

KTH series power controller



User's manual
for three phase



Precautions before usage

Notice specifications

Before installation, please check the specifications of the power controller is right or not, if not, contact the manufacturer.

Notice Files and spare parts

Before installation, please check the files and spare parts ,(refer to the packing list)

**1.user's manual(include circuit diagram)2.quality certificate
3.feedback sheet 4.of spare parts (spare parts are ordered by the customer; accessory is the manual POT)**

Notice inspection

Before installation, please check whether there is breakage, loosening of the screws, sloughing of the connections, if yes, do contact with the manufacturer.

Notice user's manual

Read user's manual carefully before installation.

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Chapter1 Fundamental principle

1. Brief introduction

KT series power controller has one phase and three phase series. It is our new equipment which applies imported advanced technology. It integrates control circuit, main circuit, protection circuit, and feedback circuit. It is light with small size, very convenient for installation, and has already been widely used these years.

2. Function

Power controller applies phase shift trigger to realize the stepless control, thus to achieve the goal of control power. The adjustment range is wide for the output voltage, normally 0-98% of rated input voltage. It has the function of soft start, soft shut off, constant current, current limiting, open-phase protection, load disconnection protection, over-current protection, over-heat protection.

2.1 Soft start, soft shut down: the output voltage will not be abrupt change when meet abrupt change of input voltage. When meet nasty load, it can prevent the controlled silicon from damage by the impact current and reversal high-voltage impact. When step input, this function can make the output stable, the time cost is about 2-3 seconds.

2.2 Constant current: when use current feedback, if the given signal is the same, though the load may change, the output current can keep stable.

2.3 Current limiting: when working current exceeds rated current to 105%, it will automatically minish the angle of flow, thus to limit the output current to be within the 105% of the rated current.

2.4 Over-current protection: when peak value of the working current reach 150% of the rated current, it will quickly stop all the output, and lock itself. Now you should cut off the main power supply, check the load, and then restart.

2.5 Over-heat protection: when the temperature is too high or the fan stops, the temperature of radiator exceeds 85, it will

automatically stop all the output, and lock itself. Now you should cut off the main power supply, check the load, and then restart.

2.6 Open-phase protection : when one phase is missing , it will automatically stop all the output , and lock itself. Now you should cut off the main power supply , check the load , and then restart.

3. Range of application

KT series power controller can control the power of nasty load, resistive load, gas load, it can precisely control the temperature. It can control the temperature of the following: Carbonized silicon, molybdenum disilicide, tungsten, molybdenum, niobium; the temperature of salt bath furnace and electric melting oven. voltage control of rectifying transformer, furnace transformer, power transformer primary side; DC winding excite control of magnetic voltage regulator , transductor , it also can smooth stepless adjustment and constant control of the temperature and light.

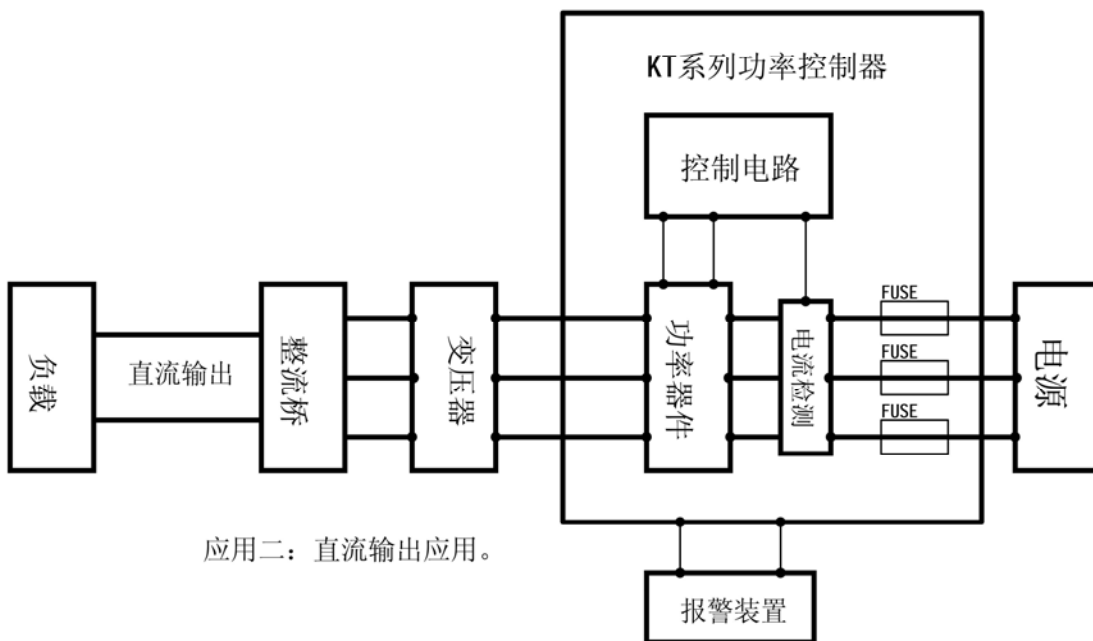
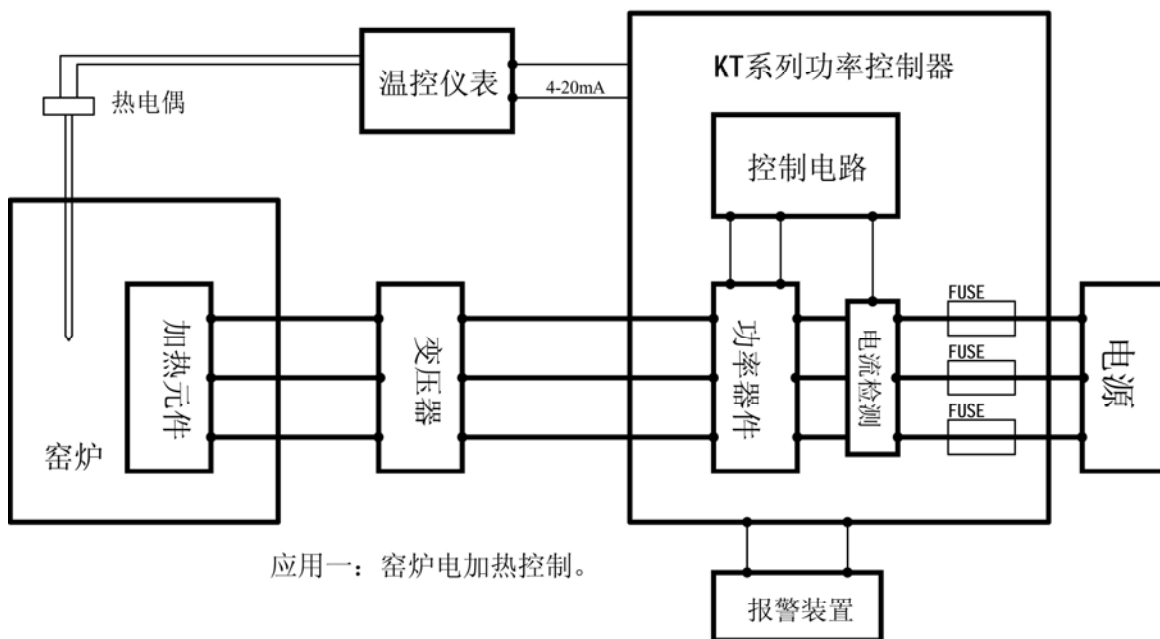
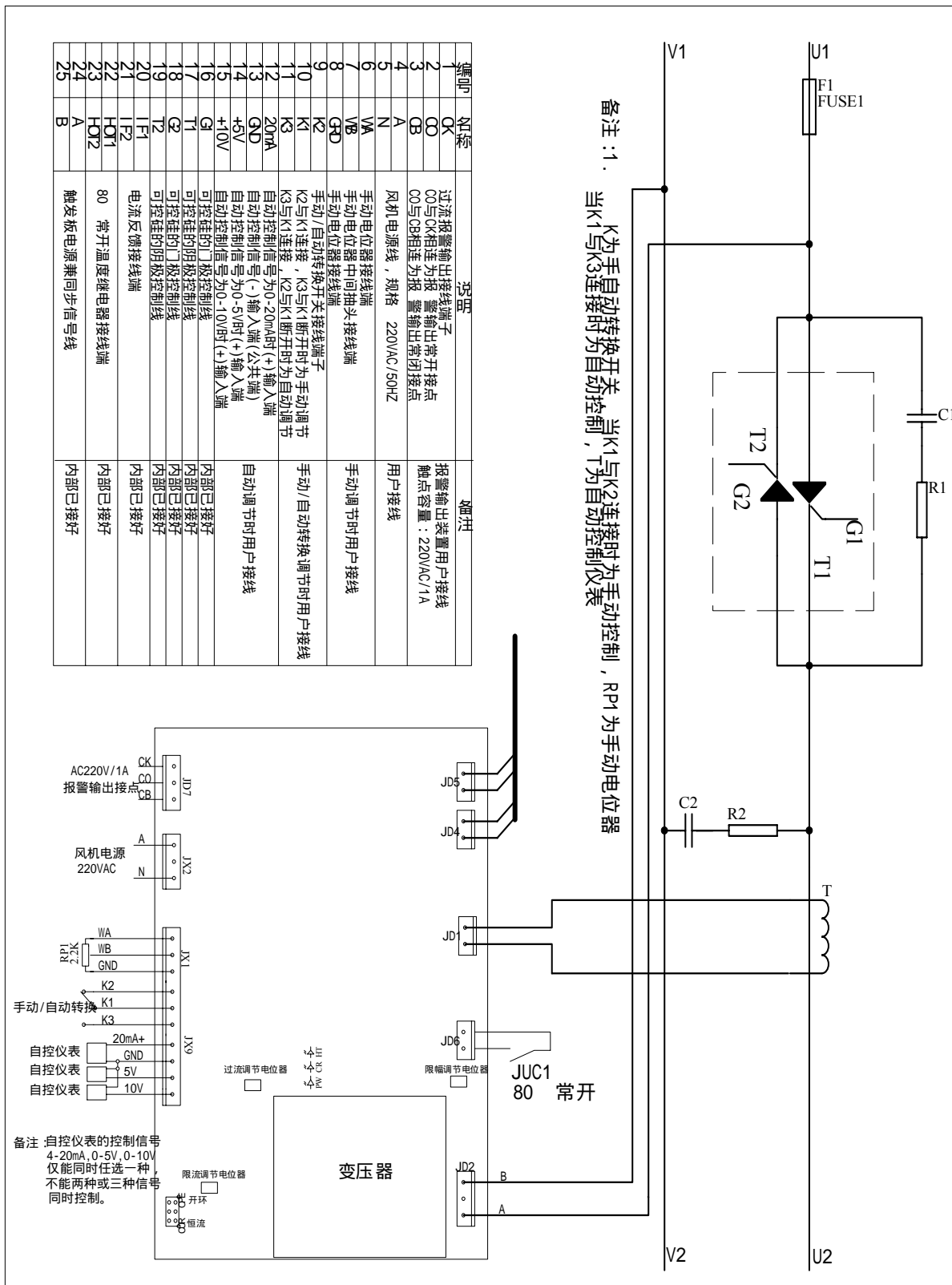


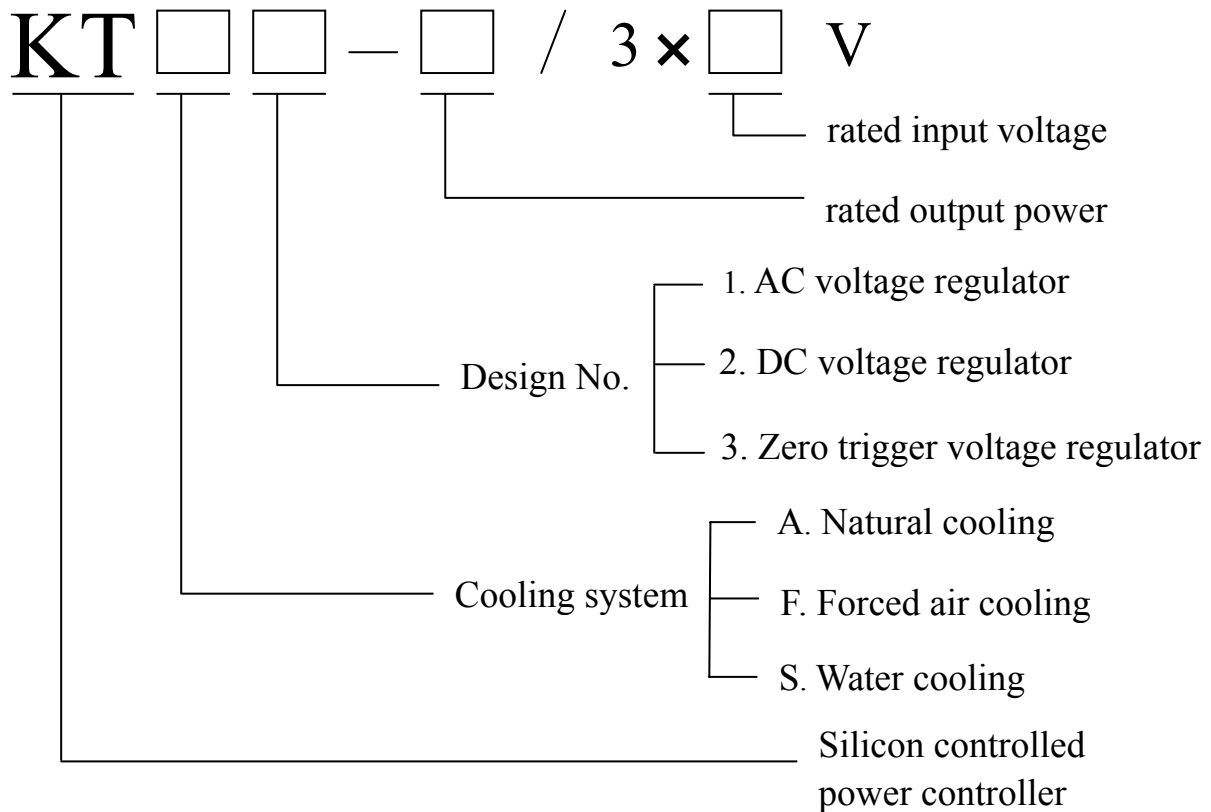
Fig 1 Representative application

4. Schematic diagram of controller system



Chapter 2 Technical specification

1. Model name



2. Technical indicators

Rated input voltage	Ome phase 3×220V、 3×380V、 3*440V
Range of input voltage	± 10% of rated input voltage
Frequency	50Hz or 60Hz
Fan power supply	AC220V 15-65VA
Range of output voltage	0-98% of rated voltage
Range of output current	0-105% of rated current
Input control signal	Control signal : DC0-5V , DC0-10V , DC4-20mA
Applicable load	Resistive load , inductive load , voltage regulator Primary side , gaseous discharge load
Onoff system	Soft start , soft shut off , time 2-3seconds
Mechanism	Cellular:below 200A,cabinet type : above 300A
Constant current	When use feedback current , control signal keep

characteristic	unchanged,output current keep stable within the rated current even when the load changes
Current limiting characteristic	Output current $\geq 150\%$ of rated current, automatically reduce the angle of flow
Over-current protection	Peak value of output current $\geq 150\%$ of rated current, it will stop the output, and lock itself, indication light on, and trigger out.
Over-heat protection	The fan stops,the temperature of radiator exceeds 85 ,it will automatically stop all the output,but not locked,when the temperature lower than 80 ,it will output again.
Open-phase protection	When open- phase, it will stop the output, and lock itself, indication light on, and trigger out.
Cooling system	25A-80A natural cooling,80A-300A forced air cooling
Load disconnection protection	When one phase cut, the current unstable rate reach 50%,it is taken as load disconnection, it will stop output and lock itself, indication light on, and trigger out.,(this function is optional)
Insulation resistance	Above 20M(2500vM)
Insulation withstand voltage	AC2500V,no flash over and breakage within one second
Relative humidity	20 ,relative humidity 90%,no dew
interference killing feature	Main circuit can bear 10KV/3us pulse surging
Working mode	continuous
Storage temperature	-5 ~ 60
Working temperature	-5 ~ 40
Sea level height	1000m rating unchanged, 1000m,rating reduce 5%/100m
criterion of acceptability	GB3797-89 , GB3859

3. Model specifications

Model	Rated current (A)	Rated capacity (KVA)	Cooling system	Structure	View size and Installation size	Weight (Kg)				
KTA1-10KVA/3 × 220V	25	10	Air natural cooling Force air cooling	Cellular	Fig 2 、 Fig 4	15Kg				
KTA1-17KVA/3 × 380V		17								
KTA1-17KVA/3 × 220V	45	17								
KTA1-29KVA/3 × 380V		29								
KTA1-22KVA/3 × 220V	60	22								
KTA1-39KVA/3 × 380V		39								
KTA1-30KVA/3 × 220V	80	30	Force air cooling		Custom cellular	Fig 3 、 Fig 5	25Kg			
KTA1-52KVA/3 × 380V		52								
KTF1-36KVA/3 × 220V	100	36								
KTF1-62KVA/3 × 380V		62								
KTF1-41KVA/3 × 220V	110	41								
KTF1-72KVA/3 × 380V		72								
KTF1-49KVA/3 × 220V	130	49								
KTF1-85KVA/3 × 380V		85								
KTF1-60KVA/3 × 220V	160	60								
KTF1-105KVA/3 × 380V		105								
KTF1-75KVA/3 × 220V	200	75								
KTF1-131KVA/3 × 380V		131								
KTF1-94KVA/3 × 220V	250	94								
KTF1-164KVA/3 × 380V		164								
KTF1-114KVA/3 × 220V	300	114		undecided				Cabinet style		
KTF1-197KVA/3 × 380V		197								
KTF1-189KVA/3 × 220V	500	189								
KTF1-328KVA/3 × 380V		328								
	Above 500A	Watercooling , air cooling								

4. Requirement for using

4.1 The protection level of the shell is IP10.Please install inside vertically,(the angle is $\pm 5^\circ$),which is benefit for heat

abstraction, be sure there is no bitter vibration and impact, no corrosion and air.

4.2 When installed in the cabinet, the temperature can not exceed 40 °C, there should be a space of 300mm-400mm on both sides of the controller, which benefit for the circulation of the air. If several controller installed in the same cabinet, suggest “—” style horizontally, avoid the high temperature air from the lower controller when installed vertically. Please take careful consideration of the ventilation of the cabinet when install big-size controller.

5. Exterior and installation size

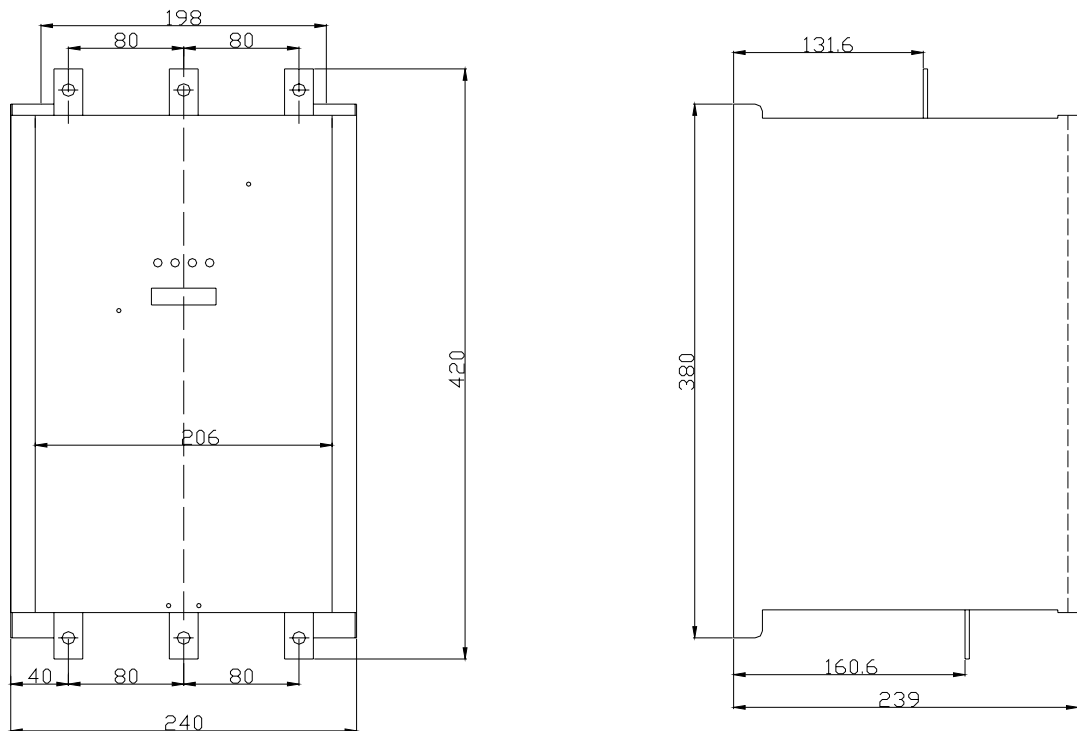


Fig2 exterior size

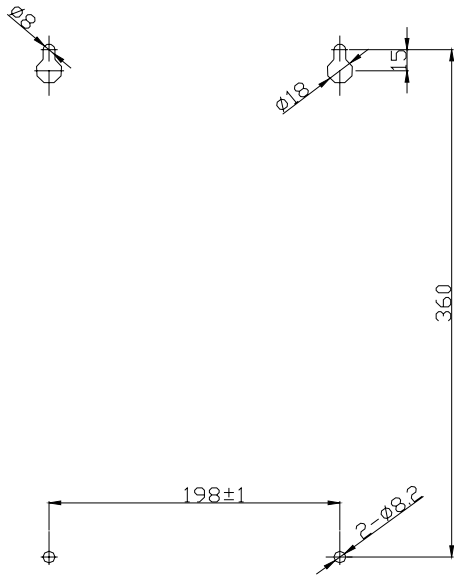


Fig 3 (Exterior and installation size)

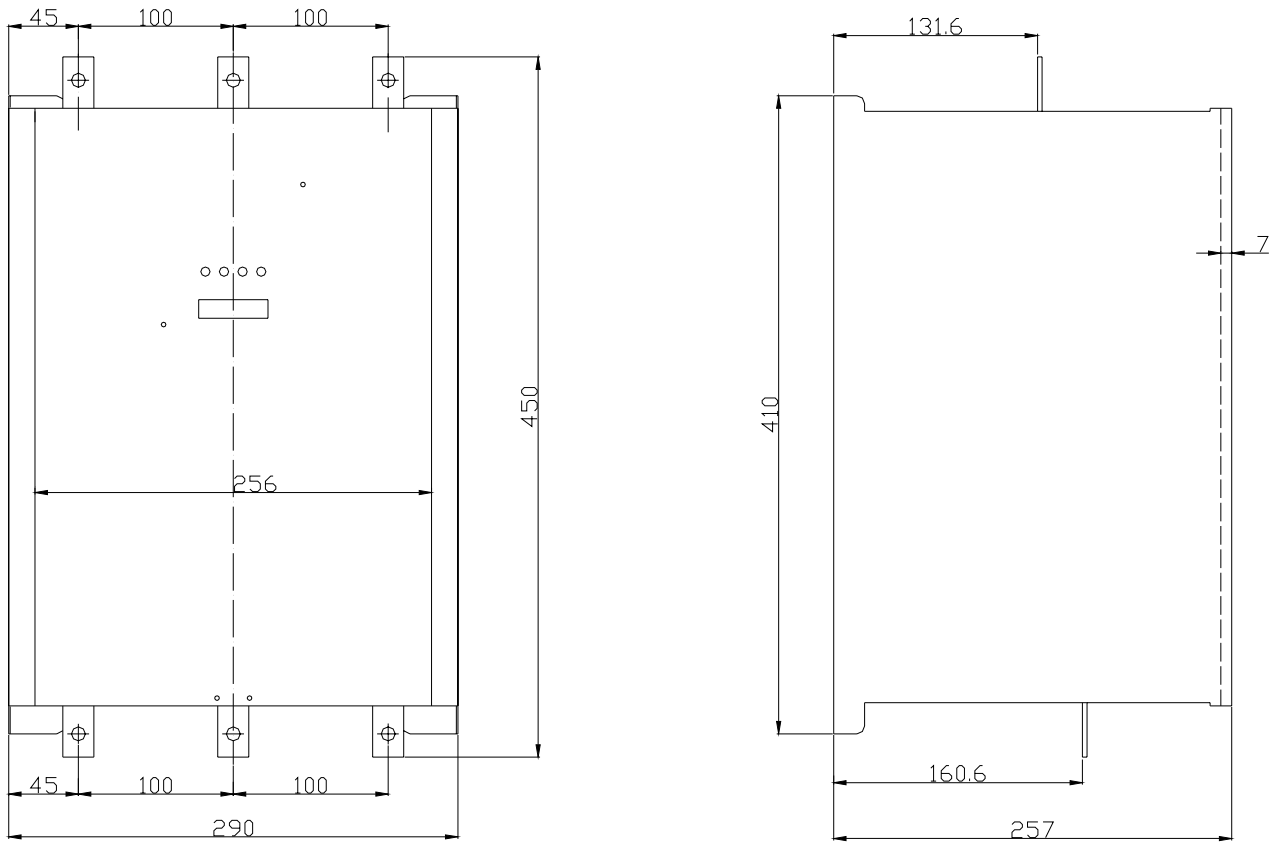


Fig4 exterior size

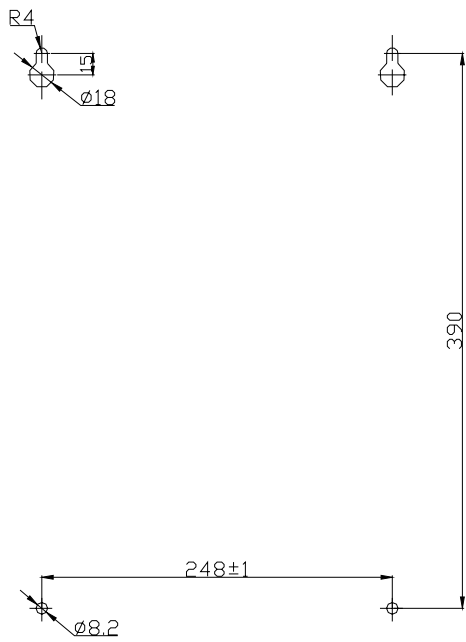
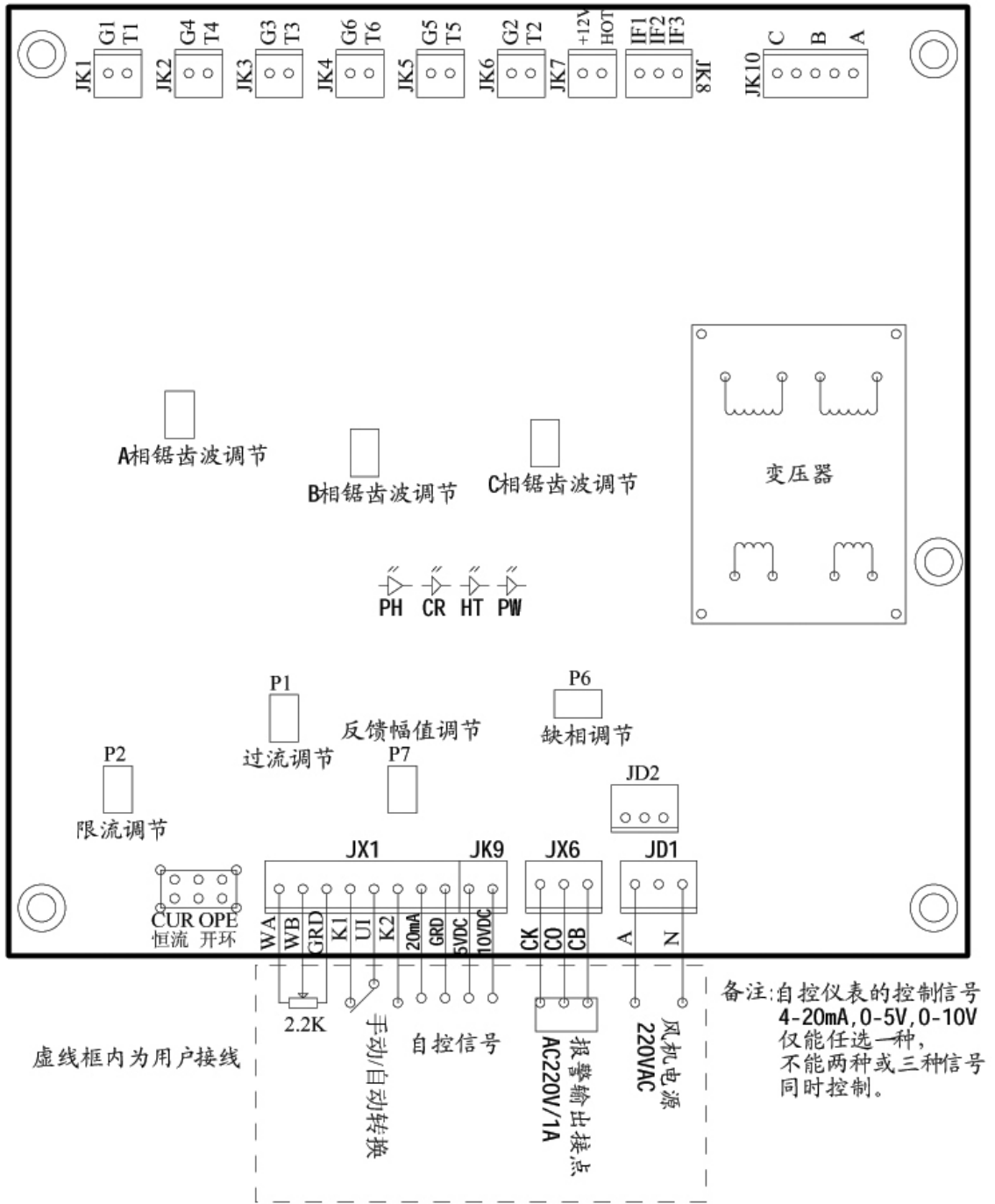


Fig5 exterior size

Chapter 3 Instruction for connections

1. Terminal diagram of the circuit and instruction



2. Instruction of connecting terminal

Terminal No.	Terminal name	Connection instruction	Remark	
JX1	WA	Manual POT terminal	User ' s connection in manual status	
	WB	Manual POT middle plug terminal		
	GRD	Manual POT terminal		
	K2	Manual/auto switch terminal	Manual/auto shift,user ' s connection	
	K1	K1 connect with K2 , K1 disconnect with K3 , manual status		
	K3	K1 connect with K3 , K1 disconnect with K2 , auto status		
	JK9	20mA	Auto-control (+) 20mA signal input	User ' s connection under auto adjustment auto signal : 20mA,+5V,+10V,you can only assume one of three auto signals
GRD		Auto-control (—) common signal input		
JK9	+5V	Auto-control (+) 5VDC signal input		
	+10V	Auto-control (+) 10VDCsignal input		
JX6	CK	alarm output terminal	Alarm output	
	CO	CO connect with CK , normal open contact of alarm output		
	CB	CO connect with CB , normal close contact of alarm output		
JD1	A	fan power supply terminal AC220V/50Hz	User ' s connection	
	N			
JK1..... JK6	G1T1... ...G6T6	Controlled silicon gate and signal line	Connected inside	
JK8	IF1	Power feedback terminal	Connected inside	
	IF2			
	IF3			
JK7	12V	80 normal open thermorelay terminal	Connected inside	
	HOT			
JK10	A	Trigger plate power and sync signal line terminal	Connected inside	
	B			
	C			

3. Instruction of POT and pulling switch

P1 is over-current adjustment POT : adjust the peak value of cutoff (reduce clock wise) , normally is 150% of the rated current peak ,

when working current exceeds the value , it will stop output.

P2 is current limiting adjustment POT :adjust the peak value of the output (reduce clock wise) , normally is 105%of rated current , when exceeds the value , it will automatically reduce the angle of flow , keep the peak value.

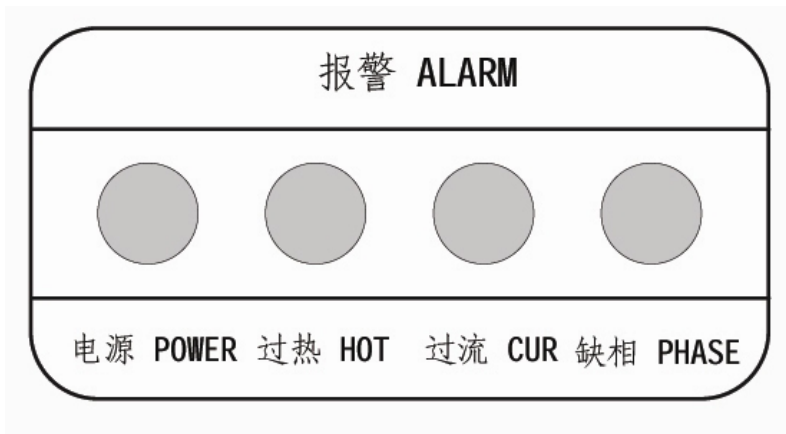
P3,P4,P5 is A , B , C phase sawtooth wave POT , used to adjust the output voltage of three phase。 It is adjusted when leaving factory , there is no need to readjust.

P6 is open-phase adjustment POT : It is adjusted when leaving factory , there is no need to readjust.

P7 is current feedback amplitude adjustment POT : it is adjusted when leaving factory , when using , when adjust P2 , current output can ' t increase , you can adjust P7 to reduce the amplitude , increase the output current , be sure not to exceed 105% of rated current , or will over-load.

K1 is the pulling switch :it has two shifts。 CUR is constant current control。 It is using current feedback to reach constant current , it is set here before leaving factory。 OPE is open status , used when commissioning.

4.Instructionof indication light



PHASE	open-phase indication light 。 when one of the phase open , the light on , it is off when under normal running
HOT	over-heat indication light。 When temperature is too high or the fan stops , the temperature of radiator exceeds 85 。 the light on , it is off when under normal running
CURRENT	over-flow indication light , when working current peak exceeds 150% of rated current peak , the light on , it is off when under normal running

POWER	working indication light
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5. Instruction of wiring connection

5.1 Connect main line U1,V1,W1,U2,V2,W2,the main circuit bear the whole loads.U1,V1,W1 is input line , connect the power device of the users,like airbreak switch,fuse,etc.U2,V2,W2 connect the load,like Resistive load,inductive load,voltage regulator Primary side,etc.

5.2 Fan power connection,terminal A and N is the power line, (mode of natural cooling need no connection) .

5.3 Connect control signal line and manual/auto shift line,terminal K1,U1,U2 is the manual/auto connection.When K1connected with U1, (K2 disconnected with U1) ,that is manual control , connect the manual POT ,terminal WA,WB and GND.When K2connected with U1,(K2disconnected with U1),that is auto control , connect the control signal line,terminal20mA and GND.Or connect terminal 5Vdc GNF or 10Vdc and GND.You can only assume one of the three phase signals.

5.4 Connect alarm signal control line.When meet over-heat ,over-flow,open-phase,it will alarm,passive contact can be connected with alarm circuit,the capacity of the contact is 220VAC/1A.terminal CK and CO is the normal open terminal,terminal CO is the common terminal ;terminal CB and CO is the normal closed terminal.

Chapter 4 Procedure of installation and commission

Please read this instruction carefully before installation and commissioning.

1. Inspect power controller

1.1 Check whether there is scratching,breakage,if yes,contact with the manufacturer.

1.2 Open the panel,check whether there is loosen of the lead,sloughing,Use screwdriver to fasten all terminal screws.

1.3 Open circuit control panel,check if the screw connecting

copper bar and controlled silicon module is loosen,fasten the screw.

2.Inspect transformer.

Do simple check of the transformer when applying voltage regulator Primary side.

2.1 Cut the connection of the primary side and sub-side,use multimeter to check primary side vs sub-side,primary side vs ground,sub-side vs ground,all the above resistance should be 1M.

2.2 Check the damping screw and stalloy are loosen or not,fasten the screws.

3.Inspect load

3.1 Relieve the connection of the transformer and the load,use multimeter to check the resistance of electrode vs ground or heating zone vs ground is ok or not.If there are two point short circuit,that will cause unstable current,over-load,even break the power controller.

3.2 Check electrode or heating zone is loosen or not.

3.3 Only when the resistance is ok,can you connect with the sub-side of the transformer,and fasten the screw,poor contact caused by loosen of the screw may also cause breakage of the controller.

4.External connection to the power controller

4.1 Connect fan power,see Fig 6

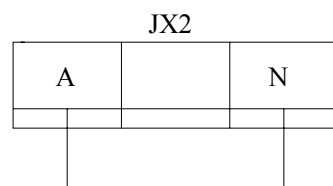


Fig 6 (fan power)

4.2 Connect control signal line and manual/auto shift line.See Fig 7

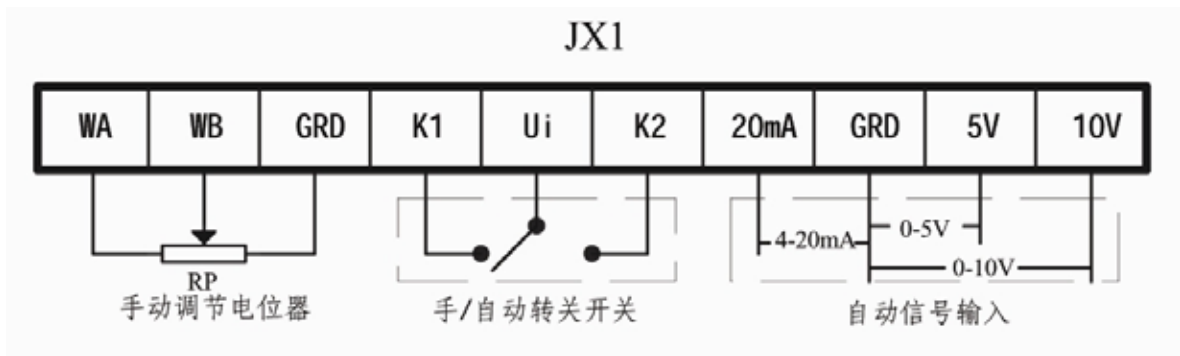


Fig 7

4.3 “K” is the manual/auto switch ,prepared by users。 (if users don ‘ t ask for manual/auto shift , K2 AND U1 is in short circuit。 If users ask for manual/auto shift , please follow RP is the manual adjustment POT。

Connect control signal line and terminal 20 mA and terminal GND or terminal 5VDC and terminal GND or terminal 10VDC and terminal GND , you can only assume one of the three signals.

4.4 Connect alarm signal control line.(CK , CO , CB are passive contacts , capacity is 220V/1A) .

See Fig8,CK and CO are alarm output normal open connection,CO is over-load alarm common connection,CB and CO are alarm output normal closed connection.

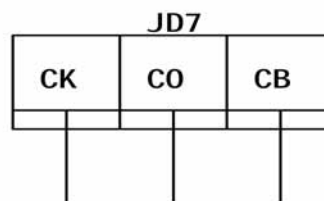


Fig 8

5.Light load experiment

Connect the input power lead,cut the connection with the load,use two incandescent lamp of 100W/220V,connect two lamps in series,connect respectively to the output end of the controller.Open the control panel,put the pulling switch to open ,do the following check.

5.1 check indication light POWER is on or not,check the fan is in normal working status.

If POWER is not on,fan is not working,check according to the

following:

5.1.1 Check the voltage U1,V1,W1 is normal or not.

5.1.2 Check quick fuse blow or not.

5.1.3 Check JK10 , check whether the voltage between three phases is the same with U1 , V1 , W1.

5.1.4 Check the connection of the transformer and bonding pad are loosen or disconnected.

5.1.5 Check transformer is ok or not ,primary side and sub-side of mains transformer open circuit or short circuit ,check the primary side loop and sub-side loop is ok or not , normally , primary side 1-2k , sub-side 10-20.

5.1.6 Check the fan connection is correct or not , use multimeter to test the voltage between terminal A and N is 220V or not.

5.2 manual adjustment POT ,output voltage U2 ,V2 ,W2 should be adjustable within 0-372V , and stable at any point , if the output voltage can't change with the control signal ,do the following check :

5.2.1 Adjust the manual POT , there is no output voltage.

5.2.1.1 Check U1 , V1 , W1 voltage to be $3*380V \pm 10\%$.

5.2.1.2 Check manual shift switch should be in manual shift , there is connection between U1and K1.

5.2.1.3 Check manual POT (2。 2K) connection is correct or not , DC between terminal WB (U1) and GND should be adjustable within 0-6V。 Terminal WB , K1 , U1 should be connected at the same time.

5.2.1.4 Load connection open-circuit or lamp inside open circuit , check the output resistance of any two phases should be the same.

5.2.1.5 The controller break , there is manual signal , no controlled silicon trigger signal。 Check as following :put it in 6V (highest voltage) , use multimeter to test G1 and T1 , the Voltage between G6 and T6 should be 0.4-0.6 , if there is no signal , there should be problem in the circuit board , contact with the manufacturer if damage.

5.2.2 The output voltage don't go with the manual POT ,there is output voltage or peak value.

5.2.2.1 Check pulling switch is open or not. if put in constant shift , feedback signal is very weak , increase the signal , three lamps will light up , you can see soft start , the lamp from dark to light , it is normal that you can ' t do linearity control , just put it to open shift.

5.2.2.2 Check the manual POT connection is correct or not ,and the POT is damaged or not.The DC between terminal WB (U1) and GND should be adjustable between 0-6V,if not adjustable ,there could be wrong connection or damage of the POT.Terminal WB,K1,U1 should be connected at the same time.

5.2.2.3 Control circuit damage.There is manual control signal,but controlled silicon signal doesn't go with the manual signal.Check : when U1 and GND adjust between 0-6VDC , use multimeter to test between G1 and T1,the Voltage between G6 and T6 should be 0-0.6,if the voltage signal remain high,there should be problem with control circuit board.

5.2.2.4 Controlled silicon damage.Normally there should be closed circuit between cathode and anode.Check : use multimeter to test between U1 and U2 , V1 and V2 , W1 and W2 , the resistance between the above should be 500K,if the resistance is 0,there the controlled silicon damages.

5.2.3 Output voltage can be controlled by manual POT , but three phases are not stable

5.2.3.1 The voltage of U1,V1,W1 is not stable ,that cause the output voltage unstable.

5.2.3.2 The resistance of three phase load (lamp) is not stable,that cause the output voltage unstable.Check : the power of three lamps should be the same,the resistance of U2,V2,W2 should be the same.

5.2.3.3 Control circuit board damage.One or several trigger signal of 6 signals don't work,cause controlled silicon obstructed,output voltage unstable.Check : put it in 6V (highest voltage) ,use multimeter to test G1 and T1,the

Voltage between G6 and T6 should be 0.4-0.6, the 6 voltage signal should be the same. Use multimeter to test the DC of U2, V2, W2, normally should be $\leq \pm 3$, if $\geq \pm 100$, there could be problem with control circuit board.

5.2.3.4 Controlled silicon damage. check the trigger signal line JK1 and JK6 is loosen or not. there should be 2 causes: 1. short circuit of cathode and anode. 2. trigger pole G, T open-circuit. way of identification: use multimeter to test, the resistance of JK1-JK6 six group trigger pole should be 10-30.

If all the above are normal, you can go to Rated load experiment, put the pulling switch to constant current shift, connect the output terminal with the load.

6. Rated load experiment

Connect the load, adjust the manual POT to minimum, make the voltage between U1 and GND 0 or $< 1.2\text{VDC}$. connect the main power, adjust POT, output value change with POT, voltage of three phase should be stable,

Remark :if use 4-20 mA temperature controller, put the switch to auto, connect U1 and K2.(4 mA -20mA, 1.2V-6V)

6.1 Three phase of the output voltage unstable:

6.1.1 U1, V1, W1 voltage unstable, that cause output voltage unstable

6.1.2 Load resistance of three phase unstable, may be caused by following reasons:

6.1.2.1 Load unstable.

6.1.2.2 Poor contact in the connection.

6.1.2.3 Many small load open-circuit.

6.1.2.4 Electrode or heating zone has one or two points short circuit to the ground, may cause unstable voltage or over-load, even damage the controller

6.1.2.5 Load transformer unstable output or damage, you can check the idling current and voltage.

6.1.3 Trouble with controller, check: take away the load, make

the experiment according to the above Light load experiment.

Check: take off the load, make the experiment according to the above Light load experiment.

When meet over-current alarm, the controller will lock itself ,you need to cut off the power and restart again.

6.2 Over-current alarm, over-current light on, no output

6.2.1 Load trouble.

6.2.1.1 Main circuit ,load connection not good.

6.2.1.2 Load short circuit, electrode or heating zone has one or two points short circuit to the ground.

6.2.1.3 Trouble with the controller.

6.2.2 The poor contact problem.

6.2.2.1 Control circuit board damage, lack one or two trigger signal, make the controlled silicon one-way ducting. if used in primary side, it will magnetizing the controller and cause over-load alarm.

6.2.2.2 Controlled silicon damage,one or two group trigger pole G,T open circuit, make the controlled silicon one-way ducting. if used in primary side, it will magnetizing the controller and cause over-load alarm.

6.2.2.3 Circuit board uncontrolled or controlled silicon damage,(cathode and anode short circuit),make the output voltage uncontrolled, when the temperature increase, the working current increase to cause over-load alarm.

6.2.2.4 Poor contact of the pulling switch, the output current don't interfere feedback adjustment, when the temperature increase, the working current increase to cause over-load alarm.

The loosen of the screw of the controlled silicon may cause over-heat of the controlled silicon. check: take off the load, make the experiment according to the above Light load experiment.

When meet over-current alarm, the controller will lock itself ,you need to cut off the power and restart again.

6.2.3 Open-phrase alarm, the indication light on, no output.

6.2.3.1 Check the fan is in normal working status, whether

there is abnormal noise or speed.

6.2.3.2 Temperature may be too high, or in poor draft.

6.2.3.3 Long-time over-load working, make the radiator too hot to cause over-heat alarm, choose high-power controller.

It won't lock itself when over-heat alarm, when the temperature lower down, it can output again.

6.2.4 Control signal reach maximum, the output current can't reach rated current.

6.2.4.1 Check the signal to be 6VDC, test the voltage between U2 and GND should be around 6V.

6.2.4.2 Output voltage to be maximum of 380V, the output current can't reach rated current. load resistance is too big (heating power too low) or load side voltage too low, change to high-power load.

6.2.4.3 Output voltage can't reach maximum, the output current can't reach rated current. the current limiting is 105% of rated current, you can adjust current limiting POT P2 to increase output current, be sure not to exceed 110%, If it doesn't work, you can adjust P7 A to lower feedback amplitude, increase output current, be sure not to exceed 110%, also can't exceed 100% of the rated value of current feedback transformer.

Suggestions : Better to change to high-power controller rather adjust P2 and P7.

6.2.5 Range of signal is limited.

Sign: control 0-3VDC, should be full output.

6.2.5.1 Poor contact of the pulling switch, the output current don't interfere feedback, thus easy to over-current, and limit the range of signal.

6.2.5.2 Current feedback transformer. damage and open circuit.

6.2.5.3 The rated current is far bigger than the working current.

Check all the above and be sure to be normal ,you can put down the panel and put into normal operation.

7. Analyze and check procedure when meet abnormal condition

7.1 According to troubles to check voltage, control signal, transformer, heater.

7.2 Use light load experiment to check whether there is problem with power control.

7.3 After trouble shooting, use rated load experiment ,linearity control the output of the controller.

Chapter5 Notice for order

Please designate the following:

1. Rated input voltage

2. Rated working current

3.Control signal e.g: manual POT,auto control signal4-20mA, manual/auto shift(auto signal 0-10VDC).

Example:KTF1-86KVA/3*380,control signal 4-20mA, manual/auto shift, three phases.



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