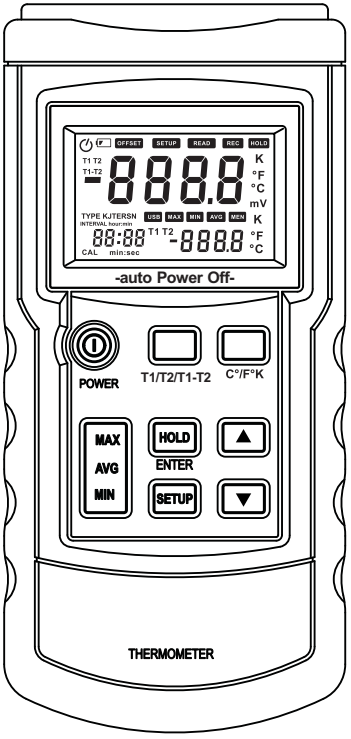
Digital Thermometer



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1.Safety Information

In order to properly use the thermometer, please read this user's manual carefully before using, especially the “Safety Information” section. It is recommended that you keep this manual properly, either with the meter or in a place where you can refer to at any time.

⚠ Warning

Warning indicates a situation or action which may cause danger to the user. To avoid electrical shock or personal injury, please follow these procedures:

- Before using the thermometer, check the case for damage and missing parts, especially the insulation around joints. If the thermometer appears to be damaged, do not use.
- First, disconnect thermocouple and thermometer before opening the meter case.
- When the battery indicator “ ▭ ”appears, the battery should be replaced immediately.
- If the thermometer doesn't work normally, do not continue to use it. Protective equipment may be damaged. If there is doubt, the meter should be sent to a designated repair site.
- Do not use the thermometer in explosive gas, vapor or dusty environments.

- Do not apply voltage exceeding the rated voltage marked on the thermometer (30V) between thermocouples or between thermocouple and ground.
- When there is possible potential difference between thermocouples, insulated thermocouple should be used.
- Repairs to the thermometer should be made using specified replacement parts.
- When the thermometer case is opened, do not use.

⚠ Caution

Situations or actions which may cause damage to the meter or equipment in testing are listed below. To avoid damage to the meter or equipment, please use it carefully.

- Select appropriate thermocouple, function grade and measuring range when using the thermometer.
- When dual-line measurement is used, ensure that there is no potential difference between two lines.
- Do not attempt to charge the batteries.
- When installing batteries, note the “+” and “-” polarities of batteries.

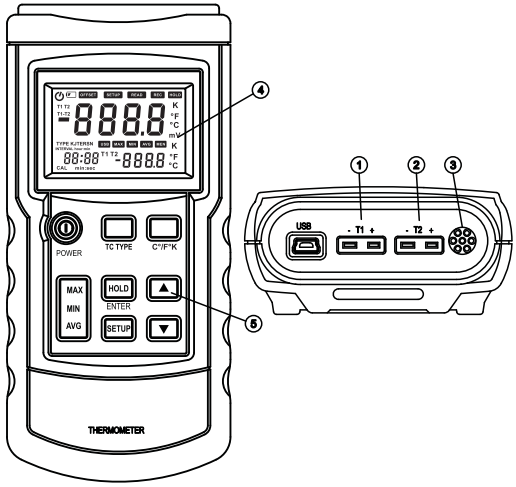
2. Product Overview

This digital thermometer uses a thermocouple with microprocessor as the temperature sensor. It has the following features:

- Suitable for various thermocouples, such as K, J, T, E,
- It can show results with °C, °F and K (Kelvin)
- Maximum, minimum and average value measurement
- Data hold
- Thermocouple deviation compensation
- Relative time display
- Automatic power-off (automatic power-off time can be set by users)
  Self-calibration (please read “User Self-calibration” section carefully before using this function)
- Dual-line input (T1, T2)

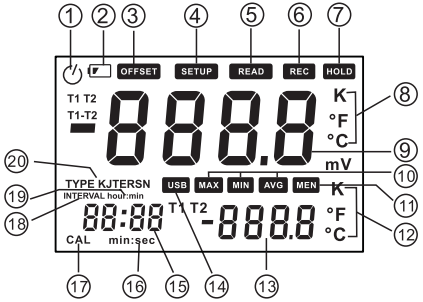
3. Meter Description

3.1 Components



① Thermocouple T1 input
② Thermocouple T2 input
③ Measure under normal temperature
④ Display
⑤ Key

3.2 Display



①	Automatic power-off indicator
②	Low battery indicator. Battery should be replaced.
③	Thermocouple measurements include a deviation value
④	Status setup indicator with flashing display
⑤	Indicator to display saved data
⑥	Indicator to save data automatically with flashing display
⑦	Data hold state
⑧	Main display unit
⑨	Main display
⑩	MAX, MIN, AVG
⑪	Indicator to save data
⑫	Auxiliary display unit

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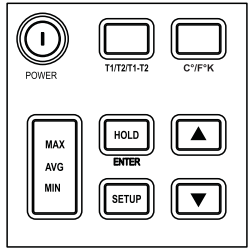
⑬	Auxiliary display
⑭	USB port
⑮	Time display
⑯	Indicate time display min: sec
⑰	Indicate calibrating state
⑱	Indicate auto-save time setting
⑲	Indicate time display hour: min
⑳	Indicate thermocouple type

3.3 Keys Description



POWER	Power on or off thermometer
T1/T2/ T1-T2	Select to display T1, T2 and T1-T2
˚C/˚F/K	Unit selection: Celsius (°C), Fahrenheit (°F), Kelvin (K)
MAX/MIN /AVG	View maximum, minimum and average value. Long press to close
HOLD	Data hold
ENTER	To confirm, see user setting for details
SETUP	To set, see user setting for details
▲	To change setting options or add functions, see specific operation for details
▼	To change setting options or reduce functions, see specific operation for details

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4. Setting Meter

4.1 SETUP Option

Press the SETUP key to enter setup mode. "SETUP" symbol will flash on the screen, Press it again to switch setting states sequentially. Save all previous settings before exiting. If the meter is turned off in the process of setting, setting changes will not be saved. Changed settings will take effect immediately after exiting setup mode.
Loop sequence: thermocouple type setting (TYPE) - OFFSET (T1) setting - OFFSET (T2) setting - automatic power-off time setting - system time setting (S-T) - power frequency setting (LinE) - normal temperature compensation (NTC) switch setting - auto-calibration switch setting (CAL) - save setting and return to normal measurement state (if self-calibration is set to ON, return to the calibration state, then turn the meter off and restart to return to normal measurement state).

4.2 SETUP Option Setting

1. Thermocouple type setting (TYPE)
   Enter thermocouple type setting mode. Use ▼▲ to set thermocouple types: K, J, T, E
2. OFFSET (T1) setting
   Users can adjust the thermometer displayed value to compensate for a certain kind of thermocouple error. See “Adjust the temperature sensor error with deviation value” section.
   Allowable adjustment range is ±6°C.
   After entering OFFSET (T1) setting state, the offset value setting can be changed with ▼▲ .

Note: When this offset value is no longer required, please restore this offset value to 0.0. Changing the thermocouple type will automatically restore offset value to 0.0.

3. OFFSET(T2) setting
   Users can adjust the thermometer show value to compensate for a certain kind of thermocouple error. See “Adjust the temperature sensor error with deviation value” section. Allowable adjustment range is ±6°C.
   After entering OFFSET (T2) setting state, the offset value setting can be changed with ▼▲ .

Note: When this offset value is no longer required any more, please restore this offset value to 0.0. Changing the thermocouple type will automatically restore offset value to 0.0.

4. Automatic power-off time setting (P)
   Enter the automatic power-off time setting mode. “P-” will show on the screen. Set automatic power-off time (5 to 60 minutes) with ▼▲ . Hold ▼▲ to quickly increase or decrease. Set the sleep time less than 5 minutes to show “OFF”, turns off the automatic power-off function.
   When automatic power-off function is active, “ ⏻ ” will show on the screen; otherwise, it won't display.
   Automatic power-off time is counted from last key operation.
   When the thermometer is in automatica data recording and PC communication state, it won't enter automatic power-off state
5. System time setting (S-T)
   System time is the time from powering on. It will automatically be cleared after power failure.
   Enter the system time setting. “S-T” will show on the screen. The system time can be set with ▼▲ .

Press ENTER key to select time format, including "hour:min" or "min:sec". Hold ▼▲ to quickly increase or decrease. If this setting is not changed, the system time is the current thermometer running time.

6. Power frequency setting (LinE)
   To get the best measurement results, please set the thermometer's power frequency to local usage Enter the power frequency setting. "LinE" will show on the screen. Select and set interference frequency to 50Hz or 60Hz with ▼▲ .
7. Normal temperature compensation (NTC) switch setting Enter the normal temperature compensation (NTC) switch setting mode. "NTC" will show on the screen. By default, it is in ON state upon booting. ON/OFF can be set for normal temperature compensation with ▼▲ . The thermometer will automatically restore to ON state after reboot.
8. Auto-calibration switch setting (CAL)
   Enter the ON/OFF setting of auto-calibration (CAL) mode. "CAL" will show on the screen. By default, it is in OFF state upon booting. ON/OFF can be set for calibration function with ▼▲ . By setting this item to ON, users can enter the calibration mode. See "User Self-Calibration" for details.
   Note: Use this function with caution!

5. Using The Meter

5.1 Connecting Thermocouple

1. Insert the thermocouple to input jack
2. Press the power key to turn on the thermometer power
3. Set the thermocouple type to be consistent with the inserted thermocouple type

Note: If the thermocouple is not connected to the selected input end or the thermocouple is "open", or when it exceeds measuring range, "OL" will show on the thermometer.

5.2 Displaying Temperature

1. Press °C/°F/K key to select appropriate temperature unit
2. Put the thermocouple to the testing position
3. Measurement results will display on the screen

5.3 Data Hold

1. Press HOLD to keep reading on the screen. " HOLD " will show on the screen
2. Press HOLD key again to close "HOLD" function and restore measurement state.

5.4 Viewing MAX, MIN and AVG Readings

1. Press MAX/MIN/AVG key to view MAX, MIN and AVG readings.
2. Hold MAX/MIN/AVG key to exit MAX/MIN/AVG view mode

5.5 Use offset Value To Adjust Temperature Probe Error

Use OFFSET (T1) and OFFSET (T2) in the SETUP option to adjust the thermometer readings to compensate for a certain kind of thermocouple error.

1. Put the thermocouple in a known and stable temperature environment (such as in ice bath or dry well calibrator)
2. Stabilize the temperature reading
3. Under the SETUP option, adjust OFFSET value until the temperature reading on the auxiliary display is consistent with the calibrated temperature (see “SETUP Option Setting”).

5.6 User Self-Calibration

After users enter calibration mode, the meter can be calibrated. Calibration points and calibration methods are shown here:

1. Calibration point:
   a) Normal Temperature 25°C
   b) T1 input channel, 0μV and 40.000mV
   c) T2 input channel, 0μV and 40.000mV
2. Calibration methods:
   a) Put the thermometer into a thermotank with the temperature of 25°C for 3 to 5 minutes.
   b) Power on the thermometer to stabilize the thermometer.
   c) Set self-calibration (CAL) to ON state in the “SETUP” setting option, and exit setting state. It will return to the calibration state.
   d) Adjust the screen temperature with ▼▲ keys until the temperature is consistent with the thermotank.

e) Press “ENTER” key to save the current calibration value.
f) Press “T1/T2/T1-T2” key to switch to T1 measurement channel.
g) Input 0μV in T1 measurement channel
h) After stabilizing, press “ENTER” key to save the current calibration value.
i) Input 40.000mV in T1 measurement channel
j) After stabilizing, press “ENTER” key to save the current calibration value.
k) Press “T1/T2/T1-T2” key to switch to T2 measurement channel.
l) Input 0μV in T2 measurement channel
m) After stabilizing, press “ENTER” key to save the current calibration value.
n) Input 40.000mV in T2 measurement channel
o) After stabilizing, press “ENTER” key to save the current calibration value.
p) Power off and restart to complete calibration.

Note: Make sure your standard source is accurate, then make calibration. The user is responsible for using an accurate calibration source. If the meter is inaccurate due using an inaccurate calibration source, the user bears the liability.

6. Meter Maintenance

6.1 Replace Battery

When the battery indicator "▭" appears on the thermometer, the battery should be replaced immediately. The procedure is:

1. Turn off the thermometer power
2. Release the battery cover screw to remove the battery cover
3. Replace with 9V battery
4. Put the battery cover back and tighten screw.

6.2 Clean

When the thermometer surface is dirty and cleaning is required, use a soft cloth or sponge to wipe gently with a little clear water, soap water or commercial detergent. To avoid damage, don't immerse the thermometer in water.

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7.Technical Data

The indicator is accurate within the temperature range from 18°C to 28°C, when relative humidity is not more than 80%. Warranty period is one year (not including thermocouple error).

Function	The meter	
Thermocouple type	K, J, T, E	
Measurement channel	T1/T2	
Measurement range	K: -200.0°C to +1372°C -328.0°F to +2501°F J: -210.0°C to +1200°C -346.0°F to +2192°F T: -250.0°C to +400°C -418.0°F to +752°F E: -150.0°C to +1000°C -238.0°F to +1832°F R: 0°C to +1767°C 32°F to +3212°F S: 0°C to +1767°C 32°F to +3212°F N: -200.0°C to +1300°C -328.0°F to +2372°F	
Display resolution	0.1°C/ °F / K<1000° (1°C/ °F / K for R-type and S-type) 1°C/ °F / K >1000°	
Precision T1/ T2/T1-T2	±[0.5% +0.5°C]	K,J,T,E:±(0.2%+0.5°C) R,S:±(0.2%+1°C) N:±(0.2%+0.5°C)

	<-10°C: within +0.5°C； <-200°C: within +1°C T-type < -200°C for reference only
Time	Relative time
Data record	0~999, 1000 groups in total
Temperature scale	ITS-90
Applicable standard	NIST-175
Setting functions	Recording interval setting*, thermocouple type setting, thermocouple offset setting, automatic power-off time setting, system time setting, power frequency setting, temperature compensation switch setting, self-calibration switch setting, data clearing*
Power supply	9V Battery