

IR3000C Infrared Radiation Thermometer

Operation instruction



1. Summarize

IR3000C Infrared Radiation Thermometer is a non-contact type thermometer. It consists of IR probe and control meter. It absorbs infrared radiation energy from object to measure the temperature of object.

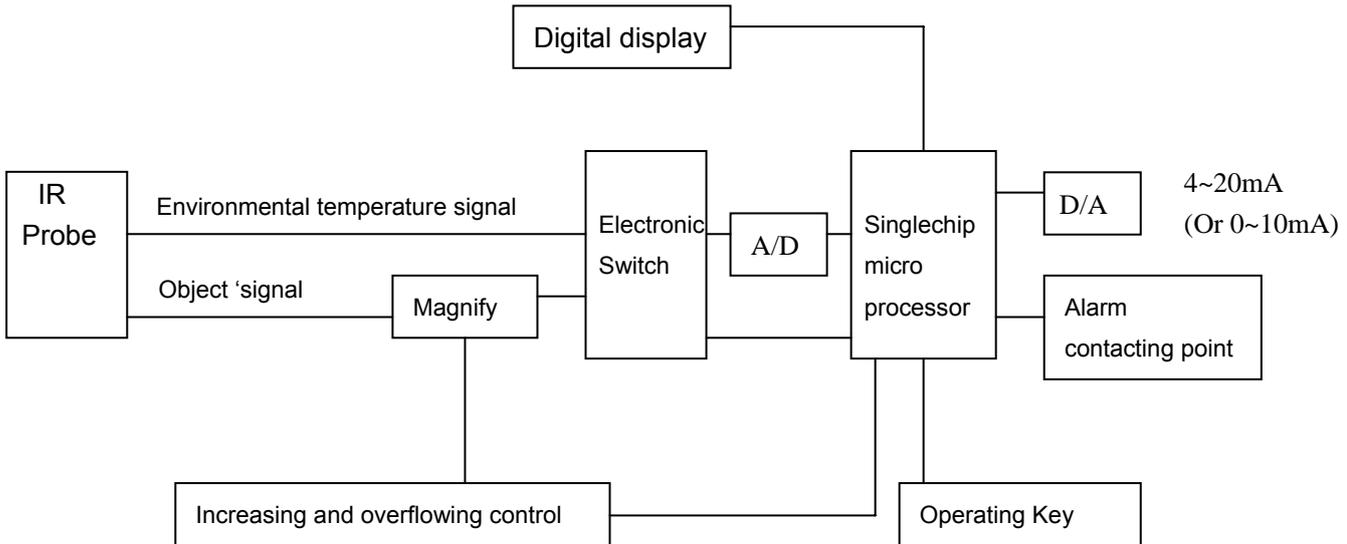
The meter adopts the technology of Singlechip micro processor. It is easy to set high limit alarm, low limit alarm, emissivity, time constant, hot t setting time and so on by operating Key, and choose the working state of real time value, average value, peak value and steel rolling.

The Infrared radiation thermometer is widely used for online temperature measuring in many industries, such as, metallurgy, machinery, ceramic, glass, Kiln , chemical, silicate produce, cement, foodstuff, textile, paper, film and so on.

2. Main technical specification:

1. Measuring range: 0~800°C; 600~2500°C, and 1000~3000°C for selection
2. Accuracy: $\pm 1\%$
3. Distance coefficient: L \leq 30D for temperature range of 0~800°C
L \leq 70D for temperature range of 700~3000°C
(L means measuring distance, D means diameter of object)
4. Sensor component : Thermopile for 0~800°C
optical silicon sensor component for 700~3000°C
5. Response wavelength: 8~14 μ m for 0~800°C ;
0.4~1.1 μ m for temperature of more than 700°C
6. Response time: <1 second for 0~800°C,
<0.1 second for temperature of more than 700°C)
7. Emissivity: $\epsilon=0.001\sim 1.000$ (adjustable)
8. Simulated output signal: 4~20mADC (or 0-10mA)
Output contacted point: Contacted point of High limit alarm output
Contacted point of Low limit alarm output
9. Simulated output transferred value: High limit value (UH) and low limit value (UL)
may be set according to user's requirement (within measuring range).
10. Working environment: Environmental temperature 0~50°C, relative humidity $\leq 85\%$
- 11...Power supply: AC220V $\pm 15\%$ 50Hz ± 3 Hz
12. Power consumption: about 5W
13. Panel size of meter: 96X 96mm.
Size of installation hole: 91x91mm

3. Working principle

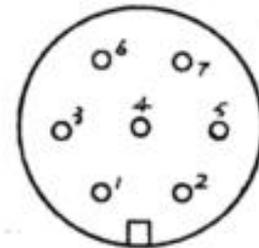


Working principle: The head of IR Probe focus the radiation energy of object on probe by optical system, Probe receive the radiation energy, and then transform it to relevant electrical signal. After magnifying by front magnifier, it outputs a signal of 0~-5V non-linear electrical voltage and also transmits a signal of environmental temperature to the control meter for processing. After receiving the signals from IR probe, the control meter process environmental temperature signal, electric signal and linearization etc, then display temperature and output signal of 4~20mA. The various kinds of measuring functions can be chosen by operating Key.

4. Structure

HDIR-1 B Infrared Radiation Thermometer consists of IR probe and control meter. They are connected with seven core shielded cables.

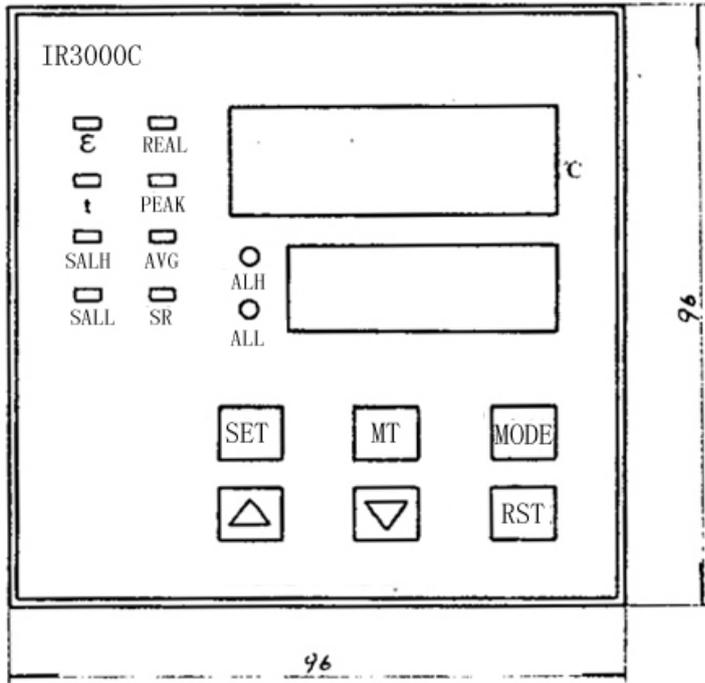
1. IR probe is composed of aluminum sheath, optics system, sensor component and magnifier, ETC. The output object' signal of IR probe is 0~ -5VDC.
2. The connection drawing of IR Probe
 - (1): -12V
 - (2): +12V
 - (3): Vst (Environmental temperature signal)
 - (4) and (5): GND
 - (6): Useless
 - (7): Vsc (object 'signal)



Connection drawing of IR probe

3. Control meter is composed of plastic body, power supply transformer, panel, PCB and input/output terminals ETC. The figuration of control meter are as follows:

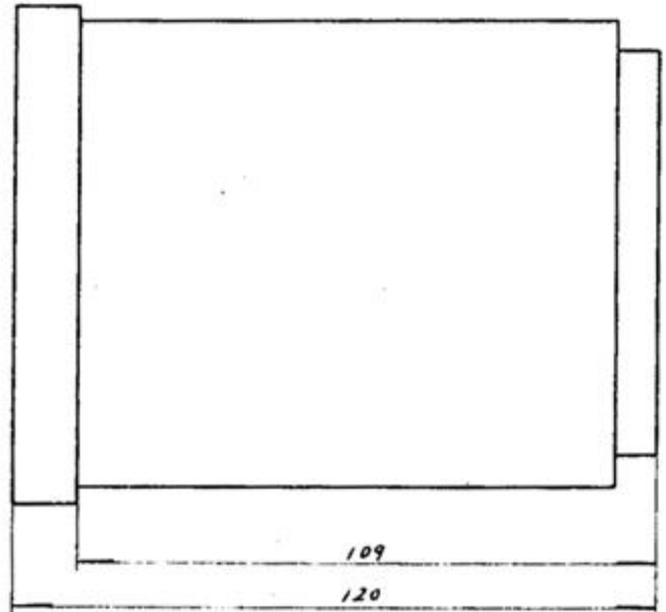
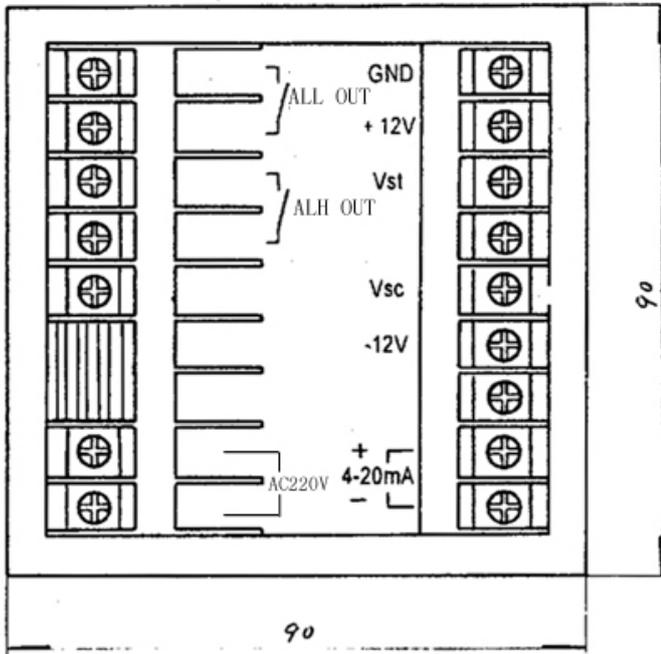
(1). IR3000C panel



- ε: Lamp of setting emissivity
- REAL: Lamp of measuring real time value
- t: Lamp of setting time constant
- PEAK: Lamp of measuring peak value
- SALH: Lamp of setting high limit alarm
- AVG: Lamp of measuring average value
- SALL: lamp of setting low limit alarm
- SR: Lamp of value for steel rolling
- ALH: Lamp of high limit alarm output
- ALL: Lamp of low limit alarm output
- SET: Setting button
- MT: Measuring button
- MODE: Function button
- RST: Reset button

(2). Connecting terminal in back of control meter

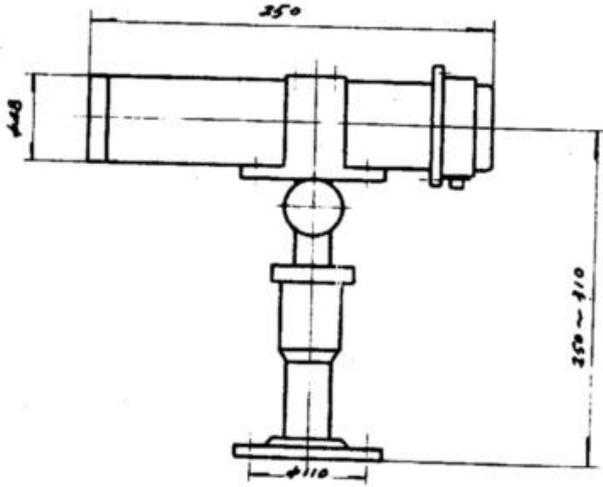
(3). Side view of control meter.



ALL OUT: Low limit alarm output
 ALH OUT: High limit alarm output

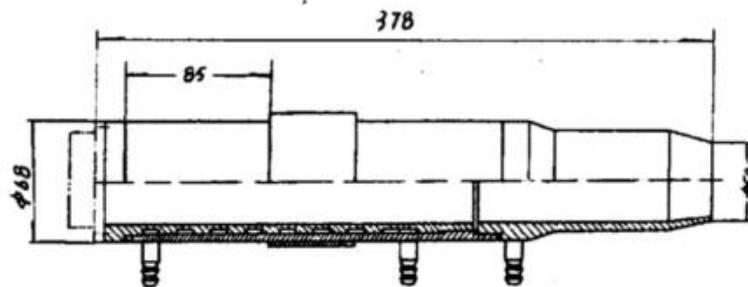
5. The installation of IR probe and attention

1. Installing probe tightly and properly according to drawing A



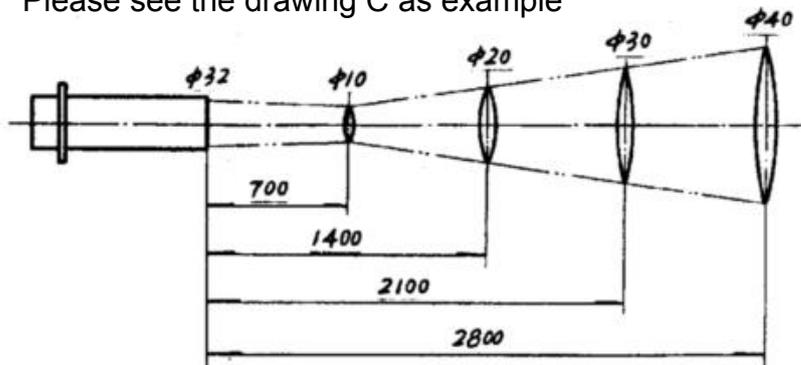
Probe installation (drawing A), Installing device is subject to supply..

In case IR probe is installed in high temperature environment (say: more than 65C), it require extra device of water-cooled ventilation for cooling. Probe is installed as per drawing A and extra device of water-cooled ventilation as per Drawing B. (Note: it needs special order for extra device of water-cooled ventilation for cooling)



Water-cooled and ventilation device (Drawing B)

2. The installation distance of probe should be adjusted according to the size of measured object, and should conform to the requirement of distance coefficient. Please see the drawing C as example



Distance coefficient (Drawing C)

3. It is very important to sight correctly in order to ensure accurate measure. The small square in the collimator should be in the middle of view field. On the other hand, the size of sight part of object should conform to the requirement of above clause No.2.

4. The standard length of seven core shielded cable is 10 meters. The special length is available according to buyer's special requirement.
5. Do not touch optics element in IR probe. If there is dust on the surface of optics element, please use absorbent cotton with alcohol to wipe it or use rubber blowing tool to blow it off.
6. If using extra device of water-cooled ventilation for cooling, it should be checked periodically, so as to avoid block of water and gas pipeline.

6. Operation instruction

1. Connect output port of IR probe with terminal in back of control meter by seven core shielded cable properly. , then connect control meter to 220VAC/50HZ power supply.
2. After switching on, the thermometer enters working state. Pay attention to check if thermometer works normally or not.
3. There are two working state in thermometer, that is, setting state and measuring state,
Press key to enter waiting state of setting and Key to enter waiting state of measuring respectively.

(1). Working state of setting: After thermometer enters waiting state of setting, the upper window displays SEL, at this time, press key to enter ϵ setting

state, the upper window displays parameter symbol E and low window displays parameter value, meanwhile, ϵ indicating lamp light on. Press key each time, it will change the setting state from one parameter to another parameter, meanwhile, the upper and low window display parameter symbol and parameter value respectively, and corresponding indicating lamp light on. Press key continuously to change the setting state of parameter circularly.

Parameter name and their symbol are as follows:

Emissivity: E(Please refer to appendix of "the function choice and emissivity modification for different application")

Time constant: (s)

Hot t setting time : (ms)

High limit value: H

Low limit value: L

High limit of simulative output transferred value: UH

Low limit of simulative output transferred value: UL

Press key or key to change each parameter value. Press and release key or key, the setting value will increase or decrease step by step. Keep pressing key or key, the setting value will increase or decrease quickly, so as to shorten the setting time.

(2). Working state of measuring: After the meter enters waiting state of measuring, the upper window displays PEL, at this time, press MODE key to enter measuring state of real time value and the REAL lamp light on. The upper window displays measured temperature value, low window displays the emissivity of measured object,

press MODE key each time, it will change the measuring state from one to another.

meanwhile, corresponding indicating lamp light on, the upper window displays measuring value, low window displays the emissivity of measured object, Press MODE

key continuously to change the working state of measuring of “real time value REAL”, “peak value PEAK”, “average value AVG”, and “steel rolling SR” circularly.

a. Real time value REAL: After the thermometer enters the measuring state of real time value, the REAL lamp light on, the upper window displays the instantaneous temperature of measured object.

b. Peak value: It is the highest temperature of measured object. In some temperature measuring condition, the temperature of measured object may drop or fluctuate quickly because measured object has own characteristic and may be disturbed from environment. In this case, the indication value of thermometer will be in low side. It is not easy to measure the highest real temperature. So,

choosing proper time constant τ_1 can change the speed of temperature drop ,so as to measure the peak temperature of measured object quickly (See the drawing D). After thermometer enters measuring state of peak value, the PEAK lamp light on, the upper window displays the peak temperature of measured object.

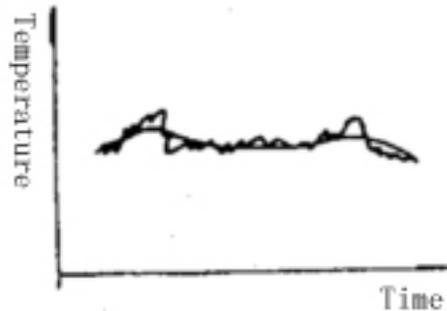


Drawing D (Function of peak value)

c. Average value: In some temperature measuring condition, the measuring temperature value may fluctuate on the basis it's real display temperature because measured object has own characteristic and may be disturbed from environment. In this case, neither it read data from display window of thermometer correctly, nor it is helpful to data record and control. The function of average value can eliminate this problem of fluctuation. Choosing proper time

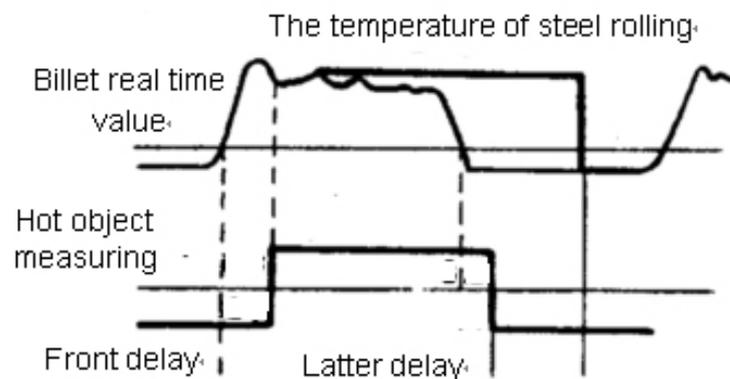
constant τ_1 can get the display temperature which is close to the real temperature of measured object. Setting time constant τ_1 properly make not only eliminating the fluctuation of temperature display value, but also reflecting

the slow change of real temperature (refer to drawing E). After thermometer enters measuring state of average value, the AVG lamp lights on, upper window displays the average temperature of measured object. **(Note:** time constant in the average value and peak value can be set from 0.1S to 99s according to specific application. The time means sampling time)



Drawing E (function of average value)

- d. Steel rolling: this function is special for the temperature measuring of billet in the field of steel rolling. It has the function of setting the temperature of high limit and low limit and alarm output. After the billet passes by, the thermometer will display a temperature value (peak value), displaying time is 10 seconds. During heating and rolling billet, the front temperature is usually higher and can not represent temperature of all billets, so proper delay of measuring frontal temperature can eliminate the above front effect. Thermometer has hot t setting time (t_2), so as to adjust front delay time (refer to drawing F). Hot t setting time (t_2) can be chosen from 0 to 99ms.



Drawing F

7. The attention of order

1. Before order, it is better to indicate (a).application in details, (b).the measured object and (c).measuring range for correct selection of our type.
2. Before order, please indicate if the extra device of water-cooled and ventilation is needed.
3. Before order, please make sure if our standard length of 10 meters seven core cable is enough for use.
4. Please provide details if other special requirement is required.

Appendix:

The function choice and emissivity modification for different application (for reference)

Application	Function choice	Emissivity
Molten steel, molten iron	Average value or peak value	0.6-0.78
Temperature measurement on top of hot air furnace in steel factory	Average value or peak value	0.8-0.93
Temperature measurement of ignition device for sinter furnace's in steel factory	Real time value or average value	0.8
Temperature measurement of coke during pushing coke in cokery	Peak value	0.9-0.95
Temperature measurement of cokery ' heat repertory	Real time value	0.95
Temperature measurement of burning zone in fire-resistant tunnel kiln	Real time value	0.85-0.95
Temperature measurement of glass liquid in glass furnace	Average value	0.8
Temperature measurement of glass wire drawing and glass dripping	Average value	0.4
Temperature measurement of primary rolling ,Middle rolling and final rolling of steel ingot during steel rolling	Steel rolling	0.7-0.76
Temperature measurement of smelting and moulding for copper liquid .	Peak value	0.75-0.85
Temperature measurement of pressing and drawing tube for copper material	Peak value	0.75-0.85
Temperature measurement of aluminum liquid moulding	Peak value	0.48-0.66
To be used in Carbon material or other super high temperature field.	By field testing	

They can be modified according to the field characteristic for special application.