.1.1 Thermometer view] and [3.3 Fiber optics]) If you want to use the different combination of the thermometer and the fiber optics assembly, you are requested to return them for re-calibration.

Caution For mounting the lens assembly with the air purge case, connect the fiber optics after mounting the air purge case. For removing, disconnect the fiber optics and then remove the air purge case. If the air purge case being connected with the fiber optics is mounted or removed, the fiber optics may be damaged by the weight of the air purge case.

Caution Make sure to turn the optical connector of the fiber optic assembly with your hand for its connection. Don't turn it by using a tool like as pliers to prevent it.

Cramp type terminals are used for wirings of power, ground and input/output terminals. Insert a 3mm minus driver to the concave part at the upper side of the terminal board as shown above, and lift the driver up like as a lever to open the wiring part. Insert a lead wire to the opening wiring part.

5.1.2 Wirings to power terminals



Warning

When connecting power to the power terminals, make sure that all mains power is turned off to prevent an electric shock.

Caution

The use of the power unit IR-ZFEP is recommended. Use a Class 2 power supply (24V DC) when you don't use the IR-ZFEP and use cords of 0.14 to 24mm² for wiring.

5.1.3 Wirings to ground terminals

Caution

Provide a low impedance earth ground (lower than 100Ω) connection to the ground terminal.

5.1.4 Wirings to receiving instruments

Reference

The current output is 4 to 20mA DC and isolated.
The contact output is the open collector output (photo-coupler).
Use a receiving instrument under the ratings (30V, 50mA).

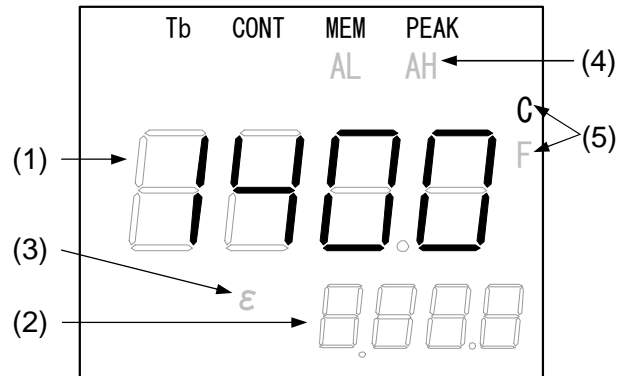
6. Operation

6.1 Digital display

After the installation, the connections and the wirings are completed, turn all mains power on. Measurement starts and the measured value is displayed in the main display.

When the low alarm or the high alarm activates, the status marker “AL” or “AH” will light. (on the condition that the low alarm or the high alarm has been programmed)

- (1) Main display :7-segment LCD 4 digits
Displays measured value or parameters
- (2) Sub display :7-segment LCD 4 digits
Displays parameter menus.
- (3) Sub marker :ε ... Emissivity
- (4) Status marker :AL ... Low alarm
: AH ... High alarm
- (5) Temperature unit C ... °C (Celsius)
F ...°F (Fahrenheit)



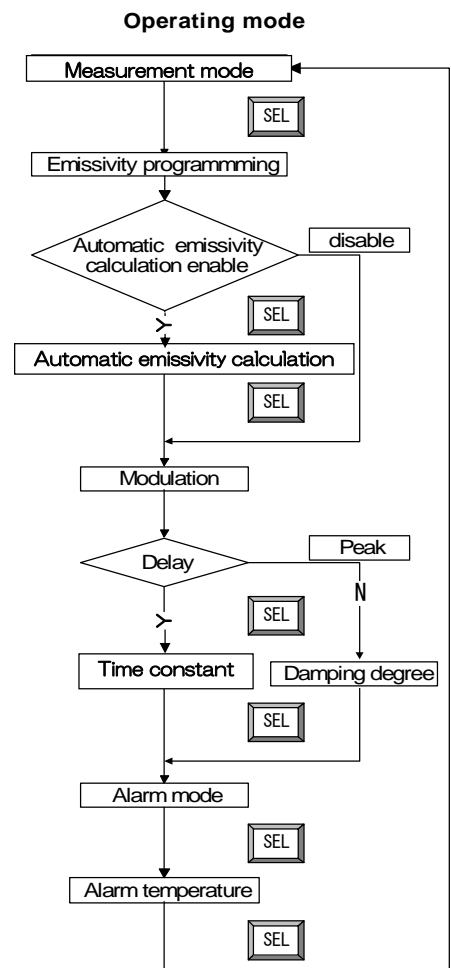
[Measurement mode]
The measured value is displayed in the main display.
Nothing is displayed in the sub display and in the sub marker.

6.2 Parameter programming/selection (Operating mode)

In the measurement mode, program or select a parameter by using **[SEL]** key.

The operator mode covers programming or selection of emissivity, automatic emissivity calculation, signal modulation mode, modulation degree, and alarms. For each program menu, refer to [6.4 Operating mode].

The right figure shows the flow chart of the parameter menus by pressing **[SEL]** key in the measurement mode.

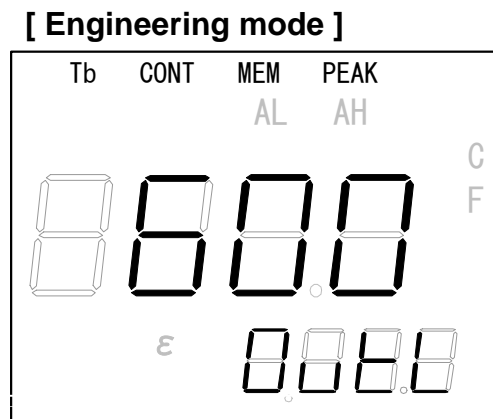
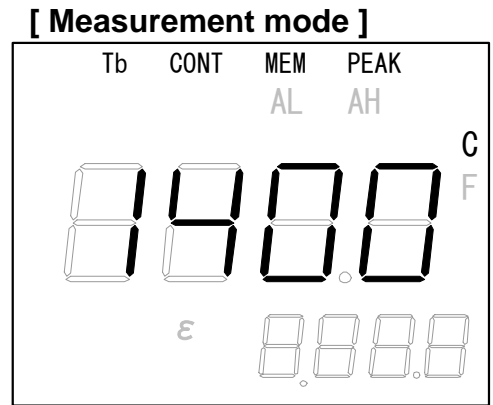


6.3 Parameter programming/selection (Engineering mode)

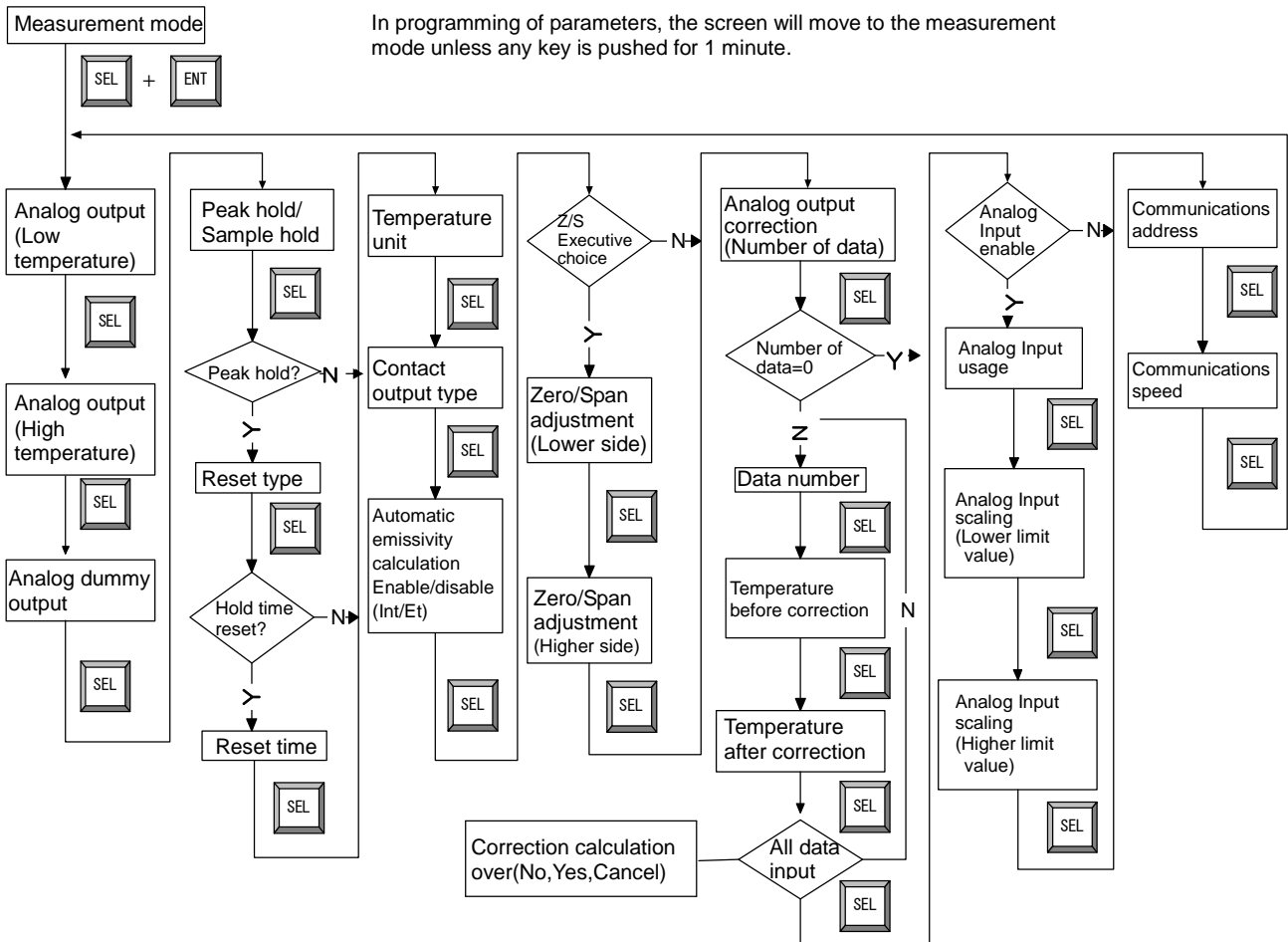
In the measurement mode, press **SEL** key and **ENT** key simultaneously to display the engineering mode shown in the right figure for programming or selecting a parameter.

The engineering mode covers programming or selection of analog output scaling, analog dummy output, hold function (without hold function, peak hold or sample hold), temperature unit, contact output, automatic emissivity calculation (internal or external), zero/span adjustment, analog output correction, analog input (for the thermometer with the option of analog input), and communications (for the thermometer with the option of communications interface). For each program menu, refer to [6.5 Engineering mode].

The lower figure shows the flow chart of the parameter menus by pressing **SEL** key in the engineering mode.



Engineering mode

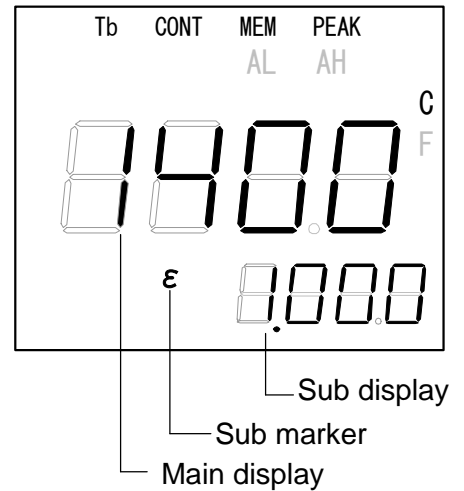


6.4 Operating mode

6.4.1 Emissivity programming

If the emissivity of object measured is low, the temperature displayed becomes lower than the exact temperature and the emissivity is to be compensated.

- 1) To program the emissivity value, press **SEL** key in the measurement mode screen until “ ϵ ” appears in the sub marker as shown in the right figure.
- 2) By pressing \triangleright key, the most significant digit of the sub display will blink.
- 3) Use \triangle or ∇ key to program the desired value.
- 4) To shift to the next lower digit, press \triangleright key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.



Remarks

The programmable range is **0.050** to **1.999**.
The default value is **1.000**.

6.4.2 Automatic emissivity calculation

The emissivity is automatically calculated when you coincident the measured value to the reference temperature value entered by function keys or by an analog input (option).

Remarks

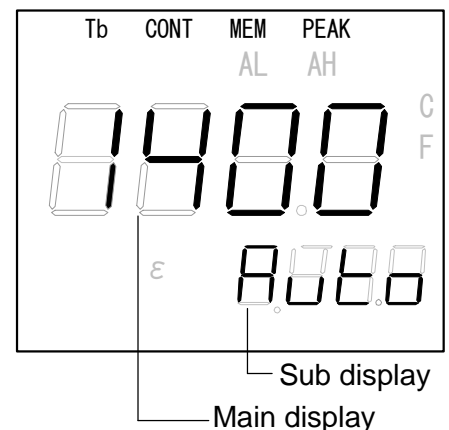
This function is effective when “**In**” (internal) or “**Et**” (external) is selected in [6.5.6 Automatic emissivity calculation type selection.].

6.4.2-1 Automatic emissivity calculation(Internal)

:Input of reference temperature

In the measurement mode, the emissivity is automatically calculated by entering the reference temperature value measured by a thermocouple or other sensor in advance.

- 1) To program the reference temperature value, press **SEL** key in the measurement mode screen until “**Auto**” appears in the sub display as shown in the right figure.
- 2) By pressing \triangleright key, the most significant digit of the main display will blink.
- 3) Use \triangle or ∇ key to program the desired value.
- 4) To shift to the next lower digit, press \triangleright key.
The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.



Remarks

- The programmable range is **0** to **6280°C**.
- The default is **the minimum temperature value** of the measuring range.

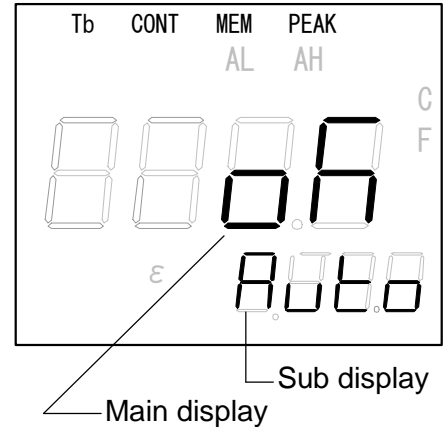
6.4.2-2 Automatic emissivity calculation (External: IR-FA□5□□ only) : Selection of external programming

In the measurement mode, the emissivity is automatically calculated by entering the reference temperature value by the analog input (option).

Reference

Necessary to program the scaling of the analog input in [6.5.9 Analog input programming]).

- 1) To select the external programming, press **SEL** key in the measurement mode screen until “Auto” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, “ok” will blink in the main display.
- 3) Confirm that the analog input is connected to the input/output terminals (9 and 10).
(Ref. [5.1 Connections/Wirings])
- 4) To activate this selection, press **ENT** key.



Caution

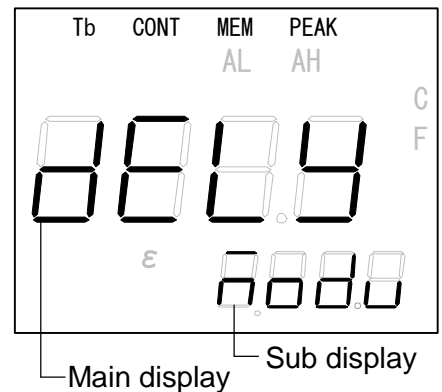
For the correct measurement, confirm the connections of the analog input.

6.4.3 Signal modulation mode selection

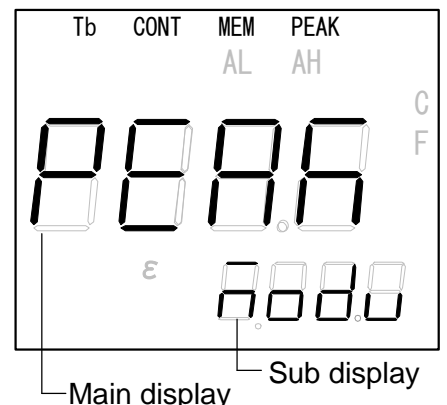
Two kinds of the signal modulation mode are available, one is “dELy” (displays the measured value smoothly for fluctuating original signal) or the other is “PEAk” (displays the measured value by modulating the original signal after the tracing of peak value).

To display the measured value based on the original signal, select “dELy” and program the modulation degree to “0.0”. (Ref. [6.4.4-1 Modulation time constant programming])

- 1) To select the signal modulation mode, press **SEL** key in the measurement mode screen until “Modu” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, “dELy” or “PEAk” will blink in the main display.
- 3) Use **▲** or **▼** key to select the desired mode.
- 4) To activate this selection, press **ENT** key.



dELy	The measured value is displayed by the first-order lag signal based on the modulation time constant programmed in [6.4.4-1 Modulation time constant programming].
PEAk	When the measured temperature is rising up, the measured value is displayed by the original signal. When the measured value is falling down, the measured value is displayed by the damping degree programmed in [6.4.4-2 Damping degree selection].



6.4.4 Modulation degree programming







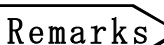
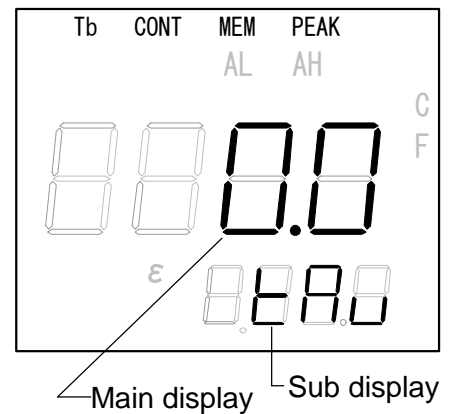
Execute the programming of the modulation degree together with [6.4.3 Signal modulation mode selection].

When the "dELy" is selected in the signal modulation mode, the first-order lag degree can be adjusted. Further, when the "PEAK" is selected, the damping degree of signal after tracking the value can be adjusted.

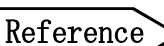
6.4.4-1 Modulation time constant programming (Effective when the "dELy" is selected in the signal modulation mode.)

When the input signal is fluctuated, the measured value is displayed smoothly.

- 1) To program the modulation time constant, press **SEL** key in the measurement mode screen until "tAu" appears in the sub display as shown in the right figure.
- 2) By pressing  key, the most significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To shift to the next lower digit, press  key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.






- The programmable range is **0.0** to **99.9**(second).
- The default value is **0.0** second (original signal).

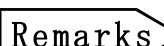
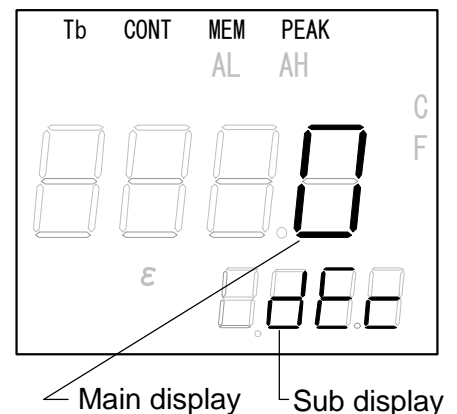


- By selecting "dELy" and programming to "0.0", the measured value based on the original signal is displayed.

6.4.4-2 Damping degree selection

(Effective when the "PEAK" is selected in the signal modulation mode.)

- 1) To select the damping degree, press **SEL** key in the measurement mode screen until "dEc" appears in the sub display as shown in the right figure.
- 2) By pressing  key, "0" at the least significant digit in the main display will blink.
- 3) Use  or  key to select the desired damping degree [0, 2, 5 or 10(°C/second)].
- 4) To activate this selection, press **ENT** key.



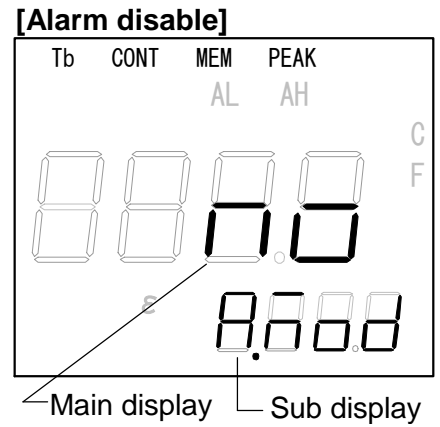
- The default value is **0°C** (°C/second).

6.4.5 Alarm programming

This programming is for the selection of the alarm type (high alarm, low alarm or alarm disable) and the programming an alarm set-point (1 point only in the high alarm or the low alarm).

6.4.5-1 Alarm type selection (High alarm, low alarm or alarm disable)

- 1) To select the alarm type, press **[SEL]** key in the measurement mode screen until “A.Mod” appears in the sub display as shown in the right figure.
- 2) By pressing **[▶]** key, “no”, “Hi” or “Lo” will blink in the main display.
- 3) Use **[▲]** or **[▼]** key to select the desired type.
- 4) To activate this selection, press **[ENT]** key.

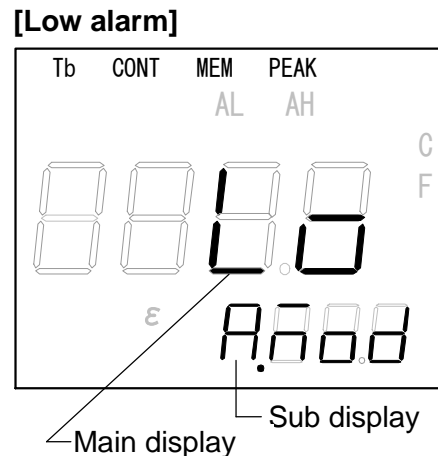
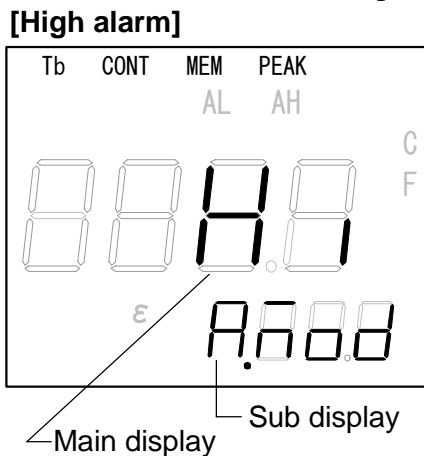


[Alarm type]

No: Alarm disable

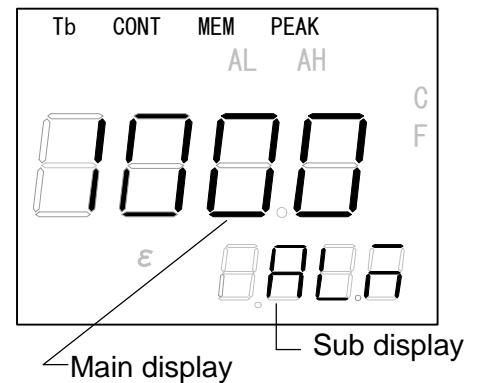
Hi: High alarm (The open collector of the contact output is ON when the measured value becomes over the alarm set-point)

Lo: Low temperature alarm (The open collector of the contact output is OFF when the measured value becomes below the alarm set-point)



6.4.5-2 Alarm set-point (1 point only in high alarm or low alarm in [6.4.5-1 Alarm type selection])

- 1) To program the alarm set-point, press **[SEL]** key in the measurement mode screen until “ALM” appears in the sub display as shown in the right figure.
- 2) By pressing **[▶]** key, the most significant digit of the main display will blink.
- 3) Use **[▲]** or **[▼]** key to program the desired value.
- 4) To shift to the next lower digit, press **[▶]** key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **[ENT]** key.



Remarks

- The programmable range is **0** to **6280°C**.
- The defaults are: **Hi** (High alarm) : Maximum value of the measuring range
Lo (Low alarm) : Minimum value of the measuring range

6.5 Engineering mode

In the measurement mode, press **SEL** and **ENT** keys simultaneously to display the engineering mode screen. Refer to the engineering mode screen in [6.3 Parameter programming/selection (Engineering mode)].

Caution

- To return to the measurement mode screen from the engineering mode screen
 - The screen will be automatically returned to the measurement mode screen if any key is not pressed for 1 second in the programming of each parameter.
 - The screen will return to the measurement mode screen when the programming from [6.5.1 Analog output scaling programming] to [6.5.8 Analog output correction programming] is completed.
- Note: Up to [6.5.9 Analog input programming] in case of IR-FA□5□□.
Up to [6.5.10 Communications programming] in case of IR-FA□S□□.

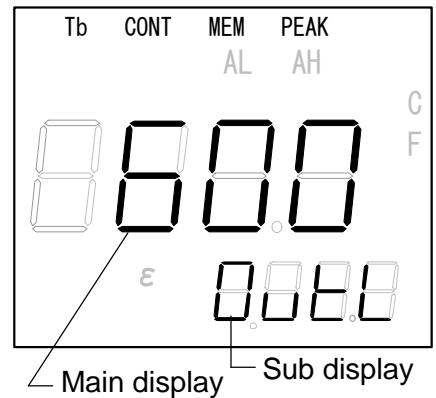
6.5.1 Analog output scaling programming

6.5.1-1 Analog output minimum value programming..."OutL"

This programming is for the minimum value of the temperature scaling when the measured value is outputted by analog signal.

- 1) To program the analog output minimum value, press **SEL** key in the engineering mode screen until "OutL" appears in the sub display as shown in the right figure.
- 2) By pressing \blacktriangleright key, the most significant digit of the main display will blink.
- 3) Use \blacktriangle or \blacktriangledown key to program the desired value.
- 4) To shift to the next lower digit, press \blacktriangleright key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.

[Minimum value]



Reference

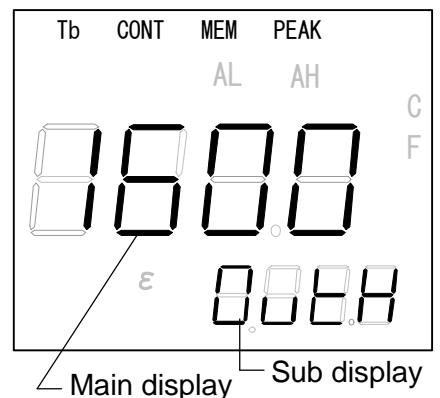
- The programmable range is **0 to 6280°C**.
- The defaults is **OutL** (Minimum value) : Minimum value of the measuring range

6.5.1-2 Analog output minimum value programming..."OutH"

This programming is for the minimum value of the temperature scaling when the measured value is outputted by analog signal.

- 1) To program the analog output maximum value, press **SEL** key in the engineering mode screen until "OutH" appears in the sub display as shown in the right figure.
- 2) By pressing \blacktriangleright key, the most significant digit of the main display will blink.
- 3) Use \blacktriangle or \blacktriangledown key to program the desired value.
- 4) To shift to the next lower digit, press \blacktriangleright key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.

[Maximum value]



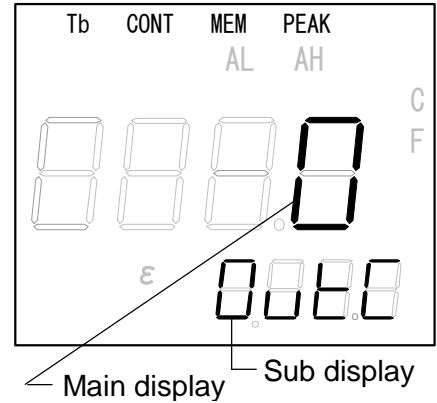
Reference

- The programmable range is **0 to 6280°C**.
- The defaults is: **OutH** (Maximum value) : Maximum value of the measuring range.

6.5.2 Analog dummy output programming

This programming is for analog dummy output based on programmed ratio. The output of 0 to 100% is corresponding to 4 to 20mA. Note that this screen will not move to the measurement mode even if any key is not pushed for 1 minute.

- 1) To program the dummy analog output, press **SEL** key in the engineering mode screen until “**OutC**” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, the most significant digit of the main display will blink.
- 3) Use **▲** or **▼** key to program the desired value.
- 4) To shift to the next lower digit, press **▶** key.
The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.
Then, the programmed value is outputted as a dummy output.



Caution

When “**OutC**” is displayed, “**0**” is displayed in the main display. However, the dummy output corresponding to “**0**” is not outputted even if **ENT** key is pressed on this condition.
Take the above procedure to program to “**0**”. If the dummy output is not required, press **SEL** key with “**0**” displayed to move to the next programming mode.

Remarks

- Programmable range is **0** to **100** (%).
Example) **0** (%) = 4mA, **50** (%) = 12mA, **100** (%) = 20mA
- The default value is **0** (%).

6.5.3 Hold functions (Hold disable, sample hold, peak hold) selection

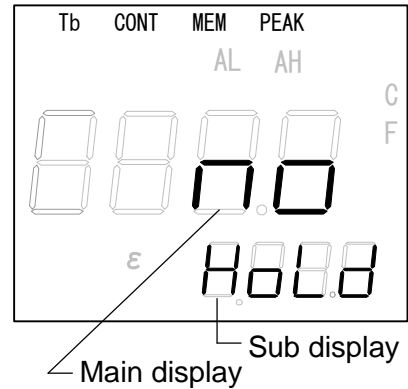
This mode is for the selection of the hold function (hold function disable, sample hold or peak hold). When the peak hold is selected, [6.5.3-2 Peak hold reset type (time reset or remote contact reset) selection] is necessary. Furthermore, when the internal time reset is selected, [6.5.3-3 Peak hold reset time programming] is necessary.

For the sample hold, only the selection of the hold mode is required.

6.5.3-1 Hold function type selection

- 1) To select the hold function type, press **SEL** key in the engineering mode screen until “HoLd” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, “no”, “PEAk” or “SAMP” will blink in the main display.
- 3) Use **▲** or **▼** key to select the desired type.
- 4) To activate this selection, press **ENT** key.

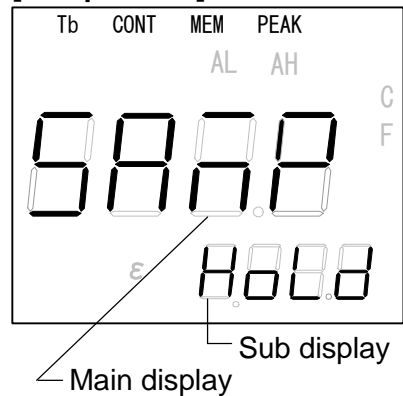
[Hold function disable]



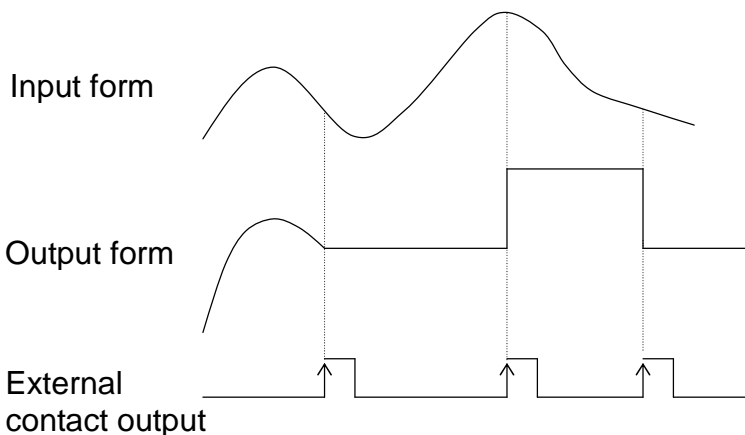
[Hold function types]

- no** : Hold function disable
- PEAk** : Peak hold
- SAMP** : Sample hold

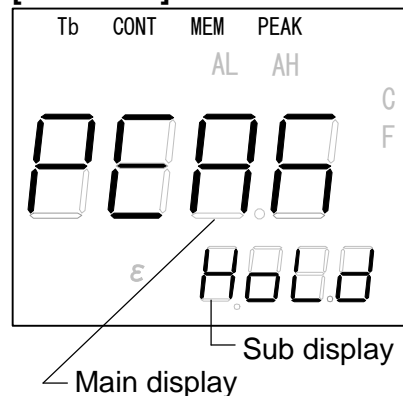
[Sample hold]



[Sample hold]



[Peak hold]



Remarks

- The default is no (hold function disable).

Caution

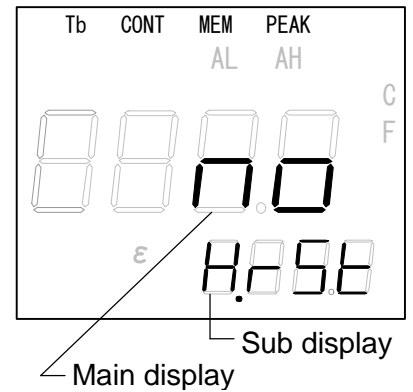
For the sample hold, the measured value is hold by the remote contact. (The pulse width more than 55m/sec is required for the remote contact.)

6.5.3-2 Peak hold reset type selection

(It is necessary to select when the peak hold is selected in [6.5.3-1 Hold function type selection].)

- 1) After the selection of “PEAK” in [6.5.3-1 Hold function type selection], press **[SEL]** key until “HrSt” (selection screen of peak hold reset type) appears in the sub display as shown in the right figure.
- 2) By pressing **[▶]** key, “no”, “in” or “Et” will blink in the main display.
- 3) Use **[▲]** or **[▼]** key to select the desired type.
- 4) To activate this selection, press **[ENT]** key.

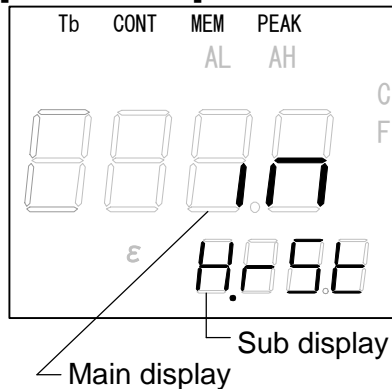
[Reset disable]



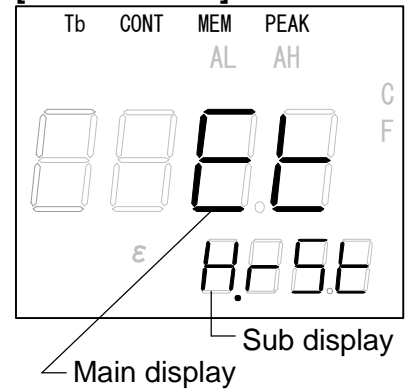
[Reset types]

- no** : Reset disable
- in** : Internal (time reset)
- Et** : External (remote contact reset)

[Internal reset]



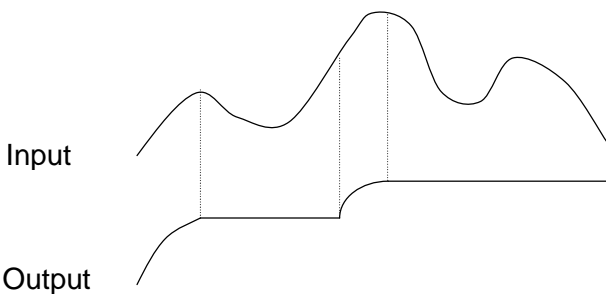
[External reset]



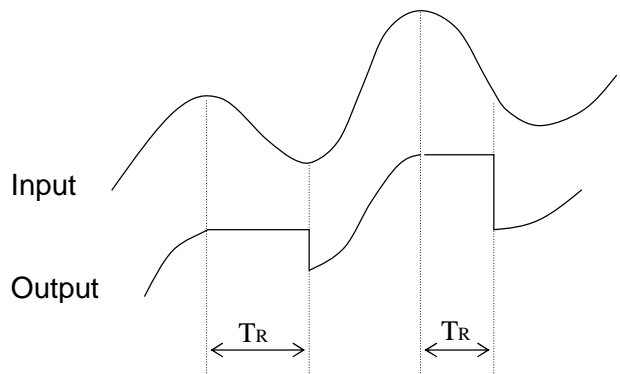
Remarks

- The default is no (reset disable).

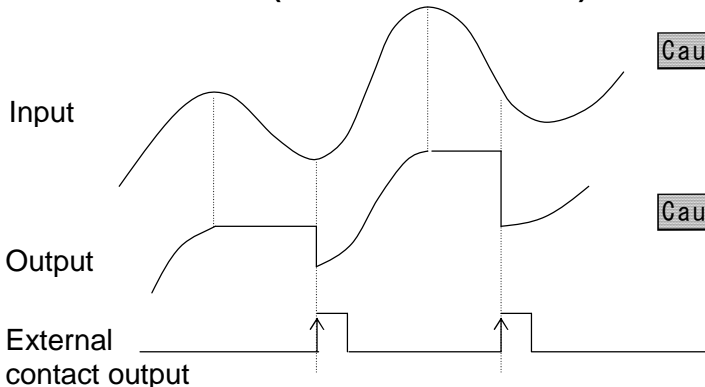
[Peak hold (Reset disable)]



[Peak hold internal (Time reset)]



[Peak hold external (Remote contact reset)]



Caution





T_R : Reset time 0.0 to 99.9 sec
In case of “0.0” is set, hold time is less than 0.0 to 0.1.

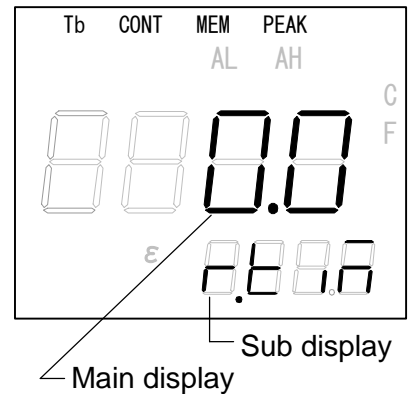
Caution

For the sample hold, the measured value is hold by the remote contact.
(The pulse width more than 55msec is required for the remote contact.)

6.5.3-3 Peak hold reset time programming

(It is necessary to program the reset time when the peak hold is selected in [6.5.3-1 Hold function type selection] and then “in” (internal reset) is selected in [6.5.3-2 Peak hold reset type selection].)

- 1) After the selection of “in” (time reset), press **SEL** key until “r.tim” (programming screen of peak hold reset time) appears in the sub display as shown in the right figure.
- 2) By pressing  key, the most significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To shift to the next lower digit, press  key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key. Then, the programmed value is outputted as a dummy output.






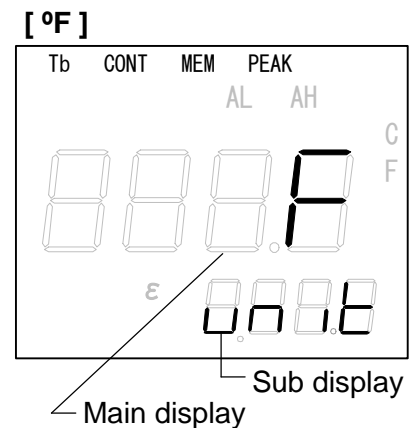
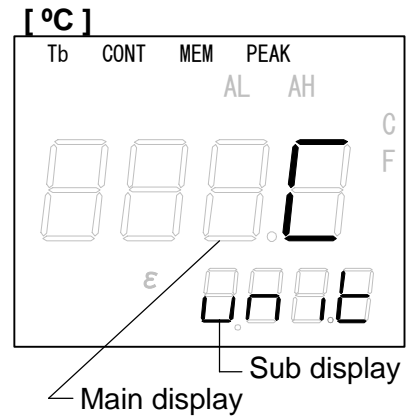
Remarks

- The programmable range is **0.0** to **99.9** (second).
- The default value is **0.0** second.

6.5.4 Measurement unit selection

This mode is for the selection of the measurement unit for measured temperature.

- 1) To select the measurement unit, press **SEL** key in the engineering mode screen until “unit” appears in the sub display as shown in the right figure.
- 2) By pressing  key, “C” or “F” will blink in the main display.
- 3) Use  or  key to select the desired unit.
- 4) To activate this selection, press **ENT** key.



[Measurement units]

C : °C

F : °F

Remarks

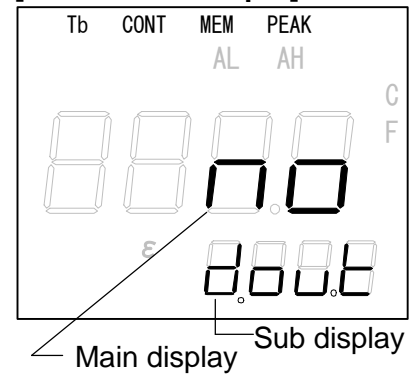
- The default is C (°C).

6.5.5 Contact output item selection

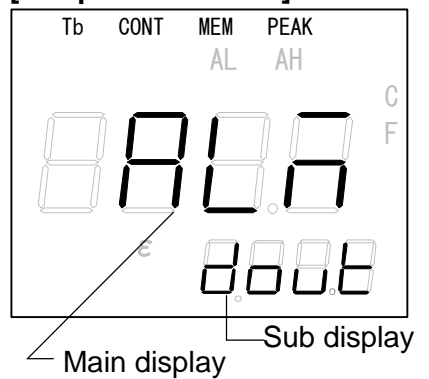
This mode is for the selection of the contacts output item type.

- 1) To select the contacts output item type, press **SEL** key in the engineering mode screen until “**dout**” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, “**no**”, “**ALM**” or “**Err**” will blink in the main display.
- 3) Use **▲** or **▼** key to select the desired type.
- 4) To activate this selection, press **ENT** key.

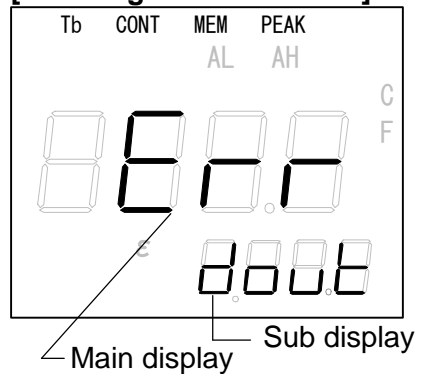
[No contacts output]



[Temperature alarm]



[Self-diagnosis abnormal]



[Contact output items]

- no** : No contacts output
- ALM**:High/low temperature alarm
- Err** :Self-diagnostic abnormal

Remarks

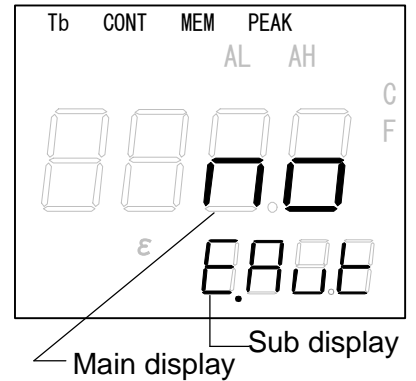
- The default is **ALM** (high/low temperature alarm).

6.5.6 Automatic emissivity calculation type selection

This mode is for the selection of the automatic emissivity calculation type (calculation disable, internal by keys or external calculation by analog input).

- 1) To select the automatic emissivity calculation type, press **SEL** key in the engineering mode screen until “**E.Aut**” appears in the sub display as shown in the right figure.
- 2) By pressing \triangleright key, “**no**”, “**in**” or “**Et**” will blink in the main display.
- 3) Use \triangle or ∇ key to select the desired type.
- 4) To activate this selection, press **ENT** key.

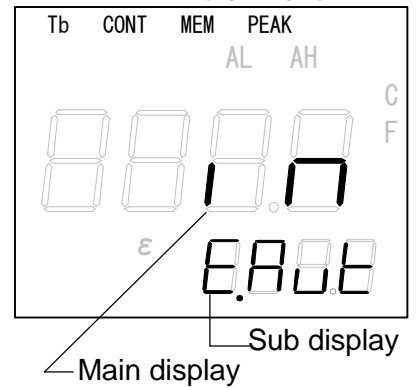
[Calculation disable]



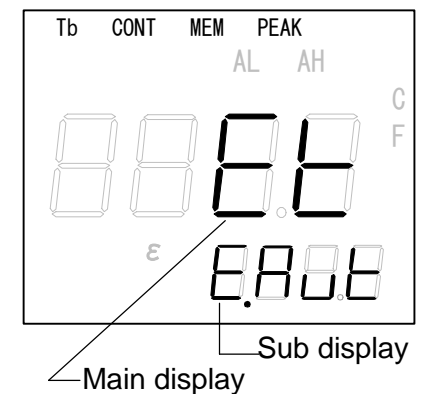
[Automatic emissivity calculation types]

- no** : Calculation disable
- in** : Internal (by key)
- Et** : External (by analog input)

[Internal automatic Emissivity calculation (by keys)]



[External automatic Emissivity calculation (by analog input)]



Remarks

- The default is **no** (automatic emissivity calculation disable).

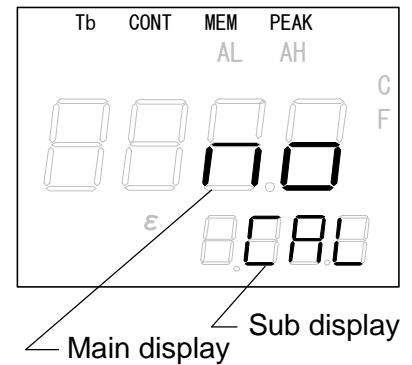
6.5.7 Zero/span adjustments

This mode is for the zero and span adjustments of your thermometer by entering the black body temperature at the minimum temperature range (zero side) and the maximum temperature range (span side) by using your block body furnace.

It is necessary to measure the furnace temperature at the zero side and the span side by a reference radiation thermometer in advance.

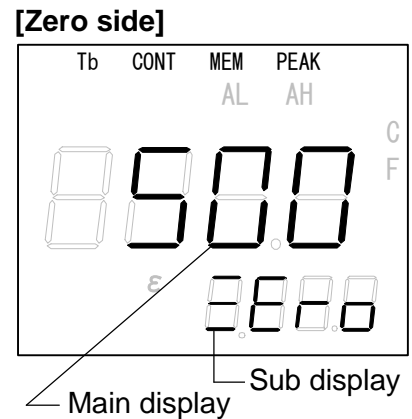
6.5.7-1 Zero / span adjustments executive choice

- 1) **[SEL]** key is pushed from the engineering mode screen how many times, and made to indicate the zero, span adjustment executive choice screen "CAL". "no" is indicated by a main indication part. When **[SEL]** key is pushed, zero, span adjustment is skipped, and it goes on the analog output compensation screen. The operation of (2)-(5) is done to carry out zero, span adjustment
- 2) When a **[▶]** key is pushed, the character "no" of the main indication part goes on and off.
- 3) **[▲]** key is pushed under the flashing condition, and "YES" is chosen.
- 4) When a choice is finished and an **[ENT]** key is pushed, flashing stops, and zero, span adjustment practice is registered.
- 5) When **[SEL]** key is pushed, it goes 6.5.7-2 "Zero" adjustment.



6.5.7-2 "Zero" side adjustment : Adjustment by furnace temperature at zero side

- 1) To enter the zero side temperature, press **[SEL]** key in the engineering mode screen until "ZEro" appears in the sub display as shown in the right figure.
- 2) By pressing **[▶]** key, the most significant digit of the main display will blink.
- 3) Use **[▲]** or **[▼]** key to program the desired value.
- 4) To shift to the next lower digit, press **[▶]** key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **[ENT]** key.

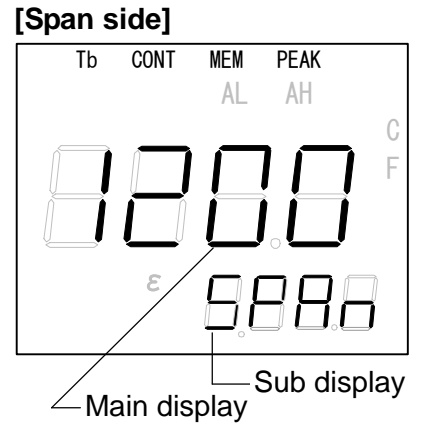


Remarks

- The programmable range is **0** to **6280°C**.
- The default is **the minimum temperature value** of the measuring range.

6.5.7-3 “Span” side adjustment : Adjustment by furnace temperature at span side

- 1) To enter the span side temperature, press **SEL** key in the engineering mode screen until “SPAn” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, the most significant digit of the main display will blink.
- 3) Use **▲** or **▼** key to program the desired value.
- 4) To shift to the next lower digit, press **▶** key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.



Remarks

- The programmable range is **0 to 6280°C**.
- The default is **the maximum temperature value** of the measuring range.

6.5.8 Analog output correction programming

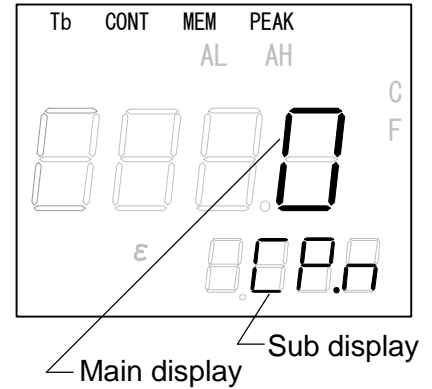
This mode is for the correction of the analog output by knee-points (up to 8 points). It is necessary to program from 6.5.8-1 to 6.5.8-5 continuously.

6.5.8-1 Programming of number of analog output correction data (number of knee-point)

Program the number of the knee-point. When “0” is programmed, no analog output correction is executed.

- 1) To program the number of the analog output correction data, press **SEL** key in the engineering mode screen until “CP.n” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, the least significant digit of the main display will blink.
- 3) Use **▲** or **▼** key to program the desired value.
- 4) To activate this programming, press **ENT** key.

[Number of analog output correction data number of knee-point]



Remarks

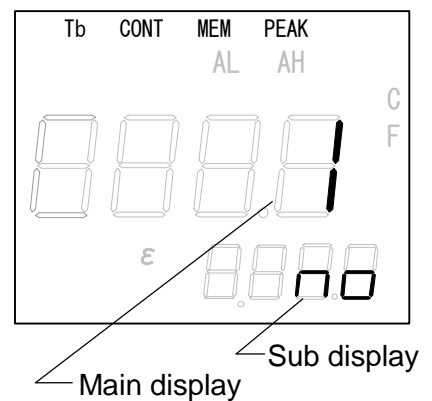
- The numeric figure in the main display is available from 0 to 9. However, the programmable range is 0 and 2 to 8.
- The default value is 0.

6.5.8-2 Programming of analog output correction data No.

Program the analog output correction data No, for the data to be corrected.

- 1) After the programming of the number of the analog output correction data (number of knee-point) in [6.5.8-1 Programming of number of analog output correction data (number of knee-point)], press **SEL** key until “no” appears in the sub display as shown in the right figure.
- 2) By pressing **▶** key, the least significant digit of the main display will blink.
- 3) Use **▲** or **▼** key to program the desired value.
- 4) To activate this programming, press **ENT** key.

[Analog output correction data No.]







Remarks

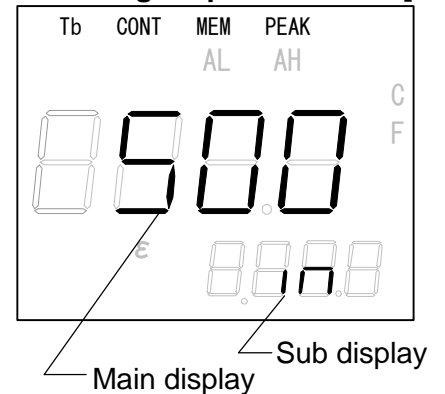
- The numeric figure in the main display is available from 0 to 9. However, the programmable range is 1 to 8.
- The default value is 1.

6.5.8-3 Entering of data before analog output correction

Enter the data before the analog output correction.

- 1) After the programming of the analog output correction data No. in [6.5.8-2 Programming of analog output correction data No.], press **SEL** key until “in” (entering screen of data before analog output correction) appears in the sub display as shown in the right figure.
- 2) By pressing  key, the most significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To shift to the next lower digit, press  key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.

[Entering of data before analog output correction]







Remarks

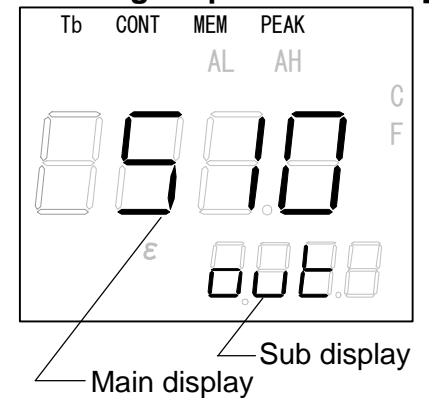
- The programmable range is **0** to **6280°C**.
- The default is **0°C**.

6.5.8-4 Entering of data after analog output correction

Enter the data after the analog output correction.

- 1) After the entering of the data before the analog output correction in [6.5.8-3 Entering of data before analog output correction], press **SEL** key until “out” (entering screen of data after analog output correction) appears in the sub display as shown in the right figure.
- 2) By pressing  key, the most significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To shift to the next lower digit, press  key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.

[Entering of data after analog output correction]







Remarks

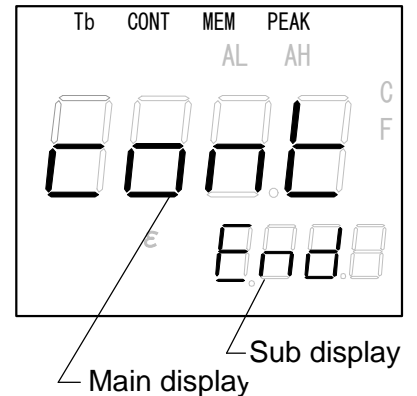
- The programmable range is **0** to **6280°C**.
- The default is **0°C**.

6.5.8-5 Selection of analog output correction for programming item

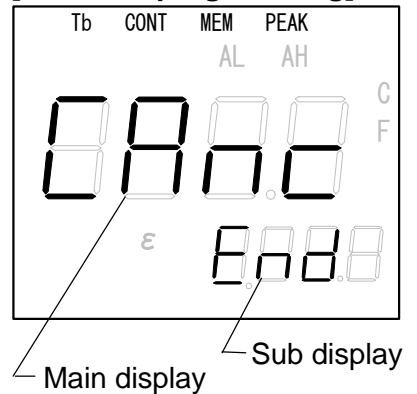
This mode is for the selection of continuous entering of analog output correction data, execution of correction command or exiting from this programming.

- 1) After the entering of the data after the analog output correction in [6.5.8-4 Entering of data after analog output correction], press **SEL** key until “End” (selection screen of analog output correction programming item) appears in the sub display as shown in the right figure.
- 2) By pressing  key, the most significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To shift to the next lower digit, press  key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.

[Continuous data entering]



[Exit from programming]



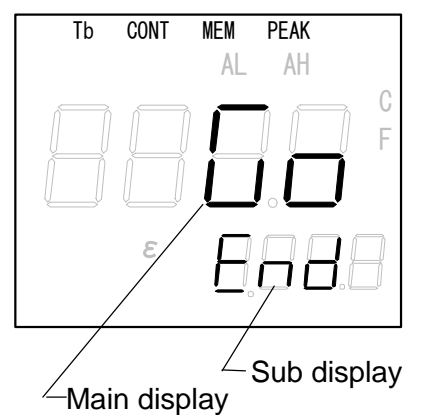
[Correction programming items]

Cont : For continuous entering. Press **SEL** key to return to the Programming screen of [6.5.8-2 Programming of analog output correction data No.]

CAnc : For exiting from this programming. Press **SEL** key to move to the next mode.

Go : For execution of correction command.

[Correction command execution]






Remarks

- The default is **cont** (continuous entering).

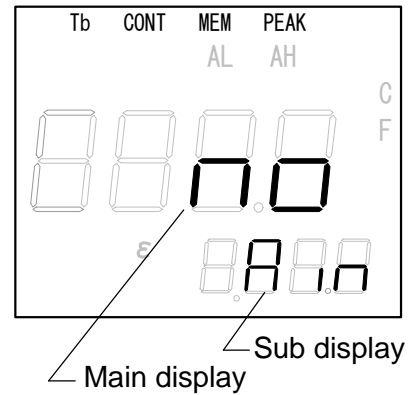
6.5.9 Analog input programming (for IR-FA□5□□ with option analog input)

6.5.9-1 Selection of analog input items

This mode is for the selection of the analog input (analog input disable, for remote emissivity programming or for automatic emissivity calculation).

- 1) To select the analog input item, press **SEL** key in the engineering mode screen until “**Ain**” appears in the sub display as shown in the right figure.
- 2) By pressing  key, “**no**”, “**ErMt**” or “**EAut**” will blink in the main display.
- 3) Use  or  key to select the desired type.
- 4) To activate this selection, press **ENT** key.

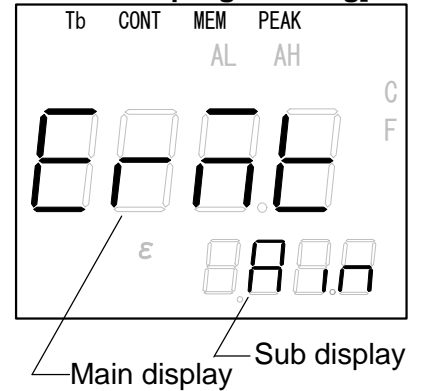
[Analog input disable]



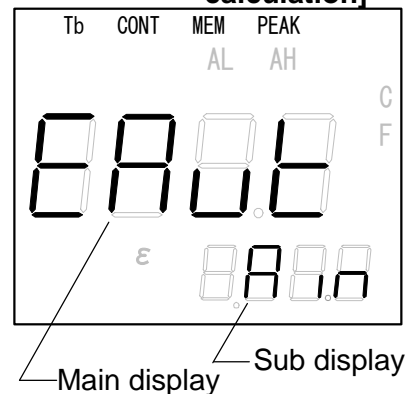
[Analog input items]

- no** : Analog input disable
- ErMt** : For remote emissivity programming
- EAut** : For automatic emissivity calculation

[Remote Emissivity programming]



[Automatic emissivity calculation]







Remarks

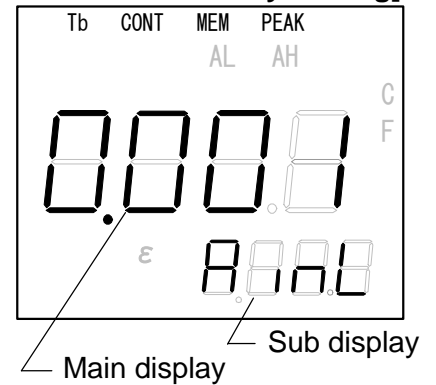
- The default is **no** (analog input disable).

6.5.9-2 Emissivity scaling for remote emissivity programming

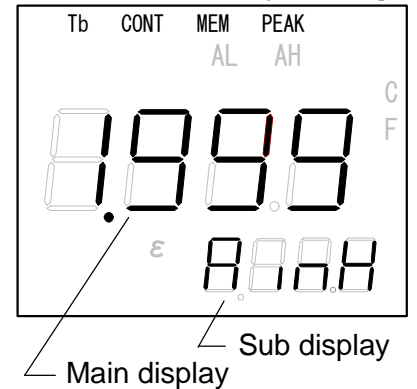
This mode is for the scaling of the emissivity value when the remote emissivity programming is selected.

- 1) To program the minimum emissivity value for the scaling, press **SEL** key in the engineering mode screen until “**AinL**” appears in the sub display as shown in the right figure.
- 2) By pressing  key, the most significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To shift to the next lower digit, press  key.
The next lower digit will blink.
- 5) Repeat the above procedure of 3) and 4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **ENT** key.
- 7) To program the maximum emissivity value for the scaling, press **SEL** key in the engineering mode screen until “**AinH**” appears in the sub display as shown in the right figure.
- 8) Repeat the above procedure from 2) to 6) .

[Minimum value of emissivity scaling]



[Maximum value of emissivity scaling]



Remarks

- The programmable range is **1.999** to **0.001**.
- The defaults are:
AinL (Minimum value) : **0.050**
AinH (Maximum value) : **1.999**

Caution

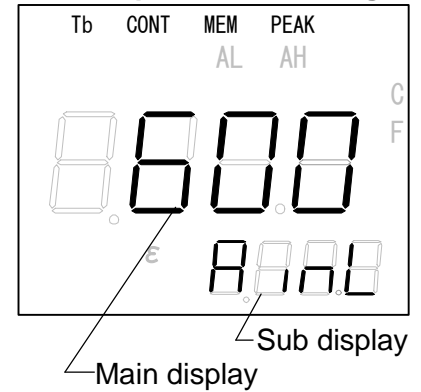
Confirmation of the value programmed by the remote emissivity programming. In the emissivity programming screen in the operator mode, you can confirm the value programmed by the remote emissivity programming. However, even if you change the analog input value on the condition that the programmed value is displayed, the displayed value is not changed. For your confirmation of the new value, it is necessary to return to the measurement mode and then display the emissivity programming screen again.

6.5.9-3 Temperature scaling for automatic emissivity calculation

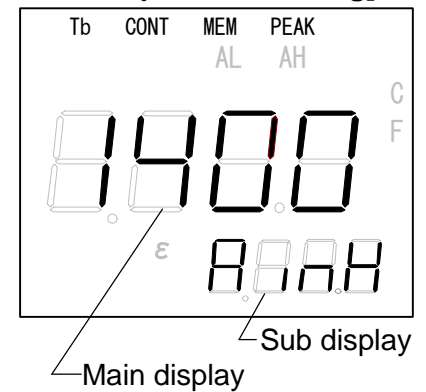
This mode is for the scaling of the temperature value when the automatic emissivity calculation is selected.

- 1) To program the minimum temperature value for the scaling, press **[SEL]** key in the engineering mode screen until “**AinL**” appears in the sub display as shown in the right figure.
- 2) By pressing **[>]** key, the most significant digit of the main display will blink.
- 3) Use **[△]** or **[▽]** key to program the desired value.
- 4) To shift to the next lower digit, press **[>]** key. The next lower digit will blink.
- 5) Repeat the above procedure of (3) and (4) up to the least significant digit for programming (4 digits).
- 6) To activate this programming, press **[ENT]** key.
- 7) To program the maximum temperature value for the scaling, press **[SEL]** key in the engineering mode screen until “**AinH**” appears in the sub display as shown in the right figure.
- 8) Repeat the above procedure from (2) to (6) .

[Minimum value of temperature scaling]



[Maximum value of temperature scaling]






Remarks

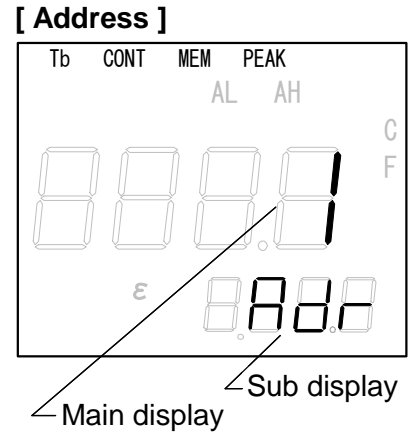
- The programmable range is **0** to **6280°C**.
- The defaults are:
AinL (Minimum value) : Minimum value of the measuring range
AinH (Maximum value) : Maximum value of the measuring range

6.5.10 Communications programming (for IR-FA□S□□ with optional communications)

This mode is for the programming of the address (effective in multi-drop connections) of this thermometer and communications speed.

6.5.10-1 Address programming




- 1) To program the address of this thermometer, press **SEL** key in the engineering mode screen until “Adr” appears in the sub display as shown in the right figure.
- 2) By pressing  key, the least significant digit of the main display will blink.
- 3) Use  or  key to program the desired value.
- 4) To activate this programming, press **ENT** key.

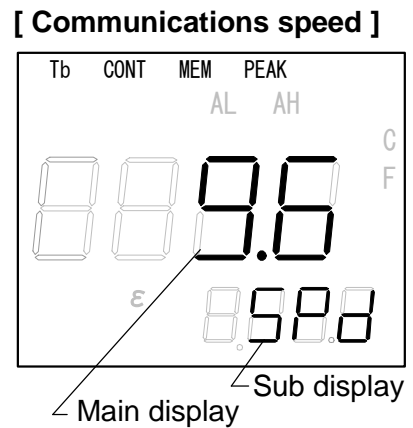


Remarks

- The numeric figure in the main display is available from 1 to 99. However, the programmable range is **1 to 32**.
- The default value is **1**.

6.5.10-2 Communication speed selection

- 1) To select the communications speed, press **SEL** key in the engineering mode screen until “SPd” appears in the sub display as shown in the right figure.
- 2) By pressing  key, “4.8”, “9.6” or “19.2” will blink in the main display.
- 3) Use  or  key to select the desired type.
- 4) To activate this selection, press **ENT** key.



[Communications speed]

- 4.8 : 4800 bps
- 9.6 : 9600 bps
- 19.2 : 19200 bps

Remarks

- The numeric figure in the main display is available from 1 to 99. However, the programmable range is **1 to 32**.
- The default value is **1**.

Caution

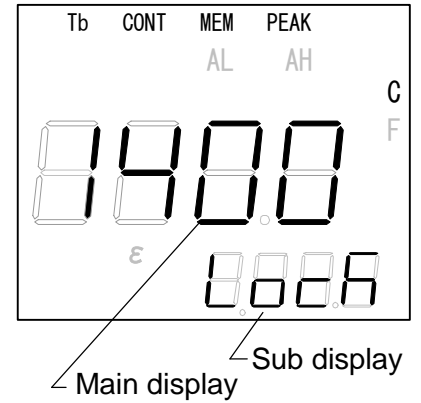
- To return to the measurement mode screen from the engineering mode screen
 - The screen will be automatically returned to the measurement mode screen if any key is not pressed for 1 second in the programming of each parameter.
 - The screen will return to the measurement mode screen when the programming from [6.5.1 Analog output scaling] to [6.5.8 Analog output correction] is completed.
- Note:** Up to [6.5.9 Analog input programming] in case of IR-FA□5□□.
Up to [6.5.10 Communications programming] in case of IR-FA□S□□.

6.6 Key lock

This mode is for the locking of the function keys temporarily when you do not want to change the programmed parameters.



- 1) To activate the key lock, press **SEL**, \triangle and **ENT** keys simultaneously for 2 seconds in the measurement mode screen until “**Lock**” appears in the sub display.
- 2) During the key lock, “**Lock**” is displayed in the sub display as shown in the right figure.
- 3) To release the key lock, press **SEL**, \triangle and **ENT** keys simultaneously for 2 seconds in the condition that “**Lock**” is displayed in the sub display.
- 4) “**Lock**” will disappear and the screen will return to the measurement mode screen.

[Key lock]

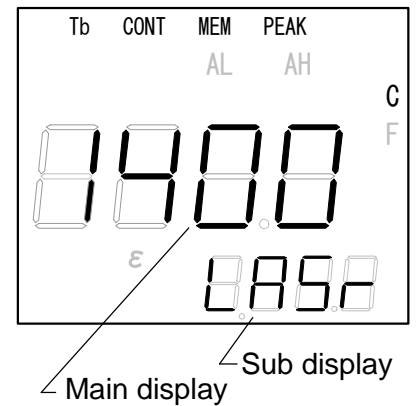


6.7 Laser targeting (Option)

This mode is for the targeting by the laser.

- 1) To activate the laser targeting, press **SEL** and  keys simultaneously for 2 seconds in the measurement mode screen until “LASr” appears in the sub display.
- 2) During the laser targeting, “LASr” is displayed in the sub display as shown in the right figure.
- 3) To stop the laser targeting, press **SEL** and  keys simultaneously for 2 seconds in the condition that “LASr” is displayed in the sub display.
- 4) “LASr” will disappear and the screen will return to the measurement mode screen.

[Laser targeting]

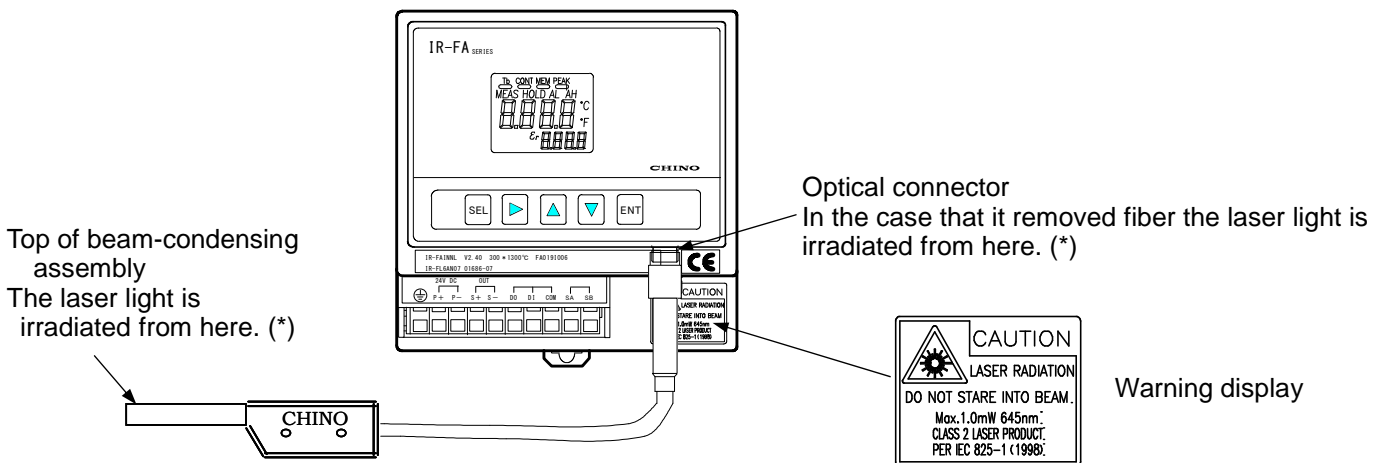


Warning

Please never peek into the laser light beam, because there is the fear that gives the obstacle to the eye.

Caution

- Laser does so that it is lighted only at the time of the confirmation of a the measurement place and please defend it the above procedure when it is lighted.
- The control and adjustment by the procedure of the exception that prescribed here bring about the being bombed of dangerous laser radiation.



Caution

Please do so that laser is lighted only at the time of the confirmation of the measurement position.

Caution

In illumination condition (*) of the laser light is irradiated from the place. Please never look it.

6.8 Self-diagnostic function

This self-diagnosis function is built-in. An error No will be displayed on abnormal conditions.

Sub display	Contents	Countermeasure	Output (Note*)
8888	Abnormal ambient temperature	Use the thermometer in the environment from 0 to 50°C.	Yes
8884	E ² PROM abnormal (Writing and reading impossible)	Return to factory to us.	Yes
8885	Analog output correction data abnormal (Same data before correction existed.)	Check the data before correction again.	No
8886	Zero/span adjustment abnormal (Data at zero > data at span)	Adjust zero and span again.	No
8887	Remote emissivity programming exceeding the programmable range	Program to 0.001 when the emissivity programming value is overshooting from the minimum value and 1.999 when it is overshooting from the maximum value.	No
8888	Automatic emissivity calculation exceeding the programmable range	Program the emissivity value to 1.000. However, this programming is not stored.	No

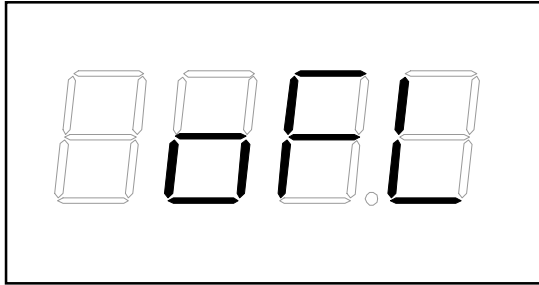
Caution

On the items with Yes in the output column, the contact signal for the abnormal condition is outputted from the contact output terminals (OFF at abnormal condition). This output is available when “**Self-diagnostic abnormal**” is selected in [6.5.5 Contacts output item selection] in the engineering mode.

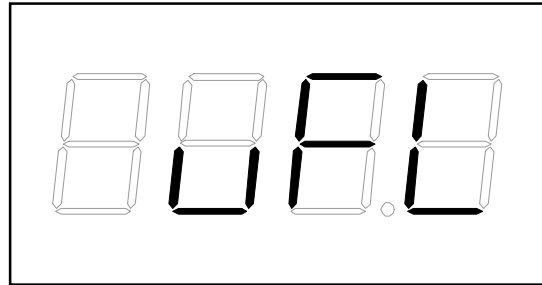
6.9 Overflow/underflow

- “oFL” is displayed when the measured temperature is higher than the maximum value of measuring range + 20°C.
- “uFL” is displayed when the measured temperature is lower than the minimum value of measuring range – 20°C.

[Overflow]



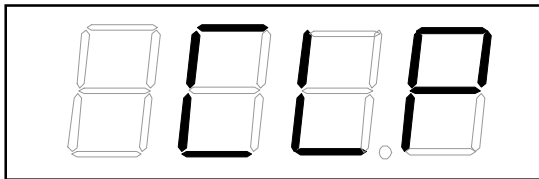
[Underflow]



6.10 Under flow display for two-color type

**radiation thermometer only:
“CLP”**

“CLP” is displayed when the measured temperature using two-color type radiation thermometer is lower than minimum value of measuring range. And analog output is lower than 4mA.



This phenomenon occurs to etc. (1) View lacking (2) Measuring with cap to tip of fiber optics

Reference

- When measured temperature has not reached to the minimum value of measuring range at the post period of measurement start, CLP' or 'UFL' are displayed.
- The view lacking is expected, in the case that this phenomenon occurred although the temperature of the measurement objects is rising.

7. Maintenance and check

7.1 Periodical checking : Check the followings periodically or if required.

•Connections and wirings: Check all connections and wirings.

Caution

When connecting the optical connectors of the fiber optics to the optical connectors of the thermometer and the lens assembly, make sure to turn them with your hand. (Don't turn them by using a tool like as pliers.)

Warning

1. Please do not disassemble this device, in the case of using for IR-FA□□L□ or IR-FAQ□□L (Option : Laser targeting).
2. Please never peek into a/the laser light beam, because there is the fear that gives an obstacle to the eye.

7.2 Trouble shooting

7.2.1 Measuring value not displayed or displayed lower

Checking item	Countermeasure
The power lamp is not lit.	Turn on the power supply.
The optical connector is not connected firmly. The optical fiber is disconnected.	Connect the optical connector firmly. For the disconnection of the optical fiber, replace it.
The power voltage is not in the allowable range.	Supply the power with the correct voltage.
The measured temperature is lower than the minimum value of the measuring range.	It is necessary to use a thermometer with the measuring range covering the measured temperature.
The emissivity value (emissivity ratio value) programmed is too high.	Program the correct value by referring to [6.4.1 Emissivity programming].
The top of optical fiber is dirty or cracked.	When the optical fiber is dirty, wipe off dirt with a cloth wetted with alcohol. Check if the optical fiber is cracked visually. If cracked, replace it.
The view field is interfered.	Make the view field not interfered by referring to [3.2 Fiber optics assembly].
The optical fiber is bent smaller than the allowable bending radius.	Bend the optical fiber bigger than R100mm.

7.2.2 Measuring value displayed higher

Checking items	Countermeasure
The measured temperature is higher than the maximum value of the measuring range.	It is necessary to use a thermometer with the measuring range covering the measured temperature.
The emissivity value (emissivity ratio value) programmed is too low.	Program the correct value by referring to [6.4.1 Emissivity programming].

7.2.3 Display fluctuated

Checking items	Countermeasure
The fiber optics is not fixed firmly or vibrated.	Fix the fiber optics firmly and install it in a place not vibrated.
The optical connector is not connected firmly.	Connect the optical connector firmly.
The power voltage is not in the allowable range.	Supply the power with the correct voltage.
The view field is interfered by steam.	Purge the steam by air.
The measured temperature is fluctuated exactly.	Program the emissivity value and the modulation degree by referring to the following paragraphs. [6.4.1 Emissivity programming] [6.4.2 Automatic emissivity calculation] [6.4.3 Signal modulation mode selection] [6.4.4 Modulation degree programming]

8. Reference

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.

8.1 Emissivity table

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

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 / 024Fe / 16Cr	0.36	—	(*) : Oxidized on surfaces	
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		

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

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	0.3

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

Other	Emissivity
Carbon pigment	0.90 to 0.95
Graphite	0.87 to 0.92

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

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
Inconel	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

Other	Emissivity
Asbestos	0.90
Asphalt	0.85
Carbon	0.85
Graphite	0.80
Soot	0.95
Cement, Concrete	0.70
Cloth	0.80

Reference

The above tables are not applied to two colors thermometers.

Caution

The emissivity value varies by surface temperature, measured temperature and other conditions.
Use the above tables as guidance.

9. General Specifications

9.1 Thermometer

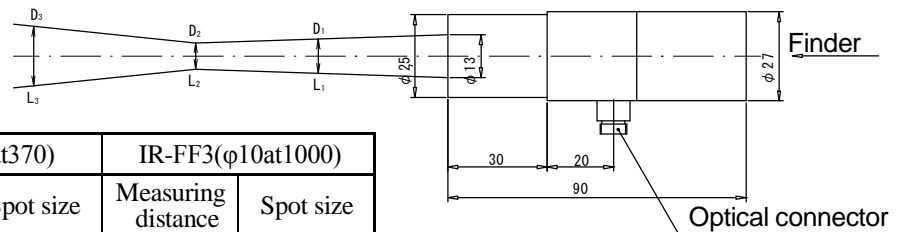
Model	IR-FAI	IR-FAS	IR-FAQH	IR-FAQI	IR-FAQS
Measuring System	Single-color radiation thermometer		Two-colors thermometer (Two-wavelength type)		
Detecting Element	InGaAs	Si	Hybrid element	InGaAs/InGaAs	Si/ Si
Measuring Wavelength	1.55 μ m	0.9 μ m	0.9/1.55 μ m	1.35/1.55 μ m	0.85/1.00 μ m
Measuring Range	150 to 1600°C	400 to 3000°C	600 to 3000°C	300 to 1500°C	800 to 2000°C
Accuracy Ratings	Less than 1000°C: $\pm 5^\circ\text{C}$ 1000 to 1500°C: $\pm 0.5\%$ of readings 1500 to 2000°C: $\pm 1.0\%$ of readings More than 2000°C: $\pm 2\%$ of reading				
Repeatability	Within 0.2°C		0.2°C		
Stability	Temperature drift	0.1°C /°C or 0.015%/°C of measured value, whichever larger		0.2°C /°C or 0.02% of measured value, whichever larger	
	Under EMC test environment	$\pm 10^\circ\text{C}$ or $\pm 1\%$ of full scale, whichever larger		$\pm 30^\circ\text{C}$ or $\pm 5\%$ of full scale, whichever larger	Out of CE-marking
Resolution	0.5°C		1.0°C		
Response Time	0.01s		0.04s		
Emissivity Compensation	Emissivity range 1.999 to 0.050				
Signal Modulation	REAL: Original signal (at the modulation degree programmed to 0) DELAY: First-order lag tracing (Modulation time constant: 0.0 to 99.9s, 0.1s increment) PEAK: Peak tracing (Damping degree 0, 2, 5, 10°C/s, selection)				
Display System	LCD 4-digit (Temperature and parameter) Display resolution 1°C °C /°F (Key switching)				
Analog output	4 to 20mADC, Isolated output, Load resistance: less than 500 Ω Accuracy: $\pm 0.2\%$ (to the full scale of scaling) Analog output resolution: 0.01% (to the full scale of scaling) ·Output scaling (optional programming in measuring temperature range) ·Dummy output (optional programming in 0 to 100% of analog output)				
Contact output	1 point (error or high/low alarm)				
Contact input	1 point (peak hold or sample hold)				
Parameter settings by keys	·Operator mode: Emissivity, signal modulation, alarm and others ·Engineering mode: Measurement unit, output scaling, ZERO/SPAN, output correction and others including option-related-parameters				
Communications interface	RS485 (option): Sending of measured data (up to 1-digit below decimal point), and sending/receiving of parameters				
Calculation function	·ZERO/SPAN adjustment ·Automatic emissivity calculation ·Output correction				
Self-diagnostic	Thermometer temperature abnormal, parameter error				
Ambient Temperature	0 to 50°C				
Allowable vibration	Less than 3G				
Rated power supply	24V DC (22 to 28V)				
Power consumption	About 30VA				
Connections	Cramp type no-screw terminals				
Installation	DIN-rail installation or wall installation				
Housing material	Resin				
Outside dimensions, Weight	W90XH90XD60mm. About 250g(main unit)				
CE marking	EN61326-1 ClassA				
Analog input (Optional)	4 to 20mA DC, remote emissivity programming or automatic emissivity calculation.				
Laser targeting (Optional)	Semi conductor laser (ON/OFF by key) Less than 1.0mW(645nm) (IEC60825-1 CLASS 2)				

9.2 Lens assembly

	IR-FL□N□□□	IR-FL□A□□□
Spot size/measuring distance	Refer to [4.2.3 Spot size and measuring distance]	
Connections	Connector	
Installation	Screw	
Material	Aluminum	
Accessories		Exclusive air purge case Air flow: 1 to 5NI/min

9.3 Fiber optics

	IR-FL□N□□□	IR-FL□A□□□
Optical fiber	Single core quartz fiber 400μm	
Sheath	Heat-resistive type : Heat-resistive sheath + glass wool braided Reinforced type : Heat-resistive sheath + glass wool braided + Flexible metal tube	
Working temperature	0 to 150°C	
Length	4m standard, Up to 50m up on request Reinforced type: Up to 20m	
Allowable bending radius	100mm	



IR-FF1(φ5at500)		IR-FF2(φ4at370)		IR-FF3(φ10at1000)	
Measuring distance	Spot size	Measuring distance	Spot size	Measuring distance	Spot size
L1:400	D1:φ7	L1:270	D1:φ7	L1:800	D1:φ11
L2:500	D2:φ5	L2:370	D2:φ4	L2:1000	D2:φ10
L3:600	D3:φ9	L3:470	D3:φ9	L3:1200	D3:φ15

Unit : mm

9.4 Standard temperature range

• Single-color type

Model	Measuring range	Lens assembly
IR-FAI	150 to 450°C*	IR-FL5 IR-FL6
	200 to 700°C	
	250 to 1000°C	
IR-FAS	300 to 1300°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL8
	250 to 1000°C	
	300 to 1300°C	
IR-FAS	350 to 1600°C	IR-FL5 IR-FL6
	400 to 900°C*	
	500 to 1200°C	
	600 to 1800°C	
IR-FAS	700 to 2400°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL8
	600 to 1800°C	
	700 to 2400°C	
IR-FAS	800 to 3000°C	IR-FL5 IR-FL6
	600 to 1800°C	
	700 to 2400°C	
IR-FAS	800 to 3000°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL8
	600 to 1800°C	
	700 to 2400°C	

*Mark is for model IR-FA□NU only.
(Optional laser targeting is not available.)

• Two-color type

Model	Measuring range	Lens assembly
IR-FAQH	600 to 1500°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4,IR-FL5 IR-FL6,IR-FL8
	700 to 2000°C	
	800 to 2400°C	
	1000 to 3000°C	
IR-FAQI	300 to 1200°C	IR-FL5 IR-FL6
	400 to 1500°C	
	400 to 1500°C	
IR-FAQS	450 to 1500°C	IR-FL0,IR-FL1 IR-FL2,IR-FL3 IR-FL4
	800 to 1600°C	
	1000 to 2000°C	
IR-FAQS	850 to 1600°C	IR-FL8
	1000 to 2000°C	

10. List of starting up modes

10.1 Starting up modes

Keys	Screen	Remarks	Paragraph
(Power on)	Measurement mode	Temperature measurement and parameter programming in the operator mode	6.1 6.4
Press SEL and ENT keys simultaneously in measurement mode screen.	Engineering mode	Parameter programming in the engineering mode	6.3 6.5
Press SEL , Δ and ENT keys simultaneously for 2 seconds in the measurement mode.	Key lock	Locking/release of function keys	6.6
Press SEL and Δ keys simultaneously for 2 seconds in measurement mode.	Laser targeting	Laser targeting/stop (option)	6.7

10.2 Screens

Screen	Outline
Measurement mode	<ul style="list-style-type: none"> ·Measurement starts by power on. ·By pressing SEL key, the screen moves to the parameter programming screen (for emissivity value, signal modulation, alarm and other parameters) in the operator mode. (Ref. [6.4 Operator mode]) ·The screen automatically returns to the measurement mode screen when the programming up to [6.4.5Alarm programming] is completed or if any key is not pressed for 1minute.
Engineering mode	<ul style="list-style-type: none"> ·By pressing SEL and ENT keys simultaneously, the screen moves to the parameter programming screen (for analog output scaling, analog dummy output, hold function, analog output correction, optional analog input, optional communications and other parameters) in the engineering mode. (Ref. [6.5 Engineering mode]) ·The screen automatically returns to the measurement mode screen when the programming up to [6.5.8 Analog output correction programming] is completed (except the thermometer with optional specifications) or if any key is not pressed for 1minute.
Key lock	<ul style="list-style-type: none"> ·The key lock is used not to change the parameters being programmed. ·By pressing SEL, Δ and ENT keys simultaneously for 2 seconds in the measurement mode, the function keys are locked. ·For releasing, pressing SEL, Δ and ENT keys simultaneously for 2 seconds again. (Ref. [6.6 Key lock])
Laser targeting (option)	<ul style="list-style-type: none"> ·The laser (option) is targeted or stopped. ·By pressing SEL and Δ keys simultaneously for 2 seconds in the measurement mode, the laser is targeted. ·For releasing, pressing SEL and Δ keys simultaneously for 2 seconds again. (Ref. [6.7 Laser targeting])

10.3 Parameter programming/selection

10.3.1 Parameter programming/selection (operating mode)

Parameter item	Sub display	Parameter	Default	Paragraph
Emissivity (ratio) *1	ε (εr) (Sub marker)	0.050 to 1.999	1.000	6.4.1
Automatic emissivity calculation	Auto	0 to 6280°C	Minimum value of measuring range	6.4.2
Signal modulation mode	modu	dELy、PEAk	dELY	6.4.3
Modulation degree *2	tAu dEC	0.0 to 99.9 (second) 0, 2, 5, 10°C (°F)/second	0.0 second 0°C/second	6.4.4
Alarm type	A.Mod	No: Alarm disable Hi: High alarm Lo: low alarm	Hi Maximum value of measuring range Minimum value of measuring range	6.4.5

*1:The emissivity ratio "εr" is displayed in IR-FAQH only.

*2:The parameters for the modulation degree differ by the signal modulation mode selection.
(Ref. [6.4.3 Signal modulation mode selection.])

10.3.2 Parameter programming/selection (engineering mode)

Parameter item	Sub display	Parameter	Default	Paragraph
Analog output scaling	OutL or OutH	OutL: Minimum value (0 to 6280°C) OutH: Maximum value (0 to 6280°C)	Minimum value of measuring range Maximum value of measuring range	6.5.1
Analog dummy output	OutC	0 to 100%	0%	6.5.2
Hold function	HoLd	no : Hold function disable PEAK : Peak hold SAMP : Sample hold	no	6.5.3-1
Peak hold reset type	H.rSt	no : Reset disable In : Internal - Time reset Et :External -Remote contact reset	no	6.5.3-2
Peak hold reset time	r.tim	0.0 to 99.9 seconds	0.0 second	6.5.3-3
Measurement unit	unit	C, F	C	6.5.4
Contact output	dout	no : No contact output ALM : High/low temperature alarm Err : Self-diagnostic abnormal	ALM	6.5.5
Automatic emissivity calculation	E.Aut	no : Calculation disable In : Internal - Key Et : External – Analog input	no	6.5.6
Zero/span adjustments	Zero SPAn	(0 to 6280°C)	Minimum and maximum value of measuring range	6.5.7
Analog output correction	CP.n no In Out End	Number of analog output correction data : 0, 2 to 8 Analog output correction data No. : 1 to 8 Data before analog output Correction : 0 to 6280°C Data after analog output Correction : 0 to 6280°C Analog output correction programming Cont : Continuous entering Canc :Exit from programming Go : Correction execution	0 1 0°C 0°C cont	6.5.8-1 6.5.8-2 6.5.8-3 6.5.8-4 6.5.8-5
Analog input item for IR-FA□5□□	Ain	no : Analog input disable ErMt : Remote emissivity programming Eaut : Automatic emissivity calculaiton	no	6.5.9-1
Emissivity scaling	AinL AinH	Remote emissibity programming: ε = 0.001 to 1.999	0.050~1.999	6.5.9-2.
Temperature scaling	AinL AinH	Automatic emissivity calculatio: Temp = 0 to 6280°C	Minimum and maximum value of measuring range	6.5.9-3
Communications	Adr SPd	Address : 1 to 32 Communications speed : 4.8 ... 4800bps 9.6 ... 9600bps 19.2 ... 19200bps	1 9.6	6.5.10

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