FY Type series Fastron Electronics

User manual of full digital three phase SCR power controller

Preface

Product appearance drawing

First use

Users who use this product for the first time should read this manual carefully. If you have doubts about some functions and performance, please consult our technical support personnel for help, which is beneficial to the correct use of this product.

Application standard

GB/T 3859.1-2013

GB/T 3859.2-2013

Contents

Safety precautions

Safety note

- Please read and observe this safety note before installing, operating and maintaining the product.
- In order to ensure personal and equipment safety, please follow the product identification and all safety precautions in the manual when installing, operating and maintaining the product.
- The "caution", "warning" and "danger" items in the manual do not represent all safety precautions to be observed, but only supplement all safety precautions.
- The product should be used in the environment that meets the requirements of design specifications, otherwise it may cause failure, and the abnormal function or component damage caused by non-compliance with relevant regulations is not within the scope of product quality assurance.
- Our company will not bear any legal liability for personal safety accidents and property losses caused by illegal operation of products.

Definition of safety level

"Danger" means death or serious bodily injury if not operated according to regulations.

"Warning" indicates that failure to comply with regulations may result in death or serious bodily injury.

"Caution" indicates that failure to comply with regulations may result in minor bodily injury or equipment damage.

Safety precautions

Open package acceptance

- Before unpacking, please check whether the outer package of the product is in good condition, whether it is damaged, soaked, damped, deformed, etc.
- Please open the package according to the order of layers. Do not knock it violently!
- When unpacking, please check the surface of the product and its accessories for damage, corrosion, bumping, etc.
- After unpacking, please check whether the quantity and data of products and accessories are complete according to the packing list.

- When unpacking, the product and its accessories are found damaged, rusted and used. Please do not install it!
- Please do not install the product when it is found that there is water in the product, parts are missing or damaged when unpacking!
- Please check the packing list carefully. If the packing list does not match the product name, please do not install it!

Storage and transportation

- Please store and transport the products according to the storage and transportation conditions. The storage temperature and humidity meet the requirements.
- Avoid storage in places such as water splashing, direct sunlight, strong electric field, strong magnetic field and strong vibration.
- Avoid storing the product for more than 3 months. If the storage time is too long, please take more strict protection and necessary inspection.

- Please pack the products strictly and transport them by vehicle. More closed boxes must be used for long-distance transportation.
- It is strictly forbidden to transport the product together with equipment or goods that may affect or damage the product.

- Be sure to use professional loading and unloading equipment to handle large or heavy equipment and products.
- When carrying the product by hand, please be sure to hold the product shell firmly to avoid the product parts falling down, otherwise there is a risk of injury!
- When handling the product, please be sure to lift and put it gently. Pay attention to the objects under your feet at any time to prevent tripping or falling, otherwise there is a risk of injury or product damage!
- When the equipment is lifted by lifting tools, it is forbidden to stand or stay under the equipment.

Installation

- Please read the product manual and safety precautions carefully before installation!
- Do not refit this product!
- It is forbidden to screw the fixed bolts and red marked bolts of product parts and components!
- Please do not install this product in the place with strong electric field or strong electromagnetic wave interference!
- When the product is installed in the cabinet or terminal equipment, the cabinet or terminal equipment shall be provided with corresponding protective devices such as fireproof enclosure, electrical protective shell and mechanical protective shell, and the protection grade shall meet the requirements of relevant IEC standards and local laws and regulations.

Danger

- It is strictly forbidden to install, connect, protect, maintain, inspect or replace parts by non professionals!
- The installation, wiring, maintenance, inspection or component replacement of this product can only be carried out by professionals who have received relevant training of electrical equipment and have sufficient electrical knowledge.
- The installation personnel must be familiar with the product installation requirements and relevant technical data.
- When installing the equipment with strong electromagnetic interference such as transformer, please install shielding protection device to avoid misoperation of the product!

Wiring

Danger

- It is strictly forbidden for non professional personnel to carry out equipment installation, wiring, maintenance, inspection or component replacement!
- Do not conduct wiring operation when the power is on, otherwise there will be a risk of electric shock.
- Please cut off the power supply of all equipment before wiring.
- Please make sure that the equipment and products are well grounded, otherwise there will be electric shock hazard.
- Please follow the steps specified in ESD, and wear an electrostatic bracelet for wiring to avoid damaging the internal circuit of the device or product.

Warning

- The cable or copper bar used in wiring must meet the current carrying standard, and the shielding layer of shielded cable needs to be grounded reliably at one end!
- After wiring, make sure that there are no dropped screws or bare cables inside the equipment and products.

Power on

- Before power on, please make sure that the equipment and products are installed in good condition and the wiring is firm.
- Before power on, please make sure that the power supply meets the requirements of the equipment to avoid equipment damage or fire!
- When power on, the mechanical device of the equipment or product may act suddenly. Please keep away from the mechanical device.
- After power on, please do not open the equipment cabinet door or product protective cover, otherwise there is a risk of electric shock!
- It is strictly forbidden to touch any wiring terminal of the equipment under the power on state, otherwise there is a risk of electric shock!
- It is strictly forbidden to dismantle any device or part of the equipment and products under the power on state, otherwise there is a risk of electric shock!

Operation

- It is strictly forbidden to touch any terminal of the equipment in the running state, otherwise there is a risk of electric shock!
- It is strictly forbidden to dismantle any device or part of the equipment and products in the running state, otherwise there is a risk of electric shock!
- Do not touch the equipment shell, fan, etc. to test the temperature, or it may cause burns!
- It is strictly forbidden for non professional personnel to detect signals during operation, otherwise personal injury or equipment damage may be caused!

- During operation, avoid other objects or metal objects falling into the equipment, otherwise the equipment will be damaged!

- Do not use the method of contactor on-off to control the start-up and stop of the equipment, otherwise the equipment will be damaged!

Maintenance

- It is strictly forbidden for non professional personnel to carry out equipment installation, wiring, maintenance, inspection or component replacement!
- It is strictly forbidden to maintain the equipment under the power on state, otherwise there is a risk of electric shock!

lease carry out daily and regular inspection and maintenance of the equipment and products according to the equipment maintenance and maintenance requirements, and make maintenance records.

Repair

- It is strictly forbidden for non professional personnel to carry out equipment installation, wiring, maintenance, inspection or component replacement!
- It is strictly prohibited to carry out equipment maintenance under the power on state, otherwise there is a risk of electric shock!

- Please guarantee the equipment according to the product warranty agreement.
- In case of equipment failure or damage, professional personnel shall carry out troubleshooting and maintenance for the equipment and products according to the maintenance guidance, and make maintenance records.
- Please replace according to the instructions for replacement of vulnerable parts.
- Do not continue to use the damaged machine, or it will cause more damage.

- After replacing the equipment, please make sure to check the wiring and set the parameters again.

Scrap
 - Please scrap the equipment and products according to the relevant national regulations and standards, so as to avoid property loss or casualties! - Scrap equipment and products should be treated and recycled according to the industrial waste treatment standards to avoid environmental pollution.

Safety sign

In order to ensure the safe operation and maintenance of the equipment, please observe the safety signs pasted on the equipment and products. Do not damage or peel off the safety signs. The safety signs are as follows:

Safety sign	Content description
	- Please read the operation manual before installation and operation, otherwise there will be electric shock danger!

Product information

1.1 Data plate and type definition

Data plate

Fig.1-1 Data plate

Type definition

FY3 - A080 V4 2 W0

Mark	Product name
FY3	Power controller series

Mark	Current level
A020	20A
…	…
A600	600A

Mark	Voltage level
V2	AC220V
V4	AC400V
V5	AC500V
V5	AC690V

Mark	External control panel options
W0	None
W1	External control panel + 1 meters display line
W2	External control panel + 2 meters display line
W3	External control panel + 3 meters display line
W4	External control panel + 4 meters display line
W5	External control panel + 5 meters display line

Mark	Selection of fan supply voltage
1	AC110V
2	AC220V

Fig.1-2 Type Definition

1.2 Technical specification

Item	Specification

Main circuit voltage	Three-phase: AC 220、AC400、AC500、AC690 (frequency: 30-65HZ)
Control power supply	100～240VAC
Control mode	α、U、I、P、U^2、I^2
Operation mode	Phase mode, cycle mode
Output voltage	0-98% of the main circuit power supply
Output current	ee specification
Communication bus	RS485 interface, support Modbus communication protocol
Analog input	IN1:4～20mA； IN2:DC0～5V/DC0～10V
Switch input	3 loops (passive): start & stop, manual / auto, reset
Relay output	One loop relay output（220VAC/30VDC 5A）
Stability	≤0.2%
Display	OLED liquid crystal display
Protection	System fault, thyristor fault, main circuit fault, over-current protection, overheat protection
Applicable load	Resistive load, transformer load, impedance change load
Usage occasion	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, drip or salt, etc
Altitude	No derating is required below 1000m. 1% derating is required for every 100m increase above 1000m. The maximum altitude is 3000m. Please contact the manufacturer for more than 3000m
Ambient temperature	-10℃～ +50℃，When the ambient temperature is between 40 ℃ and 50 ℃, derating is required. The derating is 2% for every 1 ℃ increase of ambient temperature
Humidity	Less than 95% RH, no condensation
Vibration	Less than 5.9m/s²（0.6g）
Storage temperature	-20℃ ～ +60℃
Installation	Vertical position, screw installation

1.3 Product specification and installation

Model	Rated current	Cooling mode
FY3-A020 □□ □□ □□	20A	Natural cooling
FY3-A040 □□ □□ □□	40A	Air cooling
FY3-A060 □□ □□ □□	60A	Air cooling
FY3-A080 □□ □□ □□	80A	Air cooling
FY3-A100 □□ □□ □□	100A	Air cooling
FY3-A200 □□ □□ □□	200A	Air cooling
FY3-A250 □□ □□ □□	250A	Air cooling
FY3-A300 □□ □□ □□	300A	Air cooling
FY3-A350 □□ □□ □□	350A	Air cooling
FY3-A400 □□ □□ □□	400A	Air cooling
FY3-A500 □□ □□ □□	500A	Air cooling
FY3-A600 □□ □□ □□	600A	Air cooling

Installation dimension

Rated current	（mm） Dimension (mm)			（mm） Installation hole position (mm)		（mm） Installation aperture （mm）	（kg） Weight (kg)
	H	W	D	A	B		
20A	260	145	197	110	248	φ6	5.1
40～100A							5.5
150～200A	320		244		308		9
250A	405	207	290	170	387	φ9	15.2
300～350A							17
400～450A	435	312	320	270	416		26
500～600A		367		320			28

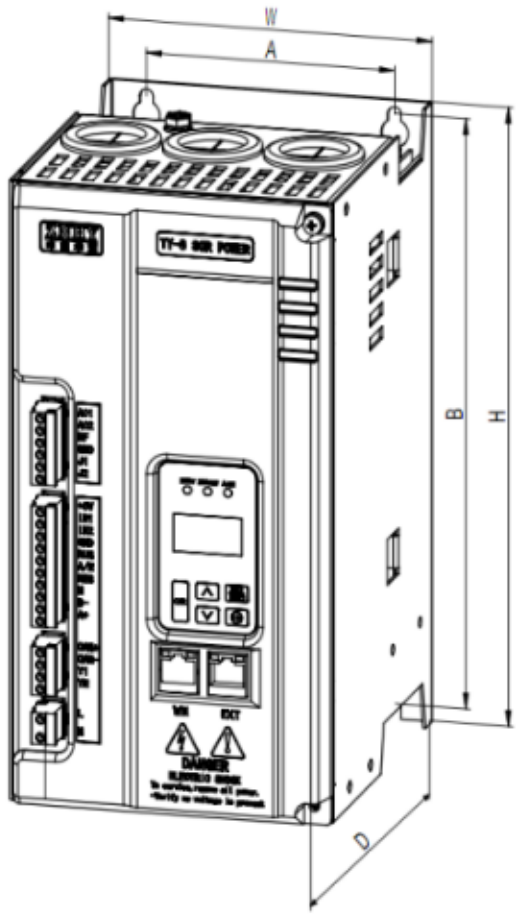

Fig. 1-4 outline dimension and installation dimension of FY3 series

2 System connection

2.1 FY3 series system connection diagram

When using FY3 series power controller to constitute the system, it is necessary to install all kinds of electrical components at the controller input side to ensure the safety and stability of the system. The system structure of FY3 series power controller is shown in the figure below:

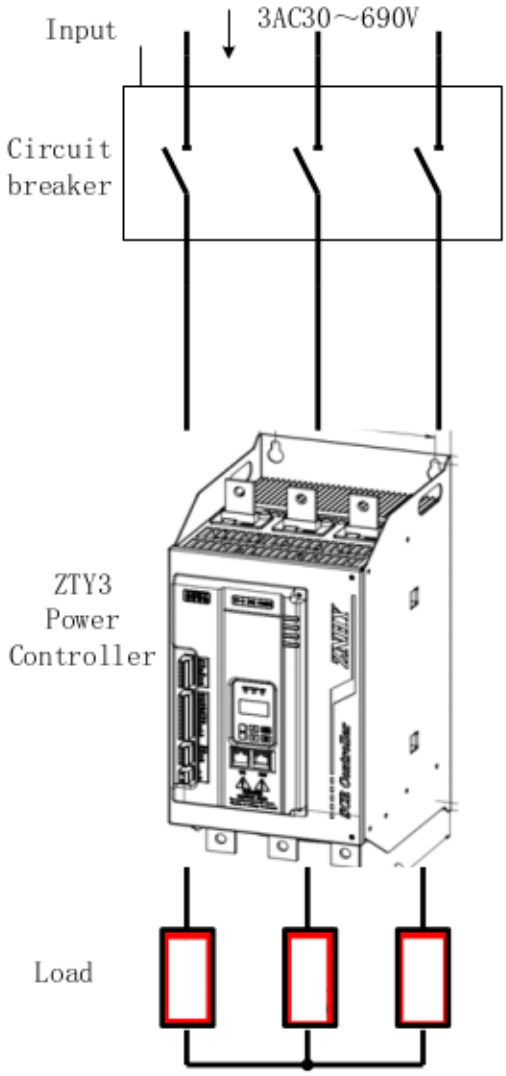

Fig. 2-1 power controller system connection diagram

2.2 Description of FY3 series system composition

Table 2-1 instructions for FY3 peripheral electrical components

Accessories	Installation position	Function description
Circuit breaker	Between power supply and controller input side	Short circuit breaker: cut off the power supply when the load is over current to prevent accidents.
Fuse	Between power supply and power controller input side	Prevent accidents due to short circuit and protect the secondary semiconductor devices

2.3 List of options

Peripheral options include external lead operation and functional expansion controller, as shown in the table below. For detailed usage, please refer to the instructions of the accessory. If you need the following options, please specify when ordering.

Table 2-2 list of FY3 series power controller options

Name	Model	Function	Remark
External LCD operation panel	FYXS1	External LCD display and operation panel	External display panel, wire length 1 ~ 5 meters, the controller can be controlled by external display panel

3 Installation and wiring

3.1 Installation

3.1.1 Installation environment

1) Ambient temperature: The ambient temperature has a great influence on the life of the power controller. The ambient temperature of the power controller is not allowed to exceed the allowable temperature range (- 10 ℃ ~ 50 ℃).

2) Install the power controller on the surface of the flame retardant object, and there should be enough space around it to dissipate heat. When the power controller works, it is easy to produce a lot of heat. It is vertically installed on the mounting support with screws.

3) Please install it in a place that is not easy to vibrate.

4) Avoid installation in places of direct sunlight, damp and water drop.

5) Avoid installation in places with corrosive, flammable and explosive gases in the air.

6) Avoid installation in places with oil and dust.

7) This series of products are installed in the cabinet and need to be installed in the final system. The final system should provide corresponding fireproof enclosure, electrical protective enclosure and mechanical protective enclosure, and meet the requirements of local laws and regulations and relevant standards.

3.2 Wiring

3.2.1 Reference wiring diagram

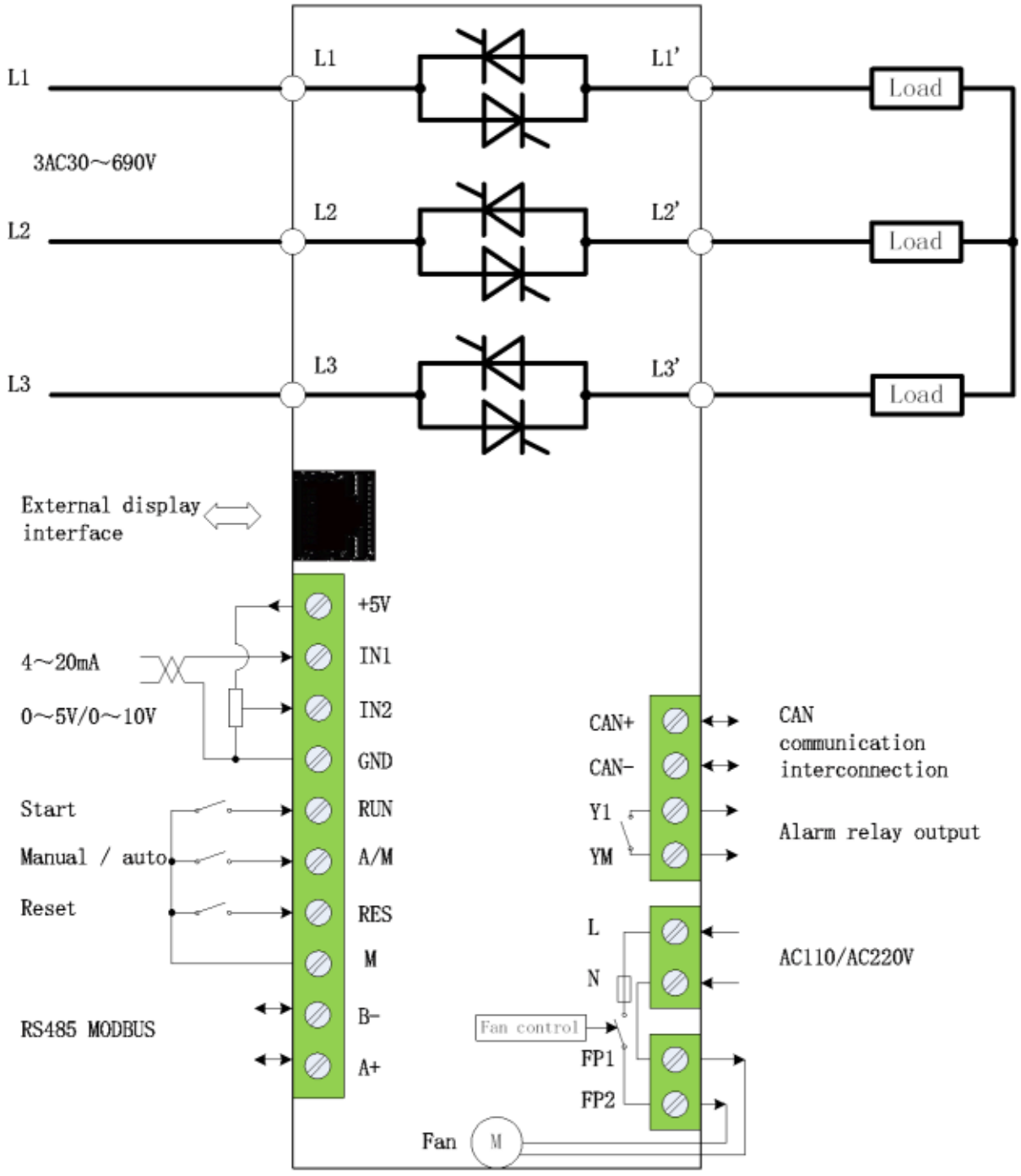

Fig. 3-1 reference wiring diagram

3.2.2 Description of main circuit terminal

Terminal marking	Terminal name	Function description
L1、L2、L3	Main circuit input	Main power supply, AC30 ~ 690V
L1'、L2'、L3'	Main circuit output	Connect to load

3.2.3 Description of control circuit terminal

Terminal symbol	Terminal name	Function description
L、N	Control power supply	AC100 ~ 240V, control board working power supply
IN1	Analog input	4 ~ 20mA input
IN2	Analog input	DC0 ~ 5V / DC0 ~ 10V input
GND	Analog input common	
RUN	Start	RUN, M off: controller shutdown RUN, M short circuit: controller start
A/M	Auto / manual switching	A / M is disconnected from M: the setting signal comes from the setting 1 A / M and M short circuit: the setting signal comes from the setting 2
RES	Reset	RES disconnected from M: no action RES and M short circuit: fault reset
M	Switch input common terminal	
A+,B-	RS485	MODBUS communication port

	communication port	
FP1,FP2	Fan power supply	AC110V/AC220V, same level as control power supply
Y1,YM	Alarm relay output	Passive relay, 220VAC/30VDC 5A

4 Panel operation

4.1 Panel introduction

Through the operation panel, you can set / modify the function code, monitor the working state, and control the operation (start and stop) of the power controller.

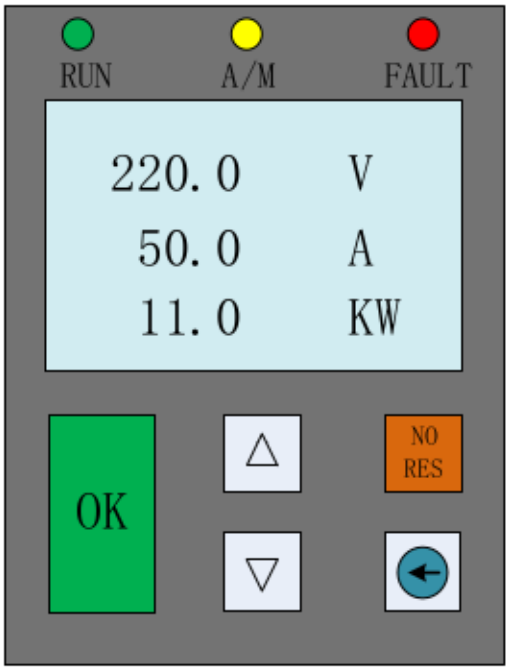

Fig. 4-1 schematic diagram of display panel

4.2 Description of the keys

Table 4-1 keyboard key function table

Key	Name	Function
OK	Confirm	Determine the setting parameters
NO RES	Cancel / reset	Cancel and exit settings/Used for fault reset in case of fault alarm
△	Move up / increase	Move up menu / parameter add settings
▽	Move down / decrease	Move down menu / parameter reduction settings
←	Shift key	Move the cursor to the left

4.3 Function indicator

RUN : The operation indicator light is not on when the controller is shut down, but is always on when the controller is in normal operation.

A/M : Auto / manual indicator light. It is off when terminal A / M is disconnected from M, and it is always on when terminal A / M and M are short circuited.

FAULT : The fault indicator is off when the controller is in normal operation, but is always on when the controller is in fault.

TO SET CURRENT LIMIT, VOLTAGE LIMIT, POWER LIMIT

Access Menu Level 3;
3.02 - Set Voltage Limit from 0 to 100%
3.03 - Set Current Limit from 0 to 100%
3.04 - Set Power Limit from 0 to 100%

5 Fault handling

5.1 Fault alarm and solutions

The power controller may encounter the following faults in the use process. Please refer to the following methods for simple fault analysis:

Fault description	Fault cause	Solutions
Overheat	The ambient temperature is too high	Reduce ambient temperature
	The fan is damaged	Replace the fan
Overcurrent	Load short circuit or load power more than 2 times rated load	Check the load for short circuit
Main circuit fault	The main circuit is not powered on or the voltage of the main circuit is too low	Check whether the main circuit power supply is powered on with a multimeter
Thyristor fault	Thyristor damaged	Replace the thyristor
Frequency fault	Power frequency overrun	Frequency range of power grid: 45～65HZ

6 Daily maintenance

6.1 Daily maintenance

Please make sure to check the function of the controller every time after confirming that it is not damaged. Please make a copy of the inspection confirmation form for use, and stamp the "confirmation" seal on the confirmation column after each confirmation.

Item	Contents	Solutions	Confirmation
Fan	Abnormal use of cooling fan of power controller	● Confirm whether the cooling fan is running; ● Confirm whether the cooling fan is abnormal; ● Confirm whether the ventilation channel is blocked; ● Confirm whether the ambient temperature is within the allowable range.	
Installation environment	Whether the power cabinet and cable duct are abnormal	● Confirm whether the cable inlet and outlet of the power controller is damaged; ● Confirm whether there is vibration on the mounting bracket; ● Confirm whether the copper bar and connecting wire terminals are loose and corroded.	
Input voltage	Whether the power supply voltage between	● Confirm whether the input voltage is within the allowable range;	

	the main circuit and the control circuit is abnormal	● Confirm whether there is heavy load starting around	

6.2 Regular inspection

Item	Contents	Solutions	Inspection
Complete machine	Whether any accumulation of garbage, dirt and dust on the surface	● Confirm whether the power controller is powered off; ● Use vacuum cleaner to remove garbage or dust to avoid contacting parts; ● When the dirt on the surface can not be removed, alcohol can be used to wipe and wait for drying to volatilize completely;	
Cable	Whether the power line and connection are discolored; whether the insulation layer is aged or cracked.	● Replace the cracked cable; ● Replace the damaged connection terminals	
Air duct ventilation	Whether the air duct and heat sink are blocked; whether the fan is damaged.	● Clean the air duct; ● Replace the air duct.	

Control loop	Whether the control components are in poor contact; whether the terminal screw is loose; whether the control cable is insulated and cracked.	● Clean the foreign matters on the surface of control circuit and connecting terminal; ● Replace the damaged and corroded control cable.	

6.3 Replacement of wearing parts of power controller

6.3.1 Life of wearing part

The main vulnerable parts of power controller are cooling fan and electrolytic capacitor for filter. The service life is closely related to the service environment and maintenance. The general life time is as follows:

Device	Life time 【note】
Fan	≥5 years
Electrolytic capacitor	≥5 years

【Note】: The service life is the service time under the following conditions, and the user can determine the replacement life according to the operation time.

1) Ambient temperature: 40 ℃
2) Load rate: 100%
3) Operation rate: 24 hours / day

6.3.2 Cooling fan replacement

1) Possible damage causes: bearing wear, blade aging.
2) Criteria: whether there are cracks in the fan blade, whether there is abnormal vibration sound when starting up, whether the fan blade operates

abnormally.

3) Fan replacement method:

6.4 Power controller storage

After purchasing the power controller, the following points must be paid attention to for temporary storage and long-term storage:

1) When storing, try to pack them into the packing box of our company according to the original packing.

2) It is not allowed to place the whole machine in humid, high temperature or outdoor exposure for a long time.

3) Storage for a long time will lead to the deterioration of electrolytic capacitor. It must be electrified once within 6 months for at least 5 hours.

Appendix A: Function parameter table

“R” ： Indicates that the parameter displays the actual test record value and cannot be changed;

“W” ： Indicates that the setting value of the parameter can be changed when the power controller is in shutdown and running state;

“T” ： Indicates that the setting value of the parameter cannot be changed when the power controller is in the running state;

“X” ： Indicates that the parameter is a "manufacturer parameter", which is only set by the manufacturer and cannot be operated by the user;

Function code	Name	Range	Factory value	Property	Description
0 Basic information					
0.01	Running state	0、1	-	R	
0.02	Auto mode	0、1	-	R	
0.03	Vab input	0.0～3276.7	-	R	
0.04	Vbc input	0.0～3276.7	-	R	
0.05	Vca input	0.0～3276.7	-	R	
0.06	Vab output	0.0～3276.7	-	R	
0.07	Vbc output	0.0～3276.7	-	R	
0.08	Vca output	0.0～3276.7	-	R	
0.09	Output voltage	0.0～3276.7	-	R	
0.10	Ia output	0.0～3276.7	-	R	
0.11	Ib output	0.0～3276.7	-	R	
0.12	Ic output	0.0～3276.7	-	R	
0.13	Output current	0.0～3276.7	-	R	
0.14	Output power	0.00～327.67	-	R	
0.15	Start signal	0、1	-	R	

0.16	AI1 set (%)	0．00～100.00%	-	R	
0.17	AI2 set (%)	0．00～100.00%	-	R	
0.18	Panel set (%)	0．00～100.00%	-	R	
0.19	Communication set (%)	0．00～100.00%	-	R	
0.20	Set total (%)	0．00～100.00%	-	R	
0.21	Voltage feedback (%)	0．00～120.00%	-	R	
0.22	Current feedback (%)	0．00～120.00%	-	R	
0.23	Power feedback (%)	0．00～120.00%	-	R	
0.24	Total feedback (%)	0．00～120.00%	-	R	
0.25	Grid frequency (Hz)	0．00～100.00	-	R	
0.26	Control angle	0．00～180.00	-	R	Thyristor control angle a
0.27	Voltage loop output (%)	0．00～100.00%	-	R	
0.28	Current loop output (%)	0．00～100.00%	-	R	
0.29	Power loop output (%)	0．00～100.00%	-	R	
0.30	Accumulated electricity（kW·h）	0～32767		R	
1 .Parameter setting					
1.01	Communication start	0、1		W	
1.02	Start & stop source	0～5		W	Set start signal source 0： Terminal RUN control 1： Communication

					control 2： Expansion panel control start & stop 3:The terminal and communication are effective at the same time 4: Expansion panel and communication are effective at the same time 5:Terminal, communication and panel are effective at the same time
1.03	Communication AM setting	0、1		W	
1.04	Am control source	0～2		W	AM control signal source 0：Terminal A / M control 1：Communication A / M control 2： Expansion panel A / M control
1.05	Control selection	0～11		W	Set the working mode of the controller 0：Phase shift open loop 1：Phase shifting constant voltage 2：Phase shifting constant current 3：Phase shifting constant power 4：Zero crossing open loop 5：Zero crossing constant voltage 6：Zero crossing constant current 7：Zero crossing constant

					power 8：Variable period open loop 9：Variable period constant voltage 10：Variable period constant current 11：Variable period constant power
1.06	Minimum control angle	0.00	0.00	W	Set control angle limit
1.07	Reserve (S)	-		W	
1.08	Fixed period number	100～32767		W	
1.09	Fixed period soft start number	0～15		W	
1.10	A setting source	0～3		W	Select auto / remote signal source
1.11	M setting source	0～3		W	Select local / manual signal source
1.12	Communication set	0～32767		W	Use with 1.13
1.13	Communication set rating	0～32767		W	1.12 ÷ 1.13 = communication set %
1.14	AI2 range	0、1		W	0： AI2 input 0 ～ 5V signal 1：AI2 input 0 ～ 10V signal
1.15	Ramp mode	0、1		W	
1.16	Ramp up speed (%)	0.00～100.00	1.00	W	
1.17	Ramp down speed (%)	0.00～100.00	100.00	W	
1.18	Power decimal	-	1		

	places				
1.19	Zero crossing control parameter	-	0.300		
1.20	Voltage loop P	0.000～32.767	0.500	W	Voltage PID setting
1.21	Voltage loop I	0.000～32.767	0.300	W	
1.22	Voltage loop D	0.000～32.767	0.000	W	
1.23	Current loop P	0.000～32.767	0.300	W	Current PID setting
1.24	Current loop I	0.000～32.767	0.200	W	
1.25	Current loop D	0.000～32.767	0.000	W	
1.26	Power loop P	0.000～32.767	0.300	W	Power PID setting
1.27	Power loop I	0.000～32.767	0.200	W	
1.28	Power loop D	0.000～32.767	0.000	W	
2. Fault information					
2.01	Total fault	0、1	0	R	0 No fault 1 Fault
2.02	Fault reset	0、1	0	W	Keyboard / communication settings reset
2.03	Present fault	0～5	0	R	
2.04	Fault record 1	0～5	0	R	
2.05	Fault record 2	0～5	0	R	
2.06	Fault record 3	0～5	0	R	
2.07	Fault record 4	0～5	0	R	
2.08	Fault record 5	0～5	0	R	
2.09	System fault	0、1	0	R	0 No fault 1 Fault
2.10	Overheat	0、1	0	R	0 No fault 1 Fault
2.11	Overcurrent	0、1	0	R	0 No fault

					1 Fault
2.12	Thyristor fault	0、1	0	R	0 No fault 1 Fault
2.13	Main loop fault	0、1	0	R	0 No fault 1 Fault
2.14	Lower limit of grid voltage (V)	10.0～1000.0	30.0	T	Alarm when the power grid is lower than this value
3 .System information					
3.01	Software version	-	-	R	
3.02	Rated voltage (V)	-	-	X	
3.03	Rated current (A)	-	-	X	
3.04	Rated power (kW)	-	-	X	
3.05	Com address	1～247		W	
3.06	Com baud rate	4800～115200	9600	W	
3.07	Com check bit	0～2	1	W	
3.08	Com stop bit	0～1	0	W	
3.09	Password set	-32768～32767	0	W	