

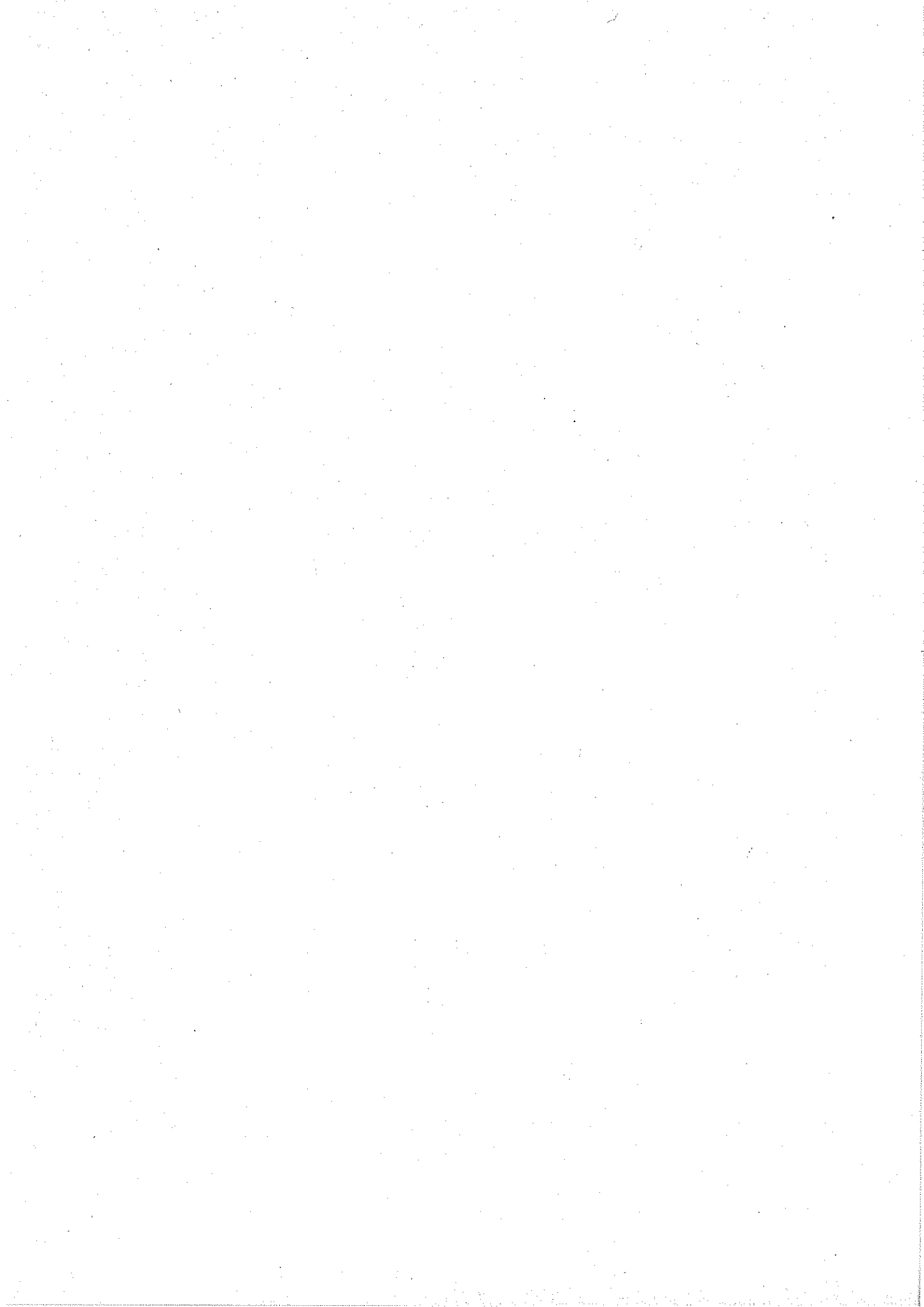
FREEZE DRYERS

Models DC-41A/41B

Instruction Manual

Yamato Scientific Co., Ltd.

Tokyo, Japan





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## 1. PRECAUTION IN INSTALLING

- (1) Please do not install the Freeze Dryer at the following places.
- ① Where flammable gas or corrosive gas is around.
  - ② Humid places.
  - ③ Where the ambient temperature is at 35°C or more or the temperature difference is too big.
  - ④ Where the sunshine directly comes in.
  - ⑤ Where the wind from the airconditioners hits the sample containers directly.

- (2) The vacuum pump for this Freeze Dryer should have the free air displacement of 50 l/min or more and the ultimate vacuum of  $10^{-4}$  Torr.

(Suitable type for example: Yamato Model PD-52 Vacuum pump with free air displacement of 50 l/min.)

Please connect the hose nipple (outside diameter 18mm) at the left side and the suction port nipple of the vacuum pump tightly with a vacuum hose so that there is no air leakage.

If the hose differs from the suction port nipple in diameter, please use a proper reducer to connect securely.

- (3) Connect the electric plug and the 3-wire grounded outlet.

If grounded outlet is not available, please use the grounding type adapter to ground the lead wire.

## 2. SPECIFICATIONS

| Models   | DC-41A   | DC-41B |                                       |  |
|--|--|--------|---------------------------------------|--|
| <p><u>Performance</u></p> <p>Sample temperature*1</p> <p>Max. freeze drying capacity</p> <p>Max. freeze drying speed</p>   | <p>Below -30°C ( when the number of sample is one.)</p> <p>Below -20°C ( when the number of sample is five.)</p> <p>200g disdtilled water/batch*2</p> <p>approx. 30g of water/hr.</p>  |        |                                       |  |
| <p><u>Composition</u></p> <p>Condenser</p> <p style="padding-left: 20px;">Dimension</p> <p style="padding-left: 20px;">Material</p> <p>Number of container to be set</p> <p>Vacuum gauge</p> <p>Measuring range (Indication)</p> | <p>Adsorption material (molecular sieve)</p> <p>Outside diameter 150mm X height 330mm</p> <p>Stainless steel SUS 304</p> <p style="text-align: center;">5 pcs.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; vertical-align: top;"> <p>Bourdon tube</p> <p>0 ~ 76cmHg</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Thermocouple</p> <p>200 ~ 10<sup>-1</sup> Pa/2~10<sup>-3</sup></p> <p style="text-align: right;">Torr</p> </td> </tr> </table> |        | <p>Bourdon tube</p> <p>0 ~ 76cmHg</p> | <p>Thermocouple</p> <p>200 ~ 10<sup>-1</sup> Pa/2~10<sup>-3</sup></p> <p style="text-align: right;">Torr</p> |
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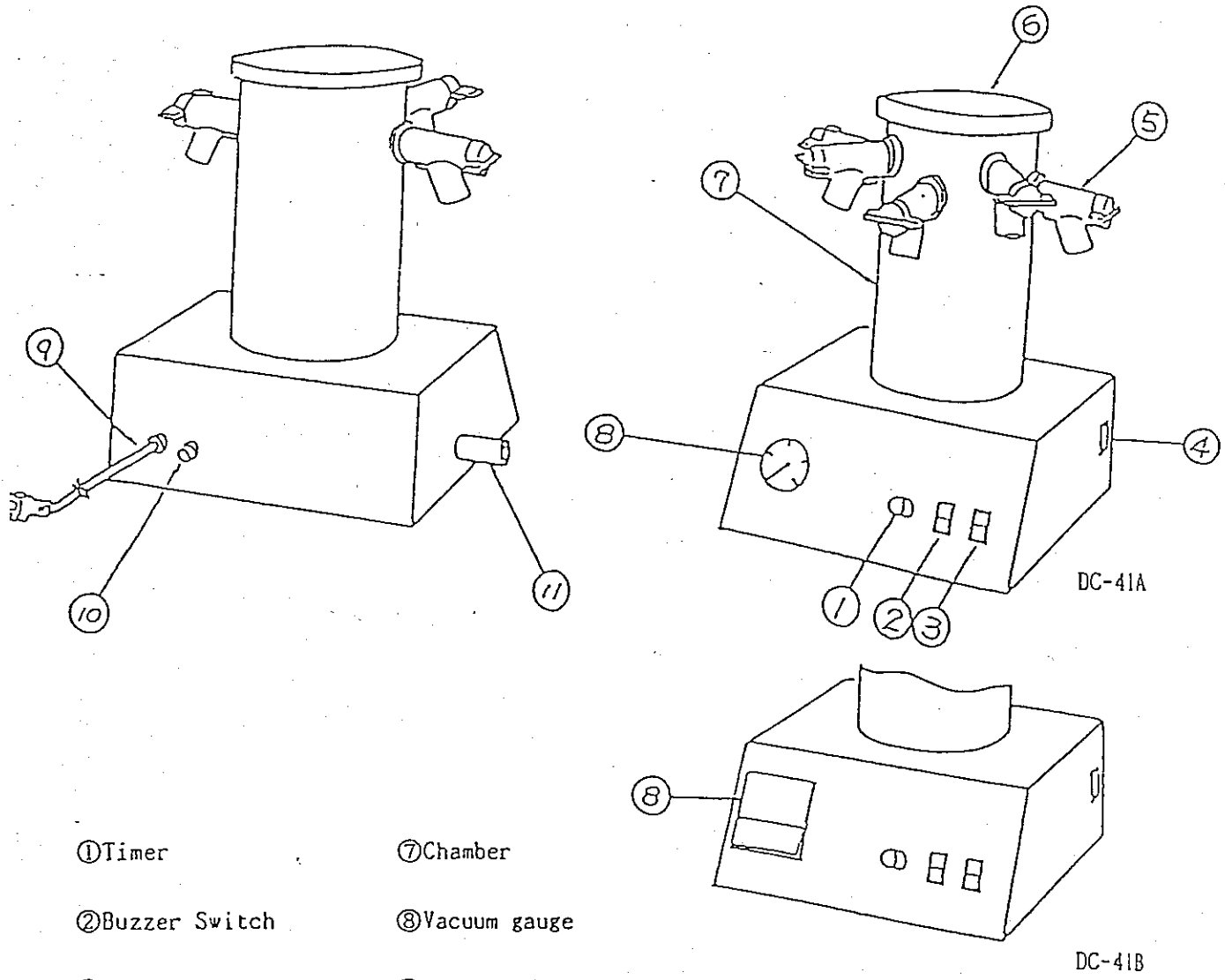
|                            | DC-41A  | DC-41B |
|----------------------------|---|--------|
| <u>Standard</u>            |   |        |
| Overall dimensions         | 340 (W) X 340 (D) X 446 (H) mm (Protruding parts are not included.) |        |
| Hose nipple                | Outside diameter 18mm   |        |
| Power supply               | AC 220V 50Hz, 1A  |        |
| Weight                     | Approx. 14kg (The weight of molecular sieve is not included.)       |        |
| <u>Accessories</u>         |   |        |
| Vacuum valve               | 5 pcs.  |        |
| Vacuum hose                | Inside diameter 15mm X length 1m 1 pc.                              |        |
| Molecular sieve            | 2.5 kg  |        |
| Grounding type             |   |        |
| Silicone grease for vacuum | 1 piece in cup  |        |
| Fuse                       | 1 pc.   |        |
| Instruction manual         | 1 copy  |        |

\* 1 When 120ml flask of optional accessories is used and the amount of sample is 10g per flask.

Please note that performance varies depending on the amount of samples, kind of sample, shape and size of containers.

\* 2 This quantity of distilled water is processable when 2.5kg of molecular sieve is used.

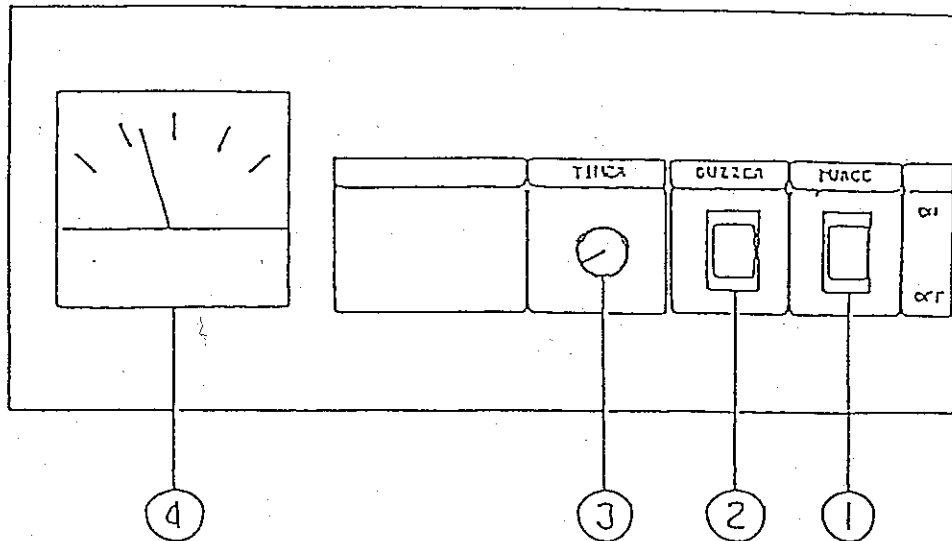
### 3. EXTERNAL VIEW



- ① Timer
- ② Buzzer Switch
- ③ Purge Switch
- ④ Power Switch
- ⑤ Valve
- ⑥ Chamber cover
- ⑦ Chamber
- ⑧ Vacuum gauge
- ⑨ Fuse
- ⑩ Hose Nipple



#### 4. ILLUSTRATION OF EACH PART OF THE PANEL



- ① Purge switch ..... It makes the circuit atmospheric and prevents oil from flowing backward when the vacuum pump stops.
- ② Buzzer switch ..... It informs that time is up by buzzer sound.
- ③ Timer ..... It sets the freeze drying time. (Please adjust the time according to the amount and kind of the sample.)
- ④ Vacuum gauge ..... It indicates the vacuum degree in the circuit.  
 (Type A ..... Bourdon)  
 (Type B ..... Thermocouple)

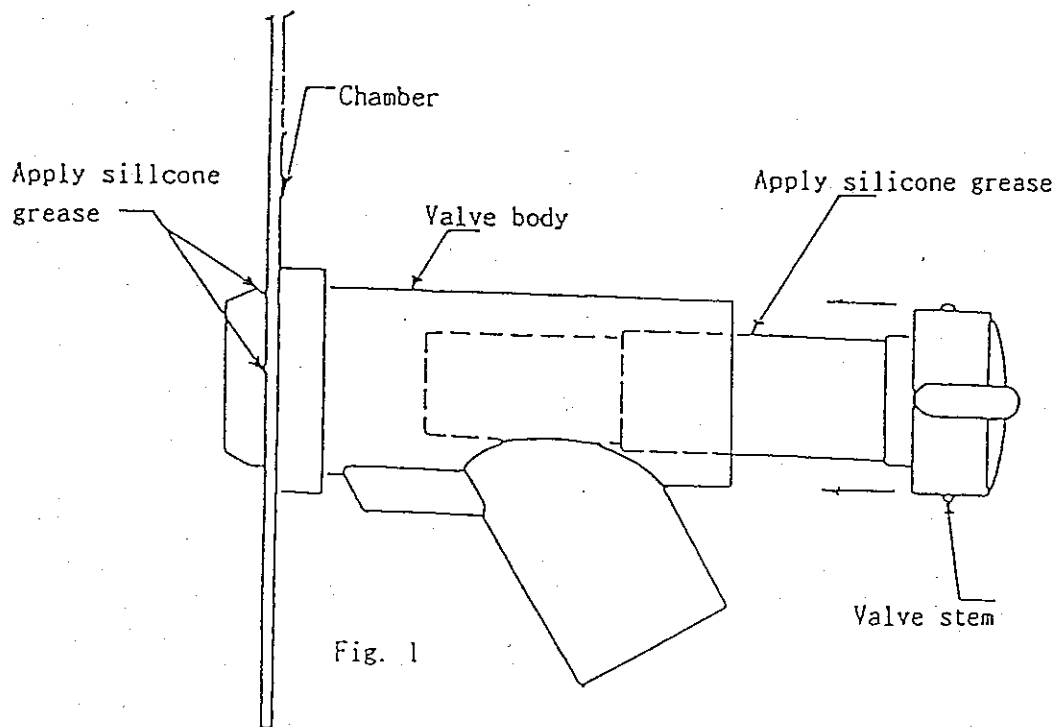
## 5. ASSEMBLING

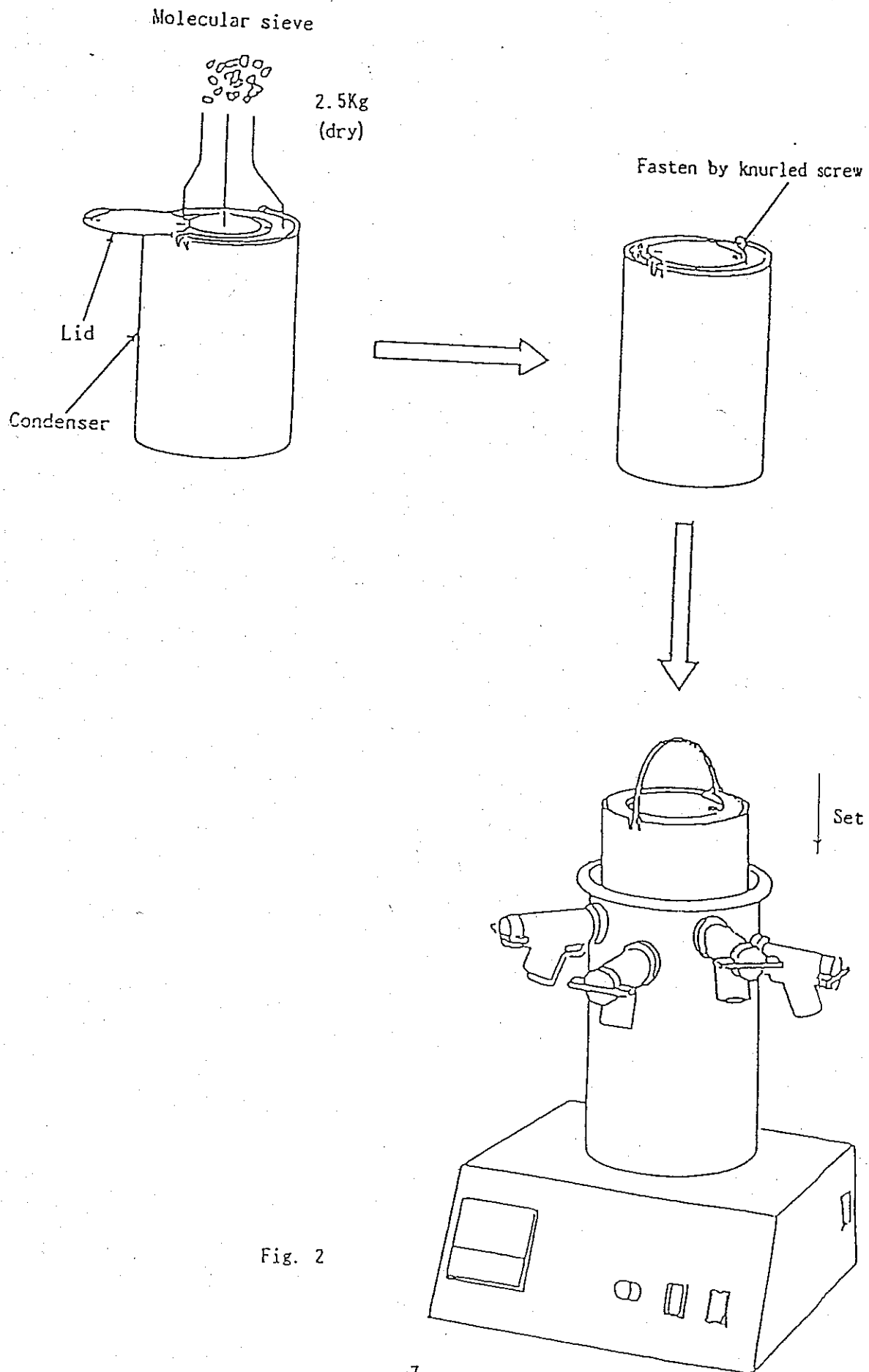
(1) How to attach the valve. (Fig. 1)

- ① Apply silicone grease to the groove of the valve body and the holes of the chamber. Then, insert the end of the valve body straight into the holes of the chamber with turning it.
- ② Apply silicone grease to the external surface of the valve stem, then, insert it into the valve body.
- ③ When you take off the valve, please do the above procedure conversely.

(2) How to attach the condenser. (Fig. 2)

- ① Charge the molecular sieve in the condenser. Open the lid at the top center of the condenser and charge the molecular sieve inside.
- ② After filling up, close the lid and fasten securely with the knurled screws.
- ③ Place the condenser in the chamber.





## 6. OPERATION

### (1) Preparation for the operation.

- ① Regenerate the molecular sieve in the condenser completely and cool it.
- ② Fasten the lid of the condenser securely with knurled screw.
- ③ Set the condenser in the chamber.
- ④ Connect the vacuum pump and the hose nipple of the main body with a vacuum hose.
- ⑤ Turn off the purge switch.
- ⑥ Turn the valve to " VENT " to close. (Fig. 3)

### (2) Starting operation.

- ① Start up the vacuum pump.
- ② Please make sure that atmosphere is adequately vacuumed with the vacuum gauge.
- ③ Attach the samples which are prefrozen the valve and turn the valve to " VAC " to open.

This makes the pressure of the container reduced. (Fig. 4)

- ④ Set the timer. Timer should be adjusted according to the quantity and kind of the sample.
- ⑤ Turn the buzzer " ON " .

(3) Stopping operation.

- ① Check the condition of the sample before terminating the drying process.
- ② When the freeze drying is finished, turn the valve to " VENT " and take off the sample containers. (Fig. 3)
- ③ Turn the purge switch " ON " before you stop the vacuum pump.
- ④ Turn the buzzer switch " OFF " to stop the buzzer.

Valve close

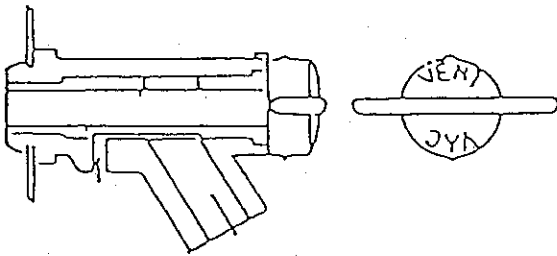


Fig. 3

Valve open

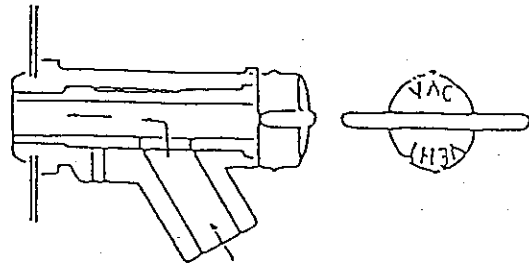


Fig. 4

## 7. REGENERATION AND STORAGE OF THE MOLECULAR SIEVE

- (1) When you finish the freeze drying, take out the condenser from the chamber and put it into the regeneration oven with opening the lid of the condenser stood for regeneration. (Fig. 5)
- (2) Temperature for regeneration is  $250^{\circ}\text{C}$ .
- (3) Regeneration time is approx. 12 hours after the chamber temperature of the oven gets  $250^{\circ}\text{C}$ .
- (4) Once the regeneration is over, store the molecular sieve in the sealed container.

(5) Cooling should be done in the sealed container.  
Take out the condenser

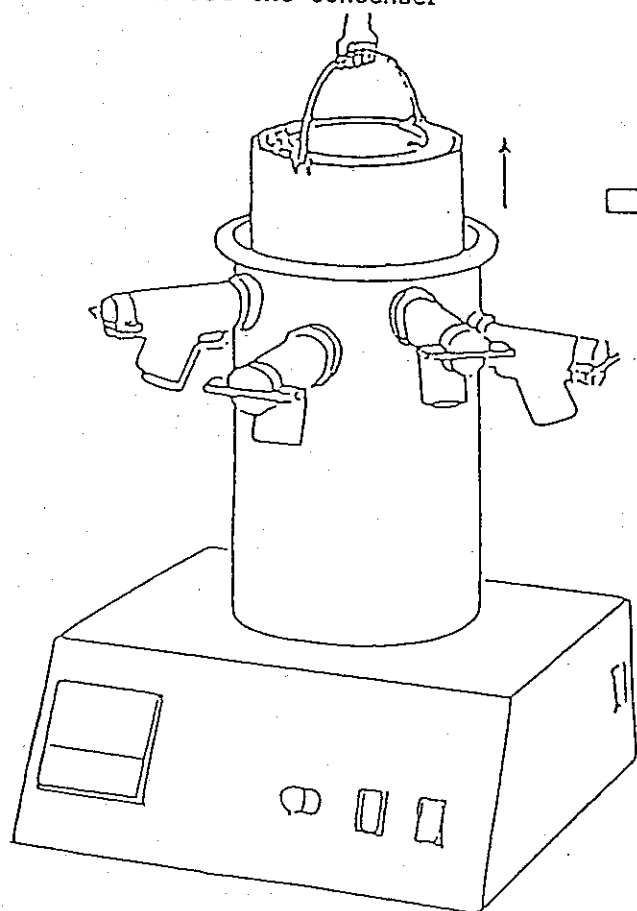
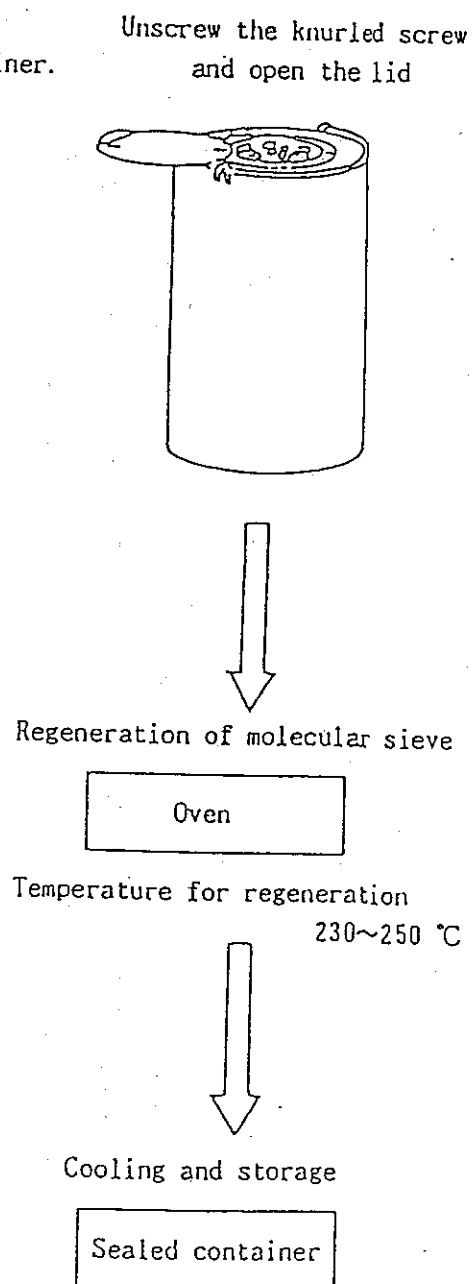


Fig. 5



## 8. CAUTION IN OPERATION

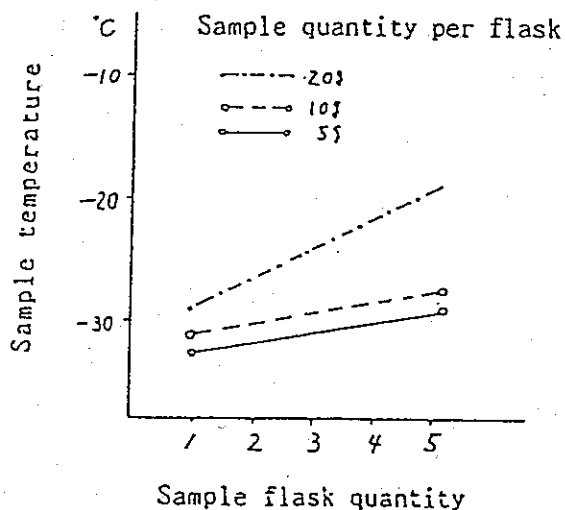
- (1) Molecular sieve in accessories is adsorbent exclusive for water.  
Please note that solvent other than water can not be adsorbed and is absorbed in the vacuum pump.
- (2) Please note that rubber packing and valve body can be corroded by acid and chloric solvents, benzene, toluene, and so on.
- (3) Please use the containers for the samples we designate. As the inside diameter of the ampule adapter is 7mm, diameter of the connection tube for the ampule should be 7 ~ 9mm.
- (4) After each batch of freeze drying, please be sure to regenerate the molecular sieve and keep it sealed up. If you leave it in the chamber after the operation it adsorbs the moisture in the air and becomes saturated. Please use the condenser storage container we designate.
- (5) When you regenerate the molecular sieve, the temperature in the regeneration oven is very high, please handle with care.
- (6) Please note that the regeneration temperature for the molecular sieve should not be higher than necessary. The right temperature is 250 °C . If you make it higher than that the adsorbing capacity of the molecular sieve becomes weaker.
- (7) Setting of the condenser into the chamber should be done immediately before the operation starts.
- (8) To decide the sample quantity and the frequency of the operation, please refer to " 9. REFERENCE DATA " . If the sample quantity is too large, the vapor sometimes cannot be adsorbed in the condenser and goes to the pump.
- (9) After the operation, please let the air in the circuit open to the atmosphere. If you leave the vacuum pump evacuated, the oil in the pump might go back to the circuit.

- (10) The timer is used for indicating the processing time merely as a reference. The freeze drying continues after the time elapses.
- (11) If you do not use the timer, turn the buzzer switch " OFF " .  
If it is turned " ON " , the buzzer buzzes.
- (12) Please make sure that the freeze dryer is grounded.
- (13) It is impossible to warrant the freeze dryer against malfunction in case purchaser or user has made unauthorized remodeling or misused.
- (14) If you find any malfunction, turn the power switch off and pull out the power supply cord and inform the sales agent.

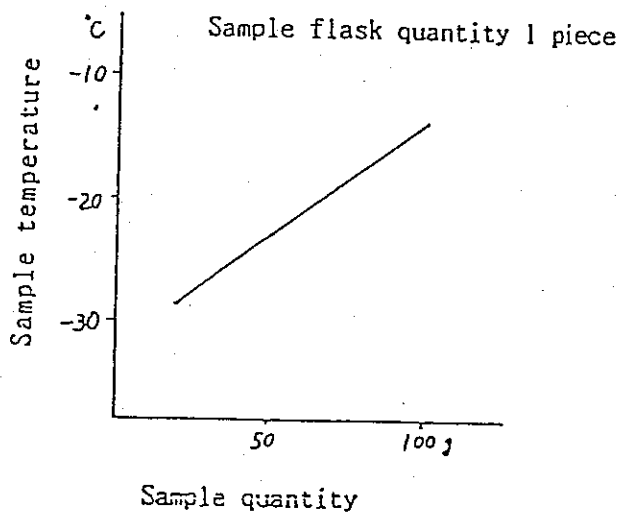


## 9. REFERENCE DATA

When 120mℓ flask (Yamato) is used.

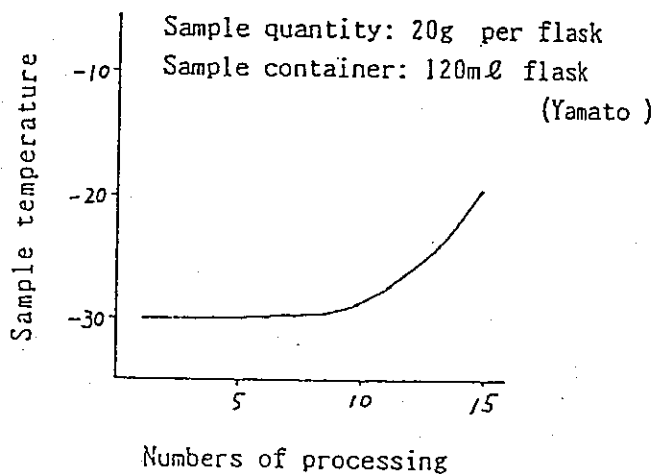
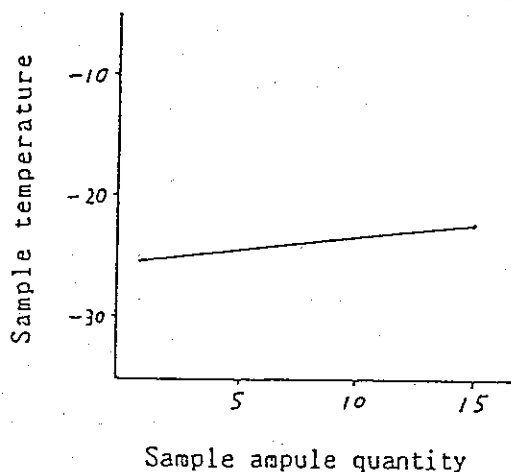


When 500mℓ eggplant shape flask is used.



When one sample flask is repetively used.

When ampule (  $\phi 5 \times \ell 150\text{mm}$  ) is used.



\* The above experimental data were given under the following conditions:

Sample: distilled water

Vacuum pump capacity: 50 l/ min .

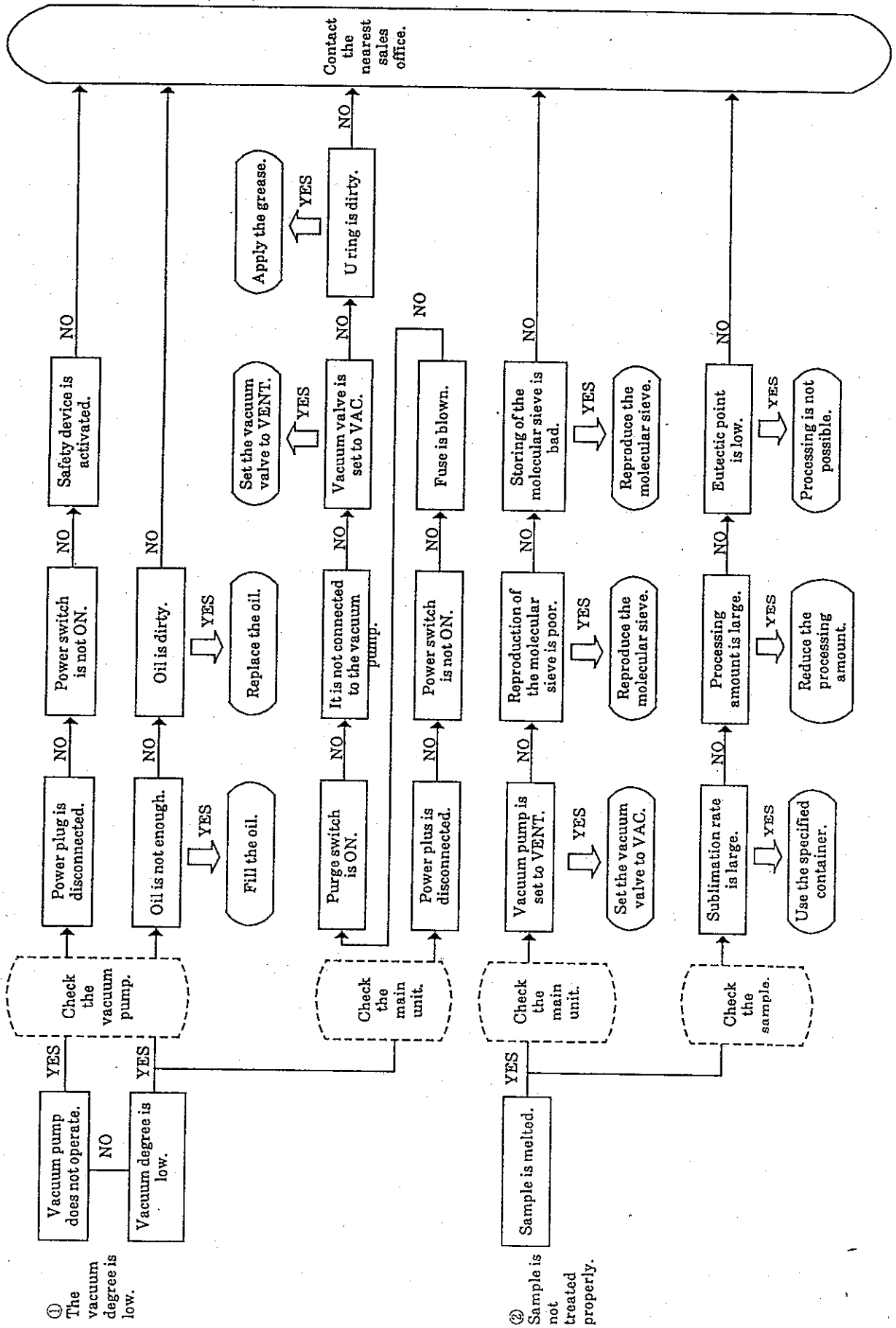
Room temperature: 25 °C

Please note that the kind of the sample, the shape and size of the container,

the capacity of the pump will make these data different a bit.

# 10. TROUBLESHOOTING

Check the followings if the product should have abnormality or trouble.



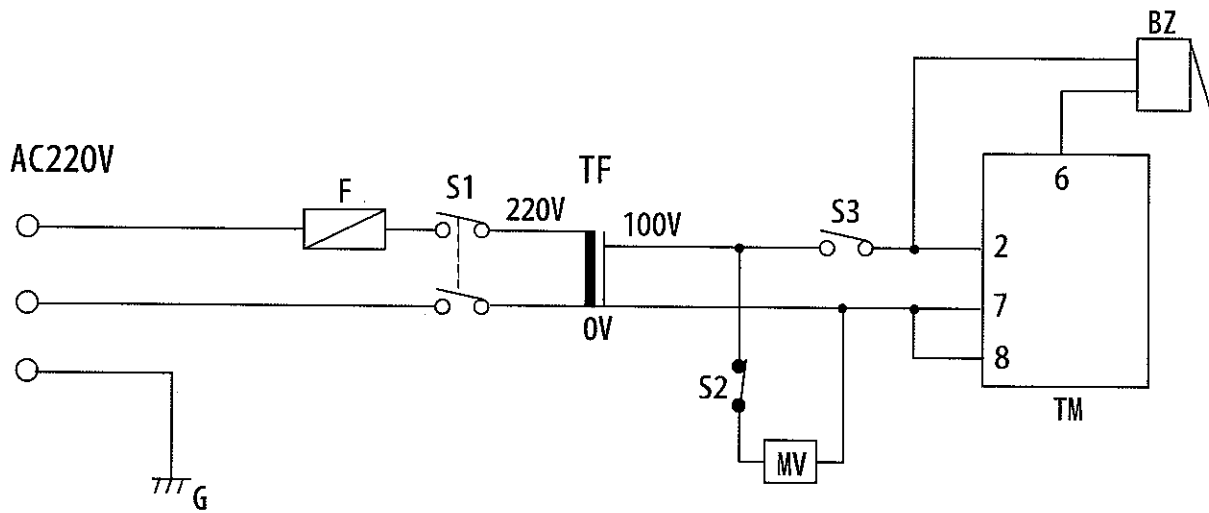
11. REPLACING PARTS LIST

| Part Name.                    | Part No.   | Specification       | Manufacturer      |
|-------------------------------|------------|---------------------|-------------------|
| Power switch                  | 212514-105 | AJ921002B3          | Matsushita Denko  |
| Purge switch                  | 212514-106 | HLS112A (BLACK)     | Fujisoku          |
| Buzzer switch                 | 212514-106 | HLS112A (BLACK)     | Fujisoku          |
| Purge valve                   | 212514-141 | AG31-02-1-AC100V    | CKD               |
| Timer                         | 212514-111 | STMN-111            | Tateishi Denki    |
| Buzzer                        | 212514-112 | EA4201              | Matsushita Denko  |
| Fuse                          | 212514-103 | 6.4 × 30 mm 1A 125V | On the market     |
| U ring                        | 221481-105 | CR                  | Yamato Scientific |
| O ring                        | 212514-134 | P24 (NBR)           | On the market     |
| Molecular sieve               | 212514-200 | 3A-3.2 Pellet       | Union Showa       |
| Vacuum valve main unit        | 212514-300 | CR                  | Yamato Scientific |
| Vacuum valve stem             | 212514-301 | PP                  | Yamato Scientific |
| Bourdon's tube vacuum meter*1 | 212514-121 | AA15-221            | Nagano Keiki      |
| Thermocouple vacuum meter*2   | 212515-123 | MTG-011             | Nichiden Aneruba  |
| Measurement ball*2            | 212515-124 | TG-550              | Nichiden Aneuruba |

The part marked with \*1 is only for the model DC-41A.

The parts marked with \*2 are only for the model DC-41B.

# WIRING DIAGRAM



| MAR K | PARTS NAME     |
|-------|----------------|
| BZ    | BUZZ ER        |
| F     | FUSE           |
| MV    | PARG E VALVE   |
| S1    | POW ER SWITCH  |
| S2    | PARG E SWITCH  |
| S3    | BUZZ ER SWITCH |
| TM    | TIMER          |
| TF    | TRAN SFO RM ER |