PANRAN

PR291/PR293 Series

Nanovolt Microhm Thermometer

Manual

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Panran Measurement & Calibration Technology Co., Ltd.

Contents

Attention

1. Please read this manual before using the device, so as to help you master the basic operation knowledge.
2. Do not touch the touch screen with the sharp objects, so as to avoid the damage to the touch screen.
3. Please do not use the device while it is charging, so as to avoid the AC interference signals affecting the accuracy of measurement.
4. The device supports the USB flash disk storage, please plug and remove the USB flash disk in the shutdown state.
5. The technical indexes described in this manual are all from the low-speed measurement mode and the welding fork screw wiring mode of the rear channel. The measurement accuracy will slightly be affected by using other wiring mode or measurement mode.

1 Overview

The PR291/PR293 is a high-performance test instrument for DC small-signal measurement. It can collect voltage, resistance, current and various temperature signals with a high sensitivity. It contains a variety of working modes and has rich temperature measurement functions, making the temperature calibration and temperature transfer process simple.

1.1 Features

- Measurement sensitivity of 10nV / 10μΩ

The breakthrough design of ultra-low noise amplifier and the low ripple micro-mini power supply module greatly reduces the reading noise of the signal loop, thereby increasing the reading sensitivity to 10nV/10uΩ, and the maximum effective display bits are increased to 8 bits.

- Excellent annual stability

PR291/PR293 series thermometers, adopting the ratio measurement principle and with built-in reference-level standard resistors, have extremely low temperature coefficient and excellent annual stability. Without adopting the constant temperature reference function, the annual stability of the whole series can still be significantly better than the commonly used 7 1/2 digital multimeter.

- Integrated multi-channel low-noise scanner

In addition to the front channel, there are 2 or 5 independent sets of full-function test terminals are integrated on the rear panel according to different models in the PR291/PR293 series thermometers. Each channel can independently set the test signal type, and has a very high consistency between channels, so multi-channel data acquisition can be performed without any external switches. In addition, the low-noise design ensures that the signals connected through the channels will not bring additional reading noise.

- High-precision CJ compensation

The stability and accuracy of the CJ temperature play an important role in the measurement of high-precision thermocouples. Commonly used high-precision digital meters need to be combined with special CJ compensation equipment for thermocouple measurement. The dedicated High-precision CJ compensation module is integrated in the PR293 series thermometers, so the CJ error of the used channel that better than 0.15℃ without other peripherals can be realized.

- Rich temperature metrology functions

PR291/PR293 series thermometers are a special test instrument tailored for the temperature metrology industry. There are three working modes of acquisition, single-channel tracking, and temperature difference measurement, among which the temperature difference measurement mode can analyze the temperature uniformity of all kinds of constant temperature equipment.

Compared with the traditional digital multimeter, a 30mV range specifically for measuring S-type thermocouples and a 400Ω range for PT100 platinum resistance measurement are added. And with built-in conversion programs for various temperature sensors, a variety of sensors (such as standard thermocouples, standard platinum resistance thermometers, industrial platinum resistance thermometers and working thermocouples) can be supported, and certificate data or correction data can be referenced to trace the temperature of the test results. PR291 series only supports resistance signal measurement, and its measurement and conversion ability of resistance signal is the same as pr293 series.

- Data analysis function

In addition to data display, data curve drawing and data storage functions, real-time data maximum/minimum/average value, a variety of temperature stability data can be calculated, and the maximum and minimum data can be marked to facilitate intuitive data analysis on the test site.

- Portable design

The high-precision digital meters commonly used in laboratories are usually large in size, not portable, and rely on external power supply. The PR291/PR293 series thermometers are small in size and light in weight, and are powered by large-capacity lithium batteries. In contrast, PR291/PR293 series products are more convenient for high-level temperature testing in various field environments.

1.2 Technical Specifications

1.2.1 Tables for Models

Function / Model	PR293A	PR293B	PR291B
Device type	Nanovolt microhm thermometer		Microhm thermometer
Resistance measurement			●
Full function measurement	●	●	
Number of rear channel	5	2	2
Weight	2.85 kg（without charger）	2.7kg（without charger）	2.7kg（without charger）
Battery type	7.4V 6800mAh, rechargeable lithium battery		
Battery duration	≥13 hours		
Dimension	230mm×220mm×110mm		
Dimension of display screen	Industrial-grade 7.0 inch TFT color screen		
Working environment	-5～35℃，≤80%RH		

1.2.2 Electrical specifications

Range	Data scale	Resolution	One year accuracy (ppm reading+ppm range)	Temperature coefficient （5℃～35℃） (ppm reading+ppm range)/℃
30mV	-35.00000mV～35.00000mV	10nV	60+15	3+1.5
100mV	-110.00000mV～110.00000mV	10nV	60+5	3+0.5
1V	-1.1000000V～1.1000000V	0.1μV	60+5	3+0.5
50V	-55.00000V～55.00000 V	10μV	100+10	3+1.0
100Ω	0.00000Ω～105.00000Ω	10μΩ	30+5	2+0.1
400Ω	0.0000Ω～410.0000Ω	0.1mΩ	30+5	2+0.1
1KΩ	0.0000000kΩ～1.1000000kΩ	0.1mΩ	30+5	2+0.1
10KΩ	0.000000kΩ～11.000000kΩ	1mΩ	40+5	2+0.1
50mA	-55.00000mA～55.00000mA	10nA	60+5	3+0.5

Note:
Adopting the four-wire measurement method to measure resistance: the excitation current of 10KΩ range is 0.1mA, and the excitation current of other resistance ranges is 1mA.
The current measurement function: current sensing resistor is 10Ω.
The environment temperature during the test is 23℃±3℃.

1.2.3 Temperature specifications

- Temperature measurement with platinum resistance thermometers

Model / Object	SPRT25	SPRT100	Pt100	Pt10	Pt1000
Data scale	-200℃～660℃	-200℃～740℃		-200℃～800℃	
One year accuracy	-200℃，0.006℃ 0℃，0.012℃ 100℃，0.016℃ 300℃，0.023℃ 600℃，0.035℃	-200℃，0.006℃ 0℃，0.013℃ 100℃，0.016℃ 300℃，0.023℃ 600℃，0.036℃		0℃，0.02℃ 100℃，0.024℃ 300℃，0.032℃	0℃，0.015℃ 100℃，0.020℃ 300℃，0.029℃
Resolution	0.0001℃				

- Temperature measurement with noble metal thermocouples

Model / Object	S	R	B
Data scale	0 ℃ ～ 1760℃		300 ℃ ～ 1800℃
One year accuracy	300℃，0.05℃ 600℃，0.1℃ 1000℃，0.1℃		600℃，0.12℃ 1000℃，0.12℃ 1500℃，0.1℃
Resolution	0.001℃		
Note: The above results do not include CJ compensation error.			

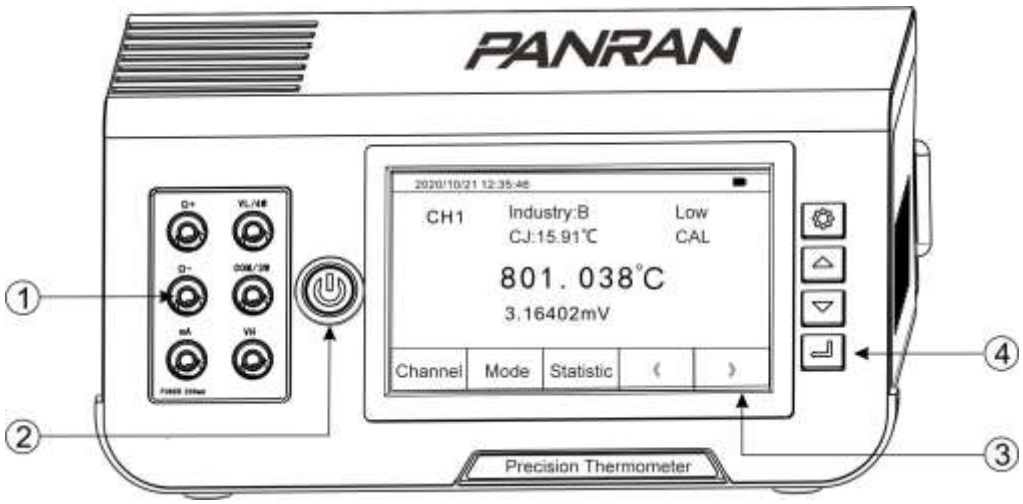
- Temperature measurement with base metal thermocouples

Model / Object	K	N	J	E	T
Data scale	-100℃～1300℃	-200℃～1300℃	-100℃～900℃	-90℃～700℃	-150℃～400℃
One year accuracy	300℃，0.05℃ 600℃，0.04℃ 1000℃，0.1℃	300℃，0.03℃ 600℃，0.04℃ 1000℃，0.08℃	300℃，0.02℃ 600℃，0.04℃	300℃，0.02℃ 600℃，0.05℃	-150℃，0.06℃ 300℃，0.02℃
Resolution	0.001℃				
Note: The above results do not include CJ compensation error.					

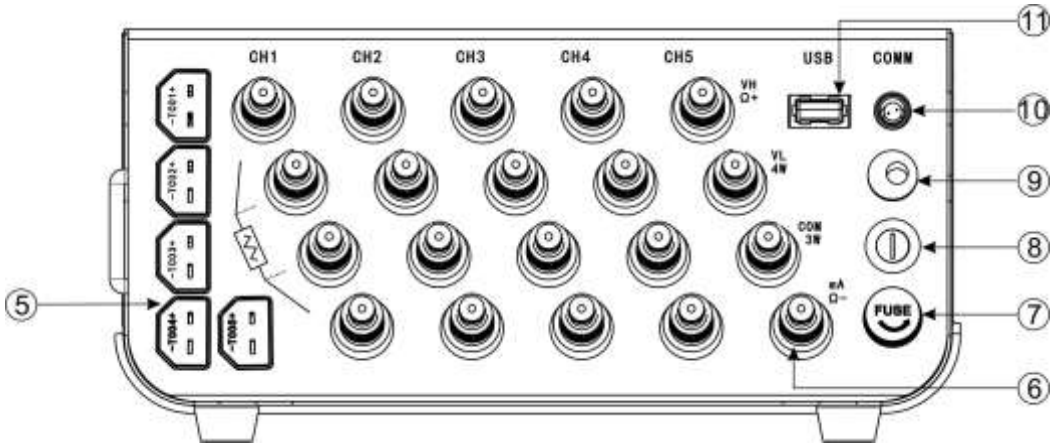
- Technical specifications of built-in thermocouple CJ compensation

Object	PR293A	PR293B
Data scale	-10℃～40℃	
One year accuracy	0.2℃	
Resolution	0.01℃	
Channels number	5	2
Maximum difference between channels	0.1℃	

1.3 Appearance



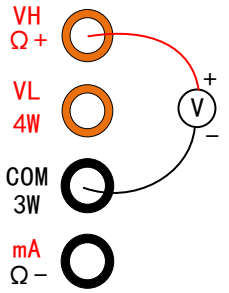
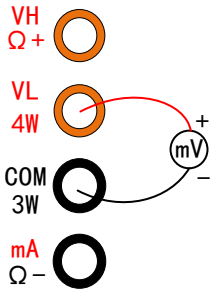
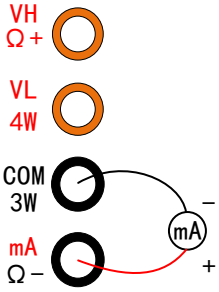
1. Front channel
2. Power on
3. Screen display
4. Buttons for the device



5. Thermocouple socket
6. Wiring terminal
7. Fuse 1
8. Fuse 2
9. Power charging interface
10. Communication interface
11. USB flash disk interface

1.4 Sensor Connection

1.4.1 Wiring diagram

<table>
<tr><td rowspan="3">PR293A rear channel wiring</td><td>High voltage signal measurement</td><td>Low voltage/thermocouple signal measurement</td><td>Current measurement</td></tr>
<tr><td> 
</td><td> 
</td><td> 
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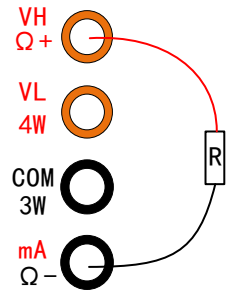
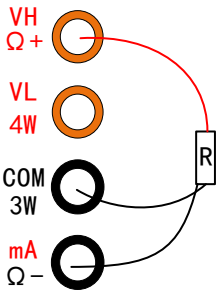
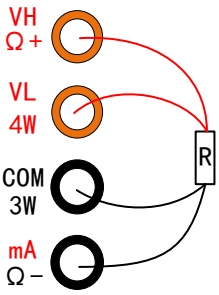
<tr><td> 
</td><td> 
</td><td> 
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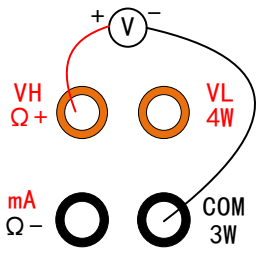
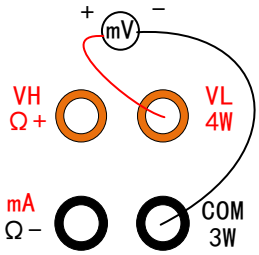
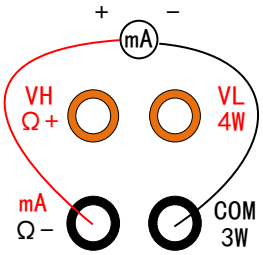
<tr><td> 
</td><td> 
</td><td> 
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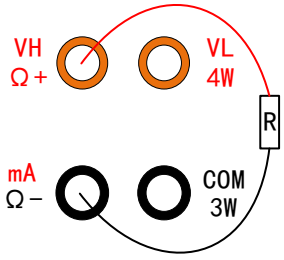
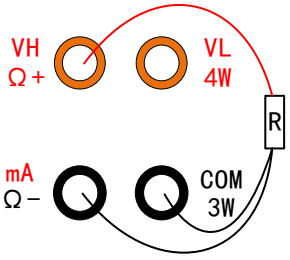
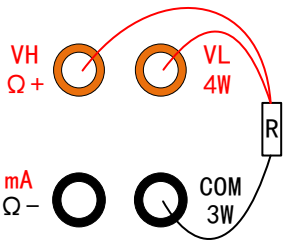
<tr><td> 
</td><td> 
</td><td> 
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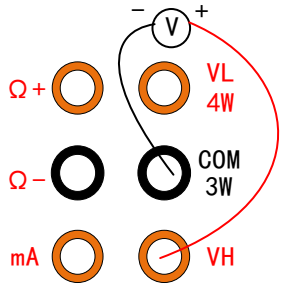
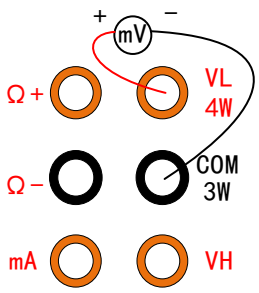
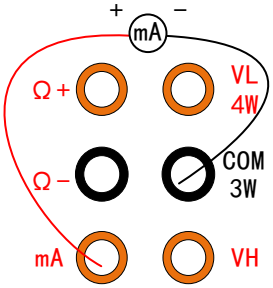
<tr><td rowspan="4">PR293A/293B front channel wiring</td><td>High voltage signal measurement</td><td>Low voltage/thermocouple signal measurement</td><td>Current measurement</td></tr>
<tr><td> 
</td><td> 
</td><td> 
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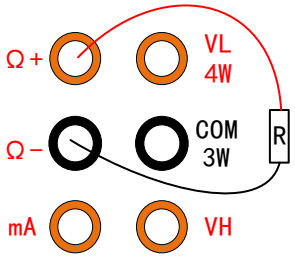
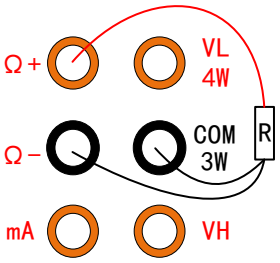
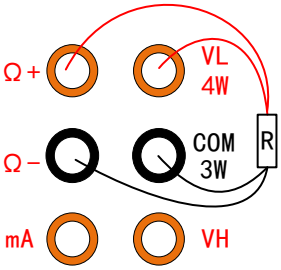
<tr><td> 
</td><td> 
</td><td> 
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Because PR291B only has resistance measurement function, its wiring method refers to the resistance measurement part of PR293B in the above table.

1.4.2 Wiring mode

The rear channel of PR293/PR291 series nanovolt micro-ohm thermometer can select the copper fork clamp type or copper fork screw type wiring, the front channel of it applies the banana plug wiring. The measured technical index obtained by using the copper fork wiring mode will be better than that obtained by the banana plug wiring mode. The users can choose the appropriate wiring mode according to the test conditions and technical index requirements. The rear channel of PR293 series products is also equipped with the thermocouple quick sockets which are corresponding to five rear channels respectively; the users can achieve the quick thermocouple wiring measurement through the thermocouple quick plug. The different wiring methods are introduced in the following figure.

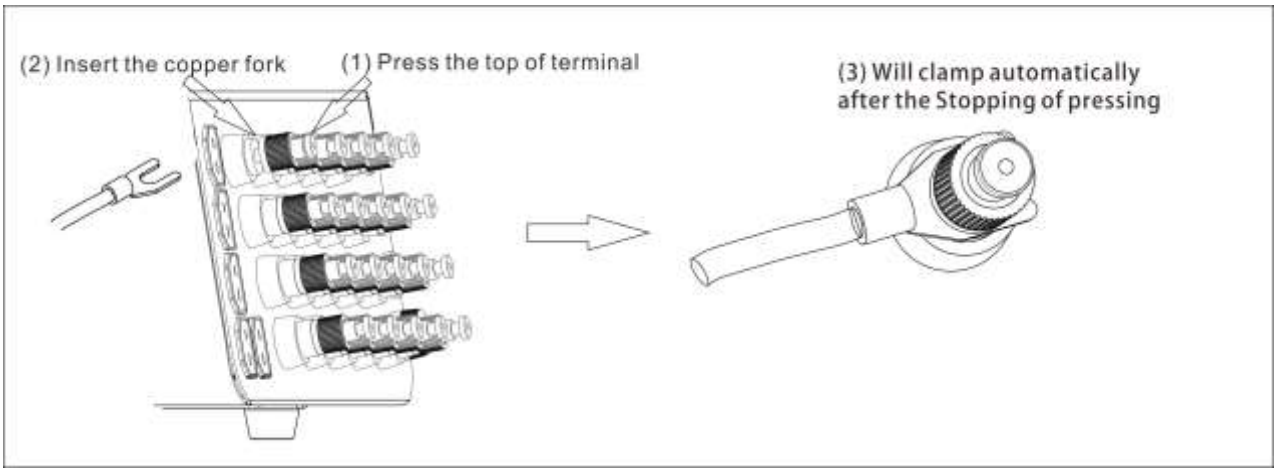


Figure 1.1 Copper fork clamp type connection

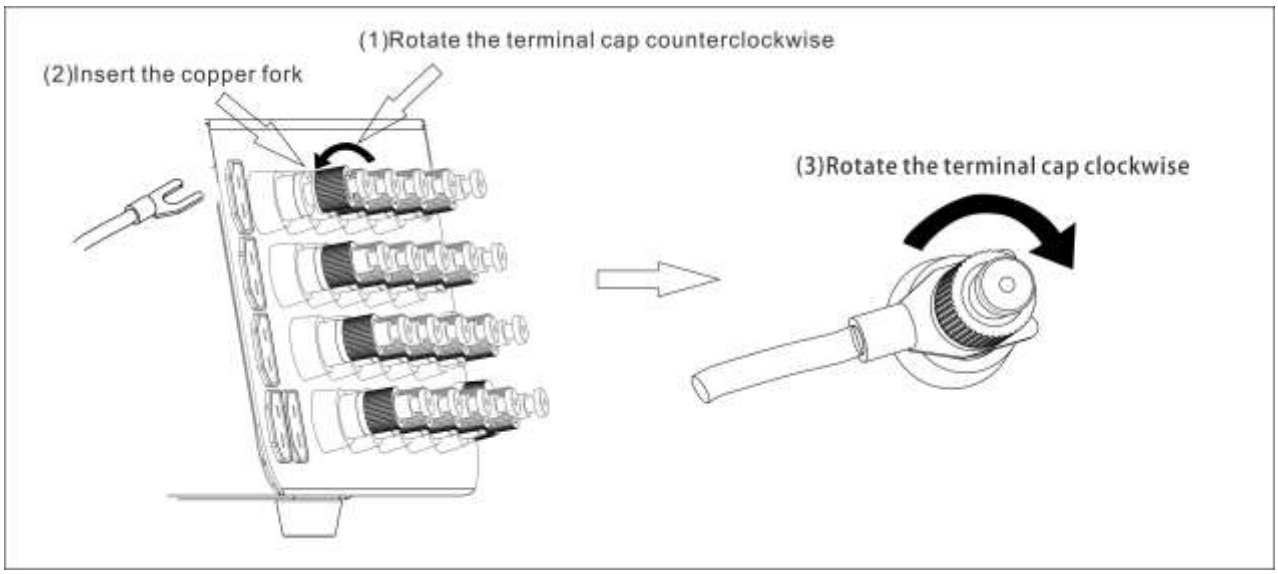


Figure 1.2 Copper fork screw type connection

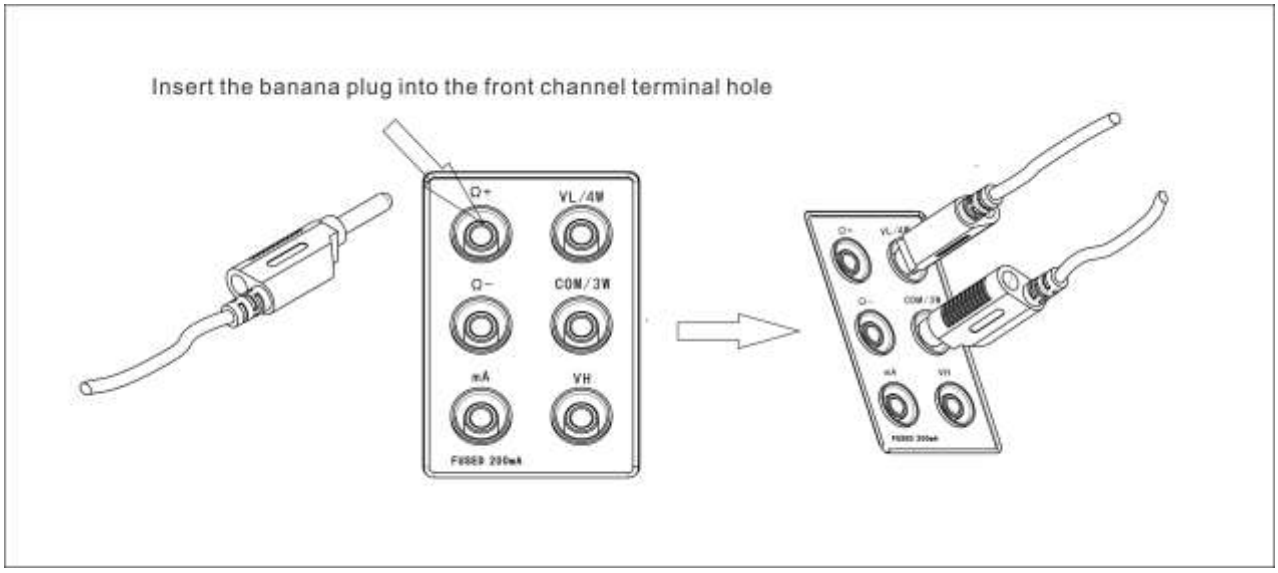


Figure 1.3 Banana plug wiring in the front channel

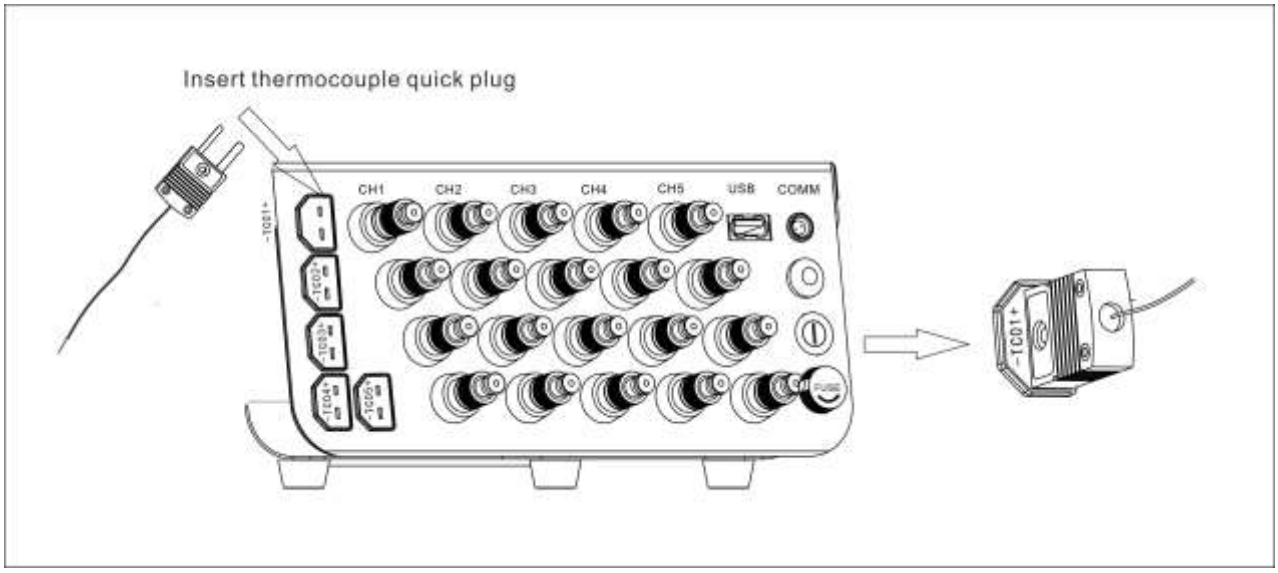


Figure 1.4 Thermocouple quick plug wiring

2 Application Operations

This chapter introduces the basic application operations of the PR291/PR293 series nanovolt and microohm thermometers from two aspects: key description and main interface introduction.

2.1 Key descriptions

key	Function
	Power on key: press and hold for 3 seconds to power on the device in the off state, and press and hold for 3 seconds in the on state to power off.
	Set key: system settings.
	Arrow key: select upwards.
	Arrow key: select downwards.
	OK.

2.2 Introductions to the main interface

Take the main interface of PR293A multi-channel display mode as an example, as shown in Figure 2.2.1.

No.	Description
1	Inspection countdown
2	Time and date
3	Channel display
4	Screen key
5	Relevant working status indication

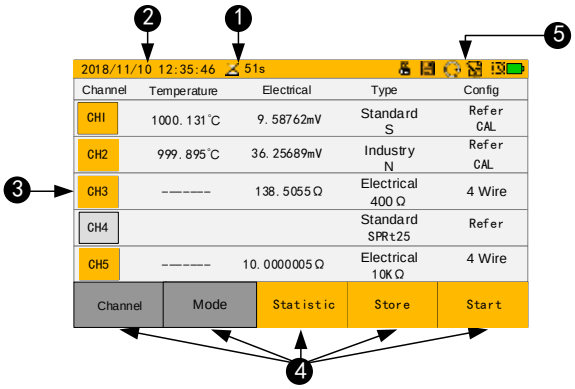


Figure 2.2.1
PR293A multi-channel display main interface

Running status indicator description

Indicator	Description
	USB: displaying when the USB stick is inserted.
	Save: when saving the current operation, it will be displayed.
	Timing power off: indicating that the timing power off function has been activated.
	Record: flashing when the dual-channel temperature difference display mode is turned on.
	Record: it will flash when the record is turned on in the multi-channel mode and the inspection is started, and it is grayed out when the record is turned on but the inspection is not started.
AZ	Dynamic reset.

3 Basic Settings

This chapter mainly introduces the basic setting operation of PR291/PR293 series nanovolt and microohm thermometers from two aspects: operation setting and basic setting.

After powering on, click the key of to enter the setting menu as shown in Figure 3.1.

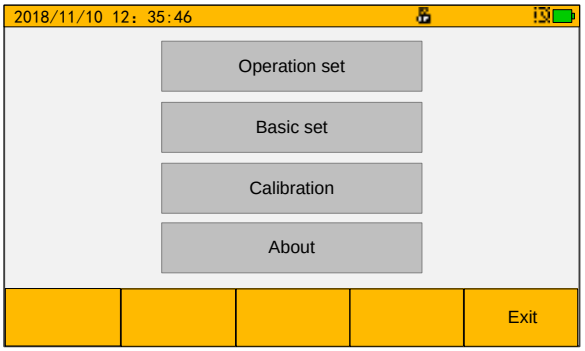


Figure 3.1 Setting menu

3.1 Running settings

This section mainly introduces the operation setting method of PR291/PR293 series nanovolt and microohm thermometers.

As shown in Figure 3.1, click “Operation set” to enter the running settings interface. In the interface of Figure 3.1.1, you can set the inspection interval time, measurement speed, resistance dynamic reset, and temperature stability time.

- Inspection time interval: used to set the inspection record interval time in the multi-channel display mode, including real-time (30 seconds/time), 1 minute (1 minute/time), 3 minutes (3 minutes/time), 5 minutes (5 minutes/time), 10 minutes (10 minutes/time).
- Measuring speed: used to set the measuring speed of the device, including normal and low speed. The low speed mode has higher temperature reading stability.
- Dynamic reset (including start and prohibit): in the four-wire resistance measurement mode, selecting to enable dynamic reset can eliminate lead errors and obtain the same effect as the current commutation technology; enabling dynamic reset in the thermocouple measurement mode can eliminate parasitic potentials.
- Temperature stability time: used to set the temperature stability time in the dual-channel temperature difference measurement mode, divided into 5 minutes, 10 minutes, 15 minutes, and 20 minutes.

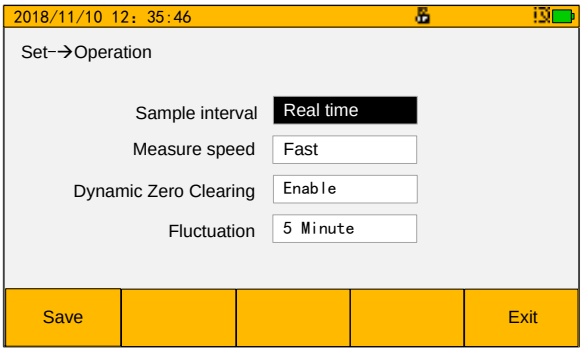


Figure 3.1.1 Running settings

The detailed setting method is shown in Figure 3.1.2:

- Click to select the edit box corresponding to the setting operation, then the edit box will turn black.
- Use the up and down arrow buttons to switch the desired setting.
- After the setting is completed, click save.

Figure 3.1.2 Setting method

3.2 Basic Settings

This section mainly introduces the basic setting method of PR291/PR293 series nanovolt and microohm thermometers.

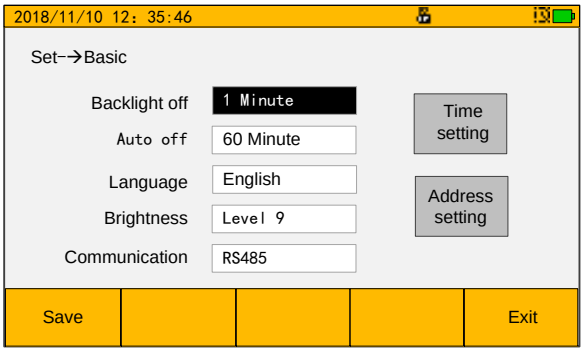


Figure 3.2.1 Basic setting interface

Click “Basic set” in Figure 3.1 of the setup menu to enter the basic settings interface as shown in Figure 3.2.1. Various settings can be set on the interface, such as powering-off time of backlight, timing power-off time, language, brightness, communication equipment, time, communication address.

3.2.1 Backlight settings

Backlight setting is used to set the working mode of the display backlight.

The time that the backlight function automatically powers off can be set to 1 minute, 3 minutes, 5 minutes, 10 minutes. And the “禁止” mode will prohibit the device’s backlight function from turning off automatically. In other modes, if no operation is operated within the selected time, the backlight function will automatically turn off.

3.2.2 Powering-off settings

The powering-off setting is used to set whether to enable automatic powering off and the time setting of automatic powering off.

The time that can be set for automatic powering off is 10 minutes, 20 minutes, 30 minutes, 60 minutes. . And the “Disable” mode will prohibit the device from automatically powering off. In other modes, if no operation is operated within the selected time and no inspection is started, the device will automatically power off.

3.2.3 Time settings

The time setting is used to set the system time. For example, if the time is set to 12:35 on November 16, 2018, the data entered using the numeric keys should be as shown in Figure 3.2.2. Simply click the edit box to switch the input line. If you make a mistake, click the “Clear” key to delete the input data. After the time setting is completed, click the “Save” key on the screen to save the current setting.

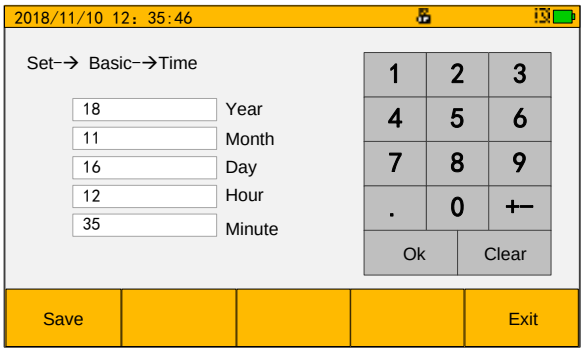


Figure 3.2.2 Time setting

After the battery is removed, the system time needs to be reset.

3.2.4 Address settings

Click “Adress setting” on the interface of Figure 3.2.1 to enter the interface of Figure 3.2.3 for address settings. In this interface, you can enter an address value from 001 to 999.

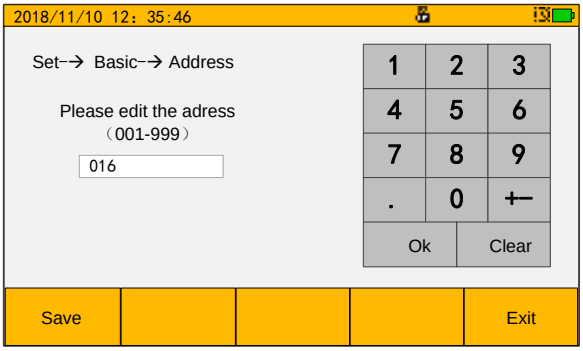


Figure 3.2.3 Address setting

The communication address is only used to identify different instruments during communication.

3.2.5 Other settings

- Language setting: used to set the language mode of the device, divided into “Chinese” and “English”. The setting method is the same as section 3.1.
- Brightness setting: used to set the screen brightness of the device, divided into 1~9 levels, the larger the number, the higher the brightness. The setting method is the same as section 3.1.
- Communication setting: used to set the communication mode of the device, divided into “RS485” wired communication and “Zigbee” wireless communication. The setting method is the same as section 3.1.
- Calibration: calibration operation “Zigbee” will change the calibration value of the device, and an authorization code is required. Please contact our after-sales support for the method of obtaining the authorization code.
- About: the factory information of PR293 series nanovolt and microohm thermometer in this interface can be viewed.

4 Functions

This chapter mainly introduces the detailed usage methods and functions of the PR291/PR293 series nanovolt and microohm thermometers from three aspects: channel setting, display mode, and data statistics.

4.1 Channel settings

The PR291 series of nanovolt micro-ohm thermometers and the PR293 series of nanovolt micro-ohm thermometers have 5 (or 2) rear detection channels and 1 front channel respectively, and parameters can be set independently for each channel. The PR293 series thermometers support a wide range of temperature sensors, including 4 types of standard thermocouples, 2 types of standard platinum resistance thermometers, 8 types of industrial platinum resistance thermometers and 11 working thermocouples. It is also supported to refer to certificate values or correction values for temperature traceability of test results. (PR291 only supports the measurement of resistance signals)

Click the “Channel key on the main interface to enter the channel setting interface. The gear or sensor type can be modified by clicking on the touch screen. As shown in Figure 4.1.1, it is the selected gear or measuring sensor type when it is displayed in yellow. The parameters of each channel can be set independently, and the channel can be switched by clicking the keys “Prior” and “Next” on the screen or the mechanical keys and . After setting, click “Save” to save the information, and click “Exit” to exit the channel setting interface.

4.1.1 Electrical options

Click “Electrical” in the channel setting interface to enter the electrical options, as shown in Figure 4.1.1. Electrical includes gears of 30mV, 100 mV, 1V, 50V, 100Ω, 400Ω, 1KΩ, 10KΩ, 50mA.

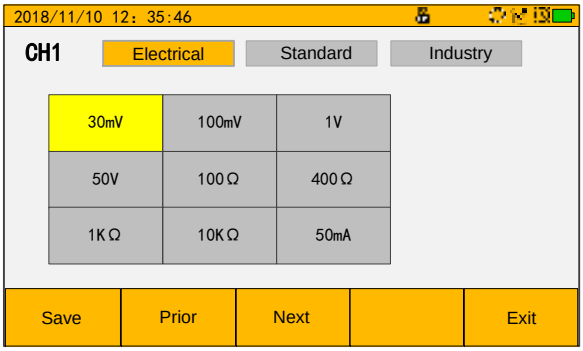


Figure 4.1.1 Electrical options

When the selected gear is an electrical ohm gear or an industrial thermal resistance, the resistance measurement method needs to be set, as shown in Figure 4.1.2. Click the selected box to switch the test method as shown in Figure 4.1.3.

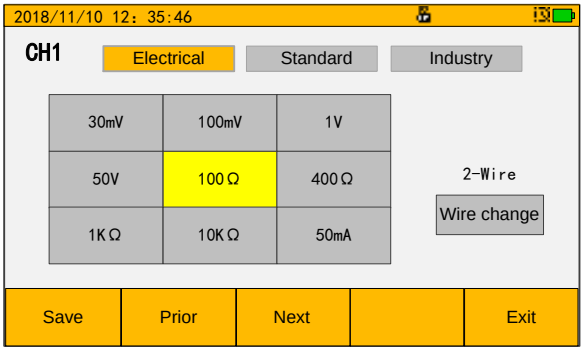


Figure 4.1.2 Resistance gear of electrical option

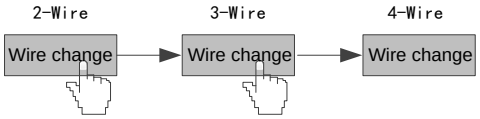


Figure 4.1.3 Test method setting of resistance

4.1.2 Standard sensor options

Click “Standard” in the channel setting interface to enter the standard sensor options, as shown in Figure 4.1.4. Standard sensors include S, R, B, T, SPRT25, SPRT100. Standard sensors can quote certificate values. When selecting the standard thermocouple sensor, it is necessary to set whether the reference end is open or not. As shown

in the following figure 4.1.4, Set is the off state, Set is the enabled state, click to make the corresponding settings.

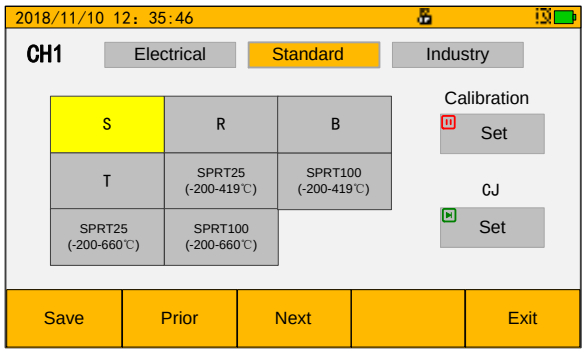


Figure 4.1.4 Standard level option

■ Certificate setting

Click the "Calibration" key on the screen to enter the certificate setting interface as shown in Figure 4.1.5. Choose whether the certificate value is enabled or not, and can enter the certificate value of the standard instrument below (the setting method is the same as the time setting method in section 3.2.3). This device can support the setting and saving of two sets of certificate values (option one, option two). The option displayed in gray in the key below is the certificate item used.

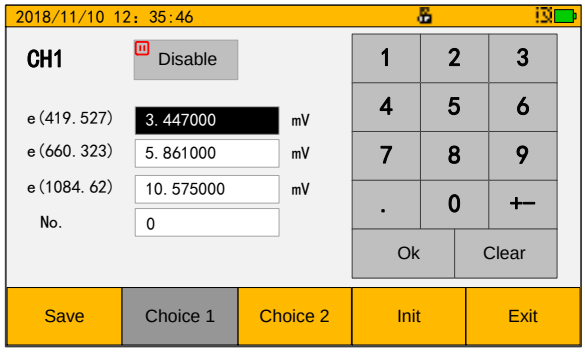


Figure 4.1.5 Certificate setting interface

Click "Init" below and a prompt of "Whether to restore?" will pop up, as shown in Figure 4.1.6. Click "OK"and the two sets of certificate values will be initialized to default values (it is the factory default value of the equipment).

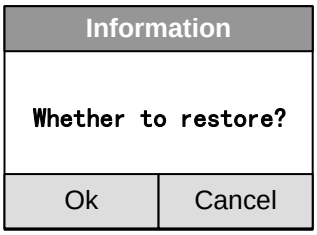


Figure 4.1.6 Certificate setting interface

■ Reference end setting

Click the "CJ" key to enter the reference end setting interface. The reference end includes two states: work and forbidden: when the reference end is in use, the internal reference terminal compensation method is used; when the reference end is disabled, the user-defined compensation method is adopted, and a user-defined reference end temperature value needs to be entered manually.

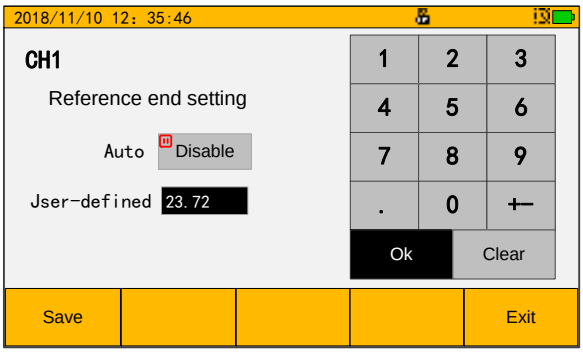


Figure 4.1.7 Certificate setting interface

4.1.3 Industrial grade sensors

Click "Industry" in the channel setting interface to enter the industrial sensor options, as shown in Figure 4.1.8. Industrial sensors include S, R, B, K, N, E, J, T, PT10, PT00 (3851), PT100 (3916), PT200, PT500, PT1000, Cu50, Cu100, Wre3-25, Wre5-26, EA2. Industrial-grade sensors can quote correction values, click the "修正值" key to enter the correction value setting interface as shown in Figure 4.1.9. Whether the correction value is enabled or not can be set here. The number of correction points can be 1 to 6. The setting method is the same as 3.2.3 Time setting method. Click initialize to modify the correction value to the factory default value. The method is the same as the

initialization of the certificate value in section 4.1.2.

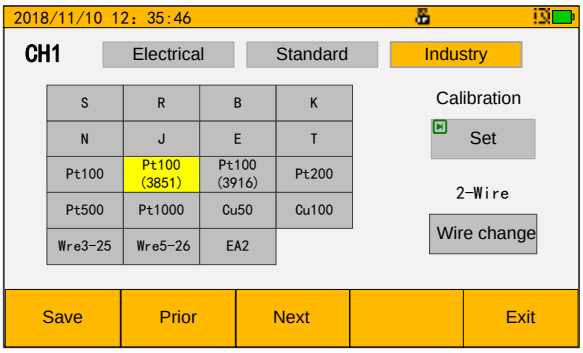


Figure 4.1.8 Industrial grade sensor

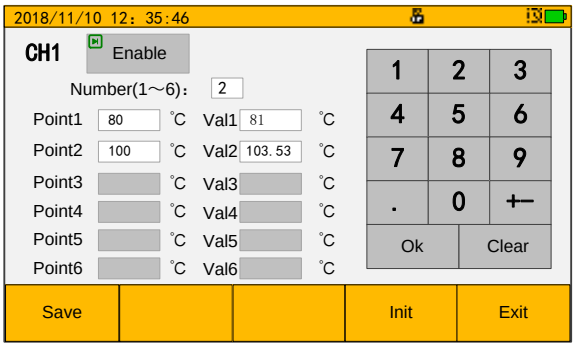


Figure 4.1.9 Correction value interface

4.2 Display mode

This section mainly introduces the three channel display modes of the PR291/PR293 series nanovolt micro-ohm thermometers, namely, multi-channel display mode, single-channel display mode, and dual-channel display mode. Switch the display mode by clicking the “Mode” key on the screen.

4.2.1 Multi-channel display mode (inspection mode)

The multi-channel display mode is the inspection mode. The interface displays the channel number, temperature value, power value, type and configuration. As shown in Figure 4.2.1, click the channel number on the PR293A screen to switch the channel to selected or unselected mode (the default state is all selected). The “CH4” channel is in the unselected mode and will not participate in the inspection, and the other channels are in the selected mode and participate in the inspection. Click “Start” to inspect the selected channel. The character “Refer” of the “CH1” channel is displayed in red to indicate that the reference end of the channel is disabled, and the reference end of “CH2” is in use. The display of “CAL” and “Calibration” means that the channel uses the item.

Both PR293B and PR291B have two channels, and the interface is shown in Figure 4.2.2. The function is similar to the above PR293A.

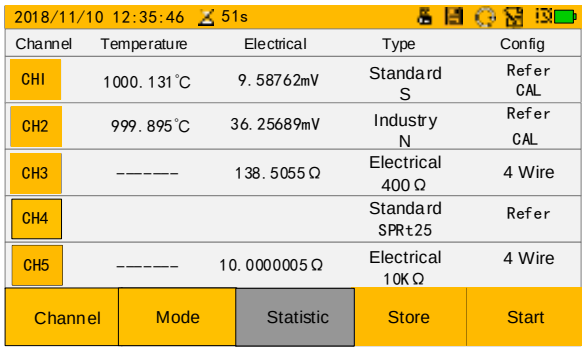


Figure 4.2.1 PR293 multi-channel mode

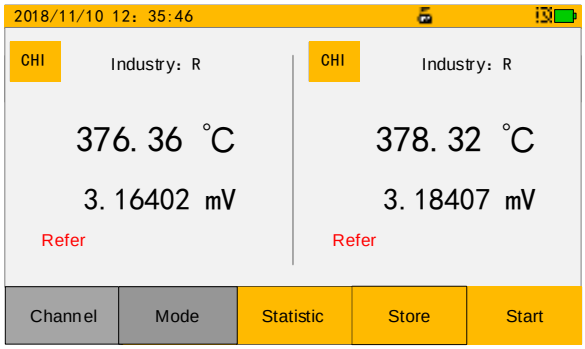


Figure 4.2.2 PR293B multi-channel mode

Click “Start” to start the inspection operation. As shown in Figure 4.2.3, in the inspection mode, clicking the “Store” key will open the recording mode, and the record save mark will be displayed in the upper right corner. Clicking “Store” here will close the recording mode. Click “Statiatie” to view the curve of each channel and the maximum, minimum and stability from the beginning of the inspection to the current. Refer to section 4.3 for specific operations.

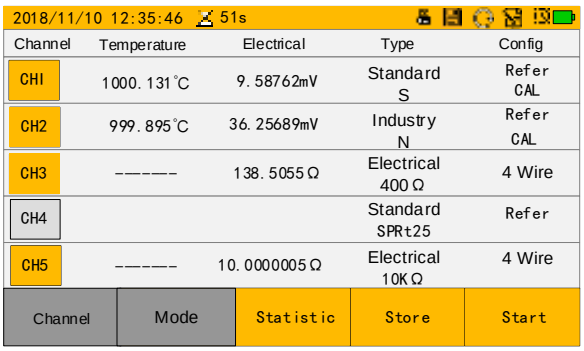


Figure 4.2.3 Start inspection

4.2.2 Single channel display mode (measurement mode)

This interface separately displays the measurement type, power value, configuration parameter and temperature value of a channel, as shown in Figure 4.2.4. Press ▲ or ▼ key to switch channels. Click the "Statiatie" key on the screen to view the temperature curve of the channel, and click the "Data" key in the statistics interface to view the real-time measurement maximum, minimum, stability, and real-time measurement data of the channel. Refer to section 4.3 for specific operations. Click " 《"“》 " to adjust the number of decimal places of the measured value.

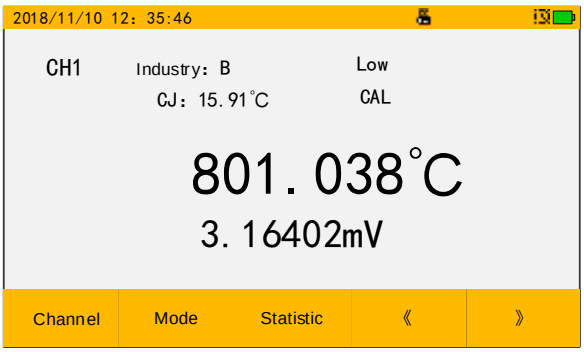


Figure 4.2.4 Single channel display mode

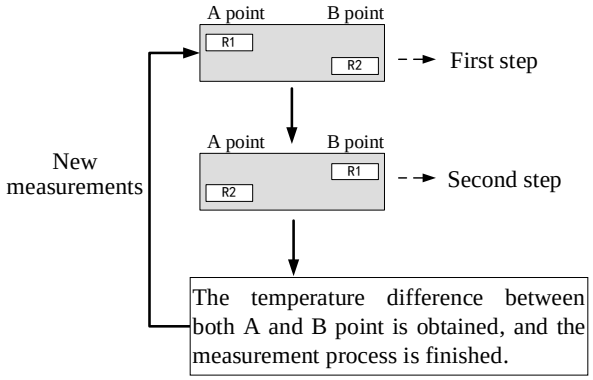
4.2.3 Dual-channel display mode(temperature difference measurement mode)

This mode is the temperature difference measurement mode, as shown in Figure 4.2.4. The device uses CH1 and CH2 channels to participate in the measurement by default. The temperature difference measurement can measure the temperature difference between two points in the space. The test methods include exchange method, shift method, and reset method. The test types include large temperature difference and small temperature difference.

4.2.3.1 Principle of temperature difference test

The following illustrates the operation methods of three basic temperature difference measurement. Assuming that the sensor used is a standard platinum resistance, the CH1 channel platinum resistance is represented by R1, and the CH2 channel platinum resistance is represented by R2. The two spatial points to be measured are A and B respectively.

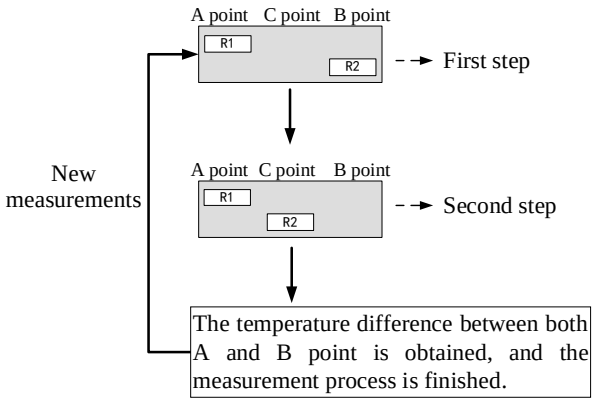
■ Exchange method



First step, place standard 1 at A point and standard 2 at B point, and wait for the R1 and R2 readings in the "data 1" line to stabilize.

Second step, place standard 2 at A point and standard 1 at C point, and wait for the R2 and R1 readings in the "data 2" line to stabilize.

■ Shifting method

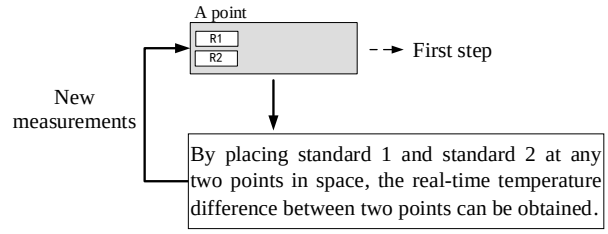


First step, place standard 1 at A point and standard 2

at B point, and wait for the R1 and R2 readings in the “data 1” line to stabilize.

Second step, place standard 1 at A point and standard 2 at B point, and wait for the R1 and R2 readings in the “data 2” line to stabilize.

■ Reset method



First step, place standard 1 and standard 2 together at A point, and wait for the R1 and R2 readings to stabilize.

It can be seen from the above operation flow chart:

The “exchange method” and “shifting method” compare the measuring values of two steps, and eliminate the inherent errors between the standard sensors and the random measurement errors of the equipment itself. But only one temperature difference value is obtained per operation. They are suitable for measuring the temperature field of constant temperature equipment.

The “reset method” only compares the measurement values in the first step, the inherent errors between the standard sensors are cleared out, and then the temperature difference at any two points can be measured in real time. This method cannot eliminate the random error of the equipment, the accuracy is slightly lower, but the dynamic real-time error measurement can be carried out.

The measurement type can select the “large temperature difference” or the “small temperature difference”, which option is valid only for the thermocouple sensors. When the “small temperature difference”is selected, the temperature difference value is calculated by the electric quantity difference in △ : and the Seebeck coefficient, which has higher accuracy. In other cases, the temperature difference value is calculated directly from the temperature value at each step.

4.2.3.2 Operating instruction

As shown in Figure 4.2.5, click the “Set” key to enter the temperature difference parameter setting interface, where you can set the test method and test type. Click “Store” to start the recording function, click again to cancel the recording. After the test is completed, click the “Reset” key to start a new test.

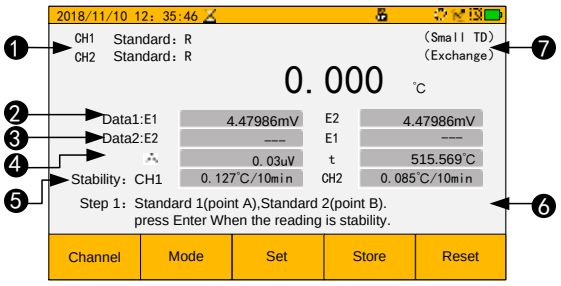


Figure 4.2.5 Dual channel display mode

1. Sensor type.
2. Real-time data during the first step of operation. After pressing the ↵ key, the current data is saved and used as the input parameter for the temperature difference calculation.
3. Real-time data during the second step of operation. After pressing the ↵ key, the current data is saved and used as the input parameter for the temperature difference calculation.
4. The difference obtained from the test.
5. Temperature stability. (Through this stability, you can observe whether the reading is stable in real time, and confirm the reading when the reading is stable enough.)
6. Operation tips.
7. Test type and test method.

Two sensors of the same type must be

selected for the two channels of the small temperature difference test.

The sensor type selected for the small temperature difference test cannot be a thermal resistance.

4.3 Statistics

Click the "Statistic" key in the main interface to enter the curve interface, which is used to display the single-channel or multi-channel temperature curve as shown in Figure 4.3.1.

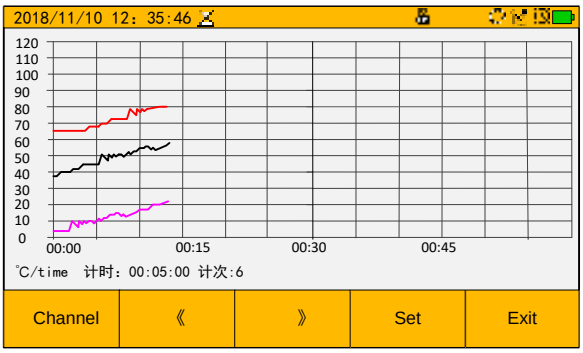


Figure 4.3.1 Temperature curve

Click "Set" (available only in multi-channel mode), you can choose to view the temperature curve of a certain channel or certain channels individually as shown in Figure 4.3.2. The gray display means that the channel is not selected, and the selected channel will be displayed in the same color font as the channel curve. When the acquisition time is long, click "》" or "《" to view the extended part of the temperature curve along the time axis.

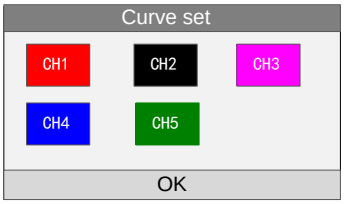


Figure 4.3.2 Curve setting

Click "Data" to view the real-time measurement value of the measurement channel, and click "》" or "《" to view the maximum, minimum and stability of the measurement channel, as shown in Figure 4.3.3.

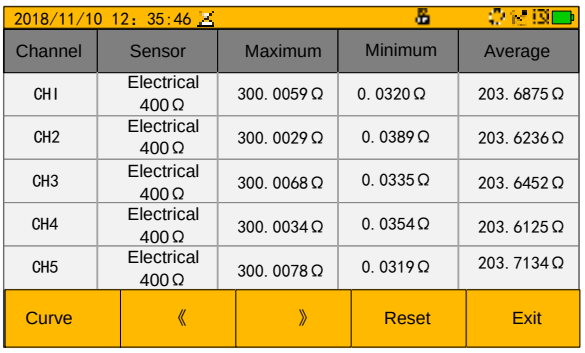


Figure 4.3.3 Data interface

4.4 Reset Function

In the case of inspection mode or single-channel measurement mode, press the key on the right side to bring up the dialog box shown in 4.4.1, click OK to reset the current measurement value to zero, which means that the current measurement value is calibrated as the zero point of the test.

The reset function is primarily used to eliminate load scanning switching potentials, but can also be used to view subsequent changes in temperature or power values relative to a certain point.

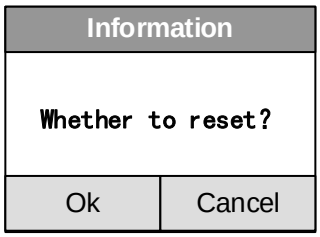


Figure 4.4.1 Reset dialog box

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