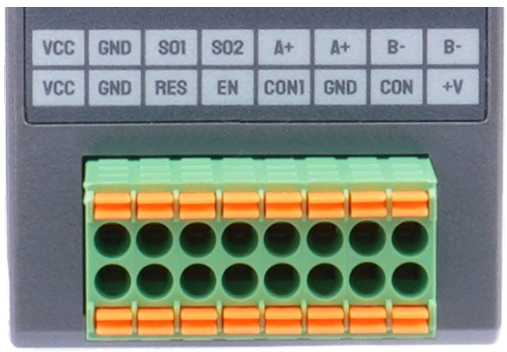
SCR20CA-S Single-phase AC Power Controller

❑ model: SCR - 20 - CA - S

Single-phase AC controller | nominal current | Closed-loop control | Configure fan

- ❑ The SCR20CA constant voltage/constant current/constant power regulator allows for switching between functions simply by setting parameters via an operable digital panel or a communicating device, achieving multi-functionality in one unit.
- ❑ The SCR20CA-S is a highly integrated feedback control voltage regulator system with a built-in high-power thyristor chip, digital phase-shift control circuit, output voltage and current measurement circuit, and a MODBUS-RTU communication system based on RS485 bus.
- ❑ The control signal is 0-10V/4-20mA, and customers can set and switch it via the digital panel.
- ❑ The sampling method is true RMS sampling; the fully isolated voltage and current sampling system ensures safe isolation between the control circuit and the power circuit.
- ❑ Overvoltage and overcurrent protection, and overheat protection when the temperature exceeds 95°C.
- ❑ Load open circuit detection; load life monitoring; no AC input detection.
- ❑ The digital panel is operable, making it easy to view and modify parameters.
- ❑ The control terminals are pluggable and spring-loaded, facilitating troubleshooting and equipment replacement.
- ❑ The controller and heat sink are integrated into one unit, eliminating the need to purchase a separate heat sink. The unique design and installation structure allows for mounting on rails or with screws.
- ❑ Operating ambient temperature: -25°C to +45°C. The surrounding area should be dry, well-ventilated, away from heat sources, dust, and corrosive liquids and gases.
- ❑ The controller cannot be used as a disconnect switch. For safety, an air switch must be installed in front of the controller.

Port description:

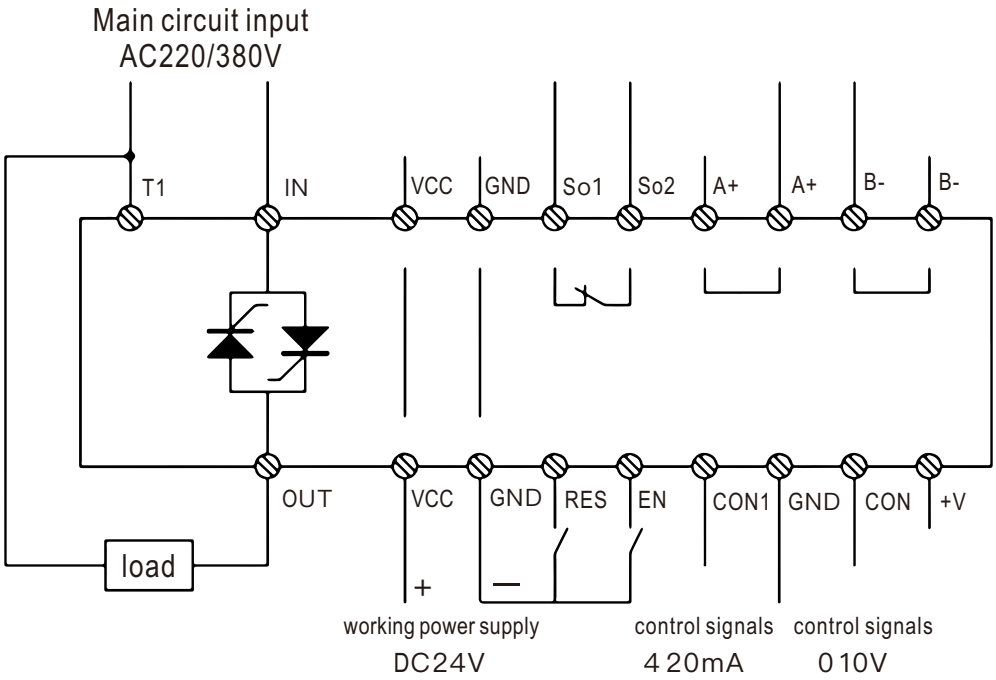


Function	illustrate
VCC、GND	Operating power supply, 24VDC, power ≤3W
RES	Reset signal, shorted to GND to reset.
EN	Enable signal, shorted to GND to disable.
CON1	4-20mA control signal
GND	Signal common terminal
CON	0-10V control signal
+V	Control the positive terminal of the power supply; the potentiometer resistance should be greater than 10KΩ.
SO1、SO2	Isolated status output: under normal conditions, SO1 and SO2 are closed; under fault conditions, So1 and SO2 are open.
A+、B-	Isolated RS-485 communication interface

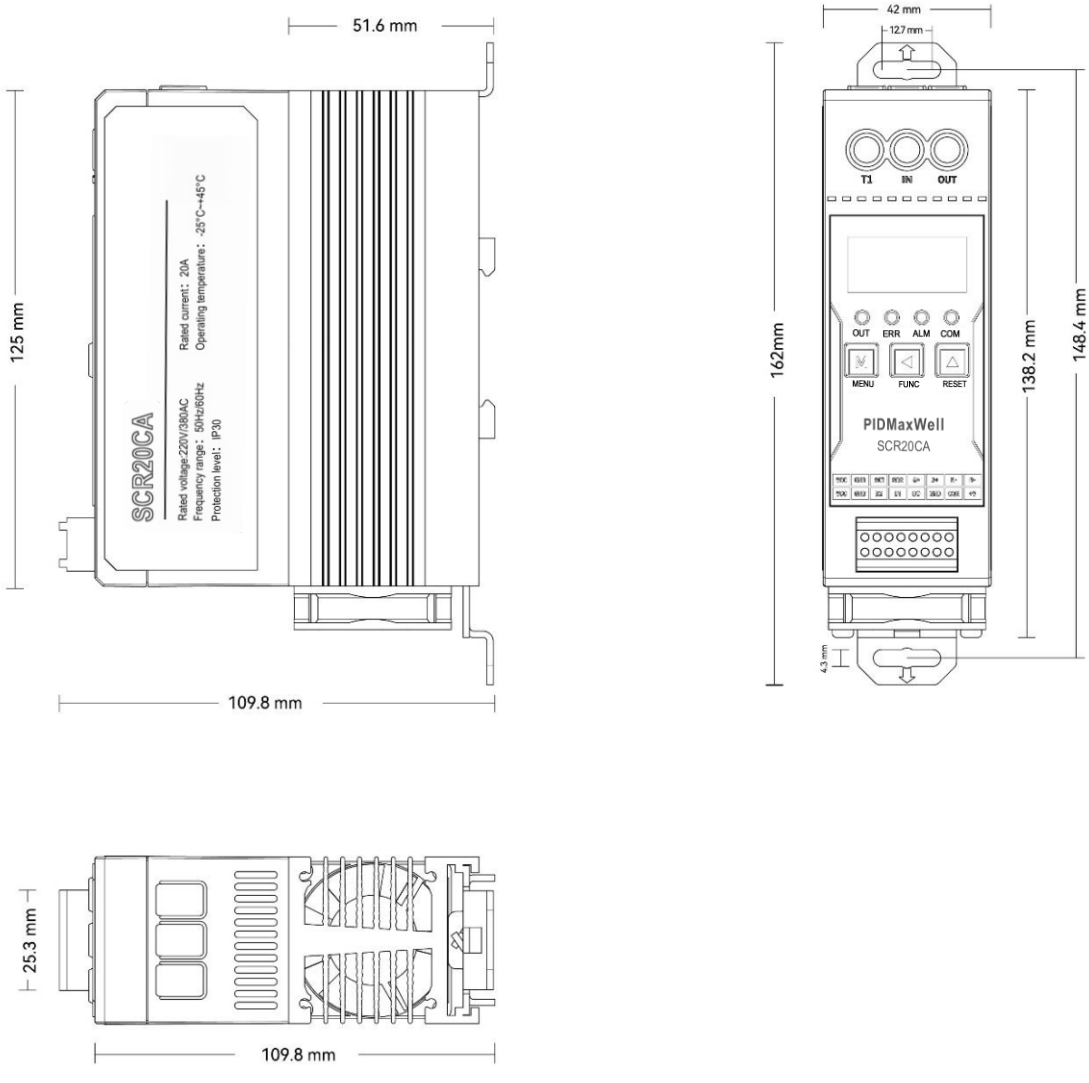
Operating parameters:

working power supply	control signals	Main circuit input voltage	Output current	Work mode	Operating frequency
Voltage: 24V Power: ≤ 3W	0-10V/4-20mA Analog Input	AC 220V/380V	40A	Constant voltage/constant current/constant power	50/60Hz adaptive
Output voltage asymmetry	Voltage instability	Forward and reverse peak withstand voltage	di/dt	dv/dt	
<2%	<0.5%	≥1400V	100A/μS	500V/μS	

Application circuit diagram:



Installation dimensions and instructions



Digital control panel description:

❑ Upon power-on, the digital control panel displays station number d001, with station number 1 as the default. If there are multiple controllers, station numbers can be set sequentially: d001 (default). ⟶ Press the menu button [M] ⟶ Display F000 ⟶ pass [◀] and [▲] Set the modifiable shift position and addition/subtraction numbers to F017. ⟶ Press the menu button [M] Enter to display current value ⟶ pass [◀] and [▲] Change to the desired value (according to Table 8.2.3). ⟶ Press the menu button [M] Return to previous menu ⟶ Long press the menu button [M] 2S.
Save the values and exit; other parameter settings are done in the same way.

❑ The digital control panel can be used for querying [◀] Buttons switch display content,You can switch between viewing voltage value UXX.X, current value CXX.X, power PX.XX, and station number dxxx.

❑ If EXXX is displayed, it indicates a fault. For fault diagnosis, please refer to Tables 8.2.1 and 8.2.2. Overvoltage E017 and overcurrent E018 faults need to be manually reset after being cleared. You can use the reset button to reset them. Other faults do not need to be manually reset. When multiple faults exist, they will be displayed in a cycle and end with END.

Display content	meaning
UXX.X	Output voltage value, unit V
CXX.X	Output current value, in amperes (A)
PX.XX	Output power value, unit: KW
dXXX	Station number value

Note: After completing parameter selection and modification, you need to press and hold the menu button to return to the monitoring state and update and save the changed data. Otherwise, the changed data will not be saved. Also, if there is no button operation for more than 30 seconds in the parameter selection or modification state, it will automatically return to the monitoring state, and the data will not be updated and saved.

(For fault code display, see Tables 8.2.1 and 8.2.2 for descriptions of fault bits. See Table 8.2.3 for the meanings and values of the parameter items.)

❑ **Communication instructions:**

1. Serial Port Settings: Stop bits 1, no parity, adjustable baud rate (default 115200), address range 1-247
2. Register Addresses and Descriptions:

① . Input Register (Read-only, Zone 3):

Register address	name	effect	Remark
0	Output voltage value	Resolution 0.1V	
1	Output current value	Resolution 0.01A	
2	Output power value	1W resolution	
3	Fault Register 1	Manual reset is required after a fault occurs.	See Fault Table 8.2.2 for details.
4	Fault Register 2	After the fault is cleared, the fault bit is automatically reset to zero, and the system will not stop if the hardware conditions for operation are met.	See Fault Table 8.2.1 for details.

② Fault section, Table 8.2.2: (Fault codes are displayed in parentheses)

Register address	Function	illustrate	Automatic recovery	Affects output
0 (E017)	Overvoltage fault	The output voltage is higher than the set value for a continuous period of time.	Manual	yes
1 (E018)	Overcurrent fault	The output current is higher than the set value for a continuous period of time.	Manual	yes
2 (E019)	Main line disconnected	The input T1 or IN is disconnected.	yes	yes
3 (E020)	Main line disconnected	The input T1 or IN is disconnected.	yes	yes

③ Fault section table 8.2.1: (Fault codes are displayed in parentheses)

Register bits (fault codes)	Function	illustrate	Automatic recovery	Affects output
1(E002)	Overheating	Sets the position when overheating occurs and resets it when the temperature returns to normal.	yes	No
2(E003)	Open circuit under load	Set when load is lost, condition: the output voltage is higher than the load loss detection voltage value set in the holding register, and the circuit current is less than the load loss detection current set in the holding register area.	yes	No
3(E004)	Thyristor short circuit	The load current is uncontrollable.	Power device damage cannot be recovered	yes
4(E005)	Unable to reach the set value	The output voltage or power cannot reach the set value.	yes	yes
5(E006)	No output	The failure is caused by a problem with the trigger or power device, resulting in a situation where there is a given signal but no output.	The power device or triggering part is damaged and cannot be recovered.	yes

④ Output registers (4 zones are readable and writable) Table 8.2.3: (Menu items are displayed in parentheses)

Register address (parameter)	name	effect	Remark
0	control bit	Bit 1: Reset operation bit. Writing 1 clears faults and automatically clears them upon completion. Bit 2: Parameter load bit. Writing 1 loads data without storing it; used for debugging. Bit 3: Parameter storage bit. Writing 1 loads and stores parameters.	The bits 1-3 will be automatically cleared after the operation is completed.
1	Setting value	The voltage value is written during constant voltage mode; the current value is written during constant current mode; the power value is written during constant power mode; open-loop mode: data range 0-1000	
2(F000)	Work mode	Four modes are available: 0: Constant Voltage Mode: Output voltage is constant (default). 1: Constant Current Mode: Output current is constant. 2: Constant Power Mode: Output power is constant. 3: Open-Loop Mode: Phase-shift control function only.	In closed-loop mode, the closed-loop function can be achieved when the input power supply provides a value greater than the set parameter value. That is, there is no boost function.
3(F001)	Sampling method	0: True valid value (default)	Unmodifiable
4(F002)	Given signal source selection	There are 2 options: 0: Analog (default) 1: Communication	
6(F003)	Overvoltage protection value	The fault position is set if the output voltage exceeds this value.	With a 220V input, the overvoltage value is 250V. With a 380V input, the overvoltage value is 450V.
7(F035)	Current limit	Calculate the analog current range given by this value (default 40A).	
8(F004)	Overcurrent protection value	The fault setting will activate if the output current exceeds this value. Default: 64.82A (Maximum: 64.82A)	
9(F005)	Loss of load detection voltage	Load loss detection begins when the output voltage exceeds this value; the default value is 30V.	
10(F006)	Loss of load detection current	When the output voltage is greater than or equal to the voltage set in register 7, and the output current is less than or equal to this set current, the load loss fault is set. See the fault bit description in Table 8.2.1. The default value is 100, which is 1A.	
11(F007)	Fault confirmation time	This parameter can be used to delay the occurrence of overvoltage or overcurrent faults, in units of 10ms. Default value: 50. This means the fault position is activated and the output is cut off after 500ms of continuous fault occurrence. Maximum value: 65535, which is 65535 * 10ms.	
12(F008)	Voltage loop P value	PID control loop parameters: 1~1023, default: 460	
13(F009)	Voltage loop I value	PID control loop parameters: 11~1023, default: 20	
14(F010)	Voltage loop D value	PID control loop parameters: 0~11, default: 0	
15(F011)	Current loop P value	PID control loop parameters: 1~1023, default: 460	
16(F012)	Current loop I value	PID control loop parameters: 11~1023, default: 20	
17(F013)	Current loop D value	PID control loop parameters: 0~11, default: 0	
18(F014)	Power loop P value	PID control loop parameters: 1~1023, default: 460	
19(F015)	Power loop I value	PID control loop parameters: 11~1023, default: 20	
20(F016)	Power loop D value	PID control loop parameters: 0~11, default: 0	
21(F017)	Local address	modus communication station number (1-247), default: 1	(Can be set manually)
22(F018)	baud rate	0:4800 1:9600 2:19200 3:38400 4:115200 (Default)	The original baud rate cannot be used after modification, which will cause communication failure.
34(F024)	Monitoring status display	Display items shown in the monitoring state of the display panel. 0: Address (default)	

		1: Voltage value 2: Current value 3: Power value	
35(F025)	Temperature alarm setting	This setting specifies the temperature alarm value for power devices. An overheat alarm will be triggered when the temperature exceeds this parameter. Range: 50-99 degrees Celsius, Default: 95 degrees Celsius.	
42(F026)	Simulation port gives selection	0: 0-10V Analog Channel Valid (CON Port) (Default) 1: 4-20mA Analog Channel Valid (CON1 Port)	
43(F033)	Input voltage selection	0: 220V Input (Default) 1: 380V Input	
51(F034)	Fan start-up temperature	50 (default), When the heatsink temperature reaches this value, the fan located at the top of the heatsink starts running. The fan stops running when the temperature drops to 5 degrees Celsius below the fan operating temperature. Under the default parameters, it stops running at 45°C.	

3. The given signal source can be one of the following (address 4 in zone 4):

(1) Mode 0: Analog quantity

Using this mode indicates that the input signal from the analog port is used as the given signal for the above modes. The analog signal voltage of this module is 0V-10V. Considering the influence of interference, signals below 0.5V will not be responded to. The voltage value corresponding to the analog given signal will be reflected in address 1 of zone 4. You can find out the given value of the current analog signal by reading the value of this unit.

(2) Mode 1: Communication

This mode indicates that the given signal source for the above modes is communication, and the value of address 1 in zone 4 is directly used as the given signal. There are the following 4 scenarios:

model	Register value	meaning
Constant pressure mode	0-3800	From 0V to 380V, the last digit is a decimal.
Constant current mode	0-4000	Numbers from 0A to 40A, with the last two digits being decimals.
Constant power mode	0-8800	At 220V, the power output ranges from 0W to 8800W, with no decimals.
	0-15200	At 380V, the power output ranges from 0W to 15200W, with no decimals.
Open-loop mode	0-1000	Internal phase shift angle range

4. Operating Mode Description: Supports 4 control modes, namely:

(1) Mode 0: Constant voltage mode (default)

The control mechanism of this mode uses the given signal as a reference for the output voltage, maintaining a constant output voltage when the input voltage is greater than the given value. For example, with an input of 230V and a given value of 200V, the output voltage will remain constant even when the input voltage is higher than 200V, but will not reach 200V when the input voltage is lower than 200V. The corresponding range for constant voltage mode is shown in Table 3.1 below.

(2) Mode 1: Constant Current Mode

The control mechanism of this mode uses the given signal as a reference for the output current. As long as the current obtained by dividing the input voltage by the load resistance is greater than the given value, the output current will remain constant. The corresponding range for constant current mode is shown in Table 3.1 below.

(3) Mode 2; Constant power mode

This mode uses the product of the output voltage and current as the feedback quantity, and a given signal as the reference, to keep the product of the load voltage and current constant. Maintaining a constant output requires that, given the input voltage, the load can generate a power output greater than the given value. The range corresponding to the constant power mode is shown in Table below.

model	Input voltage 220V	Input voltage 380V
Constant pressure mode range (V)	0-220	0-380
Constant current mode (A)	0-40	0-40
Constant power mode (W)	0-8800	0-15200

(4) Mode 3: Open-loop mode

This mode corresponds to the conduction angle, which directly controls the output voltage. Assuming a fixed conduction angle, the output voltage in this mode is directly determined by the input voltage. The load determines the current, which in turn determines the output power. Since there is no closed-loop operation, the load voltage, current, and power will change with the input voltage.

5. Overvoltage and Overcurrent Protection:

The registers corresponding to the output overvoltage and overcurrent functions are registers 6 (overvoltage), 8 (overcurrent), and 11 (fault confirmation time) in zone 4. These are also the two faults that require manual reset for this module. The specific functions are as follows:

①. Overvoltage Protection: If, within the time specified at address 11 in zone 4, the output voltage exceeds the value set at address 6 in zone 4 consecutively, overvoltage protection will be triggered, causing the module's output to shut down and setting bit 0 of register address 3 in zone 3. After this fault occurs, the fault bit needs to be cleared by writing bit 1 of address 0 in zone 4 or by power-off and restart.

②. Overcurrent protection: If the output current value exceeds the value set in address 8 of zone 4 consecutively within the time specified at address 11 of zone 4, overcurrent protection will be triggered, causing the module's output to shut down and setting bit 1 of address 3 of register 3 of zone 3. After this fault occurs, the fault bit needs to be cleared by writing bit 1 of address 0 of zone 4 or by power-off and restart.

When this occurs, the normally closed contacts SO1 and SO2 of the fault relay change from normally closed to normally open, and the red indicator light on the panel flashes.

6. Overheat alarm:

This module has a built-in temperature detection unit. When the heat sink temperature exceeds 95°C, an overheat alarm will be triggered, but the output will not be shut down so as not to affect the operation of the device. At this time, the second bit of address 4 in the flag bit 4 is set. When the temperature is below 60°C, this flag bit will be automatically cleared to zero.

When this occurs, the normally closed contacts SO1 and SO2 of the fault relay change from normally closed to normally open, and the green indicator light on the panel flashes.

7. Load detection:

Load detection is used to trigger load abnormality faults when the load is lost or the current in the load is less than a set value during normal operation. Two registers are related to this: voltage detection value (address 9 in zone 4) and current detection value (address 10 in zone 4). This fault is triggered when the output voltage is greater than the voltage detection value and the load current is less than the current detection value, causing the second bit of flag bit 4 in zone 3 to be set. Triggering this flag bit does not stop the module output, so it is automatically cleared after the load recovers.

When this occurs, the normally closed contacts SO1 and SO2 of the fault relay change from normally closed to normally open, and the green indicator light on the panel flashes.

8. Thyristor fault detection:

When the thyristor is uncontrolled or unresponsive, bits 3 and 5 of address 4 in zone 3 are triggered respectively. These faults indicate that the module has been damaged.

When this occurs, the normally closed contacts SO1 and SO2 of the fault relay change from normally closed to normally open, and the green indicator light on the panel flashes.

9. Failure to reach set value:

This fault bit is effective in non-open-loop mode. When the input voltage is too low and the output cannot reach the set value, this fault bit is triggered to indicate that the current voltage is too low to reach the set value. The 4th bit of address 4 in zone 3 will be set, and this bit will be automatically cleared after the voltage recovers.

When this occurs, the normally closed contacts SO1 and SO2 of the fault relay change from normally closed to normally open, and the green indicator light on the panel flashes.

10. Regarding PID parameters:

This module provides three independent PID control loops, corresponding to voltage PID, current PID, and power PID respectively. When a mode is selected, the corresponding PID loop is invoked, and the PID parameters are used. See the descriptions at addresses 12 to 20 in the zone 4 table. PID debugging can be performed by setting bit 2 of zone 4 address 0, which loads the PID parameters into the current PID loop without writing them to the non-volatile register. Debugging is performed by setting bit 3 of zone 4 address 0 to write the parameters to the non-volatile register.