110804

CSC

VERTICAL MOLYSILI FURNACE

WITH

ROTATIOAL LIFTER

MODEL: VEF-1800-ACS

Operation Manual

CRYSTAL SYSTEMS CORPORATION

9633-1 Kobuchisawa, Hokuto, Yamanashi 408-0044 JAPAN

TEL: +81-551-36-5271

FAX : +81-551-36-5273

e-mail : csc@crystalsys.co.jp

URL: www.crystalsys.co.jp

1) Introduction

This furnace is vertical cylinder shaped. Using Molysili heater (MolybdenumDisilicide; $MoSi_2$), it is able to heaten easily up to super high temperature range of Max 1800 ℃ in the air.

The furnace body is made of combination of special Alumina board and ceramic high insulation board, and has very efficient insulation ability.

Sample chamber is made of high purity alumina tube, enabling atmospheric control. Combining with Rotating Lifter, it is easy to make thin long rod samples which are straight and have uniform density.

2) Name of equipment: VERTICAL MOLYSILI FURNACE WITH LIFTER MODEL: VEF-1800-ACS

3) Specifications

No	Item	specifications	Remarks
1	Max Temperature	・1800℃	
2	Normal operation	・1700℃	
3	Heating element	・$Mosi_2$ 6 pcs ・200×200×3×6×25 (mm)	U shaped
4	Furnace Tube	・ϕ60×ϕ50×900mm (SSA-S)	
5	Jacket water cooled)	・water cooled at the bottom	
6	Insulation	・RF board (Aluminafiber)	
7	Temperature Control method	・Program controller (with PID) ・Thyristor (with current limitter) ・Transformer	Eurotherm 2416 3.6KVA
8	Atmosphere control	・ Air 10L/min ・	
9	Thermocouple	・PtRh20%-PtRh40% 235mm	1 pc
10	Electric furnace	・size ϕ500×H400 ・weight 50Kg ・With safety lid	

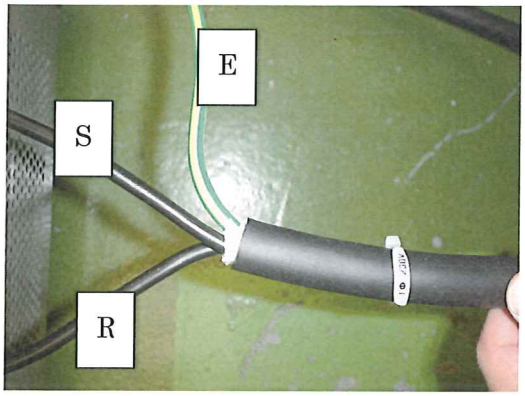
11	Lifter	・ stroke 600mm ・ number of up-and-down ・ 1～9999 ・ feed rod length optional ・ RPM 1～100rpm ・ Movement speed 3～70mm/min	
12	Electric Furnace control BOX	・ Indicator: Power INPUT Electricity current、 Voltage, Program controller、 OUTPUT SW ・Material Steel plate ・Size W570×D630×H850 ・Weight 60Kg	
13	Power source	・200V 30A 1-phase	

4) Cable connection and assemble

4) -1 Cable connection

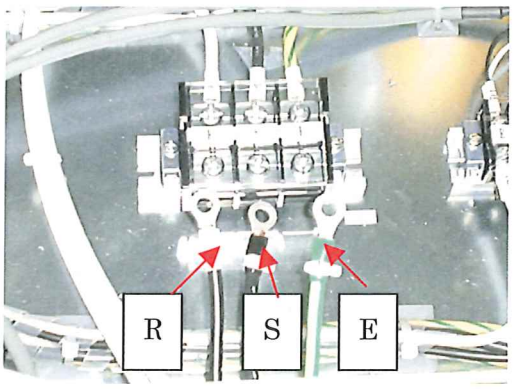
Regarding the attached cable, the shape of one end which connects inside the furnace control box and the shape of the other end which connects to distributing board are different.
Please connect the end as cut to distributing board, and the end which has press terminal to Furnace control box.

Distributing board side

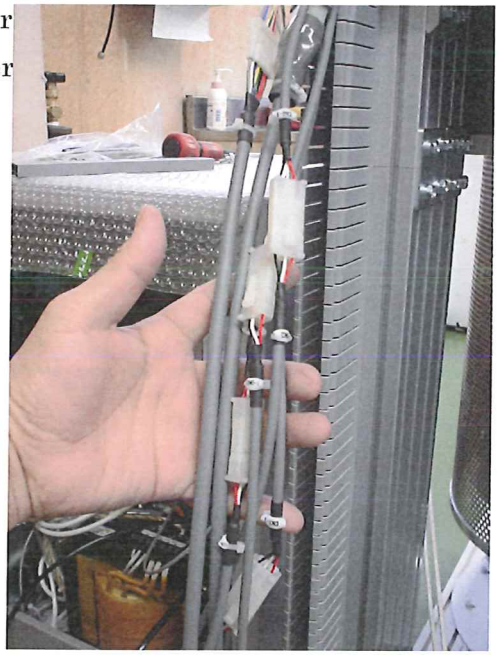


Connect the distributing board side to 1-phase 230V.

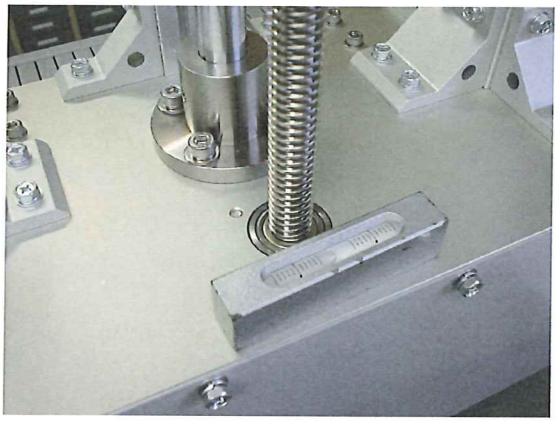
inside the electric furnace control box

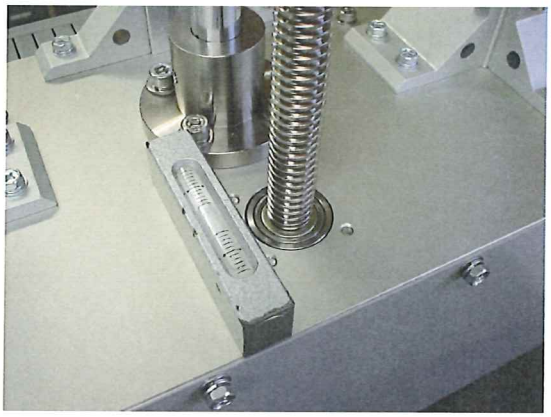


With regard to motor cable, please connect the connector in the left side duct with the connector(the same number In the control box.

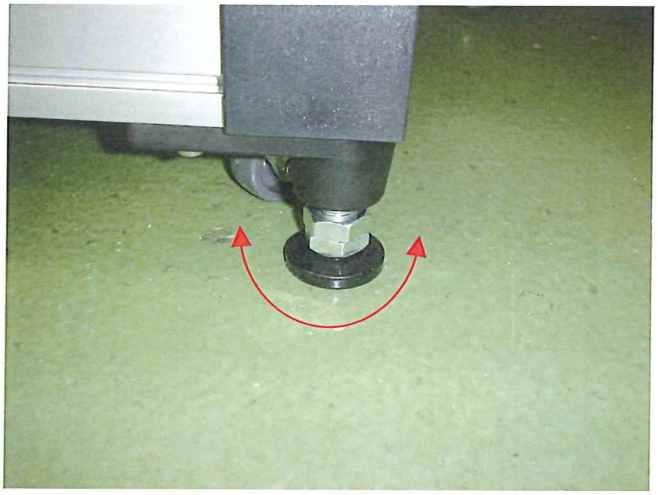


4) -2 Levelling



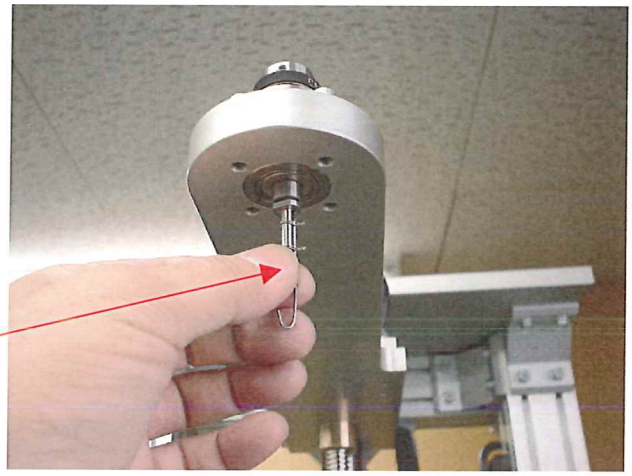


Place the level (attachment) on the driving part plate (a shown by the photo), and fix the four foot,、please adjust so that the air bubble comes to the center.



4) -3 **Seed holder**

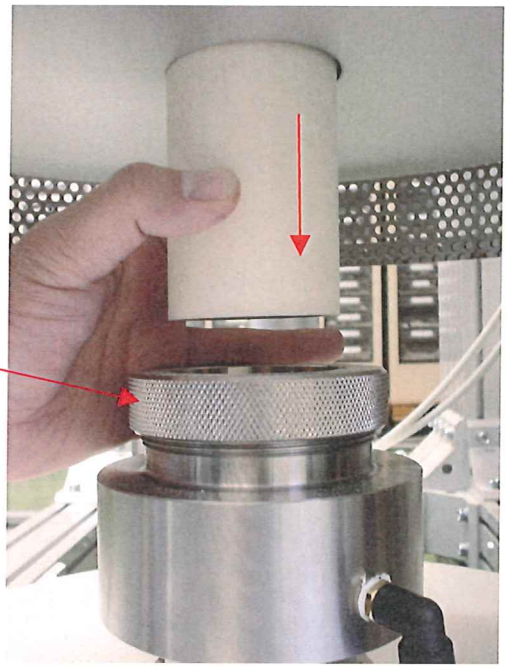
The jig to suspend the seed holder is adhered to the plate.
So tear off the jig and screw it as shown by the photo.



5) **Furnace tube preparation**

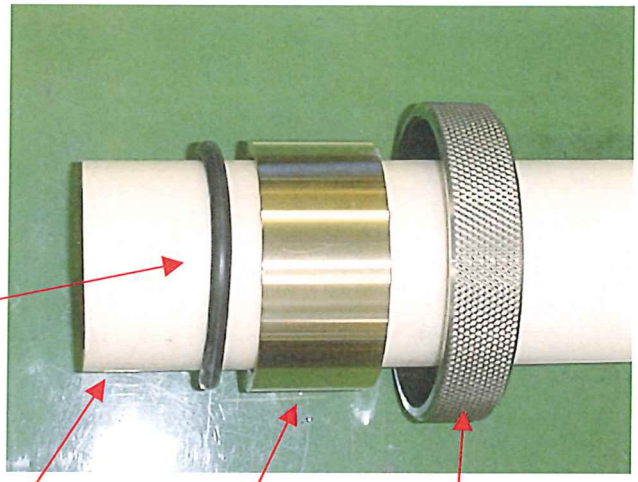
Insert the furnace tube SSA-S （φ60×900mm）
To bottom water-cooled holder from the top of the furnace as shown by the photo.

By tighten the metal part, O-ring can seal it.



6) **Preparation of Furnace Tube**

The sealing parts are to be put on the furnace tube in the order shown by the photo at both ends.



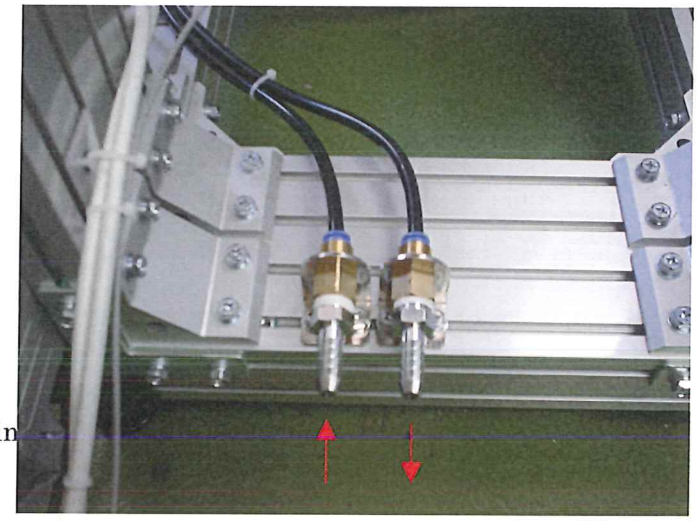
7) Water coolant

Water coolant locates at bottom of main body .

Please connect attached hose carefully (do not mix-up IN andOUT)

(If you have Chiller, please connect with Chiller. If not, connect with tap water)

Please set the flow rate at 2～3 litter/min



The connect to water-cooled holder is one-touch connector, so please insert it fully.

As the hight of connectors are different, please feed the water from bottom position and drain water from top position.

8) GAS

Gas connectors are “red”. Please connect with the water-cooled holder as shown by the photo.

GasIN can be connected with 1/4 inch tube for your preferable gas.

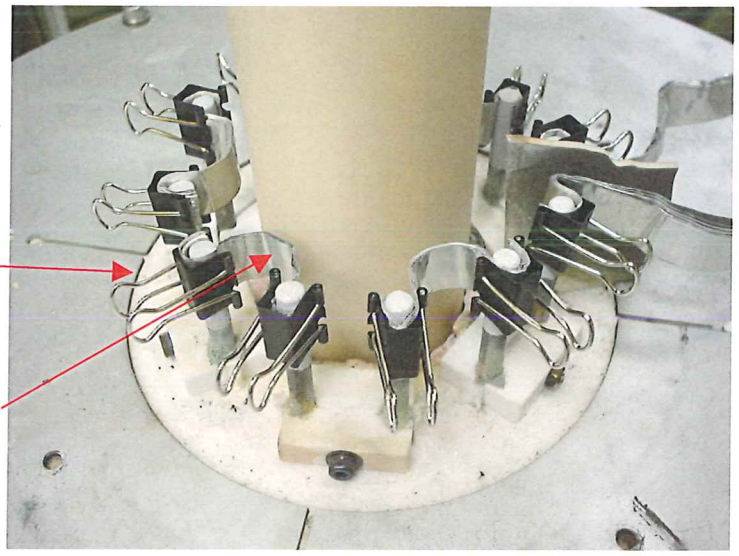
9) Connection of heaters

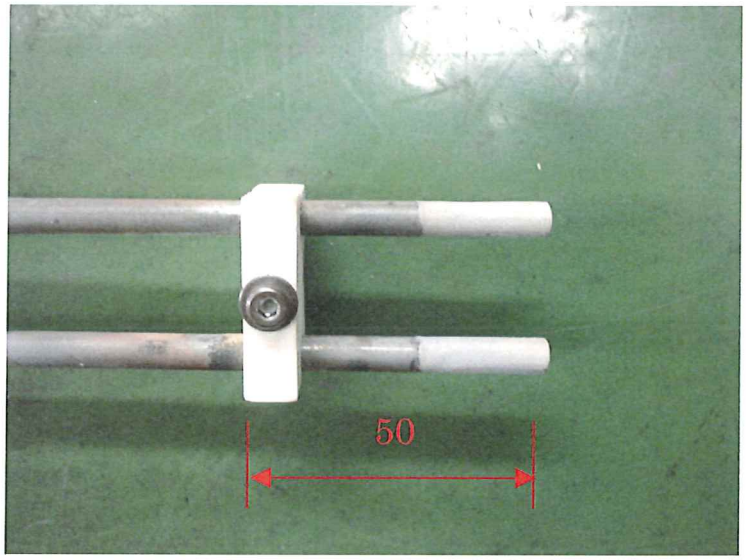
Insert Molysili heaters from upper direction as shown by the photo.

Please insert carefully because they are fragile.

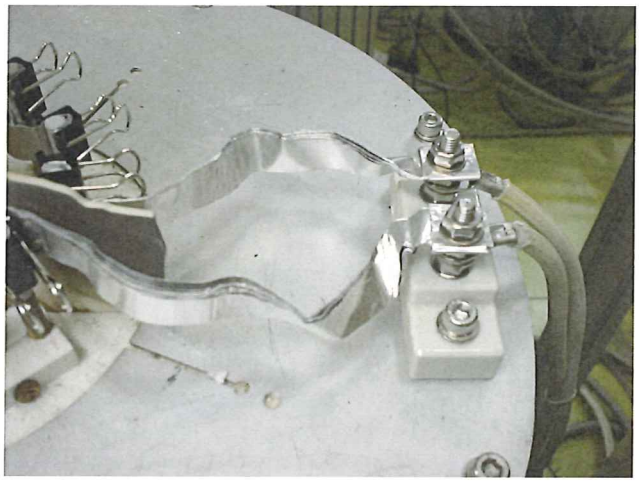
Clip

Aluminum Bus Bar

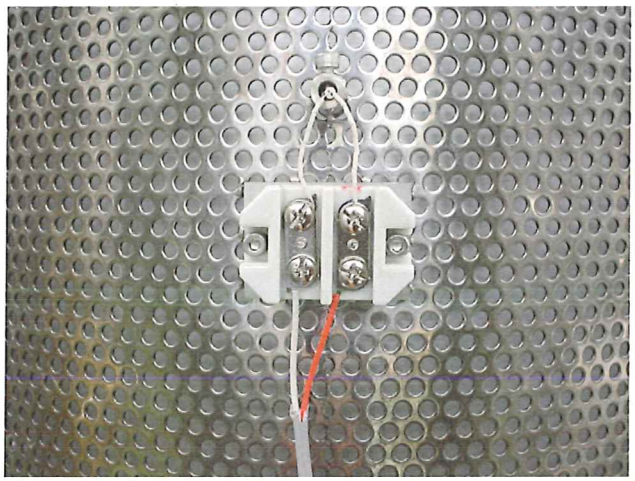




Connect the heater bur with the terminal tightly.



Connect the thermocouple with compensation lead.

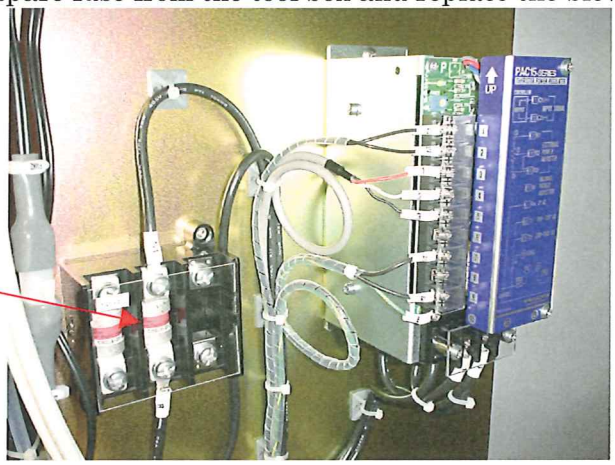


10) **Fuse**

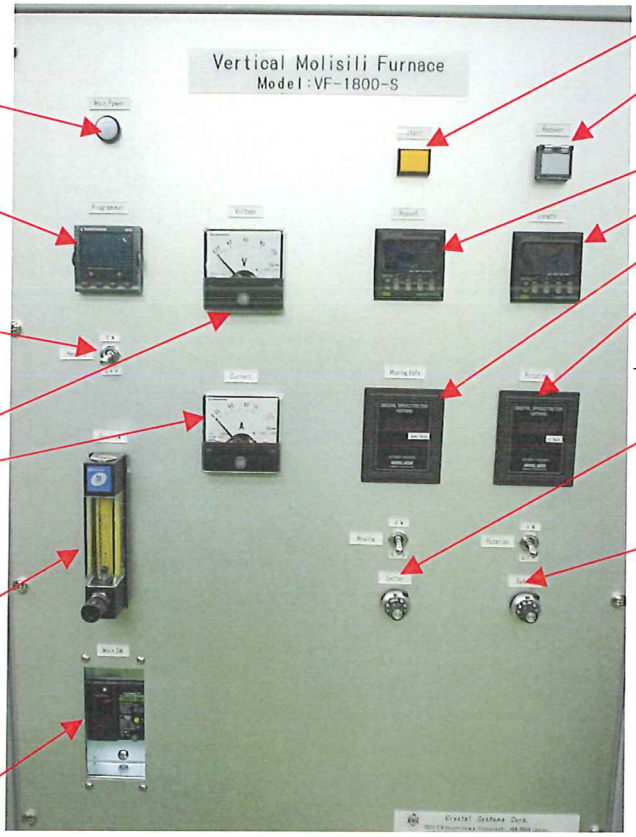
In the control box, the quick-melt-fuse is installed. Please check the fuse when power is off and no problem at other parts.、

when the fuse is blown, please pick up the spare fuse from the tool box and replace the blown fuse in the fuse box.

FUSE BOX



11) Parts explanation



Main breaker	Power is supplied when turn it ON
Power-input lamp	The lamp is on when power is supplied.
Program controller	Temperature can be increased or decreased by the program.
Output	When it is turned ON, the program controller sends signal and turns on the heater.
Current meter	It shows current value.
Voltage meter	It shows voltage value.
Flow meter	It is used for Air atmosphere control.
Start SW	It is used to up-and –down raw material rod.
Recover SW	Under whatever conditions, you can return to original position by pushing the return SW
Counter setting	How many sinterings will be done.
Sintering rod length:	To set the length of rod sintering

Vertical movement SW and speed adjuster: ON-OFF SW for up-and-down movement.
You can set the speed at your option

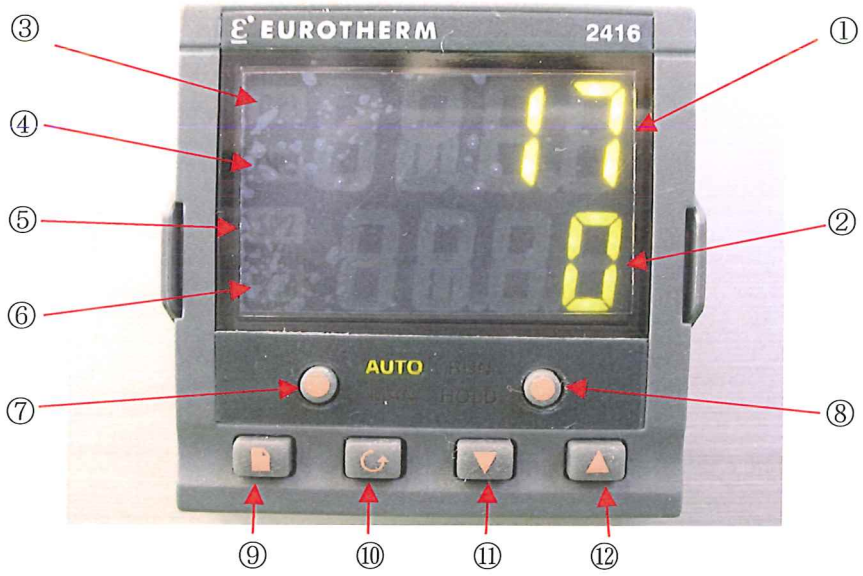
Rotation SW and speed adjuster: ON-OFF SW for rotation movement.
You can set the speed at your option

12) How to operate the program controller

12) -1 Introduction:

2416 controler is proud of high stability installed with self-tuning and adaptive-tuning. It has programming capability and you can program up to 16 segments regularly.

12) -2 Names and functions of each part:



① To indicate the set-up value or process value.

② To indicate set-point

③ (OP1)

When lit, it indicates that module 1 output is on.

④ (OP2)

When lit, it indicates that module 2 output is on.

⑤ (SP2)

When lit, it indicates that setpoint 2, (or a setpoint 3-16) has been selected.

⑥ (REM)

When lit, it indicates that a remote setpoint input has been selected.

⑦ • (AUTO/MAN)

To exchange automatic and manual modes.

⑧ • (RUN/HOLD)

It is used to make the program run or stop. When it is running, "RUN" is lit, and when it is temporary stop, "HOLD" is lit. "RUN" light flashes at the end of a program. And at the time of holdback, "HOLD" light flashes. After keeping on pushing 2 seconds, the program is reset and "RUN" or "HOLD" disappears.

⑨ • (Page button)

To show next list.

⑩ • (Scroll button)

To show next parameters..

⑪ • (Down button)

To decrease a value of setpoint or parameter

⑫ • (Up button)

To increase a value of setpoint or parameter

12)-3 How to operate

Following is the example of operating method to increase the temperature of the electric furnace.

Example) To increase the temperature by 200℃/hour up to 1,500℃.

I Push the main switch "ON".

II Confirm that the program output switch (heater output) is off.

III How to input the program

Please confirm that the display is HOME DISPLAY(No parameter is shown)

・ Press Page button three times

「ＰｒｏＧ Ｌｉｓｔ」appears

・ Press Scroll button three times.

「ｔｙＰＥ ｒｍｐ．ｒ」appears

※ ｒｍｐ．ｒ Ramp to a new setpoint at a set rate

ｒｍｐ．ｔ Ramp to a new setpoint at a set time

・ Press Scroll button one time

「ｔＧｔ」appears

・ Press Up button

Set「１５００」(to increase to １５００℃)

・ Press Scroll button one time

「ｒＡｔＥ」appears

・ Press Up button

Set 「２００．０」(２００℃／ｈ)

※ To increase too fast damages the heater, less than 200℃ is preferable.

・ Press Scroll button one time

「ＳｅＧｎ 2」appears

・ Press Scroll button one time

「ｔｙＰＥ　Ｅｎｄ」appears

※ Please refer to attachment in case you will make a program at next stage

・ Press Scroll button one time

「Ｅｎｄ　ｔ　Ｄｗｅｌｌ」appears

・ Press Page button six times

HOME DISPLAY　　PROGRAM ENDS

※ This program controller is multi-function, and the equipment itself is designed for Sintering of raw materials, therefore it is considered that above function is sufficient.

Ⅳ Turn heating switch “ON”

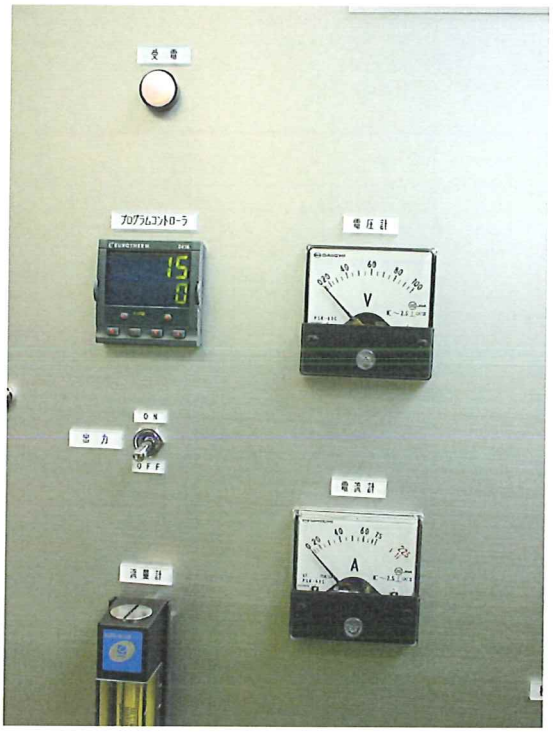
Ⅴ Press （ＲＵＮ／ＨＯＬＤ） button to start program

Ⅵ Confirm that “RUN” is lit.

Then the temperature-increasing program ends.

12) -4 To start OUTPUT

After setting the program,
please push RUN button.



12) -5 Program change on the way

Example) To insert new program when temperature is increasing, say, at 1,500℃

・ Press（ＲＵＮ／ＨＯＬＤ）button one time

↓ 「Ｈｏｌｄ」appears

・ Press Page button five times

↓ 

「ＳＰ Ｌｉｓｔ」appears

・ Press Scroll button one time

↓ 

「ＳＰ１」appears

・ｏｒ・ Press Up, Down button

↓ Set the same value as present（１５００）

・ Press (ＲＵＮ／ＨＯＬＤ) button and hold in for two seconds

↓

Ｈｏｌｄ disappears

↓

Input new program。

Input method is the same as 5)-3.

12)-6 PID set-up

Setting-up when shipped from the factory

「ＰＩＤ」values are as follows

Ｐｂ・・・・・・・ 72

ｔｉ・・・・・・・ 103

ｔｄ・・・・・・・ 4

Ｐｂ２・・・・・・ 5

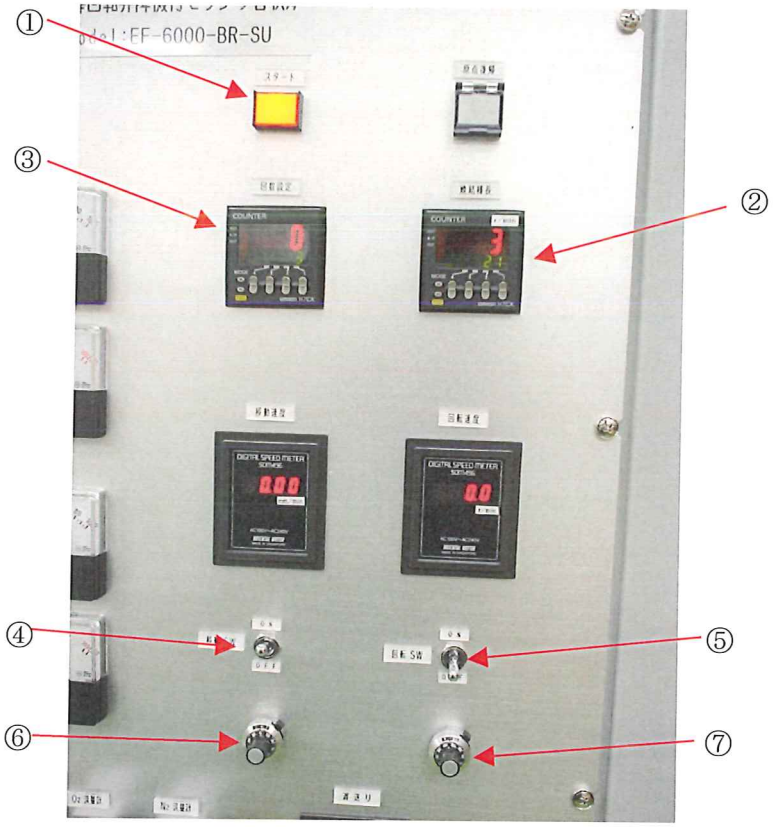
ｔｉ２・・・・・・ 58

ｔｄ２・・・・・・ 9

13) SAMPLE ROD ROTATIONAL LIFTER

13) -1 Rotational Lifter

When use as rotational lifter, please operate as follows;



(1) Input the sample rod length to be sintered at ②length of sintered rod.

(2) Input round-trip number of sintering at ③ counter.

(3) Turn on the up-and-down SW

(4) Turn on rotation SW ⑤

※ Regarding the speed rate, please set ⑥、⑦ beforehand.

(5) Turn on the start button ①, and initiate the sintering.

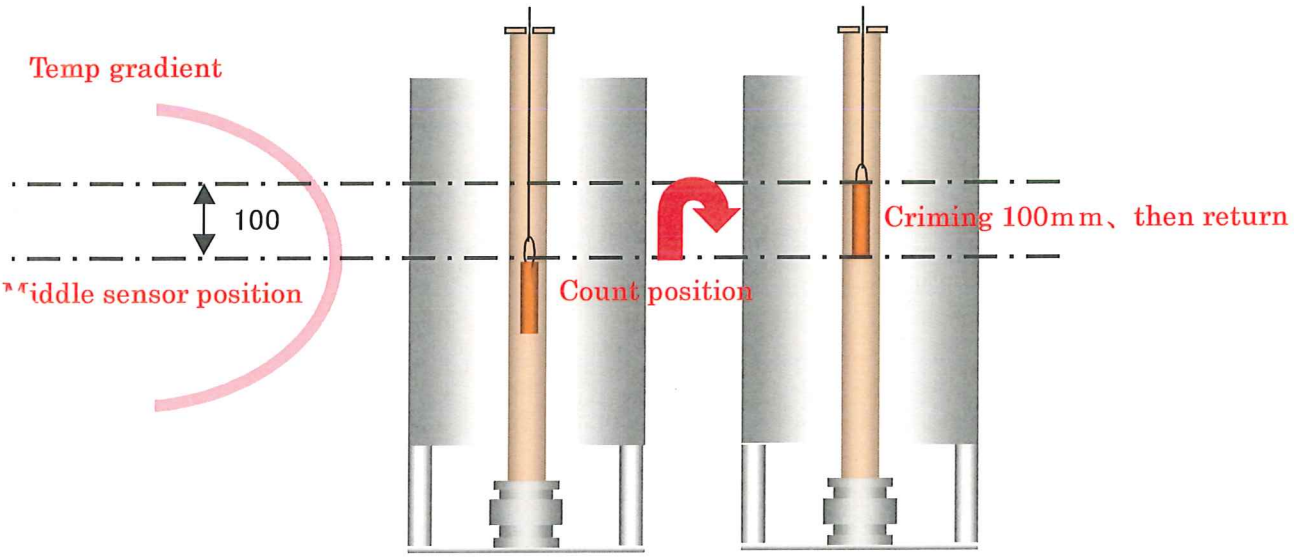
※ When the system stops by power supply stoppage or limit switch NG etc, by pushing the reset button, the system is designed to get back to original position (TOP position).

13) -2 The idea of how to count the up-sand-down

You have to input how long the sample is sintered in the furnace. At this time, you have to decide related factors such as the length of the raw material rod, round-trip number, moving speed.、

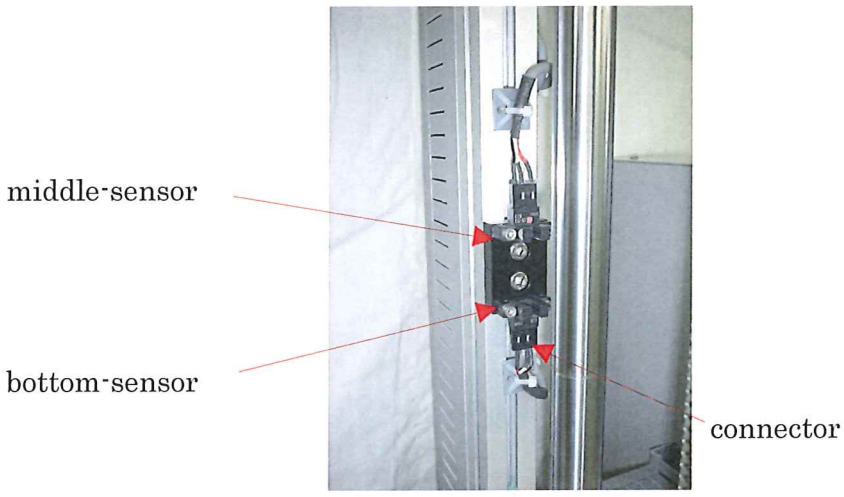
At present, it is designed that the fuck which suspends the sample is return back at the position of the sensor.

For a example, in case 100mm sample rod is to be sintered for 2 hours、the moving speed is set at 20mm/min and the round-trip number is set at 12 times.



1round trip takes 10 min, so 12 round-trip takes 2 hours. Including other movements than round trips, 1 job needs approximately 3 hours.

14) **Explanation of SENSOR**



Top sensor locates at original position. Middle sensor locates at the position of counting the round trips. It is designed that the fuck of sample suspending jig reaches the center of the furnace..

The bottom sensor is the limit switch which avoids the accidents in case the middle sensor gets out of order.

Just in case of the accident, the traveling part is stopping at the position of bottom sensor, so

just press the reset button. Then, pull out the connector of the sensor, the traveling part starts climbing and stops at the original position. Please contact the manufacturer.

15) ATTENTION:

- Please turn off the main breaker when no use in long time.
- Please install the furnace in the stable condition.

Drawing table

June.11.2012

Number	Drawing No	Name	Note
1	CIT125-200	Vertical Molysili furnace with Rotational lifter	
2	CIT125-201	CIRCUIT DIAGRAM	
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			

NO		DATE

California Institute of Technology

Production number CSS2403-5

	Date	Signature
Approved by	2012/6/11	I.Shindo
Checked by	2012/6/11	S.Ozawa
Drawing by	2012/6/11	S.Kimura

Name

Crystal systems corp.

Title

Vertical Molysili Furnace with Rotational Lifter

Model

VEF-1800-ACS

PARTS LIST

Title Vertical Molysili furnace with Rotational lifter

Model VEF-1800-ACS Drawing No CIT125-200

No	NAME	Model	QUANT	NOTE
1	BRUSHLESS MOTOR	AXHM230K-GFH GFH2G30	1	(ORIENTAL)
2	BAND	220J2	1	(BANDO)
3	BEARING	608ZZ	2	(NSK)
4	SENSOR	EE-SX671	4	(OMRON)
5	BRUSHLESS MOTOR	AXHM450K-GFH GFH4G200	1	(ORIENTAL)
6	ALUMINA TUBE	φ6×φ4×550L(SSA-S)	1	(CSC)
7	FIREPLACE WICK PIPE	φ60×φ50×900L (SSA-S)	1	(CSC)
8	MORISILIHEATER	1800 TYPE 200×200 ×6×3×25	6	(CSC)
9	THEMOCOUPLE	PR20:40 φ0.5×L=258 PIPE SSA-S	1	(CSC)
10	PIPE HOLDER	TYPEφ60 with GAS PORT	1	(CSC)
11	PILOT LIGHTS	AP6M266W AP6-026D	1	(IDEC)
12	PROGRAM CONTROLLER	EURO THERM 2416	1	(EURO THERM)
13	VOLTMETER	QS60V100N	1	(KASUGA)
14	TOGGLESWITCH	S-331UL	3	(NIKKAI)
15	AMMETER	QS60AS755N	1	(KASUGA)
16	FROW METER	RK1150-V-B-1/4-10L	1	(KOFLOK)

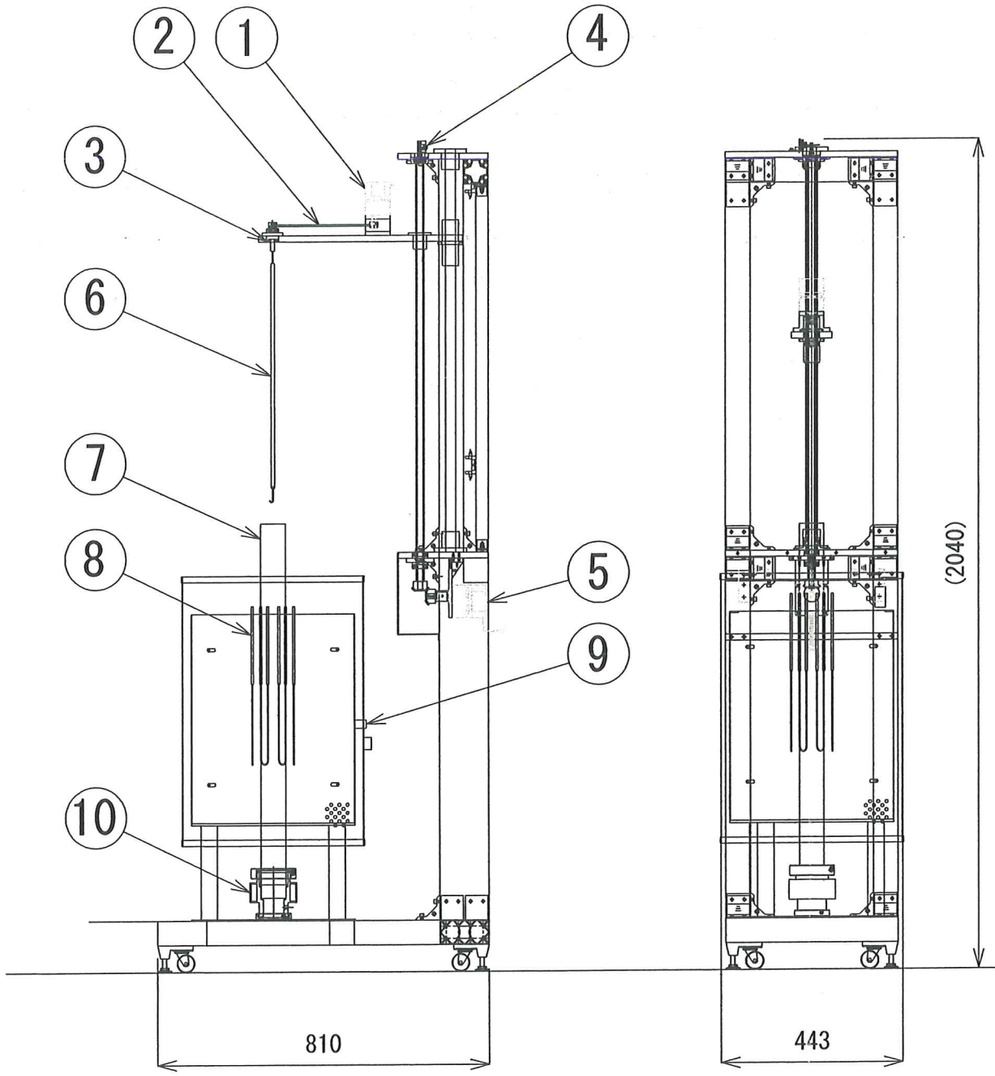
PARTS LIST

Title Rotating Lifter,Vertical Molysili Furnace

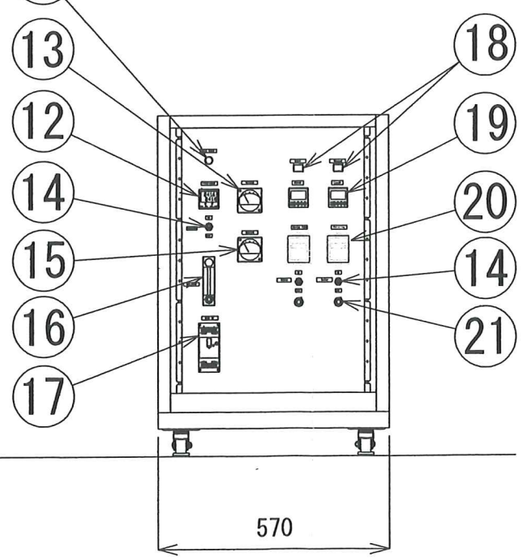
Model VEF-1800-ACS Drawing No CIT125-200

No	NAME	Model	QUANT	NOTE
17	MAIN POWER	EW32AAG-2P030B	1	(FUJI ELECTRIC)
18	PUSH BUTTONSWITCH	A16L-JWM-24D-2 A16L-JYM-24D-2	1	(OMRON)
19	DIGITAL COUNTER	H7CX-A4D	2	(OMRON)
20	DIGITAL ROTATION	SDM496	2	(ORIENTAL)
21	SPPED SETTING RECEPTACLE	22HP-10M 20kΩ MG20-22B	2	(SAKAE)

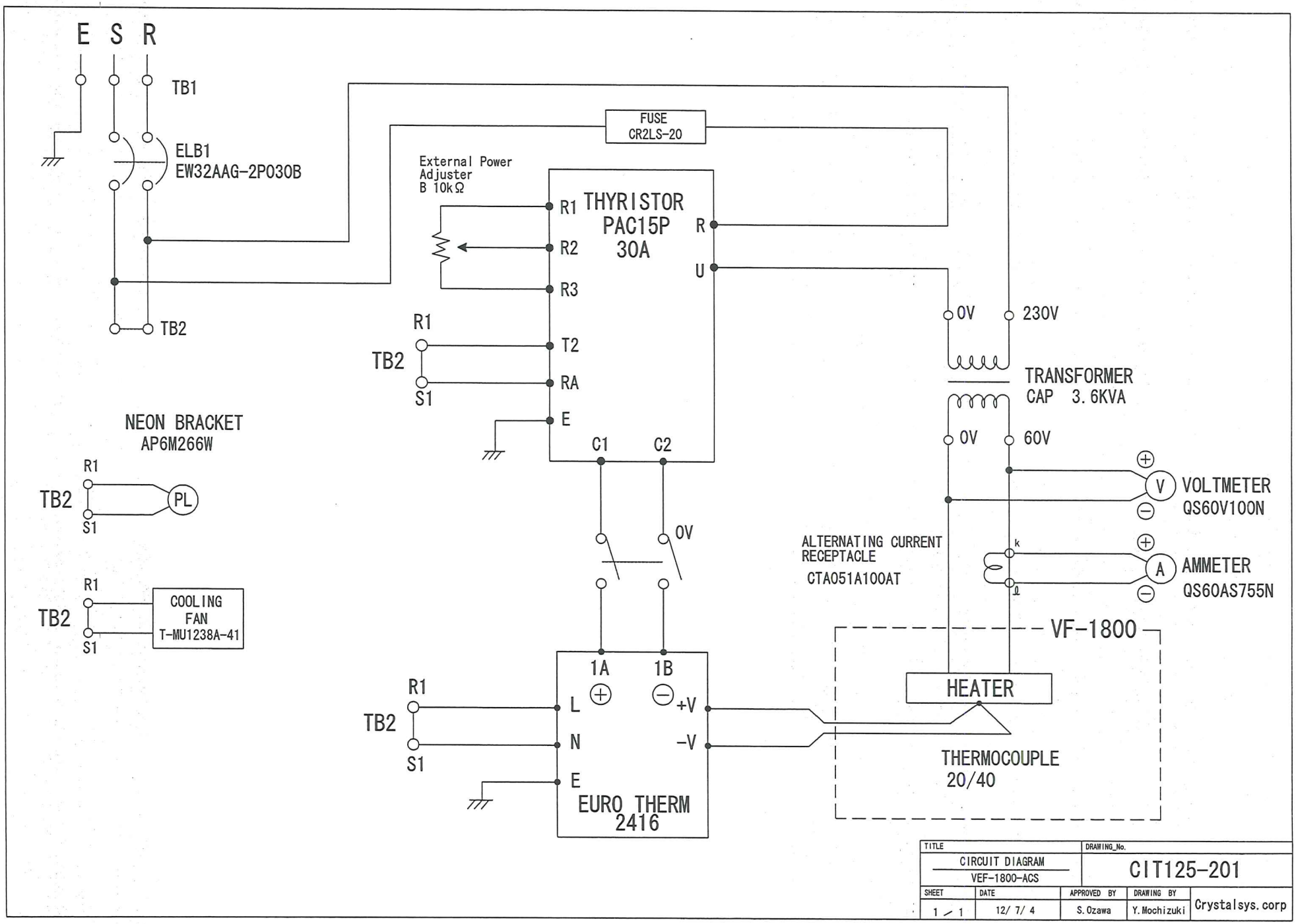
Vertical Molisili Furnace
Rotational Lifter



CONTROL BOX

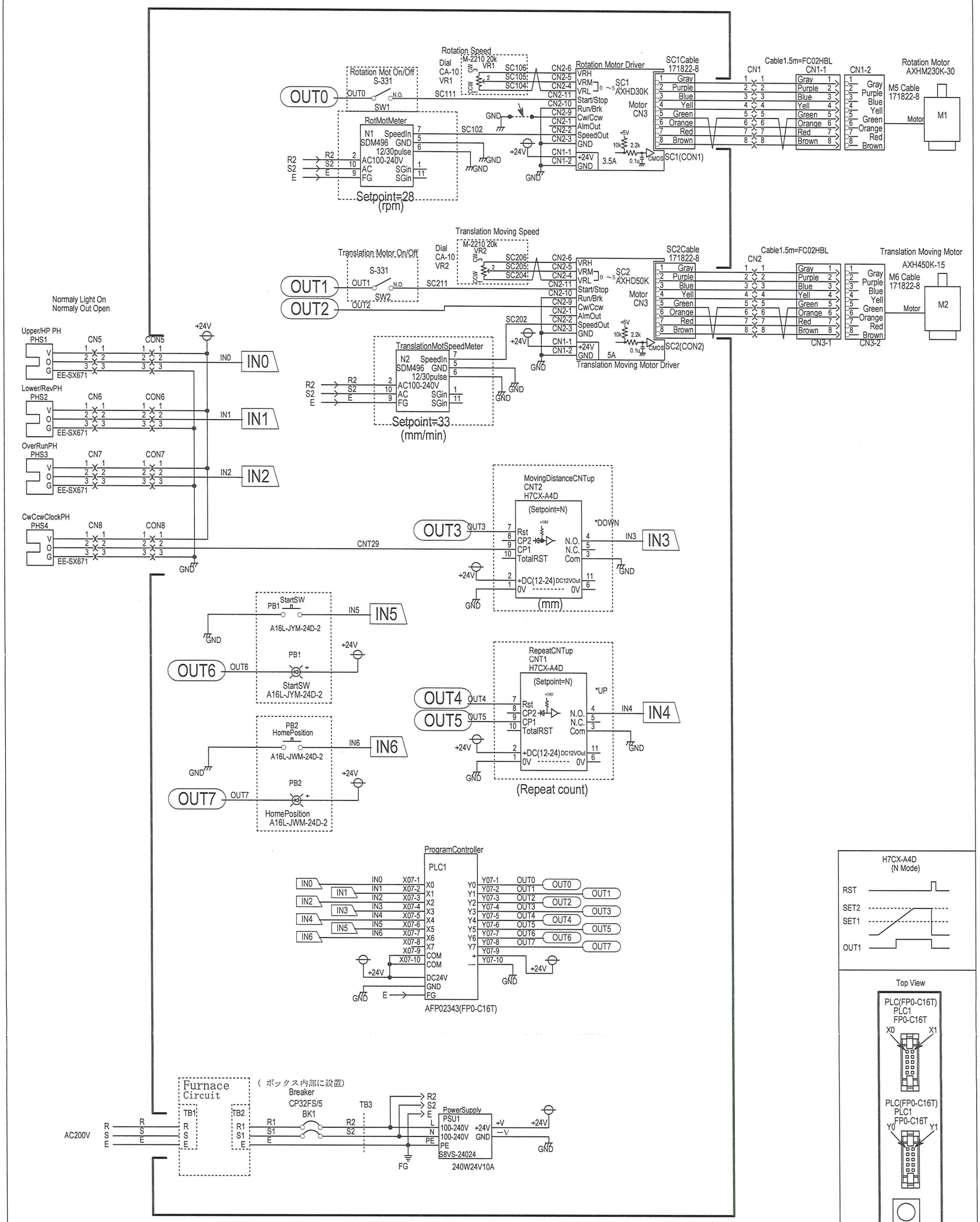


Make	Date	Revise	Sign
	Scale 1/15	Date 12/ 7/ 4	Title Vertical Molisili Furnace Rotational Lifter
Approved by I.Shindo	Checked by S.Ozawa	Drawing by S.Kimura	Model VEF-1800-ACS
Crystal Systems corp.			Drawing No. CIT125-200



TITLE		DRAWING_No.	
CIRCUIT DIAGRAM VEF-1800-ACS		CIT125-201	
SHEET	DATE	APPROVED BY	DRAWING BY
1 / 1	12/ 7/ 4	S.Ozawa	Y.Mochizuki

Crystalsys.corp



TITLE	DRAWING_No.
Feed Rod Rotational Lifter Electronic circuit diagram	10630005

SHEET	DATE	DESIGN	
1 /1	2007/07/12 18:16	S.O.	CRYSTAL SYSTEMS INC.

PLCLifter.dcd 2006/05/22 16:28 Print 2008/03/17 11:14