

TD1860 Multi-function Calibrator



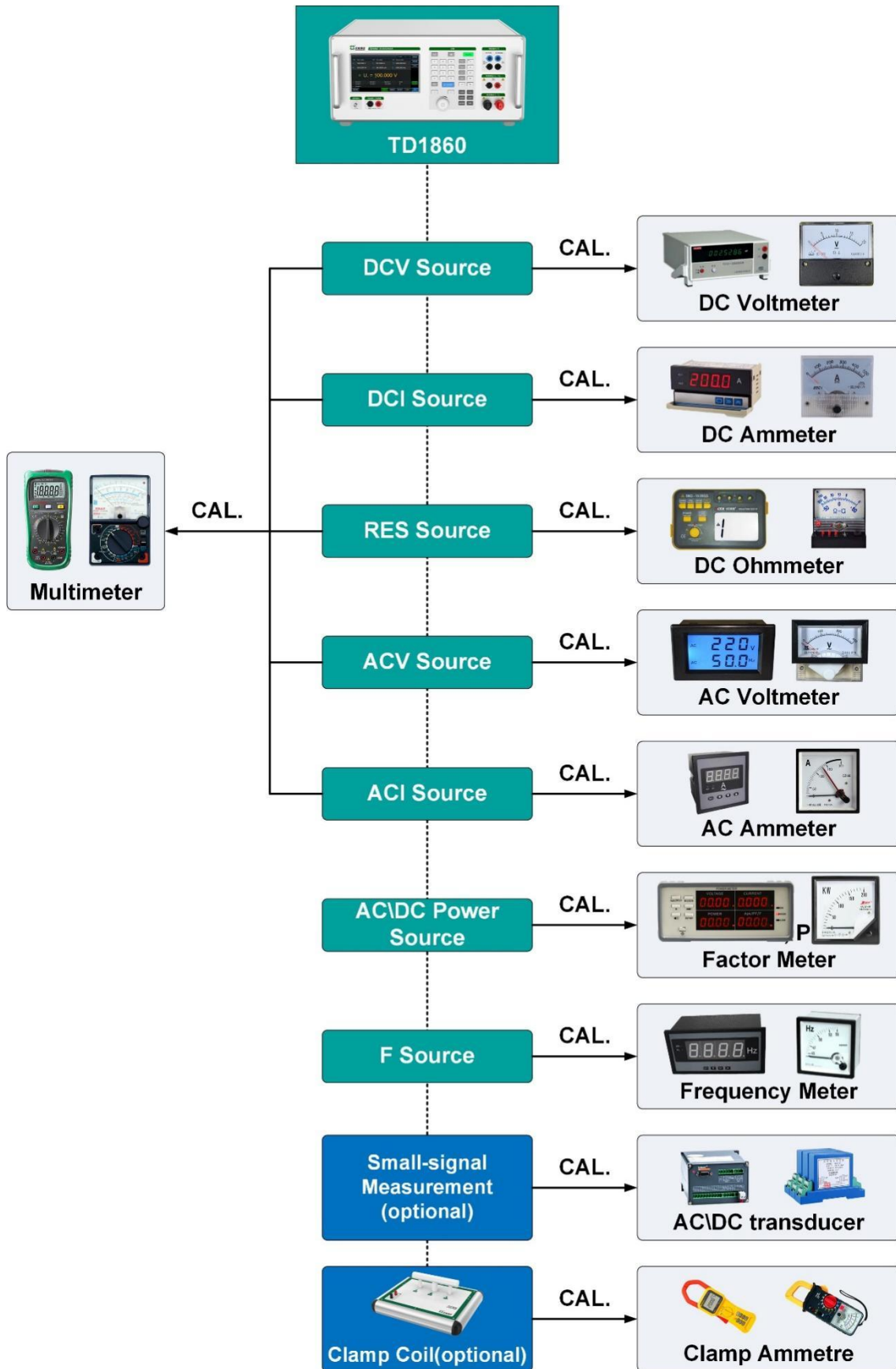
1. Summary

TD1860 is a multi-function calibrator with wide range and high precision, integrates AC\DC voltage source, AC\DC current source, DC resistance source, etc. The DC accuracy class is up to 0.01, and the AC accuracy class is up to 0.05. It's applied for calibrating 4.5 digits multimeters, voltmeter, ammeter, ohmmeter, power meter.

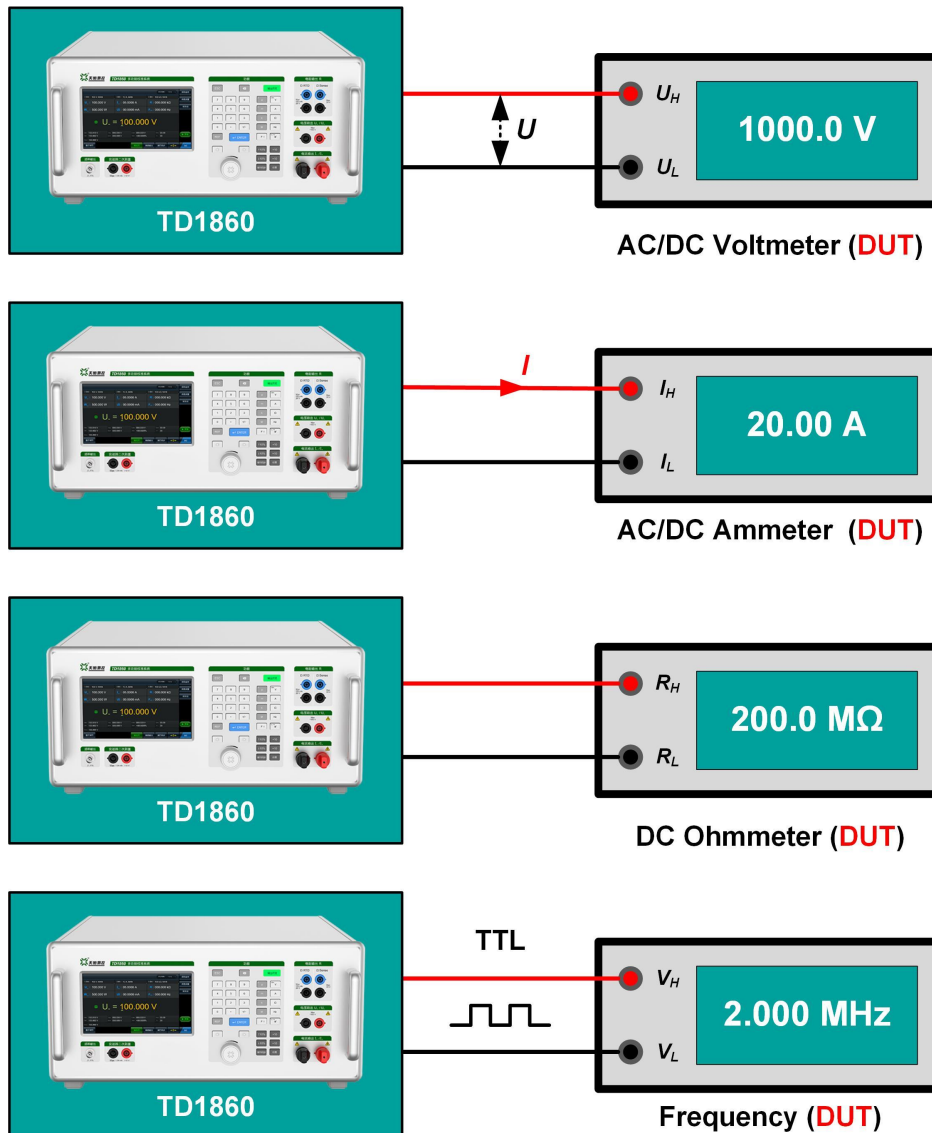
2. Features

- DC voltage output: $\pm(10 \text{ mV} \sim 1100 \text{ V})$
- DC current output: $\pm(3 \mu\text{A} \sim 22 \text{ A})$ (33 A optional)
- AC voltage output: $3 \text{ mV} \sim 1100 \text{ V}$
- AC current output: $30 \mu\text{A} \sim 22 \text{ A}$ (33 A optional)
- Sinusoidal wave frequency: $45 \text{ Hz} \sim 1500 \text{ Hz}$
- Simulated DC resistance: $0 \Omega \sim 220 \text{ M}\Omega$
- 2 MHz square wave frequency output
- Phase output
- AC/DC power output
- Remote adjustment(optional)
- Clamp meter calibration(optional)
- Transducer calibration(optional)

3. Application

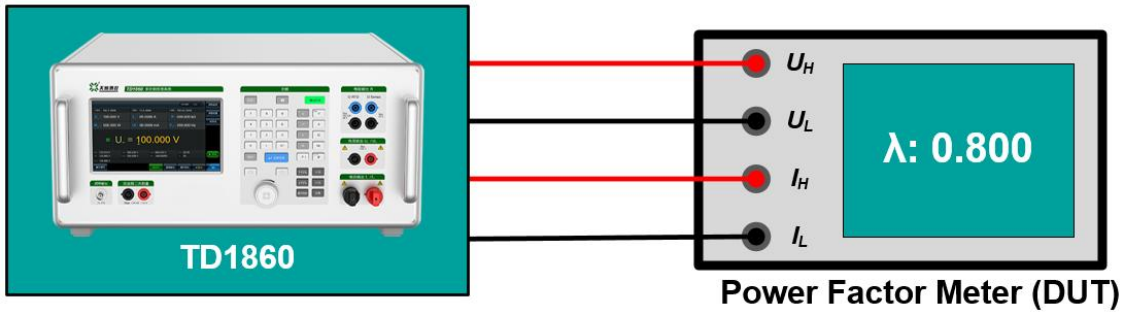
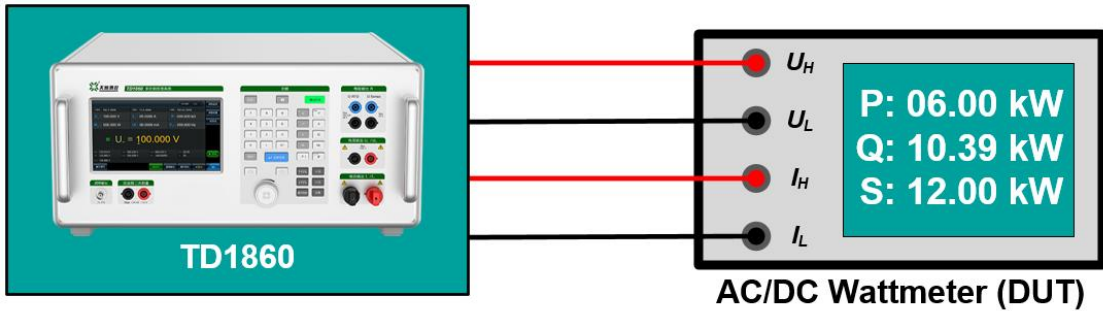


☆ Calibrate AC/DC Electrical Measuring Instruments



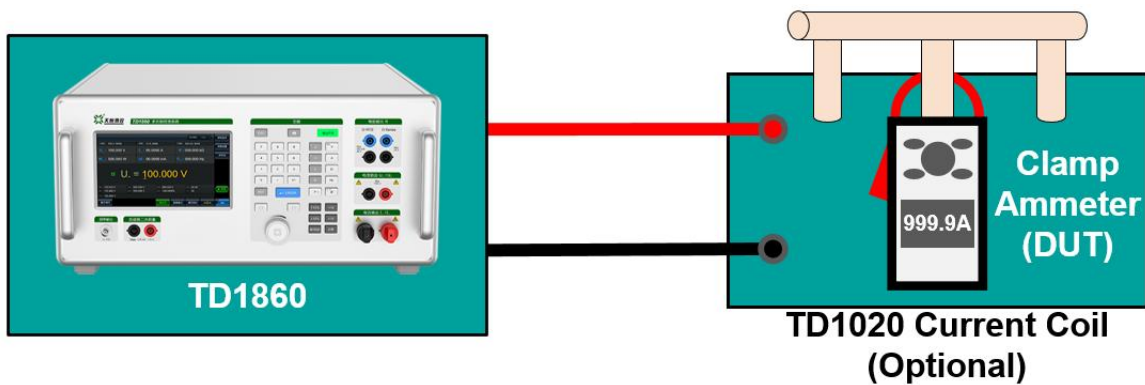
- **DCV Output:** $\pm(10 \text{ mV} \sim 1100 \text{ V})$
- **DCI Output:** $\pm(3 \mu\text{A} \sim 22 \text{ A or } 33 \text{ A})$
- **ACV Output:** $3 \text{ mV} \sim 1100 \text{ V}$ 、 $45 \text{ Hz} \sim 1500 \text{ Hz}$
- **ACI Output:** $30 \mu\text{A} \sim 22 \text{ A or } 33 \text{ A}$ 、 $45 \text{ Hz} \sim 1500 \text{ Hz}$
- **RES Output:** $0 \Omega \sim 220 \text{ M}\Omega$
- **Frequency Output:** $1 \text{ Hz} \sim 2 \text{ MHz}$
- Calibrate digital multimeter, AC/DC voltmeter, AC/DC ammeter, DC ohmmeter, frequency meter.

☆ Calibrate AC\DC Power Meters



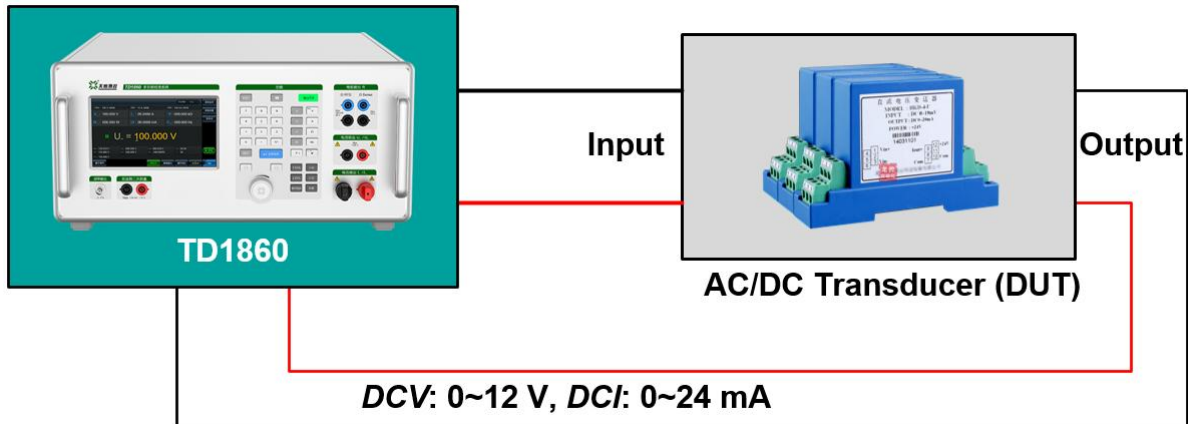
- Calibrate DC power meter, real power meter, phantom power meter, apparent power meter, power frequency phase meter and power factor meter.

☆ Calibrate Clamp Ammeter (optional)



- Equivalent to 1000AT current through input 20A current to the 50T Coil, which is suitable for calibrating DC clamp meters.

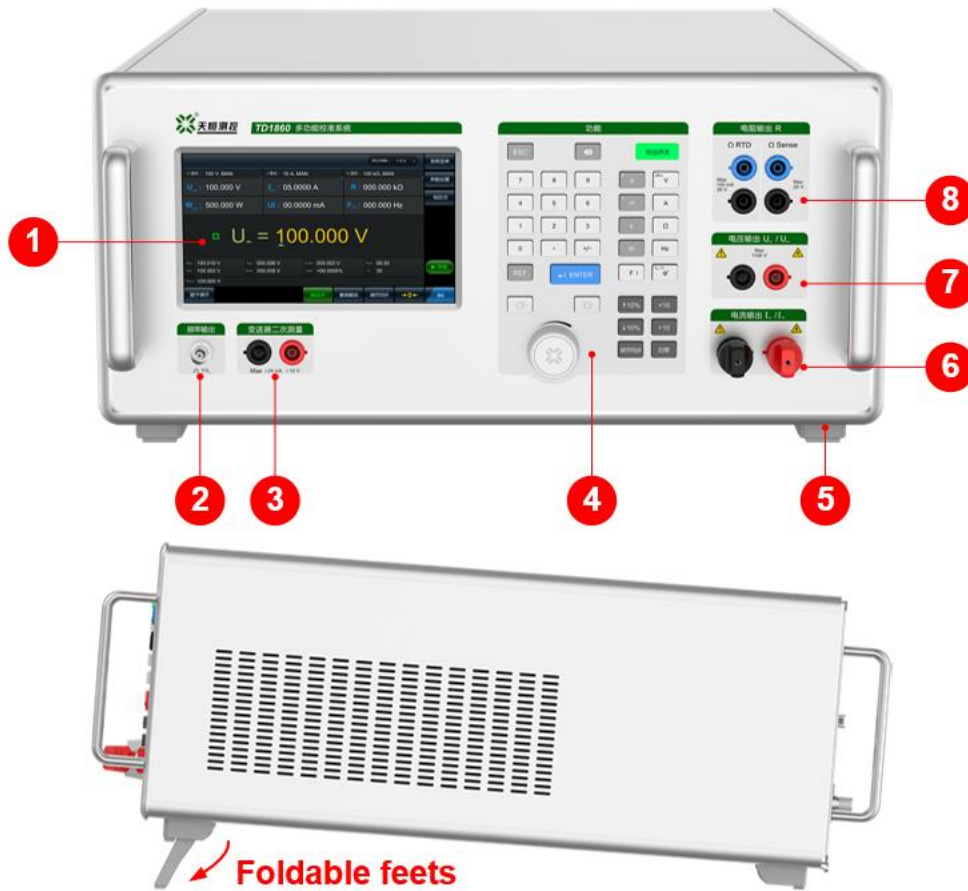
☆ Calibrate AC/DC Transducer (optional)



- DC small-signal measurement. (V_{\max} : 12 V, I_{\max} : 24 mA)
- Calibrate the proportional error of AC/DC voltage/current transducer.

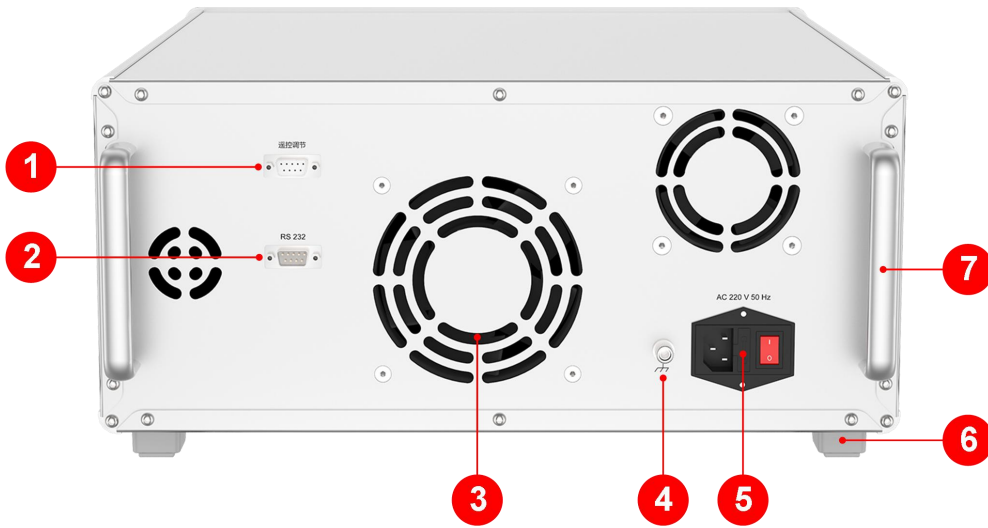
4. Panel Features

☆ Front\Side Panel



Item	Description
1	LCD touch screen.
2	Pulse frequency output terminal.
3	Input terminals for transducer.
4	Operation panel.
5	Foldable feet.
6	AC/DC current output terminals.
7	AC/DC voltage output terminals.
8	Simulated DC resistance output terminals.









☆ Rear Panel



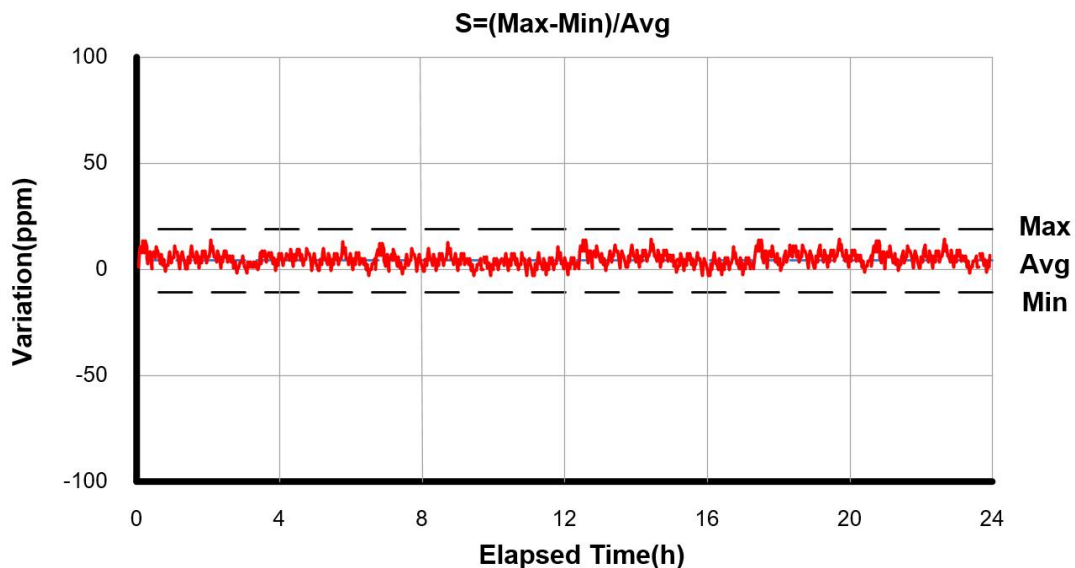
Item	Description
1	Remote box interface.
2	RS232 communication interface.
3	Cooling vents.
4	Chassis ground binding post.
5	AC 220V power interface.
6	Foldable feet.
7	Handle: used for carrying instruments.

5. Characteristics

☆ Wide Output Range

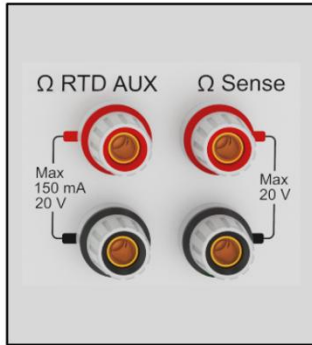
	1 μ	1m	1	1k	1M	1G
DCV	10 mV  1100 V					
DCI	3 μ A  22 A / 33 A					
RES	1 Ω  220 M Ω					
ACV	3 mV  1100 V					
ACI	30 μ A  22 A / 33 A					
F _~	45 Hz  1500 Hz					
F _{~n}	1 Hz  2 MHz					
P _{U-I}	3 V \times 0.3 mA  600 V \times (22 A / 33 A)					

☆ High Stability and Accuracy

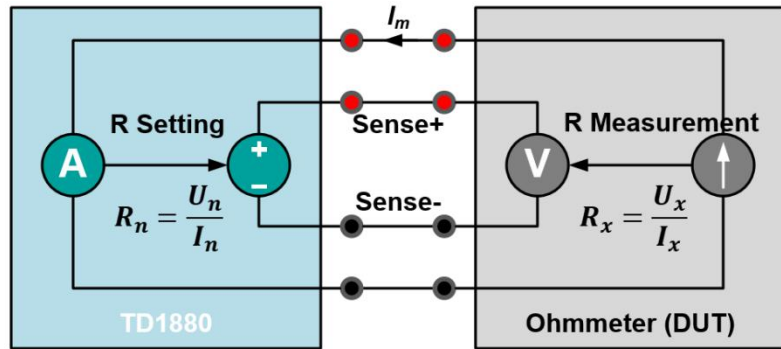


- The DC voltage stability is up to 0.005%/24h, and the DC current stability is up to 0.01%/24h.

☆ 4-terminals Simulated DC Resistance



Figure(a) 4 terminals



Figure(b) Wiring Diagram

- 2-terminals and 4-terminals resistance wiring mode. When calibrating the low value resistance, the four wire system wiring mode can effectively eliminate the measurement error caused by the resistance of the test lead and improve the measurement accuracy.
- Compared with the standard physical resistance box, the analog resistance output has the following characteristics:
 - ☑ Continuously adjustable, with better adjustment fineness and sensitivity
 - ☑ Smaller size and lighter weight
 - ☑ No influence of transfer switch error, residual resistance error and contact resistance error.

☆ Multiple Output\Adjustment Methods

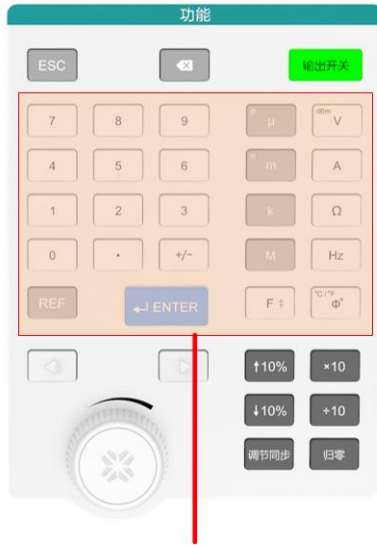


Figure (a) Keypad

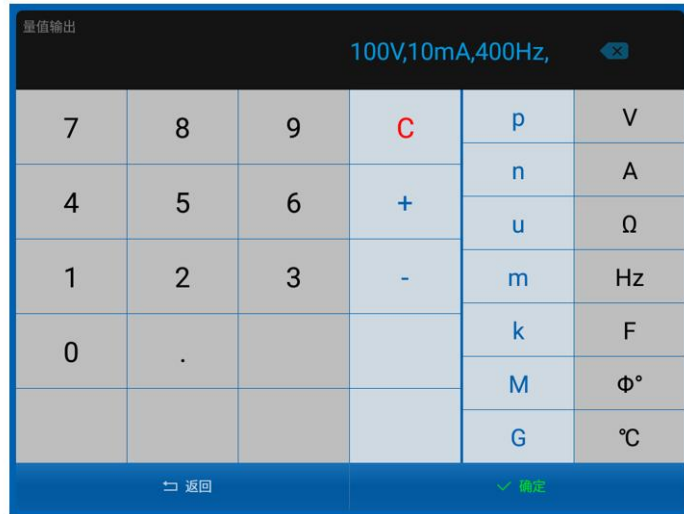
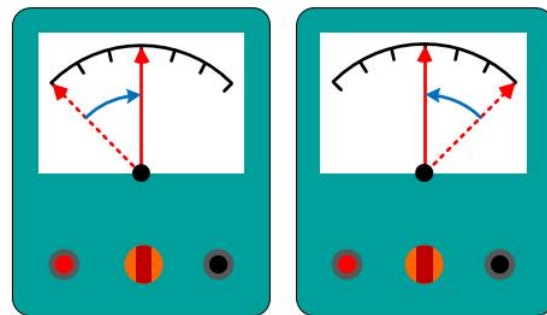


Figure (b) Touch Screen Output

- **“Direct Output”** mode: the value output can be set directly by physical key or touch screen.



Remote Box (optional)



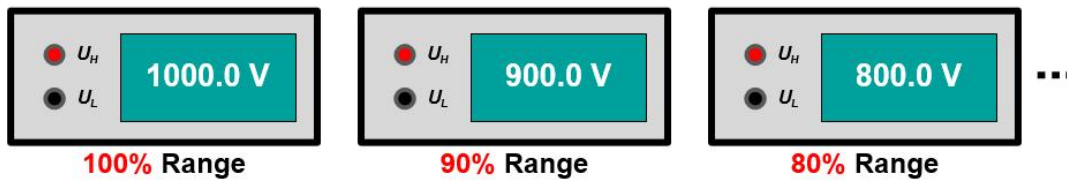
Convenient to calibrate "differences between rising and falling"

- Calibration of the analog pointer meter usually needs to test scale by scale, especially "differences between rising and falling" (the change caused by the rise and fall of the calibration point).
- Remote box can realize the coarse and fine adjustment of current or voltage.

☆ Multiple Output\Adjustment Methods



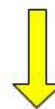
"% setting"



- Touch "Calibration Point" of screen for "% setting".

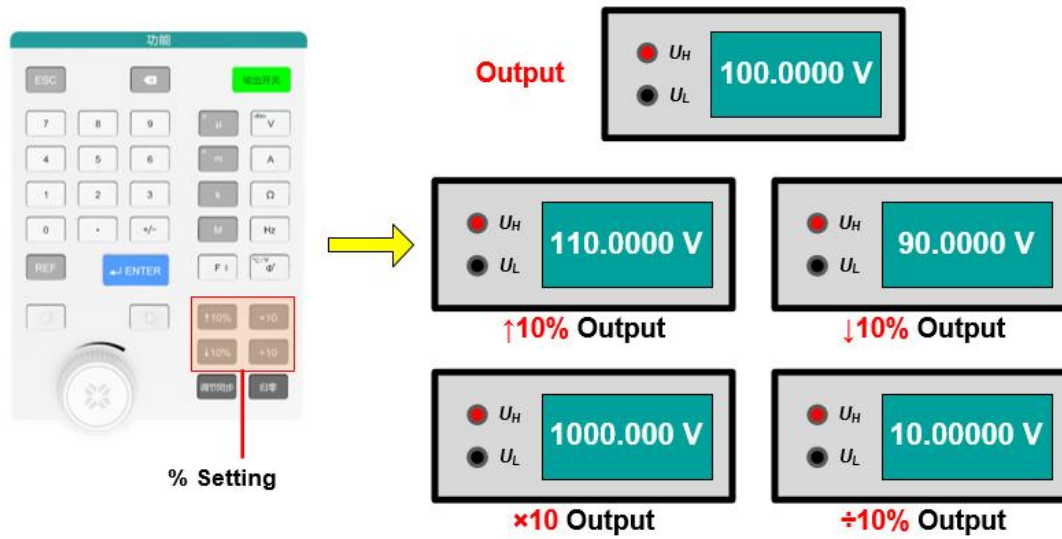


Rotary Knob



- "Rotary Knob" mode, User can set in clockwise direction or anticlockwise direction.

☆ Multiple Output\Adjustment Methods



- Use the key $\uparrow 10\%$ 、 $\downarrow 10\%$ 、 $\times 10$ 、 $\div 10$ on the front panel, can realize the adjustment of the quantity value, and can also be used to perform the relevant test of linearity.

6. Specifications

6.1 DC Voltage Output

Range	Resolution	Stability	Accuracy ^[1]		Max Burden (mA)	Ripple Factor (%)
		24 hours (23±1)°C	90 days (23±5)°C	1 year (23±5)°C		
		±(ppm*output + μV)				
100 mV	1 μV	40 + 5	64 + 10	80 + 10	300	<0.5
300 mV	1 μV	40 + 5	64 + 10	80 + 10	300	<0.5
1 V	10 μV	40 + 10	64 + 15	80 + 15	300	<0.5
3 V	10 μV	40 + 10	64 + 15	80 + 15	300	<0.5
10 V	100 μV	40 + 100	64 + 150	80 + 150	600	<0.5
30 V	100 μV	40 + 150	64 + 150	80 + 150	800	<0.5
100 V	1 mV	40 + 1500	64 + 1500	80 + 1500	300	<0.5
300 V	1 mV	40 + 1500	64 + 1500	80 + 1500	120	<0.5
1000 V	10 mV	40 + 5000	64 + 5000	80 + 5000	40	<0.5

Note[1]: When the output is negative, the floor uncertainty is double. For example, when the output is 1 V, the accuracy is (80 ppm × 1 V + 30 μV);

- Output range: ±(10 mV ~ 1100 V)
- Short-circuit and overload protection

6.2 DC Current Output

Range	Resolution	Stability	Accuracy ^[1]		Compliance Voltage (V)	Ripple Factor (%)
		24 hours (23±1)°C	90 days (23±5)°C	1 year (23±5)°C		
		±(ppm*RD + μA)				
30 μA	100 pA	96 + 0.02	108 + 0.02	120 + 0.02	11	<0.5
100 μA	1 nA	96 + 0.04	108 + 0.04	120 + 0.04	11	<0.5
300 μA	1 nA	96 + 0.04	108 + 0.04	120 + 0.04	11	<0.5
1 mA	10 nA	96 + 0.08	108 + 0.08	120 + 0.08	11	<0.5
3 mA	10 nA	96 + 0.08	108 + 0.08	120 + 0.08	11	<0.5
10 mA	100 nA	96 + 0.8	108 + 0.8	120 + 0.8	11	<0.5
30 mA	100 nA	96 + 0.8	108 + 0.8	120 + 0.8	11	<0.5
100 mA	1 μA	96 + 8	108 + 8	120 + 8	11	<0.5
300 mA	1 μA	96 + 24	108 + 24	120 + 24	4	<0.5
1 A	10 μA	96 + 80	108 + 80	120 + 80	3.5	<0.5
3 A	10 μA	96 + 80	108 + 80	120 + 80	4	<0.5
10 A	100 μA	96 + 800	108 + 800	120 + 800	3.5	<0.5
20 A(30 A) ^[2]	100 μA	96 + 800	108 + 800	120 + 800	2.8	<0.5

Note [1]: When the output is negative, the floor uncertainty is double;

Note [2]: 30 A range is optional.

- Output range: ±(3 μA ~ 22 A\33 A)
- Open-circuit and overload protection

6.3 Simulated DC Resistance

Range	Resolution	Accuracy		Allowable Current
		90days(23±5)°C	1year(23±5)°C	
		±(ppm*output + Ω)		
0 Ω	—	5 mΩ	5 mΩ	1mA~ 300mA
10 Ω	100μΩ	240 + 0.015	300 + 0.015	1mA~ 150 mA
30 Ω	100μΩ	240 + 0.015	300 + 0.015	1mA~ 150 mA
100 Ω	1 mΩ	120 + 0.015	150 + 0.015	1mA~ 80 mA
300 Ω	1 mΩ	120 + 0.03	150 + 0.03	1mA~ 40 mA
1 kΩ	10 mΩ	80 + 0.1	100 + 0.1	1mA~ 20 mA
3kΩ	10 mΩ	80 + 0.2	100 + 0.2	0.1mA~ 6mA
10 kΩ	100 mΩ	80 + 1	100 + 1	0.1mA~ 2mA
30 kΩ	100 mΩ	80 + 2	100 + 2	10μA~ 600 μA
100 kΩ	1 Ω	80 + 10	100 + 10	10μA~ 200 μA
300 kΩ	1 Ω	80 + 20	100 + 20	1μA~ 60 μA
1 MΩ	10 Ω	80 + 100	100 + 100	1μA~ 20 μA
3 MΩ	10 Ω	80 + 300	100 + 300	0.25μA~ 6 μA
10 MΩ	100 Ω	240 + 1k	300 + 1k	0.25μA~ 2 μA
30 MΩ	100 Ω	400 + 3k	500 + 3k	25nA~600nA
100 MΩ	1kΩ	1600 + 80k	2000 + 80k	25nA~200nA
200 MΩ	1kΩ	4000 + 100k	5000 + 100k	2.5nA~ 45nA

- Output range: 10 Ω ~ 220 MΩ
- Over-current and reverse connection protection

6.4 AC Voltage Output

Range	Resolution	Frequency (Hz)	Accuracy		Max Burden (mA) [Source Internal Resistance]	Harmonic (%)
			90 days (23±5)°C	1 year (23±5)°C		
			±(ppm*RD + mV)			
30 mV	100 nV	45≤F≤1k	360 + 0.03	400 + 0.03	[1Ω]	<0.5
		1k<F≤1.5k	540 + 0.03	600 + 0.03		<0.5
100 mV	1 μV	45≤F≤1k	360 + 0.03	400 + 0.03	[1Ω]	<0.5
		1k<F≤1.5k	540 + 0.03	600 + 0.03		<0.5
300 mV	1 μV	45≤F≤1k	270 + 0.05	300 + 0.05	100	<0.5
		1k<F≤1.5k	450 + 0.05	500 + 0.05		<0.5
1 V	10 μV	45≤F≤1k	270 + 0.2	300 + 0.2	300	<0.5
		1k<F≤1.5k	450 + 0.2	500 + 0.2		<0.5
3 V	10 μV	45≤F≤1k	360 + 0.2	400 + 0.2	300	<0.5
		1k<F≤1.5k	450 + 0.2	500 + 0.2		<0.5
10 V	100 μV	45≤F≤1k	270 + 2	300 + 2	500	<0.5
		1k<F≤1.5k	450 + 2	500 + 2		<0.5
30 V	100 μV	45≤F≤1k	360 + 2	400 + 2	800	<0.5
		1k<F≤1.5k	450 + 2	500 + 2		<0.5
100 V	1 mV	45≤F≤1k	270 + 20	300 + 20	400	<0.5
		1k<F≤1.5k	450 + 20	500 + 20		<0.5
300 V	1 mV	45≤F≤1k	360 + 20	400 + 20	120	<0.5
		1k<F≤1.5k	450 + 20	500 + 20		<0.5
1000 V	10 mV	45≤F≤1k	270 + 200	300 + 200	40	<0.5
		1k<F≤1.5k	450 + 200	500 + 200		<0.5

- Output range: 3 mV ~ 1100 V
- Short-circuit and overload protection

6.5 AC Current Output

Range	Resolution	Frequency (Hz)	Accuracy		Compliance Voltage (V)	Harmonic (%)
			90 days (23±5)°C	1 year (23±5)°C		
			±(ppm*RD + μA)			
300 μA	1 nA	45≤F≤1k	360 + 0.12	400 + 0.12	50	<0.5
		1k<F≤1.5k	450 + 0.12	500 + 0.12		<0.5
3 mA	10 nA	45≤F≤1k	270 + 0.6	300 + 0.6	50	<0.5
		1k<F≤1.5k	360 + 0.6	400 + 0.6		<0.5
30 mA	100 nA	45≤F≤1k	270 + 6	300 + 6	50	<0.5
		1k<F≤1.5k	360 + 6	400 + 6		<0.5
300 mA	1 μA	45≤F≤1k	270 + 60	300 + 60	15	<0.5
		1k<F≤1.5k	360 + 60	400 + 60		<0.5
1 A	10μA	45≤F≤1k	270 + 200	300 + 200	15	<0.5
		1k<F≤1.5k	360 + 200	400 + 200		<0.5
5 A	10μA	45≤F≤1k	270 + 600	300 + 600	4	<0.5
		1k<F≤1.5k	360 + 600	400 + 600		<0.5
20 A (30 A) ^[1]	100μA	45≤F≤1k	270 + 4000	300 + 4000	2.5	<0.5
		1k<F≤1.5k	360 + 4000	400 + 4000		<0.5

Note [1]: 30 A range is optional.

- Output range: 30 μA ~ 22 A or 33 A
- Open-circuit and overload protection

6.6 Sinusoidal Wave Frequency Output

Range ^[1]	Resolution	Accuracy
45.0000 Hz ≤ F ≤ 99.9999 Hz	0.0001 Hz	±0.01%
100.000 Hz ≤ F ≤ 999.999 Hz	0.001 Hz	±0.01%
1000.00 Hz ≤ F ≤ 1500.00 Hz	0.01 Hz	±0.01%

Note [1]: The output mode is AC voltage or AC current.

6.7 AC/DC Power Output

Frequency Range (f)	Voltage Range (U)	Current Range (I)	Optimum Accuracy %*Power Output [1][2]
DC	10 mV ~ 1100 V	3μA ~ 22 A/33 A	±0.05
45 Hz ~ 65 Hz	3 V ~ 600 V	0.3 mA ~ 22 A/33 A	±0.1

Note [1]: active power $|\sin\phi|\geq 0.5$, reactive power $|\cos\phi|\geq 0.5$;

Note [2]: For more accurate technical indicators of power accuracy or power accuracy under other power factors, please refer to the calculation formula:: $U_p = \sqrt{U_U^2 + U_I^2 + U_\lambda^2}$, U_U is the accuracy of voltage, U_I is the accuracy of current, U_λ is the accuracy of power factor.

6.8 Phase and Power Factor Output (45 Hz ~ 65 Hz)

Phase		Power Factor	Accuracy	
WATTS	VARS	$\lambda = \cos\phi$	Phase	Power Factor
0°	90°	1.00000	0.05°	0.000%
10°	80°	0.98481	0.05°	0.015%
20°	70°	0.93969	0.05°	0.032%
30°	60°	0.86603	0.05°	0.050%
40°	50°	0.76604	0.05°	0.073%
50°	40°	0.64279	0.05°	0.104%
60°	30°	0.50000	0.05°	0.151%
70°	30°	0.34202	0.05°	0.240%
80°	10°	0.17365	0.05°	0.495%
90°	0°	0.00000	—	—

Note [1]: Phase range: 0.000 ° ~ 359.999 °, fineness: 0.005 °

Note [2]: Power factor range: -1 ~ 0 ~ 1, fineness: 0.000 1

Note [3]: Calculation formulas for the accuracy of other power factor:

$$U_\lambda = [1 - \cos(\phi + \Delta\phi) / \cos\phi] \times 100\%$$

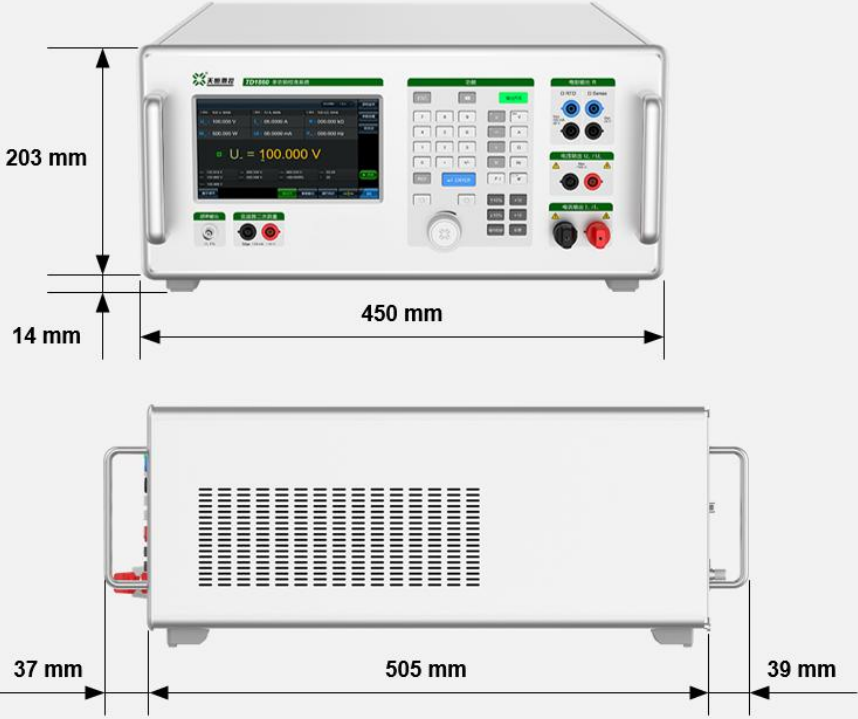
6.9 Pulse Frequency Output

Range ^[1]	Resolution	Accuracy	Shake
1.000 00 Hz ≤ F ≤ 9.999 99 Hz	10 μHz	±(20 ppm*RD + 20 μHz)	<20 ns
10.000 0 Hz ≤ F ≤ 99.999 9 Hz	0.1 mHz		
100.000 Hz ≤ F ≤ 999.999 Hz	1 mHz		
1.000 00 kHz ≤ F ≤ 9.999 99 kHz	10 mHz		
10.000 0 kHz ≤ F ≤ 99.999 9 kHz	0.1 Hz		
100.000 kHz ≤ F ≤ 999.999 kHz	1 Hz		
1.000 00 MHz ≤ F ≤ 2.000 00 MHz	10 z		
Note [1]: The output type is TTL level.			

6.10 DC Small-signal Measurement (optional)

Type	Range	Measurement Range	Accuracy
DCV	1 V	±(0 ~ 1.2) V	±(0.006%*RD + 0.004%*RG)
	10 V	±(0 ~ 12) V	±(0.006%*RD + 0.004%*RG)
DCI	2 mA	±(0 ~ 2.4) mA	±(0.006%*RD + 0.004%*RG)
	20 mA	±(0 ~ 24) mA	±(0.006%*RD + 0.004%*RG)

7. General Specifications

Power Supply	AC (220±22) V, (50±2) Hz
Maximum Power Consumption	600 VA
Warm Up Time	Twice the time since last warmed up, to a maximum of 30 minutes.
Temperature Performance	Operating temperature: 0°C~40°C Calibration temperature: 18°C~28°C Storage temperature: -20°C~70°C
Humidity Performance	Operating humidity: <80% @ 30°C, <70% @ 40°C Storage humidity: (20%~80%) R·H, No condensation
Communication Interface	RS232
Dimensions	450 mm(W)× 505 mm (D) × 203 mm (H), excluding handles and feet.
	
Weight	About 19.5kg

8. Ordering Information

