RT-1300

High Temperature Atmosphere Furnace

Operational Manual

Contents

Thank you for purchasing RT-1300 atmosphere Furnace. To avoid any misuse and damage, please read the operation instruction carefully before operation

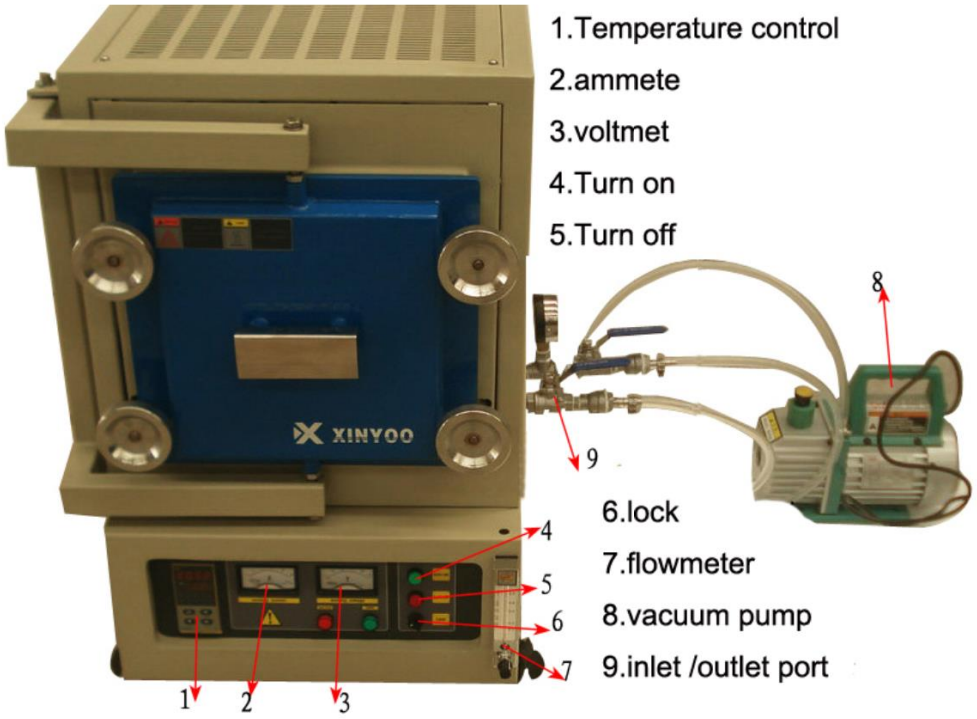
1. Introduction

RT-1300 atmosphere furnace use Sic heater as heating element，the max. Temperature is1400℃。The furnace temperature is controlled by high precision SCR (Silicon Controlled Rectifier) digital controller with accuracy +/-1 deg oC and 30 segments programmable.

2. Technical Specifications

Name	Unit	Parameter
Power	KW	4
supply voltage	V HZ	220V，50HZ
Max.temp.	℃	1400
Working Temp.	℃	1300
Suggested heating rate	℃/min	<15
Temperature accuracy controlled	℃	±1℃
Heating element		Sic heater
Thermal Couples	KWH	S type
Chamber size	mm	200*150*150mm

3. Furnace Structure



4. Instruction of the 518 Intelligent Temperature Controller

（1）Main Features：

• The 518 temperature controller uses advanced AI intelligent adjustment method, no over shooting, and has auto tune function.

• Both of Input and output employ digital calibration system and insure accurate and stable measurement.

• Measuring accuracy:0.2% in full scale.

• Alarm function: Up limit and input open circuit.

• 30 segments programmable. Auto and manual operation can be switched without disturbing.

• Power off protection. In the case power off or other disturbing, input data can be saved via smart EPROM IC to ensure continuously running once power resume

• Universal switching power:240V AC, 50/60Hz

• Power consumption: ≤ 4W

（2）Temperature Controller Connections：

There are 20 connectors in the backside of temperature controller. The connection is shown as

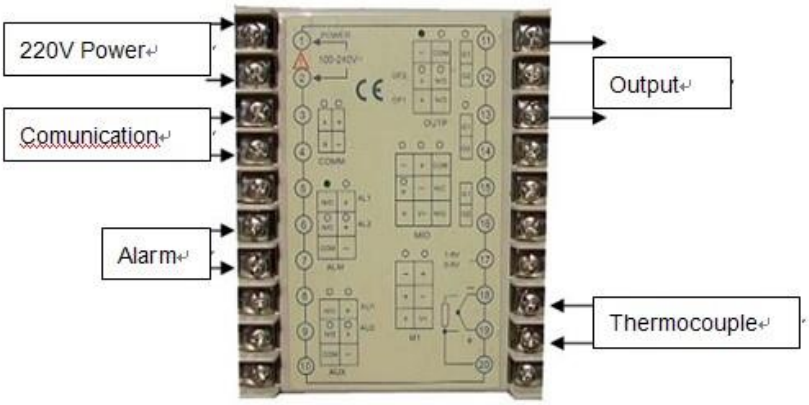


Figure 1

（3） Indication of Front Panel of Temperature Controller：

Figure 2

1. The Key of Panel

1)、working indication （OUT）

2)、Alarm 1 （AL1）

3)、Alarm 2 （AL2）

4)、auxiliary indication （AUX）

5)、Current Temperature from thermal couples（PV）

6)、Control Temperature value（SV）

7)、Key for changing display and setting parameters in various

8)、Key for reducing value, also for program running or pause （RUN/HOLD）

9)、Key for shift setting. Also enter program setting （A/ M）

10)、Key for value increase, also for stopping program （STOP）

2. Setting Procedure of 518 Temperature Controller

Before running the furnace, you must plug in power.

Install thermal couples at the top of the furnace and make sure connection correctly (blue wire connecting with negative; red wire connecting with positive, Then turn lock in clockwise rotation to get temperature controller power on , You can set program in temperature controller.

(1)Starting State of Display of Controller Panel

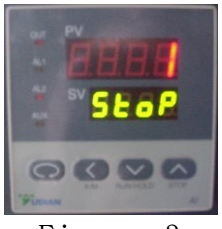


Figure 3

When turning power on, controller display shows the model No (518) of controller, software version first. A few seconds later, controller will display temperature condition. PV shows real temperature, and SV shows setting temperature. If “SV” flashing and shows “Stop”, it means that control program is at stop state; If “SV” shows “Hold”, means that program is at the pause stage. (Fig3)

(2)Switching Function of Display

Under starting state of temperature display as Fig. 5, e.g. the panel can be switched to program setting function and parameter setting function by touching key: Touch key and hold for one second, PV will show "Step" and SV show Step # (Usually show 1), Press key once again, PV will show the setting time in the step, and SV shows the time that has run in this step. Press key and hold for two seconds under "starting state", Display will show parameter setting function , (PV shows M5, and SCV shows 389.7) as Fig 5

Please don't change any parameter unless you understand what parameter is. The all parameter has been preset according to our experience. Next chapter will explain how to change "Parameters "

Please be advised that *If no any key touch action on the panel in 30 seconds, display will return to* ***"Starting State*** *"automatically. And all revised data will be saved.*

Figure 4 Figure 5 Figure 6 Figure 7 Figure 8

In order to set temperature control program, you must switch display panel from "starting state "to

Fig. 6 state. (Please follow procedure from Fig. 3 to Fig 5)

Then touch Key and hold for one second, the Panel enters temperature program setting stage. On the display, (as Fig.7)

PV shows first segment for temperature SV shows Initial temperature value

Then touch Key, program enters holding time (as Fig. 8)

PV show the segment number for time

SV shows time setting (Munities) in this segment.

By touch key or, you can increase or decrease the value to be set.

Yudian 518 controller allows you to set one temperature profile up to 30 segments

By touch key and uses key and you can get in next segment for temperature or time setting.

During program setting, by touching and holding for two seconds, you can return to previous setting and make revising.

By touching key first, then press key, you can exit program setting mode. If no key operation for 30 seconds, display exits program setting mode and returns to “starting state”.

(3) Example for Setting Temperature Control Program with 6-segment Profile

For a complicated temperature control profile, we strongly suggest you to make drawing as Fig.9 then make form as table 1 to list all data in every stage.

Fig. 9 is the temperature profile that we would like to set

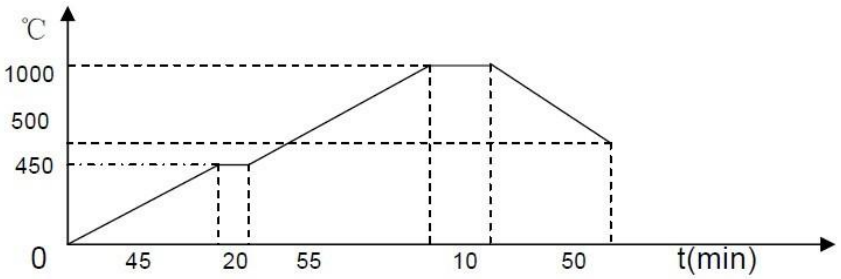


fig9

Symbol in Panel	Data to be In-put	Meaning in the program
C 01	0	Initial Temperature
t 01	45	0-450℃ need 45minutes
C 02	450	Target temperature value to first heating stage
t 02	20	450℃ hot insulation for 20 minutes
C 03	450	Target temperature value to second heating stage
t 03	55	450~1000℃ need 55minutes
C 04	1000	Target temperature value to third heating stage
t 04	10	1000℃ constant temperature for 10 minutes
C 05	1000	Target temperature value to fourth heating stage
t 05	50	1000~500℃ temperature drop need 50 minutes
C 06	500	Target temperature value to fifth heating stage
t 06	－121	Program end, Out-put power off. Furnace cooling down naturally

Using 4 keys of enter data listed the above table into controller separately

Different time setting shows different meaning:

Time setting（min）	Meaning
t xx=1—9999	time value for XX segment
txx=0	Controller will be paused at xx segment (Hold)
txx=－（1—150）	Negative value is a control order, which let program stop running, or jump to other segment
txx=－（A×30＋B）	here B values is 1- 30. Which indicates program will jump to the segment at B value

5. Instruction for Quick Start.

1. When temperature program set up ready, touch key and hold for two seconds, then display SV will show letter “run”, furnace will run automatically segment by segment according to program step by step.
Under furnace running state, “Out “indicator ‘s brightness will change based on power out value.
If you want the furnace to stop running temporarily, please push key and hold for two seconds, then display SV will show letter “ Hold”, the furnace enters “pause state “. In the “pause state”, controller will keep furnace temperate at the value when “pause” order was given, but time running is stop.
Under the “ Pause “ state, push key for two seconds, SV display will shows “ run”. And furnace will start running again from the point where is paused.
If you want to stop running furnace, whatever under “ pause” or “ running “ state, you can push key and hold for two seconds, then, SV display shows “ stop” , furnace totally stop running and controller will be in “starting sate”. If you want to run again, the program will start at the beginning step. If furnace temperature still is higher than “ C 02”, program will not run until temperature going down to “ C 02”. In order to run faster, you can choose program run from “step 2”, or “step 3”.

2. Function Parameters Set Up and Revise
The following function parameters are preset in the temperature controller. They are very important for controlling furnace temperature stably and accurately. Unless you have enough experience, please don’t change the preset parameters in the controller. In order to change the function parameters, follow procedure as below:

Press key and hold for two seconds under “starting state”, display will enter parameter setting function

Touch key and hold for one second again, PV display will shows symbol: “M5 “(Fig.10), “P” (Fig. 11), “t” (Fig. 12), “CtrL” (Fig 13) and “LOC” (Fig.14) respectively.

Using and key to change the value under different parameter setting.

Hold key for two seconds, setting will go back to previous parameter.

Press Key, then push, Display will exist “parameter setting”.

Fig10

Fig11

Fig12

Fig13

Fig14

Using and key to change the value under different parameter setting.

Hold key for two seconds, setting will go back to previous parameter.

Press Key, then push, Display will exist “parameter setting”.

Below is the list of the parameters and their meanings：

Parameter in Display Panel	Parameter 's function	Range to set	Preset value in the controller
M5 (Maintenance Parameter)	Adjust temperature difference between set value and real value. the larger M5 value, the longer adjust time, and M5 smaller time is shorter	0－9999	289.7 （200—500）
P (Speed parameter)	Adjustment rate in controller. P value increases adjustment faster; decrease, adjustment slower	1－9999	16 (3—10)
T (Delay time Parameter)	Control temperature over shooting. **t** value smaller, temperature overshoot smaller, otherwise overshoot larger.	0－2000	6 (3—10)
CtrL (Control type)	1= Auto tune from front panel 2= Auto tune first, then go to 3 or 4 automatically 3= built-in Auto tune, can not be changed from front panel 4= more accurate auto tune	1，2，3，4	3
LOC (Parameter lock)	Preset in controller. Please never change	0—9999	0

Procedure for running furnace

□ Plug in power (Green Power indicator is on, cooling fan run)

□ Turn Power switch lock on, (Yudian 518P controller is on)

□ Let 518P control display is at “starting state “, e.g. PV panel shows temperature value, and SV displays “stop”. If controller is no at the state, touch key, 518P controller shall be back to “starting state “

□ Input temperature program. (Please be advised that heating rate shall not be too fast in low temperature stage to avoid damage furnace)

□ Push green “Turn On “power switch button.

□ Push Key on the controller and hold for 2 seconds, PV panel shows “Run”, now furnace is running automatically

Procedure for shut down furnace

□ Push key to make sure the controller is at “stop “state.

□ Touch Red “Turn-Off” button shut down furnace power

□ Turn lock to close position to cut off power to control panel

□ If possible, close power switch from cable.

□ End

6、Maintenance and Cautions

a) When power on, if you cannot hear a sound from cooling fan, please don’t continue to operate. You must shut down power to check or replace the cooling fan.

b) During furnace running, please don’t touch furnace to avoid any high temperature burn.

c) Before operating the furnace please must place the alumina insulation block behind the front door of the furnace for good insulation performance.

d) Please don’t open the front door of the furnace above 300℃ to prevent insulation inside furnace from cracking.

e) If the furnace is used at first time or not use for long time, please preheat the furnace at 300℃ for at least 2 hours to remove moisture inside to avoid chamber cracking.

f) MoSi2 heating element is only suitable for using in air or inert gas environments. Other active gas, such as H2, Cl2 and SO2, will damage heating element.

g) Please don’t use the furnace at 400 – 700℃ temperature range for long time because MoSi2 heating element will be easy to be oxidized in the temperature range.

h) MoSi2 heating element is very brittle. Please pay a great attention during moving and handling. Also, please avoid rapid heating and cooling to avoid the heating element broken. Max. 10℃/min heating or cooling rate is suggested.

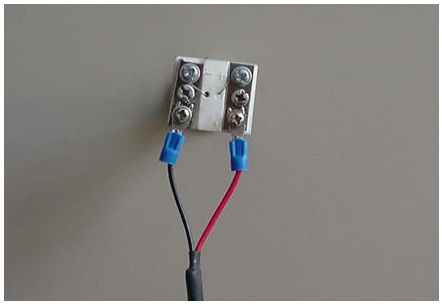
i) Please check heating element for every three months to see if they are in good connecting condition. If connection gets loose, please open case and tighten them properly.
j) Please always keep inside clean before operation to avoid contamination to your sample.
k) Furnace must be used under following condition:
Temperature: -10 – 75℃; Elevate: < 1000 M, Humidity < 85%; Environment: no vibration and conductible dust, explosive, flammable and corrosive gases

7. Trouble Shooting for typical Problems

Problems	Reason	Solution
Open Power Lock, no power indication	Fuse in control panel is broken	Check control panel, and replace fuse
Green Power indictor is off, but Red open circuit indicator is On	Fuse in main power circuit is broken	Open the cover of front panel and replace the fuse
No current shows in meter , but has Max. Voltage	Heating element broken	Find broken heating element, and replace it
Controller display panel SV shows“ OraL”	Thermal Couples broken	Replace Thermal couples
Controller display panel SV shows“ HI AL”	Furnace temperature > 1400℃, Protection from Alarm	Cool furnace down, and find reason why temperature is so high (program setting may be wrong)
Power and heating element are OK, but furnace can’t be controlled by program.	Controller or related circuit may be damaged	Heck controller.

How to install thermocouple

Insert thermocouple into the furnace from rear, and make the space 5mm from thermocouple top to ceramic/quartz tube. Note: Red wire to “+” and Blue wire to “-” .



How to replace Heating element

1) Take of 4 screws on top of furnace, and then open the cover, as Fig 25

2) Take off the screw of clip for heating element, as Fig 26

3) Take off aluminum plates between connections of heating element, as Fig. 27

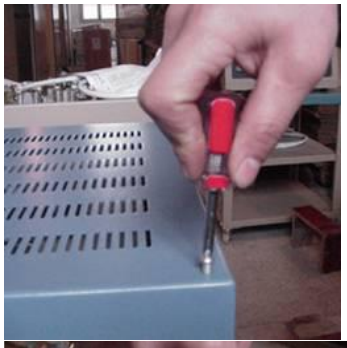


Figure 25

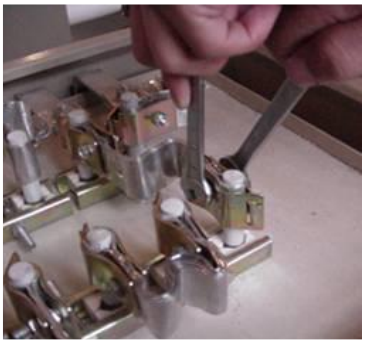


Figure 26

Figure 27

4) Take off the screws of metal clip for fixing ceramic block, as Fig 28

5) Take off the ceramic black between rods of U type heating element, as Fig 29

6) Take off the U type heating element which needs to be replaced, as Fig. 30

7) Replace a new heating element. Please put ceramic block together with the heating element, and make sure the ceramic block shall fit position as before, as Fig 31.

Fig. 28

Fig. 29

Fig. 30

Fig. 31

8) When tighten the screw of metal clip for heating element, please make sure the bottom of U heating element does not touch the bottom of furnace chamber. Usually the bottom of U element shall rise 5 mm high from the bottom of furnace chamber

9) Then, follow the procedure 4, 3, 2, 1 to tighten screw and finish the exchange of heating element