TH0200 Standard Resistance Measuring Device

1. Summary

The TH0200 is a high-precision, wide-range resistance measurement standard. It comes with a built-in reference resistor, enabling fast and accurate measurement of 0.01-grade or lower standard resistors/resistance boxes. It also supports external connection of a standard reference resistor for achieving even higher measurement precision.

This device utilizes a comparator bridge principle, making it ideal for metrology laboratories to perform measurement, comparison, transfer, and calibration of standard resistors or resistance boxes.

References:

JJG 166-2022 *Verification Regulation of DC Standard Resistors.*

JJG 982-2022 *Verification Regulation of DC Resistance Boxes.*

2. Features

- Output Current Range: 3.16 μ A ~ 10 A
- Resistance Measurement Range: 1 m Ω ~ 11 M Ω
- Typical Resistance Measurement Uncertainty: 10 ppm

  Built-in Standard Reference Resistor: Enables fast and convenient testing; supports external connection for higher precision resistance measurements
- Measurement Cycle: 8 seconds (adjustable)
- Equipped with RS232, USB, and LAN interfaces, facilitating the construction of automated testing systems
- Large LCD touchscreen: Offers intuitive display and user-friendly operation
- Simultaneously displays test power, current, and measured resistance values
- Provides statistical analysis features, including mean value and standard deviation

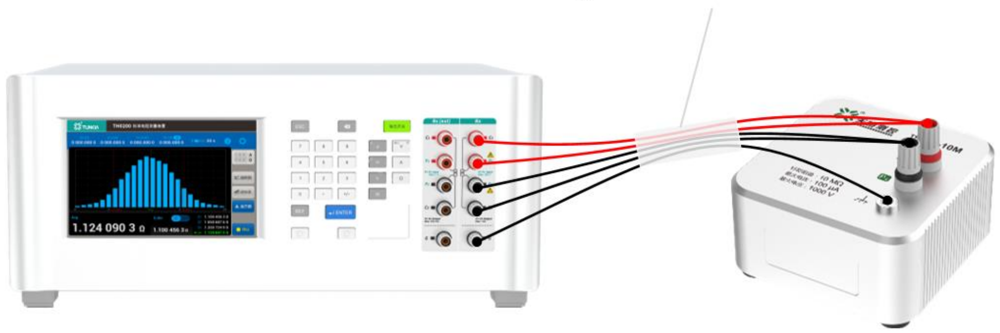
- High reliability with excellent protection mechanisms
- Optional dedicated software for automatic calibration of resistors/resistance boxes

3. Applications

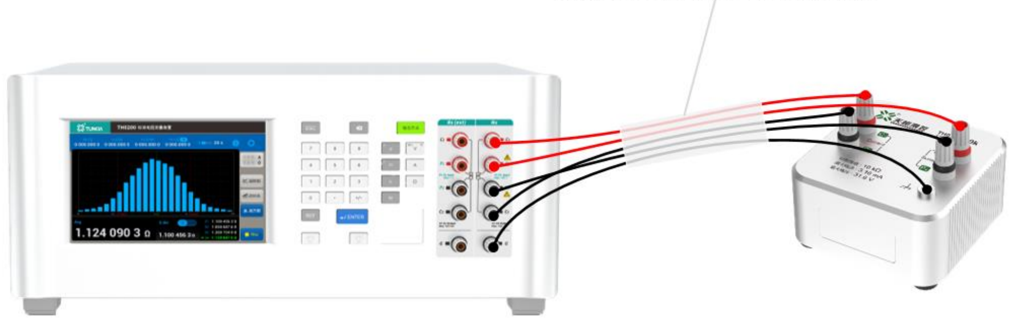
- Transfer of standard resistor values
- Calibration of standard resistors
- Calibration of wide-range resistance boxes
- Verification of single and double bridge calibration devices

4. Functional Characteristics

☆ Calibration of 2-wire/4-wire resistance (box) with internal reference



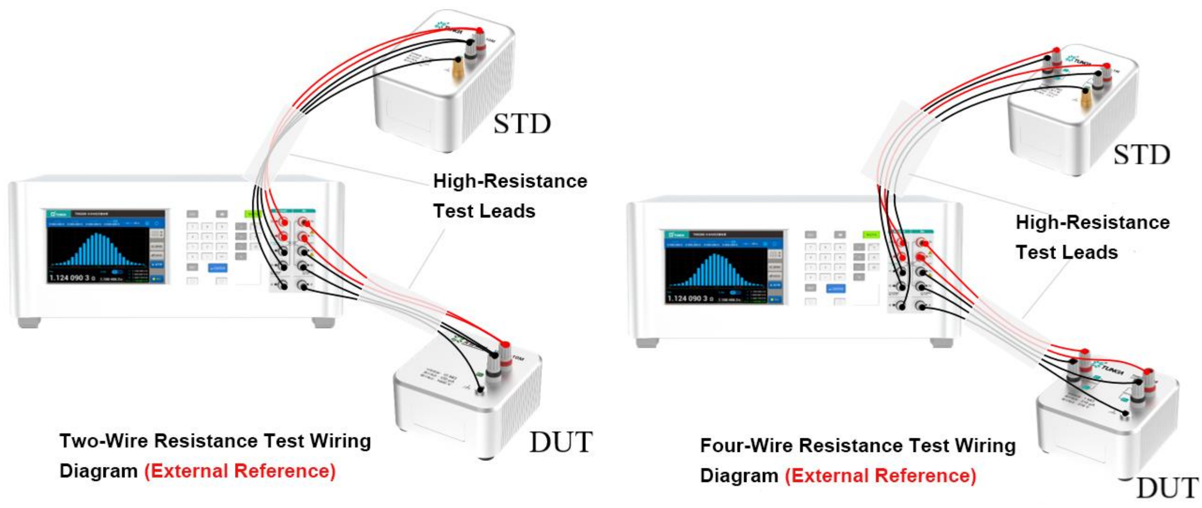
Two-Wire Resistance Test Wiring Diagram (Internal Reference)



Four-Wire Resistance Test Wiring Diagram (Internal Reference)

- Using built-in standard resistors as references to calibrate 0.005-grade or lower standard resistors/resistance boxes
- For measured resistance values R ≥ 100 kΩ, two-wire method is recommended。
- For measured resistance values R ≤ 10 kΩ, four-wire method is recommended
- The four-wire method effectively eliminates errors caused by lead resistance, improving measurement accuracy

☆ Calibration of 2-wire/4-wire resistance (box) with external reference



- Using external standard resistors as references, calibrate 0.001-grade high-precision standard resistors/resistance boxes
- For measured resistance values R ≥ 100 kΩ, the two-wire method is recommended
- For measured resistance values R ≤ 10 kΩ, the four-wire method is recommended
- The four-wire method effectively eliminates errors caused by lead resistance, improving measurement accuracy

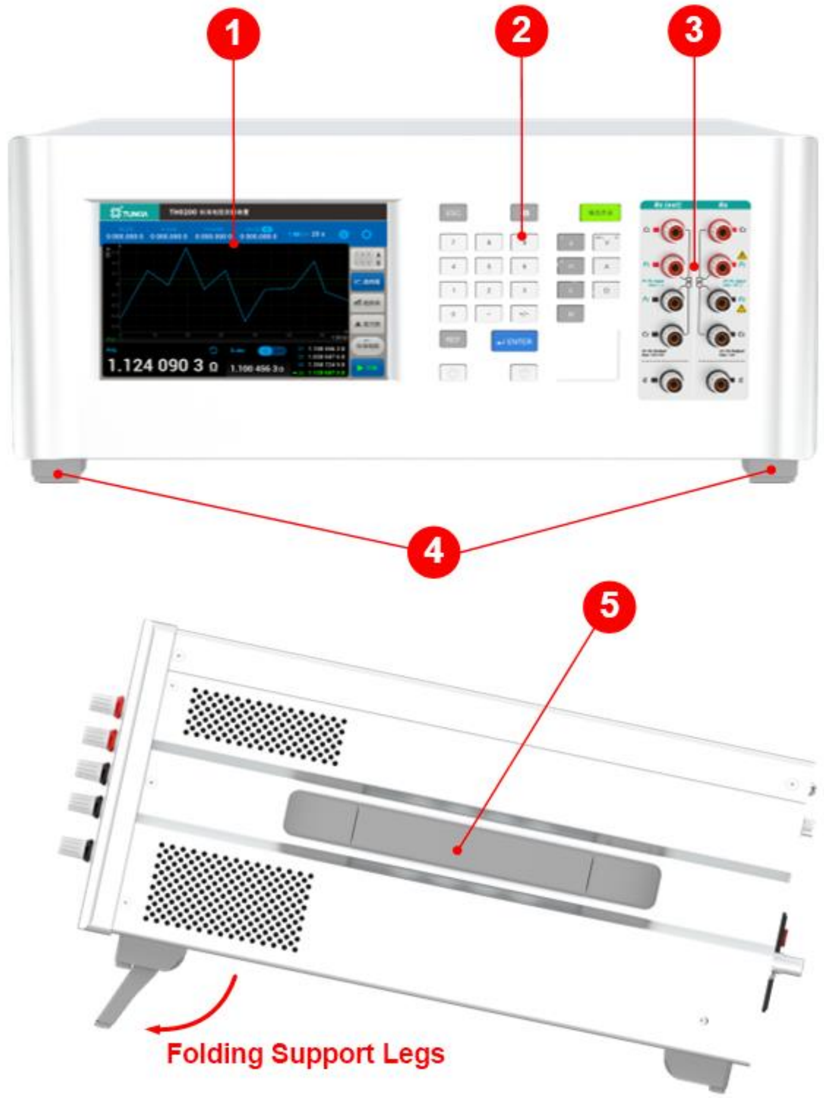
☆ Comprehensive Resistance Testing and Analysis

S/N	Function
1	Visually display the changing trend of resistance measurement values.
2	Perform comprehensive analysis of resistance measurement values, including average (Avg), standard deviation (S.dev), and number of measurements (N).
3	Switchable trend charts, tables, and histograms for easy user analysis of measurement data.

Advantages: The integration of system-wide testing and analysis functions eliminates the need for manual, time-consuming, and multiple measurement recording in traditional testing methods, significantly optimizing test operations and improving calibration efficiency. It also facilitates easy evaluation of the resistance testing process by test personnel.

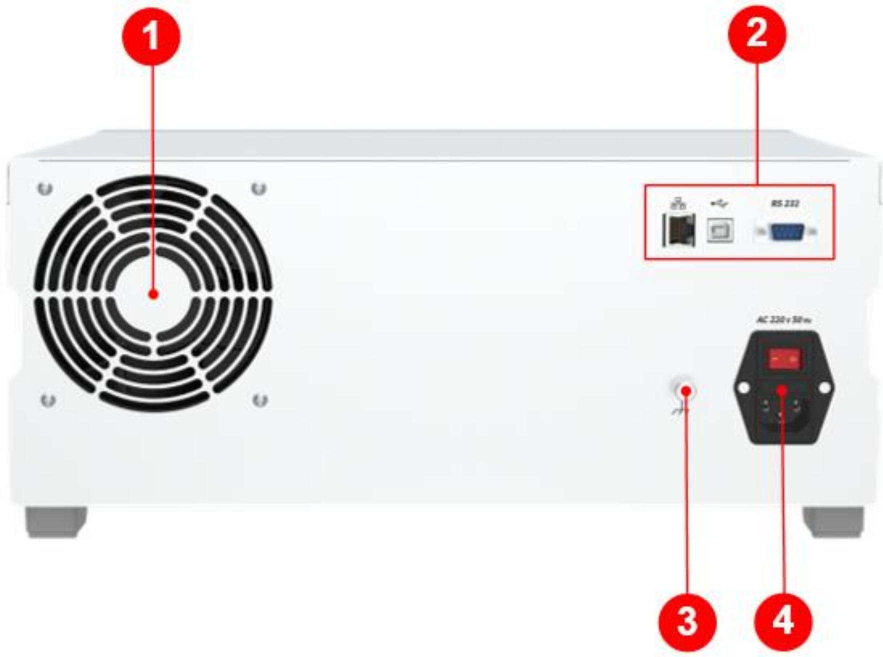
5. Product Appearance

☆ Front Panel/ Side Panel



S/N	Function
1	Large-size LCD touch color screen with multi-channel voltage and waveform display, intuitive touch operation, enhancing the instrument's usability.
2	Button and knob operation panel allows users to easily set resistance calibration values, making metrology work more convenient.
3	Measurement terminals for tested resistance/resistance box (Rx) and standard reference resistance (Rs).
4	Foldable support feet elevate the instrument by approximately 15° for optimal operation and viewing angles.
5	Ergonomically designed handle for easy transportation of the instrument.

☆ Rear Panel



S/N	Function
1	**High-power cooling fan:** Efficient cooling system ensures long-term stable operation of the instrument.
2	**Versatile communication interfaces:** Includes RS232, USB, and LAN, enabling users to build fully automated testing systems.
3	**Chassis Ground:** Ensure the chassis is properly grounded before using the equipment.
4	**Power Interface:** Power input interface with switch and fuse.

6. Technical Specifications

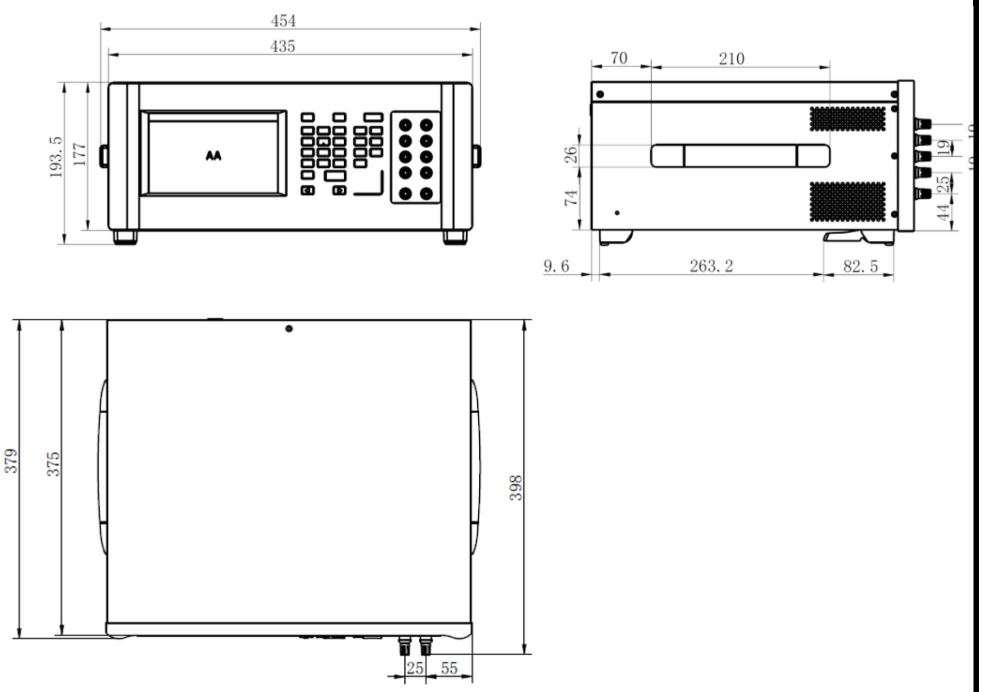
6.1 Internal Reference Mode

Resistance	Resolution	Test Current	Test Power	Measurement Uncertainty （ k=2 , μΩ / Ω ）
1 mΩ	100 pΩ	3.16 A ~ 10 A	10 mW ~ 100 mW	30+ K_P[1]*2
10 mΩ	1 nΩ	1 A ~ 3.16 A	10 mW ~ 100 mW	20+ K_P[1] *1
100 mΩ	10 nΩ	0.316 A ~ 1 A	10 mW ~ 100 mW	10+ K_P[1] *0.5
1 Ω	100 nΩ	0.1 A ~ 0.316 A	10 mW ~ 100 mW	10
10 Ω	1 μΩ	31.6 mA ~ 100 mA	10 mW ~ 100 mW	10
100 Ω	10 μΩ	10 mA ~ 31.6 mA	10 mW ~ 100 mW	10
1 kΩ	100 μΩ	3.16 mA ~ 10 mA	10 mW ~ 100 mW	10
10 kΩ	1 mΩ	1 mA ~ 3.16 mA	10 mW ~ 100 mW	10
100 kΩ	10 mΩ	0.316 mA ~ 1 mA	10 mW ~ 100 mW	10
1 MΩ	100 mΩ	31.6 μA ~ 100 μA	1 mW ~ 10 mW	30
10 MΩ	1 Ω	3.16 μA ~ 10 μA	0.1 mW ~ 1 mW	50
Note 1： K_P is the power coefficient，K_P=100 mW/ test power				

6.2 External Reference Mode

Resistance	Resolution	Reference Resistance	Test Current	Test Power	Proportional Measurement Uncertainty(k=2 , μΩ / Ω)
1 mΩ	100 pΩ	10 Ω	3.16 A ~ 10 A	10 mW ~ 100 mW	20+ K_P[1]*2
10 mΩ	1 nΩ	10 Ω	1 A ~ 3.16 A	10 mW ~ 100 mW	15+ K_P[1]*1
100 mΩ	10 nΩ	10 Ω	0.316 A ~ 1 A	10 mW ~ 100 mW	5+ K_P[1] *0.5
1 Ω	100 nΩ	10 Ω	0.1 A ~ 0.316 A	10 mW ~ 100 mW	5
10 Ω	1 μΩ	10 Ω	31.6 mA ~ 100 mA	10 mW ~ 100 mW	5
100 Ω	10 μΩ	10 Ω	10 mA ~ 31.6 mA	10 mW ~ 100 mW	5
1 kΩ	100 μΩ	100 Ω	3.16 mA ~ 10 mA	10 mW ~ 100 mW	5
10 kΩ	1 mΩ	100 Ω	1 mA ~ 3.16 mA	10 mW ~ 100 mW	8
100 kΩ	10 mΩ	1 kΩ	0.316 mA ~ 1 mA	10 mW ~ 100 mW	8
1 MΩ	100 mΩ	10 kΩ	31.6 μA ~ 100 μA	1 mW ~ 10 mW	20
Note 1： K_P is the power coefficient，K_P=100m W/ test power					

7. General Technical Specifications

<table>
<tr><td>Power Supply</td><td>AC 90 V ~ 264 V / 47 Hz ~ 63 Hz</td></tr>
<tr><td>Warm-Up Time</td><td>Minimum 1 hour. The warm-up time after power-off should be at least twice the duration of the power-off period</td></tr>
<tr><td>Maximum Power Consumption</td><td>150 VA</td></tr>
<tr><td>Temperature Performance</td><td>Operating Temperature: 18 °C ~ 28 °C
Storage Temperature: -20 °C ~ 60 °C</td></tr>
<tr><td>Humidity Performance</td><td>Operating Humidity: (20% ~ 50%) R.H., non-condensing
Storage Humidity: (15% ~ 80%) R.H., non-condensing</td></tr>
<tr><td>Display Screen</td><td>LCD; 7 inch;</td></tr>
<tr><td>Instrument Weight</td><td>About 13 kg</td></tr>
<tr><td>Communication Interfaces</td><td>RS 232, LAN, USB(Type-B)</td></tr>
<tr><td rowspan="2">Dimensions</td><td>W * D * H=435 mm * 398 mm * 177 mm(Excluding handle and support feet)</td></tr>
<tr><td>


Units: mm
</td></tr>
</table>

8. Principle Block Diagram

TH0200 Standard Resistance Measuring Device has two measurement modes as shown in Figures 8-1 (Mode 1) and 8-2 (Mode 2). The system automatically matches based on the measured resistance value:

1）K_1 open, K_2~ K_n connected (any one), this is the 'Internal Reference Mode' (using the built-in standard resistor R_{s1} as the reference). Measurement is performed by comparing the voltage across the measured resistance R_x and the internal reference resistor R_{s1}.

2）K_1 connected, K_2~ K_n disconnected, this is the 'External Reference Mode' (using an external standard resistor R_{s2} as the reference). Measurement is performed by comparing the voltage across the measured resistance R_x and the external reference resistor R_{s2}.

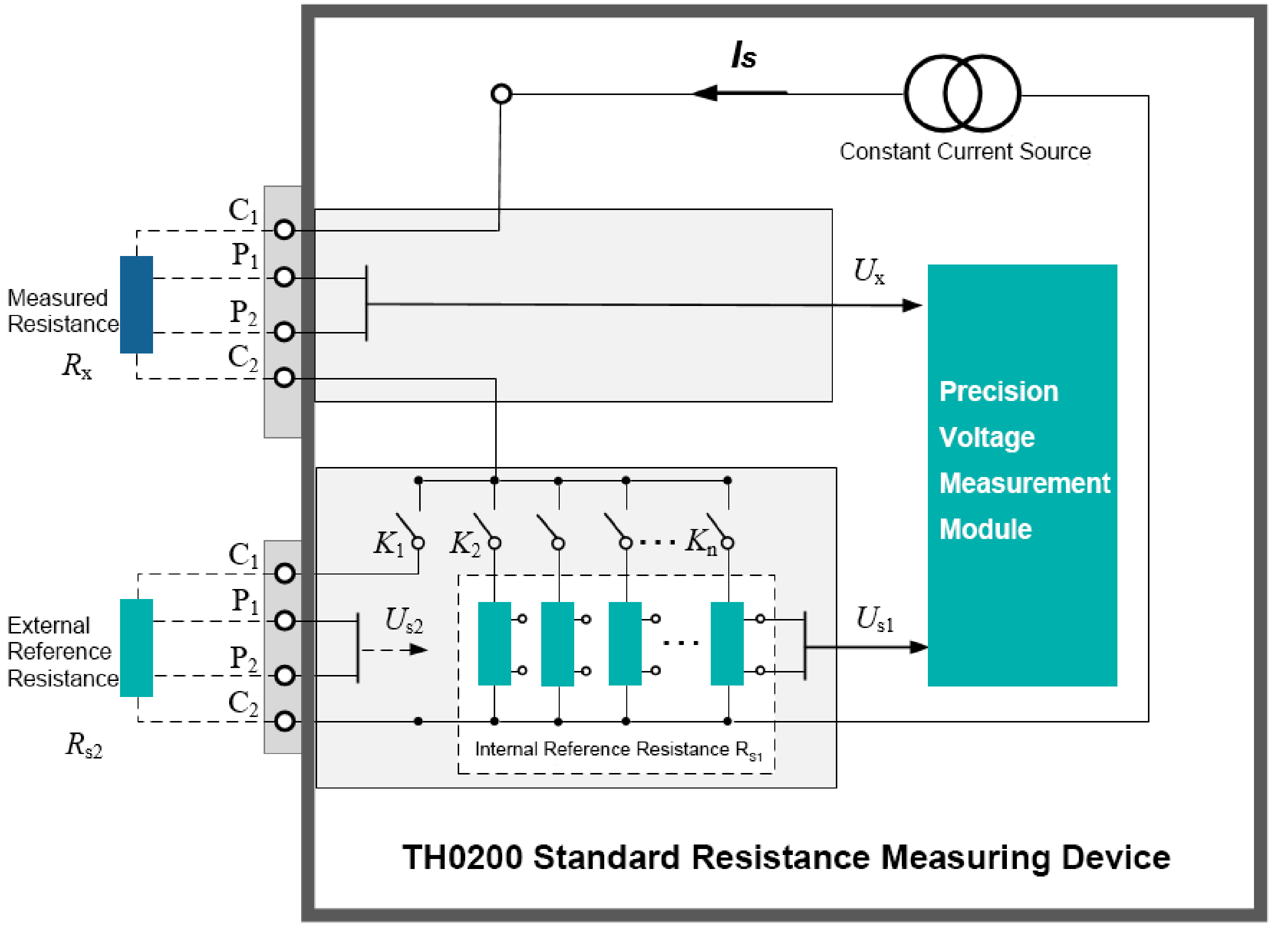


Figure 8-1: TH0200 Test Principle Block Diagram (Mode 1)

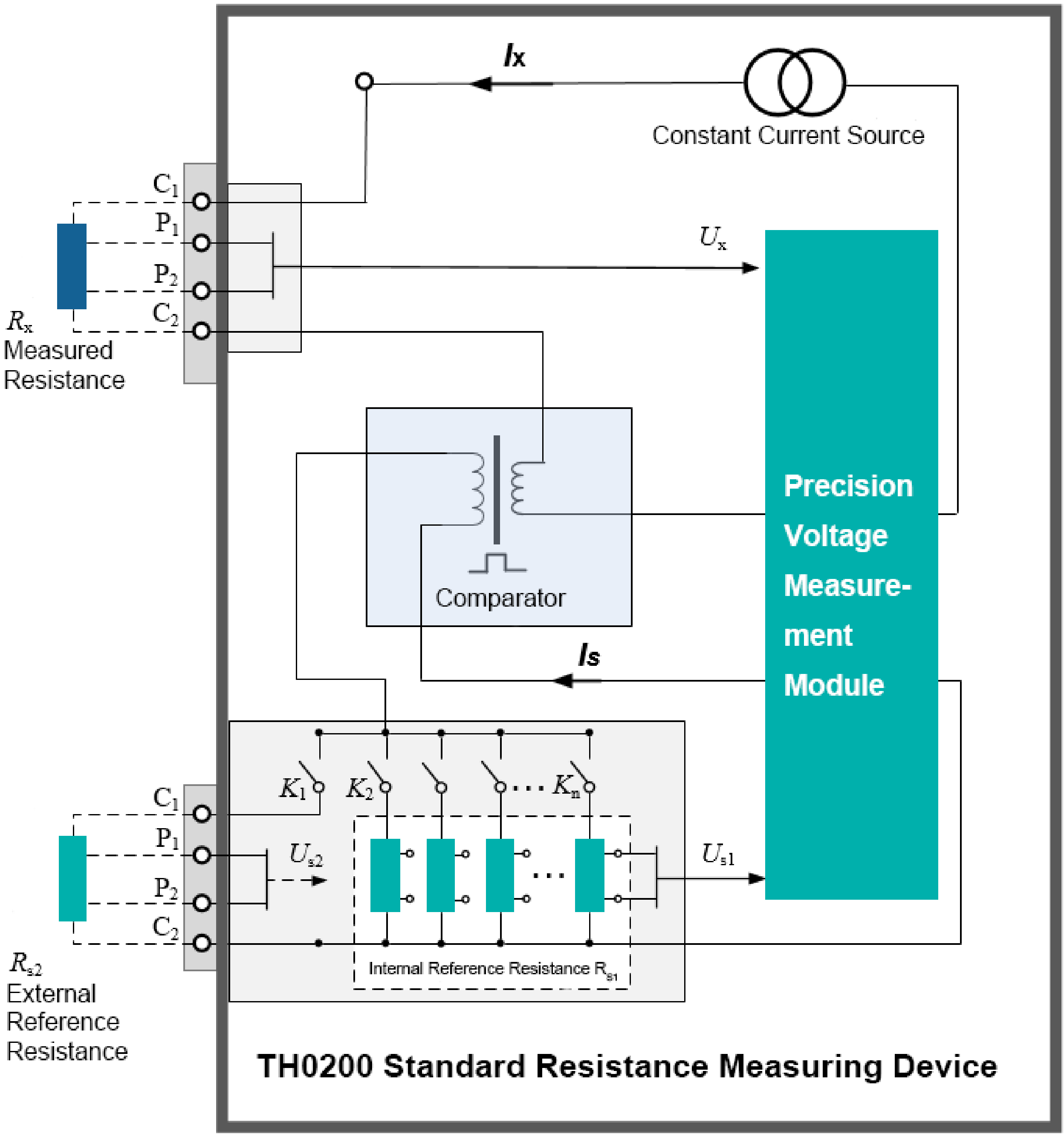
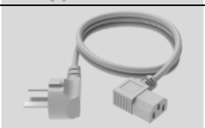


Figure 8-2: TH0200 Test Principle Block Diagram (Mode 2)

9. Accessory List

S/N	Image	Name	Specifications	Quantity	Remarks
1		Precision Resistance Test Lead	5-in-1 / 1.4 m / Φ4-Φ4 Banana Plug Cable	2 pieces	Standard Accessories
2		U-shaped Test Clips	Φ8 Thin Test Clips / Φ4 Plug Holes	2 red and 2 black	Standard Accessories
3		Dedicated Test Lead	1.6mm2*0.4m; A/B ends with Φ4 banana plugs; ET-54	1 red and 1 black	Standard Accessories
4		Power Cord	AC 220V/10A	1 piece	Standard Accessories
5		Packaging Box	Aluminum Alloy Packaging Box	1 piece	Standard Accessories

S/N	Image	Name	Specifications	Quantity	Remarks
1		Calibration Software	Card USB Drive	1 set	Software Accessories
2		Data Cable	1.8m / USB to RS232(DB9 Socket)	1 piece	
3		Packaging Box	Pelican	1 piece	Packaging Accessories

Note: The above accessories need to be purchased separately and must be specified in the order contract.