TD1880 High-Precision Multi-Product Calibrator

Introduction

- TD1880, a wide-range, multi-value and high-precision calibrator, can accurately output ultra-precision AC/DC voltage, current, phase adjustment and power, and also has the functions of pulse output and simulating DC resistance, thermocouple (TC), thermal resistance (RTD) and capacitance. Applied to calibrate 6½ and below digits multimeters or other electrical measuring instruments.

Reference

- JJG 124-2005 Verification Regulation of Amperemeters, Voltmeters, Wattmeters and Ohmmeters.
- JJF 1587-2016 Calibration Specification for Multimeters
- JJF 1284-2011 Calibration Specification of Calibrators for Electrical Meters
- JJF 1638-2017 Calibration specification of multifunctional standard source

Features

- Electrical Parameters Output: Voltage is up to 1020 V, current is up to 20.5 A at a frequency 10 Hz ~ 500 kHz.
- Resistance Simulation: Continuously variable range, 1 Ω ~ 1100 MΩ, pulse output range: 1 Hz ~ 2 MHz.

- The output current has high stability (the typical value is better than 10 ppm/h) and high accuracy (the typical value is 50 ppm/a), and its measurement accuracy is higher than the international similar products.
- Value Adjustment Method: Fixed-point, rotary encoder, step and potentiometer (option).
- Output Switch: The output can be turned on/off arbitrarily by one-touch operation.
- TC and RTD simulation: Support for simulation of up to 8 types of TC and 6 types of RTD.
- Strong load capacity of AC, can drive various types of analogue meters and digital meters, so the applicable range of measured instruments is very wide.
- The protection of voltage and current sources ensures high reliability under complex conditions.
- Excellent Human-Computer Interaction: Large LCD touch screen display, touch and button operation modes, easy for users to measure manually.
- Transmitter Measurement (Option): Measure the secondary DC signal of the transmitters.
- Proprietary Software (Option): Support the calibration of the checked meters by semi-automatic or full-automatic, data management and report export.

Specification

DC Voltage

Range	Accuracy(k=2) (T_{cal}±5°C) ppm*+μV		Stability (T_{cal}±1°C) ppm*+μV	Resolution	Max. Load Current
	90days	1year	24 h		
0~330.0000 mV	15 + 1	20 + 1	3 + 1	100 nV	[60 Ω]
0~3.300000 V	8 + 2	10 + 2	2 + 1.5	1 μV	20 mA
0~33.00000 V	10 + 20	12 + 20	2 + 10	10 μV	15 mA
30.0000 V~330.0000 V	15 + 150	18 + 150	2.5 + 100	100 μV	10 mA
100.000 V~1020.000 V	15 + 1500	18 + 1500	3 + 300	1 mV	10 mA
Auxiliary output AUX [1]					
0~330.0000 mV	40 + 5	50 + 5	30 + 5	0.1	10 mA
0.300000 V~3.300000	40 + 50	50 + 50	30 + 50	1	10 mA

V					
3.000000 V~7.000000 V	40 + 100	50 + 100	30+ 100	1	10 A
[1]: Provide a dual-channel DC voltage output (option).					

Range	noise	
	0.1 Hz ~ 10 Hz (peak-to-peak value)	10 Hz ~ 10 kHz (effective value)
0~330.0000 mV	1 μV	6 μV
0~3.300000 V	10 μV	60 μV
0~33.00000 V	100 μV	600 μV
30.0000 V~330.0000 V	4 mV	20 mV
100.000 V~1020.000 V	15 mV	20 mV
Auxiliary output(AUX)		
0~330.0000 mV	5 μV	20 μV
0.300000 V~3.300000 V	20 μV	200 μV
3.000000 V~7.000000 V	100 μV	1000 μV

DC current

Range	Accuracy(k=2) (T_{cal}±5°C) ppm*+μA		Resolution	compliance voltage	Maximum perceptual load
	90 days	1year			
0~330.0000 μA	80 + 0.02	100 + 0.02	100 pA	11 V	400 μH
0~3.300000 mA	65 + 0.03	80 + 0.03	1 nA	11 V	

0~33.00000 mA	60 + 0.25	80 + 0.25	10 nA	9 V	
0~330.0000 mA	60 + 2	80 + 2	100 nA	7 V	
0~1.100000 A	80 + 20	100 + 20	1 μA	6 V	
1.000000 A~3.300000 A	120 + 50	150 + 50	1 μA	6 V	
3.00000 A~20.50000 A	280 + 300	350 + 300	10 μA	4 V	

Range	noise	
	0.1 Hz ~ 10 Hz (peak-to-peak value)	10 Hz ~ 10 kHz (effective value)
0~330.0000 μA	2 nA	20 nA
0~3.300000 mA	20 nA	200 nA
0~33.00000 mA	200 nA	2 μA
0~330.0000 mA	2 μA	20 μA
0~1.100000 A	8 μA	500 μA
1.000000 A~3.300000 A	20 μA	1 mA
3.000000 A~20.50000 A	200 μA	10 mA

Note: Support current output for a long time at full rangeResistance

Range [1]	Accuracy(k=2) (T_{cal}±5°C) ppm*+Ω		Resolution	Max current
	90 days	1 year		
0 Ω~11.00000 Ω	32 + 0.008	40 + 0.01	10 μΩ	1 mA~150 mA
10.00000 Ω~33.00000 Ω	24 + 0.012	30 + 0.015	10 μΩ	1 mA~150 mA
30.0000 Ω~110.0000 Ω	20 + 0.012	25 + 0.015	100 μΩ	1 mA~80 mA
100.0000 Ω~330.0000 Ω	20 + 0.016	25 + 0.02	100 μΩ	1 mA~40 mA
0.300000 kΩ~1.100000 kΩ	20 + 0.016	25 + 0.02	1 mΩ	1 mA~20 mA

1.000000 kΩ~3.300000 kΩ	20 + 0.16	25 + 0.2	1 mΩ	0.1 mA~6 mA
3.00000 kΩ~11.00000 kΩ	20 + 0.16	25 + 0.1	10 mΩ	0.1 mA~2 mA
10.00000 kΩ~33.00000 kΩ	22 + 0.8	28 + 1	10 mΩ	10 μA~0.6 mA
30.0000 kΩ~110.0000 kΩ	22 + 0.8	28 + 1	100 mΩ	10 μA~0.2 mA
100.0000 kΩ~330.0000 kΩ	25 + 8	32 + 10	100 mΩ	1 μA~60 μA
0.300000 MΩ~1.100000 MΩ	25 + 8	32 + 10	1 Ω	1 μA~20 μA
1.000000 MΩ~3.300000 MΩ	40 + 120	60 + 150	1 Ω	0.25 μA~6 μA
3.00000 MΩ~11.00000 MΩ	104 + 200	130 + 250	10 Ω	0.25 μA~2 μA
10.00000 MΩ~33.00000 MΩ	200 + 2500	250 + 2500	10 Ω	25 nA~600 nA
30.0000 MΩ~110.0000 MΩ	400 + 3000	500 + 3000	100 Ω	25 nA~200 nA
100.0000 MΩ~330.0000 MΩ	2400 + 100000	3000 + 100000	100 Ω	2.5 nA~60 nA
300.000 MΩ~1100.000 MΩ	11000 + 480000	14000 + 480000	1 kΩ	1 nA~20 nA
Note [1]: The output is continuously adjustable.				

AC voltage (sine wave)

Range	frequency(Hz)	Accuracy(k=2) (T_{cal}±5°C) ppm*+μV		Resolution	maximum load
		90days	1year		
1.00000 mV~ 33.00000 mV	10≤F≤45	600 + 6	800 + 6	10 nV	[10 Ω]
	45<F≤10k	100 + 6	120 + 6		
	10k<F≤20k	160 + 6	200 + 6		
	20k<F≤50k	800 + 6	1000 + 6		
	50k<F≤100k	2800 + 12	3500 + 12		
	100k<F≤500k	6000 + 50	8000 + 50		
30.0000 mV~ 330.0000 mV	10≤F≤45	250 + 8	300 + 8	100 nV	[60 Ω]
	45<F≤10k	112 + 8	140 + 8		
	10k<F≤20k	130 + 8	160 + 8		
	20k<F≤50k	280 + 8	350 + 8		
	50k<F≤100k	600 + 20	750 + 20		
	100k<F≤500k	1600 + 70	2000 + 70		
0.300000 V~ 3.300000 V	10≤F≤45	250 + 50	300 + 50	1 μV	20 mA
	45<F≤10k	80 + 50	100 + 50		
	10k<F≤20k	150 + 50	180 + 50		
	20k<F≤50k	240 + 50	300 + 50		
	50k<F≤100k	550 + 100	700 + 100		
	100k<F≤500k	2000 + 600	2400 + 600		
3.00000 V~ 33.00000 V	10≤F≤45	160 + 650	200 + 650	10 μV	15 mA
	45<F≤10k	80 + 500	100 + 500		
	10k<F≤20k	160 + 500	200 + 500		
	20k<F≤50k	280 + 500	350 + 500		

	50k<F≤100k	350 + 1500	550 + 1500		
30.0000 V~ 330.0000 V	45≤F≤1k	80 + 2000	100 + 2000	100 μV	30 mA [1]
	1k<F≤10k	80 + 6000	100 + 6000		
	10k<F≤20k	160 + 6000	200 + 6000		
	20k<F≤50k	240 + 6000	300 + 6000		
	50k<F≤100k	1200 + 50000	1500 + 50000		
300.000 V~ 1020.000 V	45≤F≤1k	100 + 10000	120 + 10000	1 mV	8 mA [2]
	1k<F≤5k	120 + 10000	150 + 10000		
	5k<F≤10k	160 + 10000	200 + 10000		
AUX [3]					
10.0000 mV~ 330.0000 mV	10≤F≤20	480 + 300	600 + 300	100 nV	5 mA
	20<F≤45	480 + 300	600 + 300		
	45<F≤1k	400 + 300	500 + 300		
	1k<F≤5k	800+ 300	1000 + 300		
	5k<F≤10k	1800 + 400	2000 + 400		
	10k<F≤30k	3200 + 500	4000 + 500		
0.300000 V~ 3.300000 V	10≤F≤20	480 + 400	600 + 400	1 μV	5 mA
	20<F≤45	480 + 400	600 + 400		
	45<F≤1k	400 + 400	500 + 400		
	1k<F≤5k	800+ 500	1000 + 500		
	5k<F≤10k	1800 + 900	2000 + 900		
	10k<F≤30k	3200 + 1500	4000 + 1500		
3.000000 V~ 5.000000 V	10≤F≤20	480 + 400	600 + 400	1 μV	5 mA
	20<F≤45	480 + 400	600 + 400		
	45<F≤1k	400 + 400	500 + 400		
	1k<F≤5k	800 +800	1000 + 800		
	5k<F≤10k	1800 + 1000	2000 + 1000		

Note [1]: when the output frequency is 3kHz, the maximum load is 30 mA; when the output frequency is> 3kHz, the maximum load is 5 mA.

Note [2]: The maximum load at the output frequency is 8 mA, and the maximum load is> 3kHz when the output frequency is 3 mA.

Note [3]: Provide a dual-channel AC voltage output (option).

AC current (sine wave)

Range	Frequency(Hz)	Accuracy(k=2) (T_{cal}±5°C) %*+μA		Resolution	(rms)	Maximum perceptual load(μH)
		90 days	1year			
29.0000 μA~ 330.0000 μA	10≤F≤20	0.08 + 0.1	0.1 + 0.1	0.1 nA	7 V	200
	20<F≤45	0.04 + 0.1	0.05 + 0.1			
	45<F≤1k	0.024 + 0.1	0.03 + 0.1			
	1k<F≤5k	0.08 + 0.1	0.1 + 0.1			
	5k<F≤10k	0.16 + 0.2	0.2 + 0.2			
	10k<F≤30k	0.64 + 0.4	0.8 + 0.4			
0.300000 mA~ 3.300000 mA	10≤F≤20	0.04 + 1.5	0.05 + 1.5	1 nA	7 V	200
	20<F≤45	0.028 + 0.1	0.035 + 0.1			
	45<F≤1k	0.024 + 0.1	0.03 + 0.1			
	1k<F≤5k	0.024 + 0.2	0.03 + 0.2			
	5k<F≤10k	0.024 + 0.5	0.03 + 0.5			
	10k<F≤30k	0.16 + 0.6	0.2 + 0.6			
3.00000 mA~	10≤F≤20	0.04 + 2	0.05 + 2	10 nA	7 V	50
	20<F≤45	0.02 + 2	0.025 + 2			

33.00000 mA	45<F≤1k	0.016 + 2	0.02 + 2			
	1k<F≤5k	0.016 + 3	0.02 + 3			
	5k<F≤10k	0.04 + 5	0.05 + 5			
	10k<F≤30k	0.16 + 6	0.2 + 6			
30.0000 mA~ 330.0000 mA	10≤F≤20	0.04 + 20	0.05 + 20	100 nA	5 V	50
	20<F≤45	0.02 + 20	0.025 + 20			
	45<F≤1k	0.012 + 30	0.015 + 30			
	1k<F≤5k	0.016 + 30	0.02 + 30			
	5k<F≤10k	0.016 + 100	0.02 + 100			
	10k<F≤30k	0.08 + 500	0.1 + 500			
0.100000 A~ 1.100000 A	10≤F≤20	0.04 + 100	0.05 + 100	1 μA	5 V	2.5
	20<F≤45	0.024 + 50	0.03 + 50			
	45<F≤1k	0.016 + 50	0.02 + 50			
	1k<F≤5k	0.016 + 100	0.02 + 100			
	5k<F≤10k	0.04 + 500	0.05 + 500			
1.000000 A~ 3.300000 A	10≤F≤20	0.04 + 100	0.05 + 100	1 μA	4 V	2.5
	20<F≤45	0.024 + 100	0.03 + 100			
	45<F≤1k	0.016 + 100	0.02 + 100			
	1k<F≤5k	0.032 + 100	0.04 + 100			

	5k<F≤10k	0.04 + 900	0.05 + 900			
3.00000 A~ 20.50000 A	45≤F≤100	0.024 + 1000	0.03 + 1000	10 μA	3 V	1
	100<F≤1k	0.032 + 1000	0.04 + 1000			
	1k<F≤5k	0.048 + 2000	0.06 + 2000			

Sine wave frequency

output range [1]	Resolution	Accuracy(k=2) (T_{cal}±5°C)
10.00000 Hz ≤ F ≤ 99.99999 Hz	10 μHz	0.005%
100.0000 Hz ≤ F ≤ 999.9999 Hz	0.1 mHz	0.005%
1.000000 kHz ≤ F ≤ 9.999999 kHz	1 mHz	0.005%
10.00000 kHz ≤ F ≤ 99.99999 kHz	10 mHz	0.005%
100.0000 kHz ≤ F ≤ 500.0000 kHz	0.1 Hz	0.005%
Note [1]: Output mode: AC voltage or AC current		

DC Power

Time	current range / voltage range	Accuracy(k=2) (T_{cal}±5°C) %* power output [1][2]		
		3 mA ~ 300 mA	300 mA ~ 3 A	3 A ~ 20.5 A
90days	30 mV ~ 1020 V	0.016	0.018	0.039
1year	30 mV ~ 1020 V	0.018	0.021	0.046

Note [1]: DC power output range (virtual load)：0 ~ 20.91 kW。

Note [2]: For more accurate technical indicators of DC power measurement, refer to the calculation formula：$U_W = \sqrt{U_U^2 + U_I^2}$，$U_U$: the voltage measurement uncertainty，U_I:The current measurement uncertainty.

AC Power（45 Hz ~ 65 Hz、λ=1）

Time	current range / voltage range	Accuracy(k=2) (T_{cal}±5°C) %* power output [1][2]		
		3 mA ~ 300 mA	300 mA ~ 3 A	3 A ~ 20.5 A
90 天	30 mV ~ 330 mV	0.119	0.051	0.069
	330 mV ~ 1020 V	0.115	0.041	0.064
1 年	30 mV ~ 330 mV	0.122	0.055	0.076
	330 mV ~ 1020 V	0.118	0.046	0.069

Note [1]: AC power output range (virtual load)：0 ~ 20.91 kW。

For more accurate technical indicators of DC power measurement, refer to the calculation formula： $U_P = \sqrt{{U_U}^2 + {U_I}^2 + {U_\lambda}^2}$， U_U: the voltage measurement uncertainty， U_I:The current measurement uncertainty.U_λ Is the measurement uncertainty caused by the power factor.

7.9 Phase and power factor

Frequency (Hz)	voltage range (U)	current range (I)	Auxiliary voltage range(AUX) [1]	Phase adjustment range [2] (φ)	Power factor adjustment range [3] (λ)
DC	0~±1020 V	0~±20.5 V	0~±7 V	—	—
10~45	30 mV~33 V	3 mA~3.3 A	10 mV~5 V	0.000°~359.999°	-1~0~1
45~1k	30 mV~1020 V	3 mA~20.5 A	10 mV~5 V	0.000°~359.999°	-1~0~1
1k~5k	3 V~1020 V	30 mA~3.3 A	10 mV~5 V	0.000°~359.999°	-1~0~1
5k~10k	3 V~1020 V	30 mA~3.3 A	0.3 V~5 V	0.000°~359.999°	-1~0~1
10k~30k	3 V~330 V	30 mA~330	0.3 V~3.3 V	0.000°~359.999°	-1~0~1

		mA			

Note [1]: The auxiliary voltage output is an option

Note [2]: phase resolution: 0.001

Note [3]: Power factor resolution: 0.000 01

phase		Accuracy(k=2) (T_{cal}±5°C)					
		10~20Hz	20~45Hz	45~1kHz	1k~5kHz	5k~10kHz	10k~30kHz
φ		0.1°	0.1°	0.05°	0.5°	1.0°	2.0°
phase(φ)	(λ)	Power measurement uncertainty component caused by the phase uncertainty[4]					
		10~20Hz	20~45Hz	45~1kHz	1k~5kHz	5k~10kHz	10k~30kHz
0°	1.00000	0.000%	0.000%	0.000%	0.004%	0.015%	0.061%
10°	0.98481	0.031%	0.031%	0.015%	0.158%	0.323%	0.676%
20°	0.93969	0.064%	0.064%	0.032%	0.321%	0.650%	1.331%
30°	0.86603	0.101%	0.101%	0.050%	0.508%	1.023%	2.076%
40°	0.76604	0.147%	0.147%	0.073%	0.736%	1.480%	2.989%
50°	0.64279	0.208%	0.208%	0.104%	1.044%	2.095%	4.220%
60°	0.50000	0.302%	0.302%	0.151%	1.515%	3.038%	6.106%
70°	0.34202	0.480%	0.480%	0.240%	2.401%	4.810%	9.649%
80°	0.17365	0.990%	0.990%	0.495%	4.953%	9.913%	19.853%
90°	0.00000	—	—	—	—	—	—

Note [4]: Calculation formula: $U_\lambda = [1 - \cos(\varphi + \Delta\varphi)/\cos\varphi] \times 100\%$

pulse frequency

Output range [1]	Resolution	Accuracy(k=2) (T_{cal}±5°C) ppm*RDμHz	wow flutter
1.000000 Hz ≤ F ≤ 9.999999 Hz	1 μHz	20 + 20	<2 ns
10.00000 Hz ≤ F ≤ 99.99999 Hz	10 μHz		
100.0000 Hz ≤ F ≤ 999.9999 Hz	0.1 mHz		
1.000000 kHz ≤ F ≤ 9.999999 kHz	1 mHz		
10.00000 kHz ≤ F ≤ 99.99999 kHz	10 mHz		
100.0000 kHz ≤ F ≤ 999.9999 kHz	0.1 Hz		
1.000000 MHz ≤ F ≤ 2.000000 MHz	1 Hz		
Note [1]: Output type: TTL			

capacitance

Range [1]	Accuracy(k=2) (T_{cal}±5°C) %*output+*nF		Resolution	working frequency
	90days	1year		
1.100 0 nF~3.299 9 nF	0.4 + 0.04 nF	0.5 + 0.04 nF	0.1 pF	10 Hz~3 kHz
3.300 0 nF~10.999 9 nF	0.2 + 0.04 nF	0.25 + 0.04 nF	0.1 pF	10 Hz~1 kHz
11.000 0 nF~32.999 9 nF	0.2 + 0.4 nF	0.25 + 0.4 nF	0.1 pF	10 Hz~1 kHz
33.000 nF~109.999 nF	0.2 + 0.4 nF	0.25 + 0.4 nF	1 pF	10 Hz~1 kHz
110.000 nF~329.999 nF	0.2 + 0.3 nF	0.25 + 0.3 nF	1 pF	10 Hz~1 kHz
0.330 00 μF~1.099 99 μF	0.2 + 1 nF	0.25 + 1 nF	10 pF	10 Hz~600 Hz
1.100 00 μF~3.299 99 μF	0.2 + 3 nF	0.25 + 3 nF	10 pF	10 Hz~300 Hz
3.300 0 μF~10.999 9 μF	0.2 + 10 nF	0.25 + 10 nF	100 pF	10 Hz~150 Hz
11.000 μF~32.999 9 μF	0.32 + 30 nF	0.40 + 30 nF	100 pF	10 Hz~120 Hz
33.000 μF~109.999 μF	0.36 + 100 nF	0.45 + 100 nF	1 nF	10 Hz~80 Hz
110.000 μF~329.999 μF	0.36 + 300 nF	0.45 + 300 nF	1 nF	0 Hz~50 Hz
0.330 00 mF~1.099 99 mF	0.36 + 1 μF	0.45 + 1 μF	10 nF	0 Hz~20 Hz
1.100 00 mF~3.299 99 mF	0.36 + 3 μF	0.45 + 3 μF	10 nF	0 Hz~6 Hz
3.300 0 mF~10.999 9 mF	0.36 + 10 μF	0.45 + 10 μF	100 nF	0 Hz~2 Hz
11.000 0 mF~30.000 0 mF	0.6 + 30 μF	0.75 + 30 μF	100 nF	0 Hz~0.6 Hz
Note [1]: The output is continuously adjustable.				

Thermocouple output and measurement (functional option)

Type	Out put range [1] [2] °C		Accuracy(k=2) [3], (T_{cal}±5°C) °C	
	min	max	90days	1year
B	410	600	0.33	0.35
	600	900	0.26	0.28
	900	1800	0.20	0.22
E	-200	0	0.09	0.10
	0	600	0.06	0.08
	600	1000	0.08	0.10
J	-200	-100	0.12	0.13
	-100	750	0.07	0.08
	750	1200	0.08	0.10
K	-200	-100	0.15	0.16
	-100	1000	0.08	0.10
	1000	1370	0.10	0.12
N	-200	-100	0.21	0.22
	-100	400	0.07	0.09
	400	1300	0.09	0.11
R	-50	50	0.36	0.38
	50	300	0.25	0.27
	300	1000	0.18	0.20
	1000	1750	0.18	0.20
S	-50	50	0.36	0.38
	50	300	0.25	0.27
	300	1000	0.18	0.20
	1000	1750	0.21	0.23
T	-200	100	0.13	0.15

	-100	0	0.08	0.11
	0	400	0.06	0.08
G	0	200	1.80	2.00
	200	500	0.28	0.30
	500	2300	0.23	0.25
C	0	800	0.13	0.14
	800	2000	0.22	0.23
	2000	2300	0.30	0.31
D	0	200	0.28	0.30
	200	500	0.18	0.20
	500	1900	0.23	0.25
	1900	2300	0.33	0.35

Note [1]: Resolution: 0.01 C

Note [2]: Internal resistance of the output source: 10

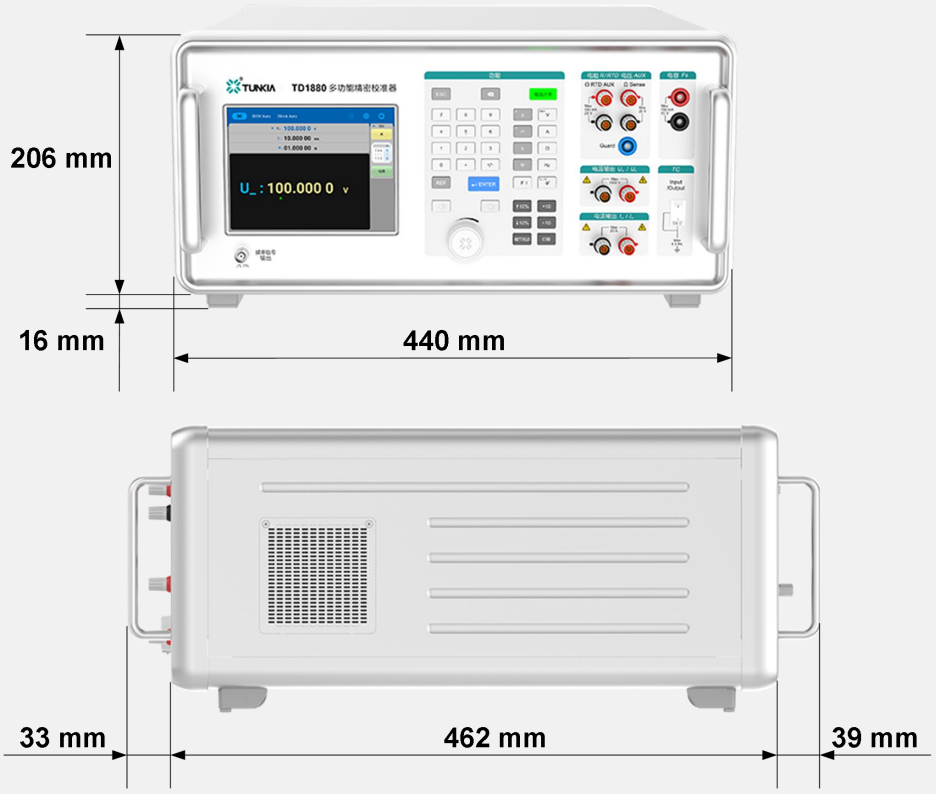
Note [3]: Excluding the thermocouple error

Note [4]: Use external compensation, S, R, B, K, N, E, J, T meets ITS-90 international temperature standard, C, D meet ZBN05003-88, and G meets ASTM standard

Output / measurement range: -10 mV ~ 80 mV
Measurement Uncertainty: (25 ppm + 2 V)
Display digits: 7-bit decimal system
Pripple coefficient: <0.5%

Thermal resistance

Type	Out put range [1] °C		Accuracy(k=2), (T_{cal}±5°C) °C	
	min	max	90 days	1year
Pt385, 25 Ω	-200	850	0.20	0.25
Pt385, 100 Ω	-200	850	0.04	0.05
Pt385, 200 Ω	-200	320	0.30	0.35
	320	850	0.35	0.40
Pt385, 500 Ω	-200	-30	0.04	0.05
	-30	850	0.13	0.15
Pt385, 1000 Ω	-200	850	0.07	0.09
Pt3916, 100 Ω	-200	630	0.04	0.05
Pt3926, 100 Ω	-200	630	0.04	0.05
Cu427, 10 Ω	-50	150	0.28	0.38
Cu50	-50	150	0.07	0.09
Cu100	-50	150	0.04	0.05
Ni120	-80	260	0.02	0.02
Note [1]: Resolution: 0.001 C				

440 mm (W) × 462 mm (D) × 206 mm (H)

约 24 kg