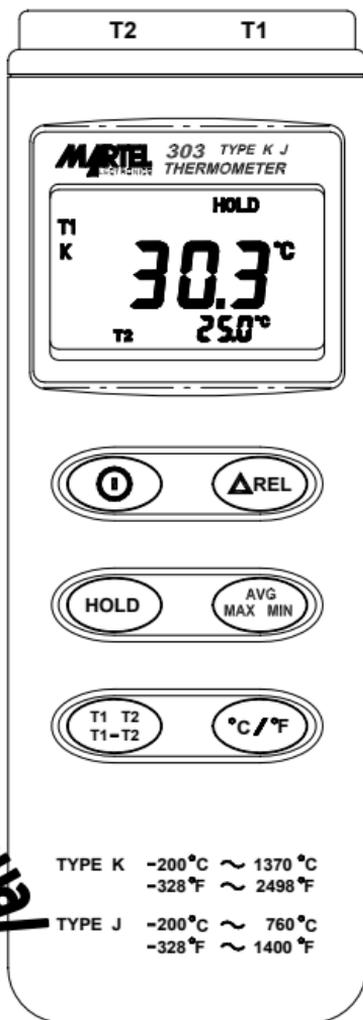


# MARTEL 303

ELECTRONICS

## TYPE K J THERMOMETER



Instruction Manual

MARTEL ELECTRONICS

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## **I. Introduction:**

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

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

## **II. Specifications:**

### **Numerical Display:**

4 digital liquid crystal display

### **Measurement Range:**

K-Type -200°C ~ 1370°C

-328°F ~ 2498°F

J-Type -200°C ~ 760°C

-328°F ~ 1400°F

### **Resolution:**

K-Type:

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

-328°F~ 1000°F, 0.1°F; else 1°F

J-Type:

-200°C~ 600°C, 0.1°C; 600°C ~760°C, 1°C

-328°F~ 1000°F, 0.1°F; else 1°F

### **Maximum Voltage at Thermocouple Input:**

60V DC, or 24Vrms AC

### **Environmental:**

Operating Temperature and Humidity:

0°C ~50°C (32°F ~ 122°F); 0~80% RH

Storage Temperature and Humidity:

-10°C to 60°C (14°F ~ 140°F); 0~80% RH

Altitude up to 2000 meters.

**Accuracy: at ( 23 ± 5°C )**

Range	Accuracy
K-Type -200°C ~ 1370°C	±(0.1% reading + 0.7°C)
J-Type -200°C ~ 760°C	±(0.1% reading + 0.7°C)
K-Type -328°F ~ 2498°F	±(0.1% reading + 1.4°F)
J-Type -328°F ~ 1400°F	±(0.1% reading + 1.4°F)

For T1-T2 Measurement, the accuracy is

±( 0.2% T1-T2 reading + 1.7°C) or

±( 0.2% T1-T2 reading + 3.4°F)

**Temperature Coefficient:**

For ambient temperatures from 0°C ~ 18°C and 28°C ~ 50°C, for each °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:** 2.5 times per second

**Dimension:** 7.36"x2.56"x1.2" (184x64x30 mm)

**Weight:** 7.4oz. Approx. (210g)

**Accessories:**

K-Type Bead Probe, Battery, Carrying Case, Instruction Manual

**Options:**

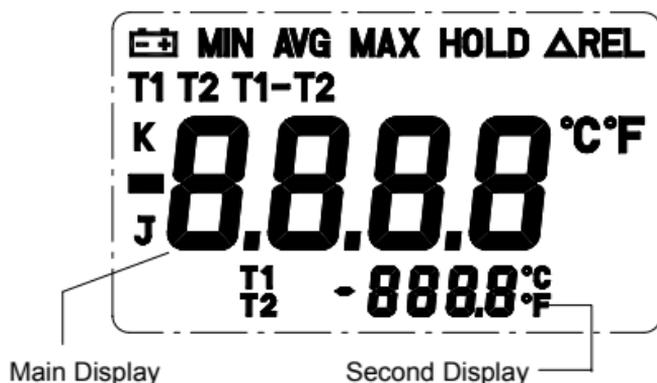
Software Package (Program, RS232 Connection Cable), AC Adapter.

**Power requirement:**

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

**Battery Life:**

Approx. 100hrs with alkaline battery

**AC Adapter:**9V<sub>DC</sub> ±15% 100mA**III. Symbol Definition and Button****Location:**

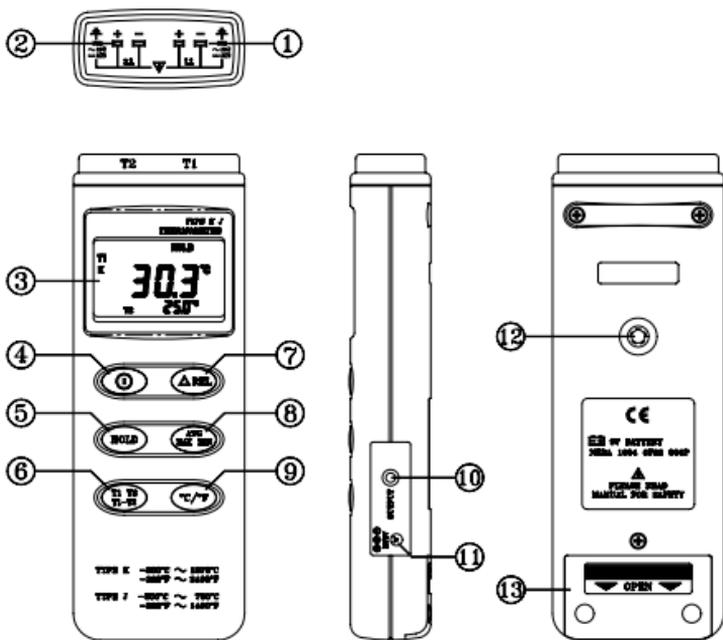
- :This indicates that the minus temperature is sensed.

°C °F :Centigrade and Fahrenheit indication.

K J :Thermocouple Type Indication

**HOLD** :This indicates that the display data is being held.**MAX** :The Maximum value is now being displayed**MIN** :The Minimum value is now being displayed**AVG** :The Average value is now being displayed.Δ**REL** :The reading is now under Relative Mode.

:The Battery is not sufficient for proper operation.



- ① T1 K J type temperature sensor connector
- ② T2 K J 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 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 Connecting the Thermocouples**

Plug the thermocouple into the input connectors.

### **4.3 Selecting the Temperature Scale**

When the meter is first powered on, the default scale is set at Celsius (°C). Change it to Fahrenheit (°F) by pressing “ °C/°F ” button, Press it again to change back to Celsius.

### **4.4 Selecting the Thermocouple Type**

By default, when the meter is powered on, it defaults to a K-Type, To change to a J-Type, press and hold the “°C/°F” button while turning on the meter.

### **4.5 Data-Hold Operation**

Hold the present reading and keep it on the display by pressing the “HOLD” button. Release the data-hold operation by pressing the “HOLD” button again.

When the meter is under Data Hold operation, the “ $\Delta$ REL”,  and “ °C/°F ” buttons are disabled.

### **4.6 T1,T2,T1-T2 Display Control:**

Select T1, T2 , or T1-T2 to show on the main display by pressing the  button. When T1 or T2 is selected to show on the main display, the other temperature will be shown on the secondary display. Selecting T1-T2 will display the difference between the T1 and T2 inputs.

### **4.7 Relative Operation for Main Display:**

When the “ $\Delta$ REL” button is pressed, the meter will

memorize the present reading and will then display the difference between the new reading and the memorized data. Press the “ $\Delta$ REL” button again to exit the Relative operation.

#### 4.8 MAX/MIN/AVG Operation for Main Display:

When the  button is pressed, the meter will enter the MAX/MIN mode. In this mode, the maximum value, minimum value, and average value of latest four (4) data samples is kept in the memory simultaneously, and updated with every new data sample.

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

Press  again, the MIN symbol will show on the display along with the minimum reading.

Press  again, the AVG symbol will show on the display along with the average reading.

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

Press  to circulate the display mode among these options.

When the meter is in the  mode, “ $\Delta$ REL” and “ °C/°F ” are disabled.

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

#### 4.9 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 there are no key operations or

RS232 communication. To disable the auto power off feature, press the "HOLD" button while turning on the meter. Two successive beeps indicates the auto power off feature is disabled.

#### 4.10 Low Battery Condition

When the battery voltage falls below that required for proper operation, the  symbol will show on the display. Replace the battery.

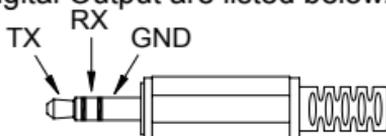
#### 4.11 Digital Output:

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 commands for the Digital Output are listed below.



RS232 command	Function	Remarks
K(ASC 4BH)	Ask for model No.	Send 4 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","3", ASCII(13) .

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

- **Command T:**  
Equivalent to pushing the HOLD button.
- **Command M:**  
Equivalent to pushing the HOLD and AVG/MAX/  
MIN buttons and no message is returned.
- **Command R:**  
Equivalent to pushing the REL button and no  
message is returned.
- **Command C:**  
Equivalent to pushing the °C / °F button and no  
message is returned.

- **Command A:**

**1<sup>nd</sup> BYTE:**

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

**2<sup>nd</sup> 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

**3<sup>rd</sup> 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→4<sup>th</sup> byte and 5<sup>th</sup> byte represent ##### 0→4<sup>th</sup> byte and 5<sup>th</sup> 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→6<sup>th</sup> byte and 7<sup>th</sup> byte represent ##### 0→6<sup>th</sup> byte and 7<sup>th</sup> 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

**4<sup>th</sup> BYTE:** first two BCD code of main window value.

**5<sup>th</sup> BYTE:** last two BCD code of main window value

**6<sup>th</sup> BYTE:** first two BCD code of sub window value.

**7<sup>th</sup> BYTE:** last two BCD code of sub window value.

**8<sup>th</sup> BYTE:** The last byte is the end byte , its value is 3, first and last byte are used to check frame error.

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