

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.

1. Features

■ Measurement sensitivity of 10nV / 10 $\mu\Omega$

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/10 $\mu\Omega$, 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°C 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.

通道	温度值	电量值	类型	配置
CH1	1000.131°C	9.58762mV	标准级 S	证书值
CH2	999.895°C	36.25689mV	工业级 N	
CH3	-----	138.5055Ω	电学 350Ω	四线制
CH4	100.0211°C	35.39287Ω	标准级 SPRt25	四线制
CH5	-----	10.0000005Ω	电学 10KΩ	四线制
通道	模式	统计	记录	开始

Multi-channel mode

修正点数量 (1~6):		值	
温度点1	80 °C	值1	81 °C
温度点2	100 °C	值2	103.53 °C
温度点3	°C	值3	°C
温度点4	°C	值4	°C
温度点5	°C	值5	°C
温度点6	°C	值6	°C

1	2	3
4	5	6
7	8	9
.	0	+/-
确定		清除

保存			初始化	退出
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Correction data interface

2. Models catalog

Function \ Model	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°C , ≤80%RH		

3. Electrical specifications

Range	Data scale	Resolution	One year accuracy (ppm reading ppm range)	Temperature coefficient (5°C ~ 35°C) (ppm reading +ppm range)/°C
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°C±3°C.

4. Specifications

■ Temperature measurement with platinum resistance thermometers

Model Program	SPRT25	SPRT100	Pt100	Pt1000
Data scale	-200.0000 °C ~ 660.0000°C	-200.0000 °C ~ 740.0000°C	-200.0000 °C ~ 800.0000°C	
PR291/PR293 series one year accuracy	At -200°C, 0.004°C At 0°C, 0.013°C At 100°C, 0.018°C At 300°C, 0.027°C	At -200°C, 0.005°C At 0°C, 0.013°C At 100°C, 0.018°C At 300°C, 0.027°C	At 0°C, 0.018°C At 100°C, 0.023°C	At 0°C, 0.015°C At 100°C, 0.023°C

	At600°C, 0.042°C	At 600°C, 0.043°C	At 300°C, 0.032°C	0.020°C At 300°C, 0.029°C
Resolution	0.0001°C			

■ Temperature measurement with noble metal thermocouples

Model Program	S	R	B
Data scale	100.000 °C ~ 1768.000 °C		250.000 °C ~ 1820.000 °C
PR291、PR293series one year accuracy	300°C,0.035°C 600°C,0.042°C 1000°C,0.050°C		600°C,0.051°C 1000°C,0.045°C 1500°C,0.051°C
Resolution	0.001°C		

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 °C ~ 1300.000 °C	-200.000 °C ~ 1300.000 °C	-100.000 °C ~ 900.000 °C	-90.000°C ~ 700.000 °C	-150.000 °C ~ 400.000 °C
PR291、PR293series one year accuracy	300°C,0.022°C 600°C,0.033°C 1000°C,0.053°C	300°C,0.022°C 600°C,0.032°C 1000°C,0.048°C	300°C,0.019°C 600°C,0.030°C 1000°C,0.046°C	300°C,0.016°C 600°C,0.028°C 1000°C,0.046°C	-200°C,0.040°C 300°C,0.017°C
Resolution	0.001°C				

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 °C ~ 40.00 °C	
One year accuracy	0.2 °C	
Resolution	0.01 °C	
Channels number	5	2
Maximum difference between channels	0.1°C	

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