SECURITY OR SAFETY
controllers & more

D55 Digital portable thermo meter

Distribuidor Master HANYOUNG nux

CONTENTS

Introduction

This product has a microcontroller inside and this is a digital thermometer that uses a K- or J-type thermocouple as a temperature input sensor. Temperature indication follows IEC584 temperature/voltage tables. A TC-POP-type thermocouple is included in the package of the product.

Before using this thermometer, please read the safety information and for the first time user, please follow the instructions described in 6.Operating Instruction to use the thermometer properly.

Safety information

Alerts declared in the manual are classified to Danger, Warning and Caution by their criticality

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury

⚠ DANGER

In order to avoid electric shock, do not use this thermometer when the voltage of the target surface is above 24 V a.c or 60 V d.c.

⚠ WARNING

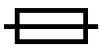
1. In order to avoid damages or burns, do not attempt to measure temperature inside a microwave oven with this thermometer.
2. In order prevent electric shock, please remove the thermocouple connector from the main unit before opening the main unit case.
3. Do not use this thermometer in areas exposed to flammable and explosive gas because it is not designed for the explosion protection.
4. It may lead to injury or property damage if this thermometer is used other than the manufacturer's intended use.

⚠ CAUTION

1. The specification and contents in this user manual are subject to change without prior notice.
2. Please check that the specification of the product is matched with what you ordered.
3. Please inspect whether that the product is damaged during a shipment.
4. Do not bend the thermocouple cable excessively for several times because there is a possibility of disconnection. Specially, do not bend the cable too close to the connector.
5. In order to prevent damages or malfunction of the product, please supply the rated voltage.

6. There should not be interference when measuring temperature.
7. Please use this product in a place where the operating ambient temperature is 0 ~ 50 ℃ (Max. 40 ℃ for a close installation) and humidity is 35 ~ 85 % RH (without condensation).
8. Please use this product in a place where corrosive gas (such as harmful gas, ammonia, etc.) and flammable gas do not occur.
9. Please use this product in a place where there is no direct vibration and a large physical impact to the product.
10. Please use this product in a place where there is no water, oil, chemicals, steam, dust, salt, iron or others (Contamination class 1 or 2).
11. Please do not wipe this product with organic solvents such as alcohol, benzene and others. (Please use mild detergent)
12. Please avoid places where excessive amounts of inductive interference and electrostatic and magnetic noise occur and heat accumulation occurs due to direct sunlight or radiant heat.
13. Please use this product in a place where the elevation is below 2,000 m.
14. In order to use this product properly and safety, we recommend periodic maintenance.
15. Some parts of this product have limited expected lifetime and aged deterioration.
16. The warranty of this product (including accessories) is 1 year only when it is used for the purpose it was intended under normal condition.
17. Before using a temperature controller, there could be a temperature difference between PV of the temperature controller and the actual temperature so please operate the temperature controller after compensating the temperature difference appropriately.

※ International symbol in this manual.

	OFF		High voltage danger
	ON		Earth
	AC		Refer to explanation in manual
	DC		Double Insulation
	DC or AC		Fuse

2. OPERATING LIMITATIONS

The thermometer is designed to operate within below ranges.

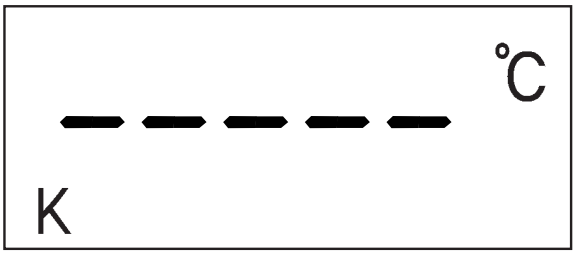
● THERMOCOUPLE MEASUREMENT RANGE

K Type thermocouple (Yellow color plug)
: -100 ℃ ~ 1300 ℃ (-148 ℉ ~ 2372 ℉)
J Type thermocouple (Black color plug)
: -100 ℃ ~ 760 ℃ (-148 ℉ ~ 1400 ℉)

● ENVIRONMENT CONDITION

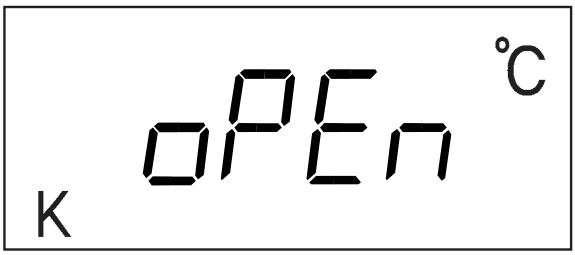
Temperature : 0 ℃ ~ 50 ℃(32 ℉ ~ 122 ℉)

Humidity : 0 % RH ~ 90 % RH(0 ℃ ~ 35 ℃)
(32 ℉ ~ 95 ℉)
0 %RH ~ 70 %RH(35℃ ~ 50 ℃)
(95 ℉ ~ 122 ℉)



〈Figure 1〉

(Over temperature range)



〈Figure 1〉

(Open thermocouple)

Thermocouple limitations will be shown later in manual. If you use anther brand's T/C, please refor to specifications for that.

3. FUNCTIONS

3-1 DISPLAY

The display is described as below.
Number in circle is the same as Figure 2.

① Temperature display
It indicates the temperature of T/C connected to the input.

② ℃/℉ Temperature scale
It is indicating whether degrees celsius or degrees fahrenheit.

③ HOLD Mode

It is shown that the thermometer is in HOLD mode. (Refer to HOLD mode in later)

④ Low battery indication

This symbol indicates replacement of battery. Replace the battery as soon as possible. (Refer to battery replacement in later)

⑤ J K Thermocouple indication

This symbol indicates which type of thermocouple using.

(NOTE) To get corrent measurement value, select a sensor type according to sensor which is set up to the thermometer.

⑥ MIN/MAX

MIN indicates minimum temperature emorized, MAX indicates maximum temperature memorized.

⑦ AUTO

When selecting AUTO, temperature of T1 sensor, T2 sensor, and T1-T2 sensor will be indicated in order.

⑧ T1/T2/T1-T2

T1, T2, T1-T2 indicate temperature respectively.

3-2. CONTROL SWITCHES

The control switches are described as below. Number on circle is the same as Figure 2.

⑨ ON/OFF

This switch turns the thermometer ON or OFF.

⑩ ℃/℉

This switches between ℃ and ℉.

(When pressing this switch more than 3sec., temperature correction mode will be selected.)

⑪ HOLD

Pressing HOLD key selects HOLD mode. (Refer to HOLD mode in later)
If pressed the HOLD switch when power ON, thermocouple type will be changed. (But, in temperature correction mode it is operated by increase switch)

⑫ MAX/MIN

Pressing this switch, Maximum temperature or Minimum temperature will be indicated. (But, in temperature correction mode it is operated by decrease switch)

⑬ AUTO

Pressing this switch, temperature of T1, temperature of T2 and T1-T2 (Temperature difference betweentwo sensor) will be indicated in turns.

⑭ T1

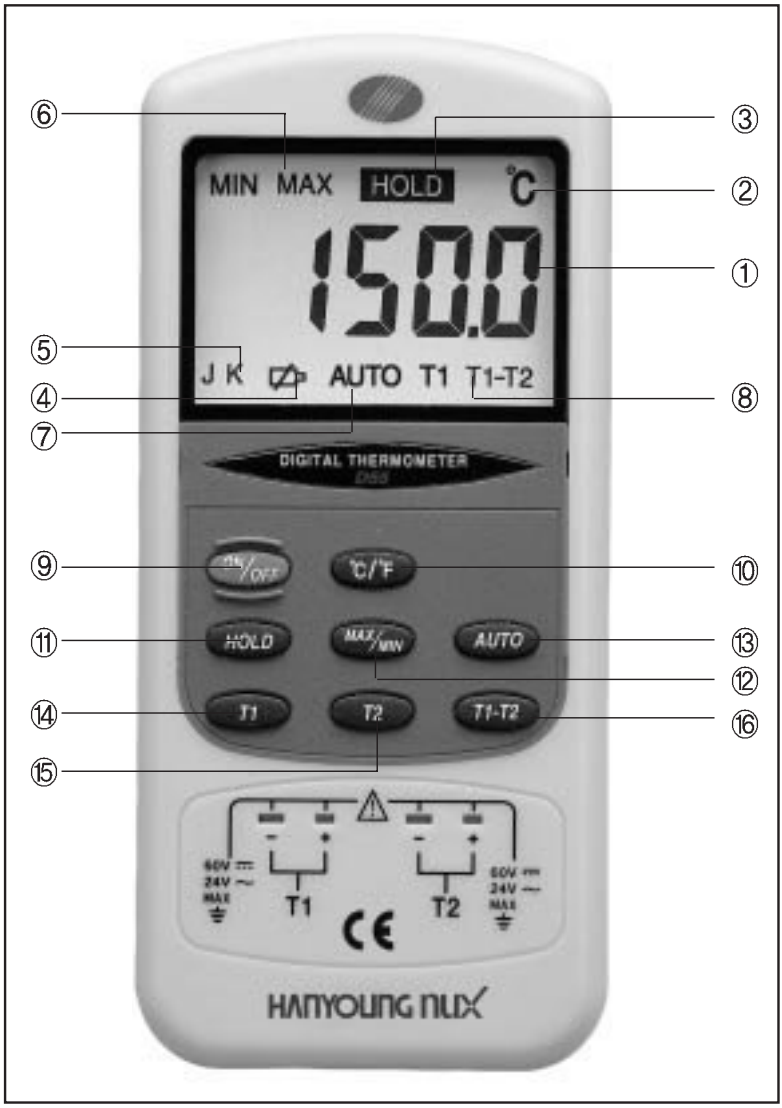
Pressing this switch, temperature of T1 sensor will be selected.

⑮ T2

Pressing this switch, temperature of T2 sensor will be selected.

⑯ T1-T2

Pressing this switch, temperature difference between T1 and T2 will be indicated.



〈Figure 2〉 Functional description

4. OPEN THERMOCOUPLE INDICATION / OVER TEMPERATURE RANGE INDICATION

It is indicated in case of below.
(Refer to Figure 1)

4-1. If thermocouple is opened or not connected, OPEN will be indicated.

4-2. In case of exceeding temperature range, ----- is indicated. While indicating like above, display indicate functions selected (T/C type, temperature scale, etc).

5. OPERATING GUIDE

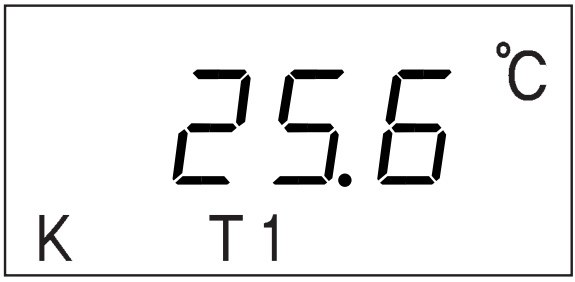
This procedure is intended to familiarize with operating thermometer.
It starts in condition of disconnecting from thermometer.

5-1. Press the ON/OFF switch.

Self-test will be shown.(Figure 2)
The display indicates (Figure 1) and point out disconnection of thermocouple.(OPEN)
At power on, the thermometer is set up to connect K type thermocouple.
(Refer to selecting of termocouple type to select J type)

5-2. Connect K type (Yellow plug) thermocouple to input connector.

The thermometer indicates a temperature of thermocouple. (Figure 3)



〈Figure 3〉 Example temperature

5-3. Press HOLD switch and stop all temperature measurements.

Last measurement value has indicated.
Press HOLD switch again to continue measurement.

6. OPERATING DESCRIPTION

6-1. POWER ON

All display segments light a lamp while the thermometer fulfil self-test when the thermometer is turned on. (Figure 2)

After 3 seconds, the thermometer indicates the first measurement value. If thermocouple is not connected, the display shows ERROR.(Figure 1)

6-2. CONNECT THE THERMOCOUPLE

This thermometer can be used K type or J type thermocouple. To get corrent measurement value, select a sensor type according to sensor which is set up to the thermometer. The setting condition is indicated in display as K or J.

This thermometer is set K type thermocouple at the factory.

This is set to TC-POP type thermocouple.

To use thermometer for J type thermocouple, refer to selecting the thermocouple type.

The thermometer indicates a temperature of thermocouple connected to input.

When thermocouple is not connected or opened, OPEn will be indicated. (Figure 1)

6-3. CHANGING THE TEMPERATURE SCALE

℃ or ℉ is indicated at the display.

When the thermometer is turned on, a temperature scale which was used right before is indicated.

To change the temperature scale, press ℃/℉ switch.

6-4. HOLD MODE

When pressing (HOLD) switch, HOLD is indicated and retains the last value at the display.

Press (HOLD) switch again to remove HOLD MODE and to continue measurement.

While the HOLD MODE is selected, ℃ or ℉ will be changed.

6-5. SELECT THE THERMOCOUPLE TYPE

This thermometer can be used K type or J type thermocouple.

K type is set when power up because the thermometer is set K type at the factory.

To select J type thermocouple, turn the thermometer off.

Then, press (HOLD) switch and (ON/OFF) switch at the same time.

The thermocouple type will be indicated at the lower.

[NOTE]

Check the displayed thermocouple type matches the thermocouple type you are using.

To change the thermocouple type, refer to selecting the thermocouple type.

[OFFSET ADJUSTMENT]

To allow the variation in standard thermocouple, the OFFSET control is set at the factory.

You could get measurement accuracy at a particular temperature by adjusting the OFFSET contrd.

[NOTE]

When planning to do long term measurement at a single temperature with a particular thermocouple, the OFFSET should be only adjusted. The OFFSET control does not need to be adjusted to obtain accuracy for the thermometer and the thermocouple.

Press (℃/℉) switch for 3 sec. to enter OFFSET contrd mode. At that time, HOLD and T1 or T2 will be flickering at the display.

To increase value, press (HOLD) switch and to decrease value, press (MAX/MIN) switch.

After adjusting, press (℃/℉) for 3 sec. to display measurement temperature.

If not pressing any switches for 30 sec., the thermometer displays measurement temperature automatically.

6-6. INDICATING MAX. MEASUREMENT VALUE OR MIN. MEASUREMENT VALUE

If pressing MAX/MIN for 3 sec., (MAX/MIN) is flickering. From now, the thermometer memorize maximum and minimum temperature measured.

When pressing MAX/MIN switch, a max. value and min. value will be indicated respectively.

6-7. T1, T2, T1-T2 INDICATION

By pressing (AUTO) switch, T1, T2, temperature will be indicated in turns.

Press (AUTO) again to display T1 or T2 selected.

6-8. ADJUSTING THE OFFSET

Perform the follow procedure.

1. After connecting the thermocouple to input connector of thermometer, turn the thermometer ON.
2. Take thermocouple to stable temperature environment at the temperature you wish to measure and wait until the measurement temperature is stabilized.
3. Adjust the OFFSET control so that thermometer matches temperature of the known environment.
   Leave sufficient time for measurement lag .

6-9. INTERNAL CALIBRATION

This thermometer should be calibrated to get its accuracy once a year.
Ask the calibration to the service center nearest you.

6-10. MEASUREMENT TECHNICS

To get accuracy, please read below.

6-10-1. Choosing a thermocouple probe

To get optimum accuracy, use the probe which is proper for each application.
For example, use the immersion probe to measure liquid or gel, the air probe to measure air, the surface probe for surface measurements.

6-10-2. Thermocouple connector

Thermocouple connector are made from the same materials with thermocouple wire.

To keep accuracy, using thermocouple connect that materials proper the thermocouple you are using.

The thermometer has thermocouple probe with the correct type connector.

When connecting a small-sized thermocouple plug to K type or J type thermocouple, confirm the type of connect which matches the thermocouple type.

Connection method as table 1.

<Table 1> Thermocouple Connections

K type (Yellow connector body)	
Positive(+)Lead :	Non-magnetic Yellow insulation (When using color coded) Chromium-nickel alloy (Chromel) Connect to narrow connector
Negative(-)Lead :	Magnectic Red insulation (When using color coded) Aluminum-nickel alloy (Alumel) Connect to wide connector
J type (Black connector body)	
Positive(+)Lead :	Magnectic White insulation (When using color coded) Iron Connect to narrow connector
Negative(-)Lead :	Non-magnetic Red insulation (When using color coded) Copper-nickel alloy (Constantan) Connect to wide connector

6-10-3. Reducing Thermal Error

When measuring a surface temperature, error can occur if there is a poor connection between thermocouple and object measured.

To reduce thermal error, please follow as follow.

1. Clean the surface of object
2. Use proper contact pressure
3. Use thermal conducting compound (silicone grease etc) between thermocouple and the surface.
   (If permanent connection, use thermal epoxy.)

- When you measure above temperature than ambient, adjust the connection of thermocouple to surface until getting the highest temperature.
  Please use above methods.
- When you measure below temperature than ambient, adjust the connection of thermocouple to surface until getting the lowest temperature.
  Please use above methods.
- When you measure near temperature with ambient, read measuring value stablilized.

6-10-4. Cause of error

High voltage at the surface measured can cause error and damage of instrument.
Use caution when you measure live circuit.
Observe the maximum voltage limitation (24 V a.c or 60 V d.c).
An electric field can cause incorrect temperature measure.

6-10-5. Thermocouple limitations

Thermocouple ability is depending on the inherent accuracy, environmental and electrical limitations.

The limitations of K type and J type are at the TABLE 2.

〈 Table 2 〉 Thermocouple characteristics

J type thermocouple
Temperature Range : -200 ℃ ~ +760 ℃ -328 ℉ ~ +1400 ℉
Environmental Limitation : OK for rudicing atmospheres or vaccum. Not OK for sulfurous atmospheres.
COLOR CODE : See Table 1
Initial Tolerances : Standard = ±2.2 ℃ or 0.75 % (±3.96 ℉ or 0.75 %)
K type thermocouple
Temperature Range : -270 ℃ ~ +1370 ℃ -454 ℉ ~ +2498 ℉
Environmental Limitation : OK for in the O_2, N_2, CO_2 ges, Not OK for in the H_2, CO gas or corrodes in low-oxygen atmaspheres.
COLOR CODE : See Table 1
※ Whichever is larger

6-11. BATTERY REPLACEMENT

The thermometer is powered by single 9V battery.(6F22 or 006P)

How to change battery.

1. Press △ at the rare case and then thrust with thumb to open the cover.
   Change the battery and connect.

6-12. PROPER DEALING OF THERMOCOUPLE

Please keep the following cautions to maintain a thermocouple in a good condition.

- Avoid excess bending. Bending can change the thermocouple characteristics.
- Do not overheat the thermocouple.
  Consider the specification for the maximum temperature of any thermocouple assembly.
  The wire itself can lose its accuracy if it is used for a long period.
- Avoid chemical reactions.
  Chemical reactions can damage the thermocouple.

6-13. CLEANING

Clean the thermocouple with a damp cloth and a mild detergent.
Do not use abrasives, solvents, or alcohol.

6-14. INSTRUMENT SPECIFICATION

See the Table 3.

6-15. SERVICE CENTER REPAIR

Send the faulty to the service center.
Please write a description of fail.
Hanyoung has NO responsibility for damage in transit.

※ We will repair or replace when the faulty is in warranty at no charge.
(But, abuse or accidental damage will be quoted.)

6-16. OUT OF WARRANTY AREA

Please ask details to service center.

6-17. INSTRUMENT SPECIFICATIONS

Electrical

〈 Table 3 〉

Classi-fication	Specification
Measurement Range	K type thermocouple : −100 ℃ ~ +1300 ℃ (−148 ℉ ~ +2372 ℉) J type thermocouple : −100 ℃ ~ +760 ℃ (−148 ℉ ~ +1400 ℉)
Resolution	K type thermocouple : 0.1 ℃ or 0.2 ℉ at −50 ℃ to 1200 ℃ 1 ℃ or 1 ℉ at the out of −50 ℃ to 1200 ℃ J type thermocouple : 0.1 ℃ or 0.2 ℉ at −50 ℃ to 760 ℃ 1 ℃ or 1 ℉ at −50 ℃ to −100 ℃
Accuracy	K type thermocouple : ±(0.1 % of display+ 0.7 ℃) ±(0.1 % of display+ 1.3 ℉) J type thermocouple : ±(0.1 % of display+ 0.8 ℃) ±(0.1 % of display+ 1.4 ℉)
Input Protection	Input voltage between input pins is 60 V d.c or 24 V rms a.c.
Environmental	Ambient temperature : 0 ℃ ~ 50 ℃ (32℉ ~ 122 ℉) Storage temperature : −40 ℃ ~ 60 ℃ (−40 ℃ ~ 140 ℉) Humidity : 0 % ~ 90 % (0 ℃ ~ 35 ℃, 32 ℉ ~95 ℉) 0 % ~ 70 % (35 ℃ ~ 50 ℃, 95 ℉ ~ 122 ℉) RF Fields : Electric field of Low-frequency or High-frequency may occur error.
Weight	About 216 g
Battery	Standart 9 V (6F22 or 006P) Life : About 200 hours

This specification is for the thermometer and it is not proper to the thermocouple.
Please read specification of thermocouple before using.

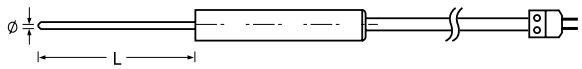
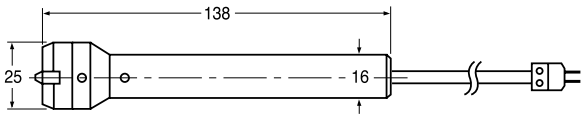
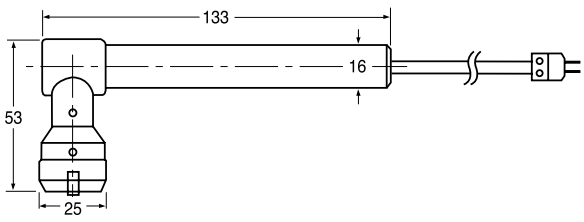
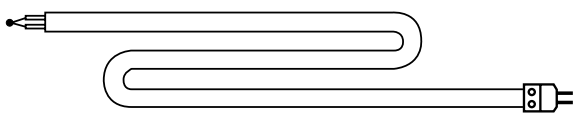
- Thermocouple Specifications -

Type : K (Alumel, chromel)

Operation range : -40 ℃ ~ 260 ℃ (-40 ℉ ~ 560 ℉)

Operating limitations are depending on condition of the thermocouple limltations.

- Figure of thermocouple -

TC-PJP	
TC-PIP	
TC-PLP	
TC-POP	

(※ Wire length 1 m)

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