



K3 UP

VACUUM PRESSURE CASTING MACHINE



OPERATIONS MANUAL

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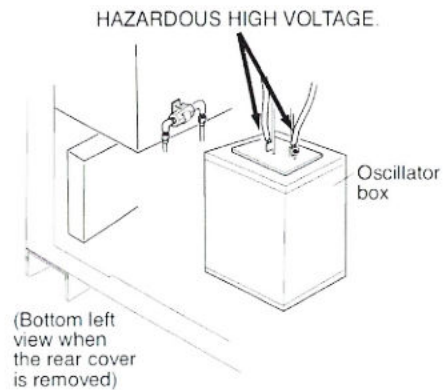
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1. INTRODUCTION

1-1. SAFETY INSTRUCTIONS

DANGER

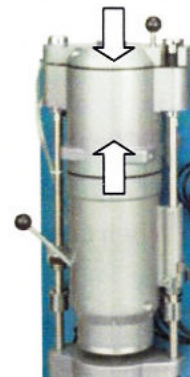
Do not open panels unless instructed in this manual, because hazardous voltage is flowing inside of machine. When it is necessary to open panels, always turn power off before opening panels for safety, otherwise hazardous voltage can cause an electrical shock, burn or death.



WARNING

1. When you press START button, do not place fingers, hands, a part of body, or an article between the bottom of lid and top of melting chamber or between the bottom of melting chamber and top of mold chamber.

When you press START button, the lid will move downwards and mold chamber will move upwards to close with pressure. Their pressing force to close is very strong.



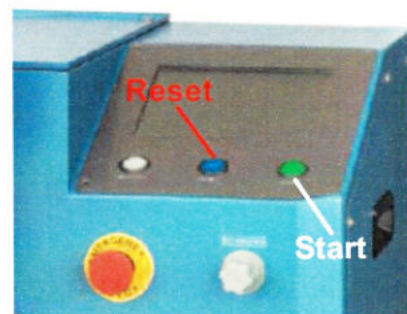
IMPORTANT

When you need to release the lid or the chamber, press RESET button immediately. The lid of chamber does not open by pressing EMERGENCY STOP button.



If you release START button while lid is lowering, lid moves upward to its original position.

If you release START button in one second after lid starts to close, lid moves upward to its original position.



2. When you check, replace, or clean crucible, heating coil and mold chamber and their surrounding area, after heating has been applied, wait until they are at room temperature, otherwise you may suffer burns.
3. Do not place any material on operation panel because misoperation of equipment may be caused. Do not place any material on lid and its surrounding area.
4. Electromagnetic waves from machine may adversely influence medical equipment such as a pacemaker or an implantable cardioverter defibrillator (ICD).
People wearing it should not be near machine.



CAUTION

1. Do not look into molten metal continuously for a long time. Wear protection glasses.
2. Check that no crack or breakage is observed on crucible, protection crucible, before their setting. Do not push crucible body, or metal in crucible, strongly.
When crucible has a crack, molten metal may leak through it, resulting damage of machine.
3. Crucibles have their casting lives. Do not use a deteriorated crucible. Check condition of crucible before use.
4. Do not leave machine unattended, while it is turned on.



- 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 a crucible breakage or contacting with high temperature parts are not compensated by the manufacturer.
- Damages resulting from delay of reaction at emergency and mistaken operation are not compensated by the manufacturer.
- Damages by electrical noise, over voltage, or wiring error caused from an external vacuum pump are not compensated by the manufacturer.
- Casting results by the machine or 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.

1-2. PASSWORD

1-2-1. KIND OF PASSWORD

Three kinds of password are prepared for machine as follows.

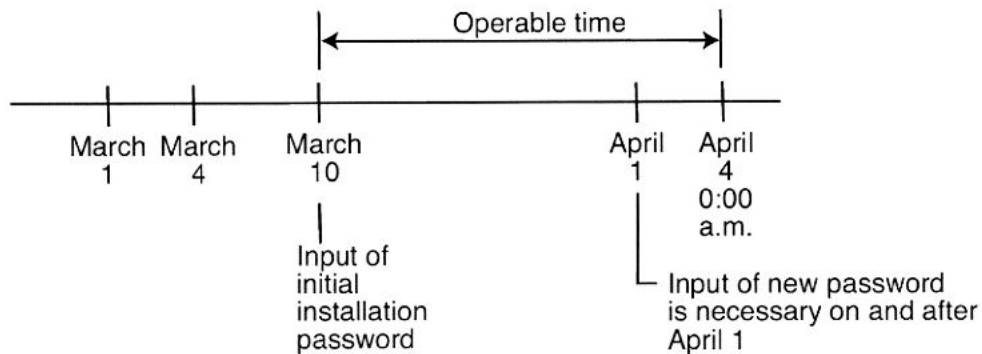
1) Initial installation password

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

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

Unless final password is input, input of new update password is necessary monthly to use machine on and after this day. Without new password, operation becomes impossible.

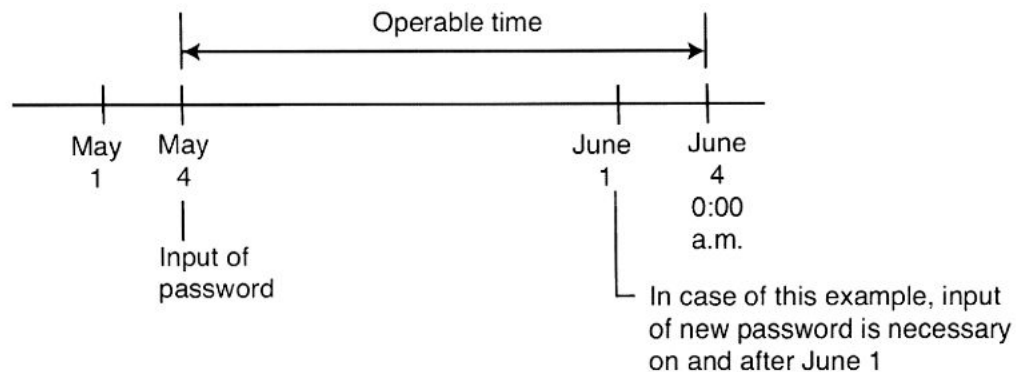
Example of initial installation password:



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 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: If input is done before the first day of the month to which next monthly calculation starting time belongs, monthly update subtraction counter is decreased by extra one month. Input should be done on or after the first day of the month to which calculation starting day belongs.

3) Final password

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

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

1-2-2. ISSUE OF PASSWORD

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

Model name: K3UP

Production Serial No. : xxx

Current monthly update history count: xx

1-3. SPECIFICATION LABEL

The principal specifications label of this machine is affixed on the backside panel.

NOTE: When ordering spare parts, specify the production serial number that is printed on that label. Apply power specified voltage printed on the label. Should any voltage exceed beyond the specified voltage, the manufacturer is not responsible to guarantee performance of K3UP.

1-4. WORKING CONDITIONS

- 1) Use machine at temperatures ranging 0-40 degrees Celsius and humidity under 70%.
- 2) Apply power voltage 380VAC, 50/60 Hz, 3 phase only.
- 3) Do not use machine under atmosphere with too much dust or with harmful gas.

1-5. OTHERS

1) K3UP is controlled by genuine computer which needs longer time for starting up comparing with other electric equipment apparatus.

2) We have "half life period" on back up light for Liquid Crystal Display (LCD).

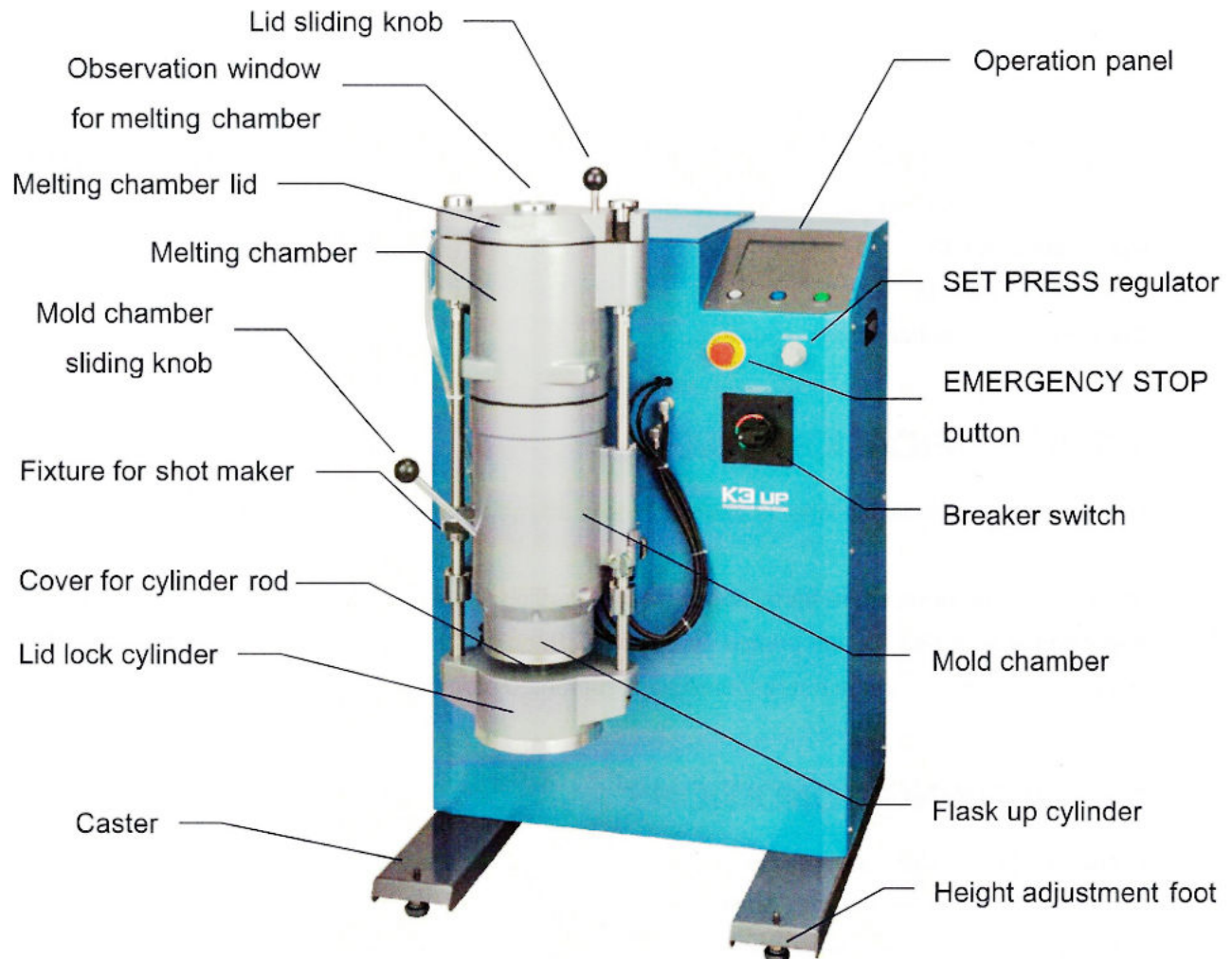
Actual half life period on K3UP's display is approx. 3 years when you use it with 100% brightness.

K3UP is always shipped out with initial brightness setting 50% to save life time of back up light.

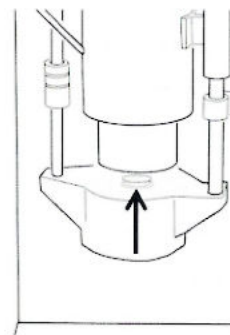
You can also control its life by using suspend function.

2. NOMENCLATURE

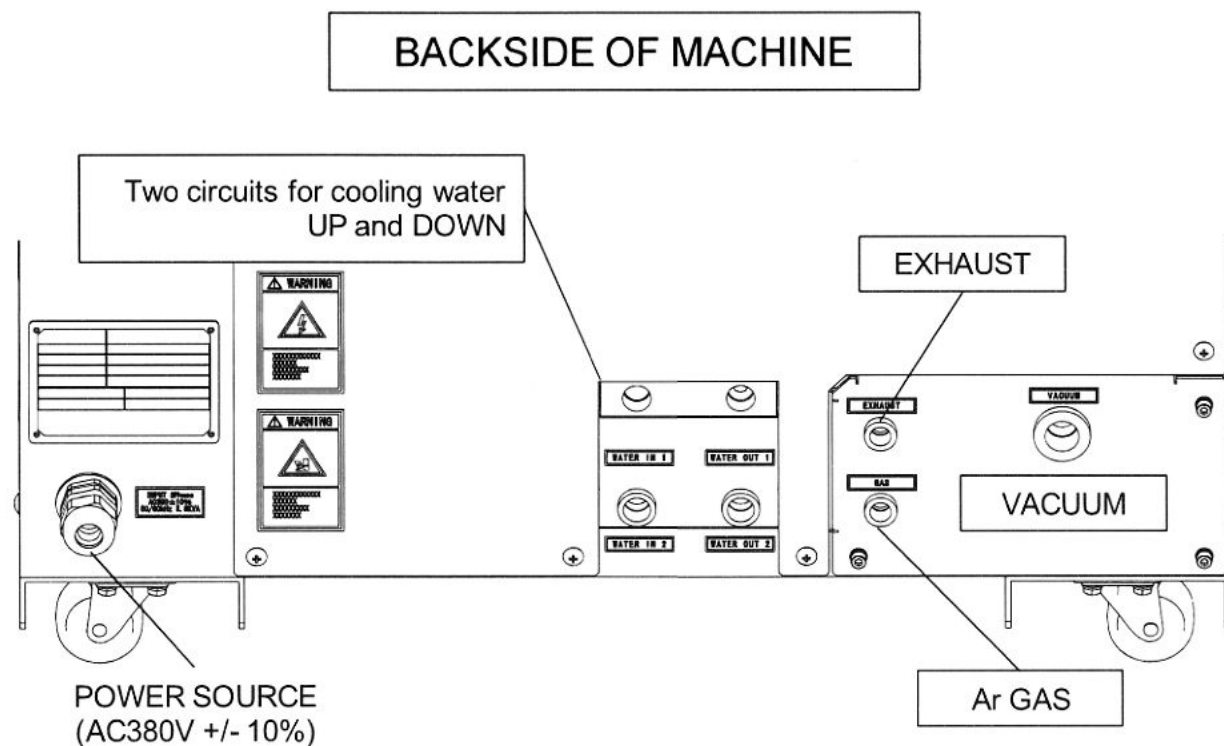
2-1. MAIN BODY



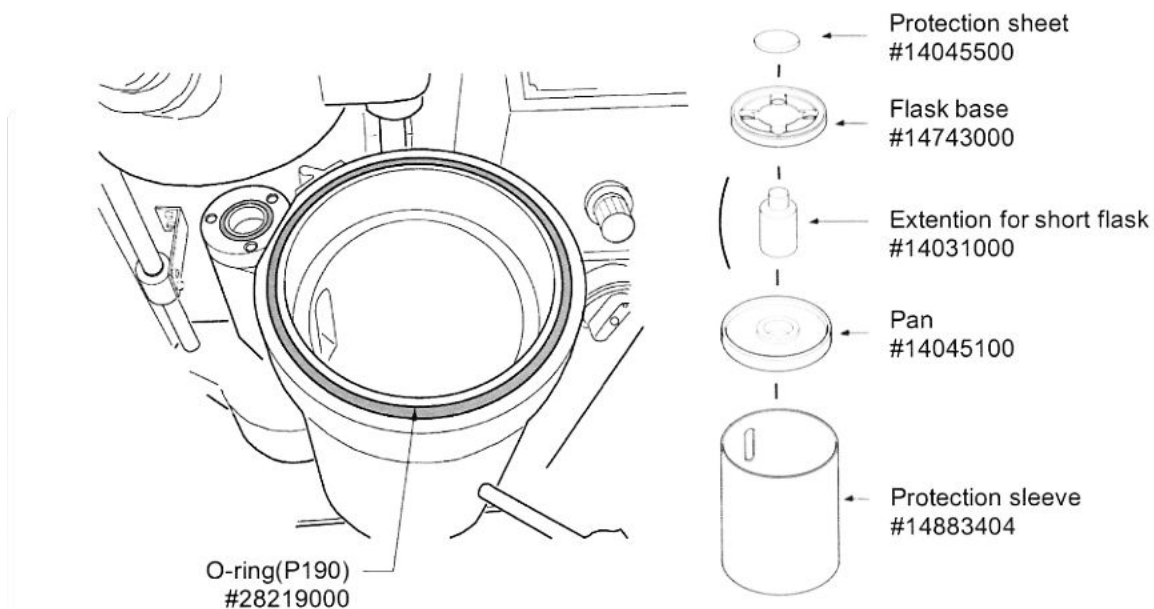
When installation;
1) Remove fixation screw bolt for transportation.
2) Place cover for cylinder rod.



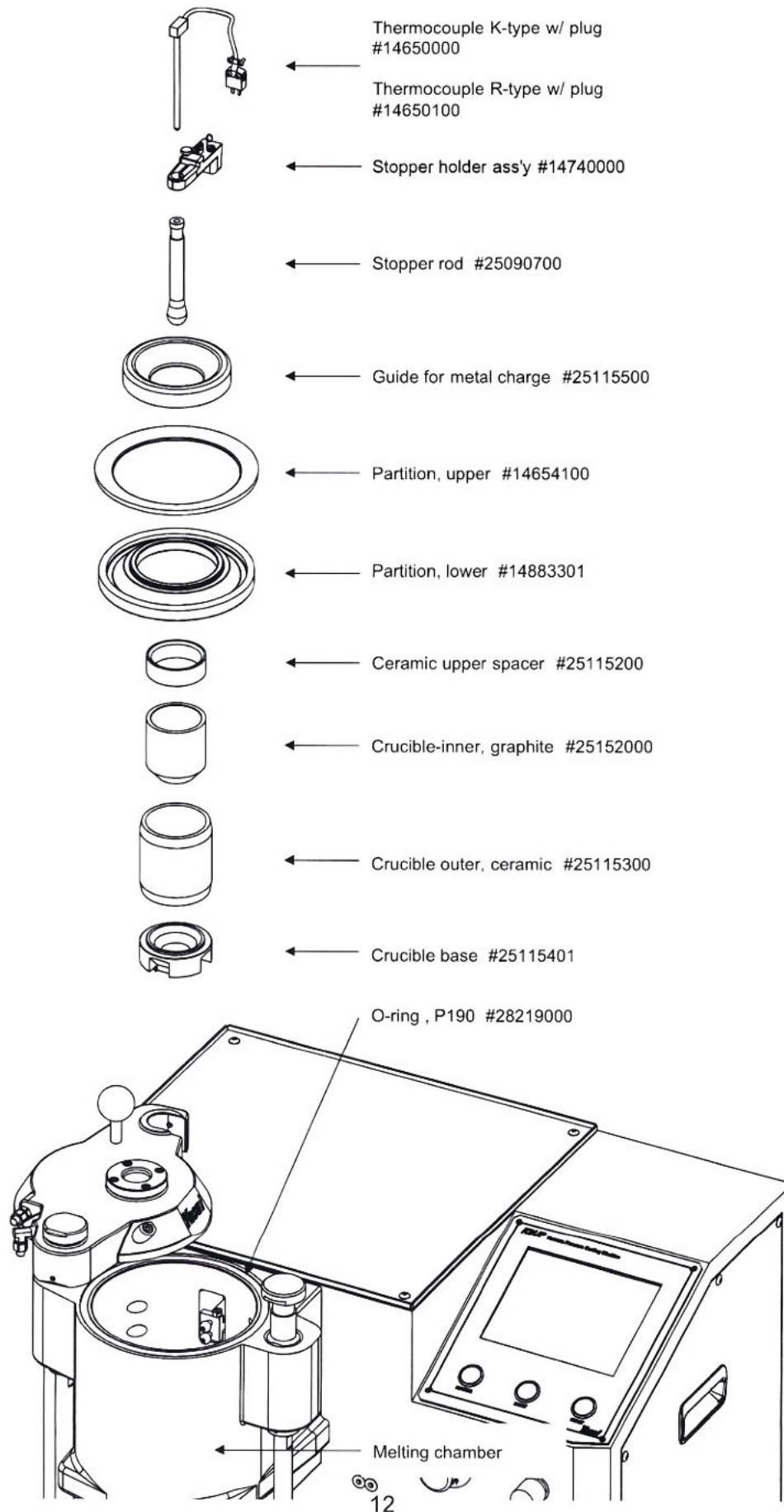
2-2. REAR PANEL



2-3. MOLD CHAMBER



2-4. MELTING CHAMBER



3. PREPARATION BEFORE CASTING

3-1. CHECKING POINTS BEFORE POWER ON

Check the below points prior to power ON.

- 1) Connection of vacuum pump and its direction of rotation.
- 2) Pressure of supply inert gas.
- 3) Connection of hose to WATER IN.
- 4) Connection of hose to WATER OUT.



CAUTION

Make sure before starting heating that the faucet of water is turned on and tap water is running inside machine.

3-2. SETTING CRUCIBLE AND OTHER PARTS

Set up the below items.

Melting chamber.

- 1) Outer crucible, inner crucible, ceramic spacer and crucible base.
- 2) Partition, Guide for metal charge.
- 3) Stopper holder, stopper.
- 4) Thermocouple.

Mold chamber.

- 1) Protection barrel, pan and flask base.

Below mold chamber.

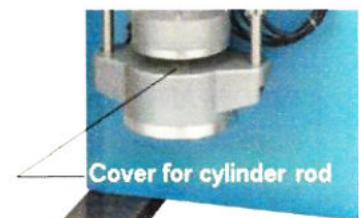
- 1) Cover for cylinder rod.



IMPORTANT

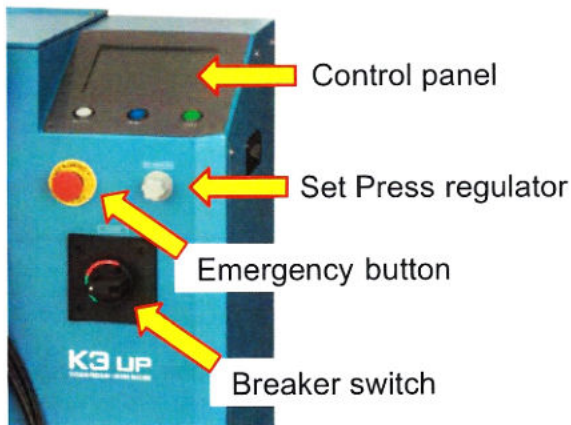
If cylinder rod head cover is forgotten, the lid lock action cannot be performed properly.

At the time of installing machine, be sure to check it is set in place.

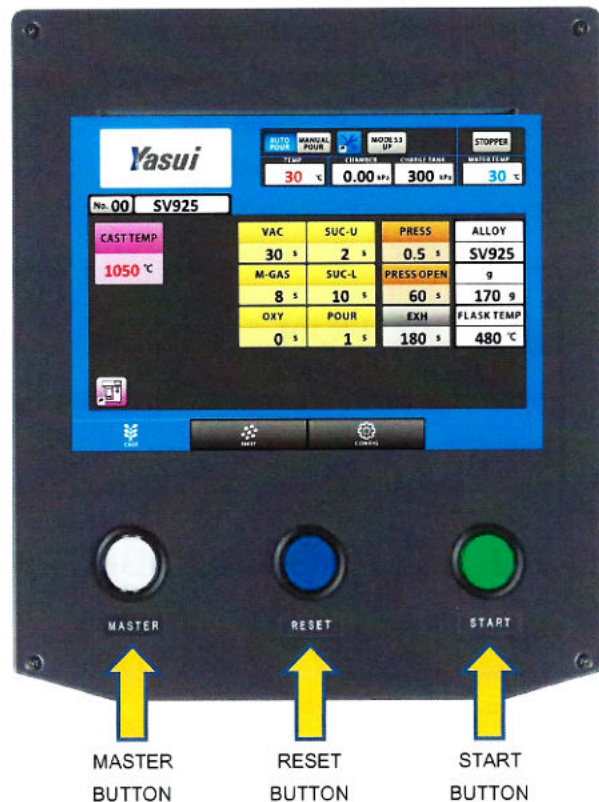


4. OPERATION

4-1. OPERATION PANEL AND OTHERS



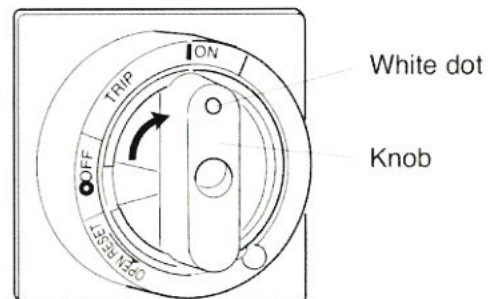
Major operation will be done around this area.



4-2. POWER ON

Turn knob of BREAKER switch until its white dot is set to ON position.

Power is supplied to all necessary parts.



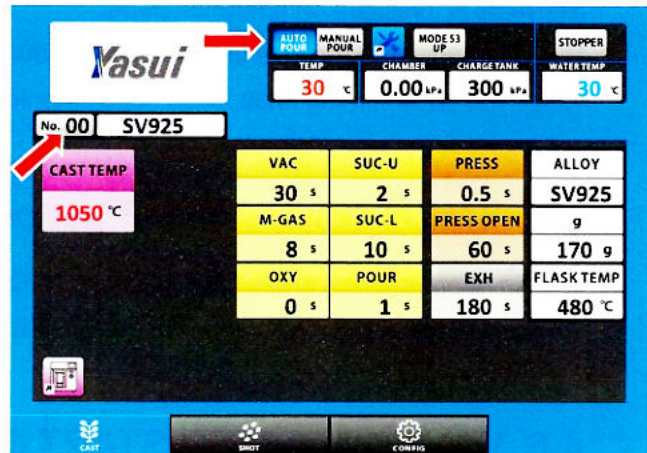
IMPORTANT: Turn knob securely until it clicks into place.

IMPORTANT: When white dot of BREAKER switch moved to TRIPPED position during use of machine, over current has flown inside the machine (machine became TRIPPED condition by over current). In this case, check the cause and take necessary action. Then, turn knob to RESET position. Next, turn knob to ON.

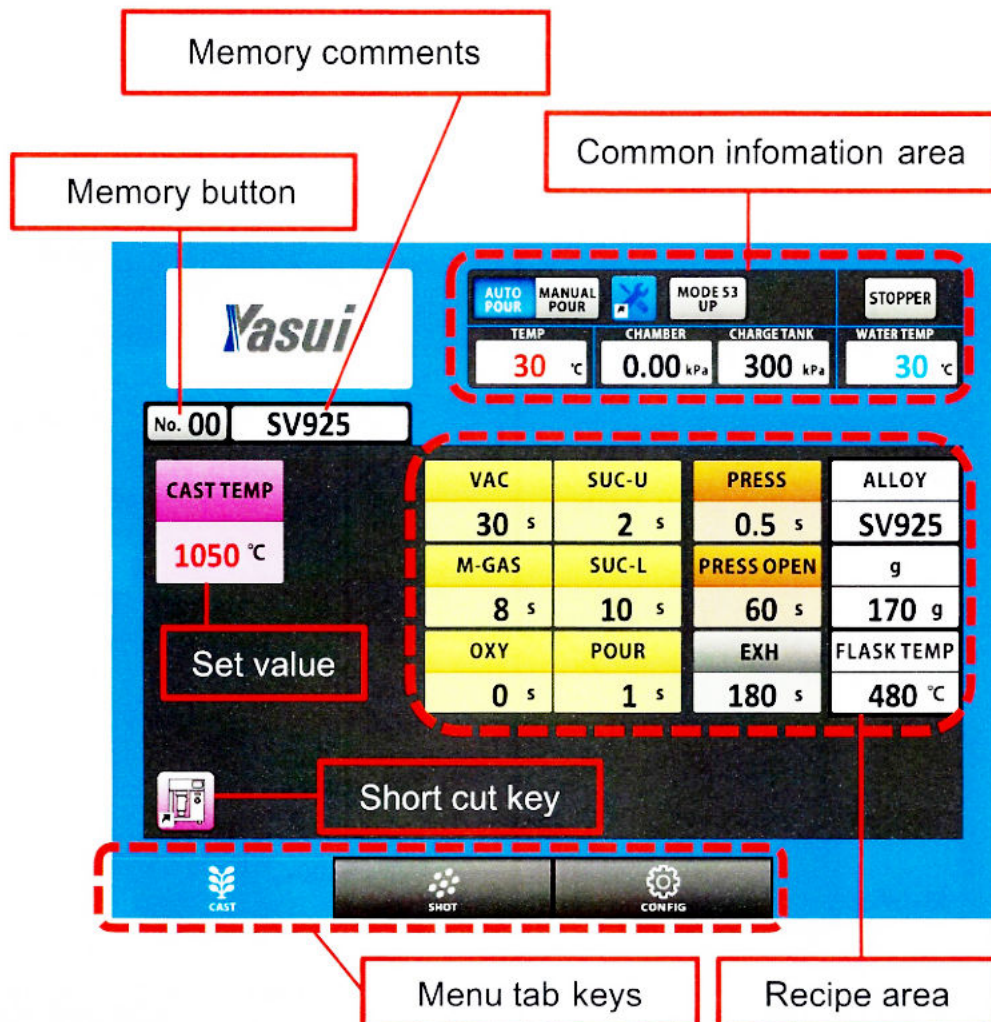
4-3. OPERATION

AUTOMATIC OPERATION

- 1) Turn main breaker ON.
- 2) Push MASTER button.
- 3) Select memory at main display.
- 4) Put metal into crucible and close lid.
- 5) Put mold into chamber and close.
- 6) Push START button for more than 2 seconds.
- 7) Take mold out from chamber when casting process completed.



Details on the main display;



4-4. SET PRESS Regulator

Turn SET PRESS regulator knob to set the final pressurization value of internal charge tank.

Set value is indicated on operation panel.

Maximum pressure value of this machine is 300 kPa.

When you finish turning knob, push knob in for locking.

4-5. EMERGENCY STOP button

In case of emergency, press EMERGENCY STOP button to stop all of the functions.

To recover, turn it clockwise and press RESET button.

4-6. WINDOW AFTER START BUTTON

After pushing START button for actual casting, the window changes to GAUGE window.

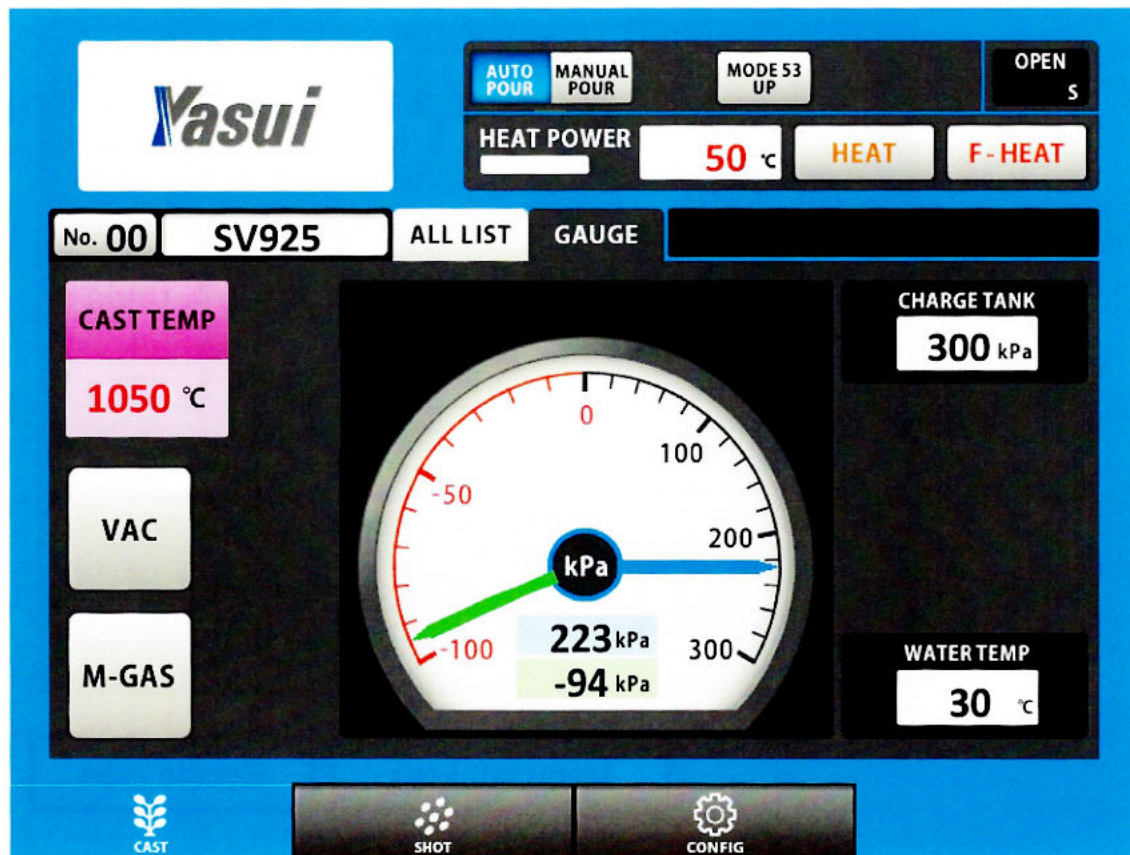
Big bourdon tube style manometer enables you to feel pressure instinctively by needles.

While digital display in the gauge is very useful for reviewing casting result.

K3UP shows not only pressure in melting chamber but also mold chamber pressure.

You will know the condition of sealing disk, investment quality, difference by control suction value and others to improve casting result.

Other tabs except for ALL LIST tab are not shown while casting operation.



4-6-1. LEFT SIDE OF WINDOW



There is 'CAST temperature setting' box on top of this window.
You can change setting during heating by tapping this box to call keyboard.

VAC button in the middle.
You can adjust vacuum level by this button.

M-GAS button at bottom
You can provide additional M-GAS by this button.

4-6-2. RIGHT SIDE OF WINDOW

Charge tank pressure indicator on top.
You can adjust it by regulator in front of machine.
You can check cooling water temperature at drain exit.
Please be careful you will have warning when it increased over 40 degrees Celsius.

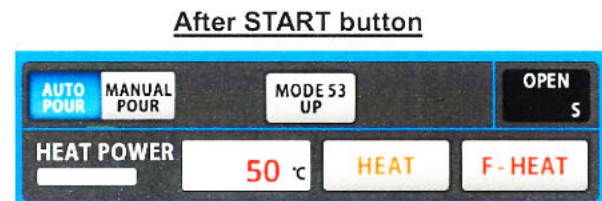


4-6-3. TOP OF WINDOW

You can switch pouring mode and function mode.
Lower area is for observing temperature and pressure.



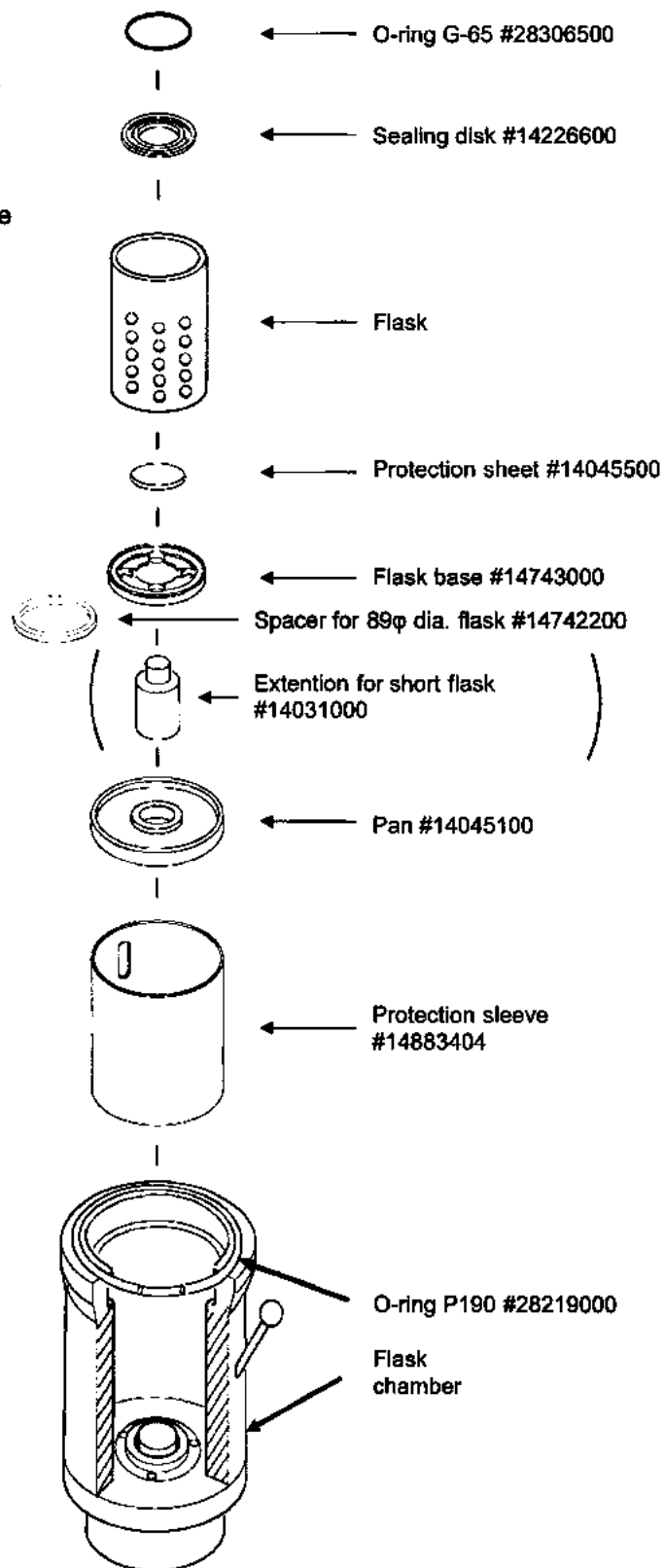
Some of them will change function after casting
START button pushed.
The details will be described later.

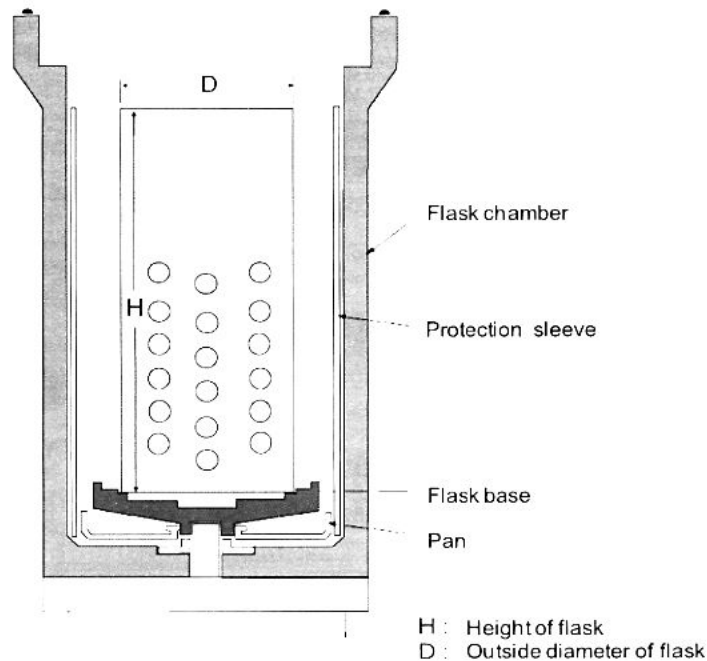


5. FLASK





5-1. FLASK COMBINATION

Use of a perforated flask is recommended.
Position of flask and other accessories in order as the below figure.



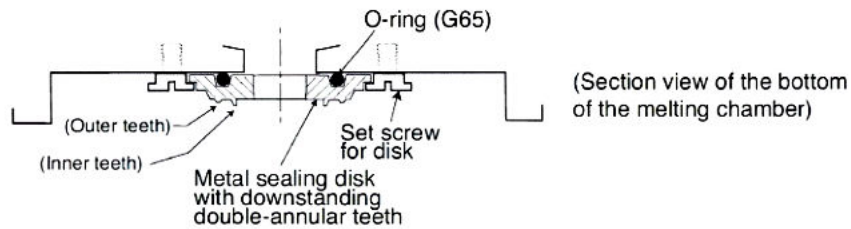


The below flasks can be used.

Flask base	Size of flask to be used	
	Height (H)	Outside diameter (D)
Flask base 	190 mm to 230 mm (7 1/2" to 9")	89 mm (3 1/2") to 125 mm (5") (when flask is not deformed)
Flask base  to be used together with the adapter for short flask (H=40 mm) 	150 mm to 190 mm (6" to 7 1/2")	(The positioning ring #14742200 is necessary for 89 mm flask) 

5-2. METAL SEALING DISK

Top of flask is pressed against the bottom of melting chamber. Then, pressurization and suction are actuated. Gas passes from upper surface of flask mold through inside of mold, then is disperses through side walls and bottom of the mold to outside. Use metal sealing disk with down standing double-annular teeth to seal upper surface of flask mold.



IMPORTANT

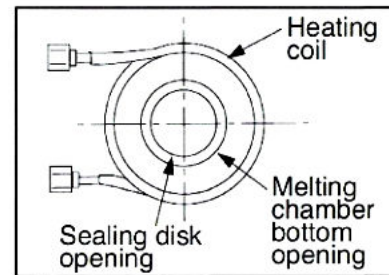
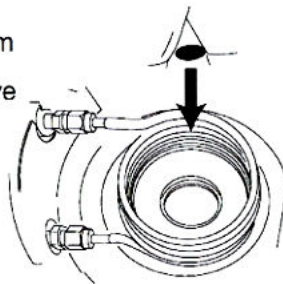
Wrong fixation of metal sealing disk with down standing double-annular teeth may greatly affect casting results.

Check the below 1 to 4.

1) Check periodically the conditions of metal sealing disk and O-ring. The O-ring used for this sealing is consumable. So, replace into a new one before sealing effect is weakened.

2) Adjust horizontal location so that the disk is exactly centered, and then tighten three screws evenly. If the disk is not set properly, results of casting will be greatly affected.

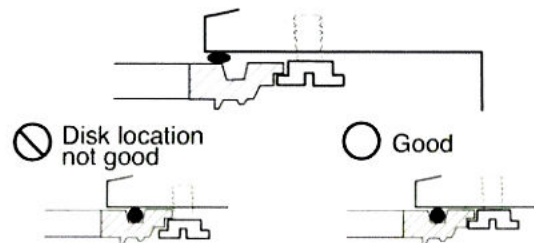
Look into the bottom opening of melting chamber from above



3) Take care that O-ring will not go off the groove of disk and will not be flattened.

4) Wrong positioning of set screw and disk will disturb tightening of the screw to its end.

⊘ O-ring location not good



When a part of these teeth is broken, a good casting result may not be expected. Check them periodically.

5-3. O-RING CONDITIONS

As the O-ring is used for times, its sealing capability may be weakened which affects casting result.

When deterioration of O-ring is found, replace into a new one. (item #28306500 O-ring, G-65)

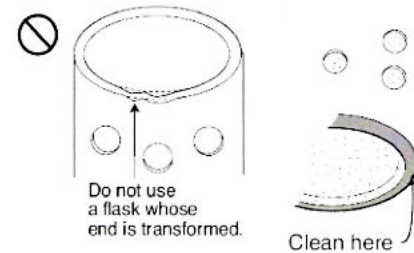
O-ring has their lives. It is recommended to keep its spares in stock.

NOTE: In one of the below cases, it is possible that the investment may be cracked.

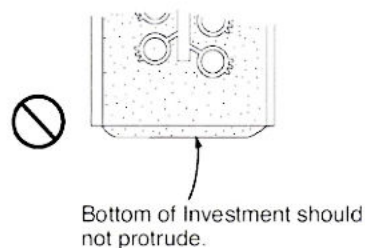
- 1) Pressure of melting chamber indicates rapid decrease suddenly.
- 2) Pressure increase is slower than usual at the time of pressurization.
- 3) Suction speed (after cast start) is slower than usual.

5-4. CORRECT PLACEMENT OF FLASK

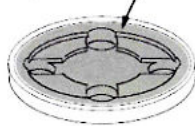
- 1) Buildup of investment powder on either top edge or bottom edge of flask may result in failure of casting.
Before placing flask into burnout furnace, scrape spilled investment on both edges of the flask completely.



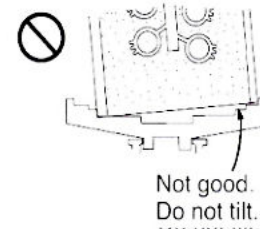
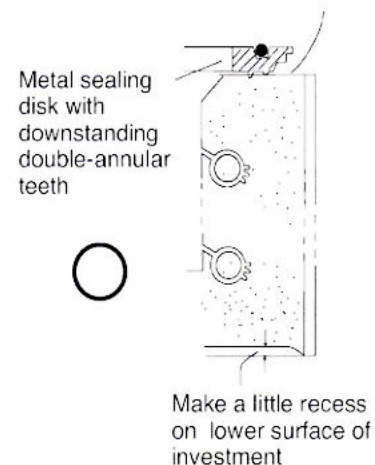
- 2) Check to see that investment surface is not protruding over the upper side edge or the lower side edge of flask, so that sealing will be secured. (Check rubber base also)
Make space as required referring to the below figure.



Remove a lump of investment powder residue from this area if there remains any, so that the flask will not tilt when it is set in position.



When you use the metal sealing disk with downstanding double-annular teeth, the upper surface of investment must be flat.

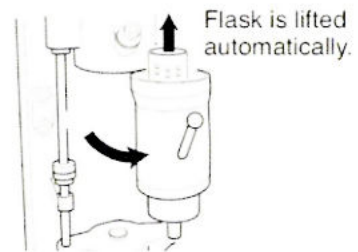
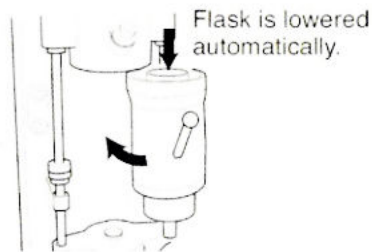


- 3) Slide mold chamber in and out for trial to check that flask automatically goes up and down.



CAUTION

Do not slide mold chamber toward machine body too fast.



6. MAINTENANCE

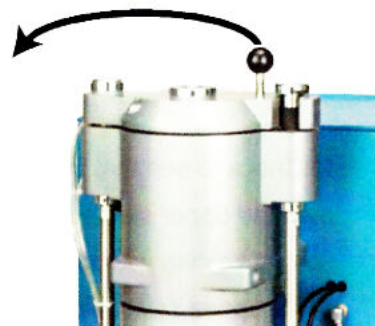


WARNING

1. Be sure to turn BREAKER switch OFF before starting maintenance. Be careful with electric current in some part of the machine even when switch turned OFF, unless power supply cable is removed.
2. Care should be taken so that skin is protected from direct contact with heated parts after heating is applied, because it requires some time for each part to cool down.

6-1. CLEANING OBSERVATION WINDOW

When observation window on lid became dirty, rotate lid to the left and clean surface of lens glass beneath.



IMPORTANT

1. When you clean sight glass removing eye piece ring, Tighten it securely after cleaning. When tightening is insufficient, vacuum leakage may be caused.
2. However, it might be better not to remove sight glass from casing except for exchanging it.

6-2. GAS CYLINDER

Replace gas cylinder early when remaining amount in the cylinder became small. Take enough care during replacement of gas cylinder, so that any dust will not enter inside of gas tube.

6-3. CRUCIBLE AND STOPPER

After casting, slag sticks on the surface of crucible and stopper. Always clean it with a hard brass-wire brush or the like before next casting.



CAUTION

1. When those parts are not cleaned, leakage of molten metal may be caused, resulting inferior casting. Further, a trouble which hinders normal operation of machine may be caused, so take deliberate care about leakage of molten metal.
2. Shape of crucible and stopper will transform after long time use. That's why you need to check every time before casting to see whether the lower end of the stopper and inside bottom opening of crucible are securely fitted for perfect sealing.

6-4. FILTERS FOR CHAMBERS

6-4-1. CLEANING

Two filters are installed inside the panel for filter.

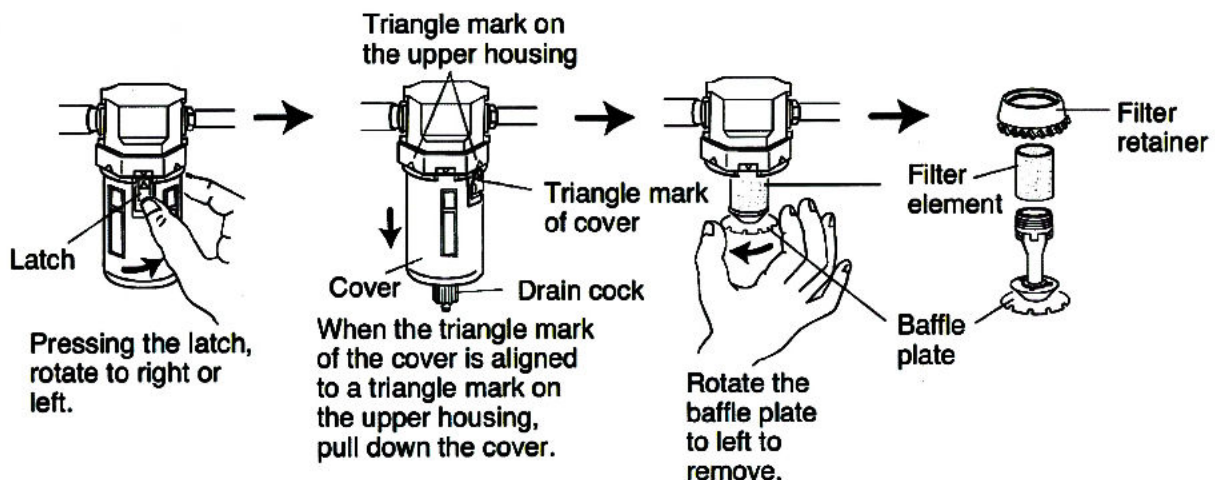
- Clean filter for mold chamber after every daily work.
- Cleaning of filter for melting chamber depends on amount of zinc contained in molten metal you use, however, it is better to clean that filter frequently.

Condition of filter is likely to affect casting results. When the mesh of filter element in vacuum filter is clogged, it may be better to replace element with a new one.

6-4-2. DISASSEMBLING FILTER UNIT

Open filter panel on left side of machine. You will see similar two filters.

Both two filters should be frequently checked and cleaned.

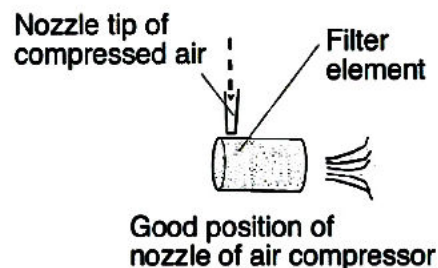


#14071100 Filter ELEMENT (F4000).

#14070800 BAFFLE set, incl. deflector, baffle & O-ring.

6-4-3. CLEANING FILTER

Press the tip of air compressor nozzle on outer surface of filter. If you place the tip of nozzle of a vacuum cleaner (available in the market) inside of filter, cleaning will be more effective. When it is difficult to remove clogged dusts, use an ultrasonic cleaner available in the market for cleaning.



6-4-4. REASSEMBLING

Check that O-ring is put back in place at the time of reassembling.

Apply grease on the surface of O-ring for better sealing.

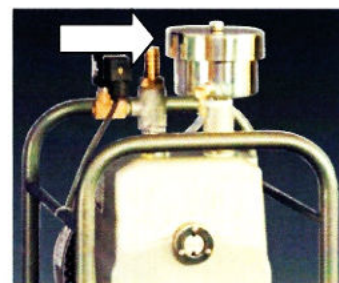


IMPORTANT

1. Use only grease made for exclusive use for vacuum sealing.
Do not use grease which is available for general mechanical use etc.
 2. If direction of the filter element is reverse at reassembling, it will not be possible to lock plastic cover.
 3. Clogging degree of filter element depends on mold condition after burnout and suction timing.
- Further, the filter element cannot catch all particles perfectly (Some of particles pass through filter)



** We strongly recommend checking oil mist trap element (#17561501) on vacuum pump as well as filters in casting machine.
Many casters don't care about this and have vacuum problem.

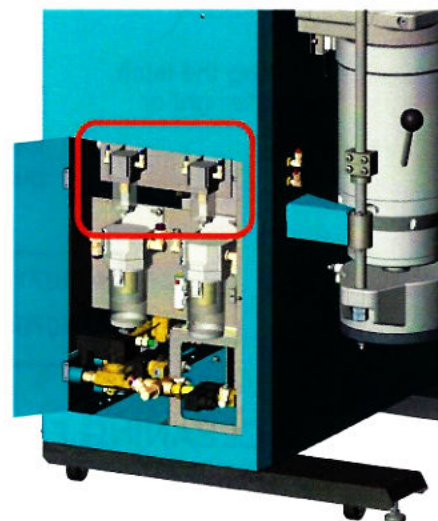


6-5. FILTERS FOR SENSORS

New filters for pressure sensors equipped in the same room of vacuum filter cabinet.

Much easier to check and clean filter elements.

- 1) Twist filter bowl 45 degrees to remove.
- 2) Unscrew filter element to remove.
- 3) Clean element by air blow as mentioned already.
- 4) Restore them.



6-6. SCRAPER

There is a piston for jack up under flask base.

Small chips and grains of metal and investment are often left around there.

Try to clean there every day removing flask base and pan.

This part which goes up and down always receives heat from hot flasks every time of casting.

So sealing material becomes brittle and gas leakage happens in certain period.

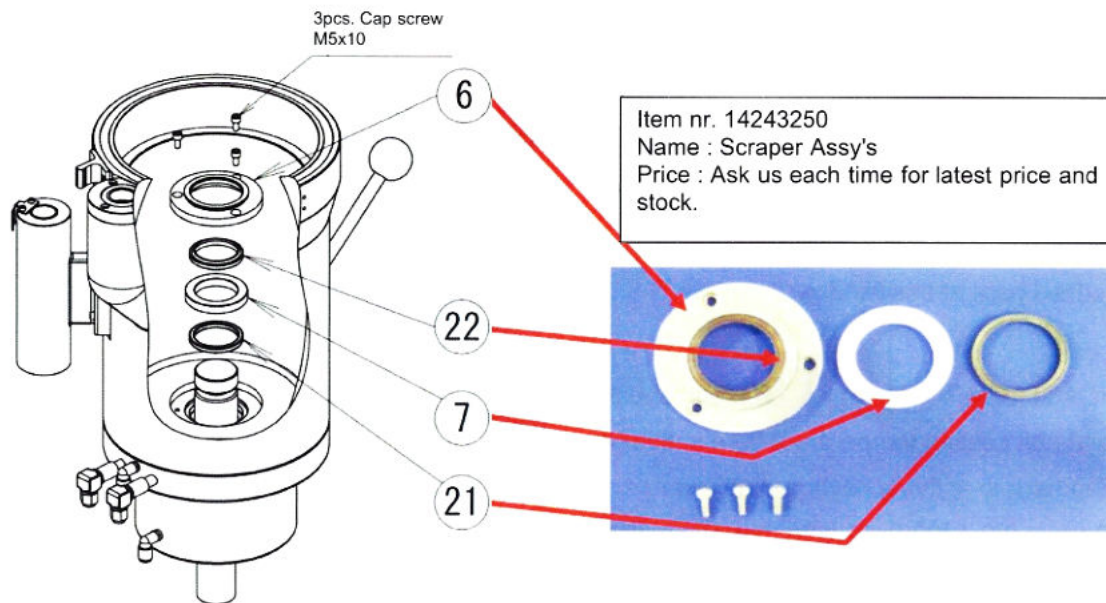
Sometimes hot metal gives damage directly on them.

You will not be able to jack up or vacuum level will become lower which causes non filling on casting if leakage on this part.

Replace them before getting those problems.

We strongly recommend replacing as Assembly kit of 4 parts.

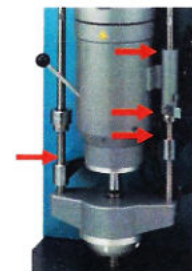
Especially it is not very easy to get good condition on assembling part #6 and #22 without special assembling tool.



6-7. LUBRICATION

Lubrication must be done on movable part at fixed intervals.

e.g. Just a little amount of machine oil every day.

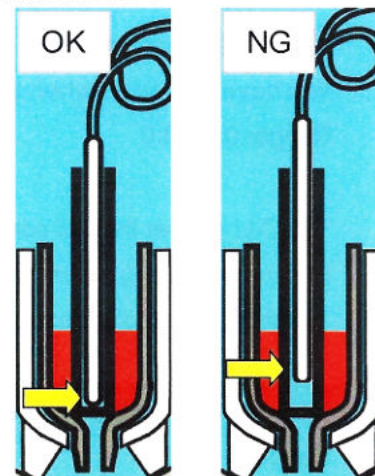
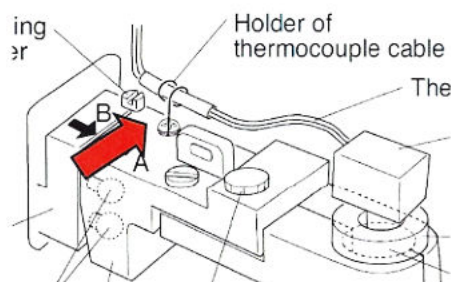


6-8. Thermocouple

Thermocouple wire must be connected to correct socket through 'cable holder'.

It can be lifted up by wire tension which causes lower temperature showing while metal can be boiling.

This makes a lot of defects on casting results as well as thermocouple defective in short period.



7. ADVANCED OPERATION

7-1. CAST WINDOW

You will see the window just after turning power ON as shown on the right.

7-1-1. RECIPE

Principal casting parameter can be seen and edited here at this window.



• CAST TEMP : You can check and edit casting temperature here in this box.

Tap here to activate keyboard at lower part on the window to edit.

Range: 0.0-1200(for K-type thermocouple)



• VAC (To set vacuum keep time)

Timer for evacuation of melting chamber and mold chamber after pressing START button. When the timer of this key is in action, timer display is counted down.

Range: 0.0-999

• M-GAS (To set inert gas charging time)

Timer for gas charge into melting and mold chambers after VAC.

When inside pressure of chamber reached 100 kPa, M-GAS is stopped for safety.

Range: 0.0-20.0

VAC	SUC-U
30 s	2 s
M-GAS	SUC-L
8 s	10 s
OXY	POUR
0 s	1 s

• OXY (To set air introduction time)

Timer for opening exhaust valve to introduce air into melting and mold chambers.

You have 2 choices when to introduce OXY at CONFIG tab.

Range: 0.0-10.0

• SUC-U (To set time of communication between two chambers)

Suction of melting chamber is carried out during this time.

Timer for action of communication valve between suction line of melting chamber and mold chamber.

When process temperature reaches Set Value and CAST START is activated, action set by this key starts, and after elapse of setting time it is turned off.

Range: 0.0-10.0

- SUC-L (To set time of communication between two chambers)

Suction of melting chamber is carried out during this time.

Timer for action of communication valve between suction line of melting chamber and mold chamber.

When process temperature reaches Set Value and CAST START is activated, action set by this key starts, and after elapse of setting time it is turned off.

Range: 0.0-100.0

- POUR (To set waiting time for start of pouring by lifting of stopper)

Timer from expiration of time preset by "SUC-U" to lifting of stopper rod.

When the timer is in action, it is counted down.

Range: 0.0-100.0

- PRESS (To set waiting time for starting pressurization)

Waiting time from start of POUR to action start of PRESS.

Range: 0.0-100.0

- PRESS OPEN (Pressure valve open time)

This is for time to open pressure valve between melting chamber and charge tank.

Range: 0.0-999.0

PRESS	ALLOY
0.5 s	SV925
PRESS OPEN	g
60 s	170 g
EXH	FLASK TEMP
180 s	480 °C

- EXH (To set time to exhaust finish)

Timer from pouring start to finishing exhaust of gas in the chamber is set.

To avoid wearing of the crucible by oxidation, it is recommended to set a longer time.

When the timer is in action, it is counted down.

Range: 0-999

- ALLOY : You can take note alloy used as your reference for better quality.

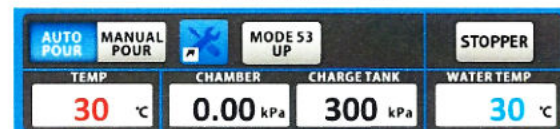
- g : You can take note amount alloy used.



- FLASK TEMP : You can take note flask temperature.


7-1-2. UPPER PART on CAST window

Before casting

Some selections here in this area.

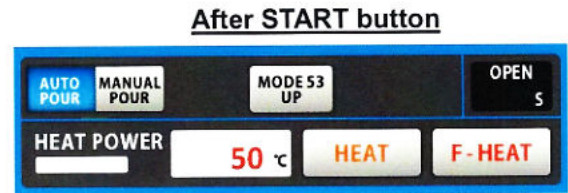


-   : Choice of Auto pour or Manual pour. Manual pour is called Semi Auto in previous model. The button turns its color blue when chosen.

-  : Short cut button to MAINTENANCE window. No need to go through CONFIG window.

- **STOPPER** : Manual stopper lifting up and down for cleaning or checking contact to crucible. This will become **OPEN** 'OPEN' box for EXH counting down window after casting start.

- **MODE 53 UP** : MODE 53 UP button.



- **TEMP**: Present temperature measured by thermocouple is indicated here; will become HEAT

POWER indicator for actual heating power ratio after casting start.

- **CHAMBER** : Present pressure in melting chamber is indicated here; will become present temperature monitor.

- **CHARGE TANK**: Present pressure of charge tank is indicated here; will become HEAT button, you can heat on or off while casting.

- **WATER TEMP**: Present temperature of drain water is indicated here; will become Full HEAT button for 100% heating anytime when you touch.

7-1-3. MODE 53 UP button

This is a button to choose another casting mode to preheat without loading flask in chamber.

This mode is called "AFTER MODE" on K2 NEXT, "mold-in after preheating" mode on K3S.

The button will turn its color to blue  when activated by tapping with your finger.

Casting process by this mode will be carried out as following step;

1) Load metal into crucible, Press START button without flask loaded.

Primary process (preheating) starts as follows.

Lid-lock ----> VAC ----> M-GAS ----> HEAT ----> When temperature has reached SV, Chambers lock is released automatically for loading flask.

2) Open flask chamber to load flask very slowly and carefully not to give molten metal any shock to prevent leakage at the contact between stopper and crucible hole.

3) Press START button once again.

Secondary process which is as same as standard mode starts.

NOTE:

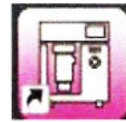
[1] K3S had another temperature setting for suspending preheat, while K3UP doesn't have this and casting temperature will be a trigger of releasing chambers lock.

So you have to be careful on operation after this as metal in crucible is completely liquid already.

[2] Lid lock is also released by this mode after preheating but try not to slide and open lid to minimize oxidation of molten metal.

7-1-4. SHORT CUT KEY for MACHINE window, CONFIG tab

This short cut key brings you to MACHINE window for advanced setting parameters on casting recipe.



MACHINE		BACK	
PID Automatic tuning	ON OFF	PID Value	P I D
			9 58 14
FLASK-UP TIMING	FLASK-UP TIMING - 20 °C	AUTO-POUR start condition	CAST ZONE CAST KEEP TIME
			± 3 °C 3.0 s
MIXING	ON OFF	%CONTROL	ON OFF
GAUGE	Single Dual	MAX POWER	MAX POWER
			80 %
OXYTIMING	AFTER M-GAS AFTER FLASK UP		

CAST SHOT

•PID Automatic tuning: You can get suitable PID settings automatically when you turn it ON.

•PID Value: Setting for each value of PID control. (P: Proportional, I: Integral, D: Differential)
PID control is a kind of feedback control system using 3 parameters.

PI control is for reaching CAST temperature very promptly with big heating power but tries not to overshoot setting value controlling power before target.

After reaching target, D controls heating power to maintain target temperature until CAST starts.

Range: 0-1000

•FLASK-UP TIMING: Temperature to determine when jack up flask.

Range: 3-100

•AUTO POUR start condition.

CASTING ZONE: Casting is started at this area (+/- X degrees Celsius of CAST temperature)

Range: 0.0-100

•CAST KEEP TIME: Holding time at CAST temperature ZONE.

CAST starts automatically by combination of TIME and ZONE. (Details described later).

Range: 0.0-100.0

•MIXING: Choose MIXING molten metal function.

•% CONTROL: In addition of PID control, you can control maximum heating power at 3 ranges up to target for more sensitive heating. For instance zinc rich gold can easily vapor when melting. You can reduce it by heating lower power at first step of 3 ranges. Range: 0-1200(1-4), 0-100(5-7)

%CONTROL		ON	OFF
MAX POWER	TEMP RANGE	MAX POWER	
	4 800 ~	7 100 %	
	2 600 ~ 3 800	6 80 %	
	~ 1 600	5 60 %	

•GAUGE:

You have 2 choices of gauge indication.

GAUGE	Single	MAX POWER	80 %
	Dual		
OXY TIMING	AFTER M-GAS	AFTER FLASK UP	

•MAX POWER: When you turn OFF % control, Maximum heating power can be controlled in whole range to target. You can combine this function with PID control for much more sensitive heating. Range: 0-100

•OXY: You have 2 choices when to introduce OXY here in this window.

'AFTER GAS' is to introduce OXY after M-GAS finished.

'AFTER FLASK UP' is when flask jack up finished.

* Additional information about CASTing ZONE and TIME

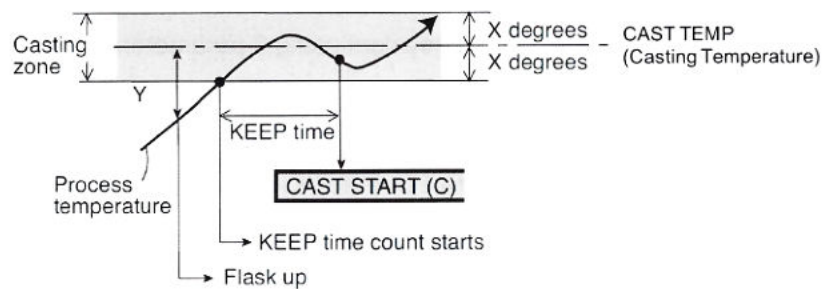
When temperature enters Casting Zone by heating, casting is started on specified conditions.

" Casting Zone =

Temperature SV of TEMP. CONTROLLER +/- X degrees Celsius"

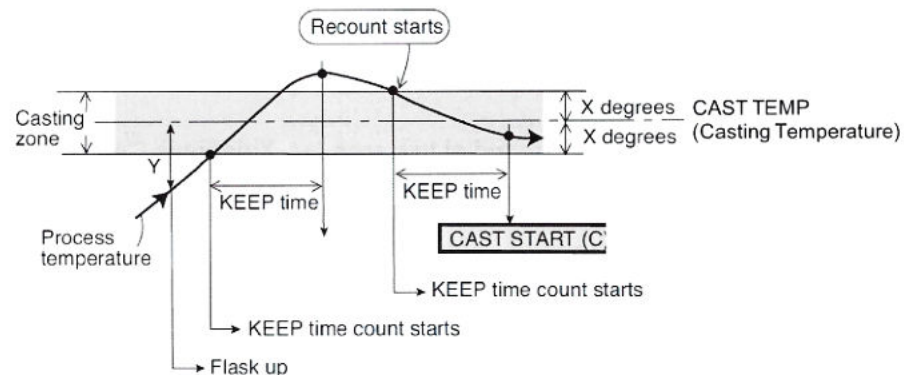
(Default setting of X: 3 degrees Celsius)

Range: 0.0-100



- Y degrees Celsius for activating flask up is set with key (Default setting: set temperature (SV) -20 degrees Celsius).

Range: 3-100

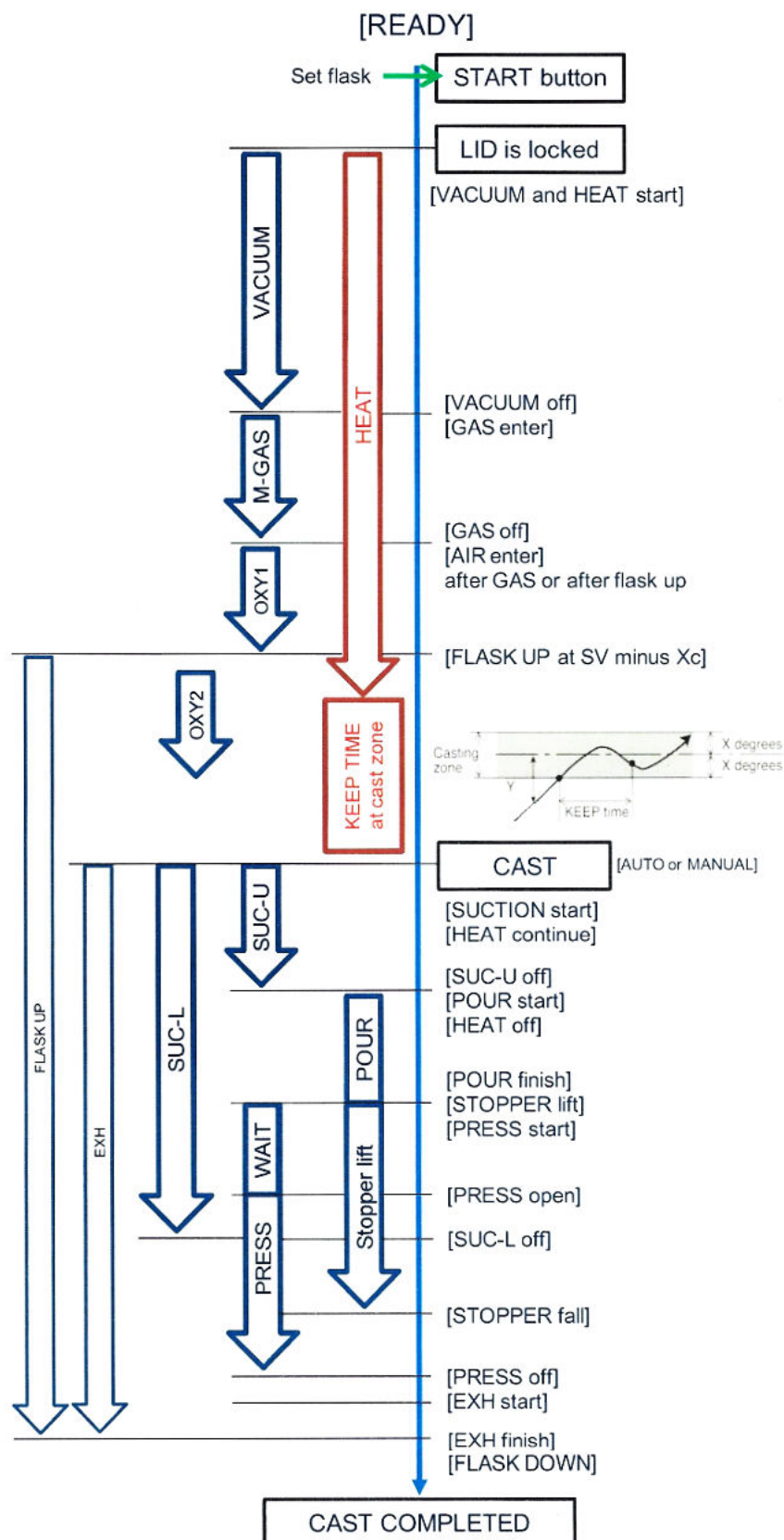


When measured present temperature goes out of Casting Zone during KEEP time, counting of time starts again when temperature returns into CASTing ZONE.

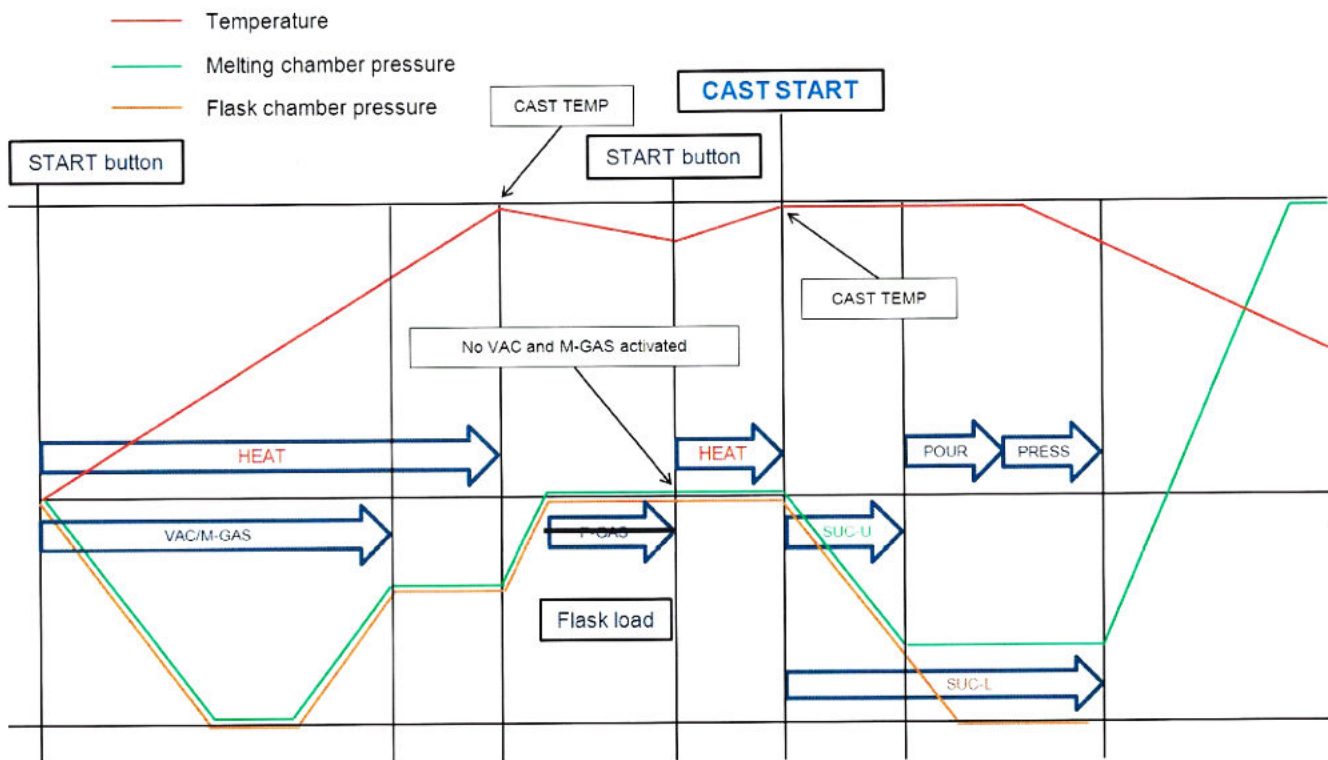
FLOW CHART OF CASTING

If you press START button in AUTO MODE, casting is automatically started.
Check safety and understand this manual before starting actual process.

<FLOW CHART FOR STANDARD AUTO MODE ("MOLD-IN BEFORE HEATING" MODE)>



<FLOW CHART FOR MODE 53 UP ("MOLD-IN AFTER PRE-HEATING" MODE)>



7-1-5. MEMORY REGISTRATION

You can register your own recipe with number and name.

1) As already described, Tap memory number.

No	Comment	No	Comment	No	Comment
00	BASIC	10		20	
01		11		21	
02		12		22	
03		13		23	
04		14		04	
05		15		25	
06		16		26	
07		17		27	
08		18		28	
09		19		29	

CANCEL OK

Yasui

MODE 53 UP STOPPER

TEMP 30 °C CHARGE 0.00 sPa CHARGE TIME 300 sPa WATER TEMP 30 °C

No. 00 SV925

VAC	SUC-U	PRESS	ALLOY
30 s	2 s	0.5 s	SV925
M-GAS	SUC-L	PRESS OPEN	g
8 s	10 s	60 s	170 g
OXY	POUR	EXH	FLASK TEMP
0 s	1 s	180 s	480 °C

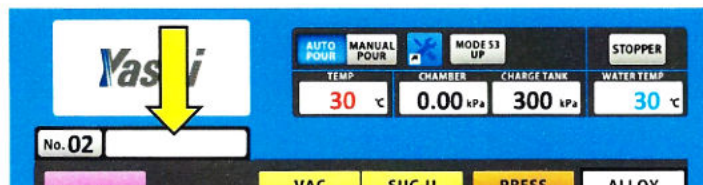
CAST TAMP 1050 °C

2) Choose any number you like.

3) Window goes back with number chosen.



4) Tap blank box to put name or comment.



5) Keyboard opens. Type any letters you like.

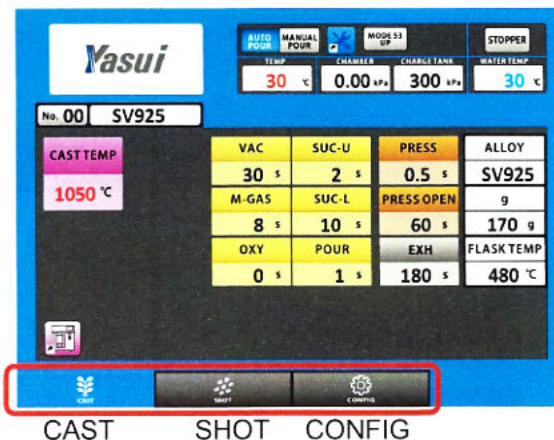
6) Tap OK button to close



TAB key switches

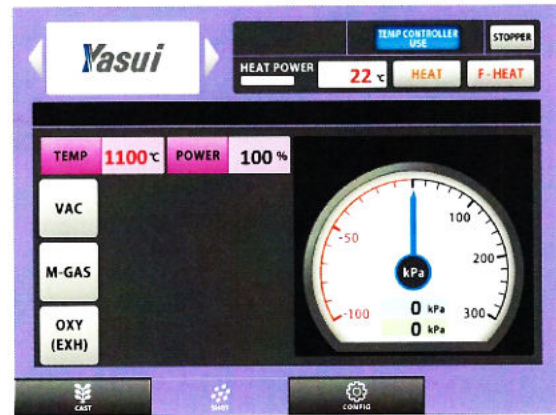
Initial CAST window is one of other kinds of tabs on the display.

There are 2 other tabs, SHOT and CONFIG tab.



7-2. SHOT tab

This is an operation window for shot making.
Please refer instruction of SHOT MAKER.



7-3. CONFIG tab

You have several configuration and other menus in this window.
< How to open CONFIG menu window >

Tap CONFIG



tab to open CONFIG menu.



CONFIG tab

< About each icon >



MACHINE

You can check machine information, set advanced parameter here in this window.



COPY/CLEAR

You can copy or delete registered recipes.



COUNTER

You can check how many shots done by AUTO in the past



LANGUAGE

You can select language here.



SECURITY

You can edit password and lock recipes.



PAYMENT PASSWORD

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



DISPLAY

You can control suspend timer and brightness.



MAINTENANCE

You can check status of machine, try single action of each function for maintenance.



LOG & HISTORY

You can check machine log when problem happened.



DATE & TIME

DATE & TIME

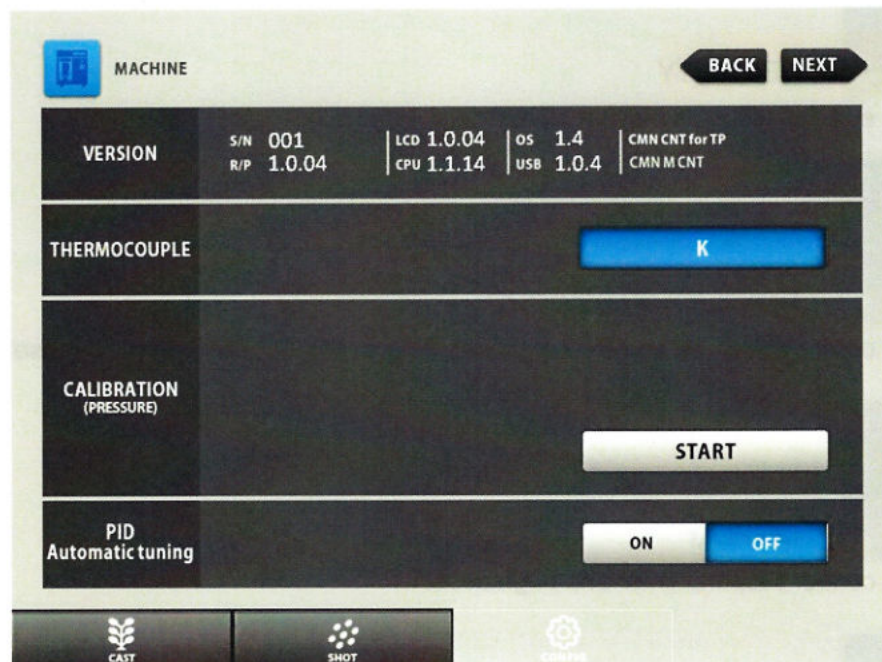
You can set calendar and clock at your region.

7-3-1. MACHINE

< How to open MACHINE display >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap MACHINE  icon to open MACHINE display



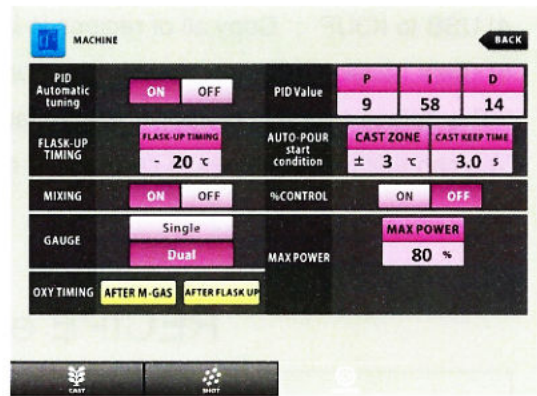
1) VERSION: Serial number of the machine, Firmware version and other information are indicated here.

2) THERMOCOUPLE: You can check type of thermocouple.

3) CALIBRATION (PRESSURE): This function is used at installation or when location is changed.

'MACHINE' window has 2 pages.

The second page is already described as the window which you can open through short cut key at CAST window.



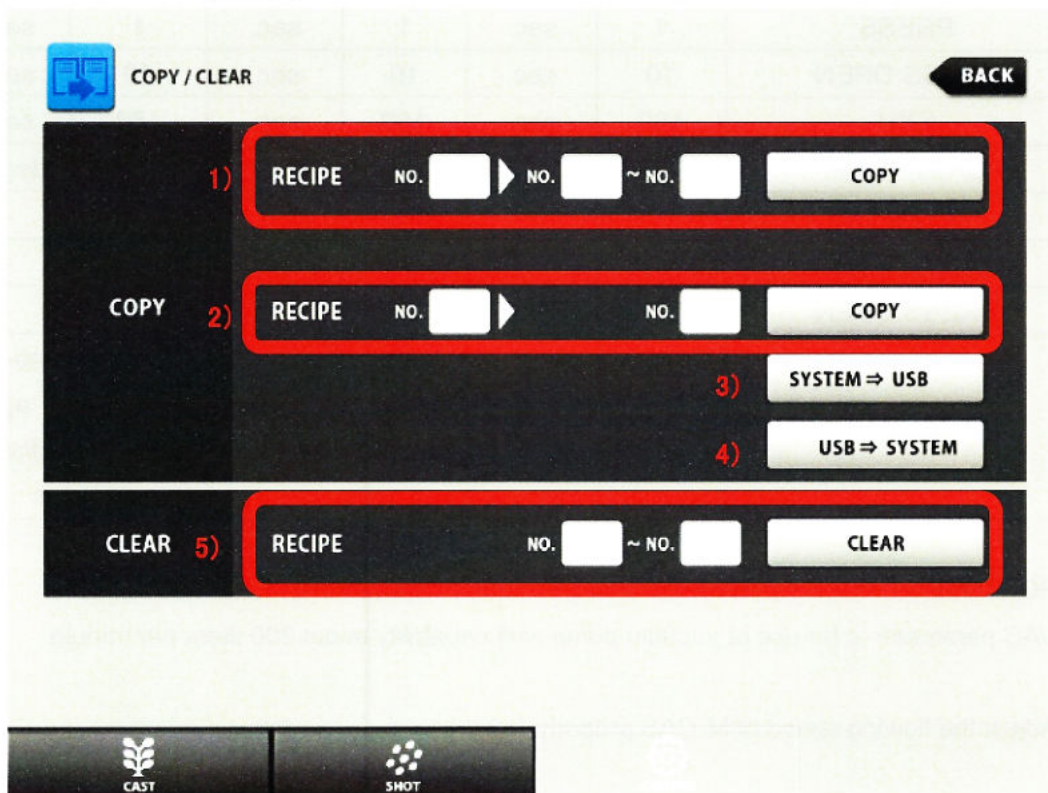
7-3-2. COPY/CLEAR

You can copy and delete registered recipes here in this page.

< How to open COPY/CLEAR window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap COPY/CLEAR  icon to open COPY/CLEAR window.



< How to copy and delete >

- 1) Several copy : Copy one recipe to several recipe numbers.
- 2) Single copy : Copy one recipe to another recipe number.
- 3) K3UP to USB : Copy all of recipes in K3UP to USB flash drive.

4) USB to K3UP : Copy all of recipes in USB flash drive to K3UP.

5) Clear recipe : Clear recipe chosen from No. XX to No. YY.

* The default recipe is already preset at factory.

You can edit these recipes to create your original recipe.

RECIPE example for K3UP

	1		2		3	
VAC	60	sec.	30	sec.	30	sec.
M-GAS	4	sec.	8	sec.	0	sec.
* (after M-GAS)	(-0.70)	MPa	(-0.00)	MPa	(-0.00)	MPa
OXY	0	sec.	0	sec.	3	sec.
SUC-U	0	sec.	2	sec.	0	sec.
SUC-L	10	sec.	10	sec.	10	sec.
POUR	1	sec.	1	sec.	1	sec.
FLASK UP	-10	deg.c.	-10	deg.c.	-10	deg.c.
PRESS	1	sec.	1	sec.	1	sec.
PRESS OPEN	10	sec.	10	sec.	10	sec.
EXH	180	sec.	180	sec.	180	sec.
CAST TEMP	1000	deg.c.	1000	deg.c.	1000	deg.c.
PRE PRESS	-	-	-	-	-	-
DELAY TIME	-	-	-	-	-	-
PRESS OPEN	-	-	-	-	-	-
ALLOY	General casting		Casting of zinc rich gold/silver/ copper/brass		Casting of anti- oxidation agent rich gold/silver /copper/brass	

IMPORTANT

1) VAC parameter is for use of vacuum pump with capability about 300 liters per minute.

2) Adjust the flowing speed of M-GAS properly.

3) If longer EXH value is set, oxidation of the crucible will be smaller, which will result in extended life of crucible.

4) Adjust CAST TEMP parameter depending upon casting.

5) Set the pressure of internal pressure tank by adjusting SET PRESS regulator so that pressure

inside of melting chamber after metal pouring will be within from 100 to 200 kPa.

6) When using metal containing large amount of high evaporation rate materials such as zinc etc. and pouring it in high vacuum condition, vapor of zinc etc. is easily generated.

As a result, dust of metal will be accumulated inside of chamber and further dust of zinc etc. will flow in and affect pipe components inside of machine.

When using such metal, be sure to have atmospheric pressure after M-GAS as mentioned in the chart above. 8 second is only an example in certain tubing to achieve 0 kPa.

Time will be different at each factory.

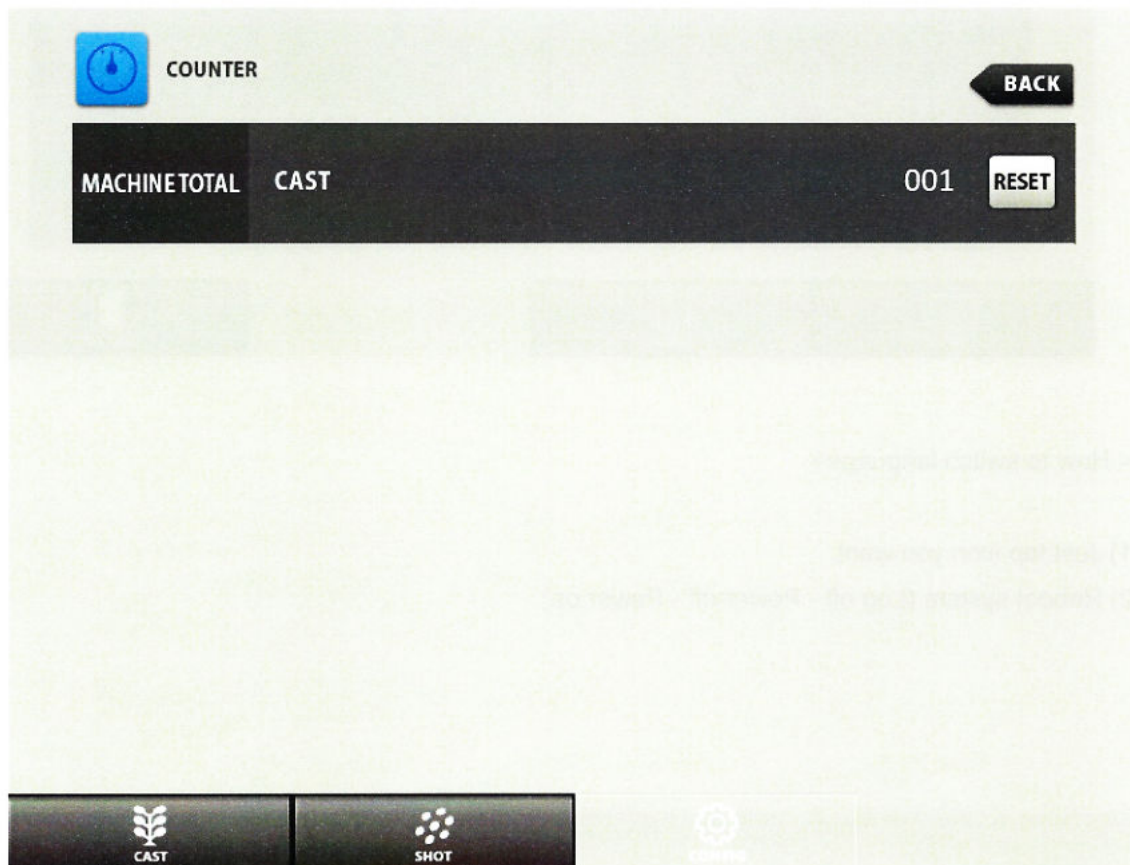
7-3-3. COUNTER

* It is not possible to edit counter.

< How to open COUNTER window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap COUNTER  icon to open COUNTER window.



7-3-4. LANGUAGE

You can choose language

< LANGUAGE window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap LANGUAGE  button to open.



< How to switch language>

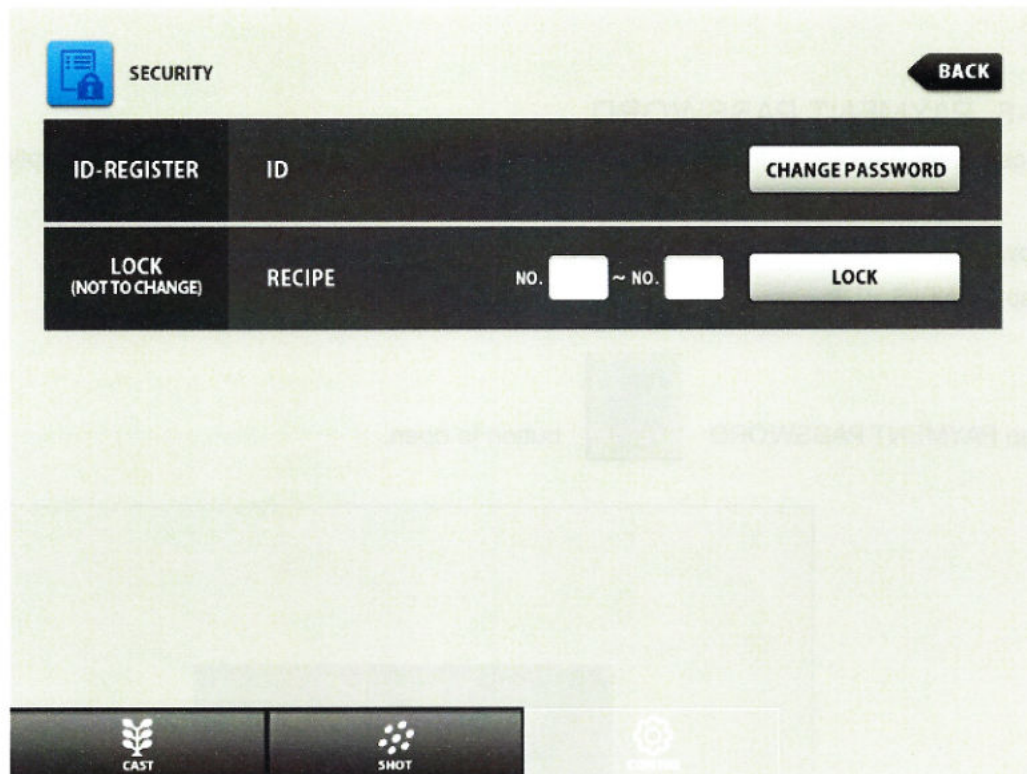
- 1) Just tap icon you want.
- 2) Reboot system (Log off - Power off - Power on)

7-3-5. SECURITY

You can change your ID and protect recipes already registered here in this page.

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap SECURITY  button to open.



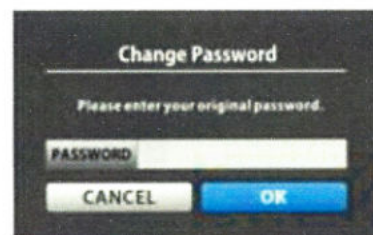
< ID-REGISTER >

1) Tap CHANGE PASSWORD  button.

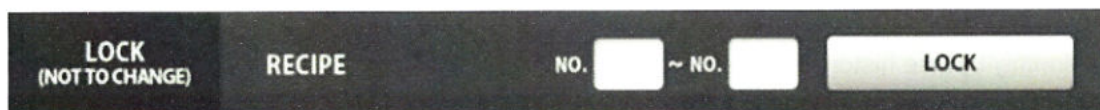
2) Tap blank cell to open keyboard and Enter new password you want to register

3) Tap present password (before change).

Default password is "YASUI_K3UP"



< RECIPE LOCK >



1) Enter any number you want to lock.

2) Tap LOCK button to open keyboard.

3) Enter password.

4) Lock button turns blue.



< Unlock RECIPE >

1) Tap LOCK button to open keyboard

2) Enter password

3) Lock button turns white

7-3-6. PAYMENT PASSWORD

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

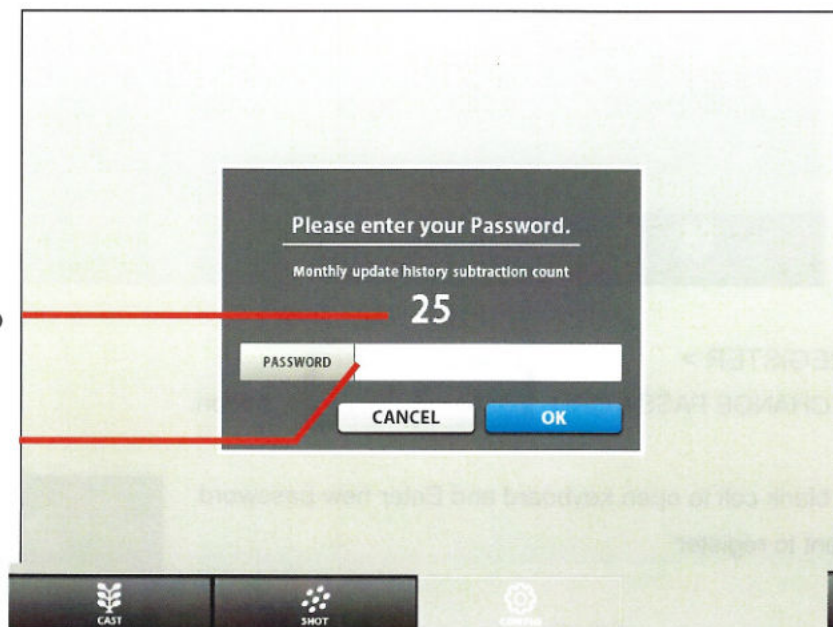
< How to open PAYMENT PASSWORD window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap PAYMENT PASSWORD  button to open.

2) The rest of months to be paid

1) Password box



1) PASSWORD



You can enter password.

2) Monthly update history subtraction count.


The rest of months of payment.

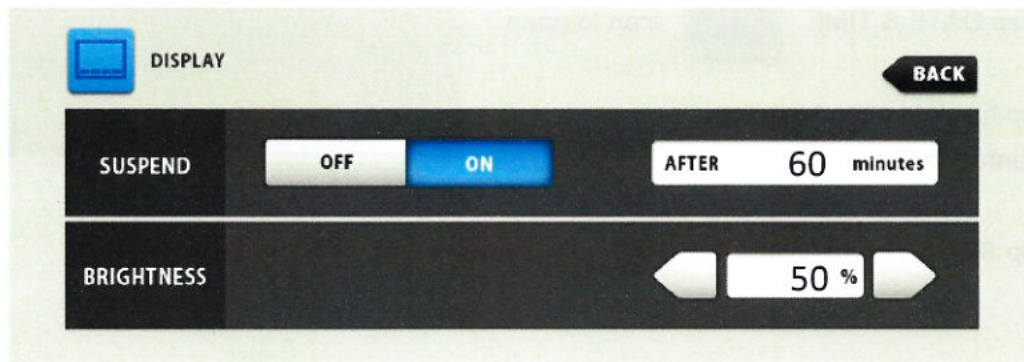
7-3-7. DISPLAY

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

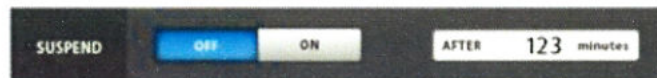
< How to open DISPLAY window >

1) Tap CONFIG  tab to open CONFIG menu.

2) Tap DISPLAY  button to open.



3) SUSPEND





You can activate Automatic power OFF function of the display.

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

4) BRIGHTNESS



You can adjust the brightness of display.

Tap  button to decrease, tap  button to increase.

You can also long tap for continuous adjusting.

You can also tap number and open keyboard to set directly.

The range is 0 - 100%

7-3-8. DATE & TIME

You can set date and time at your region here.

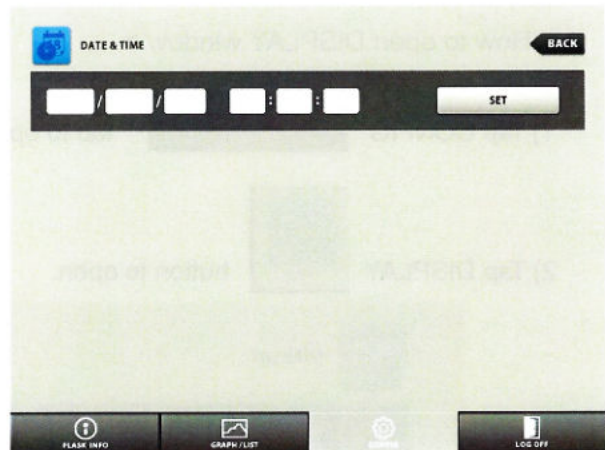
< How to open "DATE & TIME" window >

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.

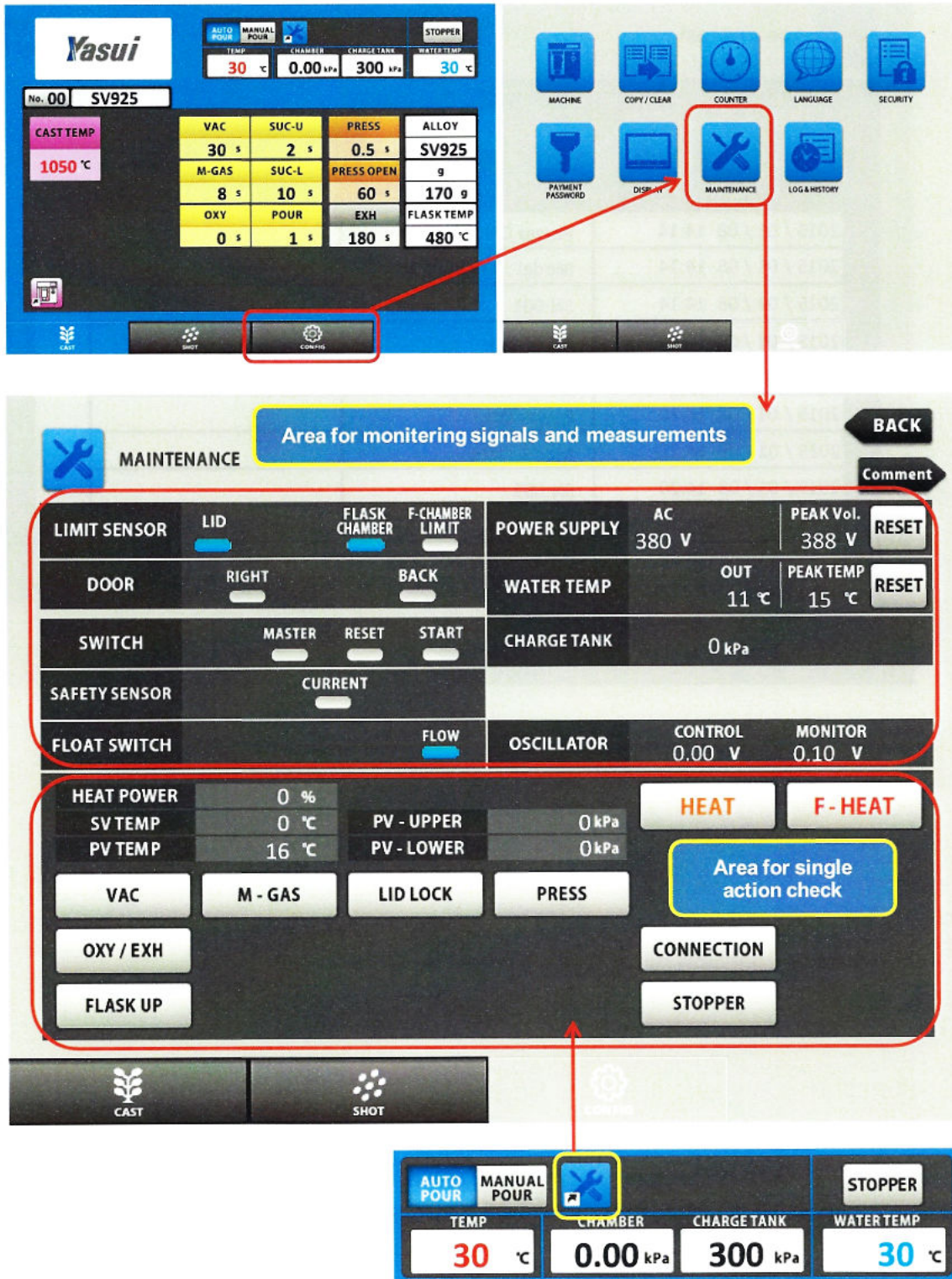


7-3-9. MAINTENANCE

You can activate each single action of K3UP for maintenance and other purpose.

- 1) Tap CONFIG tab at CAST window.
- 2) Tap MAINTENANCE button.
- 3) Check each function by tapping buttons. You can also monitor electric power, signals and other circumstances.

* You can also open the page through short cut key on main display as already described at page 27.

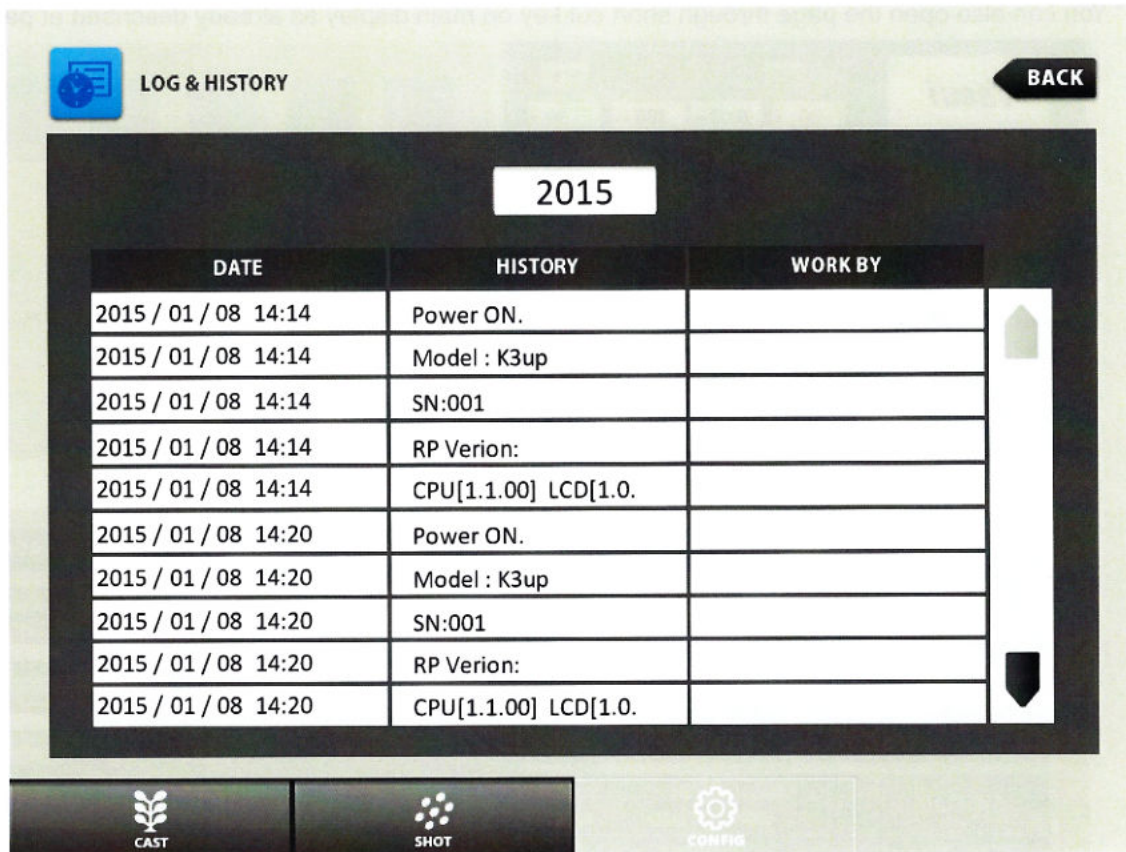


7-3-10. LOG & HISTORY

You can check machine log when problem happened.

It is very difficult to communicate about problems on machine. However you can easily report what is happening on it by taking picture and send us or our distributors this window.

It is very useful tool to diagnose.



LOG & HISTORY

2015

DATE	HISTORY	WORK BY
2015 / 01 / 08 14:14	Power ON.	
2015 / 01 / 08 14:14	Model : K3up	
2015 / 01 / 08 14:14	SN:001	
2015 / 01 / 08 14:14	RP Verion:	
2015 / 01 / 08 14:14	CPU[1.1.00] LCD[1.0.]	
2015 / 01 / 08 14:20	Power ON.	
2015 / 01 / 08 14:20	Model : K3up	
2015 / 01 / 08 14:20	SN:001	
2015 / 01 / 08 14:20	RP Verion:	
2015 / 01 / 08 14:20	CPU[1.1.00] LCD[1.0.]	

CAST SHOT CONFIG

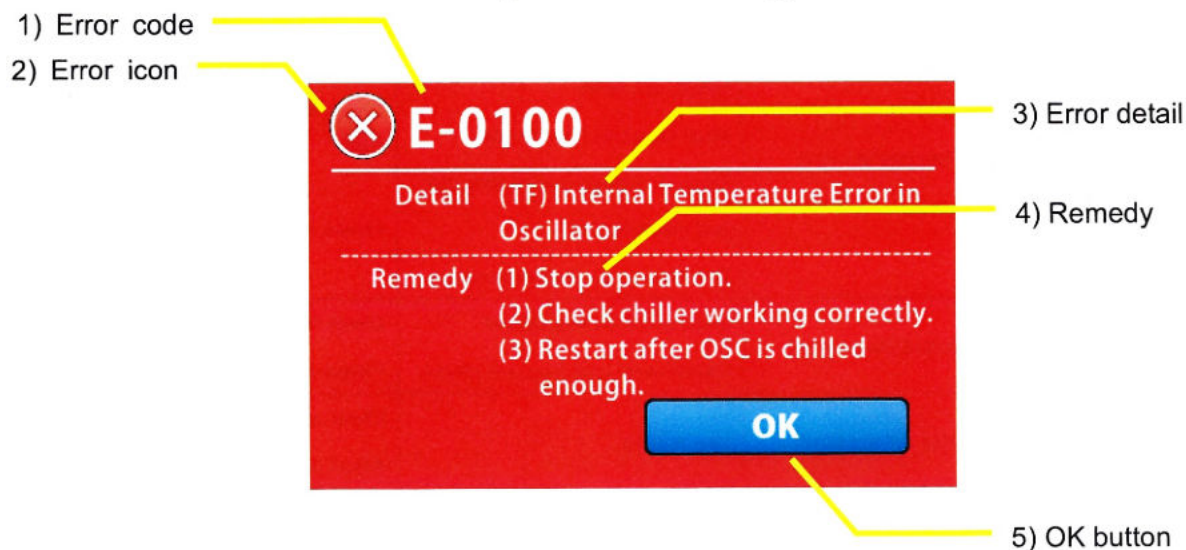
8. TROUBLE SHOOTINGS

8-1. ERROR MESSAGES

K3UP shows messages when accidents happen.

You cannot operate K3UP 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.

8-2. ERROR CODE

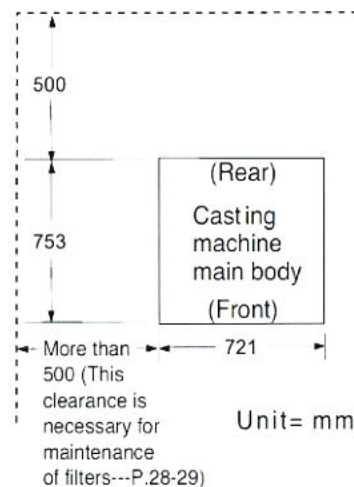
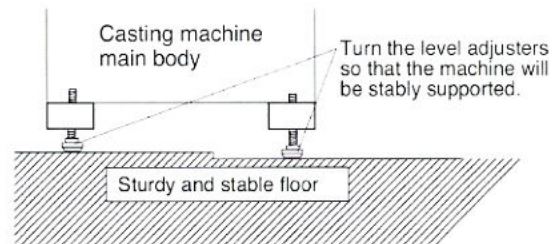
Error code	Level	Description	Cause	Remedy
E00	00	Error	EMERGENCY STOP	Emergency stop button is pushed.
E01	00	Error	(TF) Internal Temp Error in oscillator	Temp exceeds over 55c (1)Stop operation. (2)Check chiller working correctly. (3)Restart after OSC is chilled enough.
	01	Error	(AC) Over current in oscillator	Short circuit on heating coil Defective on oscillator Replace defective part. Please contact distributor.
	02	Error	(NQ) Resonance circuit error	Rapid fuse open Short circuit on heating coil Open circuit between heating coil and matching coil Defective on oscillation elements Check "OPEN" of heating coil. Please contact distributor.
	03	Error	(HF) Output Overcurrent	Short circuit on heating coil Defective on matching coil, others Check "SHORT" of heating coil. Please contact distributor.
	04	Error	(VL) Input voltage error	Low voltage Check main power voltage. Adjust the correct voltage.
E04	00	Error	Cooling water supply error	Cooling water flow and pressure not enough (flow 3L/min, Pressure 1.5kg/cm2 required) (1)Check water tap. (2)Check water pressure, amount. (3)Check strainer filter.
E05	00	Error	Water supply temperature error / Cooling water for heating coil	Cooling water supply temperature exceeds 35c Reduce temp. Increase amount of cooling water.
	01	Error	Water discharge temperature error / Cooling water for heating coil	Drain water temp too high Water supply not enough Check water temp. Check water flow.
	03	Warning	Water temperature caution level	Drain water temp too high Water supply not enough Check water temp. Check water flow.
E06	00	Error	No response	No response of temperature controller Turn on power again. Please contact distributor.
	07	Error	Temp control device communication error (Hardware)	Turn on power again. Please contact distributor.
E07	00	Error	Thermocouple disconnection	Check any damages on thermocouple.
	01	Error	Measurement temperature error of melting chamber	Check type of thermocouple and parameter setting.

			(High)		Check any damages on thermocouple.
	02	Error	Defective on thermocouple or oscillator		Replace defective part.
E08	00	Error	Right side panel is "open"		Close panel. Check sensor and wiring.
	02	Error	Rear panel is "open"		Close panel. Check sensor and wiring.
E13	00	Error	Exhaust operation error	Exhaust not completed	(1) Turn off "Breaker SW". (2) Turn on "Breaker SW" again. Clean the valve & tube for exhaust.
E14	00	Warning	Voltage caution level	Power out of range 335V-425V	Check supply voltage.
E15	00	Error	Voltage error	Power out of range 315V-445V operation suspended	Check supply voltage.
E17	00	Error	Melting chamber pressure sensor error	Pressure sensor detected pressure out of range	Check inside of tube. Check pressure sensor.
	01	Error	Flask chamber pressure sensor error	Pressure sensor detected pressure out of range	Check inside of tube. Check pressure sensor.
	02	Error	Pressure sensor error	Pressure sensor output exceeds capacity range	Check inside of tube. Check pressure sensor.
	03	Error	Charge tank pressure sensor error	Sensor output exceeds capacity range	Check inside of tube. Check pressure sensor.
E18	02	Error	Vacuum error	Pressure does not go down over certain value in certain time after vacuum starting up	Check power supply of "Vacuum pump". Check vacuum pump and pressure sensor.
E19	00	Warning	Recipe error	Recipe exceeds capacity range when start casting	Correct recipe.
E20	00	Error	Contact error of panel switches	Contacts on operation panel are closed when turning power ON	Replace the short-circuited switch.
E24	00	Error	Earth over current	Too much current for ground	Check short-circuit between heating coil and chamber wall.
E26	00	Warning	Lid is "open"	Lid is open when operation starts	Close lid. Check lid sensor.
E27	00	Warning	Flask chamber is "open"	Flask chamber is open when operation starts	Close flask chamber. Check flask sensor.
E28	00	Warning	Slow heating speed		Check thermocouple and heating coil.
E29	00	Error	Slow pressure speed	No arrival target	Check solenoid valve and pipes. Check flask chamber, flask may be broken.

9. INSTALLATION

9-1. PLACE

- 1) Floor must be sturdy and stable. The machine must be free from vibrations.
- 2) The machine must be leveled. (When floor is not flat, adjust level adjuster, so that the machine should be leveled.)
- 3) Do not install machine at place where material such as gas, that may affect casting and operation of machine, is produced.
- 4) Machine must be installed at a dustless place.
- 5) Electrical noise should not be produced nearby.
- 6) Proper power supply is necessary.
- 7) Save enough space around machine for daily maintenance.



9-2. POWER SOURCE

Use power source of AC 380 V +/- 10%, three phase, 5.5KVA, 50/60 Hz for machine.



WARNING

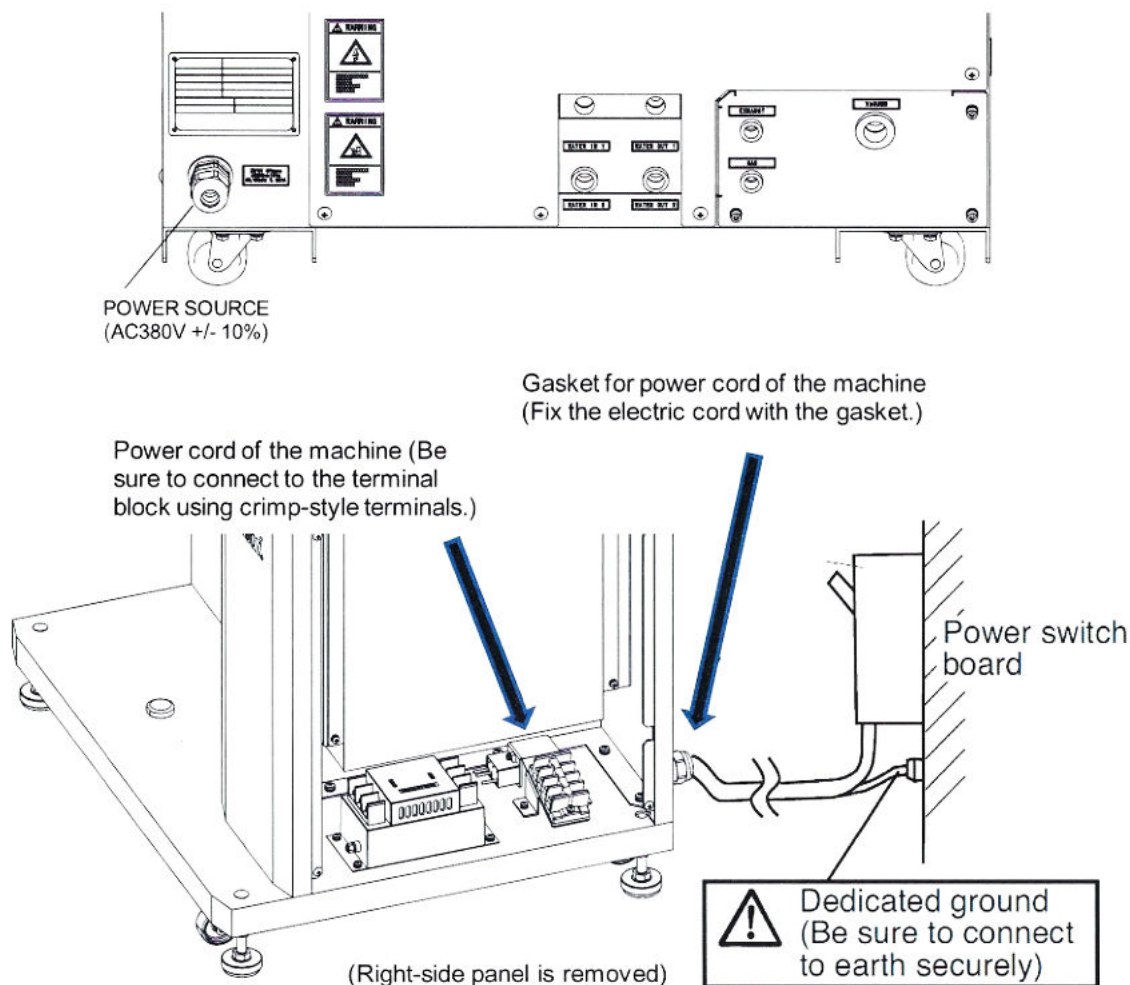
1. Machine must be earthed effectively.
2. This machine is not equipped with a ground-fault circuit interrupter. Connect to ground-fault circuit interrupter on power switch board in your factory. If grounding wire is not earthed correctly, ground-fault circuit interrupter may not work normally. Connect grounding wire correctly.
3. Connection of power supply cable should be made by a specialized electric technician only.
4. Do not connect vacuum pump to K3UP machine body. Use another exclusive power supply line for vacuum pump.

- 1) Open right-side cover.
- 2) The terminal block for power source is located at the bottom.
Connect power cable to terminal block.



IMPORTANT

Three-phase current is used for power supply in this machine.
Therefore, correct connection of power cable is important.



9-3. CONNECTING WATER HOSE

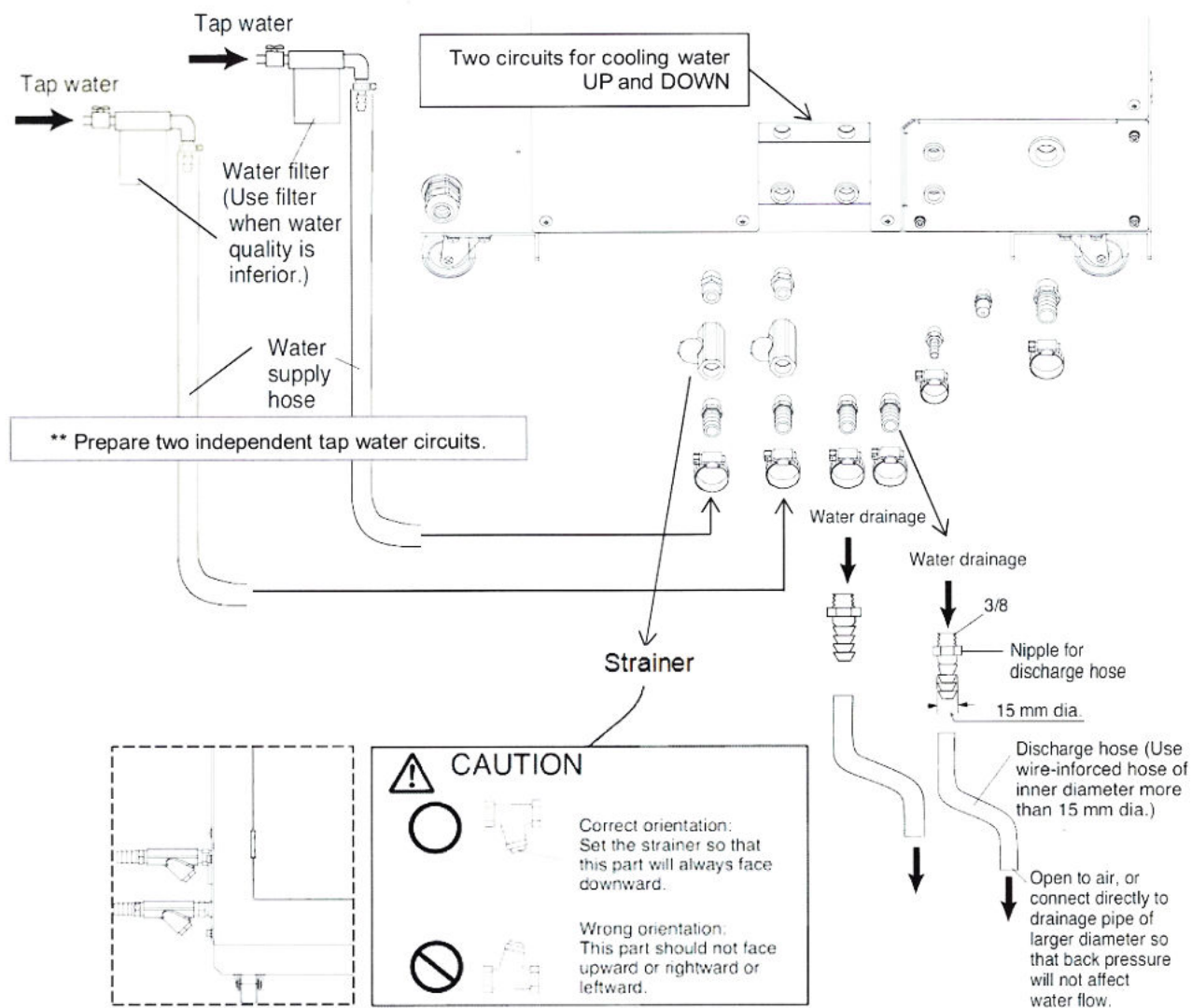
This machine needs internal circulation of tap water for cooling. Connect to water supply of sufficient water pressure (water supply pressure: over 0.15 MPa in average, and water supply flow rate: more than 3 liters per minute).



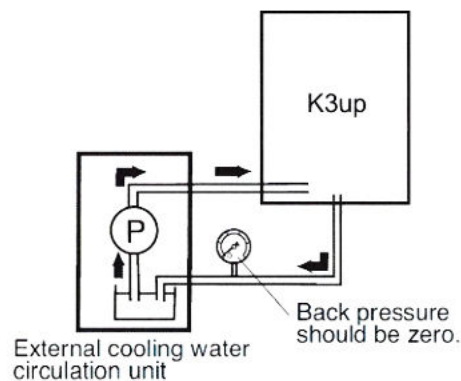
CAUTION

1. In case water from tap is not clean, water should be supplied through water filter available in the market. (Water filter and hose are not provided with K3UP.) Select water filter of adequate size so that water flow should not be decreased.
2. Be sure to complete water supply correctly before start heating.

Connect a water supply hose and a water discharge hose as below figure.



When using external cooling water circulation unit available in the market, arrange it so that back pressure should be 0 (zero). (External cooling water circulation unit is not provided with K3UP.)



IMPORTANT

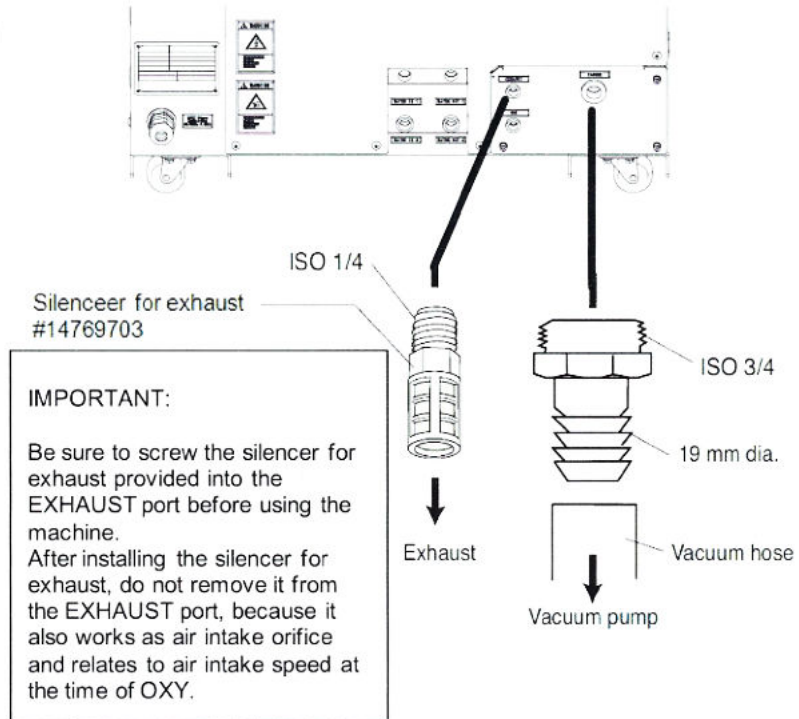
1. Boost pressure of its pump should be high enough.
2. Consult with a qualified technician for arrangement of circulation unit.

The manufacturer shall in no event be liable for any damage resulting from use of external cooling water circulation unit.

9-4. CONNECTING VACUUM PUMP

Connect vacuum pump specified by manufacturer to the machine as follows.

(Vacuum pump is not included in K3UP.)

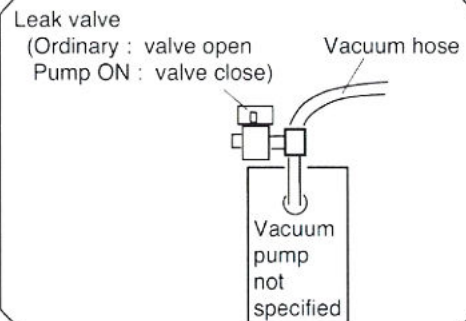


CAUTION

1. Use a pump of more than 300 liters per minute.
2. Do not forget to pour vacuum oil in pump cylinder.
3. Connect power cable of vacuum pump to wall power outlet separately from casting machine, so that the pump will operate alone independently.

Be sure to set a 'leak valve' to vacuum pump so that the inside of the hose will become exhaust condition at the moment when pump is turned OFF. That leak valve should synchronize with power ON-OFF in such a manner that when pump is ON, the leak valve should be OFF and when pump is OFF, the leak valve should be ON.

4. After checking of cable connection, check also that rotating direction of motor of vacuum pump is correct. Particular care should be taken at cable connection to avoid reverse rotation by phase difference.



9-5. SUPPLY OF INERT GAS



WARNING

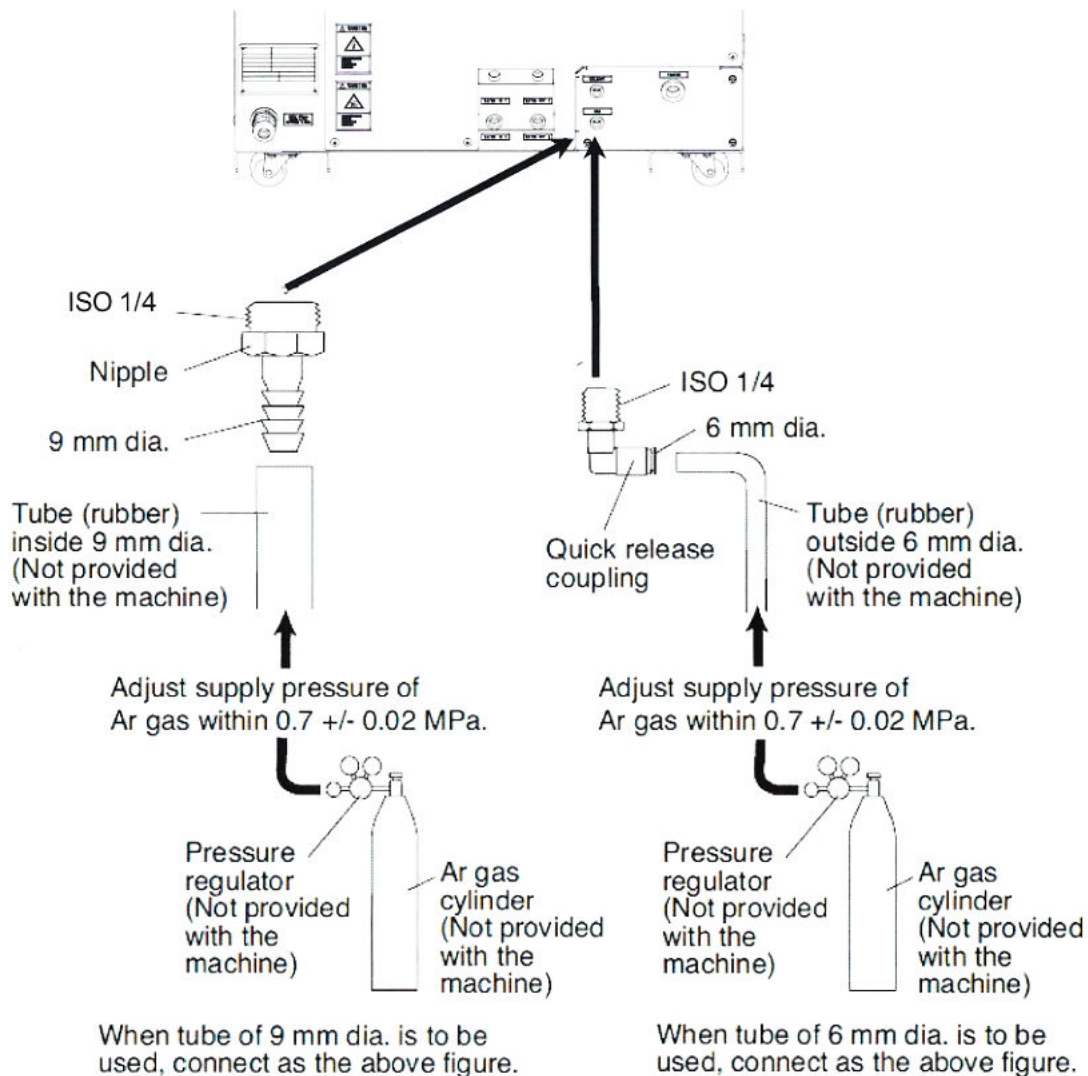
1. Never use inflammable gas (such as hydrogen gas, etc.).
2. Never replace gas cylinder while machine is in operation.
3. Observe below mentioned requirement of gas supply. In case gas supply flow rate is extremely small (for example: gas pipe from gas cylinder to K3UP is narrow and long), machine may not work properly.

Argon gas is standard supply gas of this machine.

Both below-mentioned 1) and 2) requirements should be satisfied.

1) Gas supply pressure: 0.7 MPa

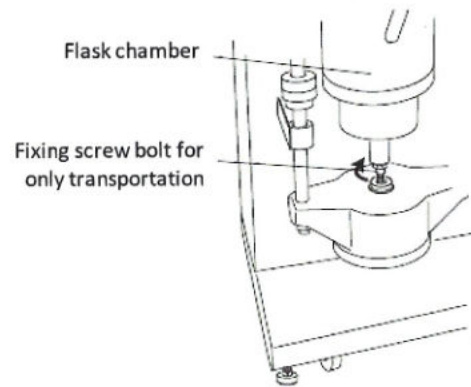
2) Gas supply flow rate: more than 120 liters per minute



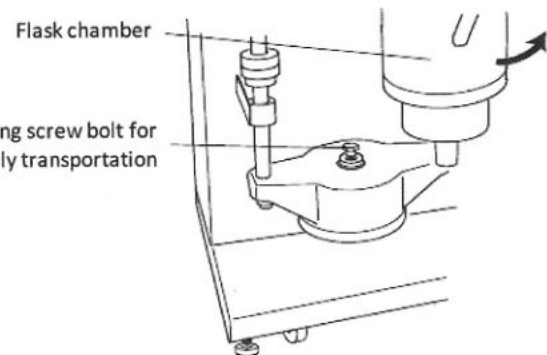
9-6. FLASK CHAMBER

9-6-1. REMOVING FIXATION BOLT FOR TRANSPORTATION

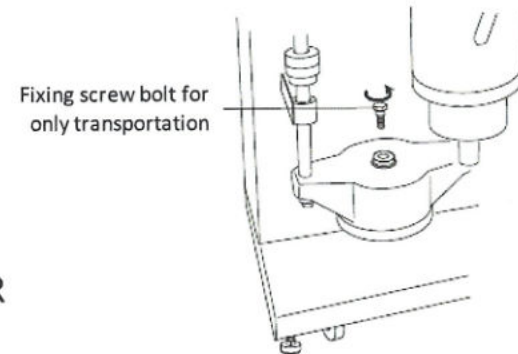
1) Turn fixation bolt for transportation.
(Hexagonal head bolt, Size: ISO M12 L=45mm)
clockwise, so that mold chamber can be moved
back and forth freely.



2) Slide mold chamber to front side.

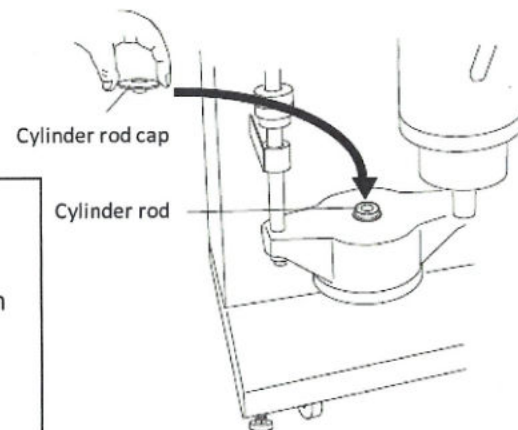


3) Remove fixation bolt for mold chamber turning it
counterclockwise.



9-6-2. CYLINDER ROD HEAD COVER

Place cap on top of cylinder rod for protection.



IMPORTANT

If cylinder rod head cover is forgotten, lid lock action
cannot be performed properly.

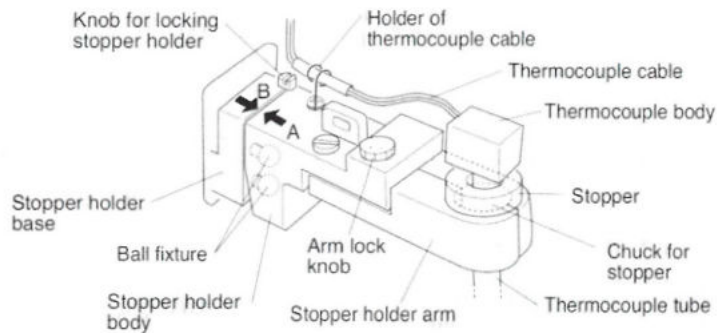
At the time of installing machine, be sure to check
it is set in place.

9-7. THERMOCOUPLE



CAUTION

It is possible that a large amount of moisture is contained in protection tube of a new thermocouple. Carry out preheating up to around 200 degrees Celsius before actual casting.



- 1) Set stopper holder in place, making alignment with ball fixture.
- 2) Turn knob for locking stopper holder, so that a part of knob will be positioned over upper rear edge of stopper holder body. This position of knob can lock stopper holder.

IMPORTANT;

Check that the level of stopper holder (A) and that of stopper holder base (B) will be the same as shown in the figure.

- 3) Lift arm lock knob, so that stopper holder arm will be released. Then, slide and open stopper holder arm to left side.
- 4) Lifting stopper holder, set stopper to chuck and close stopper holder arm. Lower arm lock knob.
- 5) Put tube of thermocouple body into hole of stopper.



CAUTION

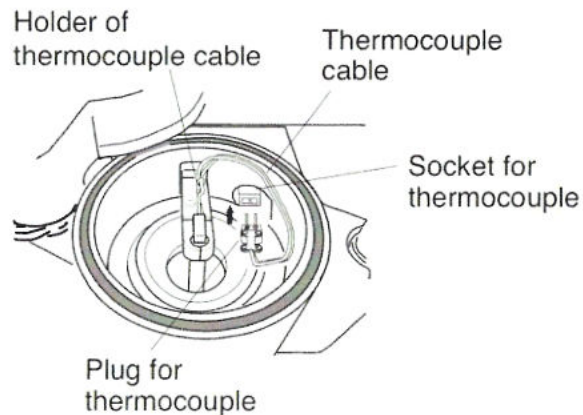
Thermocouple must be set in place until its lower end makes contact with bottom of stopper hole.

6) Route thermocouple cable through holder of thermocouple cable on stopper holder body.



CAUTION

1. Carefully route thermocouple cable so that the cable should not be caught by other parts.
2. Do not kink thermocouple cable.



7) Plug thermocouple into socket of machine. (It is not possible to connect plug in reverse direction.)

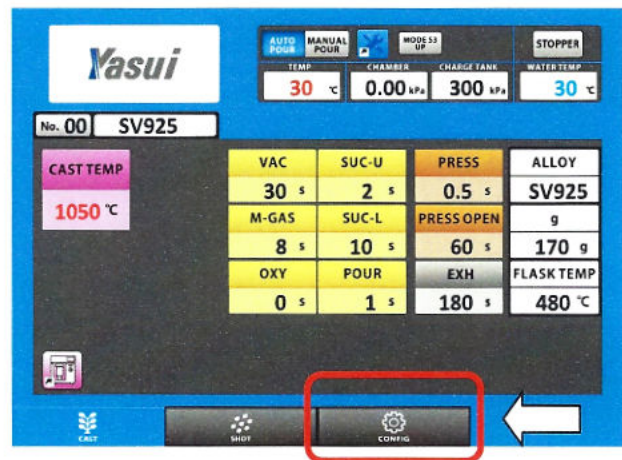
9-8. CALIBRATION (Zero adjustment of pressure sensor)

You have to calibrate machine after installation and transportation.

- 1) Turn main breaker switch ON.
- 2) Push Master Button when requested.
- 3) Tap CONFIG button to open another page.

* Maintain chambers released.

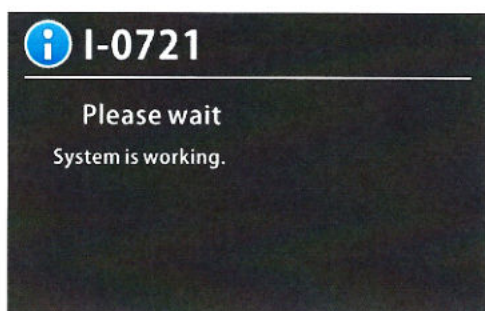
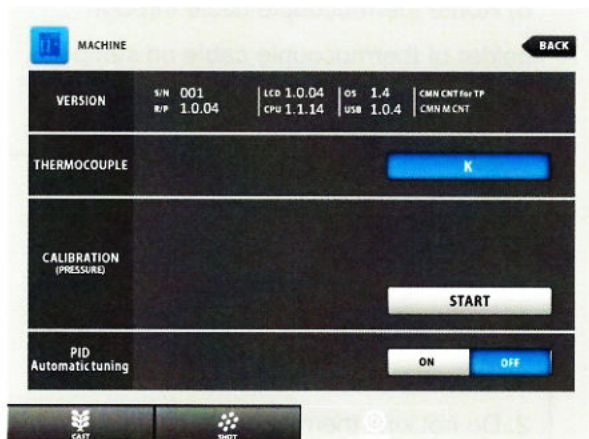
Charge tank pressure must be set 0 by regulator.



4) Tap MACHINE button



5) Tap START button



6) Calibration starts automatically
Pop up message will be shown for a while.



10. SPECIFICATIONS

Power source	380VAC +/-10%, 50/60Hz 3phase, 5.5KVA
Oscillation	4kw
Net Weight	Approx. 190 Kg
Dimension	721 (W) x 753 (D) x 1,201(H)mm
Max.flask size	125mm dia.×230mm(H) standard
Crucible volume	90cc
Max. casting amount	60cc
Max. temperature	1200 degrees Celsius
Max. pressure	0.3MPa
Replacing gas	Argon gas 0.7MPa / over 120 liters per min.
Program memory	100 memories
Cooling Water	Tap water direct cooling system more than 3L/min, more than 0.15MPa, Less than 30c
Casting system	Vacuum Pressure Casting system
Alarm	Digital indication by self diagnosis
Vacuum pump	Option over 300 liters/min.

