# PR291/PR293 Series Nanovolt & Microhm Thermometer

**PANRAN**

**Changsha Panran Technology Co.,Ltd**

√ High-precision resolution of 7 1/2
√ Integrated thermocouple CJ compensator
√ Multiple measurement channels

PR291 series microhm thermometers and PR293 series nanovolt microhm thermometers are high-precision measuring instruments specially designed for temperature metrology. They are suitable for many operations, such as the measurement of temperature data of temperature sensor or electrical data, the temperature uniformity test of calibration furnaces or baths, and the temperature signal acquisition and recording of multiple channels.

With the measurement resolution better than 7 1/2, compared with the general high-precision digital multimeters that have been widely used in temperature metrology for a long time, there are a lot of optimized designs in terms of range, function, accuracy, and ease of use to make the temperature calibration process more accurate, convenient and faster.

## 一、 Features

### ■ Measurement sensitivity of 10nV / 10μΩ

The breakthrough design of ultra-low noise amplifier and the low ripple power supply module greatly reduces the reading noise of the signal loop, thereby increasing the reading sensitivity to 10nV/10u Ω , and effectively increasing the effective display digits during temperature measurement.

■ **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.

■ **Data analysis function**

In addition to various test data, curves and data storage can be displayed, 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**

High-precision digital meters commonly used in laboratories are usually large and not portable. In contrast, PR291/PR293 series thermometers are a smaller in volume and weight, which is convenient for high-level temperature testing in various on-site environments. In addition, the design of the built-in large-capacity lithium battery also makes operation process easier.

多通道模式

Multi-channel mode

修正值界面

Correction data interface

## 二、Models

| Model / Function | PR291B | PR293A | PR293B |
|---|---|---|---|
| Device type | Microhm thermometer | Nanovolt microhm thermometer | |
| Resistance measurement | ● | | |
| Full function measurement | | ● | ● |
| Number of rear channel | 2 | 5 | 2 |
| Weight | 2.7 kg（without charger） | 2.85kg（without charger） | 2.7kg（without charger） |
| Battery duration | ≥6 hours | | |
| Warm-up time | Valid after 130 minutes of warm-up | | |
| Dimension | 230mm×220mm×105mm | | |
| Dimension of display screen | Industrial-grade   7.0 inch TFT color screen | | |
| Working environment | -5～30℃，≤80%RH | | |

## 三、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 | 35 + 10.0 | 3+1.5 |
| 100mV | -110.00000mV～110.00000mV | 10nV | 40 + 4.0 | 3+0.5 |
| 1V | -1.1000000V  ～1.1000000V | 0.1μV | 30 + 2.0 | 3+0.5 |
| 50V | -55.00000 V～55.00000 V | 10μV | 35 + 5.0 | 3+1.0 |
| 100Ω | 0.00000Ω～105.00000Ω | 10μΩ | 40 + 3.0 | 2+0.1 |
| 400Ω | 0.0000Ω～410.0000Ω | 0.1mΩ | 40 + 3.0 | 2+0.1 |
| 1KΩ | 0.0000000kΩ  ～  1.1000000kΩ | 0.1mΩ | 40 + 2.0 | 2+0.1 |
| 10KΩ | 0.000000kΩ  ～  11.000000kΩ | 1mΩ | 40 + 2.0 | 2+0.1 |
| 50mA | -55.00000 mA  ～  55.00000 mA | 10nA | 50 + 5.0 | 3+0.5 |

Note 1: 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.

Note 2: The current measurement function: current sensing resistor is 10Ω.

Note 3: The environment temperature during the test is 23℃±3℃.

## 四、 Specifications

### ■ Temperature measurement with platinum resistance thermometers

| Model / Program | SPRT25 | SPRT100 | Pt100 | Pt1000 |
|---|---|---|---|---|
| Data scale | -200.0000 ℃ ～ 660.0000℃ | -200.0000 ℃ ～ 740.0000℃ | -200.0000 ℃ ～ 800.0000℃ | |
| PR291、PR293series one year accuracy | At -200℃, 0.004℃<br>At 0℃, 0.013℃<br>At 100℃, 0.018℃<br>At 300℃, 0.027℃<br>At600℃, 0.042℃ | At -200℃, 0.005℃<br>At 0℃, 0.013℃<br>At 100℃, 0.018℃<br>At 300℃, 0.027℃<br>At 600℃, 0.043℃ | At 0℃, 0.018℃<br>At 100℃, 0.023℃<br>At 300℃, 0.032℃ | At 0℃, 0.015℃<br>At 100℃, 0.020℃<br>At 300℃, 0.029℃ |
| Resolution | 0.0001℃ | | | |

### ■ Temperature measurement with noble metal thermocouples

| Model / Program | S | R | B |
|---|---|---|---|
| Data scale | 100.000 ℃ ～ 1768.000 ℃ | | 250.000 ℃ ～ 1820.000 ℃ |
| PR291、PR293series one year accuracy | 300℃,0.035℃<br>600℃,0.042℃<br>1000℃,0.050℃ | | 600℃,0.051℃<br>1000℃,0.045℃<br>1500℃,0.051℃ |
| Resolution | 0.001℃ | | |

Note: The above results do not include CJ compensation error.

■ **Temperature measurement with base metal thermocouples**

| Model / Program | K | N | J | E | T |
|---|---|---|---|---|---|
| Data scale | -100.000 ℃ ～ 1300.000 ℃ | -200.000 ℃ ～ 1300.000 ℃ | -100.000 ℃ ～ 900.000 ℃ | -90.000℃ ～ 700.000 ℃ | -150.000 ℃ ～ 400.000 ℃ |
| PR291、PR293series one year accuracy | 300℃,0.022℃ 600℃,0.033℃ 1000℃,0.053℃ | 300℃,0.022℃ 600℃,0.032℃ 1000℃,0.048℃ | 300℃,0.019℃ 600℃,0.030℃ 1000℃,0.046℃ | 300℃,0.016℃ 600℃,0.028℃ 1000℃,0.046℃ | -200℃,0.040℃ 300℃,0.017℃ |
| Resolution | 0.001℃ | | | | |

Note: The above results do not include CJ compensation error.

■ **Technical specifications of built-in thermocouple CJ compensation**

| Program | PR293A | PR293B |
|---|---|---|
| Data scale | -10.00 ℃ ～ 40.00 ℃ | |
| One year accuracy | 0.2 ℃ | |
| Resolution | 0.01 ℃ | |
| Channels number | 5 | 2 |
| Maximum difference between channels | 0.1℃ | |