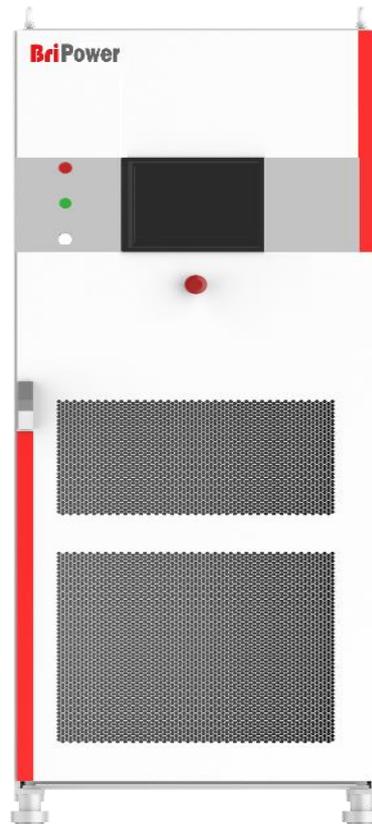


## **User manual of ESA Series Power Supply**

Product features might be changed by software upgrade. Please acquire the latest version of the manual from our website or contact technical support.



## **About Bridge Technology**

Bridge Technology is a company focusing on business of power supplies and test systems for new energy applications. We are devoted to providing high quality products and solutions for customers.

Bridge Technology has a top-class R&D team in China, works on modularization and standardization power supplies and systems. We have sales, technical support, R&D and manufacture in Shanghai and Nanjing.

Nanjing Bridge New Energy Technology was founded on Jan 12th, 2016, focusing on R&D and manufacturing BriPower brand power systems, including bi-directional AC sources for grid simulation, bi-directional DC sources for battery simulation, and regenerative loads. The BriPower AC&DC power systems are widely used in new energy and related fields.

## **Date and Revision**

Sep 2019 Revision 1.0

## **Contact Information**

Factory: Nanjing Bridge New Energy Technology Co., Ltd

Sales Company: Shanghai Bridge Electronic Technology Co., Ltd

General information: [info@bridgetech.cn](mailto:info@bridgetech.cn)

Technical Support: [support@bridgetech.cn](mailto:support@bridgetech.cn)

Repair & Calibration: [service@bridgetech.cn](mailto:service@bridgetech.cn)

Int'l Sales: [contact@bridgetech.com.sg](mailto:contact@bridgetech.com.sg)

Tel: +86 40010-18618

Web: [www.bripower.cn](http://www.bripower.cn)

## **Summary of Safety Requirement**

Please review the following safety precautions carefully before putting the equipment into operation to avoid any personal injury or damage to the equipment and any product connected to it. To prevent potential hazards, please follow the instructions specified in this manual to use the instrument properly.

### **Use Proper Cables**

Please choose the proper specification cable according to the equipment specification within the local country could be used.

### **Ground the Equipment**

The equipment is grounded through the Protective Earth Bus. To avoid electric shock, connect the earth terminal to the Protective Earth terminal before connecting any input or output terminals.

### **Use Proper Overvoltage Protection**

Ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the operator might be exposed to the danger of an electric shock.

### **Avoid Circuit or Wire Exposure**

Do not touch exposed junctions and components when the module is powered on.

### **Keep Equipment Surfaces Clean and Dry**

To avoid dust or moisture from affecting the performance of the equipment, keep the surfaces of the equipment clean and dry.

## Safety Notices and Symbols

### Safety Notices in this Manual:

**WARNING**

Indicates a potentially hazardous situation or practice which, if not avoided, will result in serious injury or death.

**CAUTION**

Indicates a potentially hazardous situation or practice which, if not avoided, could result in damage to the product or loss of important data.

### Safety Terms in this Manual:

**DANGER**

It calls attention to an operation, if not correctly performed, could result in injury or hazard immediately.

**WARNING**

It calls attention to an operation, if not correctly performed, could result in potential injury or hazard.

**CAUTION**

It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

### Safety Symbols on the Product or in this Manual:

**Hazardous Voltage****Safety Warning****Protective Earth Terminal****Test Ground****Chassis Ground**

## **Important Safety Instructions**

**Please read this manual thoroughly before putting the equipment into operation. Pay regard to the following safety instructions and keep this manual nearby for future purpose.**

### **INITIAL OPERATION**

This operating manual is based on the state of technology at the time of printing. However, it is possible that despite regular control and correction, the present document contains printing errors or deficiencies. Nanjing Bridge New Energy Technology Co.,Ltd assumes no liability for any technical, printing or translational errors within this manual.

### **UNPACKING**

Please make sure that the shipping carton and the packaging is free of damage. If external damage is found, it is important to record the type of damage. Please keep the original packaging to ensure the device is adequately protected in case it needs to be transported in the future or claims for compensation need to be asserted.

### **SETTING UP**

To avoid electric shocks and product failure, the device should be installed in a temperature and humidity controlled indoor environment. The ambient temperature must not exceed 40°C. The device must never be exposed to liquids or extreme humidity.

### **VISUAL INSPECTION**

The unit must be examined immediately for defects or damages in transit. Damage caused during transport may be loose or broken control knobs and bent or broken connectors. Do not use the device if any physical damage is apparent. Please inform the carriers and a representative of Bridge Technology immediately.

## MAINS OPERATION

Make sure to verify the model number and voltage stated on the nameplate. Damages due to wrong power feed are not covered by guarantee conditions.



### CAUTION

The unit must only be operated when connected directly to the mains. To avoid damage, do not connect the unit to isolating transformers, autotransformers, magnetic current limiters or similar devices.

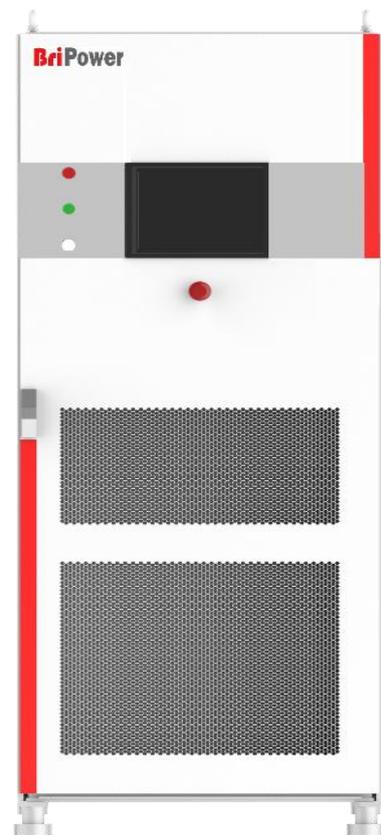
### INTENDED USE

The device corresponds to protection class I and has a galvanic isolation between the input and the output circuit. The device must be grounded on the input side, since the grounding ensures protection against contact. In the case of locally variable devices, the earth is connected to the device by means of a cold-plug connector, and the ground is connected to the screw terminal provided for locally-variable devices (screw contacts at the grid input). In the case of devices with high leakage current (marking on the device), the existing grounding bolt must additionally be connected to the domestic installation earth. For compliance with the EMC and safety regulations (CE, approvals), the device may only be operated with PE connected. The device may only be operated by trained personnel and in accordance with the instructions for use. Typical fields of application are laboratories, industry and service engineering. Applications which can lead to injuries or death in the event of a fault in the device are not permitted.

## ESA Series Overview

### Main Features

- Single system from 30kVA to 500kVA and parallel up to 4MVA and above
- Independent three-phase output
- Voltage and frequency sequencing programming via GUI, slew rate can be programmed
- ON and OFF output phase angle can be programmed
- Current limit can be programmed, output can be shorted for short circuit test
- Trigger out, TTL signal output for voltage or frequency change
- LAN/RS485/analog interfaces (standard), RS232 interface (optional)
- 4 quadrant operation, regenerative up to 100% of rated output power back to grid (-R option)
- Up to 40th harmonic waveform generation
- Voltage drop simulation (LVRT for inverter test)
- RLC load simulation (-RLC option)
- Regenerative AC load (-LD option)
- TFT-Touch panel operation
- Mod-bus/SCPI protocols
- CE conformity
- Customized voltage, current and power ranges
- Emergency stop button
- Switchable insulation monitoring
- Output contactor
- Remote sense



## **Document Overview**

### **Chapter 1 Quick Start**

Introduce the appearance, front panel, rear panel user interface as well as internal structure of power source. In addition, it provides the detailed procedures of power connection, power-on/off inspection.

### **Chapter 2 GUI Control Software**

Introduce the function and operation method of product's control software in detail.

### **Chapter 3 Remote Control**

Introduce how to realize the remote control of the equipment.

### **Appendix A — Specification of ESA Series Power Supply**

List the specifications of ESA series power supply.

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## Chapter 1 Quick Start

The contents of this chapter are as follows:

- ✧ 1.1 General Inspection
- ✧ 1.2 Appearance and Outline
- ✧ 1.3 Front Panel
- ✧ 1.4 Rear Panel
- ✧ 1.5 Internal Structure
- ✧ 1.6 Connect to Power
- ✧ 1.7 Power-on/off Inspection
- ✧ 1.8 User Interface

## **1.1 General Inspection**

### **1.1.1 Inspect the packing**

If the packaging has been damaged, do not dispose the damaged packaging or cushioning materials until the shipment has been checked for completeness and has passed both electrical and mechanical inspection.

The consigner or carrier shall be liable for the damage to the product resulting from shipment. Factory would not be responsible for free maintenance/rework or replacement of the product.

### **1.1.2 Inspect the product**

In case of any mechanical damage, missing parts, or failure in passing the electrical and mechanical tests, contact your local sales representative.

### **1.1.3 Check the accessories**

Please check the accessories according to the packing lists. If the accessories are damaged or incomplete, please contact your local sales representative.

## **1.2 Appearance and outline**

The equipment adopts integrated module design, the appearance is simple and generous.

The overall appearance of the equipment is shown in Figure 1-1. The cabinet is equipped with casters, which makes it easier to move. There are a 10-inch touch screen, status indicators and an emergency stop button on the front panel. The rear panel is composed of a communication port and a line voltage drop compensation terminal.

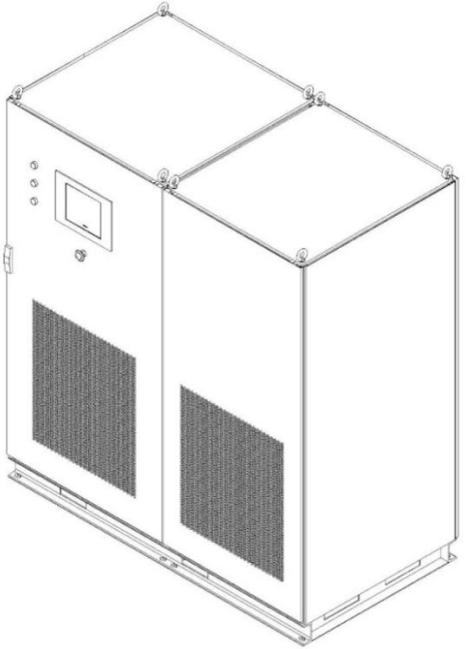


Figure1-1 Appearance of the equipment

## 1.3 Front Panel

This section introduces the front panel of ESA series power source. The differences of models are introduced separately.

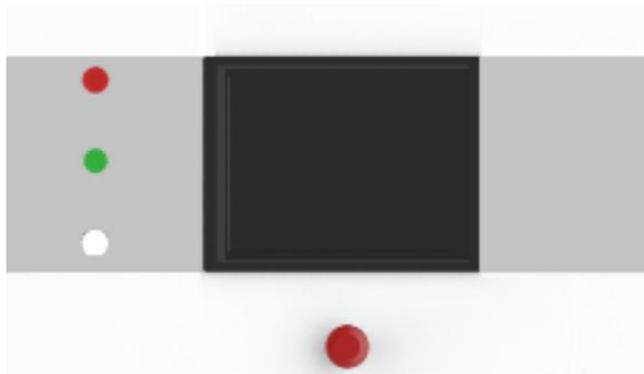


Figure1-2 Front panel of ESA series

### 1.3.1 LCD

10 inches TFT display. It is used to display the system parameter setting, system output state, menu items, prompt messages, etc. The touch displayer panel is a capacitive touch TFT screen, and is based on Windows operating system. GUI Control software is designed on the platform of LabView.

### 1.3.2 Indicator of Status

Lights indicate the working state of the power source in a concise manner. It includes indicator of standby mode, indicator of running and fault indicator.

<b>Red</b>	There is a system error.
<b>Green</b>	System is running normally.
<b>White</b>	System is standby.

### 1.3.3 Emergency Stop Button

The emergency stop button is only used when an unexpected emergency occurs. Do not press this button in normal working condition.

## 1.4 Rear Panel

This section introduces the rear panel of ESA series power source. The introduction of each part is shown in the following table.

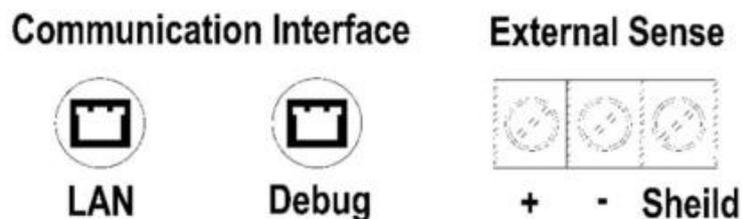


Figure1-3 Rear Panel of ESA Series

<b>LAN</b>	This interface is a communication interface used for remote control.
<b>Debug</b>	The Debug port is reserved for firmware update or debug.
<b>External Sense</b>	Terminal of voltage compensation for long distance.

The output voltages at the load can be directly monitored via the external sense on the back of the power source, which is usually for long distance power transfer.

## 1.5 Internal Structure

As shown in Figure 1-4, the left cabinet consists of control module, input circuit breaker, capacitor output filter, pre-charging resistor and transformer; the right cabinet consists of power module and output reactor components, etc.

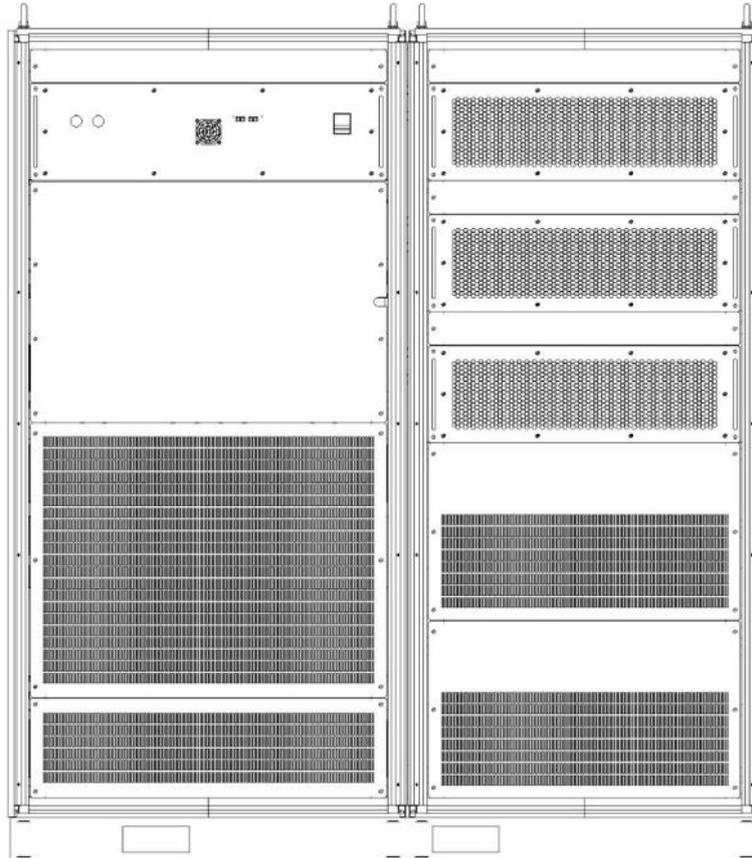


Figure1-4 Internal Structure

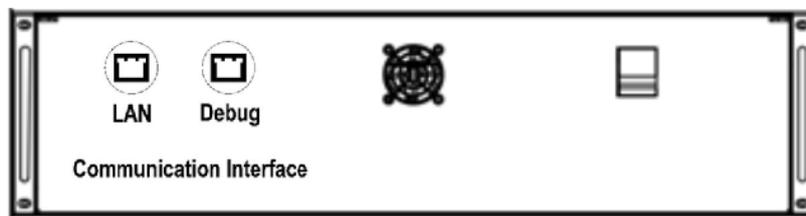


Figure1-5 Control Module

<b>LAN</b>	This interface is a communication interface used for remote control
<b>Debug</b>	The Debug port is reserved for firmware update or debug
<b>Power Switch</b>	This switch is used to power on the control module.

## **1.6 Connect to Power**

ESA series power source supports the world grid standards, but a particular product supports the GRID SYSTEM only for one country or region. Before the power supply is used, it is necessary to verify that the product specifications are consistent with the Local GRID. And please connect the power following the steps below.

### **1.6.1 Check the input power**

Make sure that specifications of the power source are consistent with the local GRID, such as voltage and frequency.

### **1.6.2 Check the fuse**

When the product leaves factory, the specified fuse is installed. Please check whether the fuse matches the actual input voltage according to the "Input Power Requirements" at the rear panel of the product.

### **1.6.3 Cable selection**

The user should select the appropriate cable and cold-pressed terminal according to the equipment's input/output voltage level and current, and crimp the grid side AC input cable and the AC output cable.

### **1.6.4 Connect the AC power**

Connect the power source to AC power supply with proper specification cable according to the product specification within the local country could be used. Wiring methods refer to the following steps.

- A.** Remove the bottom baffle after opening the front cabinet door. The user can access the grid side incoming line, earthing protection wire PE, the

positive and negative poles on the DC side into the cabinet through the threading holes at the bottom of the cabinet (marked in red in Figure 1-6), and reliably connect with the terminal/wire copper bar.



### Warning

For safety reasons, the grounding protection PE must be connected reliably.

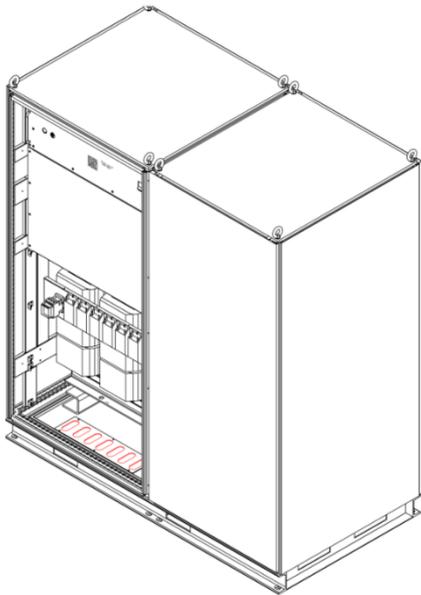


Figure1-6 Holes for cables

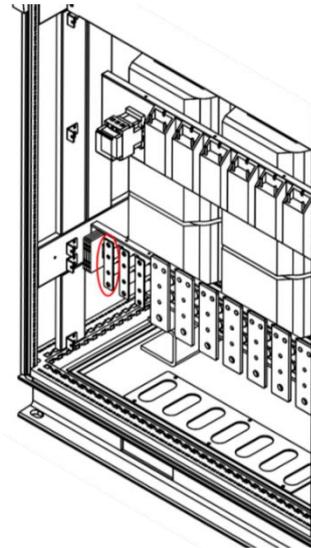


Figure1-7 The wiring copper bar

**B.** Lay the PE cable from the cable hole at the bottom of the cabinet and reliably connect with the connection copper bar shown in Figure 1-7, and ensure both side of PE cable are well grounded. The grounding terminals are connected with the main components, and the users should connect them with the earth through suitable cables before putting them into use.

**C.** The AC incoming line (L1/L2/L3/N) and the positive and negative terminals/copper bar on the DC side are shown in figure 1-8. After the cables are threaded through the holes at the bottom, it is connected to the terminal block/wiring copper bar. After the connection is completed, the phase sequence and connection reliability should be carefully checked to

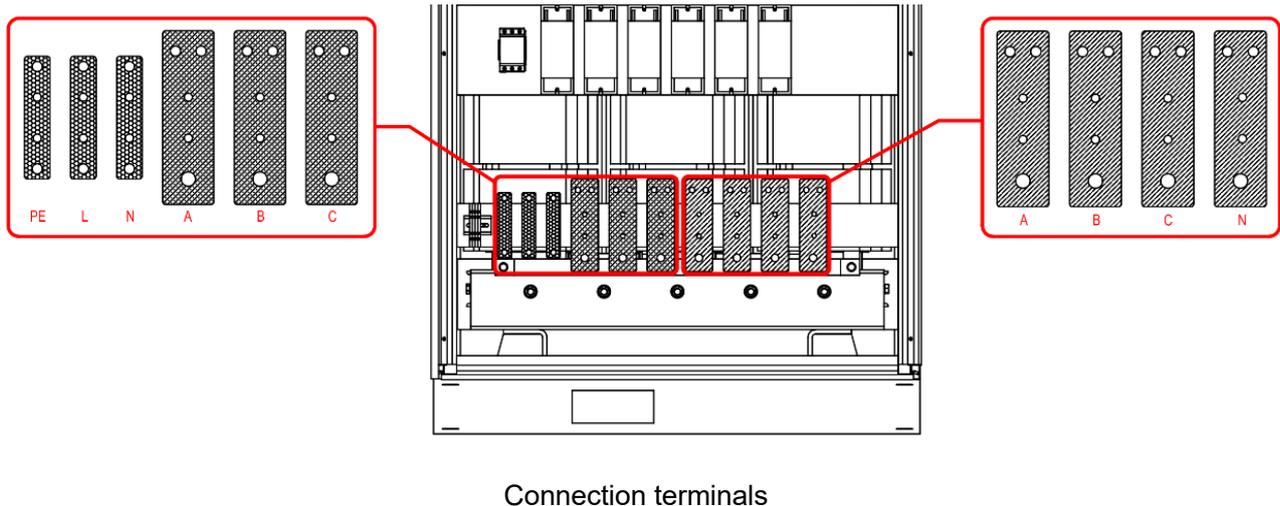
ensure that the phase sequence is correct, the connection is reliable, and the identification is clear to facilitate maintenance and repair in the future.



### Warning

Before connecting the cable, make sure that the upper switch is in the off state. Live work is strictly prohibited. At the same time, ensure that a reliable protective grounding has been made.

Figure 1-8



## 1.7 Power on Inspection

### 1.7.1 AC Input power on

After the cable connection is completed, the circuit breaker on the grid side could be turned on (as shown in Figure 1-9). It should be noted that the input connection is 3P+N, and the correct phase sequence must be confirmed.

### 1.7.2 Control module power on

After power-on for grid side, open the cabinet door, close the power switch of the control module shown in Figure 1-10 (②), then the control unit starts to work. After completing these operations, close the cabinet door, and the power supply will enter standby state.

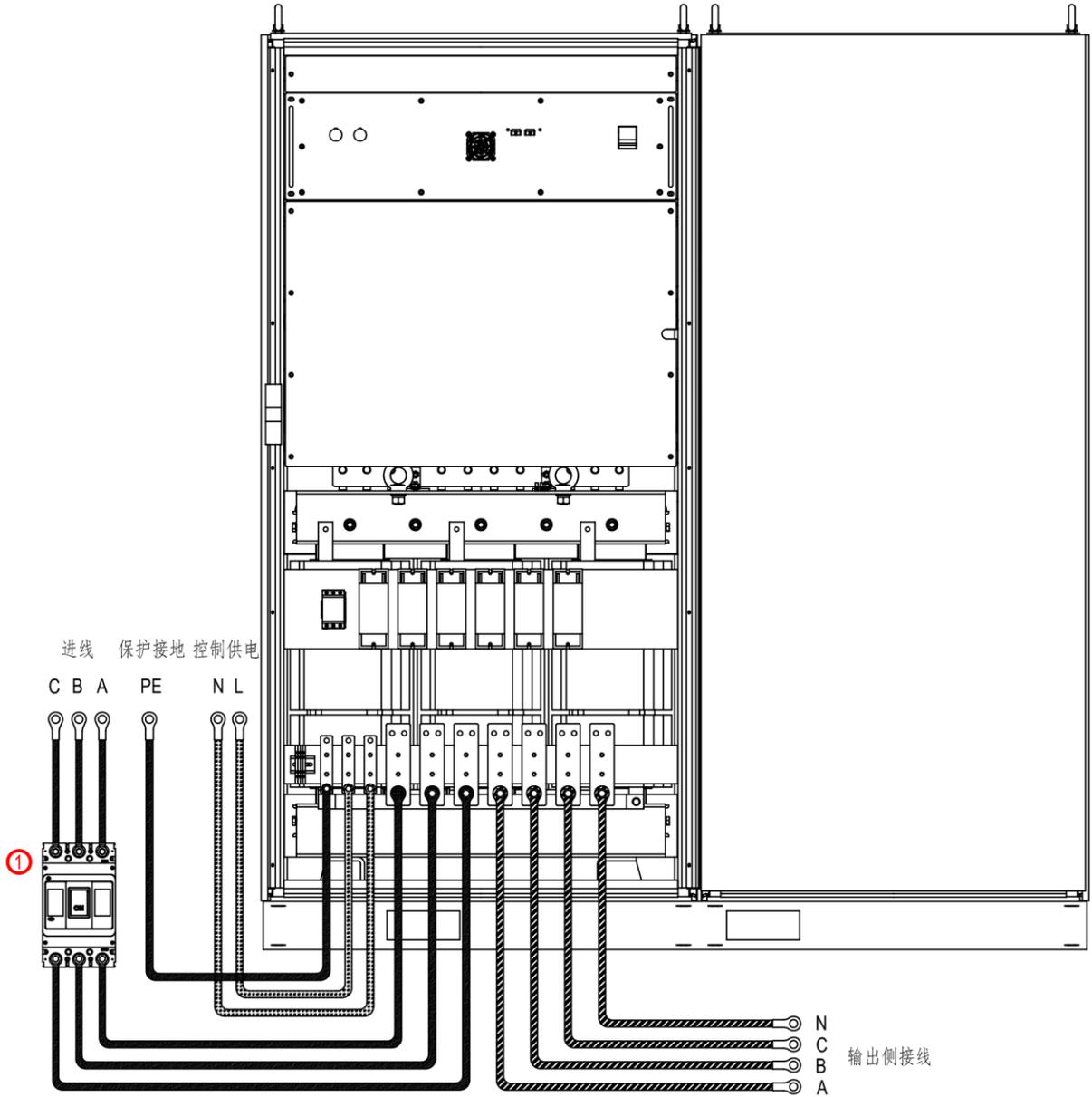


Figure1-9 Connection of Mains and DUT

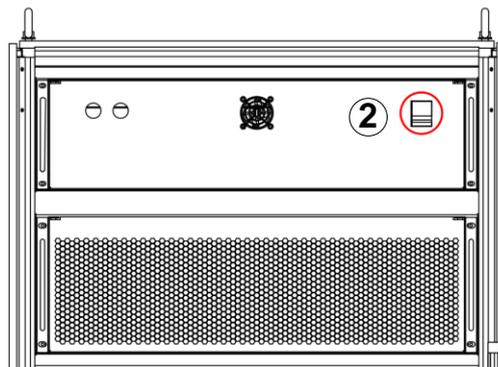


Figure 1-10 Power on the Control module

## 1.8 User Interface

The GUI software is installed in the touch panel, which is in fact a computer with Microsoft Windows. The software can also be installed in control PC connected to power supply. The GUI software provides functions including output settings, island test settings, protection parameter settings, waveform display, measurement display and faults display.

Also, the power source can be controlled in local and remote style. Both of which have same interface and operation. The modes will be described in Chapter 2.

While the Power knob is turn on, it takes several seconds to initialize the controller and other units. Make sure that the power's output connection terminals are correctly connected. Then, All the functions and parameters can be set and run via touch panel displayer or GUI software.

## Chapter 2 Control Software

The contents of this chapter are as follows:

- ✧ 2.1 Setting
- ✧ 2.2 Comprehensive Test
- ✧ 2.3 Island Test
- ✧ 2.4 Measurement Parameter Monitoring
- ✧ 2.5 Wave Monitoring
- ✧ 2.6 Fault Monitoring

## 2.1 Setting

### 2.1.1 Communication parameters

Ensure the remote workstation/PC and the power source are in the same network segment before connection. Default IP address: 192.168.1.2, port: 502, default gateway: 255.255.255.0.

The IP address of the remote workstation/PC shall not be the same as that of the power source. If the remote workstation/PC and the power source are in the same LAN, ensure their IP addresses are unique.

In addition, the touch screen software of the power source and the program control GUI software have the same operation method, and the operation method described in this chapter is applicable to both the touch screen software and the program control GUI software.



Figure 2-1 Connect Power Supply and Workstation/PC with Straight-Through Wired Cables

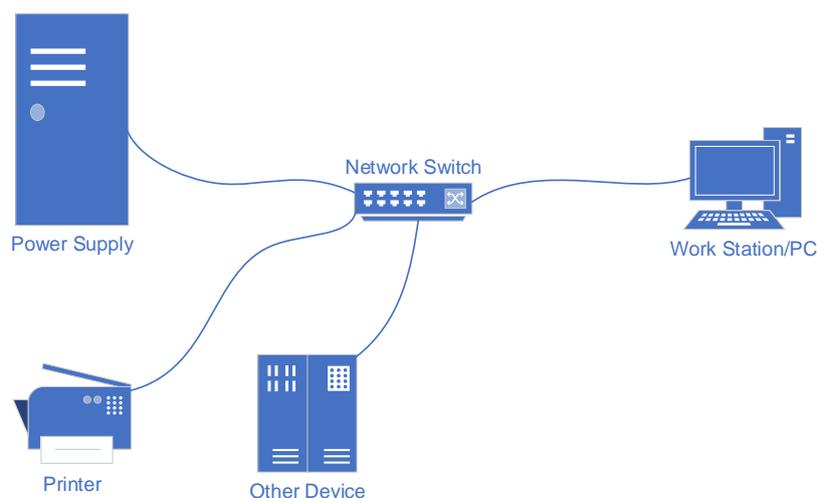


Figure 2-2 LAN connection of power supply and workstation/PC

In general, the workstation or PC connecting to the power source hardware must comply with the following requirements:

- Processor: Intel Core 2 Duo or above
- RAM: 2GB or above
- Operating System: Windows 7 or above
- 10/100/1000 Mbps network port adaptor
- Network Switch (LAN users)
- CAT 5 network cable

## 2.1.2 Protection parameters

Before performing any test, to protect the device from accidental damage, the values should be set according to test requirements. Generally, the protection value should be slightly higher than the normal supply voltage. The user can click the “Hardware Limits” option to set it, as shown in Figure 2-3. The meanings of the parameters are shown in the following table.

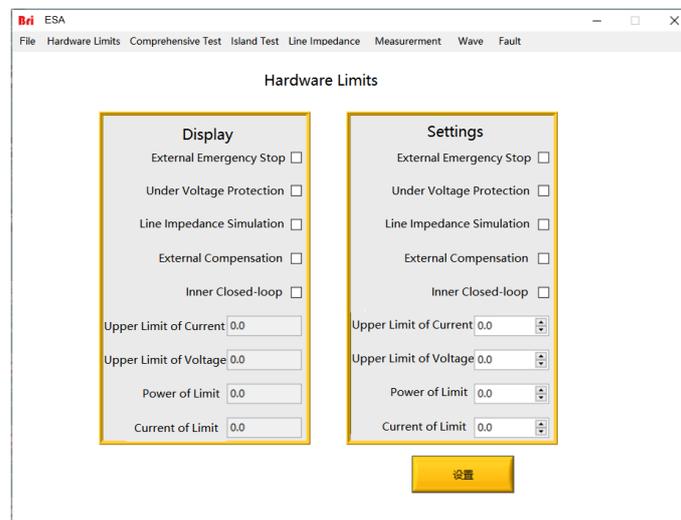


Figure 2-3 Hardware limits interface

<b>External Emergency Stop</b>	If checked, the external emergency stop button is valid.
<b>Under Voltage Protection</b>	If checked, the under voltage protection is valid.
<b>Line Impedance Simulation</b>	If checked, the line impedance simulation is valid.

<b>External Compensation</b>	If checked, the external compensation is valid. Be sure to connect the compensation terminal to the equipment under text after checking.
<b>Inner Closed-loop</b>	Open the inner closed-loop.
<b>Upper Limit of Current</b>	Set the upper limit protection value of the output current. When the output current exceeds this limit, a protection action occurs and the output circuit or input is cut off.
<b>Upper Limit of Voltage</b>	Set the upper limit protection value of the output voltage. When the output voltage exceeds this limit, a protection action occurs and the output circuit or input is cut off.
<b>Power of Limit</b>	Set the upper limit value of the output power. The power will be clamped below this value without any protection action.
<b>Current of Limit</b>	Set the upper limit value of the output current. The current will be clamped below this value without any protection action. The value is usually smaller than the OCP value.

### 2.1.3 Line impedance parameters

Line impedance is used to simulate the line side impedance of the grid. The user can start the grid side output first, and then set the relevant parameters of the line impedance, including the line equivalent inductance and line resistance. It is also possible to set the relevant parameters of the line impedance in advance and then start the output of the AC source. After the user sets the relevant parameters, click “Settings” to complete the setting.

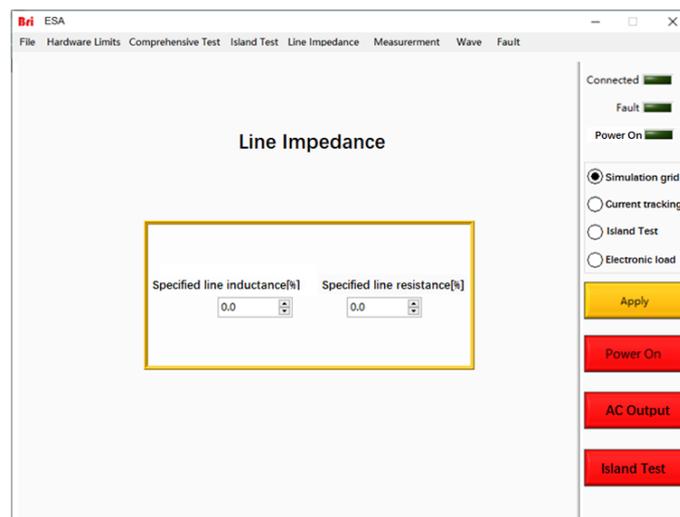


Figure 2-4 Line Impedance Interface

### 2.1.4 Administrator account

After the software logs in the administrator account, the internal parameters of the equipment can be set. It is not recommended that the user login the account to avoid accidental setting and cause equipment fault or loss of precision.



Figure 2-5 Administrator account setting interface

## 2.2 Comprehensive Test

In the standby state, click the “Comprehensive Test” menu item on the blue background in Figure 2-6 to enter the comprehensive test interface, as shown in Figure 2-7.



Figure 2-6 Standby state

Under the comprehensive test interface, the output voltage amplitude, relative phase angle, working frequency, duration, and change time of each step can be set according to the actual requirements of the equipment to be tested.

It should be noted that only the "parameter selected" step will be executed effectively. After the user has set the corresponding parameters, the “Parameter Selected” box should be checked.

If the user performs on the remote workstation/personal PC, the user should ensure that the communication parameters are set according to the previous sections of this chapter before setting the above parameters.

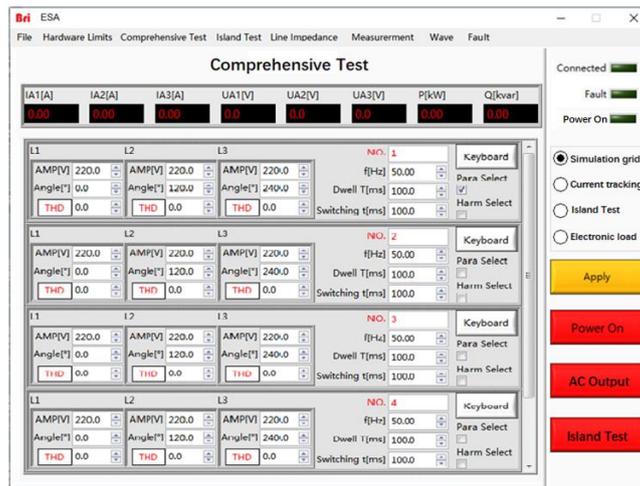


Figure 2-7 Comprehensive test interface

User can setting the harmonic by clicking the button of 'Harmonic' shown as Figure 2-8. Default values of "Harmonic set" are 0. Harmonic in percentage, start phase angle can be set. Only selected harmonic settings will be calculated. Up to 40th harmonics can be set, and harmonic waveforms are displayed.

Selected is intended to add harmonic, otherwise, no added. Fill in harmonic percentage; select the harmonic, and then, harmonic setting is finished, user also can cancel operation by clicking the 'cancel' button, and quit harmonic settings modification.



Figure 2-8 Harmonic setting



**Warning**

The device does not support the 3×N times harmonic (N=1,2,3,... ), if this function is required, please contact the factory

## 2.3 Island Test

It is a test mode set up for the island test according to IEC62116-2008. The user should be familiar with the relevant content of IEC62116 before conducting this test. The test interface is shown in Figure 2-9.

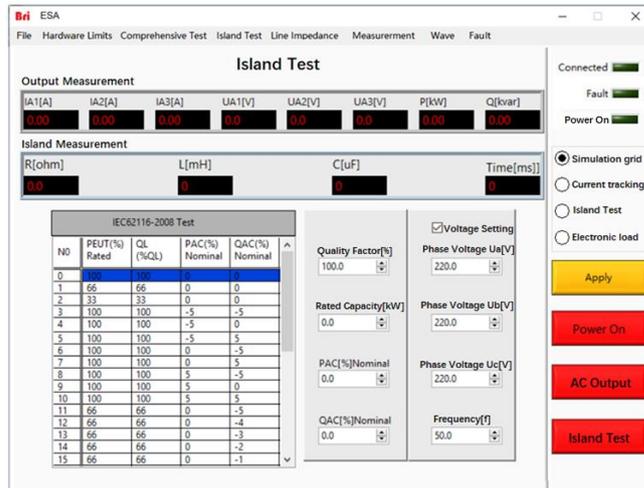


Figure 2-9 Island test interface



Figure 2-10 Working mode display area

Figure 2-10 shows the working mode display area of the software and the corresponding test controls. The test is performed as follows:

- <1> Start the grid side input, and click "grid side start/stop" to realize the closing of the grid side switch;
- <2> The user selects one of the parameters and clicks "Settings" to make the parameters take effect;
- <3> Start the AC output by clicking "Start/Stop";
- <4> Click "Island Start/Stop" to start the island test and wait for the equipment under test (photovoltaic inverter) protection action;
- <5> The equipment under test generates a protection action and completes a test of the working condition;
- <6> Select another parameter and repeat steps <3> ~ <5> to test another condition. By analogy, the test of all conditions specified in IEC62116 can be completed.

The upper part of the interface displays the current output voltage, current and power of the equipment in real time, as shown in Figure 2-11.



Figure 2-11 Island test real-time parameter display

ESA series with RLC option can be used as AC load for anti-islanding test (IEC62116-2008). When ESA power source works as AC load, user can set testing parameters, such as PAC and QAC, according to test standard IEC 62116-2008. And ESA will calculate R, L, C value, and works as an electronic RLC load. To avoid any setting exceeds hardware limits; user can't set R, L, C directly.

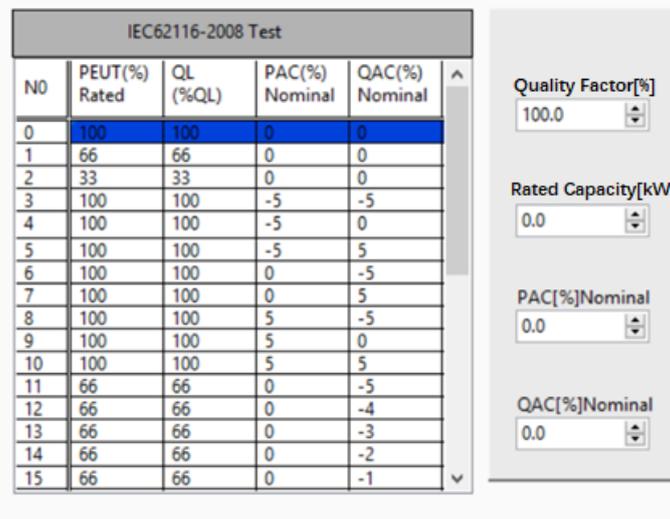


Figure 2-12 Working condition parameter groups

## 2.4 Measurement Parameter Monitoring

The measurement parameter monitoring interface is shown in Figure 2-13, which shows the input parameters, output parameters and internal monitoring

parameters of the equipment. Most of this part of the parameters are displayed in the regular test interface or startup interface.

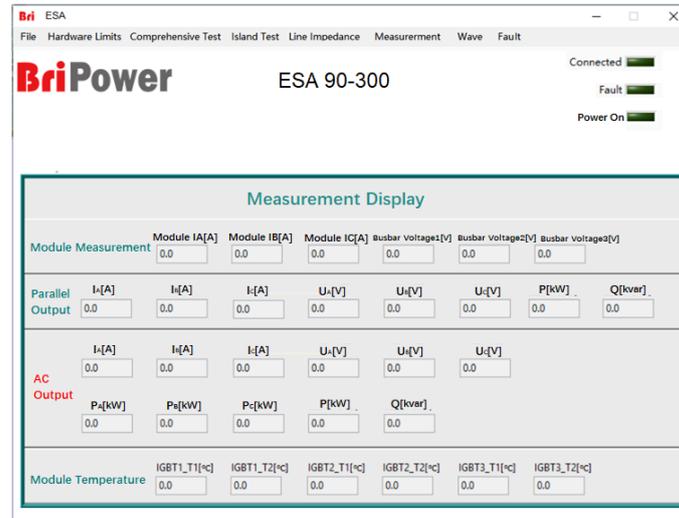


Figure 2-13 Measurement interface

The module measurement parameters include the current output of each module, the DC bus voltage and the real-time monitoring temperature of the IGBT.

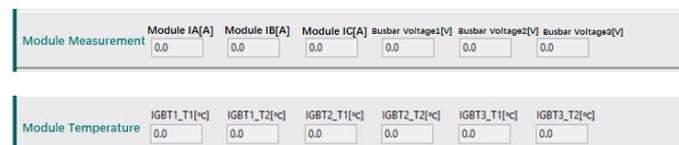


Figure 2-14 Grid side parameters

The parallel output parameters refer to the output voltage, current, active power and reactive power parameters in the case of parallel slaves.



Figure 2-15 Internal parameters

The output parameters include the three-phase output current, voltage, active power and reactive power.

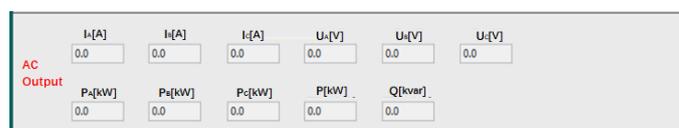


Figure 2-16 Output parameters

## 2.5 Wave Monitoring

The GUI software has a waveform recording function. When the user selects the “Save”, the output voltage and current will be recorded and stored in the storage space of the touch screen/workstation. The user can later retrieve the output waveform for browsing and analysis (as shown in Figure 2-17).

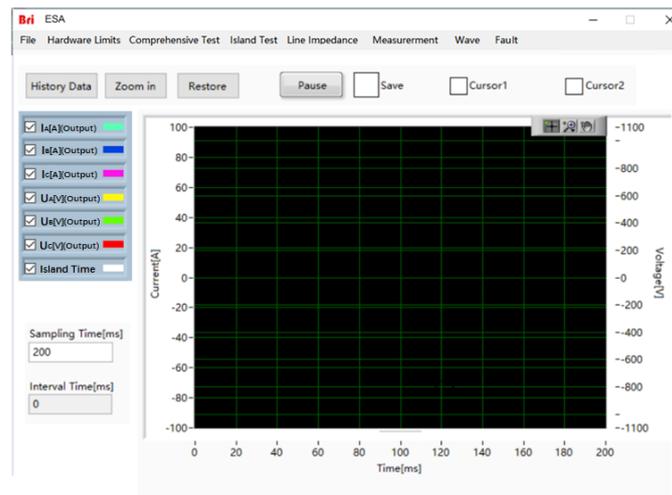


Figure 2-17 Wave monitoring interface

In the upper of the waveform browsing interface, each button has the following functions:

<b>History Data</b>	Click this button and pop up the historical waveform browsing window.
<b>Zoom In</b>	Click this button to zoom in on the waveform.
<b>Restore</b>	Click this button to restore the enlarged waveform to the default scale browsing.
<b>Pause</b>	Click this button and the waveform will stop updating and stay on the waveform captured when clicked.
<b>Save</b>	When this option is checked, the data of the waveform browsing window will be saved.
<b>Cursor1</b>	Measuring the amplitude and time of a point on the waveform, often with the cursor 2 measuring time interval.
<b>Cursor2</b>	Measuring the amplitude and time of a point on the waveform, often with the cursor 1 measuring time interval.

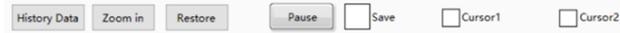


Figure 2-18 Waveform browsing interface toolbar

The historical waveform browsing window is shown in Figure 2-19. Click “Read Wave”, the historical waveform will be displayed in the left window, arranged in the order of recording time, and the user can browse one of the waveforms. Similar to the waveform browsing window, the user can also read the value of a point on the waveform or the time interval between two points by the cursors "Cursor1" and "Cursor2".

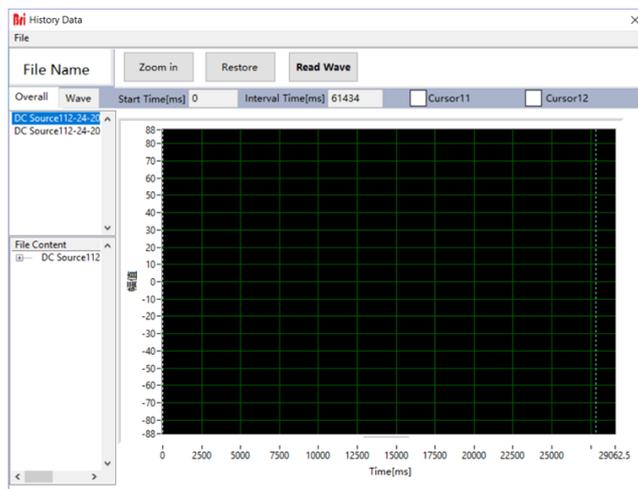


Figure 2-19 Historical waveform browsing window      Figure 2-20 Select the waveform

In the waveform browsing window, the user can select only the A/B/C three-phase voltage/current and island time data to browse the waveform, or select the browsing at the same time. In addition, the user can also set the sampling time interval of the waveform data points. The default sampling interval is 200ms.

## 2.6 Fault Monitoring

Users can browse the faults of the equipment during the test through the tabs in the "Fault" menu (as shown in Figure 2-21). In the “Fault” menu include "Status and Faults", "Software Faults" and "Reset". "Status and Faults" is the

hardware fault and status of the equipment. After troubleshooting, the user can reset the equipment by "Reset" to clear the fault.

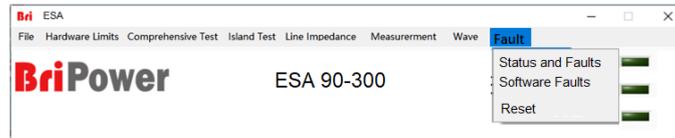


Figure 2-21 Fault browsing interface

Status and faults are mainly included in Figure 2-22.

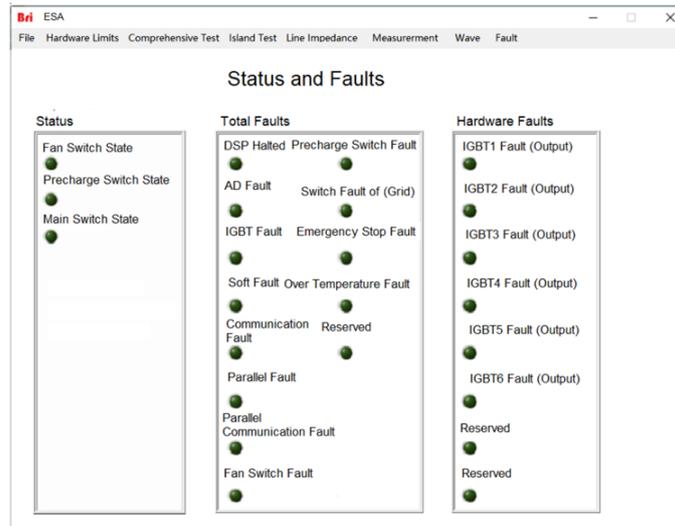


Figure 2-22 Status and Fault interface

## Chapter 3 Remote Control

The contents of this chapter are as follows:

- ✧ 3.1 Computer Setting
- ✧ 3.2 Software Setting
- ✧ 3.3 Remote Control

### 3.1 Computer Setting

The remote-control software uses LAN interface to communicate with the power supply. Before launching the remote-control software, network configuration of computer that remote-control software is running should be configured as following table.

IP Address	192.168.1.2
Subnet Mask	255.255.255.0

#### **STAP A:**

Before the control software is installed on the remote computer, please download the “LabVIEW Run-Time Engine 2014 SP1 - (32-bit) - Windows”, the file name downloaded is “LVRTE2014SP1\_f7Patchstd.exe”. The web link is:

<http://www.ni.com/download/labview-run-time-engine-2014-sp1/5198/en/>

While the file is downloaded, please install the “LabVIEW Run-Time Engine 2014 SP1 - (32-bit) - Windows”.

#### **STAP B:**

Unzip and copy the remote-control software “AC Software 1.0(Client).rar” to some directory wanted, and then create desktop shortcuts for executable file “AC Software 1.0.exe” .

#### **STAP C:**

Run the desktop shortcuts for executable file “AC Software 1.0.exe” as administrator, all facilities of the software is available.

## 3.2 Software Setting

And the default network configuration of power supply is shown in table below. Network configuration can be activated in 'communication' option of 'configuration' menu. However, it is not recommended to change the default configuration. The network configuration page is shown as Figure 3-1.

<b>IP Address</b>	192.168.1.2
<b>Port</b>	502

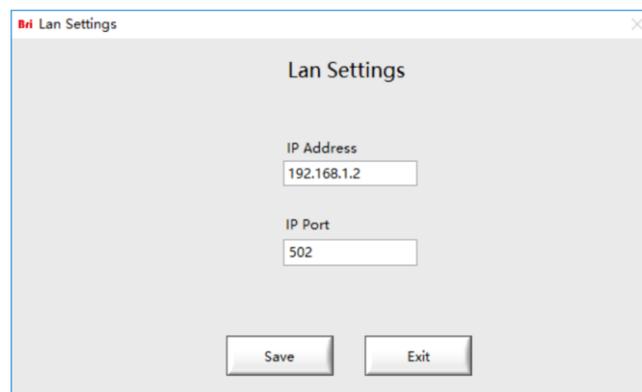


Figure3-1 Communication parameters setting interface

## 3.3 Remote Control

The remote-control software has same outline of interface and operation with the software embedded on the power supply's controller. If the remote-control mode is desired, method of operation refers to chapter 3.



### **CAUTION**

The power can be controlled via the GUI control software on the touch panel and remote-control software at the same time, but it's not recommended. The proposed approach is that one of the control software controls the operation of the power supply and the other monitors the operating parameters.

## Appendix A — Specification of ESA Series

### General Specification

Output Modes	AC
Power Level	30kVA – 500kVA in single controller. 4MVA max power available. Power Level can be customized.
Voltage Ranges	0-300V L-N (std), voltage can be customized.
Load Regulation	0.2%FS
Line Regulation	0.1%FS
THD	<1% (Resistive Load)
Voltage Programming Resolution	0.1V
Voltage Programming Accuracy	0.5%FS
Current Ranges	Customizable for customer need.
Current Resolution	0.1A
Current Accuracy	0.3%FS
Frequency range	Standard 30-100Hz
Frequency Resolution	0.001Hz
Frequency Accuracy	± 0.05%
Phase output	Phase B/C relative to phase A, 0.0~360.0°
Phase accuracy	<1.2° (@50Hz)
Harmonic Generation	Up to 40 <sup>th</sup>
Measurements	List of all type measurements done
Measurement accuracy Power	0.5%FS
Measurement accuracy AC Voltage	0.5%FS
Measurement accuracy AC Current	0.3%FS
Measurement accuracy Frequency	0.05%FS
Measurement accuracy Phase	<1.2° (@50Hz)
AC input Voltage	3P+N+PE, (Std) 380VLL±10%
Frequency	47-63Hz
Efficiency	≥90%
Power Factor	0.95
Protection	OVP, OCP, OTP
Regulatory	CE Conformity
Cooling	Forced Air Cooling
Noise	<75dB (Single Cabinet)
Temperature	Operating: 0~40°C Storage: -20~85°C
Operating Humidity	20-90%RH (None Condensing)

**Note:**

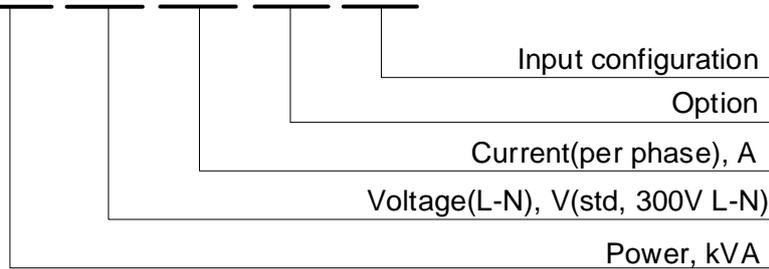
The default output of ESA is not transformer output. If transformer is used at output, frequency range will be limited to 40~70Hz. For transformer output, it will be described in quotation or proposal.

## Standard Models Specification

Power Level*	30kVA	60kVA	120kVA	250kVA	500kVA
Voltage Range*	0-300V L-N				
Output current**	46A/ph	91A/ph	182A/ph	379A/ph	758A/ph
Current resolution	0.1A				
Dimension (W*D*H mm)	800*800*2100	800*800*2100	2* 800*800*2100	3* 900*900*2100	5* 900*900*2100
Weight	<800kg	<800kg	<1600kg	<2500kg	<5000kg

## Model

**ESA AAA-BBB-CCC-DDD/EEE**



## Options

Options	Description
-232	RS232 program interface
-LD	Configured as regenerative AC load
-R	Regenerative mode
-RLC	RLC load simulation for IEC62116-2008 test

## AC Input Configuration

Please specify the input voltage (L-L).

- 208, Input Voltage 208V±10%, 3-phase
- 230, Input Voltage 230V±10%, 3-phase
- 380, Input Voltage 380V±10%, 3-phase
- 400, Input Voltage 400V±10%, 3-phase
- 480, Input Voltage 480V±10%, 3-phase