

Manual Instruction for Ariet AVR Series
Three-Phase Numerical Control Intelligent
Regulator

Preface

Thank you for using our regulator product!

This Manual Instruction contains important matters regarding to installation, use and maintenance of the product. For correct installation and use of the product, please read this Manual Instruction carefully before installation and use. If you have any question, please contact us or our agents and our professional staff will serve you sincerely.

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1. Product introduction

1-1. Overview

AVR Series Three-Phase Numerical Control Intelligent Regulator (Hereinafter referred to as Regulator) is a new-generation intelligent regulator developed throughout many years on the basis of the compensatory electricity regulator which has been produced for many years by us.

It adopts the newest DSP computing chip control technique, rapid AC sampling technique, zero-crossing switching technique and fast compensating voltage stabilizing technique, and combines the functions of intelligent meter, fast voltage stabilizing and fault diagnosis so that it can be safer, more efficient and accurate.

It is mainly composed of isolation transformer, SCR voltage stabilizing module, MCU control core +high precision current and voltage sampling component, fast voltage stabilizing and safety protection device. Featured as safety, high efficiency, energy-saving and environmental protection, it is a perfect combination of SCR technique and transformer switch technique without surge current.

The product is widely used as a part of the large electromechanical equipment used in industry, transportation, post and telecommunication, national defense, railway and scientific research, which need the electrical equipment requiring high

precision and stable voltage.

1-2. Characteristics

- (1) Intelligent instrument: The intelligent instrument can display the line voltage, phase voltage and current in a clear, accurate and real-time manner with a high resolution. With the operation through membrane keyboard, it is safe and reliable.
- (2) Three-Phase regulation: With the imbalance of output voltage less than 1%, it makes sure that the output voltage of each phase is stable in precision.
- (3) Wide scope of application: With a wide range of voltage regulation, it can be applied to the place and equipment which are used in the condition of poor quality power grid and fierce fluctuation of voltage.
- (4) Intelligent sampling: It applies intelligent single-chip sampling circuit which can efficiently ensure the precision of sampling.
- (5) Complete protection function: It has functions of reminding and protecting from overload, overvoltage, undervoltage, short circuit, etc. to ensure the regulator and load run in safety.
- (6) Strong preset function: The protection limit can be set arbitrarily.
- (7) Strong overload capability: As the whole device is made of excellent and good performance components, it can work continuously under the condition of 80% of the rated load and withstand an instantaneous (1 minute) overload (2 times)

without any damage.

- (8) Good adaptability: With a good adaptability to power grid and load, it can work continuously and stably in various poor conditions like bad power grid and complicated load.
- (9) No waveform deformation: With the current zero-crossing switch technique, its waveform remains undeformed with no disconnection or surge current during the switch.
- (10) Low loss: As it consumes minimum power which is even less than 0.5% of the loss without load, it can save a lot of electricity for customers.
- (11) Bypass function and easy maintenance: It can be switched between 'Regulation' and 'Bypass supply' so as to make the maintenance much easier.

2. Technical parameters

2-1. Technical parameters of the product

Rated capacity:	Three-phase 6KVA ~ 1000KVA Single-phase 3K~300KVA
Number of phase:	Three-phase or single-phase

Input of regulation range:	Three-phase 380V±15%	Three-phase 380V±20%	Three-phase 380V±30%
	Single-phase 220V±15%	Single-phase 220V±20%	Single-phase 220V±30%
Output voltage:	Three-phase 380V , single-phase 220V		
Regulation accuracy:	±1%	±1.5%	±2%
Efficiency:	≥99%		
Frequency:	The frequency of input voltage is 45 ~ 65Hz and so is the frequency of output voltage..		
Reaction speed:	<20ms (SCR)		
Regulation speed:	30 ms (SCR)		
Insulation grade:	E grade		
Insulation resistance:	Insulation resistance of the regulator>5MΩ		
Insulation strength:	Sinusoidal AC voltage 2500V/1 min without flashover or breakdown		
Output waveform:	No output waveform deformation or harmonic increment		
Instantaneous overload capacity:	2 times rated current		
Display mode:	LCD digital display		
Working mode:	Long-term continuous running		
Protection function:	Protection from Overload, overvoltage, undervoltage, phase failure and short circuit		
Cooling mode:	Temperature controlled forced air cooling		

Note:

① The rated capacity of the regulator is calculated as below:

$$P = \sqrt{m} I_2 U_2 10^{-3} (\text{KVA})$$

In the format: P—Rated (output) capacity of the regulator (KVA) m—Number of phases
Single phase: m=1 Three-phase: m=3

I_2 —Rated output current (A) U_2 —Rated output voltage (V) (Line voltage in case of three-phase)

② The above are the technical parameters of our regular products but cannot be used as the basis for customer's acceptance. The acceptance should be subject to the technical parameters that are specified in the contract.

③ If the customer has special requirements, he can contact our relevant department.

3. Environmental requirement

3-1. The environmental requirements for use of the product are that:

- (1) The regulator should be used indoor.
- (2) There should be neither conductive or explosive powder nor gases, steams or oil mists that corrode metals or damage insulation.
- (3) Good ventilation.
- (4) Flat and solid foundation.
- (5) Altitude no more than 1000m. It should be used in a derating manner when the altitude is more than 1000m. (Note: When the altitude surpasses 1000m, the load capacity of the regulator will drop along with the rise of the altitude.)
- (6) Ambient temperature: -5°C at minimum and +40°C at maximum. The average

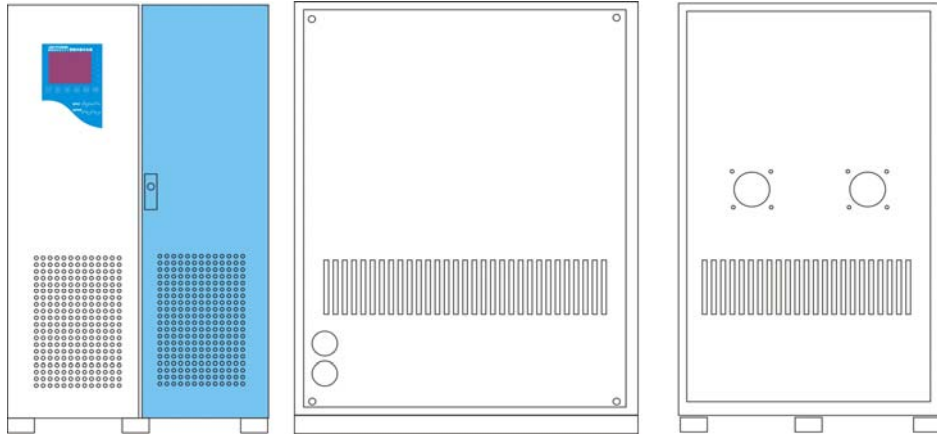
daily temperature of the cooling air shall be no more than +30°C and the average annual temperature no more than +25°C. The variation of the temperature at the working place should be no more than 5K/h. (Note: When the ambient temperature is beyond the specified limit value, the load capacity of the regulator will reduce.)

- (7) Relative humidity: $\leq 90\%RH$ ($40^{\circ}C \pm 2^{\circ}C$ without condensation).
- (8) The waveform of the power voltage is close to the sine wave ($THD \leq 4\%$).
- (9) The instantaneous peak voltage in the power grid $V_{p-p} \leq 2000V$ without lightning strike.
- (10) It cannot be exposed to the radioactive radiation.
- (11) It shall avoid abnormal mechanical stress like impact and vibration.
- (12) Parallel running of multiple regulators is not allowed.
- (13) There should be sufficient space around and on the top of the regulator for cooling and maintaining.

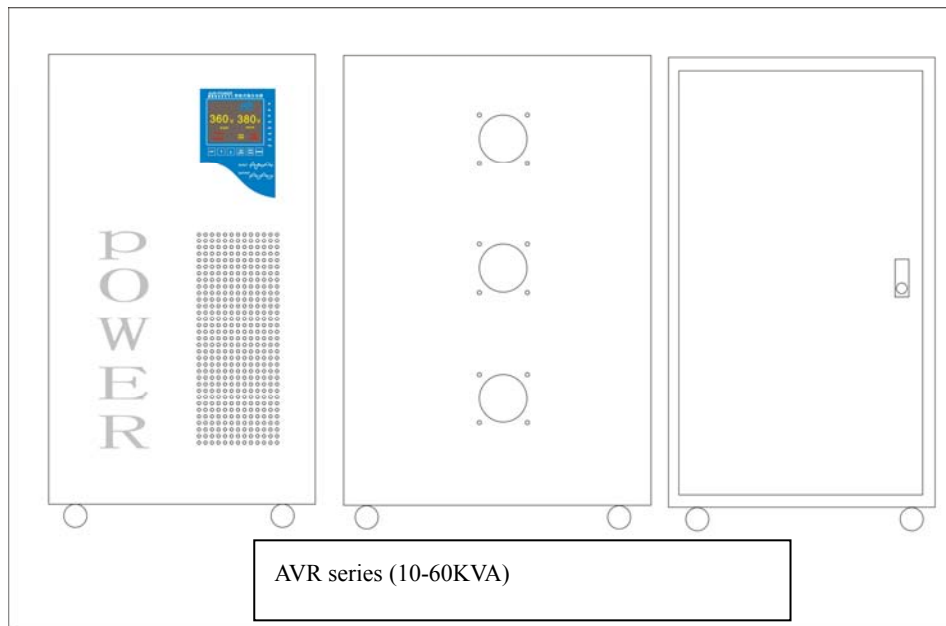
■Note:

In case that there is any special conditions that are not mentioned above, please confirm with the agent when placing an order, or consult with us during the use.

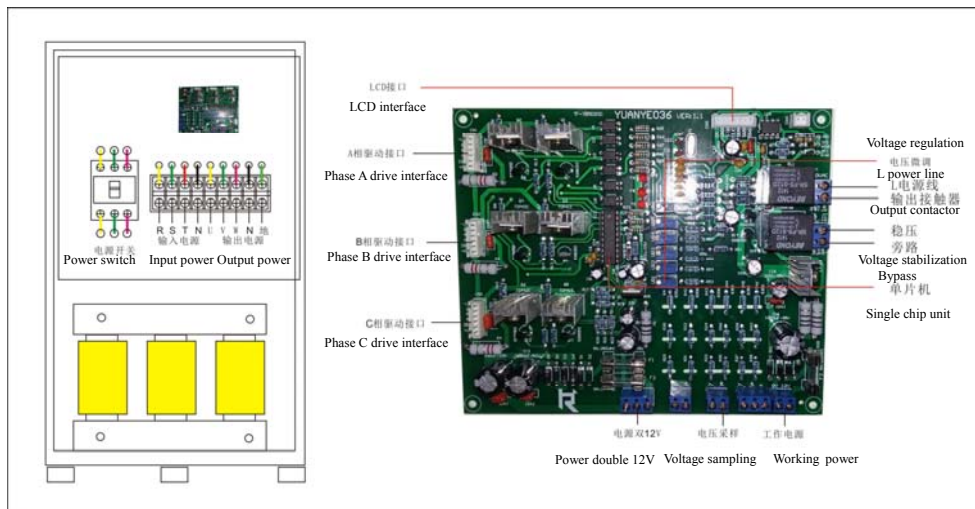
4. Appearance of the product



SBW model (SBW-80 to SBW 1000KVA)



Installation and wiring



Please read the contents as below before installation and wiring.

- Before installation and wiring, please make sure to cut off input power to prevent electric shock.
 - The product must be installed and tested by trained and qualified personnel.

5-1. Inspection before installation

- (1) Check if the model and specification of the product are consistent with the content of your order, especially the capacity, input/output power values, etc.
- (2) Check if the articles specified in the factory documents (like Instruction, qualification certificate) and order are complete.
- (3) Check if there is any electric component inside the regulator cabinet damaged during the transport.
- (4) The fasteners of the regulator must be fastened reliably without disconnection of

any wire. If there is, fasten the wire especially the control component which is not allowed to be loosened or poorly connected.

- (5) After arrival of the regulator, please open the box to check and install it within one month in case of any quality problem when it is not used for a long time.

5-2. Installation and wiring

(1) Positioning

① After inspected as qualified, the regulator can be positioned. During this process, please make sure the body and the components inside of the regulator are free from being damaged.

② After positioning the regulator, make sure the base of the regulator receives a uniform stress and its body is positioned in a stable manner.

③ There should be enough space around the regulator for ventilation and maintenance.

(2) Selection of cables:

① During the wiring, please select proper cables and lugs to ensure a reliable connection of input and output terminals.

② In selecting wires, do consider the conditions of cooling, environment, pavement and transmission distance for the load current capacity.

③ The specification of the input and output lines shall be determined by the customer based on the capacity of the regulator. Make sure to make some allowance. It is suggested to select copper wires by $3.5\text{A}/\text{mm}^2$ for the regulator.

(3) Cable connection:

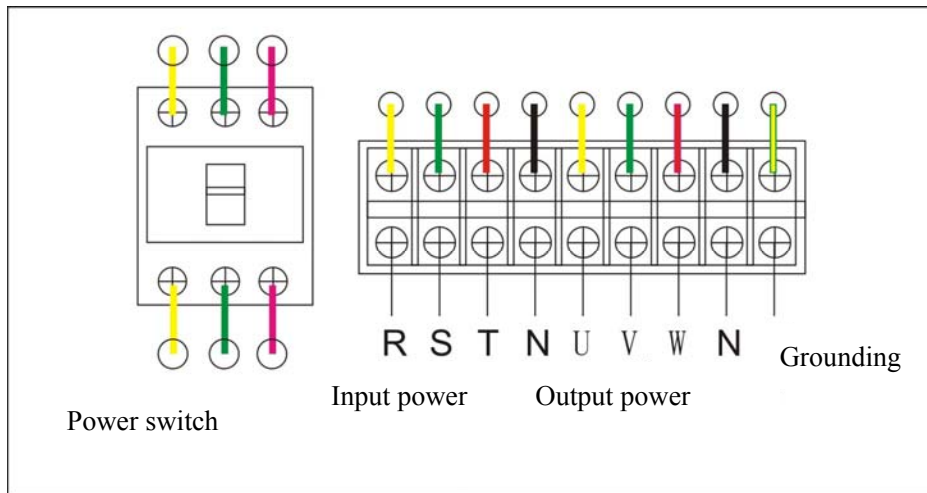
① Connect the input power line to the input line terminal inside the regulator cabinet (marked with 'Input' character and phase line identifications like 'R', 'S' and 'T').

② Connect the load wire to the output line terminal inside the regulator cabinet (marked with 'Output' character and phase line identifications like 'U', 'V' and 'W').

③ Connect the input zero line and the load zero line to the correspondent zero line terminals (marked with zero line identification 'N'). If there is no load zero line, you don't have to connect.

④ Shell protective grounding: Connect the grounding line to the grounding line interface of the regulator (marked with '≡').

(4) Wiring diagram:





Attention

• The above wiring diagram is only for reference and should be subject to the identifications on the regulator.

• During the wiring, make sure to connect the wiring terminals as per the identifications. Do not connect the input and output wires, phase line and neutral line in a wrong way! The neutral line and grounding line should not be mixed and the grounding line

should not be omitted. Otherwise, the regulator will not work in normal and even breaks.

• Do connect the neutral line, otherwise, the regulator will not work in normal. If the machine requires no neutral line, please tell us when ordering.

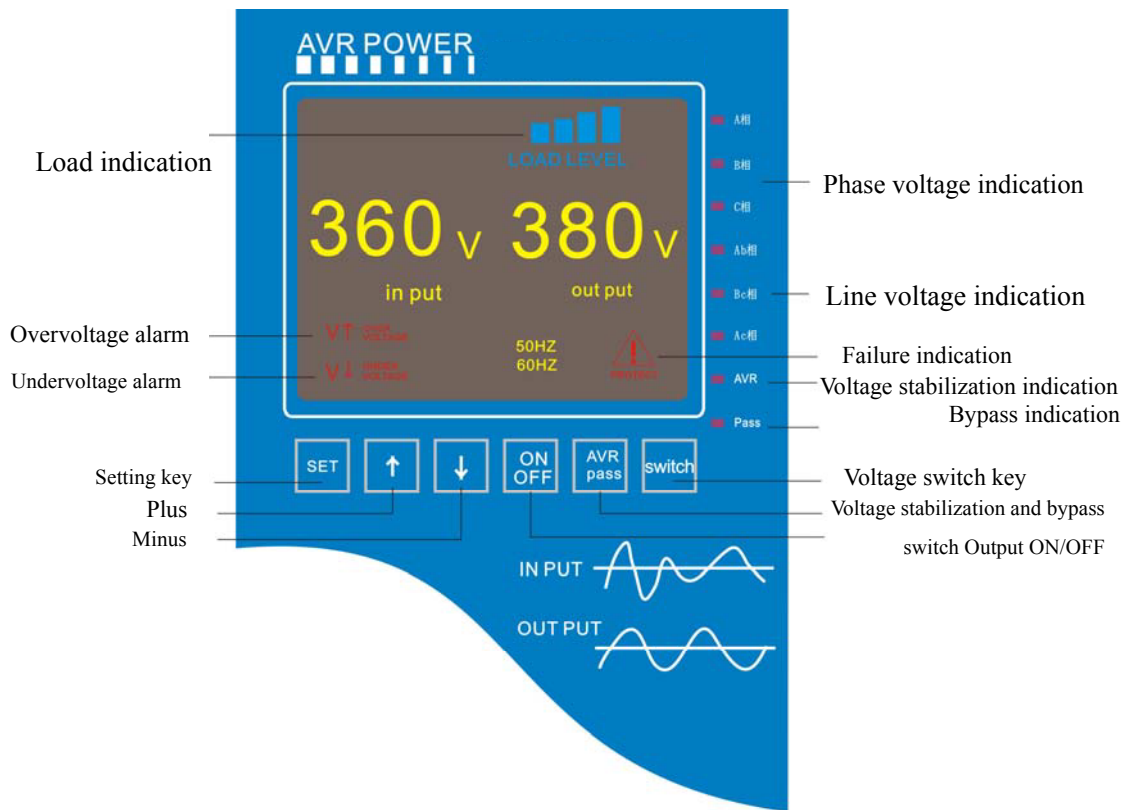
• The wiring from power supply to regulator and from the regulator to the load line should be well contacted and able to withstand the rated current from the regulator.

6. Operation

6-2. Operation of the display control panel (The following diagram is only for reference and it shall be subject to the actual display.)

(1) Panel:

Intelligent voltage stabilizing power



(2) Main functions:

- 1) Display of the voltage of input line and output line in a real-time manner.
- 2) Display of the phase voltage of each phase in a real-time manner.
- 3) Display of the output load grade in a real-time manner.
- 4) Setting of voltage stabilization precision and voltage stabilization value of each phase.
- 5) Setting of the voltage stabilization speed as well as the overvoltage, undervoltage value and overcurrent value.

6) Control and indication of the two output states of voltage stabilization and bypass.

7) Indication of overcurrent, overvoltage, undervoltage and other failures.

(3) Interpretation of setting

All the voltage values are set as the phase voltage. Please remember do not set as line voltage.

1) Setting of stable voltage of Phase U, V and W:

This setting is for the output stable voltage value of each phase, which is already set in the factory. As such, user can reset the stable voltage value as per the actual need in the way which you can refer to as follows.

Press the SET key and hold it for 3s until the output 220V flickers. After that, set the stable voltage value with plus and minus keys to finish the setting of the value of Phase U.

Press the SET key and hold it for 3s until the output 220V flickers. After that, set the stable voltage value with plus and minus keys to finish the setting of the value of Phase V.

Press the SET key and hold it for 3s until the output 220V flickers. After that, set the stable voltage value with plus and minus keys to finish the setting of the value of Phase W.

2) Setting of overcurrent protection value:

The setting of overcurrent protection value can ensure the safety running of the regulator and the load. The protection value is already set by the factory and user can reset it as per the actual need. The way of doing so is that: Press the SET key for four times and then hold it for 3s until the output current value flickers. After that, set the desired value with plus and minus keys and press SET again to finish the setting.

3) Switch of display voltage:

Press 'Switch' key and hold it for 3s with the device displaying the voltage value of the next phase in order. Switching the display value of the phase voltage and line voltage is also available.

4) Switch between 'AVR' and 'BYPASS'.

Press 'AVR/PASS' key and hold it for 3s to enter into the manual bypass mode with the 'PASS' indicating light on. Press 'AVR/PASS' key again and hold it for 3s to enter into the 'AVR' voltage stabilization state with the 'AVR' indicating light on!

4) Output ON/OFF

After switching on the total power for the first time, press 'ON/OFF' key and hold it for 3s to start the output AC contactor which outputs and displays effective voltage value. After the 'AVR' indicating light is on, enter into the output voltage stabilization mode! Press 'ON/OFF' key again and hold it for 3s and stop outputting, and then the output voltage will be displayed as '0'!

7. Notes for power supply

The following matters need user's special attentions. To protect your life safety as well as the product and the equipment connected to the product, please read it carefully before use and follow it strictly during use.

7-1. Notes

- (1) The regulator must be installed, operated and maintained by trained personnel with electrician qualification. Irrelevant personnel are not allowed to operate the regulator.
- (2) Before installing and maintaining the regulator, make sure to cut off the input power to prevent electric shock or damages to the product.
- (3) The wiring must be firm to prevent falling off and sparking, or the oxidation of the contact due to the heated resistance as it is too large. Loose contact will also lead to automatic switch to the bypass.
- (4) The input and output lines of the regulator must be laid rationally to prevent it from being treaded and worn, resulting to leakage accident.
- (5) The regulator must be connected to the ground well and user shall bear the responsibility for the electric shock accident or injuries caused by the disconnection of the grounding line.

- (6) The grounding line of the regulator cannot be connected to the service facilities as heating pipeline, water supply line, gas pipeline, etc. to prevent infringing the third party's rights and interests or causing any damages.
- (7) When the regulator is running, do not dismantle the regulator and touch the parts inside or pull the input and output lines of the regulator to prevent from electric shock accident or other electric safety accident.
- (8) Please do not operate the regulator with wet hands.
- (9) Please do not dismantle or reform the regulator without authorization to avoid failures, leakage or fire.
- (10) Do not stand or put weight on the regulator body. Do not let the foreign matters especially conductors enter the body through cooling holes or other parts to avoid failures, leakage or other safety accidents.
- (11) It is forbidden to clean the regulator with corrosive detergent or the detergent that will corrode plastics and coatings.
- (12) Please do not put any articles around the regulator so as not to block the ventilation.
- (13) When you finish using the regulator, switch it off and pull out all the external wires on the terminal plate.

7-2. Notes on power supply

- (1) Please select the product according to the actual power of all the electric equipment with a proper allowance.

- (2) The input voltage is allowed to fluctuate between $\pm 15\%$ and 30% . This range is subject to the range of fluctuation of the regulator purchased by you.
- (3) The relative harmonic content of the voltage waveform is not over 10% . If the power is too low due to the low power factor or voltage, you need to reduce the capacity of the regulator.
- (4) If the lightning is very frequent at the place where the regulator is used, please mount lightning protection device and add the device to your order.

※In case that there is any special conditions that are not mentioned above, please confirm with the agent when placing an order, or consult with us during the use.

8. Daily maintenance



Attention

Before maintenance, please make sure to cut off the input power to avoid electric shock accident or other safety accidents.

8-1. Check the working state of the regulator regularly during the use:

- (1) Check if the regulator displays the right voltages.
- (2) Check if the load exceeds the rated value.
- (3) Check if the input voltage is beyond the fluctuation range that is permitted.

In case of any abnormal phenomenon occurs during the patrol inspection, treat it immediately. If the problem cannot be treated on spot, contact the supplier or the factory timely for the solutions so as not to damage the equipment.

8-2. It is suggested to maintain the regulator regularly. The maintenance includes:

- (1) Clean SCR component of the regulator carefully and clean up the dust and dirt to avoid line failure caused by the dampened dust.
- (2) Check if the fasteners and wiring contacts inside the body loosen. In case of any unreliable connections, deal with it immediately.
- (3) Repair or change the components which are broken or damaged timely.

9. Troubleshooting



Attention

Before repairing, please make sure to cut off the input power to avoid electric shock accident or other safety accidents.

9-1. Any problems of the regulator discovered by the user during use shall be treated in reference of the following contents.

Phenomenon	Cause	Solution
Unstable output voltage	The bypass of the regulator cannot stabilize the voltage by itself.	Check if the system bypasses, if so, press 'Information query' key to check the fault code.
Bypass of the system	The regulator fails.	<p>① Switch it on and press 'Information query' key to check which phase has fault code.</p> <p>② Check if the fuse burns. If so, change the fuse. If the fuse blows again, change the SCR component or contact the factory for repairing.</p> <p>③ If the failure is overcurrent, overvoltage or undervoltage according to the query result, check if it is correctly set. If so, contact the factory for repairing.</p>
Abnormal voltage or too low voltage occurs after manual bypass	<p>① Input phase failure</p> <p>② Too low input voltage</p>	<p>① Check if the input has phase failure. If so, ask a professional to seek the cause for the phase failure.</p> <p>② Check if the input voltage is compliant with the minimum limit range of the regulator. If so, change a machine which has a higher range of regulation.</p>
Fan fails	<p>① Temperature inside the machine is lower than 55°C ;</p> <p>② The plug of</p>	<p>① It is a normal phenomenon.</p> <p>② Insert the plug into the socket firmly.</p> <p>③ Change the fan.</p>

	<p>the fan loosens.</p> <p>③ The fan burns.</p>	
<p>The regulator has a smell</p>	<p>① The SCR used to control the protection resistance breaks, making the resistance hot.</p> <p>② The protection relay with load fails.</p> <p>③ The color of the coil of the transformer changes due to the overcurrent.</p>	<p>① Change the resistance protection SCR</p> <p>② Change the protection relay.</p> <p>③ Send it to the factory for repairing.</p>
<p>The output voltage drops a lot after the bypass</p>	<p>The bypass AC contactor fails.</p>	<p>Change the AC contactor.</p>
<p>The display bar fails to display any value but the regulator is still normal after it is switched on.</p>	<p>The display panel fails.</p>	<p>Change the display panel.</p>
<p>Abnormal value occurs after a new regulator is installed.</p>	<p>Incorrect wiring</p>	<p>Check if the phase line and zero line are correctly connected and if the zero line is connected.</p>

Switch tripping	Overvoltage, undervoltage or overcurrent after system bypassing	Switch the automatic bypass to manual bypass and press 'Information query' to check the failure. If the failure is caused by the system bypass, treat it accordingly.
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Ordering Instructions

When purchasing our products, users should indicate the followings:

1. The type of voltage stabilizer (divided into the mechanical and SCR non-contact type);
2. The capacity size of voltage stabilizer, KVA;
3. The voltage standard for voltage stabilizer is generally 380V three-phase, 220V single-phase;
4. The regulator input voltage range: 15%, 20%, 30%;
5. The stabilizing accuracy requirements: 1% and 2%

Instructions for After-sales Services

Welcome to use our power supply series products. To guarantee the benefit of users, please read this Manual carefully before installation. The operation may refer to the detailed explanation provided in the Instructions. For any technical problems, please call our 24-hour hotline at +77273392600!