

RBF37+ ROTATING BURNOUT FURNACE



OPERATIONS MANUAL

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1. SAFETY INFORMATION



WARNING

1. Since this machine produces very high temperature (more than 700 degrees Celsius), always pay attention not to suffer burns.

Do not allow unskilled or untrained person to operate this machine.

2. This machine is electric furnace designed for lost-wax casting. However, depending upon material, it may be possible to use the machine for burning plastics (such as material for Rapid Prototyping). If you need to use plastics, examine properties of the plastics beforehand thoroughly and carefully and check for safety because various plastic materials are distributed on the market.

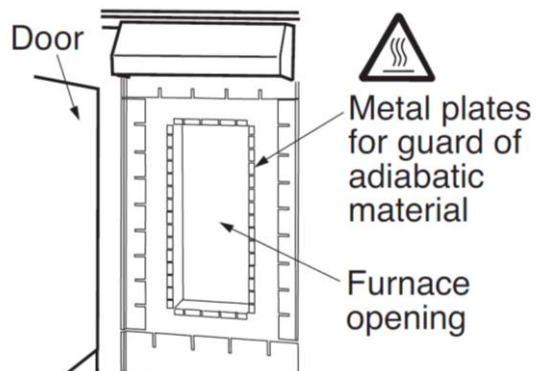
3. Do not use or stock any inflammable gas, inflammable volatile liquid, or organic solvent near the machine or in the room where the machine is installed.

4. When incomplete combustion gas of wax is generated, do not open the door. If you open the door at this time, inside of the furnace may be combusted and flame may spread toward front through the gap between the door and the furnace body.

5. Before connecting tubes for auto door, be sure to set the insert pin to the handle of door to release the door lock. Removal of the insert pin after the auto door has been installed may cause unexpected and very rapid opening of the door, which may cause injury.

6. Never stand in front of the door, when air is initially supplied to the auto door or when air is once shut off and then supplied again to the auto door to replace air supply source, as the door may unexpectedly and rapidly open or close, which may cause injury.

7. During or just after burnout, surrounding parts of the furnace opening especially the metal plates for guard of the adiabatic material are heated to very high temperature, So take utmost care not to burn your hands etc.



8. Before opening the door, ensure for safety that there is nothing in the door's way.
9. Do not leave the door of the furnace open when the machine is not used.
10. Always keep clean inside of the furnace. Investment residue or dusts on the turntable or the wax drain orifice etc. may cause clogging and prevent wax from draining out of the furnace. As a result, a large amount of incomplete combustion gas is discharged.
11. Do not pile up flasks. If flasks fall down, the inner wall of the furnace may be damaged. Further, if they come into contact with the heater wires, an accident such as short-circuit may be caused.



CAUTION

1. Periodically, check and clean the rotation driving parts. Remove wax on the bearing system.
2. Do not try to cool inside of the furnace forcibly and very rapidly using a fan. Particularly, if forced cooling is done when the machine is heated to high temperature, the door frame material may be cracked or deformed.
3. When burning out a large number of flasks in one batch, take ample time for each step of burnout cycle.
4. Always use the wax collection container. A deep container is recommended because drained wax will not splash around.
5. If you operate burnout of stone-set flasks, be sure to check that the overheat protection key switch is turned to on, check the set temperature limit value of overheat protection device beforehand, and change the set value if necessary to proper value.

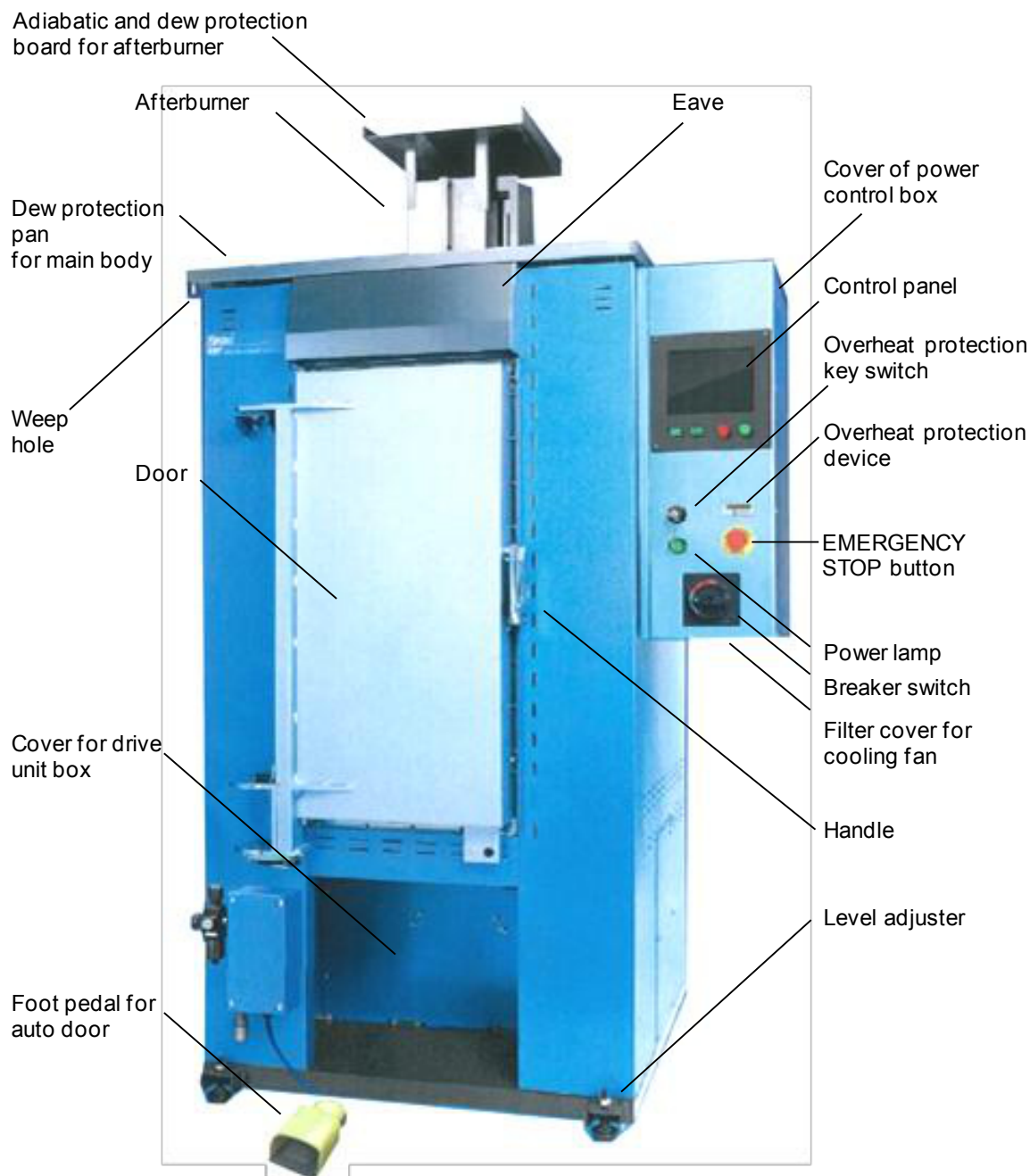


- The manufacturer shall in no event be liable for any damage resulting from improper use, negligence to follow the warnings and cautions in the instructions manual or the labels on the machine, unskillfulness, use of non-original optional / consumable accessories / spare parts, non-authorized modification.
- The manufacturer shall in no event be liable for any consequential or indirect damages including, but not limited to, loss of production or loss of profit or damages due to machine downtime.
- Damages to the instrument and / or human bodies resulting from contacting with high temperature parts, and their consequential or indirect damages are not compensated by the manufacturer.
- Damages resulting from delay of reaction at emergency and mistaken operation are not compensated by the manufacturer.
- Damages from electrical noise, over voltage, or wiring error are not compensated by the manufacturer.
- Casting results (including burnout for normal precious metal casting, for stone-in-wax casting and etc.) by this manual are not compensated by the manufacturer.
- No part of this document may be copied or in any way reproduced without the expressed written consent of the manufacturer.

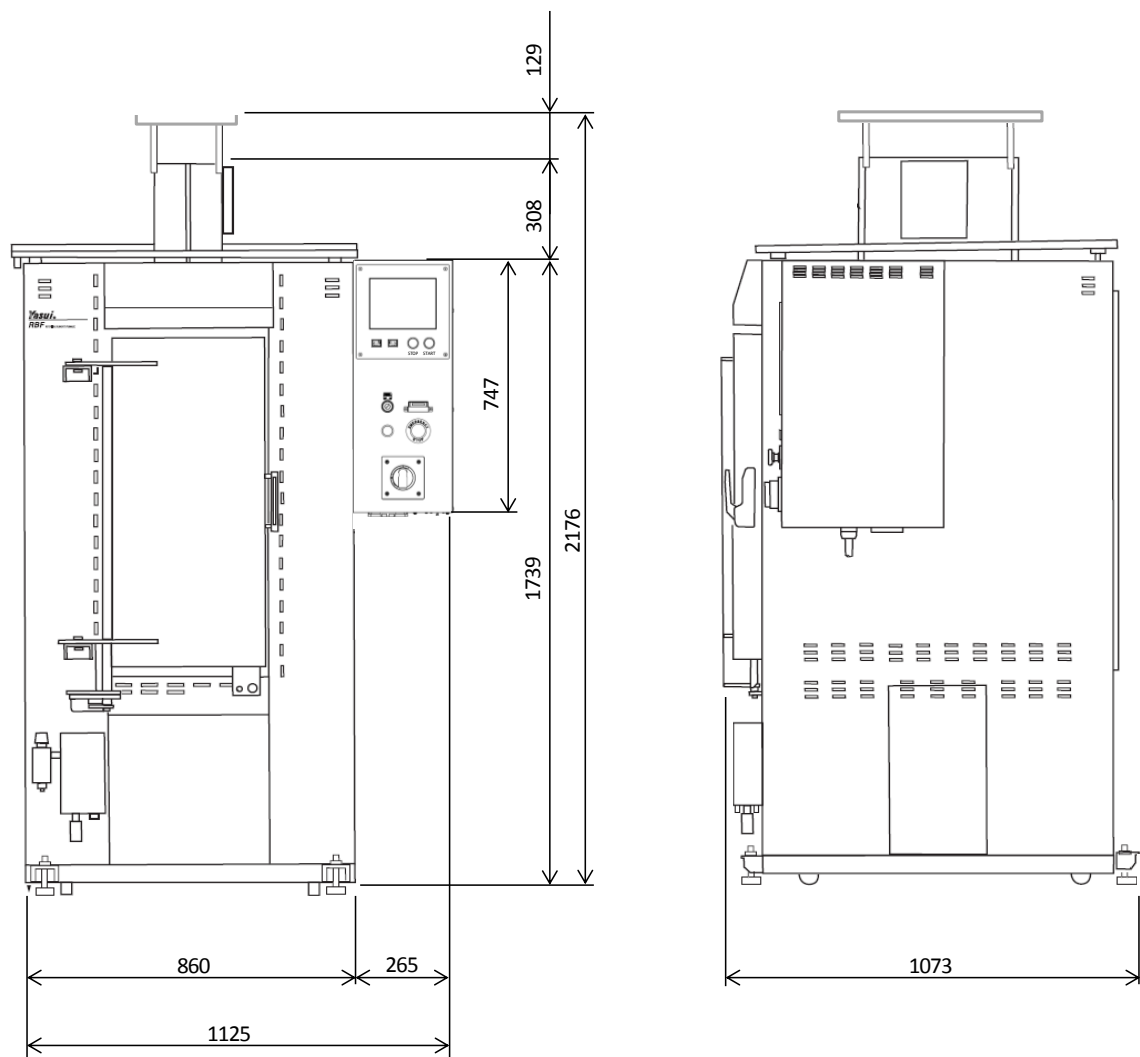
PREPARATION AND INSTALLATION

2. NOMENCLATURE

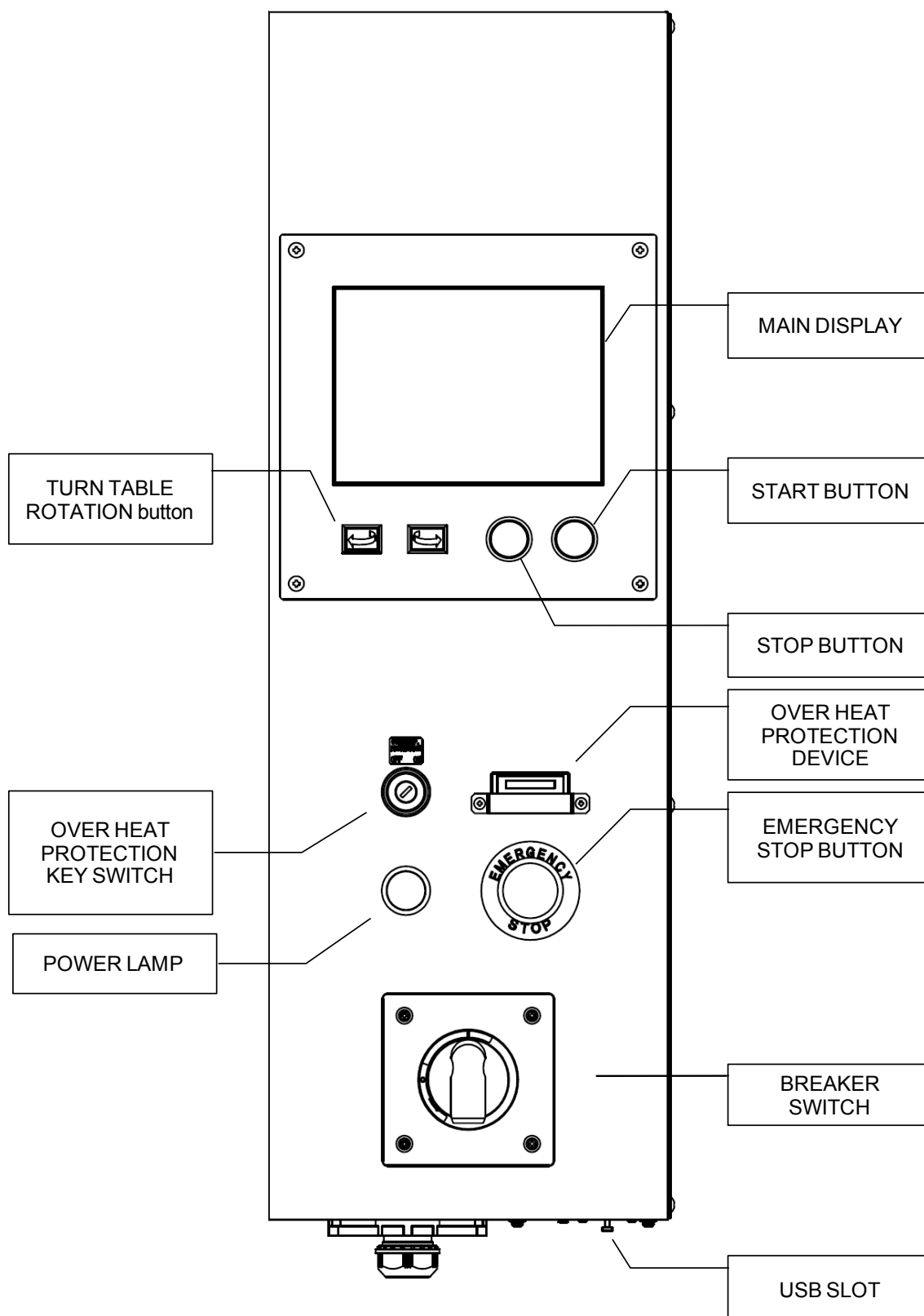
2-1. FRONT VIEW



2-2. DIMENTIONS



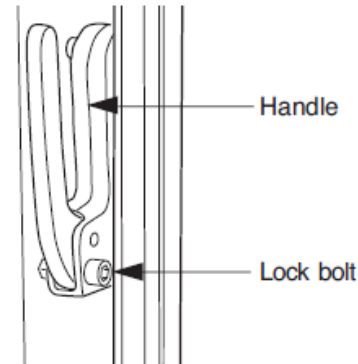
2-3. OPERATION PANEL



3. INSTALLING

3-1. UNPACKING

- 1) Remove the hex-socket head lock bolt of the handle with a hex wrench. Keep this bolt to transport the machine when necessary in the future.
- 2) Open the door, and remove cushioning material between the turntable and the heater. (Do not give unnecessary strong force at this time, otherwise the heater surface may be damaged.)



3-2. MAIN UNIT



IMPORTANT

Great attention should be given to ambient temperature at installation of the machine. In case two or more machines are arranged side by side, allow enough spacing.

Do not use the machine in a closed room.

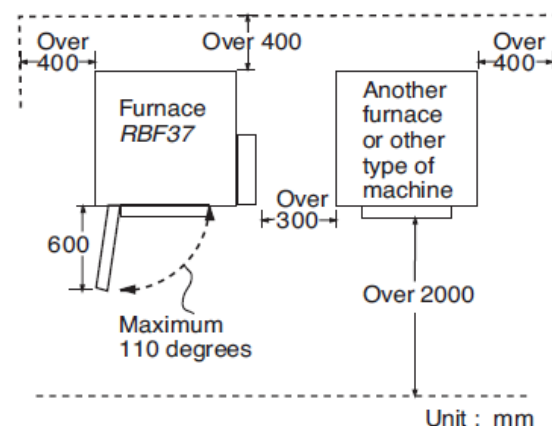
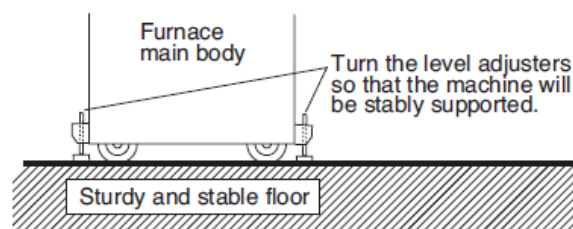
Provide adequate ventilation of air for the machine.

- 1) When doorways are not wide enough, the power control box can be separated from the furnace body temporarily. Contact the distributor at your place.

- 2) Mount the machine on a sturdy place endurable to weight. (Weight of the machine may be more than 600 Kg when flasks are contained.)

- 3) After placement of machine, turn the level adjusters so that the machine will be stably supported by the level adjusters.

- 4) Sufficient clear space should be left around the machine so that daily operation and maintenance will not be obstructed. Especially, if another furnace is placed next, there should be at least 300 mm clearance between the machines.



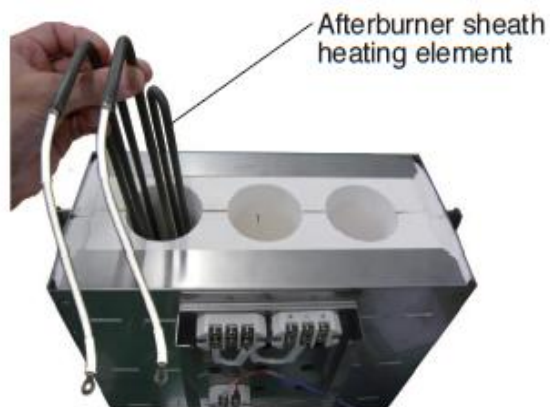
3-3. AFTERBURNER



CAUTION

- [1] Wiring should be made by a qualified technician under correct method.
- [2] Be sure to turn power off before installation.
- [3] Take care not to drop a screw or the like in the main body of the furnace. If you happen to drop it, be sure to pick it up, otherwise it might cause short-circuit.
- [4] Do not move the position of the thermocouple.

- 1) Place the sheath heating element deliberately into the hole of afterburner unit.

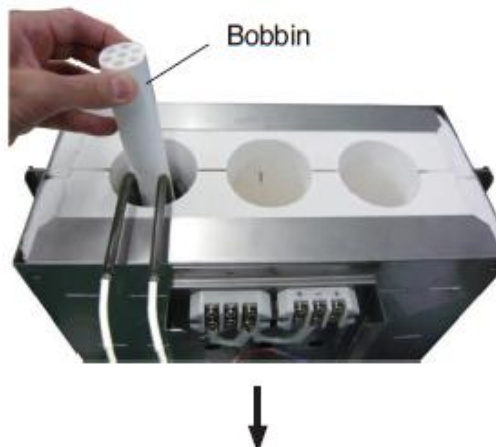


- 2) Place the afterburner bobbin deliberately.



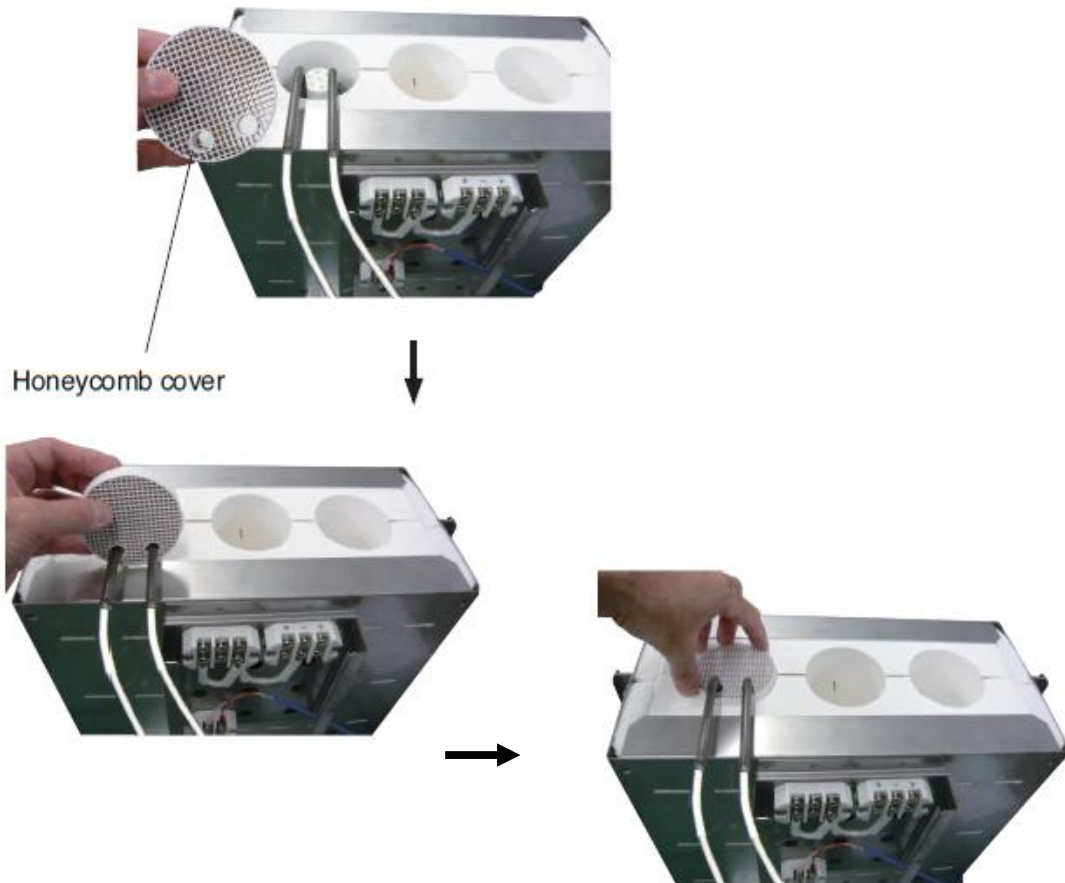
CAUTION

Take care not to drop the sheath heating element and bobbin, because the parts of the machine may be damaged.





3) Place the honeycomb cover in position passing the cables through its holes as the below figures.



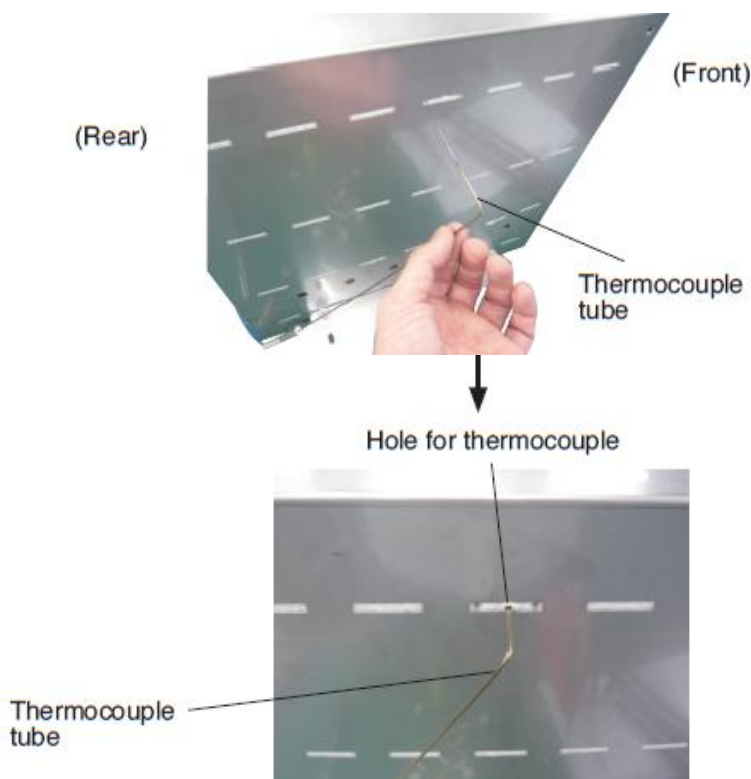
4) Connect the cable for sheath heating element to the terminal block for afterburner.



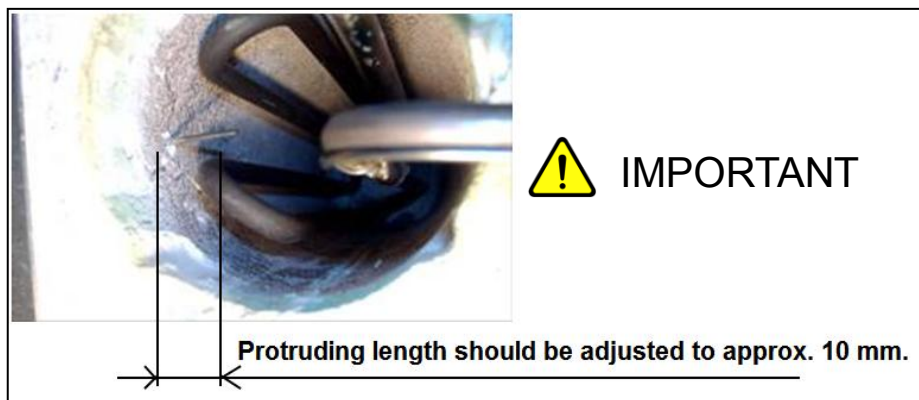
5) Repeat the above 1) to 4) for other two afterburner sheath heating elements.



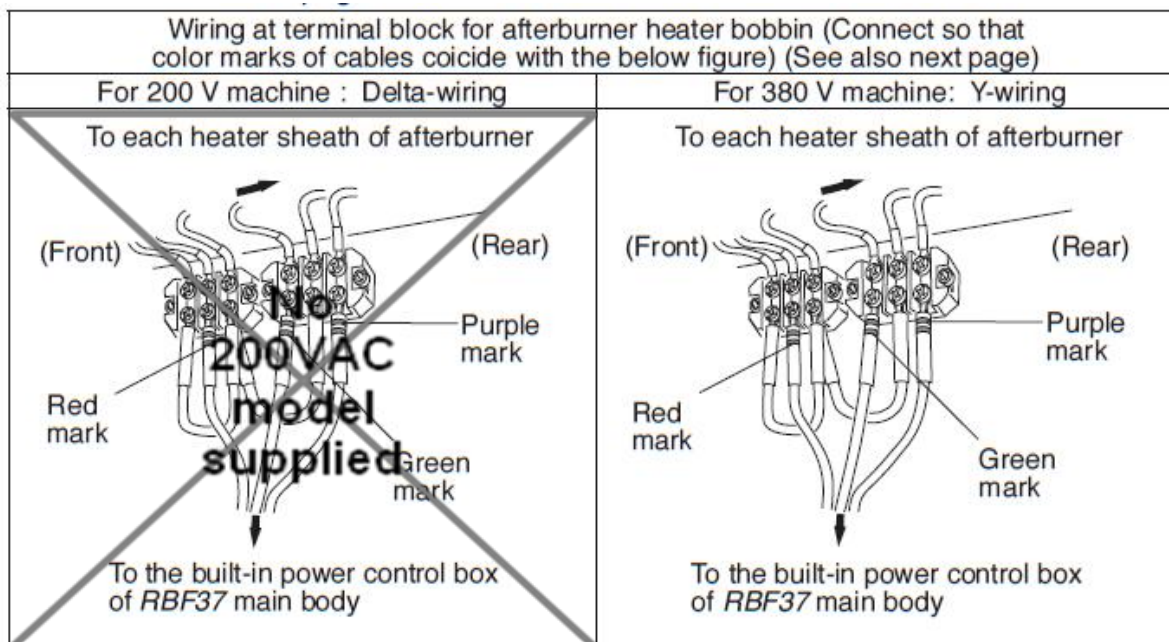
6) Insert the tip of thermocouple tube into the hole for thermocouple as the below figures.



7) Fix 2 parts with included saddles like this.



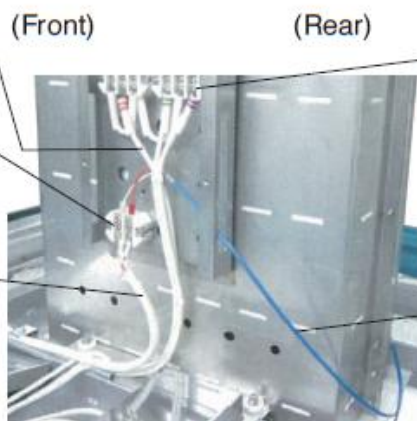
8) Place the afterburner to the top of the RBF37 main body. Connect the cables for the afterburner heater from the built-in power control box of RBF37 main body as the figures below and in the next page.



Cable for afterburner heater from the built-in power control box of RBF37 main body

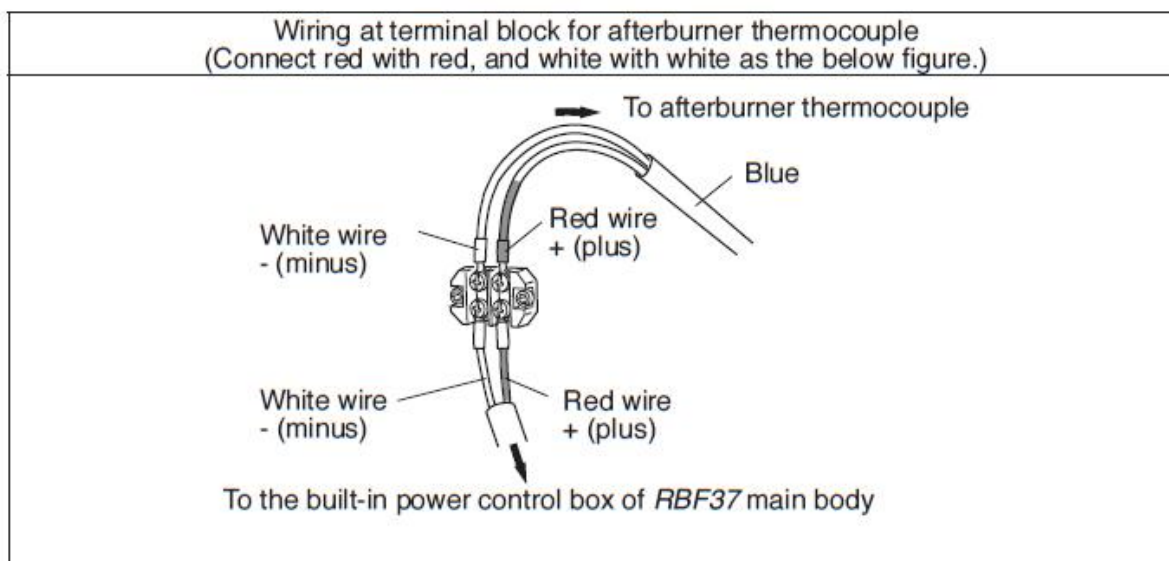
Terminal block for afterburner thermocouple (See the below enlarged figure.)

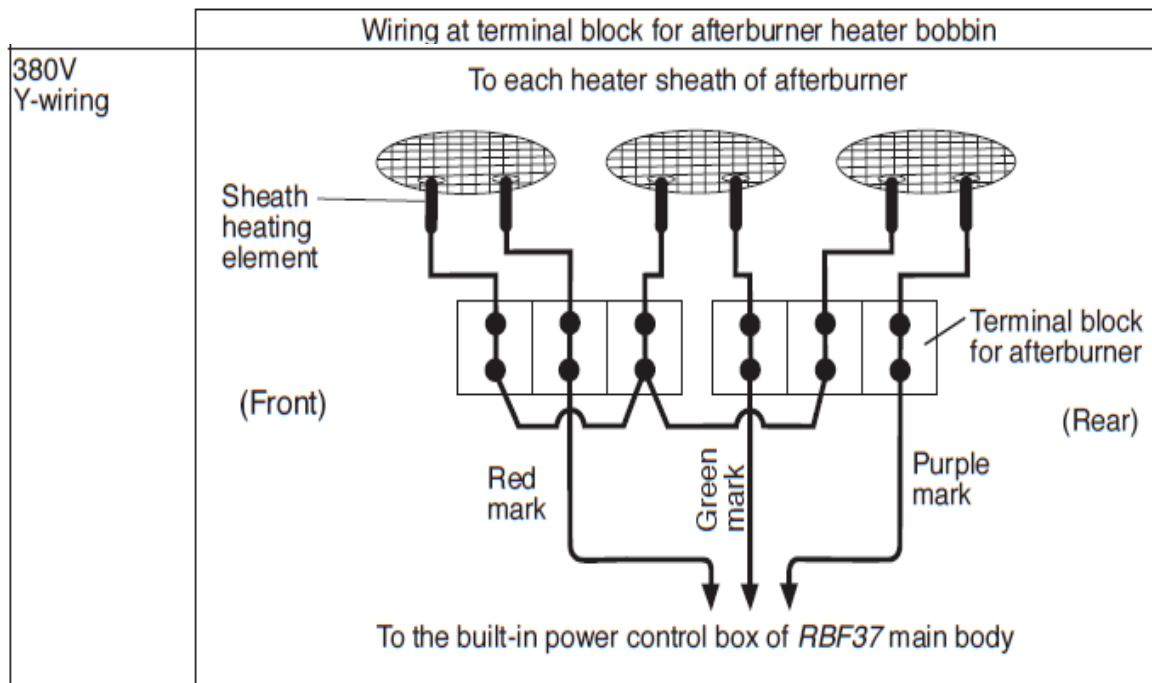
Cable for afterburner thermocouple from the built-in power control box of RBF37 main body



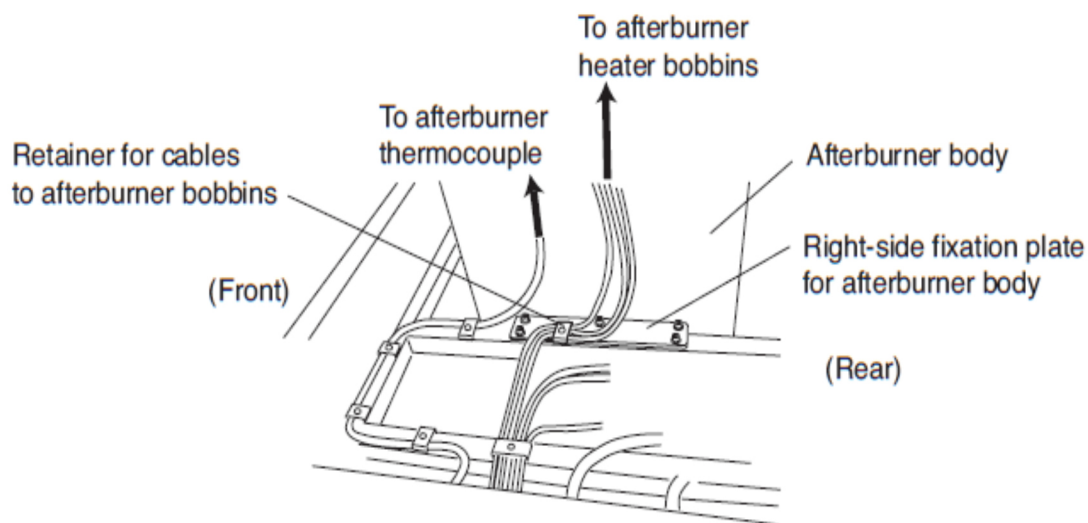
Terminal block for afterburner heater bobbin (This photo image shows wiring for 380V machine: Delta-wiring). Wiring is different in case of 200V machine. (See the above enlarged figures.)

Cable for afterburner thermocouple

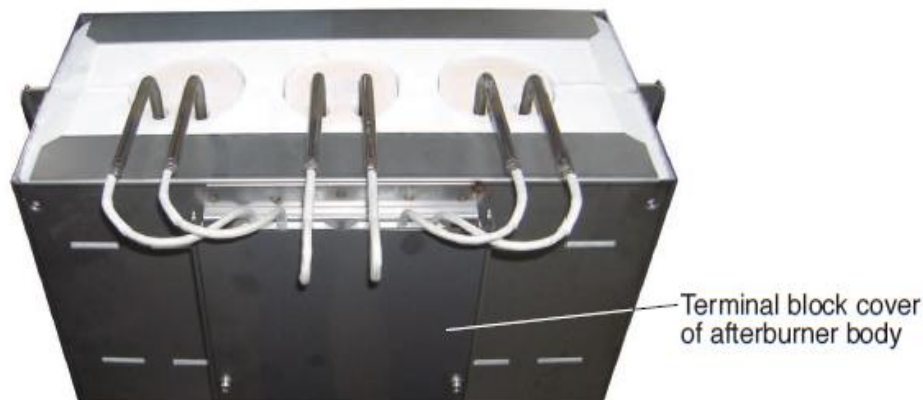




9) Fix the afterburner body with the fixation plates and bolts. On the right side, fix the cables for afterburner with the retainer to the fixation plate for afterburner body.



10) Attach the terminal block cover of afterburner body .

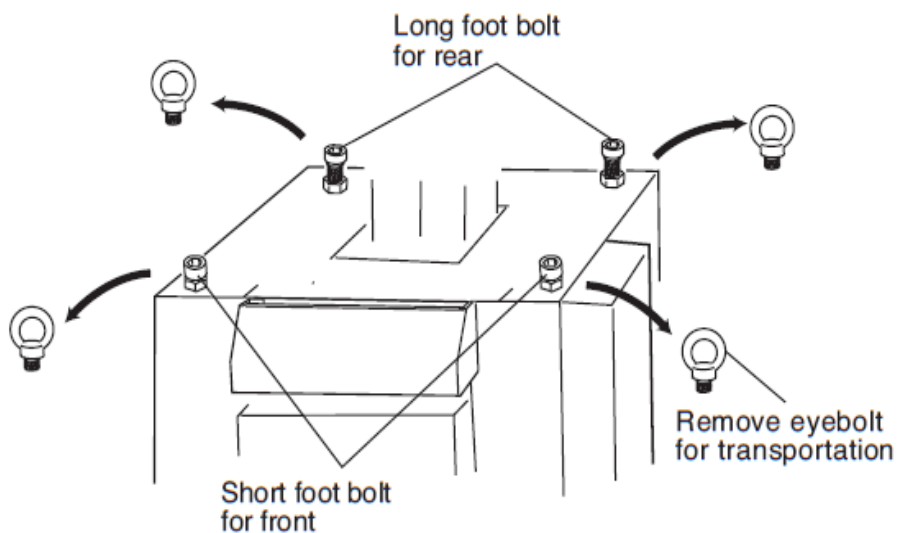


11) Unscrew the four eyebolts. Screw in the long foot bolts at the rear screw thread holes. Screw in the short foot bolts at the front screw thread holes.

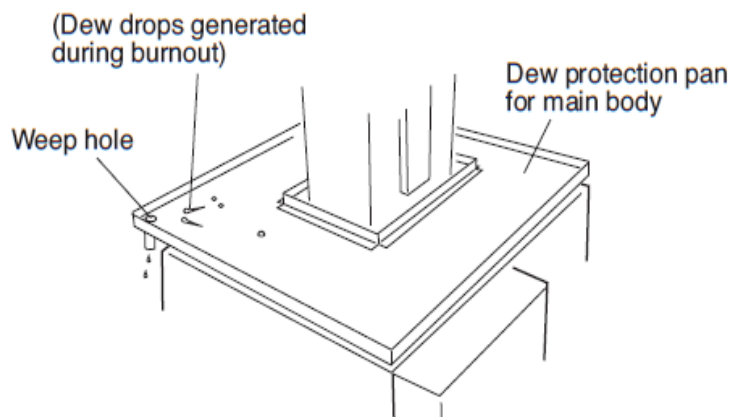


IMPORTANT

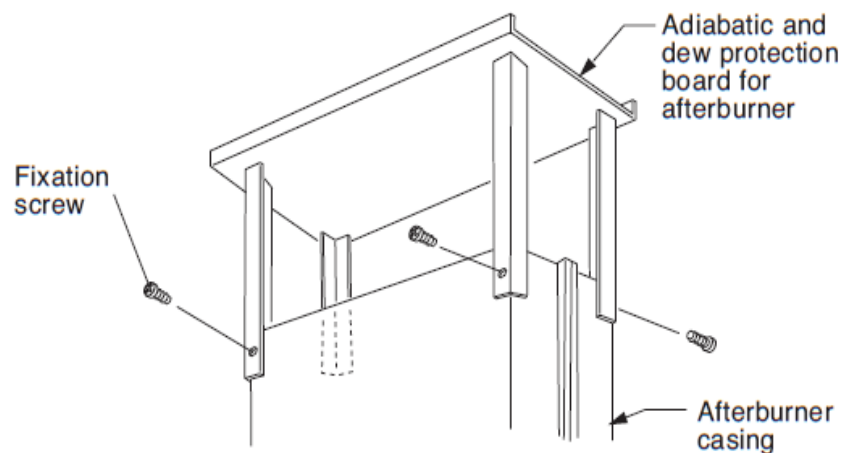
By screwing the long foot bolts into the rear threaded holes, the dew protection pan for main body can be inclined (its front will be lower than its rear). Generated water drops will naturally flow toward the weep hole. So be sure to use the longer bolt at the rear and the shorter bolts at the front.



12) Place the dew protection pan for main body as figure (the weep hole should be positioned at the front left corner), so that water droplets generated during burnout will not enter inside the RBF37 main body.



13) Be sure to assemble the adiabatic and dew protection board for afterburner as the figure.



3-4. CONNECTING POWER SUPPLY

Connect the machine to the specified power source.

Accepts input of 3-phase, AC 380 V only.



WARNING

[1] Connect to specified power supply only.

[2] Be sure to connect the grounding wire to avoid electrical shock hazards.

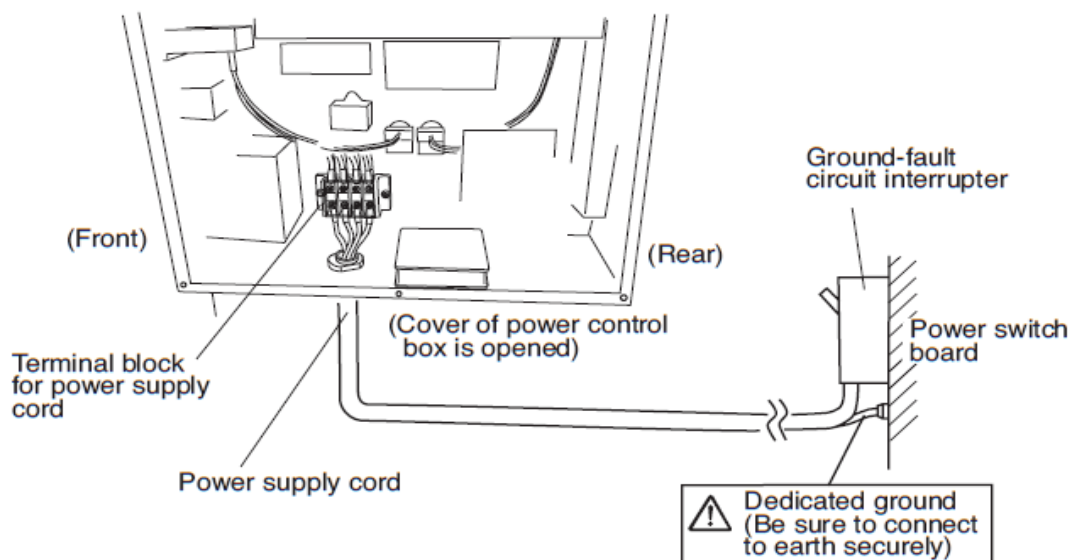
[3] This machine is not equipped with a ground-fault circuit interrupter.

Connect to the round-fault circuit interrupter on the power switch board in your factory. If the grounding wire is not earthed correctly, the ground-fault circuit interrupter may not work normally.

Connect the grounding wire correctly.

[4] Wiring should be made by a qualified electrician.

- 1) Loosen the fixation screws of the cover for power control box and remove the cover.
- 2) Connect the power supply cord to the inside terminal block. Connect in correct phase sequence. Connect the grounding wire for protection from electric hazard.
- 3) Close the cover.



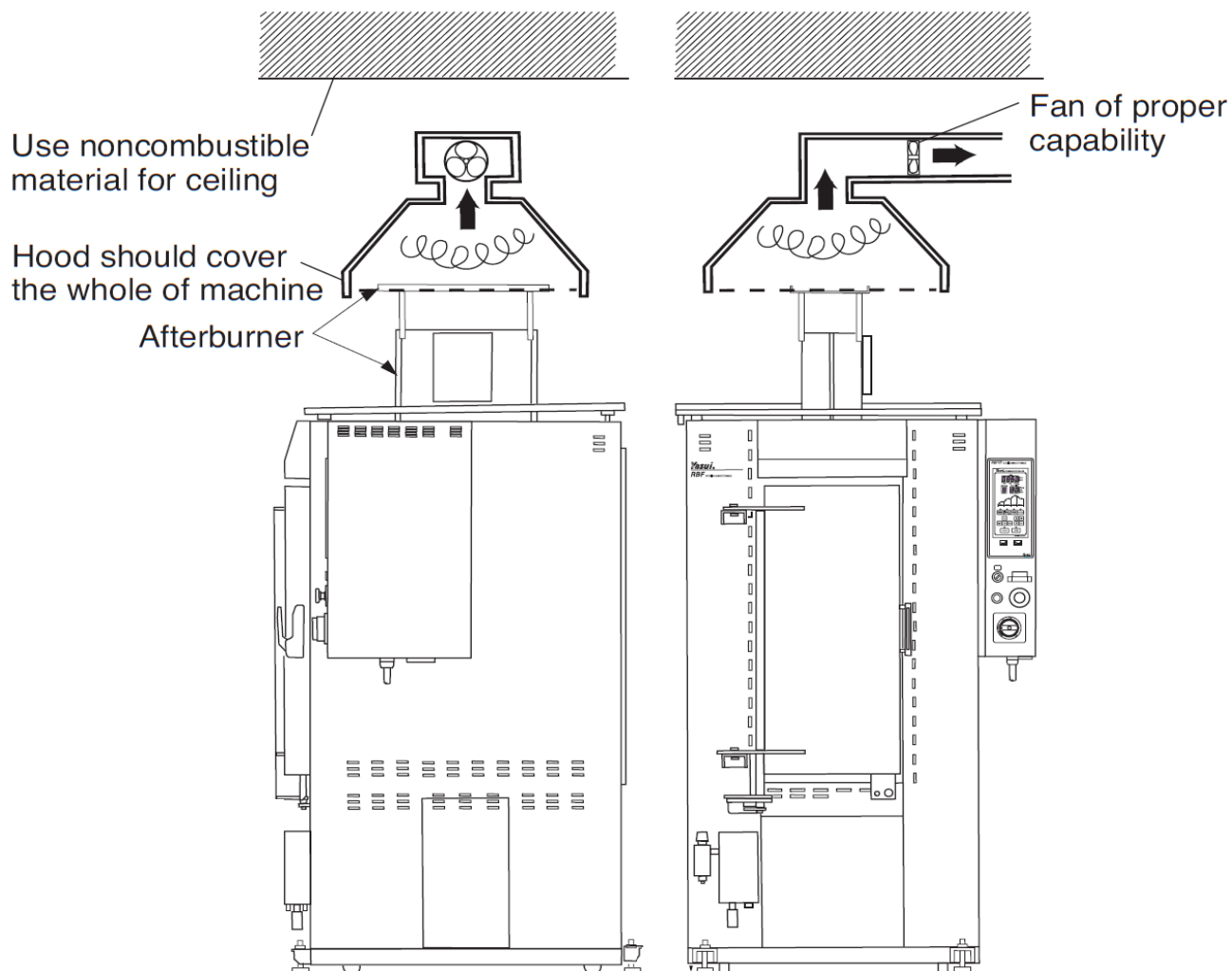
3-5. EXHAUST SYSTEM

Install equipment for exhaustion such as exhaust duct.



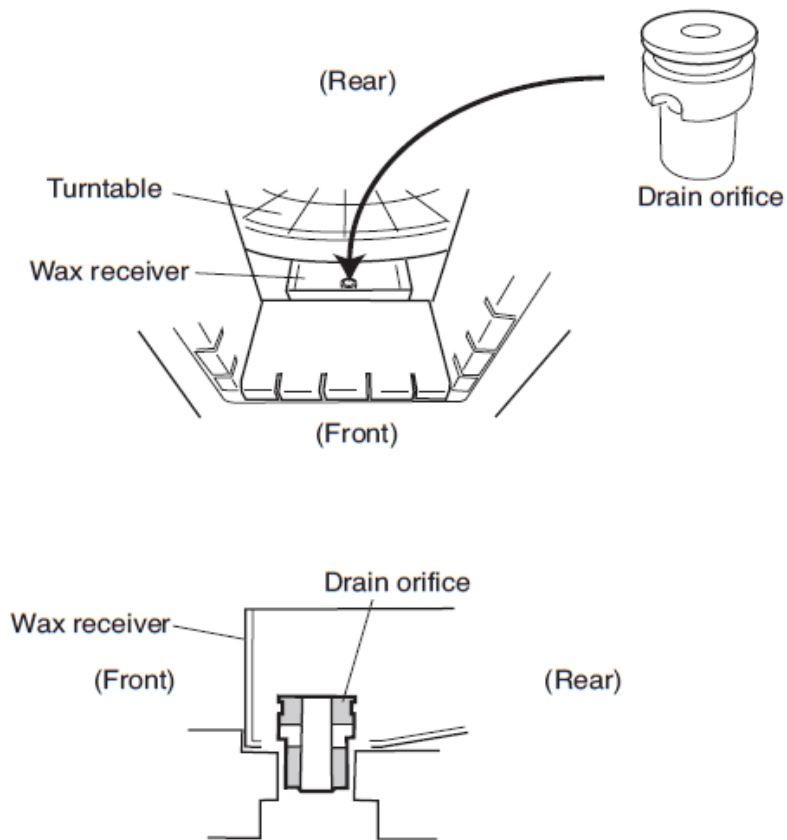
WARNING

- [1] Building of exhaust system should be done by a qualified technician.
- [2] Use noncombustible material.
- [3] Install high power fan suitable for exhaust of fumes.
- [4] Dew drops should not fall directly onto the machine body.
- [5] Make the exhaust system earthquake-resistant.
- [6] Check the exit of the exhaust device periodically to see that it is not obstructed by birds' nest or by other causes and that the exhaust fan works normally.



3-6. DRAIN ORIFICE

The drain orifice is used for limiting the amount of air which flows inside the furnace. Remove and clean the drain orifice periodically.



IMPORTANT

Always place a container below the drain orifice for collecting wax.

3-7. SETTING AUTO DOOR

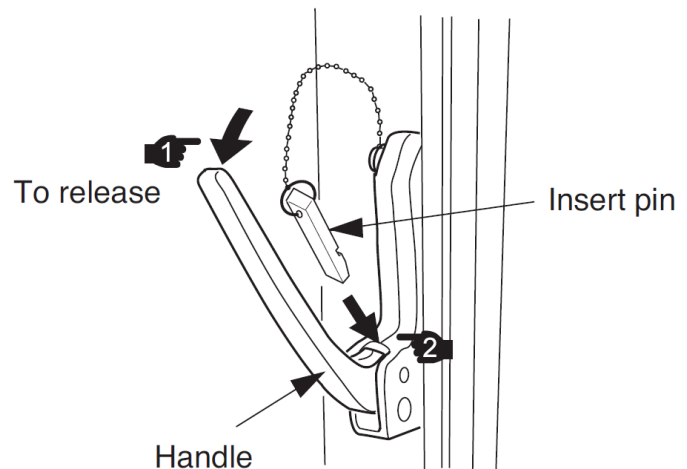


WARNING

- [1] Before connecting tubes for auto door, be sure to set the insert pin to the handle of door to release the door lock. Removal of the insert pin after the auto door has been installed may cause unexpected and very rapid opening of the door.
- [2] Never stand in front of the door, when air is initially supplied to the auto door, because the door may unexpectedly and very rapidly open or close.
- [3] Never stand in front of the door, when air is once shut off and then supplied again to the auto door to replace air supply source, because the door may unexpectedly and very rapidly open or close (because of same reason as above [2])
- [4] Do not bend or kink the air supply tube.

3-7-1. RELEASING DOOR LOCK

When the auto door is used, pull the lever of door handle and insert the pin as shown in the figure so that the door will be set to unlocked position.



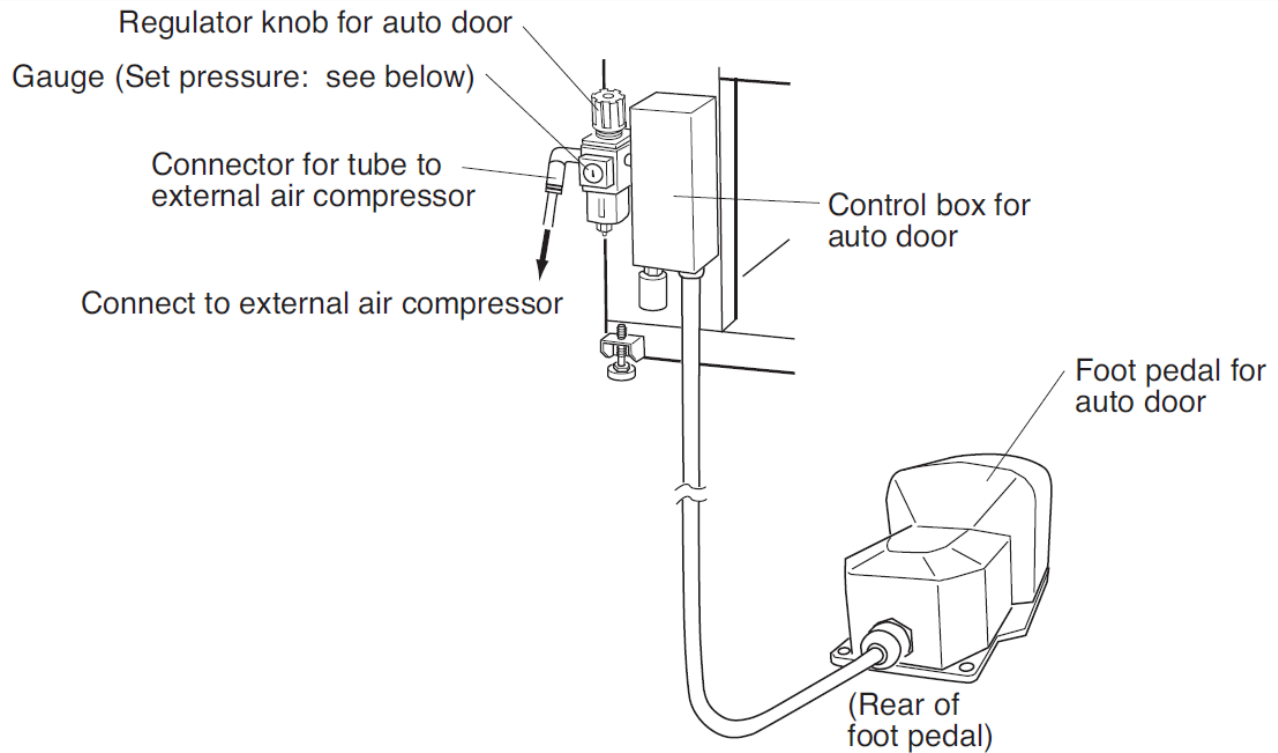
3-7-2. CONNECTING FOOT PEDAL

Connect as the figure in next page.

Connect the tube from the air supply source to the regulator attached to the auto door control box. Standard connector is dia. 6 mm tube and instantaneous push-to-connect type. Usual hose connector also can be used instead.

Connect the foot pedal to the auto door control box.

Position the foot pedal at a convenient area.

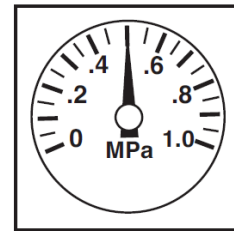


3-7-3. CHECKING REGULATOR PRESSURE



IMPORTANT

If working pressure is not sufficient, heating may become impossible, because the door limit switch cannot be set to ON. During heating, alarm message 'E-08' may appear. Further, hot air escaped may cause discoloration of metal plates and overheat of internal controller circuit.



Gauge
(The above figure shows pressure is set to 0.5 MPa.)

Check that the gauge of auto door regulator indicates the below specified pressure.

<Working pressure>

Standard RBF37 0.4 to 0.5 MPa

If the gauge does not show the above pressure, set with the knob of the regulator for auto door to the above pressure.

Note that maximum allowable working pressure is 0.8 MPa.

Depending on the conditions of felt and refractory material for the door, the door may not work normally by the above pressure value.

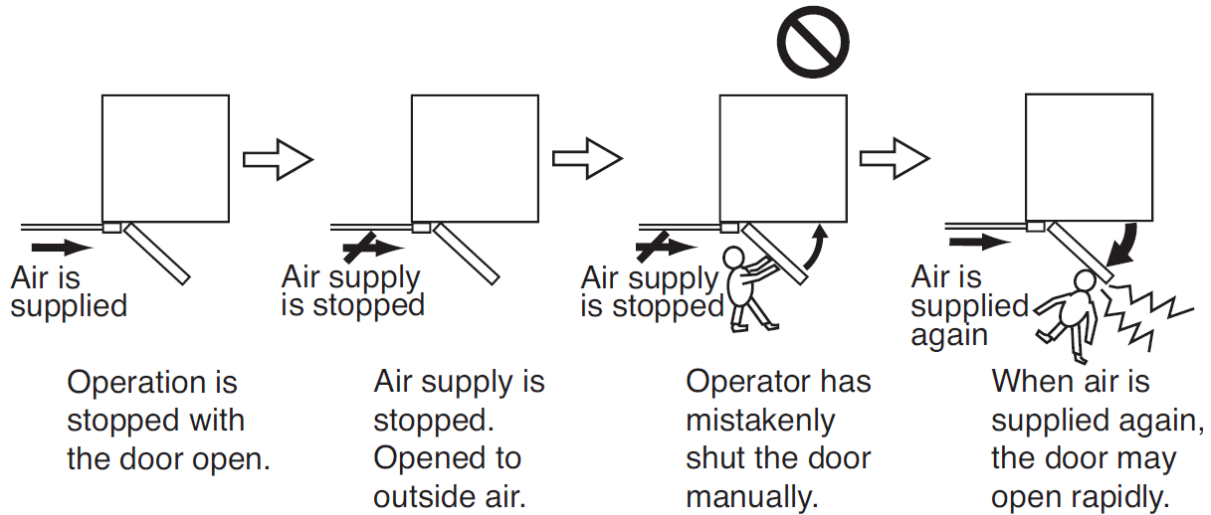
In such a case, adjust with the regulator knob.

3-8. USING AUTO DOOR



WARNING

[1] When the door is opened by the foot pedal and air supply is stopped, do not close the door with hand manually. When air is supplied next time, the door may open unexpectedly and rapidly, which may cause injury .



Also, when the door is closed by the foot pedal and air supply is stopped, do not open the door with hand manually. When air is supplied next time, the door may close unexpectedly and rapidly, which may cause injury.

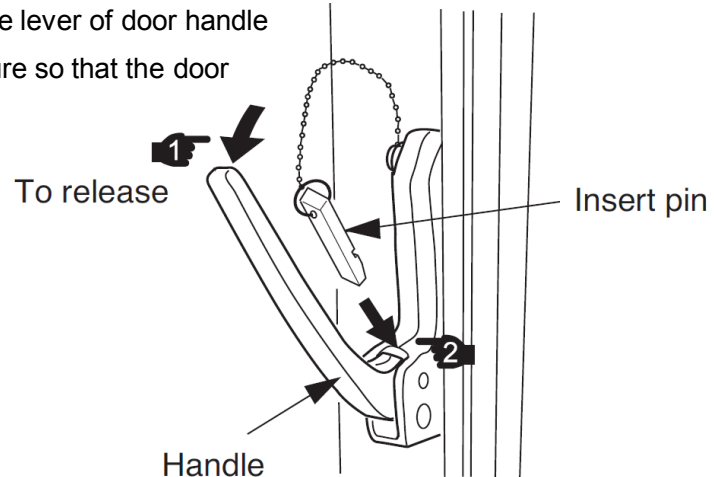
[2] When air is supplied, do not open or close the door forcibly with hand, because the door may unexpectedly and rapidly move by rebounding power, which may cause injury.

Further, the internal cylinder mechanism of the machine may be affected resulting malfunction.

[3] Always insert the pin when using the auto door.

[4] The auto door may move by air supply, independent of ON or OFF of electric power supply. So, take great cares.

1) When the auto door is used, pull the lever of door handle and insert the pin as shown in the figure so that the door will be kept to unlocked position.



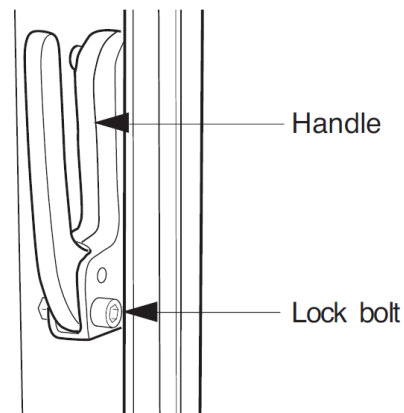
2) The auto door moves by the foot pedal. If you step down the foot pedal, the door opens and if you step down the pedal once again, the door closes.

<Safety use of the door>

- During night or heating at daytime, set the auto door to off as follows.

- 1) Close the door with the foot pedal.
- 2) Shut the air supply.
- 3) Remove the insert pin of the door handle.
- 4) Move the door back and forth a little to check that the door is securely closed and held by the latch.

NOTE: For more safety, fix the handle with the lock bolt.



By this, the door will not open by sudden stoppage of air supply, vibration etc.

- At the last step of heating and when casting is started, use the auto door.

4. MAINTENANCE

Check operating conditions periodically, so that the machine can always be used in good condition. Especially, perform the following maintenance work periodically.

4-1. CLEANING FILTER FOR COOLING FAN



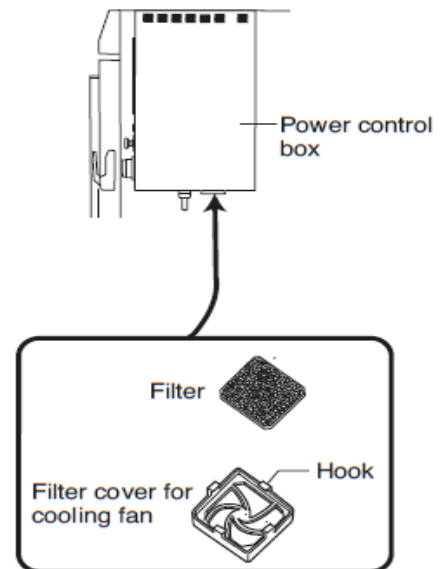
CAUTION

It is recommended to clean the filter every work day, although cleaning cycle depends on frequency of use and work environment.

If cleaning is neglected, dusts may accumulate to more than a few millimeters thickness on the filter.

Dusts accumulation or clogging of filter may cause trouble of the machine (flow of cooling air is shut off ---> cooling does not work ---> temperature of internal electric circuit rises ---> malfunction).

- 1) Move the filter cover downward to remove.
- 2) The filter can be removed together with the filter cover.
- 3) Clean the filter.
- 4) Assemble the filter and the filter cover again, so that each hook of the filter cover will be caught by each groove of the fan body.



4-2. CLEANING OF FURNACE AND ROTATING UNIT

- 1) When waste has accumulated, collect it by sucking with a vacuum cleaner available on the market.
- 2) If clogging happened in the wax collecting hole, push it through with a screwdriver or the like.

3) To collect waste in the deep bottom area of the furnace and the wax receiver, use a crevice tool nozzle of vacuum cleaner. In the case a vacuum cleaner available on the market is used, use it with a crevice tool nozzle.

4) Remove and clean the drain orifice periodically.



CAUTION

If wax is not drained smoothly (a large amount of wax remains inside the furnace) because of clogging etc., a large amount of gas over combustion capability of the afterburner may be generated, and incomplete combustion gas (black gas) may blow out from exit of the afterburner.

4-3. CHECKING CRACK OF ADIABATIC MATERIAL

Cracks in the door frame should be repaired with adhesive (P.48) at its early stage.

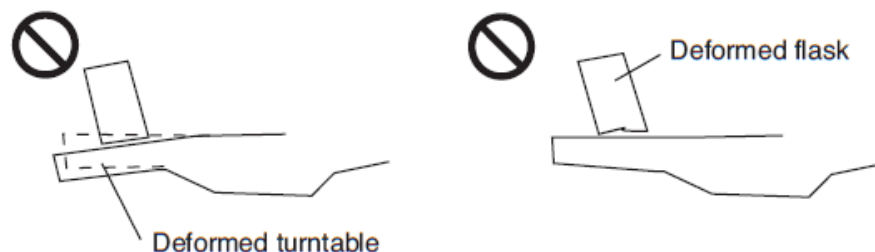
4-4. CHECKING DEFORMATION OF TURNTABLE

If the turntable is deformed by deterioration, the flask may tilt, resulting an accident such as short-circuit or damage of the heater etc.

If deformation has become so large that the flask may tilt, replacement of the turntable is necessary.

From the same reason, a deformed flask should not be used.

When you set flasks in the furnace, repeat rotation and stop of turntables for several times to make sure that the flasks will not tilt. Then, start automatic burnout operation.



(The turntables are used in high temperature environments, so their deterioration speed depends on individual using frequency and conditions.)

4-5. REPLACING THERMOCOUPLE



CAUTION

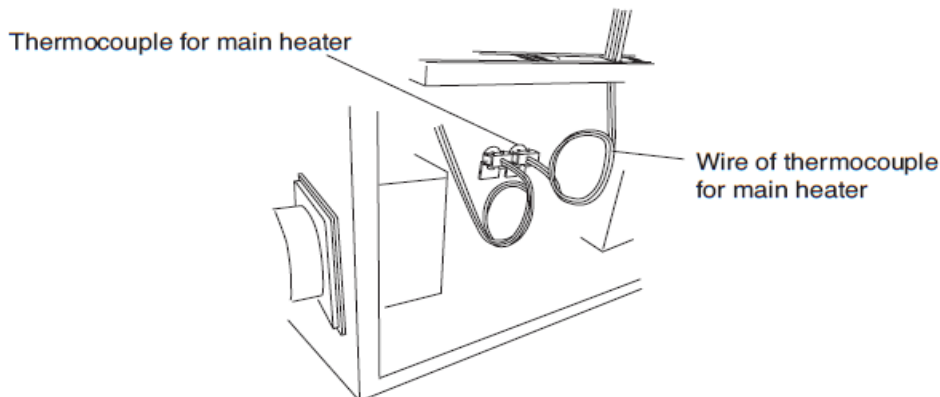
- [1] Be sure to turn power off and disconnect the power cable from the wall outlet before starting replacement work.
- [2] Take care not to drop a screw or the like inside the machine. If you happen to drop it, be sure to pick it up, otherwise it might cause short-circuit.
- [3] Take care not to reverse polarity (+ and -) at wiring.

4-5-1) REPLACING THERMOCOUPLE FOR AFTERBURNER

Remove the terminal block cover of afterburner, and then replace the thermocouple.

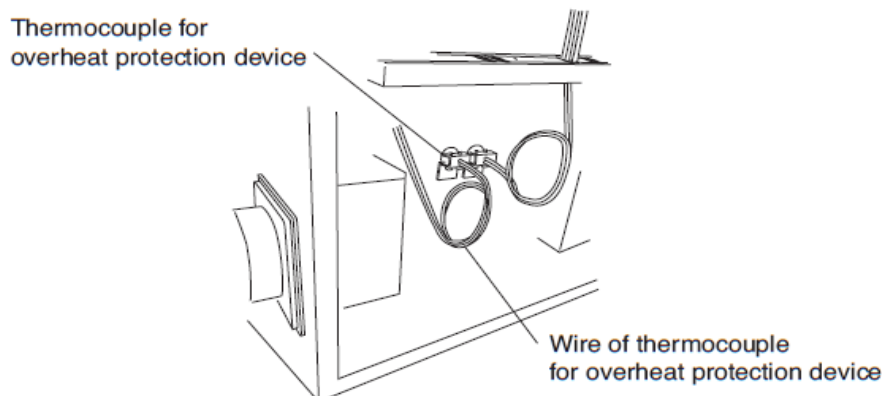
4-5-2) REPLACING THERMOCOUPLE FOR MAIN BODY

Remove the cover of power control box, and then replace the thermocouple.



(5-3) REPLACING THERMOCOUPLE FOR OVERHEAT PROTECTION DEVICE

Remove the cover of power control box, and then replace the thermocouple.



5. SPECIFICATIONS

Temperature control of main furnace accuracy	: within set temperature +/- 2 deg.C(at stable condition in the range of 100 to 850 deg.C)
Temperature control of afterburner accuracy	: within 650 +/- 3 deg.C (at stable condition)
Thermo sensor display accuracy	: within +/-10 deg.C for 0 to 1000 deg.C
Turntable position display	: 1 to 48
Step numbers	: 8 steps (MAX)
Memory numbers	: 20 memories (MAX)
Power failure detecting time	: over 5 minutes (shorter time than this will be handled as 'short break')
Max. height of acceptable flask	: 230 (H) mm
Furnace capacity for flask	: 37 flasks (100 mm diameter) 45 flasks (89 mm diameter)
Dimensions (including afterburner)	: 1125 (W) x 1073(D) x 2176 (H) mm
Net weight	: Approx. 460 Kg

6. PASSWORD

6-1. KIND OF PASSWORD

Three kinds of password are prepared for the machine as follows. Refer P.56 for input procedures.

1. Initial installation password

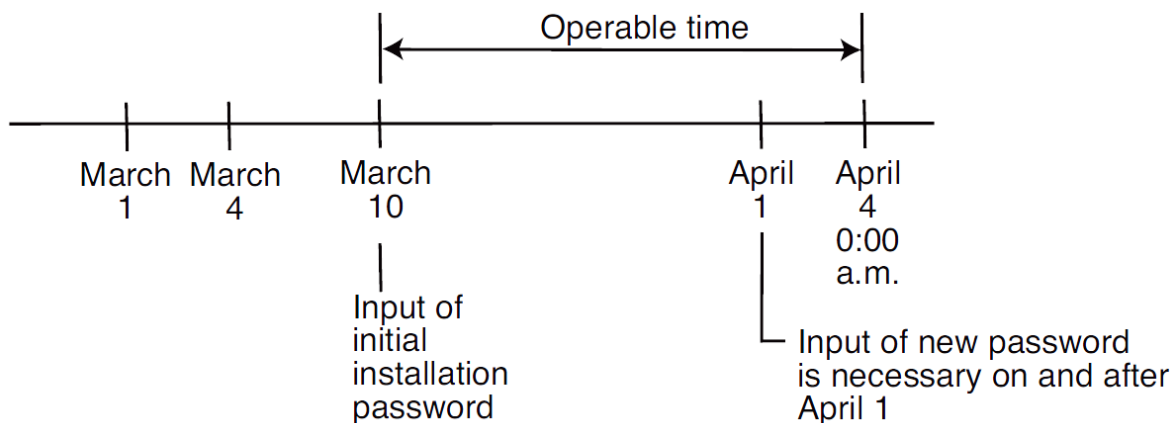
Initial installation password is necessary to release operation-lock of the machine at the time of installation of the machine.

0:00 a.m. of fourth day of the next month (Japan time) is expiration date of this password.

Unless final password is input, new update password input is necessary monthly to use the machine on and after this day.

Without the new password, operation becomes impossible.

Example of initial installation password:



2. Monthly update password

In case this machine is used by monthly use conditions, input of this kind of password is necessary on or after the first day of the month to which the next Monthly Calculation starting time belongs.

Monthly calculation starting time is 0:00 a.m. of the fourth day of every month by Japan Time.

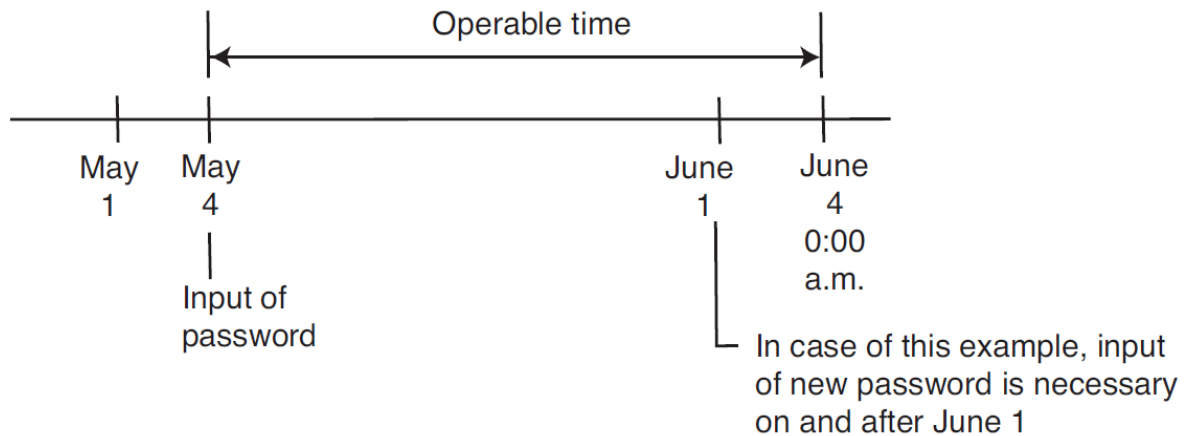


IMPORTANT

Consider the world time-zone differences, and prepare password beforehand.

Each machine has different password associated with the serial number of the machine and month, so password should be placed under control by the appropriate supervisor of your company.

Example of monthly update password:



3. Final password

When this password is input and is verified by the machine normally, the machine can be operated without time-limit.



IMPORTANT

Once this final password has been verified by the machine, the machine cannot be reset to the monthly update password mode.

6-2. ISSUE OF PASSWORD

To issue next password in the case of use by monthly update password mode, the following information is necessary.

Model name : RBF37

Production Serial No. : xxx

Current monthly update history count : xx

OPERATION AND CONFIGURATION

7. OPERATING

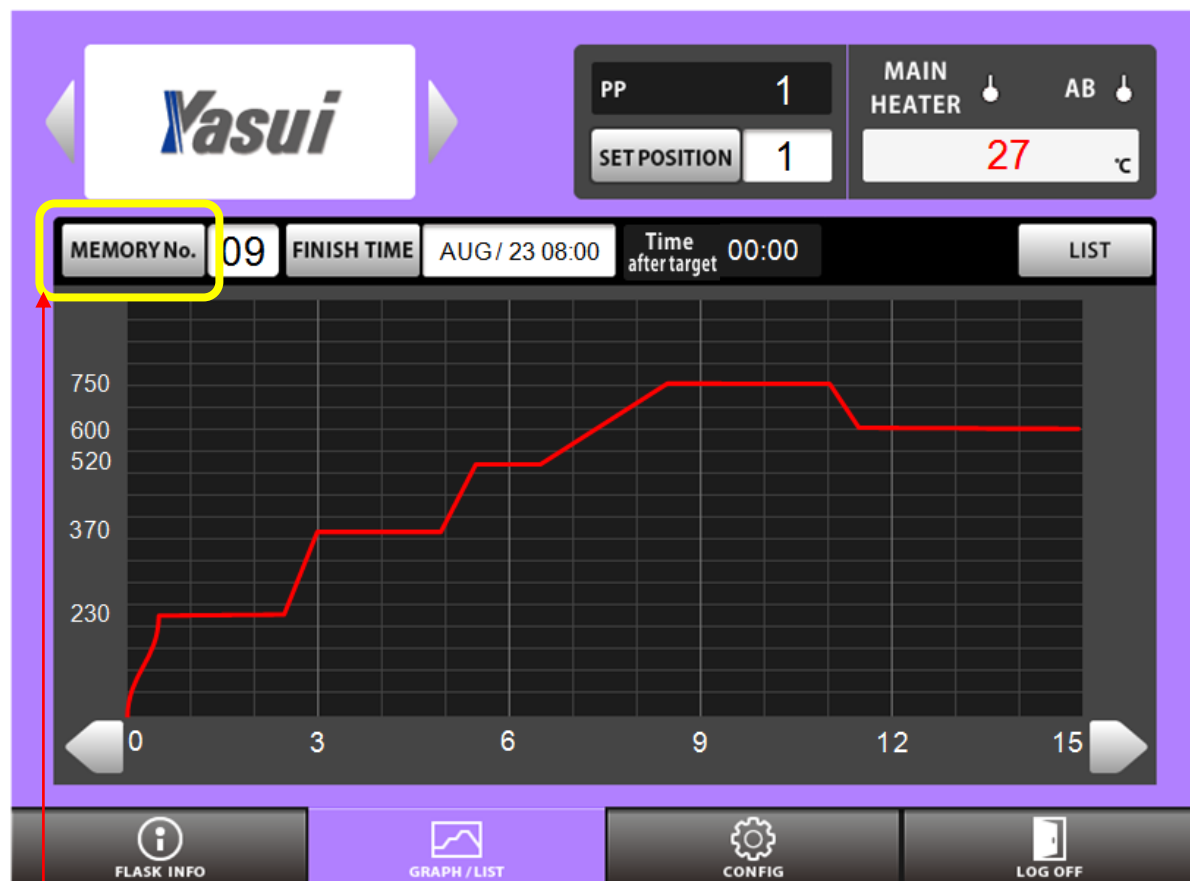
7-1. AUTOMATIC OPERATION

AUTOMATIC OPERATION can be processed as follows;

Turn breaker ON → choose Memory No. → Put flasks into furnace → Check Finish time
→ Push start button

7-1-1. POWER ON AT BREAKER SWITCH

Please wait for the display shown.



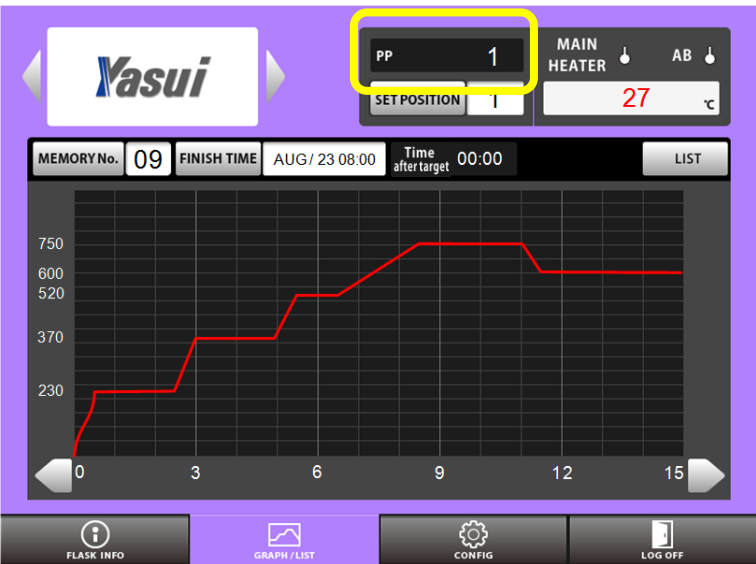
7-1-2. CHOOSE RECIPE

Tap MEMORY button to open SEARCH window to choose recipe.

Tap one of recipes at this window and tap OK button.

SEARCH					
No	Comment	No	Comment	No	Comment
00	FOR_SV925	10		20	
01	FOR_SV1000	1		21	
02	FOR_K24	2		22	
03	FOR_K18	3		23	
04	FOR_K10	14		24	
05		15		25	
06		16		26	
07		17		27	
08		18		28	
09		19		29	

7-1-3. PUT FLASKS INSIDE

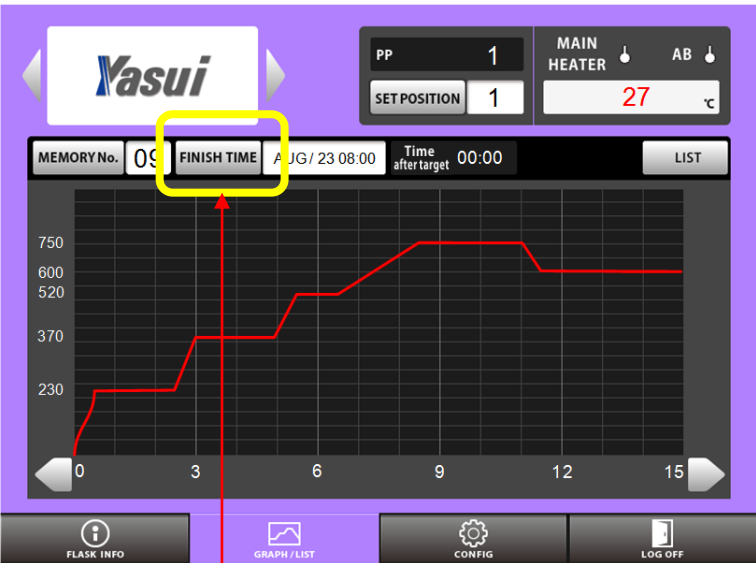


You can find the table position at PP(present position) window here.

Please take note the position each time you put flask one by one so that you can easily take out required flask without opening door each time.

7-1-4. START OPERATION

Confirm there is a line chart on the display before start burning out.



Back ground color changes



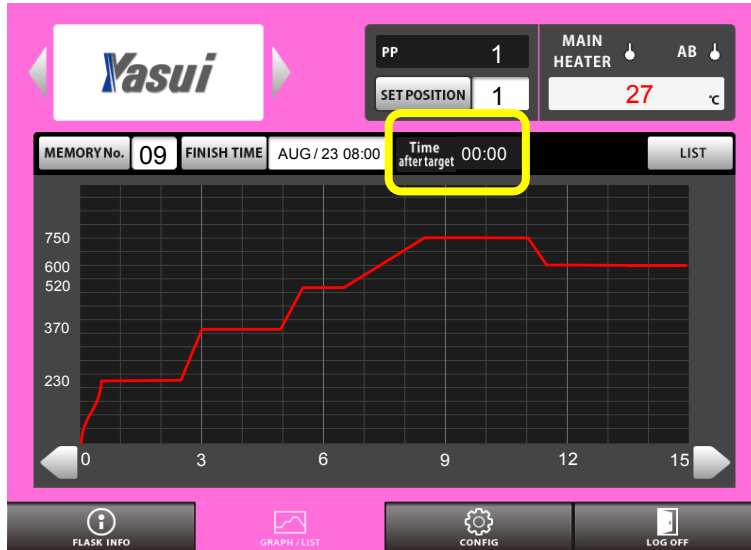
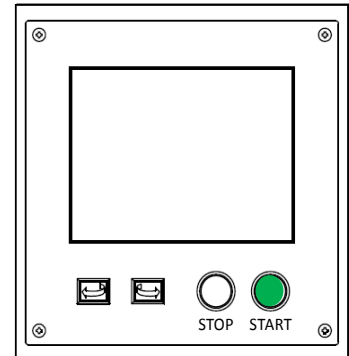
The estimated time of process end (if start now) will be indicated here.

Confirm FINISH TIME is what you expect and push start switch.
The present back ground color will turn pink.

7-1-5. BURN OUT

Wait for burnout cycle finishes.

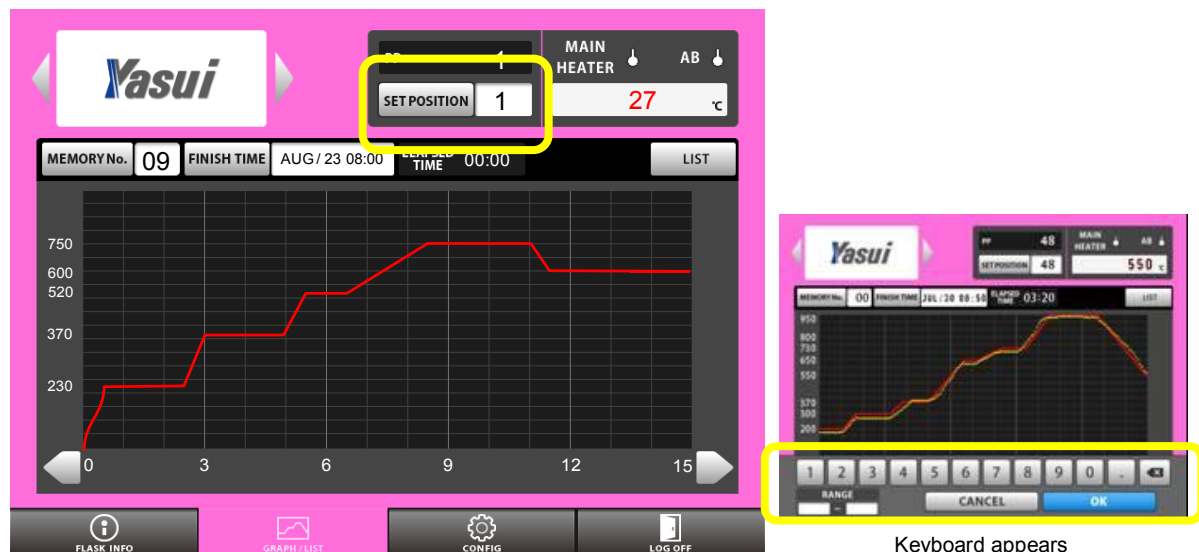
You can check how much time passed from temperature reach down to casting point here at this window.



7-1-6. TAKE FLASK OUT FOR CASTING

1) Enter the number of position you want to stop here at SET POSITION window.

Tap this button to activate key board.



2) Rotation will stop at the point you've entered.

The present back ground color will turn green.

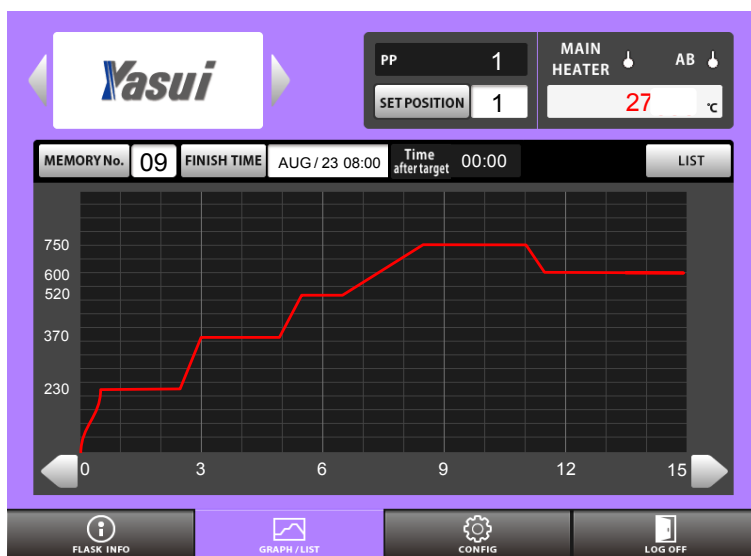
This is to prevent leaving rotation suspended.

Do not forget to push rotation button for 2 seconds after taking flask out of furnace to keep rotation



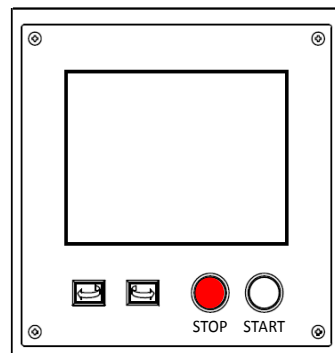
The back ground color will turn blue.

7-1-7. STOP OPERATION



Push STOP button after taking the last flask out.

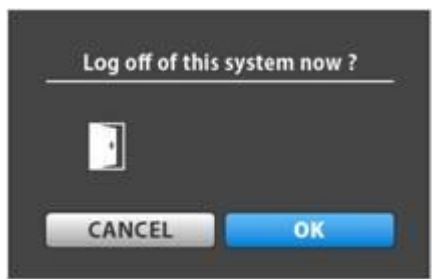
The back ground color will turn blue.



7-1-8. POWER OFF

1) Tap LOG OFF tab

2) Tap OK button



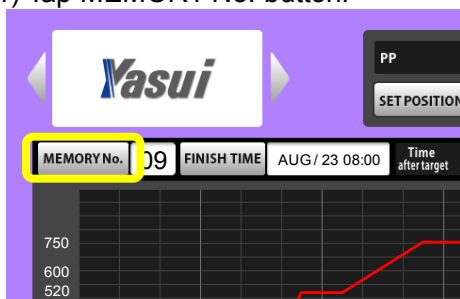
3) Turn breaker switch OFF when you see the pop up window.



7-2. HOW TO PROGRAM RECIPE MEMORIES

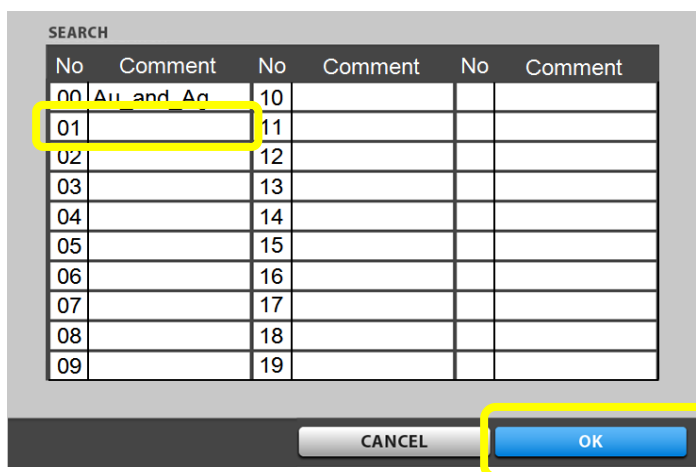
7-2-1. EDIT TEMPERATURE

1) Tap MEMORY No. button.

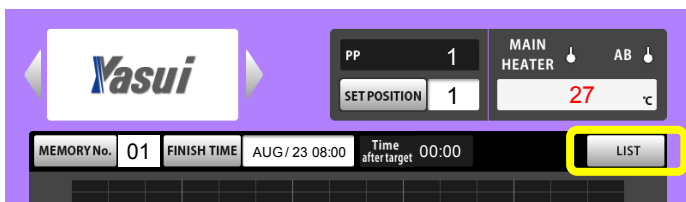


2) Tap MEMORY No.1 for instance.

3) Tap OK button after that.



4) Tap LIST button.



BACK

MEMORYNo. 01 **COMMENT** Au_and_Ag

STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	230	2:00	Yes	Yes
2	0:30	370	2:00	Yes	Yes
3	0:30	520	1:00	Yes	Yes
4	1:00	750	2:30	Yes	Yes
Final	0:30	600	2:00	Yes	No

5) If you want to change Temperature at STEP1, 230c to 250c, Tap the CELL marked as above.

6) You will see a keyboard activated.

BACK

MEMORYNo. 01 **COMMENT** Au_and_Ag

STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	230	2:00	Yes	Yes
2	0:30	370	2:00	Yes	Yes
3	0:30	520	1:00	Yes	Yes
4	1:00	750	2:30	Yes	Yes
Final	0:30	600	2:00	Yes	No

1 2 3 4 5 6 7 8 9 0 .

RANGE CANCEL OK

7) Type 2, 5, 0 and tap OK button to confirm edit.

7-2-2. EDIT OTHER FACTORS

You can edit other factors like ELV TIME, KEEP TIME by the same manner as described already.

7-2-3. ADD and DELETE STEP(s)

1) When you want to add one additional step.

Tap blank cell next to Final cell marked as below.

STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	230	2:00	Yes	Yes
2	0:30	370	2:00	Yes	Yes
3	0:30	520	1:00	Yes	Yes
4	1:00	750	2:30	Yes	Yes
Final	0:30	600	2:00	Yes	No

You will see STEP5 has been added. Please edit STEP5 and Final step and go back to GRAPH window to check the line chart.

STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	230	2:00	Yes	Yes
2	0:30	370	2:00	Yes	Yes
3	0:30	520	1:00	Yes	Yes
4	1:00	750	2:30	Yes	Yes
5	0:30	600	2:00	Yes	No
Final	1:00	450	0:30	Yes	No

2) When you want to delete one step from the recipe.

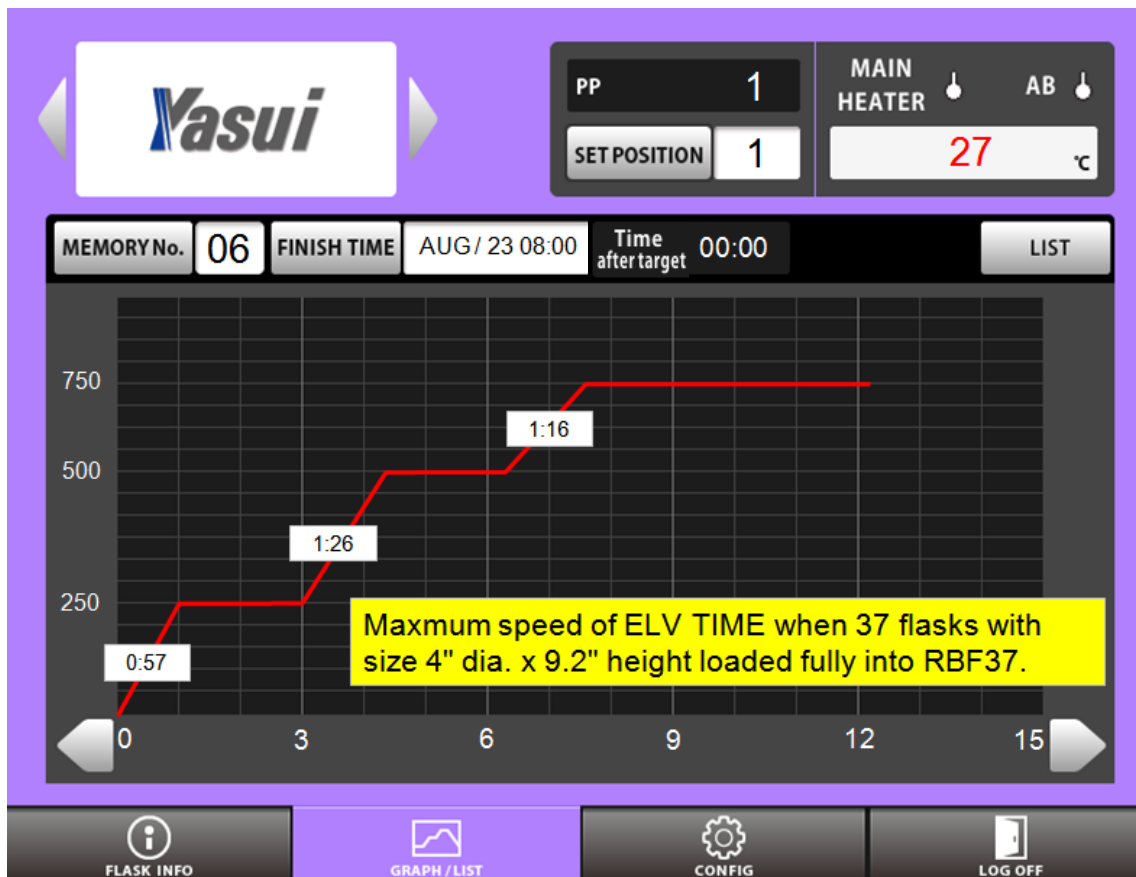
Tap previous step of Final step to delete the line.

You cannot delete all of STEPS. (Minimum recipe consists of 4 steps)

** This is for your reference when you program burnout recipe;

The chart is an actual temperature upward record at maximum load inside of RBBF37.

You can refer and program with correct time for ELV time by this.



This means you will not achieve your request even if you set 30 minutes for ELV TIME at step1 when you load max flasks inside. It takes at least 57 minutes to reach 250c and actual keep time will be shorter than you set.

Step 2 and 3 as well.

STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:57	250	2:00	Yes	Yes
2	1:26	500	2:00	Yes	Yes
3	1:16	750	5:00	Yes	Yes
Final	0:05	750	0:05	Yes	No

7-2-4. ROT, AB and COMMENT

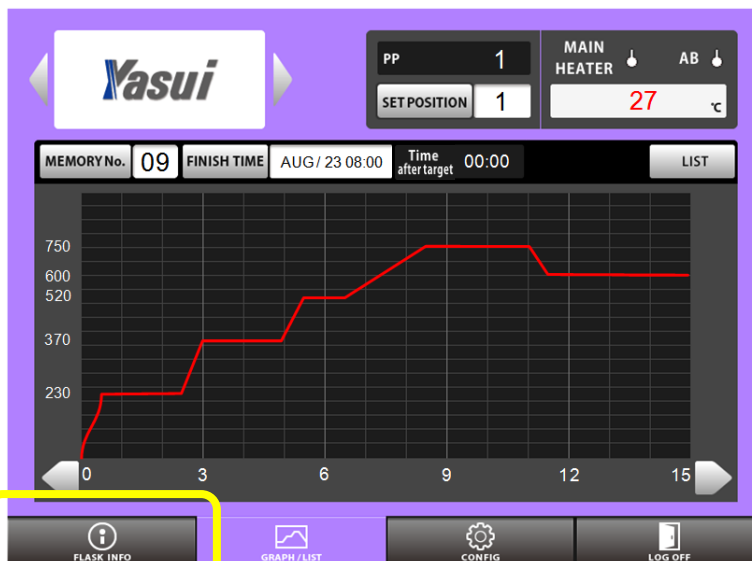
Please check the details for them described later.

7-3. MANUAL OPERATION

7-3-1. POWER ON AT BREAKER SWITCH

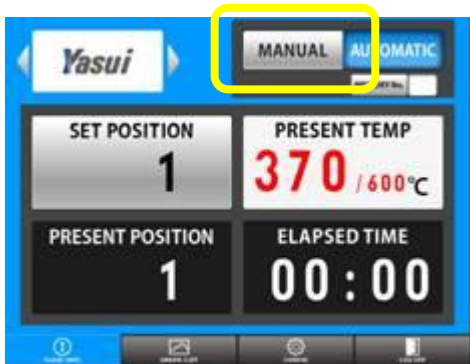


Please wait for the display shown



7-3-2. SWITCH MODE

Tap MANUAL button



Tap FLASK INFO button

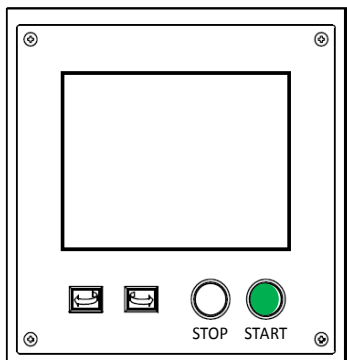


Tap PRESENT TEMP button to edit.



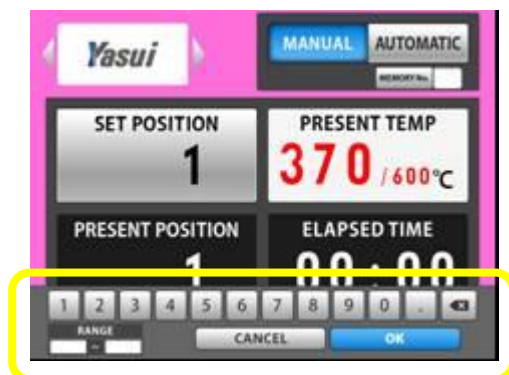
8-3-3. START HEATING

Push START button to heat. The back ground color will turn pink.



7-3-4. TAKE FLASK OUT FOR CASTING

1) Tap SET POSITION button to edit the value.



2) Rotation will stop at the point you've entered. The present back ground color will turn green. This is to prevent leaving rotation suspended.

Do not forget to push rotation button for 2 seconds after taking flask out of furnace.



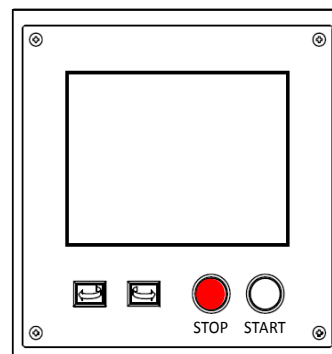
Push START button
for 2 seconds



7-3-5. STOP OPERATION

Push stop button when you want to finish heating.

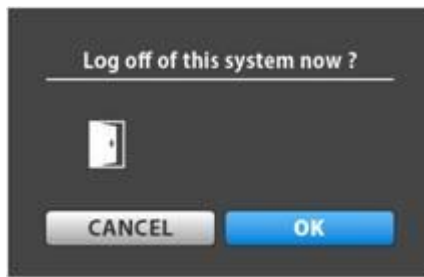
The background color will turn blue.



7-3-6. POWER OFF

1) Tap LOG OFF tab

2) Tap OK button



3) Turn breaker switch OFF when you see the pop up window.



7-4. EMERGENCY STOP BUTTON

Please push Emergency stop button in front of control box, when you want to suspend all of the function.

The button will be fixed unless you release it by manual.

Nothing can be operated on this condition.

Pop up window when button pushed.

Turn button clockwise to release lock.



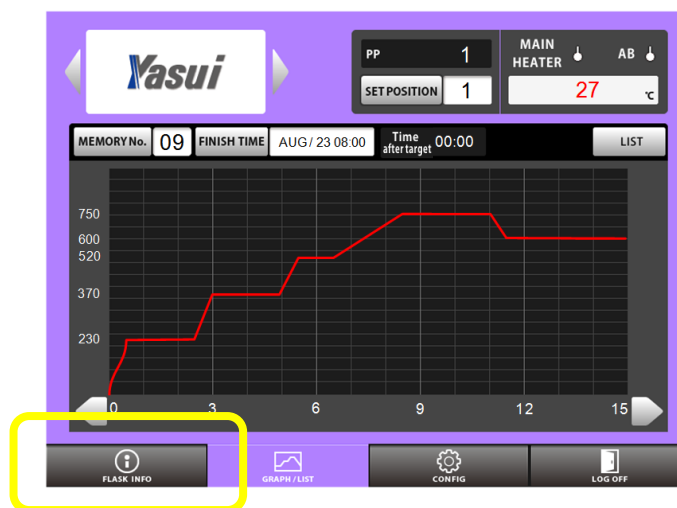
IMPORTANT

Please confirm safety before reset emergency very carefully.

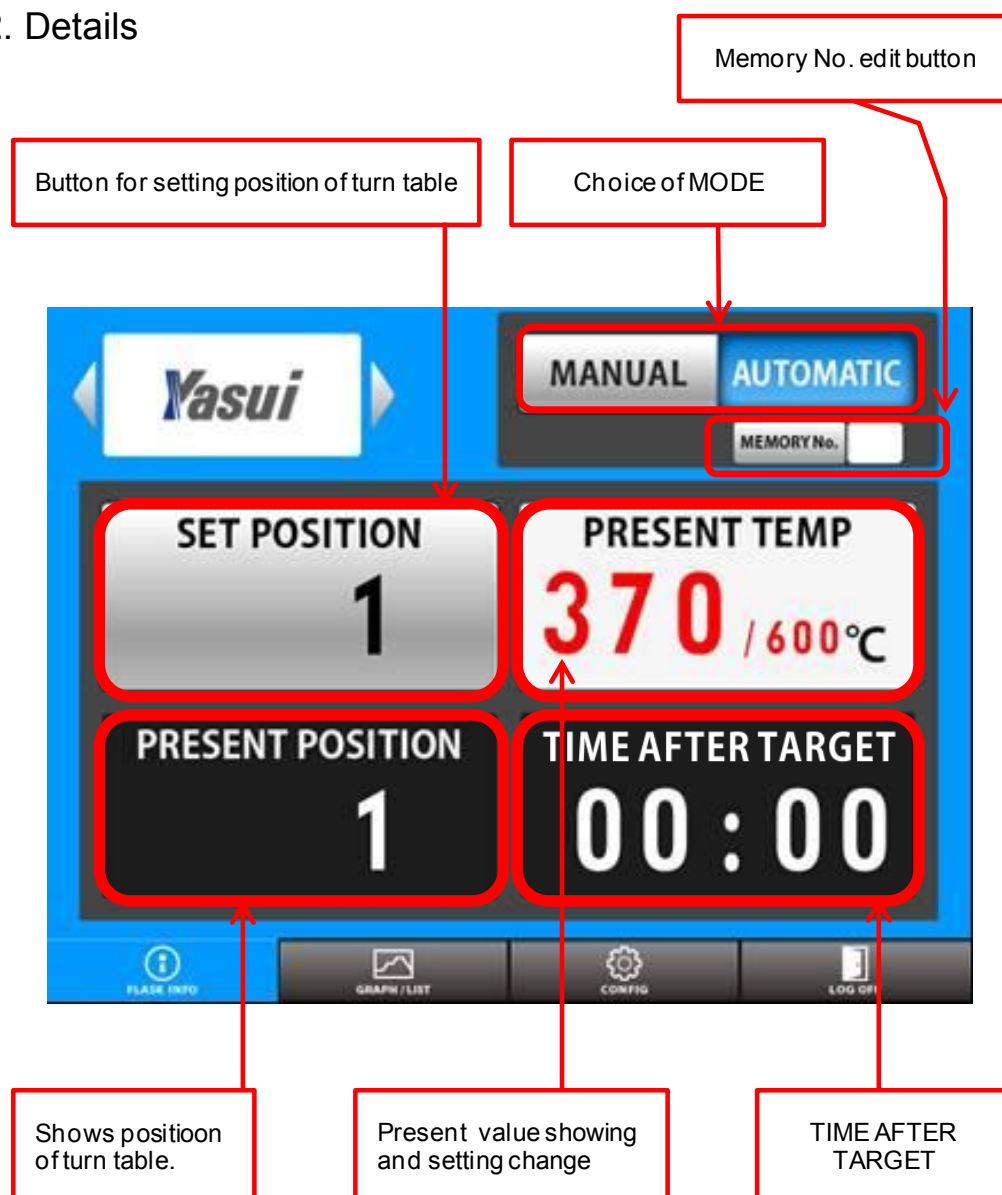
8. DESCRIPTION of EACH WINDOW

8-1. FLASK INFO window

8-1-1. Tap FLASK INFO tab to open.

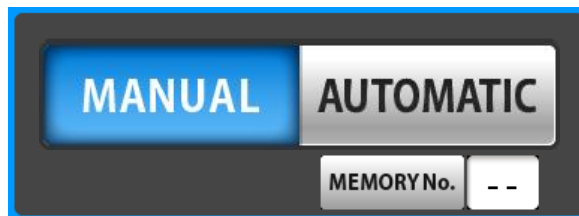
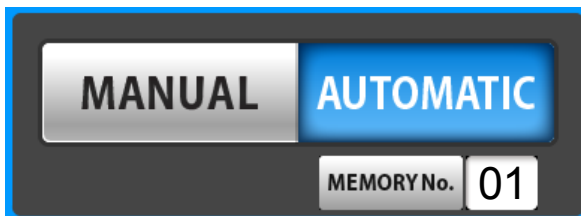


8-1-2. Details



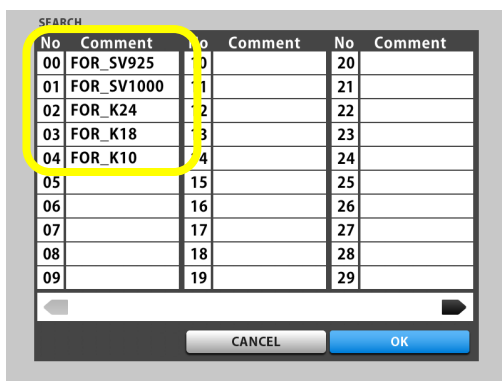
8-1-3. MANUAL / AUTOMATIC

- 1) You can choose mode AUTOMATIC or MANUAL by tapping buttons directly.
- 2) MEMORY No. will not be indicated when MANUAL mode is chosen.



8-1-4. Change memory number

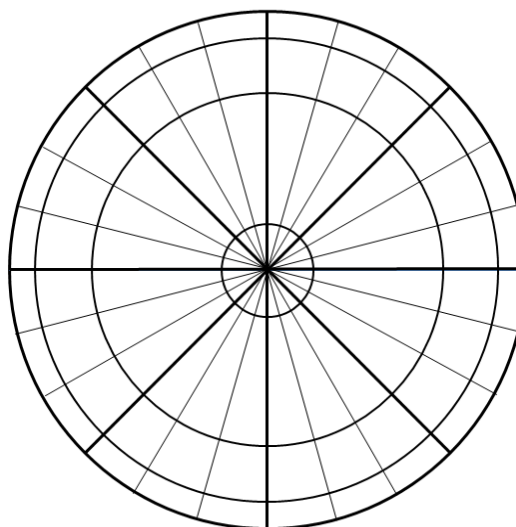
- 1) Tap memory No. button.



- 2) choose memory from the list.
Tap OK button.

8-1-5. SET POSITION

You can stop rotation at your request.
Tap this button to activate keyboard,
enter any position number you like from 1 to 48.
Tap OK button to confirm.
Rotation will stop at the position you've set.



** Turn table is divided into 48 areas

8-1-6. PRESENT POSITION

You can check present position of turn table.

It is just for monitoring.

PRESENT POSITION

1

8-1-7. PRESENT TEMP

You can set any temperature you want

by tapping this button at MANUAL mode.

Keyboard will be activated by tapping this button.

Enter temperature and tap OK button to confirm.

PRESENT TEMP

370 / 600°C

You will see this pop up window if you tap this button at AUTOMATIC mode.

This means;

- 1) Temperature setting for MANUAL heating.
 - 2) Temperature edit for AUTOMATIC mode at only final step.(No need to cancel burnout cycle anymore)
- New switching function for another casting temperature.

PRESENT TEMP

In the case of the next condition,
You can change a set temp.



- MANUAL
- At the time of automatic driving last step arrival

OK

8-1-8. TIME AFTER TARGET

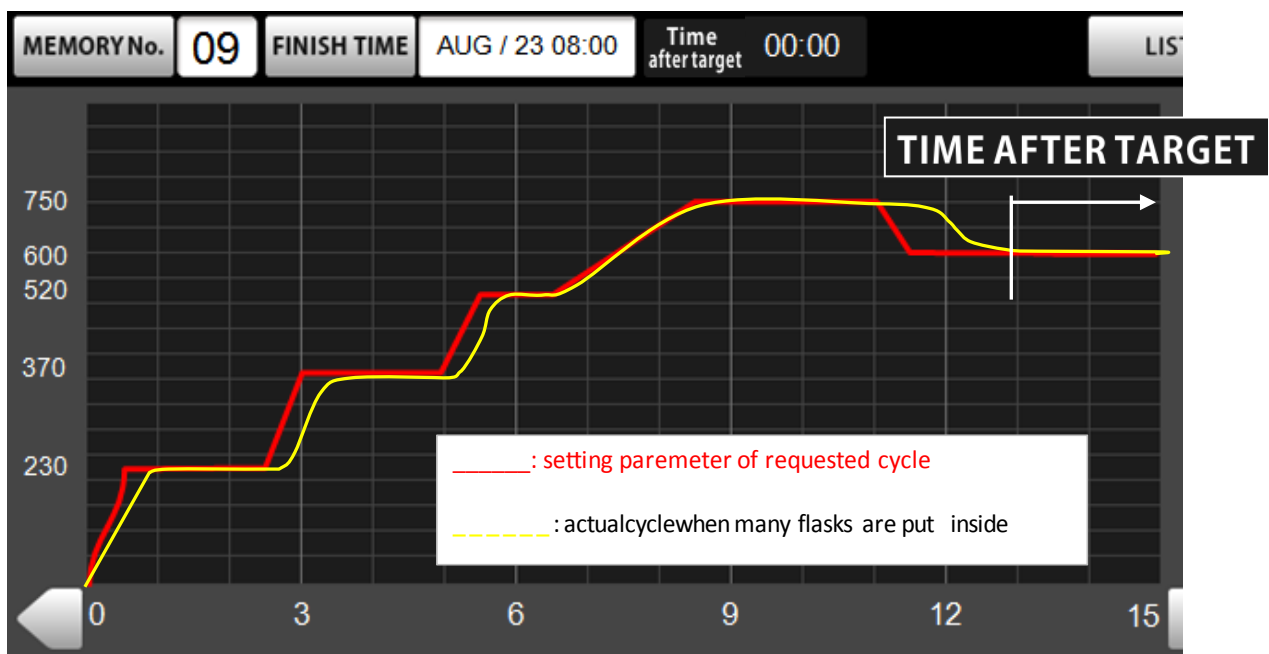
This informs you how long it passed from the point when temperature reaches final level.

You will know ideal time for final casting level by this.

Actual kept time is visible now.

TIME AFTER TARGET

00:00

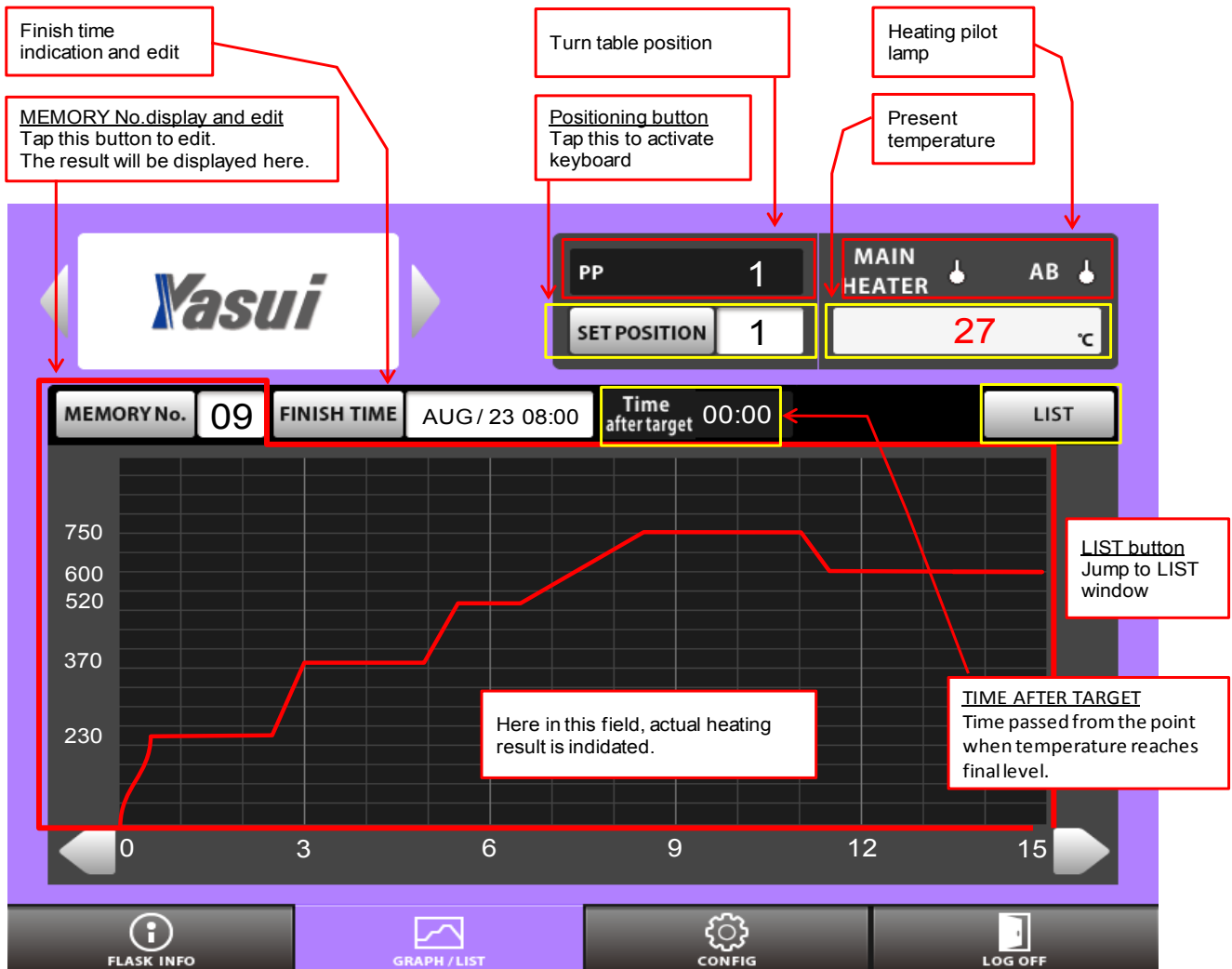


8-2. GRAPH window

8-2-1. Tap GRAPH / LIST tab to open.

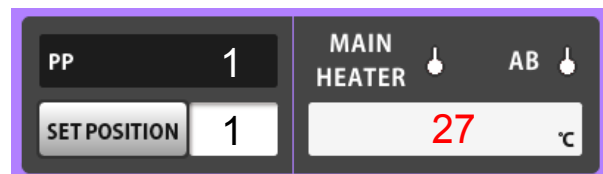


8-2-2. Details



8-2-3. PP window

Means Present Position of turn table.



8-2-4. SET POSITION

You can activate keyboard by tapping this button to stop table at the position you request.

8-2-5. PILOT LAMP

Monitor lamp for MAIN heater and After burner.

8-2-6. PRESENT TEMPERATURE

8-2-7. MEMORY No.

MEMORY Number is displayed here and can be edited.



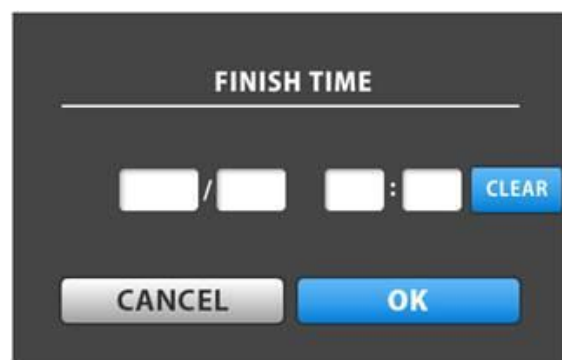
8-2-8. FINISH TIME

< When characters are indicated with black color >

FINISH TIME is indicated here in case of starting now with chosen memory.

< How to change FINISH TIME >

- 1) Tap FINISH TIME button
- 2) Enter delayed FINISH TIME you require.
- 3) The color of characters turns red which means 'Standing by'.
- RBF doesn't start heating and waits for extra time for the target you've set after you tap START button.
- 4) Tap CLEAR button at 2) if you want to cancel it.



8-2-9. TIME AFTER TARGET

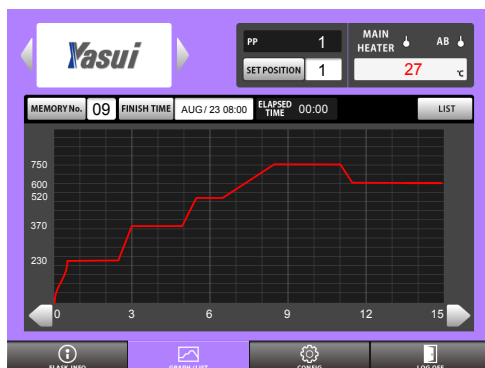
Already described in previous page.

8-2-10. LIST



You can open LIST window by tapping this button.

You can check and edit the recipe detail here in this window.



MEMORY No. 03 COMMENT					
STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	200	2:00	Yes	No
2	1:00	300	1:30	Yes	No
3	1:00	370	1:30	Yes	No
4	2:00	650	3:00	Yes	No
5	3:00	730	1:00	Yes	No
6	:	850	2:00	Yes	No
7	:	800	3:00	Yes	No
Final	:	550	1:00	Yes	No

You can refer next page for detailed information of LIST window.

8-3. LIST window (tap LIST button to jump →)

Memory No. edit button
Valid only at AUTO mode.
The window will turn Memory search window when this button is tapped.

COMMENT edit button
Selected COMMENT is indicated here.
Can be edited with keyboard by tapping this button.

After Burner setting
You can set after burner ON or OFF.
Tapped cell and before changes

BACK

STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	200	2:00	Yes	No
2	1:00	300	1:30	Yes	No
3	1:00	370	1:30	Yes	No
4	2:00	650	3:00	Yes	No
5	3:00	730	1:00	Yes	No
6	:	850	2:00	Yes	No
7	:	800	3:00	Yes	No
Final	:	550	1:00	Yes	No

Step number edit
Tapped cell will become the last step.

ELV TIME setting
You can edit Elevation time (Ramp time) here with keyboard by tapping each

Temperature setting
You can edit TEMP here with keyboard by tapping each cell.

KEEP TIME setting
You can edit timer here with keyboard by tapping each cell.

Rotation select
You can set rotation ON or OFF.
Tapped cell and later changes Yes.

OK button
Edit result will be saved and valid by tapping this.

CANCEL **OK**

8-3-1. MEMORY Number edit button

The window will turn Memory search window when this button is tapped (Only at AUTO mode)

8-3-2. COMMENT button

Selected COMMENT is indicated here.

You can register and edit comment here with keyboard by tapping this button.

8-3-3. STEP

You can set Final step by tapping one of cells in this row. (Only 4th to 8th step)

8-3-4. ELV TIME

Elevation Time, so called “ Rise Time “, “ Raise Time “, “ Ramp Time “ in other words.

The part in yellow (below)

8-3-5. TEMP

Setting Temperature

8-3-6. KEEP TIME

Holding time at each setting temperature.

8-3-7. ROT

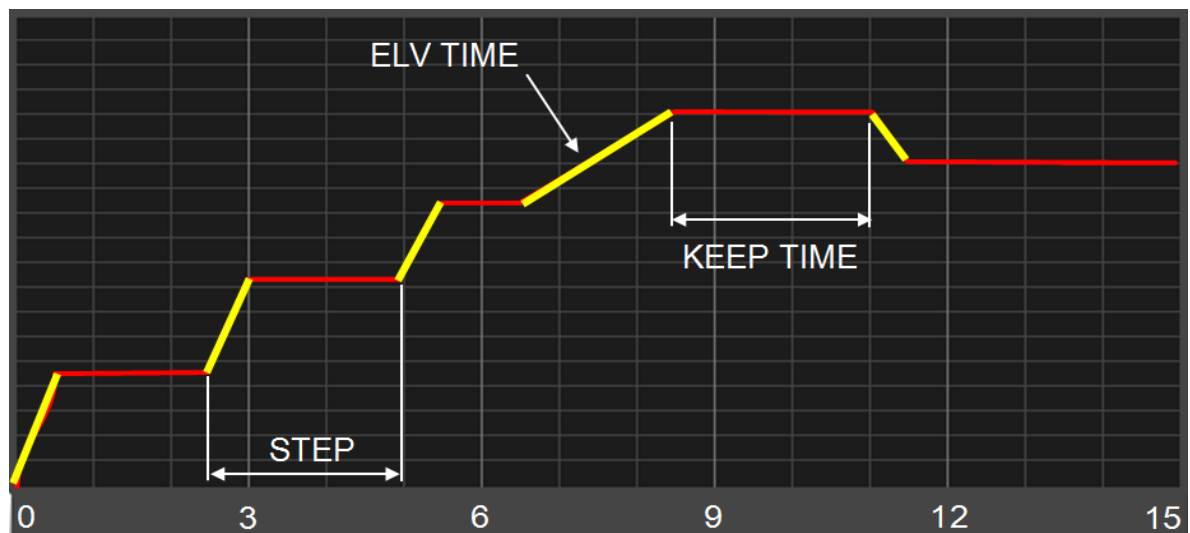
You can cancel rotation at required step.

Tapped cell and before that changes to 'NO' and the last cell which is set 'No' can be switched 'Yes' by one tap.

8-3-8. AB

You can cancel After burner heating from required step.

Tapped cell and after that changes NO and first cell with No can be switched Yes by one tap.



RBF37 is shipped with 20 Memories already included with same recipe detail. (next page)

Comment [Au_and_Ag] is registered to Memory number 00 only.

Other memories have no comment (01-19)

Please choose any Memory number to edit recipe and comment.

You don't need to register new Memory from blank recipe.



STEP	ELV TIME	TEMP	KEEP TIME	ROT	AB
1	0:30	230	2:00	Yes	Yes
2	0:30	370	2:00	Yes	Yes
3	0:30	520	1:00	Yes	Yes
4	1:00	750	2:30	Yes	Yes
Final	0:30	600	2:00	Yes	No

8-4. CONFIG

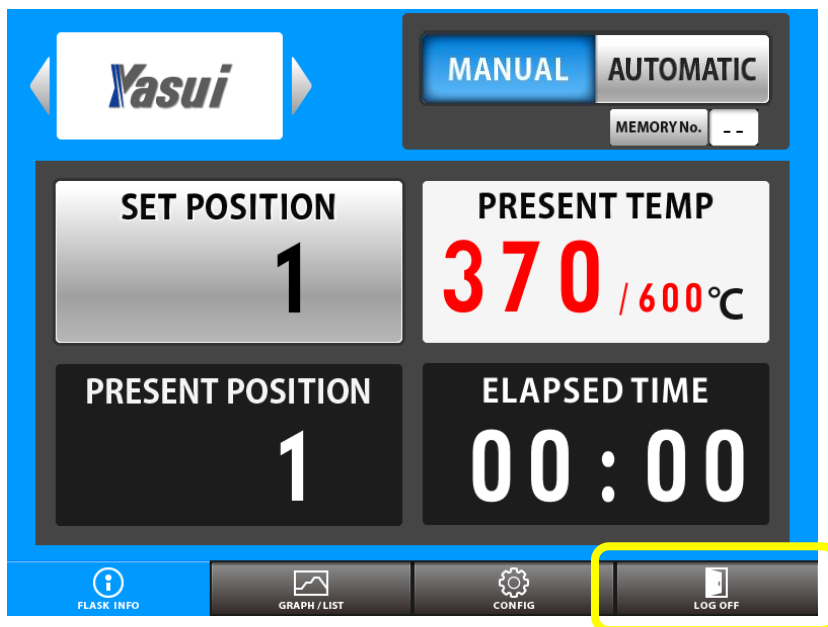
Will be described later.



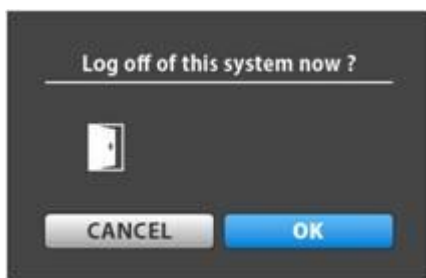
8-5. LOG OFF



1) Tap LOG OFF tab before turning breaker OFF.



2) Tap OK button



3) Turn breaker switch OFF when you see the pop up window



9. CONFIG MENU

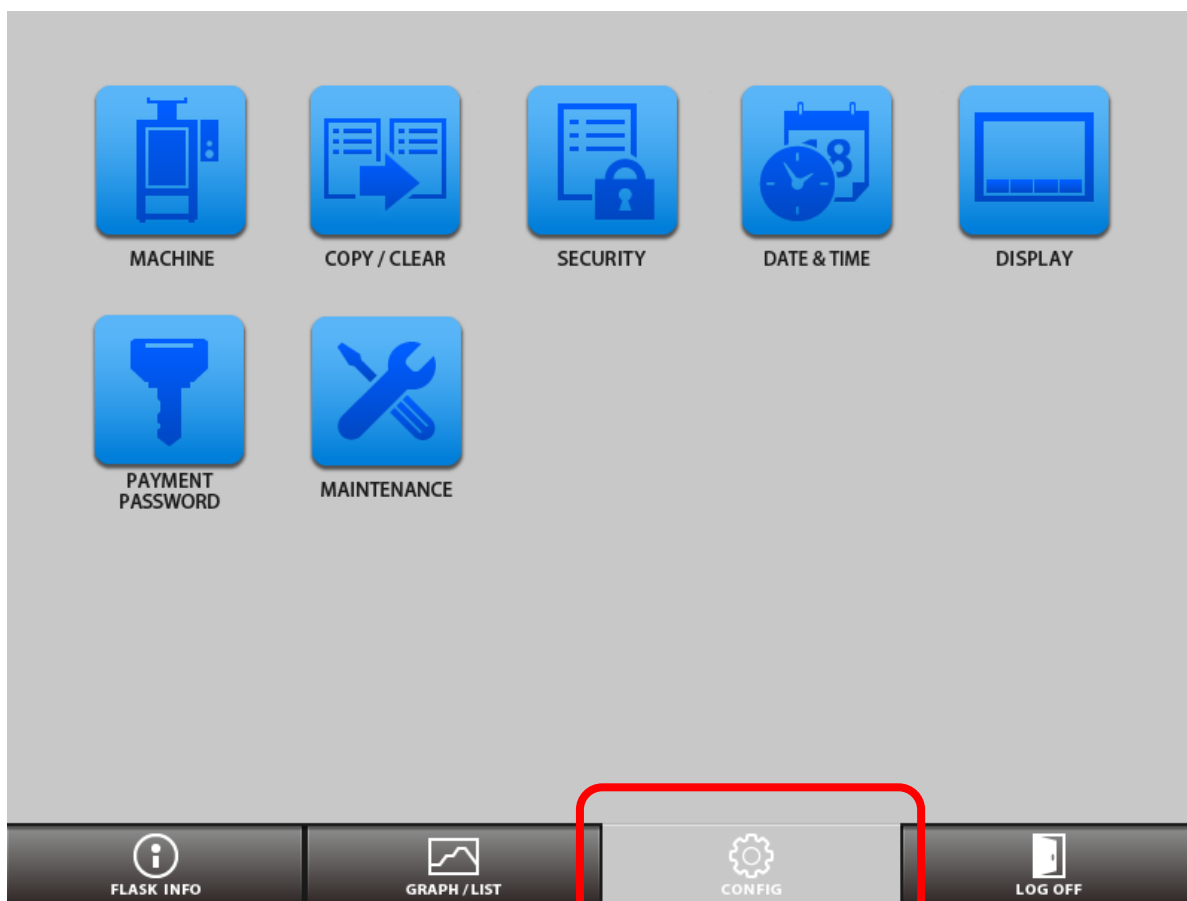
You have several configuration menus in this menu page.

< How to open CONFIG menu window >

1) Tap CONFIG



tab to open the window.



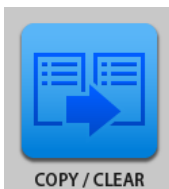
CONFIG window

< About each icon >



MACHINE

You can check machine information like its serial number and several program versions.



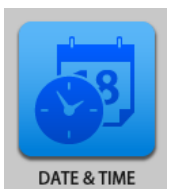
COPY

You can copy chosen recipe to minimize time for programming.



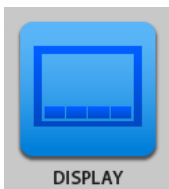
SECURITY

You can protect existing recipe details so that nobody can edit. You can also change password for protection here.



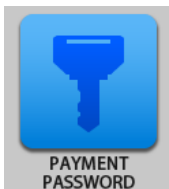
DATE & TIME

You can set calendar and clock at your region.



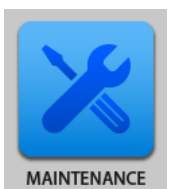
DISPLAY

You can control display setting here.



PAYMENT PASSWORD

You can enter Passwords for Monthly payment here. Only for customers who use this system.



MAINTENANCE

You can check each single action, power source, sensor and others.
Some optional configurations for maintenance can be done here.

9-1. MACHINE

You can check machine information like its serial number and several program versions.

< How to open "DATE & SCHEDULE" window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap MACHINE  icon to open.

[VERSION]

You can check program version information here.

[DATA OUTPUT]

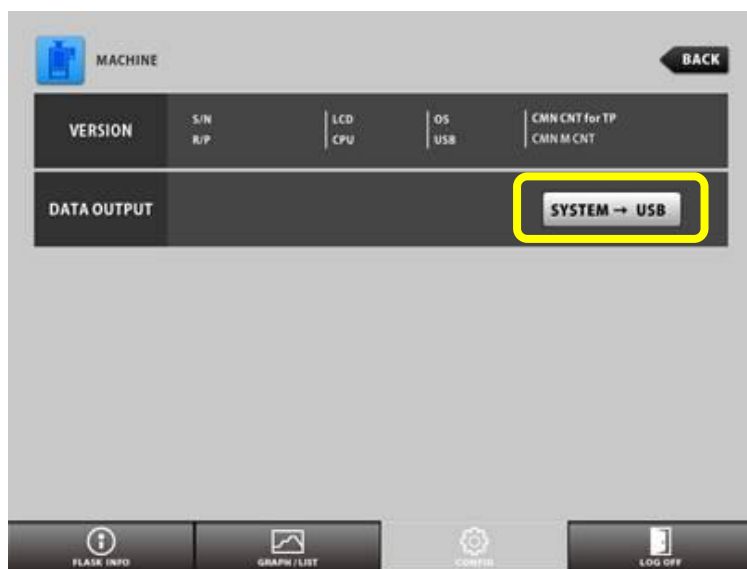
You can record temperature data into USB flash drive.

1) Put USB flash drive to the port.

2) Tap 'SYSTEM→USB' button.

3) Automatically completed

You will see a pop up window when finished.

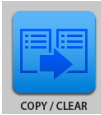


9-2. COPY

You can easily create new memory by copying existing recipe.

< How to open "COPY" window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap COPY  icon to open.

[COPY]

1) Multiple copy

- When you want to create many copy of one specific recipe.(below)

2) Single copy

- When you want to create just a copy

3) button

- You can copy all of memories in the system to USB flash drive.
Put USB flash drive into the slot and tap this button.

4) button

- You can copy all of Memories in USB flash drive to the system.
Put USB flash drive into the slot and tap this button.

* Multiple copy

When you want to copy the data of recipe 1 to memory 2-5(4 copies), Enter the value and tap COPY button as follows;



* Single copy

When you want to make a copy of recipe 1 to another memory 8, (1 copy), Enter the value and tap COPY button as follows;



[CLEAR]

- You can choose and delete any recipe here. Enter the recipe number 1 when you want to erase recipe 1 as follows;



9-3. SECURITY

You can protect recipe data and edit password for recipe edit here.

< How to open "SECURITY" window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap SECURITY  icon to open.

[LOCK]

- You can lock the recipes you choose.

1) Enter recipe numbers which you want to protect to the blanks.

Ex. 00-00 for single recipe, 00-03 for plural recipes protection.

2) Tap  button.

3) Enter password 'YASUI_RBF'.

4) You will see a pop up window 'RECIPE LOCK'



[ID REGISTER]

- You can edit password to protect RECIPES.

The default password is 'YASUI_RBF'

1) Tap  button.

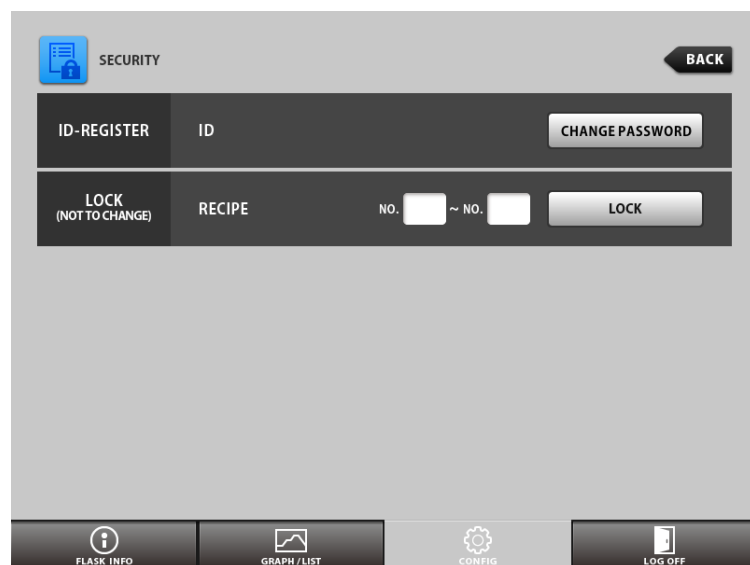
2) Enter new password you like.

3) Tap OK button.

4) Enter old password.

(In this case 'YASUI_RBF')

5) Tap OK button.



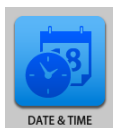
9-4. DATE & TIME

You can set date and time at your region here.

< How to open "DATE & TIME" window >

1) Tap CONFIG  tab to open CONFIG menu.

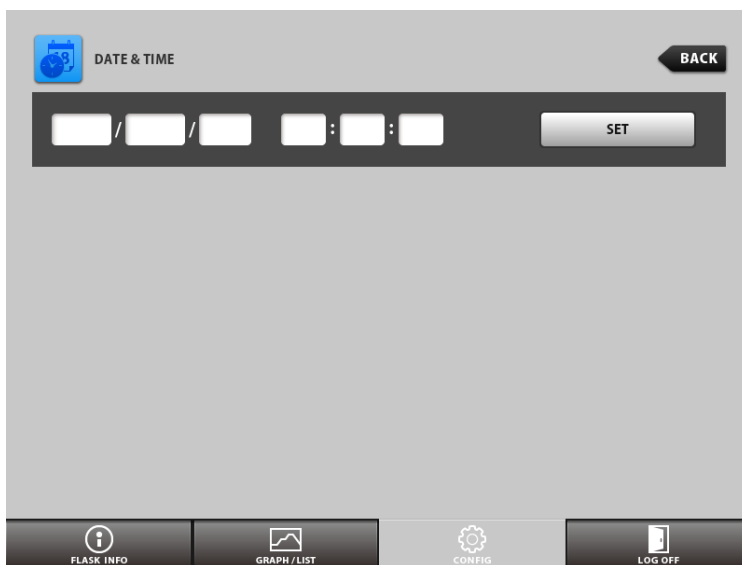
2) Tap DATE & TIME



icon to open.

- Tap blank to open keyboard to enter date and time.

- Tap SET button to finish.



9-5. DISPLAY

You can switch suspension power ON or OFF; adjust brightness.

< How to open DISPLAY window >

1) Tap CONFIG

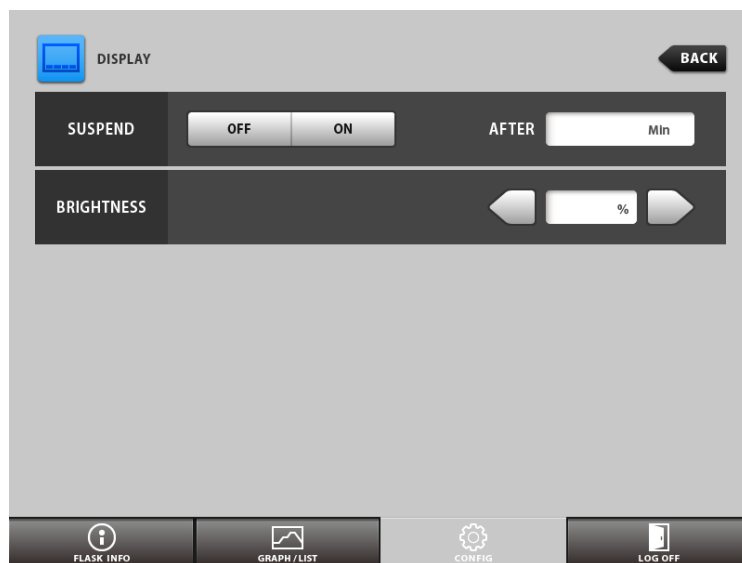


tab to open CONFIG menu.

2) Tap DISPLAY



button to open.



3) SUSPEND



You can activate Automatic power OFF function.

Choose ON for activate, timer can be set from 1-999 minutes.

4) BRIGHTNESS



You can adjust the brightness of the display.

Tap  button to decrease, tap  button to increase.

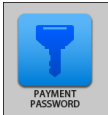
You can also long tap for continuous adjusting.

Direct entering value by keyboard can be also done. The range is 0 -100%

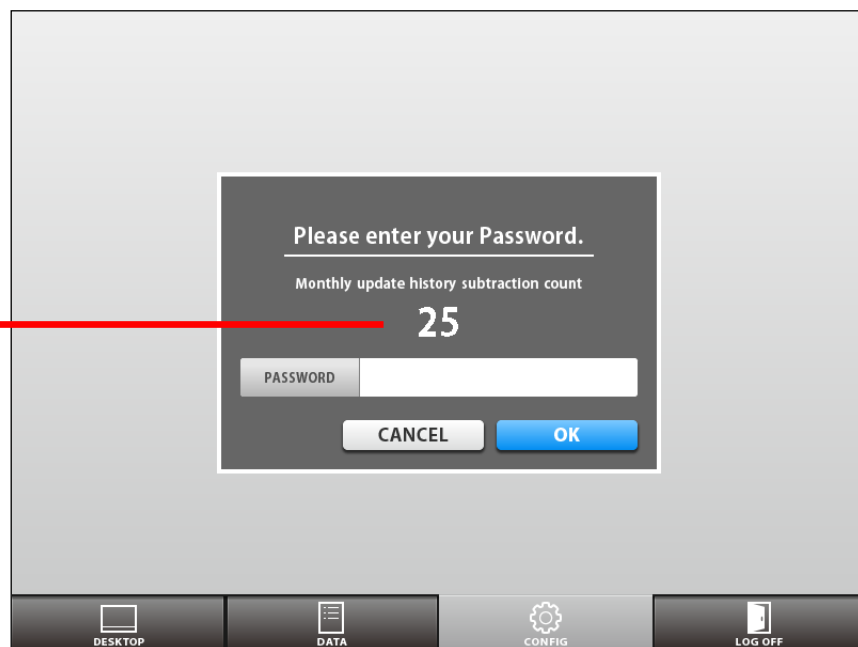
9-6. PAYMENT PASSWORD

< How to open PAYMENT PASSWORD window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap PAYMENT PASSWORD  button to open.

The rest of months
to be paid



3) PASSWORD



You can enter password.

9-6-1. WHAT IS MONTHLY PAYMENT?

Monthly payment system is to pay machine payment every month.

RBF37 stops working if you forget to pay.

RBF37 accepts anytime for any months not only every month one by one.

9-7. MAINTENANCE

< How to open MAINTENANCE window >

1) Tap CONFIG

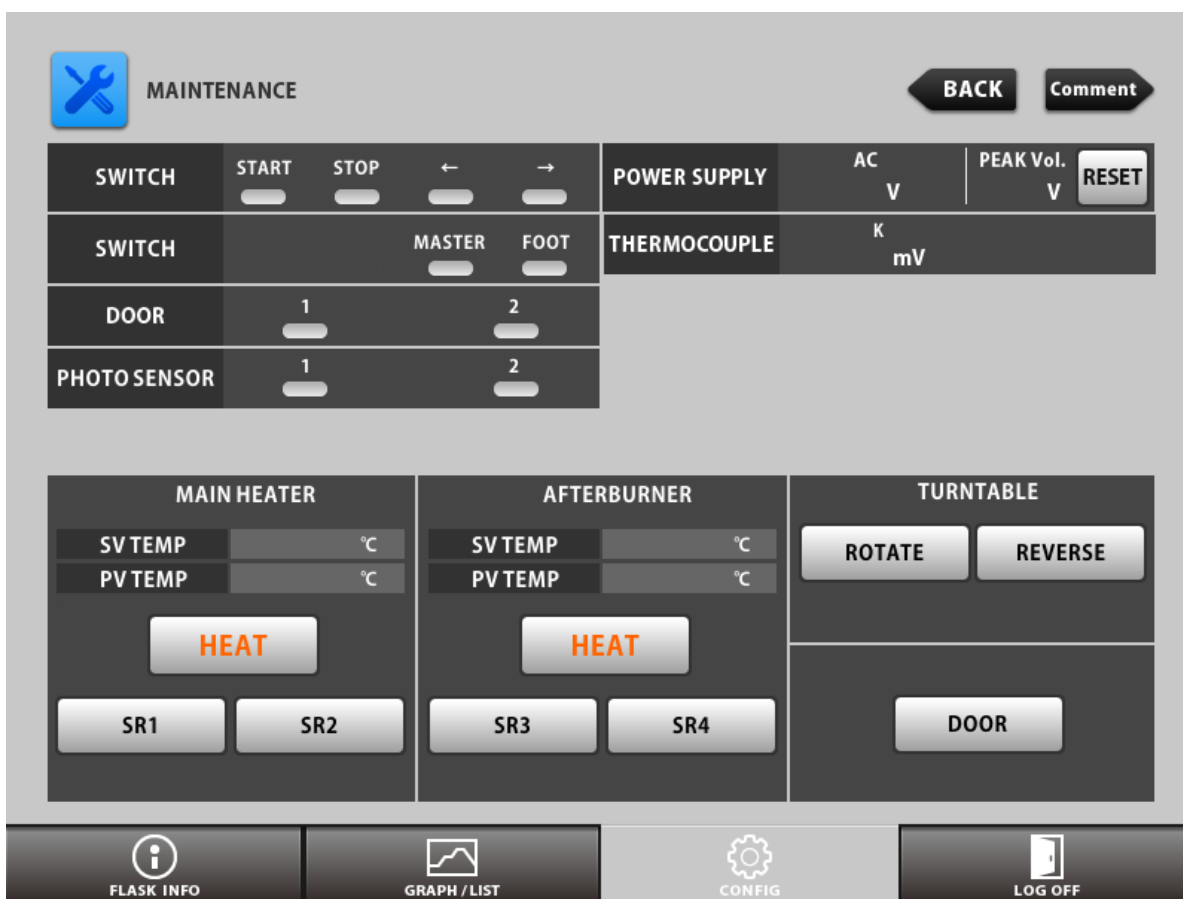


tab to open CONFIG menu.

2) Tap PAYMENT PASSWORD



button to open.



Descriptions on MAINTENANCE window

Category1	Category2	Descriptions
SWITCH	START	START switch ON/OFF monitor
	STOP	STOP switch ON/OFF monitor
	←	Rotation switch ON/OFF monitor
	→	Rotation switch ON/OFF monitor
	MASTER	MASTER switch ON/OFF monitor
	FOOT	FOOT switch ON/OFF monitor
DOOR	1	DOOR switch 1 ON/OFF monitor
	2	DOOR switch 2 ON/OFF monitor
PHOTO SENSOR	1	Original position of PHOTO SENSOR for rotation ON/OFF monitor
	2	Present position sensor ON/OFF monitor
POWER SUPPLY	AC	Input voltage monitor
	PEAK Vol.	Peak voltage input
	RESET	Reset button for peak voltage input
THERMO COUPLE	K	Input voltage through K type thermocouple for afterburner
MAIN HEATER	SV TEMP	You can tap and edit Setting Temperature Value here.
	PV TEMP	Monitor of present temperature
	HEAT	Heat button for setting value
	SR1	SSR1 (for main heater) ON/OFF switch
	SR2	SSR2 (for main heater) ON/OFF switch
AFTERBURNER	SV TEMP	You can tap and edit Setting Temperature Value here.
	PV TEMP	Monitor of present temperature
	HEAT	Heat button for setting value
	SR3	SSR3 (for After Burner) ON/OFF switch
	SR4	SSR4 (for After Burner) ON/OFF switch
TURN TABLE	ROTATE	Normal rotation ON/OFF switch
	REVERSE	Reverse rotation ON/OFF switch
DOOR		Auto DOOR ON/OFF switch

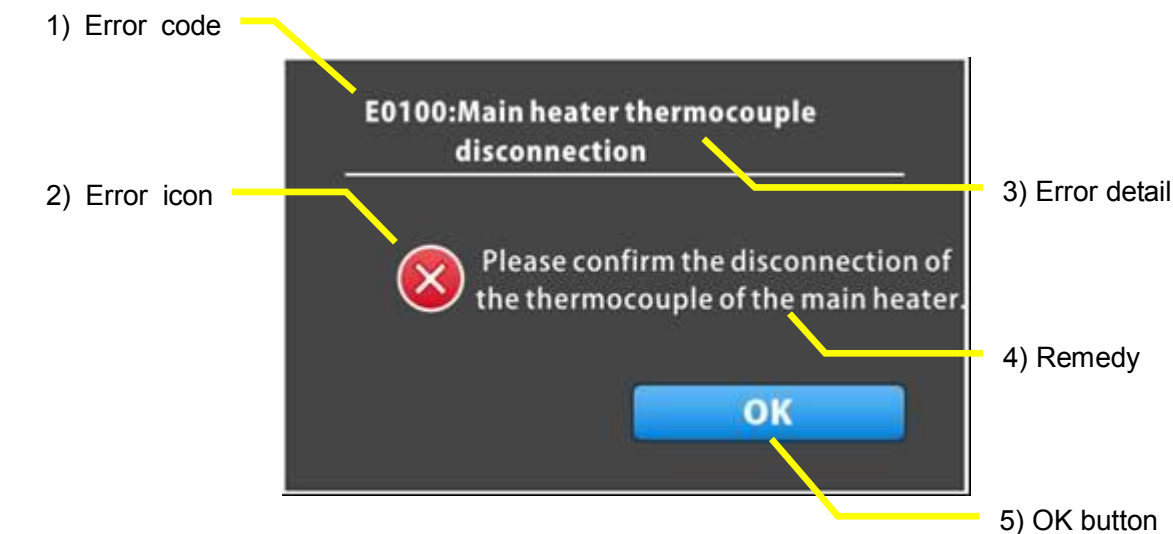
10.IN CASE OF IRREGULARITY

10-1. ERROR MESSAGES

RBF shows messages when something irregularity happens.

You cannot operate RBF while message is displayed.

Example of error message



1) Error code

Code of error.

2) Error icon

3 kinds of icons will be shown  Error,  warning,  information.

3) Error detail

Detail of error.

4) Remedy

Countermeasures.

5) OK

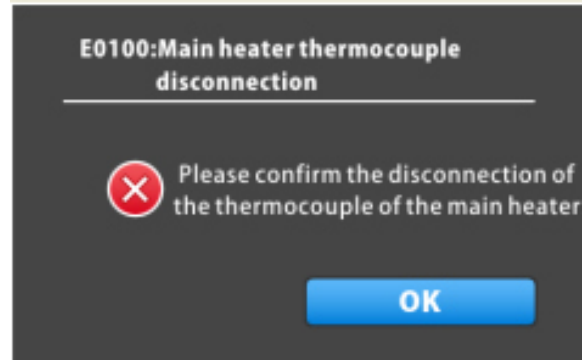
Tap OK  button to go back to previous page.

10-2. ERROR CODE LIST

E0100

[Main heater thermocouple disconnection]

- Remove cables from temperature controller
And check disconnection or defective on wires.
Replace if defective.
- Check temperature controller.



E0101

[Main heater trouble]

- Check main heater resistance under no power source supplied.
- Check SSR (solid state relay for main heater) at maintenance window by tapping SSR button to check if LED activated or not.
Replace SSR if not.



E0200

[Afterburner thermocouple disconnection]

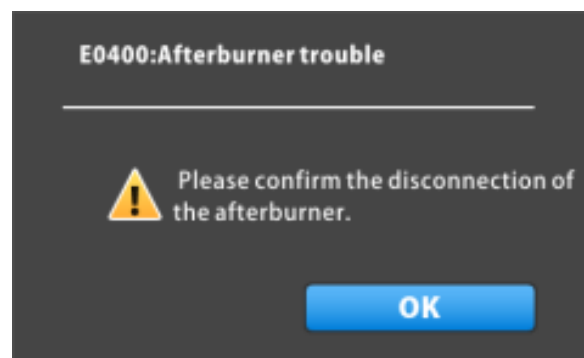
- Remove cables from control board and check disconnection or defective on wires.
Replace if defective.



E0400

[Afterburner trouble]

- Check heater resistance under no power source supplied.
- Check SSR (solid state relay for afterburner heater) at maintenance window by tapping SSR button to check if LED activated or not.
Replace SSR if not.



E0800

[Door open] Warning

- Close door.
- Door limit switch defective.
Check DOOR 2 LED shows reaction or not at maintenance window.



E0801

[Door open] Error

- Close door and push START switch.
- Door limit switch defective. Check DOOR 2 LED shows reaction or not at maintenance window.

E0900

[Blackout]

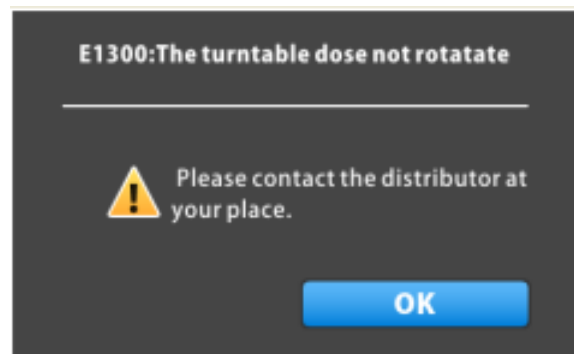
- Informs blackout record of longer than 5 minutes.



E1300

[Turn table does not rotate]

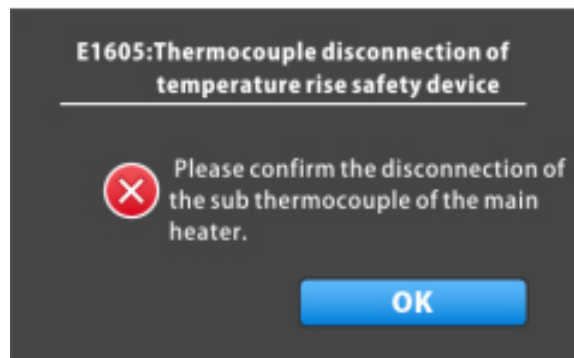
- Check motor rotating at maintenance window.
- Check photo sensor 2 ON/OFF when switch is ON or OFF.



E1605

[Thermocouple disconnection of temperature rise safety device]

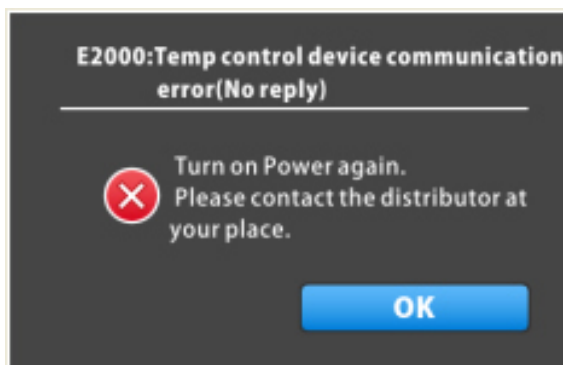
- Check if LED on SSR activated or not by turning ON at maintenance window.
- Replace thermocouple.



E2000

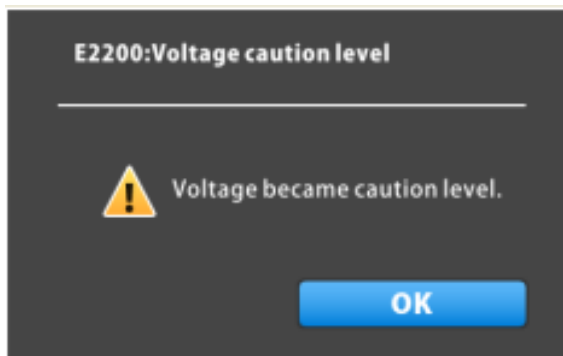
[Temp control device communication error]

- Wires breaking down.
- Check communication cable (13-15)

**E2200**

[Voltage became caution level]

- Check input voltage level and power source. (345VAC-435VAC)

**E2300**

[Voltage became abnormality level]

- System suspended
- Check input voltage level and power source. (325VAC-455VAC)
- Correct cause of the abnormality in factory electricity.

** Contact distributor about errors not mentioned above or not solved by this.

**** OTHER MESSAGES;**

Error code	Level	Description	How to recover
		Cause	Remarks
E1301	Warning	Disconnection of microphoto sensor	Check wiring on sensor PH1 Check sensor at Maintenance window
		Sensor of table original position not detected	
E1400	Error	Short circuit error on push key	Check push buttons
E1500	Error	TEMP setting error	Target must be in the range of 0-850c
		Target set over 1100c	
E1603	Error	TEMP setting error	Target must be in the range of 0-850c
E1604	Error	Main heater TEMP error	Replace heater or thermocouple, check control system
		Present temp is out of range	

E2000	Error	Temp control device communication error	Reboot
E2001	Error	Temp control device communication error	Check communication program
E2002	Error	Temp control device communication error	Check communication program
E2003	Error	Temp control device communication error	Check communication program
E2004	Error	Temp control device communication error	Replace temp controller
E2005	Error	Temp control device communication error	Check communication program
E2006	Error	Temp control device communication error	Check communication program and noise on line
E2007	Error	Temp control device error	Replace temp controller
E2800	Error	Temperature rise anomaly	Call distributor
E5200	Error	Control panel communication error	Check communication program on control board and control panel
E5201	Error	Control panel communication error	Check communication program on control board and control panel
E5202	Error	Control panel communication error	Check communication program on control board and control panel
E5203	Error	Control panel communication error	Check communication program on control board and control panel, check noise on line
E5204	Error	Control panel communication error	Check noise on line
E5205	Error	Control panel communication error	Check communication program on control board and control panel, check noise on line
E5300	Error	Flash programming error	Reboot PCB, check control program
E5301	Error	Flash programming error	Reboot PCB, check control program
E5302	Error	Flash programming error	Reboot PCB, check control program
E5303	Error	Flash programming error	Reboot PCB, check control program
E9000	Warning	Machine parameter Sum-Check NG	Initialize machine control parameter
E9001	Error	Machine parameter range injustice	Initialize machine control parameter
E9002	Error	Internal clock error	Call distributor
E9003	Error	Fatal error	Call distributor
E9003	Error	Memory leak error	Reboot. Replace System USB flash drive if not recovered
E9003	Error	System USB flash drive write error	Reboot. Replace System USB flash drive if not recovered
E9003	Error	System USB flash drive file injustice	Try to replace one of them
E9003	Error	USER USB flash drive format error	Reboot, Try another one if not recovered
E9003	Error	Initializing of I/O port error	Reboot, Replace operation board if not recovered

E9003	Error	Control board is trying to start up by down load mode (failure of update)	Rewrite firmware
E9003	Error	Control board has been reset	Reboot
E9030	Error	Memory leak error	Reboot
E9031	Error	USER USB flash write error	Reboot, Try another one if not recovered
E9032	Error	Capacity error on USER USB flash drive	Delete some files for more room and reboot
E9033	Error	System USB memory write error	Call distributor
E9034	Error	Unauthorized "SHUT DOWN"	Call distributor
E9036	Error	USB memory format error	Call distributor
E9037	Error	I/O initialize error	Call distributor
E9042	Error	Model injustice	Call distributor
E9043	Error	CPU UPDATE	Call distributor
E9044	Error	CPU error	Call distributor
E9054	Error	Data copy to another drive will begin as SYSTEM USB flash drive broken	Wait for copy finishing and normal reboot (takes long time) and replace broken drive after that
E9055	Warn	SYSTEM USB flash drive 1 broken	Replace System USB1
E9056	Warn	SYSTEM USB flash drive 2 broken	Replace System USB2
E9057	Warning	Data copy to replaced new drive will begin	Wait for copy finishing and normal reboot (takes long time) and replace broken drive after that
E9058	Warning	Data copy failed	Reboot. Replace System USB flash drive if not recovered
E9059	Error	Injustice position of SYSTEM USB flash drive	Replace one of USB flash drives
E9060	Error	Starting failure	Remove User USB flash drive and reboot
E9091	Error	Consumption replace recommendation	Replace motor, enter 'change motor' at maintenance window
E9092	Warning	Consumption replace recommendation	Replace heater, enter 'change main heater' at maintenance window
E9093	Warning	Consumption replace recommendation	Replace after burner heater, enter 'change after burner' at maintenance window

10-3. BLACKOUT

If electric power supply failed, control system reacts as follows;

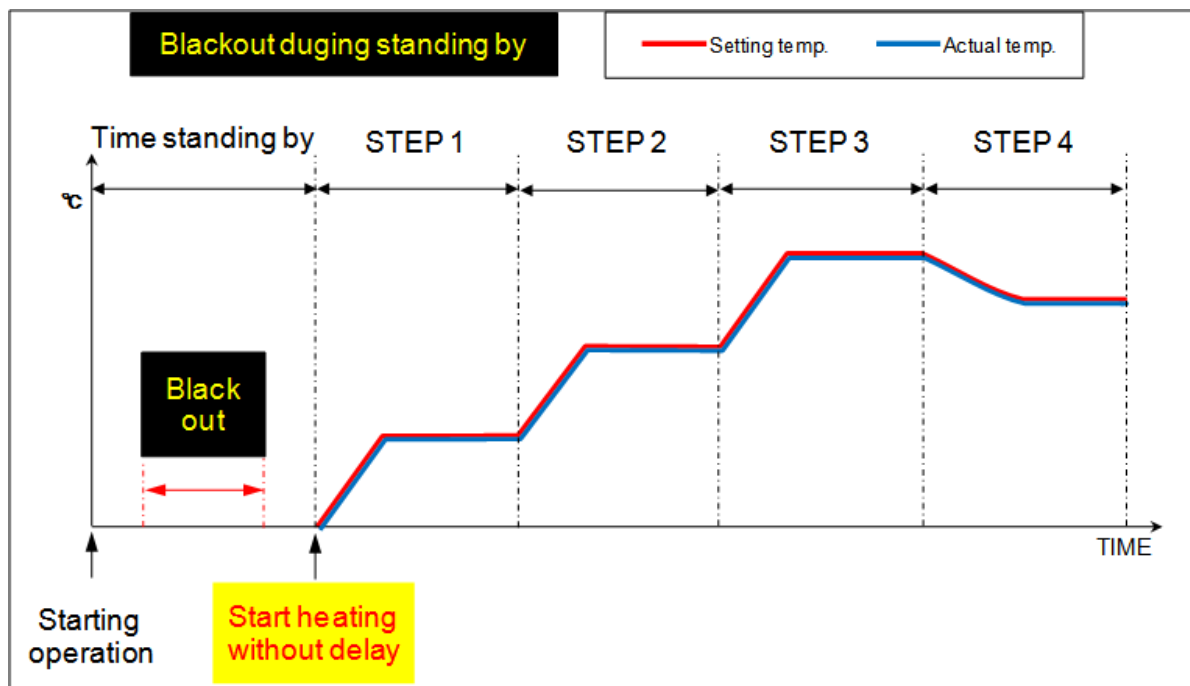
1) MANUAL BURNOUT MODE

When electric power supply is restored, the machine does not resume heating automatically. Press START key, so that the machine will resume its running.

2) AUTOMATIC BURNOUT MODE (blackout and recovery before the set time of Step 1)

In case blackout happened during standing by and restored before the set start time of Step 1, the machine resumes its running when power supply is restored.

In this case, finish of total burnout cycle will not be delayed. See the figure as follows.

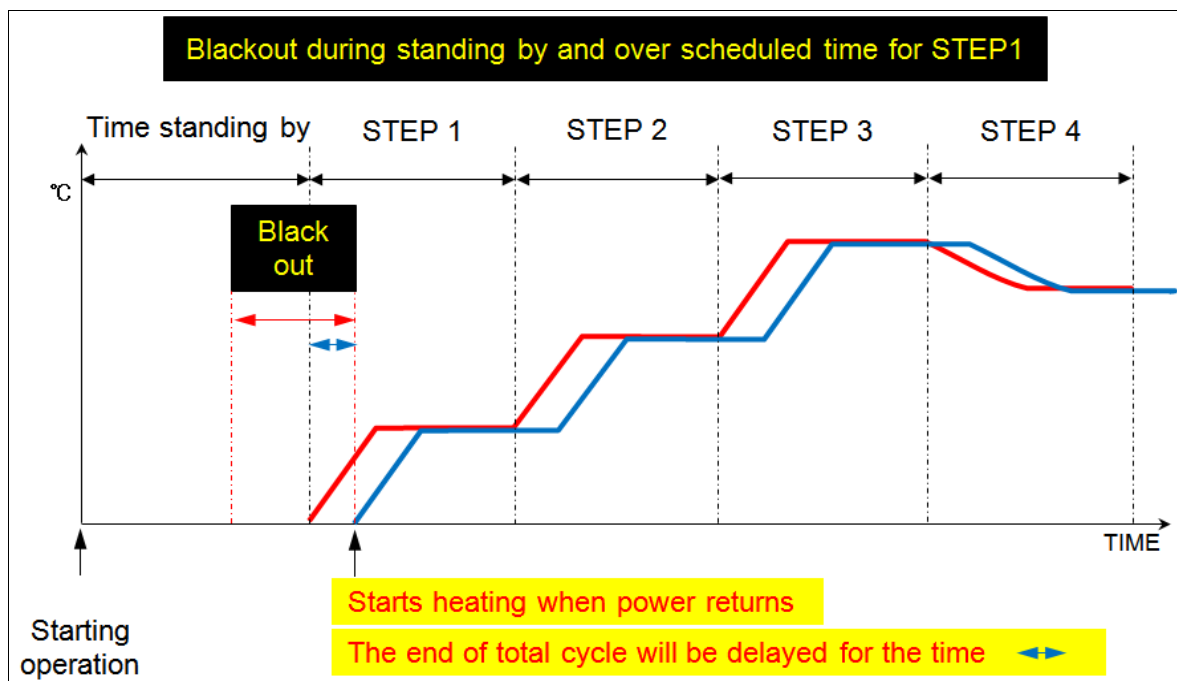


3) AUTOMATIC BURNOUT MODE (blackout before the set time of Step 1 and recovery after the set time of Step 1.

In case blackout happened during standing by restored after the set time of Step 1, the machine will be activated automatically again at the time when power supply returns.

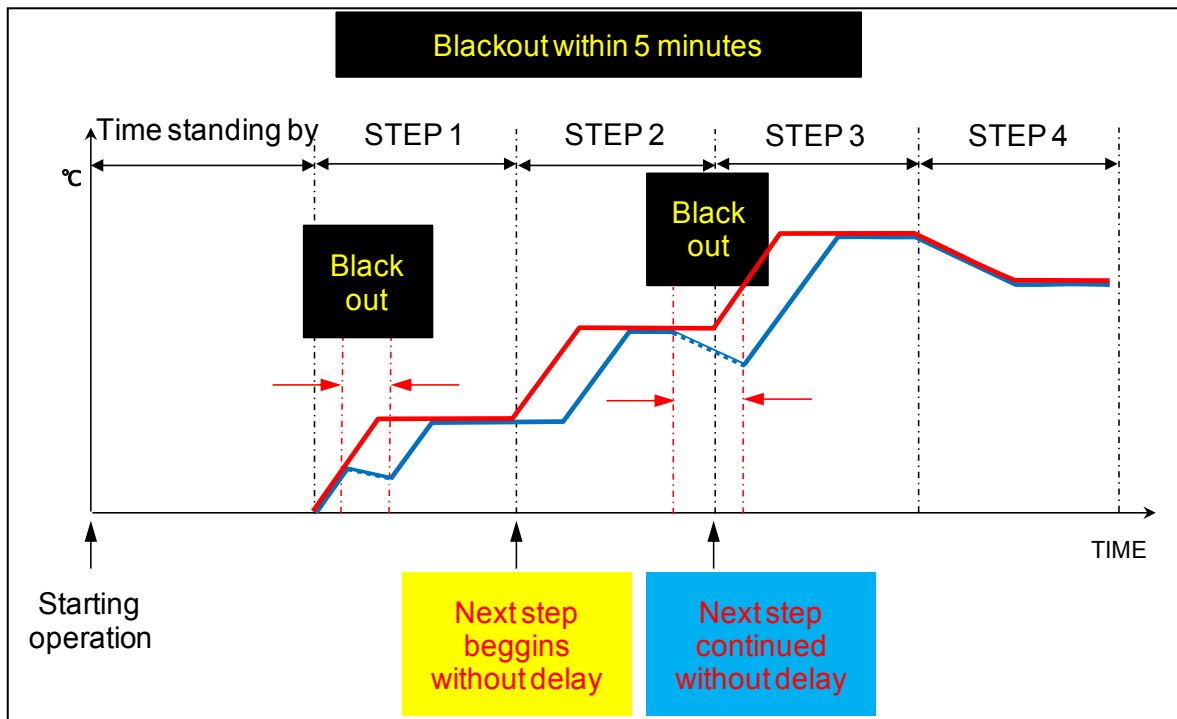
However, finish of total burnout cycle will be delayed for the time equal to blackout time period from the set start time of Step 1 to power recovery.

See the below figure.



4) AUTOMATIC BURNOUT MODE (during burnout cycle time)

When electric power supply is restored, the machine automatically resumes its running from the point where blackout occurred.



10-4. OVER HEAT PROTECTION DEVICE



CAUTION

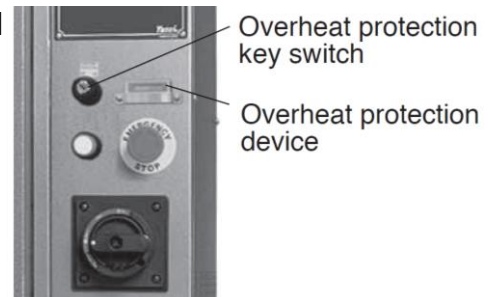
[1] Before operating burnout of stone-set flasks, be sure to check the set temperature limit value of overheat protection device, and change the set value if necessary to proper value.

[2] When changing the set value, consider that actual temperature may overshoot the set value of overheat protection device depending upon capacity of flask etc.

[3] The thermocouple for overheat protection device is consumable. If the thermocouple is damaged by wire-breakage etc. because of deterioration, the overheat protection device cannot work. So, always keep a spare thermocouple (available as a spare part) in your stock and replace the deteriorated thermocouple with a new one as far in advance as possible.

10-4-1. ON AND OFF OF OVERHEAT PROTECTION

If the overheat protection key switch located below the operation panel of the front panel is turned to ON, this overheat protection system becomes effective. If it is turned to off, the overheat protection system does not work.



10-4-2. OPERATING OVERHEAT PROTECTION

1) Check the set temperature limit on the overheat protection device and change the limit value if necessary considering properties of the stones, volume of flask etc., in accordance with the procedure described in the next page.

(Standard set value is 770 degrees centigrade.)

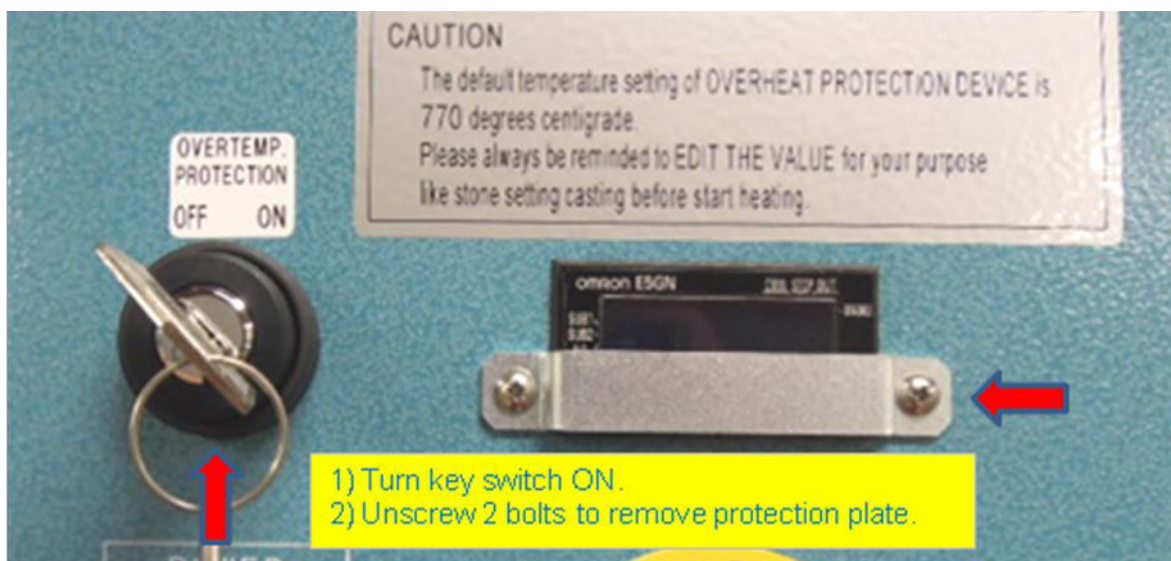
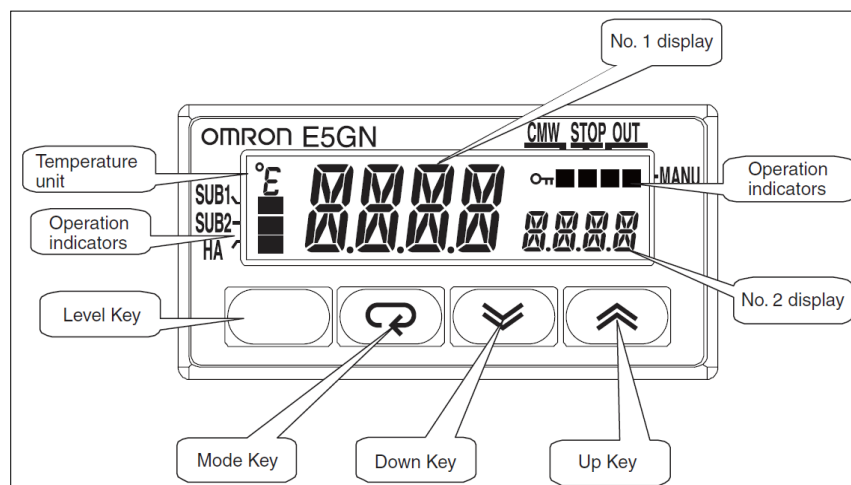
2) If actual temperature in the furnace has become higher than the set temperature limit during burnout operation, E1605 is displayed and heating is suspended.

The manufacturer shall in no event be liable for any consequential or indirect damages including, but not limited to, loss of production or loss of profit (including burnout for normal precious metal casting, for stone-in-wax casting and etc.) or damages due to machine downtime. Casting results (including burnout for normal precious metal casting, for stone-in-wax casting and etc.) by the machine or by this manual are not compensated by the manufacturer.



10-4-3. CHANGING SET VALUE OF OVERHEAT PROTECTION DEVICE

Overheat protection device;



3) Push MODE key.

4) Display goes to next page.

Push MODE key again.



5) Display changes to next page.

Edit value to your target. Push MODE key again.



6) Display changes to next page.

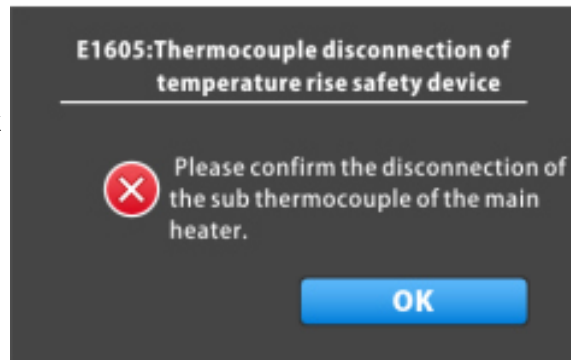
Push MODE key again.



7) You will go back to PV window.



A message E1605 will be on Operation panel when thermocouple for the device is defective, while another message **S.ERR** will blink on the display of controller which means Input error (signal from thermocouple).



CAUTION

Do not change default setting at PV window. Another configuration will be activated which disturbs normal operation.

The value must be always '0'.

