



Shangai AOYI Electric Co., Ltd

**ZKC-2000 Series**  
**Specialized Products for the Heating Control System**



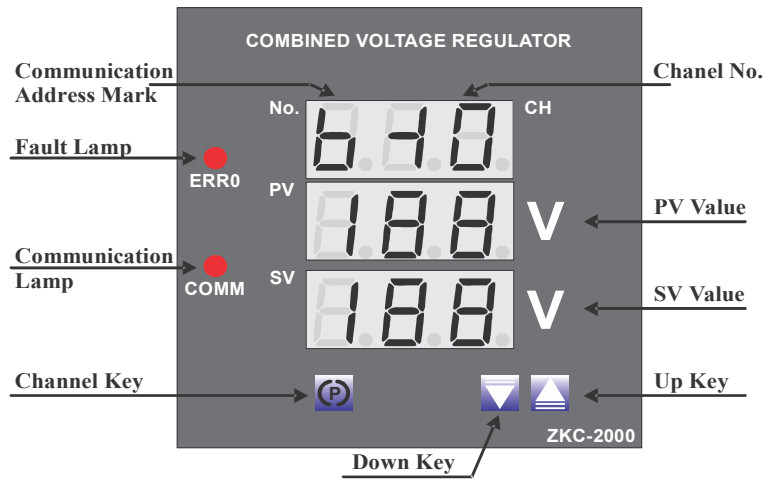
### 1. SUMMARY

1. ZKC multichannel voltage regulator (abbreviated as voltage regulator) is the novel combined voltage regulator with single-chip computer at the core, which can adjust load voltage continuously by phase shifting triggering. Due to use of depth voltage negative feedback this voltage regulator have perfect stabilized voltage property and good linearity.
2. Voltage regulator can be connected to single phase, the zero line of the load must be common. Voltage regulator has ten channels, for three phase, A phase and B phase has four channels each, C phase has two channels. Each channel can output pulse signal, which can be connected to one channel load by SSR-DV module or bidirectional thyristor from our factory.
3. Each voltage regulator can be used separately or in series to a system. Voltage regulator adopts RS485 bus interface and universal Modbus-RTU communication protocol, which can connect PLC touch screen directly.
4. Voltage regulator can connect outer control button of full power output, by this button you can operate multi voltage regulators at the same time and can output full power.
5. Voltage regulator adopts LED digital display and touch operation, which have output voltage calibration function to control output correctly. Voltage regulator can remember the state and parameter when lose of power supply. You can control ON-OFF state of each channel or control ON-OFF state of all the channels by one button, which is very convenient and efficient.
6. Voltage regulator have high accuracy, good shock-resistant, good reliability, high anti-interference, clear reading and many other advantages, which is widely used for temperature control of forming machine, etc mechanical equipment.

### 2. Main Technical Parameters

<b>Working power supply</b>	AC220V±10% 50Hz / Power ≤6W
<b>Auxiliary power supply</b>	Single phase: AC220V±20% / Three phase four wire: AC220V±20% 50Hz
<b>Working environment</b>	Temperature 0~50 °C / Relative humidity less than 85% / Non corrosive gas
<b>Output pulse</b>	Amplitude more than 3V / Width more than 50μs / Current more than 50mA
<b>Maximum angle of flow of phase-shift trigger</b>	Not less than 150°
<b>Communication mode</b>	RS485 two-line bus communication 9600 baud rate
<b>Dimensions</b>	120 x 120 x 100 mm
<b>Opening size</b>	106 x 106 mm

### 3. PANEL DESCRIPTION



#### Fault lamp (Red lamp):

When fault happened, this lamp and PV value will flash.

#### Communication lamp (Green lamp):

when communication data exchange, this lamp shines, if no communication for 5 sec, the lamp goes out.

#### Channel key, down key, up key:

Please refer to the following detailed information about these keys' setting and operating.

#### PV value:

Current value, and if fault happened, the value will flash.

#### SV value:

set value.

#### Channel NO:

NO 1~10, it will enter to the next channel every 5sec, of course, you also can lock the current channel, at this moment, the number will flash to warn you the channel is currently locked.

#### Communication address mark:

you want to connect multi voltage regulators to a system, you must set this address and every voltage regulator must have different address, if only one, you don't have to this step. When you have set the communication address, it will display a horizontal bar between the address and channel number.

#### The detailed operation is as following:

	<p>The left picture is the setting interface, you can change to the other interface by these methods:  <b>Press P key for short time:</b> Enter to the next channel  <b>Press P key for over 1s:</b> Set the current channel to ON of OFF. If the channels is OFF, PV window will display P.8.8.  <b>Down key:</b> Each time you press this key, the SV value decreases by one.  <b>UP key:</b> Each time you press this key, the SV value increases by one.  <b>Press P key and down key the same time for over 1sec:</b> Close all the open channel.  <b>Press P key and Up key at the same time for over 1 sec:</b> Open the channel which has been set ON.  <b>Press down key and up key at the same time:</b> press these keys for a short time to lock the current channel, press for over 3 sec to enter to the setting interface.</p>
	<p>The left picture is the setting interface of communication address mark: If no action for over 5 sec, it will return to the normal display interface.  <b>Down key:</b> the address decrease by one.  <b>Up key:</b> the address increase by one.  <b>P key:</b> save the result and enter to the interface of setting preheat time.</p>
	<p>The left picture is the setting interface of preheat time:  <b>Down key:</b> the preheat time decrease by one.  <b>Up key:</b> the preheat time increase by one.  <b>P key:</b> save and enter to the interface of setting calibration factor.  <b>Press down key and up key at the same time:</b> press these keys for over 3 sec to cancel and quit.                      The unit of preheat time is minute, the maximum is 20 min.</p>
	<p>The left picture is the setting interface of calibration factor.  <b>Down key:</b> the factor decrease by one.  <b>Up key:</b> the factor increase by one.  <b>P key:</b> save and enter to the normal display interface.  <b>Press down key and up key at the same time:</b> press these keys for over 3 sec to cancel and quit.                      The maximum factor is 99, the default factor is 10, if the real load voltage is less than PV value, you can turn the factor up, if not, turn the factor down.</p>

PICTURE 1. Character list

a	b	c	d	e	f	g	h	i	j	k	l
m	n	o	p	q	r	s	t	u	v	w	x

## 4. CONNECTING METHODS

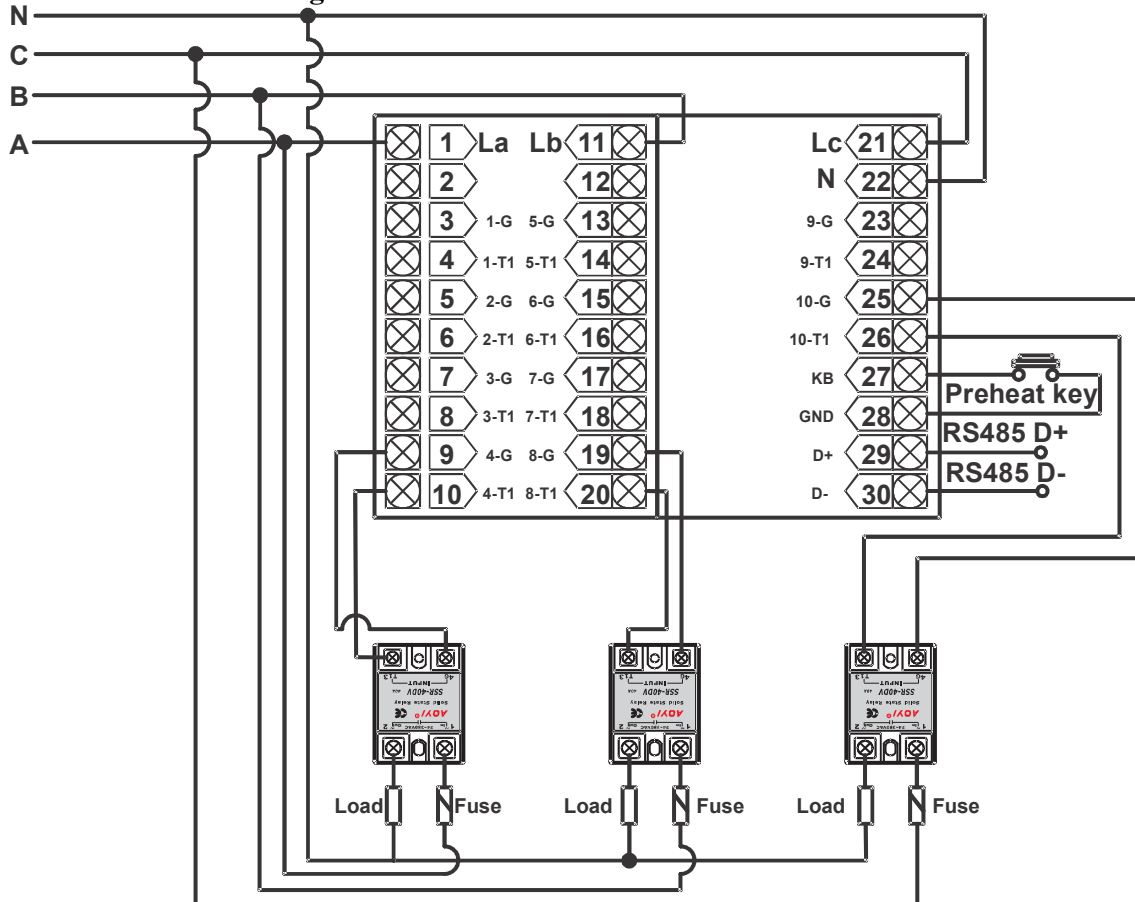
### 4.1 Three Phase connecting method

Three phase connecting method as shown in the picture 2, from the picture, we can know, voltage regulator can't be connected to loads directly, it must be with SSR-DV module from our factory. Besides, please note that the output terminal of all the SSR-DV modules must be synchronous with the load, for example, if the load was belong to La phase, then SSR-Dv output terminal need to be connected to La phase, for ten channels, 1-4th channel is belong to 1-4 channel, 5-8th channel is to Lb, and 9-10th is to Lc. In the following picture only shows the connecting method of 4th-channel of La, 8th-channel of Lband 10th-channel of Lc. The other channel connecting method is the same as this.

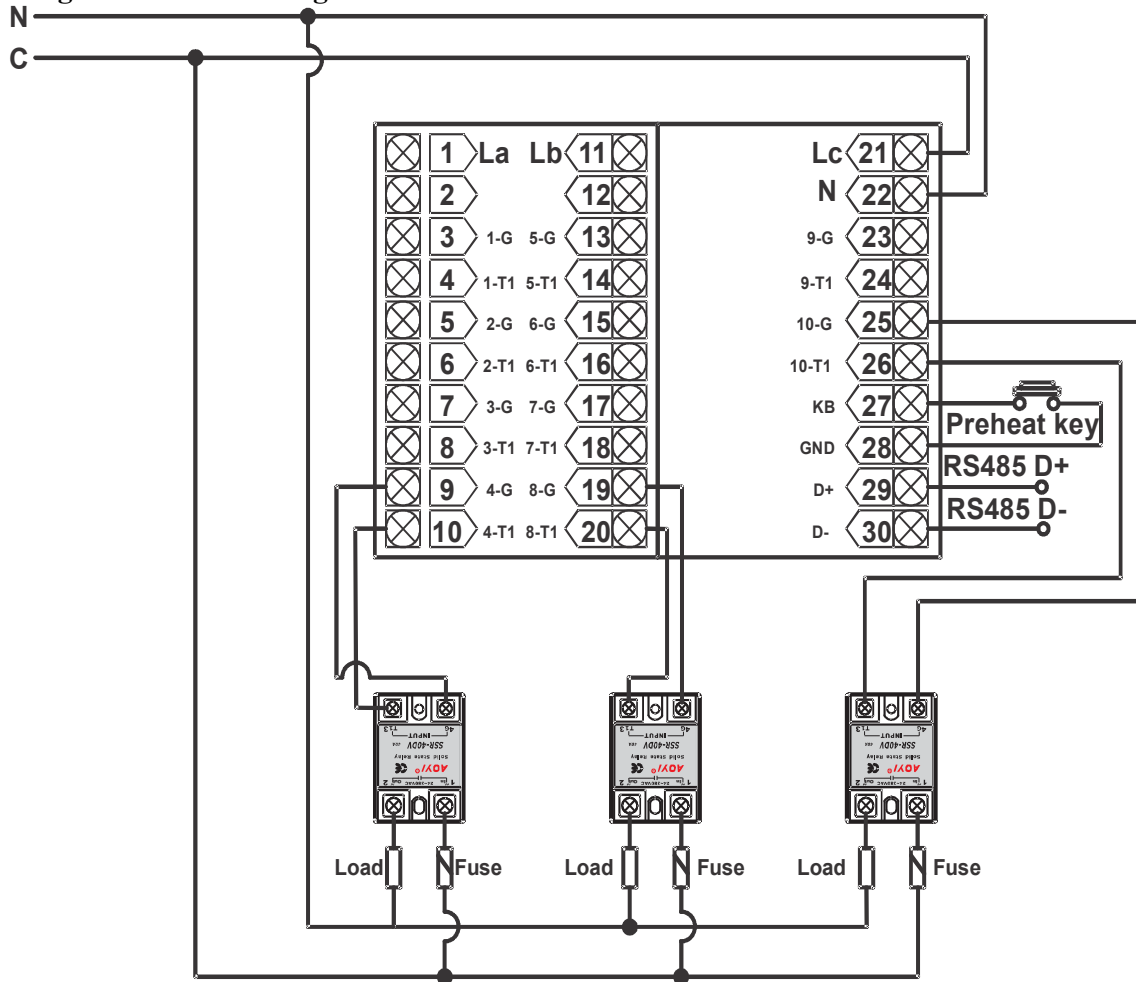
### 4.2 Single Phase connecting method

If single phase connecting, La, Lb and Lc need to be short, then to any phase of three phase, we can call this working power supply of voltage regulator. For SSR-DV module, the output terminal need to be synchronous with power supply of voltage regulator. The connecting method as shown Picture.3

PICTURE 2. Three Phase connecting method



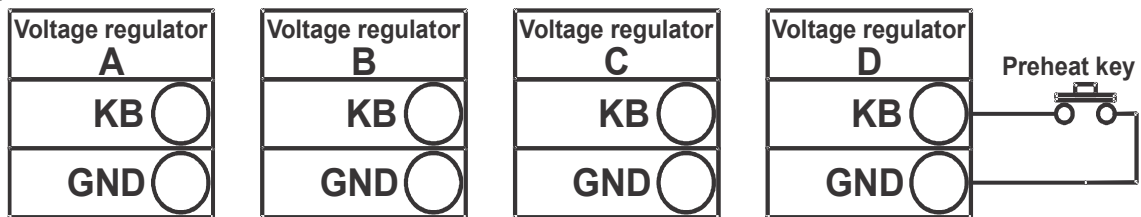
**PICTURE 3. Single Phase connecting method**



**REMARK:**

1. please use shield wire between G and T1 of every channel and SSR-DV module. And voltage regulator “G” and T1 must be corresponding to SSR-DV “G” and T1.
2. The key between “KB” (Port 27) and “GND” (Port 28) is used to start preheat function, if you press this key for over 3sec, the voltage regulator will output full power and start preheat function, the detailed operation you can refer to the previous information. For multi voltage regulators, you can control preheat function synchronously by one key, the connecting methods as Picture 4.

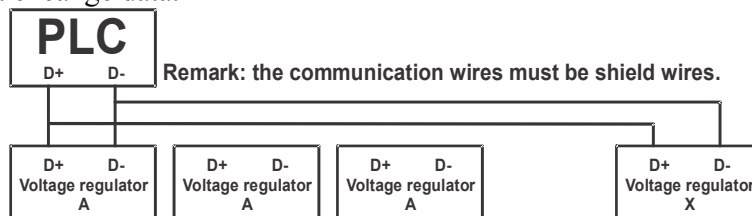
**PICTURE 4.**



**5. COMMUNICATION**

**5.1 Communication connecting methods**

First please connect the corresponding D+ and D- of every voltage regulator in series, then connect this D+ and D-. The connecting method as shown Picture 5. This communication is master-slave way, PLC is a master and issues commands and read data from all the slaves. Every voltage regulator is a slave and accept commands and transmits data to PLC. Every voltage regulator don't exchange data.



## 5.2 Communication protocol

**5.2.1** This voltage regulator adopts Modbus-RTU communication protocol. The communication format of the master device as follows:

Modbus RTU hex address (Master)

8 data-bits

1 stop-bit

non parity-bit

Baud rate: 9600bps

Support the following commands:

0x01 Read a group of logical state

0x02 Read a group of input switches logical state

0x03 Read one or multi W/R registers

0x04 Read one or multi read-only register

0x05 Force-feed one bit logical state

0x06 Write a W/R register

0x10 Write a string of W/R register

**5.2.2.** Voltage regulator communication address mark is a~x, which is corresponding to 1~24, if the communication address mark is 0, this voltage regulator communication function is shut. Voltage regulator logical state and register as follows:

<b>Read-only register</b>	0x0000~0x0009	Real time voltage value of 1~10th channel (PV value)
	0x000A	0~9th bit is corresponding to error state of 1~10th channel (1:error 0:correct)
<b>W/R register</b>	0x0000	On or off of preheat function 0:shut 1:start
	0x0001	Save all the set parameters to group NO. ( <b>Note 1</b> )
	0x0002	Copy all the parameters of the current group to the other group ( <b>Note 2</b> )
	0x0003~0x000C	Setting voltage value of 1~10th channel of the current group (SV value, the maximum is 220)
	0x000D	Preheat time of the current group (min), the maximum is 20.
	0x000E	Preheat switch logical state of the current group, 0~9th bit is corresponding to 1~10th channel (0:open, 1:close)

**NOTE1:** This register saves the group number n which has recorded all the active parameters ( $0 \leq n \leq 15$ ), the default is 0, please note that you only can save 15 groups at most. Then you can to adapt to different control requirements.

**NOTE2:** The default is 0, values read from this register is the last copied group number. At each new value is written to this register, the voltage regulator will copy all the parameters (SV value, preheat time, switch logical state) to the required group.

**REMARK:** Not only you can access and control voltage regulator by reading and writing registers but also coil (namely that is commend function of logical bit). The supported commends are the same as the previous description. The range of coil number and the corresponding active register (bit) as follows:

<b>Logical Coil number (read-only)</b>	0x0000~0x0009	The error state of 1~10th channel, which is corresponding to 0~9th bit of 0x000A register
<b>Logical Coil number (read and write)</b>	0x0000~0x0009	Output switch state of 1~10th channel, which is corresponding to 0~9th bit of 0x000E register
	0x000A	Start or shut off preheat function, clear 0 to close preheat function and stabilize the voltage, set 1 to start preheat function, this is corresponding to 0x0000 register.