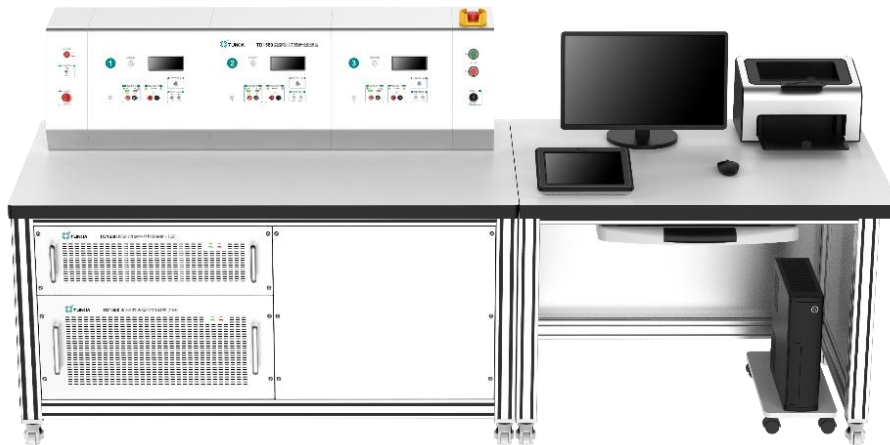# TD1580 DC Energy Meters Testing Device

*The pictures are for reference only. The configuration and details may vary depending on the application scenarios.

1. Summary

TD1580 is a comprehensive equipment dedicated to the verification and type evaluation of static DC energy meter. It is composed of DC voltage standard source, DC current standard source, DC small-signal voltage source, DC standard phantom power source composed of voltage-current combination, etc. It is applicable to the verification of direct connected or indirect connected DC energy meters or the completion of most tests of type evaluation.

2. Features

- There are two specifications of class **0.02**, class **0.05** available.

- DC standard voltage source: 10 mV～1150V（1500 V optional）.

- DC standard current source: 5 µA～120 A（600 A optional）.

- DC four-terminals small-signal voltage source: 10 µV～ 4.4 V.

- DC + AC output mode for ripple effect test.

- Programmed positive and negative voltage output to complete reverse polarity connection test of voltage line.

- Auxiliary power supply is used to supply power for electronic meters for measuring DC energy(type A).

- Power supply voltage variation can be set for voltage dip and short interruption test.

- The power supply has the loop current measurement function to detect the power consumption

of meter under test.

- Standard second pulse measurement, used to detect the daily reckoning error of electric energy meter.

- Optional single/three test positions energy verification test bench.

3. Applications

☆ **Verification DC Energy Meter**
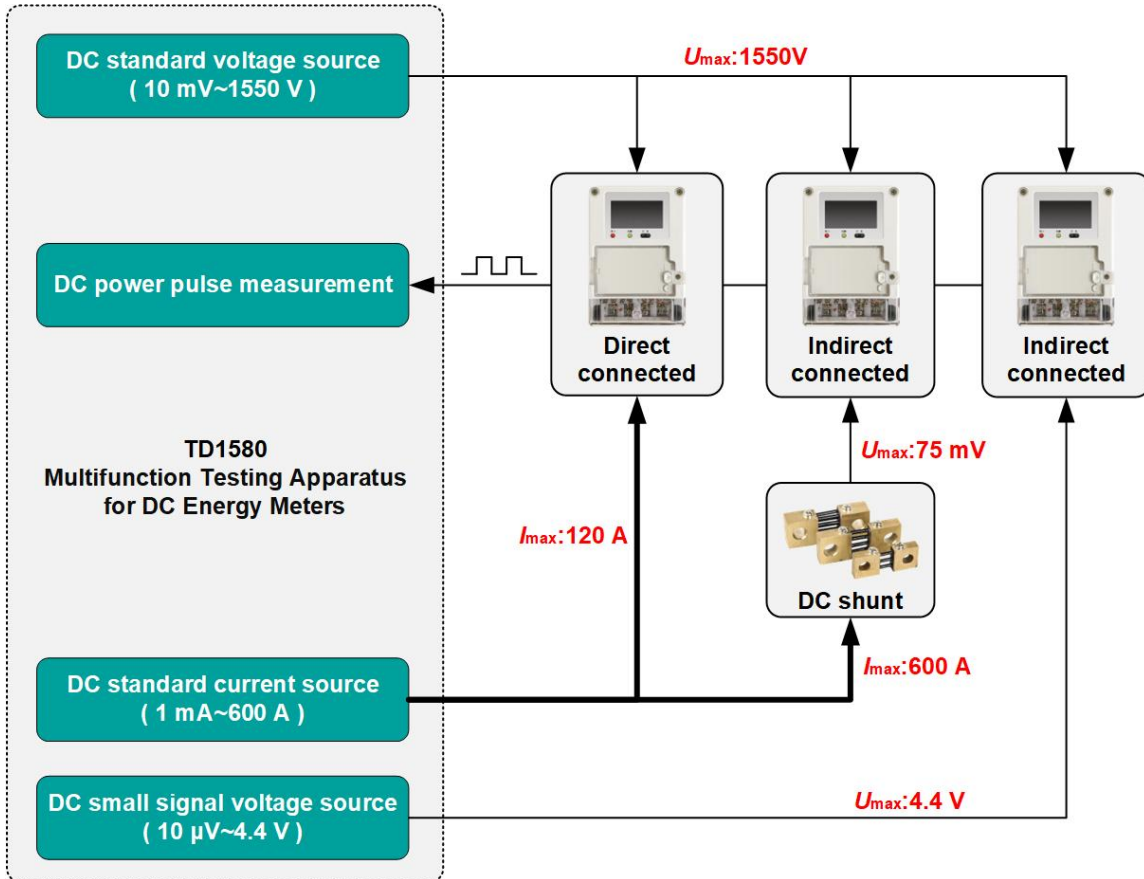
- **Application Scenario 1：** The maximum DC voltage output is 1500 V，meeting the requirements of 1.15 Un voltage test of 1 kV DC energy meters; The maximum DC current output is 600 A, meeting the requirements of 1.2 In current test of 100 A DC energy meters. With the energy pulse measurement function, the direct connected DC energy meter test can be completed.

- **Application Scenario 2：** The instrument is equipped with a 10 μV～4.4 V four-terminals small-signal voltage source, a 1500 V DC voltage source and energy pulse measurement function, and can carry out relevant tests on indirect connected DC energy meter.

- **Application Scenario 3：** The instrument supports 600 A maximum current output option，with 1500 V DC voltage source and energy pulse measurement, and carry out the overall related test work of indirect connected DC energy meter and DC shunt.

4. Characteristics

☆ Wide Range DC Power Output

DCV	10 mV ████████████ 1150 V
	10 mV █████████████ 1550 V (选件)
DCV ripple	██ 20%*U
DCI	1 mA ████████ 120 A
	1 mA █████████ 600 A (选件)
DCI ripple	███ 40%*I (20%*Imax)
DCI$_u$	10 μV █████ 4.4 V
DCI$_u$ ripple	██ 40%*I$_u$

● The maximum output of the DC standard voltage source is 1500 V, The maximum output of the DC standard current source is 600 A; The output range of the DC standard small-signal voltage source used for the verification of indirect connected DC energy meters is (10 μV～4.4 V);

☆ DC+AC（DC Ripple）Output
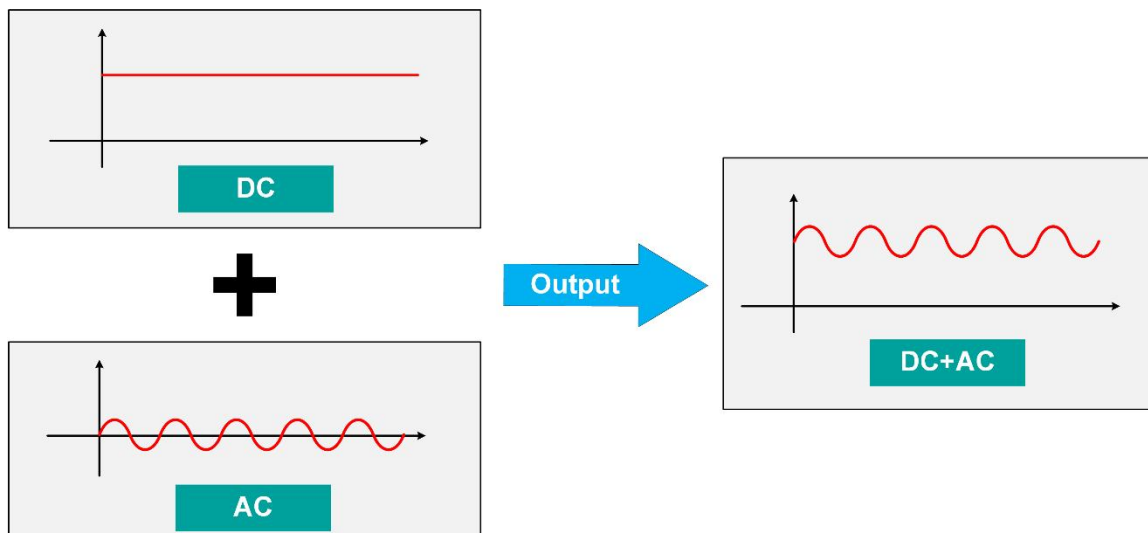
● **DC+AC output mode：** The output of each DC current can be superimposed with alternating component (ripple) with adjustable amplitude, frequency (100 Hz～1 kHz), phase to complete the ripple impact test of the energy meter under test.

☆ Clock Check Function
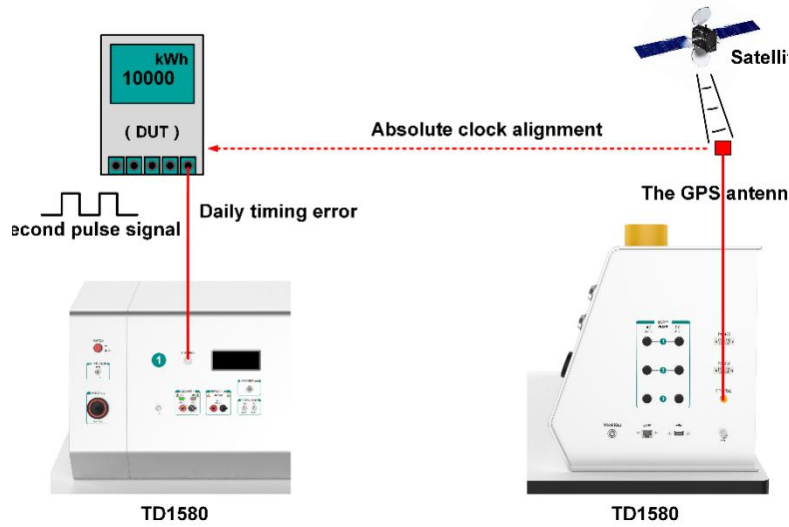
- Built in clock module with precision up to 0.2 ppm, which can accurately measure the second pulse signal for daily reckoning error test.
- Built in GPS module and antenna can receive GPS standard clock signal.

☆ Auxiliary Power Supply（Power Consumption Test）

Select the power type

Power supply terminals
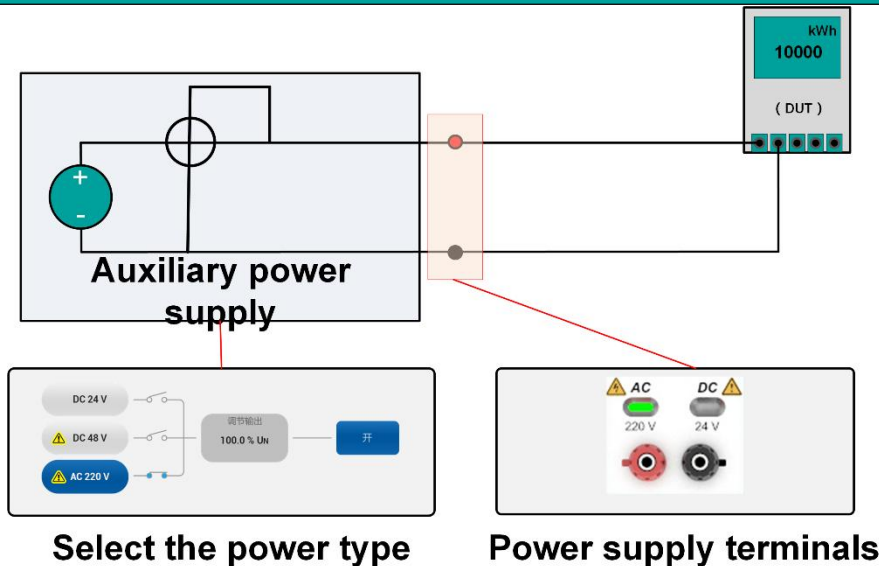
- Each meter position has built-in auxiliary supply, which can provide DC 24 V, 48 V or AC 220 V power supply for Class A electric energy meter.
- All auxiliary power supplies have independent power consumption measurement function, which can measure the real-time power consumption of DC energy meter.

☆ Adjustable Power Supply Voltage(Voltage Dip and Short Interruption Test)

ΔU =100%,1s voltage dip
(AC power supply)

ΔU =100%,1s voltage dip
(DC power supply)

ΔU =100%, rated frequency for one cycle of voltage Dip
(AC power supply)

ΔU =100%,0.3s voltage dip
(DC power supply)

ΔU =50%,1min voltage short interruption
(AC power supply)

ΔU =60%,1s voltage short interruption
(DC power supply)
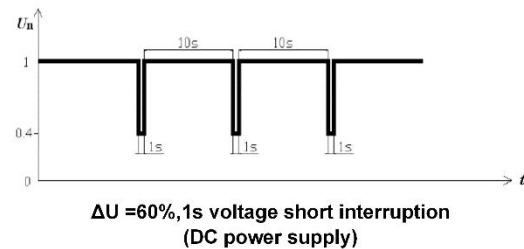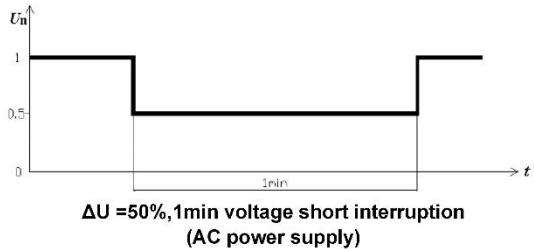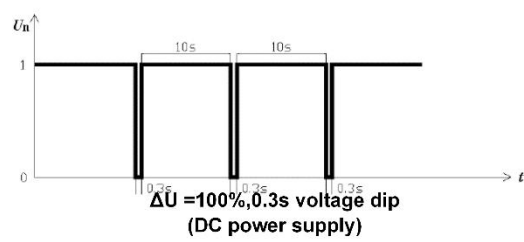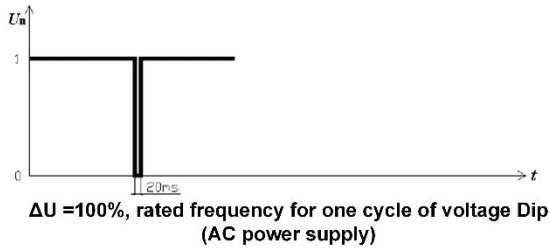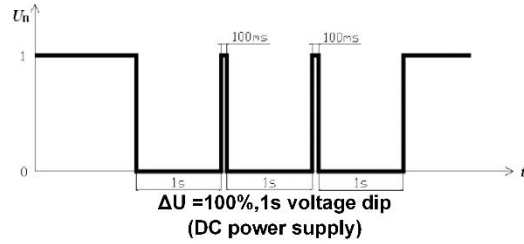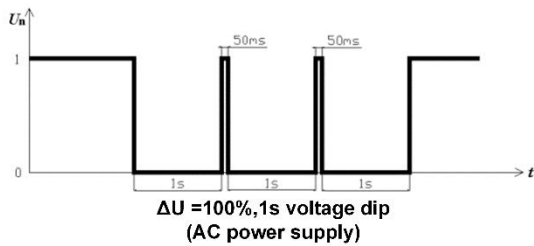
- The voltage change time of auxiliary supply can be set within 20 ms～1 min to complete voltage dip and short interruption test.

☆ Voltage Reverse Polarity Output

Positive polarity output

Reverse polarity output
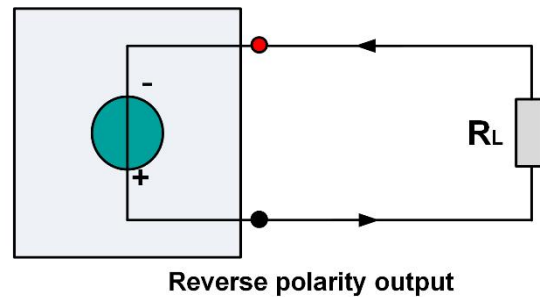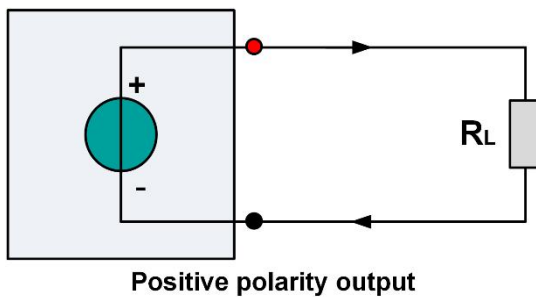
- TD1580 voltage output interface supports the positive and negative polarity output of voltage by adjusting the positive and negative electrical parameters on the software interface, and can conduct the voltage reverse polarity connection experiment on the DC energy meter.

☆ Professional Test Software

TD1580

Computer and special test software

Communication interface

DUT
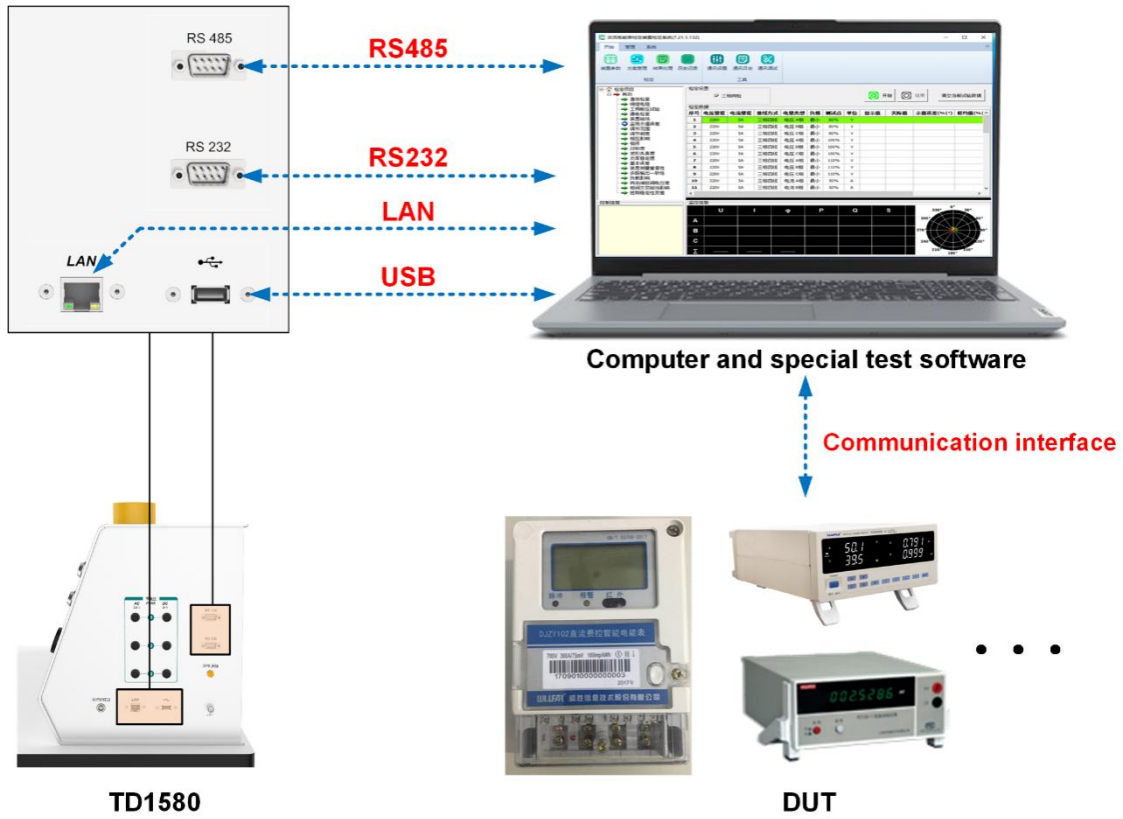
- With RS232, LAN, USB, RS485 communication interfaces, software functions can be customized according to customer needs.

5. Specifications

5.1 DC Voltage Output

Range	Resolution	Short Term Stability (% / min)		Accuracy (k=2) (ppm of reading + ppm of range) [1]		Maximum Burden Current (mA)	Ripple (%)
		Class 0.05	Class 0.02	Class 0.05	Class 0.02		
100 mV	0.1 μV	0.01	0.005	120 + 80	80 + 60	100	< 0.2
300 mV	0.1 μV	0.008	0.004	120 + 80	80 + 60	100	< 0.2
1 V	1 μV	0.005	0.002	120 + 80	50 + 40	100	< 0.2
3 V	1 μV	0.005	0.002	120 + 80	50 + 40	100	< 0.2
10 V	10 μV	0.005	0.002	120 + 80	50 + 40	100	< 0.2
30 V	10 μV	0.005	0.002	120 + 80	50 + 40	50	< 0.2
100 V	0.1mV	0.005	0.002	120 + 80	50 + 40	50	< 0.2
300 V	0.1mV	0.005	0.002	120 + 80	50 + 40	50	< 0.2
1000 V	1 mV	0.005	0.002	120 + 80	50 + 40	15	< 0.2
1500 V [2]	1 mV	0.005	0.002	120 + 80	50 + 40	10	< 0.2

Note [1] : (ppm = parts per million) (e.g., 10ppm = 0.001%).

[2]：1500V range is an option.

- Output range: ± (10 mV～1150 V), 7 / 8-bit display digits can be set.

- 1500 V voltage output is optional Accessories，extend the voltage output range to ± (10 mV～1500 V).

- Protection function：short-circuit protection、overload protection.

5.2 DC Current Output [3]

Range	Resolution	Short Term Stability (% / min)		Accuracy (k=2) (ppm of reading + ppm of range)		Maximum Burden Voltage (V)	Ripple (%)
		Class 0.05	Class 0.02	Class 0.05	Class 0.02		
250 µA	0.1 nA	0.010	0.005	120 + 80	80 + 60	12	< 0.5
500 µA	0.1 nA	0.010	0.005	120 + 80	80 + 60	12	< 0.5
1 mA	1 nA	0.005	0.003	120 + 80	50 + 40	12	< 0.5
2 mA	1 nA	0.005	0.003	120 + 80	50 + 40	12	< 0.5
5 mA	1 nA	0.005	0.002	120 + 80	50 + 40	12	< 0.5
10 mA	10 nA	0.005	0.002	120 + 80	50 + 40	12	< 0.5
25 mA	10 nA	0.005	0.002	120 + 80	50 + 40	12	< 0.5
50 mA	10 nA	0.005	0.002	120 + 80	50 + 40	12	< 0.5
100 mA	0.1 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
200 mA	0.1 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
500 mA	0.1 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
1 A	1 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
2.5 A	1 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
5 A	1 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
10 A	10 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
20 A	10 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
50 A	10 µA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
100 A	0.1 mA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
250 A[3]	0.1 mA	0.005	0.002	120 + 80	50 + 40	3	< 0.5
500 A[3]	0.1 mA	0.005	0.002	120 + 80	50 + 40	3	< 0.5

NOTES: [3] 250 A、500 A current range is optional Accessories.

- Output range: ± (5 µA～120 A), 7 / 8-bit display digits can be set.

- 600 A current output is optional Accessories, extend the current output range to ±(5 µA～600 A).

- Protection function：open-circuit protection, overload protection.

5.3 DC Small-signal Voltage Output[4]

Range	Resolution	Short Term Stability (% / min)	Accuracy (k=2) (ppm of reading + ppm of range)	Maximum Burden Current (mA)	Ripple (%)
1 mV	10 nV	0.1 μV$_{rms}$	120 + 0.3 μV	—	< 0.2
3 mV	10 nV	0.3 μV$_{rms}$	120 + 1 μV	—	< 0.2
10 mV	0.1 μV	1 μV$_{rms}$	120 + 3 μV	—	< 0.2
30 mV	0.1 μV	0.002	120 + 80	—	< 0.2
100 mV	1 μV	0.002	120 + 80	—	< 0.2
300 mV	1 μV	0.002	120 + 80	≤ 10	< 0.2
1 V	10 μV	0.002	120 + 80	≤ 10	< 0.2
4 V	10 μV	0.002	120 + 80	≤ 10	< 0.2
NOTES: [4]When independently calibrating the indirect connected DC energy meter , it can be used as its current input (corresponding shunt voltage).					

- Output range: ± (10 μV～4.4 V)，7 / 8-bit display digits can be set.

- The specification and current voltage ratio of the shunt can be set, and the output value can be displayed according to the voltage or current converted by the shunt.

- Protection function：short-circuit protection, overload protection.

5.4 Daily Reckoning Error

- Standard clock annual uncertainty of measurement of device：2×10^{-7}

- The daily reckoning error supports two error display modes: s / d and ppm / ppb

5.5 DC Electric Energy Index

DC Power/Energy	**Range**	Combination of DC voltage and DC current(or DC small-signal)
	Accuracy	Voltage uncertainty of measurement+ current uncertainty of measurement (or DC small-signal voltage uncertainty of measurement)
Energy Pulse	**Standard Electric Energy Pulse Output**	High frequency full range value corresponds to 60 kHz; Low frequency full range value corresponds to 6 Hz;
	Pulse Output Frequency	Output frequency jitter time<10 μs
	Standard Energy Pulse Input	2×10^{-7}
	Energy Error Display	Signal amplitude is 5 V, TTL level; Can accept ≤200 kHz high-frequency pulse; F_H=60 kHz × power value÷ voltage range value ÷ current range value F_L=60 kHz × power value÷ voltage range value ÷ current range value
	Energy Error Display	Auto display, resolution is 0.0001%
	Difference At Different Epitope	Position difference at different positions< ± 0.025%

5.6 Ripple Applied on DC Voltage U～

Voltage Range	Ripple Adjustable Range (Effective Value)	Accuracy（k = 2）(%*RG)		Uncertainty Limit of Electric Energy Change Caused by Ripple(%*RD)	
		Class 0.05	Class 0.02	Class 0.05	Class 0.02
3 V	0%～20.00%	0.05	0.02	0.05	0.02
10 V	0%～20.00%	0.05	0.02	0.05	0.02
30 V	0%～20.00%	0.05	0.02	0.05	0.02
100 V	0%～20.00%	0.05	0.02	0.05	0.02
300 V	0%～20.00%	0.05	0.02	0.05	0.02
1000 V	0%～20.00%	0.05	0.02	0.05	0.02
1500 V	0%～20.00%	0.05	0.02	0.05	0.02

- Ripple frequency: 100 Hz～1000 Hz, adjustment fineness: 1 Hz, Sine wave signal

- Ripple amplitude adjustment fineness: 0.01%, effective value, 7 / 8-bit display digits can be set.

5.7 Ripple Applied on DC Small-signal Voltage Iu～

Small-Signal Voltage Range	Ripple Adjustable Range (Effective Value)	Accuracy（k = 2）(%*RG)		Uncertainty Limit of Electric Energy Change Caused by Ripple (%*RD)	
		Class 0.05	Class 0.02	Class 0.05	Class 0.02
30 mV	0%～40.00%	0.05	0.02	0.05	0.02
100 mV	0%～40.00%	0.05	0.02	0.05	0.02
300 mV	0%～40.00%	0.05	0.02	0.05	0.02
1 V	0%～40.00%	0.05	0.02	0.05	0.02
4V	0%～40.00%	0.05	0.02	0.05	0.02

- Ripple frequency: 100 Hz～1000 Hz, adjustment fineness: 1 Hz, Sine wave signal

- Ripple amplitude adjustment fineness: 0.01%, effective value, 7 / 8-bit display digits can be set.

5.8 Ripple applied on DC current I～

Current Range	Ripple Adjustable Range (Effective Value)	Accuracy（k = 2）(%*RG)		Uncertainty Limit of Electric Energy Change Caused by Ripple (%*RD)	
		Class 0.05	Class 0.02	Class 0.05	Class 0.02
10 mA	0%～40.00%	0.05	0.02	0.05	0.02
20 mA	0%～40.00%	0.05	0.02	0.05	0.02
50 mA	0%～40.00%	0.05	0.02	0.05	0.02
100 mA	0%～40.00%	0.05	0.02	0.05	0.02
200 mA	0%～40.00%	0.05	0.02	0.05	0.02
500 mA	0%～40.00%	0.05	0.02	0.05	0.02
1 A	0%～40.00%	0.05	0.02	0.05	0.02
2 A	0%～40.00%	0.05	0.02	0.05	0.02
5 A	0%～40.00%	0.05	0.02	0.05	0.02
10 A	0%～40.00%	0.05	0.02	0.05	0.02
20 A	0%～40.00%	0.05	0.02	0.05	0.02

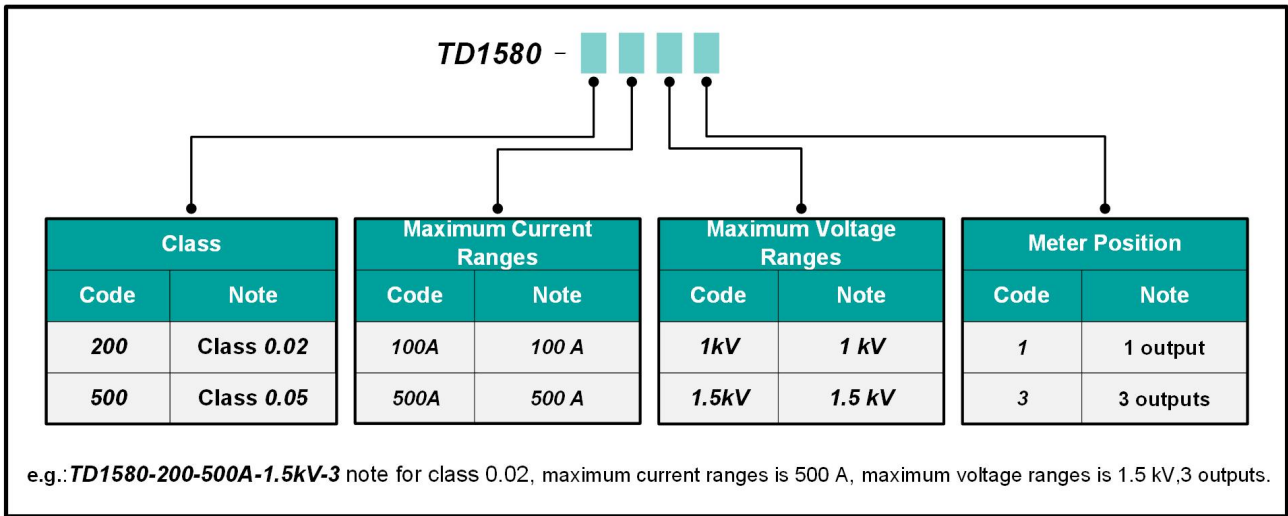| 50 A | 0%～40.00% | 0.05 | 0.02 | 0.05 | 0.02 |
100 A	0%～40.00%	0.05	0.02	0.05	0.02
200 A	0%～40.00%	0.05	0.02	0.05	0.02
500 A	0%～20.00% [5]	0.05	0.02	0.05	0.02
NOTES[5]：When the maximum current is 100A, the ripple under 100A range is 0%～20.00%。					

- Ripple frequency: 100 Hz～1000 Hz, adjustment fineness: 1 Hz, Sine wave signal

- Ripple amplitude adjustment fineness: 0.01%, effective value, 7 / 8-bit display digits can be set.

5.9 Auxiliary Power Supply of the Meter under Test

	Output Voltage	24 V / 48 V
DC Power Output	Output Range	6 V～62.4V
	Maximum Burden Current	300 mA per position
	Uncertainty of Power Consumption Measurement	Better than 0.1 VA
AC Power Output	Output Voltage	220 V
	Output Range	110 V～286 V
	Maximum Burden Current	30 mA per position
	Uncertainty of Apparent Power Consumption Measurement	Better than 0.2 VA
	Uncertainty of active power Consumption measurement	Better than 0.2 W

- Each position has independent power consumption measurement function.

6. Ordering Information

TD1580 –

Class		Maximum Current Ranges		Maximum Voltage Ranges		Meter Position	
Code	Note	Code	Note	Code	Note	Code	Note
200	Class 0.02	100A	100 A	1kV	1 kV	1	1 output
500	Class 0.05	500A	500 A	1.5kV	1.5 kV	3	3 outputs

e.g.:**TD1580-200-500A-1.5kV-3** note for class 0.02, maximum current ranges is 500 A, maximum voltage ranges is 1.5 kV,3 outputs.

7. General Specifications

Power Supply	AC (220±22) V，(50±2) Hz
Temperature Performance	Working temperature：15°C～30°C； Calibration temperature：18°C～28°C； Storing temperature：-20°C～70°C
Humidity Performance	Working humidity：＜80% @ 30°C，＜70% @ 40°C，＜40% @ 50°C Storing humidity：(20%～80%) R·H，no dewing
Interface	RS232，RS485，RJ45，USB