

# SHOT MAKER

MODEL *SM3*

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## INSTRUCTIONS

This instructions manual is for the *SM3* whose production serial No. is C041 and later.


- The Shot Maker *SM3* is designed for exclusive use in combination with the *Yasui* Casting Machine *K3* whose production serial No. is E-XXX and later.
- The Shot Maker *SM3* can not be used in combination with the *Yasui* Casting Machine *K3* whose production serial No. is A-XXX, B-XXX, C-XXX, or D-XXX.

Keep this manual for your future reference.

M. YASUI & CO., LTD.

3-7-4 Ikejiri, Setagaya-ku, Tokyo 154-0001, Japan

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# 1. SAFETY INSTRUCTIONS

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## DANGER

1. Use water to operate the shot maker *SM3*. Do not use other liquid.



2. Molten metal is put into water, so misuse during handling may cause injury, machine damage or accident, resulting danger of human body. Take enough care and handle the machine correctly.



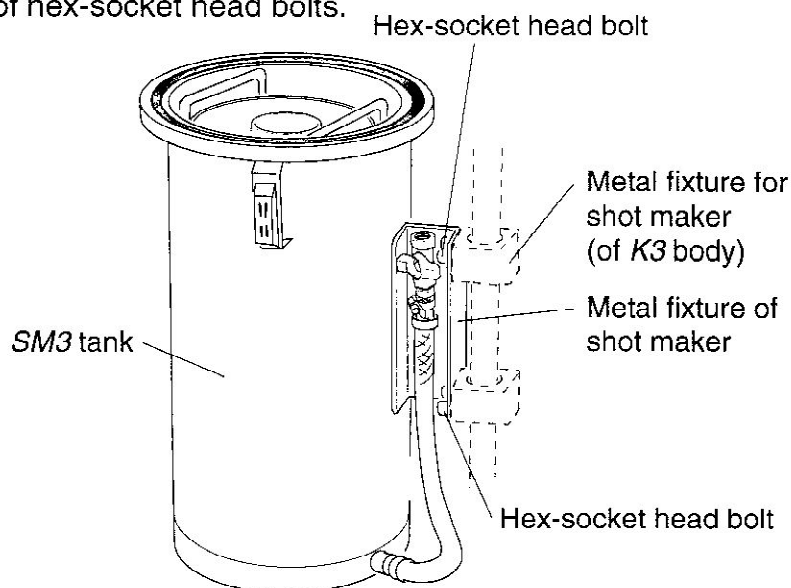
3. Pay special attention to the precautions described in pages 9 to 15 and observe them.

- 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.
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- NO PART OF THIS DOCUMENT MAY BE COPIED OR IN ANY WAY REPRODUCED WITHOUT THE EXPRESSED WRITTEN CONSENT OF THE MANUFACTURER.

## 2. INSTALLING

### 2-1. TANK

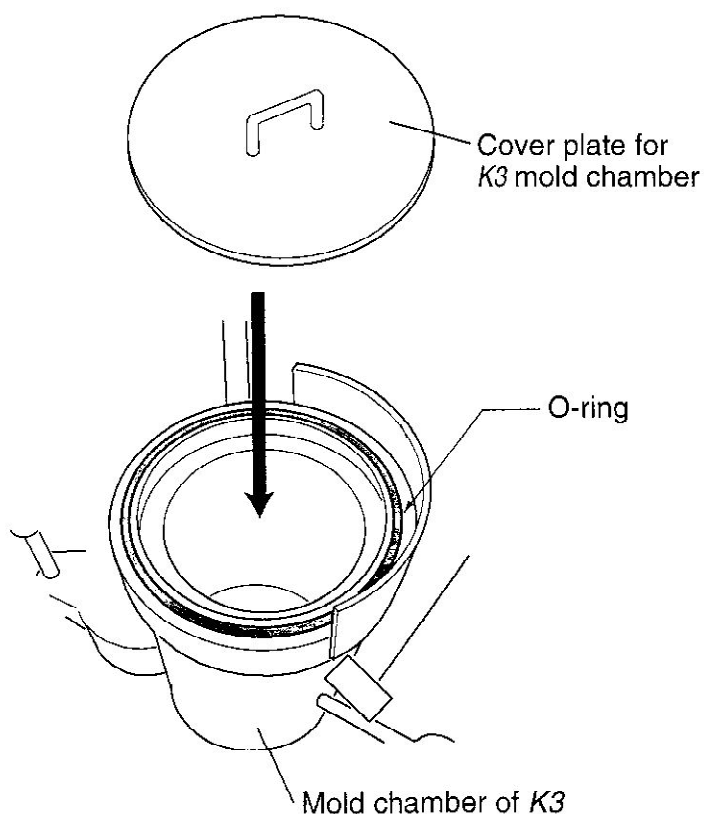
Fix the shot maker tank to the left-side shaft of the *K3* with four pieces (upper two pieces and lower two pieces) of hex-socket head bolts.



### 2-2. COVERING *K3* MOLD CHAMBER

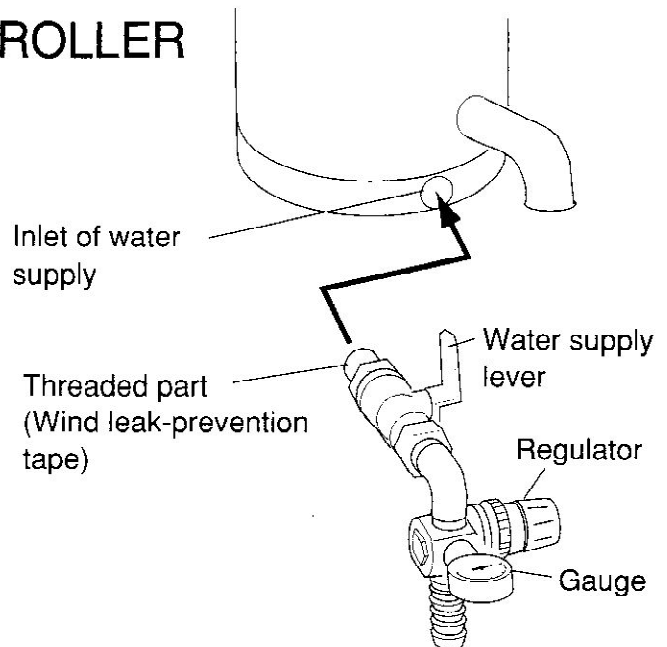
Place the cover plate for *K3* mold chamber on the mold chamber of *K3*, so that the O-ring of the mold chamber is covered.

**IMPORTANT:** If this is neglected, evacuation will be impossible.



## 2-3. WATER SUPPLY CONTROLLER

Roll leak-prevention tape around the threaded part of the water supply controller, and screw it in the inlet of water supply of the shot maker tank, so that the gauge will face upward.

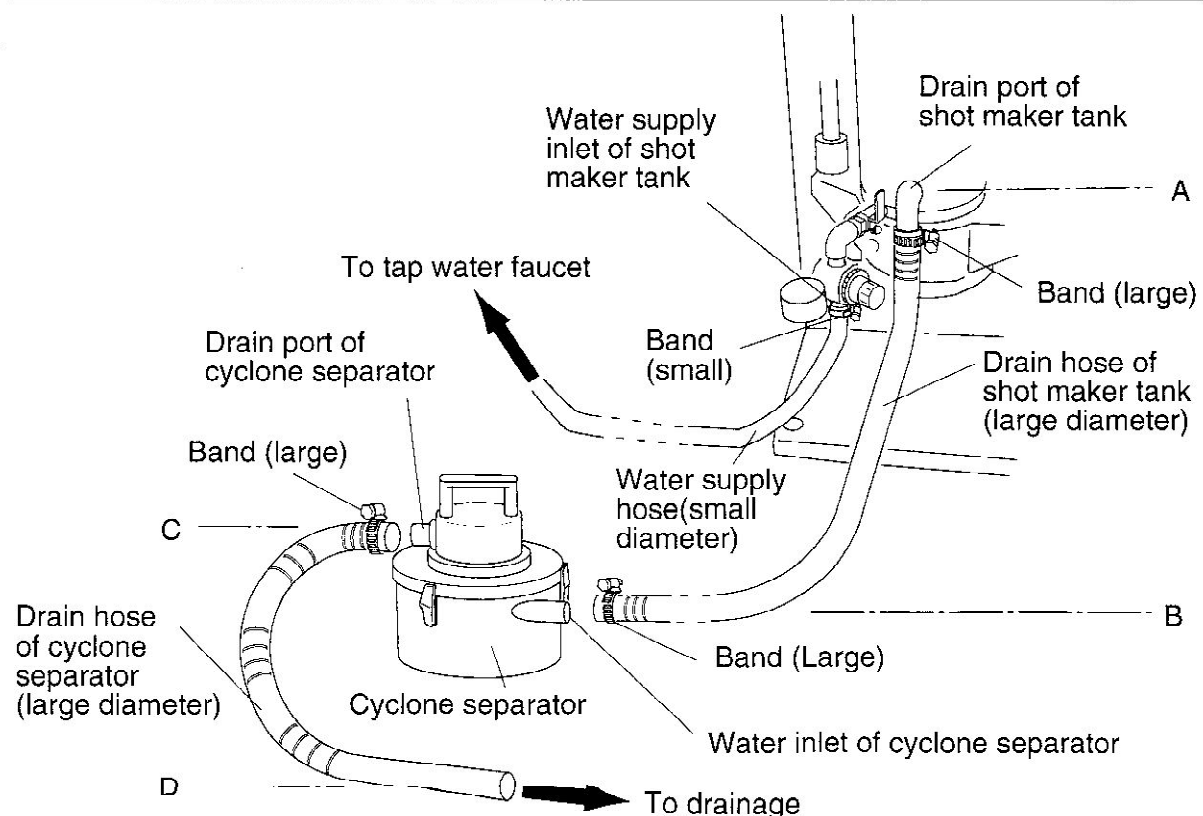


## 2-4. HOSE

After connecting hoses, fix them with hose bands.

### ⚠ CAUTION

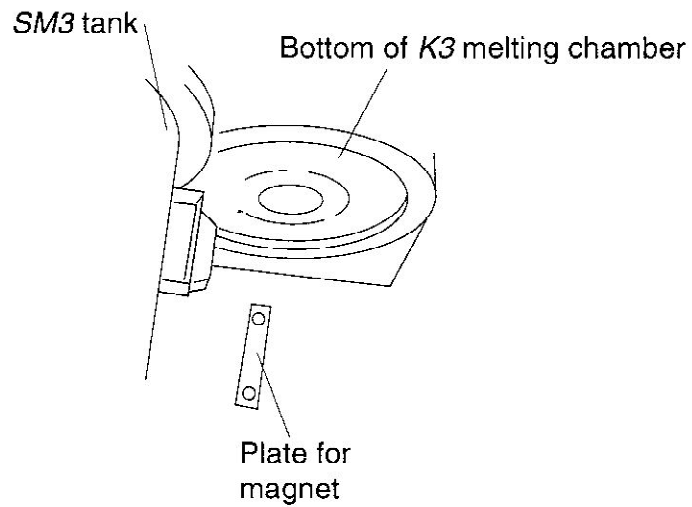
- The cyclone separator (B in the below figure) should be lower than the drain port of the shot maker tank (A in the below figure) .
  - The drain hose of cyclone separator (D in the below figure) should be lower than the drain port of the cyclone separator (C in the below figure).
- If the above is not observed, water can not be drained, which will cause trouble and accident.



## 2-5. OTHER PARTS

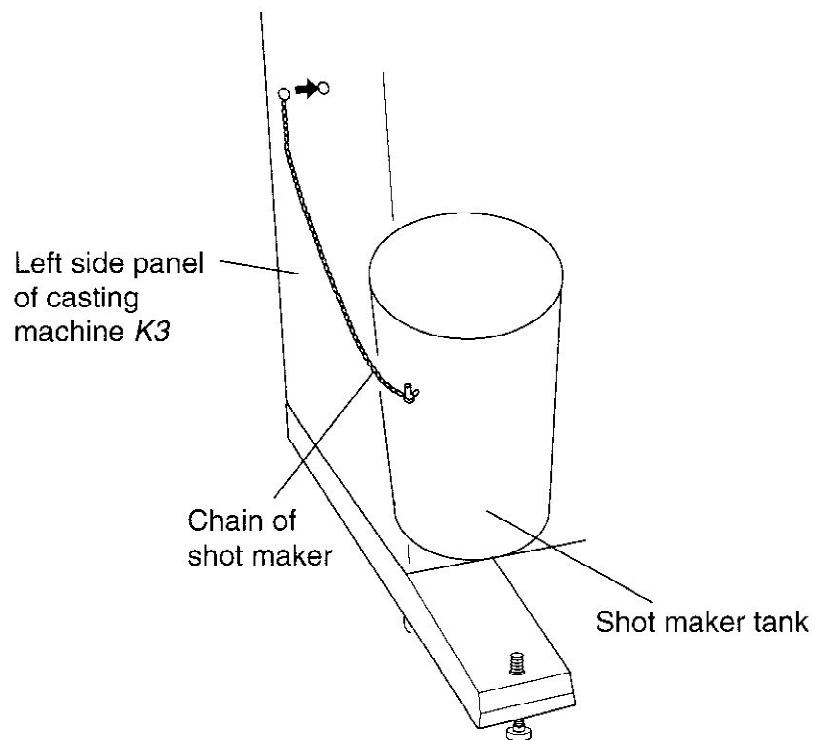
### 2-5-1. PLATE FOR MAGNET

Affix the plate for magnet on the front panel below the bottom of *K3* melting chamber.  
(This plate is provided with adhesive tape on its back.)



### 2-5-3. CHAIN

Fix the end of the chain to the the screw thread hole of *K3* left side panel.



## 2-6. CRUCIBLE

Use the crucibles exclusively designed for the shot maker only.

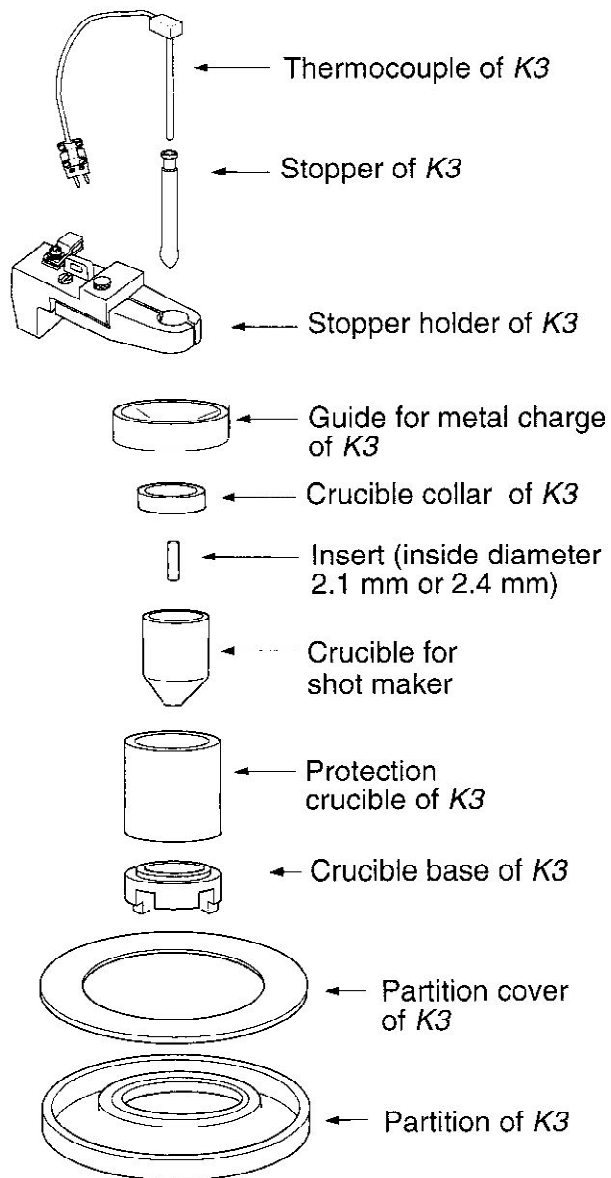


### CAUTION

If other type of crucibles are used, the machine can not work normally, and trouble or accident may be caused.

### 2-6-1. CRUCIBLES FOR CREATING NEW ALLOY

To create new alloy, set the crucible for shot maker as the figure, and use Memory No. 51 of K3.



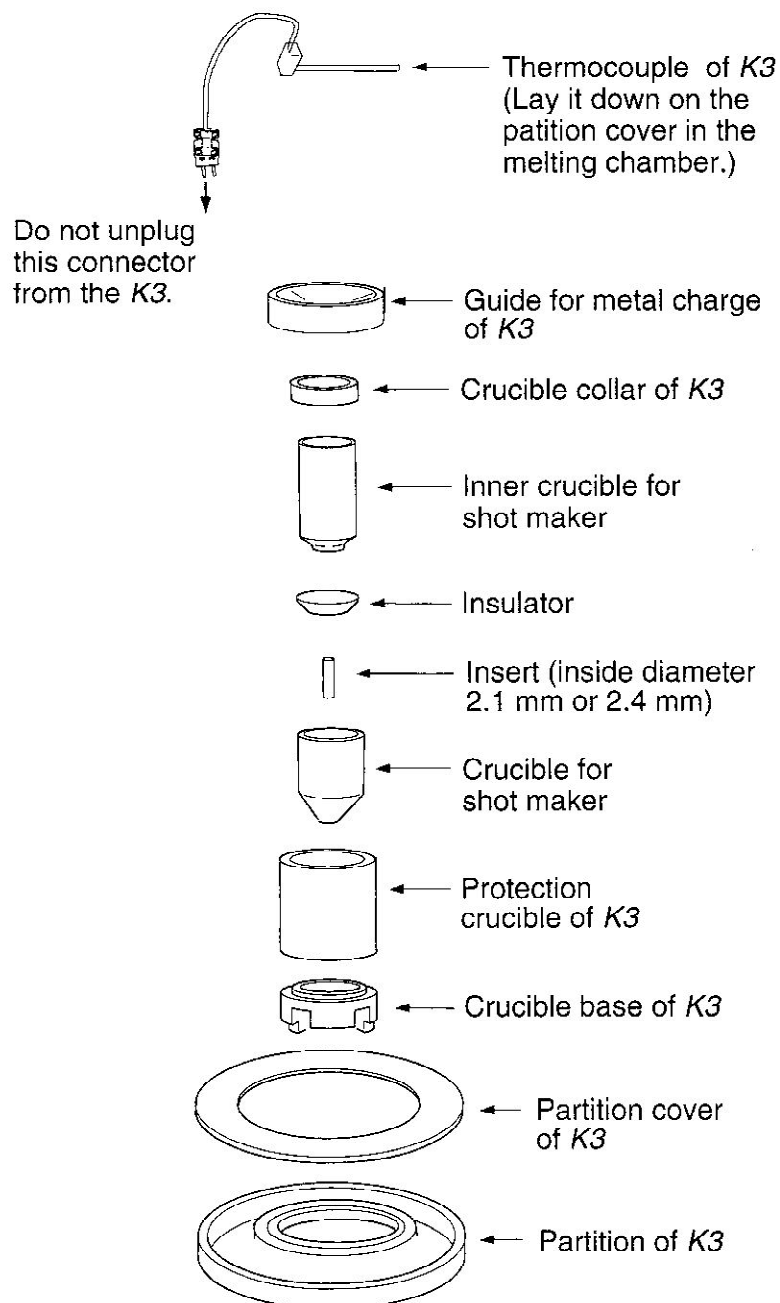
## 2-6-2. CRUCIBLES FOR REMELTING

To make shots by remelting previously-used metals, set the crucible as the figure, use Memory No. 52 of K3.

### DANGER

Be sure to use "Memory No. 52" of K3 to make shots by settings of the below figure to remelt previously-used metals. If "Memory No. 51" is mistakenly used, there is no heating limit so overheat will be caused, which may cause very hazardous results.

Remove the standard stopper of the K3. However, do not unplug the thermocouple from the K3 body. Lay down the thermocouple on the partition cover in the melting chamber.





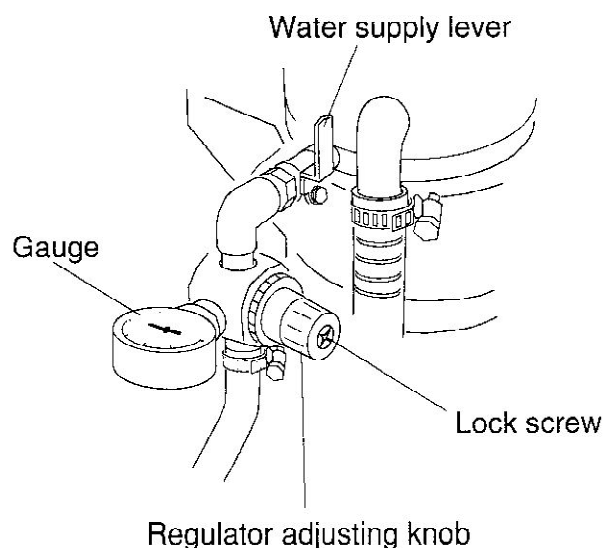
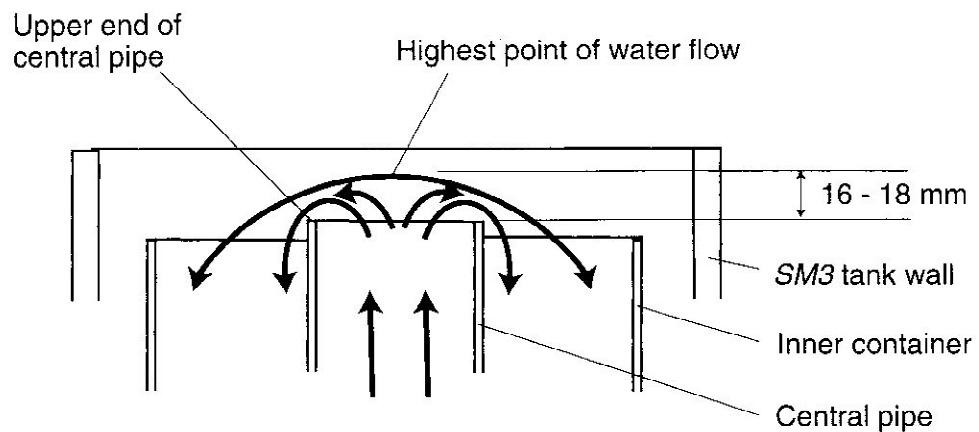
## 2-7. REGULATING WATER SUPPLY

### CAUTION

The regulator for water supply is preset to 0.1 MPa at the factory. However, water pressure or water flow speed may vary depending upon area or location. So, be sure to check and adjust water flow in the following way before use.

Turn the water supply lever ON to supply water, and then measure the height from the upper end of central pipe to the highest point of water flow with a scale etc.

- If the height is within 16 to 18 mm, no adjustment is required.
- If the height is not within 16 to 18 mm, turn the knob of the water supply regulator so that the height should be within 16 to 18 mm. (The knob is locked at the factory, so before starting adjustment, loosen the lock screw with Phillips screwdriver. After adjustment, tighten the lock screw.)




## 3. OPERATION

### 3-1. PREPARATION

#### 3-1-1. CRUCIBLE

There are two ways in making shots, one is "creating new alloy", and the other is "remelting previously-used metals" as described in P.7 and 8. Set the crucible and other parts according to your purpose.

If you selected the way that uses the stopper, check the stopper action before use by

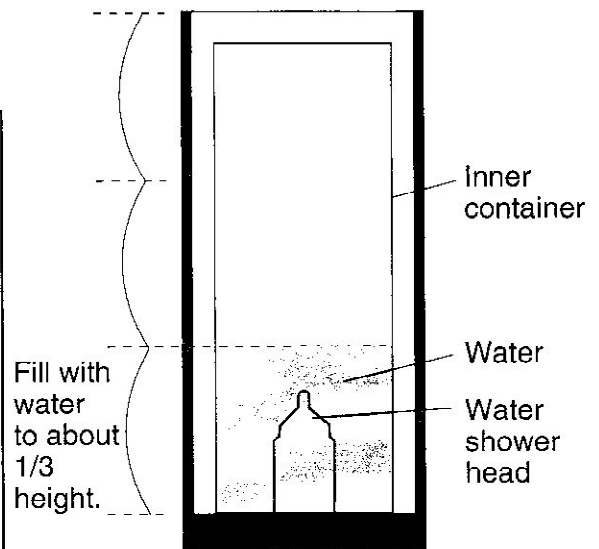
turning the  key of K3 ON and OFF in the MANUAL mode of K3.

#### 3-1-2. SHOT MAKER TANK

- 1) Set up the crucible.
- 2) Fill the inner container of the shot maker with water to approximately 1/3 height.

#### DANGER

- The top of the shower head in the tank should not be higher than the water surface level. If the shower head is over the water surface level, shower water is ejected directly to heated crucible etc., which may cause danger.
- If water amount is too large, bubbles will be produced at the time of vacuuming and water will be splashed to the heated crucible which may cause danger. Do not fill water over 1/3 height.
- At this time, if water was supplied by the water supply lever of the shot maker tank, turn the water supply lever back to the OFF position. Set the water supply lever always to OFF, except that it is turned ON at heating.



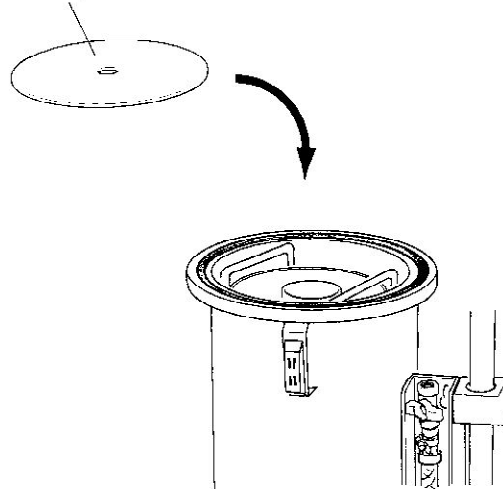
3) Place the cover plate for *SM3* on the top of the shot maker tank.



## CAUTION

Be sure to place this cover, because it shuts accidental water ejection to the bottom of melting chamber.

Cover plate for *SM3*



4) Move the standard mold chamber of the *K3* to the most right.

5) Swing the shot maker tank to below the melting chamber and set it to its place properly.

**IMPORTANT:** Check that the mold chamber of the *K3* is covered by the cover plate for *K3* mold chamber. See page 4.

### 3-1-3. PREPARING *K3*

1) Select Memory No. that is exclusively used for the shot maker.

- To create new alloy by settings of "2-6-1. CRUCIBLES FOR CREATING NEW ALLOY" in P.7, use Memory No. 51 of *K3*.

- To make shots by remelting previously-used metals by settings of " 2-6-2. CRUCIBLES FOR REMELTING" in P.8, use Memory No. 52 of *K3*.

Refer also to the corresponding pages of instructions manual provided with the *K3* about selecting Memory No.

2) When Memory No. 52 is selected with settings of "2-6-2. CRUCIBLES FOR

REMELTING" in P.8, input the parameter of




key.

## 3-2. OPERATING PROCEDURE

1) Charge the metal in the crucible.  
2) To perform the below sequential actions of 2-1) to 2-5) "Lid lock ---> Vacuum ---> M-GAS ---> Water supply ---> Heating", the operator has to handle operation of keys and valves with deliberate attention.

2-1) Slide the lid of the melting chamber of the K3 to just above the melting chamber. Press the START button of the K3, so that the melting chamber of the K3 and the shot maker will be locked.

2-2) Press the  key of the K3, so that evacuation will be started.

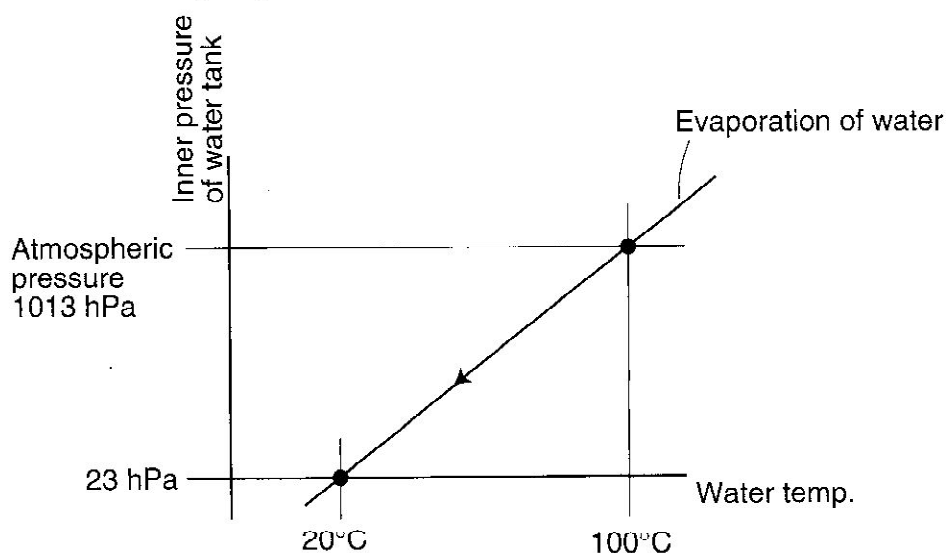
Watching the melting chamber pressure compound gauge located on the lid of the K3 melting chamber, stop evacuation at proper time, so that no bubbles should be produced from the water. To decrease generation of vapors from air bubbles in water tank, finish evacuation immediately when the gauge reached "0 hPa".


("0 hPa" can be reached in about 10 seconds, although it depends upon capability of the vacuum pump.)

Then, perform immediately the next step 2-3) of gas substitution.

### WHY VACUUM SHOULD BE FINISHED IN SHORT TIME FOR THIS MACHINE?

When water is exposed to vacuum, boiling point of water (100°C at atmospheric pressure) is lowered. Water of 20°C is boiled and evaporated at tank inside pressure of about 23 hPa. Therefore, if evacuation is performed for a long time, large amounts of water drops generated from boiled water adhere to crucible, crucible base, heating coil etc., so current-leakage and electrical shock hazards may be caused at the time of heating action of the following procedures. Further, when evacuation has been continued on boiling condition for a long time, large amounts of vapors will be taken into the vacuum pump, which will deteriorate capability of the vacuum pump.

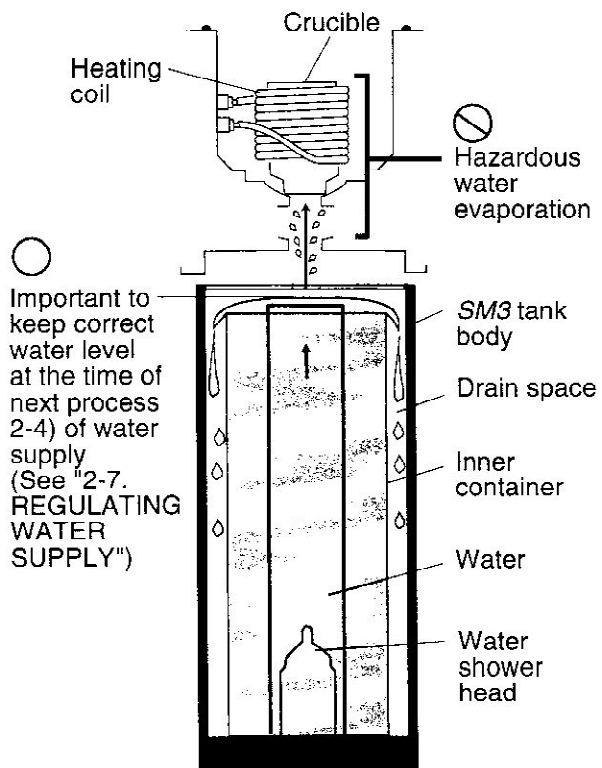


2-3) Press and hold the  key of the K3 to inject gas. Watching the melting chamber pressure compound gauge located on the lid of the melting chamber, be sure to reduce air pressure to 0.0 MPa.

## DANGER

If the melting chamber has not returned to near atmospheric pressure and water supply is performed at the next process at high vacuum, water in the tank of shot maker may be gushed up from the water shower head.

When gushed water reaches the crucible, water vapors fill inside the chamber rapidly, which may cause hazards such as electrical hazard etc. at the time of heating.



2-4) After confirming air pressure has returned to 0.0 MPa, turn the water supply lever of the shot maker to ON.

## CAUTION


1. Referring P.9 "2-7. REGULATING WATER SUPPLY", be sure to adjust water supply beforehand.
2. Open the water supply lever slowly for safety. Do not open it too fast.

2-5) After several dozen seconds from turning the water supply lever of SM3 to ON, make certain that water is discharged from the drain port of cyclone separator.

## DANGER


In case water drainage can not be checked visually, the drain space inside SM3 tank may be filled with water. If you leave the machine running, water may enter inside the melting chamber which may cause danger. In this case, stop water supply and be sure to check.

3) Start heating :

Press the  key to start heating.

4) Melting and pouring :

- In case new alloy shots are to be created by manual pouring with the stopper under


Memory No.51 (P.7), press the  key of the K3 at proper temperature after checking that the metal is fully molten so that the metal is poured.

- In case shots are to be made by remelting previously-used metals without using the K3 stopper under Memory No.52 (P.8), a molten part of the metal is poured in sequence into the shot maker tank.


### DANGER


During heating by Memory No.52, temperature in the crucible (metal) can be checked by visual observation only. Always take care to avoid overheating.

(In case shots are to be made by remelting previously-used metals without using the K3 stopper(P.8), the machine is designed so that small amount of metal including impurities will remain in the crucible owing to surface tension of the metal. Also, In case new alloy shots are to be created by manual pouring with the stopper(P.7), small amount of metal will remain similarly. After melting some times, refine the remained metal. Do not use the remained metal for casting.)

5) After pouring is finished, be sure to turn the  key of the K3 to OFF to stop heating.

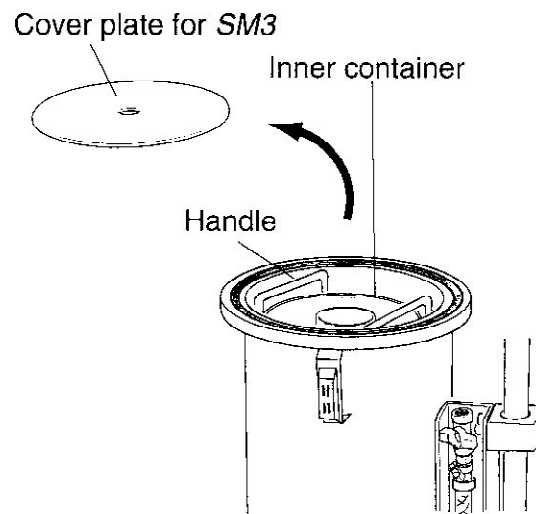
6) After the metal has been solidified completely, turn the water supply lever of the shot maker tank to OFF.

Press the  key of the K3 to carry out exhaust.

7) Press the  key of the K3 to release lid-lock.

8) Withdraw the shot maker tank. Take the cover plate for *SM3* off. Holding the handle of the inner container with both hands, take the inner container out.

**IMPORTANT:** If the inner container is removed abruptly, the metal shots in the container may be dropped out.



9) Move the metal shots to another container. Place the inner container back in the tank.

## 4. MAINTENANCE


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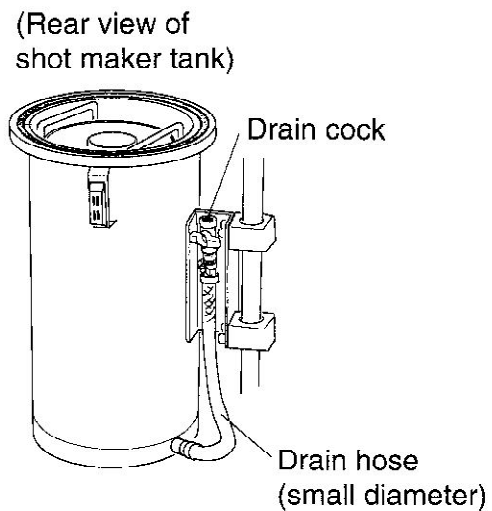
After use of the machine, open the drain cock of the drain hose (small diameter) of the shot maker tank and drain water out from the drain port. Then, wipe out inside of the tank.

Also, check that no metal shots are remained in the inner container. If they are remained, take them out of the inner container.

Small granules of metal are caught by the cyclone separator. Refine them.

After the shot maker is used, moisture inside the melting chamber of the *K3* may cause corrosion. Wipe out sufficiently, then move the mold chamber below the melting chamber

and set the *K3* machine to the MANUAL mode and evacuate using the  key (see the instructions manual of *K3*) for 20 to 30 minutes to dry inside of the melting chamber.



### CAUTION

If the casting machine is left or is operated without taking off dew drops, trouble or accident may be caused, or the life of the machine may be shortened. Make certain that water dew drops have been removed completely, so that the machine can be used safely.

Take off the upper cover of the cyclone separator periodically, and check metal remains inside, so that water drainage shall not be affected.