Electric heater controller

Current mode - instruction manual V10

Thank you for purchasing CS Series digital display electric heater controller. This manual mainly describes some necessary precautions during install and wiring. Before operation, please carefully reading this manual and fully understand all the operation procedure of this product, please bring the manual for reference at any time.

一 Appearance and features

☐ Appearance

☐ Feature

1) This product has been approved CE, safety and regulations, and conducted anti-interference.

2) New design, private mould, nice and generous, the whole machine adopts anodized aluminum alloy, small size, good heat-dissipation, long lifetime, easy install and wiring.

3) All series were equipped with high-speed fuses to prevent short-circuit current (di/dt) was damaged SCR.

4) The first of panel display input signal 4-20 mA,0-5V or 0-10V, and the second row display the loading current. Using the standard Modbus RTU communication protocol, it can quickly reading various parameters in the upper computer, and set the OUH output percentage on the upper computer to limit the output power, or use AM to manually output.

5) Linear output characteristics, high accuracy temperature control, high quality, strong interference ability.
6) Slow start time can be set.
7) Built-in a variety of protections, when abnormal conditions occur,can immediately stop the output to protect user equipment from abnormal heating.

二 Use safety, warnings and precautions

⚠ Safety

1. Before using, please reading the safety precautions carefully. This precautions are important contents related to safety,please make sure implement them.

2. If this product will be used on the equipment that causes personal injury and heavy property loss, it must be equipped with double protection or triple protection device before used.

⚠ Warnings

1.To maintain the longtime using of this product, please use the standard input voltage correctly
2.Please don't disassemble, process, modify or repair this product at will, there will be dangers of electric shock, fire, etc.

⚠ Notice Items

1.Please confirm that the product didn't damaged during transportation.
2.The environment using has a great influence on the performance and lifetime of the product, so please avoid the following environment: the high temperature and difficult air circulation,corrosive gas, harmful gas and other places (such places need to be effectively isolated by control box or control room).
3. When installed in the control box, punch holes in the box and install the exhaust fan.
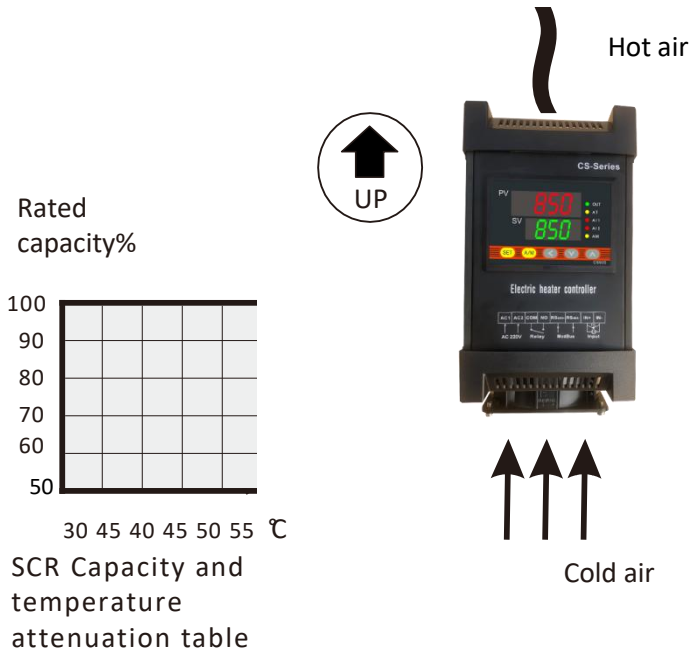4. Ambient humidity: below 90% RH (no frosting)

5. Operating cycle temperature: - 10°C ~ 50°C,Max 75°C (when the cycle temperature is between 50°C ~ 75°C, the rated current must be attenuated by 1.2% for every 1°C increase).
6. The screw connection of input and output terminals must be tight. SCR belong to a high current product. If the terminal is not tightened, it will cause arc welding phenomenon, and the current will increase several times, resulting in parts burning.
7. When the radiator temperature is high, do not touch the body.
8. The input and output terminals are in danger of electric shock. Please avoid directly contact with the conductor.
9. Load common line can not be connected to zero line or ground, otherwise SCR couldn't be closed and lose control.
10. Follow the gas thermal principle during installation, please install it vertically upwards
11. If the load didn't connected or the current less than 0.6A, the SCR maintaining current (IH) is insufficient, and the SCR power regulator cannot be tested normally, please connect the load above 0.6A when testing.
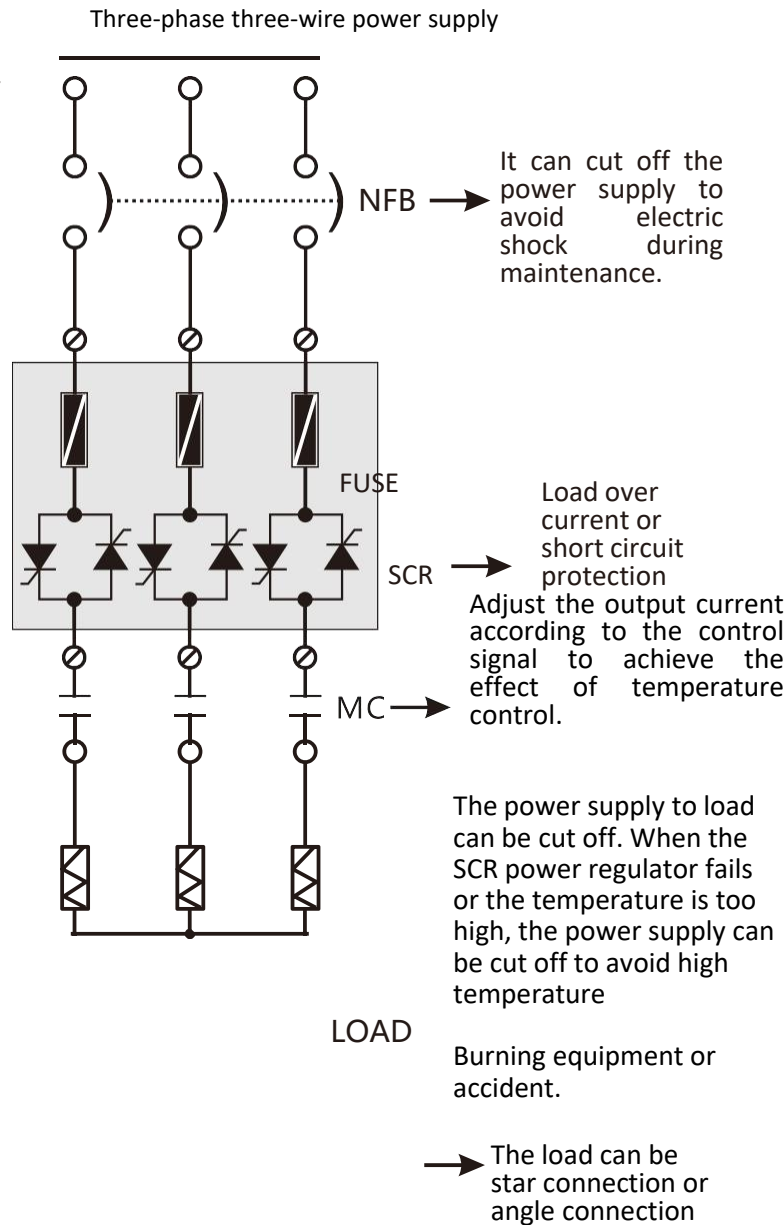
三 Installation mode and power wiring

◻ Installation mode

1)The digital display electric heating controller will generate heat inside. Please install it vertically to the inner wall of the control cabinet according to the direction shown in the figure and reserve space on both sides.

2) The control cabinet must have air ventilation holes. Please install the extraction fan according to the principle of hot air from bottom to top.

Hot air

UP

Rated capacity%

100				
90				
80				
70				
60				
50				

30 45 40 45 50 55 ℃

SCR Capacity and temperature attenuation table

Cold air

◻ Standard main circuit wiring diagram

Three-phase three-wire power supply

NFB → It can cut off the power supply to avoid electric shock during maintenance.

FUSE

SCR → Load over current or short circuit protection
Adjust the output current according to the control signal to achieve the effect of temperature control.

MC → The power supply to load can be cut off. When the SCR power regulator fails or the temperature is too high, the power supply can be cut off to avoid high temperature

LOAD

Burning equipment or accident.

→ The load can be star connection or angle connection

四 Technical specifications and panel description

4.1: Control input signal
Current input: 4-20mA DC
Input impedance: 250Ω
Voltage input: 0-5V, 0-10V
PLC signal input

4.2: Load Rated voltage range
110V:110V AC±3V 50/60Hz
220V:220V AC±3V 50/60Hz
380V:380V AC±3V 50/60Hz
440V:440V AC±3V 50/60Hz

4.3: Effective value current and refrigeration system
    40A Natural cooling
    50A-500A Forced air cooling system
    600A-1200A Special water cooling system

4.4: Control mode - phase controlled voltage regulator
    Load: suitable for resistance wire, IR lamp, silicon carbide rod, pure group heater (nickel alloy, Kanthal)
    Output voltage control range：Input voltage of 0-98%
    Output stability：When the input voltage fluctuation is ± 10%, the output voltage fluctuation is less than ± 3%

4.5: Control mode - zero
    position control power
    regulation type
    Applicable load: suitable for resistance wire
    Output voltage control range: 0-98% of input voltage
    Output stability: when dozens of units work at the same time, the harmonic is small.

4.6: Alarm protection system
    1. Over temperature alarm：
       When the radiator temperature exceeds 75 ° C, the output is cut off inside the trigger board。
    2. Over current alarm：
When the load is short circuited or the current exceeds 130-150% of the rated current, the fast fuse will fuse, the over-current alarm system will start, the al2 indicator on the display panel will be on, the output inside the trigger panel will be cut off, and the relay will output, and the action time is less than 20ms.

    3. Open phase alarm：
When the three-phase electricity is abnormal, the phase missing alarm system is activated, the al2 indicator light on the display panel is on, the output is cut off inside the trigger board, and the relay output is output, and the action time is less than 20ms。

4.7: Operating environment
    Ambient temperature range: -10 ° c-50 ° C
    Ambient humidity range：≤90%R

4.8,Insulation impedance
    Minimum ：20MΩ 500V DC

4.9,Insulator strength
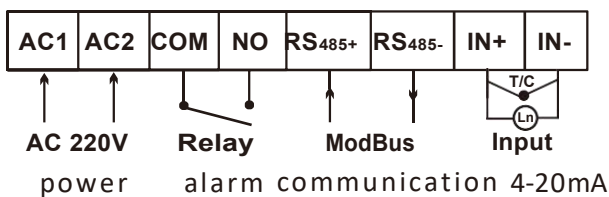   2000V AC 1Min (voltage 220V)
    2500V AC 1min (volateg 380V)

410: Panel description

PV: 4-20MA Input signal →

SV: Loading current →

OUT: Output indication
AL2: Alarm indication
AM: Manually output indication

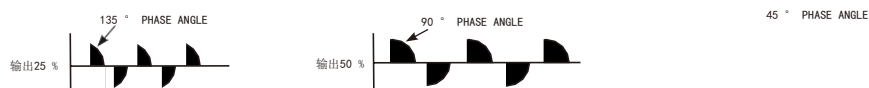| Symbol	Name	Function
PV	Input signal/ Parameter mode display	Display input 4-20m a, 0-5 V, 0-10 V / parameter name
SV	Load current (A) / parameter display	Display load current value and manual output setting value
SET	Circulation / confirmation key	When setting parameters, press this key to confirm. When switching parameter display, press this key to switch
A/M	AUTO/Manual key	Switch auto / manual output mode
≪	Shift key	Move the number of bits of the set value (thousand, hundred, ten, bits)
∨	Reduce key	Reduce setting value
∧	Increase key	Increase setting value
OUT	Output indicator	When output, this light is on
AT	Automatic calculation indicator	This light is on during automatic calculation (temperature controlled model)
AL1	Alarm1action indicate	This light is on when the first group of alarms are activated
AL2	Alarm2action indicate	This light is on when the second group of alarms are activated
AM	Manually indicator	In the state of manual output, this light is on

五 Terminal diagram

51 Voltage and current signal input.

AC1	AC2	COM	NO	RS485+	RS485-	IN+	IN-

AC 220V power   Relay   ModBus   Input
   alarm   communication   4-20mA

T/C
Ln

六 Output control mode and output waveform

135° PHASE ANGLE
输出25 %

90° PHASE ANGLE
输出50 %

45° PHASE ANGLE

Output mode:
phase control

输出90 %

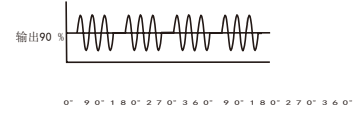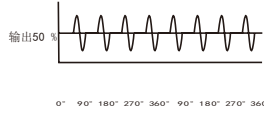0° 90° 180° 270° 360° 90° 180° 270° 360°   0° 90° 180° 270° 360° 90° 180° 270° 360°   0° 90° 180° 270° 360° 90° 180° 270° 360°
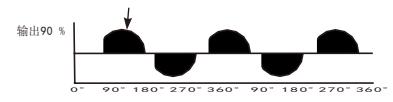
Output mode: zero position control
(cycle)

输出25%   输出50 %   输出90 %

0° 90° 180° 270° 360° 90° 180° 270° 360°   0° 90° 180° 270° 360° 90° 180° 270° 360°   0° 90° 180° 270° 360° 90° 180° 270° 360°

Electric heating controller current mode parameter data

Long press the set key for 5 seconds to enter menu one and exit the same way. At the same time, press the set key + left shift key and release it at the same time. Enter menu two and exit the same way. At the same time, press the set key + down key and release it at the same time. Enter the menu 3 and push it out.

Menu 1

parameter	Display character	Parameter	Instruction	Setting range	Factory value
P	p	Proportional band	The proportional band of PID regulation adopts the percentage of measuring range, which can directly input the P, I and D values determined under known conditions. For constant current / voltage)	0.1%-300	3
I	I	Integral time	Define the integral time of PID adjustment, unit: seconds, and cancel integration when I = 0. (for constant current / voltage)	0-3600	1
d	d	Differential time	Define the differential time of PID regulation, in seconds, When d = 0, the differential action (. For constant current / voltage	0-3600	0
PSA	PSA	Phase shift angle full position	Parameters for adjustment and full setting of phase shift angle	0-180	172
C-0	C-	control mode	1: Phase shift control of Y-type load without connecting 0 line 2: Cycle distribution zero position control	0-2	1
OUL	OPL	Lower limit of output power	Setting percentage of output power lower limit	0-100	0
OUH	OPH	Upper limit of output power	Upper limit setting percentage of output power	0-100	100
LoC	LOC	Parameter modification level	LOC = 0100: only allow mofified menu one menu two can be modified LOC = 0110: : LOC = 0000: menu one, menu two and menu three can be modified	0000-9999	0000

Menu 2

parameter	Display character	Parameter	Instruction	Setting range	
LSP	LSP	Input signal lower limit	The lower limit setting range of input signal is generally set to 0	0-100	4
USP	SP	Input signal upper r limit	Upper limit setting range of input signal	0-100	20
AnL	ANL	Input zero calibration	Factory debugging, this parameter is hidden.	0-100	0
AnH	AnH	Input full calibration	Factory debugging, this parameter is hidden.	0-100	100
dP	P	Decimal point position	Decimal place selection：0000 0bits 000.0 1bits 00.00 2bits	0000-0.000	000.0

			0.000 3bits		
PVS	PVS	Input signal correction	The PVs parameter is used to modify the input signal	-50-50	0
bAd	bAd	Baud rate	1：9600 2：19200	0-2	1
Add	Add	postal address	Mailing address 1-255	0-255	1
C-A	C-	Negative feedback selection	0: no negative feedback 1: with negative feedback (factory trial)	0-1	0
DLY	LY	output delay	1-10 to 5-20 seconds	0-10	0

Menu 3					
parameter	Display character	Parameter	Instruction	Setting range	
LSP2	L P	current display Lower limit	Current display, corresponding to transformer ratio, factory commissioning	0-100	0
USP2	P	current display upper limit	Current display, corresponding to transformer ratio, factory commissioning	0-100	100
PVS2	PV	Given value Upper limit	current display, Error correction	-50-50	0
AnL2	NL	Input zero calibration	Factory debugging, this parameter is hidden.	0-100	0
AnH2	AnH	Input full calibration	Factory debugging, this parameter is hidden.	0-100	100

八 Electric heating controller ---current mode communication protocol

8.1 Protocol overview
1、Work realization: the data exchange between the electric heating controller and the upper computer (the electric heating controller) can only be used as the slave computer to receive the inquiry and respond).

2、Serial transmission mode：ModBus RTU.
3、Transmission interface：RS485.
4、Communication medium：Shielded twisted pair.
5、Communication stack number：1~255，The upper limit of the number of thermostatic power regulators is related to the load capacity of the host.
6、Implement function code：Read hold register (03), write multiple registers (10)。
7、Data length：Each group of complete and effective messages can exchange up to 16 (8 parameters) bytes of data。
8、Numerical format：It is indicated by signed 16 bit binary complement code; the read data is magnified by 10.0 times; before writing data, the data should be magnified by 10.0 times before transmission; please pay attention to the conversion.
9、Serial port parameters：
  1) Baud rate：9600（Default value）, 19200
  2) Start bit: 1
  3) Data bit: 8
  4) Check digit：None（No effect）
  5) Stop bit：1
10、Frame checking method：Cyclic redundancy check（CRC16）。
11、Message format（N = 2）：

address	Function code	Data	CRC verification
8bits	8bits	N×8bits	16bits

8.2 Example
1、function code 03(Read set valueSV=100.0)：

request		response	
Field No	hexadecimal	Field No	hexadecimal
Stack No	01	Stack No	01
Function code	03	Function code	03
Starting addressHi	00	Byte count	02
Starting addressLo	04	Register valueHi	03
Registers Number Hi	00	Register valueLo	E8
Registers NumberLo	01	CRCLo	B8
CRCLo	C5	CRCHi	FA
CRCHi	CB		

2、Function code 10(Write settings USP=100.0)

Request		Response	
Field number	hexadecimal	Field number	hexadecimal
Stack number	01	Stack number	01
Function code	10	Function code	10
Starting addressHi	00	Starting address Hi	00
Starting address Lo	08	Starting address Lo	08
Registers No Hi	00	Registers No Hi	00
Registers No Lo	01	Registers No Lo	01
Byte count	02	CRCLo	80
Register value Hi	03	CRCHi	0B
Register value Lo	E8		
CRCLo	A7		
CRCHi	6A		

九 Electric heating controller- current mode parameter sheet

Parameters name	Address		Read write state	multiplier
	hexadecimal	decimal system		
AM	00H	0	R/W	10
MV	02H	2	R/W	10
PV	04H	4	R	10
SV	06H	6	R	10
AL2	0AH	10	R/W	10
P	10H	16	R/W	10
I	12H	18	R/W	10
D	14H	20	R/W	10
OUL	16H	22	R/W	10
OUH	18H	24	R/W	10
LSP	1AH	26	R/W	10
USP	1BH	28	R/W	10

Remarks：1.before writing out threshold ,Please write 0 * 00 to AM , so that the system is specially in manual control state
2.there should be a certain time interval between the write parameter instructions, whether it is the same address or not, otherwise it may cause the failure of the temperature control power regulator, and the interval should be more than 150 ms.

十 Selection index sheet

Model：CS [3] — [3] [3] [3] — [T] [P] [A] [H]

A   B   C   D   E   F   G   H
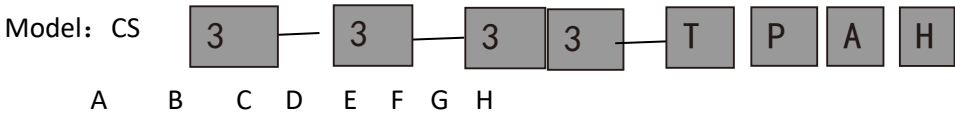
A-TYPE
CS3:Temperature control type - digital display (thermostat + power regulator)
CS6:Current mode digital display power regulator

Single phase： number of amperes（A）=1.15* loading*1000（KW）*1000

$$\text{Voltage (V)}$$

B-Phase

1:single phase   3：Three phase   three phase：number of amperes（A）=1.15* Loading（KW）*1000

$$\text{Line voltage*}\sqrt{3}$$

C-Main circuit voltage

1V:110V   2V:220V   3V:380V 4V :440V

D-Current model
40A (040)   50A(050) 60A (060)   80A (080)   100A(100)
125A(125)   150A (150)   175A (175)   200A (200)
225A(225)   250A (250)   300A (300)   350A (350)
400A(400)   500A (500)

E-Input signal
T:Thermocouple Input   M：4-20MA input D:0-5Vinput   V：0-10V input
Control model
P:Phase control   D：Zero control
F-Current display （current type ）
NO：Not display current   A：display current

constant current (current type)
NO：no constant current   H:constant current

十一 Specification & Dimension

	Current	Dimension （L*W*H））	Installed size （L*W*H））	screw	Cooling system	
Three phase	40A	210*140*185mm	164(120)*132mm	M6	Natural cooling	
	50A-100A	250*140*185mm	164(120)*132mm	M6	Fan cooling	
	125A-225A	330*140*185mm	230(170)*132mm	M8	Fan cooling	
	250A-350A	330*265*270mm	210(170)*257mm	M10	Fan cooling	
	400A-500A	390*265*270mm	210(170)*257mm	M12	Fan cooling	