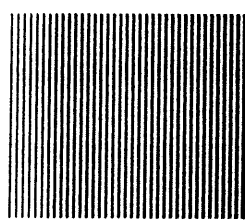


---

I R - C SERIES

RADIATION THERMOMETER

---



# INSTRUCTIONS

Always keep these instructions with the unit

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

**CHINO**

## SAFETY PRECAUTIONS

For safety's sake, always follow these precautions when operating, maintaining, and repairing the unit. Any damage or injury caused by failure to follow these precautions are not covered by the warranty and are not the responsibility of the manufacturer.

The symbol below indicates the risk of electric shock.



Always turn the power supply "OFF" during re-wiring, maintenance, and repair.

### SAFETY PRECAUTIONS

#### WARNING

#### ● Power Supply

Always be sure that the power supply provides the proper voltage before connecting the unit.

Also, the unit does not have an internal power supply switch. The installation of an external power supply switch is recommended for safe operation.

#### ● Grounding the Unit

To reduce the risk of electric shock, always ground the unit before turning it "ON."

#### ● Importance of Grounding the Unit

Never cut the unit's internal or external ground wire or remove the ground terminal coupling. Failure to properly ground the unit may result in serious bodily injury.

#### ● In Case of Malfunction

If you believe that the unit is not functioning properly, do not operate the unit. Before operating the unit, always be sure that all safety requirements have been met and that the unit is operating normally.

#### ● Operation in the Presence of Gas

Never operate the unit near or in the presence of flammable gas or gas vapor. Operating the unit in the presence of combustibles is extremely dangerous.

#### ● External Connections

Always be sure the unit is properly grounded before connecting to measuring objects or external control circuits.

Thank you for purchasing an IRC Series Radiation Thermometer. Please read these instructions carefully before operating the unit to take full advantage of its performance, features and avoid any operating difficulties.

## Table of Contents

■ Outlines . . . . .	1~3
1. Model	
2. Standard Measuring Range	
3. Measuring Distance and Measuring Diameter	
4. Small Target type	
■ Configuration . . . . .	4
■ Component Names and Functions . . . . .	5
■ Installation . . . . .	6
1. Installation Precautions	
2. Sight Adjustment	
■ Connecting Wire . . . . .	7
■ Operation . . . . .	8~9
1. Emissivity Setting	
2. Modulator	
3. Options	
■ Preventive Maintenance . . . . .	10
1. Regular Preventive Maintenance	
2. Troubleshooting	
■ External Dimensions . . . . .	11
■ Reference Data . . . . .	12~14
1. Object Emissivity	
2. Effect of Emissivity	
■ General Specifications . . . . .	15~16

# Outline

The IRC series are single-color and single-color-widerange, and also 2-color radiation thermometers using InGaAs or Si as a detector element. The detector element used in the unit is very stable and highly reliable as it eliminates the need for internal moving elements such as choppers.

The output signal from the unit, as it is linearized for temperature, does not need an additional transducer and can transmit directly to receiving instruments such as a recorder or a controller.

Furthermore, optional functions and accessories make it useful in conducting thermometry under various circumstances.

## Model

IR-CQ □□□□□

Model C : single-color CW:single-color-Widerange  
CQ : 2-color

The thermometers with CE-marking are only available in "C: single-color type".

Detector Element S : Si, I : InGaAs

Measuring Diameter and Measuring Distance

- 00 :  $\phi$  10mm /L 500mm
- 01 :  $\phi$  20mm /L1000mm
- 02 :  $\phi$  40mm /L2000mm
- 10 :  $\phi$  5mm /L 500mm
- 11 :  $\phi$  10mm /L1000mm
- 12 :  $\phi$  20mm /L2000mm
- 20 :  $\phi$  3mm /L 500mm
- 21 :  $\phi$  5mm /L1000mm
- 22 :  $\phi$  10mm /L2000mm

Connection T : Terminal connection,  
C : Plug Connection

The thermometers with CE-marking are only available in "C: Plug connection".

High-Speed Specifications & Optional Specifications

Blank : No Option

- A : High-Speed
- B : Isolated Output
- C : High-Speed+Isolated Output
- D : Remote Emissivity Setting
- E : High-Speed+Remote Emissivity Setting
- F : Remote Emissivity Setting+Isolated Output
- G : High-Speed+Remote Emissivity Setting+Isolated Output
- H : HMD Output
- I : High-Speed+HMD Output
- J : HMD Output+Isolated Output
- K : High-Speed+HMD Output+Isolated Output
- L : Non-Linear Output
- M : High-Speed+Non-Linear Output
- V : CE-marking (Isolated output)
- X : Other Special Specifications
- Y : High-Speed+Other Special Specifications

### CE-marking Conformance Specifications

EMC

Standard EN55011 Group 1, Class A  
EN50082-2 (Industrial environment)

Directive 89/336/EEC, 92/31/EEC amendment,  
93/68/EEC amendment

## Measuring Range

### ■ Standard Measuring Range

(Single-color) ★ mark is not available for small target type nor high-speed type except small target type.

☆ mark is not available for small target type with high-speed.

Model	InGaAs Element	Si Element
IR-C□0□□□	★200~ 450°C ☆250~ 600°C 300~ 750°C 350~ 900°C 400~1100°C 500~ 1300°C	★500~ 900°C ☆ 600~1100°C 700~1300°C 800~1600°C 900~2000°C 1100~ 3000°C
IR-C□1□□□	★250~ 600°C ☆300~ 750°C 350~ 900°C 400~ 1100°C 500~1300°C	★600~1100°C ☆ 700~ 1300°C 800~1600°C 900~ 2000°C 1100~ 3000°C
IR-C□2□□□	★300~ 750°C ☆350~ 900°C 400~1100°C 500~ 1300°C	★700~1300°C ☆ 800~1600°C 900~2000°C 1100~ 3000°C

(Single-color·Wide range) No high-speed type is available.

☆ mark is not available for small target type.

Model	InGaAs Element	Si Element
IR-CW□0□□□	★250~1000°C ☆300~ 1300°C 350~1600°C	★600~1800°C ☆ 700~ 2400°C 800~3000°C
IR-CW□1□□□	★300~1300°C ☆350~ 1600°C	★700~2400°C ☆ 800~ 3000°C
IR-CW□2□□□	★350~1600°C	★800~3000°C

(2-color) ★ mark is not available for small target type nor high-speed type except small target type.

☆ mark is not available for small target type with high-speed.

Model	InGaAs Element	Si Element
IR-CQ□0□□□	★300~ 650°C ☆350~ 800°C 400~1000°C 450~ 1100°C 500~1300°C 600~ 1500°C	★700~1300°C ☆ 800~1600°C 900~1800°C 1000~ 2200°C 1100~ 2400°C 1300~ 3000°C
IR-CQ□1□□□	★350~ 800°C ☆400~ 1000°C 450~1100°C 500~ 1300°C 600~1500°C	★800~1600°C ☆ 900~ 1800°C 1000~ 2200°C 1100~ 2400°C 1300~ 3000°C
IR-CQ□2□□□	★400~1000°C ☆450~ 1100°C 500~1300°C 600~ 1500°C	★900~1800°C ☆ 800~ 2200°C 1100~ 2400°C 1300~ 3000°C

# Measuring Range

## ■ Measuring Diameter and Measuring Distance

Model		Minimum Measuring Diameter	Relation between measuring Diameter and Measuring Distance(Unit:mm)
InGaAs Element	Si Element		
IR-C I00 <input type="checkbox"/>	IR-C S00 <input type="checkbox"/>	ø10/ 500mm	
IR-CWI00 <input type="checkbox"/>	IR-CWS00 <input type="checkbox"/>		
IR-CQI00 <input type="checkbox"/>	IR-CQS00 <input type="checkbox"/>		
IR-C I01 <input type="checkbox"/>	IR-C S01 <input type="checkbox"/>	ø20/1000mm	
IR-CWI01 <input type="checkbox"/>	IR-CWS01 <input type="checkbox"/>		
IR-CQI01 <input type="checkbox"/>	IR-CQS01 <input type="checkbox"/>		
IR-C I02 <input type="checkbox"/>	IR-C S02 <input type="checkbox"/>	ø40/1000mm	
IR-CWI02 <input type="checkbox"/>	IR-CWS02 <input type="checkbox"/>		
IR-CQI02 <input type="checkbox"/>	IR-CQS02 <input type="checkbox"/>		
IR-C I10 <input type="checkbox"/>	IR-C S10 <input type="checkbox"/>	ø 5/ 500mm	
IR-CWI10 <input type="checkbox"/>	IR-CWS10 <input type="checkbox"/>		
IR-CQI10 <input type="checkbox"/>	IR-CQS10 <input type="checkbox"/>		
IR-C I11 <input type="checkbox"/>	IR-C S11 <input type="checkbox"/>	ø 5/ 500mm	
IR-CWI11 <input type="checkbox"/>	IR-CWS11 <input type="checkbox"/>		
IR-CQI11 <input type="checkbox"/>	IR-CQS11 <input type="checkbox"/>		
IR-C I12 <input type="checkbox"/>	IR-C S12 <input type="checkbox"/>	ø20/2000mm	
IR-CWI12 <input type="checkbox"/>	IR-CWS12 <input type="checkbox"/>		
IR-CQI12 <input type="checkbox"/>	IR-CQS12 <input type="checkbox"/>		
IR-C I20 <input type="checkbox"/>	IR-C S20 <input type="checkbox"/>	ø 3/ 500mm	
IR-CWI20 <input type="checkbox"/>	IR-CWS20 <input type="checkbox"/>		
IR-CQI20 <input type="checkbox"/>	IR-CQS20 <input type="checkbox"/>		
IR-C I21 <input type="checkbox"/>	IR-C S21 <input type="checkbox"/>	ø 5/1000mm	
IR-CWI21 <input type="checkbox"/>	IR-CWS21 <input type="checkbox"/>		
IR-CQI21 <input type="checkbox"/>	IR-CQS21 <input type="checkbox"/>		
IR-C I22 <input type="checkbox"/>	IR-C S22 <input type="checkbox"/>	ø10/2000mm	
IR-CWI22 <input type="checkbox"/>	IR-CWS22 <input type="checkbox"/>		
IR-CQI22 <input type="checkbox"/>	IR-CQS22 <input type="checkbox"/>		

## ■ Small Target Type

Model		Minimum Measuring Diameter	Relation between Measuring Diameter and Measuring Distance(Unit:mm)
InGaAs Element	Si Element		
IR-C I0S <input type="checkbox"/>	IR-C S0S <input type="checkbox"/>	ø 4/ 200mm	
IR-CWI0S <input type="checkbox"/>	IR-CWS0S <input type="checkbox"/>		
IR-CQI0S <input type="checkbox"/>	IR-CQS0S <input type="checkbox"/>		
IR-C I1S <input type="checkbox"/>	IR-C S1S <input type="checkbox"/>	ø 2/ 200mm	
IR-CWI1S <input type="checkbox"/>	IR-CWS1S <input type="checkbox"/>		
IR-CQI1S <input type="checkbox"/>	IR-CQS0S <input type="checkbox"/>		
IR-C I2S <input type="checkbox"/>	IR-C S2S <input type="checkbox"/>	ø 1/ 200mm	
IR-CWI2S <input type="checkbox"/>	IR-CWS2S <input type="checkbox"/>		
IR-CQI2S <input type="checkbox"/>	IR-CQS2S <input type="checkbox"/>		

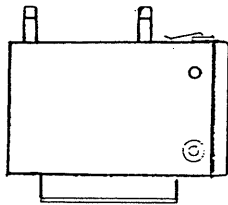
# Configuration

IR-C Series connections come in terminals or plug types, each with an exclusive cable. Other compatible cables are also acceptable. There are numerous accessories available for the unit including an indicator with power supply to the IRC as well as a detector mounting tripod, universal head, protective case.

## ■ Unit configuration

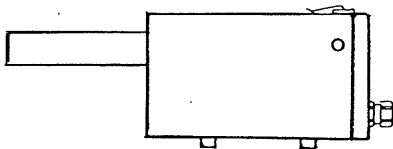
### Accessories

- Protective Case(Hard Type)  
IR-ZCCH



- Air Purge Hood IR-ZCAP
- Water Cooling Plate IR-ZCWC
- Flange Mounting Plate IR-ZCAF

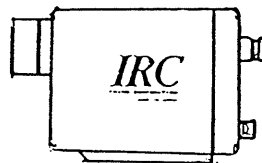
- Protective Case(Soft Type)  
IR-ZCCS



- Universal Head(Hard Type)  
IR-VMH
- Universal Head(Soft Type)  
IR-ZMS
- Universal Head(Simplifide Type)  
IR-VMS
- Tripod IR-ZBMT

### Detector

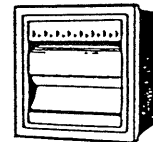
Radiation Thermometer  
IR-C



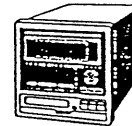
Connecting Cable  
IR-ZCR

### System Equipment

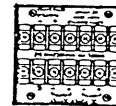
Recorder



Controller



DC Power Supply Box  
HN-W1A



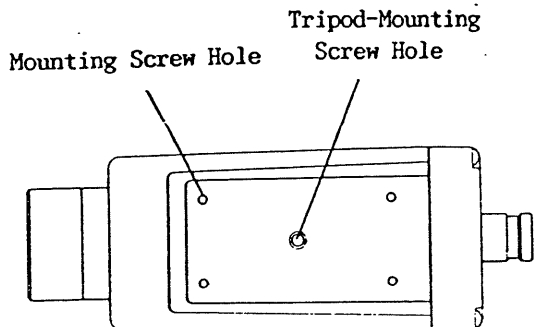
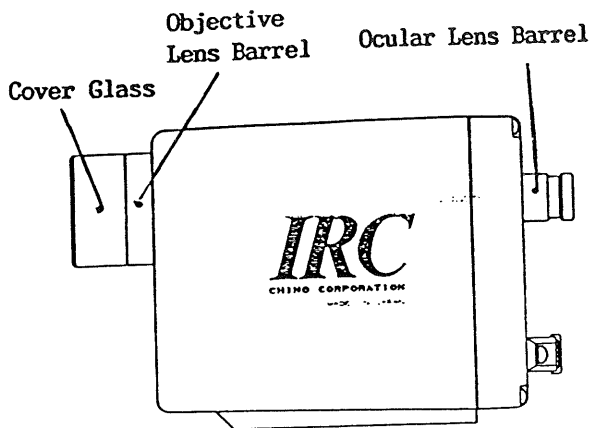
Indicator with  
Power Supply IR-GC



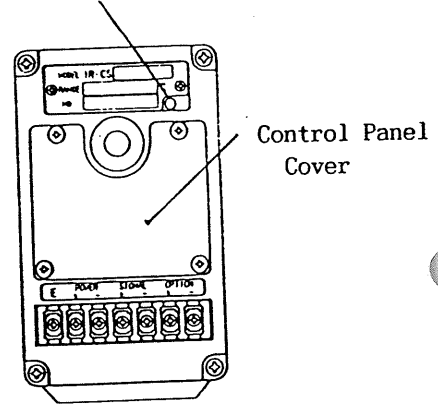
# Component Names and Functions

- **Cover Glass**  
An optical glass which protects the objective lens from dirt and scratches. It is screwed into the front panel of the objective lens with a special holder.
- **Objective Lens Barrel**  
Adopts a fixed-focus method where the focal point is fixed and cannot be altered.
- **Ocular Lens Barrel**  
Adjust to focus on a point inside the finder. Refer to Page 6 for detailed adjustment instruction.
- **Tripod-Mounting Screw Hole**  
These are W1/4 screw holes for mounting on the exclusive tripod (IR-ZBMT) or the simplified universal head (IR-VMS). It is also possible to mount the unit on any commercial tripod using these screw holes.
- **Mounting Screw Hole**  
These are M4 screw holes for mounting the protective case (IR-ZCCH/IR-ZCCS). Use these screw holes to securely fix the protective case to the main unit.
- **Power Supply Indicator Lamp**  
Lamp will glow red when power (DC24V) is supplied.
- **Control Panel Cover**  
This is a control panel cover for the emissivity and modulator. By removing the M2 screws, the cover can be removed to set the emissivity & modulator.
- **Control Panel**  
Sets emissivity and modulation. Refer to Page 8 for detailed setting instructions.
- **Plug Type Connection**  
Connects the unit to a receiving instrument with an exclusive cable (IR-ZCRC).
- **Terminal Type Connection**  
Connects the units to a receiving instrument using an exclusive cable (IR-ZCRT) or other suitable cable (See Page 7).

The thermometers with CE-marking are not available in terminal connection type.

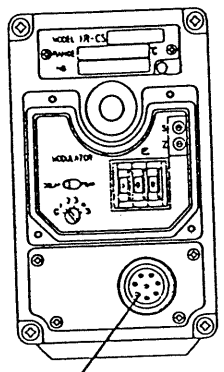
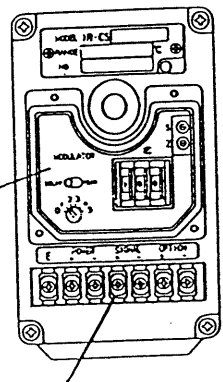


Power Supply Indicator Lamp



(Terminal Type)

(Plug Type).



Terminal Plate

Plug



## ■ Installation Precautions

### ● Vibration and Shock

A detector can withstand 3G vibration, but vibration and shocks to the unit will cause unreliable temperature readings in the long term and will also cause position blurring in the measuring surface preventing stable measurement.

If the unit is exposed to high vibration and shock, either reduce the vibration and /or shocks with cushioning materials or change the installation site.

### ● Induction

The thermometer is designed to prevent interference by induction, but it is still suggested that the unit is be installed as far as possible from induction heat transmitters and electric lines.

### ● Ambient Temperature

The thermometer can withstand temperatures up to 50°C. The unit must be water cooled if the installation site has a high atmospheric temperature or the atmospheric temperature of the thermometer exceeds 50°C due to heat radiated from a high temperature object. Water cooling is recommended in any high-temperature environment to ensure reliability.

### ● Optical Path

Select a site where the optical path between the thermometer and measuring surface will not be interrupted by water droplets, dust, smoke, or steam. If such particles or other phenomena affect the operating environment, the air purge system should be employed to clear the optical path.

### ● Exaggerated Readings

Select a site where sunlight, incandescent light, flame, or other sources of radiant heat do not affect the thermometer and measuring surface. The thermometer will indicate higher than actual temperatures when it is affected by such sources. (The influence is particularly noticeable when measuring lower temperatures.) If such conditions cannot be avoided, take measures to insulate the unit from the heat sources.

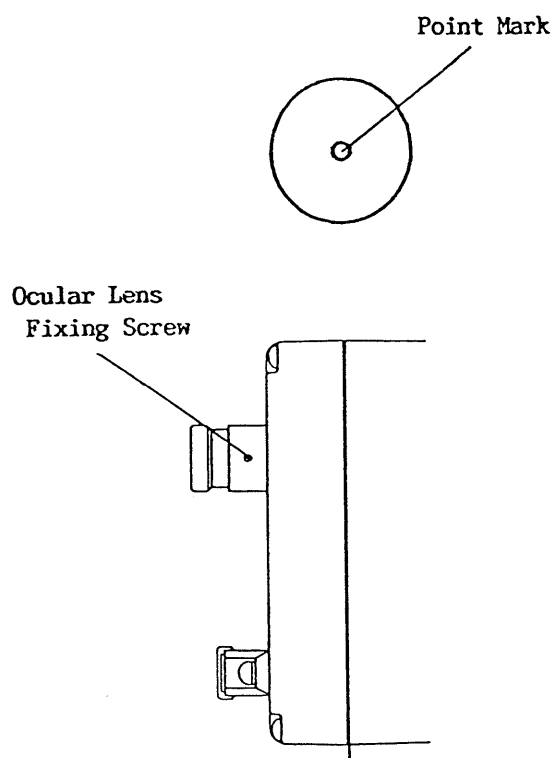
## ■ Sight adjust

Loosen the ocular lens fixing screw (M2, slot locking screw) next to the ocular lens barrel to free the ocular lens component. (Loosen the fixing screw without removing it.) Look into the eyepiece, moving the ocular lens back and forth until the point mark is properly adjusted, and tighten the fixing screw. When adjusting the ocular lens, be sure that the size of the measuring object is at least 1.5 times greater than the point mark.

\* The fixing screw can be tightened with the supplied screwdriver or other precision screwdriver.

### Precautions

The point mark and the measuring diameter will coincide with in the preset measuring distance. The measuring diameter will be greater than the regular point mark when outside the preset measuring distance. Be sure to check the relation of the measuring diameter and measuring distance.



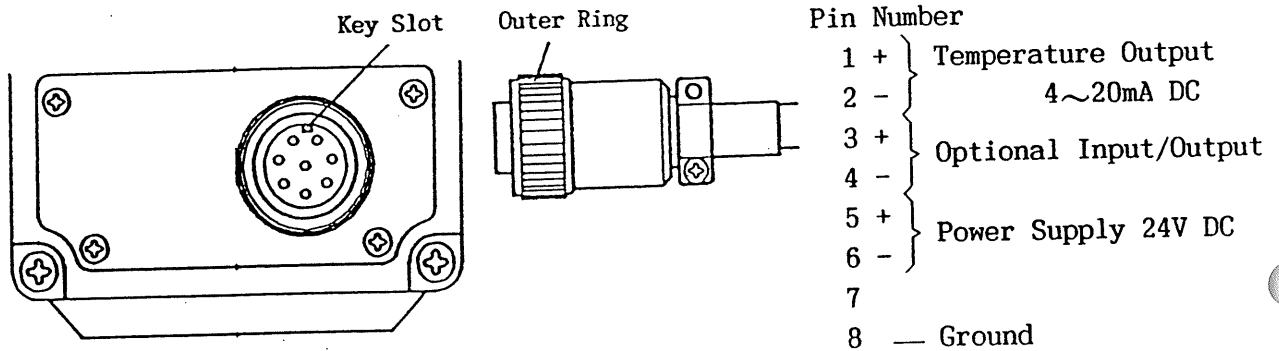
# Connectors

The IR-C Series uses terminals or plug type connections.

## ● Plug type connections

Plug type connection is completed by simply inserting the cable plug (IR-ZCRC) into the receptacle on the thermometer's back panel.

- ① To connect, match up the cable plug with the key slot in the back panel receptacle and insert, rotating the outer ring on the cable plug clockwise until it locks.
- ② To disconnect, release the lock by rotating the outer ring on the cable plug counterclockwise and pulling the cable plug out the back panel receptacle.



### (Cable Specifications)

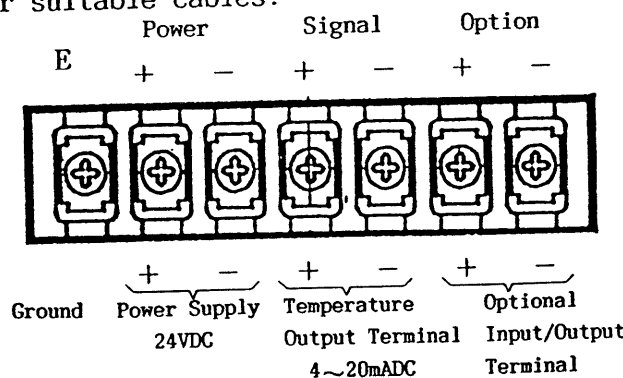
- Twist Pair Type Shielded Instrumentation Cable
- Nominal Cross Section -  $>0.5\text{mm}^2$
- Recommended Cable - Sunlight SX 3P  $\times$   $0.5\text{mm}^2$  manufactured by Taiyo Electric Wire Company.
- Working Connector
  - Thermometer Receptacle — RM15TRH-8PH manufactured by Hirose Electric Company
  - Cable Plug — RM15TP-8S manufactured by Hirose Electric Company

Note for thermometers with CE-marking

Please mount the attached ferrite core within 10cm from a connector.

## ● Terminals Type Connections

Seven terminal screws are arranged on the terminal plate of the thermometer back panel as in the below figure. Connections can be made using the supplied cable (IR-ZCRT) or other suitable cables.



### (Cable Specifications)

- Twist Pair Type Shielded Instrumentation Cable
- Nominal Cross Section -  $>0.5\text{mm}^2$
- Recommended Cable - Sunlight SX 3P  $\times$   $0.5\text{mm}^2$  manufactured by Taiyo Electric Wire Company.

The thermometers with CE-marking are not available in terminal connection type.



Malfunction and instrument damage can result from improper terminal connections. Before turning the power supply back "ON", double check all connections.

Before operation, be sure that the lens axis is set, all connection are secure and correct, the installation is complete, and if using water cooling or air purging, double check the water and air supplies. When the power(24VDC) is turned "ON", the thermometer will immediately resume operation.

## ■ Emissivity Setting

When measuring temperature with the radiation thermometer, it is necessary to set the emissivity precisely in order to get accurate readings. Emissivity is set up to 2 digits (3 digits in case of 2-color type) below decimal point without indication of decimal point.

Emissivity Set Value

(Example) 0.57    →    0 5 7    (IR-C, IR-CW)

                  1.027    →    1 0 2 7    (IR-CQ)

Any figure greater than 1 in the first column will be re-computed as 1. For example, the value 362 will set emissivity to 1.62.

Emissivity is the amount of heat radiated from the object and therefore it varies according to the object's composition, surface(texture, surface oxidation), and temperature. If the object's emissivity is known, set that value. If the value is not known, calculate the emissivity by one of the following means.

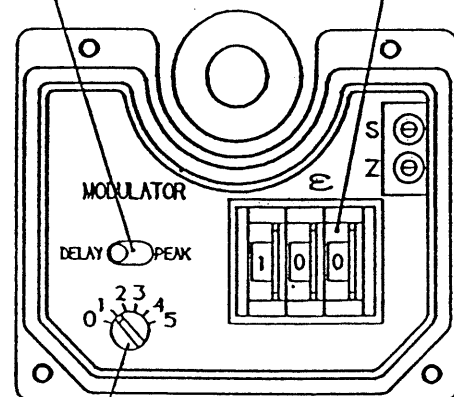
- ① Measure the temperature of the surface of an object with a thermometer such as a thermocouple, then set the emissivity value so that the radiation thermometer will indicate the same temperature.
- ② Apply a blackbody coating(which has an emissivity close to 1)to the surface of the measuring surface and set the emissivity using the area as a true temperature.

## ■ Modulator

A modulator is used for the fluctuated measured value. Select Real, Delay, or Peak mode according to your needs.

- Real .. Real mode will output a real measured signal. With the time constant switch set to 0, the output is real, regardless of other setting.
- Delay .. Delay mode will smooth the real measured signal and reduce its range of fluctuation. The greater the time constant, the smaller the range, and the slower the response time.
- Peak .. Peak mode will extract a maximum value from the real measured signal. Peak mode becomes Real mode when the measured value is very high, and switches to Delay mode when the measured value is very low.

Modukator Shift Switch      Emissivtiy Setting Digital Switch  
 ※ 4digits on IR-CQ



Time Constant Shift Switch

(Standard Model)

- Time Constant Switch
 

0 --- Real Output, 1 --- 1seconds, 2 --- 2seconds	}	63% Response
3 --- 5seconds, 4 --- 10seconds, 5 --- 20seconds		

## Operation

### ■ Optional Specifications

IR-C has many optional specifications.

Refer to the following instructions according to the model you are using.

#### ● Isolated Output

This will generate output(4~20mADC)from the thermometer by isolating the electric circuit of the main unit.

#### ● Emissivity Remote Setting

The setting of emissivity is done by input signal from option terminals.

4~20mADC corresponds to emissivity

0.00~2.00(12mADC is equivalent to

emissivity 1.00). Also, using the

emissivity setting selector switch, you

can either switch into remote setting

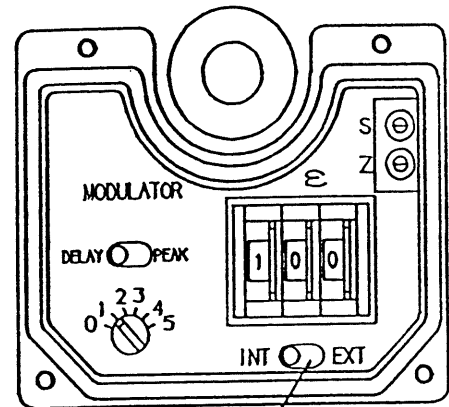
mode or use the internal emissivity

setting digital switch.

INT .. Emissivity Setting Selector  
Switch(Internal Input)

EXT .. Remote Emissivity  
Setting(External Input)

However, this input will not be isolated from the internal circuit.



Emissivity Setting Selector Switch  
(Remote Emissivity Setting)

#### ● HMD Output

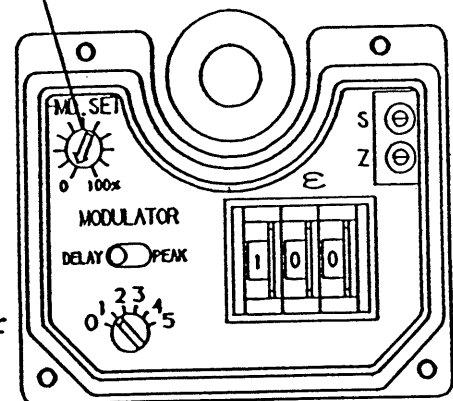
When a measured value exceeds a set temperature, the "On/Off" signal will be output from the option terminals. (Open collector signal)

Exceeding a set value .... ON

Under a set value ..... OFF

A set temperature will be set by HMD setting. The 0~100% of the set value corresponds to the(Lower limit temperature)~(the upper limit temperature)of the measured temperature range. The HMD output is generated after modulator adjustments. The HMD output, however, is not isolated from the internal circuit.

HMD Setting



(HMD Output)

#### ● Non-Linear Output

A voltage signal proportional to the energy of a measured temperature will be output from the option terminals.

10V Output for MAXIMUM Temperature

Non-linear output is not isolated from the internal circuit.

※ Non-linear output(option)is not applicable to IR-CW nor IR-CQ

#### ● High-speed specification

Response time of real output will be 0.5msec(95% indication).

Modulation will take the same reaction as the standard model in delay or peak modes.

#### Thermometers with CE-marking

The thermometers with CE-marking equip an isolated output as standard for conforming to EMC directive (Refer to Page 1.). Other optional specifications than the isolated output are not available in the thermometers with CE-marking.

## Preventive Maintenance

### Regular preventive maintenance

Conduct the following preventive maintenance regularly or as necessary.

#### • Cleaning the Optical Area

Always keep the optical area of the detector clean. If particles land the cover glass or the lens, clear it with a blower such as those used for cameras. If the blower does not remove the particles, gently wipe the cover glass with alcohol using a cotton swab or gauze.

CAUTION) NEVER wipe the lens. Only blow dirt off the lens with a blower. The lens surface coating will be stripped if wiped.

#### • Secure Mounting:

Be sure that all screws are securely fastened when using a protective case or other screw-mounted components.

#### • Secure Terminal Connections:

Be sure that all terminal connections are secured. Re-tighten as necessary.

#### • Cooling water:

Check the water flow and temperature when water cooling the unit with the protective case. The water temperature should be less than 40°C after circulating through the unit.

#### • Air Purge:

Be sure that the air in the air purge system is free from particles or humidity when using the air purge system with the protective case. Particles in the air can cause the system to fail.

In order to conduct a scale calibration you will need a blackbody furnace. If you do not have a blackbody furnace, contact our sales agent for a manufacturer who can conduct the scale calibration for you. (There will be a charge for calibration service.)

### Troubleshooting

When encountering problems, first refer to the following indications and corrective actions. If the problem is not solved, contact our sales agent.

#### ● When there is no reading or the reading is low, check that:

- ① power 24VDC is supplied.
- ② all connections are correct and uninterrupted.
- ③ the power supply voltage is correct.
- ④ the measuring surface covers a point mark.
- ⑤ the temperature of the measuring surface is within the measuring range of the thermometer. (Is the actual temperature low?)
- ⑥ the optical path of the thermometer is clear.
- ⑦ the emissivity is set too high.
- ⑧ the surface temperature of the thermometer exceeds 50°C.
- ⑨ the atmospheric temperature of thermometer is too low and the optical system has condensation.

#### ● When the reading is high, check that

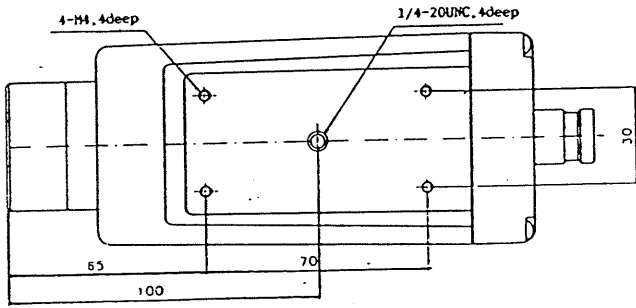
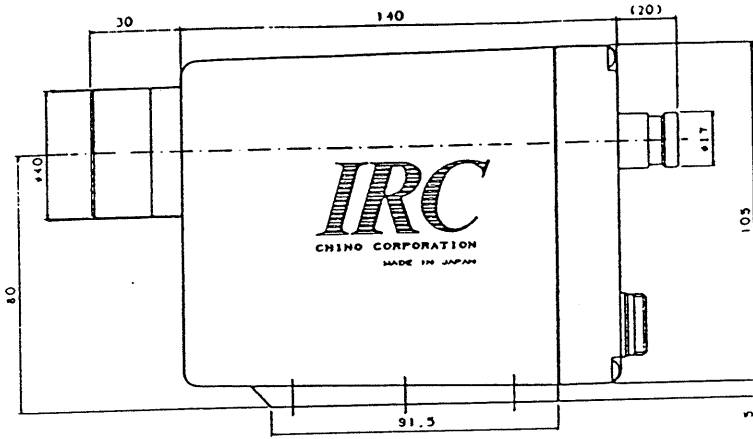
- ① the temperature of the measuring surface exceeds the measuring range. (Is the actual temperature high?)
- ② the emissivity is set too low.
- ③ the external heat source is affecting the measuring surface or the thermometer.

#### ● When the reading varies too greatly, check that

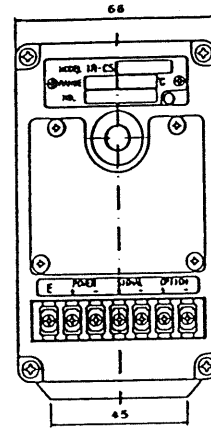
- ① the thermometer is securely mounted.
- ② all plug-in connections are secure and uninterrupted.
- ③ the screws in the terminal plate are securely fastened.
- ④ the cables are damaged or cut.
- ⑤ the power supply voltage is correct.
- ⑥ the optical path is uninterrupted by smoke or dust.
- ⑦ the temperature of the measuring surface is constant.
- ⑧ the emissivity of the measuring surface changes. (Especially for moving objects)

# External dimensions

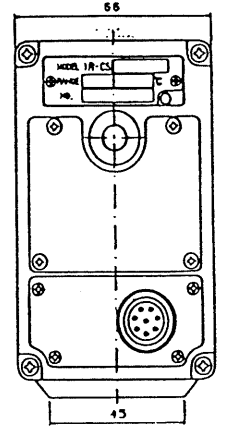
## Thermometer



(Back Panel)



(Terminals)



(Plug Receptacle)

Unit:mm

### ■ Emissivity settings

Since the emissivity of an object depends on the object's composition, surface, texture, degree of oxidation, temperature, and wavelength, the emissivity can be expressed as the ratio ( $\epsilon$ ) of heat radiated by the object to the heat radiated by a blackbody furnace at the same temperature measured at same wavelength.

### ● Spectral Emissivity ( $\lambda=0.65\mu\text{m}$ )

In general, the emissivity ( $\epsilon$ ) of  $0.65\mu\text{m}$  is a reference as determined by the use of an optical pyrometer.

Metal	Emissivity		Oxidized Materials	Emissivity
	Solid Form	Fluid Form		
Zinc	0.42		Alumel(surface Oxidation)	0.87
Alumel	0.37		Chromel P(Surface Oxidation)	0.87
Aluminum	0.17	0.12	Constantan(Surface Oxidation)	0.84
Antimony	0.32		Magnet	0.25~0.5
Iridium	0.30		Cast Iron(Surface Oxidation)	0.70
Yttrium	0.35	0.35	55Fe,37.5Cr,7.5Al(Surface Oxidation)	0.78
Uranium	0.54	0.34	70Fe,23Cr,5Al,2Co(Surface Oxidation)	0.75
Gold	0.14	0.22	80Ni,20Cr(Surface Oxidation)	0.90
Silver	0.07	0.07	60Ni,24Fe,16Cr(Surface Oxidation)	0.83
Chrome	0.34	0.39	Stainless Steel(Surface Oxidation)	0.85
Chomel P	0.36		Aluminium Oxide	0.22~0.4
Cobalt	0.36	0.37	Ytiteium Oxide	0.60
Constantan	0.35		Uranium Oxide	0.30
Zirconium	0.32	0.30	Cobalt Oxide	0.75
Mercury		0.23	Columbium Oxide	0.55~0.71
Tin	0.18		Zirconium Oxide	0.18~0.43
Carbon	0.32	0.30	Tin Oxide	0.32~0.60
Tungsten	0.43		Cerium Oxide	0.58~0.82
Tantalum	0.49		Titanium Oxide	0.50
Cast Iron	0.37	0.40	Iron Oxide	0.63~0.98
Titanium	0.63	0.65	Copper Oxide	0.60~0.80
Iron	0.35	0.37	Thorium Oxide	0.20~0.57
Copper	0.10	0.15	Vanadium Oxide	0.70
Thorium	0.54	0.34	Beryllium Oxide	0.07~0.37
Nickel	0.36	0.37	Magnesium Oxide	0.10~0.43
80Ni,20Cr	0.35			
60Ni,24Fe,16Cr	0.36			
Platinum	0.30	0.38		
90Pt, 10Rh	0.27			
Palladium	0.33	0.38		
Vanadium	0.35	0.35		
Bismouth	0.29			
Beryllium	0.61	0.61		
Manganese	0.59	0.59		
Molybdenum	0.37	0.40		
Rhodium	0.24	0.30		

※ The above list is not applied to 2-color thermometers.

※ The above list is only reference, as the emissivity differs on surface, wavelenth, etc.

## Reference

### ■ Effect of Emissivity

On a single-color radiation thermometer, when measuring the object's temperature with emissivity set at 1.00, the temperature reading will be lower than the actual temperature if the object's emissivity is less than 1. The affect of emissivity on the radiation thermometer's reading is described in the following table. (Actual readings will vary slightly.)

- IR-CI, IR-CWI (Measuring Wavelength 1.55 $\mu$ m, Measureable Range 200~1600 $^{\circ}$ C)

Temperature( $^{\circ}$ C)	Temperature Indiated( $^{\circ}$ C)									
	200	197	195	192	188	184	179	173	164	150
200	200	197	195	192	188	184	179	173	164	150
300	300	296	292	288	282	276	269	260	248	229
400	400	395	389	383	376	368	358	346	330	304
500	500	493	486	478	468	458	445	430	409	376
600	600	591	582	572	560	547	531	511	485	445
700	700	698	678	665	651	634	615	591	560	511
800	800	787	773	758	740	720	697	669	632	574
900	900	885	868	849	829	806	778	745	702	636
1000	1000	982	962	941	917	890	858	820	770	695
1100	1100	1079	1056	1031	1004	972	936	893	836	751
1200	1200	1176	1150	1121	1090	1054	1013	964	901	806
1300	1300	1272	1243	1211	1175	1135	1089	1034	963	859
1400	1400	1369	1336	1299	1259	1215	1163	1102	1024	910
1500	1500	1465	1428	1387	1343	1293	1237	1169	1084	959
1600	1600	1561	1520	1475	1426	1371	1309	1235	1142	1007
Emissivity $\epsilon$	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10

- IR-CS, IR-CWS (Measuring Wavelength 0.9, Measuring Range 500~3000 $^{\circ}$ C)

Temperature( $^{\circ}$ C)	Temperature Indiated( $^{\circ}$ C)									
	500	496	492	487	481	475	467	457	444	423
500	500	496	492	487	481	475	467	457	444	423
600	600	595	589	583	576	568	558	546	529	502
700	700	694	687	679	671	661	649	634	613	580
800	800	792	784	775	764	752	738	720	695	656
900	900	891	881	870	858	843	826	805	776	730
1000	1000	989	978	965	950	933	913	889	855	803
1100	1100	1088	1074	1059	1042	1023	1000	971	933	873
1200	1200	1186	1170	1153	1134	1112	1085	1053	1010	942
1300	1300	1284	1266	1247	1225	1200	1170	1133	1085	1009
1400	1400	1382	1362	1340	1315	1287	1254	1213	1159	1075
1500	1500	1480	1457	1433	1405	1373	1336	1291	1231	1139
1600	1600	1577	1552	1525	1494	1459	1418	1368	1303	1202
1700	1700	1675	1647	1617	1583	1545	1500	1445	1373	1263
1800	1800	1772	1742	1708	1671	1629	1580	1520	1442	1323
1900	1900	1869	1836	1800	1759	1713	1659	1594	1510	1382
2000	2000	1966	1930	1890	1846	1796	1738	1668	1577	1439
2100	2100	2064	2024	1981	1933	1879	1816	1740	1643	1496
2200	2200	2160	2118	2071	2019	1961	1893	1812	1707	1551
2300	2300	2257	2211	2161	2105	2042	1970	1883	1771	1605
2400	2400	2354	2304	2250	2190	2123	2045	1953	1834	1657
2500	2500	2450	2397	2339	2275	2203	2120	2022	1896	1709
2600	2600	2547	2490	2427	2359	2283	2195	2090	1956	1760
2700	2700	2643	2582	2516	2443	2362	2268	2157	2016	1810
2800	2800	2739	2674	2604	2526	2440	2341	2224	2075	1859
2900	2900	2835	2766	2691	2609	2518	2413	2290	2134	1906
3000	3000	2931	2858	2779	2692	2592	2485	2355	2191	1953
Emissivity $\epsilon$	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10



● IR-CQ1 (Measuring Wavelength 1.35/1.55 $\mu\text{m}$  Measureable Range 300~1500 $^{\circ}\text{C}$ )

Temperature( $^{\circ}\text{C}$ )	Temperature Indiated( $^{\circ}\text{C}$ )										
300	239	251	264	276	288	300	312	324	335	347	359
400	317	334	350	367	384	400	416	433	449	466	483
500	392	414	435	457	478	500	522	544	566	588	611
600	465	492	518	545	572	600	628	656	685	714	744
700	535	567	600	632	666	700	735	770	807	844	883
800	603	641	679	718	759	800	843	886	932	978	1027
900	669	712	757	803	851	900	951	1004	1059	1117	1177
1000	732	782	833	887	942	1000	1060	1124	1190	1260	1334
1100	793	849	908	969	1033	1100	1171	1245	1325	1409	1499
1200	852	915	981	1050	1123	1200	1282	1369	1463	1563	1672
1300	909	979	1052	1130	1212	1300	1394	1495	1605	1724	1854
1400	964	1041	1122	1208	1301	1400	1507	1624	1751	1892	2047
1500	1017	1101	1190	1286	1388	1500	1622	1755	1903	2067	2253
Emissivity $\epsilon$	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25

● IR-CQS (Measuring Wavelength 0.85/1.00 $\mu\text{m}$  Measuring Range 700~3000 $^{\circ}\text{C}$ )

Temperature( $^{\circ}\text{C}$ )	Temperature Indiated( $^{\circ}\text{C}$ )										
700	603	623	643	662	681	700	719	737	755	773	791
800	684	708	731	754	777	800	823	845	867	890	912
900	762	790	818	846	873	900	927	954	981	1008	1035
1000	839	872	904	936	968	1000	1032	1064	1096	1128	1160
1100	915	952	989	1026	1063	1100	1137	1175	1212	1250	1289
1200	989	1031	1073	1115	1157	1200	1243	1286	1330	1374	1419
1300	1062	1109	1156	1204	1252	1300	1349	1399	1449	1501	1553
1400	1133	1185	1238	1291	1345	1400	1456	1512	1570	1629	1689
1500	1203	1261	1319	1378	1439	1500	1563	1627	1692	1759	1828
1600	1272	1335	1399	1465	1532	1600	1670	1742	1816	1892	1971
1700	1339	1408	1478	1550	1624	1700	1778	1858	1941	2027	2116
1800	1405	1480	1557	1635	1716	1800	1886	1976	2069	2165	2266
1900	1470	1551	1634	1720	1808	1900	1995	2094	2198	2306	2419
2000	1533	1620	1710	1803	1900	2000	2105	2214	2329	2449	2576
2100	1595	1689	1786	1886	1991	2100	2214	2335	2461	2595	2737
2200	1656	1756	1860	1968	2081	2200	2325	2457	2596	2745	2903
2300	1716	1823	1934	2050	2172	2300	2436	2580	2733	2897	3074
2400	1775	1888	2006	2130	2261	2400	2547	2704	2873	3054	3250
2500	1832	1952	2078	2210	2351	2500	2659	2830	3014	3214	3431
2600	1889	2015	2149	2290	2440	2600	2772	2957	3158	3378	3619
2700	1944	2077	2218	2368	2528	2700	2885	3086	3305	3546	3813
2800	1998	2138	2287	2446	2616	2800	2999	3216	3455	3719	4014
2900	2051	2198	2355	2523	2704	2900	3114	3348	3607	3896	4222
3000	2103	2257	2600	2600	2791	3000	3229	3481	3762	4079	4439
Emissivity $\epsilon$	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25

# General Specifications

## ■ General Specifications

### Single-color type

Measuring system: Narrow band radiation thermometer

Detecting element/measuring wavelength: Si.....0.9 $\mu$ m  
InGaAs..1.55 $\mu$ m

Measuring temperature range: 200 to 3000 $^{\circ}$ C (Refer to Page 2)

Accuracy rating:  $\pm 4^{\circ}$ C at lower than 800 $^{\circ}$ C

$\pm 0.5\%$  of measured value at higher than 800 $^{\circ}$ C, but lower than 1500 $^{\circ}$ C

$\pm 1.0\%$  of measured value at higher than 1500 $^{\circ}$ C, but lower than 2000 $^{\circ}$ C

$\pm 2.0\%$  of measured value at higher than 2000 $^{\circ}$ C

( $\epsilon=1.0$ , Ambient temperature  $23\pm 5^{\circ}$ C, Humidity 35 to 75%RH under reference operating conditions)

Reproducibility: Within  $\pm 0.2^{\circ}$ C

Stability: (1) Temperature drift

0.1 $^{\circ}$ C/ $^{\circ}$ C or 0.015%/ $^{\circ}$ C of measured value, whichever is larger

(2) Under EMC test environment (Only applicable to thermometers with CE-marking)

$\pm 5^{\circ}$ C or  $\pm 1\%$  of temperature range, whichever is larger

Resolution: 0.2 $^{\circ}$ C (0.5 $^{\circ}$ C in case of high-speed type)

Response time: 10ms (95% response)

(0.5ms in case of high-speed type)

Emissivity compensation: 1.99 to 0.10 (Digital switch setting)

### Single-color · Wide type

Measuring system: Narrow band radiation thermometer

Detecting element/measuring wavelength: Si.....0.9 $\mu$ m  
InGaAs..1.55 $\mu$ m

Measuring temperature range: 250 to 3000 $^{\circ}$ C (Refer to Page 2)

Accuracy rating:  $\pm 5^{\circ}$ C at lower than 1000 $^{\circ}$ C

$\pm 0.5\%$  of measured value at higher than 1000 $^{\circ}$ C, but lower than 1500 $^{\circ}$ C

$\pm 1.0\%$  of measured value at higher than 1500 $^{\circ}$ C, but lower than 2000 $^{\circ}$ C

$\pm 2.0\%$  of measured value at higher than 2000 $^{\circ}$ C

( $\epsilon=1.0$ , Ambient temperature  $23\pm 5^{\circ}$ C, Humidity 35 to 75% RH under reference operating conditions)

Reproducibility: Within  $\pm 0.2^{\circ}$ C

Temperature drift: 0.1 $^{\circ}$ C/ $^{\circ}$ C or 0.015%/ $^{\circ}$ C of measured value, whichever is larger

Resolution: 0.2 $^{\circ}$ C

Response time: 10ms (95% response)

Emissivity compensation: 1.99 to 0.10 (Digital switch setting)

### 2-color type

Measuring system: Two-wavelength ratio operation system 2-color radiation thermometer

Detecting element/measuring wavelength: Si.....0.85/1.00 $\mu$ m  
InGaAs..1.35/1.55 $\mu$ m

## General Specifications

Measuring temperature range: 300 to 3000°C (Refer to Page 2)

Accuracy rating:  $\pm 5^\circ\text{C}$  at lower than 1000°C

$\pm 0.5\%$  of measured value at higher than 1000°C,  
but lower than 1500°C

$\pm 1.0\%$  of measured value at higher than 1500°C,  
but lower than 2000°C

$\pm 2.0\%$  of measured value at higher than 2000°C

( $\epsilon=1.0$ , Ambient temperature  $23\pm 5^\circ\text{C}$ , Humidity 35 to  
75%RH under reference operating conditions)

Reproducibility: Within  $\pm 0.5^\circ\text{C}$

Temperature drift:  $0.2^\circ\text{C}/^\circ\text{C}$  or  $0.02\%/^\circ\text{C}$  of measured value, whichever  
is larger

Resolution:  $0.5^\circ\text{C}$  ( $1^\circ\text{C}$  in case of high-speed type)

Response time: 20ms (95% response)

(0.5ms in case of high-speed type)

Emissivity compensation: 1.25 to 0.75 (Digital switch setting)

### Common Specifications

Modulator: Peak/Delay selection

Decay time ... Time constant 0, 1, 2, 5, 10, 20sec.

6-step selection (Real output when time constant 0sec.)

Output: 4 to 2mADC (Linear output, Load resistance: Lower than  
550 $\Omega$ )

Optical system: Lens condensing system, Fixed focus type

Lens diameter: 20mm $\phi$  (10mm $\phi$  in case of small target type)

Collimation: A direct viewing finder is attached.

Working temperature: 0 to 50°C

Working humidity: Lower than 90%RH (No dew condensation is  
allowable.)

Allowable vibration: Less than 3G

Power supply: 24VDC (22 to 28V)

Power consumption: Approx. 3VA

Connection method: Terminals or plug

Casing material: Aluminum diecast

Weight: Approx. 1kg

### Optional Specifications

Isolated output: 4 to 20mADC (Load resistance: less than 550 $\Omega$ )

Emissivity remote setting: 4 to 20mADC (input resistance 50 $\Omega$ )

HMD output: Open-collector output (Less than 30mA), Judgement after  
modulation

Non-linear output: 0 to 10VDC (10V at maximum temperature) (Output  
resistance: 10 $\Omega$ )

High-speed type response time: 0.5ms (95% indication at real output)

Note1) The combination of emissivity remote setting, HMD output and  
non-linear output is not available. Please select one.

Note2) Non-linear output is not available on IR-CW AND IR-CQ.

Note3) The thermometer with CE-marking equip an isolated output as  
standard, but other optional specifications than the  
isolated output are not available in the thermometers with  
CE-marking.

# CHINO

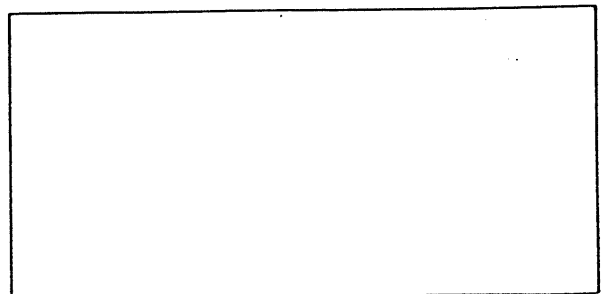
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