CD-1700X
High Temperature Muffle Furnace
Operation Manual

Contents

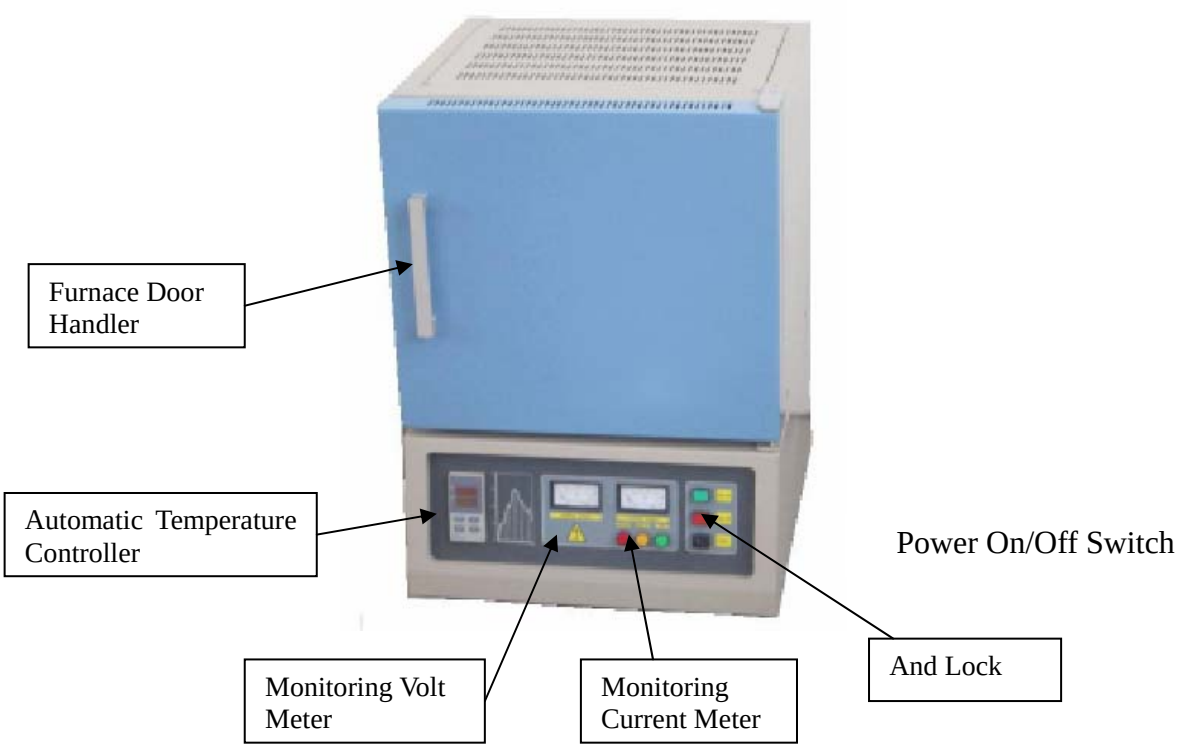
1. Introduction

CD-1700 high temperature muffle furnace uses $MoSi_2$ rods as heating element. Max. temperature inside furnace can be reached at 1650℃. The furnace temperature profile can be set up by 30 segment and run automatically by the 708 type temperature controller. It is excellent for material research, ceramic research labs.

2. Technical Specifications

Name	Unit	Parameter
Power	KW	4
Voltage	V	AC220V single phase 50/60Hz
Max. Temperature	℃	1700
Continuous working temperature	℃	1600
Suggested heating rate	℃/m	＜10
Temperature accuracy controlled	℃	±1℃
Heating element		$MoSi_2$
Connection of heating element		Series connection
Thermal Couple Heat capacity inside chamber	KWH	B type Pt-Rh to Pt-Rh＜80
Dimension of inside chamber	mm	160L x 160W x 140H
Dimension of outside	mm	480L x 500W x 680H
Net Weight	Kg	120

3. Furnace Structure



4. Instruction of the 708 Intelligent Temperature Controller

(1). Main Features:

- The 708 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.
- 51 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: 85V-264VAC, 50-60Hz
- Power consumption: ≤5W

(2). Temperature Controller Connections:

There are 20 connectors in the backside of temperature controller. The connection is shown as Fig 1:

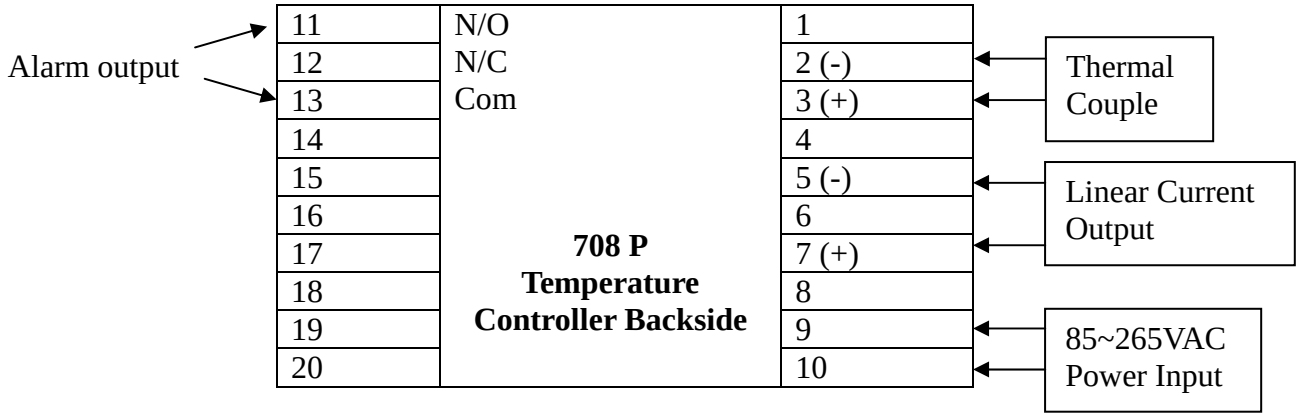


Fig. 1

(3). Indication of Front Panel of Temperature Controller

On Front Panel of 708 temperature controller, there are several signs and icons such as OUT, AL1, AL2, AUX, PV, SV, , , , and , which indicate the meaning as the Figure 2

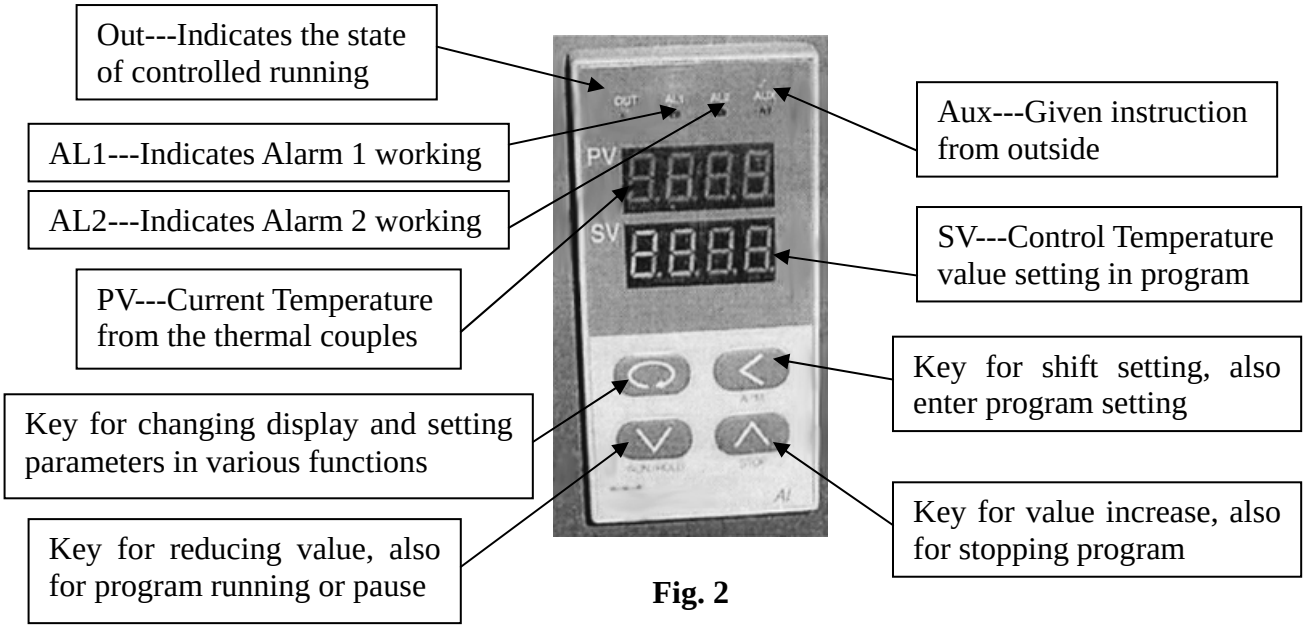


Fig. 2

5. Setting Procedure of 708 Temperature Controller

Before running the furnace, you must plug in 220-240VAC power.

Install thermal couples at the back of the furnace and make sure connection correctly (blue wire connecting with negative; brown wire connecting with positive, Fig. 3)

Then turn lock in clockwise rotation to get temperature controller power on (Fig. 4)

After setting program in temperature controller, push “power on” button to make cooling fan running (Fig. 4)

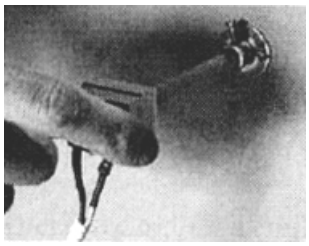


Figure 3

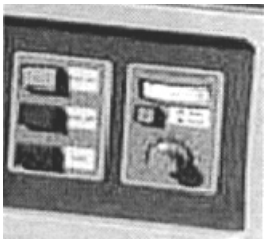


Figure 4

(1). Starting state of Display of Controller Panel

When turning power on, controller display shows the model No (708) 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.

(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 # (Usual show 1) as Fig. 6

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 as Fig. 8, (PV shows M5, and SCV shows 289.7)

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 advise that If no any key touch action on the panel, display will return to “**Starting State**” automatically, and all revised data will be saved.

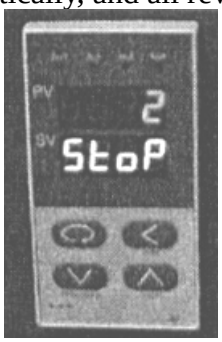


Figure 5

Fig. 6

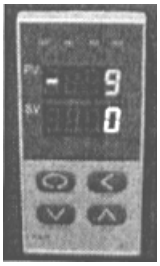


Fig. 7

Fig. 8

(3). Setting Temperature Control Program

In order to set temperature control program, you must switch display panel from “starting state” to Fig. 7 state. (Please follow procedure from Fig. 4 to Fig. 7)

Then touch key and hold for one second, the panel enters temperature program setting stage. On the display, (as Fig. 9) PV shows first segment for temperature,SV shows Initial temperature value.

Then touch key , program enters holding time (as Fig. 10)

PV show the segment number for time

SV show time setting (Munites) in this segment

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

Yudian 708 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”.

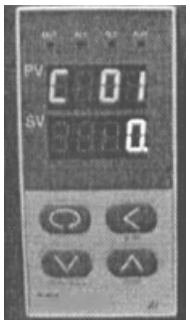


Fig. 9

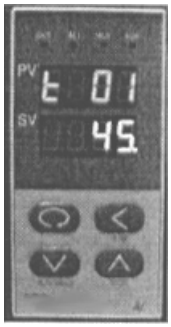


Fig. 10

(4). 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. 11, then make from as table 1 to list all data in every segment. Fig. 11 is the temperature profile that we would like to set.

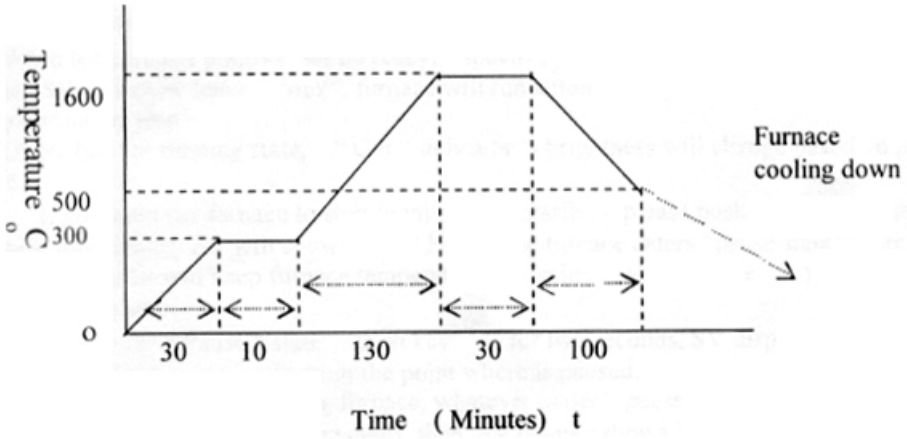


Fig. 11

According to this profile, you shall list all segment in the following:

Table 1

Segment	Symbol in Panel	Data to be In-put	Meaning in the program
1	C 01	0 (℃)	Initial Temperature
2	t 01	30 (min.)	Ramping time from 0~300℃, average heating rate is 10℃/min.
3	C 02	300 (℃)	Target temperature value to first heating stage (300℃)
4	t 02	10 (min.)	Soaring time at 300℃ stage
5	C 03	300 (℃)	Temperature value at the heating flat
6	t 03	130 (min.)	Second heating time from 300-1600℃
7	C 04	1600 (℃)	Average heating rate is 10℃/min.
8	t 04	30 (min.)	Soaring time at 1600℃ stage
9	C 05	1600 (℃)	Temperature value at peak heating flat.
10	t 05	100 (min.)	Cooling time to 500℃, cooling rate is 11℃ /min.
11	C 06	500 (℃)	Target temperature to be cooled (500℃)
12	t 06	-121	Program end, Out-put power off. Furnace cooling down naturally. (t 06=-120 is an order to stop running)

Using 4 keys of , , , enter data listed the above table into controller separately, then, you finish one temperature control program finish.

Please be noted that "txx" is time value for XX segment. It can be set from 1-9999 minutes. However, if "txx" is set as the following value, it can be as a special order. These order only can be used in complicated multi temperature profile program.

If **txx=0:** Controller will be paused at xx segment (Hold). Next program only can be run by a manual order (touch A/M key)

If **txx=-(1-150)** Negative value is a control order, which let program stop running, or jump to other segment.

If **txx=-(A x 30+B),** here B value is 1-30, which indicates program will jump to the segment at B value.

When **A=0**, only execute segment jump function.

When A=1, program will cut off power delay.

When **A=4, B=1**, program will execute "stop" order

(5). Run Temperature Control Program with Furnace

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" indictor'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 temperature 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 then point where is paused.

If you want 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 state". 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”.

(6). Furnace 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.12), “P”(Fig.13), “t” (Fig. 14), “CtrL” (Fig. 15) and “LOC” (Fig. 16) 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” .

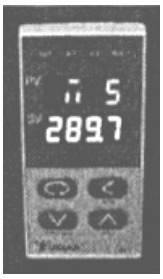


Fig. 12

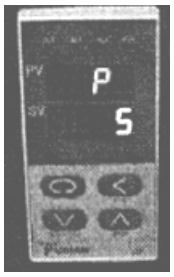


Fig.13

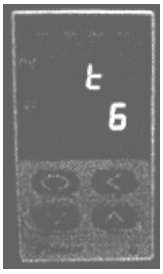


Fig.14

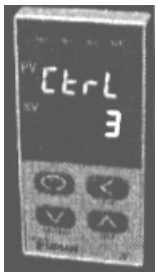


Fig.15

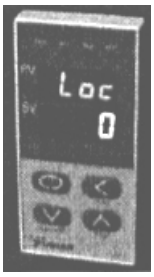


Fig.16

Table 2 lists the parameters and their meanings:

Parameter in display panel	Range to set	Parameter’s function	Preset value in the controller
M5 Maintenance parameter	0-9999	Adjust temperature difference between set value and real value. The larger **M5** value, the longer adjust time, and **M5** smaller time is shorter.	289.7 (adjust between 200-500)
P Speed parameter	1-9999	Adjustment rate in controller. **P** value increases adjustment faster, decrease, otherwise overshoot larger.	5 (select between 3-10)
T Delay time parameter	0-2000	Control temperature over shooting. **T** value smaller, temperature overshoot smaller, otherwise overshoot larger.	6 (3-10)
CtrL Control type	1, 2, 3, 4	1= Auto tune from front panel 2= Atuo 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	3
LOC Parameter lock	0-9999	Preset in controller. Please never change	0

Again, only in the case that you find temperature control is not stable during running, the parameters above may be considered to be adjusted.

Before adjust the parameters, you shall use “**Auto-Tune**” function to achieve the best setting result. The procedure is as the following:

Let furnace stay in a temperature that is the most important for you.

Set Loc value to 2

Let display return to “starting state”

Hold key for two seconds, then front panel of controller will flash with letter “AT”, which means controller is in “Auto-Tune” state.

After “Auto-Tune”, AT letter will disappear and controller will select all M5, P and t value automatically.

You may repeatly set “Auto-Tune” 2-3 times to achieve the best result.

After Auto-Tune, please set CtrL to 3.

If temperature is still not stable after Auto-Tune, you may adjust M5, P, and t value manually.

In the special case, furnace can not be run properly due to voltage varies in different area, you may need to adjust some parameters as the Table 3.

Again, the parameters have been preset according to our experience. Please don’t adjust the following parameters unless you are very familiar with the function of parameters.

Table 3

Parameter symbol in PV panel	**Value preset in SV panel**	**Function Note**	
HIA1	1700	Max. Temp limit	
Local	200	Initial Temp limit	Limit output current below 200℃
dHAL	999.9	Alarm in positive tolerance	
dLAC	999.9	Alarm in negative tolerance	
dF	0.3	Adjustment difference	dF smaller, auto tune has higher accuracy
CtrL	3	Control type	
M5	289.7	Maintenance parameter	
P	5	Speed parameter	
t	6	Delay time parameter	
Ctr	1	Output period	Reflect controller’s adjustment speed
Sn	6	Thermal couples type	B type T.C
DIp	0	Position of decimal	
DIL	0	Display value in Min.	
DIH	1800	Display value in Max.	
Se	0.0	Main input shift and adjustment	Tolerance between input and sensor
OPT	1	Output type	Select T is output from 0-10mA. Please make sure if this value is compatible with controller
OPL	16	Output limit below 200℃	This value will determine Max. output current when below 200℃. Please select 16 first. If the output current is too low, please increase the value up to 80. The most suitable value that the current-meter shows is 120-140 A in initial heating stage.
OPH	100	Output up limit	Limit Max. output power. Max value is 130. Please set the value as low as possible to avoid damaging heating stage.

ALP	100	Alarm function	
CF	82 System function	Selection	82 means limit output current in two stage
Addr	1	Communication address	
bAud	9600 Communication	Frequency	
dL	1	Input digital filter	dL value larger, measured temperature more stable, but reaction time is slow
run	60	Running condition	
Loc	0	Parameter revising grade	Value “0” will lock the data that has been entered. The value “808” will open lock to allow you to revise all parameters
EP1	M5		
EP2	P		
EP3	t		
EP4	ContrL		
EP5	OP2	After adjusting, set to NoneE	
EP6	OPL	After adjusting, set to NoneE	
EP7	NoneE		
EP8	NoneE		

In order to adjust the parameters above, you need to do as the following:
From function parameter state of “Loc” as shown in Fig.16, change “Loc” value from “0” to “808” as shown in Fig. 17

Fig.17

Fig.18

Fig.19

Fig.20

Fig.21

Fig.22

Then, you can revise the parameters from “HIAL” (Fig. 18) --- “Sn” (Fig 19)--- “oPL” (Fig 20)--- “oPH” (Fig 21) by the key , , step by step. After changing the parameter and make sure all parameters are correct, you need to change “LOC” to “0” as shown in Fig 22.

6. Installation Procedures

Please follow the instructions as the below for furnace installation
Open shipping package to check if all compoments are good condition. If find any damage caused by shipping, please report it to our company immediately.
The furnace must be placed in flate surface to avoid vibration, where must keep from flammable and explosible material.
The furnace uses AC 220V/5KW power. Please make sure that power source in your lab is enough to meet this power requirement. You must use a power plug (not included) at ＞30A current rating to connect furnace.