AC POWER SOURCE
AFV Series
Product Manual

If you meet any problems, you should seek immediate assistance from branches of AC Power that the equipment was purchased or customer service & support department of AC Power Corp.

AC Power pursues policy of continual product development and reserves the right to change the equipment design without prior notice.

Safety instructions

Danger

Dangerous high voltages exist inside this machine. Do not open any covers of this machine unless authorized and done by trained technicians. Otherwise, electrical shock to persons may happen.

In case the machine needs to be moved or re-wired, all electricity to the machine must be disconnected and removed. After electricity is removed, please wait for at least 20 minutes before touching any live parts of this machine or electrical shock may occur: the electrical charges on the bulky capacitors inside the machine need some time to be fully discharged.

For optimal safety protection to the users, this machine must have solid connections to the earth. Do not use this machine if it is not grounded.

In case of fire, use an extinguisher with powder chemicals instead of liquid agents. Electrical shock may occur if liquid extinguishing products are used.

Any foreign objects and/or liquid are strictly prohibited from entering to the inside of this machine.

Caution

Storage and operating environment have a certain degree of influence on the life and reliability of this product. Therefore, avoid placing and/or operating this machine in environments with the following:

(i). Having extreme ambient temperature or humidity that exceeds the allowable limit stated in the specification, temperature: 0℃～45℃, humidity: 0～90%.

(ii). Having direct sunlight exposure, or being near a heat source.

(iii). Places that tend to be vibrated or hit by other objects.

(iv). Having heavy dust, heavy salt, corrosive chemicals or inflammable chemicals in the air.

Please keep air ventilation inlets and outlets clear and clean. Obstruction on the inlet or outlet will have significant negative impact on the machine's quality and reliability.

If the machine will not be used for a long time, please store it in a dry and clean environment with temperature in the range of -40℃～+70℃.

Caution

i

This machine is composed of many delicate and precision devices. Please do not open any covers of this machine unless authorized and done by trained technicians. Warranty is voided if the quality seal is broken.

Contents

Chapter I   Product Introduction

AFV series power supply is a programmable power supply for grid simulation. By virtue of advanced SPWM technology and direct digital frequency synthesis (DDS) waveform technology, the power supply has stable   output frequency and good continuity. AFV series power supply not only can provide continuous, pure and stable sinusoidal voltage, but also can achieve local control and remote control by the user's PC for the power supply system through internal control and communication modules. At the same time, the internal electronic circuit can quickly detect over current, overload, overvoltage and output short circuit, automatically protect and cut off the output, and send out an alarm. The integrative laminated busbar technology and modular configuration are applied in the power supply inverter unit to improve reliability and stability. The touch screen display and control are utilized for easier operation.

The main performance characteristics of AFV series variable frequency power supply are as follows:

- By virtue of advanced SPWM technology and direct digital frequency synthesis (DDS) waveform technology are used, the power supply has stable output frequency and good continuity;

- The patented inner loop energy-saving test design is used to save the energy consumption;

- High precision settings and output;

- Comprehensive and stable protection, perfect self-diagnostic maintenance function and higher system reliability;

- The laminated busbar structure is used to effectively reduce the inductance of the inverter circuit and improve the reliability of the inverter;

- Intelligent fan speed regulation control is used with built-in dust filter to achieve efficient heat dissipation and effective protection function under harsh environment;

- Communication interface: Communication way RS485 (standard configuration) and Ethernet (optional configuration);

- Running event recording function is provided, and the number of records may be up to 255.

Chapter II   Working Principle

2.1 Functional block diagram of complete machine

All functional units of AFV series variable frequency power supply control system from input to output according to the functional sequence are shown in Fig. 2-1.
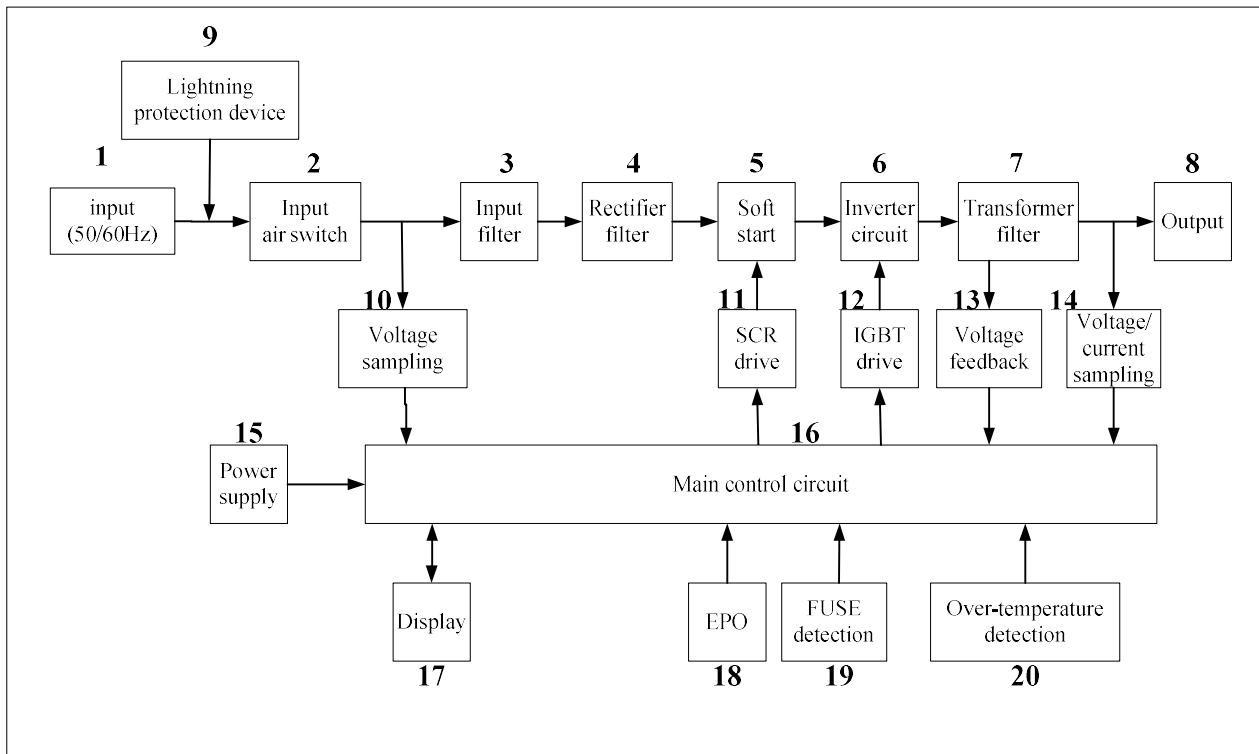

Fig. 2-1 Functional block diagram of complete machine

2.2 Description of functional block diagram

1)   input: Connect from power supply endpoint to the input terminal disk of the equipment.

2)   Input air switch: Control the commercial power input equipment.

3)   Input filter: Input inductor and capacitor filter.

4)   Rectifier filter: Convert the input alternating current into direct current.

5)   Soft start: DC capacitor is charged slowly to reduce the impulse current.

6)   Inverter circuit: Convert the direct current into PWM waveform.

7)   Transformer filter: Boost the output voltage of IGBT and output the voltage after LC filter.

8)   Output: The output voltage is transferred to the output terminal disk (or output copper bar) through the contactor.

9)   Lightning protection device: Overvoltage protection, lightning protection, restraining surge current, absorbing spike pulse, etc.

10) Voltage sampling: Input voltage sampling conditioning circuit.

11) SCR drive: Drive control circuit of soft start SCR.

12) IGBT drive: Amplify PWM signals to drive IGBT power components.

13) Voltage feedback: Steadily output voltage amplitude.

14) Voltage/current sampling circuit: Sampling conditioning circuit of output voltage and current.

15) Power supply: Power supply of all PCB.

16) Main control circuit: The processing of all input and output signals.

17) Display: Touch screen display.

18) EPO: Emergency stop signal.

19) FUSE detection: Transmit the FUSE power-off signal to the control circuit for trip protection.

20) Over-temperature detection: Transmit the over-temperature signal to the control circuit for trip protection.

2.3 Constitution of main control circuit

The main control circuit is mainly divided into the three parts, namely protection sampling module, main control module and display control module. The relationships between these three parts are shown in Fig. 2-2.
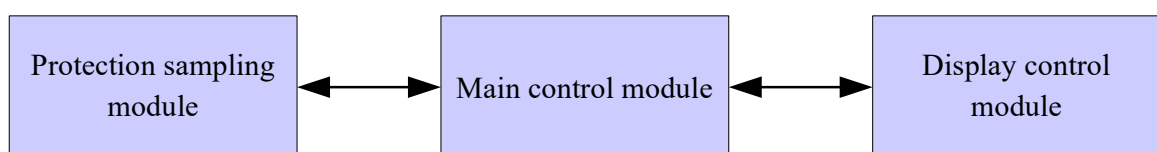

Fig. 2-2 Block diagram of control parts

Chapter III   Transportation and Installation

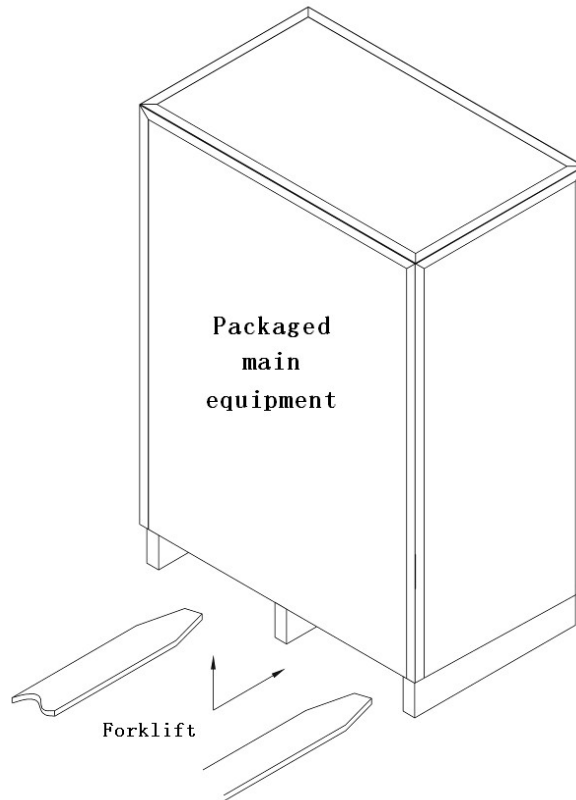## 3.1 Transportation precautions

Fig. 3-1 Schematic diagram of transportation

Because the equipment is heavy, the lifting operations need to be slow during the transportation of the forklift, so as to prevent damaging the equipment itself or the surroundings.

During the transportation that the equipment needs to be fixed firmly to prevent the equipment from sliding or dumping due to vehicle bumps. Although the shockproof packaging was design in, it is recommended that more cautious should be taken in consideration in case of driving on bumpy roads.

3.2 Unpacking inspection

● When open the wooden boxes which contain the equipment, pay extra attention on handling it due to heavy weight consideration. Avoid dropping or dumping occurs.

● Before turn on the equipment check the equipment condition if any damage was found. You should inform service staff of our company to take proper treatment.

● Check the accessories according to the delivery accessory list. If any accessories are missed, please contact the customer service.

3.3 Installation environment requirements

When selecting the installation environment, the following matters should be followed:

1) Install the equipments in indoor and keep the environment air flow. Try to keep the equipment air inlet/outlet free of dust;

2) The ground on which the equipment is installed should have sufficient strength and flatness, and the equipment shall not shake after the installation is in place;

3) The equipment adopts incoming line and outgoing line. Therefore, it is recommended to arrange these lines and cables connected to the external from the cable trenches, so as to facilitate the installation and maintenance;

4) Where the equipment placed should give sufficient space to allow the heat which produced by the equipment to radiate. (see Fig. 3-2)   At the same time, do not cover the air inlet of the front panel, for allowing heat to radiate;

5) Do not use the equipment in the environment with dust, volatile gases, too high saline matter or corrosive substances, because this may affect the product life;

6) Do not place the equipment in the environment with too high temperature or humidity; and away from water, flammable gases, corrosive or heat sources and avoid direct sunlight;

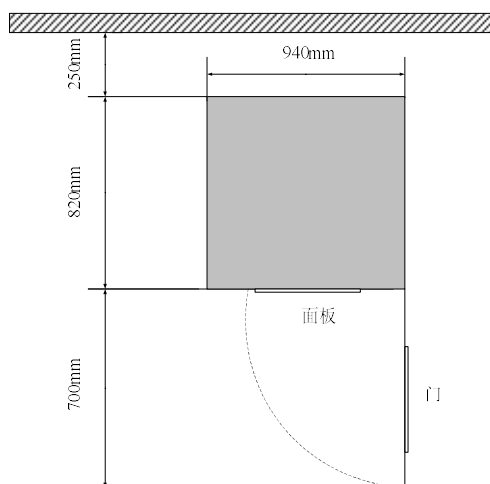7) Use correct power distribution way to guarantee the safety of the equipment and user 's equipment.

Fig. 3-2 Schematic diagram of bottom of fixing device

3.4 Description of cable connection

The cable connection of the main circuit is as follows:

3.4.1 Single-phase input and single-phase output connection terminal

Input connection terminal is Copper bar as shown 3-3(b),while the machine capacity is greater than 20k;

Fig. 3-3-(a)
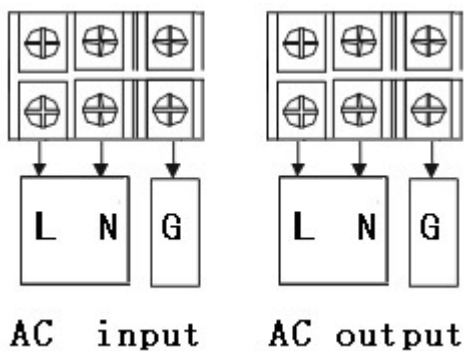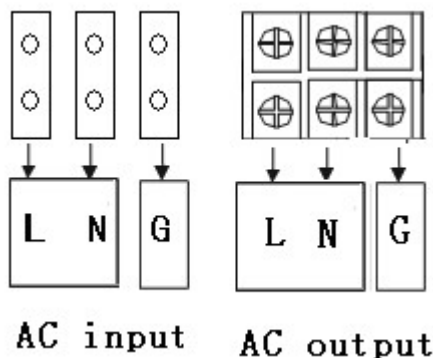

Fig. 3-3-(b)

Fig. 3-3 Single phase input and single phase output connection terminal

3.4.2 Three-phase input and single-phase output connection terminal

Output connection terminal is Copper bar as shown 3-5(b),while the machine capacity is greater than 15k; Input and Output connection terminal are Copper bar as shown 3-5(c),while the machine capacity is greater than 60k;

Fig. 3-4-(a)

Fig. 3-4-(b)

Fig. 3-4-(c)

3.4.3 Three-phase input and three-phase output connection terminal

Input and Output connection terminal are Copper bar as shown 3-5(b),while the machine capacity is greater than 60k;
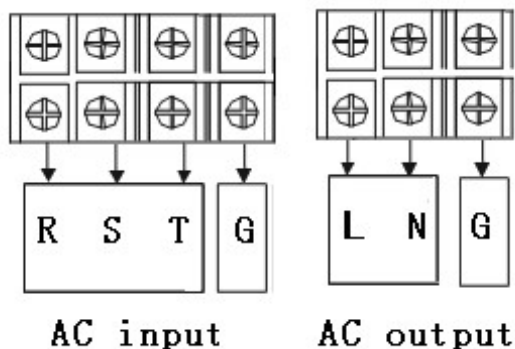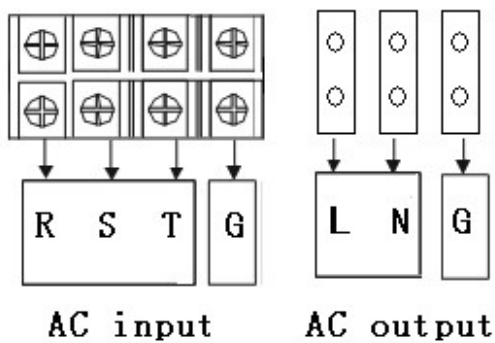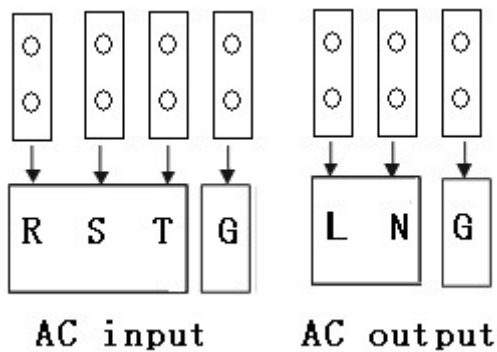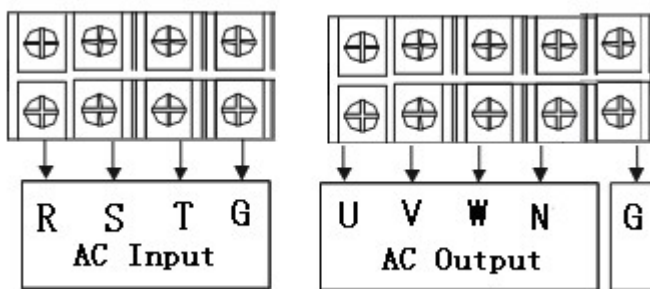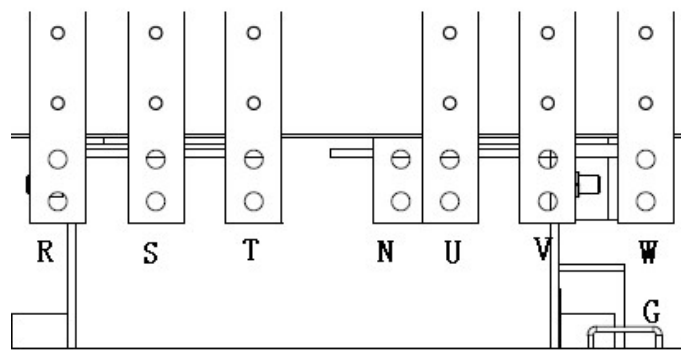

Fig. 3-5-(a)

Fig. 3-5-(b)

Fig. 3-5 Schematic diagram of wiring terminal

Before installing the equipment, all the switches need to be disconnected. The circuit cables should be connected properly according to the above diagram.

3.5 Cable wiring

1) Use the voltmeter to confirm whether there is no voltage output in the distribution lines;

2) Confirm whether all the switches of the variable frequency power supply are in the "OFF" position;

3) The input and output cables can be selected according to the cables recommended in Tables 3-1 ;

Table 3-1 Input table of distribution cables

(a) Input high voltage

Input：△ 380V,400V,415V,480V				
model	Input current (A)	Input live wire (mm2)			ground wire (mm2)
		A	B	C	
AFV−11008	55.9	10mm^2			10mm^2
AFV−11010	64.6	16mm^2			16mm^2
AFV−11015	96.9	25mm^2			16mm^2
AFV−11020	129.1	35mm^2			16mm^2
AFV−11030	193.8	70mm^2			35mm^2
AFV−31010	22	2.5mm^2	2.5mm^2	2.5mm^2	2.5mm^2
AFV−31015	33	$4\ \text{mm}^2$	$4\ \text{mm}^2$	$4\ \text{mm}^2$	$4\ \text{mm}^2$
AFV−31030	66A	16mm^2	16mm^2	16mm^2	16mm^2
AFV−31045	99	25mm^2	25mm^2	25mm^2	16mm^2
AFV−31060	132	35mm^2	35mm^2	35mm^2	16mm^2
AFV−31080	197	70mm^2	70mm^2	70mm^2	35mm^8
AFV−31100	246	95mm^2	95mm^2	95mm^2	50mm^9
AFV−31120	296	120mm^2	120mm^2	120mm^2	70mm^{10}
AFV−33010	22	2.5mm^2	2.5mm^2	2.5mm^2	2.5mm^2
AFV−33015	33	$4\ \text{mm}^2$	$4\ \text{mm}^2$	$4\ \text{mm}^2$	$4\ \text{mm}^2$
AFV−33030	66	16mm^2	16mm^2	16mm^2	16mm^2
AFV−33045	99	25mm^2	25mm^2	25mm^2	16mm^2
AFV−33060	132	35mm^2	35mm^2	35mm^2	16mm^2
AFV−33080	197	70mm^2	70mm^2	70mm^2	35mm^{16}
AFV−33100	246	95mm^2	95mm^2	95mm^2	50mm^{17}
AFV−33120	296	120mm^2	120mm^2	120mm^2	70mm^{18}
AFV−33160	394.7	$70\text{mm}^2{*}2$	$70\text{mm}^2{*}2$	$70\text{mm}^2{*}2$	70mm^{19}

(b) Input low voltage

model	Input current (A)	Input live wire (mm2)			ground wire (mm2)
		Input：△ 200V,208V			
		A	B	C	
AFV−11008	101.0	25mm^2			16mm^2
AFV−11010	126.3	35mm^2			16mm^2
AFV−11015	189.4	70mm^2			35mm^2
AFV−11020	252.6	95mm^2			50mm^2
AFV−11030	378.9	70mm^2*2			70mm^2
AFV−31010	42.1	6mm^2	6mm^2	6mm^2	6mm^2
AFV−31015	63.1	16mm^2	16mm^2	16mm^2	16mm^2
AFV−31030	126.3	35mm^2	35mm^2	35mm^2	16mm^2
AFV−33010	42.1	6mm^2	6mm^2	6mm^2	6mm^2
AFV−33015	63.1	16mm^2	16mm^2	16mm^2	16mm^2
AFV−33030	126.3	35mm^2	35mm^2	35mm^2	16mm^2

Table 3-2 Output table of distribution cables

model	Output current (A)	Output live wire (mm2)			zero line (mm^2)	ground wire (mm2)
		U	V	W		
AFV−11008	HI：33.3A LO：66.7A	16mm^2			16mm^2	16mm^2
AFV−11010	HI：41.7A LO：83.3A	16mm^2			16mm^2	16mm^2
AFV−11015	HI：62.5A LO：125A	35mm^2			35mm^2	16mm^2
AFV−11020	HI：83.3A LO：166.7A	50mm^2			50mm^2	25mm^2
AFV−11030	HI：125A LO：250A	95mm^2			95mm^2	50mm^2
AFV−31010	HI：41.7A LO：83.3A	16mm^2			16mm^2	16mm^2
AFV−31015	HI：62.5A LO：125A	35mm^2			35mm^2	16mm^2
AFV−31030	HI：125A LO：250A	95mm^2			95mm^2	50mm^2
AFV−31045	HI：187.5A LO：375A	70mm^2*2			70mm^2*2	70mm^2
AFV−31060	HI：250A LO：500A	95mm^2*2			95mm^2*2	95mm^2
AFV−31080	HI：333.3A LO：666.7A	70mm^2*3			70mm^2*3	70mm^2*2
AFV−31100	HI：416.7A LO：833.3A	70mm^2*4			70mm^2*4	70mm^2*2
AFV−31120	HI：500A LO：1000A	95mm^2*4			95mm^2*4	95mm^2*2

AFV-33010	HI：13.9A LO：27.8A	$4mm^2$	$4mm^2$	$4mm^2$	$4mm^2$	$4mm^2$
AFV-33015	HI：20.8A LO：41.7A	$10mm^2$	$10mm^2$	$10mm^2$	$10mm^2$	$10mm^2$
AFV-33030	HI：41.7A LO：83.3A	$16mm^2$	$16mm^2$	$16mm^2$	$16mm^2$	$16mm^2$
AFV-33045	HI：62.5A LO：125A	$35mm^2$	$35mm^2$	$35mm^2$	$35mm^2$	$16mm^2$
AFV-33060	HI：83.3A LO：166.7A	$50mm^2$	$50mm^2$	$50mm^2$	$50mm^2$	$25mm^2$
AFV-33080	HI：111.1A LO：222.2A	$70mm^2$	$70mm^2$	$70mm^2$	$70mm^2$	$35mm^2$
AFV-33100	HI：138.9A LO：277.8A	$120mm^2$	$120mm^2$	$120mm^2$	$120mm^2$	$60mm^2$
AFV-33120	HI：166.7A LO：333.3A	$150mm^2$	$150mm^2$	$150mm^2$	$150mm^2$	$75mm^2$
AFV-33160	HI：222.2A LO：444.4A	$70mm^2*2$	$70mm^2*2$	$70mm^2*2$	$70mm^2*2$	$70mm^2$

The reference cables recommended in the above-mentioned tables are multi-core flexible copper cables, and the user can select different cables according to the input and output current conditions by themselves. When the length of the input or output lines exceed 20 meters, it is recommended that the wire diameter of the cable should be doubled.

4) Properly connect the input distribution lines to the corresponding wiring terminals at the input terminal of the equipment successively, and connect the output load lines to the corresponding wiring terminals at the output terminal of the equipment.

Chapter IV   Product Specifications

4.1 Technical specifications

1）Single–phase input/Single-phase output specification

Model	AFV-11008	AFV-11010	AFV-11015	AFV-11020	AFV-11030
Output capacity (kVA)	8	10	15	20	30
AC input — Phase number	Single phase				
AC input — Voltage	115V/200V, 120V/208V, 220V/380V, 230V/400V, 240V/415V, 277V/480V				
AC input — Voltage Range	±15％				
AC input — Frequency range	47Hz-63Hz				
AC input — Power factor (resistive)	0.9				
AC output — Phase number	Single phase				
AC output — Waveform	Standard sinusoidal wave				
AC output — Voltage — Low	0V-150.0V（L-N）				
AC output — Voltage — High	0V-300.0V（L-N）				
AC output — Frequency	45Hz-65Hz(option45-500Hz)				
AC output — Frequency stability rate	≤0.01%				
Complete machine performance — Power voltage regulation	≤1%				
Complete machine performance — Load regulation	±1% (linear load)				
Complete machine performance — Waveform distortion (THD)	≤2% (linear load)				
Complete machine performance — Efficiency	≥90%				
Complete machine performance — Reaction time	≤2ms				
Complete machine performance — Protection device	Input no-fuse switch, output over/under voltage, over current, overload, input over/under voltage, reverse current protection, over temperature & short circuit, conduct fast protection and lock fault, display fault;				
Display — Display interface	Touch screen				
Display — Voltage	0.2V+0.1％FS resolution：0.1V				
Display — Current	0.2A+0.1％FS resolution：0.1A				
Display — Frequency	0.01Hz+0.01％FS resolution：0.01Hz				
Display — Real power	0.2kW+0.1％F, Resolution：0.1kW				
Display — Apparent power	0.2kVA+0.1％FS, Resolution：0.1kVA				
Display — Power factor	±0.01 resolution：0.01 Hz				
Environment — Insulation reactance	≥DC500V 10MΩ				
Environment — Withstand voltage insulation	AC 1800V 10mA/ 1 minute				
Environment — Cooling device	Fan cooling				
Environment — Working temperature	0°C-45°C				
Environment — Relative humidity	0-90% (non-condensing state)				
Environment — Altitude	Below 1,500m				

2）Three –phase input/Single-phase output specification

Model		AFV-31010	AFV-31015	AFV-31030	AFV-31045	AFV-31060	AFV-31080	AFV-31100	AFV-31120
Output capacity (kVA)		10	15	30	45	60	80	100	120
AC input	Phase number	3φ3W+G							
	Voltage	115V/200V, 120V/208V, 220V/380V, 230V/400V, 240V/415V, 277V/480V			230V/400V, 240V/415V, 277V/480V				
	Voltage range	±15％							
	Frequency range	47Hz-63Hz							
	Power factor (resistive)	0.9					0.85		
AC output	Phase number	3φ4W+G							
	Waveform	Standard sinusoidal wave							
	Voltage — Low	0V-150.0V（L-N）							
	Voltage — High	0V-300.0V（L-N）							
	Frequency	45Hz-65Hz(option 45-500Hz)							
	Frequency stability rate	≤0.01%							
Complete machine performance	Power voltage regulation	≤1%							
	Load regulation	±1% (linear load)							
	Waveform distortion (THD)	≤2% (linear load)							
	Efficiency	≥90%					≥85%		
	Reaction time	≤2ms							
	Protection device	For input no-fuse switch, output over/under voltage, over current, overload, input over/under voltage, reverse current protection, over temperature & short circuit, conduct fast protection and lock fault, display fault;							
Display	Display interface	Touch screen							
	Voltage	0.2V+0.1％FS resolution：0.1V							
	Current	0.2A+0.1％FS resolution：0.1A							
	Frequency	0.01Hz+0.01％FS resolution：0.01Hz							
	Real power	0.2kW+0.1％F, Resolution：0.1kW							
	Apparent power	0.2kVA+0.1％FS, Resolution：0.1kVA							
	Power factor	±0.01 resolution：0.01 Hz							

Environment	Insulation reactance	≥DC500V 10MΩ
	Withstand voltage insulation	AC 1800V 10mA/ 1 minute
	Cooling device	Fan cooling
	Working temperature	0°C-45°C
	Relative humidity	0-90%　(non-condensing state)
	Altitude	Below 1,500m

3）Three –phase input/Three-phase output specification

Model	AFV-33010	AFV-33015	AFV-33030	AFV-33045	AFV-33060	AFV-33080	AFV-33100	AFV-33120	AFV-33160
Output capacity (kVA)	10	15	30	45	60	80	100	120	160
AC input — Phase number	3φ3W+G								
AC input — Voltage	115V/200V, 120V/208V, 220V/380V, 230V/400V, 240V/415V, 277V/480V					230V/400V, 240V/415V, 277V/480V			
AC input — Voltage range	±15%								
AC input — Frequency range	47Hz-63Hz								
AC input — Power factor (resistive)	0.9					0.85			
AC output — Phase number	3φ4W+G								
AC output — Waveform	Standard sinusoidal wave								
AC output — Voltage — Low	0V-150.0V（L-N）								
AC output — Voltage — High	0V-300.0V（L-N）								
AC output — Frequency	45Hz-65Hz(option45-500Hz)								
AC output — Frequency stability rate	≤0.01%								
Complete machine performance — Power voltage regulation	≤1%								
Complete machine performance — Load regulation	±1% (linear load)								
Complete machine performance — Waveform distortion (THD)	≤2% (linear load)								
Complete machine performance — Efficiency	≥90%					≥85%			
Complete machine performance — Reaction time	≤2ms								
Complete machine performance — Protection device	For input no-fuse switch, output over/under voltage, over current, overload, input over/under voltage, reverse current protection, over temperature & short circuit, conduct fast protection and lock fault, display fault;								
Display — Display interface	Touch screen								
Display — Voltage	0.2V+0.1％FS resolution：0.1V								
Display — Current	0.2A+0.1％FS resolution：0.1A								
Display — Frequency	0.01Hz+0.01％FS resolution：0.01Hz								
Display — Real power	0.2kW+0.1％F, Resolution：0.1kW								
Display — Apparent power	0.2kVA+0.1％FS, Resolution：0.1kVA								
Display — Power factor	±0.01 resolution：0.01 Hz								
Remote interface	RS-485(standard);RS-232/GPIB(optional)								
Environment — Insulation reactance	≥DC500V 10MΩ								

	Withstand voltage insulation	AC 1800V 10mA/ 1 minute
	Cooling device	Fan cooling
	Working temperature	0°C-45°C
	Relative humidity	0-90% (non-condensing state)
	Altitude	Below 1,500m

4.2 Shape structure

AFV series products correspond to the corresponding size according to the capacity.

Table 4-1 Equipment size

Model	Corresponding size			
	W (mm)	D (mm)	H (mm)	Wheeled
AFV-11008,AFV-11010,AFV-11015, AFV-31010	600	850	945	√
AFV-11020,AFV-11030 AFV-31015, AFV-31030 AFV-33010,AFV-33015,AFV-33030	600	850	1340	√
AFV-31045,AFV-31060, AFV-33045, AFV-33060	800	860	1545	√
AFV-31080 AFV-33080,AFV-33100	1050	970	1800	无
AFV-31100, AFV-31120 AFV-33120,AFV-33160	1150	1240	1900	无
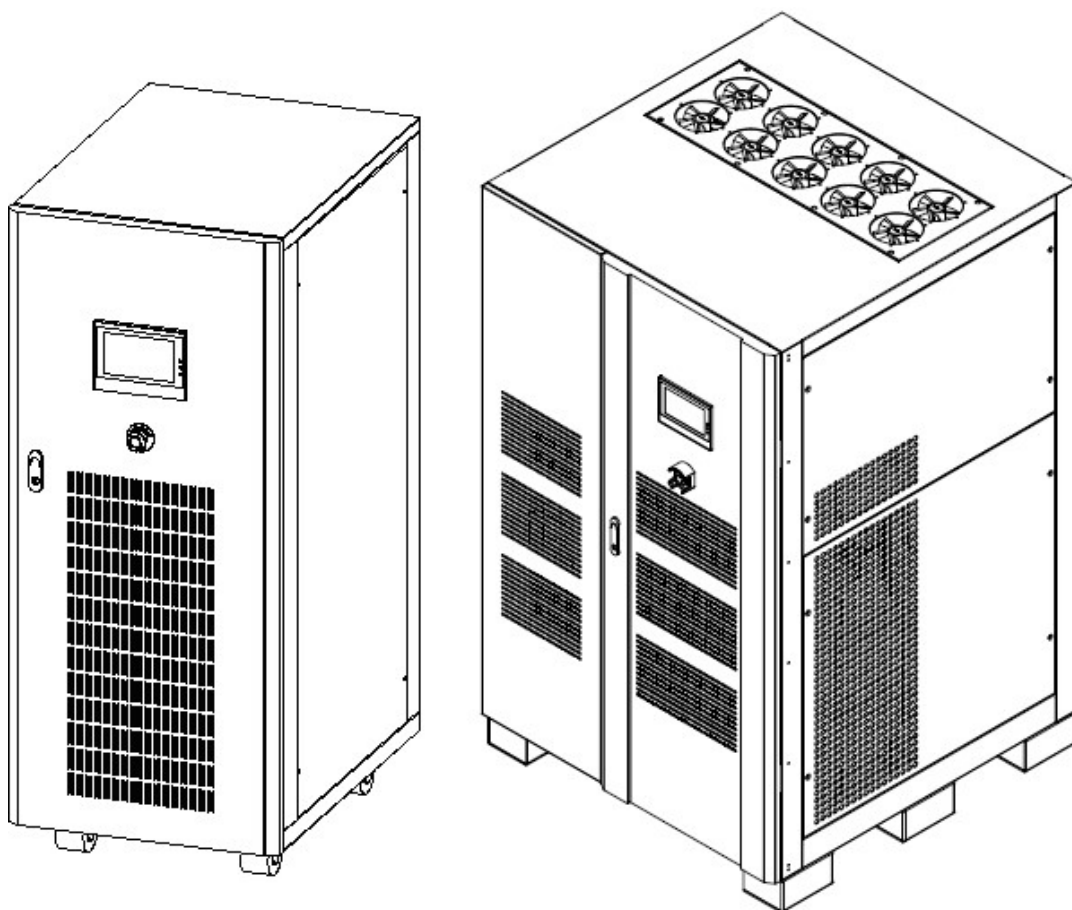
Fig. 4-1 Axonometric view of complete machine appearance
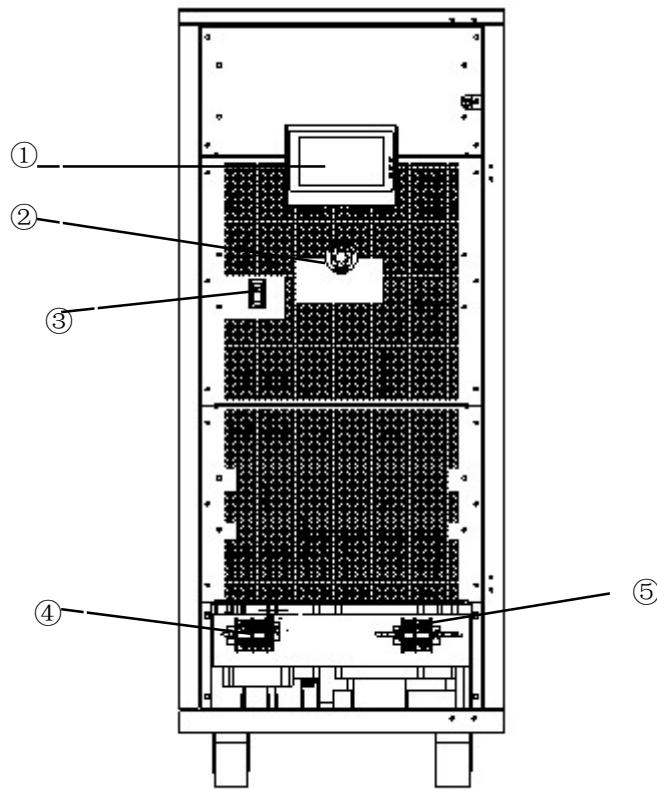
(a)AFV-11XXX series
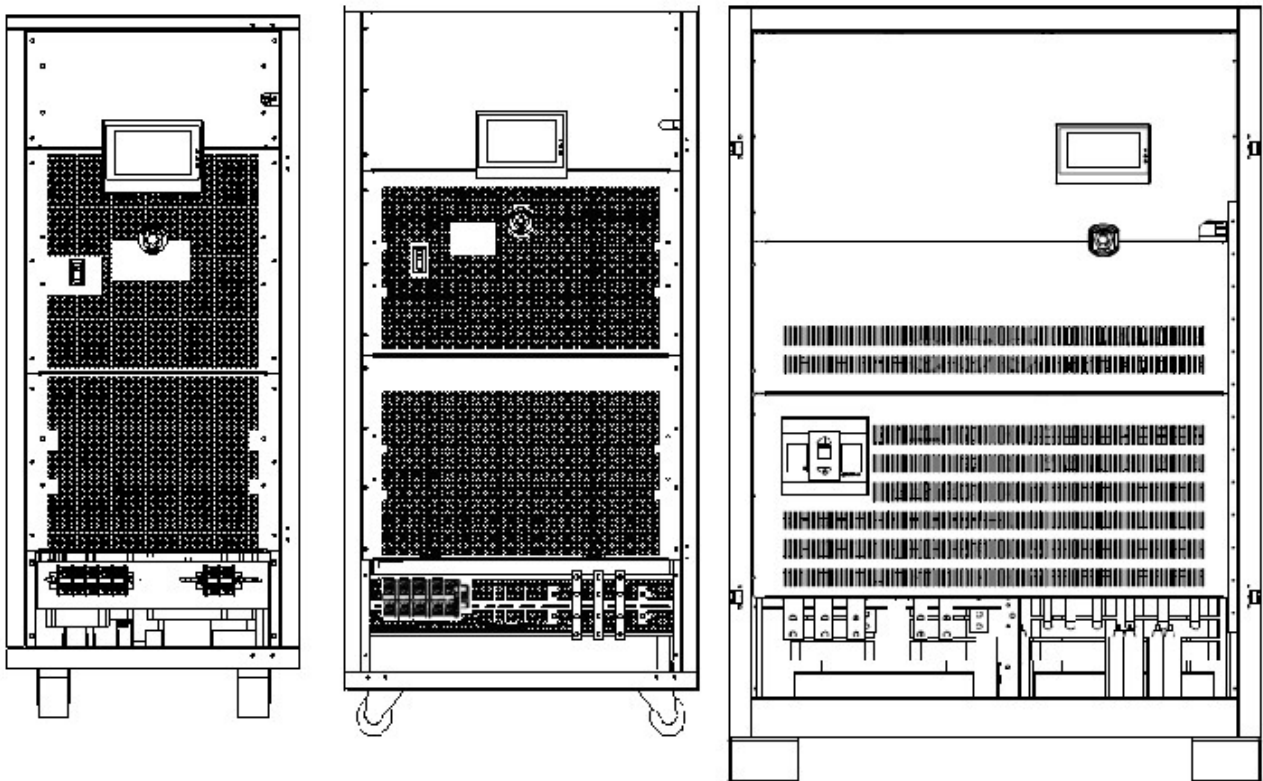
(b)AFV-31XXX series
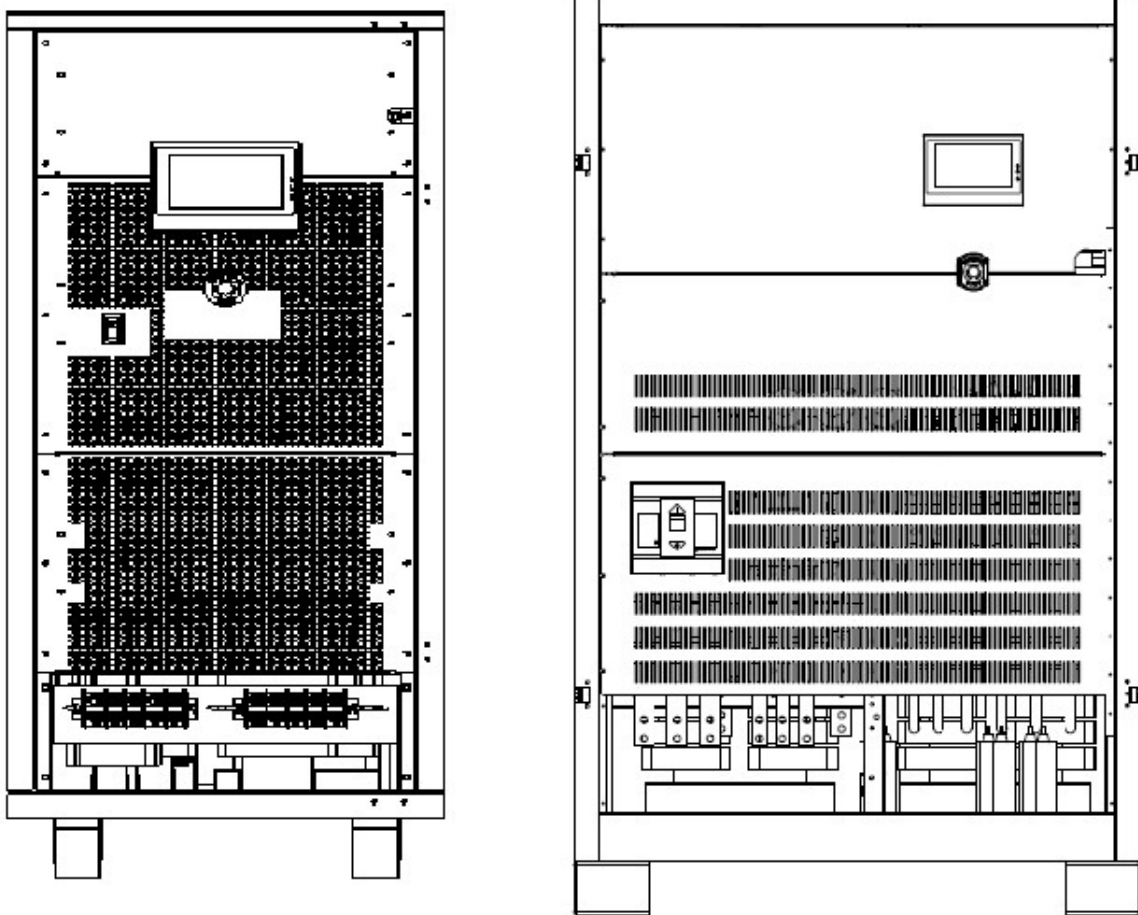
(c)AFV-33XXX series

Fig. 4-2 Description of complete equipment appearance

① Touch screen.

② Emergency stop button.

③ Input switch.

③④   Input terminal;

④⑤   Output terminal.

Chapter V Operation

5.1 Initial power-up of system

The input and output wirings should be properly connected according to the input and output connection way in Section 3.3. If the system is started, the main engine fan will start to operate, the panel display screen is on and the main interface is entered, indicating that the start-up is normal and the parameter setting can be conducted for the machine.

Note: If there is an external load, the load switch should be disconnected first, and the input switch should be connected (it needs to confirm whether the electric power of the input terminal row is normal before the input switch is connected).

Users can enter the application interface by clicking "Application". Users can set the output voltage and frequency value, press the [Operation] key after the setting is completed, and then click "Meas." to display the actual output each phase voltage, current, frequency, etc.

5.2 Menu description

Application

The application interface displays each phase voltage, current and frequency of output terminal of the AFV(equipment).

System

In the application interface, time setting and system maintenance can be setting by requirement.

Event

Record the historical work information of the equipment.

5.3 Parameter setting

Parameters set up correctly is basic requirement for running the AFV(equipment) smoothly. Detailed user modes are described as follow.

5.3.1 Start-up

When the AFV(equipment) power on, the screen will show company LOGO as shown in Fig. 5-1.

Fig. 5-1 Start-up interface

The initialization interface is shown in Fig. 5-2.
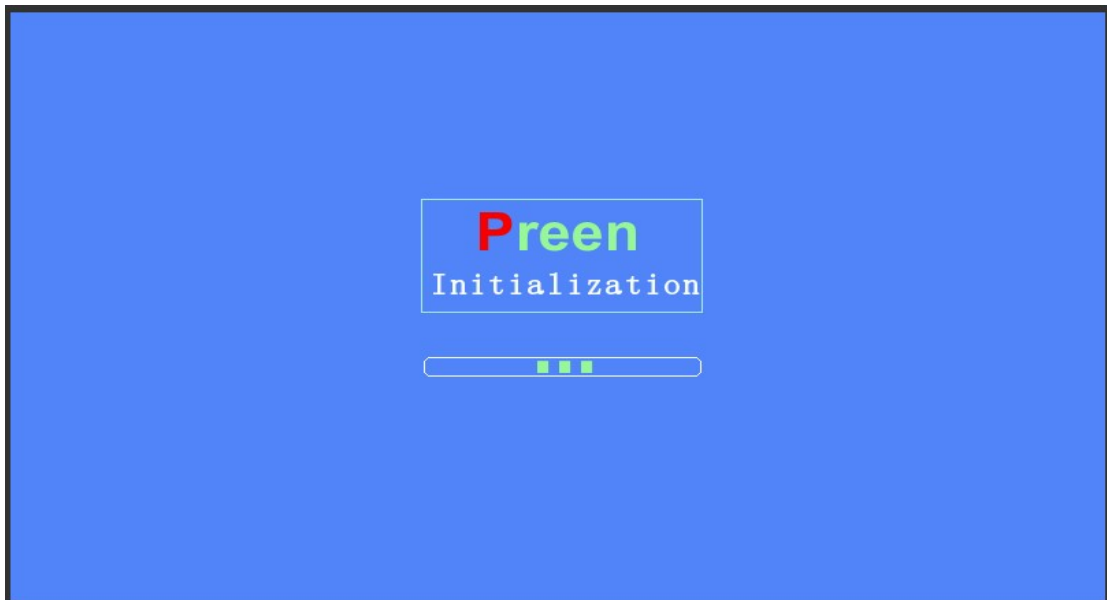
Fig. 5-2 Initialization interface

5.3.2 User mode

Enter the main menu of the user mode. The interface display is shown in Fig. 5-3.

Fig. 5-3 Main menu of user mode

● 【APP】--Application: Enter the operation setting interface;

● 【SYSTEM】: Enter the time setting and system maintenance interface;

● 【EVENT】: Enter the equipment work record information table interface.

5.4 Application interface

In the application interface, users can conduct the operations of the general mode, Step mode, Gradual mode and Measurement mode of the equipment.

Note: All the product information in the operation interface of the equipment should comply with the model specifications of the actual equipment.

5.4.1 General mode
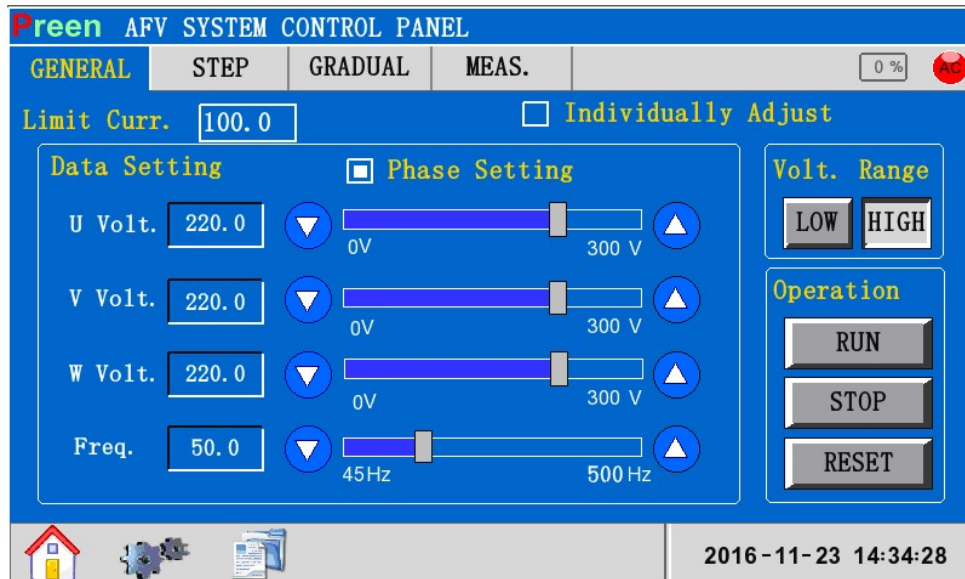
(a) Three-phase output setting interface
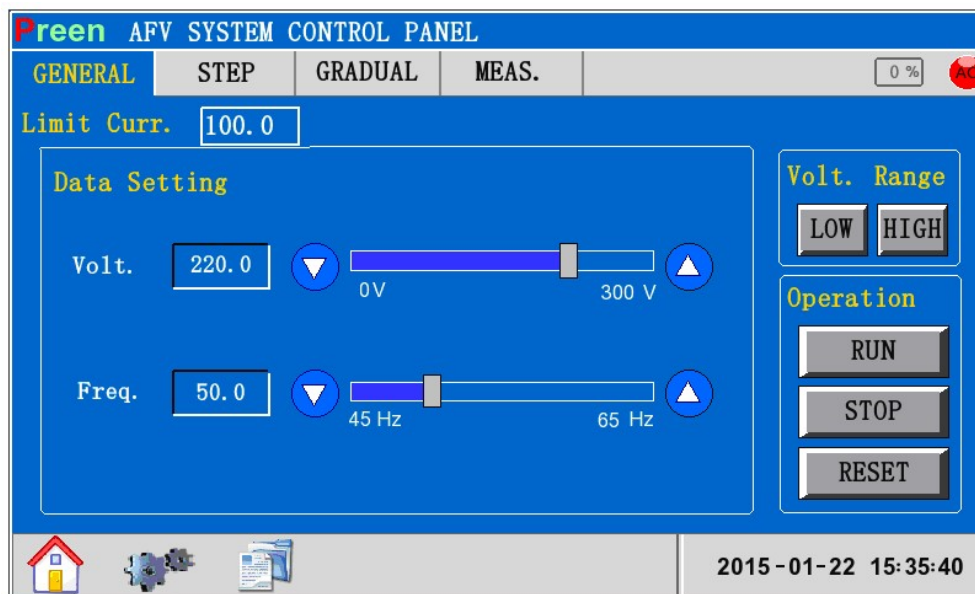
(b) Single-phase output setting interface

Fig. 5-4 Setting interface of general mode

- 【Limit Curr.】:Setting different current protection value.
- 【Individually Adjust】:Individual Adjust Volt. When this option is chosen, each phase can be set up independently.
- 【Phase Setting】:When this option is chosen, the phase angle can be set up.

Note：Above function is optional.

- 【U Volt.】/【V Volt.】/【W Volt.】-- U-phase voltage/ V-phase voltage/ W-phase voltage: The following three ways can be used for setting voltage at all phases:

  a) Directly input the voltage value in `220.0`. Click the box to pop up the keyboard, and then input the voltage value;

  b) In the box of `0V ——— 300 V` touch left and right for adjustment;

  c) Click ▽ & △ to conduct the setting. The variation unit is 0.1.

  Note：If the【Individual Adjust Volt.】is not picked，setting up a value on a specific single phase, the value on the same field for the other two phases will be changed to the same value as the one you just entered simultaneously.

- 【Freq】:Frequency: The setting way is same as that of voltage;

- 【LOW】: The equipment starts to output the low voltage after clicking it;

- 【HIGH】: The equipment starts to output the high voltage after clicking it;

- 【RUN】: The equipment starts the output according to the set value after clicking it;

- 【STOP】: The equipment stops the output after clicking it;

- 【RESET】: The equipment restores the initial state after clicking it;

- 【 AC 】: AC indicator light displays the operational state of the AC output of the equipment: Red represents that the mode of the equipment is in the stop state, while green represents that the mode of the equipment is running.

5.4.2 Step mode

(a) Step mode setting interface
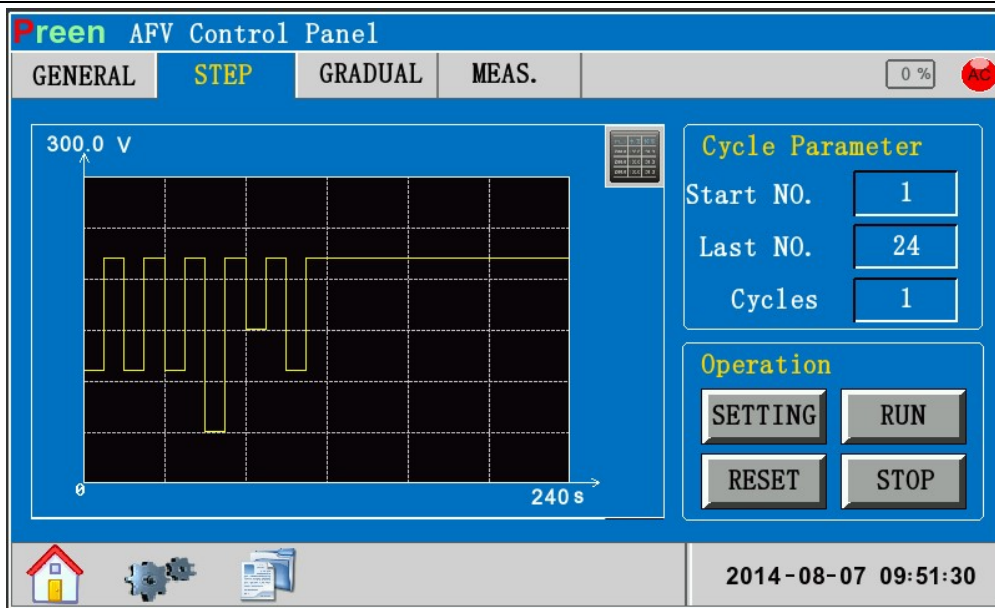
(b) Step mode effect interface

- 【SETTING】: Download the set parameters;

- 【RUN】: The equipment starts to run the step mode after clicking it;

- 【RESET】: The equipment restores the initial state after clicking it;

- 【STOP】: The equipment stops running the step mode after clicking it;

- & : Switch over step setting interface and step effect interface.

5.4.3 Gradual mode

(a) Gradual mode setting interface
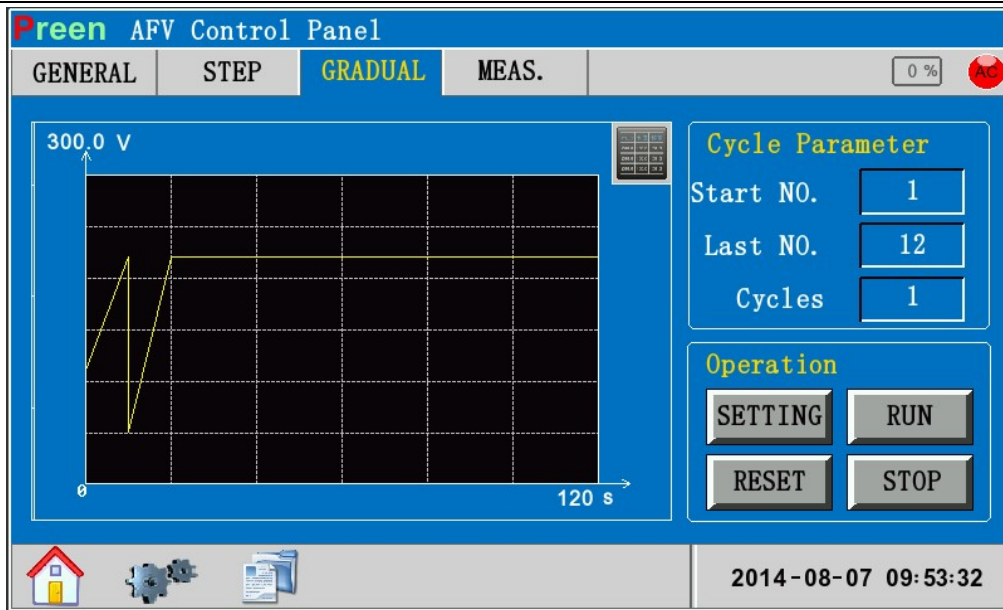
(b) Gradual mode effect interface

● 【SETTING】: Download the set parameters;

● 【RUN】: The equipment starts to run the gradual mode after clicking it;

● 【RESET】: The equipment restores the initial state after clicking it;

● 【STOP】: The equipment stops running the gradual mode after clicking it;

● &: Switch over gradual change setting interface and gradual change effect interface.

5.4.4 Measurement mode
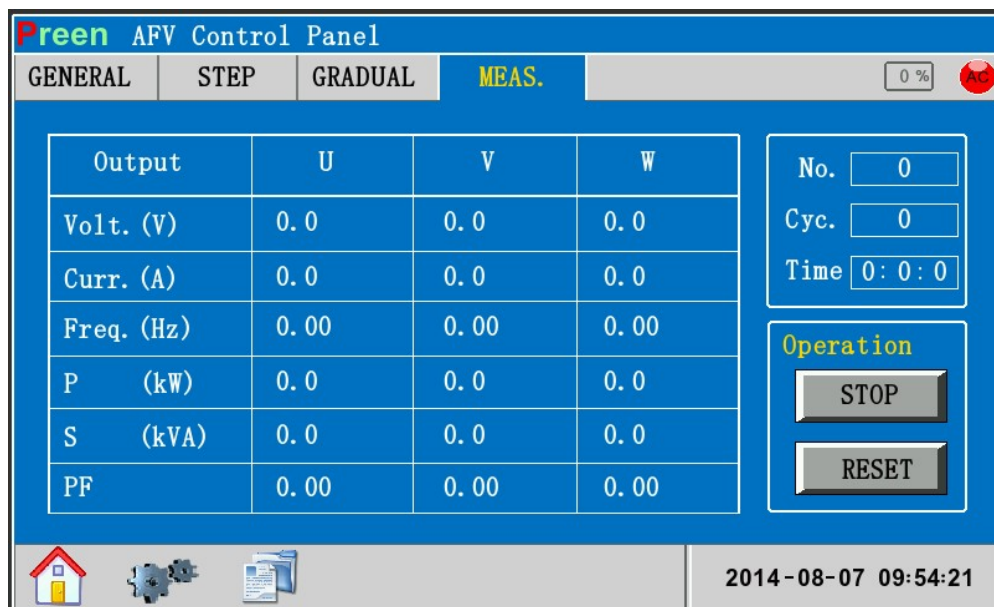
(a) Three-phase output setting interface
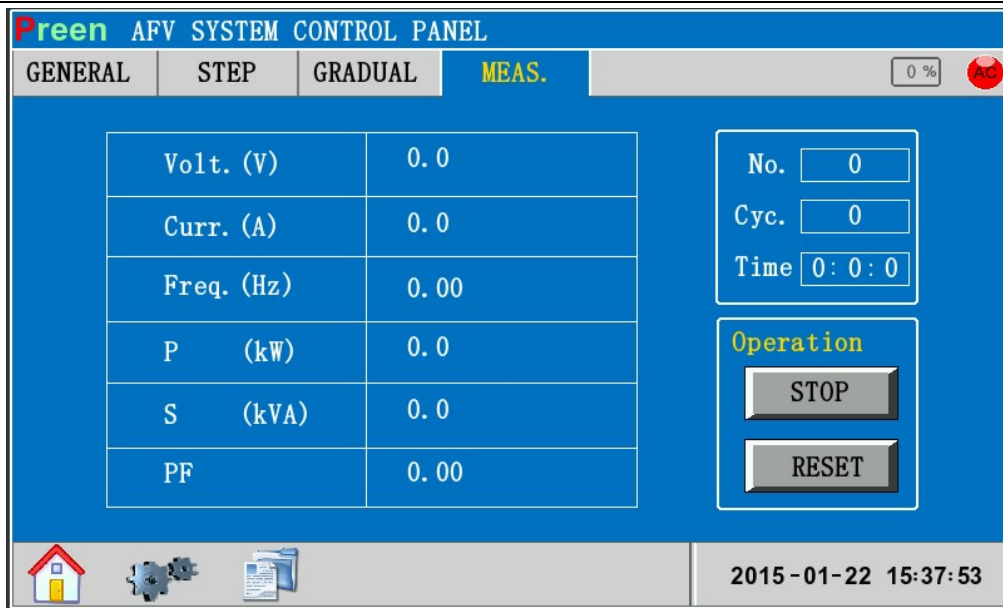
(b) Single -phase output setting interface

Fig. 5-7 Real-time acquisition interface

【MEAS.】--Measurement: Real-time acquisition;

● 【STOP】: The equipment stops the output after clicking it;

● 【RESET】: The equipment restores the initial state after clicking it;
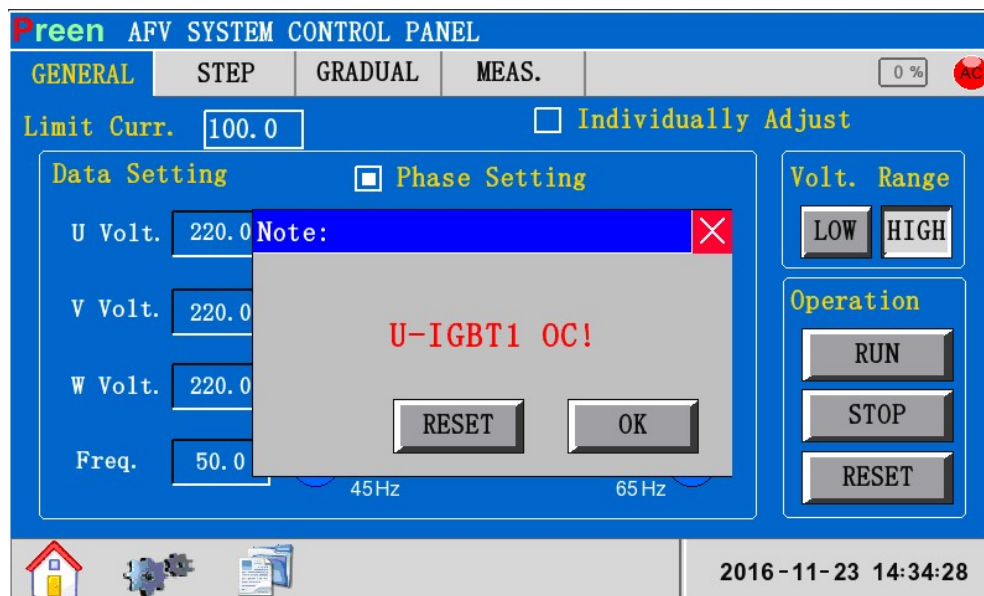
Fig. 5-8 Fault alarm interface

● 【RESET】: Fault reset;

● 【OK】: Click it to return to the real-time acquisition interface.

5.4.5 System maintemance interface
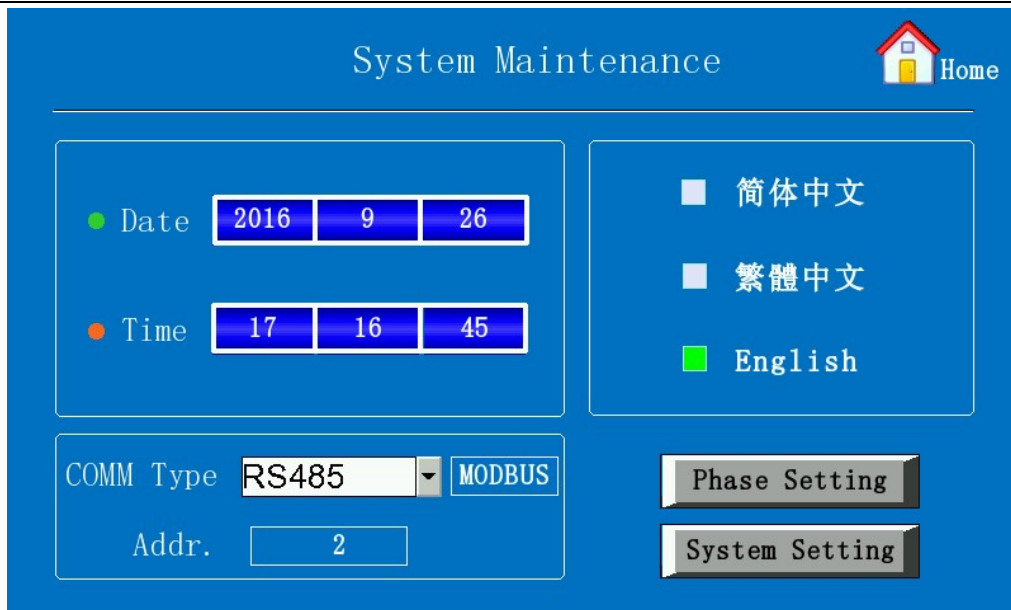
Fig. 5-9 System maintemance interface

- 【Date】: Setting the date;

- 【Time】: Setting the time

- 【System Setting】: The system configuration is only for the users to view, and it cannot be modified. If it needs to modify the system configuration, please contact the manufacturer and customer service personnel;

- 【Addr】: Setting the communication address, default value is 2;

- 【COMM Type】: Select the communication interface (or protocol), default is RS485;

- 【Phase Setting】:Option function ,Click it to Enter the Phase setting interface.
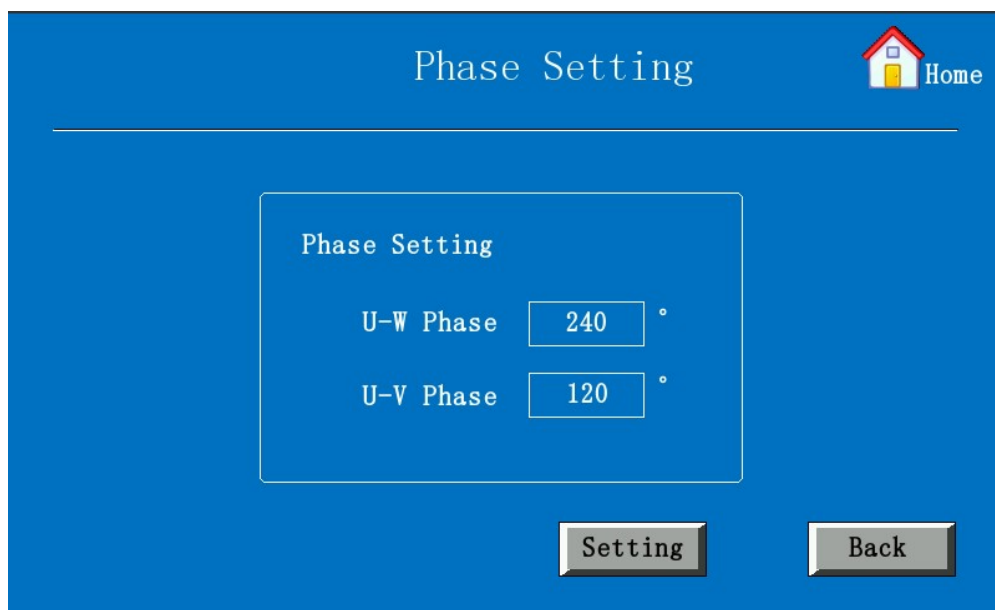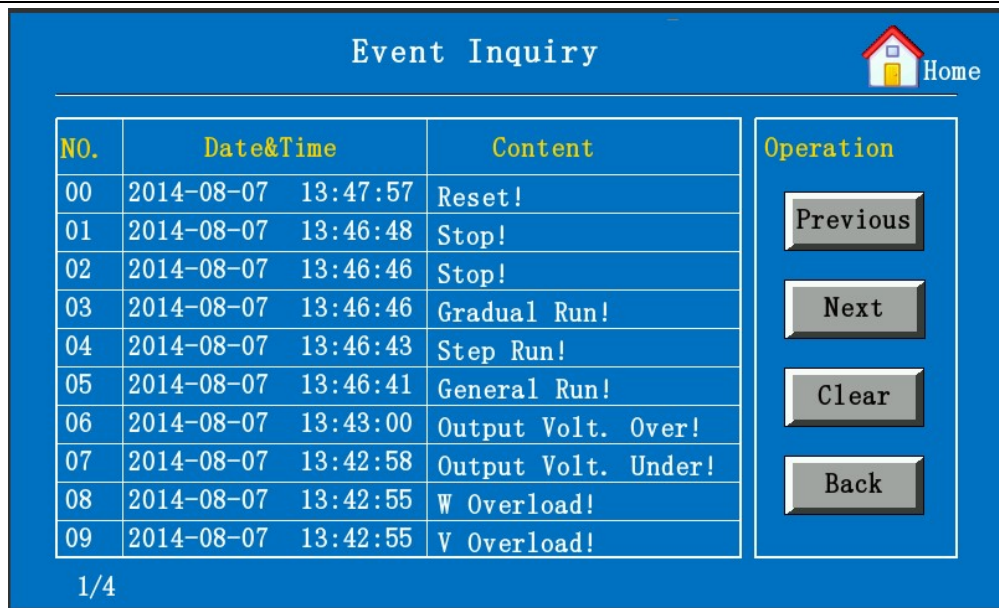
Fig. 5-10 Phase setting interface

5.4.6 System log

System log interface is shown in Fig. 5-11.

Fig. 5-11 System log setting interface

● 【Previous】/【Next】: Browse the historical event contents;

● 【Clear】: Empty the system log table;

● 【Back】: Return to the previous menu.

Chapter VI   Remote Control

6.1 Communication interface

RS-485 and RS-232 are standard communication interfaces for this series of machine. RS-232 supports SCPI command and RS-485 supports MODBUS RTU command. The RS-232 and RS-485 belong to the same interface with different pins and need to be configured in factory. LAN, USB, GPIB options apply different converters and connect to the RS-232/485 port.

6.1.1 Interface of RS-232/485

Open the front cover, RS-232/RS-485 interface is located in the back of touch screen shown as below figure:
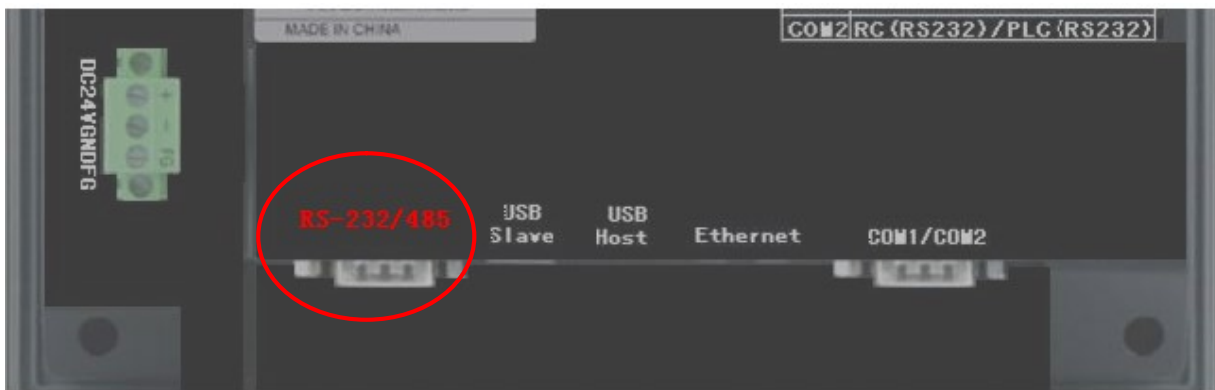
a) Back of the touch screen computer

RS-485 interface is female connector, and has nine pins		
Pin	Signal	PC
1	Rx-(B)	RS 485 B
5	GND	Signal Gnd
6	Rx+(A)	RS 485 A

b) Pin definition of this RS-485interface

| RS-232 interface is female connector, and has nine pins		
Pin	Signal	PC
2	RXD	TXD
3	TXD	RXD
5	GND	Signal Gnd

c) Pin definition of this RS-232 interface

Fig. 6-1 Pictures of RS485 connection

6.1.2 Indication of remote control on touch screen

While the communication interface of this machine is successfully linked with other computing equipment, there will be an indication text ("under remote control …") shown on the

screen, as below figure:
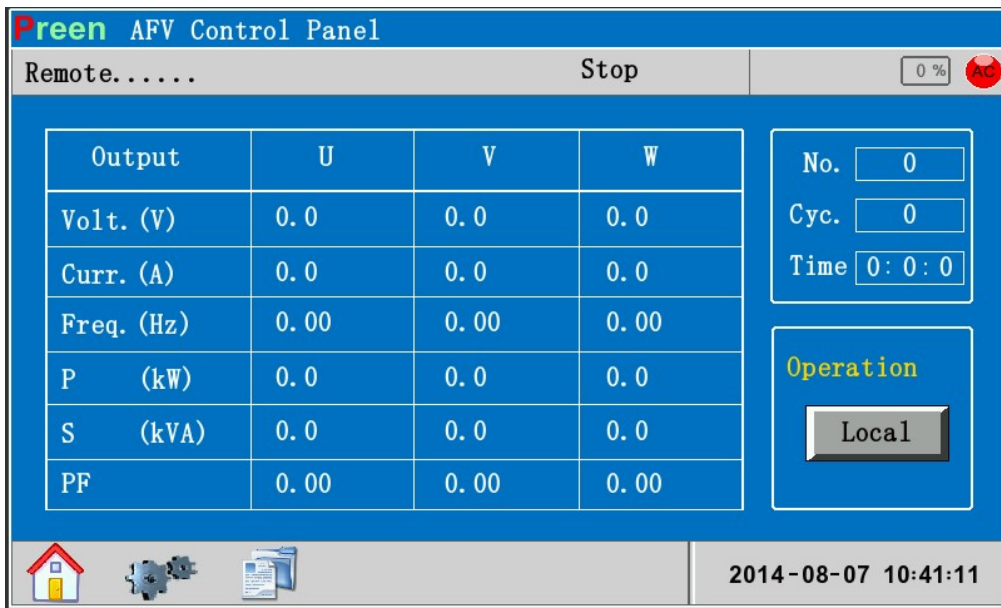
(a) Three-phase output setting interface

(b) Single-phase output setting interface

Fig. 6-2 "Under remote control"… shown on screen

6.2 Operations of remote control on PC

6.2.1 Software installation

Open the software CD package, install the software by executing the setup.exe in the CD, as shown in the below picture.
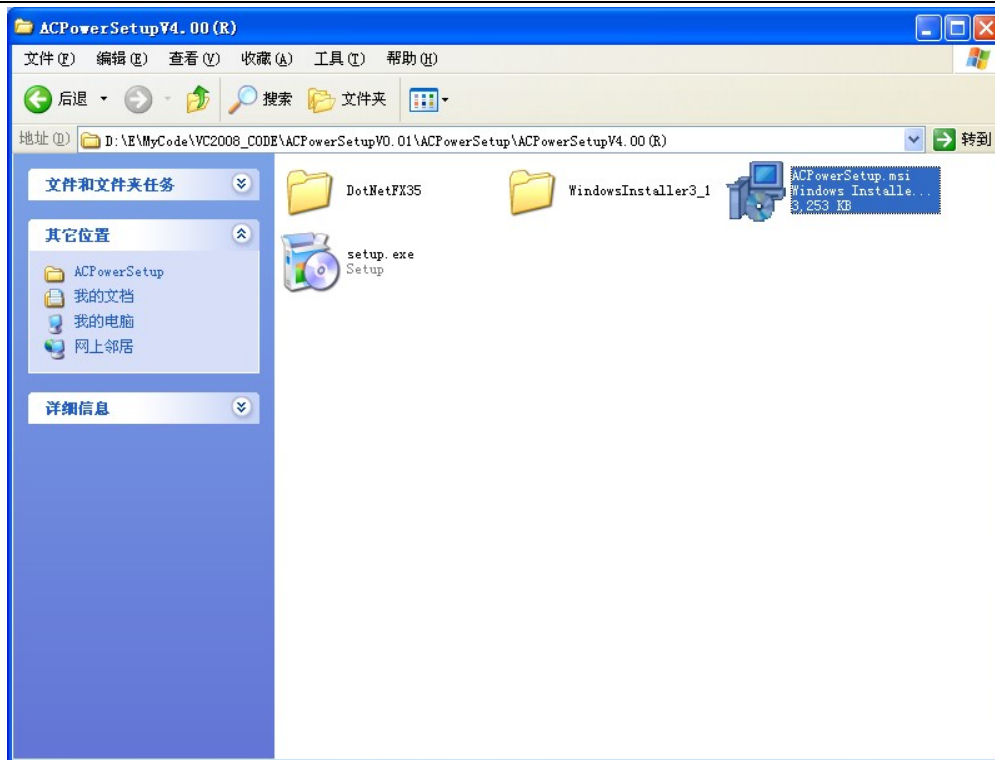
Fig. 6-3 Software installatin kit on the CD

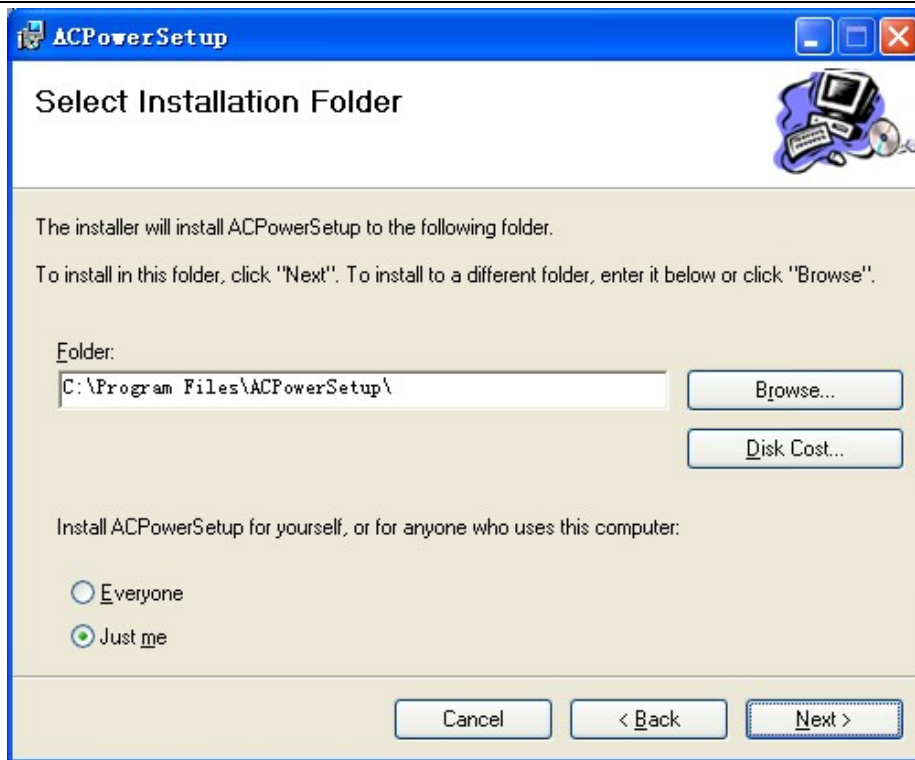Operating system supported: Windows XP、WIN7、WIN8.

Fig. 6-4   Procedures of the installation: 1st step.

Fig. 6-5   Procedures of the installation: 2nd step.

Choose the installation folder, recommend installing on D:\ disk (do not install on system disk).
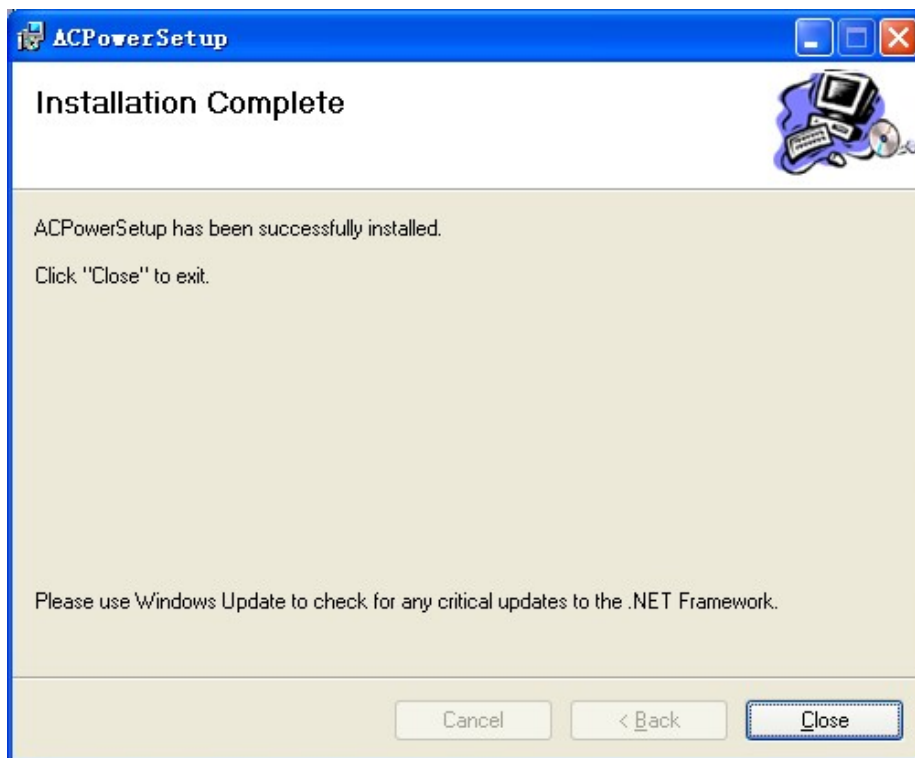

Fig. 6-6 Procedures of the installation: 3rd step.

Fig. 6-7   Shortcut on the PC desktop after successful installation

6.2.2 Operations on PC

Double click the shortcut (as shown in fig. 6-7) on the desktop, then enter the communication setting UI (as shown in fig. 6-8). Before communication interface are successfully linked, the operation button 【Read Dev. Info.】 is grayed (and can not operate).
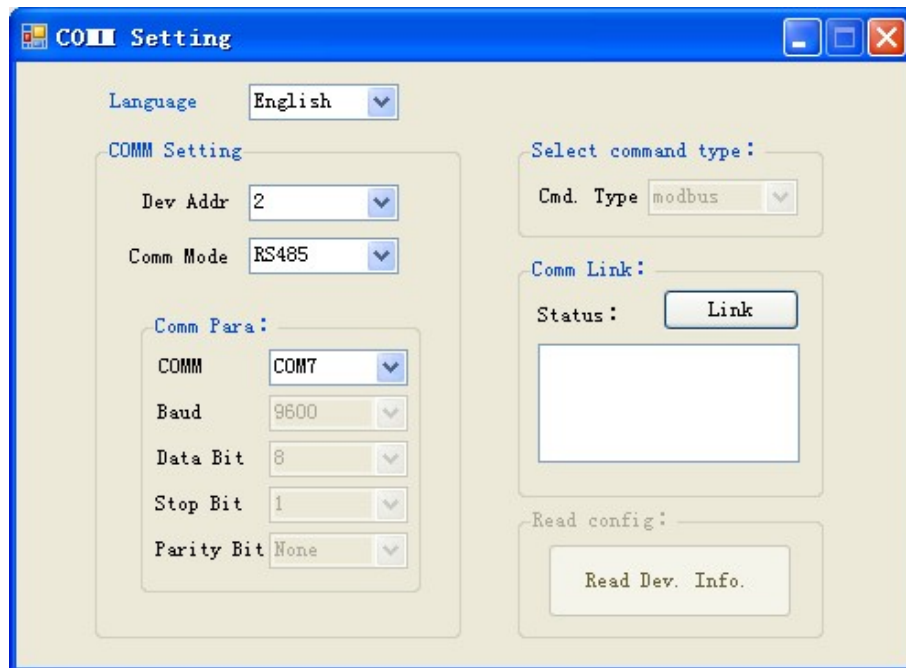

图 6-8   Communication UI

● Dev Addr：Address of this machine while in communication，for this series (AFV) of machines, default value is 2；

● Comm mode: Select the communication interface (or protocol), default is RS485；

● Comm ：Serial number of the com port to be selected；

● 【Link】：Click on this button after setting up all the required parameters for that specific communication mode, physical link is created. Status of this action will be shown on the blank area below this button.

● Other communication parameter is fixed: 9600bps，databit：8， stopbit：1，check：None；

● After a successful connection, button 【Read Dev. Info.】lift ashing, click【Read Dev. Info.】 (communication right) enter such as 6-9 shown in the device information display interface:
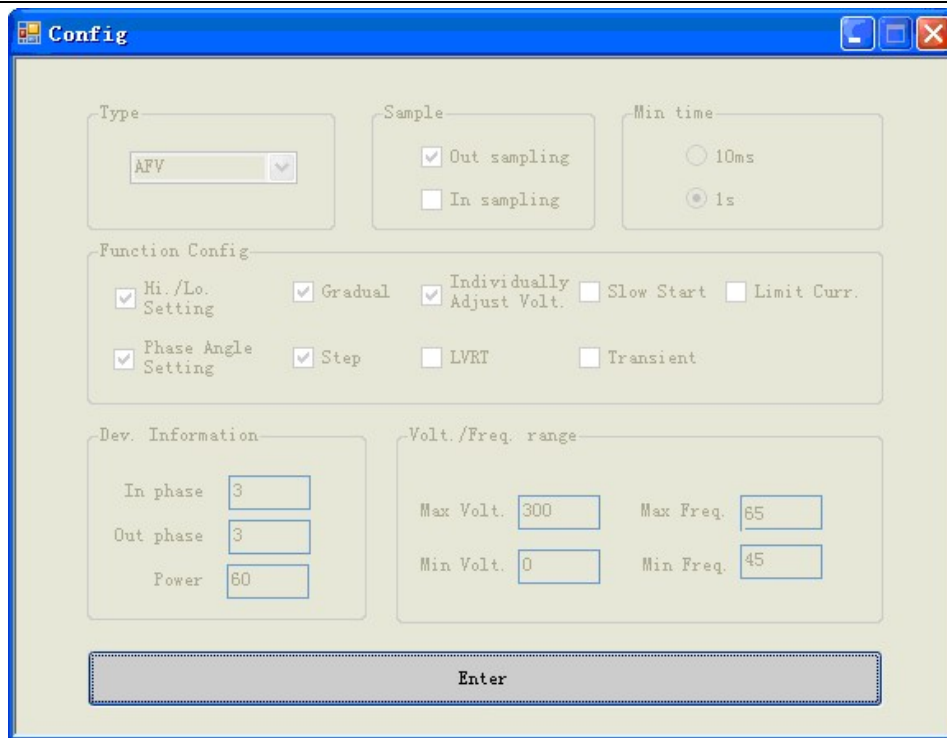
6-9 System Config UI

Users can view the system configuration information read from the power supply equipment is consistent with the parameters of the actual product, if it does not meet, please contact customer service staff to resolve.

After system configuration parameters confirm, click 【Enter】 button to enter the main interface of the software function, as shown in figure 6-10.

6.2.3 Main interface
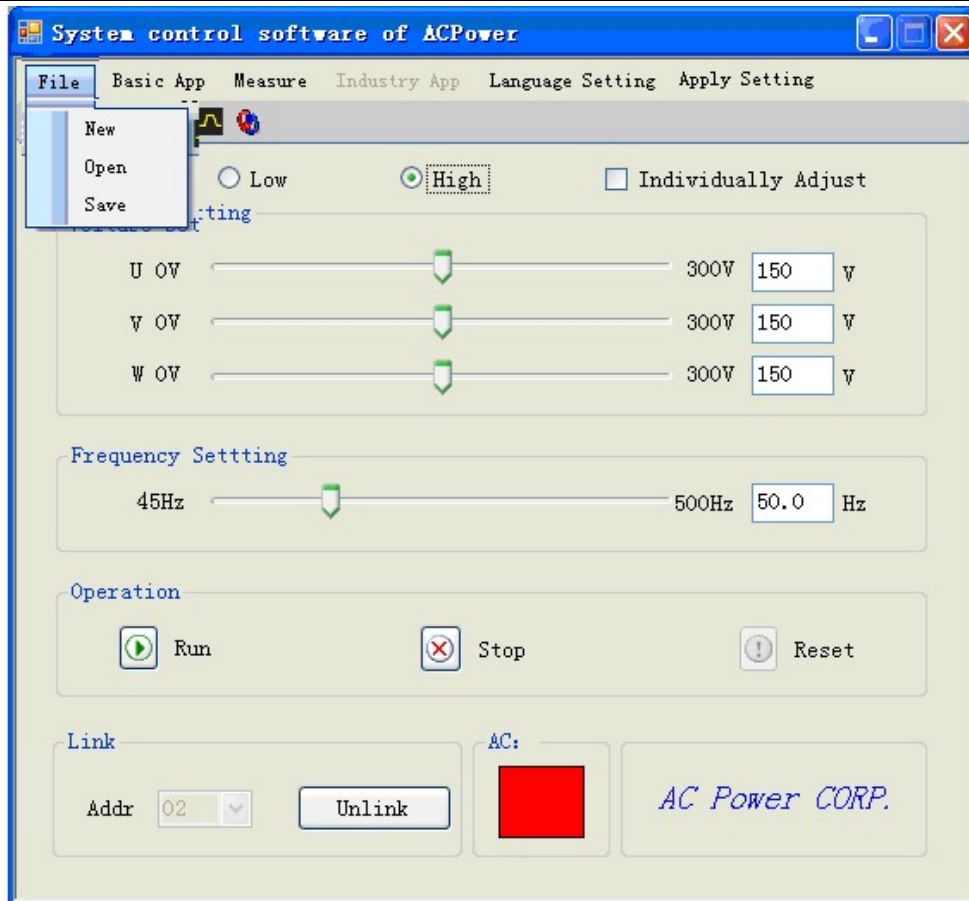
(a) Three-phase output setting interface
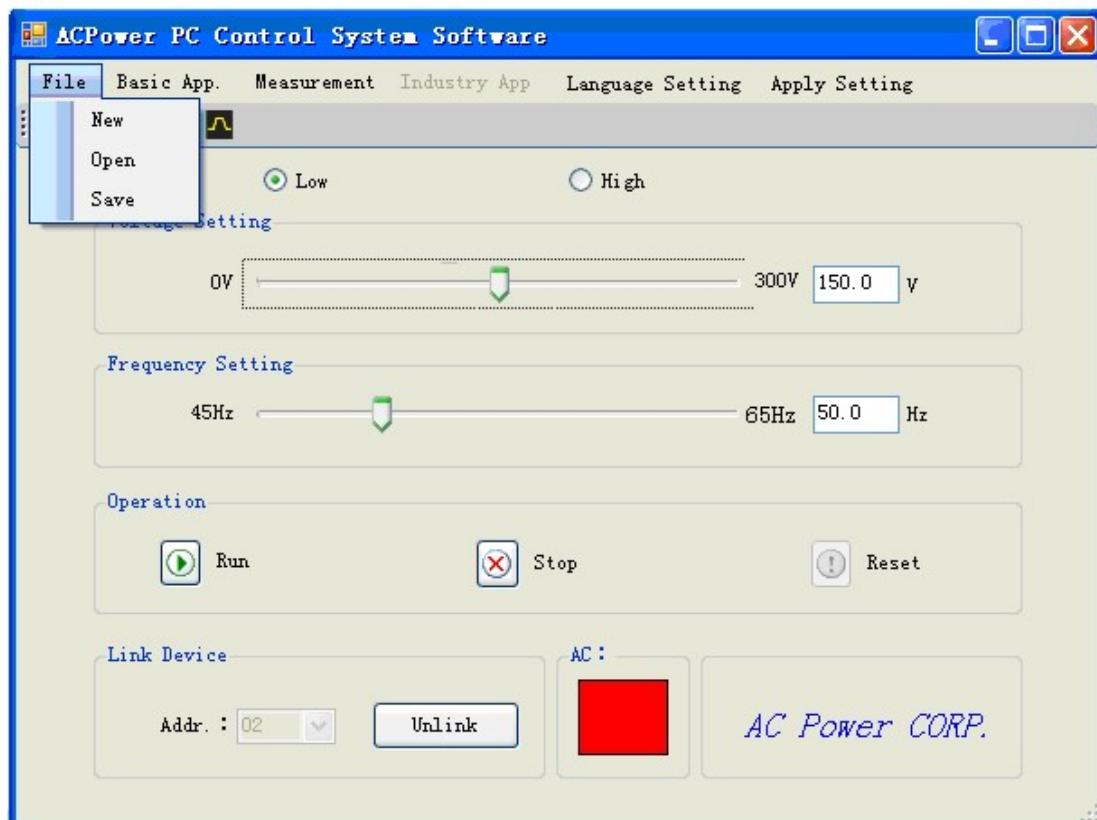
(b) Single-phase output setting interface

Fig. 6-10 Main interface of upper computer

In the above menu：

- 【New】：Create a new file for system data storage；

- 【Open】：Open an existing system data file；

(1) 【Save】：Store all the data that users have created into the current system data file;In the menu of "Basic App", click on 【Step】，and get into all the options and actions in "step" mode.
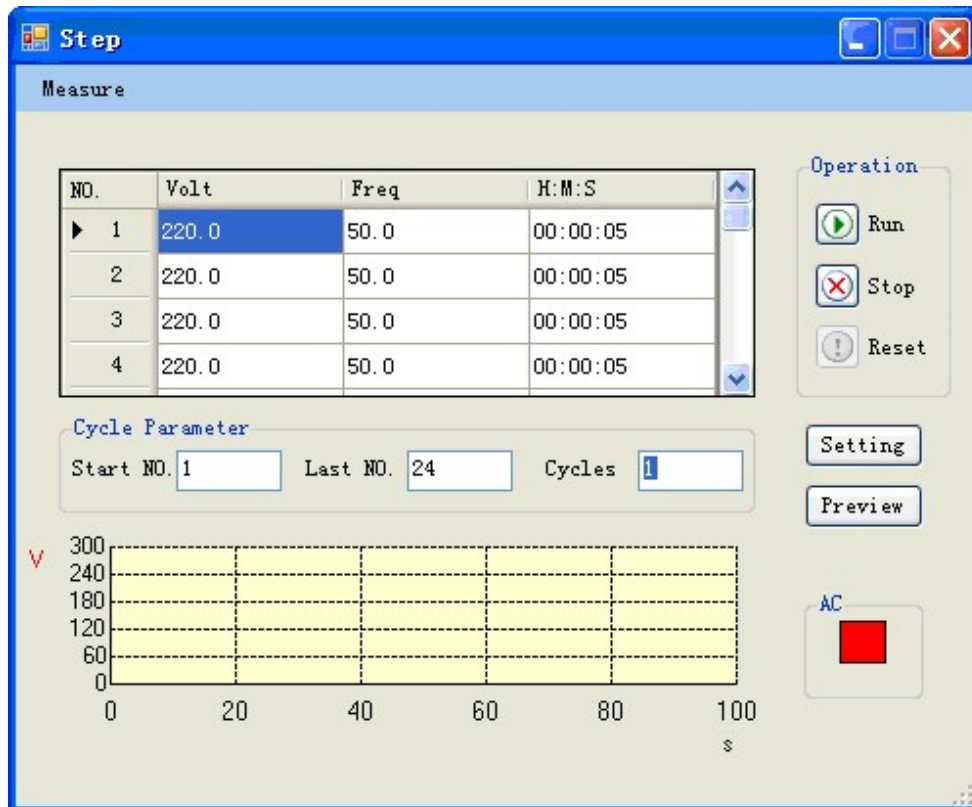
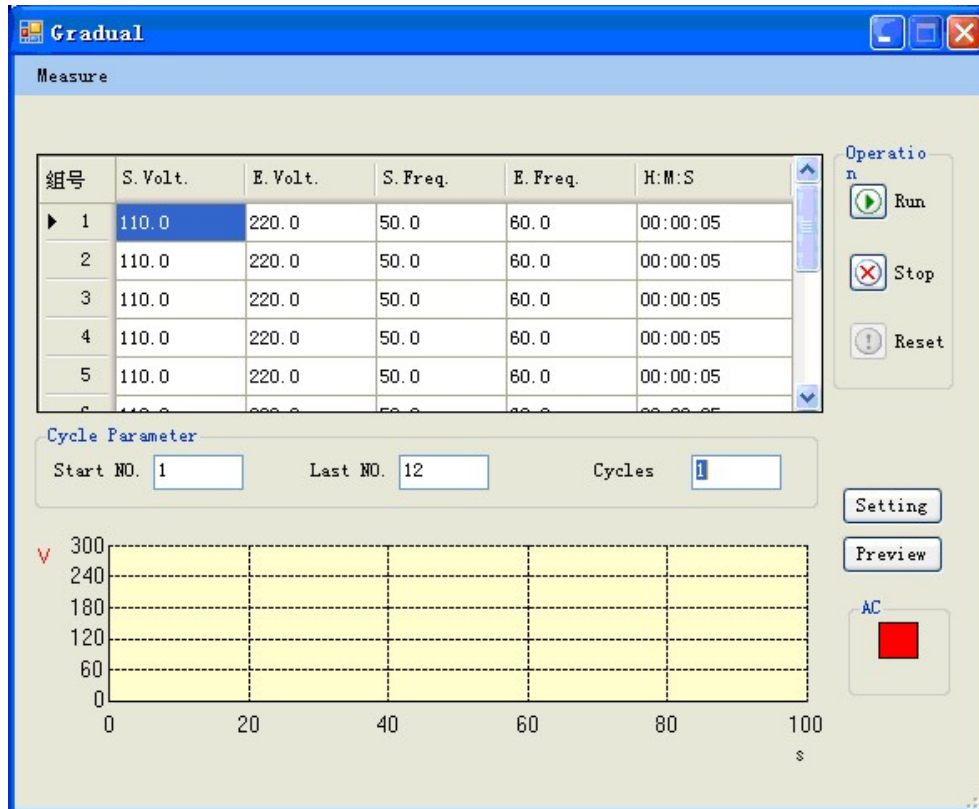(a) Menu of "step change" – Parameters settings

(b) Menu of "step" – Results preview

Fig. 6-11 Menu of "step" mode in remote control

- 【Cycle parameter】：The machine will start the output from the first procedure set in "Start No." to the last procedure set in "End No.", and execute the whole procedures continuously for the number of iteration of the parameter set in this field. The maximum number of procedures that can be stored is 24. The maximum number of iteration is 255.

- Click on 【Preview】 can preview the procedures (once executed) in time domain；

- 【Setting】：Save all the parameters in the touch screen into the control unit . User has to execute this action before running the whole "Step" procedures；

- All the data the users enter in this menu will be saved, once any of the action buttons of 【Preview】，【Setting】 or 【Run】 is clicked.

- 【 ▮ 】 indicator ：Red light indicates that the machine is in idle state (output stopped), while green light indicates the machine is in normal working state (output activated).

Note：If none of the above 3 action buttons has been clicked, all the data the user has entered in this session will be lost once this menu is exited.

- 【Run】Once clicked, the machine will start the output immediately as above procedures setup；

- 【Stop】 Once clicked，the machine will stop the output immediately；

- 【Reset】Once clicked, the machine will release itself from the "alarm" state.

(2) In the menu of "Basic App", click on 【Gradual】will bring you to the menu of "Gradual" mode.

(a) Menu of "Gradual" – Parameters settings
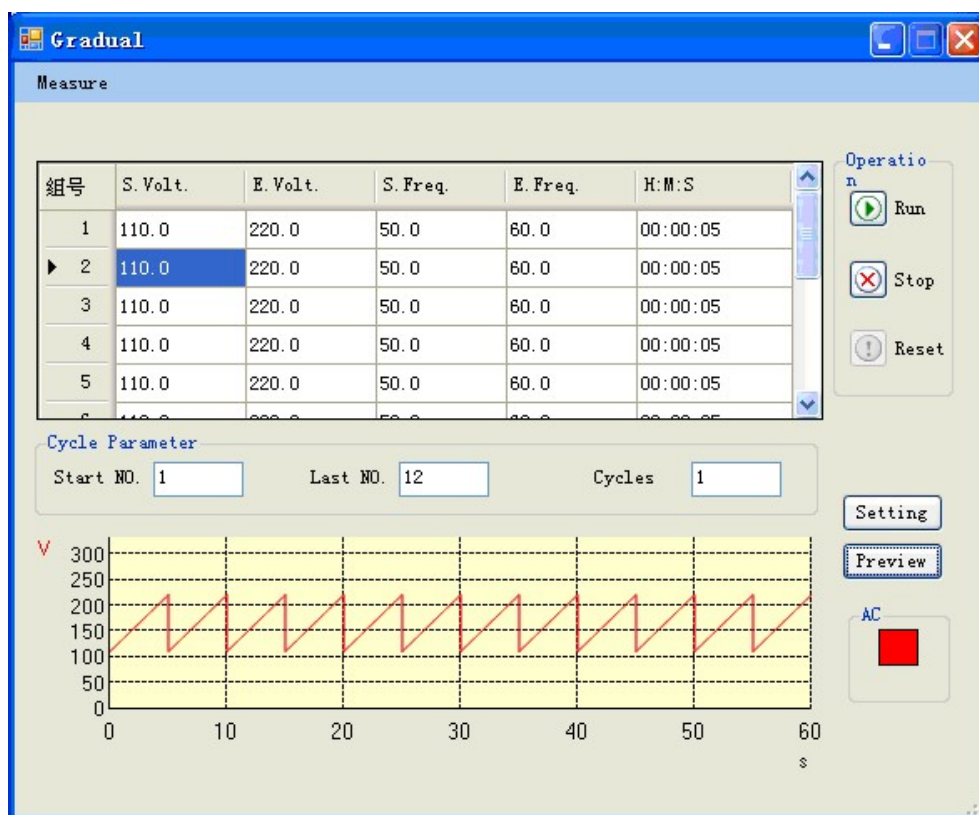
(b) Menu of "Gradual"   – Results preview

Fig. 6-12   Menu of "Gradual" mode under remote control

- 【Cycle parameter】：The machine will start the output from the first procedure set in "Start
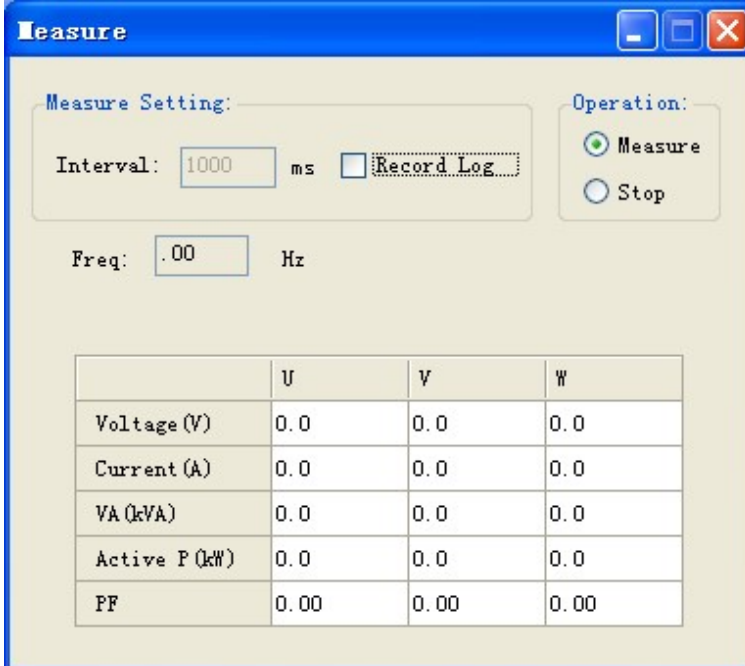
No." to the last procedure set in "End No.", and execute the whole procedures continuously for the number of iteration of the parameter set in this field. The maximum number of procedures that can be stored is 12. The maximum number of iteration is 255.

- Click on【Preview】can preview the procedures (once executed) in time domain.

- 【Setting】：Save all the parameters in the touch screen into the control unit inside the machine, the user have to execute this action before running the whole "Gradual" procedures.

- All the data the users enter in this menu will be saved, once any of the action buttons of 【Preview】, 【Setting】 or 【Run】 is clicked.

- 【█】 indicator ：Red light indicates that the machine is in idle state (output stopped), while green light indicates the machine is in normal working state (output activated).

Note：If none of the above 3 action buttons has been clicked, all the data the user has entered in this session will be lost once this menu is exited.

- 【Run】Once this button is clicked, the machine will start the output immediately as above procedures setup；

- 【Stop】 Once clicked，the machine will stop the output immediately；

- 【Reset】Once clicked, the machine will release itself from the "alarm" state

(3) Click on【Measure】will enter the menu of "Measure".

(a) Three-phase output setting interface

(b) Single-phase setting interface

Fig. 6-13 General Mode
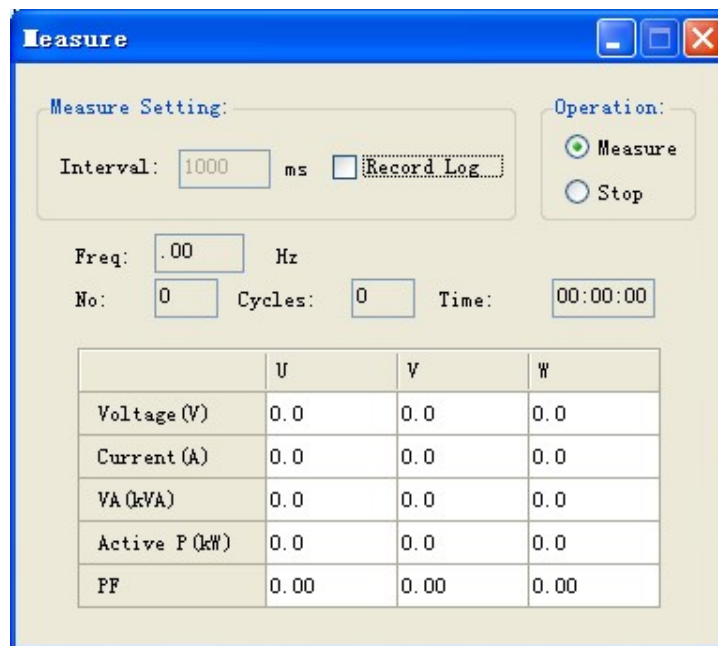
(a) Three-phase output setting interface
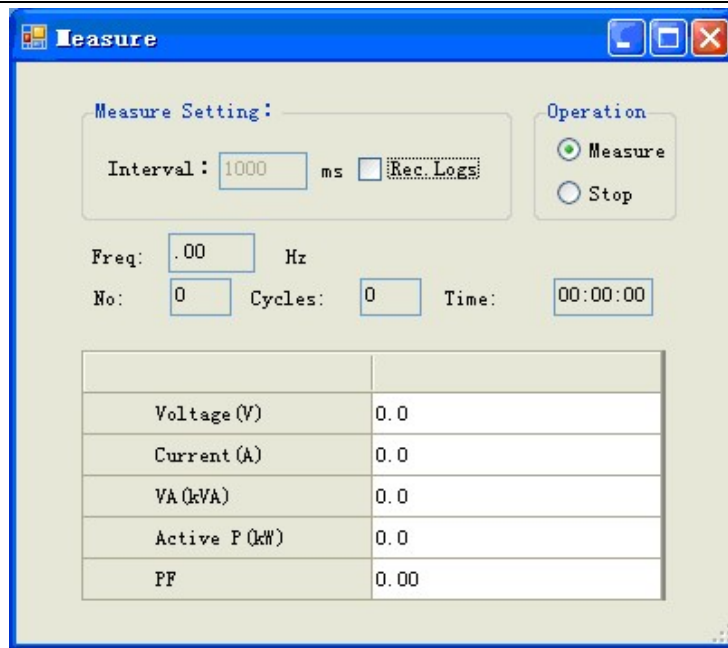
(b) Single-phase setting interface

Fig. 6-13 Menu of "Measure" under remote control

- "Interval" : The time interval fixed the default value:1000ms.
- "Record Logs": Save all the data measured in this mode into a log file.The file path:C://ACPower.
- "Measure" collection and "Stop" collection can be clicked and executed any time.
- Input measure data:R/S/T phase data is measure on anytime.
- Output measure data:U/V/W phase data is measure when the device running.

Note: these items can be selected only under the collection is ongoing.

(4) Click on the sub-menu of【Language Setting】, there are 3 kinds of languages can be chosen. Click on the language you want, and all the user-interface in this software will be changed to that language.
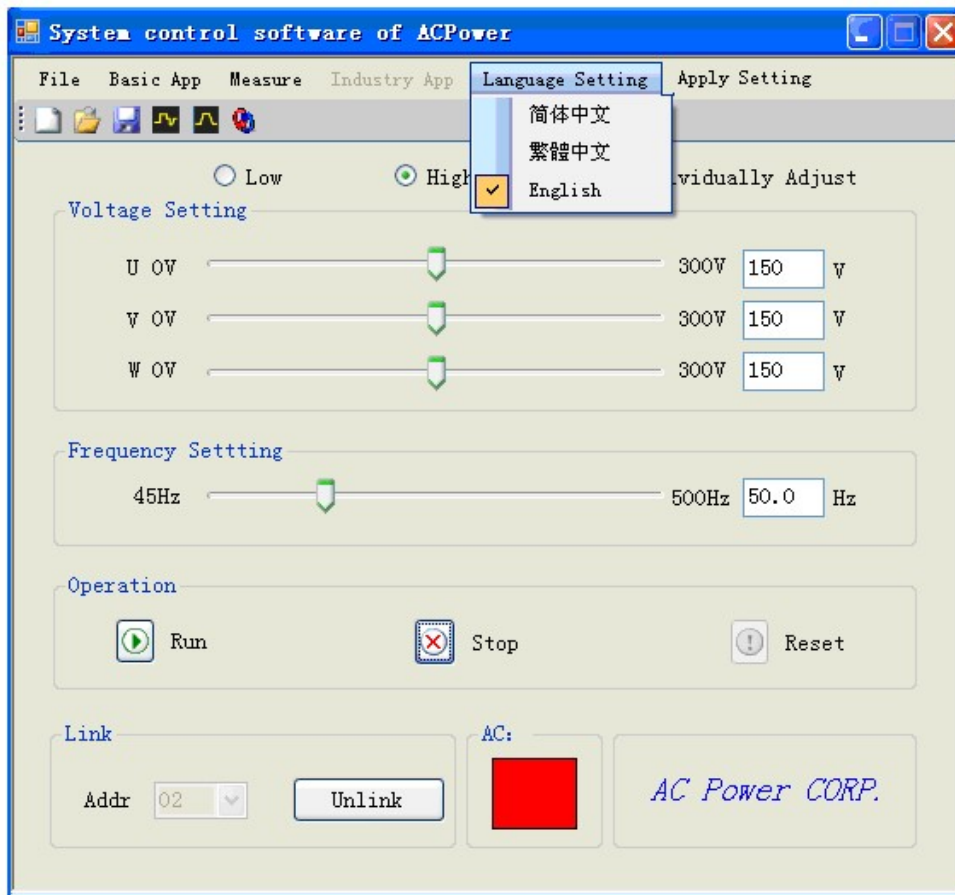
(a) Three-phase output setting interface
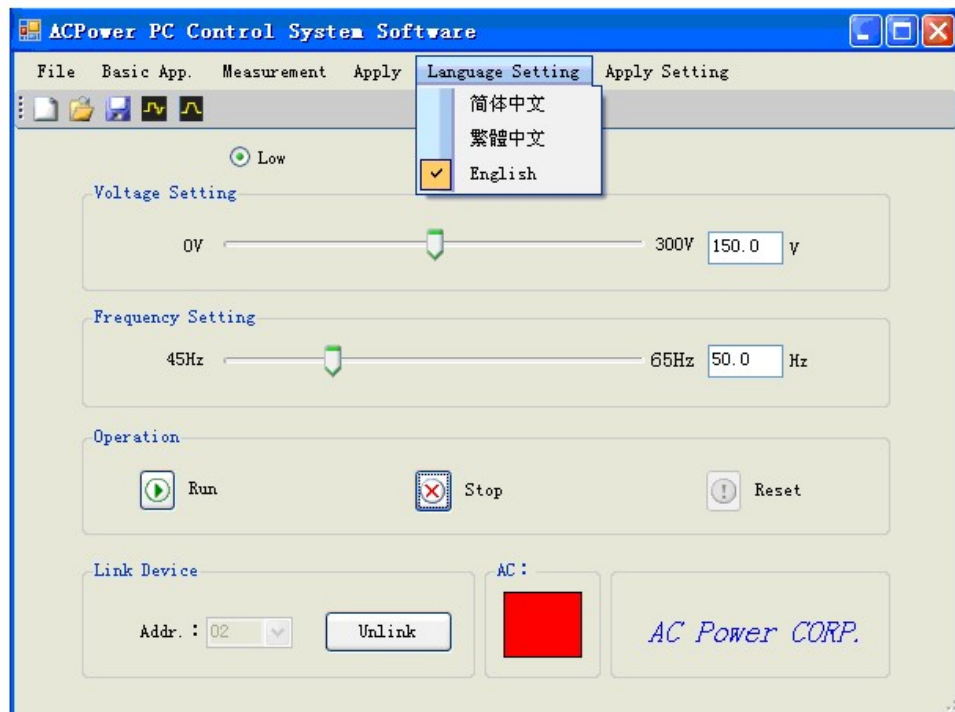
(b) Single-phase setting interface

Fig. 6-14   Language selection under rermote control

(5) Click on【Apply Setting】will enter the menu of "Phase Angle and Max Curr.

Setting".(Optional function)

(a) Phase Angle and Max Current optioning interface

(b) Phase Angle setting interface

(c) Max Current setting interface

Fig. 6-15 Phase Angle and Max Current setting interface

Chapter VII   Maintenance

Extreme temperature, high humidity, heavy dust, chemicals pollution and physical vibration all could impose negative impacts on the life and reliability of this machine. Nevertheless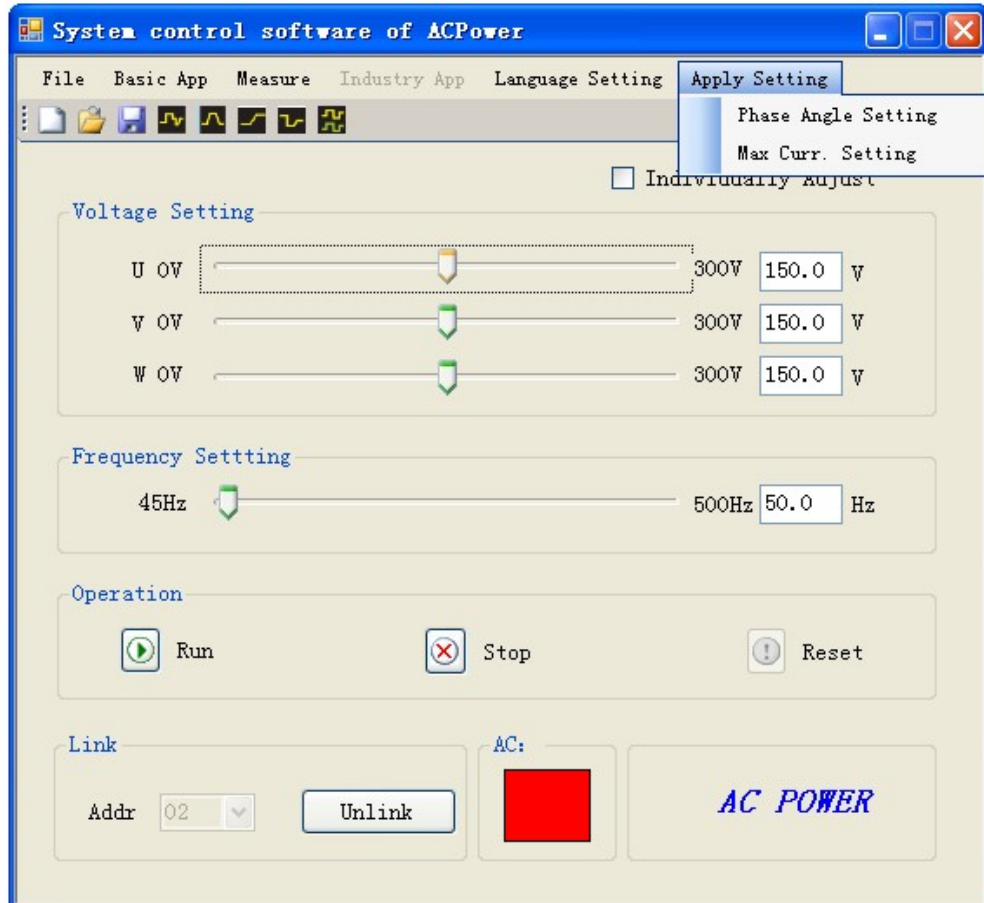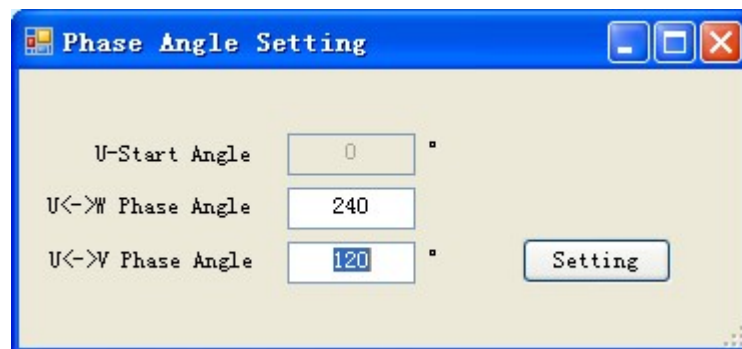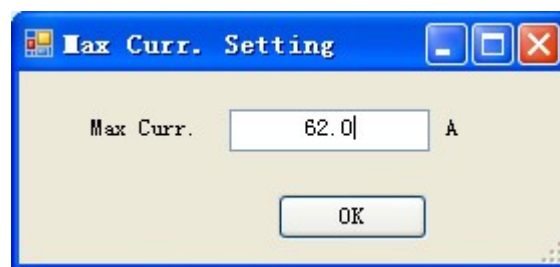, the nature aging of all the electrical and mechanical components would further cause it to be more vulnerable to all kinds of faults. Therefore, routine and periodic maintenance are necessary and key to the reliability of this machine in the long run.

⚠️ ***Only authorized and trained technical professionals are allowed to carry out the maintenance on this machine.***

7.1   Routine maintenance

First, the daily operating environment must comply with the requirements stated in this user manual. Routine inspection on the environment and the machine should be checked on a regular basis. All the environment data, the operating status and the parameters set in the machine should be recorded as well. It is best to have a detailed and accurate "machine usage log file" for all time reference and maintenance.

Abnormal phenomenon on the machine can be detected by the routine inspection and maintenance. Once observed, the users should try to identify the root cause first and remove the problem immediately. Call our customer service if you are not able to identify the cause, or not able to remove the problem. The earlier the problem can be removed, the longer the life of the machine. Checking items in the routine maintenance are listed in Table 7-1.

Table 7-1 List of checking items on routine maintenance

Object to check	Inspection details			Criteria
	Checking items	When to check	Methods to check	
Environ-ment	(1). Temperature and humidity (2). Dust, moisture and water leakage (drop on the machine). (3). Abnormal Chemical vapor	Anytime	(1).Thermometer, Hygrometer (2). Visual inspection (3). Visual inspection and smell	(1). Ambient temperature must < 40˚C, or maximum load need to be de-rated. Humidity should be comply with the spec requirements. (2). Little dust, no condensing, no water drop on the machine. (3). No abnormal smell, no abnormal color in the air.

This machine	(1)Shock, vibration (2)Heat dissipation (3)Acoustic noise	Anytime	(1) Visual inspection, sense of moving. (2)Thermometer (3)Sense of hearing	(1)No shock, no vibration。 (2)Fan operating: check to see if speed and air flow volume OK or not. Measure the temperature on the surface of the enclosure; they should not have more than 30˚C temperature rise. (3) No abnormal acoustic noise.。
Input / Output status	(1)Input voltage (2)Output voltage (3)Output current (4)Temperature inside the machine	Anytime	(1)Voltmeter (2)Voltmeter (3)Ammeter (4)Thermometer	(1)within the spec limit (2)within the spec limit (3)within the spec limit (4)Temperature rise＜40˚C

7.2   Periodic maintenance

Depending on the usage of this machine and the environment where it works，a periodic maintenance can be carried out once every 3~6 months.

Maintenance task：

Screen filter for the air inlet should be detached and washed clean.

Note：Open the front door of the enclosure to detach and re-install the screen filter, there is a cover in front of the screen filter, it needs to be removed before the filter can be accessed.

Chapter VIII Troubleshooting and Solutions

Before seeking services, users can first do self-inspection and record fault phenomena in details according to tips in this section. When you need to seek services, please contact the dealer.

Table 8-1 Alarm contents and solutions

Fault code	Fault type	Possible causes of faults	Solutions
Err-01	U-phase IGBT1 overcurrent fault	U-phase IGBT is damaged	Check and replace IGBT
Err-02	U-phase IGBT2 overcurrent fault	U-phase IGBT is damaged	Check and replace IGBT
Err-03	U-phase IGBT3 overcurrent fault	U-phase IGBT is damaged	Check and replace IGBT
Err-04	U-phase IGBT4 overcurrent fault	U-phase IGBT is damaged	Check and replace IGBT
Err-05	V-phase IGBT1 overcurrent fault	V-phase IGBT is damaged	Check and replace IGBT
Err-06	V-phase IGBT2 overcurrent fault	V-phase IGBT is damaged	Check and replace IGBT
Err-07	V-phase IGBT3 overcurrent fault	V-phase IGBT is damaged	Check and replace IGBT
Err-08	V-phase IGBT4 overcurrent fault	V-phase IGBT is damaged	Check and replace IGBT
Err-09	W-phase IGBT1 overcurrent fault	W-phase IGBT is damaged	Check and replace IGBT
Err-10	W-phase IGBT2 overcurrent fault	W-phase IGBT is damaged	Check and replace IGBT
Err-11	W-phase IGBT3 overcurrent fault	W-phase IGBT is damaged	Check and replace IGBT
Err-12	W-phase IGBT4 overcurrent fault	W-phase IGBT is damaged	Check and replace IGBT
Err-13	Radiator over-temperature	The fan works abnormally	Check the fan
Err-14	Transformer over-temperature	The fan works abnormally	Check the fan
Err-15	Emergency stop button	The emergency stop button is presses	Check the emergency stop button
Err-16	Fuse 1 is broken	The fuse blows out	Check and replace the fuse
Err-19	IGBT over-temperature 1	The fan works abnormally	Check the fan
Err-20	IGBT over-temperature 2	The fan works abnormally	Check the fan
Err-21	Input undervoltage fault	The input voltage is too low	Check the input voltage
Err-22	Input overvoltage fault	The output voltage is too high	Check the input voltage
Err-23	DC voltage is too low	The input voltage is too low	Check the input voltage
Err-24	DC voltage is too high	The output voltage is too high	Check the input voltage
Err-25	U overload	U-phase overload	Check the load
Err-26	V overload	V-phase overload	Check the load
Err-27	W overload	W-phase overload	Check the load
Err-28	Output undervoltage fault	The output voltage is too low	Check the output voltage
Err-29	Output overvoltage fault	The output voltage is too high	Check the output voltage

Chapter Ⅸ   Customer Service

AC Power Corp. (Suzhou) provides all kinds of technical service to its customers. Please first contact the sales representative from whom you acquire this machine for any questions or problems. If you not able to reach that sales representative, then you are welcome to contact the nearest branch office or our Suzhou central office for solid support. Our contact information are listed as follows：

● Telephone：(+86) **400-885-2800**

● Support on the web：

Customers may browse our website to seek technical information or on-line support.

Our website：

http：//www.acpower.net

Our Email for customers：

E-mail：sales@acpower.net

Please refer to the provisions in the warranty contract for details of the maintenance tasks. We do provide our customers with various kinds of packages for paid service in which there are different levels of customization. These paid services includes "fast response on issues encountered", "preventive maintenance" and "continuation of warranty after original warranty expires". Contact the sales representative or the branch office for more details.

TEquipment.NET USA
An Interworld Highway, LLC Company
Call Us 1.877.571.7901

Appendix Guarantee Card

Preen

Quality

Service

Innovation

Warranty

For customer, _____

Model: _____ Serial Number: ____ _____

    Should this machine malfunction or fail due to material or manufacturing flaws within one year, AC Power Corp. (APC) will take full responsibility for the repairs. This warranty only holds if the machine has been operating for normal use and in the normal environment specified in the manual. APC reserves the right to charge the customer for the repairs if the defects are due to any cause other than material or manufacturing flaws, and/or if the defects are due to any cause resulting from operating in a severe environment (factors beyond the allowable limits).

    The warranty begins on the date when this machine is installed and our sales representative signs this document; it is only valid when the machine has been installed correctly and while operated properly. No modifications on the structure or circuitry and no replacement of any components by unauthorized personnel are allowed under this warranty.

    In case of machine malfunction or failure, please call our customer service for help first. Under some situations and directed by our company staffs, you may need to uninstall it, pack and wrap it up securely, and then send it back to us with a description of the problems encountered. We shall resolve your problems as soon as possible.

    Please keep this warranty paper all the time even after it expires. We will only take a minimum charge for the repairs after the warranty's expiration if you still hold this paper.

Thank you for choosing AC Power Corp.

Sales representative (AC Power Corp.)：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿   Date ：＿＿＿＿＿＿＿＿＿＿＿