AN23600Eseries

High-power DC electronic load

User manual （V2.7）

Limited warranty and scope of liability

Ainuo Electronics guarantees that every product you purchase is fully qualified in quality and measurement. This warranty does not include fuses.

All of Ainuo's instruments are warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, if the product was proved to be defective, Ainuo will provide free repair or replacement for users

From the date of shipment, Ainuo promises a one-year warranty for its products. For any hardware or software failures caused by the quality of the product itself during the warranty period, users are requested to contact Ainuo Service Department or its authorized repair points to repair the product for free. For products beyond the warranty period, Ainuo will perform paid repairs for customers.

For free maintenance products (no special problems), Ainuo promises to repair and return the machine to the customer within five working days after receiving the machine, and bear the transportation cost of the return journey.

If one of the following situations occurs, Ainuo will not perform free maintenance.

(1) Accidental damage caused during transportation.
(2) Instrument malfunction or damage caused by incorrect installation or use in a non-product specified working environment.
(3) The artificial appearance of the product is damaged (such as surface scratches, deformation, etc.).
(4) Unauthorized disassembly, repair, reconstruction, replacement of devices and product warranty seals were torn.
(5) Failure or damage caused by irresistible factors (such as lightning strikes).
(6) Direct or indirect damage caused by improper operation by the user.
(7) When using high-power batteries, disable the short-circuit or constant voltage function, otherwise it may be damaged.

If the measurement is not accurate or fails to measure due to improper operation by the user, and the instrument is normal, the return cost shall be borne by the customer.

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Safety instructions

Warning Danger: When you find the following abnormal situation, please terminate the operation immediately and disconnect the power cord. Contact Aino Electronics or Aino's authorized distributor immediately for repair. Otherwise, it may cause a fire or a potential electric shock hazard to the operator.

* Abnormal operation of the instrument.
* The instrument generates abnormal noise, odor, smoke or flash during operation.
* During operation, the instrument generates high temperature or electric shock.
* The power cord, power switch or power outlet is damaged.
* Impurities or liquids flow into the instrument.

Security Information

Warning Danger: To avoid possible electric shock hazard to the operator, please follow the instructions below.

Disclaimer: Please read the following safety information carefully before operation of the instrument. Ainuo Electronics will not assume any responsibility for personal safety and property damage caused by the user's failure to comply with the following clauses.

Instrument ground	mAke sure to connect the protective grounding to prevent an electric shock before turning on the power.
Do not use the instrument in explosive gas environment	Do not operate the instrument in the presence of flammable and explosive gas, steam or dusty. Using any electronic device in such an environment is a risk to personal safety.
Do not remove the cover of the instrument	Non-qualified maintenance personnel should notremove the cover of the instrument in an attempt to repair the instrument. The instrument still has unreleased charge for a period of time after it was shut down, which may cause a risk of electric shock.
Do not use damaged instruments	If the instrument is not working properly, the danger is unpredictable, please disconnect the power cord, do not use it again, and do not try to repair it yourself.
Do not use instruments that work abnormally	If the instrument is not working properly, the danger is unpredictable, please disconnect the power cord, do not use it again, and do not try to repair it yourself.
Do not use the instrument beyond the way specified in this manual	Outside the scope, the protective measures provided by the instrument will be invalid.

This equipment is intended to be used in below environmental conditions:

Indoor use
Altitude not more than 2000m
Temperature 0-40℃
Related Humidity 20-90%
Main supply voltage fluctuation: (100-240V AC) ±10%
Pollution degree II

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

Do not position the equipment so that it is difficult to operate the disconnecting device.

Clean the equipment regularly. Unplug the equipment before cleaning, maintenance or servicing.

Check the connection of power cord and external terminals to prevent loose connection, perform the maintenance and inspection regularly to ensure continued safety of the equipment after the maintenance and, inspection and test procedure.

If detachable cord set is damaged, do not replace MAINS supply cords by inadequately RATED cords.

Contents

Chapter 1 Overview

1.1 Principle

This AN23600E series high-power DC electronic loadare new products launched by Ainuo Instruments. The voltage of this product is divided into three types: 150V, 600V and 1200V, with power of 2~60kW. Using a new generation of digital controller, built-in 5 basic modes and 19 advanced modes, including serialization test (list mode), programming test and other advanced modes, to meet the user's programming, automated testing and other needs. featuring high power density, wide range; rich interfaces, standard RS232, optional RS485, LAN, GPIB,CAN and other interfaces for various applications.

1.2 TypitcalOperation

This series of electronic loads are widely used in product testing in many fields such as new energy vehicles OBC, power batteries, charging pile testing, power electronics, servo/server power supplies, high-voltage UPS, military, photovoltaic, grid energy storage, aerospace and other fields.

1.3 Features

1. High power density, compact, light, convenient;
2. Wide range, almost twice current range of additional high-power load with same capacity;
3. Built-in Constant Current (CC), Constant Voltage (CV), Constant Resistance (CR), Constant Power (CP), Short simulation, overcurrent protection test, LIST test etc.;
4. Built-in dynamic loading mode, dynamic frequency up to 25kHz, optional Vpk+/- test;
5. Optimized dynamic characteristics, ultra-high rapid current rise and ultra-small overshoot amplitude;
6. Built-in digital controller to ensure minimal parameter drift for high temperature loading;
7. Complete protection, including over-current, over-voltage, over-temperature, reverse connection protection and other alarm functions;
8. Built-in temperature acquisition chip and speed regulating fan control;
9. Proprietary battery mode for discharge test, power integration and timing;
10. Abundant interfaces, standard USB, RS232, RS485, LAN, GPIB, CAN and other interfaces

1.4 Main technical parameters of equipment

1.4.1 Series specifications

The voltage range of 23600E series high-power DC electronic loads (hereinafter referred to as electronic loads) is divided into three types: 150V, 600V, and 1200V. The model of each input parameter and height are shown in Table 1-1.

Table 1-1 List of load specifications and body height

Input parameters	150 V	600 V	1200 V	Height
2kW	AN23602E-150-200	AN23602E-600-140	AN23602E-1200-80	4U
3kW	AN23603E-150-300	AN23603E-600-210	AN23603E-1200-120	4U
4kW	AN23604E-150-400	AN23604E-600-280	AN23604E-1200-160	4U
5kW	AN23605E-150-500	AN23605E-600-350	AN23605E-1200-200	4U
6kW	AN23606E-150-600	AN23606E-600-420	AN23606E-1200-240	4U
8kW	AN23608E-150-800	AN23608E-600-560	AN23608E-1200-320	7U

10kW	AN23610E-150-1000	AN23610E-600-700	AN23610E-1200-400	7U
12kW	AN23612E-150-1200	AN23612E-600-840	AN23612E-1200-480	7U
15kW	AN23615E-150-1500	AN23615E-600-1050	AN23615E-1200-600	10U
18kW	AN23618E-150-1800	AN23618E-600-1260	AN23618E-1200-720	10U
20kW	AN23620E-150-2000	AN23620E-600-1400	AN23620E-1200-800	13U
24kW	AN23624E-150-2400	AN23624E-600-1680	AN23624E-1200-960	13U
30kW	AN23630E-150-2400	AN23630E-600-2100	AN23630E-1200-1200	26U
36kW	AN23636E-150-2400	AN23636E-600-2400	AN23636E-1200-1440	26U
42kW	AN23642E-150-2400	AN23642E-600-2400	AN23642E-1200-1680	34U
48kW	AN23648E-150-2400	AN23648E-600-2400	AN23648E-1200-1920	34U
54kW	AN23654E-150-2400	AN23654E-600-2400	AN23654E-1200-2160	38U
60kW	AN23660E-150-2400	AN23660E-600-2400	AN23660E-1200-2400	33U

Theparameters of each model is shown in Table 1-2:

Table 1-2 Specifications of 23600E series high-power DC electronic loads

Model		AN23602E-150-200	AN23603E-150-300	AN23604E-150-400	AN23605E-150-500	AN23606E-150-600	AN23608E-150-800
Operating range	Voltage	0-150V DC					
	Current	0-200A	0-300A	0-400A	0-500A	0-600A	0-800A
	Power	2kW	3kW	4kW	5kW	6kW	8kW
Min.operating voltage		1.8V@200A	1.8V@300A	1.8V@400A	1.8V@500A	1.8V@600A	1.8V@800A
Constant current	Range	20/100/200A	30/150/300A	40/200/400A	50/250/500A	60/300/600A	80/400/800A
	resolution	0.2/1/2mA	0.2/1/2mA	0.4/2/4mA	0.5/2/5mA	0.5/2/5mA	1/5/10mA
	Accuracy	0.05%+0.05%F.S.					
Constant voltage	Range	16/80/150V					
	resolution	0.1/0.5/1mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	15mΩ-150Ω(16V) 60mΩ-600Ω(80V) 1.5Ω-3000Ω(150V)	10mΩ-100Ω(16V) 40mΩ-400Ω(80V) 1Ω-2000Ω(150V)	7.5mΩ-75Ω(16V) 30mΩ-300Ω(80V) 0.75Ω-1500Ω(150V)	5mΩ-50Ω(16V) 20mΩ-200Ω(80V) 0.5Ω-1000Ω(150V)	5mΩ-50Ω(16V) 20mΩ-200Ω(80V) 0.5Ω-1000Ω(150V)	3.8mΩ-37.5Ω(16V) 15mΩ-150Ω(80V) 0.375Ω-750Ω(150V)
	resolution	2mA/Vsense	2mA/Vsense	4mA/Vsense	5mA/Vsense	5mA/Vsense	10mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	200/1000/2000W	300/1500/3000W	400/2000/4000W	500/2500/5000W	600/3000/6000W	800/4000/8000W
	resolution	5/20/50mW	5/20/50mW	10/50/100mW	10/50/100mW	10/50/100mW	20/100/200mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	0.2mA/us-2A/us (20A) 1mA/us-7A/us (100A) 2mA/us-14A/us (200A)	0.2mA/us-3A/us (30A) 1mA/us-10.5A/us (150A) 2mA/us-21A/us (300A)	0.4mA/us-4A/us(40A) 2mA/us-14A/us (200A) 4mA/us-28A/us (400A)	0.5mA/us-5A/us (50A) 2mA/us-17.5A/us (250A) 5mA/us-35A/us (500A)	0.5mA/us-6A/us (60A) 2mA/us-21A/us (300A) 5mA/us-42A/us (600A)	1mA/us-8A/us (80A) 5mA/us-24A/us (400A) 10mA/us-48A/us (800A)
	resolution	0.2/1/2mA/us	0.2/1/2mA/us	0.4/2/4mA/us	1/5/10mA/us	0.5/2/5mA/us	1/5/10 mA/us
Specifications	Size	426mm×177mm×600mm (W×H×D)					426 mm×309.5 mm ×650 mm
	Weight	24.5kg	29.5kg	29.5kg	35kg	35kg	61kg

Model		AN23610E-150-1000	AN23612E-150-1200	AN23615E-150-1500	AN23618E-150-1800	AN23620E-150-2000	AN23624E-150-2400
Operating range	Voltage	0-150V DC					
	Current	0-1000A	0-1200A	0-1500A	0-1800A	0-2000A	0-2400A

	Power	10kW	12kW	15kW	18kW	20kW	24kW
Min.operating voltage		1.8V@1000A	1.8V@1200A	1.8V@1500A	1.8V@1800A	1.8V@2000A	1.8V@2400A
Constant current	Range	100/500/1000A	120/600/1200A	150/750/1500A	180/900/1800A	200/1000/2000A	240/1200/2400A
	resolution	1/5/10mA	1/5/10mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA
	Accuracy	0.05%+0.05%F.S.					
Constant voltage	Range	16/80/150V					
	resolution	0.1/0.5/1mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	2.5mΩ-25Ω(16V) 10mΩ-100Ω(80V) 0.25Ω-500Ω(150V)	2.5mΩ-25Ω(16V) 10mΩ-100Ω(80V) 0.25Ω-500Ω(150V)	1.7mΩ-16.67Ω(16V) 6.7mΩ-66.67Ω(80V) 0.167Ω-333.34Ω (150V)	1.7mΩ-16.67Ω(16V) 6.7mΩ-66.67Ω(80V) 0.167Ω-333.34Ω (150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)
	resolution	10mA/Vsense	10mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	1000/5000/10000W	1200/6000/12000W	1500/7500/15000W	1800/9000/18000W	2000/10000/20000 W	2400/12000/24000 W
	resolution	20/100/200mW	20/100/200mW	40/200/400mW	40/200/400mW	40/200/400mW	100/500/1000mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	1mA/us-10A/us (100A) 5mA/us-27.5A/us (500A) 10mA/us-55A/us (1000A)	1mA/us-12A/us (120A) 5mA/us-30A/us (600A) 10mA/us-60A/us (1200A)	2mA/us-15A/us (150A) 10mA/us-32A/us (750A) 20mA/us-64A/us (1500A)	2mA/us-18A/us (180A) 10mA/us-36A/us (900A) 20mA/us-72A/us (1800A)	2mA/us-20A/us (200A) 10mA/us-40A/us (1000A) 20mA/us-80A/us (2000A)	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)
	resolution	1/5/10 mA/us	1/5/10 mA/us	2/10/20 mA/us	2/10/20 mA/us	2/10/20 mA/us	2/10/20 mA/us
Specifications	Size	426 mm×309.5 mm×650 mm (W×H×D)		426 mm×442 mm×650 mm (W×H×D)		426 mm×574.5 mm×650 mm (W×H×D)	
	Weight	66.5kg	72kg	92.5kg	98kg	113kg	124kg

Model		AN23630E-150-2400	AN23636E-150-2400	AN23642E-150-2400	AN23648E-150-2400	AN23654E-150-2400	AN23660E-150-2400
Operating range	Voltage	0-150V DC					
	Current	0-2400A	0-2400A	0-2400A	0-2400A	0-2400A	0-2400A
	Power	30kW	36kW	42kW	48kW	54kW	60kW
Min.operating voltage		1.8V@2400A	1.8V@2400A	1.8V@2400A	1.8V@2400A	1.8V@2400A	1.8V@2400A
Constant current	Range	240/1200/2400A	240/1200/2400A	240/1200/2400A	240/1200/2400A	240/1200/2400A	240/1200/2400A
	resolution	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA
	Accuracy	0.05%+0.05%F.S.					
Constant voltage	Range	16/80/150V					
	resolution	0.1/0.5/1mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)	1.3mΩ-12.5Ω(16V) 5mΩ-50Ω(80V) 0.125Ω-250Ω(150V)
	resolution	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	3000/15000/30000 W	3600/18000/36000 W	4200/21000/42000 W	4800/24000/48000 W	5400/27000/54000 W	6000/30000/60000 W
	resolution	200/1000/2000mW	200/1000/2000mW	200/1000/2000mW	200/1000/2000mW	400/2000/4000mW	400/2000/4000mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)	2mA/us-24A/us (240A) 10mA/us-48A/us (1200A) 20mA/us-96A/us (2400A)
	resolution	2/10/20 mA/us	2/10/20 mA/us	2/10/20 mA/us	2/10/20 mA/us	2/10/20 mA/us	2/10/20 mA/us
Specifications	Size	610mm×1185 mm×800 mm (W×H×D)		610 mm×1450 mm×800mm (W×H×D)		610 mm×1720 mm×800 mm (W×H×D)	
	Weight	150kg	176kg	202kg	228kg	422kg	434kg

Model		AN23602E-600-140	AN23603E-600-210	AN23604E-600-280	AN23605E-600-350	AN23606E-600-420	AN23608E-600-560
Operating range	Voltage	0-600V DC					
	Current	0-140A	0-210A	0-280A	0-350A	0-420A	0-560A
	Power	2kW	3kW	4kW	5kW	6kW	8kW

Min.operating voltage		14V@140A	14V@210A	14V@280A	14V@350A	14V@420A	14V@560A
Constant current	Range	14/70/140A	21/105/210A	28/140/280A	35/175/350A	42/210/420A	56/280/560A
	resolution	0.2/1/2mA	0.2/1/2mA	0.4/2/4mA	0.4/2/4mA	0.4/2/4mA	0.5/2/5mA
	Accuracy	0.05%+0.05%F.S.					
Constant voltage	Range	80/150/600V					
	resolution	0.5/1/5mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	0.15Ω-1500Ω(80V) 0.6Ω-6000Ω(150V) 6Ω-12000Ω(600V)	0.1Ω-1000Ω(80V) 0.4Ω-4000Ω(150V) 4Ω-8000Ω(600V)	75mΩ-750Ω(80V) 300mΩ-3000Ω(150V) 3Ω-6000Ω(600V)	50mΩ-500Ω(80V) 200mΩ-2000Ω(150V) 2Ω-4000Ω(600V)	50mΩ-500Ω(80V) 200mΩ-2000Ω(150V) 2Ω-4000Ω(600V	38Ω-375Ω(80V) 150mΩ-1.5kΩ(150V) 1.5Ω-3kΩ(600V)
	resolution	2mA/Vsense	2mA/Vsense	4mA/Vsense	4mA/Vsense	4mA/Vsense	5mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	200/1000/2000W	300/1500/3000W	400/2000/4000W	500/2500/5000W	600/3000/6000W	800/4000/8000W
	resolution	5/20/50mW	5/20/50mW	10/50/100mW	10/50/100mW	10/50/100mW	20/100/200mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	0.2mA/us-0.6A/us (14A) 1mA/us-3A/us (70A) 2mA/us-6A/us (140A)	0.2mA/us-0.9A/us (21A) 1mA/us-4.5A/us (105A) 2mA/us-9A/us (210A)	0.4mA/us-1.2A/us (28A) 2mA/us-6A/us (140A) 4mA/us-12A/us (280A)	0.4mA/us-1.5A/us (35A) 2mA/us-7.5A/us (175A) 4mA/us-15A/us (350A)	0.4mA/us-1.8A/us (42A) 2mA/us-9A/us (210A) 4mA/us-18A/us (420A)	0.5mA/us-1.8A/us (56A) 2mA/us-9A/us (280A) 5mA/us-18A/us (560A)
	resolution	0.2/1/2mA/us	0.2/1/2mA/us	0.4/2/4mA/us	0.4/2/4mA/us	0.4/2/4mA/us	0.5/2/5mA/us
Specifications	Size	426mm×177mm×600mm (W×H×D)					426 mm×309.5 mm ×650 mm
	Weight	24.5kg	29.5kg	29.5kg	35kg	35kg	61kg

Model		AN23610E-600-700	AN23612E-600-840	AN23615E-600-1050	AN23618E-600-1260	AN23620E-600-1400	AN23624E-600-1680
Operating range	Voltage	0-600V DC					
	Current	0-700A	0-840A	0-1050A	0-1260A	0-1400A	0-1680A
	Power	10kW	12kW	15kW	18kW	20kW	24kW
Min.operating voltage		14V@700A	14V@840A	14V@1050A	14V@1260A	14V@1400A	14V@1400A
Constant current	Range	70/350/700A	84/420/840A	105/525/1050A	126/630/1260A	140/700/1400A	168/840/1680A
	resolution	0.5/2/5mA	1/5/10mA	1/5/10mA	1/5/10mA	2/10/20mA	2/10/20mA
	Accuracy	0.05%+0.05%F.S.					
Constant voltage	Range	80/150/600V					
	resolution	0.5/1/5mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	25mΩ-250Ω(80V) 0.1Ω-1000Ω(150V) 1Ω-2000Ω(600V)	25mΩ-250Ω(80V) 0.1Ω-1000Ω(150V) 1Ω-2000Ω(600V)	17mΩ-166.67Ω (80V) 67mΩ-666.67Ω (150V) 0.67Ω-1333.34Ω (600V)	17mΩ-166.67Ω (80V) 67mΩ-666.67Ω (150V) 0.67Ω-1333.34Ω(600V)	13mΩ-125Ω(80V) 50mΩ-500Ω(150V) 0.5Ω-1000Ω(600V)	13mΩ-125Ω(80V) 50mΩ-500Ω(150V) 0.5Ω-1000Ω(600V)
	resolution	5mA/Vsense	10mA/Vsense	10mA/Vsense	10mA/Vsense	20mA/Vsense	20mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	1000/5000/10000W	1200/6000/12000W	1500/7500/15000W	1800/9000/18000W	2000/10000/20000W	2400/12000/24000W
	resolution	20/100/200mW	20/100/200mW	40/200/400mW	40/200/400mW	100/500/1000mW	100/500/1000mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	0.5mA/us-2.1A/us (70A) 2mA/us-10.5A/us (350A) 5mA/us-21A/us (700A)	1mA/us-2.4A/us (84A) 5mA/us-12A/us (420A) 10mA/us-24A/us (840A)	1mA/us-2.7A/us (105A) 5mA/us-13.5A/us (525A) 10mA/us-27A/us (1050A)	1mA/us-3A/us (126A) 5mA/us-15A/us (630A) 10mA/us-30A/us (1260A)	2mA/us-3.3A/us (140A) 10mA/us-16.5A/us (700A) 20mA/us-33A/us (1400A)	2mA/us-3.6A/us (168A) 10mA/us-18A/us (840A) 20mA/us-36A/us (1680A)
	resolution	0.5/2/5mA/us	1/5/10mA/us	1/5/10mA/us	1/5/10mA/us	2/10/20mA/us	2/10/20mA/us
Specifications	Size	426 mm×309.5 mm×650 mm (W×H×D)		426 mm×442 mm×650 mm (W×H×D)		426 mm×574.5 mm×650 mm (W×H×D)	
	Weight	66.5kg	72kg	92.5kg	98kg	113kg	124kg

Model		AN23630E-600-2100	AN23636E-600-2400	AN23642E-600-2400	AN23648E-600-2400	AN23654E-600-2400	AN23660E-600-2400
Operating range	Voltage	0-600V DC					
	Current	0-2100A	0-2400A	0-2400A	0-2400A	0-2400A	0-2400A

	Power	30kW	36kW	42kW	48kW	54kW	60kW
Min.operating voltage		14V@2100A	14V@2400A	14V@2400A	14V@2400A	14V@2400A	14V@2400A
Constant current	Range	210/1050/2100A	240/1200/2400A	240/1200/2400A	240/1200/2400A	240/1200/2400A	240/1200/2400A
	resolution	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA
	Accuracy	0.05%+0.05%F.S.					
Constant voltage	Range	80/150/600V					
	resolution	0.5/1/5mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	10mΩ-100Ω(80V) 40mΩ-400Ω(150V) 0.4Ω-800Ω(600V)	9mΩ-87.5Ω(80V) 4mΩ-350Ω(150V) 0.35Ω-700Ω(600V)	9mΩ-87.5Ω(80V) 4mΩ-350Ω(150V) 0.35Ω-700Ω(600V)	9mΩ-87.5Ω(80V) 4mΩ-350Ω(150V) 0.35Ω-700Ω(600V)	9mΩ-87.5Ω(80V) 4mΩ-350Ω(150V) 0.35Ω-700Ω(600V)	9mΩ-87.5Ω(80V) 4mΩ-350Ω(150V) 0.35Ω-700Ω(600V)
	resolution	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	3000/15000/30000 W	3600/18000/36000 W	4200/21000/42000 W	4800/24000/48000 W	5400/27000/54000 W	6000/6000/60000W
	resolution	200/1000/2000mW	200/1000/2000mW	200/1000/2000mW	200/1000/2000mW	400/2000/4000mW	400/2000/4000mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	2mA/us-3.6A/us (210A) 10mA/us-18A/us (1050A) 20mA/us-36A/us (2100A)	2mA/us-3.6A/us (240A) 10mA/us-18A/us (1200A) 20mA/us-36A/us (2400A)	2mA/us-3.6A/us (240A) 10mA/us-18A/us (1200A) 20mA/us-36A/us (2400A)	2mA/us-3.6A/us (240A) 10mA/us-18A/us (1200A) 20mA/us-36A/us (2400A)	2mA/us-3.6A/us (240A) 10mA/us-18A/us (1200A) 20mA/us-36A/us (2400A)	2mA/us-3.6A/us (240A) 10mA/us-18A/us (1200A) 20mA/us-36A/us (2400A)
	resolution	2/10/20mA/us	2/10/20mA/us	2/10/20mA/us	2/10/20mA/us	2/10/20mA/us	2/10/20mA/us
Specifications	Size	610mm×1185 mm×800 mm (W×H×D)		610 mm×1450 mm×800mm (W×H×D)		610 mm×1720 mm×800 mm (W×H×D)	
	Weight	150kg	176kg	202kg	228kg	422Kg	434Kg

Model		AN23602E-1200-80	AN23603E-1200-120	AN23604E-1200-160	AN23605E-1200-200	AN23606E-1200-240	AN23608E-1200-320
Operating range	Voltage	0-1200V DC					
	Current	0-80A	0-120A	0-160A	0-200A	0-240A	0-320A
	Power	2kW	3kW	4kW	5kW	6kW	8kW
Min.operating voltage		20V@80A	20V@120A	20V@160A	20V@200A	20V@240A	20V@320A
Constant current	Range	8/40/80A	12/60/120A	16/80/160A	20/100/200A	24/120/240A	32/160/320A
	resolution	0.1/0.5/1mA	0.1/0.5/1mA	0.2/1/2mA	0.2/1/2mA	0.2/1/2mA	0.4/2/4mA
	Accuracy	0.04%+0.06%F.S.					
Constant voltage	Range	150/600/1200V					
	resolution	1/5/10mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	0.3Ω-3kΩ(150V) 1.2Ω-12kΩ(600V) 30Ω-60kΩ(1200V)	0.2Ω-2kΩ(150V) 0.8Ω-8kΩ(600V) 20Ω-40kΩ(1200V)	0.15Ω-1.5kΩ(150V) 0.6Ω-6kΩ(600V) 15Ω-30kΩ(1200V)	0.1Ω-1kΩ(150V) 0.4Ω-4kΩ(600V) 10Ω-20kΩ(1200V)	0.1Ω-1kΩ(150V) 0.4Ω-4kΩ(600V) 10Ω-20kΩ(1200V)	75mΩ-0.75kΩ(150V) 0.3Ω-3kΩ(600V) 7.5Ω-15kΩ(1200V)
	resolution	1mA/Vsense	1mA/Vsense	2mA/Vsense	2mA/Vsense	2mA/Vsense	4mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	200/1000/2000W	300/1500/3000W	400/2000/4000W	500/2500/5000W	600/3000/6000W	800/4000/8000W
	resolution	5/20/50mW	5/20/50mW	10/50/100mW	10/50/100mW	10/50/100mW	20/100/200mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	0.1mA/us-0.4A/us (8A) 0.5mA/us-2A/us (40A) 1mA/us-4A/us(80A)	0.1mA/us-0.6A/us (12A) 0.5mA/us-3A/us (60A) 1mA/us-6A/us (120A)	0.2mA/us-0.8A/us (16A) 1mA/us-4A/us(80A) 2mA/us-8A/us (160A)	0.2mA/us-1A/us (20A) 1mA/us-5A/us (100A) 2mA/us-10A/us (200A)	0.2mA/us-1.2A/us (24A) 1mA/us-6A/us (120A) 2mA/us-12A/us (240A)	0.4mA/us-1.2A/us (32A) 2mA/us-6A/us (160A) 4mA/us-12A/us (320A)
	resolution	0.1/0.5/1mA/us	0.1/0.5/1mA/us	0.2/1/2mA/us	0.2/1/2mA/us	0.2/1/2mA/us	0.4/2/4mA/us
Specifications	Size	426mm×177mm×600mm (W×H×D)					426 mm×309.5 mm ×650 mm
	Weight	24.5kg	29.5kg	29.5kg	35kg	24.5kg	61kg

Model		AN23610E-1200-400	AN23612E-1200-480	AN23615E-1200-600	AN23618E-1200-720	AN23620E-1200-800	AN23624E-1200-960
Operating range	Voltage	0-1200V DC					
	Current	0-400A	0-480A	0-600A	0-720A	0-800A	0-960A
	Power	10kW	12kW	15kW	18kW	20kW	24kW

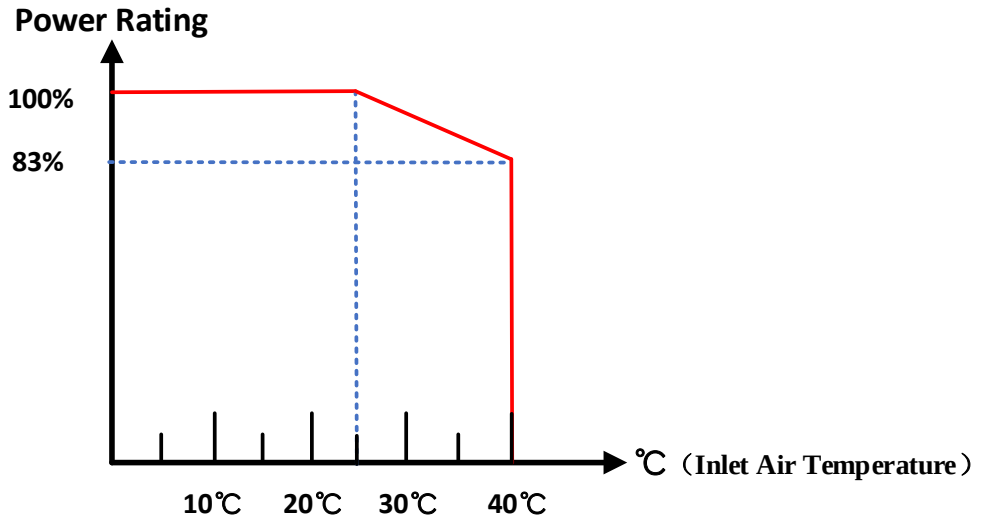
Min.operating voltage		20V@400A	20V@480A	20V@600A	20V@720A	20V@800A	20V@960A
Constant current	Range	40/200/400A	48/240/480A	60/300/600A	72/360/720A	80/400/800A	96/480/960A
	resolution	0.4/2/4mA	0.4/2/4mA	0.5/2/5mA	0.5/2/5mA	1/5/10mA	1/5/10mA
	Accuracy	0.04%+0.06%F.S.					
Constant voltage	Range	150/600/1200V					
	resolution	1/5/10mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	50mΩ-0.5kΩ(150V) 0.2Ω-2kΩ(600V) 5Ω-10kΩ(1200V)	50mΩ-0.5kΩ(150V) 0.2Ω-2kΩ(600V) 5Ω-10kΩ(1200V)	34mΩ-0.34kΩ (150V) 0.14Ω-1.34kΩ (600V) 3.34Ω-6.67kΩ (1200V)	34mΩ-0.34kΩ (150V) 0.14Ω-1.34kΩ (600V) 3.34Ω-6.67kΩ (1200V)	25mΩ-0.25kΩ(150V) 0.1Ω-1kΩ(600V) 2.5Ω-5kΩ(1200V)	25mΩ-0.25kΩ(150V) 0.1Ω-1kΩ(600V) 2.5Ω-5kΩ(1200V)
	resolution	4mA/Vsense	5mA/Vsense	5mA/Vsense	5mA/Vsense	10mA/Vsense	10mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	1000/5000/10000W	1200/6000/12000W	1500/7500/15000W	1800/9000/18000W	2000/10000/20000 W	2400/12000/24000 W
	resolution	20/100/200mW	20/100/200mW	40/200/400mW	40/200/400mW	100/500/1000mW	100/500/1000mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	0.4mA/us-1.4A/us (40A) 2mA/us-7A/us (200A) 4mA/us-14A/us (400A)	0.4mA/us-1.6A/us (48A) 2mA/us-8A/us(240 A) 4mA/us-16A/us (480A)	0.5mA/us-1.8A/us (60A) 2mA/us-9A/us (300A) 5mA/us-18A/us (600A)	0.5mA/us-2A/us (72A) 2mA/us-10A/us (360A) 5mA/us-20A/us (720A)	1mA/us-2.2A/us (80A) 5mA/us-11A/us (400A) 10mA/us-22A/us (800A)	1mA/us-2.4A/us (96A) 5mA/us-12A/us (480A) 10mA/us-24A/us (960A)
	resolution	0.4/2/4mA/us	0.4/2/4mA/us	0.5/2/5mA/us	0.5/2/5mA/us	1/5/10mA/us	1/5/10mA/us
Specifications	Size	426 mm×309.5 mm×650 mm (W×H×D)		426 mm×442 mm×650 mm (W×H×D)		426 mm×574.5 mm×650 mm (W×H×D)	
	Weight	66.5kg	72kg	92.5kg	98kg	113kg	124kg

Model		AN23630E-1200-1200	AN23636E-1200-1440	AN23642E-1200-1680	AN23648E-1200-1920	AN23654E-1200-2160	AN23660E-1200-2400
Operating range	Voltage	0-1200V DC					
	Current	0-1200A	0-1440A	0-1680A	0-1920A	0-2160A	0-2400A
	Power	30kW	36kW	42kW	48kW	54kW	60kW
Min.operating voltage		20V@1200A	20V@1440A	20V@1680A	20V@1920A	20V@2160A	20V@2400A
Constant current	Range	120/600/1200A	144/720/1440A	168/840/1680A	192/960/1920A	216/1080/2160A	240/1200/2400A
	resolution	1/5/10mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA	2/10/20mA
	Accuracy	0.04%+0.06%F.S.					
Constant voltage	Range	150/600/1200V					
	resolution	1/5/10mV					
	Accuracy	0.025%+0.025%F.S.					
Constant resistance	Range	20mΩ-0.2kΩ(150V) 80mΩ-0.8kΩ(600V) 2Ω-4kΩ(1200V)	17mΩ-0.17kΩ(150V) 67mΩ-0.67kΩ(600V) 1.67Ω-3.33kΩ(1200 V)	14mΩ-0.14kΩ(150V) 57mΩ-0.57kΩ(600V) 1.43Ω-2.86kΩ(1200 V)	13mΩ-0.13kΩ(150V) 50mΩ-0.5kΩ(600V) 1.25Ω-2.5kΩ(1200V)	11mΩ-0.11kΩ(150V) 44mΩ-0.44kΩ(600V) 1.11Ω-2.22kΩ(1200 V)	10mΩ-0.1kΩ(150V) 40mΩ-0.4kΩ(600V) 1Ω-2kΩ(1200V)
	resolution	10mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense	20mA/Vsense
	Accuracy	Vin/Rset*(0.2%)+0.2%IF.S.					
Constant power	Range	3000/15000/30000 W	3600/18000/36000 W	4200/21000/42000 W	4800/24000/48000 W	5400/27000/54000 W	6000/30000/60000 W
	resolution	200/1000/2000mW	200/1000/2000mW	200/1000/2000mW	200/1000/2000mW	400/2000/4000mW	400/2000/4000mW
	Accuracy	0.2%+0.2%F.S.					
Slew rate	Setting range	1mA/us-2.4A/us (120A) 5mA/us-12A/us (600A) 10mA/us-24A/us (1200A)	2mA/us-2.4A/us (144A) 10mA/us-12A/us (720A) 20mA/us-24A/us (1440A)	2mA/us-2.4A/us (168A) 10mA/us-12A/us (840A) 20mA/us-24A/us (1680A)	2mA/us-2.4A/us (192A) 10mA/us-12A/us (960A) 20mA/us-24A/us (1920A)	2mA/us-2.4A/us (216A) 10mA/us-12A/us (1080A) 20mA/us-24A/us (2160A)	2mA/us-2.4A/us (240A) 10mA/us-12A/us (1200A) 20mA/us-24A/us (2400A)
	resolution	1/5/10mA/us	1/5/10mA/us	1/5/10mA/us	1/5/10mA/us	1/5/10mA/us	1/5/10mA/us
Specifications	Size	610mm×1185 mm×800 mm (W×H×D)		610 mm×1450 mm×800mm (W×H×D)		610 mm×1720 mm×800 mm (W×H×D)	
	Weight	150kg	176kg	202kg	228kg	422kg	434kg

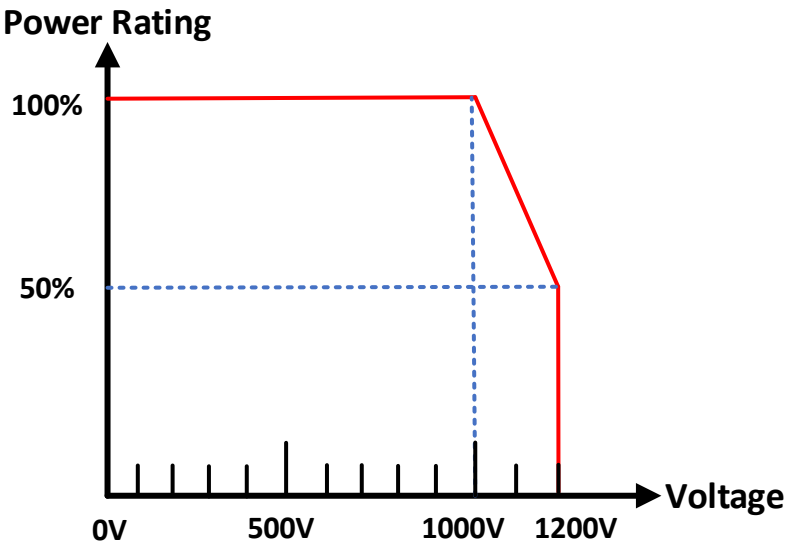
General parameters				
Voltage		150 V	600 V	1200 V
Composite impedance	Measuring range	LS: 0.1uH~20uH RS: 30mΩ~20Ω CL: 30uF~50000uF RL: Same as CR mode high range		
	Resolution	LS: 0.1uH RS: 10mΩ CL: 1uF RL: Same as CR mode high range		
LED test	Measuring range	coeff: 0.01~1		
Battery test	Discharging time	1s~100000s		
	Resolution	1s		
Current dynamics	T1&T2	0.020~99.999ms/100ms~99999ms		
	Resolution	2us/1ms		
	Accuracy	2us+100ppm		
	Minimum rise time	10us(Typical)	20us(Typical)	20us(Typical)
Current measurement	Range/resolution	Same as CC loading		
	Accuracy	0.04%+0.04%F.S.		0.04%+0.06%F.S.
Voltage measurement	Range/resolution	Same as CV loading		
	Accuracy	0.015%+0.015%F.S.		
	Input resistance	800kΩ (Typical)	1MΩ (Typical)	2MΩ (Typical)
Power measurement	Range/resolution	Same as CP loading		
	Accuracy	0.1%+0.1%IF.S.*UF.S.		
Temperature coefficient		100ppm/℃ (Typical)		
Working temperature, humidity		0 - 40℃, 20-90%RH		

Hint

1. Ensure that the performance of the load is in accordance with the specifications in the temperature range of 0-40℃;
2. The rated power and power derating at the inlet temperature of 25℃ are shown in the figure below:



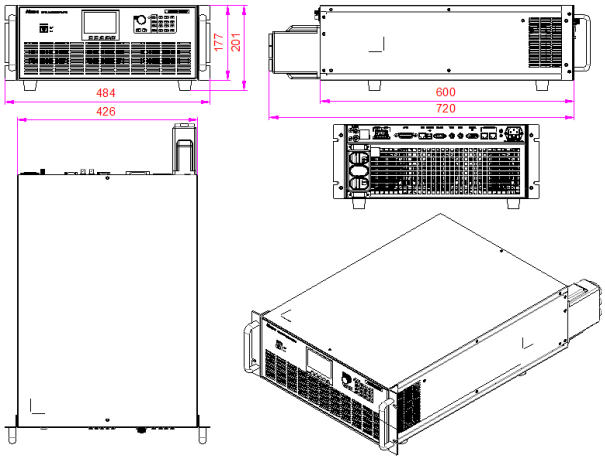
3. Short circuit function is to simulate full power pulling load, and can not do mechanical short circuit;
4. If the voltage applied to the load exceeds 1.1 times its rated voltage, it will cause permanent damage to the load;
5. For the rated power specifications of the 1200V model, please refer to the following figure to understand the power decline;



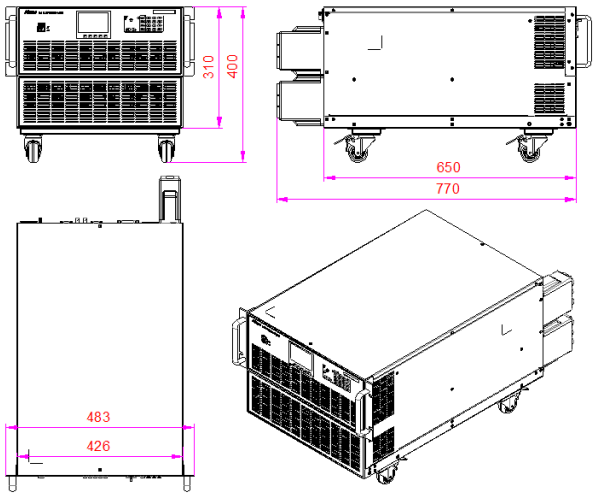
6. OTP：When the temperature of the load outlet exceeds 83℃.

1.5 Dimensions

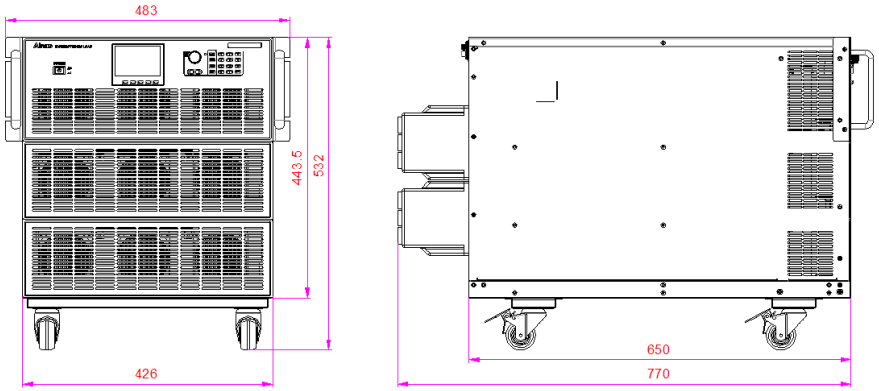
(1) 2kW-6kW types



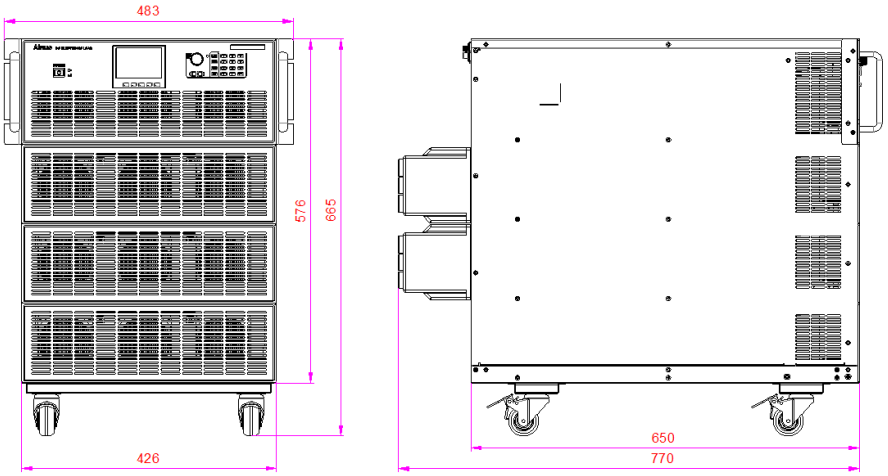
（2）8kW-12kW types



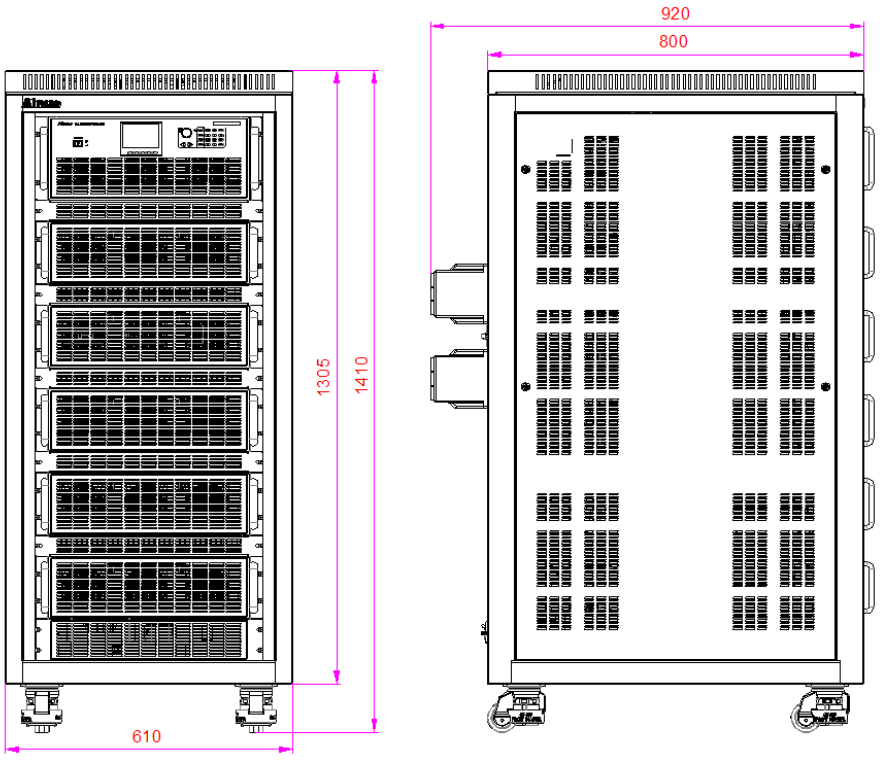
（3）15kW-18kW　types



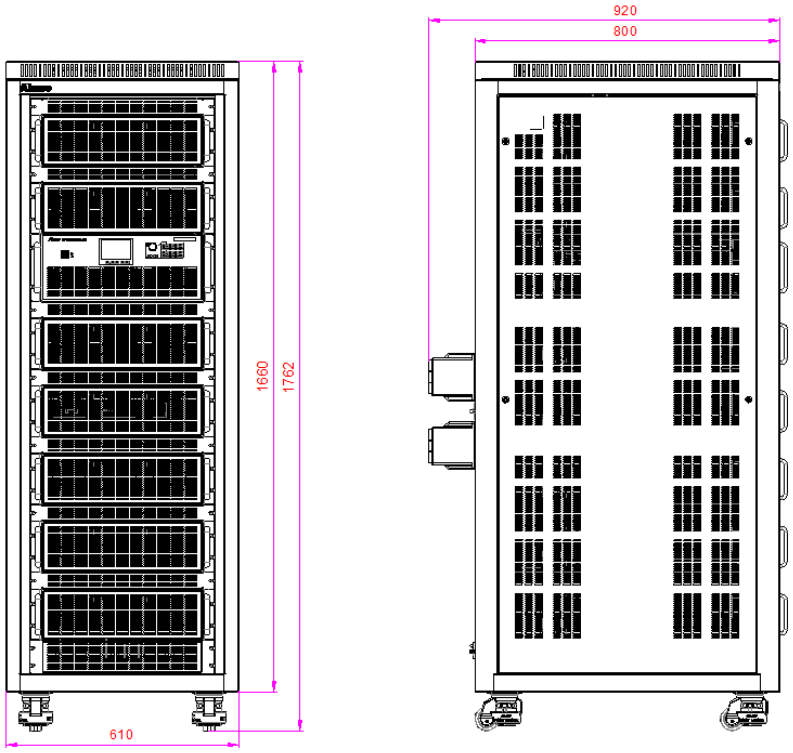
（4）20kW-24kW types



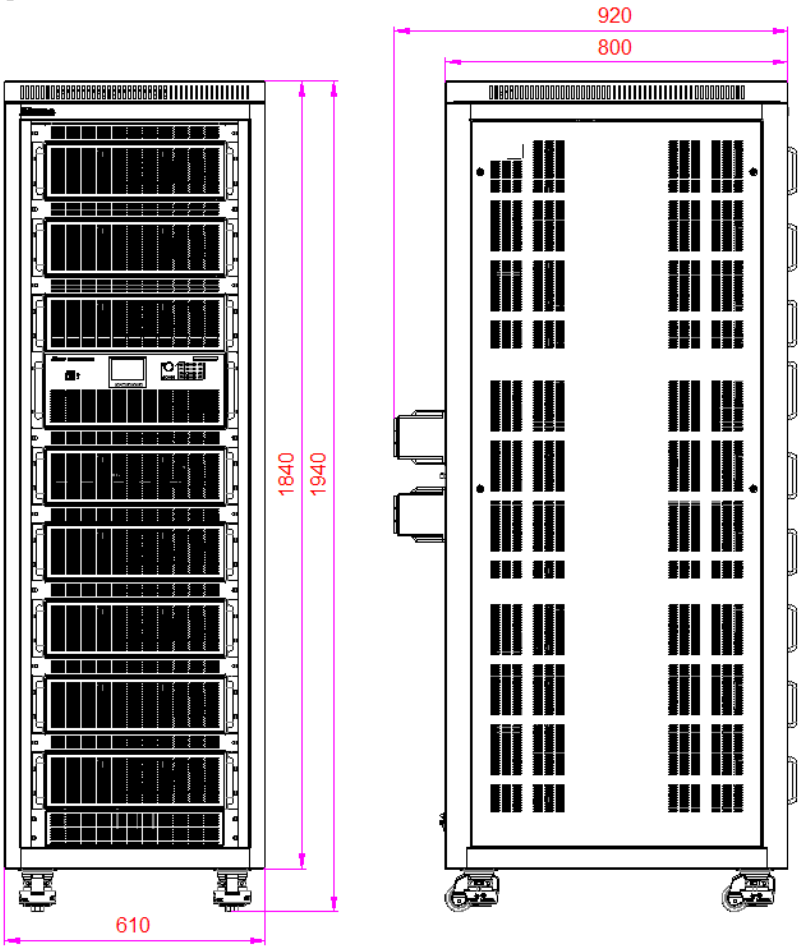
（5）30-36kW types



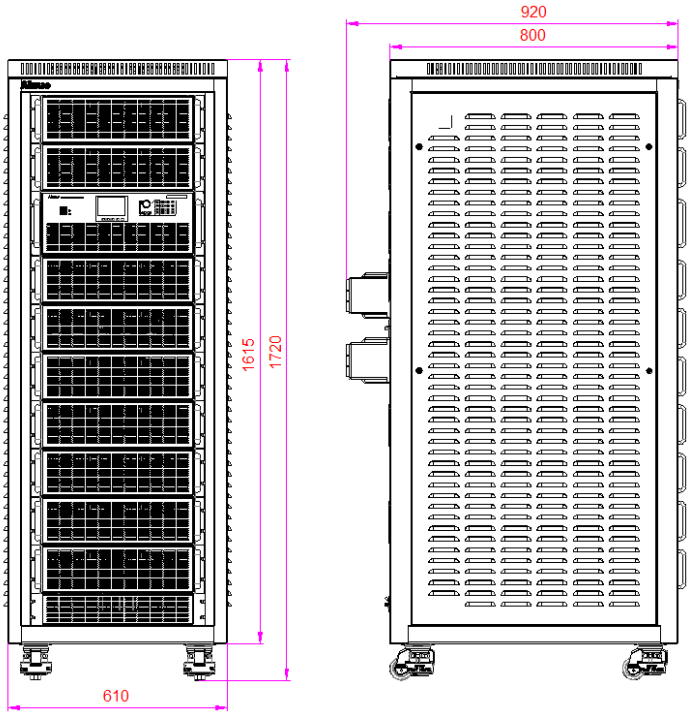
（6）42-48kW types



（7）54kW types



（8）60kW types



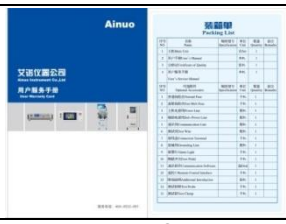
Chapter 2 Unpacking and Installation

2.1 Unpacking and Inspection

1. After receiving the goods, unpack the electronic load and take out the materials used for transportation. Check the nameplate to see whether the model matches the order; check the accessories and documents according to the "packing list" in the user manual; take out the electronic load and check for any transportation damage; check whether the fasteners fall off, or for other abnormities.

Standard attachment figure of AN23600E series high-power DC electronic loadis shown intable2-1.

Table2-1 Standard attachment figure of the load

		
16G USB flash disk	AINUO User manual	AINUO English certificate of qualification
		
ET-71(M3*4-Red) Banana plug	ET-71(M3*4-Black) Banana plug	UFE010(F10AL250V-φ5×20) Fuse
		
0.75(grey10A*2m) Power Line	RS232 communication cable	Silicone shield
		
AN236-16 Power Line	M4*16 Combination screw	M10*25 Outer hexagon bolt
		
φ10 Spring washer	φ10*D20*T1(SUS) Flat gasket	M10 (SUS) Hex nut

		
3.81-08P 接线端子		

Warning

Please keep the original packing carton for future transportation.

Ensure that the accessories of the purchased models are complete according to Table 2-2:

Table2-2 List of various types of attachments

Project	Name	Parts Number		
		23602E~23606E	23608E~23624E	23630E~23660E
1	USB flash disk 16G	1	1	1
2	User manual	1	1	1
3	English certificate of qualification	1	1	1
4	Banana plug ET-71(M3*4-Red)	1	1	1
5	Banana plug ET-71(M3*4-Black)	1	1	1
6	fuse(CE)—conquer UFE010(F10AL250V-φ5×20)	1	1	—
7	Power Line0.75 （grey 10A*2m)	1	1	—
8	RS232 communication cable	1	1	1
9	Silicone shield	1	2	2
10	Combination screw M4*16	4	8	8
11	Outer hexagon bolt M10*25	2	6	6
12	Spring washer φ10	2	6	6
13	Flat gasket φ10*D20*T1	2	6	6
14	Hex nut M10	2	6	6
15	Power Line AN236-16			1
16	3.81-08P 接线端子	1	1	1

2. Read the user manual carefully before using the product.

3. Check the input power requirements. Connect the power, turn on the switch, start the power output, and check the function.

Warning

Three-core power socket is adopted, and the ground wire is reliably grounded!

In case of any abnormities for above items, contact Ainuo Instrument Co., Ltd. or its distributor in time.

2.2 Wiring

2.2.1 General wiring method

The input can be connected via "+"/"-" copper bars on the back of the load. Pay attention to the wire diameter, length and polarity. The "+" copper bar is connected with the high potential output terminal of the UUT, and "-" copper bar with the low potential output terminal.

The wiring steps are as follows:

1. Before connecting the UUT, confirm that the instrument is powered off.

2. Connect the red/black test leads to the input terminals, and fix them with screws, flat washers, spring washers, and nuts in the accessories. When the maximum current that the test leads can withstand does not meet the current rating, use multiple red/black test leads.

3. Mount the cover of load input terminal.

4. Connect the other end of red/black test leads directly to the output terminal of the UUT. The wiring is shown in Figure 2-1.

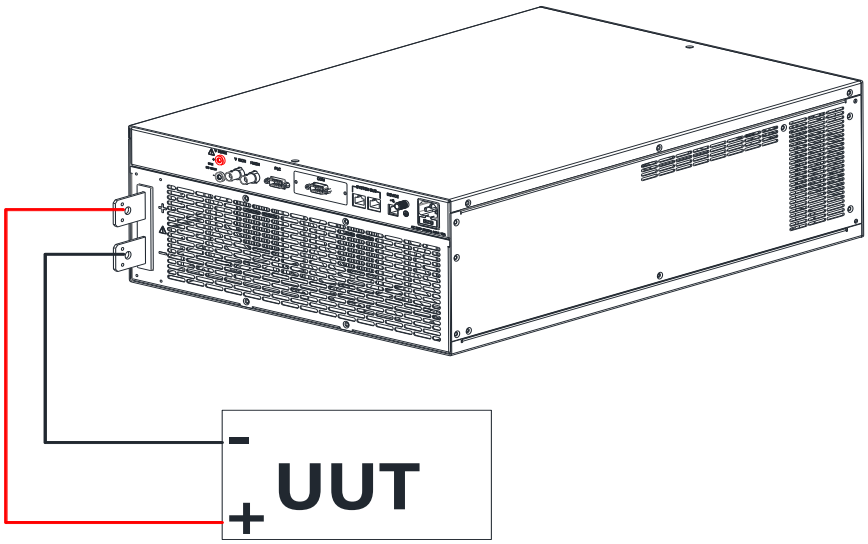


Figure 2-1 Diagram of wiring

Warning

The electronic load must be in a good heat dissipation environment when used. For load used in a cabinet, cabinet shall be well-ventilated to ensure heat dissipation.

To comply with safety regulations, the wiring must be able to withstand the short-circuit output current of other devices without overheating. The potential of "+" terminal of load must be higher than the potential of "-" terminal.

It is recommended to use the test cable provided by us to connect the equipment. To use test cables of another manufacturer, identify the maximum current that the test cable can withstand!

2.2.2 Remote voltage sampling (Vsense) connection

When the load consumes large current, large voltage drop occurs in the connection line between the instrument under test and the load terminal. To ensure measurement accuracy, two telemetry endpoints Vsense+ and Vsense- are set on the rear panel for compensation. For remote test, it is allowed to measure directly on the input terminal to improve measurement accuracy. When Vsense- and Load- (-copper bar) are short-circuited, the voltage measurement displayed on the load will automatically switch to Vsense, otherwise the load terminal will be used for measurement.

Warning

The test cable and Vsense cable should be as short as possible, and Vsense cable should be twisted together.

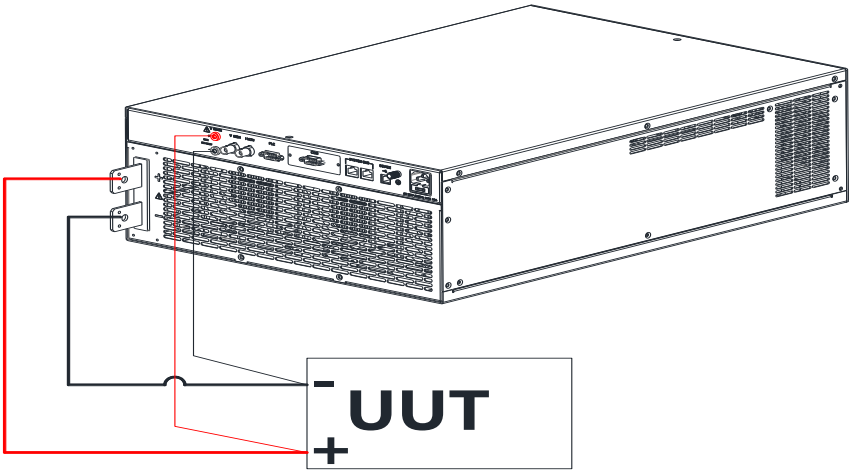


Figure 2-2 Diagram of remote telemetry wiring

2.2.3 Wiring Method of Parallel Operation

As shown in Figure 2-3, it is recommended to use the star connection, the host is connected to SENSE remote sampling, the electronic load can be directly parallel in CC, CV, CP, CR and other modes.

Figure 2-3 diagram of Parallel mode line connection

Chapter 3 Quick Start

3.1 Post

Perform self-check after power-on as follows:

Table3-1 Self-check steps

Step	LCD display	Details
Power on	Ainuo	Boot interface, synchronized with lower computer
After about 1s	main interface	Enter the mode interface set at the last shutdown
Press"MENU"⟶ Information of system	Information of system	Model of equipment, control system, display system, screen program

3.2 Brief analysis of startup problems

If the load cannot be started, please check as follows:

1. Check the power supply

Check the connection of power cable, whether the load is powered, and whether the power switch is turned on. The working voltage of load is 100-240V AC. Check the voltage of power supply.

2. Check the fuse of the load

Check the fuse of the load. If the fuse is blown, replace with 250V/10A fuse (open the small plastic cover under the power socket on the rear panel of load using a flat screwdriver. There are two fuses inside. If one is damaged, the other can be used instead. The location is shown in Figure 3-2.)

3.3 Introduction of panel

3.3.1 Introduction of front panel

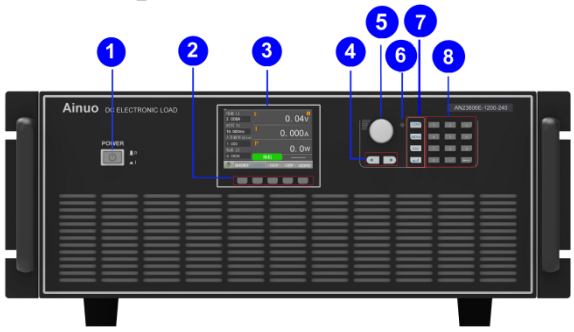


Figure 3-1 Front panel of AN23600E series high-power DC electronic loads

Figure 3-1 shows the front panel of this series of loads. The front panel is equipped with the power switch, display screen, knob, direction buttons, LEDs, control buttons, number keys, cancel keys, F1-F5 menu keys.

Table3-2 Front Panel

S/N	Name	Description
①	POWER	AC power switch of electronic load host
②	F1-F5 menu	F1~F5, shortcuts
③	Display screen	Display settings and measurement
④	Direction buttons	Also known as left/right keys ←, →
⑤	Knob	➢ Used to move the cursor up/down ➢ Parameter adjustment key, when the small cursor is called out, the parameter at this position can be adjusted;
⑥	Tricolor indicator light	Load working LED: OFF on standby, yellow during test, and red for alarm; In pass/fail judgment mode: pass: green; fail: red
⑦	Control buttons	Including LOAD, MENU, ESC, (ENTER key)
⑧	Number keys and Cancel key	Number keys 0-9, (Cancel key)

3.3.2 Introduction of rear panel

Rear panel: covering DC load positive/negative terminals, Vsense red/black terminals, I_Monitor connector, 1 COM, PLC, 1 ground terminal, 1 power socket, 1 fuse and cooling air outlet.

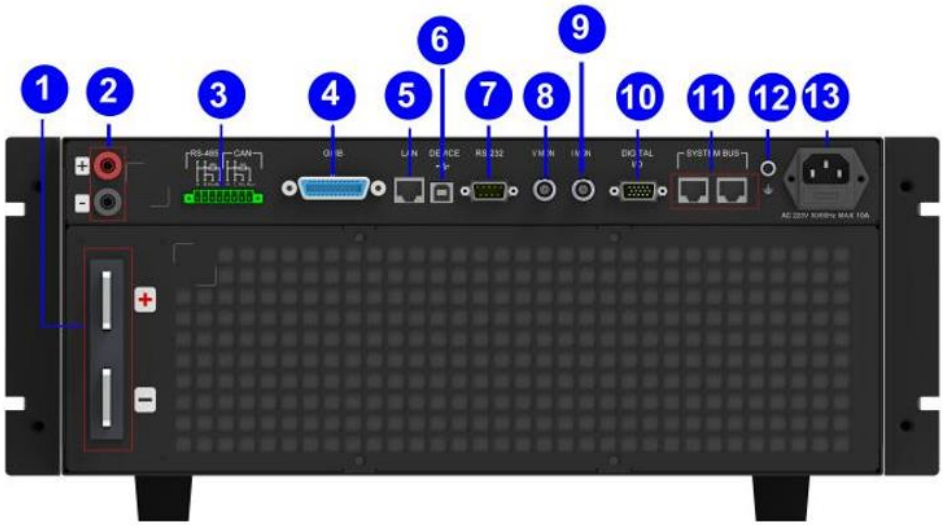


Figure 3-2 Rear panel of AN23600E series DC electronic load

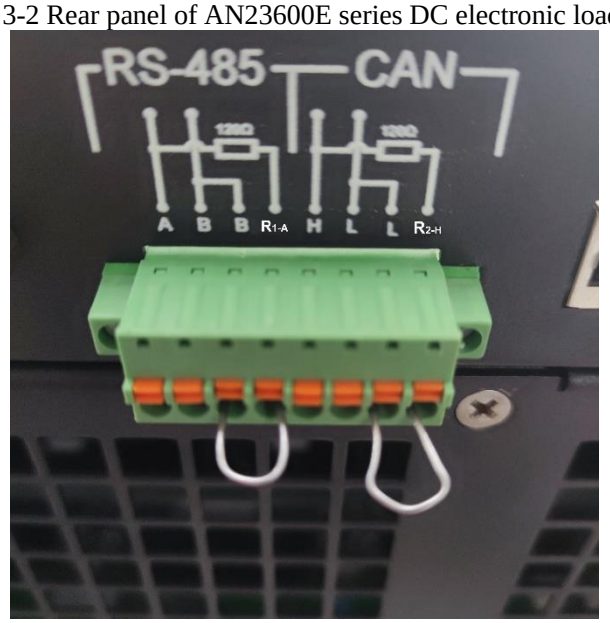


Figure 3-3 RS485 and CAN communication terminal resistors in parallel

Table3-3 Rear Panel

S/N	Name	Description
①	DC load positive and negative ends	The input connection can be made by the + and - terminals on the rear panel of each load. Note the size, length and polarity of the input connection
②	Remote voltage detection interface	When the Vsense terminal is connected to the object under test (UUT), the electronic load is automatically switched to Vsense, otherwise the load terminal is measured
③	RS485&CAN	The terminal includes 485 and CAN communication modes: RS485 communication requires that the terminal resistance pins (pins B and R1-A) be short-circuited at the very end of the bus. See Figure 3-3 CAN communication requires a short circuit of the terminal resistance pins (pins L and R2-H) on the devices at both ends of the bus. See Figure 3-3
④	GPIB	GPIB communication. The communication address is associated with the communication address in the system Settings.
⑤	LAN	Ethernet communication provides both TCPserver and UDP

		connection modes
⑥	USB-B	Built-in USB to serial communication chip, can be directly connected to the PC
⑦	RS232	Standard RS232 interface
⑧	V_Monitor	BNC connector to simulate load voltage. The output range is 0~10V, corresponding to the voltage value of 0V~ full scale under each voltage gear(Optional)
⑨	I_Monitor	BNC connector to simulate load current. The output range is 0~10V, corresponding to the current value of 0A~ full scale under each current gear(Optional)
⑩	DIGITAL I/O	External signal input port(Optional)
⑪	System Bus	Synchronous parallel bus(Optional)
⑫	Ground terminal	Ground terminal. When using the device, connect the terminal to the ground reliably
⑬	Power socket + fuse	Power input

3.4 Keyboard description

Table3-5 Keyboard description

Classification	Button	Features
Number key	0~9	Number keys, enter numbers
	←	Undo key, you can undo the last digit entered
Control buttons	LOAD	Load button to control load loading and stopping; Alarm clear key: when an alarm occurs, press it to clear. After the alarm is clear, it will be loaded according to the last setting;
	MENU	Menu key, press this key to enter to set test parameters, system parameters, view model, program number
	ESC	Restore the last setting if the input number is not confirmed; After calling the knob to adjust the parameter function, cancel the function and change to the direction function; Alarm clear, after sending the alarm, clear the alarm signal; Clear the unqualified/qualified display mark;
	◄—— （ENTER）	Parameter confirmation key, to confirm the parameter when setting the parameter, and synchronize the lower computer after confirmation; In LISTmode standby mode, enter the group editing interface key; In SHORT mode, if the switch mode is set to Toggle； This key is used as the trigger key when the trigger function is used；
Direction buttons	←、→	Left and right keys are used to switch options; when the parameter is determined, a small cursor can be called out and used for the knob to change the parameter;
Option key	F1~F5	Option key, used to select the menu at the bottom of the screen;
Knob	Knob	Used to move the cursor up and down; Parameter adjustment key, when the small cursor is called out, the parameter at this position can be adjusted;

3.5 DIGITIAL IO

The DIGITIAL IO on the back panel of the AN236E body is a 15-pin interface (D-SUB15 male interface), the specific definition is shown in the figure below。

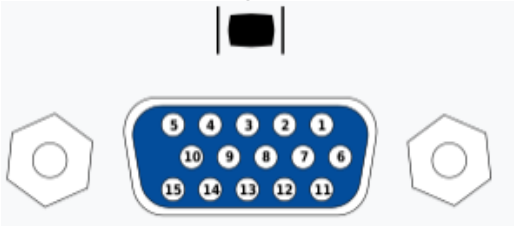


Figure 3-5 Schematic diagram of DIGITIAL IO digital port pins

Figure 3-6 DIGITIAL IO digital port pin definition

Pin	Signal	Pin	Signal	Pin	Signal
1	EXT_WAVE_I	6	LOAD_ON_ST	11	DI1
2	EXT_WAVE_V	7	——	12	DI2
3	GND	8	DO1	13	DI3
4	SHORT_ST	9	DO2	14	GND
5	——	10	DO3	15	GND

Figure 3-6 DIGITIAL IO digital port pin explanation

Pin	Signal	explain
1	EXT_WAVE_I	External waveform input signal, input voltage range 0~10V
2	EXT_WAVE_V	External waveform input signal, input voltage range 0~10V
3	GND	signal reference ground
4	SHORT ST	Short circuit output signal, TTL level, high level enable
6	LOAD_ON_ST	Short circuit output signal, TTL level, high level enable
8,9	DO1, DO2	DOUT1/DOUT2 can set the following states NONE(0) OCP TEST PASS-H(1) OCP TEST FAIL-L(2) GONG TEST PASS-H(3) GONG TEST FAIL-L(4) OTP OVP OCP OPP REV-H(5) BUS CTRL ACTIVE-H (6) BUS CTRL ACTIVE-L (7) Output voltage level, high level 5V, low level 0.6V
11,12	DI1,DI2	DOUT1/DOUT2 can set the following states NONE(0) EXTERNAL LOAD ON/OFF(1) REMOTE INHIBIT (2) If DI1 or DI2 is set to EXTERNAL LOAD ON/OFF, the load LOAD ON/OFF is only controlled by an external input signal. If DI1 and DI2 are set to EXTERNAL LOAD ON/OFF, LOAD OFF can only be enabled when both signal inputs are HIGH, and LOAD ON when both are LOW. (Under the above settings, the loading button of the display screen is invalid. After pressing it, it will prompt EXTERNAL LOAD ON/OFF, and it will automatically turn off after 3s.) If DI1 or DI2 is set to REMOTE INHIBIT, the external input signal is LOW load LOAD OFF. When the external input signal is HIGH, it can be combined with manual loading to realize load LOAD ON. When the DIx signal changes from HIGH to LOW, a REMOTE INHIBIT prompt message will appear on the display. Press the ESC/Back button to exit the prompt. If DI1 and DI2 are set to EXTERNAL LOAD ON/OFF, LOAD OFF can only be enabled when both signal inputs are HIGH, and LOAD ON when both are LOW. If DI1 and DI2 are set to REMOTE INHIBIT, EXTERNAL LOAD

		ON/OFF, DI1 input signal is HIGH, DI2 input signal is LOW. The load is automatically LOAD ON, when the DIx input signal changes the load LOAD OFF (Under the above settings, the loading button of the display screen is invalid. After pressing it, it will prompt EXTERNAL LOAD ON/OFF, and it will automatically turn off after 3s.)
14	GND	signal reference ground
15	GND	signal reference ground

3.6 Timing test

There are two test methods in timing mode. Mode one is independent function test. In the function interface, parameters such as load value and trigger condition can be set in pulling mode. After setting parameters, the test can be started. For mode 2, it is necessary to return to support timing test function mode (CC,CR,CP) after setting parameters, and use this mode normally after returning. When the sequence condition is triggered, the timing test result will automatically pop up, as shown in Figure 3-5-1 below

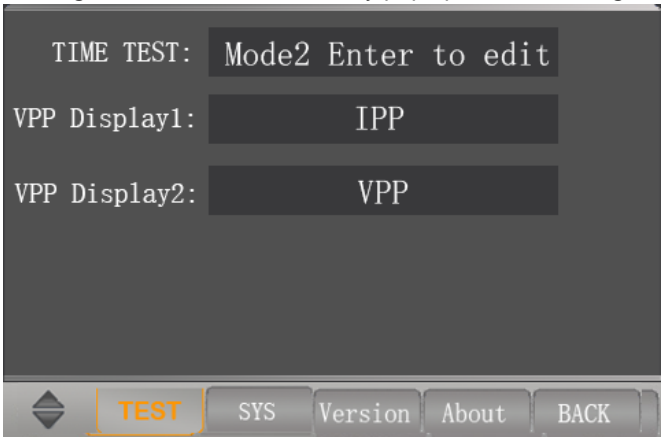


Figure 3-5-1 Timing test parameter settings

Mode 1 load provides time measurement function, accuracy 0.1mS, the load in the predetermined load conditions, automatically capture 2 trigger signals, and calculate their time interval. After the test is complete, the load displays the Time interval between the two triggers, as shown in Figure 3-5-2 below.

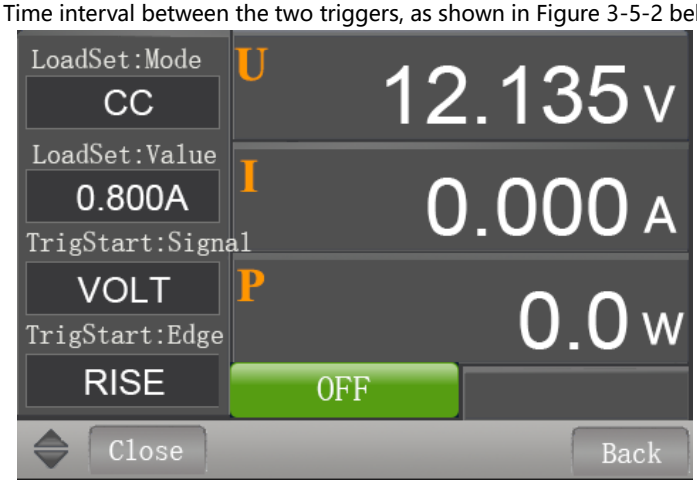


Figure 3-5-2 Timing test mode 1

Para	Content
LoadSet:Mode	CC/CV/CR/CP/OFF, left or right keys to switch mode
LoadSet:Value	Load value, unit: V/A/W/Ω keyboard input
TrigStart:Signal	Start trigger signal, VOLT/CURR/EXT, left and right keys switch mode
TrigStart:Edge	Start trigger along, RISE/FALL, left and right keys switch mode

TrigStart:Level	Start trigger value, unit: V/A keyboard input
TrigEnd:Signal	Cut-off trigger signal, VOLT/CURR/EXT, left and right keys switch mode
TrigEnd:Edge	Cut off trigger edge, RISE/FALL, left and right keys switch mode
TrigEnd:Level	Cut-off trigger value, unit: V/A keyboard input

Mode 2 provides time measurement function for voltage and current, accuracy 0.1ms, support CC,CR,CP mode test. Under the set load conditions, the start signal and end signal are automatically captured and the time interval is calculated. After the test is complete, the triggering interval on both sides is displayed. If the triggering is not completed within the timeout period, the final test result is the timeout period. Set parameters as shown in Figure 3-5-3 below.

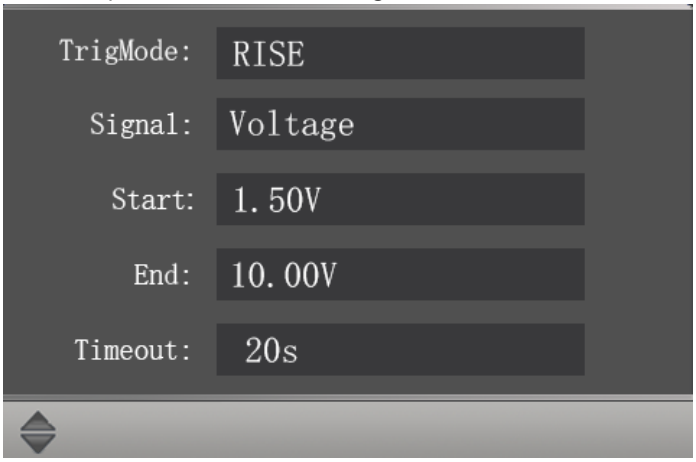


Figure 3-5-3 Timing test parameter Settings for Mode 2

Table 3-7-2 Timing test setting parameters

Para	Content
Mode:	Rise/fall, left and right keys to switch modes
Signal:	Voltage/Current, left and right keys to switch modes
Start:	Load voltage/load current, affected by trigger signal, unit: A/V
End:	Load voltage/load current, affected by trigger signal, unit: A/V
Timeout:	Time measurement timeout; unit: seconds (s)

Chapter 4 Functions and Characteristics

4.1 Basic operating mode

There are four basic operation modes for DC electronic loads: constant current operation mode (CC), constant voltage operation mode (CV), constant resistance operation mode (CR), and constant power operation mode (CP).

4.1.1 Constant current mode (CC)

In Constant Current (CC) mode, the electronic load consumes constant current regardless of the change of voltage (when the minimum input voltage is met). If the power supply cannot meet the set current of electronic load, the loading may not reach the set load current, and the voltage of power supply may be lowered.

Press F5 to adjust the options. When the option CC appears, press the corresponding option button to enter CC screen. The cursor is now at the position to set current. At this time, you can press the number keys on the panel to input the loading current (if it exceeds the upper limit of set current, the value is the upper limit of input current by default). Turn the knob to adjust the cursor to set the rising slope. Press the number keys to set the current rising slope, and the falling slope is set in the same method (Figure 4-2):

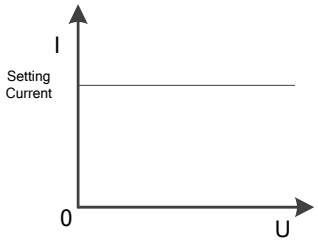


Figure 4-1 CC mode

Figure 4-2 CC mode (standby)

At this time, press the LOAD button to load. The indicator light is on, and the load is pulled according to the set value.

The load supports online change of the load value. The user can manually input the load current through the keyboard area or change the setting current through the knob. If you want to change the load value by the knob, when the cursor is at the set current, use the left and right buttons to call the small cursor, and the left and right buttons to adjust the position of the small cursor. The knob changes the value of the position, clockwise increases, and counterclockwise decreases. The effect is as follows:

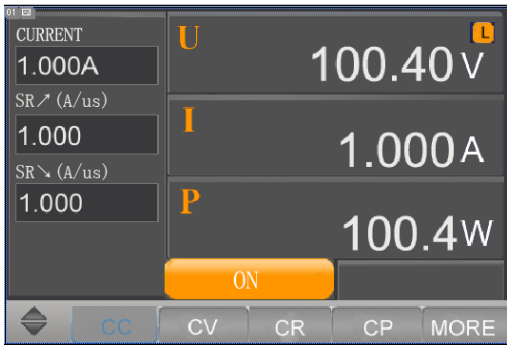


Figure 4-3 Adjust parameter via CC knob

In the unloaded state, you can also use the knob to adjust other parameters in the basic mode. The adjustment method is the same as the adjustment setting current. If you want the knob function to change back to adjust the position of the large cursor, press the ESC key.

4.1.2 Constant voltage mode (CV)

In the constant voltage operation mode, the electronic load consumes enough current to keep the voltage at a certain value. If the voltage of the source to be measured is less than the set voltage or the maximum output current is greater than the maximum current the load can absorb, the load may not maintain the voltage at a constant value.

Press F5 to adjust the option. When CV appears, press the option button to enter CV screen. The cursor is now at the position to set voltage. At this time, you can press the number keys on the panel to input the loading voltage (if the upper limit of the set voltage is exceeded, the value is the upper limit of input voltage by default). Turn the knob to adjust the cursor to the set current limit, and select the left/right key to set the current limit. At this time, press LOAD button to load. The load LED lights up and the load is pulled according to the set voltage.

The load supports online modification of the set voltage. For the modification method, refers to the constant current mode (Figure 4-5):

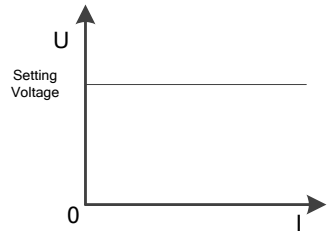


Figure 4-4 CV mode

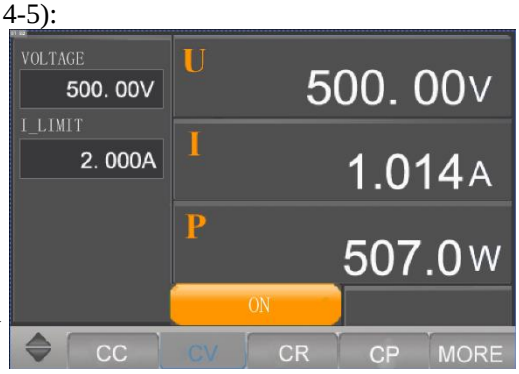


Figure 4-5 CV loading

4.1.3 Constant resistance mode (CR)

In CR mode, the electronic load is equivalent to a resistor, and the loading current is adjusted with the change of voltage, so that the ratio of the voltage to the current is constant resistance. Note that in CR mode, the maximum current to load is the external voltage divided by the set resistance. When the demand current or power is greater than the rating, it may not be equivalent to the constant resistance.

Press F5 to adjust the option. When CR appears, press the corresponding button to enter CR screen. The cursor is now at the position to set resistance. At this time, you can press the number key on the panel to input the loading resistance (if it exceeds the upper limit of resistance, the value is the upper limit of input resistance by default). Press the knob to adjust the cursor to set the rising slope. Press the number keys to set the current rising slope, and the falling slope is set in the same method (Figure 4-7):

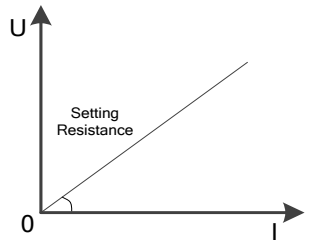


Figure 4-6 CR mode

Figure 4-7 CR mode standby

At this time, press LOAD to load. The loading LED lights up, and loading is performed according to the set resistance. The load supports online modification of the set resistance, and the modification method refers to the CC mode.

4.1.4 Constant powermode (CP)

In the constant power operation mode, the electronic load consumes a constant power, and the load current is adjusted as the external voltage changes, so that the product of voltage and current is a constant value, that is, the set power value. Note that in CP mode, the maximum current that the load needs to load is the set power divided by the external voltage. When the maximum current is greater than the set current maximum, it may not be equivalent to constant power.

Press F5 to adjust the option. When CP appears, press the corresponding button to enter CP screen. The cursor is now at the position to set power. At this time, you can press the number keys on the panel to input the loading power (if it exceeds the power upper limit, the value is the upper

limit of input power by default). Press the knob to adjust the cursor to set the rising slope. Press the number keys to set the rising slope, and the falling slope setting method is the same (Figure 4-9):

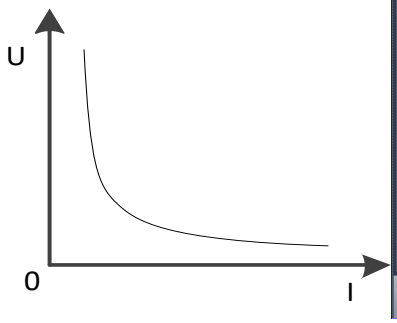


Figure 4-8 CP mode Figure 4-9 CP mode standby

At this time, press LOAD to load. The Loading LED lights up, and the loading is performed according to the set power.

The load supports online modification of the set power, the modification method refers to the constant current standard working mode.

4.1.5 Dynamic current load（CCD）

In CCD mode, no matter how the input voltage changes, dynamically current loading will be performed according to the set current and dynamic timing. Dynamic testing has three operating modes: continuous, pulse and reverse.

Continuous:

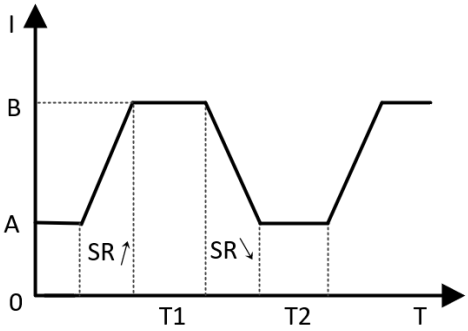


Figure 4-10-1 CCD continuous mode

In continuous mode, the electronic load switches continuously between A current and B current according to the set pulse width. Unless you exit the dynamic test or shut down the load, the load will continue to execute according to the set parameters, which is not affected by the trigger signal.

Pulse:

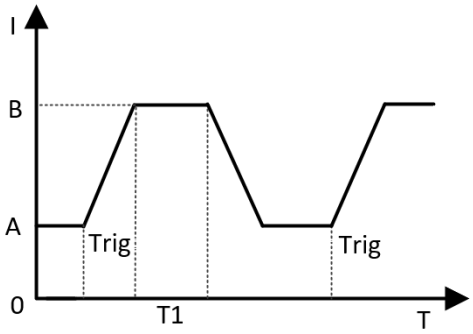


Figure 4-10-2 CCD pulse mode

In pulse mode, if the trigger signal is received, the load immediately switches from the A-value current to the B-value current, and returns to the A-value after maintaining the transient pulse width time.

Reverse:

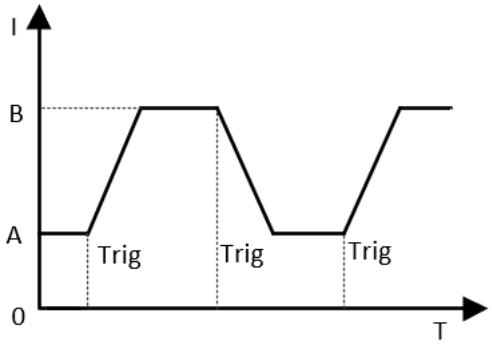


Figure 4-10-3 CCD reserve mode

In reserve mode, if the trigger signal is received, the load will switch between A and B pulling values, and the switching time is determined by the slope.

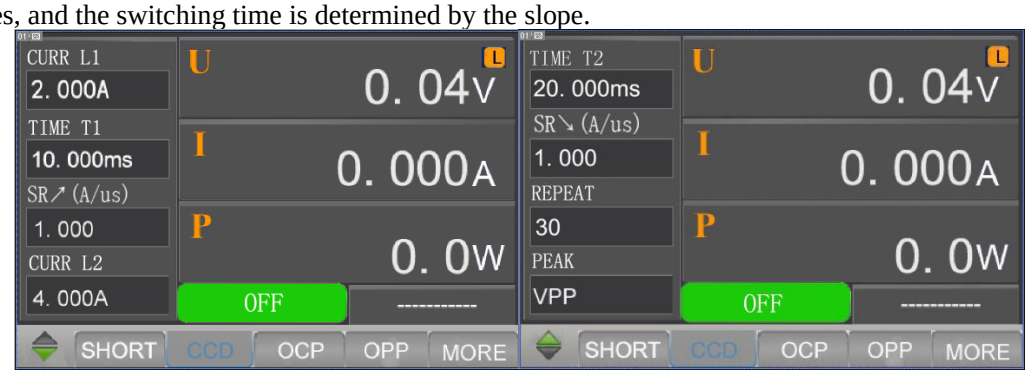


Figure 4-11 CCD mode standby

Table 4-1 CCD mode setting parameters

S/N	Name		Meaning	Setting method
1	Current L1		Load parameters of Load1 can be set	Number key input
2	Time T1		The loading time of L1 can be set	Number key input
3	Rising slope (A/us)		The rising slope of current can be set	Number key input
4	Current L2		Load parameters of Load2 can be set	Number key input
5	Time T2		The loading time of L2 can be set	Number key input
6	Fallingslope(A/us)		The falling slope of current can be set	Number key input
7	Number of repeats		Number of repeats (0=infinite loop)	Number key input
8	Display item	VPP	Loading state, the difference between the maximum voltage and the minimum voltage after average of additional measurement cycle	Left/right keys to switch
		VP+	Loading state, the maximum voltage after average of additional measurement cycle	Left/right keys to switch
		VP-	Loading state, the minimum voltage after average of additional measurement cycle	Left/right keys to switch

4.2 Advanced mode

4.2.1 Dynamic resistance load（CRD）

In CCD mode, no matter how the input voltage changes, dynamically resistance loading will be performed according to the set resistance and dynamic timing.

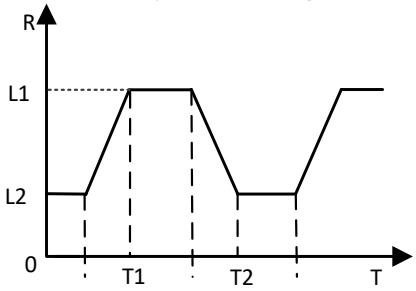


Figure 4-12CRD mode

Press F5 to adjust the option. When CRD appears, press the corresponding button to enter CRD screen. The cursor is now at the position to set resistance L1. You can press the number keys on the panel to input the resistance L1 (if it exceeds the resistance upper limit, the value is the

upper limit of input resistance by default).The setting of parameters in this mode is shown in Table 4-2.

Figure 4-13CRD mode standby

Table 4-2CRD mode setting parameters

S/N	Name		Meaning	Setting method
1	Resistance L1		Load parameters of Load1 can be set	Number key input
2	Time T1		The loading time of L1 can be set	Number key input
3	Rising slope (A/us)		The rising slope of current can be set	Number key input
4	Resistance L2		Load parameters of Load2 can be set	Number key input
5	Time T2		The loading time of L2 can be set	Number key input
6	Fallingslope(A/us)		The falling slope of current can be set	Number key input
7	Number of repeats		Number of repeats (0=infinite loop)	Number key input
8	Display item	VPP	Loading state, the difference between the maximum voltage and the minimum voltage after average of additional measurement cycle	Left/right keys to switch
		VP+	Loading state, the maximum voltage after average of additional measurement cycle	Left/right keys to switch
		VP-	Loading state, the minimum voltage after average of additional measurement cycle	Left/right keys to switch

4.2.2 Composite impedance mode (FLEX)

For a real load, the input filter capacitor will cause great inrush current at the moment of power-on. The parasitic resistance and inductance of long internal lead will cause further distortion of loading wave. Therefore, the impedance is equivalent to an impedance network, and the FLEX mode is specifically designed to simulate such loads to test the applicability of the power supply under test.

In FLEX mode, according to the load characteristics, the following four test parameters are set: simulated lead inductance L_S, simulated lead impedance R_S, load capacitive reactance C_L, and load impedance R_L.

These parameters need to be set in Standby state. After startup, the load will perform current loading based on the set impedance network.

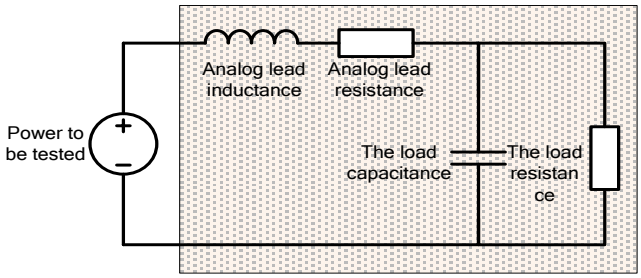


Figure 4-14 Composite impedance schematic diagram

Set parameters in FLEX mode:

Simulated lead inductance L_S: 0.1uH~20uH

Simulated lead impedance R_S: 30mΩ~20Ω

Load capacitive reactance C_L: 30uF~50000uF

Load impedance R_L: consistent with high range in CR mode

Adjust the cursor position to modify the parameter via the knob. You can input the parameter via the numeric keyboard.

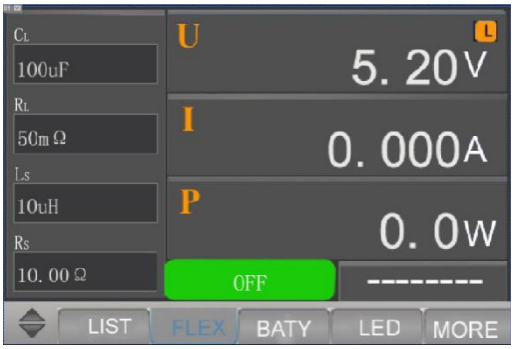


Figure 4-15 FLEX test setting

4.2.3 LED mode(LED)

Two traditional CR and CV modes are adopted for testing in current LED constant current source industry. However, since most of the LED drive power supplies are designed with switching principles, there are large current and voltage ripples, which will cause interference from high-frequency noise in common CR and CV modes, leading to deviations in the test, or even failure to test. At the same time, according to the analysis of characteristics of LEDs, it has a turn-on voltage Vd; however, in CV mode of electronic load, only the working voltage of LEDs can be simulated, failing to simulate turn-on voltage Vd. If the CV mode of electronic load is chosen to test the LED driving power supply, the test results are not accurate. The LED mode is designed for the load according to the characteristics of LEDs to simulate LED curve, which can achieve better test rest.

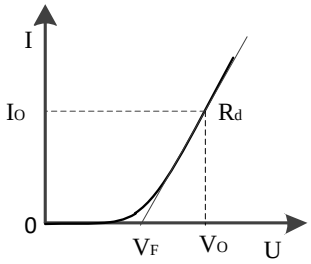


Figure 4-16 LED mode

Press F5 to adjust the option. When the option LED appears, press the corresponding option button to enter the LED test interface, adjust the cursor position by rotating the button, and set the parameters. Note that there are many LED parameters. Only 4 are displayed on the home page. You can check the remaining parameters by turning the knob continuously. The effect chart is as follows:

Figure 4-17 LED mode screen

The parameters in LED mode are as follows:

Table 4-3 LED mode parameters and significance

Parameters	Content
Working voltage Vo	Normal working voltage
Working current Io	Normal working current
Resistivity	Resistivity
Forward voltage VF	Operating voltage
Equivalent resistance Rd	Equivalent resistance

Any one of the three parameters (resistivity, forward voltageand equivalent resistance) combined with working voltage and working currentcan determine the other two ones. The relationship is as follows:

$$coeff = \frac{V_o - V_F}{V_0}$$

$$R_d = coeff * \frac{V_o}{I_o}$$

$$V_F = (1 - coeff) * V_o$$

4.2.4 LIST mode(LIST)

To facilitate testing, the user need to input the test current and time into the load, and the loading can be automatically performed based on the set current and time. In LIST test, up to 8 groups of data can be edited, and 200 steps can be edited in each group. The execution time of each step can be edited (0-100s).

Press F5 to adjust the option. When LIST appears, press the corresponding button to enter LIST test screen. To edit or change the sequence, press SET without loading to enter LIST edit page (Figure 4-19):

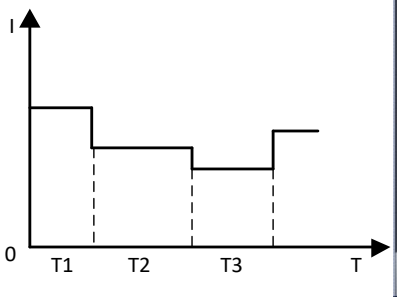


Figure 4-18 LIST test mode

Figure 4-19 LIST test

You can choose to modify sequence or single-step data through the option key. When selecting "Group Edit", you can adjust the cursor position via the knob, edit the running sequence group, the total number of sequence steps, and the output mode. The group number can be changed by entering the number, or through "Previous group" and "Next group", as shown below:

Figure 4-20 LIST test group editing

There are three output modes: continuous, reset, and hold. The specific meanings are as follows:

Table 4-4 LIST test output mode and meaning

Output mode	Meaning
Continuous	After the test, restart the loop test from the first step
Resetting	Stop loading after the test
mAintain	Keep the last load value unchanged after test reception

When you select "Step Edit", you can edit a step. You can modify the load current and the load time of this step. Among them, you can directly enter the number at the step number to view the setting of the step, or via "Previous" and "Next", as shown below:

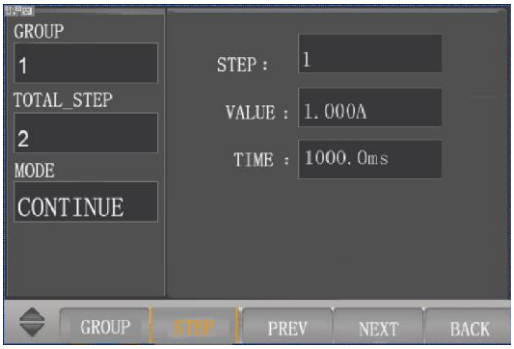


Figure 4-21 Sequence test step editing interface

After the setting completed, press return or ESC to return to main screen for testing. After setting the parameters, press LOAD button to load. The loading screen is as follows:

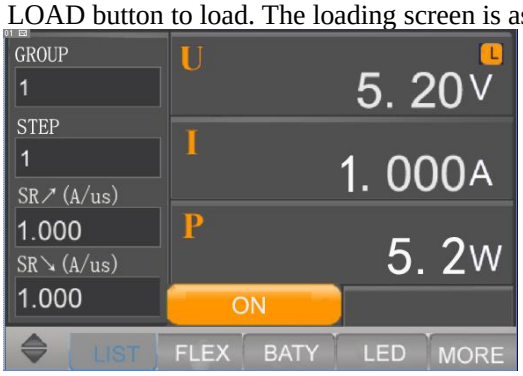


Figure 4-22 LIST test loading

4.2.5 Short mode(SHORT)

The Short mode is a mode that simulates the short condition of the source under test. The load realizes the simulation of short circuit by large current loading. When the rated power is not exceeded, the loading current is the maximum current of the range.

Press F5 to adjust the option. When Short appears, press the corresponding button to enter Short Test screen. There is only one parameter setting for Short mode, trigger mode, as shown below:

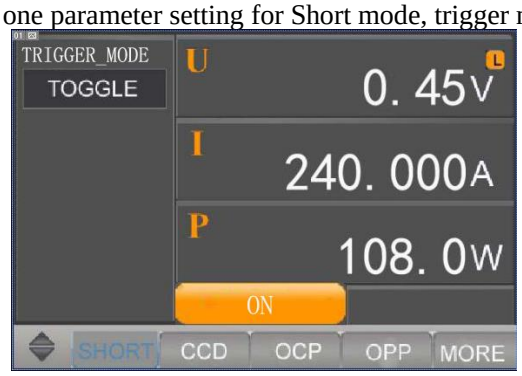


Figure 4-23 Short mode loading

The setting of parameters in this mode is shown in Table 4-5.

Table 4-5 SHORT mode setting parameters

S/N	Name		Meaning	Setting method
1	Triggermode	Hold	Switch mode. Press LOAD to start loading, and release to stop	Left/right keys to switch
		Toggle	Lock mode. Press LOAD once to start, and press again to stop	Left/right keys to switch

4.2.6 Overcurrent Protection (OCP)

mAny sources under test have over-current protection: when the output circuit is too large, the output voltage is reduced or the output is stopped. The load has a test mode for this situation - overcurrent protection. After setting the loading circuit and the judgment voltage, when the load detects that the voltage is less than or equal to the judgment voltage, the load stops, and the set current is displayed on the screen.

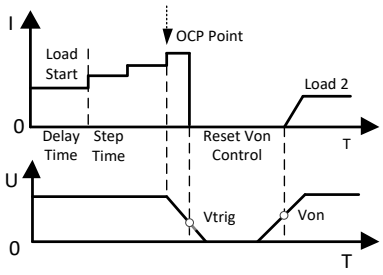


Figure 4-24 OCP mode

Press F5 to adjust the option. When the option OCP appears, press the corresponding option button to enter the OCP test interface, adjust the cursor position by rotating the button, and set the parameters. Note that there are many OCP parameters. Only 4 are displayed on the home page. You can check the remaining parameters by turning the knob continuously. The effect chart is as follows:

Figure 4-25 Overcurrent mode standby

The parameters in OCP mode are as follows:

Table 4-6 OCP mode parameters and meanings

Parameters	Significance	Setting method
Starting current	Start to load current	Number key
End current	End load current	Number key
Steps	Set the number of steps for current change (1-1000)	Number key
Step time	Single step current loading time. Step time refers to the elapsed time from the start to the end of each set current (10us~100000ms).	Number key
Judgment voltage	Judgment voltage. Stop the load when the voltage reaches or be less than this value, and output the loading current	Number key
LATCH	It can be set to OFF/ON. When LATCH is ON, it will continue to load after the test is over.	Left/right key or knob
OCP upper limit	Upper limit of over-current protection	Number key
OCP lower limit	Lower limit of over-current protection	Number key

The OCP measurements are divided into two types: qualified and unqualified. Unqualified OCP measurements means that the source to be measured has not reached the protection after the current loading ends, or the load current exceeds the upper/lower limits of OCP during protection. Qualified OCP means that the source to be tested is protected within the preset current range during the load process. The load current is displayed on the right side of Qualified (Figure 4-26), which means that the source to be tested is protected when 2.550A current is loaded.

Figure 4-26 Qualified overcurrent protection

4.2.7 Overpower Protection (OPP)

Similar to Overcurrent Protection (OCP), many sources to be tested have Overpower Protection (OPP). After setting the load circuit and the judgment voltage, when the load detects that the voltage is less than or equal to the judgment voltage, the load stops and the set power is displayed on the screen.

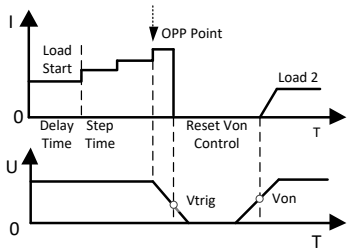


Figure 4-27 OPP mode

Press F5 to adjust the option. When OPP appears, press the corresponding button to enter OPP test screen. Adjust the cursor position via the knob and set the parameters (Figure 4-28):

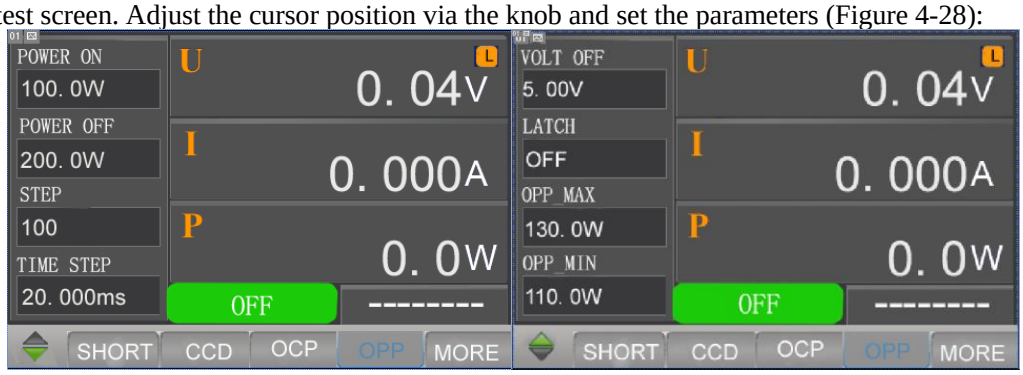


Figure 4-28 Overpower Protection setting

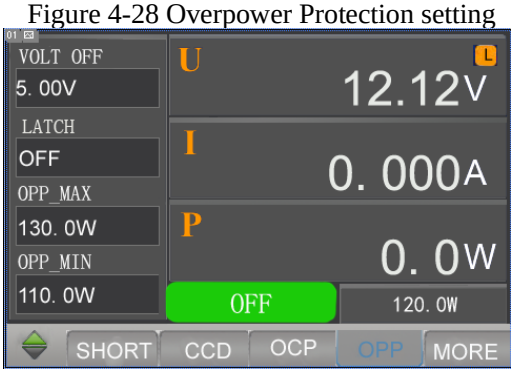


Figure 4-29 Qualified Overpower Protection

The qualified OPP measurement is shown in Figure 4-29. The right side of Qualified shows 120.0W, which means that the source to be tested is protected when 120.0W is applied.

4.2.8 BATY mode(BATY)

Experiments prove that the best way to determine battery performance is to test with load. Only the correct load test can determine whether the battery is in the expected life curve. The electronic load provides battery test function, suitable for most of batteries used in the market.

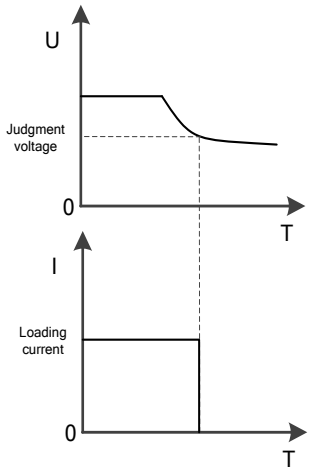


Figure 4-30 BATY mode

The electronic load can test battery capacity in CC, CR or CP mode, and the mode can be set for current battery test. In BATY mode, the shutdown time, shutdown voltage, and shutdown capacity can be programmed as the conditions for interrupting battery testing. The above three parameters are independent. If any one of them is met, the system will interrupt the load and display the conditions during shutdown. The shutdown capacity can be set to 0 (Ah/Wh), now this condition becomes invalid, and only the shutdown time and shutdown voltage is adopted as the judgment condition. During the test, you can observe the battery voltage, discharge current, load power, discharged capacity and discharge time.

Press F5 to adjust the option. When BATY appears, press the corresponding button to enter the battery test screen, as shown below:

Figure 4-31 BATY mode

The electronic load can carry out battery capacity test in CC, CR or CP mode. The setting parameters are shown in the following table:

Table 4-7 BATY mode parameters and meanings

Parameters	Significance	Setting method
Set the mode	CC CR CP Select the load mode: CC CR CP	Left/right keys to switch
Parameters	CC mode: current; CR mode: resistance; CP mode: power	Number key
Rising slope	The rising slope of current can be set	Number key
Falling slope	The falling slope of current can be set	Number key
Cut-off time	Judgement time: stop the load when the load time reaches this value	Number key
Cut-off voltage	Judgement voltage: stop the load when the voltage reaches or falls below this value	Number key
Cut-off capacity:	Judgement electric capacity: stop the load when the discharged the capacity reaches this value The unit for setting the cut-off capacity in CC and CR mode is Ah; the unit of setting the cut-off capacity in CP mode is Wh	Number key

There are three battery result query modes: TIME, Wh and Ah. The meanings are as follows:

Table 4-8 BATY test output mode and meaning

Result query	Meaning
TIME	Total load time
Wh	Cumulative load electric energy
Ah	Accumulated load discharge capacity of battery

The battery test result will be displayed on the right side of the loaded state. The following figure shows the battery test result is 3.127Ah, which means that if the battery outputs 1A, it can maintain an output voltage of 3.127h above 4.8V.

Figure 4-32 BATY test results

4.2.9 Program（PROG）

In PROG mode, users can realize continuous automatic load testing, mode switching and error result output by editing test groups and test steps.

The PROG feature consists of 10 groups of 255 steps each, and tests that can achieve up to 2550 steps are performed through links between groups.

Press F5 to adjust options. When the PROG option appears, press the corresponding option button. The PROG test screen is displayed, as shown in Figure 4-33.

Press Enter to enter the PROG group editing screen, as shown in Figure 4-34:

Figure 4-33 PROG test page

Figure 4-34 PROG group editing page

Table 4-9 PROG mode group parameters and their meanings

parameter	meaning	Setting mode
Group number	Group number to set up or start pulling first (1-10)	Numeric 、F3、F4 key
type	Group work category, currently only in list mode	Not set

link	After the test of this group is completed, the group number of the next group is 0, which means no link function is used (0-10).	Numeric key
Number of steps	Total number of steps in this group (1-255)	Numeric key
Number of repeats	The number of repeated tests in this group, 0 is infinite repetitions (0-5000)	Numeric key

Press the step editing key to enter the PROG step editing screen, as shown in Figure 4-35. You can modify the test parameters of each step.

Figure 4-35 PROG step editing

Table 4-10 PROG mode LIST step parameters and their meanings

parameter	meaning	Setting mode
Group number	The group number of the currently set step	Not set
Step number	Step number currently set	Number key or F3 or F4
Trigger mode	Step jump mode, only the AUTO mode is supported	Not set
Working mode	Only CV mode is supported in this step	Do not set •
range	The working range of this step cannot be set temporarily	Do not set •
Test time	Test time of current step (0.0001-4000S)	Numeric key
Set value	The pull value of the current step	Numeric key
Judgment time	Parameter compliance check time of the current step (0.0001- test time)	Numeric key

The rotary encoder can enter the editing interface for determining parameters of test results, as shown in Figure 4-36.

Figure 4-36 Edit result decision parameters

4.2.10 Sine wave dynamic mode（SWD）

In SWD mode, the current can be output as a sine wave with a fixed frequency. Users can change the DC component (I_DC) of the load current, the sine wave component (I_AC) of the load current, and the frequency of the sine wave (Frequency) to realize output control. Waveform control, the lowest point of the sine wave load current cannot be less than zero ampere.

Press F5 to adjust the options. When the option SWD appears, press the corresponding option button to enter the SWD test interface as shown in Figure 4-37.

Figure 4-37 SWD test interface

Table 4-11 SWD mode parameters and their meanings

parameter	significance	Setting method
I_DC	component of load current Numeric	keys
I_AC	I_AC AC component of load current Numeric	keys
Frequency	Frequency Sine wave dynamic frequency Numeric	keys

4.2.11 DC internal resistance test mode（DCR）

The DCR test method is not derived from any particular theory, it is just a definition. After a period of no current time to load (quiet time T1), and a constant current pulse for a period of time to load (load time T2), and finally after a period of no current time to load (quiet time T3). Finally, take the average of the voltage in T2 and the voltage before and after standing still, subtract it, and then divide it by the load current value in the T2 loading project. The specific calculation formula is shown in Figure 4-37

$$DCIR = \frac{(\frac{(V1+V3)}{2} - V2)}{I2}$$

Press F5 to adjust the options. When the option DCR appears, press the corresponding option button to enter the DCR test interface as shown in Figure 4-38, 4-39.

Figure 4-39 DCR test parameter setting interface

Figure 4-40 DCR test qualified interface

Table 4-12 DCR mode setting parameter meaning

Parameter	Meaning	Setting method
Rest time T1	During this time period, no current value and only voltage value is measured; range 0-100000; unit S	number keys
Loading time T2	Constant current load during this time period; range 0-100000; unit S	number keys
Pull current	Constant load current; unit A	number keys
Rest time T3	There is no current value in this time period, only the voltage value is measured; the range is 0-100000; the unit is S	number keys
DCR cap	The upper limit of the determination area of the internal resistance value of the test result	number keys
DCR lower limit	Under the judgment area of the internal resistance value of the test result	number keys

4.2.12 External Waveform Loading (EXTW)

In the external waveform mode (EXTW), the load is performed according to the selected load mode and the external input waveform. The EXT V/I input signal connection port is located at the Digitail IO port on the rear panel. The external signal 0V to 10V can correspond to the load condition from 0 to full scale.

CC mode calculation formula:

$$I_{SET} = \frac{Ext\_I}{10V} \times I_{FS}$$

CR mode calculation formula:

$$R_{SET} = \frac{10V}{Ext\_V} \times R_{FS(\min)}$$

CVmode calculation formula:

$$I\_Limit = \frac{Ext\_V}{10V} \times V_{FS}$$

$$I\_Limit = \frac{Ext\_I}{10V} \times I_{FS}$$

Press F5 to adjust the options. When the option EXTW appears, press the corresponding option button to enter the EXTW test interface as shown in the figure 4-41.

Figure 4-41 DCR test interface

Table 4-42 EXTW mode setting parameter meaning

Parameter	Meaning	Setting method
Run mode	CC/CR/CV	Left and right keys switch

4.2.13 Dynamic Load Frequency Sweep Mode (SWP CC Dymanic Sweep)

In SWP mode, the load supports constant current dynamic frequency scanning. In this mode, you can set the maximum current value, minimum current value, start frequency, end frequency, dynamic frequency, step time, load rate, current rise and fall slope value, start pull After loading, the load value will jump between the two maximum and minimum values, so as to test whether the DUT can maintain the normal output voltage under the limit dynamic frequency.

Press F5 to adjust the options. When the option SWP appears, press the corresponding option button to enter the SWP test interface as shown in Figure 4-44. 4-45.

Figure 4-44 SWP test interface

Figure 4-45 SWP test interface

Table 4-46 Meaning of SWP mode setting parameters

Parameter	Meaning	Setting method
I_MAX	Maximum load current value; unit A	number keys
I_MIN	Minimum load current value; unit A	number keys
FSTART	Start frequency value; unit Hz; range 0.01Hz-50kHz	number keys

FEND	End frequency value; unit Hz; range 0.01Hz-50kHz	number keys
FSTEP	Step frequency value; unit Hz; range 0.01Hz-50kHz	number keys
DWELL	Step time, further dwell time of each step from the beginning to the end; unit s; range 1ms-100s	number keys
DUTY	Load rate, the percentage of the continuous loading time of the high value of the step time; range 1%-100%	number keys
RISE RATE	Current rising slope; unit A/us	number keys
FALL RATE	Current falling slope; unit A/us	number keys

4.2.14 CVCC

In CVCC mode, the voltage value and current value need to be set before testing. According to the set voltage value, adjust the load current to control the output voltage. There are three response speeds in this mode: fast, normal, and slow.

Press F5 to adjust the options. When the option CVCC appears, press the corresponding option button to enter the CVCC test interface as shown in Figure 4-47

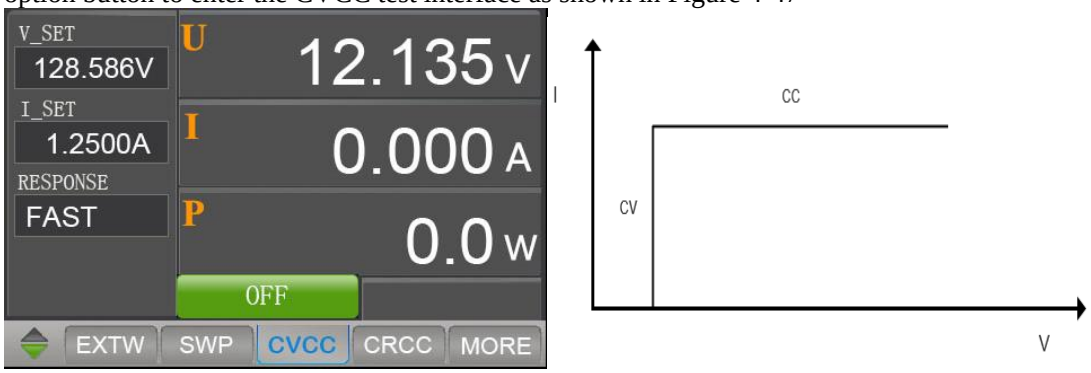


Figure 4-47 CVCC test interface

Table 4-48 CVCC mode setting parameter meaning

Parameter	Meaning	Setting method
VSET	Set the voltage value;	number keys
ISET	Set the current value;	number keys
RESPONSE	Voltage response speed; FAST/MIDDLE/SLOW	Left and right keys switch

4.2.15 CRCC

In CRCC mode, the resistance value and current value need to be set before testing. When the voltage of the object under test is output, the load will be loaded according to the set resistance value, and the output voltage of the object under test will continue to rise. When the load current exceeds the set current value, it will switch to constant current mode to load.

Press F5 to adjust the options. When the option CRCC appears, press the corresponding option button to enter the CRCC test interface as shown in Figure 4-47

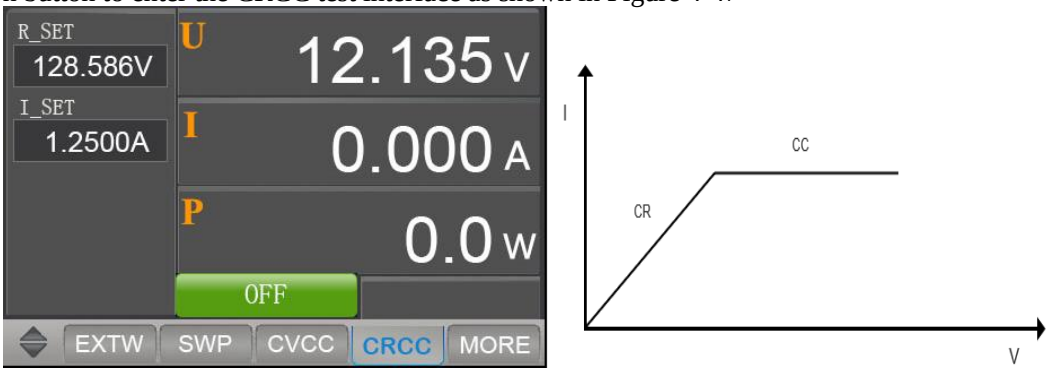


Figure 4-49 CRCC test interface

Table 4-50 CRCC mode setting parameter meaning

Parameter	Meaning	Setting method
RSET	Set the resistance value;	number keys
ISET	Set the current value;	number keys

4.2.16 CPCC

In CPCC mode, the power value and current value need to be set before testing. When the voltage of the object under test is output, the load will be loaded according to the set power value, and the output power of the object under test will continue to rise. When the load current exceeds the set current value, it will switch to constant current mode to load.

Press F5 to adjust the options. When the option CPCC appears, press the corresponding option button to enter the CPCC test interface as shown in Figure 4-51

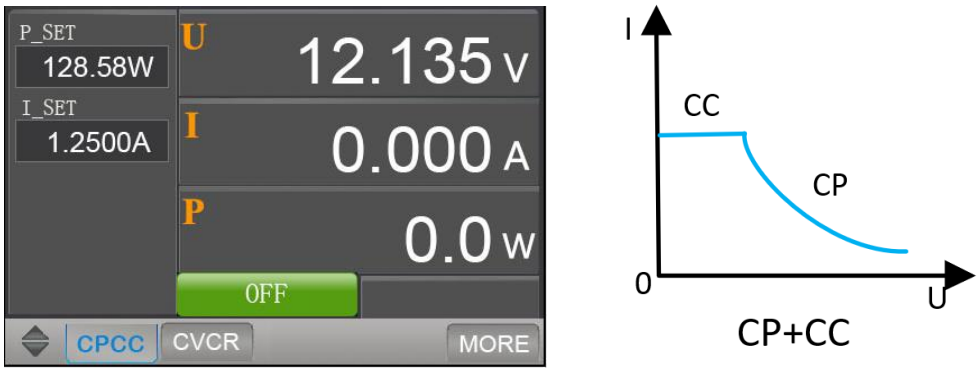


Figure 4-51 CPCC test interface

Table 4-52 Meaning of CPCC mode setting parameters

Parameter	Meaning	Setting method
PSET	Set the power value;	number keys
ISET	Set the current value;	number keys

4.2.17 CVCR

In CVCR mode, the voltage value and resistance value need to be set before testing. When the voltage of the measured object is output, the load will be loaded according to the set voltage value, and the output voltage of the measured object will continue to rise. When the load current exceeds the set resistance value, it will switch to the constant resistance mode to load.

Press F5 to adjust the options. When the option CVCR appears, press the corresponding option button to enter the CVCR test interface as shown in Figure 4-51

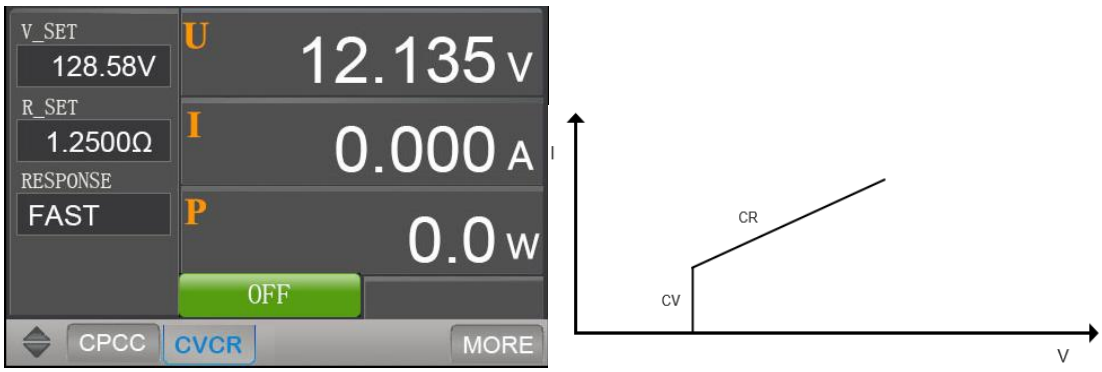


Figure 4-53 CVCR test interface

Table 4-54 CVCR mode setting parameter meaning

Parameter	Meaning	Setting method
VSET	Set the voltage value;	number keys
RSET	Set the resistance value;	number keys
RESPONSE	Voltage response speed; FAST/MIDDLE/SLOW	Left and right keys switch

4.2.18 MPPT

MPPT (Maximum Power Point) represents the maximum power on the solar panel power curve. MPPT is a way to automatically find the maximum power. The electronic load is based on the constant voltage mode and constantly changes the constant voltage value to find the maximum power point.

Press F5 to adjust the options. When the option MPPT appears, press the corresponding option button to enter the MPPT test interface as shown in Figure 4-48.

Figure 4-48 MPPT test interface

4.2.19 Parallel Mode

The parallel function can be set for the electronic load. Please refer to Figure 2-3 to connect the parallel cable and the loading cable first. To enable the parallel function, you only need to set the parallel address, terminal resistance, parallel mode, parallel number and related parameters of parallel initialization. For details, see 8.4 Parallel Process and Operation Specifications.

PARA_ADDR:

All electronic loads in the parallel network need to set the communication address, and the same address must not be repeated. The value ranges from 0 to 15. The default value is 0.

TERMINATOR:

Set the terminal resistance required for parallel communication. The terminal resistance of the first and last single machine in the parallel network is set to "On" and the remaining intermediate loads are set to "off". The default setting is"off".

PARA_MODE:

Set the control identity of the load. It can be set to single, host, or slave. The default value is Single Machine.

PARA_NUM:

This parameter specifies the total number of parallel groups. You can set a maximum of 16 parallel groups. The set number of parallel machines includes host + slave machines, which can be set in the range of "2-16". The parallel mode is not set to the host does not display.

INITIAL:

To enable or disable the parallel mode switch, select Enable to enable the parallel mode and select Off to disable the parallel mode.

The parallel support modes are as follows:

CC, CV, CR, CP, CCD, one key SHORT, CRD

Attention:

1. Enable the terminal resistance function on the first and last single machine in the parallel network. Incorrect setting of terminal resistance may lead to poor communication.

2. The PARA_ADDR cannot jump, otherwise the parallel networking fails and an error is reported.

3. Only support the same voltage specifications parallel, it is recommended to star connection.

4.3 Load parameter setting

4.3.1 Test parameter setting

The user can set the test parameters of the load. In the uninstall state, press the MENU key to enter the test setting interface, as shown below:

Figure 4-33 Test setting

The position of the cursor can be adjusted by twisting the knob to set various parameters. The test setting parameters and the meaning of each parameter are as follows:

Table 4-9 Test parameters and significance

Parameters	Meaning
Current Upper Limit	Set the maximum load current. The current range is selected as the smallest range that supports this current.
Voltage upper limit	Set the maximum allowable input voltage of the load. The voltage range is selected as the minimum range that supports this voltage.
power upper	Set the maximum load power.

limit	
Turn-on voltage	After the start command is issued, the load will only be started when the measured voltage exceeds the turn-on voltage from low to high.
Turn-off voltage	During the load process, when the voltage measurement crosses the turn-off voltage from high to low, the load will stop. It is recommended that the turn-off voltage be lower than the turn-on voltage.
GO/NG SPEC:	GO/NG test function switch, enable or disable the SPEC test function during the test, real-time display of the test results, pass display GO, failed display NG
MODE:	You can set it to absolute value or percentage mode
V_CENT:	Set the reference median value
V_HIGHT:	Set voltage upper limit when mode is absolute and range (0-100%) when mode is percentage
V_LOW:	Set voltage lower limit when mode is absolute value, range (0-100%) when mode is percentage
I_CENT:	Set the reference median value
I_HIGHT:	Set current upper limit when mode is absolute and range (0-100%) when mode is percentage
I_LOW:	Set current lower limit when mode is absolute value, range (0-100%) when mode is percentage
P_CENT:	Set the reference median value
P_HIGHT:	36/5000 Set power upper limit when mode is absolute and range (0-100%) when mode is percentage
P_ LOW:	Set the power lower limit when the mode is absolute, set the range (0-100%) when the mode is percentage
VPP_MOD:	Set On or off to display the peak voltage on the test screen
Parallel setting	Enter the parallel parameter setting interface
DIDITAL I/O	Enter the digital port parameter setting interface
Timing test	Enter the timing test parameter setting interface

4.3.2 System parameter setting

This electronic load provides parameter settings such as load communication and operating habits. In Standby state, press MENU on the keyboard to enter the system screen, and then select System Settings to enter System Settings screen. Five parameters are displayed on the initial screen. Turn the knob to enter another page to view the remaining parameters.

Figure 4-34 System Setting

System Settings parameters and meanings:

Table 4-10 System parameters and significance

Parameters	Significance
contact address	Set load communication address, range1-255,when the host computer uses 0 as the address to send ,it is equivalent to a broadcast operation ,and all loads will respond .
Baud rate	Set the load communication baud rate: 2400/9600/14400/28800/57600/115200. Press Left/right key to select.
Sound switch	Key tone switch, there is sound when the key is turned on, and no sound when the key is turned off. Note that illegal settings and alarms are not affected by the sound switch
Password switch	Password protection function switch, after opening, if you want to modify the parameters, you must enter the correct password
Set Barcode	Set a password, 6 digits. If the setting is less than 6 digits, then 0 will be used by default. When the password switch is turned off, the password is displayed in plain text; when it is turned on, it is displayed in secret. Default is 000000
Display brightness	Set the display brightness (level 1-8): 1: the darkest; 8: the brightest. Enter manually via the keyboard.
language selection	Support Chinese and English display, users can set by left and right here
Refresh rate	The refresh rate of measurement parameters,the setting range is 0.1-60s.
Rest factory	Restore all parameters to factory settings
REV check	Turn on or off the reverse connection protection alarm
COM mode	Choose to use RS232\RS485\CAN communication, which needs to match the hardware(For CAN communication Settings, short-circuit the CFG pin and GND pin on the rear panel and then run the device. After setting, disconnect the CFG pin and GND pin and restart the device.)
IP address	Set the IP address of the machine for Ethernet communication. By default, TCP communication is required, and the port is set to 2101. Other methods can be configured through "USR-M0_V2.2.5.8.exe "software.
Subnet mask	Set the subnet mask for Ethernet communication
Gateway address	Set the default gateway for Ethernet communication
DNS	Set up DNS for Ethernet communication
SENSE CHECK	Set whether the SENSE sampling terminal drop detection function is enabled

4.3.3 Version

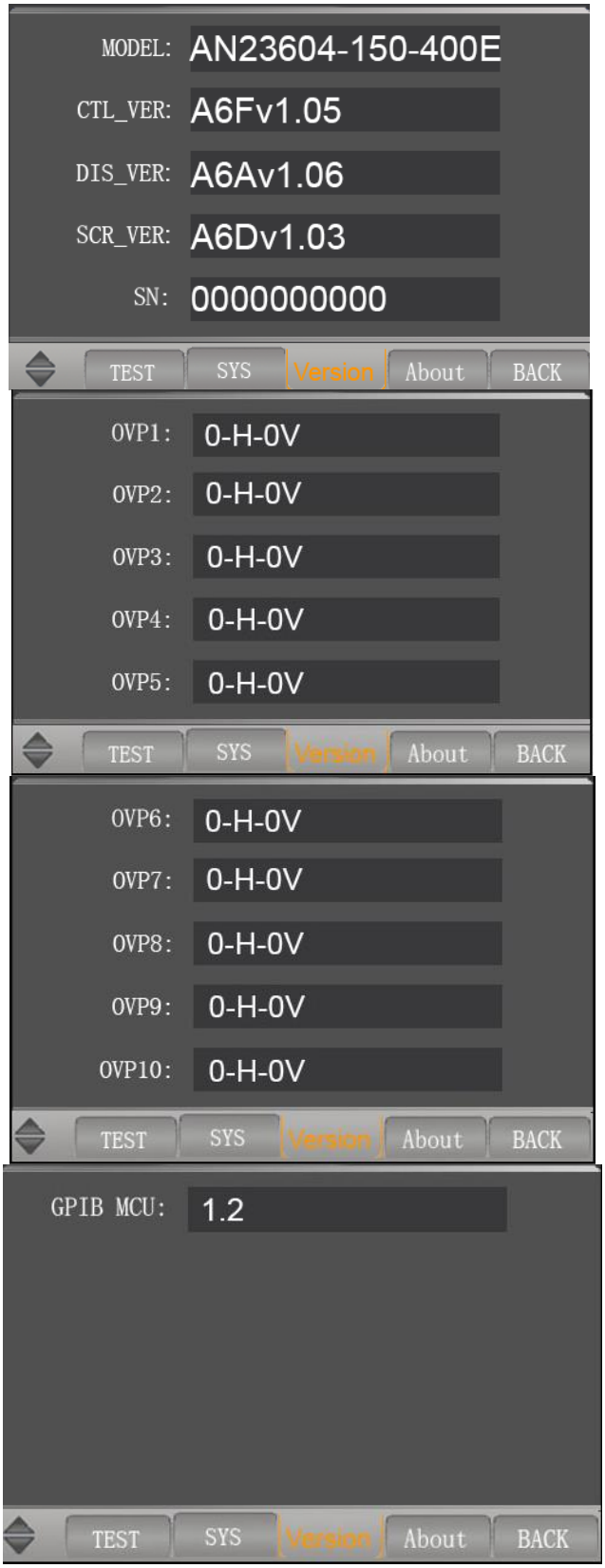


Figure4-35 Version

Version parameters and meanings:

Parameters	Significance

MODEL	AN: Qingdao Ainuo 236: high power DC electronic load 04:4KW 150: maximum voltage 150V 400: maximum current 400A E: E series products
CTL_VER	The version number of the control program
DIS_VER	The version number of the program for the human-computer interaction system
SCR_VER	Program version number of the LCD screen
SN	Factory No.
OVP1-10:	Overvoltage data storage
GPIB MCU:	GPIB communication controller program version number

Table 4-11Version parameters

4.3.4 About

Figure4-36 The QR code of Ainuo'sWechat notary number

Chapter 5 Exceptions and Alarms

During the loading process, various factors can cause poor loading effect. This electronic load has parameter setting error indication, abnormal load and alarm indication.

5.1 Parameter setting error

When the parameter setting exceeds the allowable setting, the load will be set to the maximum allowable setting by default and the buzzer will beep for long time.

5.2 Alarm

When the external load exceeds the allowable condition, the load will issue the following alarms to protect the source under test and the load itself. The generated alarm signal will be displayed on the screen and the buzzer will beep for long time. Press ESC or LOAD to eliminate the alarm signal. After the alarm is manually eliminated, if the same alarm signal is continuously detected, the display will still show the alarm, but the buzzer will no longer sound.

5.2.1 Overvoltage alarm

The user can set the maximum voltage of the load. Press MENU on the keyboard to enter the test setting. Turn the knob to move the cursor to the upper limit of voltage, and the maximum voltage is input through the numeric keyboard (not to exceed the rated maximum).

When the voltage is greater than the set maximum value, the load will generate overvoltage protection. If the load is pulled, the load will stop, the buzzer will sound, and the overvoltage will be displayed at the loaded state, as shown below:

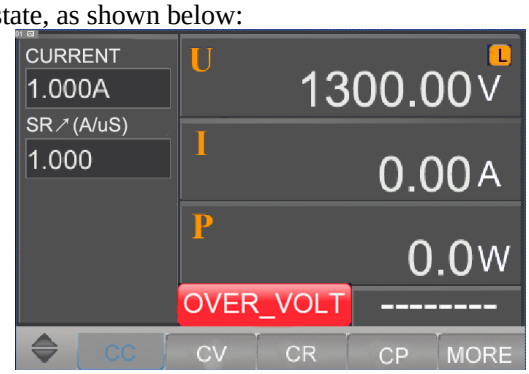


Figure 5-1 Overvoltage warning interface

After an overvoltage alarm occurs, the user can clear the alarm signal through the ESC key (note that if the voltage is still greater than the maximum value, the overvoltage alarm will continue to be displayed, but the buzzer will not sound again), or the LOAD key to clear the alarm.

The user can modify the set upper voltage limit or reduce the voltage of the power supply to be tested to avoid the overvoltage alarm again.

5.2.2 Overcurrent alarm

The user can set the maximum current of the load. Press MENU on the keyboard to enter the test setting. Turn the knob to move the cursor to the upper limit of current, and the maximum current is input through the numeric keyboard (not to exceed the rated maximum).

When the current is greater than the set maximum value, the load will generate overcurrent protection. If it is in the process of loading, it will stop pulling, the buzzer will sound, and the overcurrent will be displayed in the loaded state, as shown below:

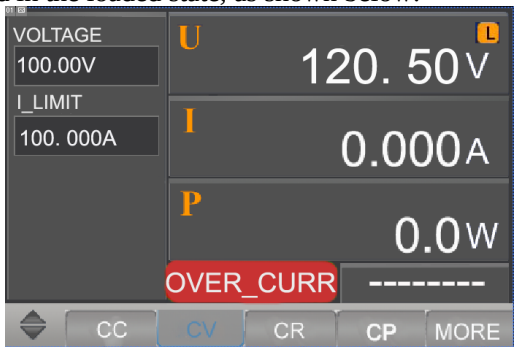


Figure 5-2 Overcurrent warning interface

After an overcurrent alarm occurs, the user can clear the alarm signal through the ESC key (note that if the current is still greater than the maximum value, the overcurrent alarm will continue to be displayed, but the buzzer will not sound again), or modify the parameters that generate excessive current, use LOAD Press the key to clear the alarm.

The user can modify the set current upper limit or modify the load parameters to avoid the overcurrent alarm again.

5.2.3 Overpower alarm

The user can set the maximum power of the load. Press MENU on the keyboard to enter the test setting. Turn the knob to move the cursor to the upper limit of power, and the maximum power is input through the numeric keyboard (not to exceed 1.01 times the rated maximum).

When the power is greater than the set maximum value, the load will generate overpower protection. If the load is pulled, the load will stop, the buzzer will sound, and the overpower will be displayed at the load state, as shown below:

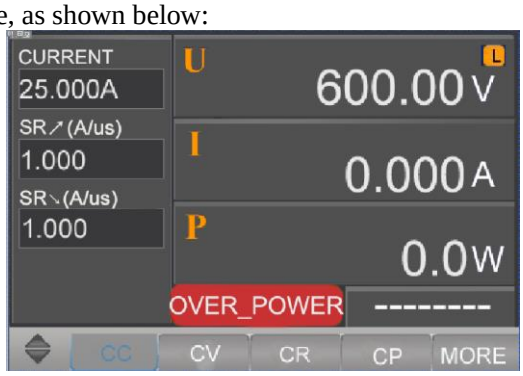


Figure 5-3Overpower warning interface

After an over-power alarm occurs, you can clear the alarm signal by pressing ESC (note that if the power is still greater than the maximum value, the over-power alarm will continue to be displayed, but the buzzer will not sound again), or modify the parameters that generate excessive current, and press LOAD to clear the alarm.

The user can modify the set power upper limit or load parameters to avoid over-power alarm again.

5.2.4 Overtemperature alarm

When the internal temperature of the load outlet 0 degrees, an over-temperature alarm will be generated. If it is being loaded at this time, it will stop the load, the buzzer will sound, and the temperature will be displayed at the load state, as shown below:

Figure 5-4 Over temperature enters the interface

After a temperature alarm occurs, you can clear the alarm signal by pressing ESC (note that if the temperature is still greater than the maximum value, the temperature alarm will continue to be displayed, but the buzzer will not sound again), or press LOAD to clear the alarm. It takes certain time to cool down, so it is recommended to start the machine for a few minutes after the temperature alarm occurs, and then clear the alarm signal after the load is sufficiently cooled down by the fan.

5.2.5 Reverse alarm

When the positive and negative poles of the load input terminal are reversed, a reverse connection alarm will be generated. If the load is being loaded at this time, the load will stop, the

buzzer will sound, and the reverse connection will be displayed at the load status, as shown in the following figure:

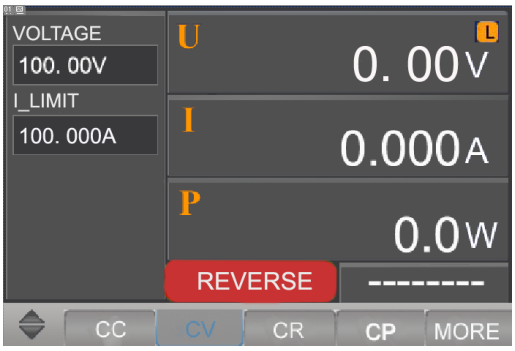


Figure 5-5 Reverse alarm interface

After the reverse connection alarm occurs, please check whether the input terminal is reversed, whether the output of the power supply to be tested is correct, and then connect it correctly.

After a reverse connection alarm occurs, you can clear the alarm by pressing ESC or LOAD.

5.2.6 SENSE alarm

The load provides voltage terminal setting error protection. When the negative terminal of the SENSE terminal and the negative terminal of the LOAD terminal are connected to the same endpoint, the load automatically switches to the SENSE sampling mode. If the positive terminal of SENSE terminal drops or the voltage of SENSE terminal is less than the voltage of LOAD terminal in SENSE sampling mode, the load will prompt SENSE_ERR. As shown below:

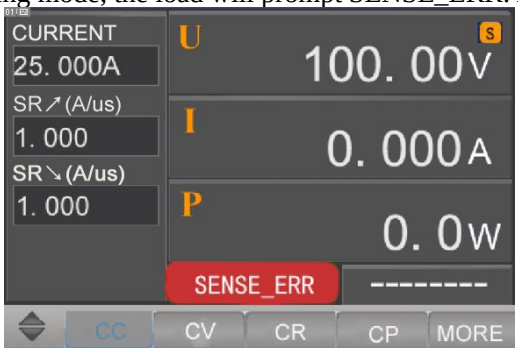


Figure 5-6 SENSE alarm interface

When a SENSE alarm occurs, check whether the SENSE line is connected and whether the connection is reliable. After correct connection, the alarm signal can be cleared by pressing ESC or LOAD key.

Chapter 6 Protocol

6.1 Message structure

6.1.1 Definition

Simple command

A simple command contains a command or keyword, usually followed by a parameter, such as:

LOAD ON or TRIG

Compound command

Two or more keywords are connected with a colon (:) to produce a compound command. The last keyword is usually followed by a parameter or a set of data, such as:

CURRent: STATic : L1 3

or

CONFigure : VOLTage : RANGe HIGH

Query command

A simple query command contains a keyword followed by a question mark, such as:

MEASure : VOLTage?

MEASure : CURRent?

Keyword format

Each keyword has two formats: long format and short format.

Long format

This format shows the full spelling of single characters of the function, such as: CURRENT, VOLTAGE and MEASURE.

Short format

This format uses only the first 3 or 4 letters of the long format, such as: CURR, VOLT, and MEAS.

In the keyword definitions and diagrams, the short format letters of each keyword will be capitalized. The electronic load can accept Volt, volt, voltage, VOLTAGE or volTAGE, etc. But if the keyword is incomplete, such as: "VOL" or "curre", it will not be accepted.

6.1.2 Numerical data format

The acceptable data types of AN23600E electronic loads are listed in Table 6-1.

Table 6-1 Data type

Symbol	Description	Example
NR1	Number without decimal point: The decimal point will be to the right of the least significant digit.	123、0123
NR2	Number with decimal point	123.、12.3、0.123、.123
NRf	Strong decimal point format • Including NR1 or NR2.	123、12.3
NRf+	Expanded decimal point format, including NRf and MIN, MAX. MIN and MAX are the maximum and minimum limits of the parameter.	123、12.3、MIN、MAX

These data types can be followed by a unit, as shown in Table 6-2.

Table 6-2 Unit of data

Mode	Class	Default unit	Reference unit
CC	Current	A	Ampere
CR	Resistance	OHM	Ohm
CV	Amplitude	V	Volt
CP	Power	W	Watt
FLEX	Inductance	H	Henry
	Capacitance	F	Farad
All	Time	S	Second
All	Frequency	Hz	Hertz
All	Slope	A/uS	Amperes/micro Second

6.1.3 Separation and termination character

In addition to keywords and parameters, data packets also require the following characters:

Separator:

It must be separated from the keyword the previous command by spaces.

Keyword separator:

Keywords (or prefixes) are separated by colons (:), semicolons (;) or both. Such as:

LOAD: SHOR ON

MEAS:CURR?;VOLT?

CURR:STAT:L1 3;:VOLT: STAT:L1 5

Termination character:

In this manual, it is assumed that the termination character is at the end of each example program code. If it needs to be marked, identify "new line" with the symbol <nl> and express it in ASCII code 0A hexadecimal (or 10 decimal).

Tree command separation:

■ Separate keywords with a colon ":" to mean that the branch enters the next level. Such as:

CONF:VOLT:ON 5

CONF is a root command, VOLT is the first level branch and ON is the second level branch. The command is moved to the next level branch by each ":".

■ The semicolon ";" can combine multiple commands into one line, and return the command to the previous colon, which is equivalent to keeping the branch depth of the last jump.

Example: Combine the following two commands:

RES:RISE 10<nl>和

RES:L1 400<nl>

RES:RISE 10<nl>and

RES:L1 400<nl>

They can be combined into a command as follows:

RES:RISE 10;L1 400<nl>

■ Return to root level:

1. Enter the line feed character "<nl>" and line feed "LF".

2. Enter a semicolon and a colon ";:" consecutively.

Example: Return to root level

①(root):VOLT:L1:30<nl>

②(root):SPEC:VOLT:H 30；

L 5;:

(root):RES：L1 400;

RISE 1.5

6.1.4 RS485 Common command format

■RS485communication mode needs to be in the command prefix address：

①A001CURRent: STATic : L1 3

② A001 LOADON

③ A001FETC:VOLT?

To improve the delivery speed of the same parameters for multiple loads,the A000 address is added as the broadcast address.All loads can respond to this adress.

6.2 Common commands

***CLS Cear Status ***

Class: Setting state

Comment: *CLS command clears the following actions:

■ Clear the following registers

① State register of all channels

② Problem state register

③ Standard event state register

④ Operation state register

■ Clear error queue

Syntax:*CLS

Parameters: none

IDN？ Identification Query

Comment: This query command requires the electronic load to indicate the identity

Query syntax: *IDN？

Returned parameters: <addr>

Query example：*IDN?

Example of return: Ainuo,23606E- 600- 420,2007236000,0.20,1.00,1.00

String	Information
Ainuo	mAnufacture
23606E- 600- 420	Model
2007236000	Serial number
0.20	Version of FPGA
1.00	Version of ARM
1.00	Version of Display

RST Rest Command

Class: Setting state

Comment: This command sets the parameters as the default

Syntax:*RST

Parameters: none

SAV Save Command

Class: Setting state

Comment: This command stores the current set parameters of all channels of the electronic load in the memory

Syntax:*SAV

Parameters: none

6.3 Specific commands

6.3.1 MODE

MODE

Comment: Set the working mode.

Syntax:MODE <space><NRF>

Parameters: <CRD>,CCL,CCM,CCH,CVL,CVM,CVH,CRL,CRM,CRH,CPL,CPM,CPH,CCDL,CCDM,CCDH,BATL,BATM,BATH,OCPL,OCPM,OCPH,OPPL,OPPM,OPPH,LEDL.LEDM,LEDH,SHORTL,SHORTM,SHORTH

Example: MODE CCL: Set low range in CC mode.

MODE CCH Set high range in CC mode.

MODE CCDL Set low range in CCD mode.

MODE CCDH Set high range in CCD mode.

MODE CRL Set low range in CR mode.

MODE CRM Set high range in CR mode.

MODE CRH Set high range in CR mode.

Query syntax: MODE？

Returnedparameters:<CRD>,CCL,CCM,CCH,CVL,CVM,CVH,CRL,CRM,CRH,CPL,CPM,CPH,CCDL,CCDM,CCDH,BATL,BATM,BATH,OCPL,OCPM,OCPH

Query example： MODE？

6.3.2 LOAD

LOAD[:STATe]

Comment: Start/stop the load.

Syntax: LOAD[:STATe]<space><NRF>

Parameters: <NRF>,OFF|0,ON|1

Example: LOAD ON: start to load.

LOAD 0: stop the load.

Query syntax: LOAD[:SATAe]?

Returned parameters: <CRD>,OFF,ON

Query example： LOAD?

LOAD:PROTection?

Note: Query the status of the electronic load.
Setting syntax: LOAD:PROTection?
Setting parameters: None
Return parameter: <NR1>,[unit =None]
Example query: LOAD:PROT?
Return example: 0

description	COMM ERR	VCC ERR	FAN ERR	PARALL ERR	OTP ERR	I_MEA ERR	TEP ERR	OV_P ERR	SENSE ERR	MODEL ERR	OV_I ERR	REV ERR	LOAD ING	OV_U	LOAD
Value	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1	0

LOAD:PROTection:CLEar

Comment: Reset the state of the electronic load.
Syntax: LOAD:PROTection:CLEar
Parameters: None
Returned parameters: <NR1> [Unit=None]
Example: LOAD:PROT:CLE
Example of return: None

LOAD:SHORt[:STATe]

Comment: Enable/disable short circuit simulation.
Syntax: LOAD:SHORt[:STATe]<space><NRf>
Parameters: <NRf>, OFF | 0, ON | 1
Example: LOAD:SHOR ON: Enable Short simulation.
LOAD: SHOR OFF: Disable Short simulation.
Query syntax: LOAD:SHORt[:STATe]?
Returned parameters: <CRD>,OFF,ON
Query example： LOAD:SHOR?

LOAD:SHORt:KEY

Comment: Set Short mode of the electronic load.
Syntax: LOAD:SHORt:KEY<space><NRf>
Parameters: <NRf>, HOLD |0, TOGGLE | 1, DISABLE | 2
Example: LOAD:SHOR:KEY TOGGLE: Set Short mode to Toggle.
LOAD:SHOR: KEY HOLD: Set Short mode to Hold.
Query syntax: LOAD:SHORt:KEY?
Returned parameters: <CRD>, HOLD, TOGGLE
Query example： LOAD:SHOR:KEY?

LOAD:ID？

Comment: This query command requires the electronic load to indicate the identity
Query syntax: LOAD:ID?
Returned parameters: <addr>
Query example：*IDN?
Example of return: Ainuo,23606E- 600- 420,2007236000,0.20,1.00,1.00

String	Information
Ainuo	mAnufacture
23606E- 600- 420	Model
2007236000	Serial number
0.20	Version of FPGA
1.00	Version of ARM
1.00	Version of Display

6.3.3 CONFIGUER

CONFigure:VOLTage:ON

Note: Set the load starting voltage to “on”.

Syntax: CONFigure:VOLTage:ON<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: CONF:VOLT:ON 0.5 :Set Von=0.5V.
CONF:VOLT:ON 500mV :Set Voff=0.5V.
CONF:VOLT:ON MAX :Set Von=mAx.
CONF:VOLT:ON MIN :Set Von=Min.
Query syntax: CONFigure:VOLTage:ON?
Returned parameters: <NR2>,<unit=Volt>
Query example: CONFigure:VOLTage:ON?

CONFigure:VOLTage:OFF

Comment: Set the load starting voltage to "OFF".
Syntax: CONFigure:VOLTage:OFF<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: CON:VOLT:OFF 0.5: Set Voff = 0.5V.
CON:VOLT:OFF 500mV :Set Voff=0.5V.
CON:VOLT:OFF MAX:Set Voff = mAx.
CON:VOLT:OFF MIN:Set Voff = Min.
Query syntax: CONFigure:VOLTage:OFF?
Returned parameters: <NR2>,<unit=Volt>
Query example: CONFigure:VOLTage: OFF?

CONFigure:DIO:IN1

Description: Set the working mode of the digital port DIN_1.
Setting syntax: CONFigure:DIO:IN1<space><NR1>[suffix]
Setting parameters: <NR1>,0~2
0: NONE,
1: EXTERNAL LOAD ON/OFF
2: REMOTE INHIBIT
Setting example: CONF:DIO:IN1 2 Set DIN1 to REMOTE INHIBIT.
Query syntax: CONFigure: DIO: IN1?
Return parameters: < CRD >, 0~2
Query example: CONF:DIO:IN1?

CONFigure:DIO:IN2

Description: Set the working mode of the digital port DIN_2.
Setting syntax: CONFigure:DIO:IN2<space><NR1>[suffix]
Setting parameters: <NR1>,0~2
0: NONE,
1: EXTERNAL LOAD ON/OFF
2: REMOTE INHIBIT
Setting example: CONF:DIO:IN2 2 Set DIN2 to REMOTE INHIBIT.
Query syntax: CONFigure: DIO: IN2?
Return parameters: < CRD >, 0~2
Query example: CONF:DIO:IN2?

CONFigure:DIO:OUT1

Description: Set the working mode of the digital port DOUT_1.
Setting syntax: CONFigure:DIO:OUT1<space><NR1>[suffix]
Setting parameters: <NR1>,0~7
0: NONE (0)
1: OCP TEST PASS-H
2: OCP TEST FAIL-L
3: GONG TEST PASS-H
4: GONG TEST FAIL-L
5: OTP OVP OCP OPP REV-H
6: BUS CTRL ACTIVE-H
7: BUS CTRL ACTIVE-L
Setting example: CONF:DIO:OUT1 2 Set DIN1 to OCP TEST FAIL-L.
Query syntax: CONFigure: DIO: OUT 1?
Return parameters: < CRD >, 0~7

Query example: CONF:DIO: OUT 1?

CONFigure:DIO:OUT2

Description: Set the working mode of the digital port DOUT_2.
Setting syntax: CONFigure:DIO:OUT2<space><NR1>[suffix]
Setting parameters: <NR1>,0~7
0: NONE (0)
1: OCP TEST PASS-H
2: OCP TEST FAIL-L
3: GONG TEST PASS-H
4: GONG TEST FAIL-L
5: OTP OVP OCP OPP REV-H
6: BUS CTRL ACTIVE-H
7: BUS CTRL ACTIVE-L
Setting example: CONF:DIO:OUT2 2 Set DIN1 to OCP TEST FAIL-L.
Query syntax: CONFigure: DIO: OUT 2?
Return parameters: < CRD >, 0~7
Query example: CONF:DIO: OUT 2?

CONFigure:PARAllel:INITial

Description: Set the load to enter or exit parallel mode
Setting syntax: CONFigure: PARAllel: INITial < space > < CRD | NR1 > [last]
Setting parameters: <CRD|NR1>,OFF | 0,ON | 1
Setting example: CONF:PARA: INIT ON Sets the host to start and parallel the host
CONF:PARA: INIT 0 Enable the host to shut down and parallel the host
Query syntax: CONFigure: PARAllel: INITial?
Query example: <CRD>, OFF,ON
Example query: CONF:PARA: INIT?

CONFigure:PARAllel:MODE

Description: Set the parallel role
Setting syntax: CONFigure:PARAllel:MODE <space><CRD|NR1>[suffix]
Setting parameters: <CRD|NR1>,NONE|0,MASTER|1,SLAVE|2
Setting example: CONF:PARA:MODE MASTER Set the parallel role to host
CONF:PARA:MODE 0 Set the parallel role to off
Query syntax: CONFigure:PARAllel:MODE?
Query example: <CRD>, NONE,MASTER,SLAVE
Example query: CONF:PARA: MODE?

CONFigure:PARAllel:NUMber

Description: Set the number of parallel machines
Setting syntax: CONFigure:PARAllel: NUMber <space><NR1>[suffix]
Setting parameters: < NR1>,2~16
Setting example: CONF:PARA: NUM 3 Set the number of parallel machines to 3
CONF:PARA: NUM 4 Set the number of parallel machines to 4
Query syntax: CONFigure:PARAllel: NUMber?[<space><MAX|MIN>]
< NR1>,2~16
Query example: CONF:PARA: NUM?
CONF:PARA: NUM?MAX
CONF:PARA: NUM?MIN

6.3.4 CURRENT

CURRent:STATic:L1

Comment: Set the static load current in CC mode.
Syntax: CURRent:STATic:L1<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: CURR:STAT:L1 20: Set the static current L1=20A.
CURR:STAT:L1 10A: Set the static current L1=10A.
CURR:STAT:L1 MAX: Set the static current L1=MAX.
CURR:STAT:L1 MIN: Set the static current L1=MIN.
Query syntax: CURRent:STATic:L1?<space><MAX|MIN>

Returned parameters: <NR2>,[Unit=Ampere]
Query example： CURR:STAT:L1?
CURR:STAT:L1? MAX
CURR:STAT:L1? MIN

CURRent:STATic:RISE

Comment: Set the rising slope in CC mode.
Syntax: CURRent:STATic:RISE<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: CURR:STAT: RISE 2.5 Set the rising slope RISE=2.5A/μs。
CURR:STAT: RISE 1A/μs:Set the rising slope RISE =1 A/μs.
CURR:STAT: RISE MAX :Set the rising slope RISE =MAX.
CURR:STAT: RISE MIN :Set the rising slope RISE =MIN.
Query syntax: CURRent:STATic: RISE? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Ampere]
Query example： CURR:STAT:RISE?
CURR:STAT:RISE? MAX
CURR:STAT:RISE? MIN

CURRent:STATic:FALL

Comment: Set the falling slope in CC mode.
Syntax: CURRent:STATic:FALL<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: CURR:STAT: FALL 2.5: Set the rising slope FALL =2.5A/μs.
CURR:STAT: FALL 1A/μs: Set the rising slope FALL =1 A/μs.
CURR:STAT: FALL MAX :Set the rising slope FALL =MAX.
CURR:STAT: FALL MIN :Set the rising slope FALL =MIN.
Query syntax: CURRent:STATic:FALL? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Ampere]
Query example： CURR:STAT:FALL?
CURR:STAT:FALL? MAX
CURR:STAT:FALL? MIN

CURRent:STATic:VRNG

Comment: Set the voltage range in CC mode.
Syntax: CURRent:STATic: VRNG<space><CRD|NR1>
Parameters: <CRD|NR1>,LOW|L|0,MIDDLE|M|1,HIGH|H|2
Example: CURR:STAT: VRNG HIGH: Set the voltage range to High.
CURR:STAT: VRNG M: Set the voltage range to Middle.
CURR:STAT: VRNG 0: Set the voltage range to Low.
Query syntax: CURRent:STATic:VRNG?
eturned parameters: <CRD>,LOW,MIDDLE,HIGH [Unit=None]
Query example： CURR:STAT:VRNG?

CURRent:DYNamic:L1

Comment: Set the load current during T1 in dynamic CC mode.
Syntax: CURRent:DYNamic:L1<space><NRf+>[suffix]
Example: Refer to the instruction for valid range.
CURR:DYN:L1 20: Set the dynamic load parameter L1 = 20A.
CURR:DYN:L1 10A: Set the dynamic load parameter L1 = 10A.
CURR:DYN:L1 MAX: Set the dynamic load parameter L1 = mAx.
CURR:DYN:L1 MIN: Set the dynamic load parameter L1 = Min.
Query syntax: CURRent:DYNamic:L1? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Ampere]
Query example： CURR:DYN: L1?
CURR:DYN: L1? MAX
CURR:DYN: L1? MIN

CURRent:DYNamic:L2

Comment: Set the load current during T2 in dynamic CC mode.
Syntax: CURRent:DYNamic:L2<space><NRf+>［suffix］

Parameters: Refer to the instruction for valid range.
Example: CURR:DYN:L2 20: Set the dynamic load parameter L2 = 20A.
CURR:DYN:L2 10A: Set the dynamic load parameter L2 = 10A.
CURR:DYN:L2 MAX: Set the dynamic load parameter L2 = mAx.
CURR:DYN:L2 MIN: Set the dynamic load parameter L2 = Min.
Query syntax: CURRent:DYNamic:L2? <space><MAX|MIN>v
Returned parameters: <NR2>,[Unit=Ampere]
Query example： CURR:DYN:L2?
CURR:DYN:L2? MAX
CURR:DYN:L2? MIN

CURRent:DYNamic:T1

Comment: Set the period parameter T1 in dynamic CC mode.
Syntax: CURRent:DYNamic:T1<space><NRf+>［suffix］
Parameters: <NRf+>, 20us ~100000ms,resolution=1 g,Unit=Second
Example: BATT:RISE 0.1 Set slope =0.1A/μs
CURR:DYN:T1 0.5: Set the dynamic period T1 = 500ms.
CURR:DYN:T1 MAX: Set the dynamic period T1 to mAx.
CURR:DYN:T1 MIN: Set the dynamic period T1 to Min.
Query syntax: CURRent:DYNamic:T1? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Second]
Query example： CURR:DYN:T1?
CURR:DYN:T1? MAX
CURR:DYN:T1? MIN

CURRent:DYNamic: T2

Comment: Set the period parameter T12in dynamic CC mode.
Syntax: CURRent:DYNamic:T2<space><NRf+>[suffix]
Parameters: <NRf+>, 20us ~ 100000ms,resolution=1us,Unit=Second
Example: CURR:DYN:T2 10ms: Set the dynamic period T2 = 10ms.
CURR:DYN:T2 0.5: Set the dynamic period T2 = 500ms.
CURR:DYN:T2 MAX: Set the dynamic period T2 to mAx.
CURR:DYN:T2 MIN: Set the dynamic period T2 to Min.
Query syntax: CURRent:DYNamic:T2? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Second]
Query example： CURR:DYN:T2?
CURR:DYN:T2? MAX
CURR:DYN:T2? MIN

CURRent:DYNamic:REPeat

Comment: Set repeat times in dynamic CC mode.
Syntax: CURRent:DYNamic:REPeat<space><NRf+>
Parameters: <NRf+>, 0 ~ 100000,resolution=1,Unit=None
Example: CURR:DYN:REP 500: Set the number of repeats = 500.
CURR:DYN:REP MAX: Set the number of repeats = mAx.
CURR:DYN:REP MIN: Set the number of repeats = Min.
Query syntax: CURRent:DYNamic:REPeat? <space><MAX|MIN>
Returned parameters: <NR1> [Unit=None]
Query example： CURR:DYN:REP?
CURR:DYN:REP? MAX
CURR:DYN:REP? MIN

CURRent:DYNamic:RISE

Comment: Set the current rising slope in dynamic CC mode.
Syntax: CURRent:DYNamic:RISE<space><NRf+>［suffix］
Refer to the instruction for valid range.
Example: CURR:DYN:RISE 2.5: Set the rising slope to 2.5A/us.
CURR:DYN:RISE 1A/us: Set the rising slope to 1A/us.
CURR:DYN:RISE MAX: Set the rising slope to the mAx. of dynamic load.
CURR:DYN:RISE MIN: Set the rising slope to the Min. of dynamic load.

Query syntax: CURRentDYNamic:RISE? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: CURR:DYN:RISE?
CURR:DYN:RISE?MAX
CURR:DYN:RISE?MIN

CURRent:DYNamic:FALL

Comment: Set the current falling slope in dynamic CC mode.
Syntax: CURRent:DYNamic:FALL<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: CURR:DYN:FALL 2.5: Set the falling slope to 2.5A/us.
CURR:DYN:FALL 1A/us: Set the falling slope to 1A/us.
CURR:DYN:FALL MAX: Set the falling slope to the mAx. of dynamic load.
CURR:DYN:FALL MIN: Set the falling slope to the Min. of dynamic load.
Query syntax: CURRentDYNamic:FALL?<space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: CURR:DYN:FALL?
CURR:DYN:FALL?MAX
CURR:DYN:FALL?MAX

CURRent:DYNamic: VRNG

Comment: Set the voltage measurement range in CCD mode.
Syntax: CURRent:DYNamic:VRNG<space><CRD | NR1>
Parameters: <CRD | NR1>, LOW |L|0, MIDDLE | M | 1, HIGH |H|2
Example: CURR:DYN:VRNG HIGH: Set the voltage range to High
CURR:DYN:VRNG M :Set the voltage range to Middle.
CURR:DYN:VRNG 0: Set the voltage range to Low.
Query syntax: CURRent:DYNamic:VRNG?
Returned parameters: <CRD>,LOW,MIDDLE,HIGH [Unit=None]
Query example: CURR:DYN:VRNG?

6.3.5 RESISTANCE

RESistance:STATic:L1

Comment: Set the static resistance level in CR mode
Syntax: RESistance:STATic:L1<space><NRf+>［suffix］
Parameters: Refer to the instruction for valid range.
Example: RES:STAT:L1 20: Set L1 constant resistance = 20Ω.
RES:STAT:L1 10 OHM: Set L1 constant resistance = 10Ω.
RES:STAT:L1 MAX :Set L1 constant resistance = MAX.
RES:STAT:L1 MIN :Set L1 constant resistance = MIN.
Query syntax: RESistance:STATic:L1?<space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Ohm]
Query example: RES:STAT:L1?
RES:STAT:L1?MAX
RES:STAT:L1?MIN

RESistance:STATic:RISE

Comment: Set the current rising slope in CR mode.
Syntax: RESistance:STATic:RISE<space><NRf+ >［suffix]
Parameters: Refer to the instruction for valid range.
Example: RES: STAT: RISE 2.5: Set the rising slope to 2.5A/us
RES:STAT:RISE 1A/us: Set the rising slope to 1A/us.
RES:STAT:RISE MAX:Set the falling slope to mAx. static load.
RES:STAT:RISE MIN: Set the falling slope to Min. static load.
Query syntax: RESistance:STATic:RISE? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: RES:STAT:RISE?
RES:STAT:RISE? MAX

RES:STAT:RISE? MIN

RESistance:STATic:FALL

Comment: Set the current falling slope in CR mode.
Syntax: RESistance:STATic:FALL<space><NRf+>[suffix]
Example: Refer to the instruction for valid range.
Example: RES:STAT:FALL 2.5: Set the falling slope to 2.5A/us
RES:STAT:FALL 1A/us: Set the falling slope to 1A/us.
RES:STAT:FALL MAX: Set the falling slope to MAX. static load.
RES:STAT:FALL MIN: Set the falling slope to Min. static load.
Query syntax: RESistance:STATic:FALL? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: RES:STAT:FALL?
RES:STAT:FALL? MAX
RES:STAT:FALL? MIN

RESistance:STATic:IRNG

Comment: Set the current measurement range in CR mode
Syntax: RESistance:STATic:IRNG<space><CRD|NR1>
Parameters: <CRD | NR1>, LOW |L|0, MIDDLE |M| 1, HIGH | H|2
Example: RES:STAT:IRNG HIGH: Set the current range to High
RES:STAT:IRNG M: Set the current range to Middle.
RES:STAT:IRNG 0: Set the current range to Low.
Query syntax: RESistance:STATic:IRNG?
Returned parameters: <CRD>,LOW,MIDDLE,HIGH [Unit=None]
Query example: RES:STAT:IRNG?

RESistance:DYNamic:L1

Comment: Set the load RESistance during T1 in dynamic CR mode.
Syntax: RESistance:DYNamic:L1<space><NRf+>[suffix]
Example: Refer to the instruction for valid range.
CURR:DYN:L1 20 : Set the dynamic load parameter L1 = 20Ω.
CURR:DYN:L1 10 OHM : Set the dynamic load parameter L1 = 10Ω.
CURR:DYN:L1 MAX : Set the dynamic load parameter L1 = mAx.
CURR:DYN:L1 MIN : Set the dynamic load parameter L1 = Min.
Query syntax:
RESistance:DYNamic:L1? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Ohm]
Query example:
CURR:DYN: L1?
CURR:DYN: L1? MAX
CURR:DYN: L1? MIN

RESistance:DYNamic:L2

Comment: Set the load RESistance during T2 in dynamic CR mode.
Syntax: RESistance:DYNamic:L2<space><NRf+>［suffix］
Parameters: Refer to the instruction for valid range.
Example: CURR:DYN:L2 20 : Set the dynamic load parameter L2 = 20Ω.
CURR:DYN:L2 10OHM : Set the dynamic load parameter L2 = 10Ω.
CURR:DYN:L2 MAX : Set the dynamic load parameter L2 = mAx.
CURR:DYN:L2 MIN : Set the dynamic load parameter L2 = Min.
Query syntax:
RESistance:DYNamic:L2? <space><MAX|MIN>v
Returned parameters: <NR2>,[Unit=Ohm]
Query example:
CURR:DYN:L2?
CURR:DYN:L2? MAX
CURR:DYN:L2? MIN

RESistance:DYNamic:T1

Comment: Set the period parameter T1 in dynamic CR mode.
Syntax: RESistance:DYNamic:T1<space><NRf+>［suffix］
Parameters: <NRf+>, 20us ~100000ms,resolution=1us,Unit=Second
Example: BATT:RISE 0.1 :Set slope =0.1A/μs
CURR:DYN:T1 0.5 : Set the dynamic period T1 = 500ms.
CURR:DYN:T1 MAX : Set the dynamic period T1 to mAx.
CURR:DYN:T1 MIN : Set the dynamic period T1 to Min.
Query syntax:
RESistance:DYNamic:T1? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Second]
Query example： CURR:DYN:T1?
CURR:DYN:T1? MAX
CURR:DYN:T1? MIN

RESistance:DYNamic: T2

Comment: Set the period parameter T12in dynamic CR mode.
Syntax: RESistance:DYNamic:T2<space><NRf+>[suffix]
Parameters: <NRf+>, 20us ~ 100000ms,resolution=1us,Unit=Second
Example: CURR:DYN:T2 10ms : Set the dynamic period T2 = 10ms.
CURR:DYN:T2 0.5 : Set the dynamic period T2 = 500ms.
CURR:DYN:T2 MAX : Set the dynamic period T2 to mAx.
CURR:DYN:T2 MIN : Set the dynamic period T2 to Min.
Query syntax: RESistance:DYNamic:T2? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=Second]
Query example： CURR:DYN:T2?
CURR:DYN:T2? MAX
CURR:DYN:T2? MIN
RESistance:DYNamic:REPeat
Comment: Set repeat times in dynamic CR mode.
Syntax: RESistance:DYNamic:REPeat<space><NRf+>
Parameters: <NRf+>, 0 ~ 100000,resolution=1,Unit=None
Example: CURR:DYN:REP 500: Set the number of repeats = 500.
CURR:DYN:REP MAX: Set the number of repeats = mAx.
CURR:DYN:REP MIN: Set the number of repeats = Min.
Query syntax: RESistance:DYNamic:REPeat? <space><MAX|MIN>
Returned parameters: <NR1> [Unit=None]
Query example： CURR:DYN:REP?
CURR:DYN:REP? MAX
CURR:DYN:REP? MIN

RESistance :DYNamic:RISE

Comment: Set the RESistance rising slope in dynamic CR mode.
Syntax: RESistance:DYNamic:RISE<space><NRf+>［suffix］
Refer to the instruction for valid range.
Example: CURR:DYN:RISE 2.5: Set the rising slope to 2.5A/us.
CURR:DYN:RISE 1A/us: Set the rising slope to 1A/us.
CURR:DYN:RISE MAX: Set the rising slope to the mAx. of dynamic load.
CURR:DYN:RISE MIN: Set the rising slope to the Min. of dynamic load.
Query syntax: RESistanceDYNamic:RISE? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example： CURR:DYN:RISE?
CURR:DYN:RISE?MAX
CURR:DYN:RISE?MIN

RESistance :DYNamic:FALL

Comment: Set the RESistance falling slope in dynamic CR mode.
Syntax: RESistance:DYNamic:FALL<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: CURR:DYN:FALL 2.5: Set the falling slope to 2.5A/us.

CURR:DYN:FALL 1A/us: Set the falling slope to 1A/us.
CURR:DYN:FALL MAX: Set the falling slope to the mAx. of dynamic load.
CURR:DYN:FALL MIN: Set the falling slope to the Min. of dynamic load.
Query syntax: RESistanceDYNamic:FALL?<space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: CURR:DYN:FALL?
CURR:DYN:FALL?MAX
CURR:DYN:FALL?MAX

RESistance:DYNamic: IRNG

Comment: Set the Currentmeasurement range in CRD mode.
Syntax: RESistance:DYNamic:VRNG<space><CRD | NR1>
Parameters: <CRD | NR1>, LOW |L|0, MIDDLE | M | 1, HIGH |H|2
Example: CURR:DYN:VRNG HIGH: Set the voltage range to High
CURR:DYN:VRNG M :Set the voltage range to Middle.
CURR:DYN:VRNG 0:Set the voltage range to Low.
Query syntax: RESistance:DYNamic:IRNG?
Returned parameters: <CRD>,LOW,MIDDLE,HIGH [Unit=None]
Query example: CURR:DYN:VRNG?

6.3.6 VOLTAGE

VOLTage:STATic:L1

Comment: Set the static load voltage in CV mode
Syntax: VOLTage:STATic:L1<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: VOLT:STAT:L1 8: Set static voltage L1=20V
VOLT:STAT:L1 24V:Set the static voltage L1=10V
VOLT:STAT:L1 MAX :Set the static voltage L1=MAX.
VOLT:STAT:L1 MIN :Set the static voltage L1=MIN.
Query syntax: VOLTage:STATic:L1? <space><MAX|MIN>
Returned parameters: <NR2>, [Unit=Volt]
Query example: VOLT:STAT:L1? MAX
VOLT:STAT:L1? MIN

VOLTage:STATic:ILIMIT

Comment: Set the current limit in CV mode
Syntax: VOLTage:STATic:ILIMit<space><NRF>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: VOLT:STAT:ILIM 3:Set the limit source current in CV mode ILIM =3A.
VOLT:STAT: ILIM MAX: Set the limit source current ILIM in CV mode to the mAx.
VOLT:STAT: ILIM MIN: Set the limit current ILIM in CV mode to the Min.
Query syntax: VOLTage:STATic:ILIMIT? <space><MAX|MIN>
Returned parameters: <NR2>, [Unit=Ampere]
Query example: VOLT:STAT:ILIM?
VOLT:STAT:ILIM? MAX
VOLT:STAT:ILIM? MIN

VOLTage:STATic:RESpone

Comment: Set the response speed of CV mode
Syntax: VOLTage:STATic: RESpone<space><NRF>
Parameters: <NRf>,SLOW|0,NORMAL|1,FAST|2
Example: VOLT:STAT:RES FAST
VOLT:STAT: RES 0
Query syntax: VOLTage:STATic:RESpone?
Returned parameters: <CRD>,SLOW,NORMAL,FAST
Query example: VOLT:STAT:RES?

VOLTage:STATic:IRANG

Comment: Set the current range of V mode
Syntax: VOLTage:STATic:IRANG<space><CRD|NR1>

Parameters: <CRD|NR1>,LOW|L|0,MIDDLE|M|1,HIGH|H|2
Example: VOLT:STAT: IRANG HIGH: Set the current range to High
VOLT:STAT: IRANG M:Set the current range to Middle.
VOLT:STAT: IRANG 0 :Set the current range to Low.
Query syntax: VOLTage:STATic:IRANG?
Returned parameters: <CRD>,LOW,MIDDLE,HIGH [Unit=None]
Query example: VOLT:STAT: IRANG?

6.3.7 POWER

POWer:STATic:L1
Comment: Set the static load power in CP mode
Syntax: POWer:STATic:L1<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: POW:STAT:L1 20: Set load parameter L1 = 20W
OW:STAT:L1 10W: Set load parameter L1 = 10W
POW:STAT:L1 MAX :Set load parameter L1 = MAX.
POW:STAT:L1 MIN :Set load parameter L1 = MIN.
Query syntax: POWer:STATic:L1? <space><MAX|MIN>
Returned parameters: <NR2>, [Unit=Watt]
Query example: POW:STAT:L1? MAX
POW:STAT:L1? MIN
POWerSTATic:RISE
Comment: Set the current rising slope in CP mode
Syntax: POWer:STATic:RISE<space><NRf+>［suffix］
Parameters: Refer to the instruction for valid range.
Example: POW:STAT:RISE 2.5: Set the rising slope to 2.5A/μs
POW:STAT:RISE 1A/RS: Set the rising slope to 1A/μs
POW:STAT:RISE MAX :Set the rising slope to the mAx. of dynamic load.
POW:STAT:RISE MIN :Set the rising slope to the MIN. of dynamic load.
Query syntax: POWerSTATic:RISE? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: POW:STAT:RISE?
POW:STAT:RISE? MAX
POW:STAT:RISE? MIN
POWerSTATic:FALL
Comment: Set the current falling slope in CP mode
Syntax: POWer:STATic:FALL<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: POW:STAT:FALL 2.5: Set the falling slope to 2.5A/μs
POW: STAT: FALL 1A/Us: Set the falling slope to 1A/μs
POW:STAT:FALL MAX Set the falling slope to MAX
POW:STAT:FALL MIN Set the falling slope to MIN.
Query syntax: POWerSTATic:FALL? <space><MAX|MIN>
Returned parameters: <NR2>,[Unit=A/μS]
Query example: POW:STAT:FALL?
POW:STAT:FALL? MAX
POW:STAT:FALL? MIN
POWerSTATic:VRNG
Comment: Set the voltage measurement range in CP mode.
Syntax: POWer:STATic:VRNG<space><CRD | NR1>
Parameters: <CRD | NR1>, LOW |L|0, MIDDLE |M| 1, HIGH |H|2
Example: POW:STAT:VRNG HIGH: Set the voltage range to High.
POW:STAT:VRNG M: :Set the voltage range to Middle.
POW:STAT:VRNG 0 :Set the voltage range to Low
Query syntax: POWerSTATic:VRNG?
Returned parameters: <CRD>,LOW,MIDDLE,HIGH [Unit=None]

Query example： POW:STAT:VRNG?

6.3.8 BATTERY

[ADVance:]BATTery:MODE

Comment: Set the execution mode in battery discharge mode.
Syntax: [ADVance:]BATTery:MODE<space><CRD | NR1>
Parameters: <CRD|NR1>,CC|0, CR| 1,CP|2
Example: BATT: MODE CC: Set execution mode = CC
BATT: MODE 2: Set execution mode = CP
Query syntax: [ADVance:]BATTery:MODE?
Returned parameters: <CRD>,CC,CR,CP [Unit=None]
Query example： BATT: MODE?

[ADVance:]BATTery:VALue

Comment: Set the load value of the execution mode in battery discharge mode.
Syntax: [ADVance:]BATT ery: VALue<space>< N Rf+>[Suffix]
Parameters: Refer to the instruction for valid range.
Example:
When BATT:MODE is set to CC mode:
BATT:VAL 0.5 :Set current = 0.5A.
BATT:VAL 500mA :Set current = 0.5A.
BATT:VAL MAX :Set current=MAX.
BATT:VAL MIN :Set current=MIN.
When BATT:MODE is set to CR mode:
BATT:VAL 0.5 :Set resistance = 0.5Ω.
BATT:VAL 500mQ ::Set resistance = 0.5Ω.
BATT:VAL MAX :Set resistance=MAX.
BATT:VAL MIN :Set resistance=MIN.
When BATT:MODE is set to CP mode:
BATT:VAL 0.5 :Set power = 0.5W.
BATT:VAL 500mW :Set power = 0.5W.
BATT:VAL MAX :Set power =MAX.
BATT:VAL MIN :Set power =MIN.
Query syntax: [ADVance:]BATTery:VALue? <space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere|Ohm|Walt]
Query example： BATT: VAL?
BATT: VAL?MAX
BATT: VAL?MIN

[ADVance:]BATTery:RISE

Comment: Set the rising slope of current in battery discharge mode.
Syntax: [ADVance:]BATTery:RISE<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: BATT:RISE 0.1 :Set slope =0.1A/s.
BATT: RISE 100mA/μs: Set slope = 0.1A/μs
BATT:RISE MIN: Set slope= MAX.
BATT:RISE MIN: Set slope= Min.
Query syntax: [ADVance:]BATTery:RISE? <space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere|Ohm|Walt]
Query example： BATT: RISE?
BATT: RISE?MAX
BATT: RISE?MIN

[ADVance:]BATTery:FALL

Comment: Set the falling slope of current in battery discharge mode.
Syntax: [ADVance:]BATTery:FALL<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: BATT:FALL 0.1: Set slope = 0.1A/μs.
BATT:FALL 100mA/μs: Set slope=0.1A/μs.

BATT:FALL MAX: Set slope= mAx.
BATT:FALL MIN: Set slope= Min.
Query syntax: [ADVance:]BATTery:FALL? <space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere|Ohm|Walt]
Query example： BATT: FALL?
BATT: FALL?MAX
BATT: FALL?MIN

[ADVance:]BATTery:ENDVoltage

Comment: Set the end voltage in battery discharge mode.
Syntax: [ADVance:]BATTery:ENDVoltage<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: BATT:ENDV0.5: Set end voltage=0.5V.
BATT:ENDV 500mV: Set end voltage=0.5V.
BATT:ENDV MAX: Set end voltage=MAX.
BATT:ENDV MIN: Set end voltage=MIN.
Query syntax: [ADVance:]BATTery:ENDVoltage?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Volt]
Query example： BATT:ENDVoltage?
BATT:ENDVoltage?MAX
BATT:ENDVoltage?MIN

[ADVance:]BATTery:TOUT

Comment: Set the timeout time in battery discharge mode.
Syntax: [ADVance:]BATTery:TOUT<space><NRf+>[suffix]
Parameters: <NRf+>, 0s~100000s,resolution= 1s,Unit=Second
Example: BATT:TOUT 100: Set pause time=100s.
BATT: TOUT MAX: Set pause time = mAx.
BATT: TOUT MIN: Set pause time = Min.
Query syntax: [ADVance:]BATTery:ENDVoltage?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Volt]
Query example： BATT:ENDVoltage?
BATT:ENDVoltage?MAX
BATT:ENDVoltage?MIN

6.3.9 OCP

[ADVance:]OCP:STARt

Comment: Set the starting current in OCP test mode.
Syntax:[ADVance:]OCP:STARt<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OCP:STAR 0.5: Set start current=0.5A.
OCP: STAR 500mA: Set start current = 0.5A.
OCP: STAR MAX :Set start current = max.
OCP: STAR MIN :Set start current = min.
Query syntax: [ADVance:]OCP:STARt?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： OCP:STAR?
OCP:STAR?MAX
OCP:STAR?MIN

[ADVance:]OCP:END

Comment: Set the end current in OCP test mode.
Syntax: [ADVance:]OCP:END<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OCP:END 0.5: Set end current = 0.5A.
OCP:END 500mA: Set end current=0.5A.
OCP:END MAX :Set end current=MAX.
Query syntax: [ADVance:]OCP: END?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]

Query example： OCP: END?
OCP: END?MAX
OCP: END?MIN

[ADVance:]OCP:STEP

Comment: Set the number of steps of OCP test mode.
Syntax: [ADVance:]OCP:STEP<space><NRf+>
Parameters: <NRf+>, 1 ~ 1000, resolution=1, unit=None
Example: OCP:STEP 500: Set the number of steps=500.
OCP:STEP MAX :Set the number of steps=MAX.
OCP:STEP MIN: Set the number of steps=Min.
Query syntax: [ADVance:]OCP: STEP?<space><MAX|MIN>
Returned parameters: <NR1> [Unit=None]
Query example： OCP: STEP?
OCP: STEP?MAX
OCP: STEP?MIN

[ADVance:]OCP:DWELI

Comment: Set the step residence time in OCP test mode.
Syntax: [ADVance:]OCP:DWELI<space><NRf+>[suffix]
Parameters: <NRf+>, 20μs ~ 100000ms,resolution=10μs,unit=Second
Example: OCP:DWEL 0.5: Set end time=500ms.
OCP:DWEL 2: Set end time=2000ms.
OCP:DWEL MAX: Set end time=MAX.
OCP:DWEL MIN :Set end time=MIN.
Query syntax: [ADVance:]OCP: DWELI?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Second]
Query example： OCP: DWELI?
OCP: DWELI?MAX
OCP: DWELI?MIN

[ADVance:]OCP:TRIGger:VOLTage

Comment: Set the trigger voltage in OCP test mode.
Syntax: [ADVance:]OCP:TRIGger:VOLTage<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OCP:TRIG:VOLT 0.5: Set trigger voltage=0.5V. OCP:TR1G:VOLT 500mV: Set trigger voltage=0.5V.
OCP:TRIG:VOLT MAX :Set trigger voltage = MAX.
OCP:TRIG:VOLT MIN: Set trigger voltage = Min.
Query syntax: [ADVance:]OCP:TRIGger:VOLTage?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Volt]
Query example： OCP:TRIGger:VOLTage?
OCP:TRIGger:VOLTage?MAX
OCP:TRIGger:VOLTage?MIN

[ADVance:]OCP:SPECification:H

Comment: Set the high-level current for current specification detection in OCP test mode.
Syntax: [ADVance:]OCP:SPECification:H<space><NRf+>[suffix]
Example: Refer to the instruction for valid range.
Example: OCP:SPEC:H 0.5: Set high level current = 0.5A.
OCP:SPEC:H 500mA: Set high level current = 0.5A.
OCP:SPEC:H MAX :Set high level current = MAX.
OCP:SPEC:H MIN :Set high level current = MIN.
Query syntax: [ADVance:]OCP:SPECification:H?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： OCP:SPEC:H?
OCP:SPEC:H?MAX
OCP:SPEC:H?MIN

[ADVance:]OCP:SPECification:L

Comment: Set the low-level current for current specification detection in OCP test mode.

Syntax: [ADVance:]OCP:SPECification:L<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OCP:SPEC:L 0.5: Set low level current = 0.5A.
OCP:SPEC:L 500mA:Set low level current = 0.5A.
OCP:SPEC:L MAX :Set low level current = MAX.
OCP:SPEC:L MIN :Set low level current = MIN.
Query syntax: [ADVance:]OCP:SPECification:H?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example: OCP:SPEC:L?
OCP:SPEC:L?MAX
OCP:SPEC:L?MIN

[ADVance:]OCP:LATCh

Comment: Set latch function in OCP test mode.
Syntax: [ADVance:]OCP:LATCh<space><CRD | NR1>
Parameters: <CRD|NR1>, OFF|0, ON | 1
Example: OCP:LATC OFF: Set latch = OFF
OCP:LATC 1: Set latch = ON.
Query syntax: [ADVance:]OCP:LATCh?
Returned parameters: <CRD>OFF,ON [Unit=None]
Query example: OCP:LATCh?

[ADVance:]OCP:RESult?

Comment: Return OCP test result.
Syntax: none
Parameters: none
Example: none
Query syntax: [ADVance:]OCP:RESult?
Returned parameters: <arg1><arg2>,<arg3>
<arg1> : Pass/Fail. <NR1>, 0: PASS 1: FAIL [Unit=None]
<arg2>: OCP current <NR2>,[unit=Ampere]
When the return value is
-1, -1: OCP test stops.
-2, -2: OCP test is ready to be executed, meeting Von or other conditions.
-3, -3: OCP test has been executed.
Query example: OCP:RES?
Example of return: 0,14.999,140

6.3.10 OPP

[ADVance:]OPP:STARt

Comment: Set the starting power in OPP test mode.
Syntax: [ADVance:]OPP:STARt<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OPP:STAR 100: Set start power = 100W.
OPP: STAR 500mw: Set start power = 0.5W.
OPP:STAR MAX :Set start power = MAX.
OPP:STAR MIN :Set start power = MIN.
Query syntax: [ADVance:] OPP:STARt?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example: OPP:STAR?
OPP:STAR?MAX
OPP:STAR?MIN

[ADVance:]OPP:END

Comment: Set the end power in OPP test mode.
Syntax: [ADVance:]OPP:END<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OPP:END 100: Set end power = 100W.
OPP: END 500mW:Set end power = 0.5W.

OPP:END MAX :Set end power = MAX.
OPP:END MIN :Set end power = MIN.
Query syntax: [ADVance:] OPP: END?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： OPP: END?
OPP: END?MAX
OPP: END?MIN

[ADVance:]OPP:STEP

Comment: Set the number of steps in OPP test mode.
Syntax: [ADVance:]OPP:STEP<space><NRf+>
Parameters: <NRf+>, 1 ~ 1000,resolution=1,Unit=None
Example: OPP:STEP 500: Set the number of steps=500.
OPP:STEP MAX :Set the number of steps=MAX.
OPP: STEP MIN: Set the number of steps = Min.
Query syntax: [ADVance:]OPP:STEP?<space><MAX|MIN>
Returned parameters: <NR1> [Unit=None]
Query example： OPP:STEP?
OPP:STEP?MAX
OPP:STEP?MIN

[ADVance:]OPP:DWELI

Comment: Set the step residence time in OPP test mode.
Syntax: [ADVance:]OPP:DWELI<space><NRf+>[suffix]
Parameters: <NRf+>, 10μs ~ 1s,resolution=10μs,Unit=Second
Example: OPP:DWEL 0.5: Set end time=0.5s.
OPP: DWEL 500ms: Set end time = 0.5s.
OPP:DWEL MAX :Set end time=MAX.
OPP:DWEL MIN :Set end time=MIN.
Query syntax: [ADVance:] OPP: DWELI?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Second]
Query example： OPP: DWELI?
OPP: DWELI?MAX
OPP: DWELI?MIN

[ADVance:]OPP:TRIGger:VOLTage

Comment: Set the trigger voltage in OPP test mode.
Syntax: [ADVance:]OPP:TRIGger:VOLTage<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OPP:TRIG:VOLT 0.5: Set trigger voltage=0.5V.
OPP:TRIG:VOLT 500mV: Set trigger voltage=0.5V.
OPP:TRIG:VOLT MAX :Set trigger voltage = MAX.
OPP:TRIG:VOLT MIN :Set trigger voltage = MIN.
Query syntax: [ADVance:] OPP:TRIGger:VOLTage?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Volt]
Query example： OPP:TRIGger:VOLTage?
OPP:TRIGger:VOLTage?MAX
OPP:TRIGger:VOLTage?MIN

[ADVance:]OPP:SPECification:H

Comment: Set the high-level power for power detection in OPP test mode.
Syntax: [ADVance:]OPP:SPECification:H<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OPP:SPEC:H 0.5: Set high level power = 0.5W.
OPP:SPEC:H 500mW:Set high level power = 0.5W.
OPP:SPEC:H MAX :Set high level power = MAX.
OPP:SPEC:H MIN :Set high level power = MIN.
Query syntax: [ADVance:] OPP:SPECification:H?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： OPP:SPEC:H?
OPP:SPEC:H?MAX

OPP:SPEC:H?MIN

[ADVance:]OPP:SPECification:L

Comment: Set the low-level power of power detection in OPP test mode.
Syntax: [ADVance:]OPP:SPECification:L<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: OPP:SPEC:L 0.5: Set low level power = 0.5W
OPP:SPEC:L 500mW: Set low level power = 0.5W.
OPP:SPEC:L MAX :Set low level power = MAX.
Query syntax: [ADVance:] OPP:SPECification:L?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： OPP:SPEC:L?
OPP:SPEC:L?MAX
OPP:SPEC:L?MIN

[ADVance:]OPP:LATCh

Comment: Set the load latch function in OPP test mode.
Syntax: [ADVance:]OPP:LATCh<space><CRD | NR1>
Parameters: <CRD | NR1>, OFF | 0, ON | 1
Example: OPP:LATC OFF: Set latch = OFF
OPP:LATC 1: Set latch = ON
Query syntax: [ADVance:]OPP:LATCh?
Returned parameters: <CRD>OFF,ON [Unit=None]
Query example： OPP:LATCh?

[ADVance:]OPP:RESult?

Comment: Return OPP test result.
Syntax: none
Parameters: none
Example: None
Query syntax: [ADVance:]OPP:RESult?
Returned parameters: <arg1><arg2>
<arg1>: Pass/Fail <NR1>, 0: PASS 1: FAIL [Unit=None]
<arg2>: OPP power <NR2>,[unit=Watt]
When the return value is
-1, -1,-1: OPP test stops.
-2, -2,-2: OPP test is ready to be executed, meeting Von or other conditions.
-3, -3,-3: OPP test has been executed.
Query example： OPP:RES?
Example of return:PASS,10

6.3.11 IMPEDANCE(FLEX)

[ADVance:]IMPedance:STATic:CL

Comment: Set the equivalent parallel load capacitance in constant impedance mode.
Syntax: [ADVance:]IMPedance:STATic:CL<space><NRf+>[suffix]
Parameters: <NRf+>, 30uF-50,000uF, resolution =1uF, unit = Farad
Example: IMP:STAT:CL 0.02: Set capacitance = 20mF.
IMP:STAT:CL 100uF:Set capacitance = 100uF.
IMP:STAT:CL MAX :Set capacitance=MAX.
IMP:STAT:CL MIN: Set capacitance = Min.
Query syntax: [ADVance:]IMPedance:STATic:CL? space><MAX|MIN>
Returned parameters: <NR2> [Unit=Farad]
Query example： IMP:STAT:CL?
IMP:STAT:CL?MAX
IMP:STAT:CL?MIN

[ADVance:]IMPedance:STATic:LS

Comment: Set the equivalent serial inductance in constant impedance mode.
Syntax: ADVance:］IMPedance:STATic:LS<space><NRf+>［suffix］

Example: <NRf+>, 0.1 ~ 20.0uH, resolution=0.1 uH, unit = Henry
IMP:STAT:LS 0.00002: Set the inductance = 20uH.
IMP:STAT:LS 1uH: Set the inductance = 1uH
IMP:STAT:LS MAX :Set the inductance = MAX.
IMP:STAT:LS MIN :Set the inductance = MIN.
Query syntax: [ADVance:]IMPedance:STATic: LS? space><MAX|MIN>
Returned parameters: <NR2> [unit=Henry]
Query example： IMP:STAT:LS?
IMP:STAT:LS?MAX
IMP:STAT:LS?MIN

[ADVance:]IMPedance:STATic:RS

Comment: Set the equivalent serial resistance in constant impedance mode.
Syntax: ［ADVance:］IMPedance:STATic:RS<space><NRf+>［suffix］
Parameters: <NRf+>, 0.03Ω ~ 20.00Ω,resolution= 0.01Ω, Unit=Ohm
Example: IMP:STAT:RS 20 Set slope =20Ω。
IMP:STAT:RS 10 OHM :Set resistance = 10Ω.
IMP:STAT:RS MAX :Set resistance = MAX.
IMP:STAT:RS MIN :Set resistance = MIN.
Query syntax: [ADVance:]IMPedance:STATic:RS? <space><MAX|MIN>
Returned parameters: <NR2> [unit=Henry]
Query example： IMP:STAT:RS?
IMP:STAT:RS?MAX
IMP:STAT:RS?MIN

[ADVance:]IMPedance:STATic:RL

Comment: Set the equivalent parallel load resistance in constant impedance mode.
Syntax: [ADVance:]IMPedance:STATic:RL<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: IMP:STAT:RL 20: Set resistance = 20Ω.
IMP:STAT:RL 10 OHM:Set resistance = 10Ω.
IMP:STAT:RL MAX:Set resistance = mAx.
Query syntax: [ADVance:]IMPedance:STATic:RL? <space><MAX|MIN>
Returned parameters: <NR2> [unit=Ohm]
Query example： IMP:STAT:RL?
IMP:STAT:RL?MAX
IMP:STAT:RL?MIN

6.3.12 LED

[ADVance:]LED: VO

Comment: Set the working voltage in LED mode.
Syntax: [ADVance:]LED: VO<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: LED: VO 0.5 :Set working voltage = 0.5V.
LED: VO 500mV :Set working voltage = 0.5V.
LED: VO MAX :Set working voltage =MAX.
LED: VO MIN :Set working voltage =MIN.
Query syntax: [ADVance:]LED:VO?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Volt]
Query example： LED:VO?
LED:VO?MAX
LED:VO?MIN

[ADVance:]LED: IO

Comment: Set the working current in LED mode.
Syntax: [ADVance:]LED: IO<space><NRf+>[suffix]
Parameters: the effective range is affected by the specification/model of load
Example: LED: IO 20:Set static current = 20A.

Example: LED: IO 10A:Set static current = 10A.
Example: LED: IO MAX:Set static current = MAX.
Example: LED: IO MIN :Set static current = MIN .
Query syntax: [ADVance:]LED:IO?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example: LED:IO?
LED:IO?MAX
LED:IO?MIN

[ADVance:]LED: COEff

Comment: Set the resistance coefficient in LED mode.
Syntax: [ADVance:]LED:COE<space><NRf+>[suffix]
Parameters: <NRf+>, 0 ~ 1,resolution=0.000001,Unit=None
Example: LED:COE 0.9 :Set the resistance coefficient coeff=0.9.
LED:COE MAX :Set the resistance coefficient coeff=MAX.
LED: COE MIN: :Set the resistance coefficient coeff=Min.
Query syntax: [ADVance:]LED:COEff?<space><MAX|MIN>
Returned parameters: <NR2> [unit=None]
Query example: LED:COE?
LED:COE?MAX
LED:COE?MIN

[ADVance:]LED: VF

Comment: Set the working voltage in LED mode.
Syntax: [ADVance:]LED: VF<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: LED: VF10 :Set working voltage = 10V.
LED: VF 500mV :Set working voltage = 0.5V.
LED: VF MAX :Set working voltage =MAX.
LED: VF MIN :Set working voltage =MIN.
Query syntax: [ADVance:]LED:VF?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Volt]
Query example:
LED:VF?
LED:VF?MAX
LED:VF?MIN

[ADVance:]LED: RD

Comment: Set the equivalent resistance in LED mode.
Syntax: [ADVance:]LED:RD<space><NRf+>[suffix]
Parameters: Refer to the instruction for valid range.
Example: LED: RD 5.5 :Set the equivalent resistance Rd=5.5.
LED: RD MAX :Set the equivalent resistance Rd=mAx.
LED: RD MIN :Set the equivalent resistance Rd=MIN.
Query syntax: [ADVance:]LED:RD? <space><MAX|MIN>
Returned parameters: <NR2> [unit=Ohm]
Query example: LED:RD?
LED:RD?MAX
LED:RD?MIN

6.3.13 LIST

[ADVance:]LIST:

Comment: Set the parameters in LIST mode.
Syntax:
[ADVance:]LIST<space><Arg1>,<Arg2>,<Arg3>,<Arg4>,<Arg5>,<Arg6>,<Arg7>,<Arg8>
[suffix]
Parameters:
select the group number to be set
Arg1: <NR1>, 1~8, resolution = 1, unit = None.

total steps to be set
Arg2：<NR1>,1~200, resolution=1，unit =None。
Set the load method:
Arg3：<NRf>,HOLD|0，RESET|1,CONTINUE|2,unit =None。
Select the step to be set:
Arg4：<NR1>,1~200, resolution=1，unit =None。
Set the current for this step:
Arg5: <NRf>, refer to the instruction for valid range.
Set the test duration of this step:
Arg6：<NRf>,0.02ms~100S,resolution0.000001s，unit =Second。
Set the rising slope of the group:
Arg7: <NRf>, refer to the instruction for valid range.
Set the falling slope of the group:
Arg8: <NRf>, refer to the instruction for valid range.
Example:
LIST 5,10,0,1,24,0.1,1.5,1.5
LIST 5,10,RESET,1,24,0.1,1.5,1.5
Query syntax: [ADVance:]LIST?<space><Arg1>,<Arg2>
Returned parameter:
number of queried group
Arg1: <NR1>, 1~8, resolution = 1, unit = None.
Query the total number of steps:
Arg2：<NR1>,1~200, resolution=1，unit =None。
Query load method:
Arg3：<NRf>,HOLD|0，RESET|1,CONTINUE|2,unit =None。
Steps to query:
Arg4：<NR1>,1~200, resolution=1，unit =None。
Current in this step:
Arg5: <NRf>, refer to the instruction for valid range.
The test duration of this step:
Arg6：<NRf>,0.02ms~100S,resolution0.000001s，unit =Second。
The rising slope of the group:
Arg7: <NRf>, refer to the instruction for valid range.
The falling slope of the group:
Arg8: <NRf>, refer to the instruction for valid range.
Query example: LIST?1,2Query the parameters of the second step of the first group in LIST mode.

6.3.14 DCR

[ADVance:]DCR:TSTART
Description: Sets the dead time TSTART for DCR mode.
Setting syntax: [ADVance:] DCR: TSTART<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0s~100000s, resolution=1s, unit=Second
Setting example: DCR: TSTART 30 Set the dead time = 30S.
DCR: TSTART MAX Set dead time = maximum value.
DCR: TSTART MIN Set dead time = minimum value.
Query syntax: [ADVance:]DCR: TSTART?<space><MAX|MIN>
Return parameter: <NR2> [unit=Second]
Query example: DCR: TSTART?
DCR: TSTART? MAX
DCR: TSTART? MIN

[ADVance:]DCR:TLOAD
Description: Set the load time TLOAD in DCR mode.
Setting syntax: [ADVance:] DCR: TLOAD<space><NRf+>[suffix]

Setting parameters: <NRf+>, 0s~100000s, resolution=1s, unit=Second
Setting example: DCR: TLOAD 30 Set the loading time=30S.
DCR: TLOAD MAX Set load time = maximum.
DCR: TLOAD MIN Set load time = minimum value.
Query syntax: [ADVance:]DCR: TLOAD?<space><MAX|MIN>
Return parameters: <NR2> [unit = Second]
Example query: DCR: TLOAD?
DCR: TLOAD? MAX
DCR: TLOAD? MIN

[ADVance:]DCR:VALue

Description: Set the load current value of DCR mode.
Setting syntax: [ADVance:] DCR:VAL<space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: DCR: VAL 0.9 Set the load current value=0.9A.
DCR: VAL 900mA Set the load current value=0.9A.
DCR: VAL MAX Set the load current value value=maximum value.
DCR: VAL MIN Set the load current value = minimum value.
Query syntax: [ADVance:] DCR:VALue?<space><MAX|MIN>
Return parameter: <NR2> [unit=None]
Query example: DCR: VAL?
DCR: VAL? MAX
DCR: VAL? MIN

[ADVance:]DCR:TEND

Description: Sets the dead time TEND for DCR mode.
Setting syntax: [ADVance:] DCR: TEND<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0s~100000s, resolution=1s, unit=Second
Setting example: DCR: TEND 30 static set static time = 30S.
DCR: TEND MAX Dead time = maximum value.
DCR: TEND MIN Static still time = minimum value.
Query syntax: [ADVance:]DCR: TEND?<space><MAX|MIN>
Return parameters: <NR2> [unit = Second]
Example query: DCR: TEND?
DCR: TEND? MAX
DCR: TEND? MIN

[ADVance:]DCR:SPEH

Description: Set the high-level resistance value for internal resistance specification detection in DCR test mode.
Setting syntax: [ADVance:]DCR:SPEH<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0.0~9999.9 mΩ, resolution = 0.1, unit = mΩ.
Setting example: DCR:SPEH 0.5 Set high level resistance=0.5mΩ.
DCR:SPEH MAX Set high level resistance = maximum value.
DCR:SPEH MIN Set high level resistance = minimum value.
Query syntax: [ADVance:] DCR:SPEH?<space><MAX|MIN>
Return parameters: <NR2> [unit = mΩ]
Query example: DCR:SPEH?
DCR:SPEH?MAX
DCR:SPEH?MIN

[ADVance:]DCR:SPEL

Description: Set the low-level resistance value for internal resistance specification detection in DCR test mode.
Setting syntax: [ADVance:]DCR:SPEL<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0.0~9999.9 mΩ, resolution = 0.1, unit = mΩ.
Setting example: DCR:SPEL 0.5 Set low level resistance=0.5mΩ.
DCR: SPEL MAX Set low level resistance = maximum value.

DCR: SPEL MIN Set low level resistance = minimum value.
Query syntax: [ADVance:] DCR:SPEL?<space><MAX|MIN>
Return parameters: <NR2> [unit = mΩ]
Query example: DCR:SPEL?
DCR:SPEL?MAX
DCR:SPEL?MIN

[ADVance:] DCR:RESult?

Description: Return the result of the DCR test function.
Set Syntax: None
Setting parameters: None
Setting example: none
Query syntax: [ADVance:]DCR:RESult?
Return parameters: <arg1><arg2>
<arg1>:Pass/Fail <NR1>, 0:PASS 1:FAIL [unit=None]
<arg2>: DCR internal resistance test result <NR2>, [unit = mΩ]
When the return value is
-1,-1 means the DCR test is stopped.
-2,-2 means that the DCR test cannot be started because it is currently in a non-SENSE state.
-3,-3 means the DCR test has been performed.
Query example: DCR:RES?
Return sample: 0,153

6.3.15 SWD

[ADVance:]SINE:IDC

Description: Set the DC component of the load current in the sine wave load mode.
Setting syntax: [ADVance:] SINE:IDC<space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: SINE:IDC 0.9 Set the load current value=0.9A.
SINE:IDC 900mA Set the load current value=0.9A.
Query syntax: [ADVance:] SINE:IDC?<space><MAX|MIN>
Return parameter: <NR2> [unit=None]
Query example: SINE:IDC?

[ADVance:]SINE:IAC

Description: Set the AC component of the load current in the sine wave load mode.
Setting syntax: [ADVance:] SINE:IAC <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: SINE:IAC 0.9 Set the load current value=0.9A.
SINE:IAC 900mA Set the pull current value=0.9A.
Query syntax: [ADVance:] SINE:IAC?<space><MAX|MIN>
Return parameter: <NR2> [unit=None]
Query example: SINE:IAC?

[ADVance:]SINE:FREQuency

Description: Set the dynamic loading frequency of the sine wave loading mode.
Setting syntax: [ADVance:] SINE:FREQuency<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0.01~20000 Hz, resolution = 0.01, unit = Hz.
Setting example: SINE: FREQ 1000 Set the load current value=1kHz.
SINE: FREQ 1kHz Set the load current value=1kHz.
Query syntax: [ADVance:] SINE: FREQuency?<space><MAX|MIN>
Return parameter: <NR2> [unit=None]
Example query: SINE: FREQ?
SINE: FREQ?MAX
SINE: FREQ? MIN

6.3.16 EXTW

[ADVance:]EXTernal:WAVeform:MODE

Description: Set the execution mode in EXTW mode.
Setting syntax: [ADVance:]EXTernal:WAVrform:MODE<space><CRD | NR1>
Setting parameters: <CRD|NR1>,CC|0, CR|1,CV|2
Setting example: EXT:WAV:MODE CC Set the execution mode to CC.
EXT:WAV:MODE 2 Set execution mode = CV.
Query syntax: [ADVance:]EXTernal:WAVeform:MODE?
Return parameters: <CRD>,CC,CR,CV [unit=None]
Query example: EXT:WAV:MODE?

[ADVance:]EXTernal:WAVeform:CC:VRNG

Description: Set the execution mode in EXTW mode.
Setting syntax: [ADVance:]EXTernal:WAVrform:MODE<space><CRD | NR1>
Setting parameters: <CRD|NR1>,CC|0, CR|1,CV|2
Setting example: EXT:WAV:MODE CC Set the execution mode to CC.
BATT:MODE 2 Set execution mode = CV.
Query syntax: [ADVance:]EXTernal:WAVeform:MODE?
Return parameters: <CRD>,CC,CR,CV [unit=None]
Query example: EXT:WAV:MODE?

[ADVance:]EXTernal:WAVeform:CR:IRNG

Description: Set the current measurement gear in CR running mode.
Setting syntax: [ADVance:]EXTernal:WAVrform:CR:IRNG<space><CRD | NR1>
Setting parameters: <CRD | NR1>, LOW |L|0, MIDDLE | M | 1, HIGH |H|2
Setting example: EXT:WAV:CR:IRNG HIGH Set the current scale to High.
EXT:WAV:CR:IRNG M Set the current gear to Middle.
EXT:WAV:CR:IRNG 0 Set the current scale to Low.
Query syntax: EXTernal:WAVrform:CR:IRNG?
Return parameters: <CRD>,LOW,MIDDLE,HIGH [unit=None]
Query example: EXT:WAV:CR:IRNG?

[ADVance:]EXTernal:WAVeform:CV:IRNG

Description: Set the current measurement gear in CV operation mode.
Setting syntax: [ADVance:]EXTernal:WAVrform:CR:IRNG<space><CRD | NR1>
Setting parameters: <CRD | NR1>, LOW |L|0, MIDDLE | M | 1, HIGH |H|2
Setting example: EXT:WAV:CV:IRNG HIGH Set the current scale to High.
EXT:WAV:CV:IRNG M Set the current gear to Middle.
EXT:WAV:CV:IRNG 0 Set the current scale to Low.
Query syntax: EXTernal:WAVrform:CV:IRNG?
Return parameters: <CRD>,LOW,MIDDLE,HIGH [unit=None]
Query example: EXT:WAV:CV:IRNG?

6.3.17 SWP

[ADVance:]CURRent:SWEep:IMAXimum

Description: Set the maximum current value in SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:IMAXimum<space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CURR: SWE:IMAX 20 Set the maximum current value=20A.
CURR: SWE:IMAX MAX Set the maximum current value value=maximum value.
CURR: SWE:IMAX MIN Set the maximum current value value=minimum value.
Query syntax: [ADVance:] CURRent: SWEep:IMAXimum?<space><MAX|MIN>
Return parameters: <NR2> [unit=A]
Query example: CURR:SWE:IMAX?

CURR:SWE:IMAX? MAX
CURR:SWE:IMAX? MIN

[ADVance:]CURRent:SWEep:IMINimum

Description: Set the minimum current value in SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:IMINimum<space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CURR: SWE:IMIN 20 Set the minimum current value=20A.
CURR: SWE:IMIN MAX Set the minimum current value value=maximum value.
CURR: SWE:IMIN MIN Set the minimum current value value=minimum value.
Query syntax: [ADVance:] CURRent: SWEep:IMINimum?<space><MAX|MIN>
Return parameters: <NR2> [unit=A]
Query example: CURR:SWE:IMIN?
CURR:SWE:IMIN? MAX
CURR:SWE:IMIN? MIN

[ADVance:]CURRent:SWEep:FSTArt

Description: Set the start frequency of SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:FSTARt<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0.01~50000 Hz, resolution = 0.01, unit = Hz.
Setting example: CURR: SWE:FSTA 200 Set the starting frequency value=200Hz.
CURR: SWE:FSTA MAX Set the starting frequency value=maximum value.
CURR: SWE:FSTA MIN Set the starting frequency value=minimum value.
Query syntax: [ADVance:] CURRent: SWEep:FSTARt?<space><MAX|MIN>
Return parameters: <NR2> [unit = Hz]
Query example: CURR:SWE:FSTA?
CURR:SWE:FSTA? MAX
CURR:SWE:FSTA? MIN

[ADVance:]CURRent:SWEep:FEND

Description: Set the end frequency of SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:FEND<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0.01~50000 Hz, resolution = 0.01, unit = Hz.
Setting example: CURR: SWE:FEND 200 Set the end frequency value=200Hz.
CURR: SWE:FEND MAX Set the end frequency value=maximum value.
CURR: SWE:FEND MIN Set the end frequency value=minimum value.
Query syntax: [ADVance:] CURRent: SWEep: FEND?<space><MAX|MIN>
Return parameters: <NR2> [unit = Hz]
Query example: CURR:SWE:FEND?
CURR:SWE:FEND? MAX
CURR:SWE:FEND? MIN

[ADVance:]CURRent:SWEep:FSTEp

Description: Set the step frequency of SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:FSTEp<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0.01~50000 Hz, resolution = 0.01, unit = Hz.
Setting example: CURR: SWE:FSTE 200 Set the step frequency value=200Hz.
CURR: SWE:FSTE MAX Set step frequency value=maximum value.
CURR: SWE:FSTE MIN Set step frequency value = minimum value.
Query syntax: [ADVance:] CURRent: SWEep: FEND?<space><MAX|MIN>
Return parameters: <NR2> [unit = Hz]
Query example: CURR:SWE:FSTE?
CURR:SWE:FSTE? MAX
CURR:SWE:FSTE? MIN

[ADVance:]CURRent:SWEep:DWELl

Description: Set the step dwell time of SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:DWELl<space><NRf+>[suffix]
Setting parameters: <NRf+>, 1ms~100s, resolution = 1ms, unit = s.
Setting example: CURR: SWE: DWEL 10.5 Set the step dwell time value=10.5s.

CURR: SWE: DWEL MAX Set step dwell time value=maximum value.
CURR: SWE: DWEL MIN Set step dwell time value = minimum value.
Query syntax: [ADVance:] CURRent: SWEep: DWEL?<space><MAX|MIN>
Return parameter: <NR2> [unit = s]
Example query: CURR:SWE:DWEL?
CURR: SWE: DWEL? MAX
CURR: SWE: DWEL? MIN

[ADVance:]CURRent:SWEep:DUTY

Description: Set the load rate of SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:DUTY<space><NRf+>[suffix]
Setting parameters: <NRf+>, 1%~99%, resolution = 1%, unit = %.
Setting example: CURR: SWE: DUTY 10 Set the load rate value=10%.
CURR: SWE: DUTY MAX Set the load rate value=maximum value.
CURR: SWE: DUTY MIN Set the load rate value = minimum value.
Query syntax: [ADVance:] CURRent: SWEep:DUTY?<space><MAX|MIN>
Return parameter: <NR2> [unit = %]
Query example: CURR:SWE:DUTY?
CURR:SWE:DUTY? MAX
CURR:SWE:DUTY? MIN

[ADVance:]CURRent:SWEep:RISE

Description: Sets the current rising slope for SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:RISE<space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CURR: SWE:RISE 1.25 Set the rising slope to 1.25A/μs.
CURR: SWE:RISE MAX Set the rising slope to the maximum load.
CURR: SWE:RISE MIN Set the rising slope to the minimum value of the load.
Query syntax: [ADVance:] CURRent: SWEep:RISE?<space><MAX|MIN>
Return parameter: <NR2>,[unit=A/μS]
Query example: CURR:SWE:RISE?
CURR:SWE:RISE? MAX
CURR:SWE:RISE? MIN

[ADVance:]CURRent:SWEep:FALL

Description: Sets the current falling slope for SWP mode.
Setting syntax: [ADVance:] CURRent:SWEep:FALL<space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CURR: SWE:FALL 1.25 Set the falling slope to 1.25A/μs.
CURR: SWE:FALL MAX Set the falling slope to the maximum value of the load.
CURR: SWE:FALL MIN Set the falling slope to the minimum value of the load.
Query syntax: [ADVance:] CURRent: SWEep:FALL?<space><MAX|MIN>
Return parameter: <NR2>,[unit=A/μS]
Query example: CURR:SWE:FALL?
CURR:SWE:FALL? MAX
CURR:SWE:FALL? MIN

6.3.17 FETCH

FETCH:CURRent?

Comment: Read current measurement.
Query syntax: FETCH:CURRent?
Returned parameters: <NR2>, [Unit=Ampere]
Query example： FETCH:CURR?
Example of return: 3.16

FETCh:CURRent:PEAK+?

Comment: Return the measurement of the mAx. peak voltage.Current
Query syntax: FETCh:CURRent:PEAK+?

Returned parameters: <NR2>,[Unit=Ampere]
Query example： FETC:CURR:PEAK+?

FETCH:VOLTage?

Comment: Read voltage measurement.
Query syntax: FETCH:VOLTage?
Returned parameters: <NR2>, [Unit=Volt]
Query example： FETCH: VOLT?
Example of return: 8.66

FETCH:POWer?

Comment: Read power measurement.
Query syntax: FETCH:POWer?
Returned parameters: <NR2>, [Unit=Watt]
Query example： FETCH: POW?
Example of return: 99.85

FETCh:AH?

Comment: Return ampere-hour measurement.
Query syntax: FETC:AH?
Returned parameters: <NR2>,[Unit=Ampere-hour]
Query example： FETC:AH?
Example of return: 6.65

FETCh:WH?

Comment: Return watt-hour measurement.
Query syntax: FETCh:WH?
Returned parameter: <NR2>,[unit=Watt-hour]
Query example： FETC:WH?
Example of return: 20.045

FETCh:VOLTage:PEAK+?

Comment: Return the measurement of the mAx. peak voltage.
Query syntax: FETCh:VOLTage:PEAK+?
Returned parameters: <NR2>,[Unit=Voltage]
Query example： FETC:VOLT:PEAK+?
Example of return: 20.5

FETCh:VOLTage:PEAK-?

Comment: Return the measurement of the Min. peak voltage of specific channel
Query syntax: FETCh:VOLTage:PEAK-?
Returned parameters: <NR2>,[Unit=Voltage]
Query example： FETC：VOLT:PEAK-?
Example of return: 20.5

FETCh:VOLTage:PEAK?

Specific channel return voltage peak value.
Query syntax: FETCh:VOLTage:PEAK?
Return parameter: <NR2>,[unit =Voltage]
Query example: FETC:VOLT:PEAK?
Example of return: 0.15

FETCh:CURRent:PEAK+?

Description: Return the measured value of the maximum peak current.
Query syntax: FETCh:CURRent:PEAK+?
Return parameters: <NR2>,[unit =Current]
Query example: FETC:CURR:PEAK+?
Return example: 10.5

FETCh: CURRent:PEAK-?

Description: The measured value of the minimum peak current returned by a specific channel.
Query syntax: FETCh: CURRent:PEAK-?
Return parameters: <NR2>,[unit = Current]

Query example: FETC: CURR:PEAK-?
Return example: 10.5
FETCh: CURRent:PEAK?
Description: Peak value of specific channel return current.
Query syntax: FETCh: CURRent:PEAK?
Return parameters: <NR2>,[unit = Current]
Query example: FETC: CURR:PEAK?
Example of return: 0.15

6.3.18 CVCC

[ADVance:]CVCC:VSET
Description: Set the voltage setting value in CVCC mode.
Set syntax: [ADVance:] CVCC:VSET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CVCC:VSET 20 Set the voltage value to value=20V.
CVCC:VSET MAX Set the voltage value value=maximum value.
CVCC:VSET MIN Set the voltage value value=minimum value.
Query syntax: [ADVance:] CVCC: VSET?<space><MAX|MIN>
Return parameter: <NR2> [unit=V]
Query example: CVCC: VSET?
CVCC: VSET? MAX
CVCC: VSET? MIN

[ADVance:]CVCC:ISET
Description: Set the current setting value in CVCC mode.
Set syntax: [ADVance:] CVCC:ISET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CVCC:ISET 20 Set the current value=20A.
CVCC:ISET MAX Set current value value=maximum value.
CVCC:ISET MIN Set current value value=minimum value.
Query syntax: [ADVance:] CVCC: ISET?<space><MAX|MIN>
Return parameters: <NR2> [unit=A]
Example query: CVCC: ISET?
CVCC: ISET? MAX
CVCC: ISET? MIN

[ADVance:]CVCC:RESponse
Description: Set the response speed of CVCC mode.
Setting syntax: [ADVance:] CVCC:RESponse<space><NRf+>
Setting parameters: <NRf+>SLOW(0), MIDDLE(1), FAST(2).
Setting example: CVCC:RES FAST
CVCC:RES 2
Query syntax: [ADVance:] CVCC:RESponse?
Query example: CVCC:RES?

6.3.19 CRCC

[ADVance:]CRCC:RSET
Description: Set the resistance setting value in CRCC mode.
Setting syntax: [ADVance:] CRCC:RSET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CRCC:RSET 20 Set the resistance value=20Ω.
CRCC:RSET MAX Set the resistance value=maximum value.
CRCC:RSET MIN Set the resistance value=minimum value.
Query syntax: [ADVance:] CRCC: RSET?<space><MAX|MIN>

Return parameters: <NR2> [unit=Ω]
Example query: CRCC: RSET?
CRCC: RSET? MAX
CVCC: RSET? MIN

[ADVance:]CRCC:ISET
Description: Set the current setting value in CRCC mode.
Set syntax: [ADVance:] CRCC:ISET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CRCC:ISET 20 Set the current value=20A.
CRCC:ISET MAX Set current value value=maximum value.
CRCC:ISET MIN Set current value value=minimum value.
Query syntax: [ADVance:] CRCC: ISET?<space><MAX|MIN>
Return parameters: <NR2> [unit=A]
Example query: CRCC: ISET?
CRCC: ISET? MAX
CRCC: ISET? MIN

6.3.20 CPCC

[ADVance:]CPCC:PSET
Description: Set the power setting value in CPCC mode.
Set syntax: [ADVance:] CPCC:PSET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CPCC:PSET 20 Set the power value to value=20W.
CPCC:PSET MAX Set the power value value=maximum value.
CPCC:PSET MIN Set the power value value=minimum value.
Query syntax: [ADVance:] CPCC:PSET?<space><MAX|MIN>
Return parameter: <NR2> [unit=W]
Query example: CPCC:PSET?
CPCC:PSET? MAX
CPCC:PSET? MIN

[ADVance:]CPCC:ISET
Description: Set the current setting value in CPCC mode.
Set syntax: [ADVance:] CPCC:ISET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CPCC:ISET 20 Set the current value=20A.
CPCC:ISET MAX Set current value value=maximum value.
CPCC:ISET MIN Set current value value=minimum value.
Query syntax: [ADVance:] CPCC: ISET?<space><MAX|MIN>
Return parameters: <NR2> [unit=A]
Example query: CRCC: ISET?
CRCC: ISET? MAX
CRCC: ISET? MIN

6.3.21 CVCR

[ADVance:]CVCR:VSET
Description: Set the voltage setting value in CVCR mode.
Set syntax: [ADVance:] CVCR:VSET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CVCR:VSET 20 Set the voltage value to value=20V.
CVCR:VSET MAX Set the voltage value value=maximum value.
CVCR:VSET MIN Set the voltage value value=minimum value.
Query syntax: [ADVance:] CVCR: VSET?<space><MAX|MIN>

Return parameter: <NR2> [unit=V]
Query example: CVCR: VSET?
CVCR: VSET? MAX
CVCR: VSET? MIN

[ADVance:]CVCR:RSET
Description: Set the resistance setting value in CVCR mode.
Set syntax: [ADVance:] CVCR:RSET <space><NRf+>[suffix]
Setting parameters: Please refer to the specification for the range of valid values.
Setting example: CVCR:RSET 20 Set the resistance value=20Ω.
CVCR:RSET MAX Set the resistance value value=maximum value.
CVCR:RSET MIN Set the resistance value=minimum value.
Query syntax: [ADVance:] CVCR:RSET?<space><MAX|MIN>
Return parameters: <NR2> [unit=Ω]
Query example: CVCR:RSET?
CVCR:RSET? MAX
CVCR:RSET? MIN

[ADVance:]CVCR:RESponse
Description: Set the response speed of CVCR mode.
Setting syntax: [ADVance:] CVCR:RESponse<space><NRf+>
Setting parameters: <NRf+>SLOW(0), MIDDLE(1), FAST(2).
Setting example: CVCR:RES FAST
CVCR:RES 2
Query syntax: [ADVance:] CVCR:RESponse?
Query example: CVCC:RES?

6.3.22 MEASURE

MEASure:CURRent?
Comment: Returns the measurement of real-time current.
Query syntax: MEASure:CURRent?
Returned parameters: <NR2> [Unit=Ampere]
Query example: MEAS:CURR?
Example of return: 6.65
MEASure:POWer?
Comment: Returns the measurement of real-time power.
Query syntax: MEASure:POWer?
Returned parameters: <NR2>,[Unit=Watt]
Query example: MEAS:POW?
Example of return: 6.65
MEASure:VOLTage?
Comment: Return the measurement of real-time voltage.
Query syntax: MEASure:VOLTage?
Returned parameters: <NR2>,[Unit=Watt]
Query example: MEAS:VOLT?
Example of return: 100.05
MEASure:INPut?
Comment: Query the source of the voltage measurement signal.
Query syntax: MEASure:INPut?
Returned parameters: <CRD >,LOAD,UUT
Query example: MEAS:INP?
Example of return: LOAD

6.3.23 PECIFICATION

SPECification[:PASS]?

Comment: Query the GO/NG function result.
Query syntax: SPECification[:PASS]?
Returned parameters: <CRD >,IDLE,GO,NG
Query example： SPEC?
Example of return: GO

SPECification[:PASS]:CURRent?
Comment: Query the GO/NG function result.
Query syntax: SPECification[:PASS]:CURRent?
Returned parameters: <CRD >,IDLE,GO,NG
Query example： SPEC:CURR?
Example of return: GO

SPECification[:PASS]:VOLTage?
Comment: Query the GO/NG function result.
Query syntax: SPECification[:PASS]:VOLTage?
Returned parameters: <CRD >,IDLE,GO,NG
Query example： SPEC:VOLT?
Example of return: GO

SPECification[:PASS]:POWer?
Comment: Query the GO/NG function result.
Query syntax: SPECification[:PASS]:POWer?
Returned parameters: <CRD >,IDLE,GO,NG
Query example： SPEC:POW?
Example of return: GO

SPECification:CURRent:C
Comment:Set the current specification to judge the center benchmark.
Syntax: SPECification:CURRent:C<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:CURR:C 10
SPEC:CURR:C 10mA
Query syntax:SPECification:CURRent:C?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： SPEC:CURR:C?
SPEC:CURR:C?MAX
SPEC:CURR:C?MIN

SPECification:CURRent:H
Comment:Set the upper limit for determining current specifications.
Syntax: SPECification:CURRent:H<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:CURR:H 10
SPEC:CURR:H 10mA
Query syntax:SPECification:CURRent:H?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： SPEC:CURR:H?
SPEC:CURR:H?MAX
SPEC:CURR:H?MIN

SPECification:CURRent:L
Comment:Set the lower limit for determining current specifications.
Syntax: SPECification:CURRent:L<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:CURR:L 10
SPEC:CURR:L 10mA
Query syntax:SPECification:CURRent:L?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Ampere]
Query example： SPEC:CURR:L?
SPEC:CURR:L?MAX
SPEC:CURR:L?MIN

SPECification:VOLTage:C

Comment:Set the voltage specification to judge the center reference.
Syntax: SPECification:VOLTage:C<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:VOLT:C 10
SPEC:VOLT:C 10mV
Query syntax:SPECification:VOLTage:C?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Voltage]
Query example: SPEC:VOLT:C?
SPEC:VOLT:C?MAX
SPEC:VOLT:C?MIN

SPECification:VOLTage:H

Comment:Set the upper limit for determining current specifications.
Syntax: SPECification:VOLTage:H<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:VOLT:H 10
SPEC:VOLT:H 10mV
Query syntax:SPECification:VOLTage:H?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Voltage]
Query example: SPEC:CURR:H?
SPEC:CURR:H?MAX
SPEC:CURR:H?MIN

SPECification:VOLTage:L

Comment:Set the lower limit for determining voltage specifications.
Syntax: SPECification:VOLTage:L<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:VOLT:L 10
SPEC:VOLT:L 10mA
Query syntax:SPECification:VOLTage:L?<space><MAX|MIN>
Returned parameters: <NR2> [Unit= Voltage]
Query example: SPEC:VOLT:L?
SPEC:VOLT:L?MAX
SPEC:VOLT:L?MIN

SPECification:POWer:C

Comment:Set the power specifications to determine the center baseline.
Syntax: SPECification:POWer:C<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:POW:C 10
SPEC:POW:C 10mW
Query syntax:SPECification:POWer:C?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Power]
Query example: SPEC:POW:C?
SPEC:POW:C?MAX
SPEC:POW:C?MIN

SPECification:POWer:H

Comment:Set the upper limit for determining current specifications.
Syntax: SPECification:POWer:H<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:POW:H 10
SPEC:POW:H 10mV
Query syntax:SPECification:POWer:H?<space><MAX|MIN>
Returned parameters: <NR2> [Unit=Power]
Query example: SPEC:POW:H?
SPEC:POW:H?MAX
SPEC:POW:H?MIN

SPECification:POWer:L

Comment:Set the lower limit for determining voltage specifications.
Syntax: SPECification:POWer:L<space><NRf+>[suffix]
Parameters: See specification details for valid value ranges.
Example: SPEC:POW:L 10
SPEC:POW:L 10mW
Query syntax:SPECification:POW:L?<space><MAX|MIN>
Returned parameters: <NR2> [Unit= POW]
Query example： SPEC:POW:L?
SPEC:POW:L?MAX
SPEC:POW:L?MIN

SPECification: TEST

Comment:Start or stop the GO/NG function.
Syntax: SPECification:TEST<space><CRD|NR1>[suffix]
Parameters: <CRD|NR1>,OFF|0,ON|1。
Example: SPEC:TEST OFF
SPEC:TEST 1
Query syntax:SPECification: TEST?
Returned parameters: <CRD> OFF,ON
Query example： SPEC:TEST?
Example of return: <CRD> OFF,ON

SPECification: TEST

Comment:Select the GO/NG function parameter setting mode.
Syntax: SPECification:TEST<space><CRD|NR1>[suffix]
Parameters: <CRD|NR1>,OFF|0,ON|1。
Example: SPEC:TEST OFF
SPEC:TEST 1
Query syntax:SPECification: TEST?
Returned parameters: <CRD> OFF,ON
Query example： SPEC:TEST?
Example of return: <CRD> OFF,ON

6.3.24 PROGRAM

PROGram:DATA

Comment: Set group parameters for the PROG mode. (No word endings)
Syntax:PROGram:DATA<space><Arg1>,<Arg2>, <Arg3>, <Arg4>, <Arg5>
Parameters: Arg1: Group number to set
<NR1>,1~10
Arg2: Group work type (currently invalid change)
<NRF>,LIST|0,STEP|1
Arg3: The group number to be linked after this group is completed
<NR1>,0~10
Arg4: Number of repetitions in this group
<NR1>,0~ 5000. 0 represents infinite cycle
Arg5: The number of steps in this group
<NR1>,1~255, the number of steps in each group is independent and unshared
PROG:DATA 1,LIST,0,2,25
Query syntax: PROGram:DATA? <space><NR1>[< space >, <MAX|MIN>]
Return parameters: <NR1>,<NR1>,<NR1>,<NR1>,<NR1>
Query example: PROG:DATA? 1
Example of return: 1,0,0,0,4

PROGram:DATA:LIST

Set LIST parameters for PROG mode (group type: LIST). (No word endings)
Syntax: PROGram:DATA:LIST<space><Arg1>,<Arg2>, <Arg3>, <Arg4>, <Arg5>,<Arg6>,<Arg7>,<Arg8>,<Arg9>,<Arg10>,<Arg11>,<Arg12>,<Arg13>,<Arg14>,<Arg15>,<Arg16>

Parameters: Arg1: Group number to set
<NR1>,1~10
Arg2: The step to set
<NR1>,1~255
Arg3: Trigger mode for step (temporarily invalid)
<NRF>,SKIP|0,AUTO|1,MANUAL|2,EXTERNAL|3
Arg4: Working mode of step (temporarily invalid)
< NRF >, CC|0,CR|1,CV|2,CP|3
Arg5: Step range (temporarily invalid)
< NRF >, LOW|0,MIDDLE|1,HIGH|2
Arg6: The pull value of the step
See specification details for range of valid values.
Arg7: The ascending slope of the step
See specification details for range of valid values.
Arg8: Descent slope of step
See specification details for range of valid values.
Arg9: Hold time of the step
<NRF>,0.1ms~4000s (greater than Arg16 at the same time), resolution 0.1ms, [unit =Second]
Arg10: Step voltage decision upper limit
See specification details for range of valid values.
Arg11: Lower limit of voltage decision for step
See specification details for range of valid values.
Arg12: Current determination upper limit of step
See specification details for range of valid values.
Arg13: Current determination lower limit of step
See specification details for range of valid values.
Arg14: Power decision upper limit of step
See specification details for range of valid values.
Arg15: Power determination lower limit of step
See specification details for range of valid values.
Arg16: Delay of Pass/Fail judgment
<NRF>,0.1ms~4000s (less than Arg9 at the same time), resolution 0.1ms, [unit =Second]
Example setting:
PROG: DATA: LIST 1, 1, AUTO, CV, HIGH, 12,0.1, 0.1, 2, 1, 1, 1, 1, 1, 1, 1)
Query syntax:
PROGram:DATA:LIST? <space><Arg1><Arg2> [<space>,<MAX|MIN>]
Query example: PROG:DATA:LIST? 1, 1
PROG:DATA:LIST? 1,1 MAX
PROG:DATA:LIST? 1,1 MIN
Example of return: 1, 1, AUTO (1), CV (2), HIGH (2), 12,0.1, 0.1, 2,0,0,0,0,0,0,1

PROGram:NSELect

Comment: Set the group number to be executed.
PROGram: NSELect <space><NRF+>
Set parameters: <NR1>,1~10
Example Settings: PROG:NSEL 10
PROG:NSEL MAX
PROG:NSEL MIN
Query syntax: PROGram: NSELect? [< space >, <MAX|MIN>]
Back parameter: <NR1>
Query example: PROG:NSEL?
PROG:NSEL? MAX
PROG:NSEL? MIN
Example of return: 10

PROGram:SAVe

Comment: Save the parameters.

Syntax:PROGram: SAVe
Example Settings: PROG: SAV

PROGram:STATe?

Comment: Query the working status of the PROG mode.
Query syntax: PROGram: STATe?
Return parameters: x1,x2,x3,x4
x1: indicates the current group number
x2: current step number
x3: Current mode,
0: CCL, 1: CCM, 2: CCH,
3: CRL, 4: CRM, 5: CRH,
6: CVL, 7: CVM, 8: CVH,
9: CPL, 10: CPM, 11: CPH
x4: Working status
0: off 1: loading
Query example: PROG:STAT?
Example of return: 1,2,1,1

PROGram:SEQuence:CLEar

Clear the number of steps in the group.
PROGram:SEQuence:CLEar <space><NRF+>
Set parameters: <NR1>,1~10
Example Settings: PROG:SEQ:CLEar 2

PROGram:SEQuence:FAIL? Program: Sequence: fail?

Comment: Query the failed test steps.
Query syntax: PROGram: SEQuence:FAIL?
Return parameters: xx-xxx, xx-xxx, xx-xxx.....
xx is the group number
xxx is the step number
All qualified return \n
Query example: PROG: SEQ:FAIL?
Example of return: 1-1,1-2,1-5

PROGram:SEQuence:REMain?

Comment: Queries the number of unused steps in the current group.
Query syntax: PROGram:SEQuence:REMain?
Back parameter: <NR1>
Query example: PROG: SEQ:REM? 2
Example of return: 251

6.3.25 TIMING-MODE2

TIMing[:STATe]

Description: Make the load start or stop the TIMING function.
Setting syntax: TIMing[:STATe]<space><NRF>
Set parameters: <NRF>,OFF|0,ON|1
Setting example: TIM ON enables TIMING function.
TIM 0 turns off the TIMING function.
Query syntax: TIM[:SATAe]?
Return parameters: <CRD>,OFF,ON
Query example: TIM?

TIMing:TRIGger:MODE

Description: Set the trigger mode of timing test.
Setting syntax: TIMing:TRIGger:MODE<space><CRD | NR1>
Setting parameters: <CRD|NR1>,RISE|0, FALL| 1
Setting example: TIM: TRIG:MODE RISE Set the trigger mode to rising trigger.
TIM: TRIG:MODE 2 Set execution mode = pulse width mode.
Query syntax: TIMing: TRIGger:MODE?

Return parameters: <CRD>, RISE, FALL [unit=None]
Query example: TIM:TRIG:MODE?

TIMing:TRIGger:SIGNal

Description: Set the trigger signal for timing test.
Setting syntax: TIMing:TRIGger:SIGN<space><CRD | NR1>
Setting parameters: <CRD|NR1>,VOLT|0, CURR| 1
Setting example: TIM:TRIG:SIGN VOLT Set the trigger signal to voltage.
TIM:TRIG:SIGN 1 Set execution mode = current.
Query syntax: TIMing:TRIGger:SIGN?
Return parameters: <CRD>, VOLT, CURR[unit=None]
Query example: TIM:TRIG:SIGN?

TIMing:TRIGger:VSTArt

Description: Set the starting voltage value in timing test mode.
Setting syntax: TIMing:TRIGger:VSTARt<space><NRf+>[suffix]
Setting parameters: Please refer to the specification details for the valid value range.
Setting example: TIM:TRIG:VSTA 20 Set the starting voltage value value=20V.
TIM:TRIG:VSTA MAX sets the starting voltage value value=maximum value.
TIM:TRIG:VSTA MIN Set the starting voltage value value=minimum value.
Query syntax: TIMing:TRIGger:VSTARt?<space><MAX|MIN>
Return parameter: <NR2> [unit=V]
Query example: TIM:TRIG:VSTA?
TIM:TRIG:VSTA? MAX
TIM:TRIG:VSTA?MIN

TIMing:TRIGger:VEND

Description: Set the end voltage value in timing test mode.
Setting syntax: TIMing:TRIGger:VEND<space><NRf+>[suffix]
Setting parameters: Please refer to the specification details for the valid value range.
Setting example: TIM:TRIG:VEND 5 Set the end voltage value value=5V.
TIM:TRIG:VEND MAX sets the end voltage value value=maximum value.
TIM:TRIG:VEND MIN Set the end voltage value value=minimum value.
Query syntax: TIMing:TRIGger:VEND?<space><MAX|MIN>
Return parameter: <NR2> [unit=V]
Query example: TIM:TRIG:VEND?
TIM:TRIG:VEND? MAX
TIM:TRIG:VEND? MIN

TIMing:TRIGger:ISTArt

Description: Set the starting current value in timing test mode.
Setting syntax: TIMing:TRIGger:ISTArt<space><NRf+>[suffix]
Setting parameters: Please refer to the specification details for the valid value range.
Setting example: TIM:TRIG:ISTA 20 Set the starting current value value=20A.
TIM:TRIG:ISTA MAX sets the starting current value value=maximum value.
TIM:TRIG:ISTA MIN Set the starting current value value=minimum value.
Query syntax: TIMing:TRIGger:ISTArt?<space><MAX|MIN>
Return parameter: <NR2> [unit=A]
Query example: TIM:TRIG:ISTA?
TIM:TRIG:ISTA? MAX
TIM:TRIG:ISTA?MIN

TIMing:TRIGger:IEND

Description: Set the end current value in timing test mode.
Setting syntax: TIMing:TRIGger:IEND<space><NRf+>[suffix]
Setting parameters: Please refer to the specification details for the valid value range.
Setting example: TIM:TRIG:IEND 10 Set the end current value value=10A.

TIM:TRIG:IEND MAX sets the end current value value=maximum value.
TIM:TRIG:IEND MIN sets the end current value value=minimum value.
Query syntax: TIMing:TRIGger:IEND?<space><MAX|MIN>
Return parameter: <NR2> [unit=A]
Query example: TIM:TRIG:IEND?
TIM:TRIG:IEND? MAX
TIM:TRIG:IEND?MIN

TIMing:TOUT

Description: Set the timing function measurement timeout.
Setting syntax: TIM: TOUT<space><NRf+>[suffix]
Setting parameters: <NRf+>, 0s~100000s, resolution = 1s, unit = Second
Setting example: TIM:TOUT 30 Set timeout time = 30S.
TIM:TOUT MAX timeout = maximum value.
TIM:TOUT MIN timeout = minimum value.
Query syntax: TIM:TOUT?<space><MAX|MIN>
Return parameters: <NR2> [Unit = Second]
Query example: TIM:TOUT?
TIM:TOUT? MAX
TIM:TOUT?MIN

6.3.26 TIMING-MODE1

TIMing[:STATe]

Make the load start or stop TIMING function.
Setting syntax: TIMing[:STATe]<space><NRF>
Set parameters: <NRF>,OFF|0,ON|1
Example setup: TIM ON starts a timing test.
TIM 0 stops the timing test.
Query syntax: TIM[:SATAe]?
Return parameters: <CRD>,OFF,ON
Sample query: TIM?

TIMing:LOAD:MODE

Set the trigger mode of timing test.
Setting syntax: TIMing:LOAD:MODE<space><CRD | NR1>
Set parameters: <CRD|NR1>,CURR|0, VOLT| 1, POW|2, RES|3, OFF|4
Example setting: TIM:LOAD:MODE CURR Set the load mode to constant current.
Query syntax: TIMing:LOAD:MODE?
Return parameters: <CRD>, CURR, VOLT, POW, RES, OFF [unit =None]
Query example: TIM:LOAD:MODE?

TIMing: LOAD:VALue

Set the timing test load value.
Setting syntax: TIMing: LOAD:VALue<space><NRf+>[suffix]
Set parameters: A/V/W/ohm, the setting value depends on the TIMing:LOAD:MODE mode
Example setting: TIM: LOAD: VAL 20 Set the current value of pulling load value=20A.
TIM: LOAD: VAL MAX Sets the load current value value= maximum value.
TIM: LOAD: VAL MIN Sets the load current value value= Minimum value.
Query syntax: TIMing:LOAD:VALue?
Back parameter: <NR2> [Unit = A/V/W/ohm]
Example query: TIM:LOAD:VAL?

TIMing:TSTart:SOURce

Note: This command is used to set the trigger source for starting a test.
TIMing:TSTart:SOURce<space><CRD | NR1>
Set parameters: <CRD|NR1>, VOLT| 0, CURR|1, EXT|2

Example setup: TIM: TST: SOUR CURR The trigger source for the start test is electric current.
Query syntax: TIMing: TSTart:SOURce?
Return parameters: <CRD>, CURR, VOLT, EXT[unit =None]
Query example: TIM: TST:SOUR?

TIMing: TSTart:EDGE
This command is used to set the trigger edge for starting a test.
Setting syntax: TIMing:TSTart:EDGE<space><CRD | NR1>
Set parameters: <CRD|NR1>, RISE| 0, FALL|1
Example setting: TIM:TST: EDGE RISE Sets the trigger edge for starting a test.
TIM:TST: EDGE 0
Example query: TIM: TST: EDGE?

TIMing: TSTart:LEVel
This command is used to set the trigger level for starting a test.
Setting syntax: TIMing: TSTart:LEVel<space><NRf+>
Setting parameters: A/V, depending on how TIMing: TSTart: SOURce is set
Example setting: TIM: TST: LEV 20 Set the initial triggering current value to 20A.
TIM: TST: LEV MAX Set the initial triggering current value= Maximum value.
TIM: TST: LEV MIN Sets the initial triggering current value value= Minimum value.
Query syntax: TIMing: TSTart: SOURce? <space><MAX|MIN>
Return parameters: <NR2> [Unit =A/V]
Example query: TIM: TST: LEV?
TIM: TST: LEV? MAX
TIM: TST: LEV? MIN

TIMing:TEND:SOURce
Note: This command is used to set the trigger source for ending the test.
Setting syntax: TIMing:TEND:SOURce<space><CRD | NR1>
Set parameters: <CRD|NR1>, VOLT| 0, CURR|1, EXT|2
Example setting: TIM: TEND: SOUR CURR The trigger source for ending the test is current.
Query syntax: TIMing: TEND:SOURce?
Return parameters: <CRD>, CURR, VOLT, EXT[unit =None]
Example query: TIM: TEND:SOUR?

TIMing: TEND:EDGE
Note: This command is used to set the trigger edge for ending the test.
Setting syntax: TIMing: TEND:EDGE<space><CRD | NR1>
Set parameters: <CRD|NR1>, RISE| 0, FALL|1
Example setting: TIM: TEND: EDGE RISE Sets the trigger edge to rise when the test ends.
TIM: TEND: EDGE 0
Example query: TIM: TEND: EDGE?

TIMing: TEND:LEVel
This command is used to set the trigger level for starting a test.
Setting syntax: TIMing: TEND:LEVel<space><NRf+>[suffix]
Setting parameters: A/V, depending on the TIMing: TEND: SOURce setting mode
Example setting: TIM: TEND: LEV 20 Set the initial triggering current value=20A.
TIM: TEND: LEV MAX Sets the initial triggering current value value= maximum value.
TIM: TEND: LEV MIN Sets the initial triggering current value value= Minimum value.
Query syntax: TIMing: TEND: SOURce? <space><MAX|MIN>
Return parameters: <NR2> [Unit =A/V]
Example query: TIM: TEND: LEV?
TIM: TEND: LEV? MAX
TIM: TEND: LEV? MIN

Section 7 Communication protocol MODBUS

7.1 Message structure

This product adopts modbusrtu protocol, and the following convention applies:

1. All arguments except CRC checksum are in big endian format (high byte first);
2. 0x03 function code is used for read register, 0x10 function code is used for write register, and other function codes are reserved;
3. The range of ID below is 0-255. The value of 0 indicates the broadcast packet not need to be returned.
4. All data are transmitted in unsigned fixed-point mode. The arguments after the decimal point are those after amplification. For example, 12550000 is transmitted for 125.5A. See Table 7-5 for the decimal point digits of each type of parameter.

7.1.1 Write register (0x10)

Table 7-11 Write register message structure

Frame structure						
Address	Function code	Register	Number of registers	Number of bytes	Data	CRC
X	0x10	XX	XX	X	XXXX……	XX

Note: X represents one byte, XX represents two bytes

Address: lower computer address, set through the display system setting interface, the default is 255;

Functions: read register 0x03 and write register 0x10;

Register: point to the register address to read/write, and only the released register address is valid;

Number of registers: the number of registers to read/write. This value is fixed in each instruction and cannot be modified at will. The size of a register can be 32 bits, 16 bits, or 8 bits;

Number of bytes: the number of data to be operated in bytes. This value is fixed in each instruction and cannot be modified at will.

Data: the data to be operated. The parameters of each instruction should be set as whole, not separately. This value is fixed in each instruction and cannot be modified at will.

CRC checksum: 16 bit CRC check, 2 bytes, low byte first.

Table 7-2 Write register response message structure

Address	Function code	Register	Number of registers	CRC
X	0x10	XX	XX	XX

Note: X represents one byte, XX represents two bytes

Address: lower computer address, set through the display system setting interface, the default is 255;

Functions: read register 0x03 and write register 0x10;

Register: point to the register address to read/write, and only the released register address is valid;

Number of registers: the number of registers to read/write. This value is fixed in each mode and cannot be modified at will. The size of a register can be 32 bits or 16 bits;

CRC checksum: 16 bit CRC check, 2 bytes, low byte first.

7.1.2 Read register (0x03)

Table 7-3 Read register message structure

Address	Function code	Register	Number of registers	CRC
X	0x03	XX	XX	XX

Note: X represents one byte, XX represents two bytes

Address: lower computer address, set through the display system setting interface, the default is 255;

Functions: read register 0x03 and write register 0x10;

Register: point to the register address to read/write, and only the released register address is valid;

Number of registers: the number of registers to read/write. This value is fixed in each mode and cannot be modified at will. The size of a register can be 32 bits, 16 bits, or 8 bits;

CRC checksum: 16 bit CRC check, 2 bytes, low byte first.

Table 7-4 Read register response message structure

Address	Number of bytes	Data	CRC
X	X	XXX……	XX

Note: X represents one byte, XX represents two bytes

Address: lower computer address, set through the display system setting interface, the default is 255;

Functions: read register 0x03 and write register 0x10;

Register: point to the register address to read/write, and only the released register address is valid;

Number of registers: the number of registers to read/write. This value is fixed in each mode and cannot be modified at will. The size of a register can be 32 bits or 16 bits;

CRC checksum: 16 bit CRC check, 2 bytes, low byte first.

7.1.3 Numerical data format

There are two kinds of commands: query command and set command. Pay attention to the range and resolution when setting/reading an argument for each model (refer to the specification table for specific range). If the range and resolution cannot be reached, it will be automatically corrected. If the received data does not conform to the frame format or the checksum error occurs, this frame will be discarded.

The number of decimal parts to be protected during transmission is listed in Table 7-5.

The unit and resolution of data are listed in Table 7-5.

Table 7-5 Data unit

Class	Default unit	Reference unit	**Decimal point digits**
Current	A	Ampere	5
Resistance	Ω	Ohm	4
Voltage	V	Volt	6
Power	W	Watt	3
Inductance	H	Henry	1
Capacitance	F	Farad	0

Time	S	Second	3
Time	ms	Millisecond	3
Frequency	Hz	Hertz	0
Slope	A/uS	Amperes/micro Second	6
Resistivity	Coe	Coefficient	6
Battery capacity	AH/WH	Ampere-hour/ Watt- hour	3
Capacitance	μF	Microfarads	0
Inductance	μH	Microhenry	1
Percentage	%	Percent	2

7.2 Command parsing

7.2.1 CC mode

Setting example: 01 10 00 01 00 03 0C 00 0F 42 40 00 03 0D 40 00 04 93 E0 73 E0

Set Echo: 01 10 00 01 00 03 D1 C8

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 01	Register address	00 01	Register address
00 03	Number of registers	00 03	Number of registers
0C	Number of argument bytes	D1 C8	CRC
00 0F 42 40	Set current 10.00000A		
00 03 0D 40	Rising slope 2.00000A/us		
00 04 93 E0	Falling slope 3.00000A/us		
73 E0	CRC		

Query example: 01 03 00 01 00 03 54 0B

Query return: 01 03 0C 00 0F 42 40 00 03 0D 40 00 04 93 E0 2E D2

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 01	Register address	0C	Number of bytes
00 03	Number of registers	00 0F 42 40	Set current 10.00000A
54 0B	CRC	00 03 0D 40	Rising slope 2.00000A/us
		00 04 93 E0	Falling slope 3.00000A/us
		2E D2	CRC

7.2.2 CV mode

Setting example: 01 10 00 02 00 03 0C 00 4C 4B 40 05 F5 E1 00 00 00 00 01 15 91

Set Echo: 01 10 00 02 00 03 21 C8

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 02	Register address	00 02	Register address

00 03	Number of registers	00 03	Number of registers
0C	Number of argument bytes	21 C8	CRC
00 4C 4B 40	Set voltage 5.000000V		
05 F5 E1 00	Limit current 1000.00000A		
00 00 00 01	Response speed 0: Slow 1: Medium 2: Fast		
15 91	CRC		

Query example: 01 03 00 02 00 03 A4 0B

Query return: 01 03 0C 00 4C 4B 40 05 F5 E1 00 00 00 00 01 08 52

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 01	Register address	0C	Number of bytes
00 03	Number of registers	00 4C 4B 40	Set voltage 5.000000V
A4 0B	CRC	05 F5 E1 00	Limit current 1000.00000A
		00 00 00 01	Response speed 0: Slow 1: Medium 2: Fast
		08 52	CRC

7.2.3 CR mode

Setting example: 01 10 00 03 00 03 0C 00 0F 42 40 00 0F 42 40 00 1E 84 80 1E A1

Set Echo: 01 10 00 03 00 03 70 08

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 03	Register address	00 03	Register address
00 03	Number of registers	00 03	Number of registers
0C	Number of argument bytes	70 08	CRC
00 0F 42 40	Set resistance 100.0000Ω		
00 0F 42 40	Rising slope 10.00000A/us		
00 1E 84 80	Falling slope 20.00000A/us		
1E A1	CRC		

Query example: 01 03 00 03 00 03 F5 CB

Query return: 01 03 0C 00 0F 42 40 00 0F 42 40 00 1E 84 80 C2 F2

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 03	Register address	0C	Number of bytes
00 03	Number of registers	00 0F 42 40	Set resistance 100.0000Ω
F5 CB	CRC	00 0F 42 40	Rising slope 10.00000A/us

		00 1E 84 80	Falling slope 20.00000A/us
		C2 F2	CRC

7.2.4 CP mode

Setting example: 01 10 00 04 00 03 0C 00 2D C6 C0 00 07 A1 20 00 09 27 C0 0D 8F

Set Echo: 01 10 00 04 00 03 C1 C9

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 04	Register address	00 04	Register address
00 03	Number of registers	00 03	Number of registers
0C	Number of argument bytes	C1 C9	CRC
00 2D C6 C0	Set power 3000.000W		
00 07 A1 20	Rising slope 5.00000A/us		
00 09 27 C0	Falling slope 6.00000A/us		
0D 8F	CRC		

Query example: 01 03 00 04 00 03 44 0A

Query return: 01 03 0C 00 2D C6 C0 00 07 A1 20 00 09 27 C0 93 EE

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 04	Register address	0C	Number of bytes
00 03	Number of registers	00 2D C6 C0	Set power 3000.000W
44 0A	CRC	00 07 A1 20	Rising slope 5.00000A/us
		00 09 27 C0	Falling slope 6.00000A/us
		93 EE	CRC

7.2.5 CCD mode

Setting example: 01 10 00 05 00 07 1C 00 0F 42 40 00 00 01 F4 00 12 4F 80 00 1E 84 80 00 00 03 E8 00 13 D6 20 00 00 00 00 63 37

Set Echo: 01 10 00 05 00 07 91 CA

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 05	Register address	00 05	Register address
00 07	Number of registers	00 07	Number of registers
1C	Number of argument bytes	91 CA	CRC
00 0F 42 40	L1 10.00000A		
00 00 01 F4	T1 0.500ms		
00 12 4F 80	Rising slope 12.00000A/us		
00 1E 84 80	L2 20.00000A		
00 00 03 E8	T1 1.000ms		
00 13 D6 20	Falling slope 13.00000A/us		

00 00 00 00	Number of repeats 0: Unlimited		
63 37	CRC		

Query example: 01 03 00 05 00 07 14 09

Query return: 01 03 1C 00 0F 42 40 00 00 01 F4 00 12 4F 80 00 1E 84 80 00 00 03 E8 00 13 D6 20 00 00 00 00 2C BB

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 05	Register address	1C	Number of argument bytes
00 07	Number of registers	00 0F 42 40	L1 10.00000A
14 09	CRC	00 00 01 F4	T1 0.500ms
		00 12 4F 80	Rising slope 12.00000A/us
		00 1E 84 80	L2 20.00000A
		00 00 03 E8	T1 1.000ms
		00 13 D6 20	Falling slope 13.00000A/us
		00 00 00 00	Number of repeats 0: Unlimited
		2C BB	CRC

7.2.6 OCP mode

Setting example: 01 10 00 06 00 08 20 00 0F 42 40 00 1E 84 80 00 00 00 03 00 06 1A 80 00 4C 4B 40 00 00 00 01 00 0C 35 00 00 0A AE 60 78 4D

Set Echo: 01 10 00 06 00 08 21 CE

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 06	Register address	00 06	Register address
00 08	Number of registers	00 08	Number of registers
20	Number of argument bytes	21 CE	CRC
00 0F 42 40	Start current 10.00000A		
00 1E 84 80	End current 20.00000A		
00 00 00 03	Number of steps: 3		
00 06 1A 80	Step time 400.000ms		
00 4C 4B 40	Threshold 5.000000V		
00 00 00 01	LATCH 0: OFF 1:ON		
00 0C 35 00	OCP upper limit 8.00000A		
00 0A AE 60	OCP lower limit 7.00000A		
78 4D	CRC		

Query example: 01 03 00 06 00 08 A4 0D

Query return: 01 03 20 00 0F 42 40 00 1E 84 80 00 00 00 03 00 06 1A 80 00 4C 4B 40 00 00 00 01 00 0C 35 00 00 0A AE 60 EC BF

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register

00 06	Register address	20	Number of argument bytes
00 08	Number of registers	00 0F 42 40	Start current 10.00000A
A4 0D	CRC	00 1E 84 80	End current 20.00000A
		00 00 00 03	Number of steps: 3
		00 06 1A 80	Step time 400.000ms
		00 4C 4B 40	Threshold 5.000000V
		00 00 00 01	LATCH 0: OFF 1:ON
		00 0C 35 00	OCP upper limit 8.00000A
		00 0A AE 60	OCP lower limit 7.00000A
		9D 85	CRC

7.2.7 OPP mode

Setting example: 01 10 00 07 00 08 20 00 04 93 E0 00 16 E3 60 00 00 00 05 00 07 A1 20 05 F5 E1 00 00 00 00 00 00 13 D6 20 00 10 C8 E0 DE 11

Set Echo: 01 10 00 07 00 08 70 0E

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 07	Register address	00 07	Register address
00 08	Number of registers	00 08	Number of registers
20	Number of argument bytes	70 0E	CRC
00 04 93 E0	Start power 300.000W		
00 16 E3 60	End power 1500.000W		
00 00 00 05	Step 5		
00 07 A1 20	Step time 500.000ms		
05 F5 E1 00	Threshold 100.000000V		
00 00 00 00	LATCH 0: OFF 1:ON		
00 13 D6 20	OPP upper limit 1300.000W		
00 10 C8 E0	OPP lower limit 1100.000W		
DE 11	CRC		

Query example: 01 03 00 07 00 08 F5 CD

Query return: 01 03 20 00 04 93 E0 00 16 E3 60 00 00 00 05 00 07 A1 20 05 F5 E1 00 00 00 00 00 00 13 D6 20 00 10 C8 E0 8B 3E

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 07	Register address	20	Number of argument bytes
00 08	Number of registers	00 04 93 E0	Start power 300.000W
F5 CD	CRC	00 16 E3 60	End power 1500.000W
		00 00 00 05	Step 5
		00 07 A1 20	Step time 500.000ms
		05 F5 E1 00	Threshold 100.000000V
		00 00 00 00	LATCH 0: OFF 1:ON

		00 13 D6 20	OPP upper limit 1300.000W
		00 10 C8 E0	OPP lower limit 1100.000W
		8B 3E	CRC

7.2.8 LIST mode

Setting example: 01 10 00 08 00 08 14 02 03 05 00 01 6E 36 00 00 06 1A 80 00 12 4F 80 00 13 D6 20 CD 4A

Set Echo: 01 10 00 08 00 08 40 0D

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 08	Register address	00 08	Register address
00 08	Number of registers	00 08	Number of registers
14	Number of argument bytes	40 0D	CRC
02	Test group Group No. to set: Group 2		
03	Current step Step No. to set: Step 3		
05	Total steps Set the total steps of current group to 5		
00	Output mode 0: Keep 1: Reset 2: Continuous		
01 6E 36 00	Set current 240.00000A		
00 06 1A 80	Test time: 400.000ms		
00 12 4F 80	Rising slope 12.00000A		
00 13 D6 20	Falling slope 13.00000A		
CD 4A	CRC		

Query example: 01 03 00 08 00 08 02 02 03 A4 FC

Query return: 01 03 14 02 03 05 00 01 6E 36 00 00 06 1A 80 00 12 4F 80 00 13 D6 20 5A E0

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 08	Register address	14	Number of argument bytes
00 08	Number of registers	02	Group No. queried: Group 2
02	Number of argument bytes	03	Step No. queried: Step 3
02	Group No. to query: Group 2	05	Total number of steps for the queried group: 5
03	Step No. to query: Step 3	00	输出 mode Output mode 0: Keep 1: Reset 2: Continuous
A4 FC	CRC	01 6E 36 00	Set current 240.00000A

		00 06 1A 80	Test time: 400.000ms
		00 12 4F 80	Rising slope 12.00000A
		00 13 D6 20	Falling slope 13.00000A
		5A E0	CRC

7.2.9 FLEX mode

Setting example: 01 10 00 09 00 04 10 00 00 00 64 00 1E 84 80 00 00 00 1E 00 00 01 90 67 0F

Set Echo: 01 10 00 09 00 04 11 C8

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 09	Register address	00 09	Register address
00 04	Number of registers	00 04	Number of registers
10	Number of argument bytes	11 C8	CRC
00 00 00 64	Load capacitive reactance 100uF		
00 1E 84 80	Load impedance 200.0000 Ω		
00 00 00 1E	Simulated lead inductance 3.0uH		
00 00 01 90	Simulated lead impedance 4.0000Ω		
67 0F	CRC		

Query example: 01 03 00 09 00 04 94 0B

Query return: 01 03 10 00 00 00 64 00 1E 84 80 00 00 00 1E 00 00 01 90 85 50

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 09	Register address	10	Number of argument bytes
00 04	Number of registers	00 00 00 64	Load capacitive reactance 100uF
94 0B	CRC	00 1E 84 80	Load impedance 200.0000 Ω
		00 00 00 1E	Simulated lead inductance 3.0uH
		00 00 01 90	Simulated lead impedance 4.0000Ω
		85 50	CRC

7.2.10 BATY mode

Setting example: 01 10 00 0A 00 07 1C 00 00 00 00 02 AE A5 40 00 12 4F 80 00 16 E3 60 00 09 27 C0 02 62 5A 00 00 0C 35 00 3B 3F

Set Echo: 01 10 00 0A 00 07 A1 C9

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 0A	Register address	00 0A	Register address
00 07	Number of registers	00 07	Number of registers
1C	Number of argument bytes	A1 C9	CRC

00 00 00 00	Operating mode 0:CC 1:CR 2:CP		
02 AE A5 40	Parameters 450.00000A		
00 12 4F 80	Rising slope 12.00000A/us		
00 16 E3 60	Falling slope 1.500000A/us		
00 09 27 C0	Cut-off time 600.000S		
02 62 5A 00	Turn-off voltage 40.000000V		
00 0C 35 00	Cut-off capacity 800.000AH/WH		
3B 3F	CRC		

Query example: 01 03 00 0A 00 07 24 0A

Query return: 01 03 1C 00 00 00 00 02 AE A5 40 00 12 4F 80 00 16 E3 60 00 09 27 C0 02 62 5A 00 00 0C 35 00 72 57

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 0A	Register address	1C	Number of argument bytes
00 07	Number of registers	00 00 00 00	Operating mode 0:CC 1:CR 2:CP
24 0A	CRC	02 AE A5 40	Parameters 450.00000A
		00 12 4F 80	Rising slope 12.00000A/us
		00 16 E3 60	Falling slope 1.500000A/us
		00 09 27 C0	Cut-off time 600.000S
		02 62 5A 00	Turn-off voltage 40.000000V
		00 0C 35 00	Cut-off capacity 800.000AH/WH
		72 57	CRC

7.2.11 LED mode

Setting example: 01 10 00 0B 00 05 14 10 B0 76 00 00 12 4F 80 00 0C 35 00 03 56 7D FF 00 02 D9 2A 8D EA

Set Echo: 01 10 00 0B 00 05 71 C8

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 0B	Register address	00 0B	Register address
00 05	Number of registers	00 05	Number of registers
14	Number of argument bytes	71 C8	CRC
10 B0 76 00	Working voltage Vo 280.000000V		
00 12 4F 80	Working current Io 12.00000A		
00 0C 35 00	Resistivity 0.800000		

03 56 7E 00	Forward voltage Vf 56.000000V		
00 02 D9 2A	Equivalent resistance Rd 18.6666Ω		
8D EA	CRC		

Query example: 01 03 00 0B 00 05 F4 0B

Query return: 01 03 14 10 B0 76 00 00 B7 1B 00 00 0C 35 00 03 56 7E 00 00 02 D9 2A 39 2F

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 0B	Register address	14	Number of argument bytes
00 05	Number of registers	10 B0 76 00	Working voltage Vo 280.000000V
F4 0B	CRC	00 B7 1B 00	Working current Io 120.00000A
		00 0C 35 00	Resistivity 0.800000
		03 56 7E 00	Forward voltage VF 56.000000V
		00 02 D9 2A	Equivalent resistance Rd 18.6666Ω
		39 2F	CRC

7.2.12 CRD mode

Setting example: 01 10 00 0C 00 07 1C 00 29 32 E0 00 00 C3 50 00 12 4F 80 00 7A 12 00 00 01 86 A0 00 12 4F 80 00 00 00 5A A1 2F

Set Echo: 01 10 00 0C 00 07 41 C8

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 0C	Register address	00 0C	Register address
00 07	Number of registers	00 07	Number of registers
1C	Number of argument bytes	41 C8	CRC
00 29 32 E0	L1 270.0000Ω		
00 00 C3 50	T1 50.000ms		
00 12 4F 80	Rising slope 12.00000A		
00 7A 12 00	L2 800.0000Ω		
00 01 86 A0	T2 100.000ms		
00 12 4F 80	Falling slope 12.00000A/us		
00 00 00 5A	Number of repeats 90 0: Unlimited		

A1 2F	CRC		

Query example: 01 03 00 0C 00 07 C4 0B

Query return: 01 03 1C 00 29 32 E0 00 00 C3 50 00 12 4F 80 00 7A 12 00 00 01 86 A0 00 12 4F 80 00 00 00 5A EB 6F

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 0C	Register address	1C	Number of argument bytes
00 07	Number of registers	00 29 32 E0	L1 270.0000Ω
C4 0B	CRC	00 00 C3 50	T1 50.000ms
		00 12 4F 80	Rising slope 12.00000A /us
		00 7A 12 00	L2 800.0000Ω
		00 01 86 A0	T2 100.000ms
		00 12 4F 80	Falling slope 12.00000A/us
		00 00 00 5A	Number of repeats 90 0: Unlimited
		EB 6F	CRC

7.2.13 Mode setting

Setting example: 01 10 00 60 00 03 03 01 02 02 19 21

Set Echo: 01 10 00 60 00 03 80 16

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 60	Register address	00 60	Register address
00 03	Number of registers	00 03	Number of registers
03	Number of argument bytes	80 16	CRC
01	CC mode See 8.1 Mode values for details		
02	Voltage range 0: Low 1: Medium 2: High		
02	Current range 0: Low 1: Medium 2: High		
19 21	CRC		

Query example: 01 03 00 60 00 03 05 D5

Query return: 01 03 03 01 02 02 94 EF

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 60	Register address	03	Number of argument bytes
00 03	Number of registers	01	CC mode

			See 8.1 Mode values for details
05 D5	CRC	02	Voltage range 0: Low 1: Medium 2: High
		02	Current range 0: Low 1: Medium 2: High
		94 EF	CRC

7.2.14 Loading/unloading

Setting example: 01 10 00 61 00 01 01 01 BC 5E

Set Echo: 01 10 00 61 00 01 50 17

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 61	Register address	00 61	Register address
00 01	Number of registers	00 01	Number of registers
01	Number of argument bytes	50 17	CRC
01	0: unloading 1: loading		
BC 5E	CRC		

Query example: 01 03 00 61 00 01 D5 D4

Query return: 01 03 01 01 31 88

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 61	Register address	01	Number of argument bytes
00 01	Number of registers	01	0: unloading 1: loading
D5 D4	CRC	31 88	CRC

7.2.15 Short circuit simulation

Setting example: 01 10 00 62 00 01 01 01 F8 5E

Set Echo: 01 10 00 62 00 01 A0 17

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 62	Register address	00 62	Register address
00 01	Number of registers	00 01	Number of registers
01	Number of argument bytes	A0 17	CRC
01	0: Stop short circuit simulation 1: Start short circuit simulation		
F8 5E	CRC		

Query example: 01 03 00 62 00 01 25 D4

Query return: 01 03 01 00 F0 48

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address

03	Function code: read register	03	Function code: read register
00 62	Register address	01	Number of argument bytes
00 01	Number of registers	00	0: Stop short circuit simulation 1: Start short circuit simulation
25 D4	CRC	F0 48	CRC

7.2.16 Short circuit loading mode (without affecting program control)

Setting example: 01 10 00 63 00 01 01 01 C5 9E

Set Echo: 01 10 00 63 00 01 F1 D7

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 63	Register address	00 63	Register address
00 01	Number of registers	00 01	Number of registers
01	Number of argument bytes	F1 D7	CRC
01	0: Switch 1: Keep		
C5 9E	CRC		

Query example: 01 03 00 63 00 01 74 14

Query return: 01 03 01 01 31 88

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 63	Register address	01	Number of argument bytes
00 01	Number of registers	01	0: Switch 1: Keep
74 14	CRC	31 88	CRC

7.2.17 Clear alarms

Setting example: 01 10 00 64 00 01 01 01 70 5E

Set Echo: 01 10 00 64 00 01 40 16

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 64	Register address	00 64	Register address
00 01	Number of registers	00 01	Number of registers
01	Number of argument bytes	40 16	CRC
01	0: Do not clear 1: Clear the alarm.		
70 5E	CRC		

Query example: 01 03 00 64 00 01 C5 D5

Query return: 01 03 01 00 F0 48

Query arguments	Remark	Parameter return	Remark

01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 64	Register address	01	Number of argument bytes
00 01	Number of registers	00	The argument is valid in case of alarm 1: Alarm flag not cleared 0: Alarm cleared
C5 D5	CRC	F0 48	CRC

7.2.18 Voltage sampling terminal

Setting example: 01 10 00 65 00 01 01 01 4D 9E

Set Echo: 01 10 00 65 00 01 11 D6

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 65	Register address	00 65	Register address
00 01	Number of registers	00 01	Number of registers
01	Number of argument bytes	11 D6	CRC
01	0: load terminal sampling 1: Sense terminal sampling		
4D 9E	CRC		

Query example: 01 03 00 65 00 01 94 15

Query return: 01 03 01 01 31 88

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 65	Register address	01	Number of argument bytes
00 01	Number of registers	01	0: load terminal sampling 1: Sense terminal sampling
94 15	CRC	31 88	CRC

7.2.19 Measurement argument query

Query example: 01 03 00 66 00 05 65 D6

Query return: 01 03 11 00 B7 69 20 00 07 9D 38 00 00 17 70 01 00 00 00 00 54 7E

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 66	Register address	11	Number of argument bytes
00 05	Number of registers	00 B7 69 20	Voltage measurement 12.020000V
65 D6	CRC	00 07 9D 38	Current measurement 4.99000A
		00 00 17 70	Power measurement 6.000W
		01	Loading state 0: Standby 1: Under loading 2: Short circuit test

		00 00 00 00	No alarm See 8.2 Alarm code for details
		54 7E	CRC

7.2.20 Ripple query (only valid for CCDs/CRDs)

Query example: 01 03 00 67 00 02 75 D4

Query return: 01 03 08 00 BC 24 10 00 B6 7E C0 EF 2D

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 67	Register address	08	Number of argument bytes
00 02	Number of registers	00 BC 24 10	Maximum peak voltage 12.330000V
75 D4	CRC	00 B6 7E C0	Minimum peak voltage 11.960000V
		EF 2D	CRC

7.2.21 Battery capacity

Query example: 01 03 00 68 00 03 84 17

Query return: 01 03 14 00 00 00 49 00 00 00 00 00 00 00 0A 00 00 00 00 00 00 00 79 FB A3

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 68	Register address	14	Number of argument bytes
00 03	Number of registers	00 00 00 49	Test time 73S
84 17	CRC	00 00 00 00 00 00 00 0A	Battery capacity 0.010AH
		00 00 00 00 00 00 00 79	Battery capacity 0.121WH
		FB A3	CRC

7.2.22 Query GO/NG result

Query example: 01 03 00 69 00 04 94 15

Query return: 01 03 04 05 01 03 03 EB CE

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 69	Register address	04	Number of argument bytes
00 04	Number of registers	05	All channels GO/NG result NG_ I_ L (current exceeds the lower limit) See 8.3GO/NG result table for details

94 15	CRC	01	Voltage channel GO/NG result GO (Qualified) See 8.3GO/NG result table for details
		03	Current channel GO/NG results NG_ L (exceeding the lower limit) See 8.3GO/NG result table for details
		03	Power channel GO/NG result NG_ L (exceeding the lower limit) See 8.3GO/NG result table for details
		EB CE	CRC

7.2.23 Query OCP/OPP result

Query example: 01 03 00 6A 00 02 E4 17

Query return: 01 03 05 02 00 0A AE 60 97 18

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 6A	Register address	05	Number of argument bytes
00 02	Number of registers	02	Test results 0: Invalid 1: Qualified 2: Unqualified
E4 17	CRC	00 0A AE 60	Protection point 7.00000A/700.000W
		97 18	CRC

7.2.24 Query ID

Query example: 01 03 00 6B 00 06 B4 14

Query return: 01 03 2E 41 69 6E 75 6F 2C 32 33 36 30 32 45 2D 31 32 30 30 2D 38 30 2C 42 31 32 33 34 35 36 37 38 39 2C 31 2E 30 37 2C 32 2E 30 34 2C 32 2E 30 33 A8 58

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 6B	Register address	2E	Number of argument bytes
00 06	Number of registers	41 69 6E 75 6F 2C	Manufacturer name (ASCII) Ainuo,
B4 14	CRC	32 33 36 30 32 45 2D 31 32 30 30 2D 38 30 2C	Product model (ASCII) 23602E-1200-80,
		42 31 32 33 34 35 36 37 38 39 2C	Number (ASCII) B123456789,
		31 2E 30 37 2C	Version of control system (ASCII)

			1.07,
		32 2E 30 34 2C	Version of display system (ASCII) 2.04,
		32 2E 30 33	Version of screen program (ASCII) 2.03
		A8 58	CRC

7.2.25 Test setup

Setting example: 01 10 00 6E 00 05 14 47 86 8C 00 04 C4 B4 00 00 1E 84 80 00 00 00 00 00 00 00 00 8D 35

Set Echo: 01 10 00 6E 00 05 61 D7

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 6E	Register address	00 6E	Register address
00 05	Number of registers	00 05	Number of registers
14	Number of argument bytes	61 D7	CRC
47 86 8C 00	Voltage upper limit 1200.000000V		
04 C4 B4 00	Current upper limit 800.00000A		
00 1E 84 80	Power upper limit 2000.000W		
00 00 00 00	Turn-on voltage 0: Disable Others: Valid		
00 00 00 00	Turn-off voltage 0: Disable Others: Valid		
8D 35	CRC		

Query example: 01 03 00 6E 00 05 E4 14

Query return: 01 03 14 47 86 8C 00 04 C4 B4 00 00 1E 84 80 00 00 00 00 00 00 00 00 66 05

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 6E	Register address	14	Number of argument bytes
00 05	Number of registers	47 86 8C 00	Voltage upper limit 1200.000000V
E4 14	CRC	04 C4 B4 00	Current upper limit 800.00000A
		00 1E 84 80	Power upper limit 2000.000W
		00 00 00 00	Turn-on voltage 0: Disable Others: Valid
		00 00 00 00	Turn-off voltage 0: Disable Others: Valid
		66 05	CRC

7.2.26 GO/NG test argument setting

Setting example: 01 10 00 6F 00 11 40 00 01 00 01 02 FA F0 80 03 47 3B C0 02 AE A5 40 00 00 03 E8 00 00 03 E8 01 31 2D 00 01 7D 78 40 00 E4 E1 C0 00 00 01 F4 00 00 01 F4 00 0F 42 40 00 12 4F 80 00 0C 35 00 00 00 05 DC 00 00 05 DC 87 B2

Set Echo: 01 10 00 6F 00 11 30 18

Setting parameters	Remark	Set Echo	Remark
01	Address	01	Address
10	Function code: write register	10	Function code: write register
00 6F	Register address	00 6F	Register address
00 11	Number of registers	00 11	Number of registers
40	Number of argument bytes	30 18	CRC
00 01	Go/Ng on/off 0: Off 1: On		
00 01	Go/Ng mode 0: Percent 1: Absolute		
02 FA F0 80	Median voltage 50.000000V		
03 47 3B C0	High voltage 55.000000V		
02 AE A5 40	Low voltage 45.000000V		
00 00 03 E8	Upper limit of voltage 10.00%		
00 00 03 E8	Voltage lower limit 10.00%		
01 31 2D 00	Current median 200.00000A		
01 7D 78 40	High current 250.00000A		
00 E4 E1 C0	Low current 150.00000A		
00 00 01 F4	Current upper limit 5.00%		
00 00 01 F4	Current lower limit 5.00%		
00 0F 42 40	Power median 1000.000W		
00 12 4F 80	High power 1200.000W		
00 0C 35 00	Low power 800.000W		
00 00 05 DC	Power upper limit 15.00%		
00 00 05 DC	Power lower limit 15.00%		
87 B2	CRC		

Query example: 01 03 00 6F 00 11 B5 DB

Query return: 01 03 40 00 01 00 01 02 FA F0 80 03 47 3B C0 02 AE A5 40 00 00 03 E8 00 00 03 E8 01 31 2D 00 01 7D 78 40 00 E4 E1 C0 00 00 01 F4 00 00 01 F4 00 0F 42 40 00 12 4F 80 00 0C 35 00 00 00 05 DC 00 00 05 DC 6D 99

Query arguments	Remark	Parameter return	Remark
01	Address	01	Address
03	Function code: read register	03	Function code: read register
00 6F	Register address	40	Number of argument bytes
00 11	Number of registers	00 01	Go/Ng on/off 0: Off 1: On
B5 DB	CRC	00 01	Go/Ng mode

			0: Percent 1: Absolute
		02 FA F0 80	Median voltage 50.000000V
		03 47 3B C0	High voltage 55.000000V
		02 AE A5 40	Low voltage 45.000000V
		00 00 03 E8	Upper limit of voltage 10.00%
		00 00 03 E8	Voltage lower limit 10.00%
		01 31 2D 00	Current median 200.00000A
		01 7D 78 40	High current 250.00000A
		00 E4 E1 C0	Low current 150.00000A
		00 00 01 F4	Current upper limit 5.00%
		00 00 01 F4	Current lower limit 5.00%
		00 0F 42 40	Power median 1000.000W
		00 12 4F 80	High power 1200.000W
		00 0C 35 00	Low power 800.000W
		00 00 05 DC	Power upper limit 15.00%
		00 00 05 DC	Power lower limit 15.00%
		6D 99	CRC

7.2.27 PROG Mode group parameter Settings

Setting example:01 10 00 0D 00 05 14 00 00 00 01 00 00 00 00 00 00 00 02 00 00 00 19 00 00 00 01 93 E6

Set Echo:01 10 00 0D 00 05 91 C9

Setting parameters	Remark	Setting example	Remark
01	address	01	address
10	Function code: write register	10	Function code: write register
00 0D	Register address	00 0D	Register address
00 05	Register number	00 05	Register number
14	Number of parameter bytes	91 C9	CRC
00 00 00 01	Group number		
00 00 00 00	type 0：LIST 1:STEP		
00 00 00 02	chain		
00 00 00 19	Total number of steps		
00 00 00 01	Number of repeats 0：infinite repetition		
93 E6	CRC		

Query example:01 03 00 0D 00 05 04 00 00 00 01 03 DB

Query return:01 03 14 00 00 00 01 00 00 00 00 00 00 00 02 00 00 00 19 00 00 00 01 37 95

Query parameter	Remark	Parameter return	Remark
01	address	01	address
03	Function code: read register	03	Function code: read register
00 0D	Register address	14	Number of parameter bytes
00 05	Register number	00 00 00 01	Group number
04	Number of parameter bytes	00 00 00 00	type 0：LIST 1:STEP

00 00 00 01	Specifies the number of the Group to be queried	00 00 00 02	chain
03 DB	CRC	00 00 00 19	Total number of steps
		00 00 00 01	Number of repeats 0：infinite repetition
		37 95	CRC

7.2.28 PROG mode group parameter setting

Setting example:01 10 00 0E 00 10 40 00 00 00 01 00 00 00 01 00 00 00 01 00 00 00 02 00 00 00 02 00 B7 1B 00 00 00 00 00 00 00 00 00 00 1E 84 80 00 BE BC 20 00 AF 79 E0 00 A0 37 A0 00 90 F5 60 00 01 FB D0 00 01 AD B0 00 0F 42 40 0D 87

Set Echo:01 10 00 0E 00 10 A0 06

Setting parameters	Remark	Setting example	Remark
01	address	01	address
10	Function code: write register	10	Function code: write register
00 0E	Register address	00 0E	Register address
00 10	Register number	00 10	Register number
40	Number of parameter bytes	A0 06	CRC
00 00 00 01	Group number		
00 00 00 01	Step number		
00 00 00 01	Trigger mode (not modifiable)		
00 00 00 02	mode (not modifiable)		
00 00 00 02	range (not modifiable)		
00 B7 1B 00	value 12.000000V		
00 00 00 00	rise0.00000A （CV mode 该参数无效）		
00 00 00 00	FALL0.00000A (This parameter is invalid for CV mode)		
00 1E 84 80	Time 2.000000S		
00 BE BC 20	Voltage NG MAX 12.500000V		
00 AF 79 E0	Voltage NG MIN11.500000V		
00 A0 37 A0	Current NG MAX 105.00000A		
00 90 F5 60	current NG MIN 95.00000A		
00 01 FB D0	Power NG MAX 130.000W		
00 01 AD B0	Power NG MIN 110.000W		
00 0F 42 40	Delay time1.000000S		
0D 87	CRC		

Query example:01 03 00 0E 00 10 08 00 00 00 01 00 00 00 01 F1 3E

Query return:01 03 40 00 00 00 01 00 00 00 01 00 00 00 01 00 00 00 02 00 00 00 02 00 B7 1B 00 00 00 07 D0 00 00 07 D0 00 1E 84 80 00 BE BC 20 00 AF 79 E0 00 A0 37 A0 00 90 F5 60 00 01 FB D0 00 01 AD B0 00 0F 42 40 71 C3

Query parameter	Remark	Parameter return	Remark
01	address	01	address
03	Function code: read register	03	Function code: read

			register
00 0E	Register address	40	Number of parameter bytes
00 10	Register number	00 00 00 01	Group number
08	Number of parameter bytes	00 00 00 01	Step number
00 00 00 01	Specifies the number of the Group to be queried	00 00 00 01	Trigger mode (not modifiable)
00 00 00 01		00 00 00 02	mode (not modifiable)
F1 3E	CRC	00 00 00 02	range (not modifiable)
		00 B7 1B 00	value 12.000000V
		00 00 07 D0	rise 0.02000A (This parameter is invalid for CV mode)
		00 00 07 D0	FALL 0.02000A (This parameter is invalid for CV mode)
		00 1E 84 80	Time 2.000000S
		00 BE BC 20	Voltage NG MAX 12.500000V
		00 AF 79 E0	Voltage NG MIN11.500000V
		00 A0 37 A0	Current NG MAX 15.00000A
		00 90 F5 60	current NG MIN 95.00000A
		00 01 FB D0	Power NG MAX 130.000W
		00 01 AD B0	Power NG MIN 110.000W
		00 0F 42 40	Delay time1.000000S
		71 C3	CRC

7.2.29 The PROG mode sets the group to be executed

Setting example:01 10 00 10 00 01 04 00 00 00 01 33 50
Set Echo:01 10 00 10 00 01 00 0C

Setting parameters	Remark	Setting example	Remark
01	address	01	address
10	Function code: write register	10	Function code: write register
00 10	Register address	00 10	Register address
00 01	Register number	00 01	Register number
04	Number of parameter bytes	00 0C	CRC
00 00 00 01	Group number		
33 50	CRC		

Query example:01 03 00 10 00 01 85 CF
Query return:01 03 04 00 00 00 01 3B F3

Query parameter	Remark	Parameter return	Remark
01	address	01	address
03	Function code: read register	03	Function code: read register
00 10	Register address	04	Number of parameter bytes
00 01	Register number	00 00 00 01	Group number
01	Number of parameter bytes	3B F3	CRC
85 CF	CRC		

7.2.30 PROG mode reads the working status

Query example:01 03 00 11 00 04 14 0C
Query return:01 03 14 00 00 00 01 00 00 00 03 00 00 00 02 00 00 00 02 00 00 00 01 56 54

Query parameter	Remark	Parameter return	Remark
01	address	01	address
03	Function code: read register	03	Function code: read register
00 11	Register address	14	Number of parameter bytes
00 04	Register number	00 00 00 01	Group number
14 0C	CRC	00 00 00 03	Step number
		00 00 00 02	工作 mode
		00 00 00 02	Voltagerange 0：Low 1：Middle 2：High
		00 00 00 01	Working state 0：OFF 1：Loading
		56 54	CRC

7.2.31 Storage instruction (LIST mode, PROG mode)

Query example:01 03 00 12 00 01 01 00 5A 94
Query return:01 03 0A 00 03 00 00 01 01 01 02 01 03 ED FA

Query parameter	Remark	Parameter return	Remark
01	address	01	address
03	Function code: read register	03	Function code: read register
00 12	Register address	0A	Number of parameter bytes
00 01	Register number	00 03	Total number of errors
01	Number of bytes	00 00	The result page number is page 0
00	To query the knot result page (0~107) (24 results per page, up to 2550 results)	01 01	Step with wrong result 01 Group 1 01 Step 1
5A 94	CRC	01 02	Step with wrong result 01 Group 1 02 Step 2
		01 03	Step with wrong result 01 Group 1 01 Step 3
		ED FA	CRC

Section 8 Appendix

8.1 Mode value

Mode	Mode code (hex)
CC	01
CV	02
CR	03
CP	04
SHORT	05
CCD	06
OCP	07
OPP	08
LIST	09
FLEX	0A
BATY	0B
LED	0C
CRD	0D

8.2 Alarm Codes

Alarm value (hex)	Remark
00	No alarm
01	Overvoltage
04	Reverse connection
08	Overcurrent
40	Overpower
02 00	Over temperature
08 00	Fan abnormality

8.3 GO/NG results table

Parameter value	Power channel GO/NG results	Current channel GO/NG results	Voltage channel GO/NG result	GO/NG results for all channels
0	IDEL (idle)	IDEL (idle)	IDEL (idle)	IDEL (idle)
1	GO (Qualified)	GO (Qualified)	GO (Qualified)	GO (Qualified)
2	NG_ H (this channel exceeds the upper limit)	NG_ H (this channel exceeds the upper limit)	NG_ H (this channel exceeds the upper limit)	NG_ V_ H (exceed voltage upper limit)
3	NG_ L (this channel exceeds the lower limit)	NG_ L (this channel exceeds the lower limit)	NG_ L (this channel exceeds the lower limit)	NG_ V_ L (exceed voltage lower limit)
4	NG_ H_ L (This channel exceeds both the upper limit and	NG_ H_ L (This channel exceeds both the upper limit and	NG_ H_ L (This channel exceeds both the upper limit and	NG_ I_ H (exceed current upper limit)

	the lower limit)	the lower limit)	the lower limit)	
5				NG_ I_ L (exceed current lower limit)
6				NG_ P_ H (exceed power upper limit)
7				NG_ P_ L (exceed power lower limit)

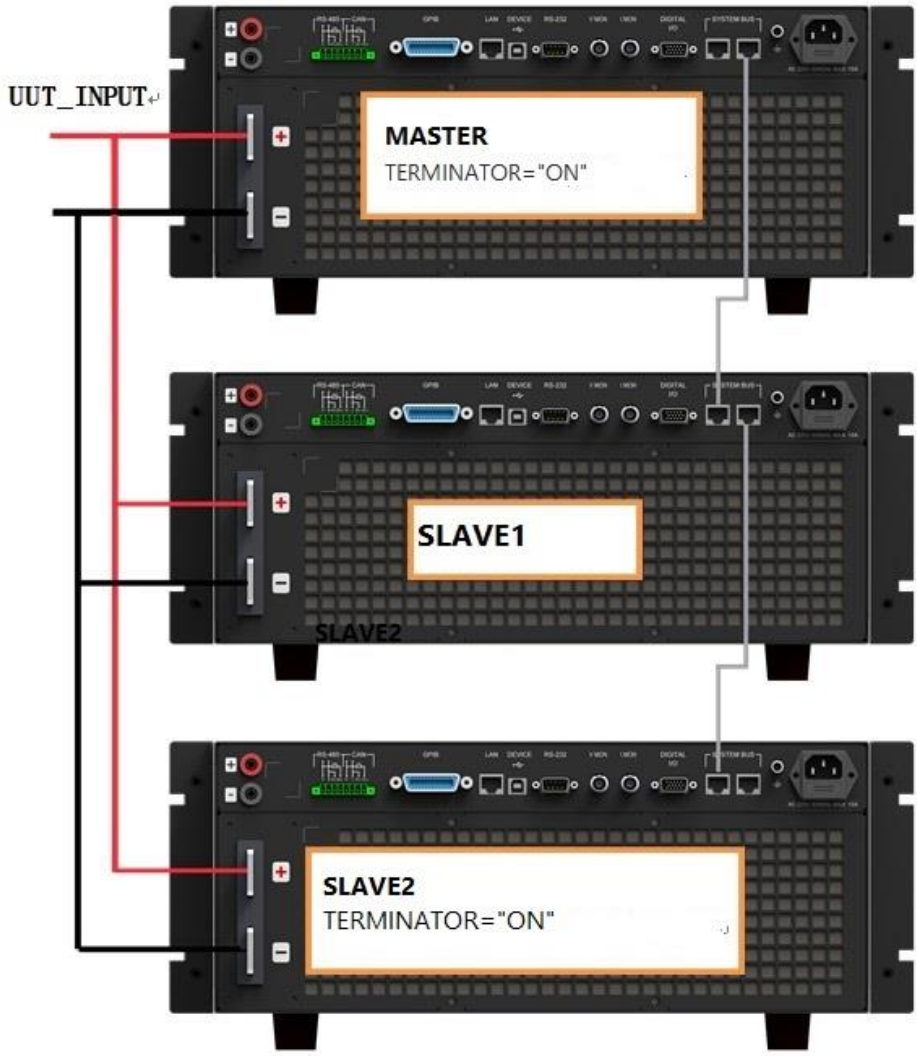
8.4 Parallel process and operation example

8.4.1 Standard operation procedure

1. The diagram of parallel connection is as follows:
   A. Connect the System Bus of each single machine using parallel communication cables, and then power on each single machine.
   B. Set the PARA_ADDR
      Set the parallel IP address of each single machine to start from 0. Set the parallel IP address of each host to 0. Set the non-jump number of each slave in sequence in the range 1-15.
   C. Set the TERMINATOR
      When setting the TERMINATOR of each single machine, set the TERMINATOR of the first and last single machine in the parallel network to "On", and set the TERMINATOR of other intermediate machines to "OFF".
   D. Set PARA_MODE
      Set the PARA_MODE for each single machine. You can set the PARA_MODE to single machine, Host, and slave. If this parameter is set to host, the PARA_ADDR must be set to 0.
   E. Set the PARA_NUM. The range is 2-16.
   F. Finally, set the INITIAL to "On" by the host, start the parallel program, and the host can set the total parameters after the parallel network is successful.
2. Boot procedure in parallel state
   Power on the slave machine first, and then power on the host. After the host is powered on, the parallel operation is automatically performed. After the networking is successful, the state before the last parallel startup is restored.
3. Cancel the parallel operation
   Set the parallel initialization to "Off" by the host to cancel the parallel, and then set the parallel mode of each single machine to "single".

8.4.2 Operation example of 3 parallel machines

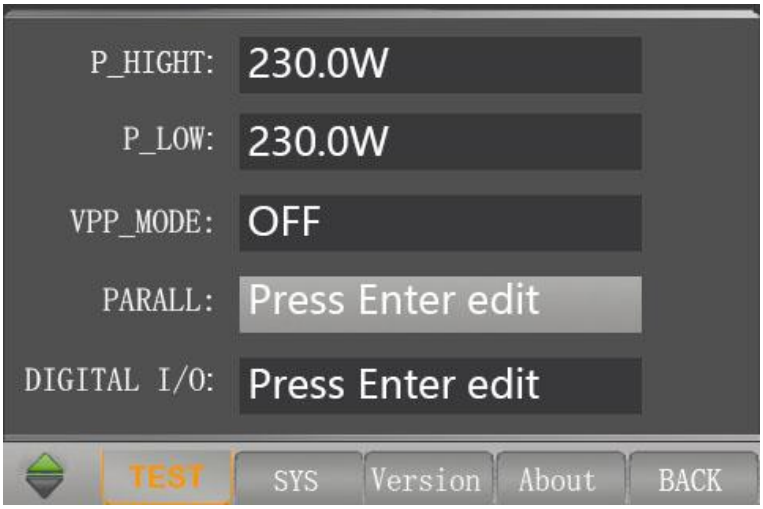
1. The parallel connection diagram is as follows:



2. AN236xx series load parallel operation

(1) First, press "MENU" key on the panel of slave 2 to enter the test setting interface:

A. A. Go to the test setting screen, find the parallel setting, and press "Enter".

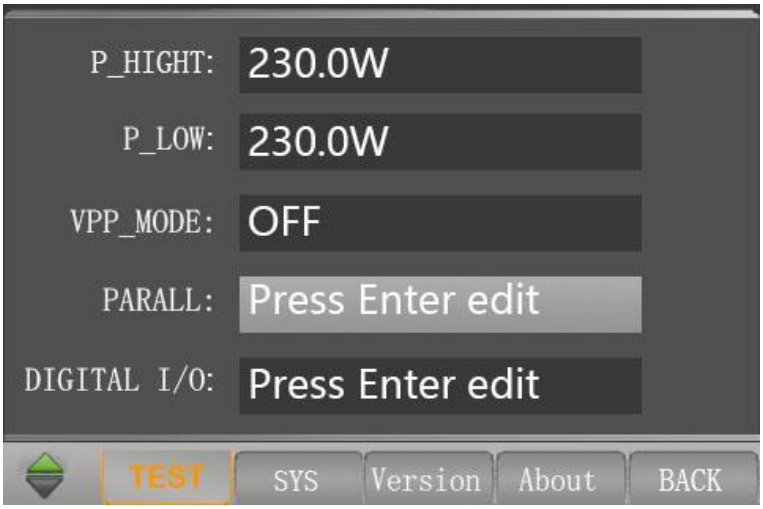


B. Enter the parallel parameters setting screen:

- Set the PARA_ADDR to "2".
- Set the TERMINATOR to "On".
- Set the PARA_MODE to "Slave ".

(2) Please press "MENU" key on the panel of slave 1 to enter the test setting interface:

A. Go to the test setting screen, find the parallel setting, and press"Enter".

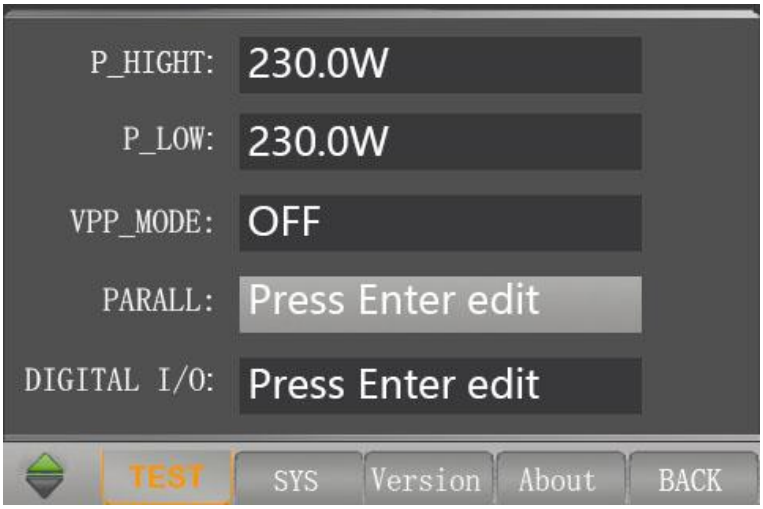


B. Enter the parallel parameters setting screen:

- Set the PARA_ADDR to "1".
- Set the TERMINATOR to "OFF".
- Set the PARA_MODE to "Slave ".

(3) Please press "MENU" key on the panel of the host to enter the test setting interface:

A. Go to the test setting screen, find the parallel setting, and press Enter.



B. Enter the parallel parameters setting screen:

- Set the TERMINATOR to "ON".
- Set the PARA_MODE to "MASTER", the PARA_ADDR is forcibly set to "0".
- Set the PARA_NUM to "3".
- Set the INITIAL to “On” to start the parallel networking.

(4) The networking is successful. On the following page, an M indicates the successfully networked host:

(5) If the networking fails, the following interface is displayed on the host. The following figure shows that the communication between the slave server and the slave server is abnormal. The possible cause is that the communication cable is not plugged in properly or the PARA_ADDR is incorrectly set:

If the networking fails, confirm that the wiring and Settings are correct again, press “ESC” to cancel the alarm, set the INITIAL to "On", and re-network.