PR235 Series Multi-Function Calibrator

PANRAN

1. Overview

The PR235 series multi-function calibrator can measure and output a variety of electrical and temperature values, with a built-in isolated LOOP power supply. It adopts an intelligent operating system and combines touch screen and mechanical buttons operations, featuring rich functions and easy operation. In terms of hardware, it uses a new port protection technology to achieve 300V over-voltage protection for measurement and output ports, bringing more excellent safety and convenient operability for on-site calibration work.

1.1 Appearance

1.2 Technical Features

- Excellent port protection performance, both the output and measurement terminals can withstand up to 300V AC high voltage mis-connection without causing hardware damage. For a long time, the calibration work of field instruments usually requires operators to carefully distinguish between strong and weak electricity, and wiring errors may cause serious hardware damage, The new hardware protection design provides a strong guarantee for protecting operators and calibrators.
- Humanized design, adopting an embedded intelligent operating system, supporting sliding screen and other operations, simplifying the operation interface while having rich software functions. Adopting the human-computer interaction mode of touch screen + mechanical buttons, the capacitive touch screen can bring an operation experience comparable to that of a smartphone, while the mechanical buttons can help improve the accuracy of operation in harsh environments or when wearing gloves. In addition, the calibrator is also designed with a flashlight function to provide lighting for low-light environments.
- Three reference junction modes can be selected: built-in, external, and custom. In the external mode, the intelligent reference junction can be automatically matched. The intelligent reference junction has a built-in temperature sensor with a correction value, made of tellurium copper. It can be used in combination or split into two independent clamps according to needs. The unique design of the clamp mouth makes it easy to bite conventional wires and nuts, so as to obtain more accurate reference junction temperature with more convenient operation.
- Measurement intelligence, electrical measurement has automatic range, and automatically recognizes the connection mode when measuring resistance or thermal resistance, eliminating the cumbersome operation of selecting range and wiring mode during measurement.
- Diversified output setting methods, values can be input via the touchscreen or set digit-by-digit using buttons. It also features three stepping modes: ramp, step, and sine, the step cycle and step length can be freely set.
- Measurement toolbox, with multiple built-in applets, can perform forward and reverse conversions of temperature values and electrical values of thermocouples

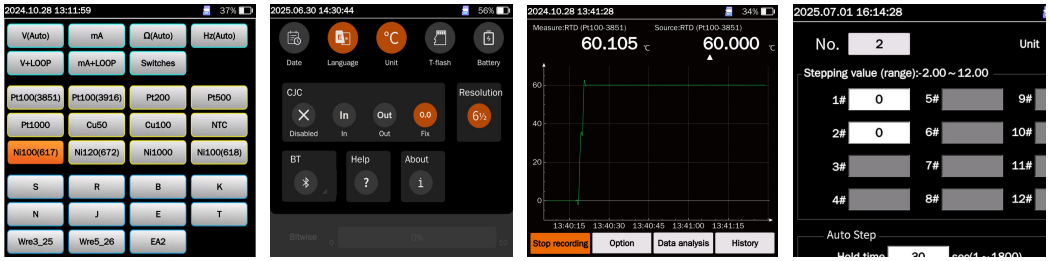
and thermal resistors, and supports mutual conversions of more than 20 physical quantities in different units.

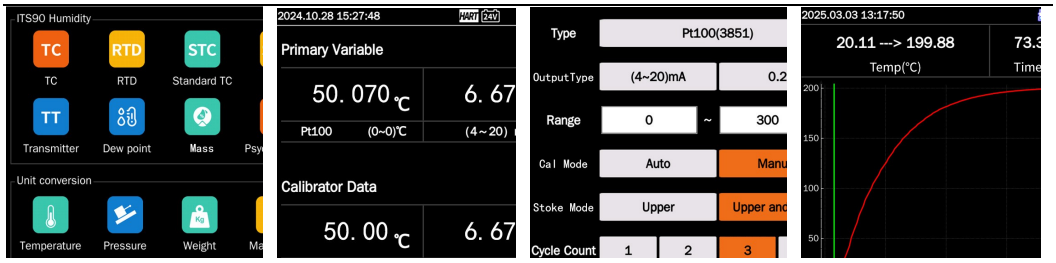
- Curve display and data analysis functions, can be used as a data recorder to record and display measurement curves in real time, and perform diverse data analysis on the recorded data, such as standard deviation, maximum, minimum, and average values.
- Task functions (Model A, Model B), built-in calibration task applications for temperature transmitters, temperature switches, temperature instruments, and thermal response time, can quickly create tasks or select templates on site, automatically perform error judgment, and output calibration process and result data after task completion. Among them, the thermal response time calibration function can automatically judge the start and end points of the step response, calculate the step response time and time constant, and export test data and step curves.
- HART communication function (Model A), with a built-in 250Ω resistor, combined with the built-in isolated LOOP power supply, it can communicate with HART type transmitter without other peripherals, and can set or adjust its internal parameters.
- Expansion functions (Model A, Model B) supporting pressure measurement, humidity measurement and other modules. Without affecting the original measurement and output functions, the calibrator automatically recognizes the module after it is inserted into the port and enters the three-screen mode.

1.3 Main Function List

Software Features	Hardware Features
■ Automatic switching of measurement range and automatic matching of measurement resistance wire system. ■ Optional built-in/external/custom reference terminal compensation. ■ Supports intelligent reference terminal. ■ Supports multi-point temperature correction for temperature sensor measurement (Model A, Model B). ■ Supports certificate value traceability for standard temperature sensor measurement (Model A, Model B). ■ Multiple sets of parameters can be set for thermistor measurement, and Steinhart-Hart and B mode temperature coefficient calculation are supported. ■ Manual/automatic ramp, step, sine output, parameters can be set. ■ Measurement data curve display. ■ Real-time analysis of measurement data. ■ Optional ℃, ℉, K. ■ Task functions (temperature transmitter, temperature switch, temperature instrument, thermal response time) (Model A, Model B). ■ HART communication function.(Model A). ■ Bluetooth communication function (Model A, Model B). ■ Battery life, health and remaining usage time estimation. ■ Chinese and English interface. ■ Screenshot function. ■ Firmware upgrade. ■ Help function.	■ Measurement and output of voltage, current, resistance and frequency functions. ■ Measurement and output of 11 types of thermocouples and 11 types of thermal resistor signals. ■ Measurement of standard platinum resistance and standard thermocouple signals (Model A, Model B). ■ Measurement of two-wire, three-wire and four-wire thermal resistors. ■ Measurement of thermistor. ■ Measurement of switch quantity and ρ value. ■ Real-time monitoring of internal multi-position temperature. ■ Monitoring of abnormal load of output function. ■ Support external module expansion. (Model A, Model B). ■ Low potential tellurium copper terminal. ■ Isolated LOOP power supply. ■ Built-in 250Ω resistor (Model A). ■ Support TF card storage. ■ Flashlight function. ■ Intelligent lithium battery. ■ Dust proof and waterproof level IP63.

1.4 Part of The Working Interface





2. Technical Parameters

2.1 General Technical Parameters

Item	Parameter		
Model	PR235A	PR235B	PR235C
Task function	√	√	×
Standard temperature measurement	√	√	×
Extended function	√	√	×
Measuring temperature sensor supports multi-point temperature correction	√	√	×
Bluetooth communication	√	√	×
HART function	√	×	×
Built-in 250Ω resistor	√	×	×
Appearance dimension	200mm×110mm×55mm		
Weight	790g		
Screen specification	4.0-inch industrial touch screen, resolution 720×720 pixels		
Battery capacity	11.1V 2600mAh rechargeable lithium battery		
Continuous working time	≥13 hours		
Work environment	Operating temperature range: (5~35)℃, non-condensing		
Power supply	220VAC±10%, 50Hz		
Calibration period	1 year		
Note: √ means this function is included, × means this function is not included			

2.2 Electrical Technical Parameters

Measurement function

Function	Range	Measuring range	Resolution	Accuracy	Remarks
Voltage	100mV	-120.0000mV～120.0000mV	0.1μV	0.015%RD+0.005mV	Input Impedance ≥500MΩ
	1V	-1.200000V～1.200000V	1.0μV	0.015%RD+0.00005V	
	50V	-5.0000V～50.0000V	0.1mV	0.015%RD+0.002V	Input Impedance ≥1MΩ
Current	50mA	-50.0000mA～50.0000mA	0.1μA	0.015%RD+0.003mA	10Ω Current sensing resistor
Four-wire resistance	100Ω	0.0000Ω～120.0000Ω	0.1mΩ	0.01%RD+0.007Ω	1.0mA Excitation current
	1kΩ	0.000000kΩ～1.200000kΩ	1.0mΩ	0.015%RD+0.00002kΩ	
	10kΩ	0.00000kΩ～12.00000kΩ	10mΩ	0.015%RD+0.0002kΩ	0.1mA Excitation current
Three-wire resistance	The range, scope and resolution are the same as those of the four-wire resistance, the accuracy of the 100Ω range is increased by 0.01%FS on the basis of the four-wire resistance. The accuracy of the 1kΩ and 10kΩ ranges is increased by 0.005%FS on the basis of the four-wire resistance.				Note 1
Two-wire resistance	The range, scope and resolution are the same as those of the four-wire resistance, the accuracy of the 100Ω range is increased by 0.02%FS on the basis of the four-wire resistance. The accuracy of the 1kΩ and 10kΩ ranges is increased by 0.01%FS on the basis of the four-wire resistance.				Note 2
Standard temperature	SPRT25、SPRT100, resolution 0.001°C, see Table 1 for details.				
Thermocouple	S, R, B, K, N, J, E, T, EA2, Wre3-25, Wre5-26, resolution 0.01°C, see Table 3 for details.				
Thermal resistor	Pt10, Pt100, Pt200, Cu50, Cu100, Pt500, Pt1000, Ni100(617), Ni100(618), Ni120, Ni1000, resolution 0.001°C, see Table 1 for details.				
Frequency	100Hz	0.050Hz～120.000Hz	0.001Hz	0.005%FS	Input voltage range: 3.0V～36V
	1kHz	0.00050kHz～1.20000kHz	0.01Hz	0.01%FS	
	10kHz	0.0500Hz～12.0000kHz	0.1Hz	0.01%FS	
	100kHz	0.050kHz～120.000kHz	1.0Hz	0.1%FS	

	ρ value	1.0%～99.0%	0.1%	0.5%	100Hz, 1kHz are effective
Switch measurement	/	ON/OFF	/	/	Trigger delay ≤20mS

Note 1: The three test wires should better use the same specifications to ensure that the test wires have the same wire resistance.

Note 2: The influence of the test wire resistance on the measurement results should be noted. The influence of the test wire resistance on the measurement results can be reduced by connecting the test wires in parallel.

Note 3: The above technical parameters are based on an ambient temperature of 23℃±5℃.

Output function					
Function	Range	Measuring range	Resolution	Accuracy	Remarks
Voltage	100mV	-20.0000mV～120.0000mV	0.1μV	0.015%RD+0.005mV	Maximum load current 10mA
	1V	-0.20000V～1.20000V	1.0μV	0.015%RD+0.00005V	
	10V	-2.0000V～12.0000V	0.1mV	0.015%RD+0.0005V	
Current	30mA	-0.000mA～31.000mA	1.0μA	0.015%RD+0.002mA	Powered by built - in LOOP
Resistance	400Ω	0.000Ω～400.000Ω	1mΩ	0.015%RD+0.1Ω	(0.1～0.4)mA excitation
				0.015%RD+0.05Ω	(0.4～0.8)mA excitation
				0.015%RD+0.02Ω	(0.8～1.2)mA excitation
				0.015%RD+0.02Ω	(1.2～5.0)mA excitation
	4kΩ	0.00000kΩ～4.00000kΩ	10mΩ	0.015%RD+0.002kΩ	(0.05～0.08)mA excitation
				0.015%RD+0.0003kΩ	(0.08～0.12)mA excitation
				0.015%RD+0.0005kΩ	(0.12～0.3)mA excitation
Thermocouple	S, R, B, K, N, J, E, T, EA2, Wre3-25, Wre5-26, resolution 0.01°C, see Table 3 for details.				
Thermal resistor	Pt10, Pt100, Pt200, Cu50, Cu100, Pt500, Pt1000, Ni100(617), Ni100(618), Ni120, Ni1000, resolution 0.001°C, see Table 2 for details.				

Frequency [Note 1]	1kHz	0.000050kHz～1.200000kHz	0.001Hz	0.015%RD+0.00005kHz	Support pulse counting function
	100kHz	0.005kHz～120.000kHz	1.0Hz	0.04%RD+0.05kHz	Settings ≤50kHz
				0.07%RD+0.05kHz	Settings > 50kHz
LOOP	Isolated power supply, output voltage 24V±0.5V, load capacity 30mA, ripple <20mVp-p				/

Note 1: Duty cycle setting range: 0.1%~99.9%, amplitude setting range: 0V~12V, pulse function maximum count value 99999.

Note 2: The above technical parameters are based on an ambient temperature of 23℃±5℃.

2.3 Temperature Parameters

Table 1 Thermal resistance measurement function		
Range	Measuring range	Accuracy[Note 1][Note 2]
SPRT25	-189.344℃～660.323℃	0.08℃@-100℃；0.1℃+0.012%RD@(0～660.323)℃
SPRT100	-189.344℃～660.323℃	0.07℃@-100℃；0.09℃+0.02%RD@(0～660.323)℃
Pt100 (3851/3916)	-200℃～850℃	0.05℃@-200℃；0.07℃@-100℃；0.09℃+0.02%RD@(0～850)℃
Pt200	-200℃～850℃	0.03℃@-200℃；0.05℃@-100℃；0.07℃+0.02%RD@(0～850)℃
Pt500	-200℃～370℃	0.02℃@-200℃；0.04℃@-100℃；0.05℃+0.018%RD@(0～370)℃
Pt1000	-200℃～850℃	0.05℃@-200℃；0.07℃@-100℃；0.09℃+0.02%RD@(0～850)℃
Cu50	-50℃～150℃	0.05℃@-50℃；0.06℃+0.01%RD@(0～150)℃
Cu100	-50℃～150℃	0.07℃@-50℃；0.09℃+0.02%RD@(0～150)℃
Ni100(617)	-60℃～180℃	0.07℃
Ni120(672)	-80℃～310℃	0.05℃@-80℃；0.06℃@(0～310)℃
Ni1000	-60℃～250℃	0.08℃
Ni100(618)	-60℃～180℃	0.07℃

Note 1: The above technical parameters are calculated based on the corresponding electrical range technical parameters.

Note 2: The four-wire measurement method is adopted.

Table 2 Output thermal resistance function		
Range	Measuring range	Accuracy[Note 1][Note 2]
Pt100 (3851/3916)	-200℃～850℃	0.05℃@-200℃；0.07℃@-100℃；0.09℃+0.02%RD@(0～850)℃
Pt200	-200℃～270℃	0.03℃@-200℃；0.05℃@-100℃；0.07℃+0.02%RD@(0～270)℃
Pt500	-200℃～850℃	0.15℃@-200℃；0.17℃@-100℃；0.2℃+0.025%RD@(0～850)℃
Pt1000	-200℃～850℃	0.08℃@-200℃；0.1℃@-100℃；0.12℃+0.025%RD@(0～850)℃

Cu50	-50℃～150℃	0.15℃
Cu100	-50℃～150℃	0.1℃
Ni100(617)	-60℃～180℃	0.07℃
Ni120(672)	-80℃～310℃	0.06℃
Ni1000	-60℃～250℃	0.1℃@-60℃；0.1℃-0.007%RD@(0～250)℃
Ni100(618)	-60℃～180℃	0.065℃

Note 1: The above technical parameters are calculated based on the corresponding electrical range technical parameters.
Note 2: Pt100, Pt200, Cu50, Cu100 ranges use 1.0mA excitation current, and Pt500, Pt1000 ranges use 0.1mA excitation current.

Table 3 Measurement/output thermocouple functions

Type	Range		Accuracy[Note 1][Note 2]
	Measurement	Output	
S	-50℃～1768℃		1.0℃@(-10～200)℃；0.6℃@(200～1500)℃；0.7℃@(1500～1768)℃；
R			1.2℃@(-10～100)℃；0.7℃@(100～200)℃；0.6℃@(200～1768)℃；
B	0℃～1820℃		1.2℃@(400～600)℃；0.9℃@(600～800)℃；0.7℃@(800～1000)℃；0.6℃@(1000～1820)℃；
K	-200℃～1372℃	-270℃～1372℃	0.2℃@(-100～700)℃；0.3℃@(700～1100)℃；0.4℃@(1100～1372)℃；
N	-200℃～1300℃	-270℃～1300℃	0.3℃@(-100～0)℃；0.2℃@(0～700)℃；0.3℃@(700～1100)℃；0.4℃@(1100～1300)℃；
J	-210℃～1200℃		0.3℃@(-200～-150)℃；0.2℃@(-150～900)℃；0.3℃@(900～1200)℃；
E	-200℃～1000℃	-270℃～1000℃	0.3℃@(-200～-150)℃；0.2℃@(-150～1000)℃；
T	-200℃～400℃	-270℃～400℃	0.4℃@(-200～-100)℃；0.2℃@(-100～400)℃；
Wre3-25	0℃～2315℃		0.5℃@(0～400)℃；0.4℃@(400～900)℃；0.5℃@(900～1200)℃；0.6℃@(1200～1600)℃；0.9℃@(1600～2100)℃；1.3℃@(2100～2315)℃；
Wre5-26			
EA2	-50℃～800℃		0.1℃@(-10～300)℃；0.2℃@(300～800)℃；

Note 1: The above technical parameters are calculated based on the corresponding electrical range technical parameters.
Note 2: The accuracy does not include the reference end compensation error. The built-in compensation needs to be used with the TC plug and add 0.3℃ reference end compensation error.

3. Packing information

Specification		Quantity	Unit	Remarks
Standard	Calibrator	1	Piece	

Accessories	External reference junction sensor(23521)	1	Piece	Temperature measurement range 0℃～50℃, with a fixing clip.
	Red and black test line	3	Set	One red and one black, length 1.2 meters, including one-side alligator clip
	Type K thermocouple compensation wire(23523)	1	Piece	Length 2 meters, including single-sided mini plug
	Portable charger(23541)	1	Piece	
	Fuse(50mA)	2	Piece	
	Fuse(100mA)	2	Piece	
	Fuse(1.25A)	2	Piece	
	TF card(32G)	1	Piece	
	TF card reader	1	Piece	
	Quick operation guide	1	Piece	
	User manual	1	Piece	
	Ex-factory test report	1	Piece	
	Certificate	1	Piece	
	Side straps	1	Piece	
	Carrying case(23531)	1	Piece	See Section 4 for appearance. appearance dimensions: 230mm×130mm×210mm
Optional Accessories	Low ripple charger(23542)	1	Piece	
	Smart reference junction (23522)	1	Piece	Silicone clip type, temperature measurement range 0℃～50℃
	Type S thermocouple compensation wire	1	Piece	
	Type R thermocouple compensation wire	1	Piece	
	Type B thermocouple compensation wire	1	Piece	
	Type T thermocouple compensation wire	1	Piece	
	Type N thermocouple compensation wire	1	Piece	
	Type J thermocouple compensation wire	1	Piece	
	Type E thermocouple compensation wire	1	Piece	
	Dedicated RS232 communication line(23525)	1	Piece	Length 1 meter
	PR9110 Intelligent digital pressure module	1	Piece	For optional ranges, see Section 7
	Temperature and humidity module(23524)	1	Piece	Temperature：-40℃～80℃ Humidity：0%RH～100%RH

4. Carrying Case Appearance

23531 appearance of the carrying case is shown in the figure below.

5. Reference End Appearance

23521 External reference junction

23522 Smart reference junction

6. External Module Appearance

23524 Temperature and humidity module

PR9110 Intelligent digital pressure module

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

7. Intelligent Digital Pressure Module Range

7.1 Regular Gauge Pressure

No.	Pressure range	Medium	Accuracy
1	（-100～0）kPa	Gas	0.05/0.1
2	（0～100）kPa	Gas	0.05/0.1
3	（0～160）kPa	Gas / liquid	0.05/0.1
4	（0～250）kPa	Gas / liquid	0.05/0.1
5	（0～400）kPa	Gas / liquid	0.05/0.1
6	（0～600）kPa	Gas / liquid	0.05/0.1
7	（0～1）MPa	Gas / liquid	0.05/0.1
8	（0～1.6）MPa	Gas / liquid	0.05/0.1
9	（0～2.5）MPa	Gas / liquid	0.05/0.1
10	（0～4）MPa	Gas / liquid	0.05/0.1
11	（0～6）MPa	Gas / liquid	0.05/0.1
12	（0～10）MPa	Gas / liquid	0.05/0.1
13	（0～16）MPa	Gas / liquid	0.05/0.1
14	（0～25）MPa	Gas / liquid	0.05/0.1
15	（0～40）MPa	Gas / liquid	0.05/0.1
16	（0～60）MPa	Gas / liquid	0.05/0.1
17	（0～100）MPa	Gas / liquid	0.05/0.1

7.2 Compound Gauge Pressure

No.	Pressure range	Medium	Accuracy
1	±100kPa	Gas	0.05/0.1
2	（-100～160）kPa	Gas / liquid	0.05/0.1
3	（-100～250）kPa	Gas / liquid	0.05/0.1
4	（-100～400）kPa	Gas / liquid	0.05/0.1
5	（-100～600）kPa	Gas / liquid	0.05/0.1
6	（-0.1～1）MPa	Gas / liquid	0.05/0.1
7	（-0.1～1.6）MPa	Gas / liquid	0.05/0.1
8	（-0.1～2.5）MPa	Gas / liquid	0.05/0.1