

# **PR291/PR293 Series Nanovolt & Microhm Thermometer**

**PANRAN**

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PANRAN instruments are available in South Africa from Intercal (Pty) Ltd

[sales@intercal.co.za](mailto:sales@intercal.co.za)

[www.intercal.co.za](http://www.intercal.co.za)

+27 11 315 432



- 10nV/10μΩ Resolution
- 30PPM Measurement Accuracy
- Automatic Reset of Parasitic Potential
- Multiple Full-function Measurement Channels

## 1. Overview

The PR291/PR293 series nanovolt & microhm thermometers are high-precision measuring instruments specifically designed for the field of temperature metrology. They feature measurement resolutions of 10nV/10μΩ and optimal measurement accuracy reaching 30ppm. Combining excellent high precision and high resolution with a portable design, they provide a more flexible and efficient measurement solution for temperature metrology.

Compared to general-purpose high-precision digital multimeters (DMMs), the PR291/PR293 series thermometers are better suited for temperature metrology in terms of range, functionality, accuracy, and ease of use. They incorporate 2 or 5 fully-functional rear-panel measurement channels. The range options are expanded to include 20mV and 400Ω specifically to match standard thermocouples and Pt100 sensors. Additionally, they offer three operational modes – patrol inspection, single-channel tracking, and temperature difference measurement – for ease of operation.

### 1.1 Appearance

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PR293AP Rear-Panel Measurement Channels



PR293BP Rear-Panel Measurement Channels



PR291BP Rear-Panel Measurement Channels

## 1.2 Features

### ■ Measurement Resolution 10nV/10μΩ

The breakthrough design of the ultra-low-noise amplifier and the miniature low-ripple power supply module significantly reduces reading noise in the thermometer's signal path. Combined with the application of novel digital filtering technology, 8-digit resolution is

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achievable in certain measurement ranges.

#### ■ **Excellent Annual Stability**

The instrument incorporates built-in reference-grade standard resistors and an oven-controlled reference, featuring an extremely low temperature coefficient (TC) and excellent long-term stability, with accuracy reaching 30ppm. Even when operating in field environments between -5°C to 35°C, it maintains excellent measurement accuracy.

#### ■ **Parasitic EMF Auto-Nulling**

All measurement channels incorporate independent hardware zero self-calibration. This enables real-time elimination of range errors caused by parasitic EMFs (electromotive forces) or drift within the measurement loop, eliminating the need for additional polarity reversal switches.

#### ■ **Integrated Multi-Channel Low Noise Scanner**

In addition to the front channel, depending on the model, the rear panel integrates 2 or 5 groups of independent full-function test terminals. Each group of channels can independently set the test signal type, and has extremely high consistency between channels, without any external switch, it can carry out multi-channel data acquisition.

#### ■ **Multifunctional Tellurium Copper Terminals**

The rear channels all use push-type multi-functional tellurium copper terminals, which are gold-plated with tellurium copper, which has excellent electrical connection performance and can provide a variety of wire connection methods.

#### ■ **Three Working Modes**

It has three working modes: patrol inspection, single-channel tracking, and temperature difference measurement. When the single-channel tracking mode working, the thermometer is used in a similar manner to a conventional digital multimeter. The temperature difference measurement mode can analyze the temperature field uniformity of various constant temperature equipment.

#### ■ **Rich Temperature Metrology Functions**

Compared with the traditional digital multimeter, the 20mV range for measuring S-type thermocouples and the 400Ω range for PT100 platinum resistance measurement are added. At

the same time, conversion programs for various temperature sensors are built-in, the certificate value or the corrected value can be quoted to carry out temperature traceability of the test results. Simultaneously, all measurement channels feature dedicated thermocouple (TC) jacks with accuracy better than 0.2°C.

### ■ Data Analysis Function

In addition to displaying various test data, curves and data storage functions, the thermometer can also perform maximum/minimum/average calculations for real-time data, and perform various calculations of temperature fluctuations.

### ■ Portable Design

Compared with the thermometers of the same level, it has a smaller volume and weight, which is convenient for high-level temperature testing in various field environments. The design of the built-in high-capacity lithium battery also makes it easier to use.

## 1.3 Partial Work Interface

Channel	Temperature	Electrical	Type	Config
CH1	1000.131°C	9.58762mV	Standard S	Refer CAL
CH2	999.895°C	36.25689mV	Industry N	Refer CAL
CH3	-----	138.5055Ω	Electrical 400Ω	4 Wire
CH4			Standard SPRT25	Refer
CH5	-----	10.0000005Ω	Electrical 10KΩ	4 Wire
Channel	Mode	Statistic	Record	Start

Channel	Mode	Set	Record	Reset
2025/02/13 12: 35:46 CH1 Standard: R (Small TD) CH2 Standard: R (Exchange) <h1 style="text-align: center;">0.000 °C</h1> Data1:E1 4.47986mV E2 4.47986mV Data2:E2 --- E1 --- Δ 0.03uV t 515.569°C Stability: CH1 0.127°C/10min CH2 0.085°C/10min Step 1: Standard 1(point A),Standard 2(point B). press Enter When the reading is stability.				
Channel	Mode	Set	Record	Reset

## 2. Technical Parameters

### 2.1 Model Selection

Model	PR291BP	PR293AP	PR293BP
Device Type	Microhm Thermometer	Nanovolt&Microhm Thermometer	
Resistance Measurement	●		
Full Function Measurement		●	●
Number of Rear Channels	2	5	2

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Weight	2.4kg	2.7kg	2.4kg
Battery Type	11.1V 6800mAh, Rechargeable Lithium Battery		
Battery Duration	≥13 hours		
Dimensions	230mm×220mm×120mm		
Display Screen Size	Industrial Grade 7.0-Inch TFT Color Screen		
Working Environment	-5°C~35°C, ≤80%RH		

## 2.2 Electrical Technical Parameters

Range	Measurement Range	Resolution	One Year Accuracy (ppm RD+ppm Range)
20mV	-5.00000mV~25.00000mV	10nV	40+25
100mV	-20.00000mV~110.00000mV	10nV	40+7
1V	-0.2000000V~1.1000000V	0.1μV	30+2
50V	-10.00000V~55.00000V	10μV	100+20
100Ω	0.00000Ω~105.00000Ω	10μΩ	30+2
400Ω	0.0000Ω~410.0000Ω	10μΩ	30+1.5
1KΩ	0.000000kΩ~1.1000000kΩ	0.1mΩ	30+1
10KΩ	0.000000kΩ~11.000000kΩ	1mΩ	30+1
50mA	-10.00000mA~55.00000mA	1nA	100+20

Note: 1.The resistance uses the four-wire measurement method, the excitation current of the 10KΩ range is 0.1mA, and the excitation current of other resistance ranges is 1mA.  
 2. For 10k range 2-wire and 3-wire resistance measurements, an additional compensation of 30mΩ is required on top of the base 4-wire accuracy.For all other resistance ranges, 2-wire and 3-wire resistance measurements require an additional compensation of 10mΩ on top of the base 4-wire accuracy.  
 3.The ambient temperature during the test is 23°C±3°C.

Range	Reading Noise	Temperature Coefficient (ppm RD+ppm Range)
20mV	50nV	3+1.5
100mV	60nV	3+0.5
1V	0.4μV	3+0.5
50V	60μV	3+1.0
100Ω	30μΩ	2+0.1
400Ω	100μΩ	2+0.1
1KΩ	0.2mΩ	2+0.1
10KΩ	2mΩ	2+0.1
50mA	80nA	3+0.5

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Note: Reading noise is defined as the difference between the maximum and minimum measured reading observed within a 1-minute period, with the input shorted or open.

## 2.3 Technical Parameter

### ■ Temperature Measurement with Platinum Resistor(RTD)

Sensor	Measurement Range	Accuracy
SPRT25	-189°C~660°C	0.003°C@-189°C; 0.009°C+0.0035%RD@(0~660)°C
SPRT100	-189°C~660°C	0.003°C@-189°C; 0.009°C+0.0035%RD@(0~660)°C
Pt10	-200°C~850°C	0.006°C@-200°C; 0.010°C@-100°C; 0.013°C+0.004%RD@(0~850)°C
Pt100	-200°C~850°C	0.003°C@-200°C; 0.006°C@-100°C; 0.009°C+0.0035%RD@(0~850)°C
Pt200	-200°C~850°C	0.002°C@-200°C; 0.005°C@-100°C; 0.009°C+0.0036%RD@(0~850)°C
Pt500	-200°C~850°C	0.006°C@-200°C; 0.010°C@-100°C; 0.012°C+0.004%RD@(0~850)°C
Pt1000	-200°C~850°C	0.004°C@-200°C; 0.007°C@-100°C; 0.010°C+0.004%RD@(0~850)°C
Cu50	-50°C~150°C	0.006°C@-50°C; 0.008°C@0°C; 0.011°C@100°C
Cu100	-50°C~150°C	0.007°C@-50°C; 0.008°C@0°C; 0.011°C@100°C

### ■ Temperature Measurement for Thermocouples

Sensor	Measurement Range	Accuracy
S	-50°C~1768°C	0.09°C@0°C; 0.06°C@300°C; 0.07°C@600°C; 0.08°C@1000°C; 0.1°C@1700°C
R	-50°C~1768°C	0.1°C@0°C; 0.06°C@300°C; 0.06°C@600°C; 0.07°C@1000°C; 0.1°C@1700°C
B	300°C~1820°C	0.02°C@300°C; 0.1°C@600°C; 0.08°C@1000°C; 0.07°C@1200°C; 0.09°C@1800°C
K	-200°C~1372°C	0.02°C@0°C; 0.03°C@300°C; 0.04°C@600°C; 0.06°C@1000°C; 0.08°C@1300°C
N	-200°C~1300°C	0.03°C@0°C; 0.03°C@300°C; 0.04°C@600°C; 0.06°C@1000°C; 0.07°C@1300°C
J	-210°C~1200°C	0.01°C@0°C; 0.02°C@300°C; 0.03°C@600°C; 0.05°C@1000°C; 0.06°C@1200°C
E	-200°C~1000°C	0.01°C@0°C; 0.02°C@100°C; 0.02°C@300°C; 0.03°C@600°C; 0.05°C@1000°C
T	-200°C~400°C	0.05°C@-200°C; 0.01°C@0°C; 0.02°C@200°C; 0.02°C@400°C
Wre3-25	0°C~2315°C	0.05°C@300°C; 0.06°C@600°C; 0.07°C@1000°C; 0.13°C@1800°C; 0.25°C@2300°C
Wre5-26	0°C~2315°C	0.05°C@300°C; 0.06°C@600°C; 0.08°C@1000°C; 0.15°C@1800°C; 0.25°C@2300°C
EA2	-45°C~800°C	0.01°C@0°C; 0.02°C@200°C; 0.02°C@400°C; 0.03°C@600°C; 0.04°C@800°C

Note: The above results do not include CJ compensation errors

### ■ Built-in Thermocouple Reference Junction Technical Parameters

Item	PR293AP	PR293BP
Measurement Range	-10°C~40°C	
One Year Accuracy	0.2°C	
Resolution	0.01°C	

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Max. Diff. Between the Channels	0.1°C
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### 3. Packaging Information

#### Standard Accessories

No.	Name	Quantity	Unit	Remark
1	Nanovolt&Microhm Thermometer	1	Unit	
2	Portable Bag	1	Piece	
3	Fuse Tube	1	Piece	100mA
4	Fuse Tube	1	Piece	1.25A
5	U Disk	1	Piece	32G
6	Charger	1	Piece	12.6V/1.5A
7	4mm Banana Plug Test Leads	4	Set	One Red and One Black Lead, Each 1.2 Meters Long, With a Single Alligator Clip Per Lead
8	Copper Spade Lug Test Leads	4	Set	One Red and One Black Lead, Each 1.2 Meters Long
9	PP1505 Test Line	PR293AP:5 PR293BP/PR291BP:2	Set	One Each in Red, Yellow, Blue, and Green, 1.2 Meters Long
10	Test Report	1	Set	
11	Certificate	1	Set	
12	Satisfaction Questionnaire	1	Set	
13	Warranty Card	1	Set	

#### Optional Accessories

No.	Name	Quantity	Unit	Remark
1	Dedicated Communication Line	1	Piece	