Nooyi® 诺易

ZBW Series Three-phase Contactless Voltage Regulator User's Manual

Nuoyi Electricity Co.,Ltd.

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Declaration

This manual is applicable to ZBW series three-phase contactless AC voltage regulators, and is of the generic version. Please strictly observe precautions, labels and marks herein. Technical indexes are provided in the technical contract or on the product nameplate in details.

1. Introduction to the product

The ZBW series digital contactless AC voltage regulator is a new-generation AC regulated power supply produced by this company. This product is digitally designed and human-oriented, and is provided with a powerful information collection system, signal processing system and detection system as well as a perfect protection system, being widely applied in all kinds of electric environments. This product features personalized design, powerful human-machine interaction, visualized display screen and status indication and monitoring interface, to ease the operation and use by users.

This product is contactless and maintenance-free, and permits separate regulation of three phases, being a upgraded product of the SBW series mechanical voltage regulator.

Product characteristics:

★ **Wide range of voltage regulation, high precision of voltage regulation, quick response**.

★ **Synchronous regulation/separate regulation**.

★ **Advanced measurement technologies**: Singlechip digital filtering and true virtual value calculation, accurate control, programmable logic device which is perfectly integrated with the singlechip.

★ **Simplified human-machine interface:** Set various indexes (for example, output voltage, voltage regulation precision, protection features etc.) via the operation panel.

★ **Complete protection features:** Change of uninterrupted power supply to mains supply or output cutoff in the case of any fault, accompanied with buzzer alarm.

★ **Slow startup against impact:** The voltage will be regulated before any output.

★ **No additional distortion of output wave:** Changeover by the zero-crossing switch, the same frequency, phase locking, compensation against sine wave superposition.

★ **Wide range of loading:** Be compatible with resistive, capacitive and inductive loads.

2. Handling and placement

2.1 Pay attention to safety during handling operation, select the forklift, trailer, crane or other handling tools of the appropriate weight.

2.2 Observe the position of center of gravity, avoid any significant swinging amplitude, and keep the product horizontal to avoid any fall.

2.3 Follow marks given on the package or product. This product shall not be reversed or tipped.

2.4 When placing this product, keep it horizontal, for any inclination may lead to equipment distortion, thus causing adverse influence on the equipment appearance and operation.

2.5 Pay attention to personal safety.

3. Working environment

This equipment shall be installed in a cool, dry, clean and well-ventilated environment. Where the environment contains conductive dust (such as metal powder, sulfide, sulfur dioxide, graphite, carbon fiber, conductive fiber etc.), acid mist or other conductive medium (substances with strong-field ionization) , the protection and prevention measures shall be taken or the equipment shall be stopped as per applicable national standards.

◆ **Altitude:** The altitude shall not exceed 1,000m, and in the case of any excess, the equipment shall be operated in the derated mode.

◆ **Ambient temperature:** -15～50℃.

◆ **Relative humidity:** 10～90%.

◆ **Ventilated environment:** The vent of this product shall maintain a distance of at least 50cm from the wall surface.

◆ **Vibration conditions:** This product shall not be used under vibration conditions.

◆ **Dust and flammable gas:** This product shall be properly protected when it is used in the environment containing dust and flammable gas.

◆ **Acid, alkali and salty mist:** This product shall be properly protected when it is used in the acid, alkali and salty mist environment.

4. Installation and wiring

4.1 Inspection prior to installation

Carry out following inspections before installation:

◆ **Out-of-box inspection.** After the product is unpacked, check the product nameplate, product model, quality certificate, warranty card, operation manual and accessories for correctness and completeness, and check whether the equipment is damaged due to transport. If any question is found, contact this company or the local dealer.

◆ **Inspection of insulation resistance.** Use the 1,000V megameter to measure the insulation resistance of various live points (for example, air switch, contactor, compensation transformer) to the earth, and make sure that the insulation resistance is ≥2.0MΩ to comply with applicable requirements. In the case of any inconformity, take heating, drying, ventilation and dehumidfying measures till the compliance with such requirements is obtained. Note that the equipment may contain any surge protection device against high leaking current (for example, lightening arrester, piezoresistor, capacitor), and when measuring the insulation resistance, such device may have to be

disconnected from the earthing line to avoid adversely influencing the measurement of the insulation resistance.

4.2 Electric wiring

Wire the equipment as per the **definitions** given in the wiring diagram, and during installation, follow the **wiring labels** bonded beside the wiring terminals.

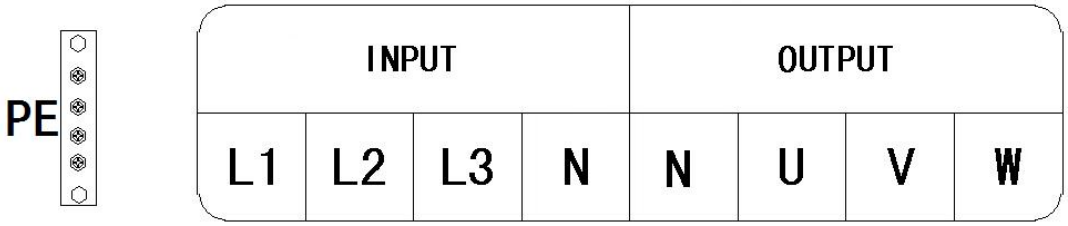

Fig. 1 Wiring diagram (only for reference)

Input wiring: **Three-phase live wire L1/L2/L3** + **Neutral line N** + earthing line PE, connected to the corresponding **input** terminal.

Output wiring: **Three-phase live wire U/V/W** + **Neutral line N** + earthing line PE, connected to the corresponding **output** terminal.

Note:

1. The input of this product must be connected to the neutral line which shall not be confused with the earthing line.

2. This product has a common input & output neutral line (internal short circuiting), and also a common input & output earthing line (internal short circuiting).

3. Certain products are provided with the dedicated earth bar and neutral bar which shall be wired as instructed.

4. The wire diameter shall be selected as per applicable standards. A too small diameter may cause heating of wires to give rise to any safety hazard.

5. Electric principle

The electric principle drawing of the ZBW series three-phase contactless AC voltage regulator is given below (only for reference).

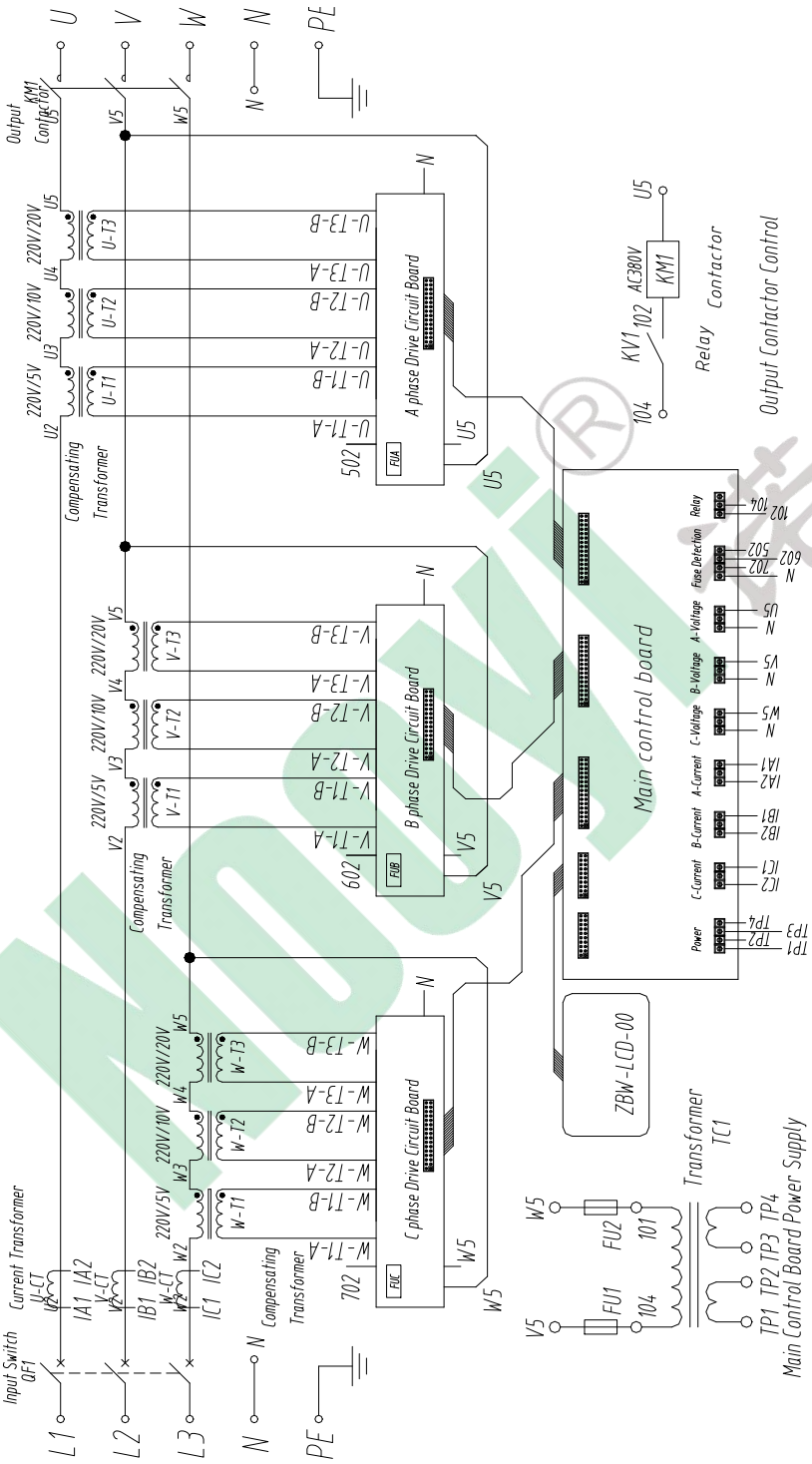

Fig. 2 Electric principle drawing (only for reference)

6. Performance index

Input	Input range	3Φ4W+PE, AC380V±20% **(for non-standard products, refer to the nameplate)**
	Frequency range	47Hz-63Hz self-adaptive
Output	Rated voltage	3Φ4W+PE, AC380V **(for non-standard products, refer to the nameplate)**
	Voltage regulation accuracy	±1-5% (ordinary product ±3%; **for non-standard products, refer to the nameplate**)
	Response speed	Quick
	Waveform distortion	No additional waveform distortion (static)
	Overall efficiency	≥98%
	Three-phase imbalance	Automatic balancing of three-phase voltage
	Delayed output	The voltage will be regulated before any output (in order to protect the equipment against any impact), with a delay of 10S (this value can be set)
Protection	Output overvoltage	The output phase voltage is higher than 10% (this value can be set), and the protection time will be determined according to the response time, with the protection method detailed in “8. LCD parameter display and setup instructions”.
	Output undervoltage	The output phase voltage is lower than 10% (this value can be set), and the protection time will be determined according to the response time, with the protection method detailed in “8. LCD parameter display and setup instructions”.
	Overload	Electronic detection; the protection time is ranged from 10 minutes to 10 seconds corresponding to the overload from 100% to 200%.
	Fuse alarm	Available, with the protection method detailed in “8. LCD parameter display and setup instructions”.
	Piezoresistor alarm	Available, with the protection method detailed in “8. LCD parameter display and setup instructions”.
	Automatic bypassing	This product can be changed to bypass automatically in the case of any fault (this feature can be set), or changed to bypass manually.

	Phase sequence error	Available, with the protection method detailed in “8. LCD parameter display and setup instructions”.
	Open phase or serious three-phase imbalance	Available, with the protection method detailed in “8. LCD parameter display and setup instructions”.
	Manual bypassing	Manual bypassing, bypass isolation voltage regulator, with easy maintenance (optional)
Indication	Voltage	Phases A, B and C are respectively provided with true valid value LCD display
	Current	Phases A, B and C are respectively provided with true valid value LCD display
	Load ratio	Load ratios of phases A, B and C
	Frequency	Frequency of mains supply
	Apparent power	Total power
	Working mode	Voltage regulation mode/mains supply mode
	Alarm information	Output overvoltage, output undervoltage, overload, fuse blow-out alarm, piezoresistor alarm etc.
Human-machine interface		Intelligent human-machine operation panel, to facilitate the setting and query of various parameters
Working method		There are two working methods: “Voltage regulation” and “Mains supply”
Communication interface		Support RS232 or RS485 serial port (optional)
Insulation resistance		Main circuit input to earth ≥2.0MΩ
Insulation strength		Main circuit to earth 50Hz/2,000.0V, no penetration within 1min
Cooling conditions		Natural cooling or forced fan cooling

7. Operation instructions

7.1 Preparation for startup

Before startup, **check whether the input and output wiring is correct**, and use the multi-meter to **check whether the input voltage is within the permissible range**. The **input switch** can be turned on only when these requirements are met.

7.2 Process of startup

Please follow the **principle of level-by-level electrification**. After power-on, observe the indication on the LCD screen, and **check whether the output voltage can satisfy the load requirements**. After the equipment voltage is regulated, the delay contactor will be closed automatically and the equipment will output the power supply. **Loads can be only switched on after the contactor is closed**.

7.3 Phase sequence error protection

(the protection mode of this function can be modified or shielded, and the protection will be activated at startup)

If the input phase sequence wiring is correct, the LCD screen will indicate normal conditions after startup, and the delay contactor will be closed.

If the input phase sequence wiring is wrong or there is any open phase, the LCD screen will indicate the anomaly after startup, with buzz warning, and the equipment has no output. Use the multi-meter to check whether t here is any open phase of the input voltage. If the phase voltages of these three input phases are normal, the phase sequence is wrong. At this moment, exchange any two phases of the input wiring, check the phase sequence for correctness and then power on the equipment.

7.4 Manual bypassing (optional)

◆"**Voltage regulation**" position: The voltage regulator is put into operation. Turn the manual bypass switch to "voltage regulation" position, and power on the equipment.

◆"**Bypass**" position: The voltage regulator is bypassed. In the case of equipment failure, disconnect the load, turn off the input switch, turn the manual bypass switch to "bypass" position, and power on the equipment.

◆"**Stop**" position: If the equipment is to be stopped for a long time, turn the manual bypass switch to "stop" position.

7.5 Operation of loads

◆ Loads must be connected one by one, and any overloading shall be prohibited.

◆ When the equipment works at any load, if the power grid is shut down and needs to be recovered, loads must be connected one by one. It is not allowed to start several large-capacity squirrel cage AC motors at the same time, for the overhigh impact current may damage the equipment.

◆ The load should not exceed 80% of the rated power of the equipment preferably to obtain the best efficiency and good reliability. If the load ratio is very high, the forced cooling measures must be provided.

◆ Frequently monitor working conditions of the equipment. Check whether the input and output voltages are normal and whether there is any overload. In the case of any anomaly, consult with this company or your local dealer to avoid damages of the equipment.

7.6 Process of shutdown

To shut down the equipment, firstly shut down loads, and then turn off the input switch to prevent the peak impact of the inductive loads at shutdown.

8. LCD parameter display and setup instructions

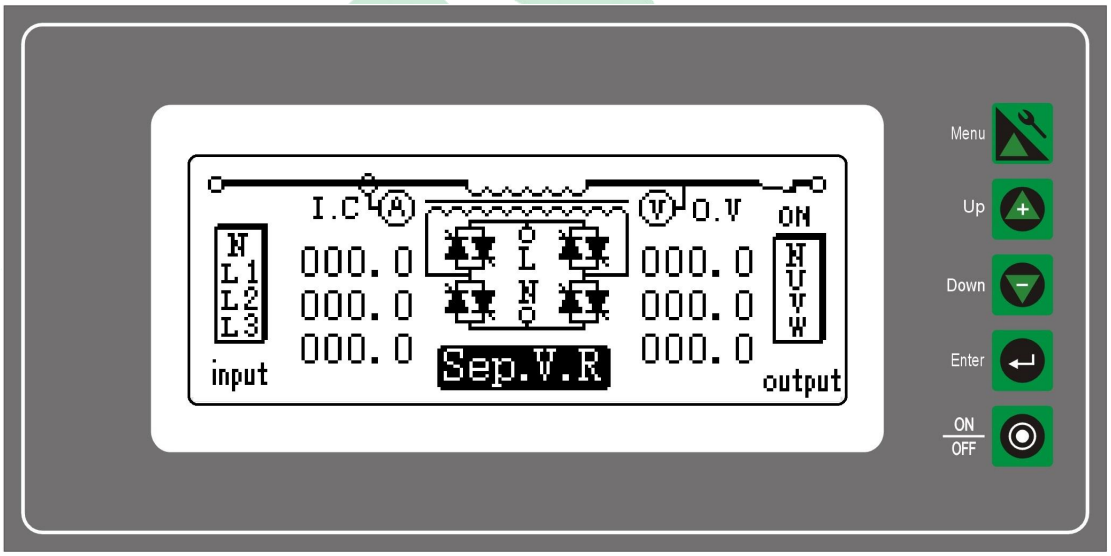

Fig. 3 Schematic diagram of LCD screen

8.1 Description on pushbuttons

◆ “MENU” button: **Menu button**. Press “MENU” and then release, and you can enter the view and setting interface.

◆ "+UP" button or"-DOWN" button: **Up/down button.** View equipment parameters together with the functional buttons.

◆ "ENTER" button: **Confirmation button.** Set equipment parameters together with the functional buttons.

◆ "ON/OFF" button: Output ON/OFF button.

8.2 View and setting of parameters

◆ After startup, enter the interface1(as shown in the figure below)

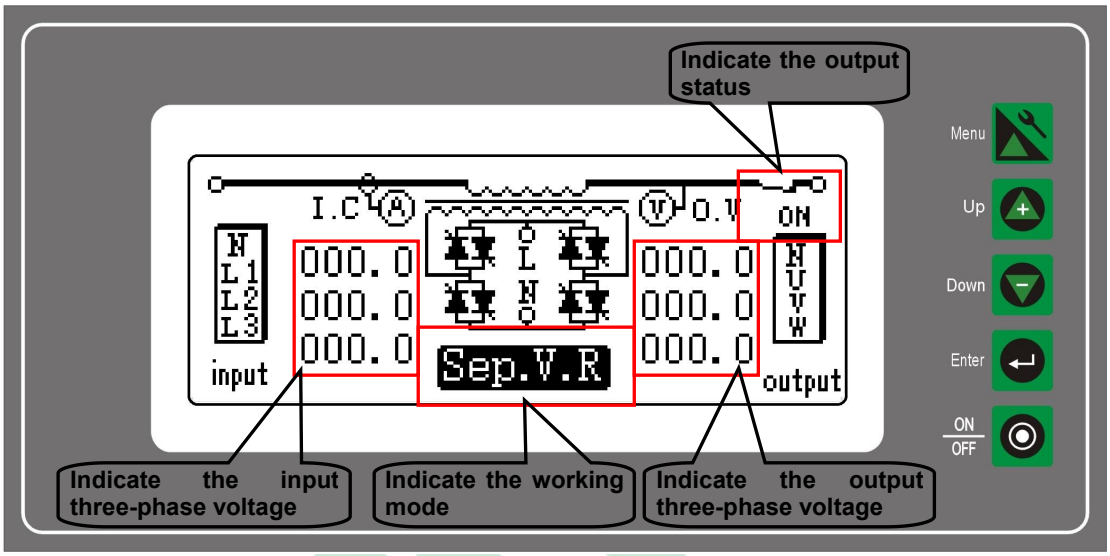

Fig. 4 Interface 1 (main interface)

◆ Push "+UP" or "-DOWN" to enter the interface 2 (see the figure below)

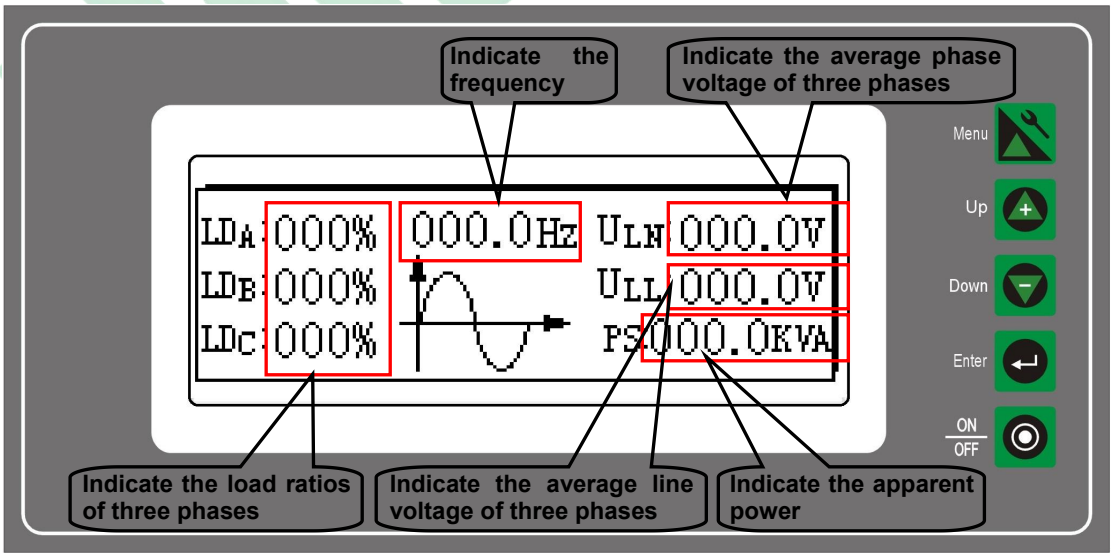

Fig. 5 Interface 2

◆ Query the current fault

After any fault occurs, a “horn” alarm logo will be shown at the upper left corner of the main interface (as shown in Fig. 6.1); at this moment, you can press “MENU” button to enter the interface 3 (Fig. 6.2 Menu interface), press “+UP” or “-DOWN” button to select “Query the current fault”, press “ENTER” to view “Current fault” interface 4 (FIg.7 Current fault interface), press “+UP” or “-DOWN” button to turn the page to query the fault information, and press “MENU” button to return.

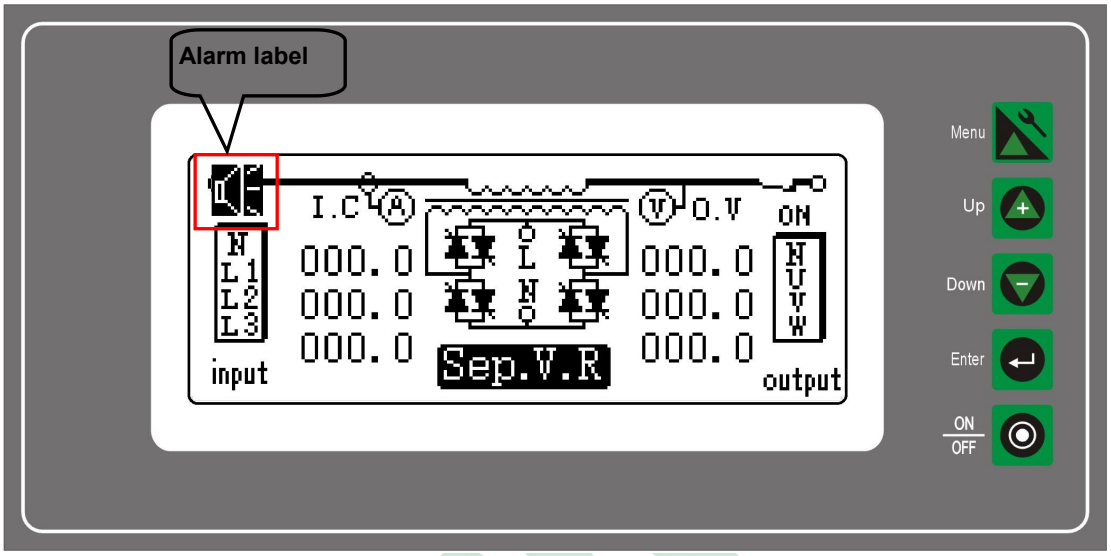

Fig. 6.1 Interface 1 (main interface)

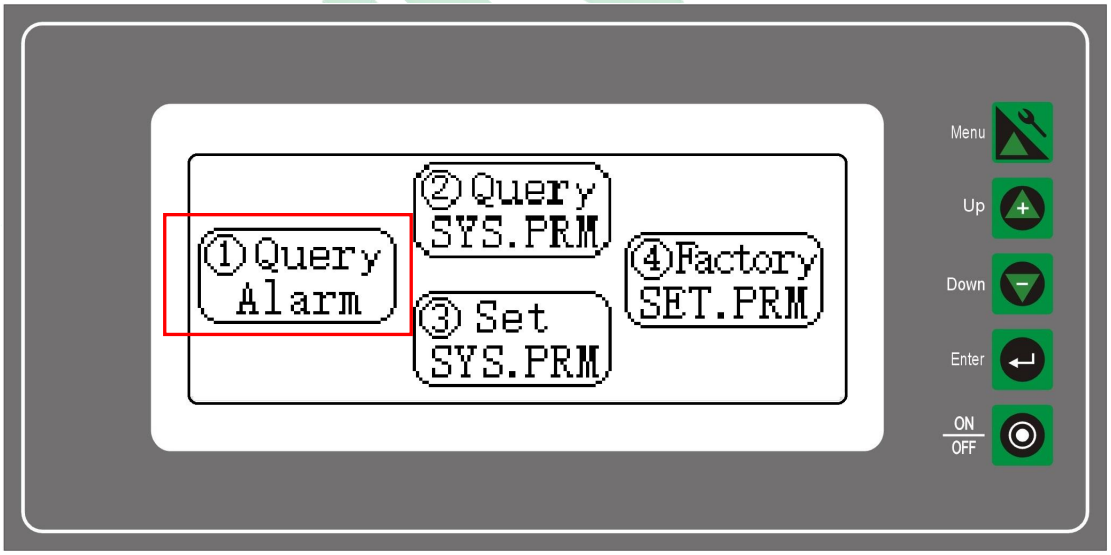

Fig. 6.2 Interface 3 (menu interface)

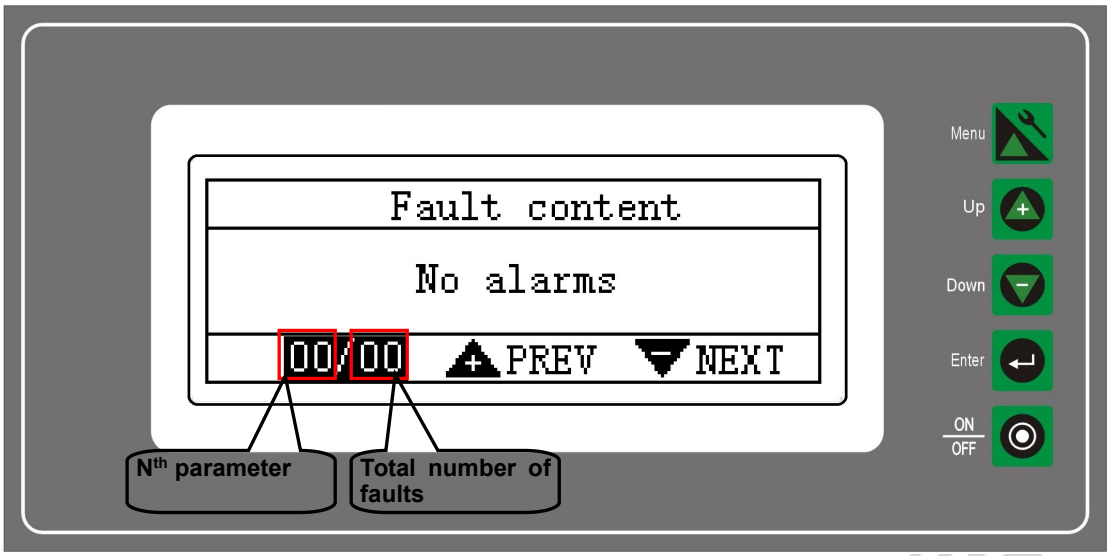

Fig. 7 Interface 4 (current fault)

Fault description and solution:

Fault description	Meaning	Solution
A\B\C overvoltage alarm	A\B\C output voltage is higher than the set overvoltage, and the output voltage is too high	Disconnect the input master switch, and restart the equipment. If the alarm is shown again, check whether the input voltage is normal
A\B\C undervoltage alarm	A\B\C output voltage is lower than the set overvoltage, and the output voltage is too low	Disconnect the input master switch, and restart the equipment. If the alarm is shown again, check whether the input voltage is normal
A\B\C fuse alarm	A\B\C fuse blow-out	Disconnect the input switch, replace the fuse in question, reclose the switch, and if the alarm is repeated, please contact the seller
A\B\C overload alarm	A\B\C load exceeds the rated value	Reduce the load appropriately
A\B\C (T1, T2, T3) surge protector alarm	A\B\C (T1, T2, T3) surge protector is penetrated by a high current similar to the lightening current	Replace the corresponding surge protector module or contact the seller

◆ Query the system parameter

Press “MENU” button to enter the interface 3 (Fig. 8 Menu interface), press “+UP” or “-DOWN” button to select “Query the system parameter”, press “ENTER” to view “System parameter” interface 5 (Fig. 9 Query the system parameter), press “+UP” or “-DOWN” button to turn the page to query the parameter information, and press “MENU” button to return. The meaning of parameter is shown in “Set the system parameter”.

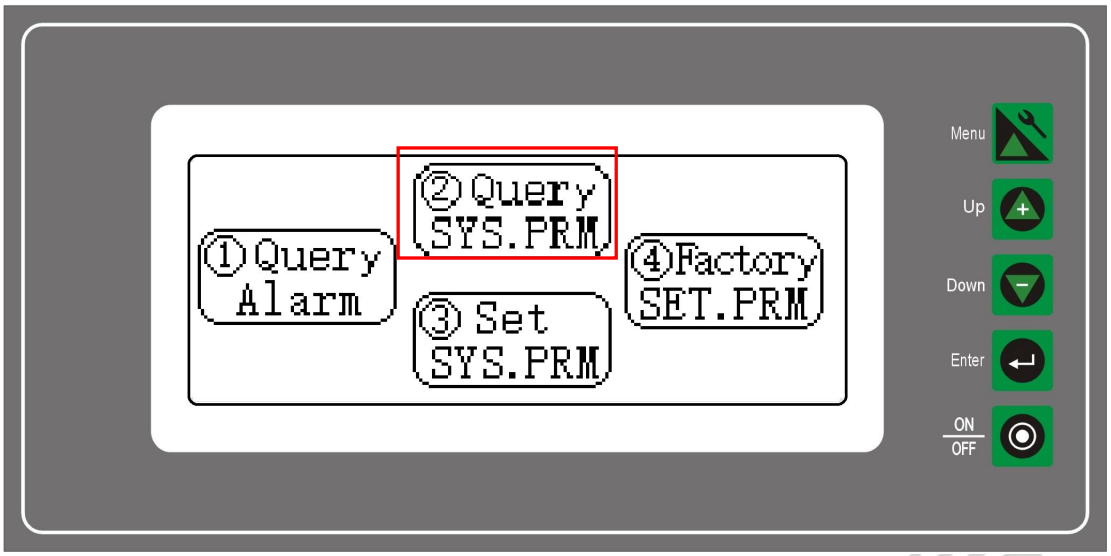

Fig. 8 Interface 3 (menu interface)

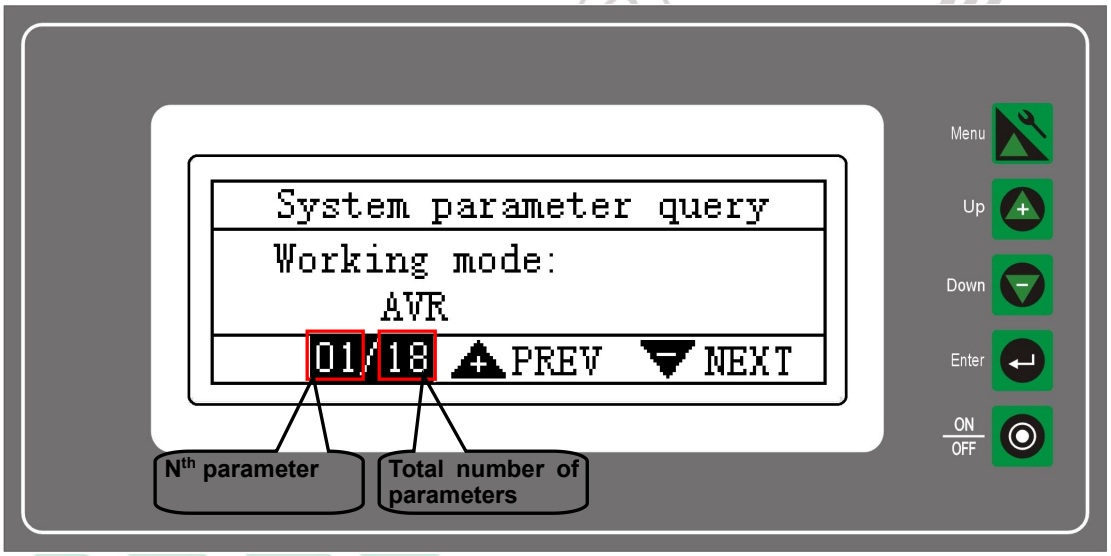

Fig. 9 Interface 5(Query the system parameter)

◆ Set the system parameter

Press “MENU” button to enter the interface 3 (Fig.10 Menu interface), press “+UP” or “-DOWN” button to select “Set the system parameter”, press “ENTER”, input the password “1111” to enter the interface 6 “Set the system parameter” (Fig.11 Set the system parameter), press “+UP” or “-DOWN” button to turn the page to choose the parameter to be set, press “ENTER” button to select or set the parameter value (press “+UP” or “-DOWN” button and hold it, then the parameter value will change at the increasing speed to facilitate the quick setting); after the desired parameter value is obtained, press “ENTER” to save the value, and press “MENU” to return.

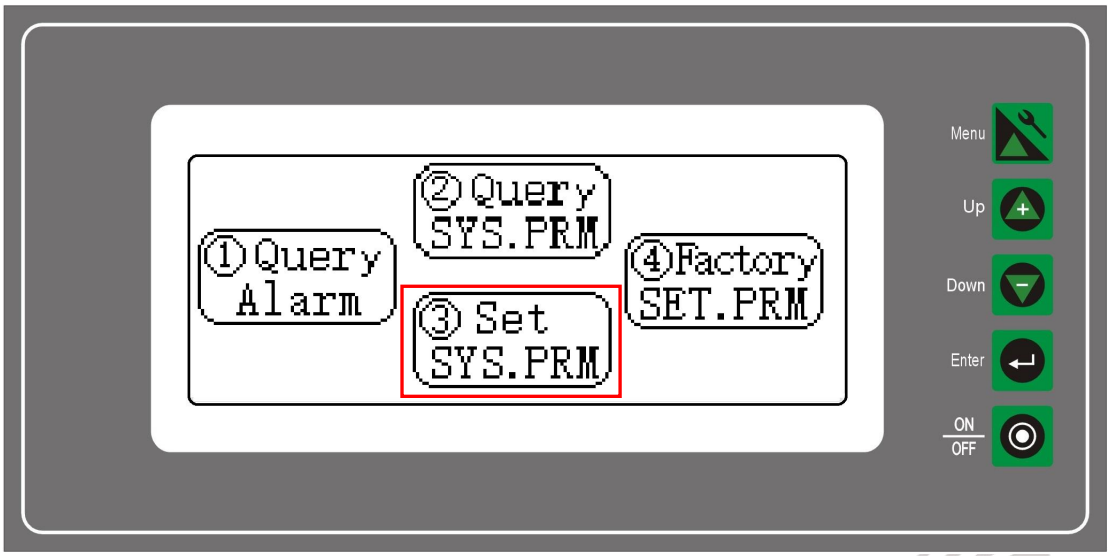

Fig. 10 Interface 3 (menu interface)

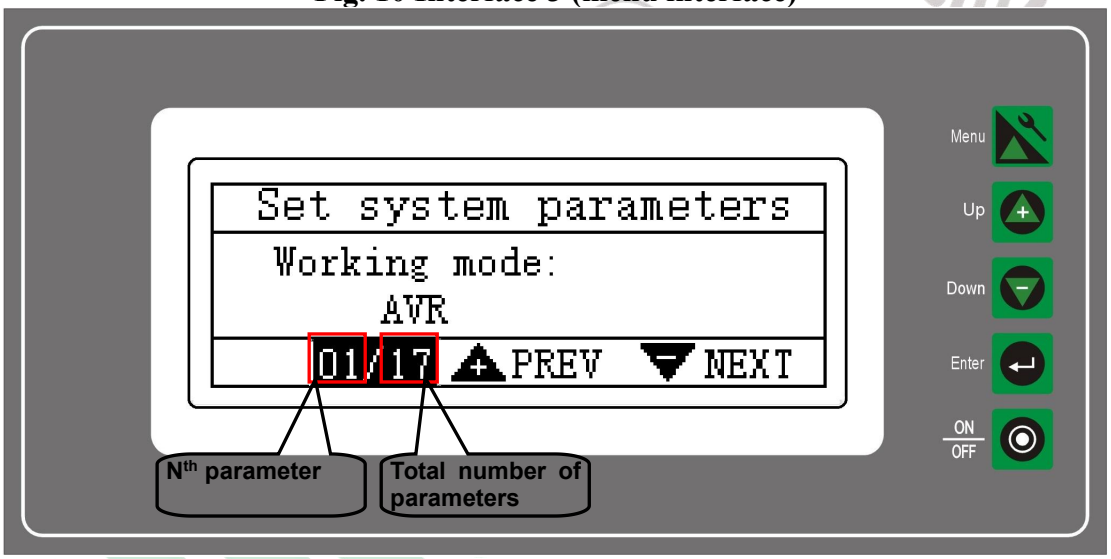

Fig. 11 Interface 6 (set the system parameter)

Content and meaning of the parameter

Page No.	Content of parameter	Definition	Meaning	Initial factory setup
01/17	Setting of working mode	1.Voltage regulation 2.Mains supply	Voltage regulation: the regulator is working Mains supply: the regulator bypass is working	Voltage regulation
02/17	Setting of voltage regulation method	1.Synchronous regulation 2.Separate regulation	Synchronous regulation: Synchronous regulation of three-phase voltage Separate regulation: Separate regulation of	Separate regulation

			three-phase voltage	
03/17	setting of central voltage	198.0-242.0V	Output voltage central value	220.0V
04/17	Setting of voltage regulation accuracy	2.0-15.0V	Output fluctuation range	Set as per the order; 6V in the case of ordinary products
05/17	Response speed	0-250	One unit of average collection cycle is equal to three 60MS cycles	10
06/17	Overload current	10.0-999.9	Setting of overload protection value	Depending on the power
07/17	Actuation after any overvoltage occurs	1.Cut off the output after any alarm is raised, and recover the output after the alarm is eliminated 2.Cut off the output 3.Change to bypass 4. No action	Method of execution after the protection is activated	Cut off the output
08/17	Actuation after any undervoltage occurs	1.Cut off the output after any alarm is raised, and recover the output after the alarm is eliminated 2.Cut off the output 3.Change to bypass 4. No action	Method of actuation after the protection is activated	Cut off the output
09/17	Actuation after any overload occurs	1.Cut off the output 2.Change to bypass	Method of actuation after the protection is activated	Cut off the output
10/17	Actuation after the fuse blows out	1.Cut off the output 2.Change to bypass	Method of actuation after the protection is activated	Change to bypass
11/17	Actuation after the surge protection fails	1.Cut off the output 2.Change to bypass	Method of actuation after the protection is activated	Change to bypass
12/17	Actuation after any phase sequence error is detected	1.Cut off the output 2. No action	Method of actuation after the protection is activated	No action

13/17	Actuation after any open phase is detected	1.Cut off the output 2.Change to bypass	Method of actuation after the protection is activated	Cut off the output
14/17	Serial port address	1-255	Address of serial port communication equipment	5
15/17	Output delayed time	0-300S	Output delayed time **When set as "0", the manual startup is required after the power supply is recovered**	10S
16/17	Overvoltage protection value	230.0V-264.0V	Overvoltage protection threshold	242.0V
17/17	Undervoltage protection value	210.0V-176.0V	Undervoltage protection threshold	198.0V

◆ Manufacturer-controlled parameter (as shown in Fig.12, this function is only intended for the use by the manufacturer during equipment commissioning, but will not be opened to the users to avoid any wrong setup)

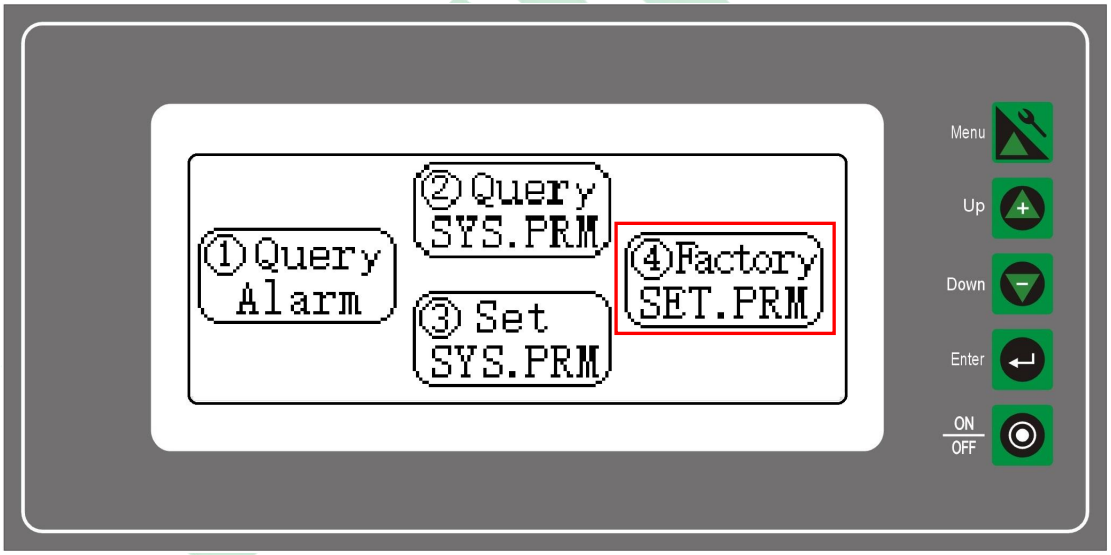

Fig. 12 Interface 3 (menu interface)

9. Communication interface (optional)

9.1 Introduction to communication

This product is provided with the RS232 communication interface which can be expanded into the RS485\RS422 interface via the changeover interface. This interface protocol supports multiprocessor communication, and at most 128 units of equipment can be accommodated.

9.2 Format of communication

The format of communication conforms to the MODBUS-RTU protocol format.

Baud rate: 9600BPS

Data format: 1 start bit, no check bit, 8 data bits, 1 stop bit (the host terminal will send data in the following format of MODBUS-RTU protocol: "9600, N, 8, 1")

For the read/write format and functional codes, please refer to MODBUS-RTU Protocol.

9.3 Table of communication parameters

Address	Data description	Parameter type and calculation	Status
0001	AD reference value	0-4096	Read only
0002	Output frequency	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only
0003-0014	Reserved bit, insignificant, no writing		
0015	Output C-phase current	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only
0016	Output B-phase current	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only
0017	Output A-phase current	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only
0018	Output C-phase voltage	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only

0019	Output B-phase voltage	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only
0020	Output A-phase voltage	Hexadecimal, round to the nearest tenth, divided by 10 to obtain the actual value	Read only
0021	Working status indication	0, mains supply; 1, voltage regulation; 2,alarm	Read only
0022	Working status setting register	0, mains supply; 1, voltage regulation	Read/write
0023	A-phase overvoltage indication	0, normal; 1, alarm	Read only
0024	B-phase overvoltage indication	0, normal; 1, alarm	Read only
0025	C-phase overvoltage indication	0, normal; 1, alarm	Read only
0026	A-phase undervoltage indication	0, normal; 1, alarm	Read only
0027	B-phase undervoltage indication	0, normal; 1, alarm	Read only
0028	C-phase undervoltage indication	0, normal; 1, alarm	Read only
0029	A-phase fuse alarm indication	0, normal; 1, alarm	Read only
0030	B-phase fuse alarm indication	0, normal; 1, alarm	Read only
0031	C-phase fuse alarm indication	0, normal; 1, alarm	Read only
0032	A-phase overload alarm indication	0, normal; 1, alarm	Read only
0033	B-phase overload alarm indication	0, normal; 1, alarm	Read only

0034	C-phase overload alarm indication	0, normal; 1, alarm	Read only
0035	A-phase T1 surge protector alarm	0, normal; 1, alarm	Read only
0036	A-phase T2 surge protector alarm	0, normal; 1, alarm	Read only
0037	A-phase T3 surge protector alarm	0, normal; 1, alarm	Read only
0038	B-phase T1 surge protector alarm	0, normal; 1, alarm	Read only
0039	B-phase T2 surge protector alarm	0, normal; 1, alarm	Read only
0040	B-phase T3 surge protector alarm	0, normal; 1, alarm	Read only
0041	C-phase T1 surge protector alarm	0, normal; 1, alarm	Read only
0042	C-phase T2 surge protector alarm	0, normal; 1, alarm	Read only
0043	C-phase T3 surge protector alarm	0, normal; 1, alarm	Read only
0044	Open phase and three-phase imbalance alarm	0, normal; 1, alarm	Read only
0045	Phase sequence error alarm	0, normal; 1, alarm	Read only
0046	Comprehensive alarm	0, normal; 1, alarm	Read only
0047-0069	Reserved bit, insignificant, no writing		
0070	Central voltage setting	1980-2400, round to the nearest tenth, divided by 10 to obtain the actual value	Read & write
0071	Voltage regulation	20-150, round to the nearest tenth, divided	Read &

	accuracy setting	by 10 to obtain the actual value	write
0072	Response speed setting	0-250, one unit consists of 3 grid cycles	Read & write
0073	Overload protection value	100-9999, round to the nearest tenth, divided by 10 to obtain the actual value, determined depending on the equipment power	Read & write
0074	Actuation after any overvoltage occurs	0.Cut off the output after any alarm is raised, and recover the output after the alarm is eliminated 1.Cut off the output 2.Change to bypass 3. No action	Read & write
0075	Actuation after any undervoltage occurs	0.Cut off the output after any alarm is raised, and recover the output after the alarm is eliminated 1.Cut off the output 2.Change to bypass 3. No action	Read & write
0076	Actuation after any overload occurs	1.Cut off the output 2.Change to bypass	Read & write
0077	Actuation after the fuse blows out	1.Cut off the output 2.Change to bypass	Read & write
0078	Actuation after the surge protection fails	1.Cut off the output 2.Change to bypass	Read & write
0079	Actuation after any phase sequence error is detected	1.Cut off the output 3. No action	Read & write
0080	Actuation after any open phase is detected	1.Cut off the output 2.Change to bypass	Read & write
0081	Maximum accuracy setting	No writing of parameters controlled by the manufacturer is allowed	Read only

0082	Voltage regulation method	0.Synchronous regulation 1.Separate regulation	Read & write
0083	Serial port address	1-255	Read & write
0084	Output delayed time	0-300	Read & write
0085	Overvoltage protection value	2300-2640, round to the nearest tenth, divided by 10 to obtain the actual value	Read & write
0086	Undervoltage protection value	2100-1760 round to the nearest tenth, divided by 10 to obtain the actual value	Read & write
0087-0090	Reserved bit		
0091	A-phase load percentage	Divided by 100	Read only
0092	B-phase load percentage	Divided by 100	Read only
0093	C-phase load percentage	Divided by 100	Read only
0094	Output contactor closed & open status	0.Open 1.Closed	Read only
0095	Output contactor control	0.Open 1.Closed	Read & write

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提供电源问题全面解决方案

Nuoyi Electricity Co.,Ltd.
Add: No 555-12-1705 Chengyin Road, Baoshan, Shanghai, China
TEL: 021-69173140；69173141
Add: No 6 Jiangjiabang Road, Huangjing Town, Taicang, Suzhou, China
TEL: 0512-53811555；53828111
E-mail: sales@yeseasy.net
Web: www.yeseasy.net