User Manual

N69200 Series High Performance High Power DC Electronic Load

Contents

1 Preface

Dear Customers,

First of all, we greatly appreciate your choice of N69200 series DC electronic load (N69200 for short). We are also honored to introduce our company, Hunan Next Generation Instrumental T&C Tech. Co., Ltd.(NGI for short).

About Company

NGI is a professional manufacturer of intelligent equipment and test & control instruments, committed to developing, manufacturing battery simulators, power supplies, electronic loads, and many more instruments. The products can be widely used in the industries of battery, power supply, fuel cell, consumer electronics, new energy vehicle, semiconductor, etc.

NGI maintains close cooperation with many universities and scientific research institutions, and maintains close ties with many industry leaders. We strive to develop high-quality, technology-leading products, provide high-end technologies, and continue to explore new industry measurement and control solutions.

About User Manual

This manual is applied to N69200 series DC electronic load, including installation, operation, specifications and other detailed information. The copyright of the manual is owned by NGI. Due to the upgrade of instrument, this manual may be revised without notice in future versions.

This manual has been reviewed carefully by NGI for the technical accuracy. The manufacturer declines all responsibility for possible errors in this operation manual, if due to misprints or errors in copying. The manufacturer is not liable for malfunctioning if the product has not correctly been operated.

To ensure the safety and correct use of N69200, please read this manual carefully, especially the safety instructions.

Please keep this manual for future use.

Thanks for your trust and support.

2 Safety Instructions

In the operation and maintenance of the instrument, please strictly comply with the following safety instructions. Any performance regardless of attentions or specific warnings in other chapters of the manual may impair the protective functions provided by the instrument.
NGI shall not be liable for the results caused by the neglect of those instructions.

2.1 Safety Notes

- **Confirm the AC input voltage before supplying power**.
- **Reliable grounding**: Before operation, the instrument must be reliably grounded to avoid the electric shock.
- **Confirm the fuse**: Ensure to have installed the fuse correctly.
- **Do not open the chassis**: The operator cannot open the instrument chassis. Non-professional operators are not allowed to maintain or adjust it.
- **Do not operate under hazardous conditions**: Do not operate the instrument under flammable or explosive conditions.
- **Confirm the working range**: Make sure the DUT is within N69200's rated range.

2.2 Safety Symbols

Please refer to the following table for definitions of international symbols used on the instrument or in the user manual.

Table 1

Symbol	Definition	Symbol	Definition
⎓	DC (direct current)	N	Null line or neutral line
~	AC (alternating current)	L	Live line
≂	AC and DC	I	Power-on
3~	Three-phase current	O	Power-off
⏚	Ground	⏻	Back-up power
⏚	Protective ground	⏹	Power-on state
⏚	Chassis ground	⏹	Power-off state
⊥	Signal ground	⚡	Risk of electric shock
WARNING	Hazardous sign	⚠	High temperature warning
Caution	Be careful	⚠	Warning

3 Inspection and Installation

3.1 Open-package Inspection

After receiving the product, please check the device by following these steps:

1. Check whether the packaging is damaged during transportation;

2, please refer to the packing list, check whether the accessories are complete;

3. Check whether the overall appearance of the equipment is abnormal.

Table 2

Item	quantity	Description
Power cord	1	
RS232 interface cable	1	
Network cable	1	
USB flash drive	1	8G
Insurance (250V/10A)	1	10A, 250V, 20*5mm, ceramic
Pluggable Connector	1	3.5mm, 3Pin
Pluggable Connector	1	3.5mm, 12Pin
Performance Test Sheet	1	
Quick Selection Guide	1	

Remarks

1. If there is any missing or damaged, please contact us authorized dealer or after-sales service department immediately. Do not return the device without a positive response.
2. If the packaging content is consistent and no problem, please take good care of the packaging box and related contents, the instrument needs to meet the packaging requirements when returning to the factory.

3.2 Power Connection

Before connecting the power cord, to prevent electric shock and damage to the instrument, please observe the following precautions:

Warnings

- Please ensure that the power supply voltage matches the rated power supply voltage of the instrument;
- Ensure that the power switch is off;
- Please use the power cord provided by our company and connect one end of the power cord to a three-pronged socket with a protective grounding terminal;

Connect one end of the power cord to the power input socket on the rear panel of the instrument and the other end to the three-pronged socket with a protective earth terminal.

3.3 Connection

3.3.1 Input Connection

To prevent electric shock and damage to the instrument, please observe the following precautions:

Warnings

- Make sure the device is powered off before connecting to the DUT.
- Before connection, please confirm rated value of test cable and do not measure the current above the rated value.
- Before connecting any wiring, please pay attention to the positive and negative polarity marks, reverse connection may burn the electronic load. When the maximum current does not meet the rated current, then use multiple red and black test wires.For example, when the maximum current is 500A, the user needs to purchase two 300A specification red and black test wires and connect them to the instrument terminals at the same time.
- Install protective cover to load input terminal.
- Connect the other end of the red and black test leads directly to the terminals of the DUT.

Notes

The electronic load connection cable must be sufficient to withstand the maximum short-circuit current connected to other devices without overheating. And when the connection inductance between the DUT and the load is less than 5.0uH, it is more in line with the high-slope load specifications and performance.

3.3.2 Sensing Connection

The load has two voltage measurement methods: remote sense and local sense.

- **Local Sense**

  If the load is lightly loaded, the input voltage can be measured by local sensing.

- **Remote Sense**

  Remote sensing is also known as four-wire method sensing. Remote sensing is recommended if the load is operating in the CV, CR, and CP functions and accurate measurements are required. Remote sensing requires a direct connection between the remote sensing terminals (S+ and S-) and the voltage output of the DUT. The wiring connections are shown in Figure 3-1.

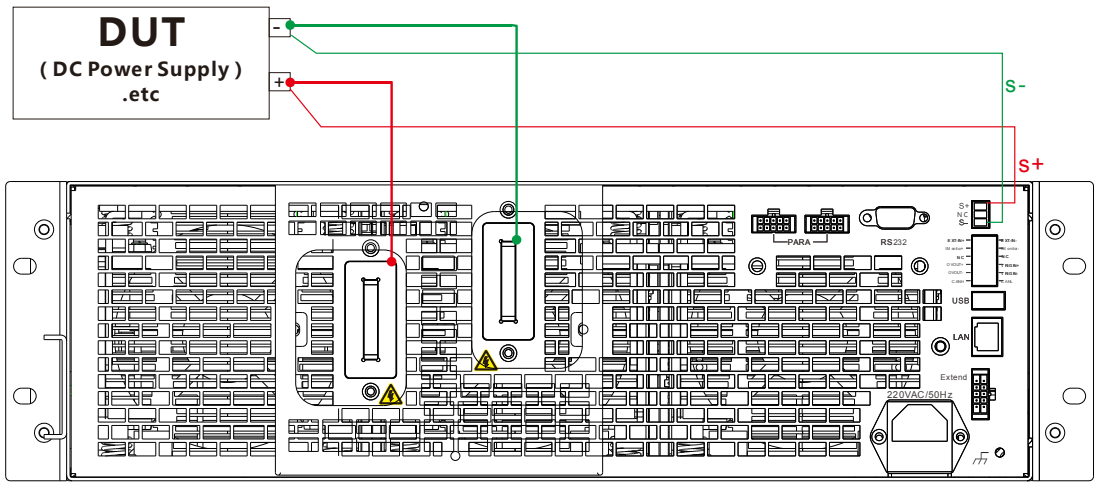


Figure 3-1 Sensing Connection

3.3.3 Low Voltage Operation

Please refer to the specifications for the minimum operating voltage for loading at full current for the N69200. If full current is required to test low voltage components or equipment, a DC power supply can be connected in series to compensate for the minimum operating voltage. The connection is shown in Figure 3-2.

In this configuration the DC power supply will provide a fixed voltage to ensure a high test voltage at the load input.

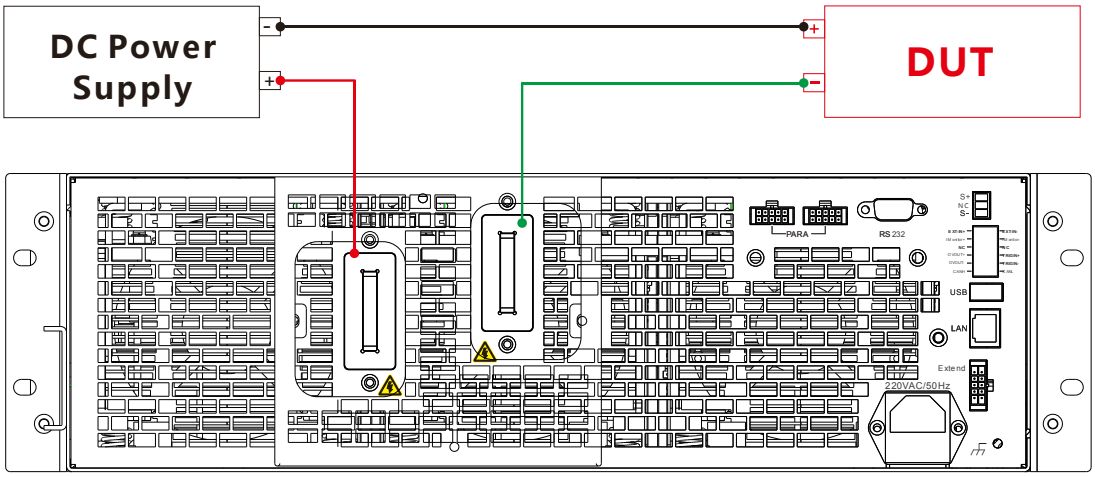


Figure 3-2 Low Voltage Operation

3.3.4 Parallel

N69200 series provides maximum power of 2~60KW, support master+master, master+slave parallel expansion of higher power. Figures 3-3 and 3-4 show two load connected in parallel (master and slave, master and master), the sample diagram takes a 3U chassis as an example.Extend role of master-slave connection port.

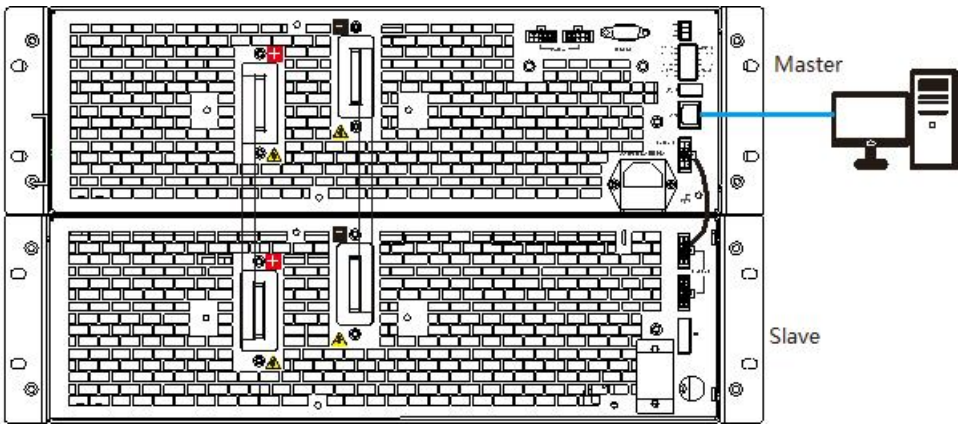


Figure3- 3 Master+ Slave

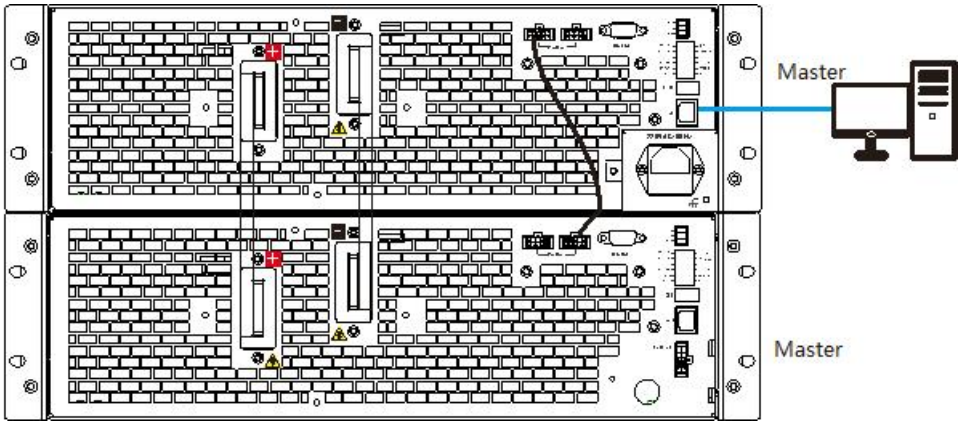


Figure3- 4 Master+ Master

3.3.5 DCIR Connection

Note: DCIR is actually ESR.

The load is tested for battery or capacitor internal resistance using the constant current discharge method. The test wiring diagram is shown in Figure 3-5 and 3-6.

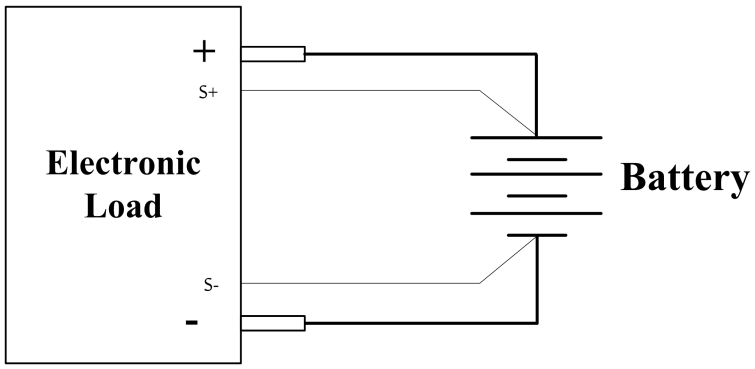


Figure3-5 Battery DCIR Connection

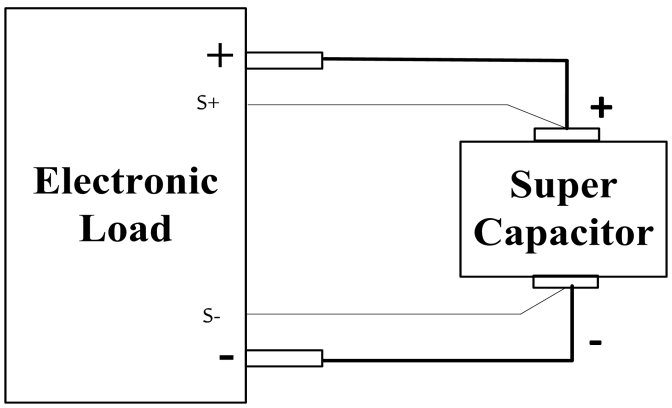


Figure3-6 Super Capacitor DCIR Connection

3.3.6 Discharge/Charge Connection

The load has a capacity test function, which can test the capacity of batteries, capacitors or other active devices. The following is an example of a battery, and the charge/discharge test connection is shown in Figure 3-7.

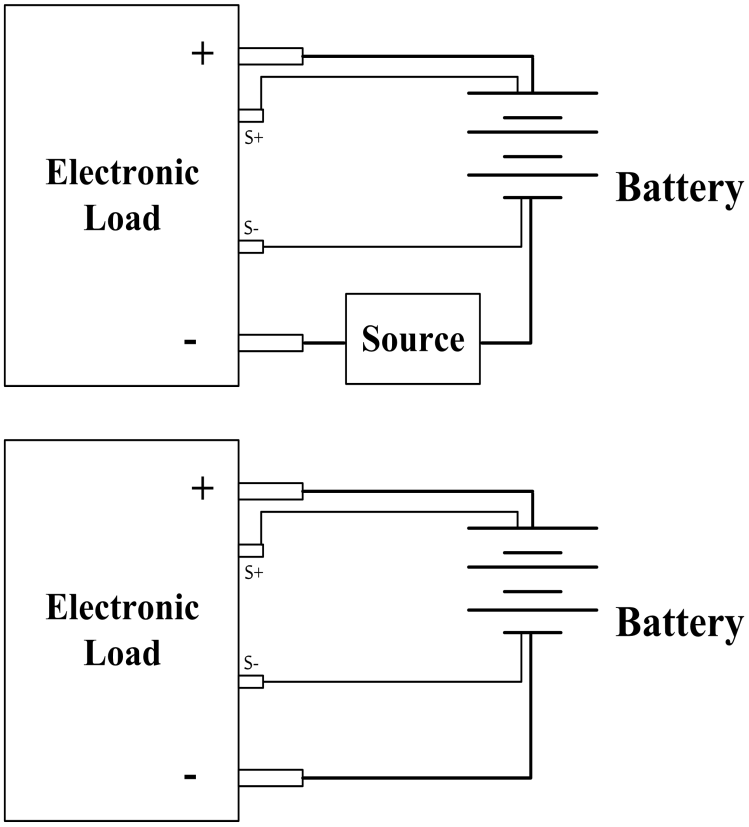


Figure 3-7 Discharge/Charge Connection

3.4 Power-on Inspection

Warnings

1. Before connecting the power cord, please ensure that the power supply voltage matches the rated power supply voltage of the instrument.
2. Make sure the power switch is off before connecting the power cord.
3. In order to prevent electric shock and fire, please use the power cord provided by the company.
4. In order to prevent electric shock, please be sure to take protective grounding. Please connect the power cord to the three-prong socket with a protected ground terminal.

If the device cannot start normally, try the following methods to resolve the problem:

1. Check whether the power cord is connected properly, whether the device has been normally powered, and whether the device switch is turned on;

2. Check whether the fuse of the instrument is blown. If the fuse is blown, replace it with the same type of fuse to avoid accidents.

Table 3-1 Fuse specifications

Model	N69200 series
Fuse specification	250V/10A (20mm×5mm) ceramic

To replace a fuse, perform the following steps

1. Turn off the instrument and remove the power cord.
2. Insert a small flathead screwdriver into the slot at the power socket and gently pry out the fuse holder.
3. Remove the fuse and replace it with the specified size.

Warnings

To ensure the safety of operators, disconnect the power supply of the device before replacing the fuse.

4 Product Introduction

4.1 Brief Introduction

N69200 series is a high performance high power programmable DC electronic load with high reliability, high precision and multi-function. N69200 series has three voltage specifications: 150V, 600V, and 1200V. It can be up to 6kW in standard 3U and 19 inch chassis, supporting parallel control and can realize power expansion through master+master and master+slave. N69200 supports three ranges of voltage, current, power and resistance, and provides high-precision measurement, which makes the test range wider of a single unit. N69200 has adjustable CV loop speed, fast current rise and fall speed, 8 operation modes, supports sequence test, dynamic test, discharge test, charge test, OCP/OPP test, short-circuit simulation, equivalent DC internal resistance (DCIR) test (optional), arbitrary waveform load test, etc. It supports local/remote control, with LAN/RS232/CAN interface, USB HOST interface (waveform import), digital input and output interface, analog input and output interface as standard, and optional GPIB interface as optional. N69200 can effectively meet various application requirements in testing, and is an ideal selection for R&D test and ATE test systems.

Main Features

- Standalone input power: 2~60kW, 3U/6kW high power density
- Voltage range: 0~150V/0~600V/0~1200V
- Current range: up to 2500A
- CV, CC, CP, CR three ranges, wide measurement range
- Voltage measurement accuracy: 0.015%+0.015% F.S.
- Current measurement accuracy: 0.04%+0.04% F.S.
- 1.6 times power loading capacity in a short time (<3s)
- Adjustable CV loop speed, matching different power supplies
- Voltage/current sampling rate: up to 500kHz
- Supporting parallel control, and realizing power expansion via master+master, master+slave
- Operation modes: CC, CV, CP, CR, CV+CC, CR+CC, CV+CR, CP+CC

- Supporting SEQ test, discharge test, charge test, OCP/OPP test and short-circuit simulation
- Supporting current monitoring output, external programming input, external trigger input, and 10kHz sine wave programming input
- 30kHz high-speed dynamic mode, dynamic frequency sweep function
- Time measurement, rise/fall time measurement accuracy: 10μs
- Equivalent DC internal resistance (DCIR) test (optional)
- Arbitrary waveform load test, sine wave up to 20kHz, supporting USB flash drive import
- Soft on/off function, current oscillation protection function
- Support optional NP101 series module to achieve 0V with load
- Multiple protection: OCP, OVP, OPP, OTP and reverse connection detection
- Supporting 100 groups of parameters to be saved when powered off and easy to recall
- LAN/RS232/CAN as standard interface, GPIB as optional interface
- Supporting MPPT maximum power point tracking function

4.2 Appearance & Dimension

4.2.1 Master Dimension

N69200 series product dimension: 132.5mm(H)*482.0mm(W)*783.8mm(D)

The following is the dimension drawing of the N69200 product's master unit:

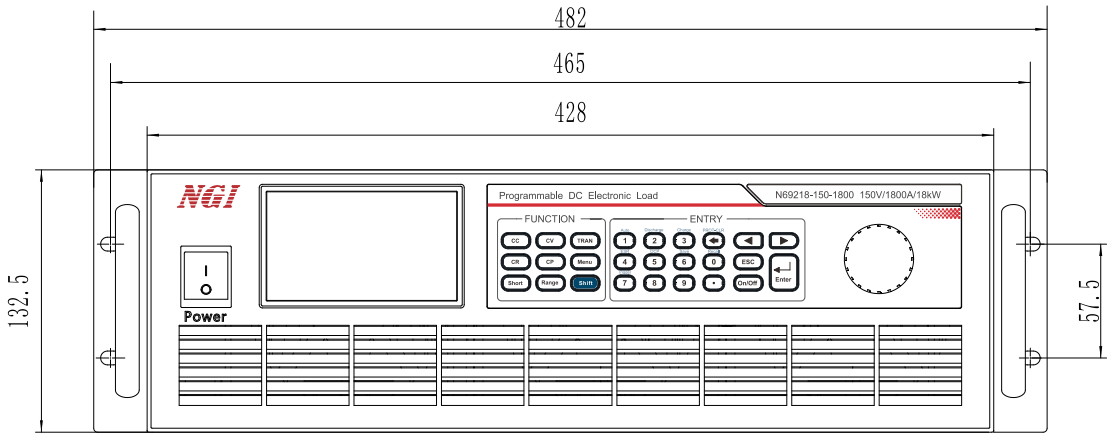


Figure 4-1 Front panel dimension (mm)

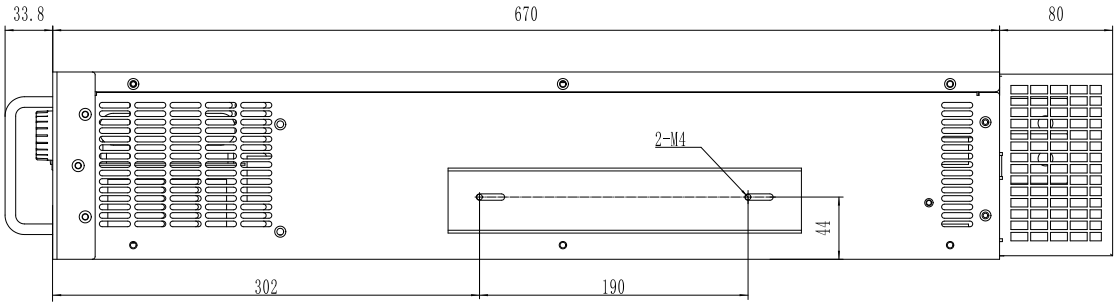


Figure 4-2 Side view dimension (mm)

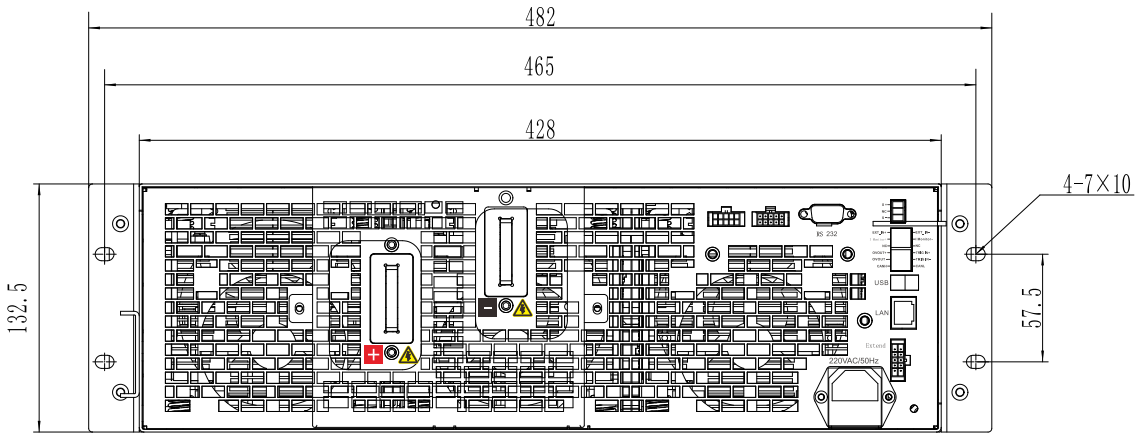


Figure 4-3 Rear panel dimension (mm)

4.2.2 Slave Dimension

Slave product dimension:132.5mm(H)*482.0mm(W)*783.8.0mm(D)

The following is the dimension drawing of the slave unit:

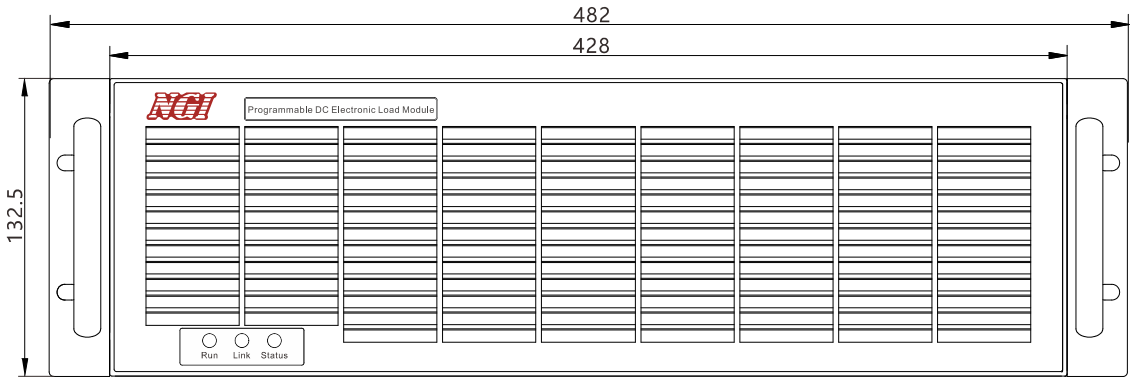


Figure 4-4 Slave Front Panel Dimension (mm)

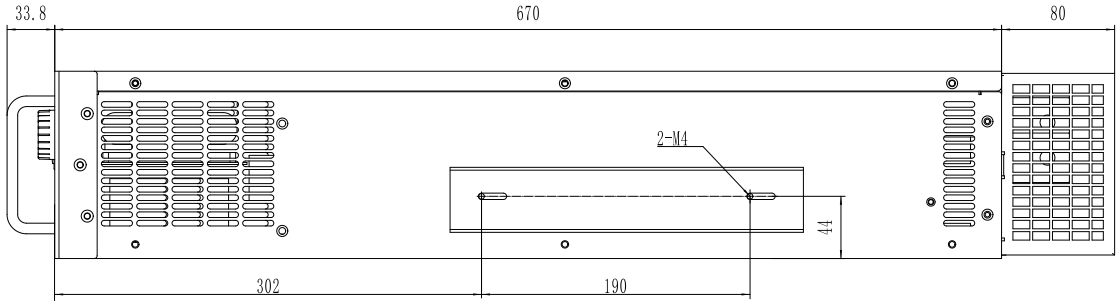


Figure 4-5 Side View

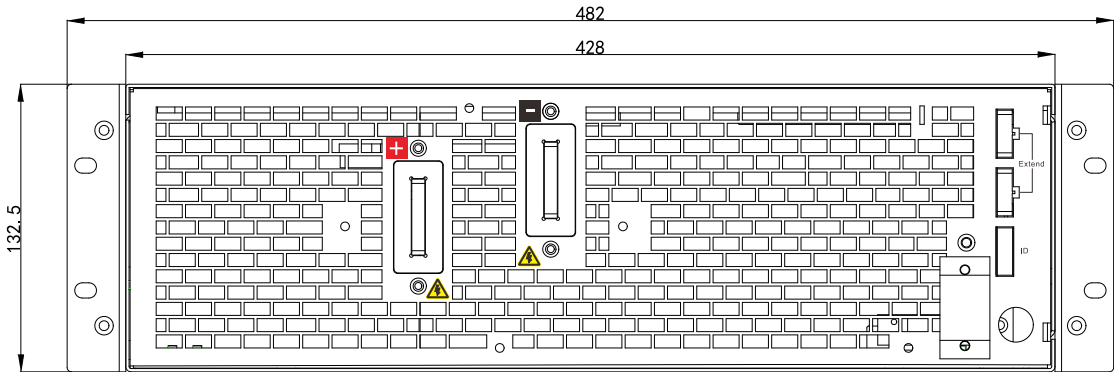


Figure 4-6 Slave Rear Panel Dimension (mm)

4.3 Front Panel Introduction

4.3.1 Master Front Panel Introduction

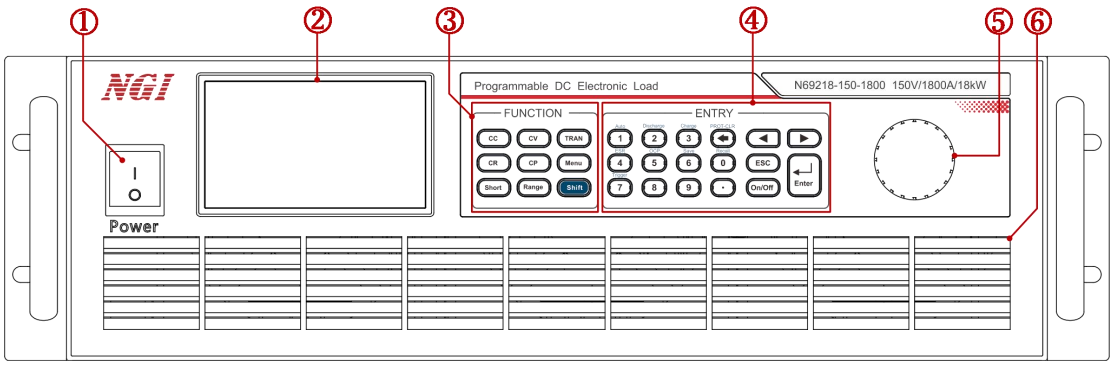


Figure 4-7 Front panel

Table 4-1

Label	Name	Description
1	Power switch	Power on or off
2	screen	Displays relevant information
3	Function buttons	Specify the corresponding function
4	Numeric buttons	Digital input key + Compound Button
5	Knob	Turn the knob to move the cursor position, change the value size, and more

6	Air outlet	air outlet

4.3.1.1 Keyboard

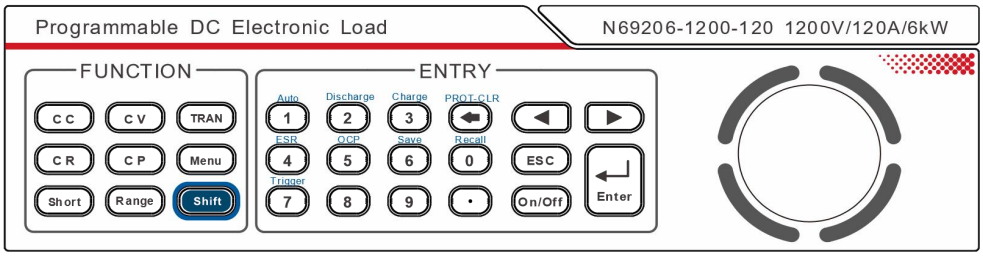


Figure 4-8 Keyboard

The keyboard of the electronic load is divided into three areas: function keypad, numeric keypad, knob.

4.3.1.2 Function Button

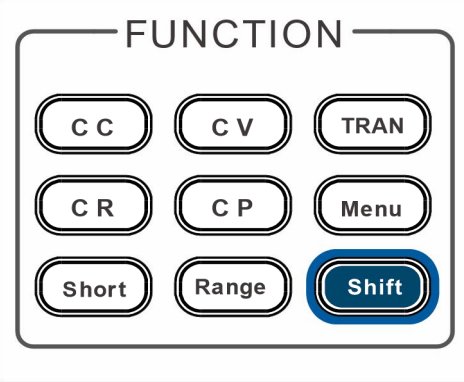


Figure 4-9 Function Button

Table 4-2

Button	Function
CC	Select the constant current test function (CC) to set the current input value
CV	Select the constant voltage test function (CV) to set the voltage input value.

TRAN	Enable Dynamic Test Function Button (TRAN)
C R	Select the constant resistance test function (CR) to set the resistance input value.
C P	Select the constant power test function (CP) and set the power input value.
Menu	Menu key, press this key to enter the main menu.
Short	Short-circuit function button to start or end the short-circuit test.
Range	Range switch key.
Shift	Compound Buttons.

Table 4-3

Button	Function
Shift + Auto 1	Enter the auto test function interface.
Shift + Discharge 2	Enter the discharge test function interface.
Shift + Charge 3	Enter the charge test function interface.
Shift + PROT-CLR ⬅	Clear the protection status key.
Shift + ESR 4	Enter the ESR Test function interface.
Shift + OCP 5	Enter the OCP Test function interface.
Shift + Save 6	Store load parameter values such as voltage, current and power setpoints.
Shift + Trigger 7	Trigger key to enable triggering.

Recall Shift + 0	Recall stored load parameter values such as voltage, current and power setpoints.

4.3.1.3 Numeric Button

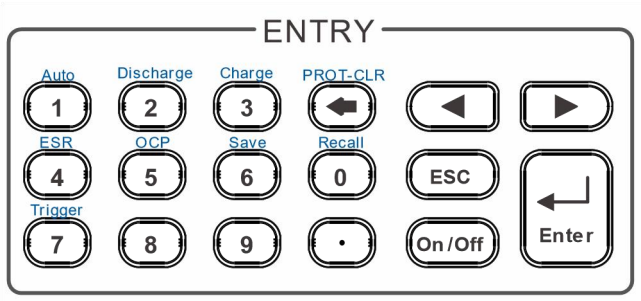


Figure 4-10 Numeric Buttons

Table 4-4

Button	Function
0 ~ 9	Value input key.
•	Decimal point.
PROT-CLR	Clear the input key.
◀ ▶	Move the keys left and right to adjust the cursor to the specified position when setting the value.
Enter	Confirm key.
ESC	Exit key, which can exit in any working state.
On/Off	Control the input state of the load: on/off.

4.3.1.4 Knob

N69200 knob is shown in Figure 4-11:

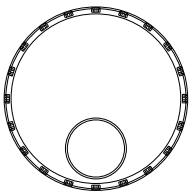


Figure 4-11 Knob

The functions are described as follows:

1. Adjust the value setting;
2. Select menu items/parameter items;
3. Confirm the set value or selected menu item/parameter item.

Adjust the value setting

In the value setting interface, turn the knob clockwise to increment the value, and turn the knob counterclockwise to decrement the value.

Select menu items/parameter items

The knob can be used to select a menu item/parameter item. In the display interface, turning the knob clockwise selects the next menu/parameter item, and turning the knob counterclockwise selects the previous menu/parameter item.

Confirm the set

After finishing setting values or selecting a menu item, press the knob to confirm it.

4.3.2 Slave Front Panel Introduction

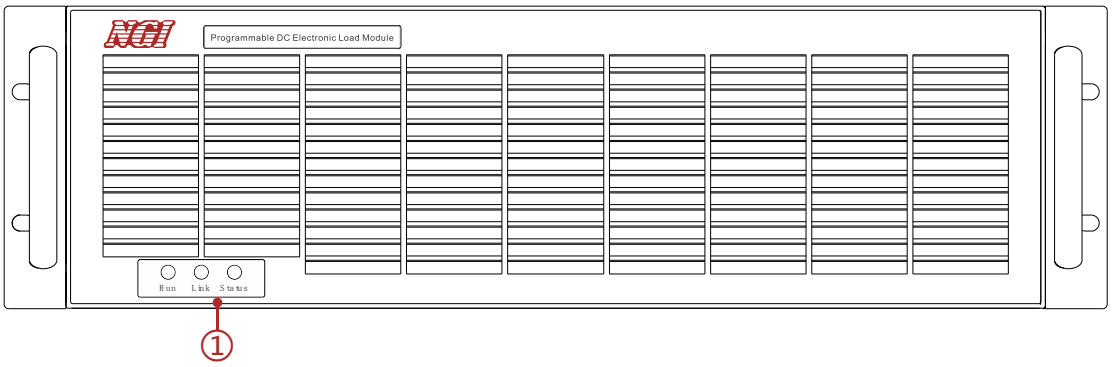


Figure 4-12 Slave Front Panel

Table 4-5

Number	Name
①	Indicator lights, from left to right, are running indicator, connection indicator, status indicator

4.4 Rear Panel Introduction

4.4.1 Master Rear Panel Introduction

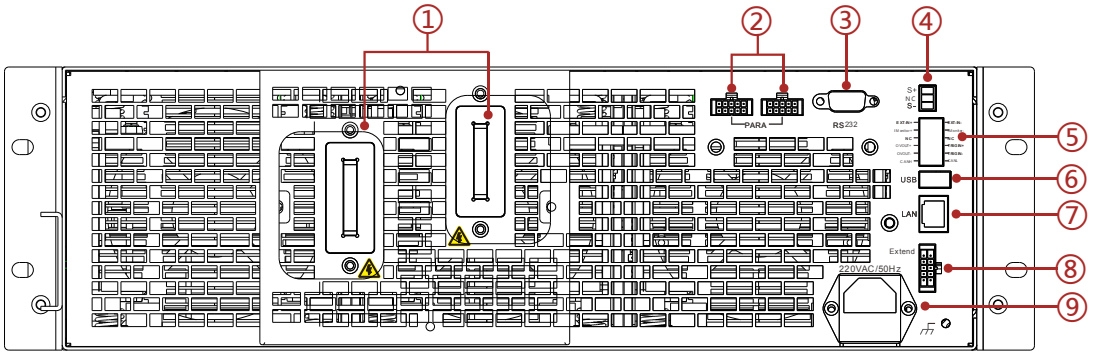


Figure 4-13 Master Rear Panel

Table 4-6

Number	Name	Description
1	Positive and negative input wiring copper bars	Connect input source output.

2	Parallel port	Used for host-to-host parallel interface.
3	RS232 interface	This port can control the instrument equipment through RS232 communication.
4	S+/S- Terminals	Used for remote sensing.
5	Control signal terminal	For connecting external programming inputs, extended inputs and outputs, and CAN control.
6	USB port	Used only for waveform data import.
7	LAN port	Can be controlled via LAN communication.
8	Parallel port	Used for master and slave parallel interface.
9	Power input socket	AC220V power input with built-in fuse.

4.4.1.1 Sense Port

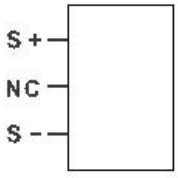


Figure 4-14 Control Port

S+ and S- are remote sampling terminals used to provide remote voltage signals to the internal measurement system of the electronic load.

It is recommended that the load be set for remote sensing when operating in CV, CR and CP modes or when accurate measurement of the DUT output voltage is required. The remote sensing terminals S+ and S- are connected directly to the output of the DUT, eliminating the voltage drop across the connecting wires and resulting in high measurement accuracy.

Notes

If remote mode is selected and the remote sensing terminals S+ and S- are not connected to the output of the DUT, the electronic load will not be able to detect the port voltage correctly under any function, and the constant voltage, constant resistance and constant power functions will not work properly.

4.4.1.2 Control Signal Terminal

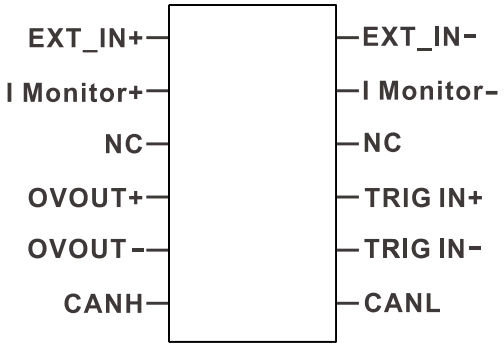


Figure 4-15 Control Signal Terminal

This terminal block (Figure 4-15) is used to connect external programming inputs, current monitoring inputs, and expand the input and output, the pin definitions of which are shown in Table 4-7.

Table 4-7

Number	Description
EXT-IN+	Externally programmed input voltage signal positive
EXT-IN-	Externally programmed input voltage signal negative
I Monitor+	Current output monitoring+
I Monitor -	Current output monitoring -
NC	Dangling
NC	Dangling
OVOUT+	Obligate
OVOUT -	Obligate
TRIG IN+	External trigger signal input to positive, compatible with 5V TTL level

TRIG IN-	External trigger signal input to negative
CANH	The CAN communication level is dominant
CANL	The CAN communication level is recessive

- **Current Monitor Output**

The current monitor terminal provides 0-10V voltage output signal, corresponding to the present current range of 0 to full scale input current, the input current value is proportional to the output voltage value on the terminal. For example: a load current full range is 300A, in CCH range, if the loading current is 30A, the output voltage of terminal "I Monitor" is 1V; if the load pulling current is 300A, the output voltage of terminal "I Monitor" is 10V; if the loading current is 300A, the output voltage of terminal "I Monitor" is 10V.

- **External Programming Input**

The CC function can be continuously controlled by inputting an external voltage signal (DC) at the "EXT_IN+" terminal. The external programmable input voltage range is 0 to 10V, corresponding to the present current range from 0 to full range input current. "EXT_IN-" is the ground terminal.

Notes

1. The external programming is only available under the CC test function.
2. It is prohibited to connect an external voltage exceeding 10V to the external programming terminal. If the external programming voltage exceeds 10V, the input current of the load may exceed the rated value, which may cause the load to enter the protection state.
3. If this function is used, the "External Programming" option must be set to "ON" in the application setting menu.

- **External Trigger Input**

Set the external control to Toggle mode, short-circuit TRIG_IN+ and TRIG_IN-. Short-circuit the load ON once, then short-circuit the load OFF once.

Set the external control to Hold mode, short-circuit TRIG_IN+ and TRIG_IN- and load ON, and disconnect TRIN_IG+ and TRIG_IN- and load OFF.

4.4.1.3 Serial Port (RS232)

The port pins are shown in Table 4-8.

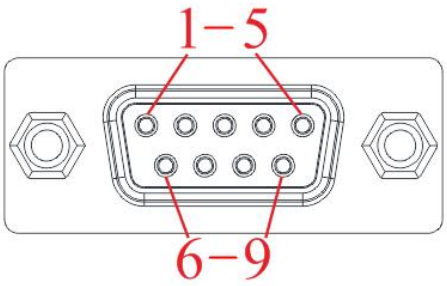


Figure 4-16 Pin Identification

Table 4-8 RS232 Pin description

Pin	Signal name and function
1	NC
2	RXD，receive data
3	TXD，transmit data
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

4.4.1.4 LAN Port

The N69200 series comes with a LAN port that connects the computer to the device's LAN port via a network cable, as shown in Figure 4-17.

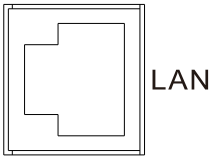


Figure 4-17 LAN port

Remarks

N69200 is equipped with three communication ports: RS232, CAN and LAN. Users can choose any one to realize the communication with the computer.

4.4.2 Slave Rear Panel Introduction

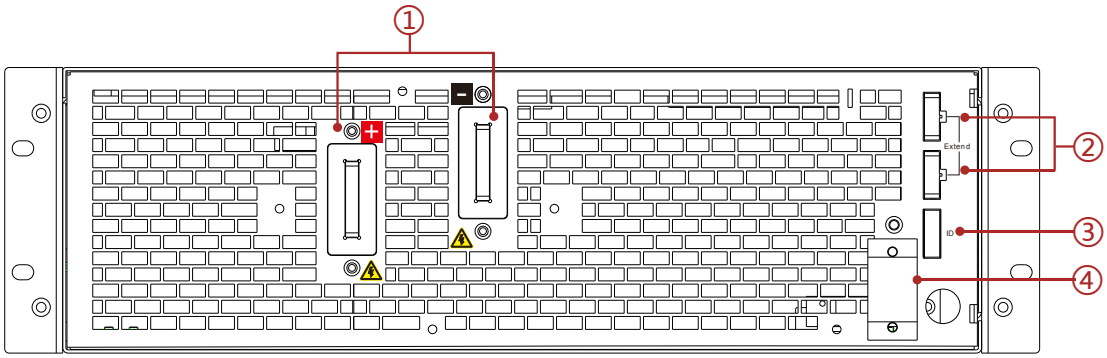


Figure 4-18 Slave rear panel

Table 4-9

No.	Name	Description
①	Positive and negative input wiring copper bars	Connect input source output.
②	Power module expansion port	For parallel connection.
③	ID DIP switch	Slave ID identification.
④	Power input socket	AC220V power input with built-in fuse.

4.5 Model Selection&Accessories

4.5.1 Model Selection

Table 4-10

Model	Specification	Size
N69202-150-200	2kW/150V/200A	19inch/3U
N69202-600-140	2kW/600V/140A	19inch/3U
N69202-1200-40	2kW/1200V/40A	19inch/3U
N69202-1200-80	2kW/1200V/80A	19inch/3U
N69203-1600-40	3kW/1600V/40A	19inch/3U
N69203-2400-40	3kW/2400V/40A	19inch/3U
N69204-150-400	4kW/150V/400A	19inch/3U
N69204-600-280	4kW/600V/280A	19inch/3U
N69204-1200-80	4kW/1200V/80A	19inch/3U
N69204-1200-160	4kW/1200V/160A	19inch/3U
N69206-150-600	6kW/150V/600A	19inch/3U
N69206-600-420	6kW/600V/420A	19inch/3U
N69206-1200-120	6kW/1200V/120A	19inch/3U
N69206-1200-240	6kW/1200V/240A	19inch/3U
N69205-1600-60	5kW/1600V/60A	19inch/3U
N69205-2400-60	5kW/2400V/60A	19inch/3U
N69212-150-1200	12kW/150V/1200A	19inch/6U
N69212-600-840	12kW/600V/840A	19inch/6U

N69212-1200-240	12kW/1200V/240A	19inch/6U
N69212-1200-480	12kW/1200V/480A	19inch/6U
N69218-150-1800	18kW/150V/1800A	19inch/9U
N69218-600-1260	18kW/600V/1260A	19inch/9U
N69218-1200-360	18kW/1200V/360A	19inch/9U
N69218-1200-720	18kW/1200V/720A	19inch/9U
N69224-150-2400	24kW/150V/2400A	19inch/12U
N69224-600-1680	24kW/600V/1680A	19inch/12U
N69224-1200-480	24kW/1200V/480A	19inch/12U
N69224-1200-960	24kW/1200V/960A	19inch/12U
N69230-150-2500	30kW/150V/2500A	19inch/15U
N69230-600-2100	30kW/600V/2100A	19inch/15U
N69230-1200-600	30kW/1200V/600A	19inch/15U
N69230-1200-1200	30kW/1200V/1200A	19inch/15U
N69236-150-2500	36kW/150V/2500A	19inch/18U
N69236-600-2500	36kW/600V/2500A	19inch/18U
N69236-1200-720	36kW/1200V/720A	19inch/18U
N69236-1200-1440	36kW/1200V/1440A	19inch/18U
N69242-150-2500	42kW/150V/2500A	19inch/21U
N69242-600-2500	42kW/600V/2500A	19inch/21U
N69242-1200-840	42kW/1200V/840A	19inch/21U
N69242-1200-1680	42kW/1200V/1680A	19inch/21U
N69248-150-2500	48kW/150V/2500A	19inch/24U

N69248-600-2500	48kW/600V/2500A	19inch/24U
N69248-1200-960	48kW/1200V/960A	19inch/24U
N69248-1200-1920	48kW/1200V/1920A	19inch/24U
N69254-150-2500	54kW/150V/2500A	19inch/27U
N69254-600-2500	54kW/600V/2500A	19inch/27U
N69254-1200-1080	54kW/1200V/1080A	19inch/27U
N69254-1200-2160	54kW/1200V/2160A	19inch/27U
N69260-150-2500	60kW/150V/2500A	19inch/30U
N69260-600-2500	60kW/600V/2500A	19inch/30U
N69260-1200-1200	60kW/1200V/1200A	19inch/30U
N69260-1200-2400	60kW/1200V/2400A	19inch/30U

***N69200 series supports parallel power expansion, for more models, please contact NGI.**

4.5.2 Options&Accessories

When using N69200 series, users can separately purchase accessories to cope with different needs of use. Including the following:

1. Output testing wire

Different model for different wire, 2m/4m optional.

Table 4-11

Current Range/A	Diameter/mm²	Model	Set
0＜X≤30	6	OT-30A	1
30＜X≤50	10	OT-50A	1
50＜X≤80	16	OT-100A	1

80＜X≤125	25	OT-200A	1
125＜X≤175	35	OT-200A	1
175＜X≤250	50	OT-300A	1
250＜X≤475	95	OT-600A	1
475＜X≤600	120	OT-600A	1
600＜X≤750	150	OT-600A	1
750＜X≤1200	120	OT-600A	2

2. Module

N69200 series can be with NP101 power supply module to realize loading under 0V.

Model	Module	Size
N69206-150-600	NP101-600	19inch/6U
N69208-150-800	NP101-800	19inch/9U
N69210-150-1000	NP101-1000	19inch/9U
N69212-150-1200	NP101-1200	19inch/9U

3. Communication Converter

N69200 series can be with NE101 communication converter, RS232 to GPIB supportable.

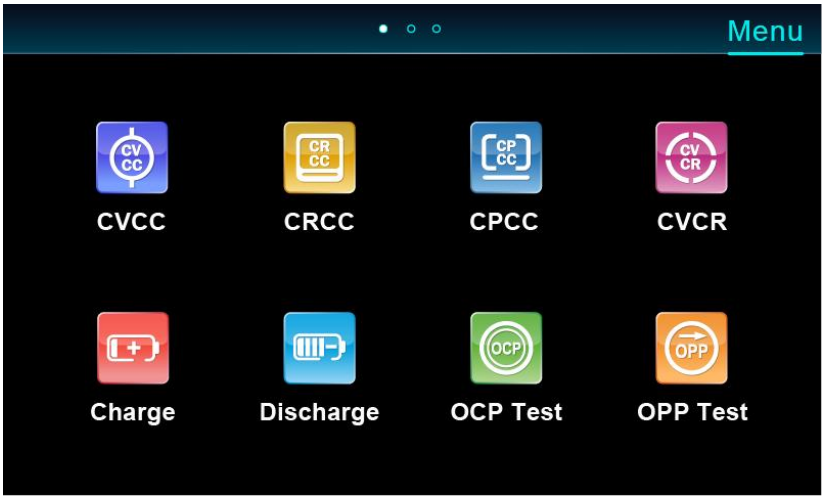
4. Rack Installation

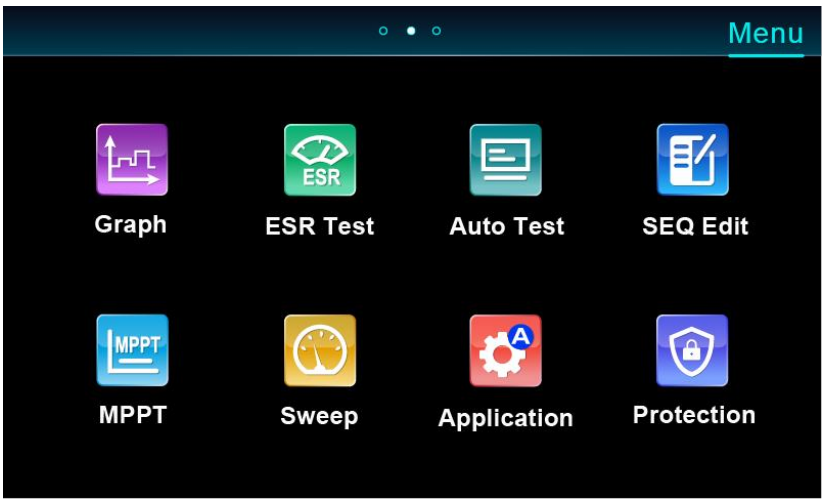
N69200 series can be installed on 19inch chassis, specified kits available

Note: options and accessories are sold separately, and users need to purchase them additionally.

5 Operation

After the device is turned on, it enters the "CC" interface by default, and you can press the "Menu" key to enter the main menu interface. The main menu interface includes CVCC, CRCC, CPCC, CVCR, Charge, Discharge, OCP Test, OPP Test, CCD Wave, ESR Test, Auto Test, SEQ Edit, MPPT, Sweep, Application, Protection, SZ, Factory Reset, System Setting, About Us 20 submenus.





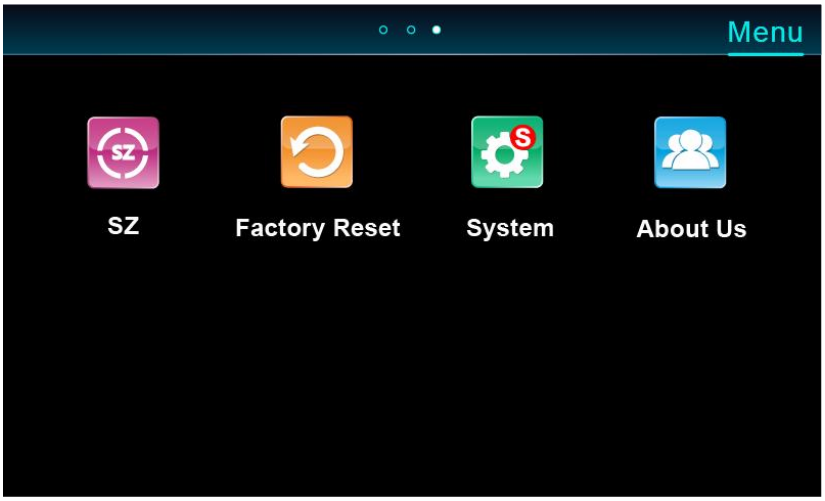


Figure 5-1 Main menu

5.1 Interface Introduction

After the N69200 series is turned on, the CC mode is displayed, as shown in Figure 5-2.

Figure 5-2 Interface introduction

Table 5-1 Marking instruction

Number	Definition	Description
1	Specification	Product specification
2	Readback	Channel readback, including voltage, current, power, time, temperature, resistance value, peak-peak value, maximum value, minimum value, The power, time, temperature and resistance value can be switched by "Shift" + "◀" or "Shift" + "▶"
3	Channel state	Channel status area in current mode, including ON/OFF status and current running function mode, etc
4	Parameters setting	Parameter setting area in current mode
5	Function mode	Includes CC, SEQ, dynamic sweep, discharge test, etc

Figure 5-3 The status bar displays information

Table 5-2

Number	Description
①	Mode and range, including CCH, CCL, CVH, CVL, CVBH, CVBL, CRH and CRL
②	Remote Sensing ON
③	External Programming ON
④	Load status（ON/OFF)
⑤⑥	Alarms, including OVP, OCP, OPP, OTP, TSF, MISS, MOT

Table 5-3

Alarms	Description
OPP	Over-power protection
OCP	Over-current protection
OCR	Over- rated current protection
OVP	Over-voltage protection
OVR	Over-rated voltage protection
OPR	Over-rated power protection
OTP	Over-temperature protection
TSF	Temperature sensor failure
MISS	Power Module Loss
MOT	Power Module over heat

- **Over-rated current protection（OCR）**

If the input current is higher than 105% of the maximum rated value, overcurrent protection will be triggered, and the interface alarm will indicate "OCR".

- **Over-rated voltage protection（OVR）**

If the input voltage is higher than 105% of the maximum rated value, the overvoltage protection will be triggered, and the interface alarm will indicate "OVR".

- **Over-rated power protection（OPR）**

The over-rated power protection function is mainly used to protect the hardware, preventing the components from being in the over-power state for a long time, which may lead to rapid aging or damage. If the input power is higher than 105% of

the maximum rated power, the over-rated power protection will be triggered, and the interface alarm will indicate "OPR".

- **Reverse polarity detection（RV）**

If the polarity of the power supply is reversed and the load detects the reversed voltage, the interface alarm prompts "RV" and an alarm sound is emitted at the same time.

- **Over-temperature protection（OTP）**

The load has an internal temperature detection sensor, if the internal temperature is detected to exceed the protection value, the load will stop pulling the load and the interface alarm will indicate "OTP".

- **Module overheat protection(MOT)**

Each power module of the load is equipped with a temperature control switch. When the temperature protection value, the switch closes, N69200 stops loading, the interface alarm prompts "MOT", and an alarm sounds.

- **Temperature Sensor Failure (TSF)**

If the temperature sensor is damaged, N69200 stops loading and the interface alarm prompts "TSF".

- **Power Module Drop Protection (MISS)**

Each power module of the load communicates with the main board through the communication cable and reports its own status at regular intervals. If the communication between the power module and the main board is interrupted due to line failure or other abnormalities, the load will stop pulling load and the alarm in the interface will indicate "MISS", and an alarm will be issued at the same time.

5.2 Load Operation Mode

Electronic load can work in the following 8 operation modes:

Constant Current (CC)

Constant Voltage (CV)

Constant Resistance (CR)s

Constant Power (CP)

Constant Voltage Constant Current (CVCC)

Constant Resistance Constant Current (CRCC)

Constant Power Constant Current (CPCC)

Constant Voltage Constant Resistance (CVCR)

5.2.1 Constant Current (CC)

5.2.1.1 Function Description

Under CC mode, the load will sink a constant current regardless of the input voltage. Figure 5-4 shows the working curve:

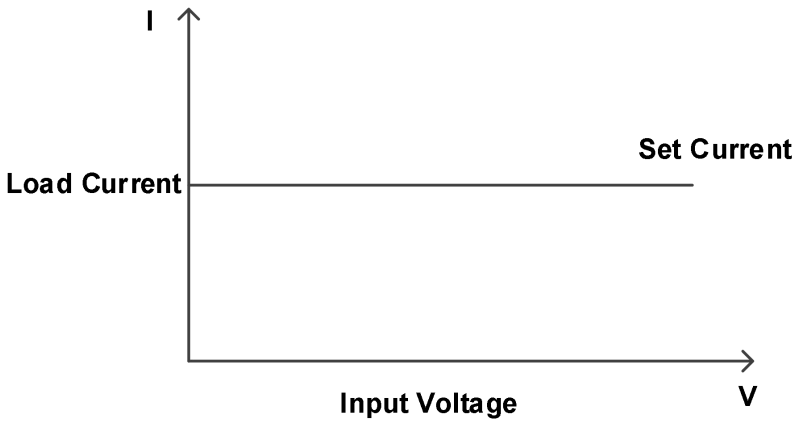


Figure 5-4 Constant Current Mode

5.2.1.2 Operation Steps

Please refer to the specification table for constant current value, rising and falling slew rate, and measuring range.

1. Press the "CC" key on the main page to Enter the CC interface (for other interfaces, press the ESC key to return to the main page), move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
2. "Range": there are two options for range CCH (constant current high range), CCM (constant current middle range), CCL (constant current low range), rotate the "knob" to select the range, press the "Enter" key to confirm;
3. "I-Set": Input through the numeric keys, and press "Enter" to confirm;
4. "Rise slew": Enter by numeric keys and press "Enter" to confirm;
5. "Fall slew": Enter by numeric keys and press "Enter" to confirm;
6. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-5.

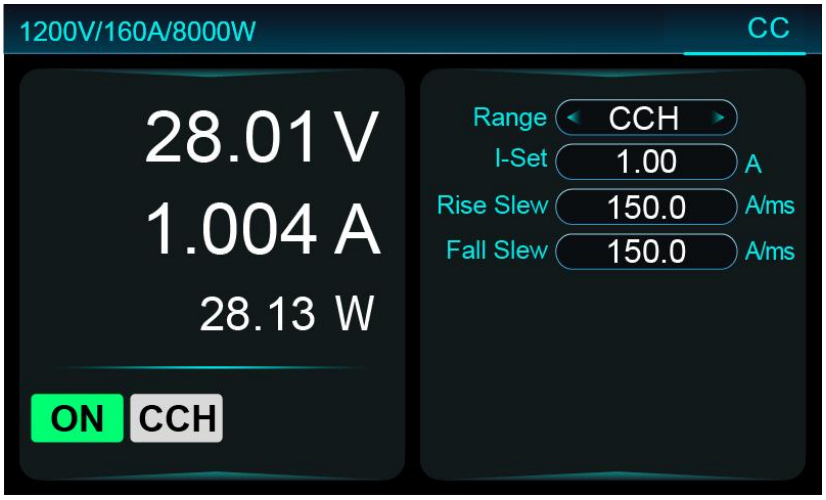


Figure 5-5 CC mode

7. Press the "On/Off" key to turn on, and the display state is "ON", test finished.

5.2.2 Constant Voltage (CV)

5.2.2.1 Function Description

Under CV mode, the load attempts to sink enough current to maintain the input voltage at the set value. Figure 5-6 shows the working curve:

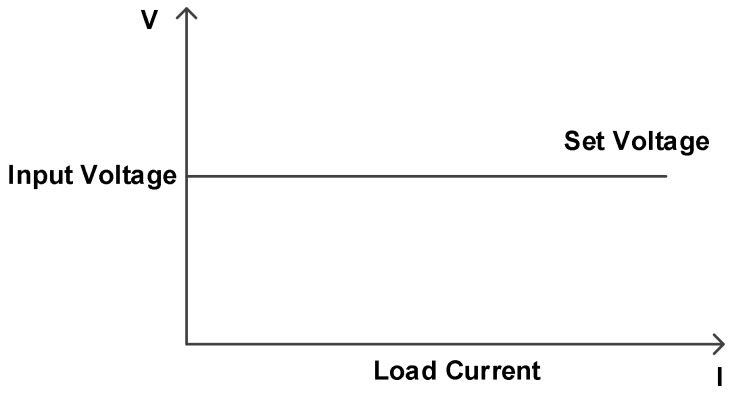


Figure 5-6 CV mode

5.2.2.2 Operation Steps

Please refer to the specification table for constant voltage value, constant voltage rate and measuring range.

1. Press the "CV" key on the main page to Enter the CV interface (for other interfaces, press the ESC key to return to the main page), move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
2. "Range": there are two options for range, CVH (constant voltage high), CVL (constant voltage low), rotate the "knob" to select the range, press the "Enter" key to confirm;
3. "V-Set": Input through the numeric keys, and press "Enter" to confirm;
4. ”V-Rate”: Input through the numeric keys, and press "Enter" to confirm;

5. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-7.

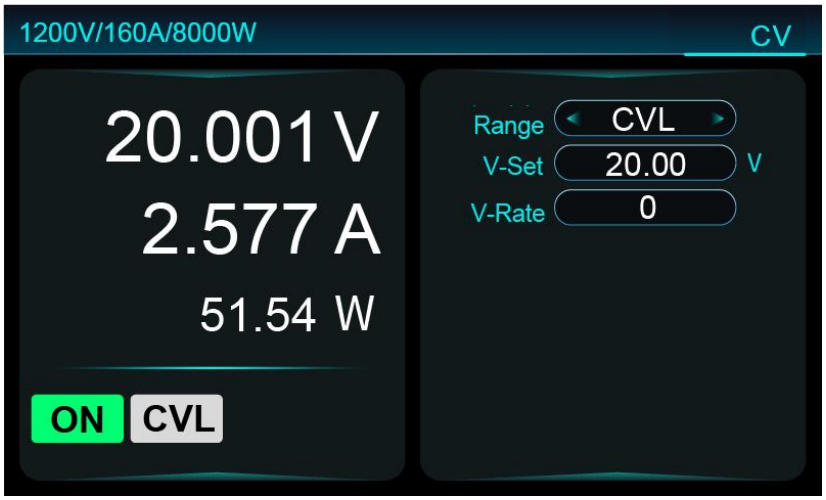


Figure 5-7 Constant Voltage Mode

6. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.2.3 Constant Resistance (CR)

5.2.3.1 Function Description

Under CR mode, the load is equivalent to a constant resistance, and the pulling current changes with the input voltage. The working curve is shown in 5-8.

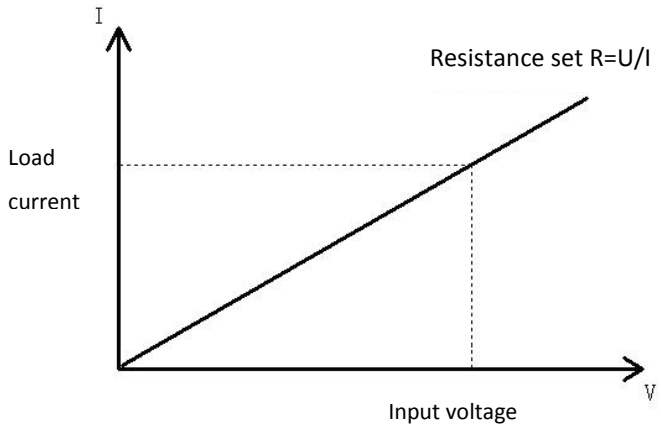


Figure 5-8 CR mode

5.2.3.2 Operation Steps

Please refer to the specification table for constant resistance value, rise/fall slew rate and measuring range.

1. Press the "CR" key on the main page to Enter the CR interface (for other interfaces, press the ESC key to return to the main page), move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
2. "Range": there are two options for range, CRH (constant resistance high), CRL (constant resistance low), rotate the "knob" to select the range, press the "Enter" key to confirm;
3. "R-Set": Input through the numeric keys, and press "Enter" to confirm;
4. "Rise slew": Input through the numeric keys, and press "Enter" to confirm;
5. "Fall slew": Input through the numeric keys, and press "Enter" to confirm;
6. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-9.

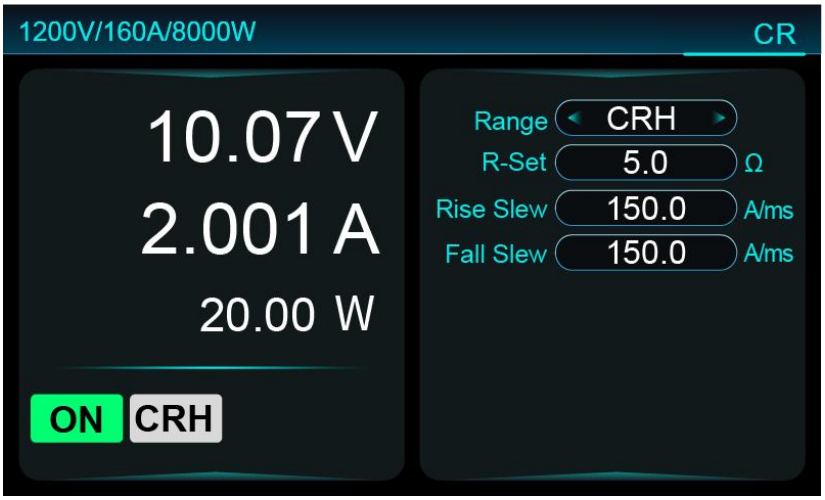


Figure 5-9 CR mode

7. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.2.4 Constant Power (CP)

5.2.4.1 Operation Steps

Under CP mode, the electronic load operates at the set power, and if the input voltage increases, the input current will decrease and the power P (=U*I) will remain at the set power. Figure 5-10 shows the working curve.

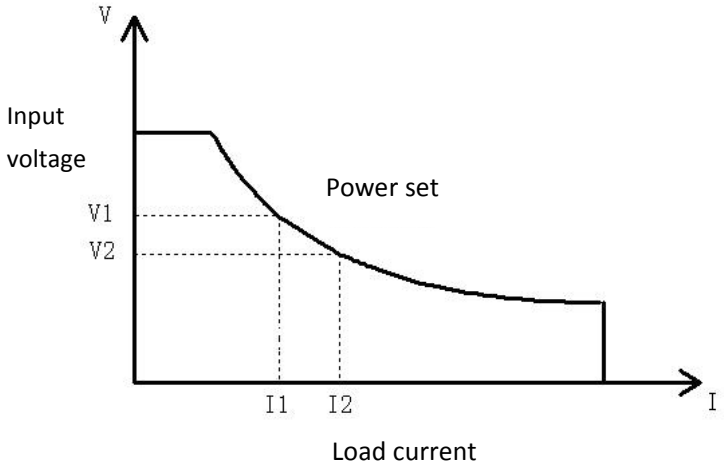


Figure 5-10 CP mode

5.2.4.2 Operation Steps

Please refer to the specification table for CP value, rise/fall slew rate and measuring range.

1.Press the "CP" key to Enter the CR interface (for other interfaces, press the ESC key to return to the main page), move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.

2."Range": there are two options for range, CPH (constant resistance high), CPL (constant resistance low), rotate the "knob" to select the range, press the "Enter" key to confirm;

3."P-Set": Input through the numeric keys, and press "Enter" to confirm;

4."Rise slew": Input through the numeric keys, and press "Enter" to confirm;

5."Fall slew": Input through the numeric keys, and press "Enter" to confirm;

7. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-11.

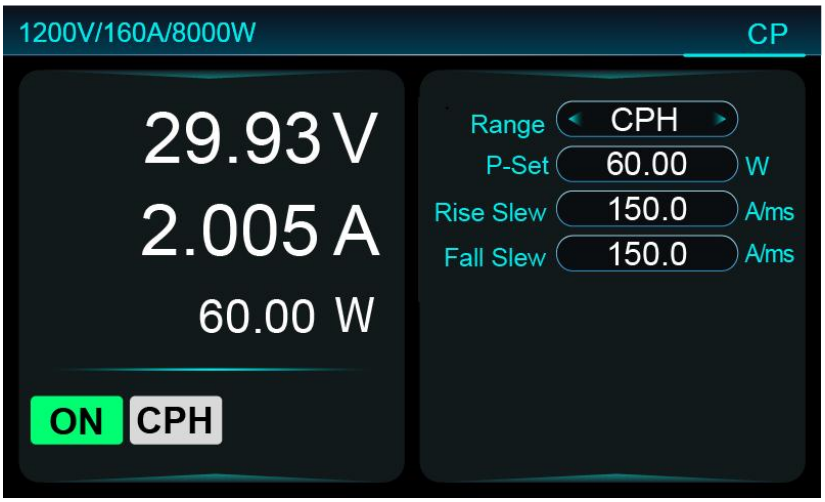


Figure 5-11 CP mode

8. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.2.5 Constant Voltage Constant Current (CVCC)

5.2.5.1 Function Description

In constant voltage and constant current mode, when the load current is less than the current limit value, the load works at constant voltage value, and when the load current is greater than the current limit value, the load works at constant current mode. Constant voltage is equipped with 10 constant voltage rate parameters, the user can choose the most suitable constant voltage rate to do the test according to the characteristics of the power supply. Figure 5-12 shows the working curve at CVCC mode.

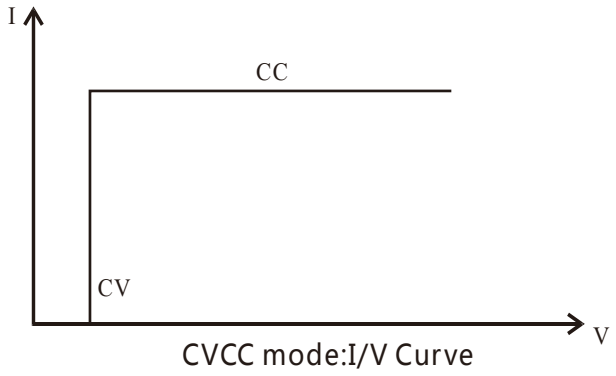


Figure 5-12 CVCC mode

5.2.5.2 Operation Steps

Please refer to the specification table for voltage, current limit, constant voltage rate and measuring range.

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "CVCC", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "Range": rotate the "knob" to select the range, press the "Enter" key to confirm;
4. "V-Set": Input through the numeric keys, and press "Enter" to confirm;
5. "I-Limit": Input through the numeric keys, and press "Enter" to confirm;

6. "V-Rate": Input through the numeric keys, and press "Enter" to confirm;
7. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-13.

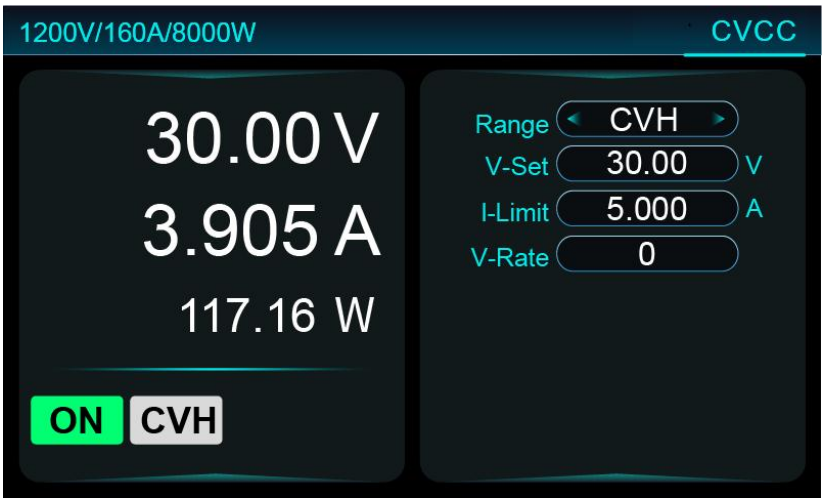


Figure 5-13 CVCC mode

8. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

Remarks

Constant voltage power should be less than 600W, otherwise it will not be converted to constant current.

5.2.6 Constant Resistance Constant Current (CRCC)

5.2.6.1 Function Description

Under CRCC mode, when the load current is less than the current limit value, the load current becomes larger as the voltage increases, and when the load current is greater than the current limit value, the load work with the constant current limit value.

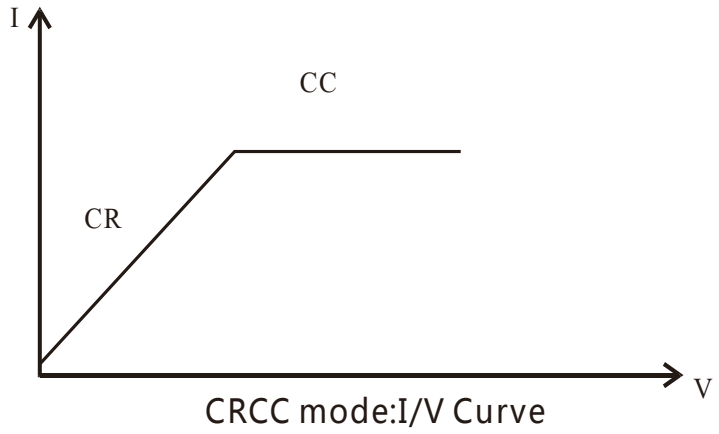


Figure 5-14 CRCC working curve

5.2.6.2 Operation Steps

Please refer to the specification table for resistance value, current limit, rise/fall slew rate and measuring range.

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "CRCC", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "Range": rotate the "knob" to select the range, press the "Enter" key to confirm;
4. "R-Set": Input through the numeric keys, and press "Enter" to confirm;
5. "I-Limit": Input through the numeric keys, and press "Enter" to confirm;
6. "Rise slew": Input through the numeric keys, and press "Enter" to confirm;
7. "Fall slew": Input through the numeric keys, and press "Enter" to confirm;

8. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-15.

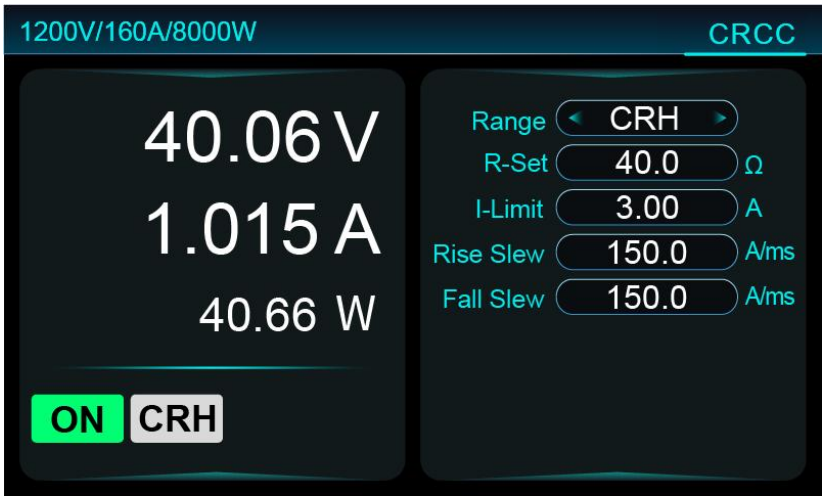


Figure 5-15 CRCC mode

9. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.2.7 Constant Power Constant Current (CPCC)

5.2.7.1 Function Description

Under CPCC mode, according to the formula P=UI, when the load current is less than the current limit value, the load is pulled by the constant power value, and when the load current is greater than the current limit value, the load works at the constant current mode with the current limit value.

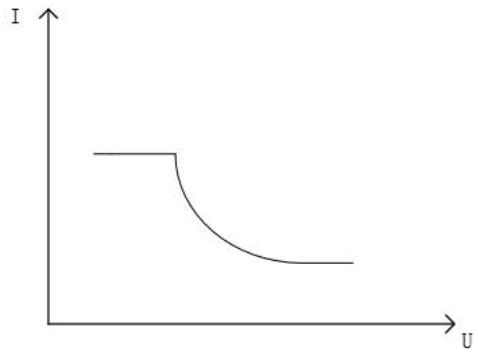


Figure 5-16 CPCC mode

5.2.7.2 Operation Steps

Please refer to the specification table for power value, current limit, rise/fall slew rate and measuring range.

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "CPCC", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "Range": rotate the "knob" to select the range, press the "Enter" key to confirm;
4. "P-Set": Input through the numeric keys, and press "Enter" to confirm;
5. "I-Limit": Input through the numeric keys, and press "Enter" to confirm;
6. "Rise slew": Input through the numeric keys, and press "Enter" to confirm;
7. "Fall slew": Input through the numeric keys, and press "Enter" to confirm;

8. Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-17.

Figure 5-17 CPCC mode

9. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.2.8 Constant Voltage Constant Resistance (CVCR)

5.2.8.1 Function Description

Under CVCR mode, the load first sets the constant voltage value and resistance limit value, and then starts the power output. The load will work at constant voltage mode first. When the output current of the power supply continues to rise and the ratio of the current voltage and current of the load exceeds the resistance limit value, it will be converted to constant resistance mode.

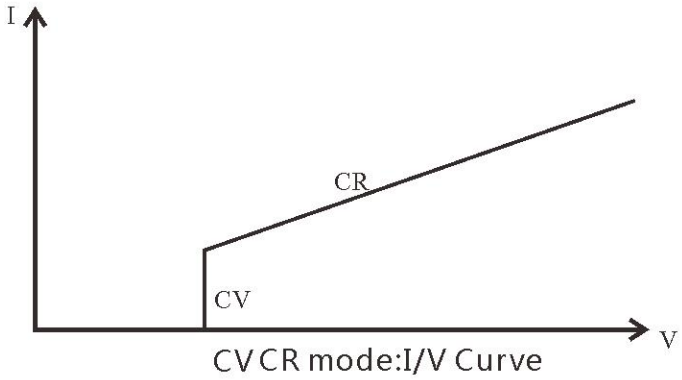


Figure 5-18 CVCR mode

5.2.8.2 Operation Steps

Please refer to the specification table for constant voltage, resistance limit, rise/fall slew rate and measuring range.

1.Press "Menu" to Enter the main menu page, rotate "knob" to select "CVCR", and press "Enter" to enter;

2.Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.

3."Range": rotate the "knob" to select the range, press the "Enter" key to confirm;

4."V-Set": Input through the numeric keys, and press "Enter" to confirm;

5."R-Limit": Input through the numeric keys, and press "Enter" to confirm;

6."V-Rate": Input through the numeric keys, and press "Enter" to confirm;

7.Press the "On/Off" key to turn on, and the display state is "ON", as shown in Figure 5-19.

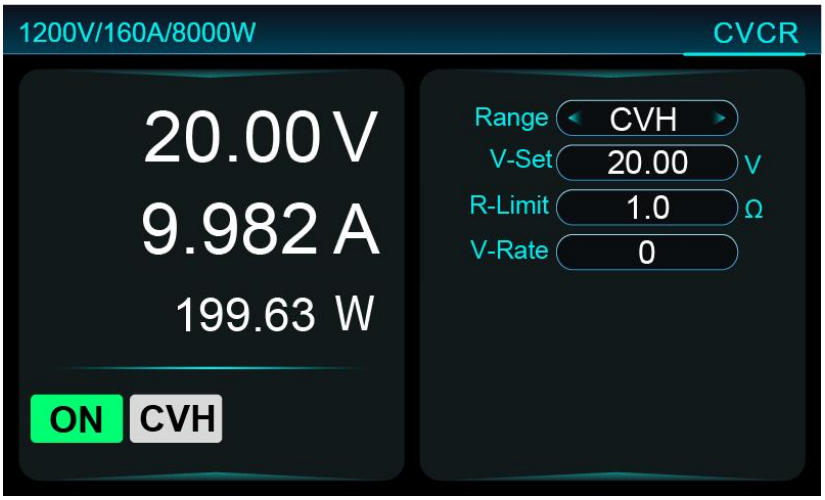


Figure 5-19 CVCR mode

8.Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.3 Dynamic Test (TRAN)

5.3.1 Function Description

The Dynamic function simulates dynamic load behavior in order to test the dynamic characteristics of a power supply. Dynamic testing has three operating modes: Conti, Pulse and Toggle. The Pulse and Toggle modes require a trigger signal, which is either the key combination "Shift+7" (Trigger) or the trigger terminal on the rear panel.

If the Conti is selected, N69200 switches continuously between the main value and the transient value according to the set pulse width, and will be executed according to the set parameters all the time.

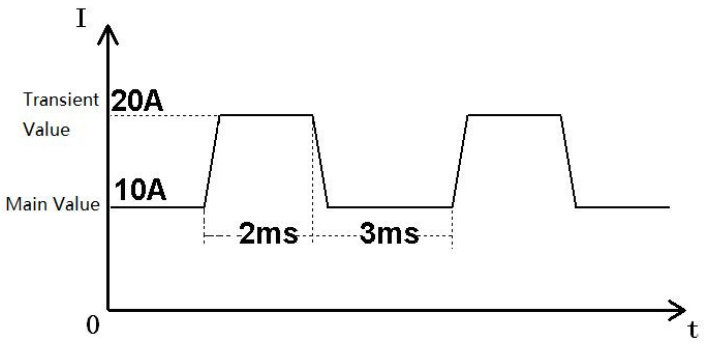


Figure 5-20 Conti

If Pulse is selected, N69200 receives a trigger signal, it switches from the main value to the transient value, and returns to the main value after maintaining the transient pulse width time. As shown in Figure 5-21, in pulse mode, when the transient test is enabled, N69200 will immediately switch to the transient value every time it receives a trigger signal, and after maintaining the pulse width time, it will automatically switch back to the main value.

Remarks

N69200 does not respond to the received trigger signal within the pulse width time of switching to the transient value.

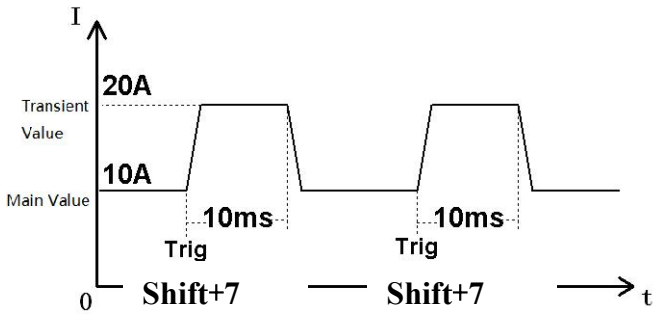


Figure 5-21 Pulse

If Toggle is selected, the trigger signal is received and N69200 will switch between the main value and the transient value, with the switching time determined by the slew. As shown in Figure 5-22.

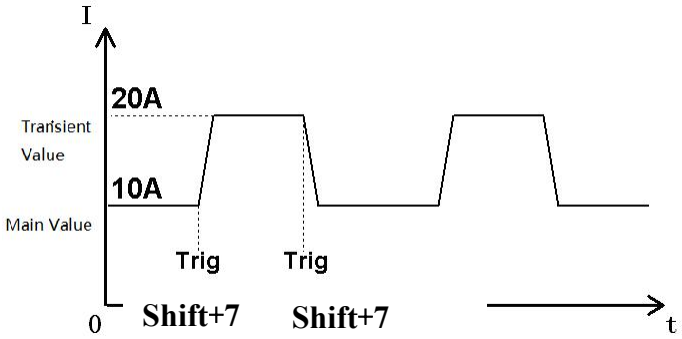


Figure 5-22 Toggle

In the dynamic operation mode, four dynamic functions can be set: dynamic current (CCD), dynamic voltage (CVD), dynamic resistance (CRD) and dynamic power (CPD).

5.3.2 Operation Steps

1. From the fixed-state function, press "Shift + CC/CV/CR/CP" key, to enter the CCD/CVD/CRD/CPD test, this section introduces the dynamic current continuity mode as an example of dynamic operation process;
2. Through the front panel "◀" "▶" key or turn the "knob" to move the cursor to the target menu items, press "Enter Press "Enter" to enter the menu item setting;
3. "Range": Turn the "knob" to select the range, press "Enter" key to confirm;

4. "Mode": turn the "knob" to select the operation mode, press "Enter" key to confirm, you can choose Conti (continuous) / Pulse (pulse) / Toggle (toggle). Different operation mode, corresponding setting parameters are also different, take Conti (continuous) mode as an example;
5. "Current1"： Input by numeric keys, press "Enter" to confirm, current1 is the main value;
6. "Current2" ： Input by numeric key, press "Enter" to confirm, current2 is the transient value;
7. "Pulse Wid.1": input by numeric key, press "Enter" to confirm, pulse width 1 is the load time of current 1, the value range is 0.025ms～60000s, press "Shift" to switch the time unit. Press "Shift" key to switch the time unit;
8. "Pulse Wid.2": input by numeric key, press "Enter" to confirm, pulse width 2 is the carrying time of current 2, the value range is 0.025ms～60000s, press "Shift" key to switch the time unit. Press "Shift" key to switch the time unit;
9. "Rise Slew": input by numeric key, press "Enter" to confirm;
10. "Fall Slew": input by numeric key, press "Enter" to confirm;
11. Press the "ON/OFF" key, the display channel status is identified as "ON", as shown in Figure 5-23;

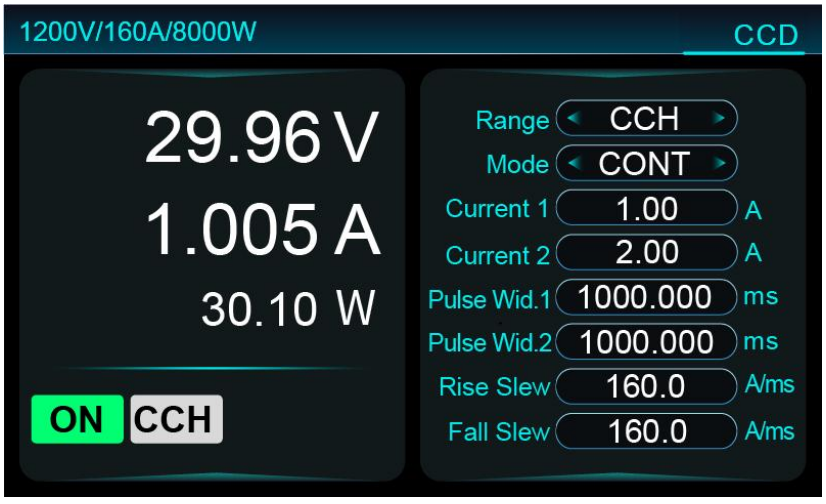


Figure 5-23 CCD

12. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.4 SEQ Edit

5.4.1 Function Description

Auto edit allows users to edit a complex sequence of changes to achieve continuous loading in different modes.

5.4.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "Auto edit", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "File No.": used to select the current sequence test file to be edited, input through the numeric key, press "Enter" key to confirm, sequence file value range 1-100;
4. "Total Steps": used to specify the total number of steps of the current sequence file, sequence length value range 1-50, input through the numeric key, press "Enter" to confirm;
5. "Link to SEQ": it is used to specify the file to continue to execute after the current sequence file is run, the value range is 0-100, input through the numeric key, and press "Enter" to confirm;
6. "Cycle": the number of runs of the sequence file, ranging from 1-60000, input through numeric key and confirmed by "Enter";
7. "Step No.": it is used to select the current test step to be edited, and then set the corresponding parameters. After the parameter setting of the current step is completed, the value range of the edit step is 1-200, input through numeric key and confirmed by "Enter";

8. "Mode" : By rotating the "knob" to switch the current step load mode, Including CCH, CCM, CCL, CVH, CVM, CVL , CRH, CRM, CRL, CPH, CPM and CPL. Different load modes have different load main values and load slew rate. If the user chooses a certain load mode, its subsequent setting items will be different.
9. "I-Set": Set the current load master value. The load master value setting item corresponds to the load mode. For example, if the load mode is set to CCH, the current parameter is Current. If the value is CRH, the current step is Resistance. Input the value using numeric keys and press Enter to confirm.
10. "Rise/ fall slew " : if the load mode is selected as other modes, then you can set the current rise and fall slew rate, input through the numeric key, press "Enter" to confirm;
11. “Dwell”: Enter the time range from 0.1ms to 100000s by numeric keys, and press Enter to confirm. If the delay time is set to 0, it means the load is running all the time, users can press "shift" to switch the time unit, and press "Enter" to confirm;
12. "Inspection": the check content is divided into VOL (check voltage), CUR (check current), POW (check power), the default is OFF (shut off “check content”) state, you can rotate the "knob" to select “check content”, press "Enter" to confirm. If the user is more concerned about the time accuracy of the waveform, the “check content” can be turned off.
13. “Check Upper Limit and Lower limit”: If the check content is not OFF, set the check upper limit and check lower limit and press Enter to confirm.

Figure 5-24 SEQ Edit

14. After this sequence is edited press the key combination "Shift+6 (Save)" to save it.

5.5 Auto Test

5.5.1 Function Description

The auto test function is used to simulate the real waveform with load and provides an efficient specification check process, which significantly improves test efficiency. This function requires calling sequence files for testing (sequence files are edited under the "Automatic Test editing" interface), and users can edit up to 10 automatic test files, each of which can support 200 test steps. In each test step, the user can set the load mode, set value, rise slew rate, fall slew rate, time unit, dwell time and check content.

When the sequence file is running, starting from step 1, the load performs the on-load action according to the parameters in the test step. When the delay reaches, the specification check (whether the sampling voltage/sampling current/sampling power is within the range) is performed, and then switches to the next step. After all the test steps are run, the load is automatically turned OFF and the test is stopped.

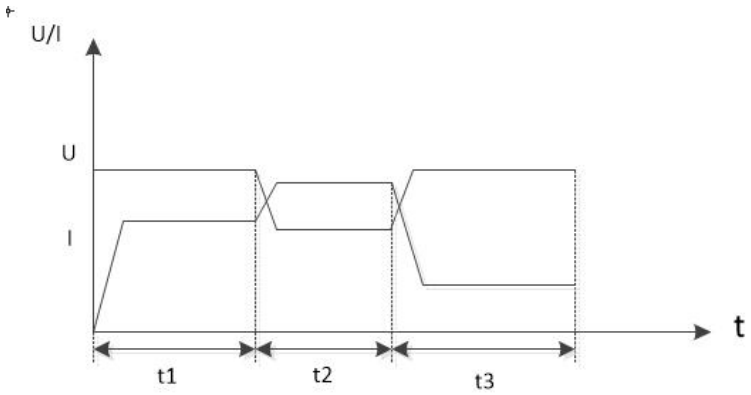


Figure 5-25 Auto test

5.5.2 Operation Steps

1. After editing the auto test file, press "Menu" to enter the main menu page, rotate "knob" to select "auto test", and press "Enter" to enter;

2. Move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "File No." : Rotate the "knob" to select the auto test file and press "Enter" to confirm;
4. Press the "On/Off" key to turn on, and the display state is "ON", observe the display reading, as shown in Figure 5-26.
5. After the test is completed, the load will automatically turn OFF and stop running, and the display status is marked as "OFF". The screen will also display the test result "PASS" or "FAIL" if the current sequence file is turned on.

Figure 5-26 Auto test

5.6 Discharge Test

5.6.1 Function Description

The discharge function is used to test the discharge of batteries or super capacitors. During the test, the voltage of the battery (or capacitor) continues to decrease. When the voltage at both ends of the battery is detected to be lower than the end voltage, the load is OFF and the discharge of the battery (or capacitor) is stopped.

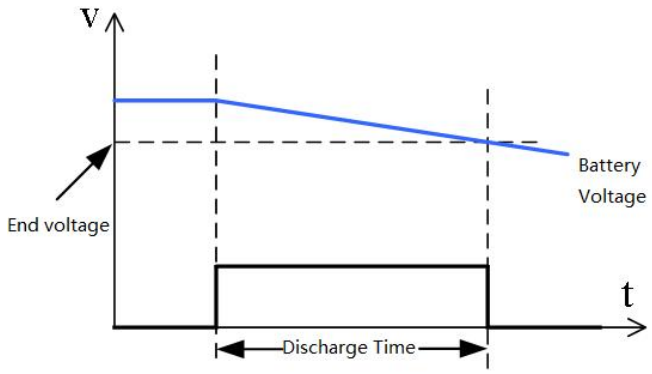


Figure 5-27 Discharge test curve

5.6.2 Operation Steps

1.Press "Menu" to Enter the main menu page, rotate "knob" to select "Discharge", and press "Enter" to enter;

2.Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.

3."I-Discharge": Input through the numeric keys, the setting range is 0 to rated current and press "Enter" to confirm;

4."V-End": Input through the numeric keys, and press "Enter" to confirm. When the voltage of the DUT drops to the end voltage, the load stops, and the setting range is 0- rated voltage;

5."T-End": Input through the numeric keys, and press "Enter" to confirm. When the discharge time is equal to the end time, and the load stops. The setting range is 0.1s~60000s;

6."C-End":Input through the digital key, press "Enter" to confirm, when the discharge capacity is equal to the end capacity, load stops, setting range is 0-6000Ah;

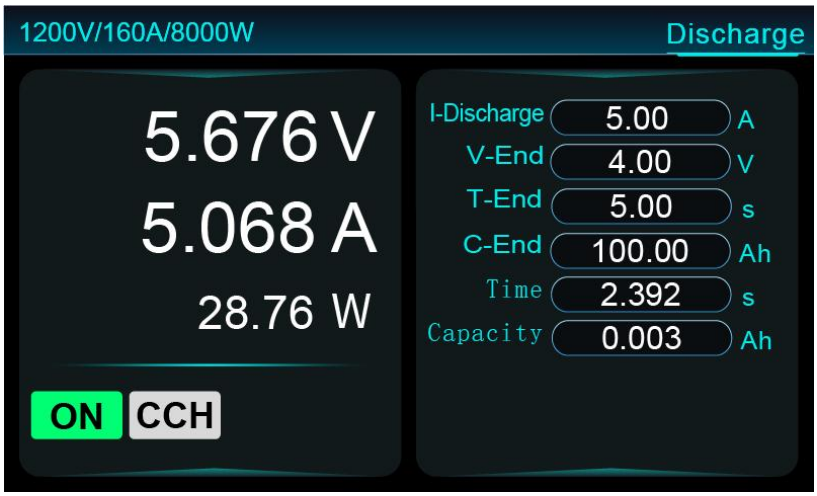


Figure 5-28 Discharge test

7.Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.7 Charge Test

5.7.1 Function Description

The charge test function is used to perform a charge test on a battery or super capacitor. In addition to providing constant current charging mode, N69200 series loads also add intelligent constant current to constant voltage charging mode.

If the charge test function is used, the load needs to be connected in series with the power supply and the battery (or super capacitor), and the remote sampling function of the load is turned on, and the Sense Mode line is used to connect to the positive and negative terminals of the battery. The wiring method is shown in Figure 5-29.

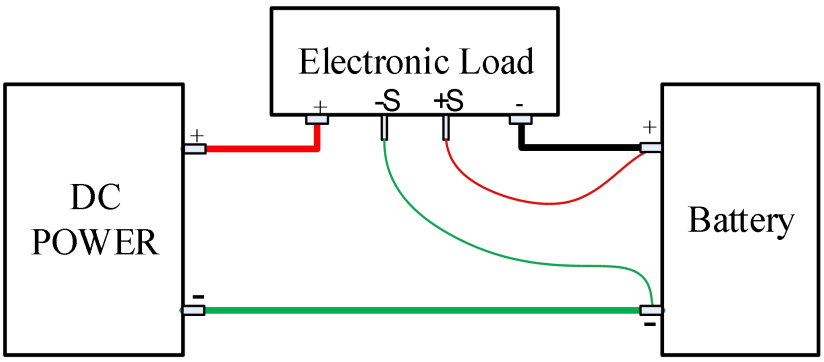


Figure 5-29 Charge Test Wiring Diagram

5.7.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "Charge", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "I-Charge": Input through the numeric keys, the setting range is 0 to rated current and press "Enter" to confirm;

4. "V-Charge ": input the end voltage by numeric key, press "Enter" to confirm, when the voltage of the DUT drops to the end voltage, stop loading, the setting range is 0-rated voltage;
5. "CV Time": input CV time by numeric key, press "Enter" to confirm, the charging duration is equal to the constant voltage time, stop loading, the setting range is 0-86400s;
6. "V-Rate": turn the "knob" to move the cursor to select the CV rate, press "Enter" to confirm, the setting range is 0-10;
7. Press the "On/Off", the display channel status is identified as "ON", as shown in Figure 5-30;

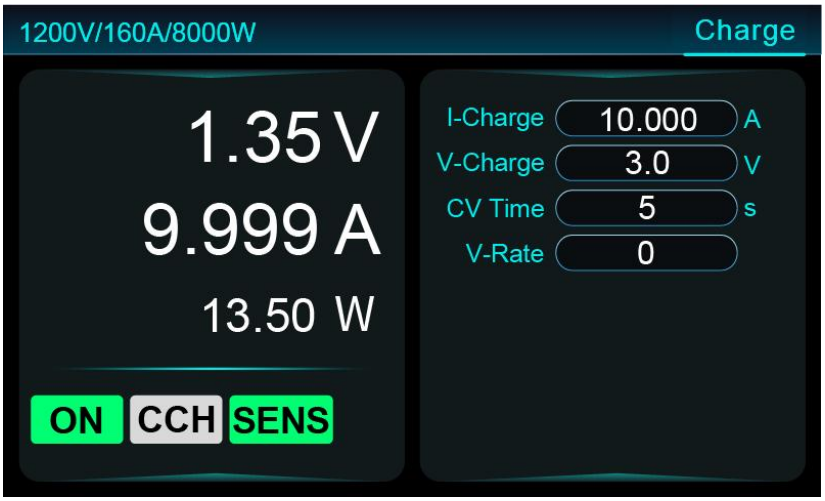


Figure 5-30 Charge Test

8. The load will charge the battery at constant current first, when charging to the charging voltage, switch to constant voltage charging. After the constant voltage time, the charging will stop and the test will end and the screen will display the battery charge (Unit: Wh).
9. Press the "ON/OFF" key to turn off, and the display state is "OFF", test finished.

5.8 Internal Resistance Test (DCIR Optional)

5.8.1 Function Description

Equivalent DC Internal Resistance (DCIR) is an important technical indicator for measuring the performance of batteries and supercapacitors. the N69200 series loads provide professional DCIR measurement functions that support a wide range of measurement standards, and have the advantages of accurate and repeatable measurement results.

The DCIR measurement function pulls the load on the DUT in constant current mode. At the moment of current pulling, the voltage change of the DUT can be accurately captured by the precise internal resistance sampling circuit of N69200, and the equivalent DC internal resistance of the DUT can be calculated according to Ohm's law.

Users press "Shift+4 (ESR)" to enter the "Internal Resistance Test" interface, or select "Internal Resistance Test" under the "Menu" menu, and press "Enter" to enter the interface, which is shown in Figure 5-31.

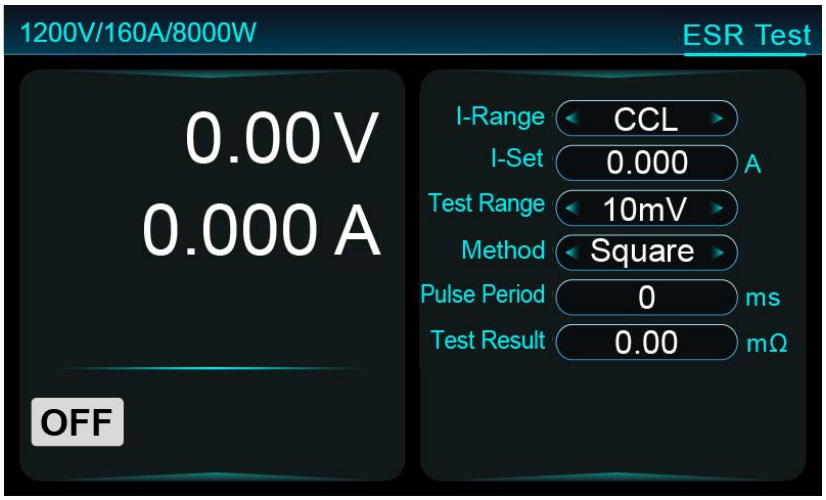


Figure 5-31 Running ESR Test

5.8.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "DCIR", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "Range": divided into CCH (constant current large range), CCM (constant current medium range), CCL (constant current small range), turn the "knob" to select the range, press "Enter" key to confirm;
4. "I-Set": input via numeric keys, press "Enter" to confirm, the setting range is 0 - rated current;
5."Test Range"： It refers to the range of pressure difference generated by the internal resistance of the DUT through the current (it is recommended to use 80% of the current range for testing), for example: the internal resistance of the DUT is about 10mΩ, the current setting is not more than 1A in the 10mV range; the current setting is not more than 10A in the 100mV range; the current setting is not more than 100A in the 1000mV range.Turn the "knob" to select the range, press "Enter" to confirm;
6. “Method”: including Square and N-ms. Turn the "knob" to select the range, press "Enter" to confirm;
7. Connect a super capacitor or battery to the input and observe the display reading, as shown in Figure 5-32.

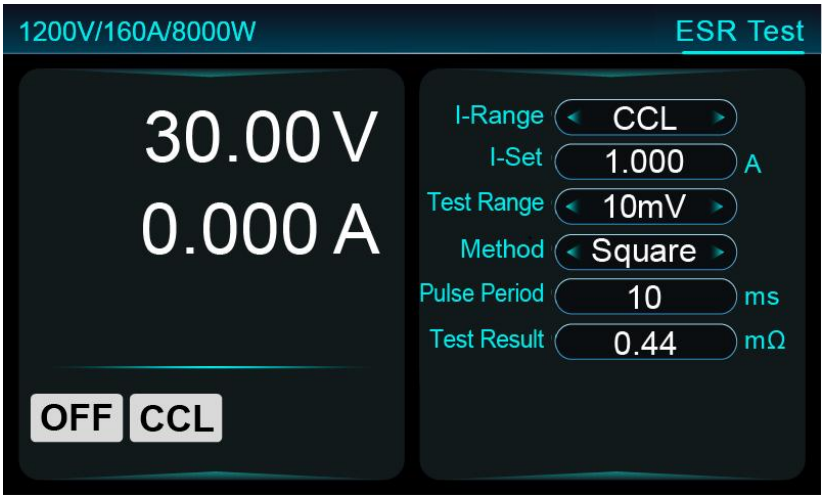


Figure 5-32 ESR Test

8. Press the "ON/OFF" key to turn off, and the display state is "OFF", test finished.

5.9 Over-Power Protection Test (OPP Test)

5.9.1 Function Description

The N69200 series electronic loads have over-power (OPP) testing capabilities. In the OPP test mode, when the input voltage reaches the Von value, the load begins to work, and the current increases according to the step value at regular intervals. At the same time, the load input voltage is detected to determine whether it is higher than the end voltage value. If it is higher, it indicates that OPP does not occur, and the power dwell operation is repeated until the power is protected; If it is lower, OPP has occurred.

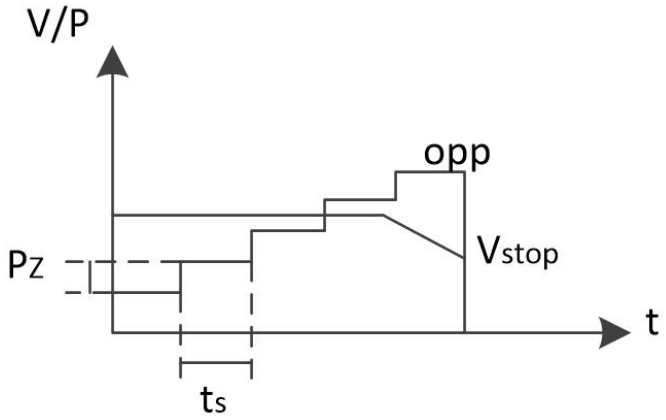


Figure 5-33 Over-power test

Remarks：Pz：Increase Power ts：dwell time Vstop：end voltage

5.9.2 Operation Steps

1.Press "Menu" to Enter the main menu page, rotate "knob" to select "Over-power test", and press "Enter" to enter;

2.Move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.

3."P-Start": Input through the numeric keys, and press "Enter" to confirm;

4."P-Incr": Input through the numeric keys, and press "Enter" to confirm;

5."V-End": Input through the numeric keys, and press "Enter" to confirm; When the voltage of the load is less than the end voltage, the load stops working.

6."P-End": Input through the numeric keys, and press "Enter" to confirm; When the over-power protection function is enabled, the maximum power is limited to the power value set by the OPP. Once the OPP is triggered, the load will stop immediately.

7."Dwell": Input through the numeric keys, set the range from 0.02s to 60000s, and press Enter to confirm. The power increases step by step to the set value of protection power.

8.Press the "On/Off" key to turn on, and the display state is "ON" and the discharge time and discharge capacity, shown in Figure 5-34.

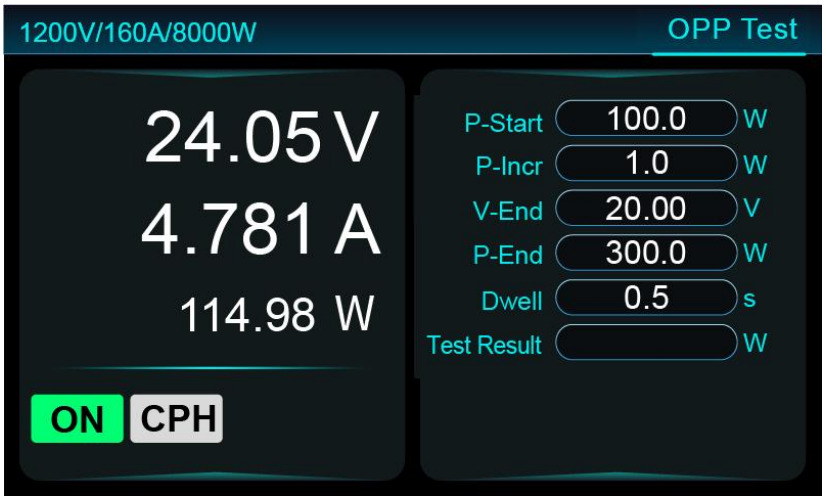


Figure 5-34 Over-power test

9.Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.10 Over-Current Protection Test (OCP Test)

5.10.1 Function Description

The N69200 series electronic load has over-current test function. In the over-current test mode, when the input voltage reaches the Von value, the electronic load starts to work, and the current increases according to the step value at certain intervals. At the same time, the load input voltage is detected to determine whether it is higher than the end voltage value. If it is higher than that, it indicates that OCP does not occur, and the current step operation is repeated until it reaches the end current. If it is lower than that, OCP has occurred.

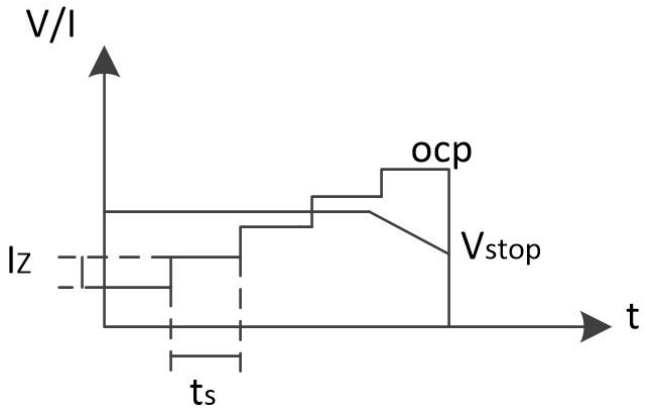


Figure 5-35 over-current test

Remarks：Iz：Increased current ts：Dwell time Vstop：End voltage

5.10.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "Discharge", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "I-Start": Input through the numeric keys, and press "Enter" to confirm;
4. "I-Incr": Input through the numeric keys, and press "Enter" to confirm;

5. "V-End": Input through the numeric keys, and press "Enter" to confirm. When the voltage at both ends of the load is less than the end voltage, the load stops working.
6. "I-End": Input through the numeric keys, and press "Enter" to confirm. When OCP is enabled, the maximum load current is limited to the set value of the protection current. Once the over-current protection is triggered, the load will be stopped immediately.
7. "Dwell": Input through the numeric keys, Set the range from 0.02s to 60000s, and press Enter to confirm. The current increases step by step to the set value of protection current.
8. Press the "On/Off" key to turn on, and the display state is "ON" and the discharge time and discharge capacity, shown in Figure 5-36.

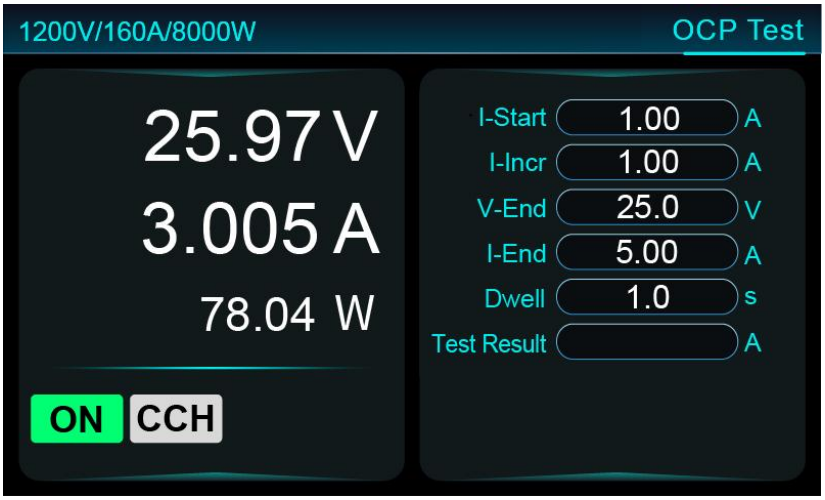


Figure 5-36 over-current test

20.Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.11 MPPT

5.11.1 Function Description

The voltage-current curves are given in Figure 5-37, where Pmax occurs at the intersection of the most Imax and Vmax.

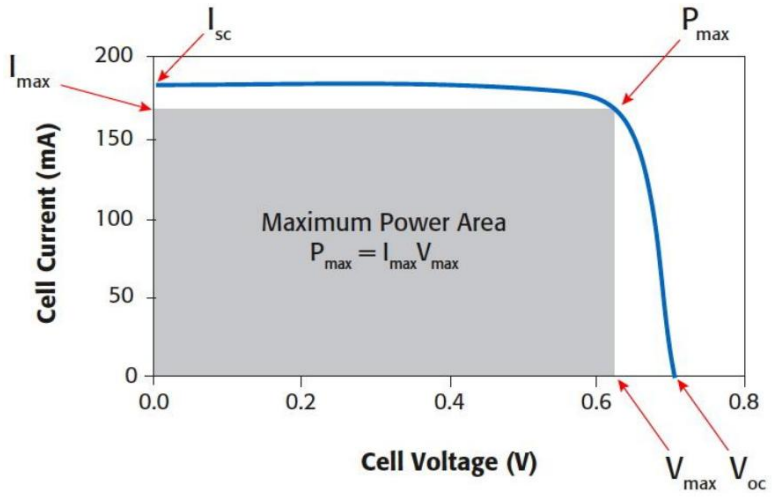


Figure 5-37 I-V curve

Maximum Power Point Tracking (MPPT) is commonly used to test the maximum output power of solar panels. In this function, the load works in CV mode and starts the test with a constant voltage close to 0V, then slowly increases the voltage until the current drops to 0 (power is 0). During this process, the load will record the electrical parameters and final test results in real time, so as to obtain the maximum power point, voltage at maximum power point, current at maximum power point, open circuit voltage, and short circuit current.

5.11.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "MPPT", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◄" "►" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings;

3. ”Mode”: including Scan mode and Trace mode. Rotate”knob”to select mode, and press "Enter" to enter;

4.“Step V”: Input through the numeric keys, and press "Enter" to confirm;

5.”Step T”: Input through the numeric keys, and press "Enter" to confirm;

Setting rang 0.1~3600s;

6.”Pmax”: Maximum power point. Input through the numeric keys, and press "Enter" to confirm;

7. Press“On/Off”, the load ON，The display channel status is identified as "ON" "CVH", as shown in Figure 5-38.

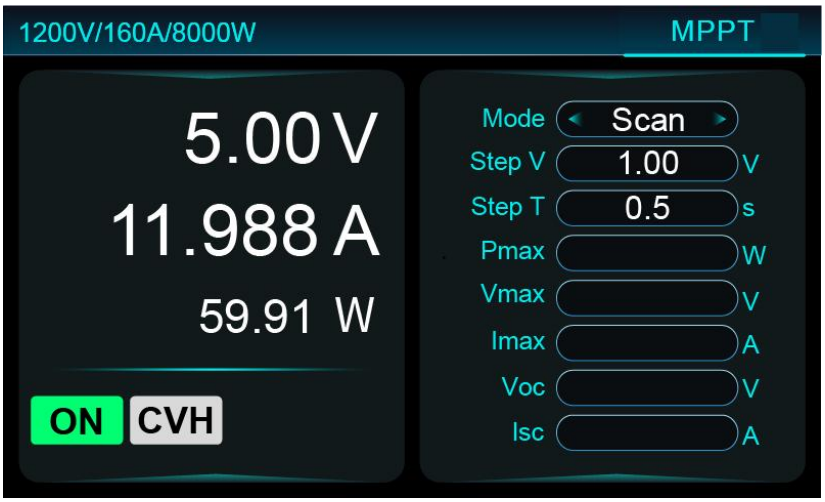


Figure 5-38 MPPT

8.When the maximum power point is reached, "Maximum Power", "Maximum Voltage", "Maximum Current", "Open Circuit Voltage" and "Short Circuit Current" are automatically calculated.

5.12 Dynamic Current Waveform (CCD WAVE Optional)

5.12.1 Function Description

N69200 can simulate real loading current by setting different types of current waveform according to the parameters. Sine, Square, Triangle, Ramp and user-defined waveform can be loaded. The customized waveform data CSV file is imported from U disk, such as "WAVES.CSV".

5.12.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "OCP", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "Type": including Sine, square, triangular, sawtooth, custom waveform, turn the "knob" to select the waveform, press "Enter" to confirm;
4. "Range": including CCH,CCM,CCL, turn the "knob" to select the range, press "Enter" to confirm;
5. “File”: Select the current editing parameter or running file, enter it with the numeric keys and press "Enter" to confirm;
6. “Frequency”： It refers to the frequency of loaded current waveform, input through numeric keys, press "Enter" to confirm, the setting range is 0.02Hz-30000Hz;
7. “Amplitude”：Input sine wave current amplitude via numeric keys, press "Enter" to confirm;
8. “Offset Value”: DC loaded current, input through numeric keys, press "Enter" to confirm;
9. “Dwell”: Input through numeric keys, press "Enter" to confirm;

10. Press the "On/Off" key load ON, the display channel status is identified as "ON", as shown in Figure 5-39.

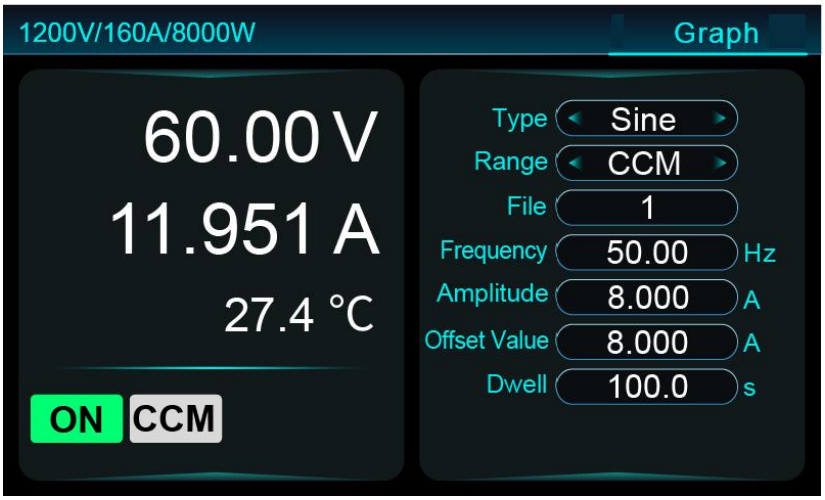


Figure 5-39 Dynamic Current Waveform

11. Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.13 Dynamic Sweep (Sweep)

5.13.1 Function Description

The load supports dynamic frequency sweep test to quickly find the voltage of the device under test in the worst case by frequency conversion. By editing two constant current values, step frequency, start frequency, end frequency, dwell time and other parameters for setting, dynamic sweep function sense rate up to 50kHz, can simulate a variety of load conditions. Figure 5-40 shows the current waveform.

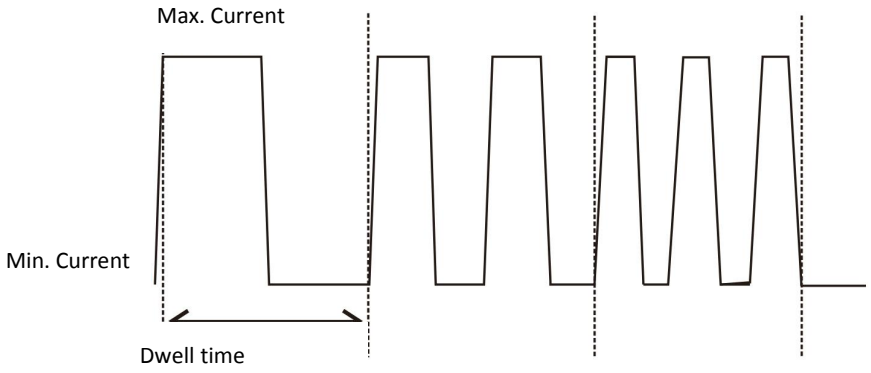


Figure 5-40 Dynamic sweep

5.13.2 Operation Steps

2.Press "Menu" to Enter the main menu page, rotate "knob" to select "Dynamic sweep", and press "Enter" to enter;

3.Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.

4."I-min": minimum current, enter by numeric key, press "Enter" to confirm;

5."I-max": Maximum current, input by numeric key, press "Enter" to confirm;

6."F-Start ": input by numeric keys, the setting range of frequency is 1.00Hz~30000Hz, press "Enter" to confirm;

7."F-End " ： Input through the numeric keys, the setting range of frequency is 1.00Hz~30000Hz, press "Enter" to confirm;

8."F-Step" ： Input through the numeric keys, the frequency setting range is 0.10Hz~30000Hz, press "Enter" to confirm;

9."Dwell": input by numeric keys, set time range 0.01s~10000s, press "Enter" to confirm;

10."Rise slope": input by numeric key, press "Enter" to confirm;

11."Fall Slew": input by numeric key, press "Enter" to confirm;

12."Duty cycle"： In a pulse cycle, the proportion of loaded time relative to the total time, enter by numeric key, press "Enter" to confirm;

13.Press the "On/Off" key load ON, the display channel status is identified as "ON", as shown in Figure 5-41.

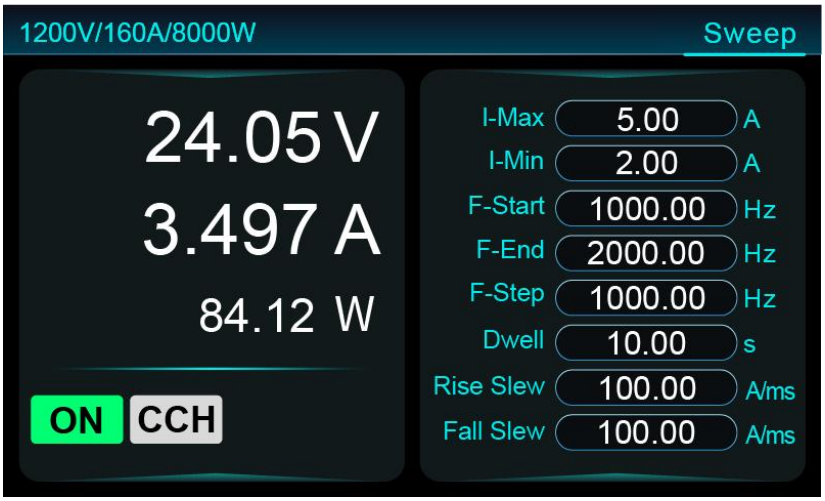


Figure 5-41 Sweep

14.Press the "On/Off" key to turn off, and the display state is "OFF", test finished.

5.14 Short Circuit Simulation (Short)

Under the CC mode, CV mode, CR mode, CP mode and TRAN mode, N69200 can simulate short-circuit operation to test the protection performance of the DUT. The current consumption when the load is short-circuited depends on the operating mode and range of the load; in CC and CP modes, the maximum short-circuit current is the maximum value of the present range; in CV mode, the short-circuit operation is equivalent to setting the constant voltage value of the load to 0V; in CR mode, the short-circuit operation is equivalent to setting the minimum value of the present range. Short-circuit operation does not change the current setting value, and the load returns to the previous state when the short-circuit operation is exited.

N69200 Short Operation Steps：

1. Switching functions (e.g. CC, CP, CV, CR, etc.);

2. Press "On/Off" key to start;

3. Press the "Short" key load short circuit, and then press the "Short" key to exit the short circuit state.

Notes

Function and range switching is not permitted in the short-circuit state of the load.

In the ON state, press the "Short" key to enter the short circuit simulation mode, the current output is about the maximum value of loading.

5.15 Impedance simulation (SZ)

5.15.1 Function Description

Impedance simulation mode is different from CC/CV/CR/CP mode. Impedance simulation test can simulate the actual inductive reactance, impedance and capacitive reactance load, so that the current can be closer to the real situation.

Impedance simulation test can simulate the capacitive load to prevent the active device from generating surge current when the load is working, which will trigger the overcurrent protection OCP of the active device. Therefore, the N69200 series provides impedance simulation test for this test requirement.

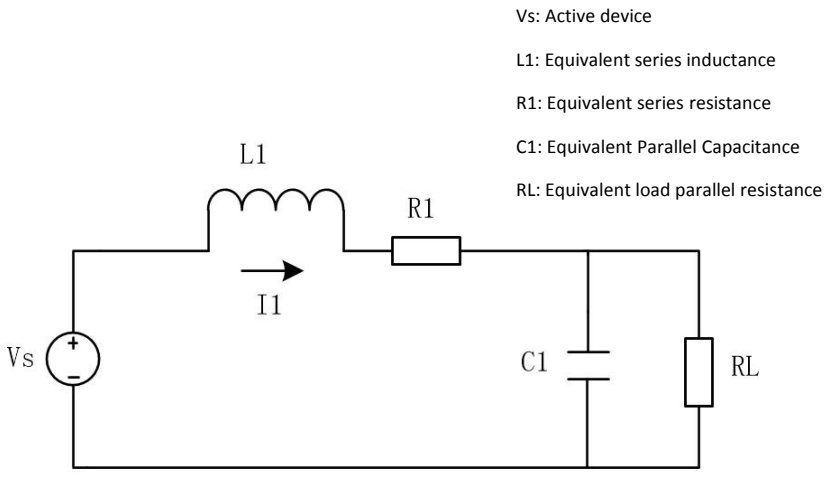


Figure 5-42 Impedance simulation

5.15.2 Operation Steps

1. Press "Menu" to Enter the main menu page, rotate "knob" to select "Sz", and press "Enter" to enter;
2. Move the cursor to the target menu through the "◀" "▶" key or rotate the "knob" on the front panel, and press the "Enter" key to enter the menu settings.
3. "RS": Input through the numeric keys, and press "Enter" to confirm; Setting range is 0.03-20Ω;

4. "LS": Input through the numeric keys, and press "Enter" to confirm; Setting range is 0.2-20μH;
5. "CL": Input through the numeric keys, and press "Enter" to confirm; Setting range is 20μF-50000μF;
6. "RL": Input through the numeric keys, and press "Enter" to confirm; Setting range is 0.05~525Ω;
7. Press the "On/Off" key to turn on, and the display state is "ON", observe the reading on the display, as shown in Figure 5-43

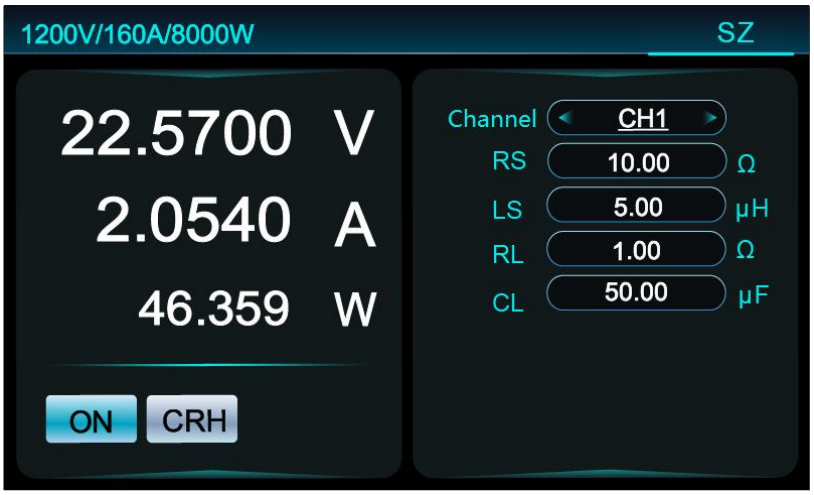


Figure 5-43 SZ mode

8. Press the "On/Off" key to turn off, and the display state is "ON"

5.16 Application

Users press the "Menu" key to enter the menu, select "Application " to enter the interface, and set relevant parameters in the application configuration interface. The interface is shown in Figure 5-54.

Figure 5-44 Application

- **Sense Mode**

Including local sense and remote sense. If remote sense is selected, two sensing lines should be connected to the power supply outputs.

- **Ext-Control**

The external trigger source, can be set to Toggle, hold or OFF.

- **Ext-Prog**

Turn the external programming interface ON or OFF.

- **CV I-Range**

Select the current range in CV mode.

- **CC V-Range**

Select the current range in CC/CR/CP mode.

- **High Precision**

Select high precision mode.

- **Poweroff Memory**

Saves the parameters from the last shutdown.

- **Turnon Load**

When this function is turned on, the power will be automatically loaded according to the setting of the last time the power was turned off.

- **Measure Rate**

Range 0.1-10.

- **Enhance Power**

Can instantly loaded 1.1 ~ 1.6 times the power, optional ON, OFF.

Requirements:

1. The measured temperature is 30 degrees or less before users loaded at times the power;

2.After loading in power doubling mode, it will be unloaded after 3s when it detects that the actual power is greater than 1.1 times, and the option will be changed to OFF automatically after unloading.

Remarks

At this time, the protection function in the protection setting is still in effect, at this time users need to set the power protection to 0.

- **M/S Mode**

1.Master-Master Parallel: When two master computers are in parallel, one of the master 2 needs to be set as slave, then the master 2 will be used as a slave, and the actual loading current will be displayed during the actual loading process. And master 1 current parameters will be superimposed, the actual loading process will show the total loading current.

2.Master-slave parallel: when a master and a slave parallel, which the slave needs to be set to slave, the factory will have been configured parameters.

- **Slaves Numbers**

Select the number of slaves when the load is operating in master mode.

5.17 System

The user presses the "Menu" button to enter the "System " interface, which is shown in Figure 5-45:

Figure 5-45 System

- **IP Address**

The default IP address is 192.168.0.123, which can be changed by the numeric key. The change will take effect after restart.

- **Mask**

The subnet mask defaults to 255.255.255.0 and cannot be changed.

- **Gateway**

The default value of the gateway is 192.168.0.1, which can be changed by the numeric key. The change will take effect after restart.

- **Series Baud rate**

N69200 supports a variety of baud rates, you can choose according to your needs (4800, 57600, 9600, 19200, 38400, 115200), the change will take effect after restart.

- **Parity**

Sets RS232 parity, which can be None, Odd, or Even.

- **CAN Baud Rate**

Set the communication baud rate in CAN communication mode (default is 250K). Settings can be changed, and reboot takes effect after the change is completed.

- **Beeper**

This option sets the sound of the device On/Off.

1. On: The default value indicates that the sound is on.

2. Off: indicates that the sound is off.

- **Page Lock**

Enable or disable page lock, turn on the lock interface, the load can no longer switch the interface when the output is ON.

- **Language**

N69200 support Chinese and English.

- **Fast Recall**

Fast recall ON/OFF.

The load can save 100 sets of commonly used parameters into EEPROM for fast recall. These parameters include: CC, CV, CR, CP & TRAN set values.

Users can use the key combination "Shift+6" (Save) and "Shift+0" (Recall) to realize the saving and recalling operation. If the fast recall function is enabled, users can directly press the numeric keys 0~100 to recall 100 groups of saved data. The steps to enable the Fast Recall function are as follows:

Take the example of saving and recalling the fixed-state CR test to illustrate the operation steps:

1, During the fixed-state CR test, set the fixed-state parameters of the resistor and press the key combination "Shift+6" (Save), the display will switch to the save page;

2, Press the numeric key "2" (Discharge), and then press "Enter" to save;

3, If users do not open the fast recall function, then press the key combination "Shift + 0" (Recall) and then press the numeric key "2" (Discharge) to realize the parameter

call; if users open the fastre call function, then directly press the numeric key. If the Fast Recall function is enabled, then press "2" (Discharge) to recall the parameter.

If there is no data in the storage area when users press the key combination "Shift+0" (Recall) to realize the call operation or quick call, the call operation will be invalid.

- **Device ID**

Set the device ID and restart after the change.

5.18 Protection

Users can press "Menu" to enter the menu and select "Protection " to enter the interface. Protection parameters can be set in the protection configuration interface, and the "protection configuration" interface is shown in Figure 5-46.

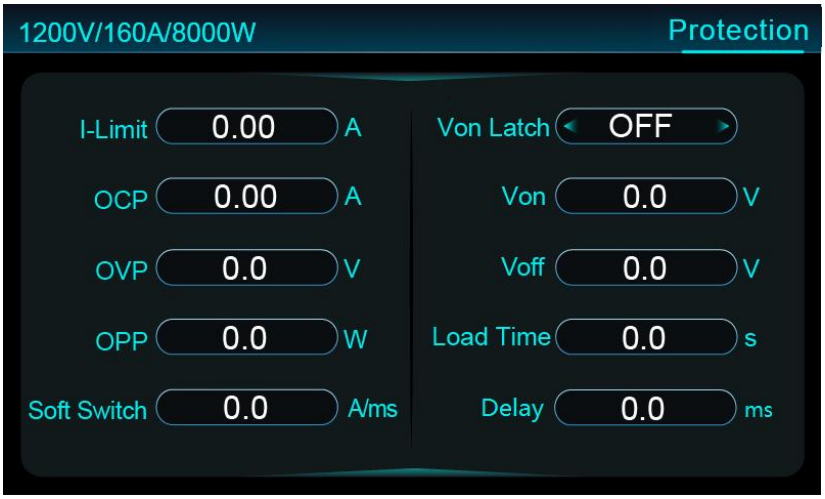


Figure 5-46 Protection

- **I-Limit**

Set programmable current limit value, limit range 0-rated current.

- **OCP**

Set programmable current protection threshold, if over-current protection is triggered, it will be unloaded immediately, and OCP will appear on the display.

- **OVP**

Set the programmable voltage protection threshold, if the over-voltage protection is triggered, it will be unloaded immediately, and the OVP will appear on the display.

- **OPP**

Set programmable power protection threshold, if the power protection is triggered, it will be unloaded immediately, and the OPP will appear on the display.

- **Soft Switch**

Set the current Rise/Fall slew for ON/OFF.

- **Von Latch**

When the setting is on, it means that N69200 starts to load when voltage is reached; when the setting is off, it means that N69200 is unloaded when the voltage is lower than the loaded voltage.

- **Von**

Set the load voltage, if the input voltage is higher than this set value, the load immediately works.

- **Voff**

Set the unloading voltage. If the input voltage is lower than the unloading voltage, the load will stop immediately.

- **Load Time**

Set the load time. The range can be set from 0.1-90000s. If this function is disabled, set to 0s.

- Delay

Set the protective delay time. The range can be set from 0-1000ms.

5.18.1 VON/VOFF

When the output voltage of the measured power supply rises or falls slowly, this function can protect it. Von behaves in Latch and Unlatch modes:

Unlatch mode: When the input voltage is higher than Von, the load is on, and when the input voltage is lower than Von, the load is stopped.

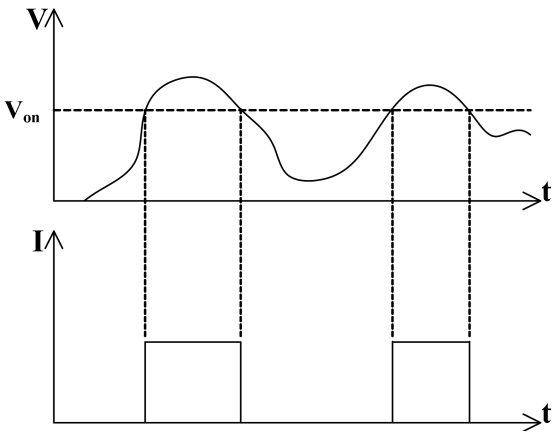


Figure 5-47 Latch V_{on}

Latch mode: The load is unloaded when the input voltage is above the Von starting load and the input voltage is below the Voff. After unloading, the input voltage is again higher than Von and the load is not automatically loaded

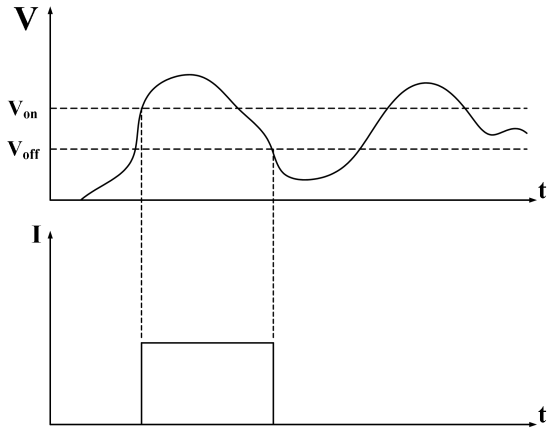


Figure 5-48 Latch Von onload and Voff offload

Notes

The value of Von should be larger than the value of Voff, otherwise there will be a work exception.

The load is unloaded after the load time reaches the set value, which can realize the accurate control of the load time.

5.18.2 Timed Unloading

Unloading after the load time reaches the set value enables precise control of the load time. For example, if the set load time is 20s, the load will be unloaded after 20s.

Steps for setting the load time:

1. Press "Menu" key to enter the main menu interface;

2. In the main menu interface, select "protection settings", press "Enter" key to determine;

3. Modify the "load time" to 20.0s;

4. Press CC to enter the constant current mode;

5. After setting parameters, press shift+ ◄ ► , switch to the constant current interface until the voltage, current and time interface is displayed;

6. Press On/Off to turn the load ON, when the timer reaches 20s the load is automatically OFF.

5.19 Factory Reset

Users press "Menu" to Enter, select "Factory reset" to enter the interface, use the left and right keys or knob to move the cursor to "Yes", and press "Enter" to restore factory Settings. Figure 5.47 shows the Factory Restore screen.

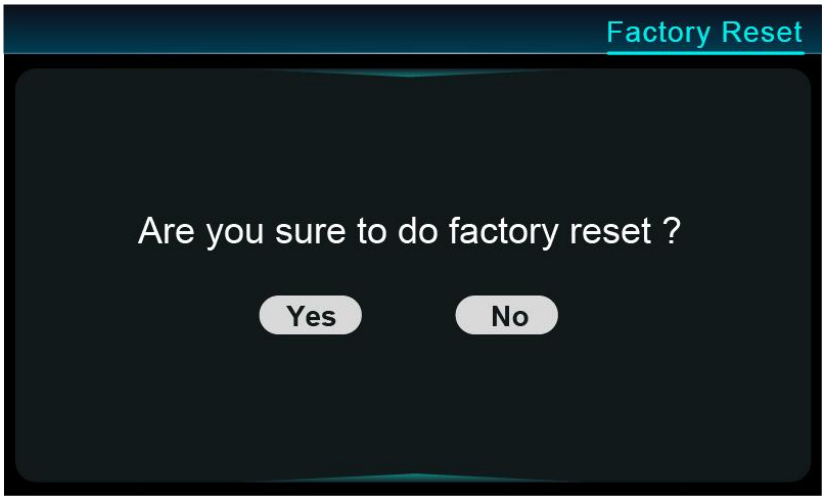


Figure 5-49 Factory reset

5.20 About Us

Users press **Menu** and select **About Us**, as is shown in the following figure. Press **Shift**, it will display SN No. and software version.

Figure 5-50 About Us

6 Application Software Installation & Configuration

6.1 PC Software Configuration

To make better use of the system performance, the following computer configuration is recommended:

- CPU: 2.0G, dual-core and above
- Memory: 4G and above
- Hard disk: 80G and above
- Port: Ethernet port
- Operating system: Microsoft Windows 7 and above

6.2 Application Software Installation and Uninstallation

6.2.1 Installation

1) Find the installation program "setup.exe" from the USB flash drive in accessory bag.

2) Make double-click on the file and begin installation.

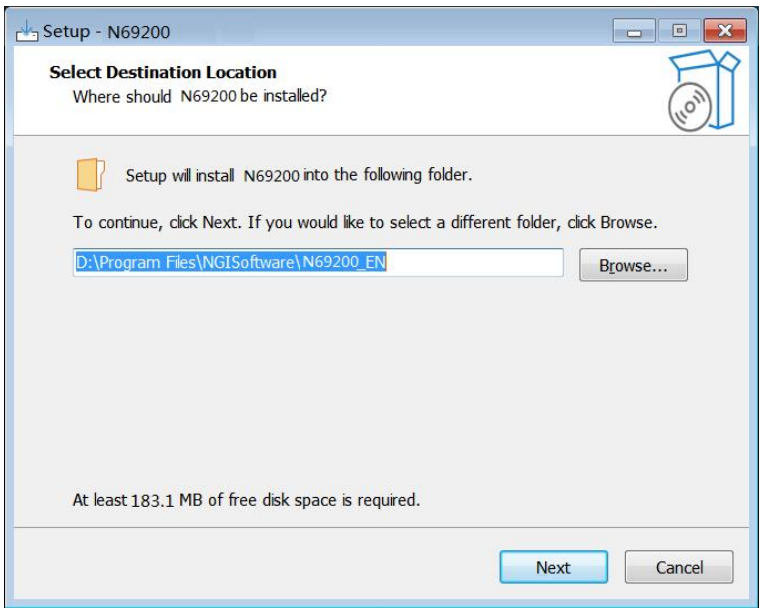


Figure 6-1 Program Installation

3) Click Next as prompted until the installation is completed. The software will automatically create a shortcut on the desktop.

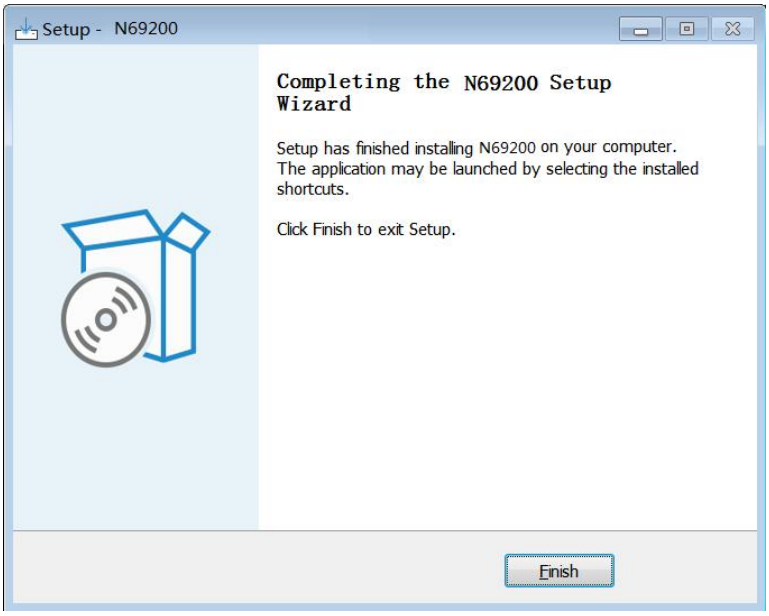


Figure 6-2 Installation Completed

6.2.2 Uninstallation

Methods for uninstallation:
Method 1: Program uninstallation can be completed through **Uninstall Program** in **Control Panel** of the operating system, or by right-clicking the shortcut and selecting uninstall.

Method 2: Find the setup program in your computer disk and delete.

6.3 PC Connection

6.3.1 Port Connection

Please plug the Ethernet cable to PC Ethernet port and the other side to N69200 LAN port. After N69200 series is turn on, enter the system configuration interface to check the network IP. PC needs to keep the same network segment with N69200 in order to search the device.

Figure 6-3 System interface

6.3.2 Disabling operating system standby mode

■ Windows 7 settings

Click **Start**→Click **Control Panel**→Click **Power Options**→Click **Change Computer Sleep Time**.

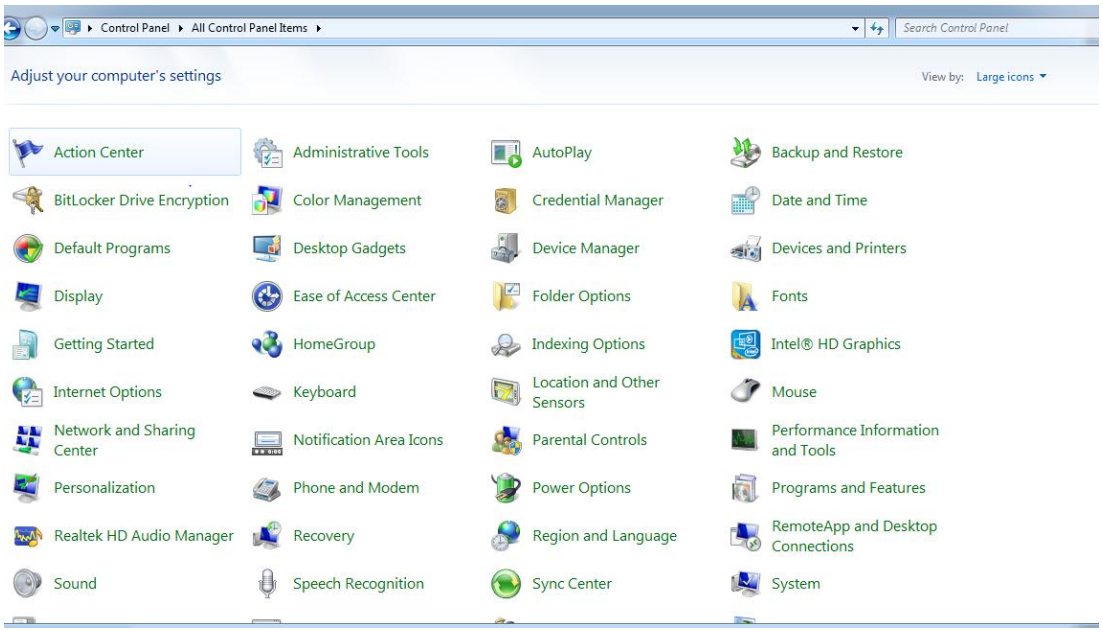


Figure 6-4 Windows 7 settings

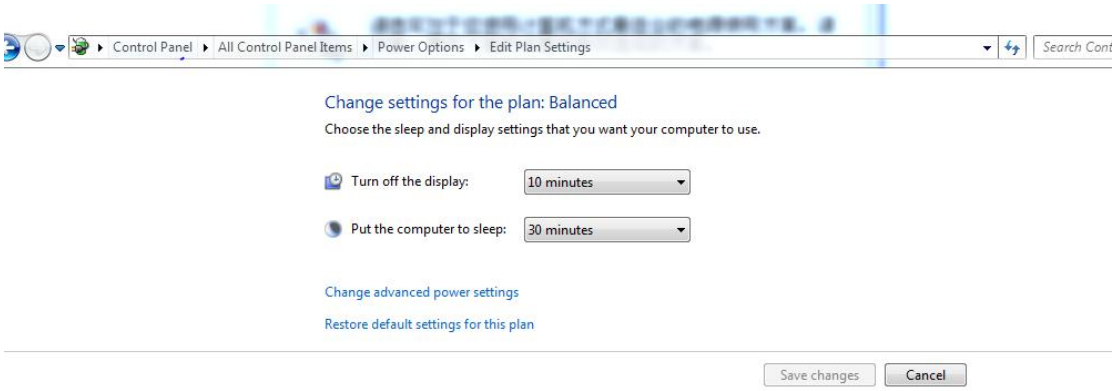


Figure 6-5 Windows 7 settings

Set **Turn off the display** and **Put the computer to sleep** to Never.

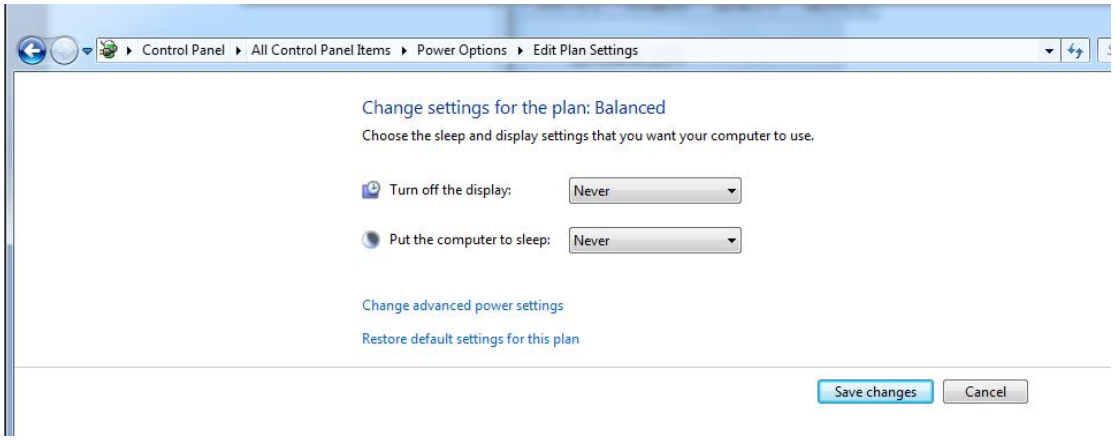


Figure 6-6 Windows 7 settings

■ Windows 10 settings

Click **Start**→Click **Settings**.

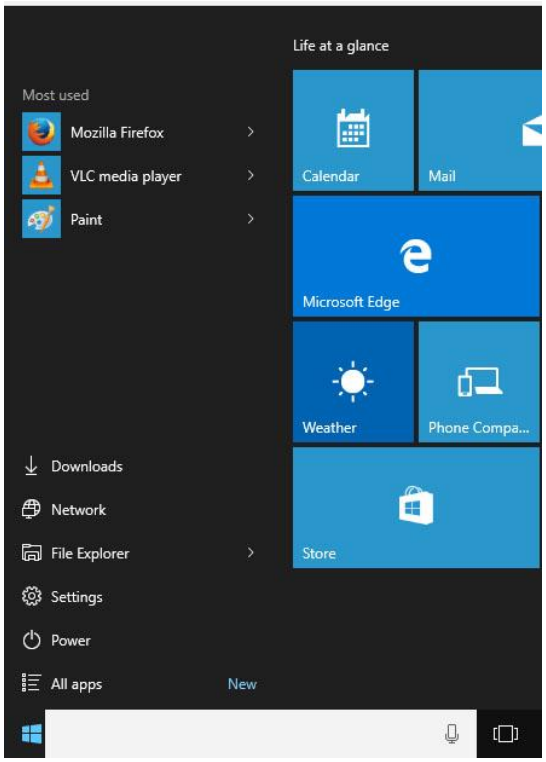


Figure 6-7 Windows 10 settings

Click **System**.

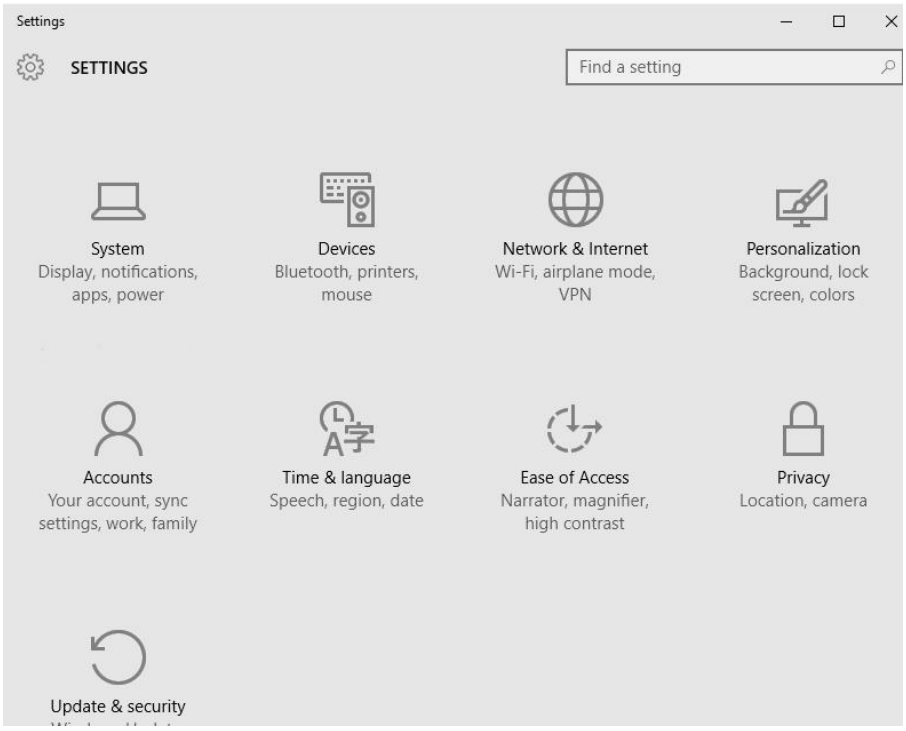


Figure 6-8 Windows 10 settings

Click **Power & sleep**.

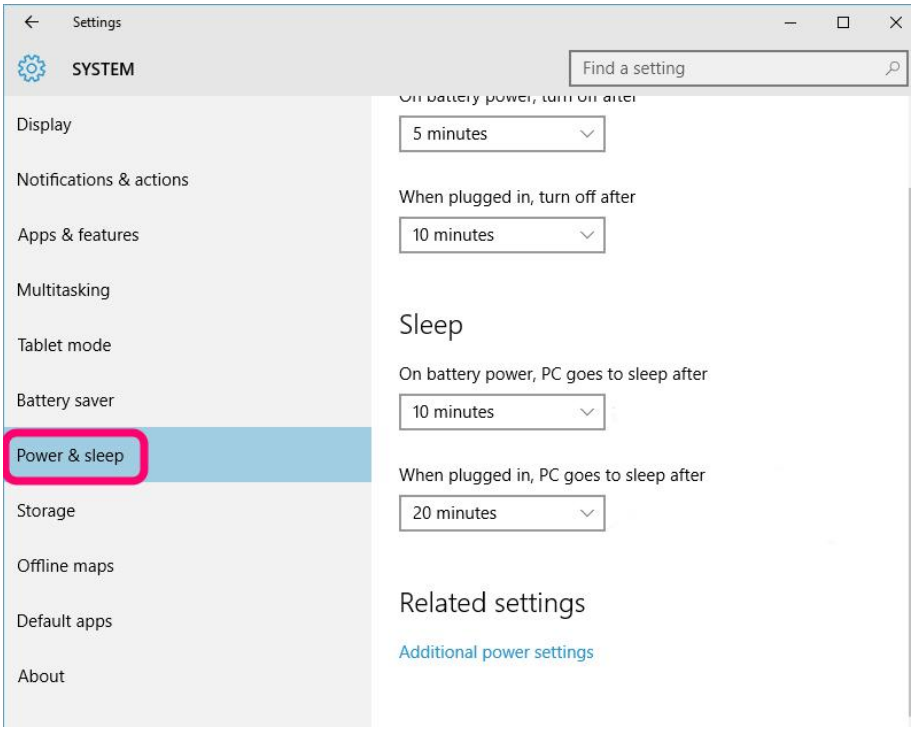


Figure 6-9 Windows 10 settings

Select **Never** for both options under **Sleep**.

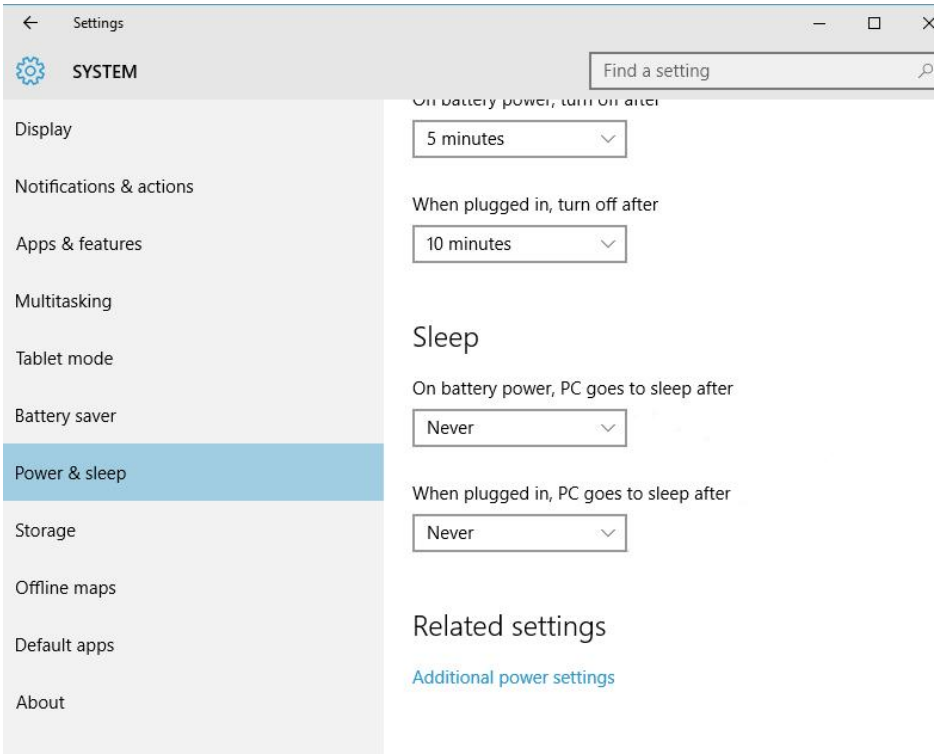


Figure 6-10 Windows 10 settings

6.3.3 Network IP Address Setting

The default IP of LAN port is 192.168.0.XXX (range from 0 to 255). Before operation, the computer IP should be assigned to the same network segment of N69200. But IP addresses should be different.

■ Windows 7 Setting

Click **Start**→Click **Control Panel**→Click **Network and Sharing Center**.

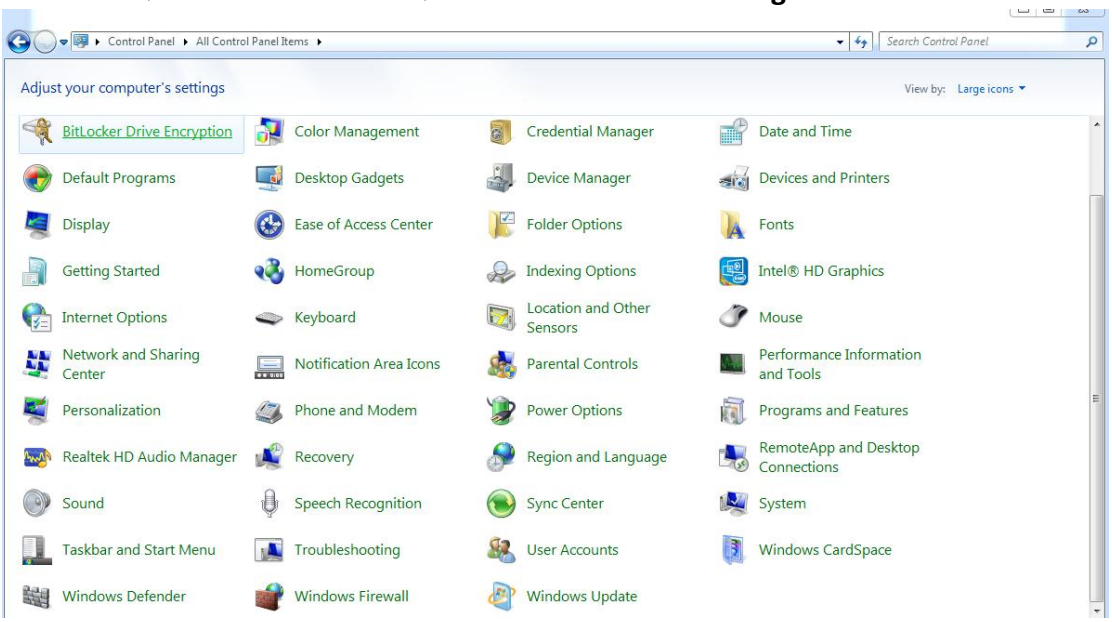


Figure 6-11 Network IP Address Setting

Click **Change adapter settings**.

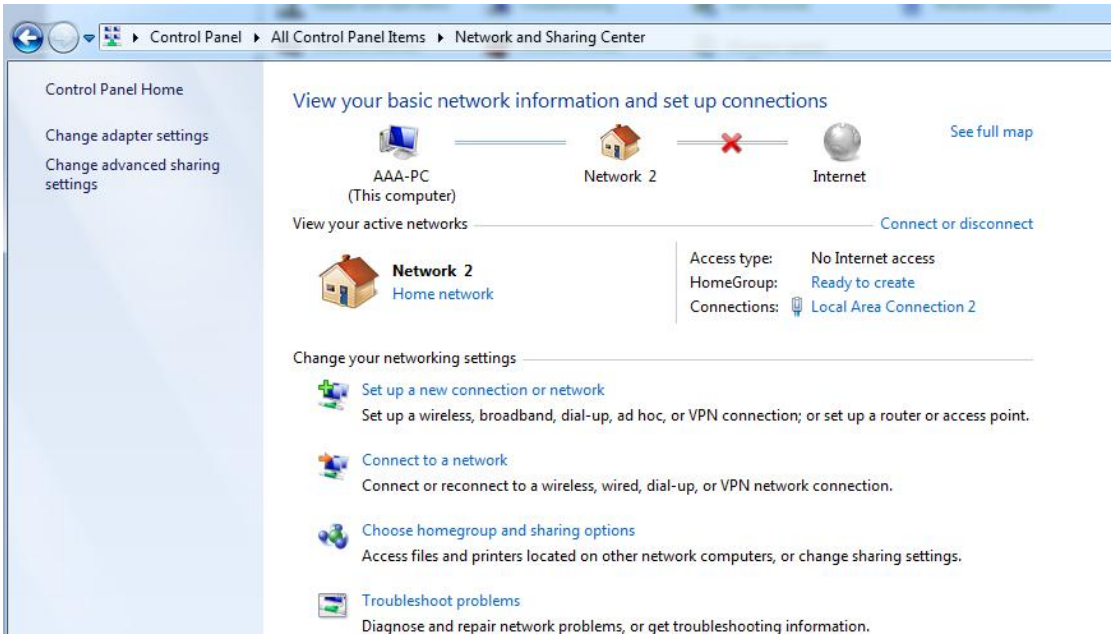


Figure 6-12 Network IP Address Setting

Select the network→Right click and choose **Properties**.

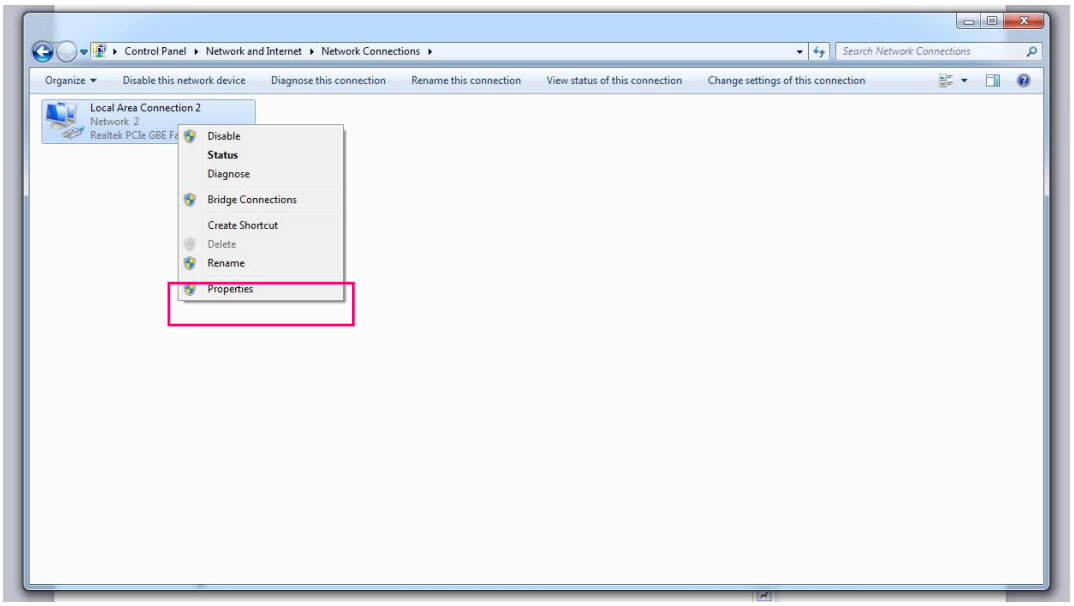


Figure 6-13 Network IP Address Setting

Click Internet Protocol Version 4(TCP/IPv4) and fill the below information and press **OK**.

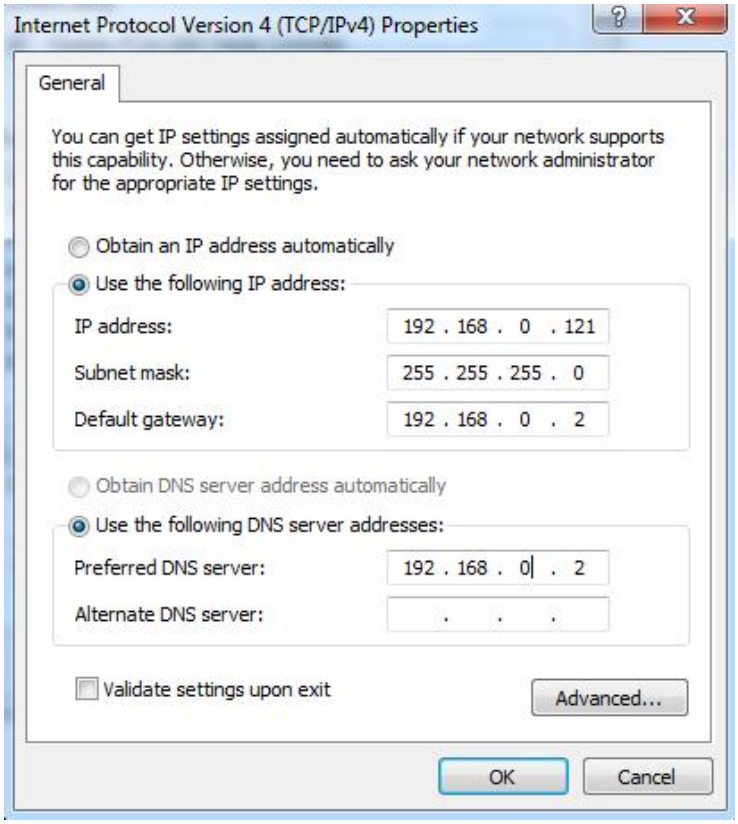


Figure 6-14 Network IP Address Setting

Click **Start**→Input **cmd**.

Input ping 192.168.0.123(default IP of N69200) and check if N69200 can communicate properly.

Figure 6-15 Run Command

If communicating properly, the below information will be reverted.

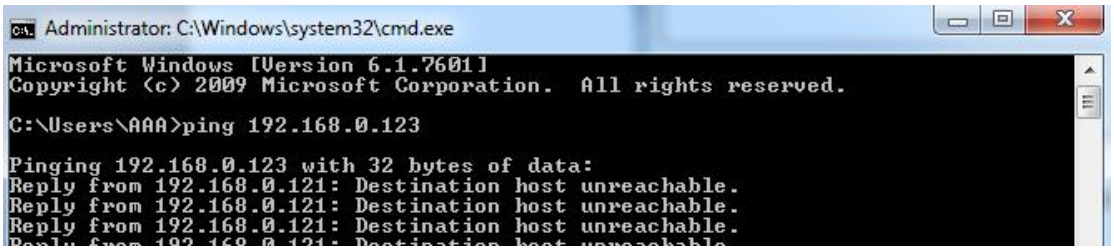


Figure 6-16 Communication Test

■ Windows 10 Setting

Click **Start**→Click **Set**→Click **Network & Internet**.

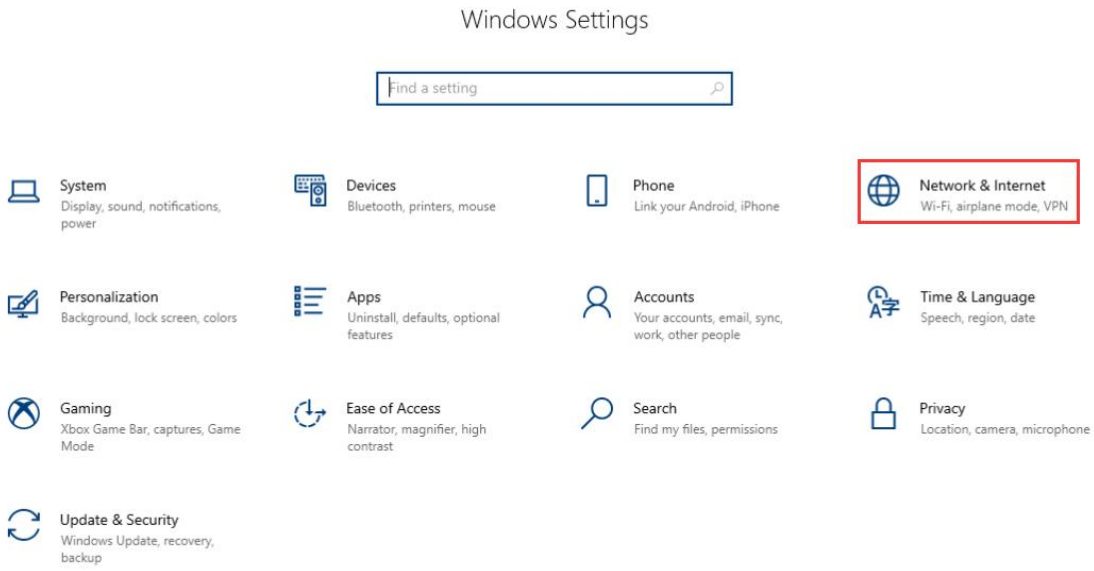


Figure 6-17 Network IP Address Setting

Click **Change adapter options**.

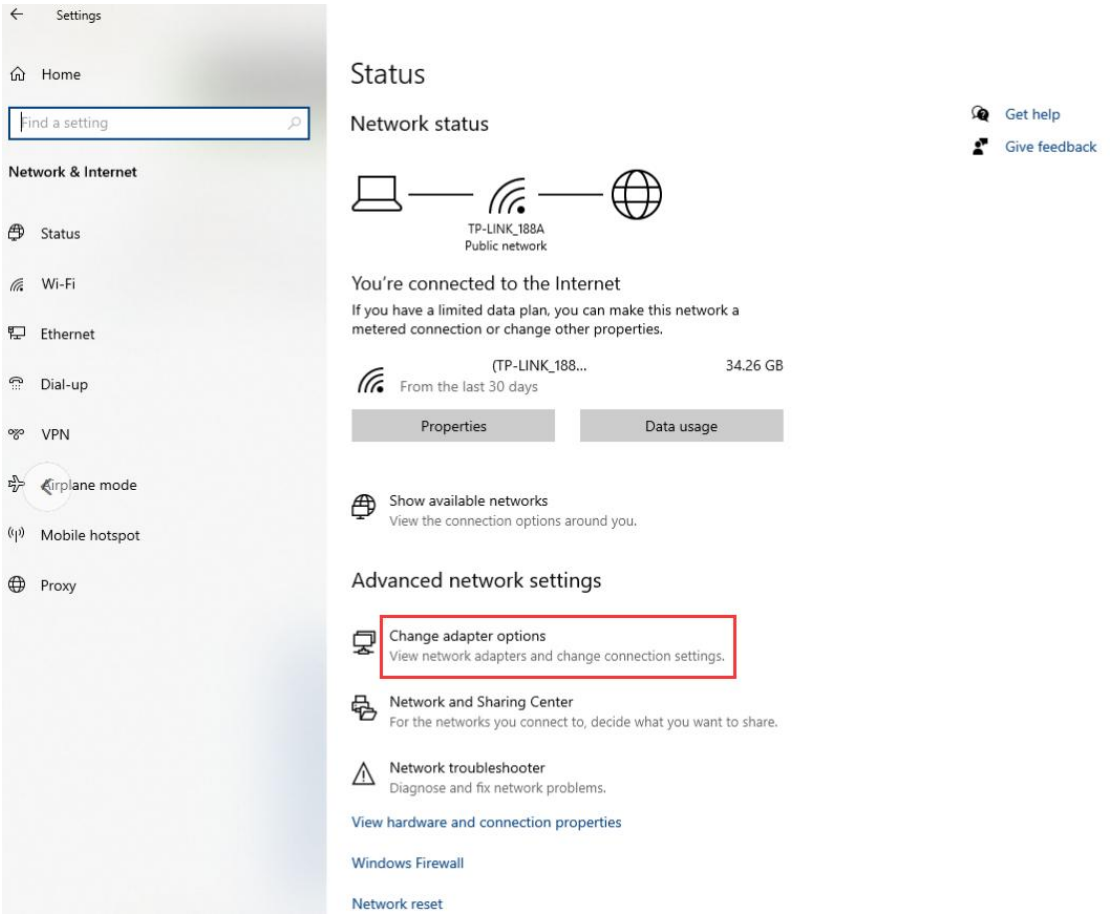


Figure 6-18 Network IP Address Setting

Select the network→Right click and choose **Properties**.

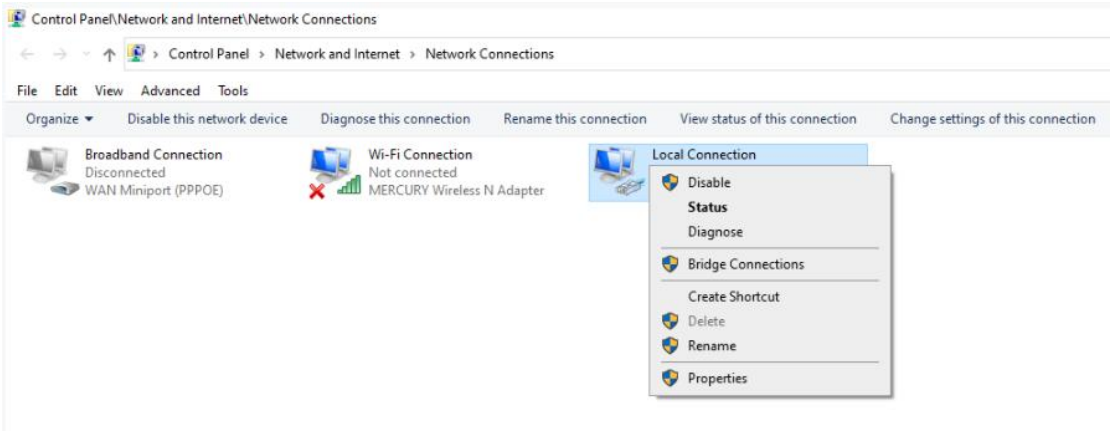


Figure 6-19 Network IP Address Setting

Click Internet Protocol Version 4(TCP/IPv4) and fill the below information and press **OK**.

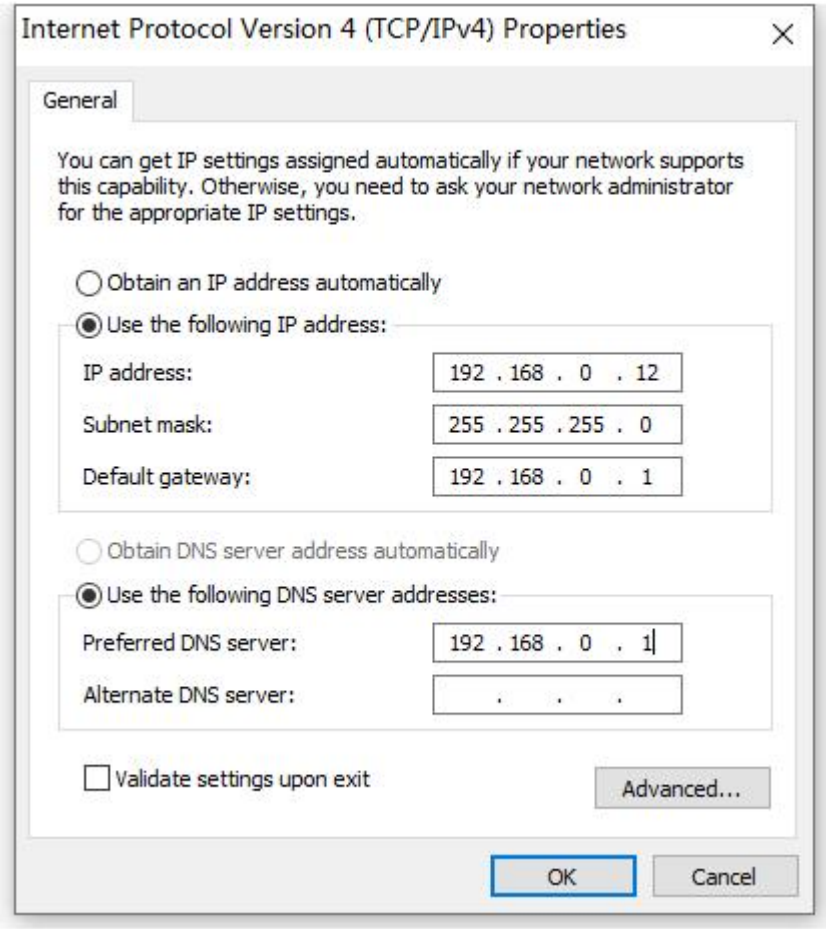


Figure 6-20 Network IP Address Setting

Click **Start**→Input **cmd**.

Input ping 192.168.0.123(default IP of N69200) and check if N69200 can communicate properly.

Figure 6-21 Run Command

If communicating properly, the below information will be reverted.

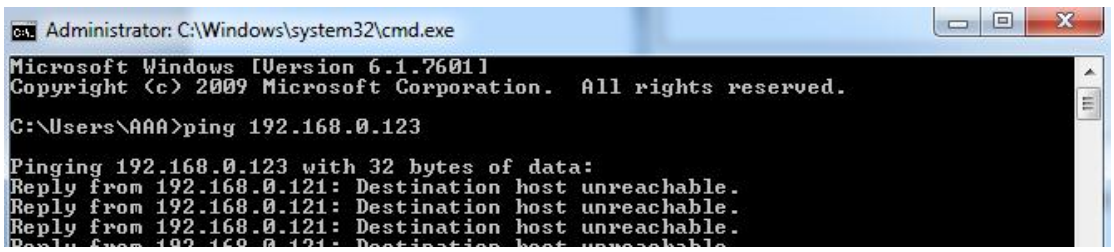


Figure 6-22 Communication Test

6.4 Operation

After the application software is successfully installed, a shortcut icon will be generated on the desktop. Please click the shortcut to enter the menu.

Figure 6-23 Shortcut

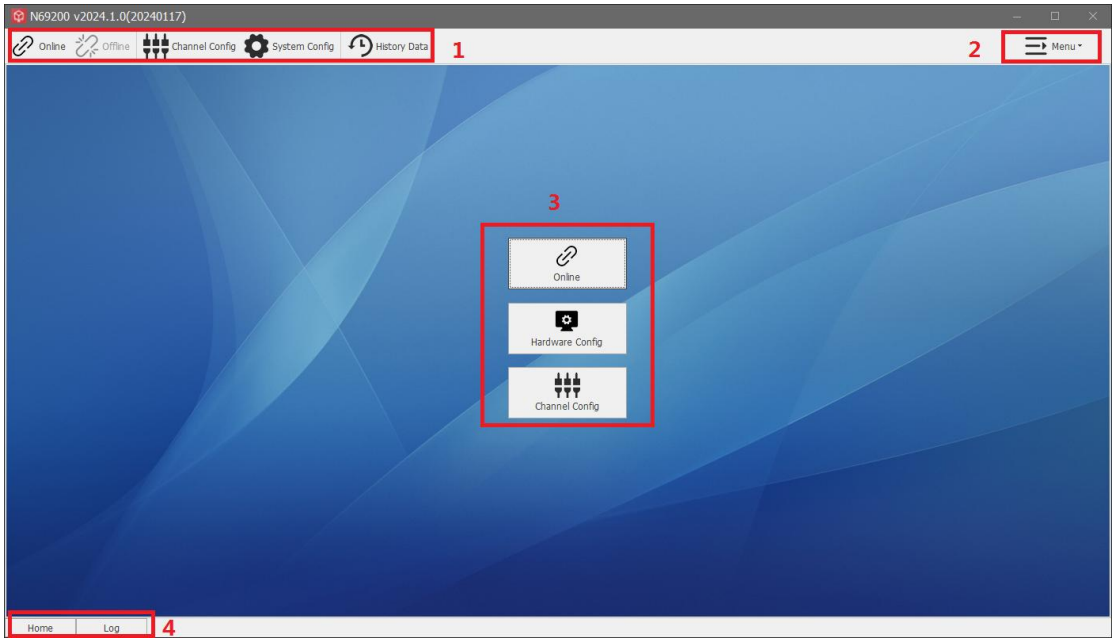


Figure 6-24 Application Software Interface

Application software interface introduction:

1. Toolbar

It includes Online and Offline, Channel Config, System Config, History Data.

2. Menu
3. Shortcut menu
4. Log

To display device exception information.

6.5 Configuration

6.5.1 Hardware Configuration

Operation Steps:

1. Click **Hardware Config(LAN)**.

2. Click **Scan**→Select 192.168.0.XXX network→Click **OK**→Click **Save** after the device is searched.

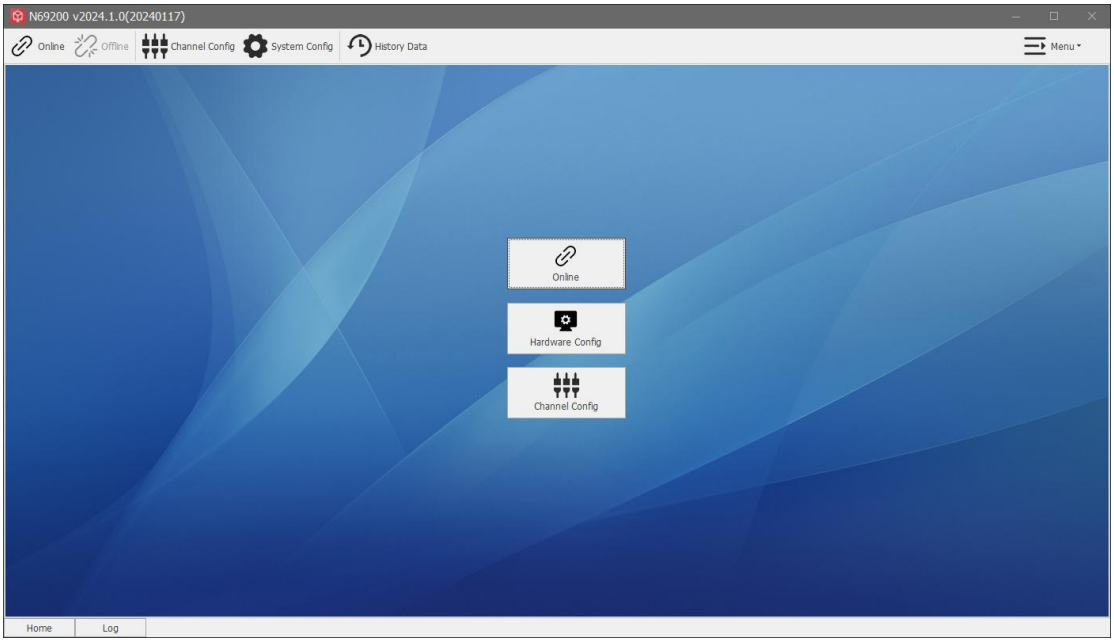


Figure 6-25 Hardware configuration

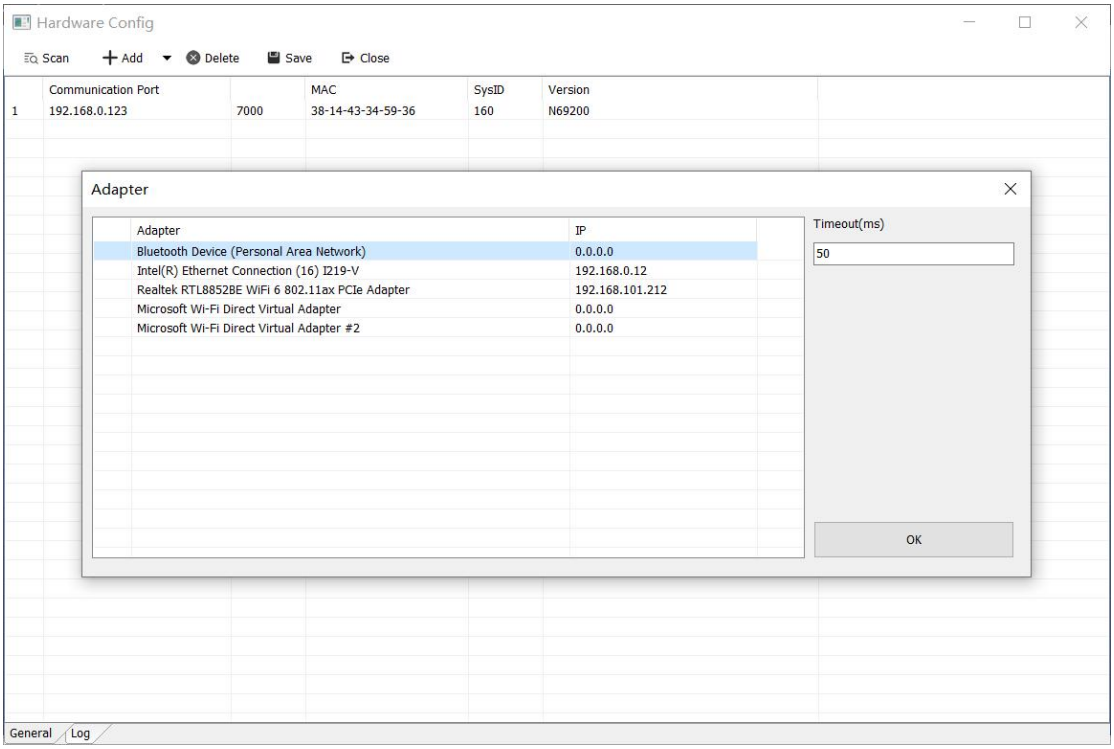


Figure 6-26 Scan

6.5.2 Channel Configuration

Click **Channel Config.**

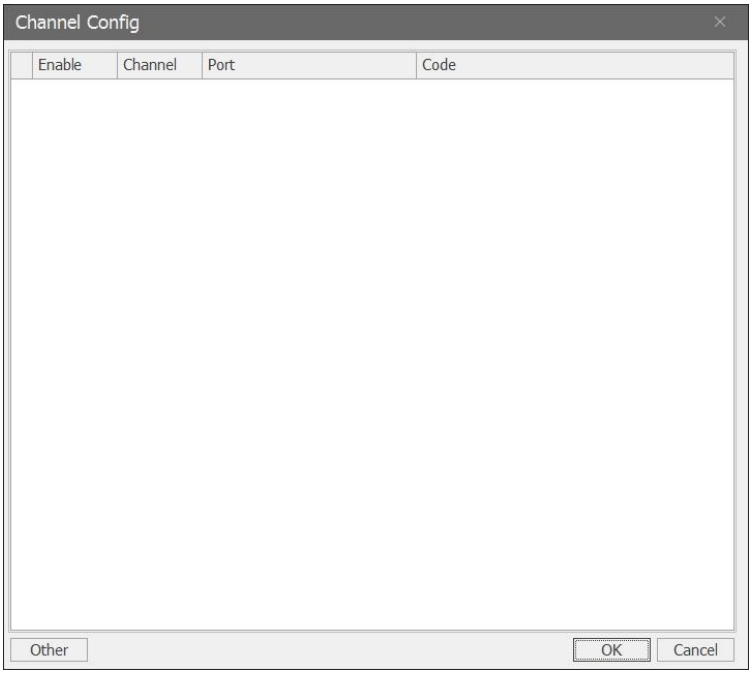


Figure 6-27 Channel Configuration

6.5.3 Advanced Configuration

Operation Steps:
Click **Menu** and then select **Advanced Config** to enter the interface.

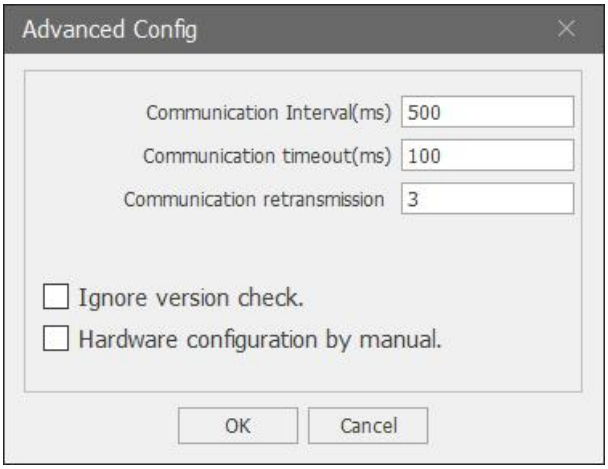


Figure 6-28 Advanced Configuration

Communication interval: Set the time interval for updating voltage and current data.

6.5.4 System Configuration

Operation Steps:
1. Select communication disconnection method: No operation or Device OFF.
2. Data File, Data Storage Time, Data Storage Duration can be set.

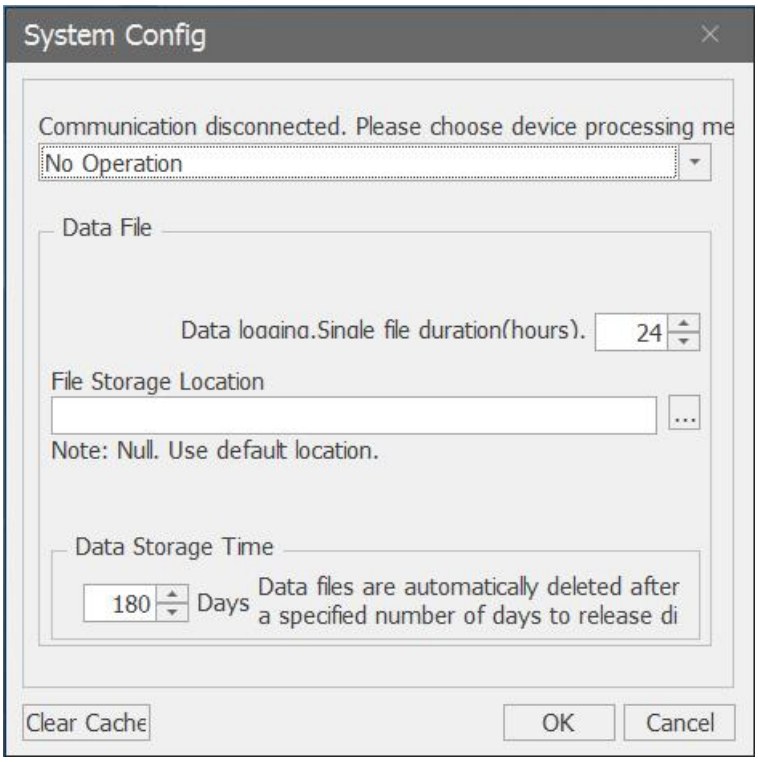


Figure 6-29 System Cofig

6.5.5 Online/Offline

Online means that the software establishes a connection with the device, and the device can be controlled only in the online state. **Offline** means that the the communication is interrupted.

Figure 6-30 Online

1. Toolbar: including online, offline, channel configuration, system configuration, clear error and historical data.

2. Functional mode: Includes CC, CV, CR, CP, CCD, CVD, CRD, CPD, and charge test function modes. Parameter setting, ON/OFF, and fault clearing are available under each mode.

3. Graph: Contains voltage, power, and resistance graphs.

4. Start Data Logging: Click to start data logging, the file data (.ndat format) will be automatically saved to the historical data.

5. Protection: including OCP, OVP, OPP

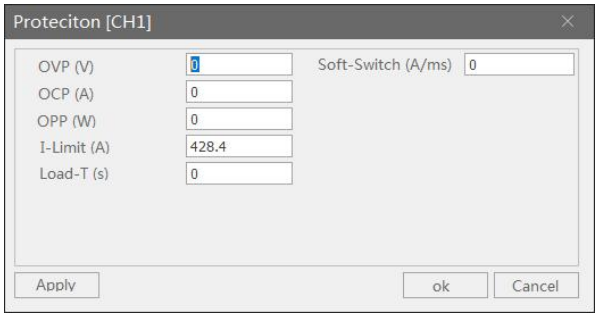


Figure 6-31 Protection

VonVoff: When the setting is on, it means that the load starts to load when the voltage reaches the loading voltage; When the setting is off, it means that the load will be turned off when it is lower than the loading voltage.

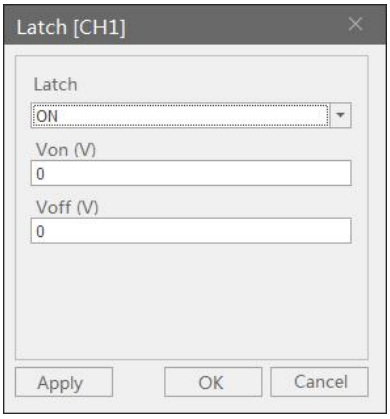


Figure 6-32 Latch

Other Settings: Same function as Application Settings.

6.5.6 History Data

Click **History Data**

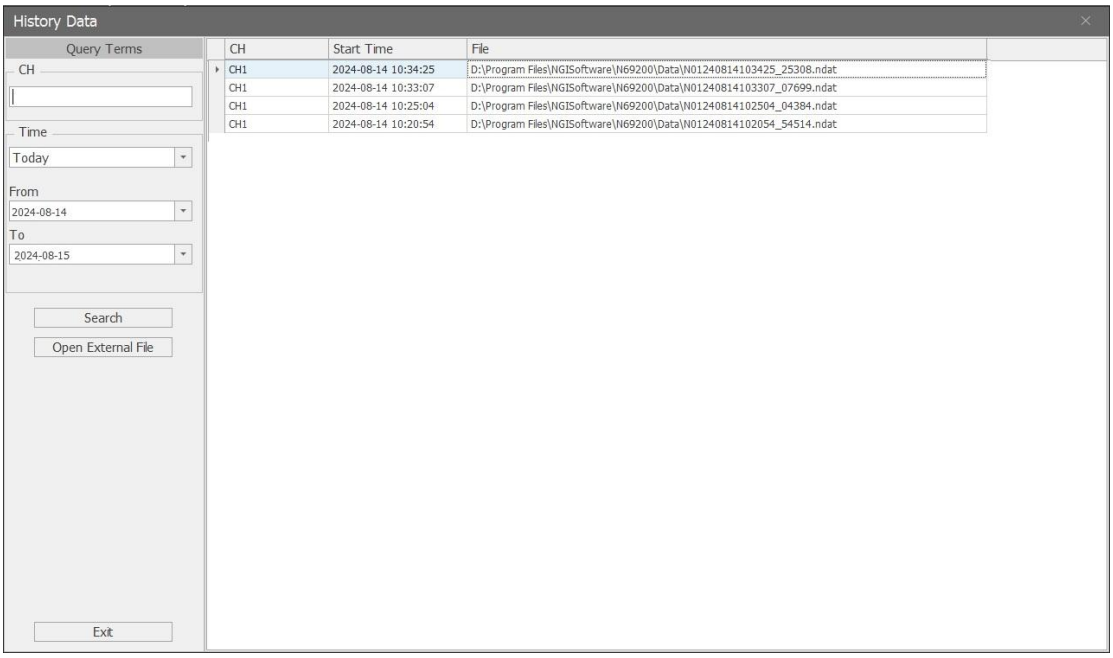


Figure 6-33 History Data

Operation steps:

1. Enter the query terms, click the ‘search’ to view the specified data;
2. Select an item in the list, double-click into the ‘Data Analysis’ to view the detailed data;

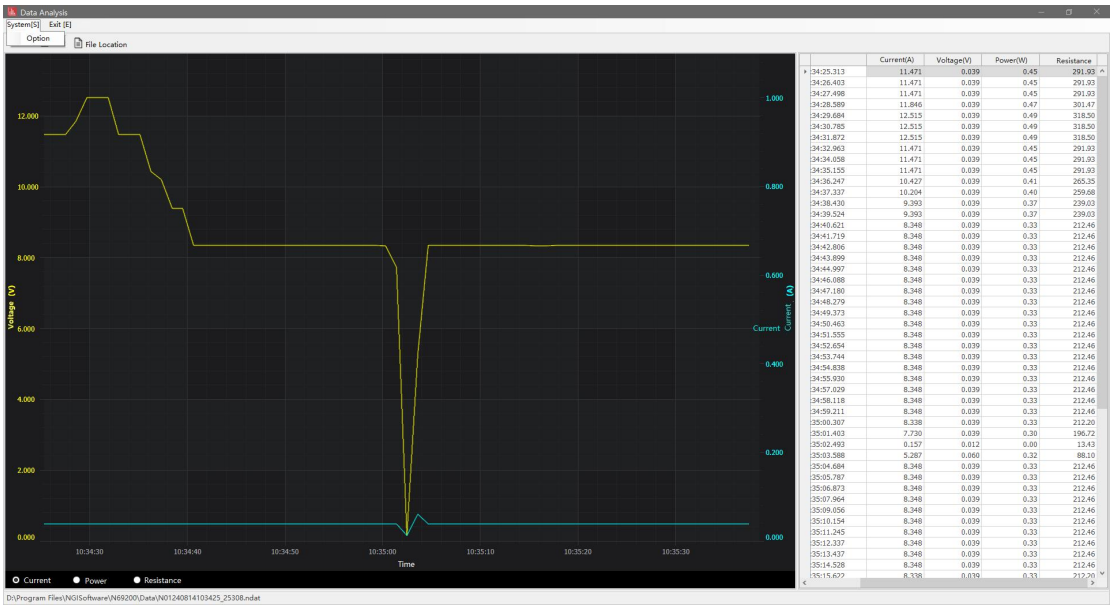


Figure 6-34 Data Analysis

7 Maintenance and Self-inspection

7.1 Regular Maintenance

Clean the Device

Please wipe lightly the device with a dry or slightly wet cloth, and do not wipe the inside of it. Make sure the power is disconnected before cleaning.

⚠ **Warning: Disconnect power before cleaning.**

7.2 Fault Self-inspection

Device Fault Self-inspection

Due to system upgrade or hardware problem, the device may break down. Please do the following necessary inspection to eliminate the troubles, which can save your maintenance and time cost. If the troubles cannot be recovered, please contact us.

The inspection steps are as below.

- Check whether the device is powered.
- Check whether the device can be turned on normally.
- Check whether the fuse has no damage.
- Check whether other connectors are correct, including wire cables, plug, etc.
- Check whether the system configuration is correct.
- Check whether all the specifications and performances are within the device working range.
- Check whether the device displays error information.
- Operate on a replacement device.

Calibration Intervals

It is suggested that N69200 series should be calibrated once a year.

8 Main Technical Data

Warning

The measurement accuracy is identified by the following three conditions: within one year after calibration, operation temperature between 18℃ and 28℃, and the relative humidity up to 80%.

Model：N69202-150-200

Model	N69202-150-200		
Voltage	0~150V		
Current	200A		
Power	2kW		
Min. Operating Voltage	2V/200A		
CV Mode			
Range	0~15V	0-75V	0-150V
Setting Resolution	1mV	1mV	10mV
Setting Accuracy (23±5℃)	0.025%+0.025%F.S.		
Readback Resolution	0.1mV	0.1mV	1mV
Readback Accuracy (23±5℃)	0.015%+0.015%F.S.		
CC Mode			
Range	0~20A	0-100A	0-200A
Setting Resolution	1mA	10mA	10mA
Setting Accuracy (23±5℃)	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	1mA	1mA
Readback Accuracy (23±5℃)	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.2kW	0-1kW	0-2kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy (23±5℃)	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy	0.1%+0.1%F.S.		

（23±5℃）			
CR Mode			
Range	0.1Ω~3750Ω	0.02Ω~750Ω	0.01Ω~375Ω
Setting Resolution	0.1Ω	0.01Ω	0.01Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~1000A/ms	0.001~5000A/ms	0.001~10000A/ms
Power Slew Range	0.001~1000A/ms	0.001~5000A/ms	0.001~10000A/ms
Resistance Slew Range	0.001~1000A/ms	0.001~5000A/ms	0.001~10000A/ms
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~1000A/ms	0.001~5000A/ms	0.001~10000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.22kg		

Model：N69202-600-140

Model	N69202-600-140		
Voltage	0~600V		
Current	140A		
Power	2kW		
Min. Operating Voltage	14V/140A		
CV Mode			
Range	0~60V	0~300V	0~600V
Setting Resolution	1mV	10mV	10mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	0.1mV	1mV	1mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~14A	0~70A	0~140A
Setting Resolution	1mA	1mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	0.1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.2kW	0~1kW	0~2kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	1Ω~21429Ω	0.2Ω~4286Ω	0.1Ω~2143Ω
Setting Resolution	1Ω	0.1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~700A/ms	0.001~3500A/ms	0.001~7000A/ms
Power Slew Range	0.001~700A/ms	0.001~3500A/ms	0.001~7000A/ms
Resistance Slew	0.001~700A/ms	0.001~3500A/ms	0.001~7000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~700A/ms	0.001~3500A/ms	0.001~7000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.22kg		

Model：N69202-1200-40

Model	N69202-1200-40		
Voltage	0~1200V		
Current	40A		
Power	2kW		
Min. Operating Voltage	30V/40A		
CV Mode			
Range	0~120V	0~600V	0~1200V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~4A	0~20A	0~40A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.2kW	0~1kW	0~2kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	8Ω~150000Ω	2Ω~30000Ω	1Ω~15000Ω
Setting Resolution	10Ω	1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~300A/ms	0.001~1500A/ms	0.001~3000A/ms
Power Slew Range	0.001~300A/ms	0.001~1500A/ms	0.001~3000A/ms
Resistance Slew	0.001~300A/ms	0.001~1500A/ms	0.001~3000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~300A/ms	0.001~1500A/ms	0.001~3000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.22kg		

Model：N69202-1200-80

Model	N69202-1200-80		
Voltage	0~1200V		
Current	80A		
Power	2kW		
Min. Operating Voltage	25V/80A		
CV Mode			
Range	0-120V	0-600V	0-1200V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0-8A	0-40A	0-80A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0-0.2kW	0-1kW	0-2kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	4Ω~75000Ω	1Ω~15000Ω	0.4Ω~7500Ω
Setting Resolution	1Ω	1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001-266.4A/ms	0.001-1332A/ms	0.001-2664A/ms
Power Slew Range	0.001-266.4A/ms	0.001-1332A/ms	0.001-2664A/ms
Resistance Slew	0.001-266.4A/ms	0.001-1332A/ms	0.001-2664A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001-266.4A/ms	0.001-1332A/ms	0.001-2664A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	22kg		

Model：N69203-1600-40

Model	N69203-1600-40		
Voltage	0~1600V		
Current	40A		
Power	3kW		
Min. Operating Voltage	40V/40A		
CV Mode			
Range	0~160V	0~800V	0~1600V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~4A	0~20A	0~40A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.3kW	0~1.5kW	0~3kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	10Ω~99.9kΩ	2Ω~40kΩ	1Ω~20kΩ
Setting Resolution	1Ω	1Ω	1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms
Power Slew Range	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms
Resistance Slew	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.005-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.22kg		

Model：N69203-2400-40

Model	N69203-2400-40		
Voltage	0~2400V		
Current	40A		
Power	3kW		
Min. Operating Voltage	40V/40A		
CV Mode			
Range	0~240V	0~1200V	0~2400V
Setting Resolution	10mV	0.1V	0.1V
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	10mV	100mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~4A	0~20A	0~40A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.3kW	0~1.5kW	0~3kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	10Ω~99.9kΩ	2Ω~60kΩ	1Ω~30kΩ
Setting Resolution	1Ω	1Ω	1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms
Power Slew Range	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms
Resistance Slew	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.005-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~130A/ms	0.001~650A/ms	0.001~1300A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.22kg		

Model：N69204-150-400

Model	N69204-150-400		
Voltage	0~150V		
Current	400A		
Power	4kW		
Min. Operating Voltage	2V/400A		
CV Mode			
Range	0~15V	0~75V	0~150V
Setting Resolution	1mV	1mV	10mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	0.1mV	0.1mV	1mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~40A	0~200A	0~400A
Setting Resolution	1mA	10mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.4kW	0~2kW	0~4kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	0.1Ω~1875Ω	0.01Ω~375Ω	0.01Ω~188Ω
Setting Resolution	0.1Ω	0.01Ω	0.01Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~2000A/ms	0.001~10000A/ms	0.001~20000A/ms
Power Slew Range	0.001~2000A/ms	0.001~10000A/ms	0.001~20000A/ms
Resistance Slew	0.001~2000A/ms	0.001~10000A/ms	0.001~20000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~2000A/ms	0.001~10000A/ms	0.001~20000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.28kg		

Model：N69204-600-280

Model	N69204-600-280		
Voltage	0~600V		
Current	280A		
Power	4kW		
Min. Operating Voltage	14V/280A		
CV Mode			
Range	0~60V	0~300V	0~600V
Setting Resolution	1mV	10mV	10mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	0.1mV	1mV	1mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~28A	0~140A	0~280A
Setting Resolution	1mA	10mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.4kW	0~2kW	0~4kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	1Ω~10715Ω	0.1Ω~2143Ω	0.1Ω~1072Ω
Setting Resolution	1Ω	0.1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~1400A/ms	0.001~7000A/ms	0.001~14000A/ms
Power Slew Range	0.001~1400A/ms	0.001~7000A/ms	0.001~14000A/ms
Resistance Slew	0.001~1400A/ms	0.001~7000A/ms	0.001~14000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~1400A/ms	0.001~7000A/ms	0.001~14000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.28kg		

Model：N69204-1200-80

Model	N69204-1200-80		
Voltage	0~1200V		
Current	80A		
Power	4kW		
Min. Operating Voltage	30V/80A		
CV Mode			
Range	0~120V	0~600V	0~1200V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~8A	0~40A	0~80A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.4kW	0~2kW	0~4kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	4Ω~75000Ω	1Ω~15000Ω	0.4Ω~7500Ω
Setting Resolution	1Ω	1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~600A/ms	0.001~3000A/ms	0.001~6000A/ms
Power Slew Range	0.001~600A/ms	0.001~3000A/ms	0.001~6000A/ms
Resistance Slew	0.001~600A/ms	0.001~3000A/ms	0.001~6000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~600A/ms	0.001~3000A/ms	0.001~6000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.28kg		

Model：N69204-1200-160

Model	N69204-1200-160		
Voltage	0~1200V		
Current	160A		
Power	4kW		
Min. Operating Voltage	25V/160A		
CV Mode			
Range	0-120V	0-600V	0-1200V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0-16A	0-80A	0-160A
Setting Resolution	1mA	1mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	0.1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0-0.4kW	0-2kW	0-4kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	2Ω~37500Ω	0.4Ω~7500Ω	0.2Ω~3750Ω
Setting Resolution	1Ω	0.1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001-532.8A/ms	0.001-2664A/ms	0.001-5328A/ms
Power Slew Range	0.001-532.8A/ms	0.001-2664A/ms	0.001-5328A/ms
Resistance Slew	0.001-532.8A/ms	0.001-2664A/ms	0.001-5328A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001-532.8A/ms	0.001-2664A/ms	0.001-5328A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	28kg		

Model：N69205-1600-60

Model	N69205-1600-60		
Voltage	0~1600V		
Current	60A		
Power	5kW		
Min. Operating Voltage	40V/60A		
CV Mode			
Range	0-160V	0-800V	0-1600V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0-6A	0-30A	0-60A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0-0.5kW	0-2.5kW	0-5kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	7Ω~99.9kΩ	1Ω~20kΩ	0.7Ω~9.999kΩ
Setting Resolution	1Ω	1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms
Power Slew Range	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms
Resistance Slew	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.005-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	650kΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	34kg		

Model：N69205-2400-60

Model	N69205-2400-60		
Voltage	0~2400V		
Current	60A		
Power	5kW		
Min. Operating Voltage	40V/60A		
CV Mode			
Range	0-240V	0-1200V	0-2400V
Setting Resolution	10mV	100mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	10mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0-6A	0-30A	0-60A
Setting Resolution	0.1mA	1mA	1mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.01mA	0.1mA	0.1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0-0.5kW	0-2.5kW	0-5kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	7Ω~99.9kΩ	1Ω~20kΩ	0.7Ω~9.999kΩ
Setting Resolution	1Ω	1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms
Power Slew Range	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms
Resistance Slew	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.005-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001-200A/ms	0.001-1000A/ms	0.001-2000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	650kΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	34kg		

Model：N69206-150-600

Model	N69206-150-600		
Voltage	0~150V		
Current	600A		
Power	6kW		
Min. Operating Voltage	2V/600A		
CV Mode			
Range	0~15V	0~75V	0~150V
Setting Resolution	1mV	1mV	10mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	0.1mV	0.1mV	1mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~60A	0~300A	0~600A
Setting Resolution	1mA	10mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.6kW	0~3kW	0~6kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	0.1Ω~1250Ω	0.01Ω~250Ω	0.01Ω~125Ω
Setting Resolution	0.1Ω	0.01Ω	0.01Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~3000A/ms	0.001~15000A/ms	0.001~30000A/ms
Power Slew Range	0.001~3000A/ms	0.001~15000A/ms	0.001~30000A/ms
Resistance Slew	0.001~3000A/ms	0.001~15000A/ms	0.001~30000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~3000A/ms	0.001~15000A/ms	0.001~30000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.34kg		

Model：N69206-600-420

Model	N69206-600-420		
Voltage	0~600V		
Current	420A		
Power	6kW		
Min. Operating Voltage	14V/420A		
CV Mode			
Range	0~60V	0~300V	0~600V
Setting Resolution	1mV	10mV	10mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	0.1mV	1mV	1mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~42A	0~210A	0~420A
Setting Resolution	1mA	10mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.6kW	0~3kW	0~6kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	0.4Ω~7143Ω	0.1Ω~1429Ω	0.04Ω~715Ω
Setting Resolution	0.1Ω	0.1Ω	0.01Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~2100A/ms	0.001~10500A/ms	0.001~21000A/ms
Power Slew Range	0.001~2100A/ms	0.001~10500A/ms	0.001~21000A/ms
Resistance Slew	0.001~2100A/ms	0.001~10500A/ms	0.001~21000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~2100A/ms	0.001~10500A/ms	0.001~21000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.34kg		

Model：N69206-1200-120

Model	N69206-1200-120		
Voltage	0~1200V		
Current	120A		
Power	6kW		
Min. Operating Voltage	30V/120A		
CV Mode			
Range	0~120V	0~600V	0~1200V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0~12A	0~60A	0~120A
Setting Resolution	1mA	1mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	0.1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0~0.6kW	0~3kW	0~6kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	3Ω~50000Ω	1Ω~10000Ω	0.3Ω~5000Ω
Setting Resolution	1Ω	1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001~900A/ms	0.001~4500A/ms	0.001~9000A/ms
Power Slew Range	0.001~900A/ms	0.001~4500A/ms	0.001~9000A/ms
Resistance Slew	0.001~900A/ms	0.001~4500A/ms	0.001~9000A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001~900A/ms	0.001~4500A/ms	0.001~9000A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	Approx.34kg		

Model：N69206-1200-240

Model	N69206-1200-240		
Voltage	0~1200V		
Current	240A		
Power	6kW		
Min. Operating Voltage	25V/240A		
CV Mode			
Range	0-120V	0-600V	0-1200V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.025%+0.025%F.S.		
Readback Resolution	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.015%+0.015%F.S.		
CC Mode			
Range	0-24A	0-120A	0-240A
Setting Resolution	1mA	10mA	10mA
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
Readback Resolution	0.1mA	1mA	1mA
Readback Accuracy（23±5℃）	0.04%+0.04%F.S.		
CP Mode			
Range	0-0.6kW	0-3kW	0-6kW
Setting Resolution	0.01W	0.1W	0.1W
Setting Accuracy（23±5℃）	0.2%+0.2%F.S.		
Readback Resolution	0.001W	0.01W	0.01W
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
CR Mode			
Range	2Ω~25000Ω	0.3Ω~5000Ω	0.2Ω~2500Ω
Setting Resolution	1Ω	0.1Ω	0.1Ω
Setting Accuracy(23±5℃)	(Vin/Rset)*0.05%+0.05%IF.S.		
Slew			
Current Slew Range	0.001-799.2A/ms	0.001-3996A/ms	0.001-7992A/ms
Power Slew Range	0.001-799.2A/ms	0.001-3996A/ms	0.001-7992A/ms
Resistance Slew	0.001-799.2A/ms	0.001-3996A/ms	0.001-7992A/ms

Range			
Dynamic Mode (CCD)			
T1&T2	0.025-60000ms		
Resolution	1μs		
Accuracy(23±5℃)	10μs+100ppm		
Rise/Fall Slew	0.001-799.2A/ms	0.001-3996A/ms	0.001-7992A/ms
Min. Rise Time	30μs		
Others			
Input Impedance	1.6MΩ（Typical）		
Protection	OVP/OCP/OPP/OTP/RV		
Communication Interface	USB (waveform import only)/LAN/RS232/CAN		
Protocol	Modbus-RTU standard protocol, CANOPEN standard protocol, SCPI standard protocol		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃-40℃; Storage temperature: -20℃-60℃		
Operating Environment	Altitude:＜2000m; Relative humidity:5%-90%RH(non-condensing) , atmospheric pressure: 80-110kPa		
Dimension	132.5mm(H)*482.0mm(W)with handle *783.8m(D)with shield		
Net Weight	34kg		

Note:

1. If the operating voltage exceeds 1.1 times the rated voltage, it will cause permanent damage to the equipment.
2. The accuracy calculation of CR mode is based on current.

For Example： N69206-150-600

Vin=20V, Rset=2Ω, IF.S.=600A (High Range)

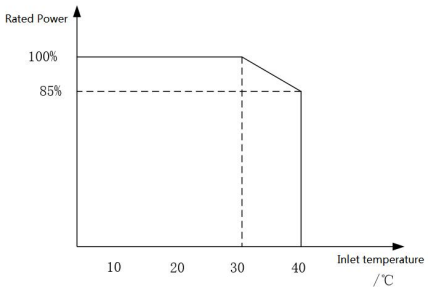
I=Vin/Rset=20V/2Ω

Imin=20V/2Ω-(20V/2Ω*(0.05%)+600*0.05%)

Imax=20V/2Ω+(20V/2Ω*(0.05%)+600*0.05%)

Imin<I<Imax

3. The power derating curve is as follows:



(This manual is for reference only, if you need other specifications, please consult the us for the latest product information. Our products will be constantly updated and technical specifications will be changed without prior notice.