N68000 Series High Power DC Electronic Load

User Manual

Version: V20211228

Contents

1 Preface

Dear Customers,

First of all, we greatly appreciate your choice of N68000 series DC electronic load (N68000 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 N68000 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 N68000, 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 N68000'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 Product

3.1.1 Brief Introduction

N68000 series is developed based on NGI's years of experience in testing for power supply, car charger, battery and supercapacitor. It is with high accuracy, high reliability and high cost performance.It has CC, CV, CP and CR mode.
N68000 series supports SEQ test, dynamic test, charge test, discharge test, OCP test, etc. The power range covers from 2.4kW to 14.4kW.

3.1.2 Features

- Power range: 2.4kW to 14.4kW
- Voltage range: 150V/600V/1000V
- Operation modes: CC/CV/CR/CP
- High power density, minimizing space occupation
- Transient over-power loading capability
- CR/CP function supported by hardware
- Charge test, Discharge test and OCP test
- Built-in ESR test function(Optional)
- Editable rise and fall slew rate
- Editable Von/Voff
- Programmable sequence test function(SEQ), up to 100 groups sequence files, up to 50 steps per file
- Comprehensive MOS protection
- Multiple protection: OCP, OVP, OTP, OPP and reverse polarity warning
- Analog programming interface(APG), current monitoring interface, and remote/local trigger function
- Multiple communication interfaces: LAN/RS232/CAN

3.2 Overview

3.2.1 N68000 Series Lineup

Table 2

Model	Specification	Model	Specification
N68024-150-200	2.4kW/150V/200A	N68036-150-300	3.6kW/150V/300A
N68024-150-060	2.4kW/150V/60A	N68036-150-090	3.6kW/150V/90A
N68024-600-020	2.4kW/600V/20A	N68036-600-030	3.6kW/600V/30A
N68024-600-060	2.4kW/600V/60A	N68036-600-090	3.6kW/600V/90A
N68024-1000-020	2.4kW/1000V/20A	N68036-1000-030	3.6kW/1000V/30A
N68024-1000-060	2.4kW/1000V/60A	N68036-1000-090	3.6kW/1000V/90A
N68048-150-400	4.8kW/150V/400A	N68060-150-500	6kW/150V/500A
N68048-150-120	4.8kW/150V/120A	N68060-150-150	6kW/150V/150A
N68048-600-040	4.8kW/600V/40A	N68060-600-050	6kW/600V/50A
N68048-600-120	4.8kW/600V/120A	N68060-600-150	6kW/600V/150A
N68048-1000-040	4.8kW/1000V/40A	N68060-1000-50	6kW/1000V/50A
N68048-1000-120	4.8kW/1000V/120A	N68060-1000-150	6kW/1000V/150A
N68072-150-600	7.2kW/150V/600A	N68084-150-700	8.4kW/150V/700A
N68072-150-180	7.2kW/150V/180A	N68084-150-210	8.4kW/150V/210A
N68072-600-060	7.2kW/600V/60A	N68084-600-070	8.4kW/600V/70A
N68072-600-180	7.2kW/600V/180A	N68084-600-210	8.4kW/600V/210A
N68072-1000-060	7.2kW/1000V/60A	N68084-1000-070	8.4kW/1000V/70A
N68072-1000-180	7.2kW/1000V/180A	N68084-1000-210	8.4kW/1000V/210A
N68096-150-800	9.6kW/150V/800A	N68108-150-900	10.8kW/150V/900A
N68096-150-240	9.6kW/150V/240A	N68108-150-270	10.8kW/150V/270A
N68096-600-080	9.6kW/600V/80A	N68108-600-090	10.8kW/600V/90A
N68096-600-240	9.6kW/600V/240A	N68108-600-270	10.8kW/600V/270A
N68096-1000-080	9.6kW/1000V/80A	N68108-1000-090	10.8kW/1000V/90A
N68096-1000-240	9.6kW/1000V/240A	N68108-1000-270	10.8kW/1000V/270A
N68120-150-1000	12kW/150V/1000A	N68132-150-1100	13.2kW/150V/1100A
N68120-150-300	12kW/150V/300A	N68132-150-330	13.2kW/150V/330A
N68120-600-100	12kW/600V/100A	N68132-600-110	13.2kW/600V/110A
N68120-600-300	12kW/600V/300A	N68132-600-330	13.2kW/600V/330A
N68120-1000-100	12kW/1000V/100A	N68132-1000-110	13.2kW/1000V/110A
N68120-1000-300	12kW/1000V/300A	N68132-1000-330	13.2kW/1000V/330A
N68144-150-1200	14.4kW/150V/1200A	N68144-150-360	14.4kW/150V/360A
N68144-600-120	14.4kW/600V/120A	N68144-600-360	14.4kW/600V/360A
N68144-1000-120	14.4kW/1000V/120A	N68144-1000-360	14.4kW/1000V/360A

For other specifications, please contact NGI.

3.2.2 Package Contents and Accessories

After receiving N68000, please check the instrument according to the following steps:

1. Check whether the instrument is damaged during transportation. If any severe damage to the package, please contact NGI or our authorized distributor.
2. Check accessories.
3. Make sure the the following accessories are attached.

Table 3

N68000 Accessories	Instructions
Power cord and fuse	For AC power connection
RS232 cable	For RS232 communication
Ethernet cable	For Ethernet connection
USB flash drive	User manual, software & technical information

If any loss or damage, please contact NGI or our authorized distributor.

4. Check the whole instrument. If N68000 chassis is damaged or has abnormal operation, please contact NGI or our authorized distributor.

3.2.3 Appearance & Dimension

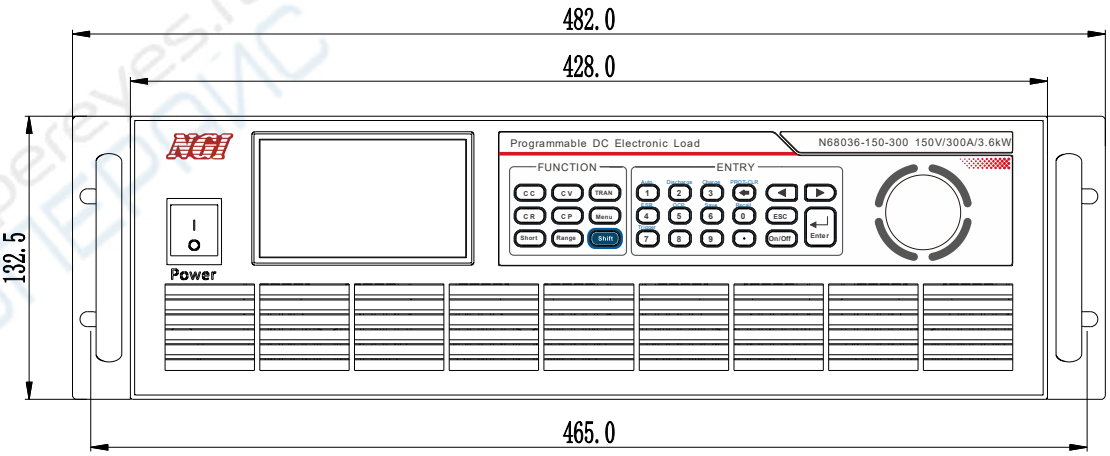

Figure 1 Front Panel Dimension(mm)

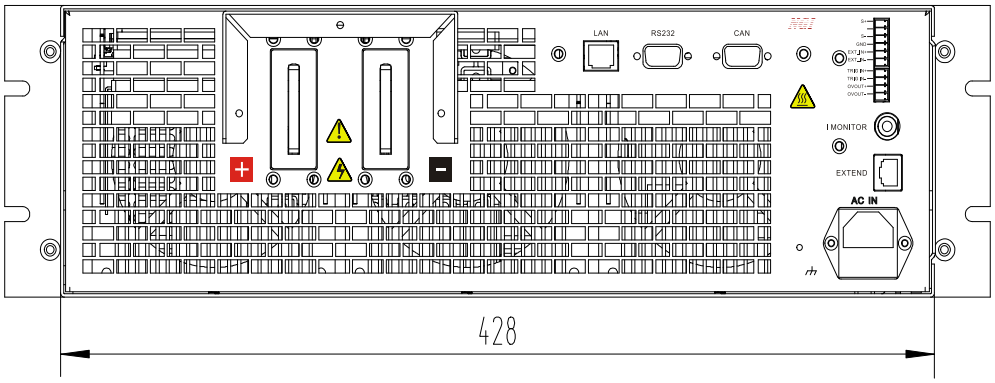

Figure 2 Rear Panel Dimension(mm)

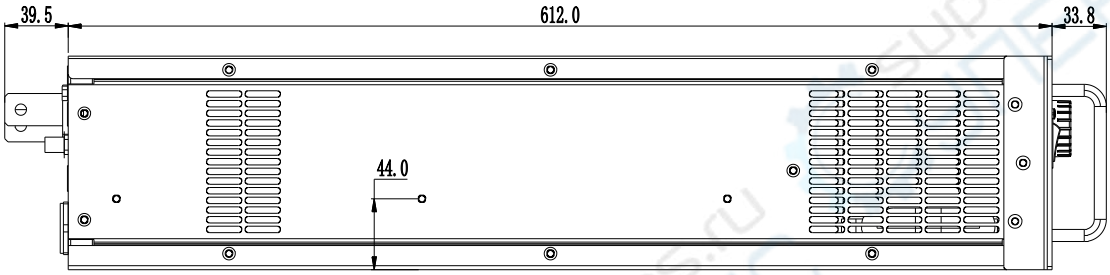

Figure 3 Side Dimension(mm)

3.3 Front Panel Introduction

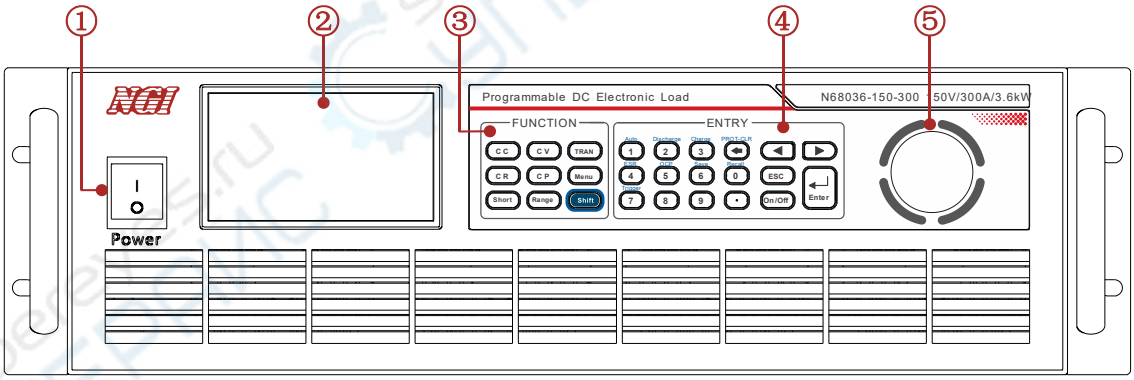

Figure 4 Front Panel

Table 4

Number	Name
1	Power switch
2	Screen
3	Function buttons
4	Numeric buttons
5	Knob

3.4 Rear Panel Introduction

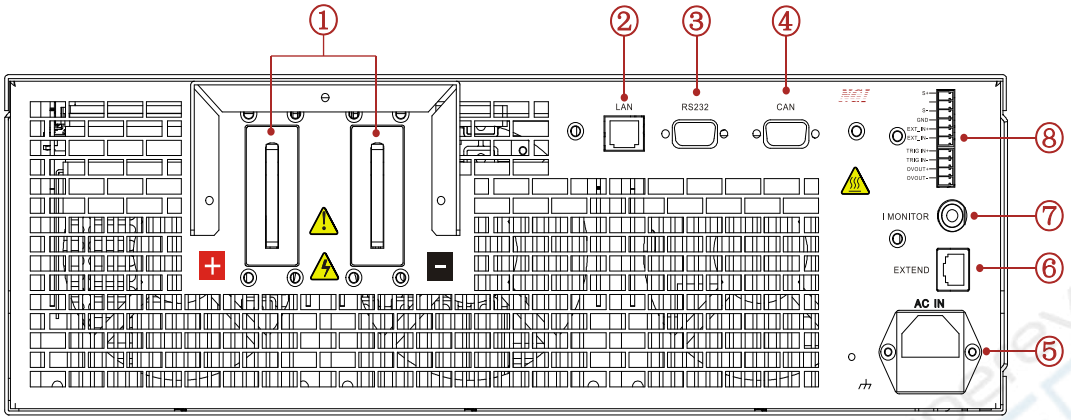

Figure 5 Rear Panel

Table 5

Number	Name
1	Input terminal (+, -)
2	LAN port
3	RS232 interface
4	CAN interface
5	AC power socket
6	Power module extension port
7	Current output monitoring interface
8	Control signal terminal

3.5 Installation Instruction

N68000 dissipates heat through the built-in fans. When installing, please make sure there is a gap of at least 20cm between N68000 and other objects for air circulation.

3.5.1 AC Input

The power cord is a 3-core wire with grounding protection. Please use a suitable socket for operation. The power cord also matches your local voltage and plug type. If it is not matched, please contact NGI.

3.5.2 Power-on Self Test

Before power-on, please make sure the following.

1) The nominal voltage of the AC input socket should be in the correct range.
2) The power cord is plugged into AC input socket.

> ⚠ Warning: The three-core power cord provides chassis grounding. Before operating on N68000, please make sure N68000 is well grounded.

After switched on, N68000 will start power-on self test. If no error is found, the LCD screen will display the below CC interface.

Figure 6 CC Interface

In case of test failure, please record the error information and contact NGI for support.

If N68000 cannot be started properly, please refer to the following steps.

1) Check whether the power cord is properly connected.
2) Check whether the power is switched on.
3) Check whether the fuse is burned out.

- If yes, please replace it.
- Please use the proper fuse.
- When replacing, please open the plastic cover at the AC power socket.

For more support, please contact NGI.

3.6 Connection

3.6.1 Input Connection

> ⚠ Warning: To meet safety requirements, the load wires should be capable of bearing the maximum current which the load can bear, without overheat.

Input connection refers to connecting the DUT to **+&-** terminals on N68000's rear panel. The major concerns for input connection are the wire diameter, length and polarity. The wire diameter should be big enough to ensure measurement accuracy. Meanwhile exceeding heating may cause safety accidents. It is recommended to use standard copper wire with bigger diameter and less length to ensure the voltage drop should be less than 0.5V while N68000 is working.

> Notice: To meet higher slew rate load specification and performance, the inductance of the wire between DUT and N68000 should be less than 5.0μH.

3.6.2 Control Connection

At the rear panel, there are terminals for remote sense, external programming input ,etc.

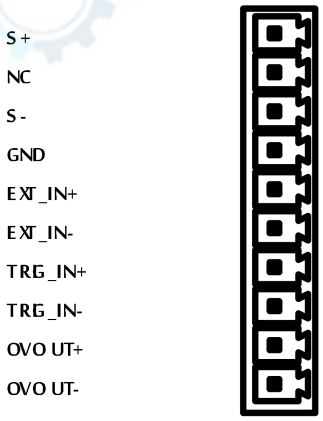

Figure 6 Control Signal Terminal

Table 6 Terminal Definition

Terminal	Definition
S+	Remote sense +

S-	Remote sense -
GND	Ground
EXT_IN+	External programming input voltage signal +
EXT_IN-	External programming input voltage signal -
Trig IN+	Trigger signal input +, compatible with 5V TTL level
Trig IN-	Trigger signal input -
OVOUT+	Reserved terminal
OVOUT-	Reserved terminal

Note: The input voltage range for external programming is 0～10V. Input voltage below 0V or above 10V may cause abnormal operation or even damage.

3.6.3 Sense Connection

N68000 provides two types of sense: local sense and remote sense. User can select sense mode on the screen.

◆ Local sense

It is used when the load current is not very high.

◆ Remote sense

Remote sense is also four-wire sense. When N68000 is working, it will cause a voltage drop in the leads between the DUT and terminals of N68000, which will affect the voltage measurement accuracy of the load. When working under CV, CR and CP mode, to ensure accurate measurement, it is recommended to use remote sense. During remote sensing, terminals S+ and S- are directly connected to the output of the DUT.

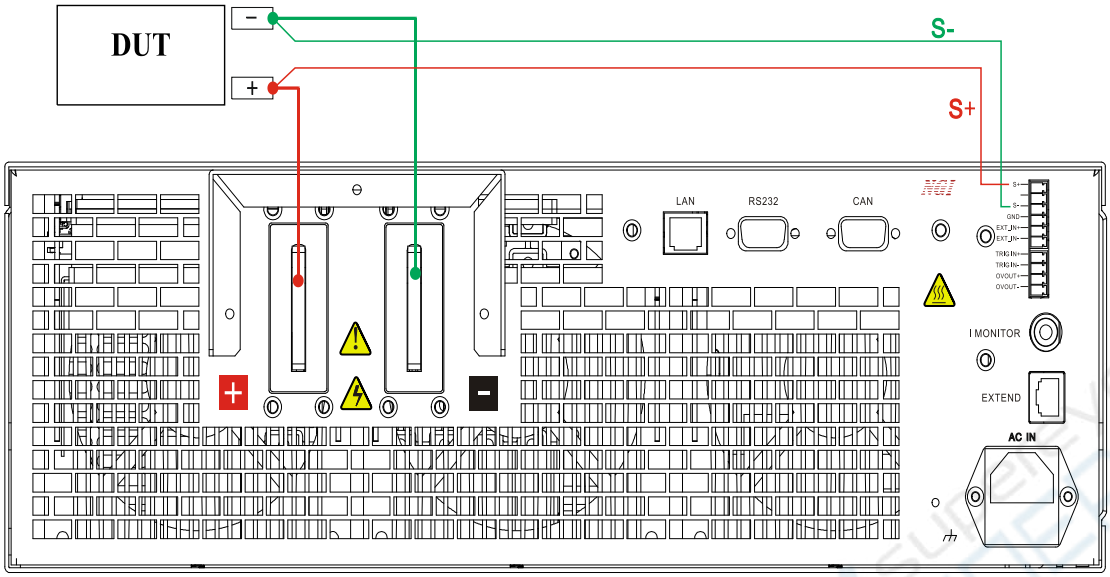

Figure 7 Remote Sense Connection

3.6.4 Low Voltage Test Connection

Please refer to the technical data sheet for the minimum operating voltage of each model. If lower voltage at full current needs to be tested, users can connect a DC power supply in series mode to compensate the minimum operating voltage. The DC power supply will provide a fixed voltage to ensure a high test voltage at N68000 input terminal.

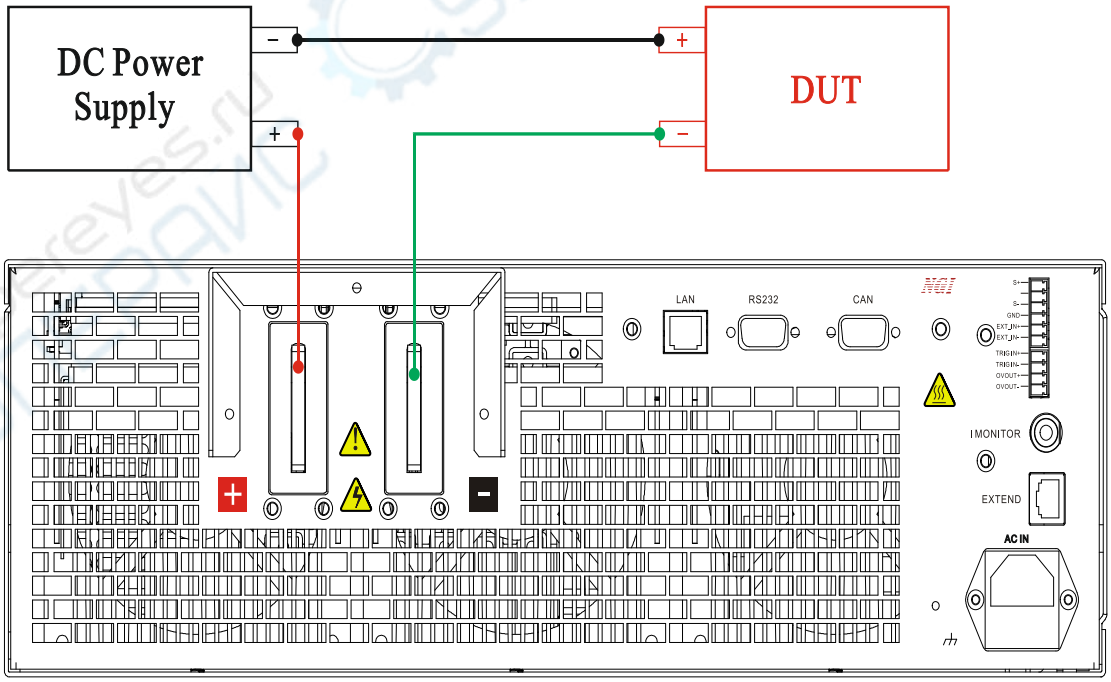

Figure 8 Low Voltage Test Connection

3.6.5 Multiple Devices Parallel Connection

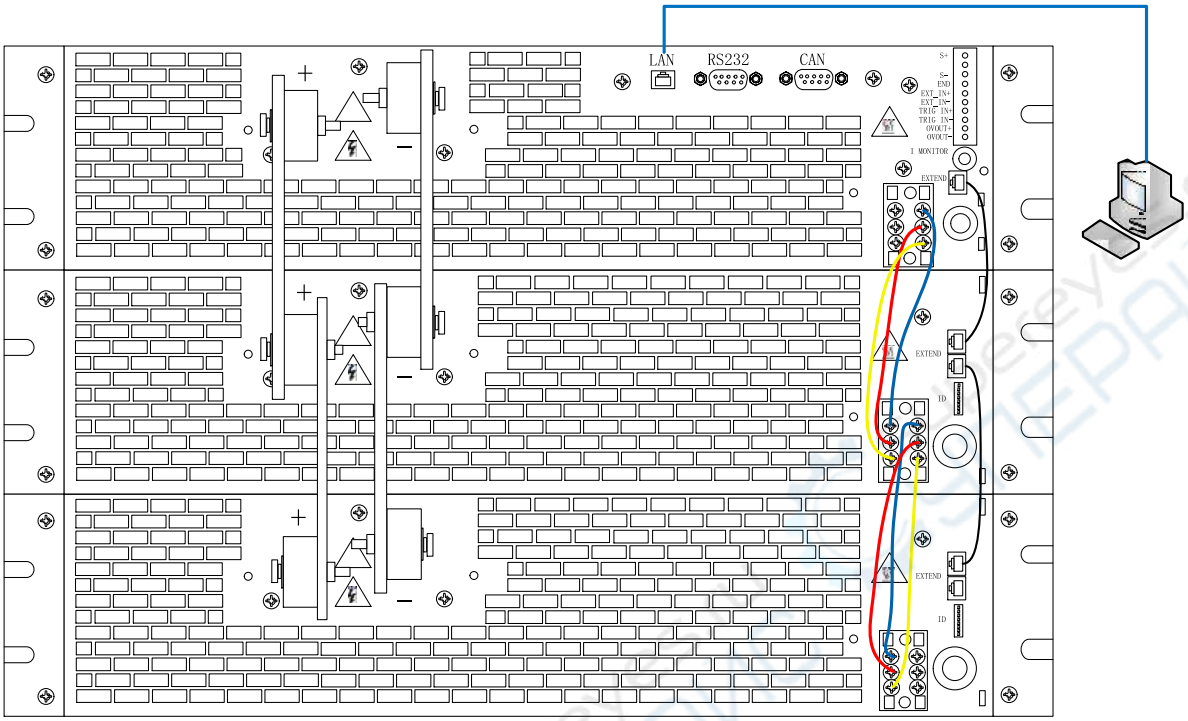

Figure 9 Multiple Devices Parallel Connection

4 Functions and Features

This chapter mainly describes the functions and features of N68000 series.

4.1 Control Mode

N68000 provides two control modes: local control and remote control. Under local control mode, users can set and operate through N68000 buttons on front panel, and check N68000 status,parameters and readback data via the LCD screen. By remote control mode, it can realize most functions of local control.

4.2 Constant Current Mode (CC Mode)

Under CC mode, N68000 consumes constant current no matter how the input voltage changes.

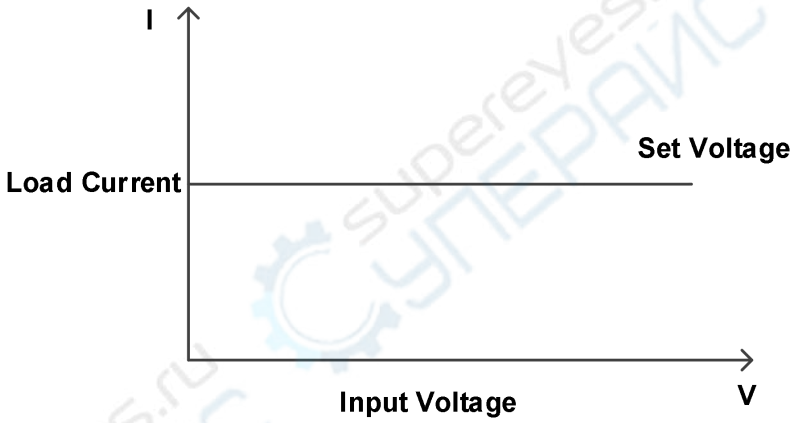

Figure 10 CC Mode

Current range

There are two ranges under CC mode: high and low. By low range, it can realize high accuracy and resolution for input control. By high range, it can realize large input range.

Low range is from 0 to 10% of maximum current.

4.3 Constant Voltage Mode (CV Mode)

Under CV mode, N68000 consumes enough current to maintain the input voltage at the set value.

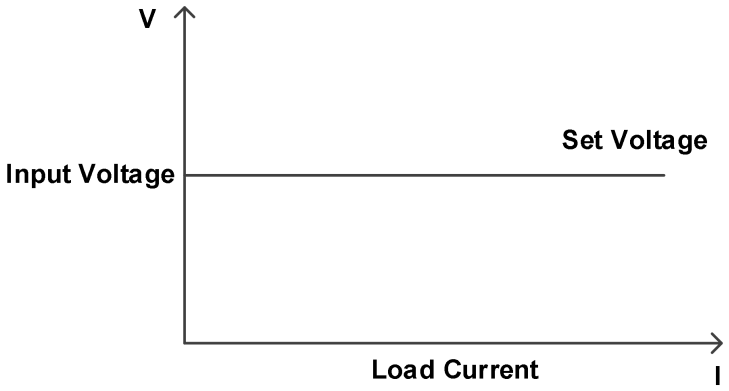

Figure 11 CV Mode

Voltage range

There are two ranges under CV mode: high and low. By low range, it can realize high accuracy and resolution for input control. By high range, it can realize large input range.

Low range is from 0 to 10% of maximum current.

4.4 Constant Resistance Mode (CR Mode)

Under CR mode, N68000 is equivalent to a constant resistance. The input current will adjust as the input voltage changes.

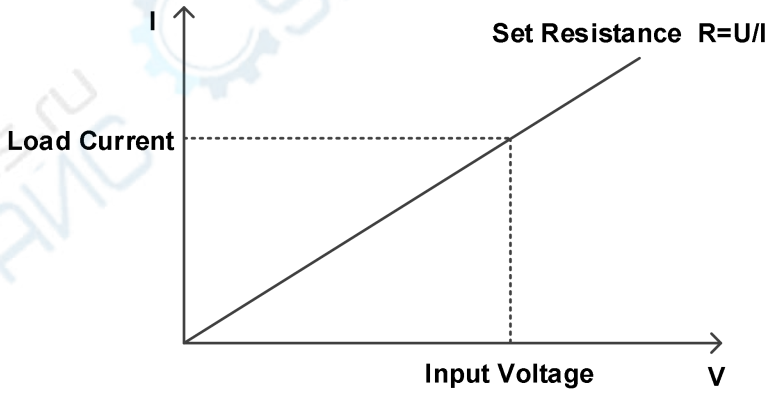

Figure 12 CR Mode

Resistance range

There are two ranges under CR mode: high and low.

For setting the resistance, when the input voltage is within the high range of rated input voltage of N68000, it is necessary to ensure that the current calculated under the Ohm's law formula is within the low range of rated input current of N68000.

4.5 Constant Power Mode (CP Mode)

Under CP mode, N68000 will consume a constant power. The input current will be linearly adjusted with the input voltage to ensure that the power consumption remains unchanged.

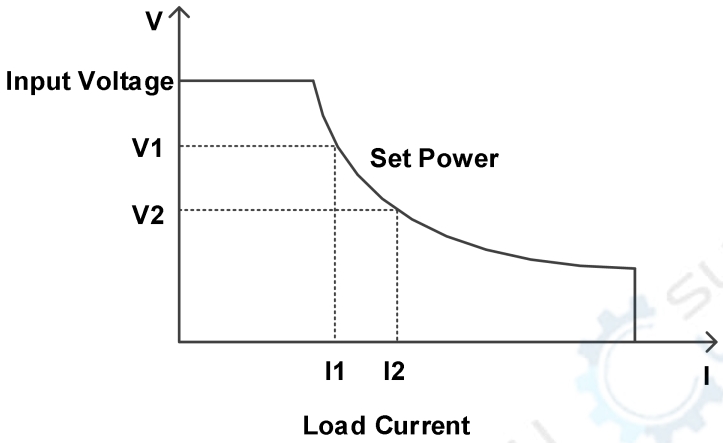

Figure 13 CP Mode

4.6 Dynamic Mode (TRAN)

The dynamic test function can allow N68000 to switch between main value and transient value, which is suitable for the test of power supply dynamic characteristics.

Please press TRAN on the front panel to enter the dynamic mode. After setting the parameters, please press On/Off to turn on/off the dynamic mode.

The dynamic mode supports CC,CV and CR functions. Under static mode, please press TRAN to enter the corresponding dynamic mode.

N68000 provides three modes for dynamic: continuous(CONT), pulse(PULSE) and toggle(TOGGLE). Among them, pulse mode and toggle mode require trigger signal. Trigger signal operation can be achieved by pressing Shift + Trigger 7, using together with trigger terminals at the rear panel.

4.6.1 Continuous (CONT)

Under continuous mode with dynamic test enabled, N68000 continuously switches between main value and transient value according to the set pulse width. Unless the dynamic mode is exited or N68000 is switched off, N68000 will continue to operate according to the set parameters. This mode is not affected by the trigger signal. Under continuous mode, the setting range of pulse width is: 0.025 ~ 60000ms.

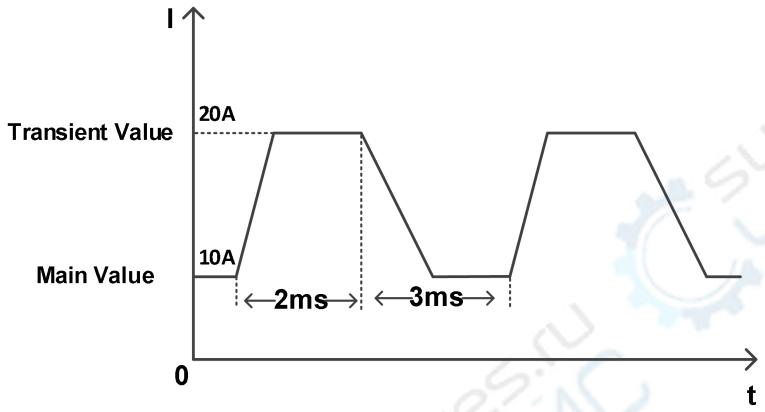

Figure 14 Continuous Mode

4.6.2 Pulse (PULSE)

Under pulse mode with dynamic test enabled, if the trigger signal is received, N68000 will immediately switch from main value to transient value, and then returns to main value after maintaining the pulse width time. The setting range of pulse width is: 0.025 ~ 60000ms.

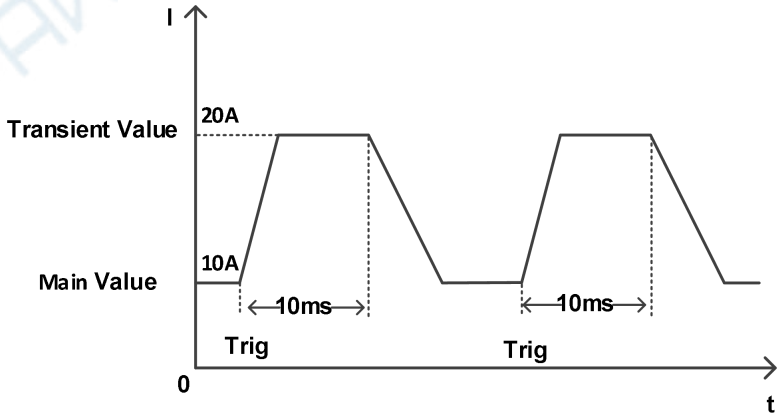

Figure 15 Pulse Mode

Note: Within the pulse width time, N68000 will not respond to the received trigger signal.

4.6.3 Toggle (TOGGLE)

Under toggle mode with dynamic test enabled, if the trigger signal is received, N68000 will switch between main value and transient value. The switching time is decided by slew rate.

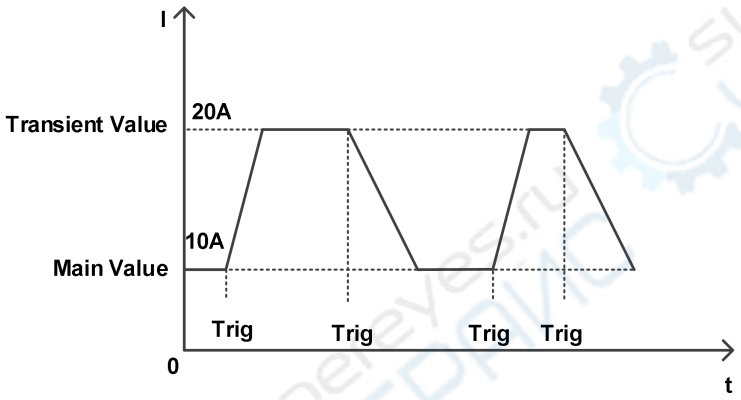

Figure 16 Toggle Mode

4.7 Auto Test Function

The auto test can be used to simulate waveform. This function can improve the test efficiency and can be achieved by SEQ function on the menu. Up to 100 sequence files editing is supported. Each file can support 50 steps.

When the sequence file runs, starting from step one, N68000 will load according to the parameters in the test step. When the dwell ends, N68000 will conduct specification check (checking if the sampling voltage/current/power is within the range). Then N68000 will switch to next step. After all test steps are completed, N68000 automatically shuts the input, stops the test, and presents the test results.

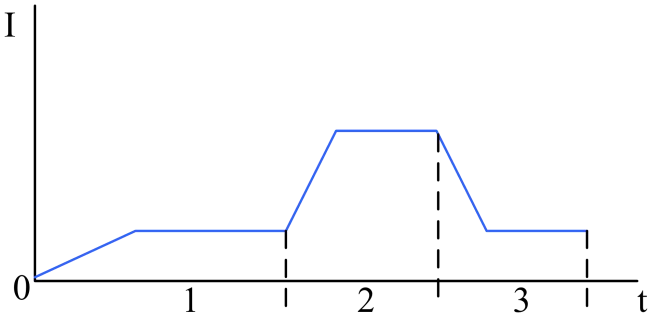

Figure 17 Auto Test

4.8 Discharge Test

The discharge test function is used to discharge batteries or supercapacitors. During the test, voltage of the battery or capacitor continues to decrease. When the voltage is lower than cut-off voltage, N68000 shuts the input and stops discharging.

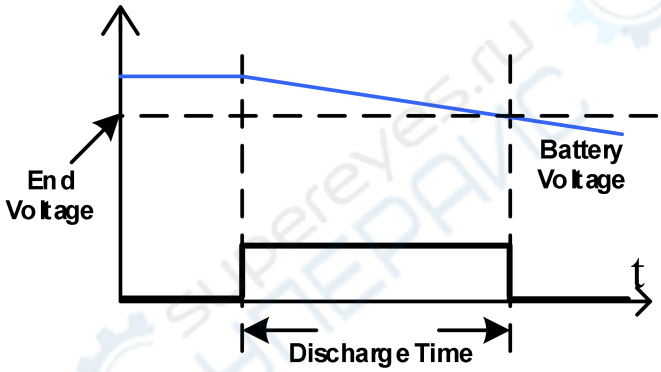

Figure 18 Discharge Test

4.9 Charge Test

The charge test function is used to charge batteries or supercapacitors. Except charging under CC mode, N68000 also provides charging from CC to CV to meet the customer's demand of charging quality (to charge as fully as possible).

The charge test function requires to connect a DC power supply and battery or supercapacitor in series, and to use remote sense.

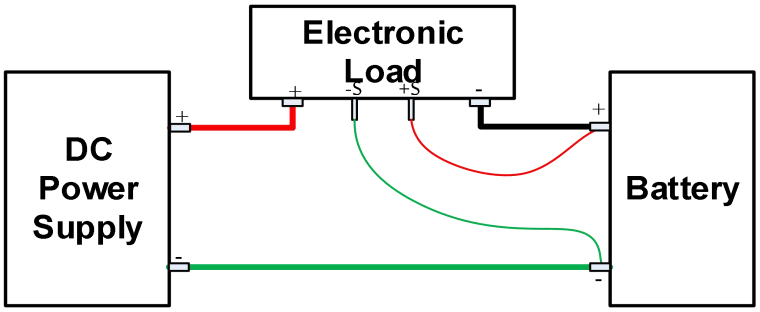

Figure 19 Charge Test

4.10 ESR Measurement (Optional)

ESR is a principal electrical parameter of battery or supercapacitor. With ESR measurement, N68000 absorbs current from the DUT under CC mode. When the current changes, the NGI internal resistance sensing circuit can accurately capture the voltage drop of DUT, and then calculate ESR value according to Ohm's law.

4.11 Over Current Protection Test (OCP Test)

N68000 provides a rise current to test whether the voltage of DUT can reach the end voltage and judge whether the OCP protection is normal. This test checks the output response of DUT under overload.

During OCP test, N68000 will load under CC mode and check whether the DUT voltage is lower than end voltage. If lower, N68000 will record the present loading current as the test result and shut the input to stop the test. If the DUT voltage is higher than end voltage, N68000 will increase the loading current until the DUT voltage is lower than end voltage or it reaches the Max. loading current.

4.12 Input Control

4.12.1 On/Off

Press On/Off to turn on or off N68000.

4.12.2 Short-circuit

Under CC, CV, CR, CP and dynamic modes, N68000 can simulate short-circuit to test the protection performance of the DUT. The current consumed by N68000 during short-circuit depends on present N68000 operation mode and current range. Under CC and CP modes, the Max. short-circuit current is the Max. value of the present range. Under CV mode, short-circuit operation is equivalent to setting the CV value to 0V. Under CR mode, short-circuit operation is equivalent to setting the minimum value of the current range. The short-circuit operation does not change the present setting value. When exiting short-circuit operation, N68000 returns to the previous state.

Steps for short-circuit:

1. Select operation mode: CC/CP/CV/CR.
2. Press On/Off and select ON.
3. Press Short for short-circuit; press Short again to exit short-circuit.

Note: It is not allowed to change operation mode and range during short-circuit.

4.12.3 Von/Voff

The Von latch function has two modes to meet your various test needs: enabled and disabled.

Disabled: When the input voltage is higher than Von, N68000 starts to sink current. When the input voltage is lower than Von, it stops sinking current.

Enabled: When the input voltage is higher than Von, N68000 starts to sink current. When the input voltage is lower than Voff, N68000 stops sinking current. After that, it will not sink current automatically even the input voltage is higher than Von again.

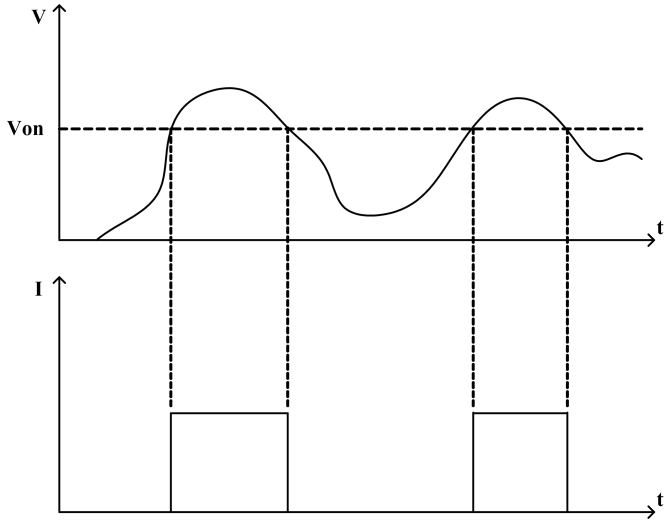

Figure 20 Von Disabled

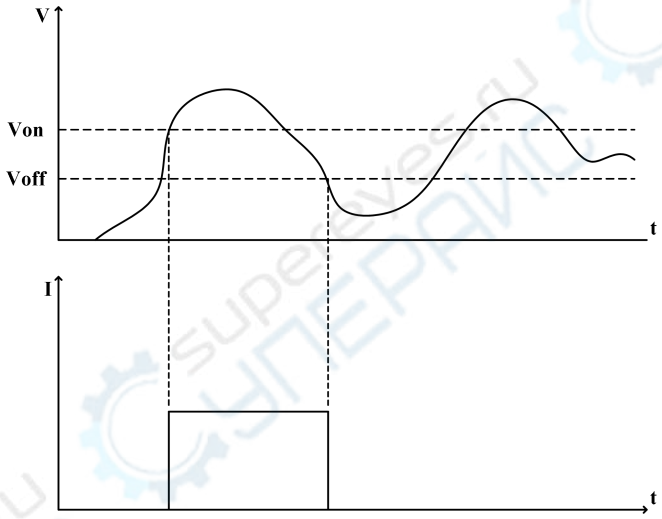

Figure 21 Von Enabled

Note: Von value should be higher than Voff value. The setting of Von is only effective in CC, CV, CR and CP test functions.

4.12.4 Load Time

N68000 provides load time setting. When the loading time reaches the set value, N68000 will stop loading, which can realize accurate control of the loading time. For example, if the loading time is set to 20s, N68000 will stop loading after 20s.

Steps for loading time setting:

1. Press 

to enter menu interface.
2. Press  or rotate  to select **Protection**.
3. Press  or 

to enter **Protection.**
4. Press  or rotate  to select **Load Time**.
5. Set the required load time.
6. Press 

or  to complete setting.

4.12.5 Programmable Protection

To protect the safety of the DUT, N68000 provides protection programming. The protection includes current limit, over voltage, over current and over power.

◆ Current Limit

By this parameter, it can control the input current and ensure the current is below **I-Limit**.

◆ OVP

When the voltage exceeds OVP, N68000 will shut the input. Alarm **OVP** will be displayed on the screen.

◆ OCP

When the input current exceeds OCP, N68000 will shut the input. Alarm **OCP** will be displayed on the screen.

◆ OPP

When the input power exceeds OPP, N68000 will shut the input. Alarm **OPP** will be displayed on the screen.

4.13 Protection Function

N68000 provides multiple protection: OCP, OVP, OPP, RV, OTP.

◆ Over Current Protection (OCP)

When the input current is 105% of rated current, OCP will occur.

◆ Over Voltage Protection (OVP)

When the input voltage is 105% of rated voltage, OVP will occur.

◆ Over Power Protection (OPP)

When the input power is 101% of rated power, OPP will occur. OPP is used to protect the hardware and prevent the components from being aged and damaged due to long time over-power.

◆ Reverse Polarity Warning (RV)

When the DUT polarity is incorrectly connected, RV will be displayed on the screen and an alarm will sound. At this time, N68000 will be in a conductive state. The maximum reverse current allowed is the same as the rated current of N68000. If the reverse current exceeds the rated current, it may cause damage to N68000.

◆ Over Temperature Protection (OTP)

There is a temperature detection circuit built in N68000. When the internal temperature exceeds the limit, N68000 shuts the input and prompts OT on the screen. Meanwhile, the fan works at full load to cool N68000.

◆ Power Module Over Temperature (MOT)

There is a temperature control switch on each power module. When the temperature exceeds the limit, the switch closes. N68000 shuts the input and prompts MOT on the screen, and an alarm will sound. Meanwhile, the fan works at full load to cool N68000.

◆ Temperature Sensor Failure (TSF)

When temperature sensor is damaged, N68000 shuts the input. TSF will be displayed on the screen.

◆ Power Module Missing (MISS)

Each power module communicates with the master through a communication cable and regularly reports its own status. If the cable fails to send information or other abnormalities cause communication interruption, N68000 shuts the input and prompts MISS on the screen, and an alarm will sound.

⚠ Warning: Do not connect the output terminal of the AC power supply to the input terminal of N68000. Meanwhile, please make sure the input voltage is within the rated input voltage of N68000.

4.14 Slew Rate and Minimum Transition Time

Slew rate is defined as the change of voltage or current per unit of time. When the slew rate is set to the maximum value, the transition time between the main value and transient value will be the shortest.

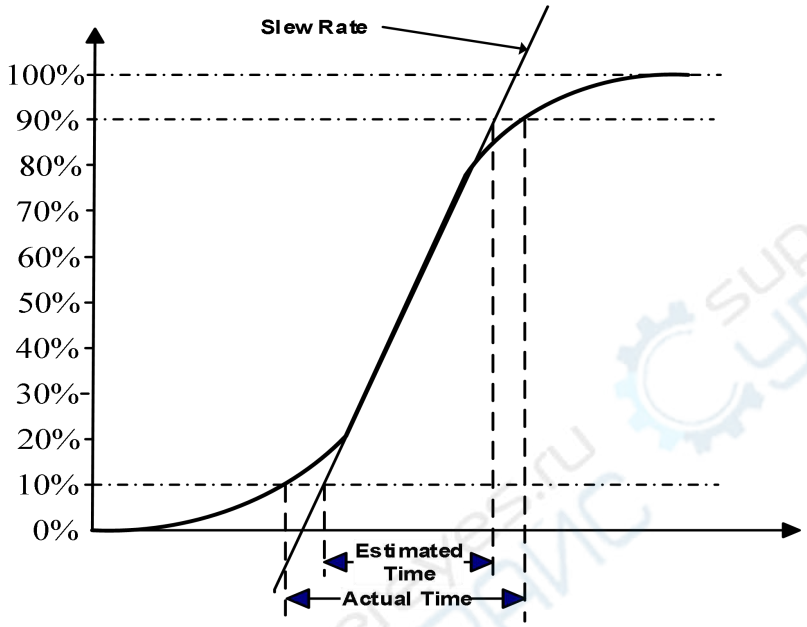

Figure 22 Slew Rate and Transition Time

Note: When N68000 switches from low voltage/current to high voltage/current, the minimum transition time is equal to the voltage/current difference divided by slew rate. When N68000 switches from high voltage/current to low voltage/current, the minimum transition time will be longer than the time calculated by the formula, due to the low range bandwidth limitation of N68000.

4.15 Save and Recall

N68000 can save 20 groups of general parameters into EEPROM, which is easy for users to recall. These parameters include CC, CV, CR, CP and TRAN setting values.

By pressing Shift + Save 6 or Shift + Save 6 on the front panel, it can save or recall. If Fast Recall function is turned on, users can directly press the numeric button 0 ~ 9 to recall the first 10 groups of saved data. Number zero corresponds to the 10th group data.

Steps to turn on Quick Recall:

1. Press Menu to enter menu interface.
2. Press ◄ ► or rotate to select **System**.
3. Press or Enter to enter **System.**
4. Press ◄ ► or rotate to select **Fast Recall**.
5. Select ON for **Fast Recall**.
6. Press ESC twice to exit.

Take CR mode for example to describe save and recall operation:

1. Set parameters under CR mode. And press Shift + Save 6 to enter save interface.
2. Press numeric button, for example Discharge 2 . And press Enter to save the parameters in group number 2.
3. If **Fast Recall** is ON, press Discharge 2 directly and recall. If **Fast Recall** is OFF, press Shift + Recall 0 + Discharge 2 to recall.

Note: If there is no data in the save area, recall operation will be invalid.

4.16 Power-off Memory

N68000 provides power-off memory function, which can save the data when turning off N68000 or in power failure. This function can be enabled by selecting ON for **Poweroff Memory** in **Application**.

4.17 Language

N68000 provides two options for language: Chinese and English.
Steps to select language:

1. Press Menu to enter menu interface.

2. Press  or rotate  to select **System**.
3. Press  or  to enter **System.**
4. Press  or rotate  to select **Language**.
5. Select Chinese or English.
6. Press  twice to exit.

4.18 Control and Monitor

4.18.1 Remote Sense

Terminals S+ and S- are for remote sense.
When working under CV, CR and CP mode, to ensure accurate measurement, it is recommended to use remote sense. During remote sensing, terminals S+ and S- are directly connected to the output of the DUT.

> Note: If remote sense is selected in **Sense Mode** under **Application**, and S+ & S- are not connected to DUT output, N68000 will not be able to measure voltage correctly. Meanwhile, CV, CR, and CP mode will not operate properly.

4.18.2 Current Monitoring Output

The current output terminal provides 0 ~ 10V voltage output signal, which is used to indicate the input current of 0 to full scale. The input current is proportional to the output voltage. For example, if the current value is 30A, the voltage of terminal **I MONITOR** is 1V. If the current value is 300A, the voltage of terminal **I MONITOR** is 10V.
GND is the ground terminal.

4.18.3 External Programming Input

The CC mode can be continuously controlled by inputting an external voltage signal (DC or AC) at the terminal EXT_IN +. The external programming input voltage range is 0 ~ 10V, which corresponds to zero to full scale of CC mode.
EXT_IN- is the ground terminal.

Note:
1. External programming is valid under CC and CV mode only.
2. It is not allowed to input voltage over 10V for external programming. If over 10V, it may cause N68000 input voltage or current to exceed rated range. In this case, N68000 will take protection.
3. To enable external programming, select ON for **Ext-Prog** in **Application**.

4.18.4 External Trigger Input

Steps to use external trigger input:
1. Set **Ext-Control** to Toggle in **Application**.
2. Short circuit terminals TRIG_IN+ and TRIG_IN-. The load will be ON.
3. Short circuit terminals TRIG_IN+ and TRIG_IN- again. The load will be OFF.

4.19 Factory Reset

Steps to set factory reset:

1. Press 

to enter menu interface.
2. Press  or rotate  to select **Factory Reset**.
3. Press 

to do factory reset.

Note:
1. The data saved in EEPROM will not be cleared after factory reset.
2. The load should be restarted after factory reset.

5 Local Operation

This chapter mainly describes the button operation and LCD screen display information.

5.1 Button

N68000 buttons are composed of three areas: function, numeric and knob.

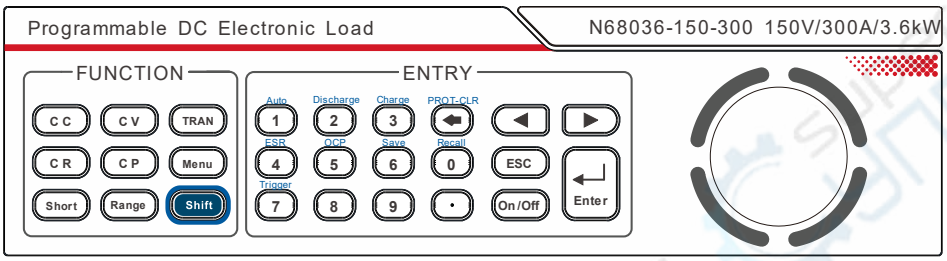

Figure 23 Buttons

5.1.1 Function Button

Table 7

Button	Function
CC	To enter constant current mode (CC mode)
CV	To enter constant voltage mode (CV mode)
TRAN	To enter dynamic/transient mode
CR	To enter constant resistance mode (CR mode)
CP	To enter constant power mode (CP mode)
Menu	To enter the main Menu
Short	To enter short-circuit function
Range	Range switch
ESC	Back to previous page
Shift	Compound button

5.1.2 Compound Button

Table 8

Compound Button	Function
Shift + Auto 1	To enter auto test
Shift + Discharge 2	To enter discharge function
Shift + Charge 3	To enter charge function
Shift + PROT-CLR ◄	To clear the protection
Shift + ESR 4	To enter ESR test
Shift + OCP 5	To enter OCP test
Shift + Save 6	To enter save interface
Shift + Trigger 7	To enable trigger signal
Shift + Recall 0	To enter recall interface

5.1.3 Numeric Button

Table 9

Button	Function
0 ~ 9	Digit input
.	Decimal point
PROT-CLR ◄	To delete
◄ ►	1.To shift or select the required item in menu 2. To control the cursor scrolling when setting parameter
Enter	To enter the desired item, confirm the input, exit from setting or remote operation

5.1.4 Knob

Table 10

Knob	Function
	By rotating: to select the desired item, adjust the parameter By pressing: to enter the edit interface, confirm the input

5.2 LCD Screen

5.2.1 Monitor Interface

Figure 24 Monitor Interface

① Load specification
② Readback area
③ Status information
④ Setting area
⑤ Operation mode

5.2.2 Status Information

Figure 25 Status Information

Table 11

Number	Definition
1	N68000 operation mode and working range: CCH, CCL, CVH, CVL, CVBH, CVBL, CRH, CRL and CP. The range can be switched by pressing Range.
2	Under external programming
3	Alarm information: OPP, OCP, OVP, OTP, TSF, MISS and MOT
4	Under remote sense
5	On/off state

Table 12

Alarm	Definition
OPP	Over power protection
OCP	Over current protection
OVP	Over voltage protection
OTP	Over temperature protection
TSF	Temperature sensor failure
MISS	Power module missing or loose wiring connection
MOT	Power module over temperature

5.3 Menu

Steps to enter menu:

1. Press Menu on the front panel.
2. Press ◄ ► or rotate ◯ to select the required function.
3. Press Enter or ◯ to enter the required parameter.
4. Press ESC to return to previous page.

Note: There are three pages for the menu. Users can press Menu to switch to next page.

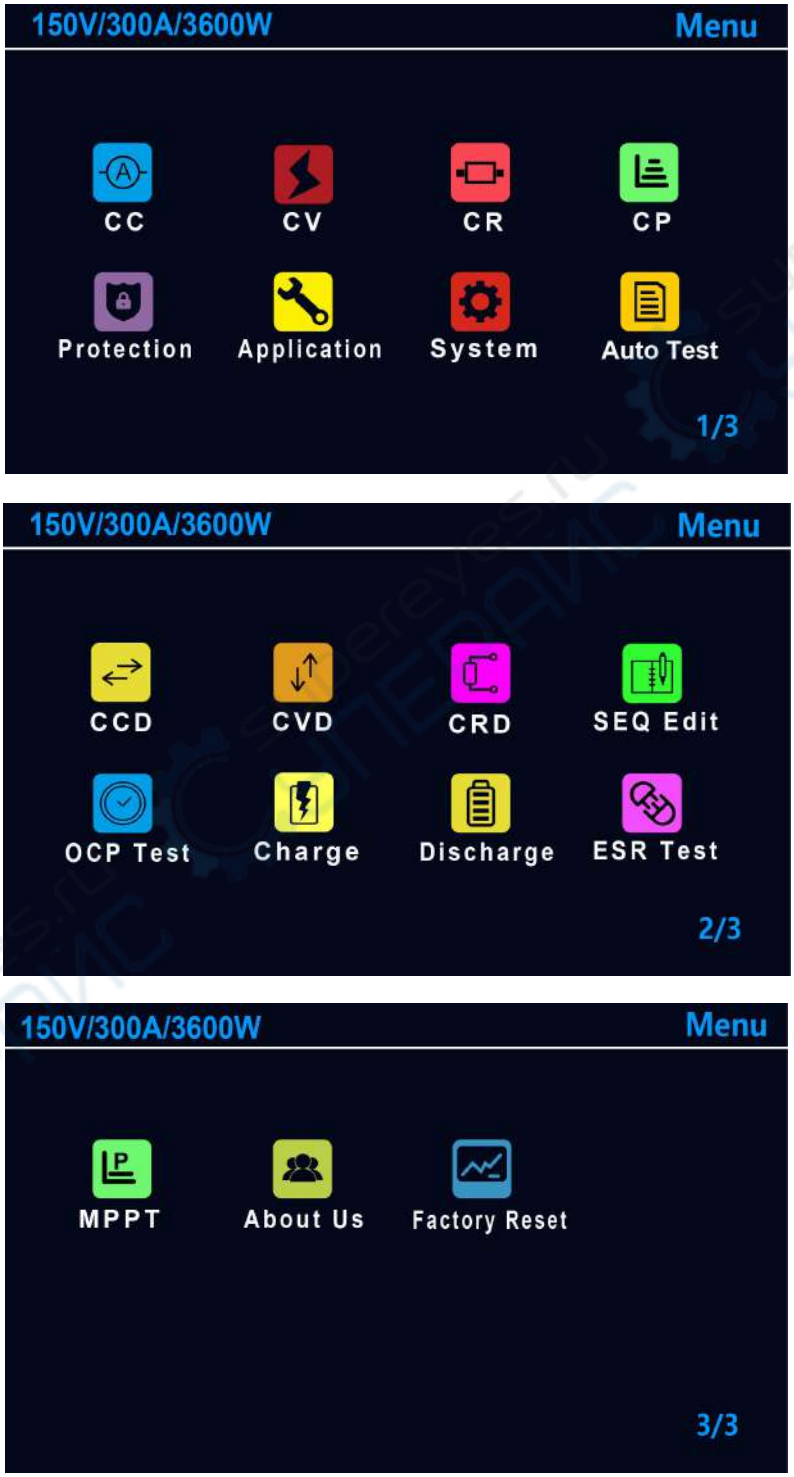

Figure 26 Menu

5.4 Setting

5.4.1 System Setting

Steps to enter **System**:

1. Press Menu on the front panel.
2. Choose **System** by pressing ◄ ► or rotating ◯.
3. Press Enter or ◯ on **System**.

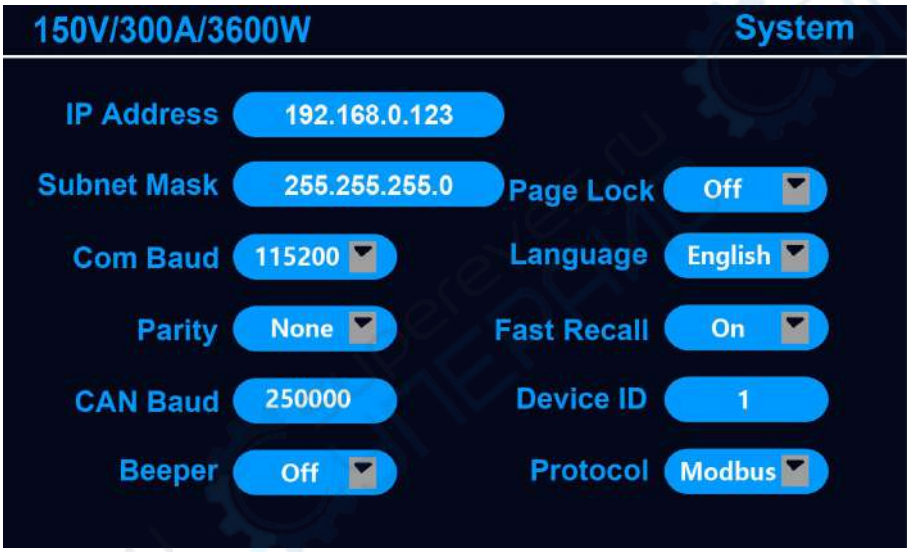

Figure 27 System Setting

Table 13

Parameter	Function
IP Address	To set communication IP address
Subnet Mask	To set communication subnet mask
Com Baud	To set baud rate for RS232 communication
Parity	Parity options: none, odd, even
CAN Baud	To set baud rate for CAN communication
Beeper	To set the button sound
Page Lock	To lock the present operation mode
Language	To select the display language
Fast Recall	To turn on/off fast recall

Device ID	To set device ID
Protocol	To set communication protocol, protocol options: Modbus or SCPI

5.4.2 Application Setting

Steps to enter **Application**:

1. Press Menu on the front panel.
2. Choose **Application** by pressing ◄ ► or rotating ◯.
3. Press Enter or ◯ on **Application**.

Figure 28 Application Setting

Table 14

Parameter	Function
Sense Mode	To set local or remote
Ext-Control	External trigger source, options: Toggle, Hold and Off
Ext-Prog	To turn on/off external programming
CV Mode	To set charge or discharge, for battery or capacitor charge & discharge test
CV Rate	This parameter is for setting CV rate. The options are slow, medium and fast. The rate is related to the response speed of external power supply. If the response speed of external power supply is high, CV rate should be set to High.

Test Duration	ESR single pulse test time is 10ms-50ms. Default is 10ms.
Poweroff Memory	This function is to save the data when turning off N68000 or in power failure.
Turnon Load	When this function is set to ON, N68000 will automatically load after power-on, according to the previous setting before power-off.
Work Mode	The options are fast and precision. Fast option provides high response speed. Precision option internally compensates for accuracy errors caused by fast response.
CV Range	To set current range under CV mode, options: CCH and CCL
CP/CR Mode	The options are fast and precision.

5.4.3 Protection Setting

Steps to enter **Protection**:

1. Press Menu on the front panel.
2. Choose **Protection** by pressing ◄ ► or rotating ◯.
3. Press Enter or ◯ on **Protection**.

Figure 29 Protection Setting

Table 15

Parameter	Function
I-Limit	To set the programmable current limit
OCP	To set the programmable current protection threshold, 0A for disabling this function
OVP	To set the programmable voltage protection threshold, 0V for disabling this function
OPP	To set the programmable power protection threshold, 0W for disabling this function
Von Latch	ON means N68000 will sink current when input voltage reaches Von. OFF means N68000 will stop loading when input voltage is below Von.
Von	To set the programmable voltage limit
Voff	When input voltage is below Voff, N68000 will stop loading immediately. To disable this function, please set it to 0V.
Load Time	This parameter is to set load time. When the time reaches, N68000 will stop loading. The programmable range is 0-60,000s. To disable this function, please set it to 0s.

5.4.4 Factory Reset

Steps to do factory reset:

1. Press 

to enter menu interface.
2. Press  or rotate  to select **Factory Reset**.
3. Press 

to do factory reset.
4. Press 

to cancel.

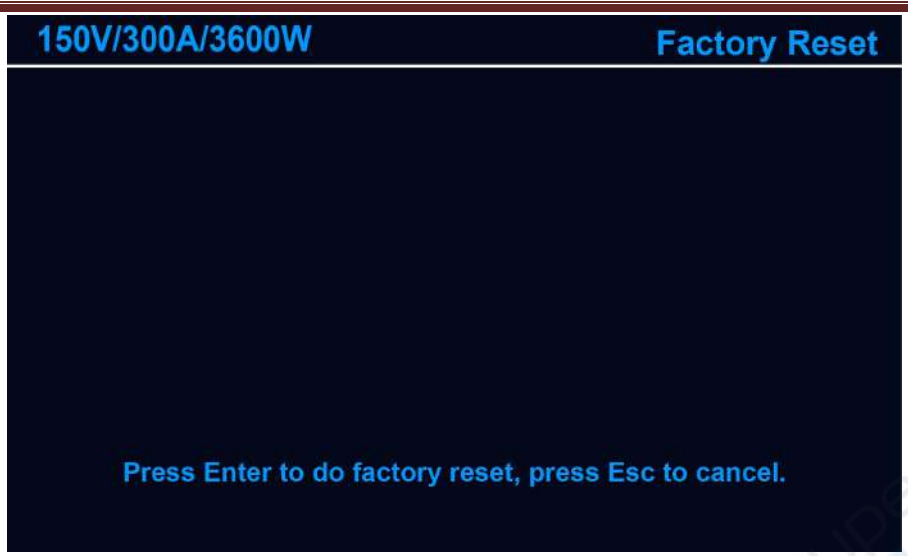

Figure 30 Factory Reset

6 Operation Guideline

This chapter mainly describes N68000 operation procedures.

6.1 Static Operation

N68000 static mode includes CC, CV, CR and CP.

6.1.1 Constant Current (CC)

6.1.1.1 CC Mode Selection

Methods to enter **CC**:

Method 1: Press CC on the front panel directly.

Method 2: Press Menu → Choose **CC** by pressing ◄ ► or rotating → Press Enter or .

Figure 31 CC Interface

Table 16

Parameter	Description
Range	To select the operation range
I-Set	To set the current

Rise Slew	To set the rise slew rate
Fall Slew	To set the fall slew rate

6.1.1.2 Range Selection

There are two options for range: CCH and CCL. It is recommended to select CCL for 0 to 10% of maximum current, and select CCH for over 10% of maximum current. This will ensure the measurement accuracy.

Methods to select range:

Method 1: Press 

on the front panel directly to switch the range.

Method 2: Press  or rotate  to select **Range**→ Press 

or  on **Range**→Press  or rotate  to select the required range→ Press 

or  to complete selection.

6.1.1.3 Current and Slew setting

Methods to set **I-Set/Rise Slew/Fall Slew** under **CC**:

Method 1: Press  or rotate  to select the required parameter→Press 

or  on the required parameter→Press numeric buttons to input the value→Press 

or  to complete setting.

Method 2: Press  or rotate  to select the required parameter→Press 

or  on the required parameter→Press to move the cursor and rotate  to adjust the numeric→Press 

or  to complete setting.

Note: To exit from **CC**, please press 

or the function button required.

6.1.2 Constant Voltage (CV)

6.1.2.1 CV Mode Selection

Methods to enter **CV**:

Method 1: Press CV on the front panel directly.

Method 2: Press Menu → Choose **CV** by pressing ◄ ► or rotating ◎ → Press Enter or ◎.

Figure 32 CV Interface

Table 17

Parameter	Description
Range	To select the operation range
V-Set	To set the voltage
Rise Slew	To set the rise slew rate
Fall Slew	To set the fall slew rate

6.1.2.2 Range Selection

There are two options for range: CVH and CVL. It is recommended to select CVL for 0 to 10% of maximum voltage, and select CVH for over 10% of maximum voltage. This

will ensure the measurement accuracy.

Methods to select range:

Method 1: Press Range on the front panel directly to switch the range.

Method 2: Press ◄ ► or rotate to select **Range**→ Press Enter or on **Range**→Press ◄ ► or rotate to select the required range→ Press Enter or to complete selection.

6.1.2.3 Voltage and Slew setting

Methods to set **V-Set/Rise Slew/Fall Slew** under **CV**:

Method 1: Press ◄ ► or rotate to select the required parameter→Press Enter or on the required parameter→Press numeric buttons to input the value→Press Enter or to complete setting.

Method 2: Press ◄ ► or rotate to select the required parameter→Press Enter or on the required parameter→Press ◄ ► to move the cursor and rotate to adjust the numeric→Press Enter or to complete setting.

> Note: To exit from **CV**, please press Menu or the function button required.

6.1.3 Constant Resistance (CR)

6.1.3.1 CR Mode Selection

Methods to enter **CR**:

Method 1: Press CR on the front panel directly.

Method 2: Press Menu → Choose **CR** by pressing ◄ ► or rotating ○ → Press Enter or ○.

Figure 33 CR Interface

Table 18

Parameter	Description
Range	To select the operation range
R-Set	To set the resistance
Rise Slew	To set the rise slew rate
Fall Slew	To set the fall slew rate

6.1.3.2 Range Selection

There are two options for range: CRH and CRL.

For setting the resistance, when the input voltage is within the high range of rated input voltage of N68000, it is necessary to ensure that the current calculated under the Ohm's law formula is within the low range of rated input current of N68000.

Methods to select range:

Method 1: Press Range on the front panel directly to switch the range.

Method 2: Press ◄ ► or rotate ◎ to select **Range**→ Press Enter or ◎ on **Range**→Press ◄ ► or rotate ◎ to select the required range→ Press Enter or ◎ to complete selection.

6.1.3.3 Resistance and Slew setting

Methods to set **R-Set/Rise Slew/Fall Slew** under **CR**:

Method 1: Press ◄ ► or rotate ◎ to select the required parameter→Press Enter or ◎ on the required parameter→Press numeric buttons to input the value→Press Enter or ◎ to complete setting.

Method 2: Press ◄ ► or rotate ◎ to select the required parameter→Press Enter or ◎ on the required parameter→Press ◄ ► to move the cursor and rotate ◎ to adjust the numeric→Press Enter or ◎ to complete setting.

> Note: To exit from **CR**, please press Menu or the function button required.

6.1.4 Constant Power (CP)

6.1.4.1 CP Mode Selection

Methods to enter **CP**:

Method 1: Press CP on the front panel directly.

Method 2: Press Menu → Choose **CP** by pressing ◄ ► or rotating ◎ →

Press Enter or .

Figure 34 CP Interface

Table 19

Parameter	Description
P-Set	To set the power
Rise Slew	To set the rise slew rate
Fall Slew	To set the fall slew rate

6.1.4.2 Power and Slew setting

Methods to set **P-Set/Rise Slew/Fall Slew** under **CP**:

Method 1: Press ◄ ► or rotate to select the required parameter→Press Enter or on the required parameter→Press numeric buttons to input the value→Press Enter or to complete setting.

Method 2: Press ◄ ► or rotate to select the required parameter→Press Enter or on the required parameter→Press ◄ ► to move the cursor and rotate to adjust the numeric→Press Enter or to complete setting.

Note: To exit from **CP**, please press Menu or the function button required.

6.2 Dynamic Operation

Dynamic function can be used to test the dynamic characteristics of DUT. There are three modes for dynamic test: CCD, CVD and CRD. Dynamic functions offers three operation modes: continuous, pulse and toggle.

Take CCD for example to describe the operation procedures below.

6.2.1 CCD Mode Selection

Methods to enter **CCD**:

Method 1: In CC mode, press TRAN on the front panel directly and switch to CCD mode.

Method 2: Press Menu → Choose **CCD** by pressing ◄ ► or rotating → Press Enter or .

Figure 35 CCD Interface

Table 20

Parameter	Description
Range	To select the operation range
Mode	To select the operation mode
Current 1	To set main value
Current 2	To set transient value
Pulse Wid. 1	To set pulse width for main value, range: 0.025ms～60000ms
Pulse Wid. 2	To set pulse width for transient value, range: 0.025ms～60000ms
Rise Slew	To set the rise slew rate
Fall Slew	To set the fall slew rate

6.2.2 Range Selection

Methods to select range:

Method 1: Press Range on the front panel directly to switch the range.

Method 2: Press ◄ ► or rotate ◎ to select **Range**→ Press Enter or ◎ on **Range**→Press ◄ ► or rotate ◎ to select the required range→ Press Enter or ◎ to complete selection.

6.2.3 Operation Mode Selection

Steps to select operation mode:

Press ◄ ► or rotate ◎ to select **Mode**→ Press Enter or ◎ on **Mode**→Press ◄ ► or rotate ◎ to select the required mode→ Press Enter or ◎ to complete selection.

6.2.4 Parameter Setting

Methods to set **Current 1/Current 2/Pulse Wid. 1/Pulse Wid. 2/Rise Slew/Fall Slew** under **CCD**:

Method 1: Press  or rotate  to select the required parameter→Press  or  on the required parameter→Press numeric buttons to input the value→Press  or  to complete setting.

Method 2: Press  or rotate  to select the required parameter→Press  or  on the required parameter→Press  to move the cursor and rotate  to adjust the numeric→Press  or  to complete setting.

Note: To exit from **CCD**, please press  or the function button required.

6.3 Auto Test

The auto test allows users to edit a complex sequence of changes to simulate various changes at the load input.

6.3.1 SEQ Edit

Steps to enter **SEQ Edit**:

Press  → Choose **SEQ Edit** by pressing  or rotating  → Press  or  .

Figure 36 SEQ Edit

Table 21

Parameter	Function
File No.	To set the sequence test file number
Total Steps	To set the total steps of SEQ file
Link to SEQ	To link to the required SEQ file after the present file is completed
Cycle	To set the number of cycles for the file under edit
Step No.	To set the step number for editing
Mode	Mode options: CCH, CCL, CVH, CVL, CVBH(constant voltage charge high range), CVBL(constant voltage charge low range), CRH, CRL, and CP. Different modes relate to different main values and slew rates.
I-Set	This parameter is for setting the main value. If CCH selected, I-Set should be set. If CRH selected, R-Set should be set.
Rise Slew	To set the rise slew rate
Fall Slew	To set the fall slew rate
Dwell	This parameter is for setting the single step delay time. The settable range is 0.0-100,000.0s. Zero means this function disabled.
Inspection	Options: OFF, Voltage, Current and Power. If time accuracy of the waveform is more focused, users can set it to OFF. If Voltage/Current/Power is selected, upper limit and lower limit should be set correspondingly.

6.3.1.1 Parameter Setting

Methods to set **File No./Total Steps/Link to SEQ/Cycle/Step No./I-Set/Rise Slew/Fall Slew/Dwell** under **SEQ Edit**:

Method 1: Press  or rotate  to select the required parameter→Press  or  on the required parameter→Press numeric buttons to input the value→Press  or  to complete setting.

Method 2: Press  or rotate  to select the required parameter→Press  or  on the required parameter→Press  to move the cursor and rotate  to adjust the numeric→Press  or  to complete setting.

6.3.1.2 Mode and Inspection Selection

Steps to select **Mode** and **Inspection**:

Press  or rotate  to select **Mode/Inspection**→ Press  or  on **Mode/Inspection**→Press  or rotate  to select the required option→ Press  or  to complete selection.

Note 1: To save the SEQ file, please press  .

Note 2: To exit from **SEQ Edit**, please press  or the function button required.

6.3.2 Starting Auto Test

Methods to enter **Auto Test**:

Method 1: Press Shift first and then Auto 1 on the front panel.

Method 2: Press Menu → Choose **Auto Test** by pressing ◄ ► or rotating ◯ → Press Enter or ◯.

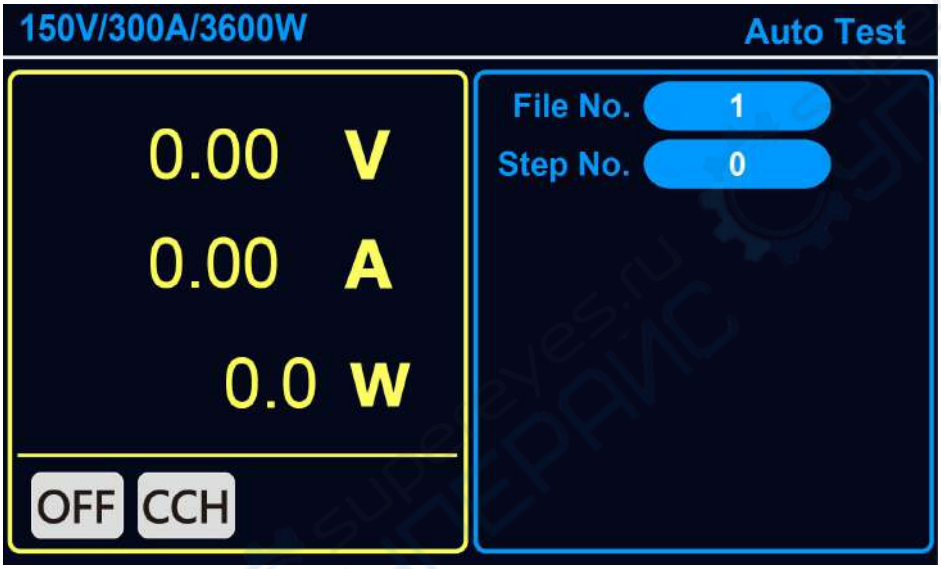

Figure 37 Auto Test Interface

Table 22

Parameter	Function
File No.	To set the sequence test file number
Step No.	Displaying the present test step number

6.3.2.1 File No. Setting

Methods to set **File No.** under **Auto Test**:

Method 1: Press ◄ ► or rotate ◯ to select **File No.**→Press Enter or ◯ on **File No.**→Press numeric buttons to input the value→Press Enter or ◯ to complete setting.

Method 2: Press ◄ ► or rotate ○ to select **File No.**→Press Enter or ○ on **File No.**→Press ◄ ► to move the cursor and rotate ○ to adjust the numeric→Press Enter or ○ to complete setting.

Note 1: After setting the file No., users can press On/Off to start auto test.

Note 2: The present step number will be displayed on the screen.

Note 3: N68000 will shut the input if the test is completed.

Note 4: PASS or FAIL will be displayed on the screen if voltage/current/power is selected for **Inspection** in **SEQ Edit**.

Note 5: To exit from **Auto Test**, please press Menu or the function button required.

6.4 Capacity Test

N68000 provides capacitance test for battery, capacitor or other power supplies. Below is wiring sample of battery capacitance test.

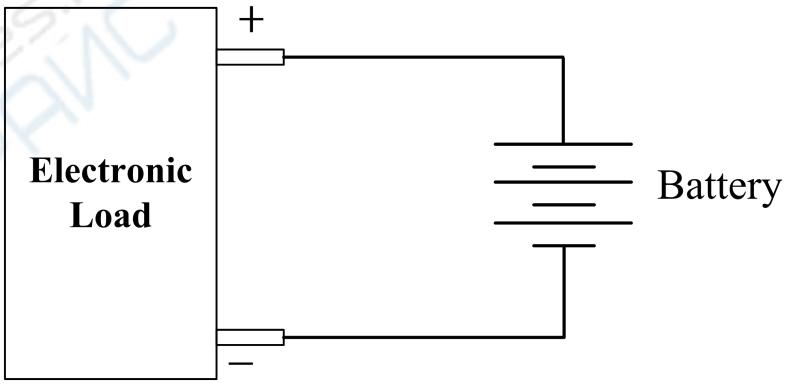

Figure 38 Battery Capacitance Test Wiring

6.4.1 Discharge

Steps to operate discharge test:

1. Connect battery with N68000 properly.
2. Set CV mode.

Press Menu →Choose **Application** by pressing ◄ ► or rotating ◯ → Press Enter or ◯ to enter **Application**→Choose **CV Mode** by pressing ◄ ► or rotating ◯ →Press Enter or ◯ on **CV Mode**→Choose **Discharge** by pressing ◄ ► or rotating ◯ →Press Enter or ◯ to complete selection.

3. Enter discharge test interface.

Methods to enter **Discharge**:

Method 1: Press Shift first and then Discharge 2 on the front panel.

Method 2: Press Menu → Choose **Discharge** by pressing ◄ ► or rotating ◯ → Press Enter or ◯.

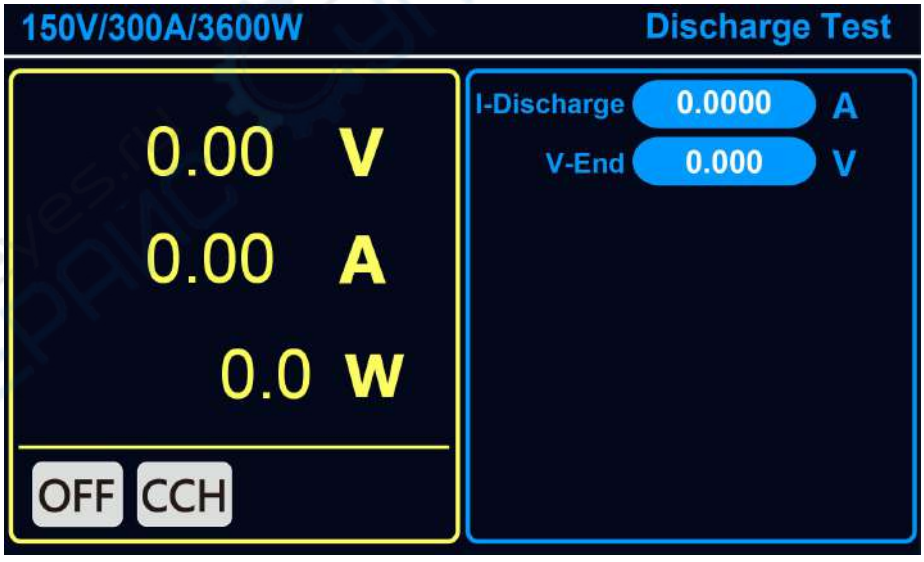

Figure 39 Discharge Test

Table 23

Parameter	Function

I-Discharge	To set the discharge current
V-End	To set the end voltage

4. Set **I-Discharge** and **V-End**.

Methods to set **I-Discharge/V-End**:

Method 1: Press ◄ ► or rotate ◎ to select the required parameter→Press Enter or ◎ on the required parameter→Press numeric buttons to input the value→Press Enter or ◎ to complete setting.

Method 2: Press ◄ ► or rotate ◎ to select the required parameter→Press Enter or ◎ on the required parameter→Press ◄ ► to move the cursor and rotate ◎ to adjust the numeric→Press Enter or ◎ to complete setting.

5. Clear the data.

N68000 records and accumulates the previous load time and discharge capacity. Before testing, please press PROT-CLR to clear the data.

6. Start discharge test.

Press On/Off to start test.

Note 1: When the battery voltage drops to V-End, the test is completed. The battery capacity (Ah) will be displayed on the screen.

Note 2: To exit from **Discharge**, please press Menu or the function button required.

6.4.2 Charge

Steps to operate charge test:

1. Connect battery with N68000 properly.
2. Set CV mode.

Press Menu →Choose **Application** by pressing ◄ ► or rotating ◯ → Press Enter or ◯ to enter **Application**→Choose **CV Mode** by pressing ◄ ► or rotating ◯ →Press Enter or ◯ on **CV Mode**→Choose **Charge** by pressing ◄ ► or rotating ◯ →Press Enter or ◯ to complete selection.

3. Enter charge test interface.

Methods to enter **Charge**:

Method 1: Press Shift first and then Charge 3 on the front panel.

Method 2: Press Menu → Choose **Charge** by pressing ◄ ► or rotating ◯ → Press Enter or ◯.

Figure 40 Charge Test

Table 24

Parameter	Function
I-Charge	To set the charge current
V-Charge	To set the charge voltage
CV Time	To set the constant voltage operation time

4. Set **I-Charge**, **V-Charge** and **CV Time**.

Methods to set **I-Charge/V-Charge/CV Time**:

Method 1: Press ◄ ► or rotate ◎ to select the required parameter→Press Enter or ◎ on the required parameter→Press numeric buttons to input the value→Press Enter or ◎ to complete setting.

Method 2: Press ◄ ► or rotate ◎ to select the required parameter→Press Enter or ◎ on the required parameter→Press ◄ ► to move the cursor and rotate ◎ to adjust the numeric→Press Enter or ◎ to complete setting.

5. Clear the data.

N68000 records and accumulates the previous load time and charge capacity. Before testing, please press PROT-CLR to clear the data.

6. Start charge test.

Press On/Off to start test.

Note 1: N68000 will firstly charge the battery at a constant current. After reaching V-Charge, it will charge at a constant voltage. Until the CV time reaches, it stops charging. The battery charge capacity (W) will be displayed on the screen.

Note 2: To exit from **Charge**, please press Menu or the function button required.

6.5 ESR Test (Optional)

N68000 test battery and capacitor ESR through constant current discharge method.

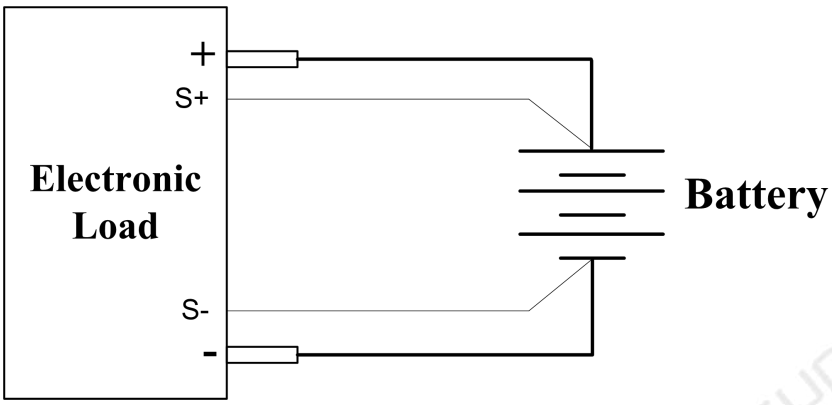

Figure 41 Battery ESR Test Wiring

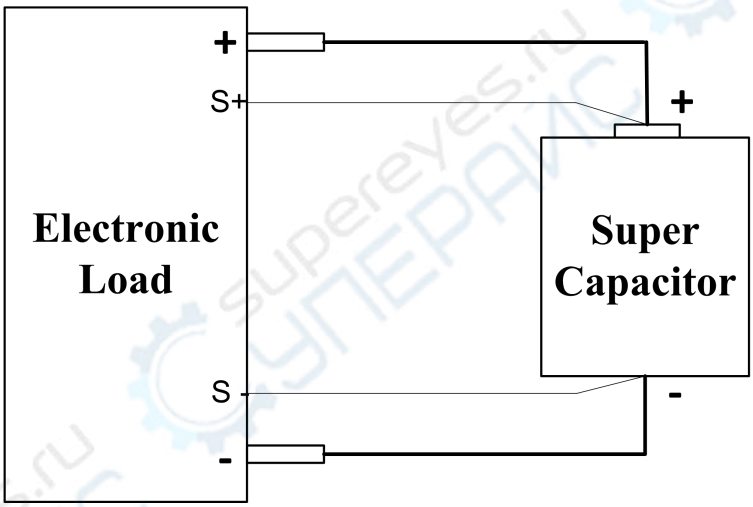

Figure 42 Capacitor ESR Test Wiring

Steps to operate ESR Test:

1. Connect battery or capacitor with N68000 properly.
2. Enter ESR Test interface.

Methods to enter **ESR Test**:

Method 1: Press Shift first and then ESR 4 on the front panel.

Method 2: Press Menu → Choose **ESR Test** by pressing ◄ ► or rotating ○ → Press Enter or ○.

Figure 43 ESR Test

Table 25

Parameter	Function
I-Range	To select the current range, options: CCH and CCL. It is recommended to select CCL for 0 to 10% of maximum current, and select CCH for over 10% of maximum current.
I-Set	To set the discharge current
Test Range	To select the test range, options: 10mV/100mV/1000mV
Method	To select the test method, options: square and N-ms (monopulse)
Test Result	Displaying the rest result

3. Select the current range.

Methods to select range:

Method 1: Press Range on the front panel directly to switch the range.

Method 2: Press ◄ ► or rotate ◎ to select **I-Range**→ Press Enter or ◎ on **I-Range**→Press ◄ ► or rotate ◎ to select the required range→ Press Enter or ◎ to complete selection.

4. Set the discharge current.

Methods to set **I-Set**:

Method 1: Press ◄ ► or rotate ◎ to select **I-Set**→Press Enter or ◎ on **I-Set**→Press numeric buttons to input the value→Press Enter or ◎ to complete setting.

Method 2: Press ◄ ► or rotate ◎ to select **I-Set**→Press Enter or ◎ on **I-Set**→Press ◄ ► to move the cursor and rotate ◎ to adjust the numeric→Press Enter or ◎ to complete setting.

5. Select parameters for **Test Range/Method**.

Press ◄ ► or rotate ◎ to select **Test Range/Method**→ Press Enter or ◎ on **Test Range/Method**→Press ◄ ► or rotate ◎ to select the required parameter→ Press Enter or ◎ to complete selection.

6. Start ESR test.

Press On/Off to start test.

Note 1: During the test, a prompt will be displayed on screen if the wiring is incorrect.
Note 2: Please use high current for supercapacitor test to obtain accurate resistance, due to the small resistance of supercapacitor.

Note 3: To exit from **ESR Test**, please press Menu or the function button required.

6.6 OCP Test

Steps to operate OCP test:
1. Connect DUT with N68000 properly.
2. Enter OCP Test interface.

Methods to enter **OCP Test**:

Method 1: Press Shift first and then OCP 5 on the front panel.

Method 2: Press Menu → Choose **OCP Test** by pressing ◄ ► or rotating ○ → Press Enter or ○.

Figure 44 OCP Test

Table 26

Parameter	Function
I-Start	To set the start current
I-Incr	To set the current increment
V-End	To set the end voltage
Dwell	To the dwell time for single step
Test Result	Displaying the rest result

3. Set parameters.

Methods to set **I-Start/I-Increment/V-End/Dwell**:

Method 1: Press ◄ ► or rotate ○ to select the required parameter→Press Enter or ○ on the required parameter→Press numeric buttons to input the value→Press Enter or ○ to complete setting.

Method 2: Press ◄ ► or rotate ○ to select the required

parameter→Press Enter or on the required parameter→Press ◄ ► to move the cursor and rotate to adjust the numeric→Press Enter or to complete setting.

4. Start OCP test.

Press On/Off to start test.

Note: To exit from **OCP Test**, please press Menu or the function button required.

6.7 MPPT Test

Steps to operate MPPT test:

1. Enter MPPT Test interface.

Steps to enter **MPPT**:

Press Menu → Choose **MPPT** by pressing ◄ ► or rotating → Press Enter or .

Figure 45 MPPT Test

2. Select the mode.

Steps to select mode:

Press  or rotate  to select **Mode**→ Press  or  on **Mode**→Press  or rotate  to select the required mode→ Press  or  to complete selection.

3. Set the parameters.

Methods to set parameters:

Method 1: Press  or rotate  to select the required parameter→Press  or  on the required parameter→Press numeric buttons to input the value→Press  or  to complete setting.

Method 2: Press  or rotate  to select the required parameter→Press  or  on the required parameter→Press  to move the cursor and rotate  to adjust the numeric→Press  or  to complete setting.

4. Start MPPT test.

Press  to start test.

Note: To exit from **MPPT**, please press  or the function button required.

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 NGI.

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 N68000 series should be calibrated once a year.

8 Main Technical Data

Attention:

The measurement accuracy is identified by the following conditions: within one year after calibration, OTP temperature 85℃, operating temperature 0-40℃, full power operating temperature 0-25℃, recommended operating temperature 18-28℃, and the relative humidity up to 80%.

Please warm up the device for half hour to ensure the measurement accuracy.

Table 27 2.4kW

Model	N68024-150-200		N68024-150-060		N68024-600-020	
Voltage	150V		150V		600V	
Current	200A		60A		20A	
Power	2400W					
Min. Operating Voltage	2V@200A		2V@60A		4.5V@20A	
CC Mode						
Range	0~20A	0~200A	0~6A	0~60A	0~2A	0~20A
Setting Resolution	1mA	10mA	0.1mA	1mA	0.1mA	1mA
Setting Accuracy (23±5℃)	0.05%+0.1%F.S.					
CV Mode						
Range	0~15V	0~150V	0~15V	0~150V	0~60V	0~600V
Setting Resolution	1mV	10mV	1mV	10mV	1mV	10mV
Setting Accuracy (23±5℃)	0.05%+0.05%F.S.					
CP Mode						
Range	0~2400W					
Setting Resolution	0.1W					
Setting Accuracy (23±5℃)	0.5%+1%F.S.					
CR Mode						
Range	0.02Ω~75Ω	0.3Ω~750Ω	0.05Ω~250Ω	1Ω~2500Ω	0.56Ω~3000Ω	11.2Ω~30000Ω

Setting Resolution	16bits					
Setting Accuracy (23±5℃)	0.35%+41.7 mS	0.35%+4.1 6mS	0.35%+1 2.5mS	0.35%+1.25 mS	0.35%+1.1m S	0.35%+0.1 mS
Slew Rate						
Current	3.3~200A/ ms	200~10000A /ms	1~60A /ms	60~3000A /ms	0.3~20A/ms	20~1000A/ ms
Voltage	1.0~50V/ms	50~500V/ ms	1.0~50V /ms	50~500V/ ms	5.0~250V/m s	250~2500V/m s
Power	3.3~200A/ ms	200~10000A /ms	1~60A /ms	60~3000A /ms	0.3~20A/ms	20~1000A/ ms
Resistance	3.3~200A/ ms	200~10000A /ms	1~60A /ms	60~3000A /ms	0.3~20A/ms	20~1000A/ ms
Accuracy (23±5℃)	(1+35%)* Setting value					
Voltage Measurement						
Range	0~15V	0~150V	0~15V	0~150V	0~60V	0~600V
Readback Accuracy (23±5℃)	0.05%+0.05%F.S.					
Current Measurement						
Range	0~20A	0~200A	0~6A	0~60A	0~2A	0~20A
Readback Accuracy (23±5℃)	0.05%+0.1%F.S.					
Power Measurement						
Range	0~2400W					
Readback Accuracy (23±5℃)	0.5%+1%F.S.					
Dynamic Mode						
T1&T2	0.015~60000ms					
Resolution	1μs/1ms					
Accuracy (23±5℃)	≤20μs+100ppm					
Others						
Interface	LAN/RS232/CAN					
AC Input	Single phase, please refer to the voltage mark at the rear panel.					
Sampling Frequency	25Hz					

Communication Response Time	≤10ms
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa
Net Weight	Approx. 23.4kg
Dimension	3U, 132.5(H)*482.0(W)with handle*612.0(D) mm

Table 28 2.4kW

Model	N68024-600-060		N68024-1000-020		N68024-1000-060	
Voltage	600V		1000V		1000V	
Current	60A		20A		60A	
Power	2400W					
Min. Operating Voltage	4.5V@60A		5V@20A		20V@60A	
CC Mode						
Range	0~6A	0~60A	0~2A	0~20A	0~6A	0~60A
Setting Resolution	0.1mA	1mA	0.1mA	1mA	0.1mA	1mA
Setting Accuracy (23±5℃)	0.05%+0.1%F.S.					
CV Mode						
Range	0~60V	0~600V	0~100V	0~1000V	0~100V	0~1000V
Setting Resolution	1mV	10mV	10mV	100mV	10mV	100mV
Setting Accuracy	0.05%+0.05%F.S.					
CP Mode						
Range	0~2400W					
Setting Resolution	0.1W					
Setting Accuracy	0.5%+1%F.S.					

CR Mode						
Range	0.19Ω~1000Ω	3.8Ω~10000Ω	0.93Ω~5000Ω	18.6Ω~50000Ω	0.31Ω~1666.6Ω	6.2Ω~16666Ω
Setting Resolution	16bits					
Setting Accuracy (23±5℃)	0.35%+3.2mS	0.35%+0.31mS	0.35%+0.7mS	0.35%+0.06mS	0.35%+1.9mS	0.35%+0.18mS
Slew Rate						
Current	1~60A/ms	60~3000A/ms	0.3~20A/ms	20~1000A/ms	1~60A/ms	60~3000A/ms
Voltage	5.0~250V/ms	250~2500V/ms	8.0~400V/ms	400~4000V/ms	8.0~400V/ms	400~4000V/ms
Power	1~60A/ms	60~3000A/ms	0.3~20A/ms	20~1000A/ms	1~60A/ms	60~3000A/ms
Resistance	1~60A/ms	60~3000A/ms	0.3~20A/ms	20~1000A/ms	1~60A/ms	60~3000A/ms
Accuracy (23±5℃)	(1+35%)* Setting value					
Voltage Measurement						
Range	0~60V	0~600V	0~100V	0~1000V	0~100V	0~1000V
Readback Accuracy (23±5℃)	0.05%+0.05%F.S.					
Current Measurement						
Range	0~6A	0~60A	0~2A	0~20A	0~6A	0~60A
Readback Accuracy (23±5℃)	0.05%+0.1%F.S.					
Power Measurement						
Range	0~2400W					
Readback Accuracy (23±5℃)	0.5%+1%F.S.					
Dynamic Mode						
T1&T2	0.015~60000ms					

Resolution	1μs/1ms
Accuracy (23±5℃)	≤20μs+100ppm
Others	
Interface	LAN/RS232/CAN
AC Input	Single phase, please refer to the voltage mark at the rear panel.
Sampling Frequency	25Hz
Communication Response Time	≤10ms
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa
Net Weight	Approx. 23.4kg
Dimension	3U, 132.5(H)*482.0(W)with handle*612.0(D) mm

Table 29 3.6kW

Model	N68036-150-300		N68036-150-090		N68036-600-030	
Voltage	150V		150V		600V	
Current	300A		90A		30A	
Power	3600W					
Min. Operating Voltage	2V@300A		2V@90A		4.5V@30A	
CC Mode						
Range	0~30A	0~300A	0~9A	0~90A	0~3A	0~30A
Setting Resolution	1mA	10mA	0.1mA	1mA	0.1mA	1mA
Setting Accuracy (23±5℃)	0.05%+0.1%F.S.					
CV Mode						
Range	0~15V	0~150V	0~15V	0~150V	0~60V	0~600V
Setting	1mV	10mV	1mV	10mV	1mV	10mV

Resolution						
Setting Accuracy	0.05%+0.05%F.S.					
CP Mode						
Range	0~3600W					
Setting Resolution	0.1W					
Setting Accuracy	0.5%+1%F.S.					
CR Mode						
Range	0.01Ω~50Ω	0.2Ω~500Ω	0.04Ω~166.6Ω	0.7Ω~1666Ω	0.38Ω~2000Ω	7.5Ω~20000Ω
Setting Resolution	16bits					
Setting Accuracy (23±5℃)	0.35%+62.5mS	0.35%+6.25mS	0.35%+18.8mS	0.35%+1.88mS	0.35%+1.6mS	0.35%+0.16mS
Slew Rate						
Current	5~300A/ms	300~15000A/ms	1.5~90A/ms	90~4500A/ms	0.5~30A/ms	30~1500A/ms
Voltage	1.0~50V/ms	50~500V/ms	1.0~50V/ms	50~500V/ms	5.0~250V/ms	250~2500V/ms
Power	5~300A/ms	300~15000A/ms	1.5~90A/ms	90~4500A/ms	0.5~30A/ms	30~1500A/ms
Resistance	5~300A/ms	300~15000A/ms	1.5~90A/ms	90~4500A/ms	0.5~30A/ms	30~1500A/ms
Accuracy (23±5℃)	(1+35%)* Setting value					
Voltage Measurement						
Range	0~15V	0~150V	0~15V	0~150V	0~60V	0~600V
Readback Accuracy (23±5℃)	0.05%+0.05%F.S.					
Current Measurement						
Range	0~30A	0~300A	0~9A	0~90A	0~3A	0~30A
Readback Accuracy (23±5℃)	0.05%+0.1%F.S.					
Power Measurement						
Range	0~3600W					
Readback Accuracy	0.5%+1%F.S.					

(23±5℃)	
Dynamic Mode	
T1&T2	0.015~60000ms
Resolution	1μs/1ms
Accuracy (23±5℃)	≤20μs+100ppm
Others	
Interface	LAN/RS232/CAN
AC Input	Single phase, please refer to the voltage mark at the rear panel.
Sampling Frequency	25Hz
Communication Response Time	≤10ms
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa
Net Weight	Approx. 27.2kg
Dimension	3U, 132.5(H)*482.0(W)with handle*612.0(D) mm

Table 30 3.6kW

Model	N68036-600-090		N68036-1000-030		N68036-1000-090	
Voltage	600V		1000V		1000V	
Current	90A		30A		90A	
Power	3600W					
Min. Operating Voltage	4.5V@90A		5V@30A		20V@90A	
CC Mode						
Range	0~9A	0~90A	0~3A	0~30A	0~9A	0~90A
Setting Resolution	0.1mA	1mA	0.1mA	1mA	0.1mA	1mA
Setting Accuracy (23±5℃)	0.05%+0.1%F.S.					
CV Mode						
Range	0~60V	0~600V	0~100V	0~1000V	0~100V	0~1000V
Setting Resolution	1mV	10mV	10mV	100mV	10mV	100mV
Setting	0.05%+0.05%F.S.					

Accuracy						
CP Mode						
Range	0~3600W					
Setting Resolution	0.1W					
Setting Accuracy	0.5%+1%F.S.					
CR Mode						
Range	0.13Ω~666.6Ω	2.5Ω~6666Ω	0.62Ω~3333.3Ω	12.4Ω~33333Ω	0.21Ω~1111.1Ω	4.2Ω~11111Ω
Setting Resolution	16bits					
Setting Accuracy (23±5℃)	0.35%+4.7mS	0.35%+0.47mS	0.35%+0.9mS	0.35%+0.09mS	0.35%+2.8mS	0.35%+0.28mS
Slew Rate						
Current	1.5~90A/ms	90~4500A/ms	0.5~30A/ms	30~1500A/ms	1.5~90A/ms	90~4500A/ms
Voltage	5.0~250V/ms	250~2500V/ms	8.0~400V/ms	400~4000V/ms	8.0~400V/ms	400~4000V/ms
Power	1.5~90A/ms	90~4500A/ms	0.5~30A/ms	30~1500A/ms	1.5~90A/ms	90~4500A/ms
Resistance	1.5~90A/ms	90~4500A/ms	0.5~30A/ms	30~1500A/ms	1.5~90A/ms	90~4500A/ms
Accuracy (23±5℃)	(1+35%)* Setting value					
Voltage Measurement						
Range	0~60V	0~600V	0~100V	0~1000V	0~100V	0~1000V
Readback Accuracy (23±5℃)	0.05%+0.05%F.S.					
Current Measurement						
Range	0~9A	0~90A	0~3A	0~30A	0~9A	0~90A
Readback Accuracy (23±5℃)	0.05%+0.1%F.S.					
Power Measurement						
Range	0~3600W					
Readback Accuracy (23±5℃)	0.5%+1%F.S.					
Dynamic Mode						

T1&T2	0.015~60000ms
Resolution	1μs/1ms
Accuracy (23±5℃)	≤20μs+100ppm
Others	
Interface	LAN/RS232/CAN
AC Input	Single phase, please refer to the voltage mark at the rear panel.
Sampling Frequency	25Hz
Communication Response Time	≤10ms
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa
Net Weight	Approx. 27.2kg
Dimension	3U, 132.5(H)*482.0(W)with handle*612.0(D) mm

Note 1: For other specifications, please contact NGI.
Note 2: All specifications are subject to change without notice.