# A Series Power Regulator

## Application

A series single-phase and three-phase intelligent power regulator, it is manufactured with digital design, high-quality original copy.It is fused newest micro-computer control technology and has excellent function.It has high performance, high precision and highautomation level. It is internally integrated powerful software modules and can meet a variety of applications. It is widely used in new energy, petrochemical, glass industry, industrial electric furnace, machinery and equipment,automotive industry and other industry sector.

## Features

1.Full digital circuit control, 32-bit ARM chip, high stability
2.Fast handle and response,control accuracy is better than 1%,resolution up to 2000:1
3.PCB board element have low failure rate and long service life
4.Adopt multi-pulse technology , low ripple and low harmonics , high power factor
5.Automatic identification of phase sequence function
6.With SCR overheating, fast fuse overcurrent protection
7.Ultra-wide range voltage input, power isolation output, superior anti-interference ability
8.Multiple analog inputs

## Model Definition

NG□A – □□□□ – □□ – □

- NG3A-Three-phase power regulator
- NG1A-Single-phase power regulator

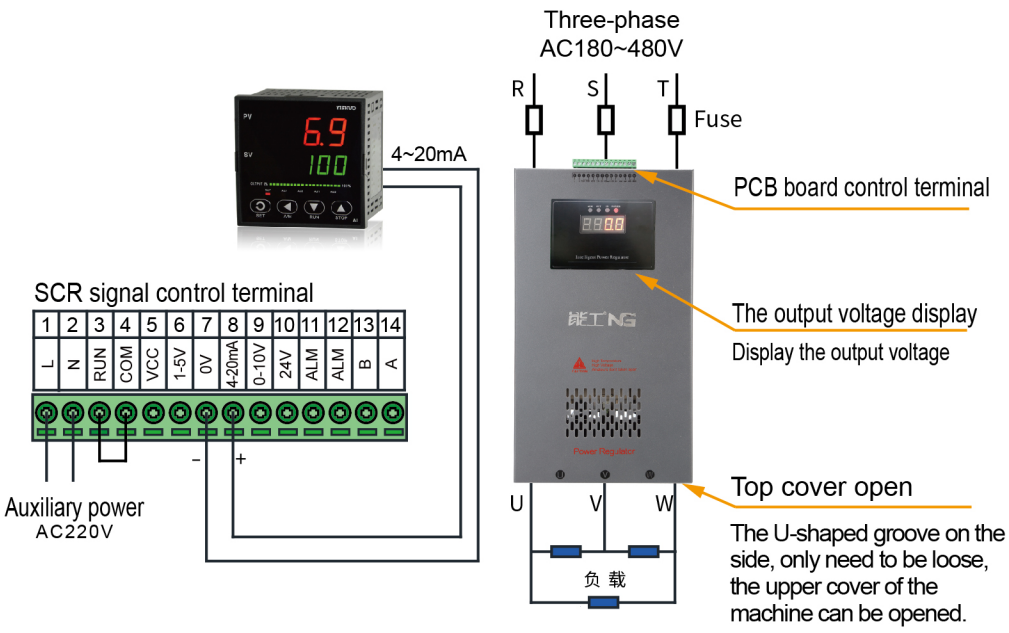
**Limit current**

**Output mode:**
YX-Phase shift control
LW-Zero control

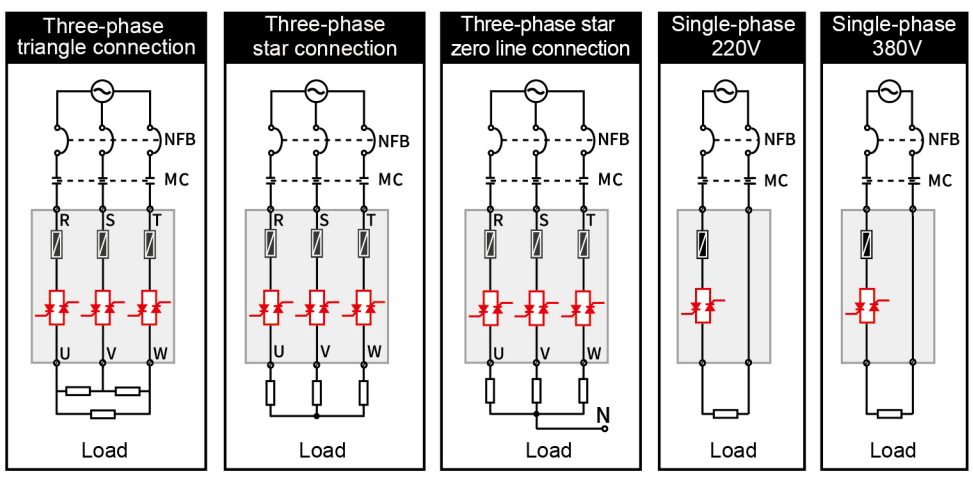
Special line voltage:
1–100~160V
2–200~220V
6–660~690V
7–750V
11–1140V

Please determine before installation: load type, and whether it is within the SCR capacity range.
Otherwise, exceeding the capacity range will affect the product life.
If the ambient temperature of the equipment is too high, it is recommended to select it at 1.5 times the margin.
The following is the theoretical minimum margin.
Calculation:(single-phase):load(KW)/ voltage(V)= amps(A) ; amps(A)*(1.5)= should use SCR amps(A)
(three-phase):[load(KW)/ voltage(V)]/√3= amps(A); amps(A)*(1.5)=should use SCR amps(A)

## Configuration Instruction



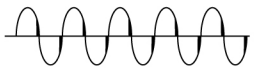
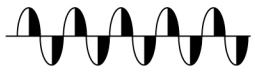
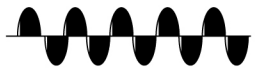
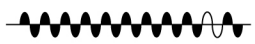

## Load Wring Instructions




## Technical parameters

| | | |
|---|---|---|
| Input | Main circuit voltage | Three-phase voltage AC 3φ 180~480V； Single-phase voltage AC 1φ180~480V(Other special voltages) |
| | Control power supply | AC220V±5%； 50HZ or 60HZ |
| | The power of the fan | AC220V |
| Output | Output voltage | The 0 ~ 98% of rated voltage (phase shift control) |
| | Control method | Phase shift control and zero crossing control |
| | Load characteristics | Resistance load, variable resistance load, primary side of transformer |
| Control features | Control signal | Simulation (DC4～20mA、DC1～5V、DC0～10V, etc.) and potentiometer |
| | Fan control | Run at startup |
| | Startup mode | Soft start,Fixed value (not editable),if demand time extension,you should explain before ordering |
| Protection | Overheating protection | When the regulator temperature is higher than 85°C, the contact alarm output,but the regulator does't shut down and the indicator light is red ; when the temperature reach 120°C, the regulator is forced to shut down. |
| | Other protection | Interior fast-blow fuse, it can protect the regulator from damage (fuse is easy to assemble and disassemble), fuse is blown to stop output, 350A or above is recommended externally |
| Environment | Environment | Temperature – 10 ℃ ~ 55 ℃; Humidity below 90% PH ( non-condensing) |
| | Elevation | The altitude should be less than 1000 meters. If the altitude exceeds, the service capacity should be reduced |
| Installation | Wall-mounted | The vertical installation, good ventilation |

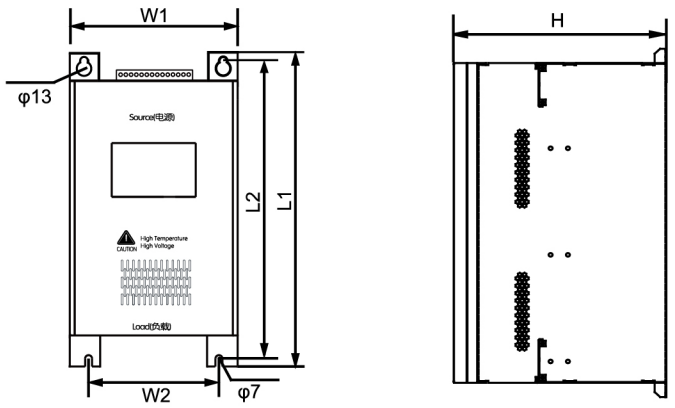
## Control Mode

| Output / Control Method | Output waveform | | |
|---|---|---|---|
| | 10%Output | 50%Output | 90%Output |
| 移相控制 |  |  |  |
| 零位控制 |  |  |  |

***Phase shift control :***Continuous intersection control, output is stable and the ammeter does't shake. But it will produce harmonics.
***Applicable load:*** Constant impedance load, variable impedance load, IR lamp, inductive load, sharply changing resistance heating element and carbon rod etc.
***Applications:*** Primary side of transformer, heat treatment equipment, petroleum, chemical and other equipment.
***Zero control:*** Distributed zero control,The minimum resolution is 1HZ,Harmonic interference is small and the current meter exhibits jitter when output
***Applicable load:***Resistance wire(Don't suitable for lighting control, inductive load, rapidly changing resistance heating element)
***Applications:*** Constant temperature air conditioner,thermal processor,baking oven, extrusion machine, etc.

## Configuration Instructions

### Product outline drawing size(unit:mm)




| Specified model | Gauge current (A) | Fuse specifications | Dimensions | | | | | Cooling method |
|---|---|---|---|---|---|---|---|---|
| | | | Length L1 | Width W1 | Deep D | Pitch L2 | Pitch W2 | |
| NG3A-30A-YX | 30A | 63A | 240 | 110 | 180 | 226.5 | 80 | Forced cooling |
| NG3A-40A-YX | 40A | 63A | | | | | | |
| NG3A-50A-YX | 50A | 63A | | | | | | |
| NG3A-60A-YX | 60A | 80A | | | | | | |
| NG3A-80A-YX | 80A | 100A | 292 | 135 | 220 | 278.5 | 101.6 | |
| NG3A-100A-YX | 100A | 125A | | | | | | |
| NG3A-125A-YX | 125A | 160A | | | | | | |
| NG3A-160A-YX | 160A | 200A | 390 | 155 | 230 | 376.5 | 121 | |
| NG3A-180A-YX | 180A | 200A | | | | | | |
| NG3A-200A-YX | 200A | 200A | 390 | 200 | 240 | 376.5 | 166.5 | |
| NG3A-250A-YX | 250A | 315A | | | | | | |
| NG3A-300A-YX | 300A | 400A | 390 | 263 | 240 | 376.5 | 229 | |
| NG3A-350A-YX | 350A | 400A | | | | | | |
| NG3A-400A-YX | 400A | 500A | 490 | 320 | 270 | 475 | 288 | |
| NG3A-500A-YX | 500A | 600A | | | | | | |
| NG3A-600A-YX | 600A | 800A | 570 | 320 | 291 | 556.5 | 289 | |
| NG3A-600A-YX-T | 600A | 800A | 530 | 593 | 297 | 500.5 | 561 | |
| NG3A-800A-YX | 800A | 1000A | | | | | | |
| NG3A-1000A-YX | 1000A | 1200A | | | | | | |

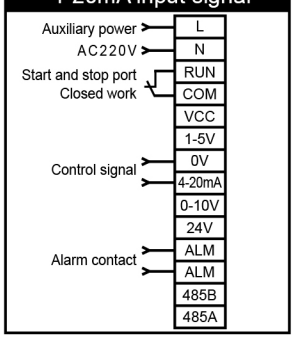
| Specified model | Rated current (A) | Fuse specifications | Dimensions | | | | | Cooling method |
|---|---|---|---|---|---|---|---|---|
| | | | length L1 | width W1 | Deep D | pitch L2 | pitch W2 | |
| NG1A-30A-YX | 30A | 63A | 240 | 110 | 180 | 226.5 | 80 | Forced cooling |
| NG1A-40A-YX | 40A | 63A | | | | | | |
| NG1A-50A-YX | 50A | 63A | | | | | | |
| NG1A-60A-YX | 60A | 80A | | | | | | |
| NG1A-80A-YX | 80A | 100A | | | | | | |
| NG1A-100A-YX | 100A | 100A | | | | | | |
| NG1A-125A-YX | 125A | 160A | 292 | 135 | 220 | 278.5 | 101.6 | |
| NG1A-160A-YX | 160A | 200A | | | | | | |
| NG1A-180A-YX | 180A | 200A | | | | | | |
| NG1A-200A-YX | 200A | 200A | | | | | | |
| NG1A-250A-YX | 250A | 315A | 390 | 155 | 230 | 376.5 | 121 | |
| NG1A-300A-YX | 300A | 400A | | | | | | |
| NG1A-350A-YX | 350A | 400A | | | | | | |
| NG1A-400A-YX | 400A | 500A | 390 | 263 | 240 | 376.5 | 229 | |
| NG1A-500A-YX | 500A | 600A | | | | | | |
| NG1A-600A-YX | 600A | 800A | | | | | | |
| NG1A-800A-YX | 800A | 1000A | 490 | 320 | 270 | 475 | 288 | |
| NG1A-1000A-YX | 1000A | 1200A | | | | | | |

## Terminal Instructions

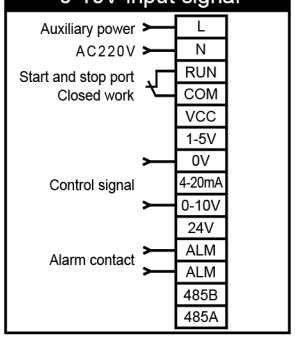
| Num. | Terminal | Features | Description |
|---|---|---|---|
| Main circuit terminal | | | |
| 1 | Source | Main loop input | AC180~480V 50/60Hz (Customer demand voltage 110V/660V/690V/750V) |
| 2 | Load | Main loop output | Connect load |
| Control terminal | | | |
| 1 | L | AC220V Auxiliary power | Used for circuit boards control power |
| 2 | N | | |
| 3 | RUN | Hardware start and stop control port | Do hardware start and stop control, close to enable |
| 4 | COM | | |
| 5 | VCC | Reference voltage +5V | Reference voltage +5V,a given reference voltage for external potentiometer use |
| 6 | 1-5V | Analog input port (+) | 1.DC1-5VAnalog signal input<br>2.Used to connect the external manual potentiometer between the wiper terminals |
| 7 | 0V | Negative electrode(-) | Control signal negative common terminal |
| 8 | 4-20mA | Analog input port (+) | DC 4-20mA analog signal input ,please specify the order |
| 9 | 0-10V | Analog input port (+) | DC0-10V analog signal input ,please specify the order |
| 10 | 24VDC | Empty feet | Empty feet, without function |
| 11 | ALM | Relay output (overheat alarm contact) | 1.Normally open contact, contact capacity AC250V/3A (resistive), DC24V/5A<br>2.Regulator over-temperature alarm contact,alarm output does not shut down when over temperature |
| 12 | ALM | | |
| 13 | 485B | RTU 485- | Optional items, communication control,this function before ordering |
| 14 | 485A | RTU 485+ | |

## Control wiring example

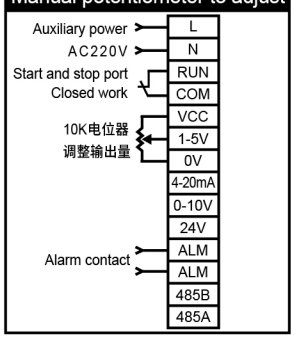
1 4-20mA input signal



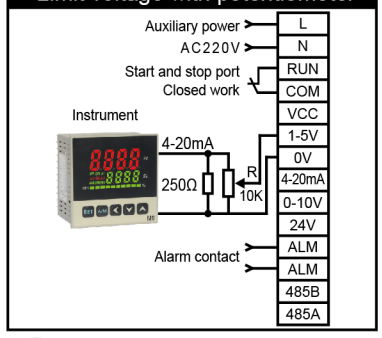

2 0-10V input signal



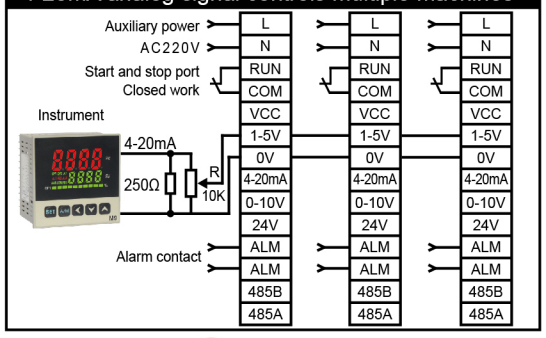

3 Manual potentiometer to adjust



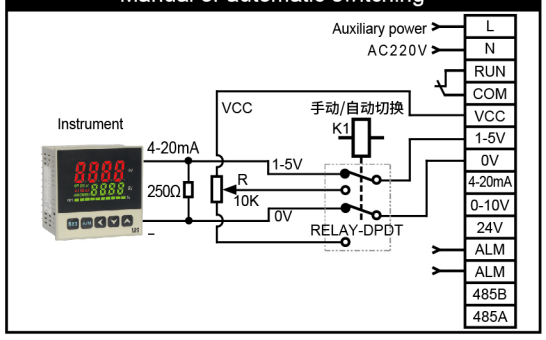

4 Limit voltage with potentiometer



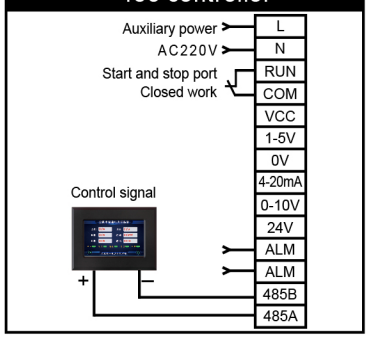

5 4-20mA analog signal controls multiple machines




6 Manual or automatic switching



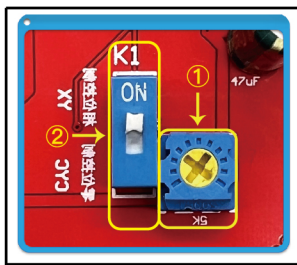

7 485 controllor








Note: 1. It is recommended to control the number of parallel regulators within 5 and use signal barriers
2. The V3.2 circuit is an upgraded version, which eliminates the need to switch jumper caps when changing input signals
3. Suggested power transmission sequence: first supply power to the main circuit, then supply auxiliary 220V power




Note: ① and ② standard products with two functions are not included by default. If this function is required, it should be explained before ordering

① Limiting potentiometer
If it is necessary to limit the output of the power regulator, the potentiometer can be rotated and adjusted

② Phase shift/zero control switching
The dial switch is under phase shift control at the ON position, otherwise it is under zero position control

Opening method of the machine: Gently unscrew the two screws on the right side of the upper cover of the product, and open the upper cover like turning a book from right to left, making it easy to connect and operate.
Machine installation spacing: There should be a space of not less than 300-400mm between the upper and lower parts of the product to facilitate air circulation. If multiple products are installed in the same cabinet, it is recommended to arrange them horizontally to avoid the air outlet (high temperature) of the lower controller during upper and lower installation, which becomes the air inlet of the upper controller. When arranging them horizontally, there should be a space of not less than 100-150mm between the two controllers.

## Troubleshooting

This series of products have overheating protection and other functions.When the fault occurs, the user can preliminarily determine the fault range according to the following reasons and make corresponding treatment.

| Display status | Abnormal troubleshooting | Treatment strategy |
|---|---|---|
| The machine is powered on, and there is no output after inputting the signal. The input light is red, and the output light is green | 1. Check whether the load is connected<br>2.check the size of the given analog signal<br>3. check whether the fast fuse is blown<br>4. Check whether the main power supply is powered on | 1. The product needs to be loaded for debugging. If there is no load for debugging, three light bulbs (100W) can be connected as dummy loads for debugging. After the transformer is loaded, it can be operated<br>2. Using the DC voltage range of a multimeter, measure the voltage between 1-5V and 0V, and 4-20mA and 0V. A given voltage requires about 1.2V; If a 0-10V signal is given, it needs to be adjusted to over 2V before the machine can have an output; If the load is connected in a triangular manner, the trigger signal should be sent to more than 25%<br>3. Adjust the multimeter to the ohmic gear, and the resistance value is 0, which is normal. If there is a resistance value, the fuse will blow, and it can be replaced<br>4. Check whether there is voltage at the incoming terminal of the main circuit<br>5. The phase loss indicator light is red, check whether the fuse or load is disconnected, and restart the power supply to start up after troubleshooting |
| Digital tube does not display | 1. Check whether the auxiliary power supplies L and N are powered on<br>2. Check whether the cables between the touch screen and the circuit board are loose | 1. Ensure that the L and N ports 220V auxiliary power supply is powered on, and check whether the power supply is connected to the circuit board<br>2. Other wiring is normal. If the touch screen connection cable is normal, the display screen is damaged and needs to be replaced |
| The machine is powered on, and there is no output after inputting the signal. The input light is green, and the output light is green | 1. Check whether the signal given is correct<br>2. Is the input signal connected inversely | 1. The machine can accept a variety of analog signals, wiring needs to be consistent with the upper computer or given analog signals<br>2. If the input signal is reversed, the input light is green, after a long time, it is easy to damage the voltage regulator |
| Load connection normal, input light red, output green, parameter display 0 | 1. Check whether the cooling fan of the machine is faulty or stuck, and whether the ambient temperature is too high<br>2. Abnormal start/stop port of external hardware | 1. The machine has an 85 °C temperature switch that does not shut down when an alarm is given; The 120 °C temperature switch is forced to shut down, and the machine temperature needs to be lowered; Ensure that the red terminal of the main board 120 ° C temperature switch is closed<br>2. the green terminal's pin 3 and pin 4 of the machine are the start/stop ports, which are passive dry contacts and are closed for operation. It is necessary to ensure that this position is in a closed state (voltage is 0V). If it is greater than 0V, there is an open circuit here |
| There is still output after the signal is cut off or the auxiliary power supply is turned off | 1. Check whether the thyristor is broken down<br>2. Check whether the line is grounded | 1. If the thyristor module is connected, it is damaged. If more than 2 modules are damaged, it is necessary to check whether the load is short circuited;<br>2. If the line or load is slightly grounded, it is easy to cause a weak output in the main circuit that is not controlled by the signal source. After turning off the power supply, a multimeter can be used to detect whether the resistance value of the load to ground is normal |
| After removing the problem, the machine still couldn't work properly | At this time, it is impossible to determine whether the signal source is abnormal or whether the motherboard is damaged | Short circuit the green terminal VCC and the 1-5V terminal. After normal power supply, observe whether the machine can output normally. If not, the main board will be damaged. |

## Maintenance

Due to the influence of ambient temperature, humidity, dust and vibration, the aging of the components inside the power regulator, etc., the powerregulator may malfunction. Therefore, it is necessary to perform daily and regular maintenance and maintenance on the controller.

The power regulator must operate in the environment specified above. In addition, some unexpected situations may occur during operation,do daily maintenance work, maintain a good operating environment,record daily operational data, analyze abnormal data and detect abnormalcauses early, which is a good method to extend the service life of the power regulator. The user can perform a regular check on the controller for 3 to 6 months depending on the usage environment. The inspection contents include:

(1) Whether the control terminal screw is loose;
(2) Whether the main circuit terminal has poor contact, whether there is any trace of overheating at the copper bar
connection; the main circuitterminal needs to be attached, otherwise it is easy to be overheated due to poor contact;
(3) Whether the power cable and the control cable are damaged, especially if the skin that is in contact with the metal
surface has a cut mark;
(4) Whether the insulation wrap of the nose of the power cable is disconnected;
(5) For the dust cleaning on the circuit board and the air duct, it is best to use a vacuum cleaner;
(6) Avoid storage in places with high temperature, humidity and dust and metal dust.

## Light load experiment

Connect the power regulator input power line, disconnect the power regulator from the load, use three 100W/220V incandescent lamps (incinctive lamp power not less than 100W) to make a dummy load, and the three bulbs are star-connected (can be connected to the neutral line) ), respectively, connected to the output of the power regulator (regulator is not allowed to run with a transformer without load).

**Detection method:**
Power regulator VCC, 1-5V, 0V three ports connected to the potentiometer, adjust the potentiometer, see the light and dark changes of the bulb.

- Please read the instructions carefully before use
- Because the product is constantly updated, the contents of this manual are subject to change without prior notice
- For easy reference, please keep this manual (V3.2 version)

SHANGHAI NENGGONG ELECTRON CO.,LTD