SPMK 斯贝克
INSTRUMENT

SPMK313X

Portable Temperature Measuring Furnace

Beijing Spake Technology Co., Ltd.

SPMK313X Portable Temperature Measuring Furnace

Operation Manual

[Version No.: V1.0]

Contents

1 Overview

Welcome to select SPMK313X portable temperature measuring furnace. Compared with similar products, the SPMK313X portable temperature measuring furnace has a smaller size, quicker rise or drop in temperature and more stable temperature control. With high-brightness backlight LCD display, simple operation and solid structure, the product is compact & portable and economical & practical. It is ideal calibration equipment of process control instruments, suitable for instrument workshops, measuring rooms and calibration laboratories. The SPMK313X portable temperature measuring furnace is mainly used to calibrate temperature elements (RTD, platinum RTD and thermometer), temperature transmitters (sensor), temperature switches and other similar temperature instruments and widely applied to industrial and mining enterprises, research institutes, military industry, measuring department and other departments.

The SPMK313X portable temperature measuring furnace adopts high-end technologies such as high-precision and high-stability temperature controllers developed independently, dual-channel precision measurement technologies and special electrical heating materials to maintain a domestic advanced level of object insertion depth, horizontal temperature field, vertical temperature field and other technologies in China and keep pace with foreign advanced technologies.

The SPMK313X portable temperature measuring furnace can perform intelligent instrument detecting function. With advanced software and hardware technology, the product is designed specially for high-precision and multifunction calibration. It can excellently perform measurement and detection of signals for RTD, thermocouple, DC voltage, millivolt

voltage, DC current and thermal switch but also supply power to transmitters under standard 24V voltage.

For safety, the SPMK313X portable temperature measuring furnace adopts a creative design to perform protection functions such as built-in load short-circuit protection, load circuit break and sensor protection to greatly ensure safety of users on the site and improve safety reliability of products.

The product has passed rigorous testing. If finding product quality problems or damage in the transportation, please directly contact with our customer center. Do not attempt to dismantle the product. Please carefully read the operation manual to properly use the product. The product should be preheated for 30 minutes before operation to ensure measurement accuracy.

2 Functions and Parameters

2.1 Functions

2.1.1 Measurement Characteristics:

1. It can measure signals of DC voltage, millivolt voltage, DC current, resistance, switch on-off, etc.;
2. It can measure eight kinds of thermocouples (S, B, R, E, J, K, T and N) and four kinds of RTD (Pt100, Pt10, Cu100 and Cu50) and offers cold junction compensation to provide more conveniences for users;
3. It can perform standard measurement for the following three standards: Standard Thermocouple (S), Standard RTD (Pt25) and Standard RTD (Pt100) and can set parameters of three standards;

4. It can supply 24V power for measurement of transmitter signals in a convenient and efficient manner;
5. It can perform dual-channel measurement function to achieve non-interference and simultaneous use.

2.1.2 Temperature Characteristics

1. It takes a leading position of object insertion depth in the industry and has good horizontal temperature field and vertical temperature field;
2. Digital temperature control is adopted with convenient setting and high temperature control stability;
3. Equalizing block can be replaced;
4. Small size, light weight, portable and pollution-free;
5. Creative built-in design of protection functions such as load short-circuit protection, load circuit break and sensor protection.

2.1.3 Other Characteristics

1. Large screen display window is adopted to keep intuitive and eye-catching;
2. Six-digit display is adopted with resolution of 0.001℃ (adjustable);
3. Temperature control resolution and measurement resolution can be separately set without interaction;
4. It can give an anti-scald alarm and remind of power failure by the safety light.

2.2 Parameters

2.2.1 Technical Parameters, Overall Dimensions and Weight

MODEL	SPMK313A	SPMK313B
Picture		
Temperature Range	(-30 ~ 155)℃(Ambient temperature25℃)	(33 ~ 660)℃
Deviation	±0.15℃	±0.5℃
Display Resolution	0.001℃	0.001℃
Insert Depth	170mm	170mm

Diameter of Thermal Block	Ø25mm	Ø25mm
Standard block insertion diameter	Ø6、Ø8、Ø10mm	Ø6、Ø8、Ø10mm
Temperature difference between holes	≤±0.05℃	≤±0.05℃
Axial temperature field	Temperature change within 40mm from the bottom of the soaking block hole≤ 0.5℃	Temperature change within 40mm from the bottom of the soaking block hole≤0.5℃
Temperature fluctuation	≤±0.03℃/15mins	≤±0.03℃/15mins
Dimension	(310×240×400)mm	(300×176×380)mm
Net Weight	14.0kg	12.0kg
Power	150W	800W

Note: in the above is standard configuration. For special requirements, both parties shall conduct consultations separately.

2.2.2 Electrical Measurement Parameters

Function	Range of Measurement	Maximum Permissible Error	Resolution	Remarks
Millivolt voltage	-75mV~75mV	±(0.01%RD+0.005%FS)	0.1μV	
DC voltage	-30 V ~30V	±(0.01%RD+0.005%FS)	0.1mV	
DC current	-30mA~30mA	±(0.01%RD+0.005%FS)	0.1μA	
Resistance	0Ω~400Ω	±(0.01%RD+0.005%FS)	1mΩ	
Switch measurement	Short circuit resistance ＜100Ω	Reaction time ＜10ms	0.01℃	Temperature at the moment of switch off-on and switch on-off
Voltage output	DC24V	±0.5V		

3 Executive Standards and Regulations

1. JJF1257-2010 Calibration Guideline of the Temperature Block Calibrators
2. Q/CPSPK 0005-2014 SPMK Portable Temperature Measuring furnace

4 Quick Start

4.1 Basic Structure

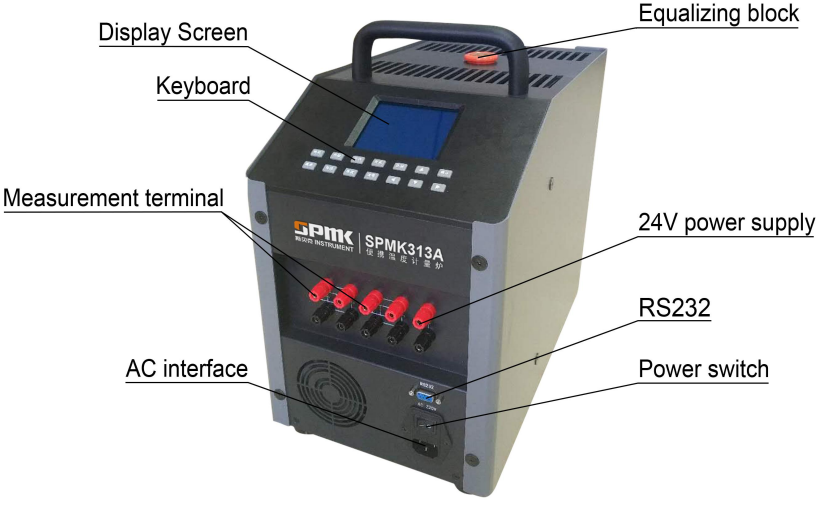


Figure 4.1-1

Display screen: display relevant control and measurement data.

Keyboard: used for control setting input.

Measurement terminal: relevant measurement access port of RTD and thermocouple.

AC interface: power supply interface of measuring furnace under access standard of 220VAC, 50Hz.

Equalizing block: the equalizing block is used to control insertion depth, horizontal temperature field and vertical temperature field.

Anti-scald indicator: it is used for anti-scald indication of temperature control furnace, it indicates furnace temperature above 50℃ if on.

24V power supply: 24V power output is used for power supply to temperature transmitter.

RS232: it is connected with the computer for control and data exchange.

Power switch: turning on / off measuring furnace power supply.

4.2 Testing Equalizing Block

Testing equalizing block (also known as the equalizing block) consists of furnace mouth insulating block and metal equalizing block under it. The insulating block is used to prevent users from directly touching the equalizing block in order to avoid finger scalding and it can keep temperature of the temperature field. If tested element OD is Ø8mm, the equalizing block with inner hole diameter of Ø8mm shall be first put into the furnace chamber and then tested element is placed into a test jack (tested element OD and test jack spacing should be minimized). Inner hole diameter of the equalizing block can be processed based on special ordering requirements of users and each equalizing block can be processed to have 1 to 4 holes based on inner diameter of the equalizing block.

4.3 Display

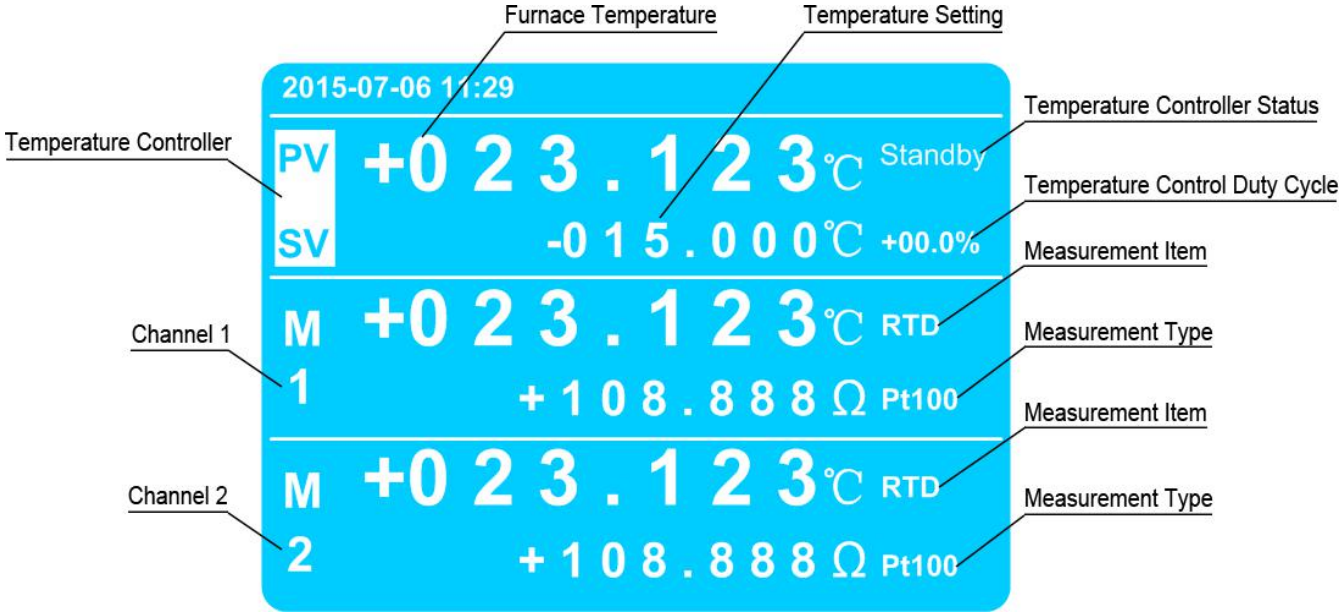


Figure 4.3-1

4.4 Keyboard

Press it for menu setting under working condition of main interface.

Press it for three seconds to enter standby state of temperature controller when main interface is under working condition and the temperature controller under non-standby state.

Press it for RTD measurement selection when Channel 1 or Channel 2 is selected.

Press it for thermocouple measurement selection when Channel 1 or Channel 2 is selected.

Press it for on-off key measurement when the Channel 2 is selected.

Press it for voltage measurement when Channel 1 or Channel 2 is selected.

Press it for current measurement when Channel 1 or Channel 2 is selected.

Press it for zero clearing of Channel 1 or Channel 2 when Channel 1 or Channel 2 is selected.

Press it to enter menu item under the menu; press it to complete entering under entering mode.

Press it under menu state to return to previous menu; press it under the entering mode to exit.

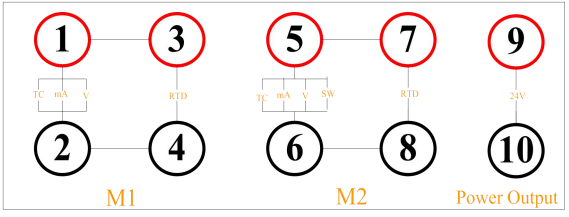

Press it for cursor move-up or password input increase by 1.


Press it for cursor moving down or password input decrease by 1.

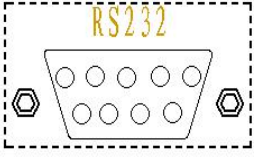

Press it for move-left in sequence.


Press it for move-right in sequence.

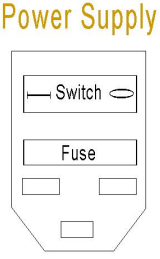
4.5 Interfaces and Interface Description



Measurement Channel



Communication Interface



Power Interface

Measurement channel: both Channel 1 and Channel 2 can measure the thermocouple, RTD, DC current, DC voltage and millivolt voltage; in addition, Channel 1 also can measure standard RTD and standard thermocouple and Channel 2 also can perform switch measurement. Channel 1 and Channel 2 can work simultaneously or separately. Measurement channels adopt 24V power output.

Communication interface: it is used for communication with the upper computer.

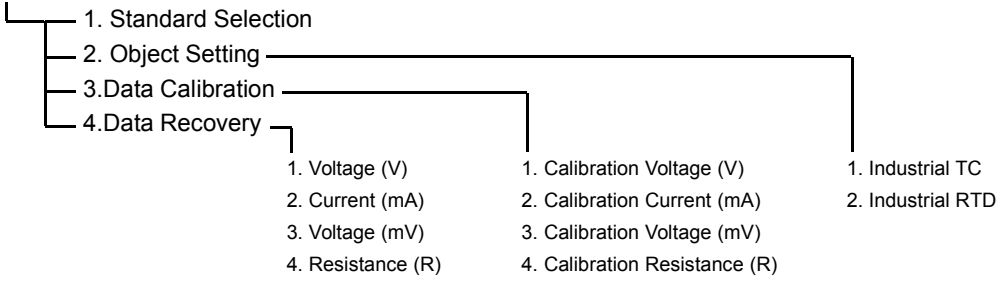
Power interface: it is used for AC power supply and equipped with switch and AC220V 10A fuse.

4.6 Menu

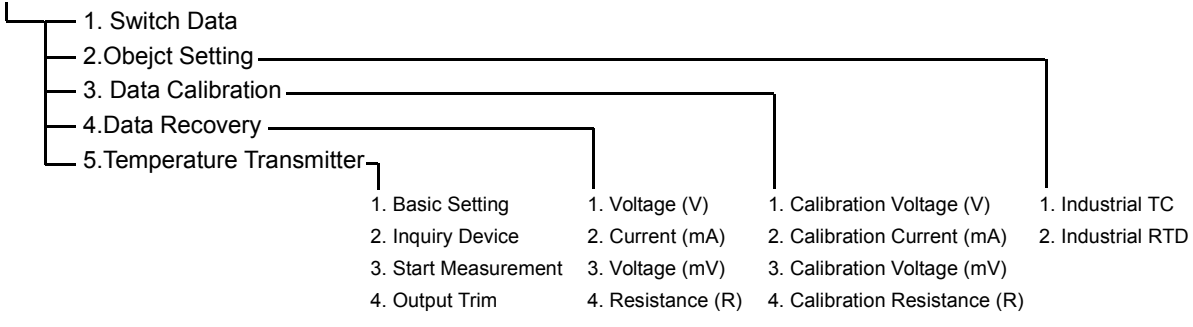
It is very simple and convenient for SPMK313X portable temperature measuring furnace to enter and exit menu operation. Under main interface, the SPMK313X portable temperature measuring furnace can enter measurement of RTD, thermocouple, switch, voltage and current by means of keyboard shortcuts. Under main interface, press Menu for inputting the password 3000 to enter menu mode, press Back for return to main interface, press ▲ and ▼ for shift (up or down) operation or value change (increase or decrease), press ◀ and ▶ for shift operation (left or right), press OK for setting completion or confirmation and press Back for return to the previous menu. All functional menu trees are shown as follows:

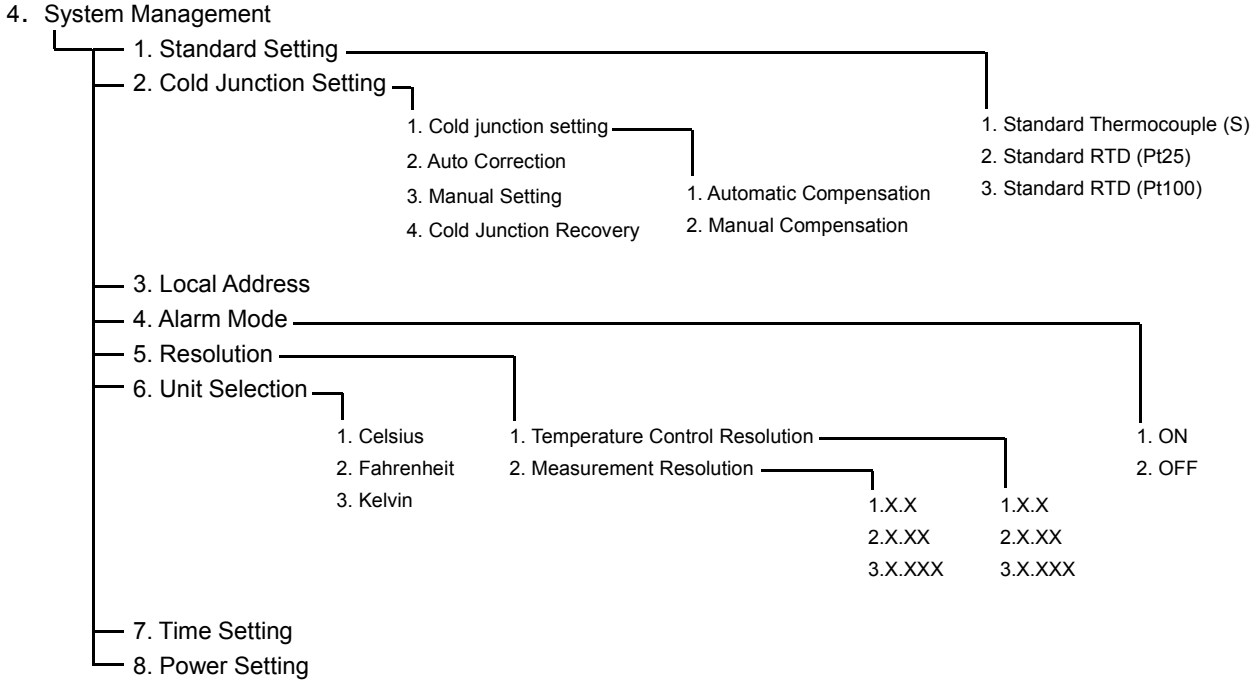
1. Temperature Controller
   - 1. Automatic Detection
   - 2. PID Parameter
     - 1. PID Self-tuning
     - 2. Grouping
     - 3. Total groups setting
   - 3. Linear Correction
     - 1. Correction Point Setting
     - 2. Total Valid Correction Points
     - 3. Linear Correction Options
   - 4. Data Recovery
     - 1. Recovery
     - 2. Exit

2. Measurement Channel 1



3. Measurement Channel 2




4. System Management
1. Standard Setting
1. Standard Thermocouple (S)
2. Standard RTD (Pt25)
3. Standard RTD (Pt100)
2. Cold Junction Setting
1. Cold junction setting
2. Auto Correction
3. Manual Setting
4. Cold Junction Recovery
1. Automatic Compensation
2. Manual Compensation
3. Local Address
4. Alarm Mode
1. ON
2. OFF
5. Resolution
1. Temperature Control Resolution
2. Measurement Resolution
1.X.X
2.X.XX
3.X.XXX
1.X.X
2.X.XX
3.X.XXX
6. Unit Selection
1. Celsius
2. Fahrenheit
3. Kelvin
7. Time Setting
8. Power Setting

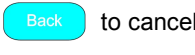
5 Basic Operations

5.1 Temperature Setting

Under main interface of the calibrator, press  or  to switch “PV, SV”, Measurement Channel 1 or Channel 2; when the display screen indicates “PV, SV” is selected (shown in Figure 5.1-1), the temperature setting SV can be modified within the temperature control range.

Under main interface state shown in Figure 5.1-1, press  for SV setting, as shown in Figure 5.1-2.

After entering setting state, conduct shift operation by  or  and value change (increase or decrease by 1) by  or  to set SV value.

Under SV setting state, press 

to cancel modification and return to the state shown in Figure 5.1-1. After SV value setting, press 

to start the control and change temperature control state to automatic control, as shown in Figure 5.1-2.

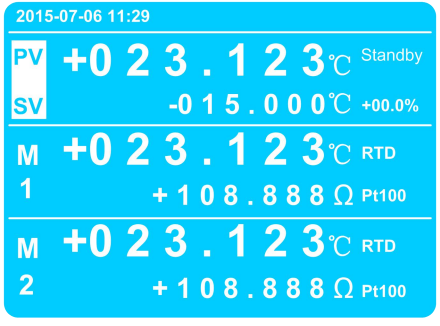


Figure 5.1-1

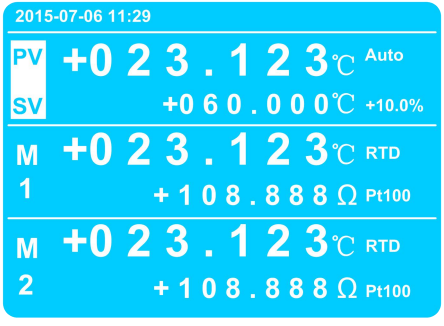


Figure 5.1-2

5.2 Temperature Control Stop

When the temperature control is under working condition (namely non-standby state), press the standby key for three seconds to enter standby state and stop temperature control.

5.3 RTD Measurement

When Measurement Channel 1 or Measurement Channel 2 is selected, press RTD for switching the interface to resistance measurement, as shown in Figure 5.3-1, select measured RTD type and connect measured RTD signals by the wiring method shown in Figure 5.3-2 to 5.3-4. RTD measuring range is 0Ω to +400Ω. If exceeding the range, main display area will indicate Overflow.

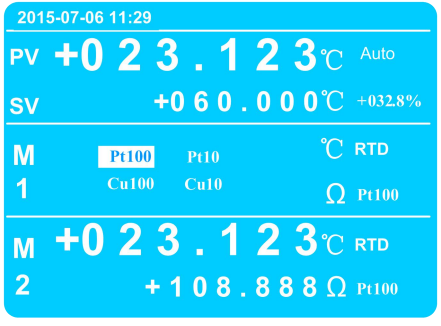


Figure 5.3-1

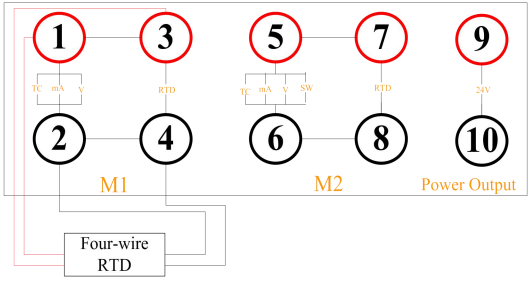


Figure 5.3-2 Four-wire RTD

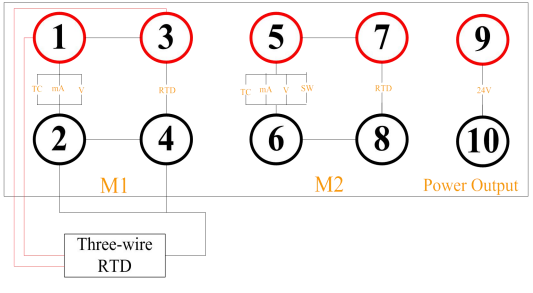


Figure 5.3-3 Three-wire RTD

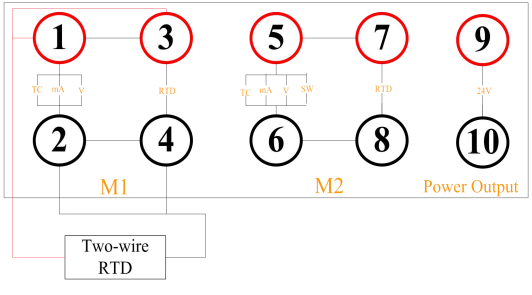


Figure 5.3-4 Two-wire RTD

5.4 Thermocouple Measurement

When Measurement Channel 1 or Measurement Channel 2 is selected, press TC for switching the interface to thermocouple measurement, as shown in Figure 5.4-1, and then connect measured thermocouple signals by the wiring method shown in Figure 5.4-2.

Figure 5.4-1

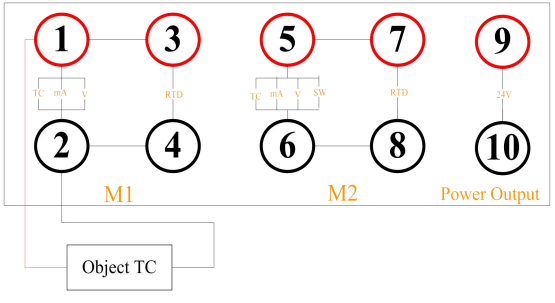


Figure 5.4-2

5.5 Voltage Measurement

5.5.1 Voltage Measurement

When Measurement Channel 1 or Measurement Channel 2 is selected, press Voltage for switching the interface to voltage measurement, as shown in Figure 5.5-1, and then connect positive signal of measured voltage to red terminal and negative signal of measured voltage to black terminal, as shown in Figure 5.5-2.

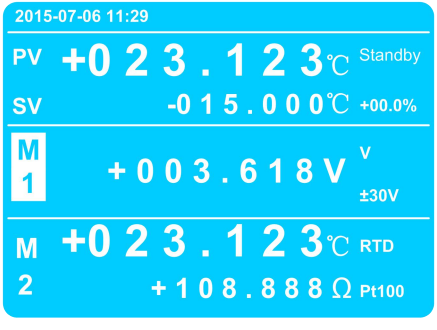


Figure 5.5-1

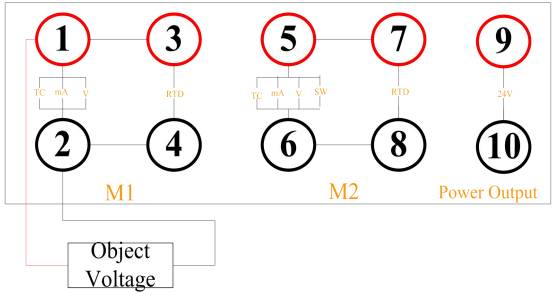


Figure 5.5-2

Voltage measurement range is -30V to +30V. If exceeding the range, the main display area will indicate overflow.

Note: high voltage beyond the measurement range will cause damage to equipment.

5.5.2 Millivolt Voltage Measurement

When Measurement Channel 1 or Measurement Channel 2 is selected, press Voltage twice for switching the interface to millivolt voltage measurement, as shown in Figure 5.5-3, and then connect positive signal of measured voltage to red terminal and negative signal of measured voltage to black terminal, as shown in Figure 5.5-4.

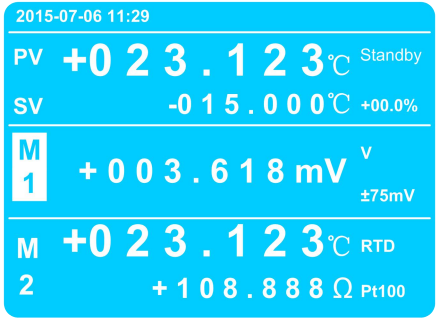


Figure 5.5-3

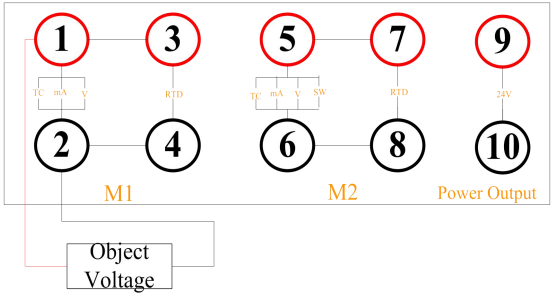


Figure 5.5-4

mV voltage measurement range is -75mV to +75mV. If exceeding the range, the main display area will indicate overflow.

5.6 Current Measurement

When Measurement Channel 1 or Measurement Channel 2 is selected, press Current for switching the interface to current measurement, as shown in Figure 5.6-1, and then connect positive signal of measured current to red terminal and negative signal of measured current to black terminal, as shown in Figure 5.6-2.

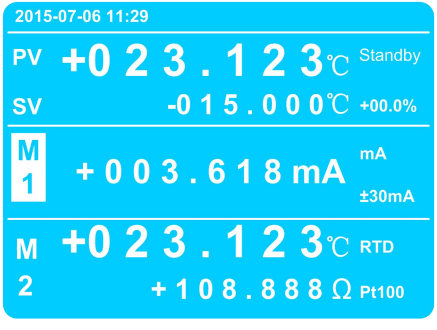


Figure 5.6-1

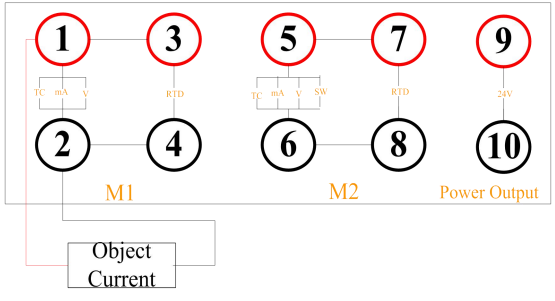


Figure 5.6-2

mA current measurement range is -30mA to +30mA. If exceeding the range, the main display area will indicate Overflow.

Note: high current beyond the measurement range will cause damage to equipment.

5.7 Switch Measurement

When Measurement Channel 2 is selected, press Switch for switching the interface to switch measurement, as shown in Figure 5.7-1, and then connect measured resistance signals by the wiring method shown in Figure 5.7-2. In addition, Measurement Channel 1 is connected with standard RTD or standard thermocouple to measure temperature.

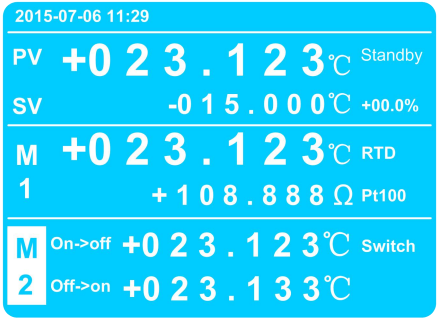


Figure 5.7-1

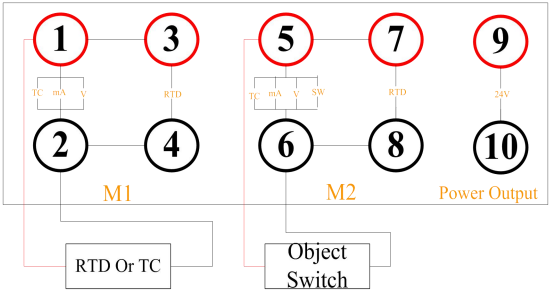


Figure 5.7-2

In the switch test, the calibrator can record 20 entries of tested data in cycles and display last data on top. On the main interface, press Menu, select 3. Measurement Channel 2, press OK to enter its submenu, select 4. Switch Data, press OK for viewing temperature value at switching and press Back for return to the previous menu.

5.8 Zero Clearing

When measured voltage needs zero cleaning, short-circuit red and black terminals of measured voltage and press Zero on the instrument keyboard after the data is stabilized in the main display area. Thus, the instrument enters zero clearing state and displays Zero Clearing in the temperature display area to indicate measurement under the state of zero clearing, as shown in Figure 5.8-1. When measured resistance needs zero clearing, short-circuit measuring terminals of four-wire RTD (1, 2, 3 and 4) and press Zero on the instrument keyboard after the data of main display area is stabilized. The instrument can return to initial state if pressing Zero again.

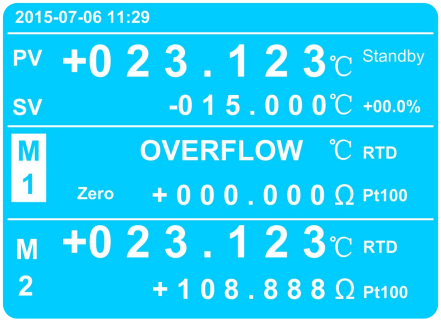


Figure 5.8-1

5.9 Parameter Setting

5.9.1 Menu Access

After starting the instrument, press Menu under main interface to get the prompt of Enter Your Password, as shown in Figure 5.9-1, enter the password 30000 (as shown in Figure 5.9-2) and then press OK to enter main menu (as shown in Figure 5.9-3). Press ▲ or ▼ to switch among 1, 2, 3 and 4, press OK to enter the next menu and press Back for return to the previous menu or main interface.

If the calibrator fails to restart, the Menu can be pressed again to enter the main menu without entering a password when the temperature controller is on the main interface (as shown in Figure 5.9-3). Other operation methods are similar to those under the state of entering the password.

Note: the user can enter main menu when pressing Menu only under main interface state of the system.

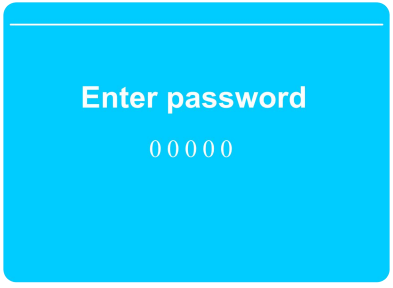


Figure 5.9-1

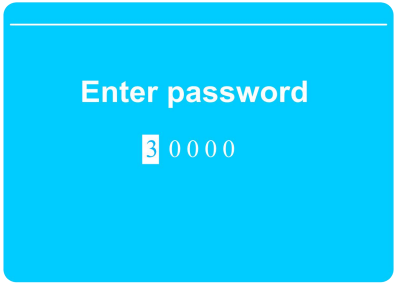


Figure 5.9-2

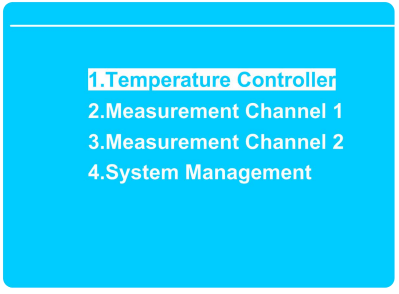


Figure 5.9-3

5.9.2 Temperature Controller

Under the interface shown in Figure 5.9-3, select 1. Temperature Controller and then press OK to enter the menu of temperature controller (as shown in Figure 5.9-4).

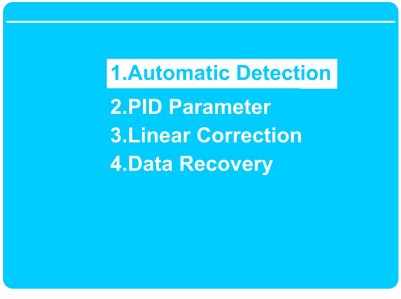


Figure 5.9-4

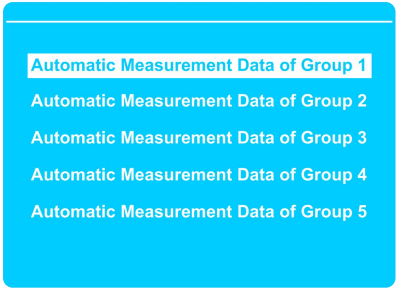


Figure 5.9-5

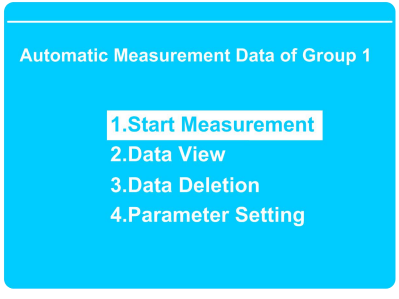


Figure 5.9-6

5.9.2.1 Automatic Detection

Under the interface shown in Figure 5.9-4, select 1. Automatic Detection, press OK (shown in Figure 5.9-5) and then select a group number (shown in Figure 5.9-6) to set parameters.

Item 1: Start measurement

Under the interface shown in Figure 5.9-6, select 1. Start Measurement and press OK for access (as shown in Figure 5.9-7). If selecting1. Exit, the instrument will exit start measurement; if selecting 2. Start, the instrument will start measurement.

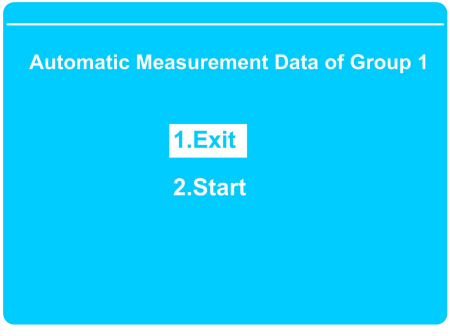


Figure 5.9-7

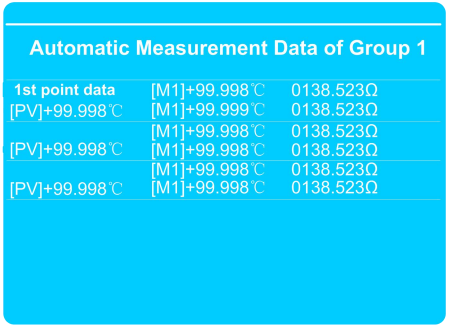


Figure 5.9-8

Item 2: Data view

Under the interface shown in Figure 5.9-6, select 2. Data View, press OK for access (as shown in Figure 5.9-8) and then press ▲ or ▼ under the interface shown in Figure 5.9-8 to select the data for viewing. PV is temperature control value, M1 is temperature and electrical measurement value of Measurement Channel 1 and M2 is temperature and electrical measurement value of Measurement Channel 2.

Item 3: Data Deletion

Under the interface shown in Figure 5.9-6, select 3. Data Deletion, press OK for access (as shown in Figure 5.9-9), and then press ▲ or ▼ under the interface shown in Figure 5.9-9. You can select 2. Delete and then press OK to delete data; select 1. Exit and then press OK to exit.

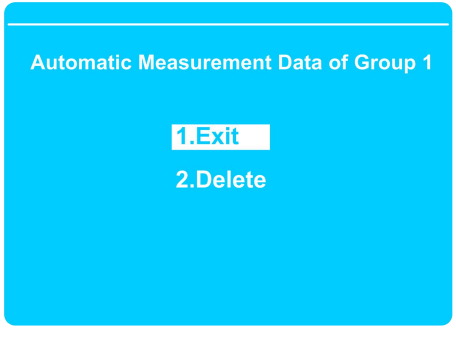


Figure 5.9-9

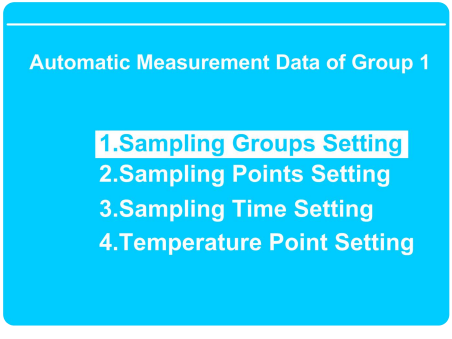


Figure 5.9-10

Item 4: Parameter Measurement

Under the interface shown in Figure 5.9-6, select 4. Parameter Setting and then press OK to enter parameter setting interface, as shown in Figure 5.9-10.

1. Sampling Groups Setting

Under the interface shown in Figure 5.9-10, select 1.Sampling Groups Setting, press OK for access (as shown in Figure 5.9-11), press ▲ or ▼ under the interface shown in Figure 5.9-11 to set required sampling groups (range of groups is 1 to 10) and then press OK to save the setting. You can press Back to exit the setting.

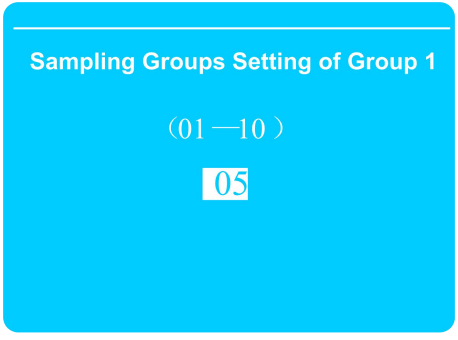


Figure 5.9-11

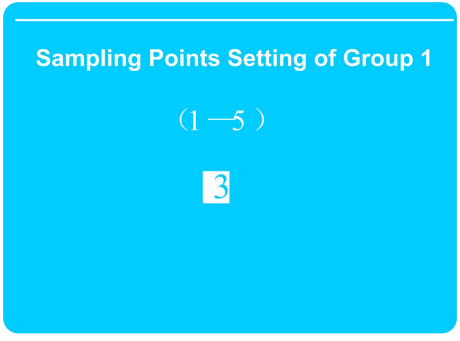


Figure 5.9-12

2. Sampling Points Setting

Under the interface shown in Figure 5.9-10, select 2. Sampling Points Setting, press OK for access (as shown in Figure 5.9-12), press ▲ or ▼ to set required sampling points (range of sampling points is 1 to 5) and then press OK to save the setting.

3. Sampling Time Setting

Under the interface shown in Figure 5.9-10, select 3. Sampling Time Setting, press OK for access (as shown in Figure 5.9-13), press ▲ or ▼ under the interface shown in Figure 5.9-13 to set required sampling time (range of sampling points is 1 to 30 seconds) and then press OK to save the setting.

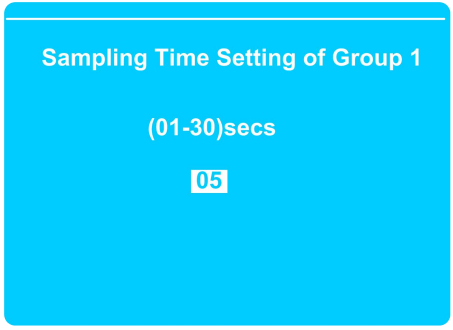


Figure 5.9-13

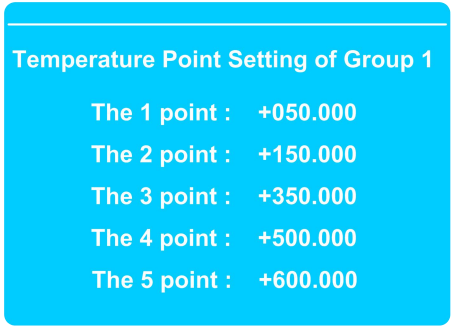


Figure 5.9-14

4. Temperature Point Setting

Under the interface shown in Figure 5.9-10, select 4. Temperature Point Setting, press OK for access (as shown in Figure5.9-14), press ▲ or ▼ under the interface shown in Figure 5.9-14 to set the temperature point, press ▶ or ◀ to select the bit for adjustment by cursor shift and then press ▲ or ▼ to select a

required temperature value, finally press OK to save the setting.

5.9.2.2 PID Parameter Setting

Under the interface shown in Figure 5.9-4, select 2. PID Parameter for access (as shown in Figure 5.9-15) to set parameters.

Figure 5.9-15

Item 1: PID Self-Tuning

PID Self-tuning is a process of the temperature controller re-searching the PID parameter value. The PID parameter is set before delivery and needs no re-tuning generally.

1. For PID tuning, under the interface shown in Figure 5.9-15, select 1.PID Self-tuning and then press OK to enter

the submenu of PID Self-tuning, as shown in Figure 5.9-16. There are five groups of PID self-tuning parameters and each group has a temperature tuning point (for temperature setting change of tuning point, see Item 2. PID Grouping). Under the interface shown in Figure 5.9-16, press  or  to select the group for self-tuning (in the first group, the self-tuning temperature point is -15℃), and then press  to enter the interface for self-tuning of the first group (Figure 5.9-17).

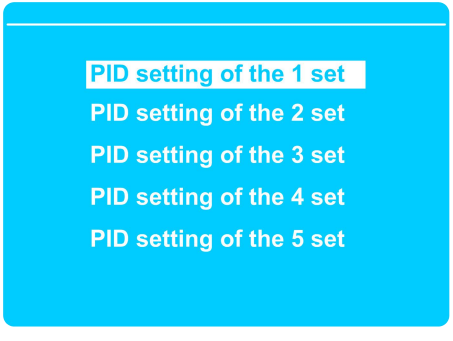


Figure 5.9-16

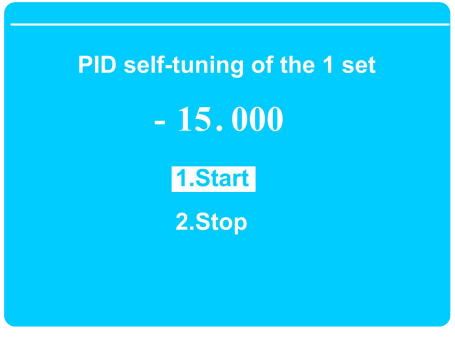


Figure 5.9-17

2. Under the interface shown in Figure 5.9-17, select 1. Start and press OK to reach the screen display shown in Figure 5.9-18 and start self-tuning of the system. In the self-tuning process, on the top of screen is Self-tuning 01 and in the line of SV is -15℃, the first group of PID self-tuning temperature setting value. If on the top of the screen is Stable Temperature Control, the group of PID self-tuning will be completed, as shown in Figure 5.9-19. The temperature controller will enter automatic temperature control state after automatically saving PID self-tuning parameters.

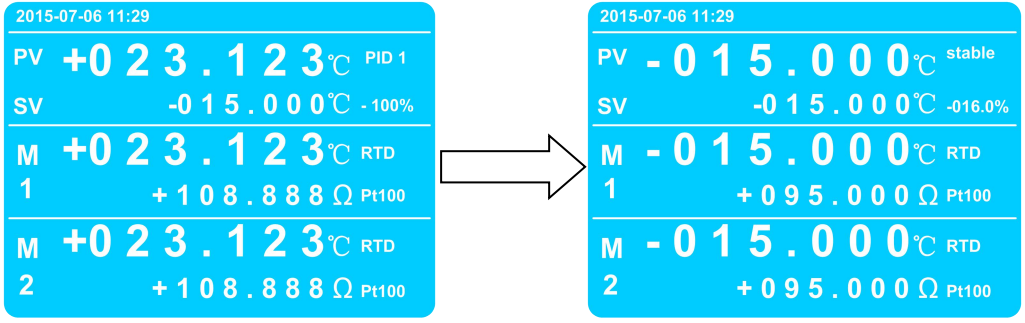


Figure 5.9-18 Figure 5.9-19

3. In the PID self-tuning process, for exiting self-tuning state, you can press Menu to reenter main menu and take the method shown in Step 1 to enter the interface show in Figure 5.9-17; select 2. Stop and press OK to stop temperature controller self-tuning, return to main interface and enter standby state.

Item 2: PID Grouping

PID Grouping is mainly used to set temperature tuning point and PID parameter. For PID values without temperature points within the measuring range, they are obtained by relevant algorithms. Each group of PID parameter values (namely proportion (P), integral (I) and differential (D)) can be obtained by three methods, including ① keyboard setting, ② PID self-tuning and ③ upper computer transmission.

Five groups of PID temperature points must be set from small to large.

Five groups of temperature setting values are set for the measuring furnace before delivery:

SPMK313A: 15℃, 0℃, 40℃, 80℃ and 120℃

SPMK313B: 70℃, 100℃, 200℃, 400℃ and 600℃

SPMK313C: 150℃, 300℃, 500℃, 600℃, 800℃, 1000℃ and 1100℃

For increase of temperature setting value groups, refers to Item 3 PID Total Groups Setting.

Five groups of PID parameters for temperature setting are set before delivery, so the user needs no modification. For operation of PID Grouping, take the following steps:

1. Under the interface shown in Figure 5.9-15, select 2. Grouping and press OK to enter the submenu of PID setting, as shown in Figure 5.9-20. Under the interface shown in Figure 5.9-20, press ▲ or ▼ to select PID group for setting (take the first group as an example) and press OK to enter setting interface for the first group of PID

parameters (Figure 5.9-21).

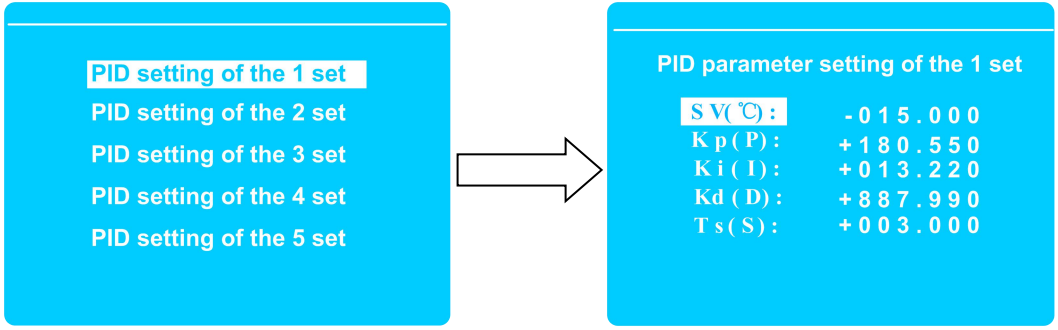


Figure 5.9-20 Figure 5.9-21

2. On the interface of Figure 5.9-21 are temperature (℃), proportion (P), integral (I), differential (D) and (S). The temperature value is that for tuning under the menu of PID Self-tuning and two groups have the same number (it is suggested for the user to only change the temperature setting and obtain the other four items by PID self-tuning). Press OK for cyclical selection among four parameters, press ▶ or ◀ for cursor shift, press ▲ or ▼ for value change and press OK after confirmation. Thus, the temperature controller will automatically save data and enter modification of the next item. If the modification is completed or given up, press Back for return to the interface shown in Figure 5.9-20.

3. Under the interface shown in Figure 5.9-20, you can continue to set next group of parameters by the method mentioned above.

Item 3: PID Total Groups Setting

For PID of the calibrator, the range of total valid PID groups is 2 to 12 (maximum value: 12; minimum value: 2) and the factory setting is 5. For modification of the total valid PID groups under the interface of Figure 5.9-15, select 3. Total Groups Setting and press OK to enter the modification interface of total groups (Figure 5.9-22); press ▲ or ▼ to modify the value and press OK after confirmation to automatically save the data by the temperature controller. If the modification is given up or competed, you can press Back to exit and return to the previous menu.

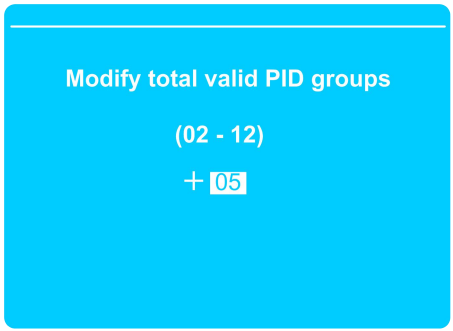


Figure 5.9-22

5.9.2.3 Linear Correction

Linear correction is made for the temperature controller before delivery, so the temperature controller needs no repeated correction. For linear correction operation, the user must adopt more accurate standard equipment (such as standard temperature sensor and standard temperature measurement instrument with an appropriate measuring range) for the operation. Otherwise, the temperature controller cannot control temperature within the specification.

Under the interface of Figure 5.9-4, select 3. Linear Correction and press OK to enter the submenu of Linear Correction (Figure 5.9-23). Under the menu are three submenus described as follows.

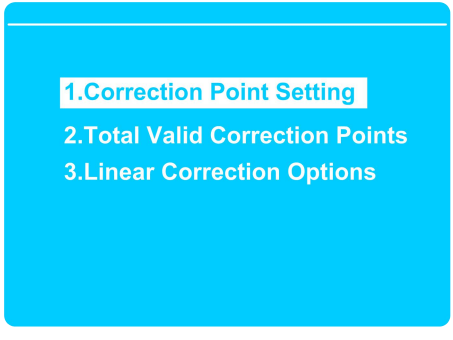


Figure 5.9-23

Item 1: Correction Point Setting

Interpretation of terms for correction point setting:

① Input Temperature refers to a group of temperature values requiring correction.

② Output Temperature refers to measured temperature value of standard calibrator after stable temperature control by the Input Temperature of SV

For 12 groups of temperature correction points, the input temperature must be set from small to large; all 12 groups of temperature correction points can be set or changed based on actual needs (the default value must be retained for the group without setting), but maximum number of groups for setting is 12.

Before delivery of the calibrator, seven groups of input temperature values are set and output temperature is corrected.

SPMK313A: -20℃, -10℃, 0℃, 30℃, 60℃, 90℃ and 130℃

SPMK313B: 50℃, 100℃, 200℃, 300℃, 400℃, 500℃ and 600℃

SPMK313C: 150℃, 300℃, 400℃, 600℃, 800℃, 1000℃ and 1200℃

Setting method for some group of correction points:

Properly connect standard temperature sensor with standard temperature instrument, insert the standard temperature sensor into the furnace and then cancel linear correction in the menu (for the operation method, see description of Item 3: Linear Correction Options).

Turn the temperature controller to standby state, enter the temperature value (input temperature) for correction by the method mentioned in 5.1 Temperature Setting in the SV line of main interface and then press OK to enter automatic temperature control state. After the temperature control is stabilized, read measured value of the standard temperature instrument (output temperature) and make records; record data of the group actually requiring correction (input temperature and output temperature).

After recording, enter the menu of Linear Correction (as shown in Figure 5.9-23), select 1. Correction Point Setting, press OK to enter the menu of Correction Point Setting (Figure 5.9-24) and then respectively set setting temperature and output temperature of correction points from small to large (Figure 5.9-25). After finishing input, press OK to automatically save the input value by the temperature controller.

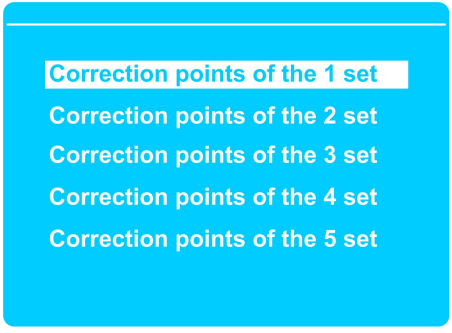


Figure 5.9-24

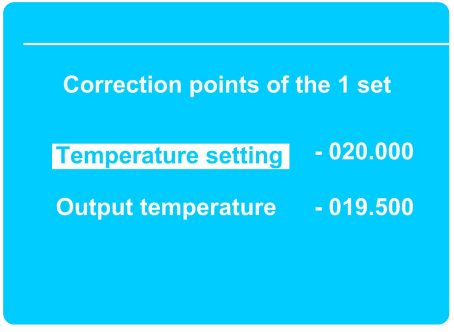


Figure 5.9-25

Item2: Total Valid Correction Points

For the calibrator, the range of total valid correction points is 2 to 12 (maximum value: 12; minimum value: 2) and the factory settings is 7. For modification of total valid correction points under the interface of Figure 5.9-23, select 2. Total Valid Correction Points and press OK to enter the modification interface of total valid correction points (Figure 5.9-26); press ▲ or ▼ to modify the value and press OK after confirmation to automatically save the data by the temperature controller. If the modification is given up or competed, the user can press Back to exit and return to the previous menu.

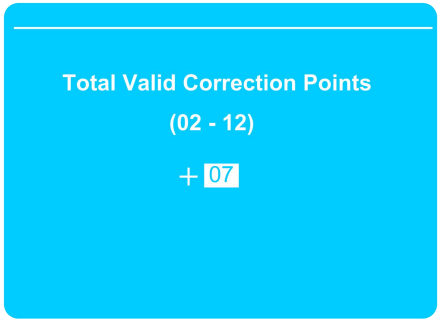


Figure 5.9-26

Item 3: Linear Correction Options

Under the interface shown in Figure 5.9-23, press  or  , select 3. Linear Correction Options and then press  to enter a submenu of Linear Correction Options (Figure 5.9-27).

1. Cancel linear correction: If the option is selected, the temperature controller will not adopt linear correction algorithm for temperature control while all corrected values of linear correction points will be invalid.
2. Start linear correction: If the option is selected, the temperature controller will adopt linear correction algorithm for temperature control while all corrected values of linear correction points will be valid.

Under the interface shown in Figure 5.9-27, press  or  for selection and press  . Linear correction menu item of Cancel or Start will be selected if its right box turns to ⊙; press  for return to the previous menu.

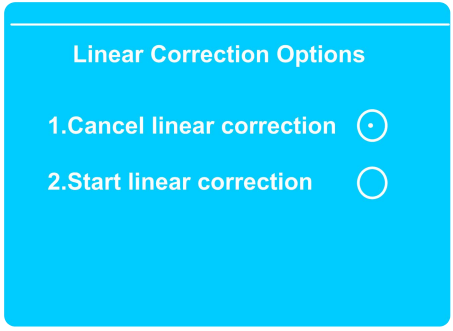


Figure 5.9-27

5.9.2.4 Data Recovery

Data recovery refers to restoring factory settings of temperature controller parameters. The user can reset the temperature controller in case of false operation in parameter of temperature controller.

Under the interface shown in Figure 5.9-4, select 4. Data Recovery and then press OK for access (as shown in Figure 5.9-28). Then, press ▲ or ▼ to select a corresponding menu item of 1: Recovery or 2: Exit; press OK. For data recovery, a hint of Success is popped up before pressing Back for return to the previous menu. For exit, directly return to the previous menu.

Figure 5.9-28

5.9.3 Measurement Channel 1

Measurement Channel 1 of the measuring furnace can perform measurement of Standard Thermocouple (S), Standard RTD (Pt25) and Standard RTD (Pt100). Under main interface of the calibrator (Figure 5.9-3), select 2: Measurement Channel 1 and then press OK to enter a submenu (Figure 5.9-29).

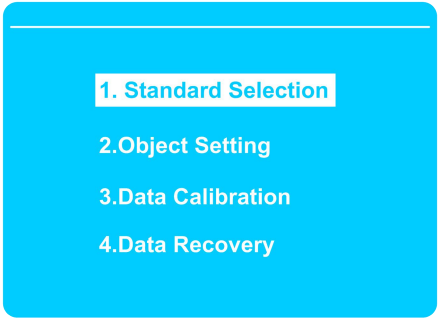


Figure 5.9-29

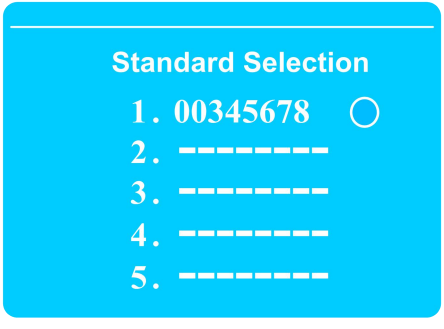


Figure 5.9-30

5.9.3.1 Standard Selection

Under the interface shown in Figure 5.9-29, select 1: Standard Selection to enter the standard selection menu (as shown in Figure 5.9-30), press ▲ or ▼ for switching and then press OK for selection. If the box on the right of

standard number turns to ⊙, the standard will be selected; press Back for return to the previous menu. At the time, Measurement Channel 1 of main interface for the calibrator displays standard thermocouple (or standard RTD) and main interface buttons for RTD, thermocouple, voltage and current are locked.

For parameter setting of standard RTD or thermocouple, refer to Section 5.9.5.1.

5.9.3.2 Object Setting

Measurement Channel 1 can be used for object measurement if not used for standard measurement. For the object measurement, the type of RTD or thermocouple for measurement needs to be selected. Under the interface shown in Figure 5.9-29, select 2. Object Setting and press OK for access. For measurement of thermocouple, select 1. Industrial TC; for measurement of RTD, select 2. Industrial RTD, and then press OK to select a specific type (thermocouple types: S, R, B, E, J, K, N and T; RTD types: Pt100, Pt10, Cu100 and Cu10).

Warm prompt: the object setting can adopt shortcut choice under main interface and the user could refer to 5.3 RTD Measurement and 5.4 Thermocouple Measurement.

5.9.3.3 Data Calibration

Data calibration is used for calibration of the instrument. If unfamiliar with the data calibration, do not enter the calibration mode without permission. If an instrument exceeds calibration interval and needs calibration, the user shall strictly take the

following operation procedures (if the user has standard equipment at a higher level and ambient conditions comply with quantity transmission requirements, it can take the following operation procedures. Otherwise, instrument measurement accuracy cannot be guaranteed). Data calibration mentioned in the section refers to electrical measurement calibration of Measurement Channel 1. Measurement Channel 2 adopts the same calibration method with Measurement Channel 1.

Under the interface shown in Figure 5.9-29, select 3. Data Calibration and then press OK for access to data calibration submenu (as shown in Figure 5.9-31).

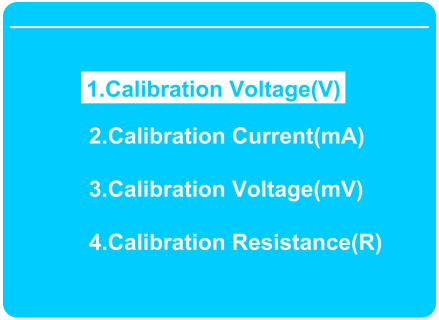


Figure 5.9-31

5.9.3.3.1 Calibration Voltage (V)

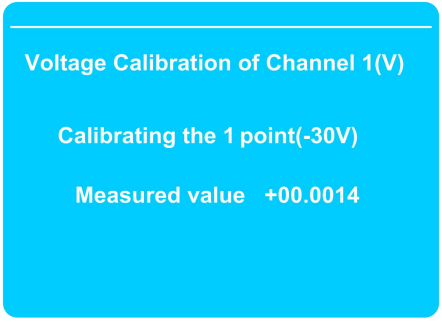


Figure 5.9-32

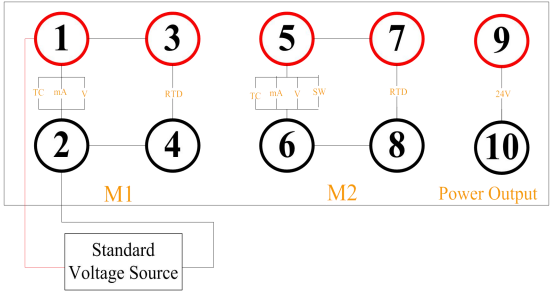


Figure 5.9-33

Methods and steps of calibration:

1. Under the interface shown in Figure 5.9-31, select 1. Calibration Voltage (V) and then press OK for access to voltage calibration page (as shown in Figure 5.9-32); connect wires by the method shown in Figure 5.9-33. For -30.000V of standard 1st point, standard voltage source shall output standard -30.000V.
2. After measuring point data is stabilized, press OK on the keyboard when the measuring point has a small difference of value from standard point. If the difference is larger, press OK again.
3. Press ▲ or ▼ to enter calibration for next point. For 0.000V, standard voltage source shall output

standard 0.000V and Step 2 shall be repeated.

4. After all three points (-30.000 V, 0.000 V and + 30.000 V) are calibrated, press Back until return to the main interface. Select voltage measurement of Measurement Channel 1 to measure output signals of standard voltage source and verify whether the above calibration data is accurate.

5.9.3.3.2 Calibration Current (mA)

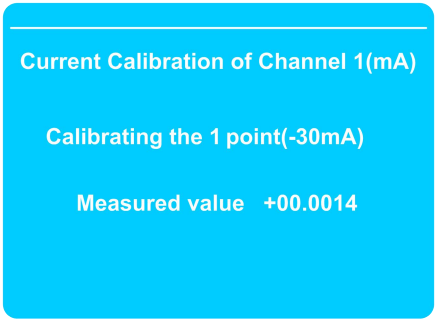


Figure 5.9-34

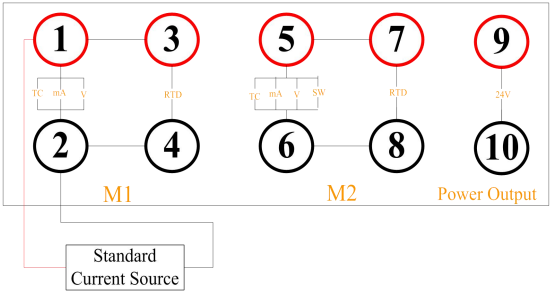


Figure 5.9-35

Methods and steps of calibration:

1. Under the interface shown in Figure 5.9-31, select 1. Calibration Current (mA) and then press OK for access to current calibration page (as shown in Figure 5.9-34); connect wires by the method shown in Figure 5.9-35. For

-30.0000mA of standard 1st point, standard current source shall output standard -30.0000mA.

2. After measuring point data is stabilized, press OK on the keyboard when the measuring point has a small difference of value from standard point. If the difference is larger, press OK again.
3. Press ▲ or ▼ to enter calibration for next point. For 0.000mA, standard current source shall output standard 0.000mA and Step 2 shall be repeated.
4. After all three points (-30.000mA, 0.000mA and +30.000mA) are calibrated, press Back until return to the main interface. Select current measurement of Measurement Channel 1 to measure output signals of standard current source and verify whether the above calibration data is accurate.

5.9.3.3.3 Calibration Voltage (mV)

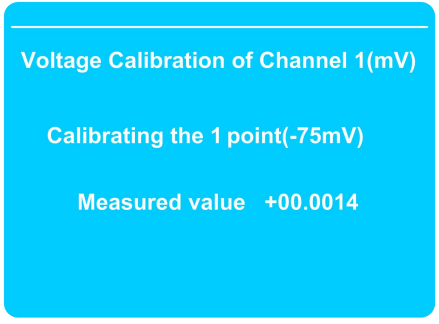


Figure 5.9-36

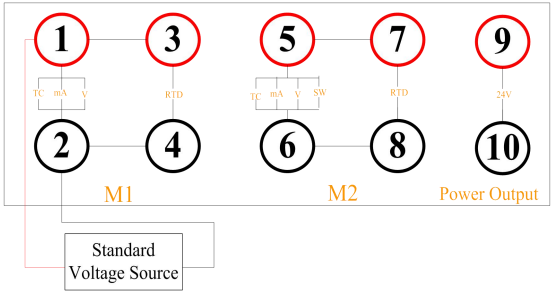


Figure 5.9-37

Methods and steps of calibration:

1. Under the interface shown in Figure 5.9-31, select 3. Calibration Voltage (mV) and then press OK for access to voltage (mV) calibration page (as shown in Figure 5.9-36); connect wires by the method shown in Figure 5.9-37. For -75mV of standard 1st point, standard voltage source shall output standard -75.0000mV.
2. After measuring point data is stabilized, press OK on the keyboard when the measuring point has a small difference of value from standard point. If the difference is larger, press OK again.
3. Press ▲ or ▼ to enter calibration for next point. For -60mV, standard voltage source shall output standard -60mV and Step 2 shall be repeated.
4. After all 9 points (-75mV, -60mV, -40mV, -20mV, 0mV, +20mV, +40mV, +60mV and +75mV) are calibrated, press Back until return to the main interface. Select voltage measurement of Measurement Channel 1 to measure output signals of standard voltage source and verify whether the above calibration data is accurate.

5.9.3.3.4 Calibration Resistance (R)

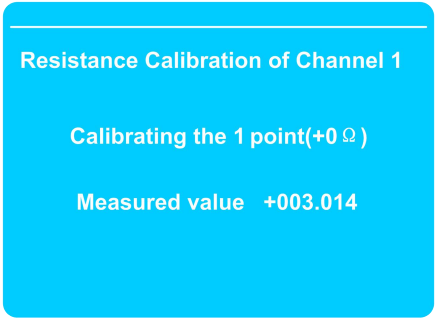


Figure 5.9-38

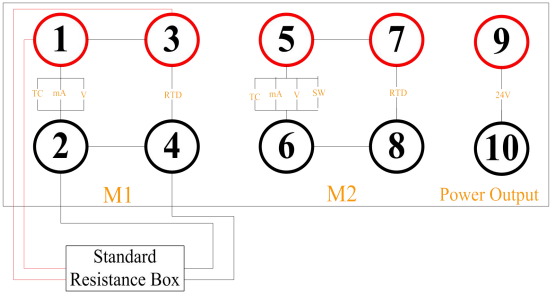


Figure 5.9-39

Methods and steps of calibration:

1. Under the interface shown in Figure 5.9-31, select 4. Calibration Resistance (R) and then press OK for access to resistance calibration page (as shown in Figure 5.9-38); connect wires by the method shown in Figure 5.9-39. Standard 1st point is +0Ω and measuring terminal 1, 2, 3 and 4 can be short-circuited.
2. After measuring point data is stabilized, press OK on the keyboard when the measuring point has a small difference of value from standard point. If the difference is larger, press OK again.
3. Press ▲ or ▼ to enter calibration for next point. For 50Ω, standard resistance box shall output standard +50.000Ω and Step 2 shall be repeated.

4. After all 9 points (0 Ω, 50 Ω, 100 Ω , 150Ω, 200Ω, 250 Ω, 300 Ω, 350 Ω and 400Ω) are calibrated, press Back until return to measurement mode of main interface. The measurement can be conducted to verify whether the above calibration data is correct.

5.9.3.4 Data Recovery

Under the interface shown in Figure 5.9-29, select 4. Data Recovery, press OK to enter its submenu (as shown in Figure 5.9-40), then select electrical measurement signal data for recovery and press OK to select whether to restore default settings (as shown in Figure 5.9-41). If selecting 1. Yes, the user can restore the data to factory settings before pressing OK to enable the setting and return to the previous menu; if selecting 2. No, no operation will be applied to the data.

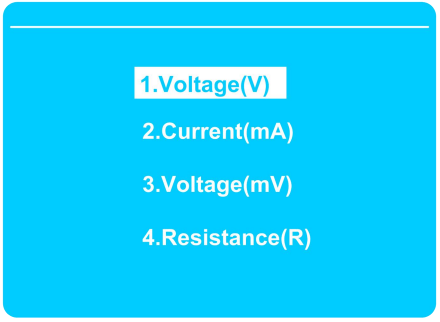


Figure 5.9-40

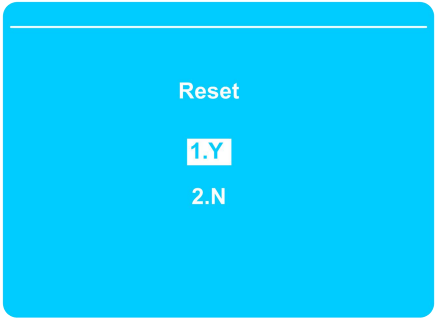


Figure 5.9-41

5.9.4 Measurement Channel 2

Measurement Channel 2 also can perform switch and temperature transmitter test function (Measurement Channel 1 cannot perform the function). It can achieve cyclical recording of 20 testing data entries for the switch test and display the testing data on the top.

Under main interface (Figure 5.9-3), select 3. Measurement Channel 2 and then press OK to enter its submenu, as shown in Figure 5.9-42.

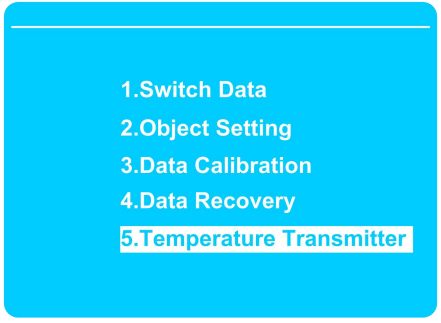


Figure 5.9-42

For the option 2. Object Setting, see Section 5.9.3.2.

For the option 3. Data Calibration, see Section 5.9.3.3.

For the option 4. Data Recovery, see Section 5.9.3.4.

5.9.4.1 Switch Data Display

Under the interface shown in Figure 5.9-42, select 1. Switch Data and press OK to view temperature value for switching, and then press Back for return to the previous menu.

5.9.4.2 Temperature Transmitter

Transmitter detecting function of Measurement Channel 2 can calibrate the temperature transmitter under Hart protocol.

Under the interface shown in Figure 5.9-42, select 5. Temperature Transmitter and then press OK to enter the temperature transmitter function menu item (as shown in Figure 5.9-43).

Wiring of the temperature transmitter is shown in Figure 5.9-44.

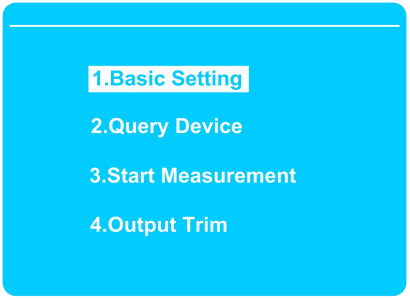


Figure 5.9-43

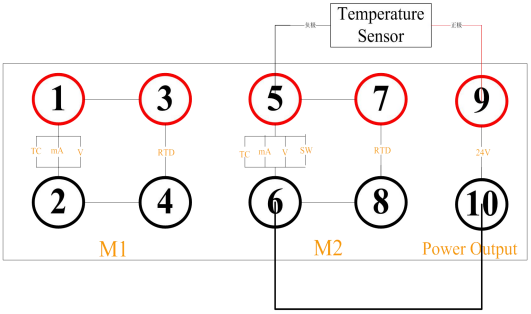


Figure 5.9-44

1. Basic Setting:

After the temperature transmitter under hart protocol is properly connected, select 1. Basic Setting on the interface shown in Figure 5.9-43 to turn on internal power supply and internal resistance. ⊙ indicates on state (as shown in Figure 5.9-45, both options shall be turned off if external power supply and resistance are adopted). After turning on the power supply and resistance, the user can press Back for return to the previous menu.

2. Query Device:

After completion of basic setting, select 2. Query Device in the menu shown in Figure 5.9-43 to enter the query device. It will display relevant information of the transmitter if the access communication is correct (as shown in Figure 5.9-46). It will display an error message prompt if the access communication is wrong (as shown in Figure 5.9-47). The transmitter can have follow-up operations only under correct communication of query device.

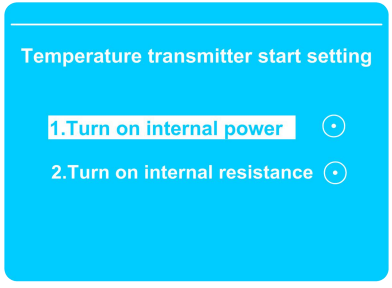


Figure 5.9-45

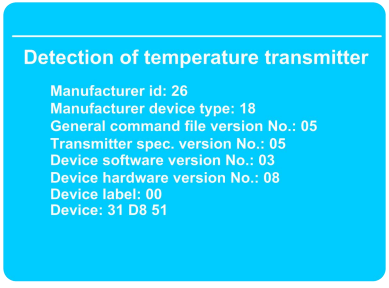


Figure 5.9-46

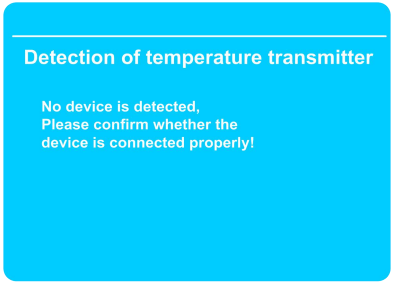


Figure 5.9-47

3. Start Measurement:

Under the menu shown in Figure 5.9-43, select 3. Start Measurement and then press OK to enter the submenu of Start Measurement (Figure 5.9-48). Then, press  or  to select OFF or ON (note: it is required to determine correct connection of temperature transmitter and successful query setting before starting transmitter measurement) and press OK for automatic return to main interface and display of transmitter information on Measurement Channel 2.

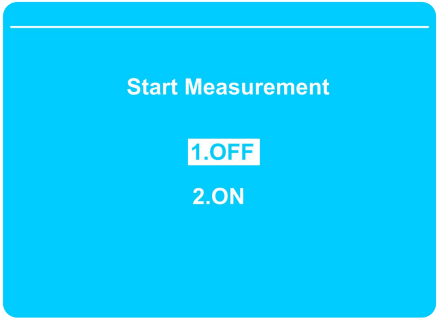


Figure 5.9-48

4. Output Trim:

Under the menu shown in Figure 5.9-43, select 4. Output Trim, press OK to enter the submenu of Output Trim (Figure 5.9-49) and press ▲ or ▼ to select a trim option.

If 4mA and 20mA output of the transmitter is deviated from actual current output, press ▲ or ▼ to modify values in the highlighted column, press ◀ or ▶ to change setting position, set calibration current as output current and then press OK to finish output current calibration, as shown in Figure 5.9-50 and Figure 5.9-51.

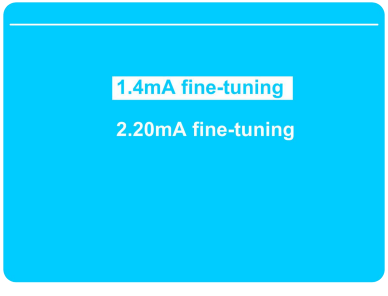


Figure 5.9-49

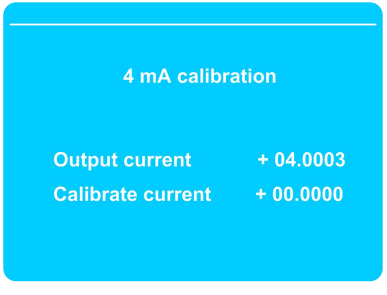


Figure 5.9-50

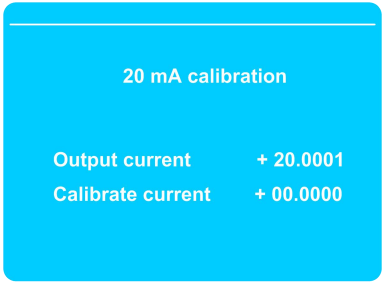


Figure 5.9-51

5.9.5 System Management

Under the main menu (Figure 5.9-3), select 4. System Management to enter the system management submenu (as shown in Figure 5.9-52 and Figure 5.9-53).

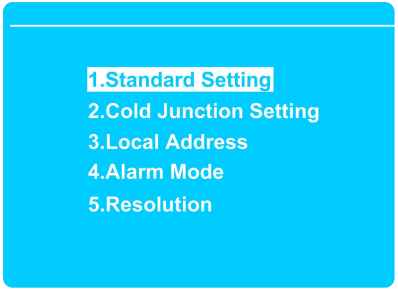


Figure 5.9-52

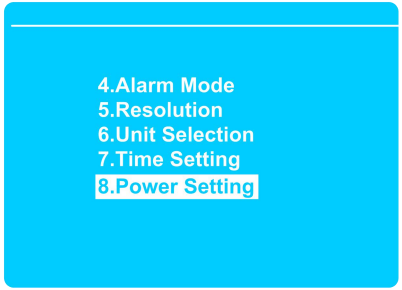


Figure 5.9-53

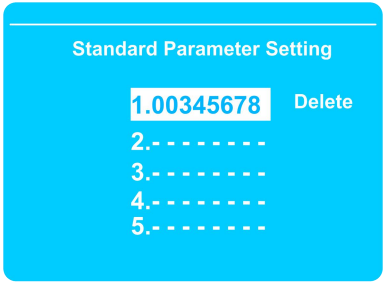


Figure 5.9-54

5.9.5.1 Standard Setting

Under the interface shown in Figure 5.9-52, select 1. Standard Setting to enter the interface of Standard Setting, as shown in Figure 5.9-54.

Press  or  to select an appropriate option and then press 

to enter the option for setting. If parameter setting is available, the user can click on Delete to set new parameters. There are three options (1. Standard Thermocouple (S), 2. Standard RTD (Pt25) and 3. Standard RTD (Pt100)) on the standard type selection interface (as

shown in Figure 5.9-55). Select an appropriate type and then press OK to enter setting interface.

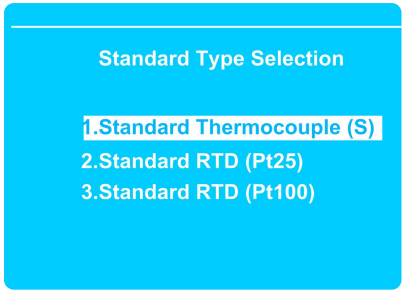


Figure 5.9-55

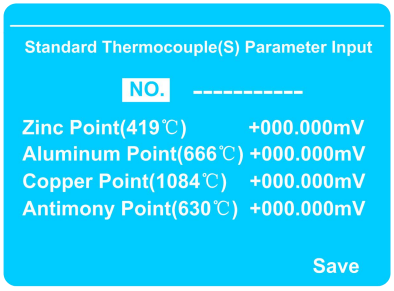


Figure 5.9-56

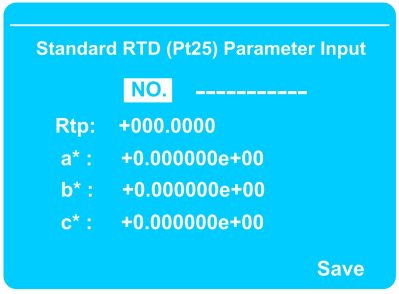


Figure 5.9-57

1. Setting of Standard Thermocouple (S) (as shown in Figure 5.9-56)

Under the interface shown in Figure 5.9-55, select 1. Standard Thermocouple (S) and then enter its submenu (as shown in Figure 5.9-56), press ◁ or ▷ for shifting, press △ or ▽ for digital increase or decrease by 1 to completely input standard thermocouple number, press OK for return to the beginning of the line, press △ or ▽ for switching temperature points to get a voltage value under each temperature point, then shift the cursor to Save, press OK to enable the parameter setting and then press Back for return to the previous menu.

2. Setting of Standard RTD (Pt25) (Figure 5.9-57)

Under the interface shown in Figure 5.9-55, select 2. Standard RTD (Pt25), enter its submenu (Figure 5.9-57) and then fill in parameter values of the RTD Pt25.

3. Standard RTD (Pt100) adopts the same setting method with Standard RTD (Pt25).

5.9.5.2 Cold Junction Setting

Under the interface shown in Figure 5.9-52, select 2. Cold Junction Setting and press OK to enter the cold junction setting submenu (Figure 5.9-58).

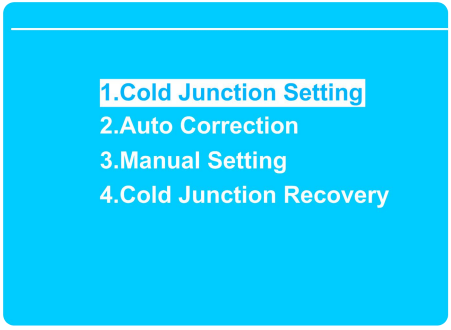


Figure 5.9-58

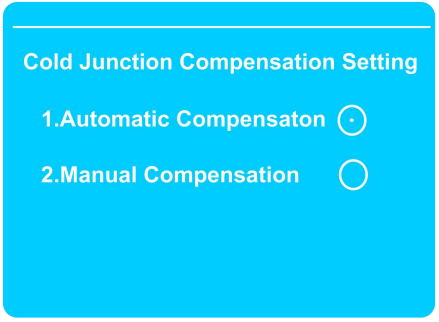


Figure 5.9-59

5.9.5.2.1 Cold Junction Setting

Under the interface shown in Figure 5.9-58, select 1. Cold Junction Setting and then press OK to enter cold junction compensation setting interface (as shown in Figure 5.9-59).

The cold junction setting can adopt manual compensation or automatic compensation. If the automatic compensation is selected, a calibrator will automatically acquire data under room temperature for compensation. If the manual compensation is selected, the user shall set the cold junction temperature. Refer to Section 5.9.5.2.3 Manual Setting.

5.9.5.2.2 Auto Correction

Under the interface shown in Figure 5.9-58, select 2. Auto Collection and then press OK to enter the auto collection interface (as shown in Figure 5.9-60).

The cold junction temperature is auto collection temperature. If the cold junction temperature is deviated from actual temperature, press ▲ or ▼ to modify digitals in the highlighted column, press ◀ or ▶ to change setting position, set temperature correction value to actual temperature value and then press OK to complete cold junction temperature correction.

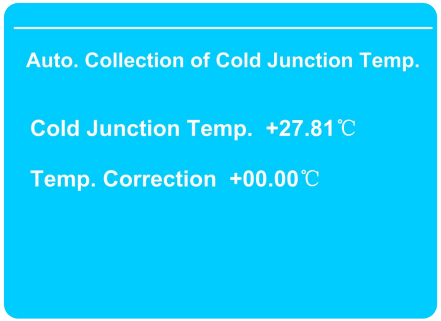


Figure 5.9-60

5.9.5.2.3 Manual Setting

Under the interface shown in Figure 5.9-58, select 3. Manual Setting and then press OK to set the cold junction compensation temperature (as shown in Figure 5.9-61). The temperature setting range is -20℃ to +70℃.

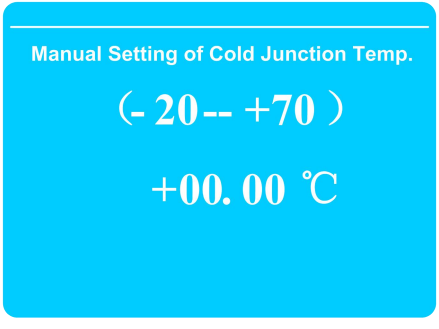


Figure 5.9-61

5.9.5.2.4 Cold Junction Recovery

Under the interface shown in Figure 5.9-58, select 4. Cold Junction Recovery and then press OK for cold junction recovery operation. The cold junction recovery is used after auto correction to restore factory settings.

5.9.5.3 Local Address

Under the interface shown in Figure 5.9-52, select 3. Local Address to enter local address setting interface, as shown in Figure 5.9-62, press  or  to modify digitals in the highlighted column and press  or  to change setting position. The address range is 0 to 255. Press  for saving after finishing input. The user can press  to cancel the setting.

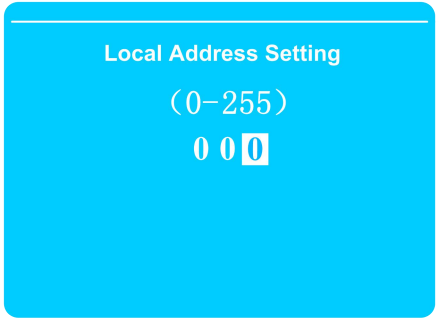


Figure 5.9-62

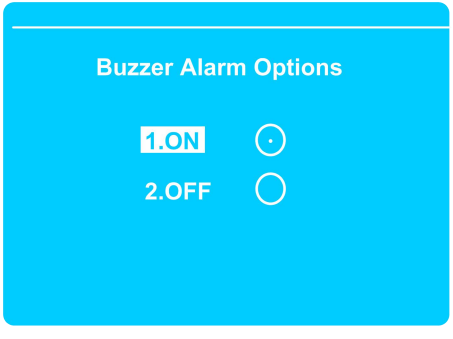


Figure 5.9-63

5.9.5.4 Alarm Mode

Under the interface shown in Figure 5.9-52, select 4. Alarm Mode and then press  to enter the alarm mode submenu (as shown in Figure 5.9-63). Then, press  or  to select a buzzer alarm mode and press

OK. If an option is selected, the right box turns to ⊙ to enable the setting; the user can press Back for return to the previous menu.

5.9.5.5 Resolution

1. Under the interface shown in Figure 5.9-52, select 5. Resolution and the press OK to enter the resolution submenu (Figure 5.9-64). The resolution is set up respectively for temperature control display and measurement display. Under the interface shown in Figure 5.9-65, press ▲ or ▼ to select a temperature control resolution option and then press OK. If an option is selected, the right box turns to ⊙ to enable the setting; the user can press Back for return to the previous menu.
2. Measurement resolution selection has the same operation with temperature control resolution selection.

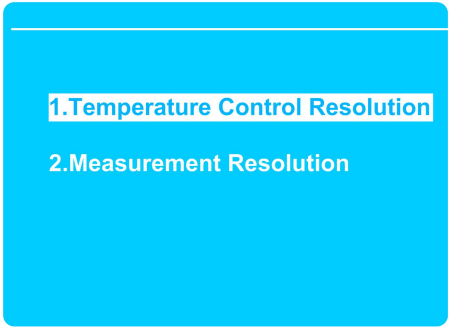


Figure 5.9-64

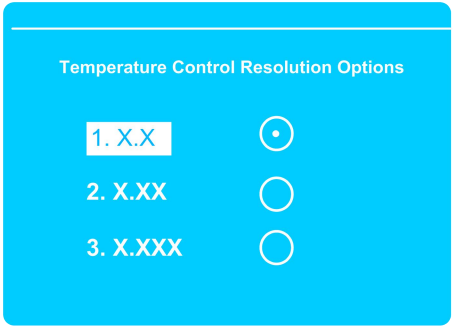


Figure 5.9-65

5.9.5.6 Unit Selection

Under the interface shown in Figure 5.9-53, select 6. Unit Selection and then press OK to enter unit selection submenu (Figure 5.9-66). There are three temperature scales (Celsius (℃), Fahrenheit (℉) and thermodynamic scale (K)) under the unit selection. Then, press  or  to select an appropriate temperature scale and then press OK. If an option is selected, the right box turns to ⊙ to enable the setting; the user can press Back for return to the previous menu.

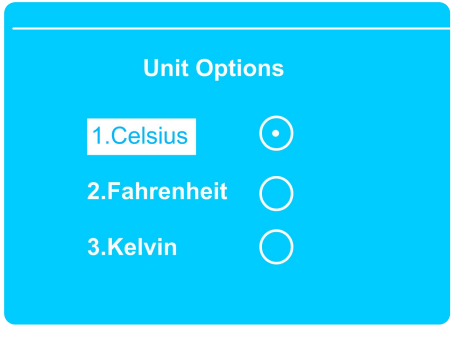


Figure 5.9-66

5.9.5.7 Time Setting

Under the interface shown in Figure 5.9-53, select 7. Time Setting and then press OK to enter time setting submenu (Figure 5.9-67). Press ◁ or ▷ to change setting position and press △ or ▽ to set time. The user can press OK to enable the time setting.

5.9.5.8 Power Setting

Under the interface shown in Figure 5.9-53, select 8. Power Setting and then press OK to enter the power setting submenu (as shown in Figure 5.9-68). Then, press △ or ▽ to select power on or power off and press OK. If an option is selected, the right box turns to ⊙ to enable the setting; the user can press Back for return to the previous menu.

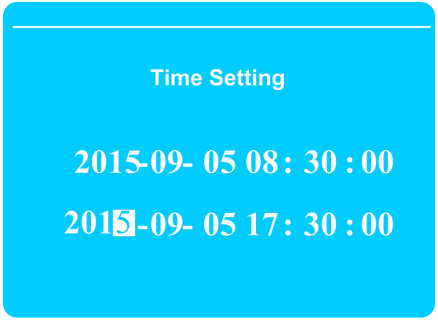


Figure 5.9-67

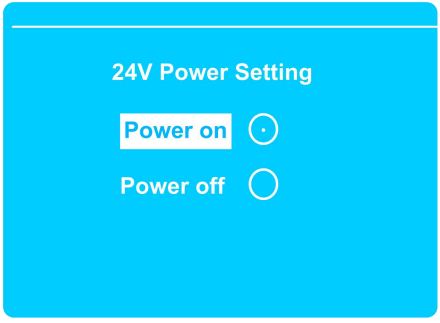


Figure 5.9-68

6 Frequent Problems and Solutions

No.	Frequent Problems	Solutions
1	No response is given after connecting a power supply and pressing the power switch	It is required to heck 220V power access port and turn on the power switch to check whether the fuse is damaged.
2	Measurement Channel 1 or Measurement Channel 2 has no display after starting	This state is resulted from measurement mode errors under normal circumstances. It is required to reset the measurement mode by keyboard (such as setting to RTD) and then restart.
3	Abnormal display of disorderly lines	It is required to turn off power supply and wait for three minutes before restarting. If disorderly lines still occur after repeated power-off and restart, the shell shall be opened for inspection by professional personnel.
4	Deformation and cracking of equalizing block	Sharp cooling of high temperature is prone to deformation and cracking of equalizing block. The equalizing block shall be returned to the factory for repair.

5	Temperature control stabilization time is longer	It is due to great ambient temperature variation and mismatching between tested temperature gauge and equalizing block jack. It is required to maintain a stable ambient temperature and adjust matching jacks.
6	Due to slow cooling, SPMK313A cannot reach given temperature range	Temperature range of SPMK313A is given based on ambient temperature. If the ambient temperature drops to 25℃, the equipment temperature can reach -20℃.
7	After power failure, anti-scald indicator remains off when furnace mouth temperature exceeds 50℃.	Indicator battery is damaged or aged. It is required to replace the battery or contact with the manufacturer.

7 Other Precautions

1. Please carefully read this manual before use.
2. Prevent scalding or temperature gauge damage when moving or taking cold and hot objects.
3. The instrument shall not be used beyond range of design and application.
4. Do not move the instrument when it is very cold or very hot, unless it is properly protected with the handing personnel receiving professional training.
5. Do not dismantle the instrument.
6. If the instrument is equipped with a carrying case, it shall not be placed into the carrying case before cooling or temperature drop.
7. Please contact the manufacturer for repair. Do not repair it by yourself.
8. Keep materials, especially inflammable materials, from high-temperature parts of the instrument to avoid ignition.
9. The instrument is high-power electric heating equipment. In order to keep you safe, it must be properly grounded in use.
10. Do not apply overflow signals to measuring holes. If the instrument fails, do not open it. Please contact with our after-sales service department. We will solve problems properly.

Accompanying Accessories

1. Two sets of test lines (four red lines and four black lines) and eight alligator clips.
2. One power cord.
3. One standard equalizing block.
4. One furnace mouth insulation block.
5. One insulation block picking tool.
6. One RS232 communication cable for purchased data download software.

Contact Information

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