

I. Introduction:

This instrument is a digital thermometer for use with any K-type thermocouple as temperature sensor.

Temperature indication follows National Bureau of Standards and IEC584 temperature/voltage table for K-type thermocouples.

II. Specifications:

Numerical Display:

4 digital liquid crystal display

Measurement Range:

-200°C ~ 1370°C -328°F ~ 2498°F

Resolution:

-200°C~ 200°C 0.1°C; 800°C ~1370°C 1°C

-200°F~ 200°F 0.1°F; else 1°F

Maximum Voltage at Thermocouple Input:

60V DC, or 24Vrms AC

Environmental:

- o Operating Temperature and Humidity:
0°C ~50°C (32°F ~ 122°F) ; 0 ~ 80% RH
- o Storage Temperature and Humidity:
-10°C to 60°C (14°F ~ 140°F); 0 ~ 80% RH
- o Altitude up to 2000 meters.

Accuracy: at (23 ± 5°C)

Range	Accuracy
-200°C ~ 200°C	±(0.3% reading + 1°C)
200°C ~ 400°C	±(0.5% reading + 1°C)
400°C~1370°C	±(0.3% reading + 1°C)
-328°F ~ -400°F	±(0.5% reading + 2°F)
-200°F ~ 200°F	±(0.3% reading + 2°F)
200°F ~ 400°F	±(0.5% reading + 2°F)
400°F ~ 2498°F	±(0.3% reading + 2°F)

For T1-T2 Measurement, the accuracy is

$\pm(0.5\% \text{ T1-T2 reading} + 2^{\circ}\text{C})$ or

$\pm(0.5\% \text{ T1-T2 reading} + 2^{\circ}\text{F})$

Temperature Coefficient:

For ambient temperatures from $0^{\circ}\text{C} \sim 18^{\circ}\text{C}$ and $28^{\circ}\text{C} \sim 50^{\circ}\text{C}$, for each $^{\circ}\text{C}$ ambient below 18°C or above 28°C add the following tolerance into the accuracy spec.

0.01% of reading + 0.03°C (0.01% of reading + 0.06°F)

Note:

The basic accuracy Specification does not include the error of the probe please refer to the probe accuracy specification for additional details.

Sample Rate:0.6 times per second

Dimension: 184x64x30mm

Weight: 210g Approx.(7.4oz)

Accessory:

K Type Bead Probe, Battery, Carrying Case, Instruction Menu.

Option:

Soft Ware Package (Program, RS232 Connection Cable) , AC Adapter.

Power requirement:

9 Volt Battery, NEDA 1604 or JIS 006P or IEC6F22

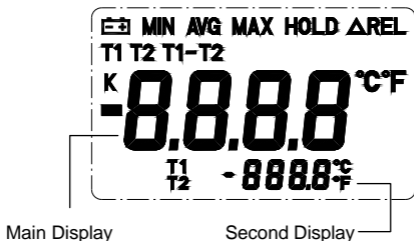
Battery Life:

Approx. 100hrs with alkaline battery

AC Adapter:

9V_{DC} $\pm 15\%$ 100mA ; Plug Diameter: 3.5x1.35mm

III. Symbol Definition and Button Location:



- : This indicates that the minus temperature is sensed.

°C °F : Centigrade and Fahrenheit indication.

K : Thermocouple Type Indication


HOLD : This indicates that the display data is being hold.

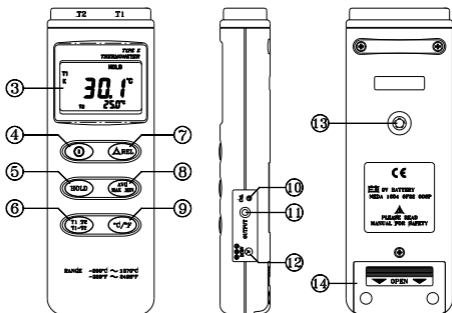
MAX : The Maximum value is now being displayed

MIN : The Minimum value is now being displayed

AVG : The Average value is now being displayed.

ΔREL : The reading is now under Relative Mode.


 : The Battery is not sufficient for proper operation.



- ① T1 K type temperature sensor connector
- ② T2 K type temperature sensor connector
- ③ LCD display
- ④ ON/OFF button
- ⑤ HOLD button
- ⑥ T1, T2, T1-T2 control button
- ⑦ Relative readout button
- ⑧ MAX MIN Average control button
- ⑨ °C, °F control button
- ⑩ Offset calibration screw
- ⑪ Digital output connector
- ⑫ AC power adapter connector
- ⑬ Tripod connector
- ⑭ Battery cabinet cover

IV. Operation Instructions:

4.1 Power-Up

Press the  key to turn the thermometer On or OFF.

4.2 Connection the Thermocouples


For measurement, plug the thermocouple into the input connectors.

4.3 selecting the Temperature Scale


When the meter was first power on, the default scale setting is set at Celsius ($^{\circ}\text{C}$) scale. The user may change it to Fahrenheit ($^{\circ}\text{F}$) by pressing “ $^{\circ}\text{C}/^{\circ}\text{F}$ ” button and vice versa to Celsius.

4.4 Data-Hold Operation

The user may hold the present reading and keep it on the display by pressing the “**HOLD**” button. When the held data is no longer needed, one may release the data-hold operation by pressing “**HOLD**” button again.

When the meter is under Data Hold operation, the “ ΔREL ”,  and “ $^{\circ}\text{C}/^{\circ}\text{F}$ ” button are disabled.

4.5 T1,T2,T1-T2 Display Control:

One may select T1,T2 or T1-T2 to show on the main display by pressing  button. When T1 or T2 is select to show on the main display, the other temperature will be shown on the second display. When one select T1-T2 to show on the main display, T1 and T2 will be shown on the second display alternately.

4.6 Relative Operation for Main Display:

When one press the “ ΔREL ” button, the meter will memorize the present reading and the difference


between the new reading and the memorized data will be shown on the display. Press the “**△REL**” button again to exit the Relative operation.


4.7 MAX/MIN/AVG Operation for Main Display:


When one press the  button the meter will enter


the MAX/MIN mode. Under this mode the maximum value, minimum value and average value of latest 8 data is kept in the memory simultaneously and updated with every new data.


When the MAX symbol is display, the Maximum is shown on the display.


Press  again, then the MIN symbol is on the display and also the minimum reading.

Press  again, the AVG symbol is on the display and also the average reading.

Press  again, MAX, MIN and AVG will blink together. This means that all these data is updated in the memory and the reading is the present temperature.

One may press  to circulate the display mode among these options.

When the meter is under  operation, “**△REL**” and “**°C/°F**” are disabled.

To exit the MAX/MIN mode, one may press and hold  for two seconds.


4.8 Auto Power Off:

By default, when the meter is powered on, it is under auto power off mode. The meter will power itself off after 30 minutes if no key operation or RS232 communication. Key combination at power on or

RS232 communication can disable auto power off.

One may press and hold “**HOLD**” button and then power on the meter and there will be two successive beeps to indicate that auto power off is disabled.

4.9 Low Battery Condition

When the battery voltage is under proper operation requirement, the  symbol will show on the LCD and the battery need to be replaced with new one.

4.10 Calibration Point:

Room Temperature $23 \pm 3^{\circ}\text{C}$

input	Adjust VR	Tolerance
0 °C	VR1	$\pm 0.1^{\circ}\text{C}$
190 °C	VR2	$\pm 0.1^{\circ}\text{C}$
1000 °C	VR3	$\pm 1^{\circ}\text{C}$
1900 °F	VR4	$\pm 1^{\circ}\text{F}$

Normally, performing offset Calibration with thermal stabled ice water through VR1 will give a very good calibration result.

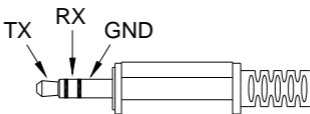
4.11 Digital Output:

The Digital Output is a 9600bps N 81 serial interface.

The RX is a 5V normal high input port.

The TX is a 5V normal high output port.

The command of Digital Output is list below.



RS232 command	Function	Remarks
K(ASC 4BH)	Ask for model No.	Send 4 bytes
D(ASC 44H)	Ask for main display Range, Data, Unit	Send 22 bytes
B(ASC 42H)	Ask for secondary display Range, Data, Unit	Send 22 bytes
S(ASH 53H)	Ask Status	Send 13 bytes
H(ASC 48H)	Hold button	
T(ASC 54H)	TIMER button	
M(ASC 4DH)	AVG/MAX/MIN button	
N(ASC 4EH)	Exit AVG/MAX/MIN mode	
R(ASC 52H)	REL button	
C(ASC 43H)	C/F button	
A(ASC 41H)	Inquire all encoded data	Send encoded 8 byte

• **Command K:**

Return 4 bytes. For example, when sends command "K" to meter, it will return "3","0","1", ASCII(13) .

• **Command D:**

Return data of main window.

Range: T1, T2, T1-T2 (7bytes), the unused characters is left as space ASC(13).

Data: ± 9999.9 , -OL,OL (7bytes include polarity and decimal point), Unit: C,F(5bytes)

When the meter receive the D command, it will send :

Range□Data□Unit.

(where □ represent space (ASC(20H))

For example:

T1□□□□□□-199.9□□C□□□□□

(0x13) represent T1,- 199.9°C, The total byte number should be 7+1+7+1+5+chr(13)=22Bytes

Command B:

Return the contents in the second display.

Command S:

Return the operation mode HOLD□MAX□REL, if the mode is not entered, the related characters will be left as space.

For example:

when the meter is under MAX display, the meter will return: □□□□□MAX□□□□□

- **Command T:**

Equivalent to one pushing on the HOLD button.

- **Command M:**

Equivalent to one pushing on the HOLD AVG/MAX/MIN button and no message is returned.

- **Command R:**

Equivalent to one pushing on the REL button and no message is returned.

- **Command C:**

Equivalent to one pushing on the C/F button and no message is returned.

- **Command A:**

1st BYTE:

The first byte is the start byte , it value is 2.

2nd BYTE:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
C/F	Low Bat	Hold	REL	K/J	MAX/AVG/MIN		

bit 2 bit 1 bit0

0 0 0 →normal mode

0 0 1 →MAXIMUM mode

0 1 0 →MINIMUM mode

1 0 0 →AVG mode

1 1 1 →calculate MAX/MIN/AVG in

back-ground and lcd

"MAX""AVG""MIN" will flash.

bit3:1→0→K TYPE 1→J TYPE

bit4:1→REL

bit5:1- HOLD 0→not HOLD

bit6:1→LOW BATTERY 0→BATTERY NORMAL

bit7:1→C 0→F

3rd BYTE:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
		point	minus	OL	point	minus	OL

bit0:1→main window value is OL 0→not OL

bit1:1→main window value is minus, 0→main window value is plus.

bit2:1→4th byte and 5th byte represent ##### 0→4th byte and 5th byte represent ###.#

bit3:1→sub window value is OL 0→not OL

bit4:1→sub window value is minus, 0→sub window value is plus.

bit5:1→6th byte and 7th byte represent ##### 0→6th byte and 7th byte represent ###.#

bit7 bit6:

00→Main window is T1-T2, sub window is T1

01→Main window is T1-T2, sub window is T2

10→Main window is T1, sub window is T2

11→Main window is T2, sub window is T1

4th BYTE: first two BCD code of main window value.

5th BYTE: last two BCD code of main window value

6th BYTE: first two BCD code of sub window value.

7th BYTE: last two BCD code of sub window value.

8th BYTE: The last byte is the end byte , it value is 3, first and last byte are used to check frame error.