WARRANTY

EYELA products are warranted against defects in materials and workmanship for a period of year following the date of shipments. EYELA will make repairs or replacements free of charge upon return to the factory, transportation paid, of the detective item except following cases. This warranty does not cover finishes nor does it cover damage resulting from accident, misuse, abuse, tampering, servicing performed or attempted by unauthorized service agency.

FOREWORD

Thank you very much for your kind patronage of EYELA. Get to know your EYELA products, but before using, to be sure to read this manual well. EYELA cannot be held responsible for the malfunction resulting from the use of EYELA products other than as specified in this manual.

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Liability Disclaimer

Liability to Tokyo Rikakikai Co., Ltd. for any defect in this instrument is limited to the invoiced price of the defective instrument. Tokyo Rikakikai Co., Ltd. has no control over the set-up, use, connection to other equipment, or data generated by means of EYELA products. Therefore, in no event shall Tokyo Rikakikai Co., Ltd. be liable for any incidental or consequential damages, losses, or liability which may result from improper use of its products, either in connections with other equipment or in the generation, reporting, or application of data and results.

R01

EYELA

Spray Dryer

Instruction Manual

SD-1000

Important

This manual is designed to use this unit safely with the best performance.
Read carefully the chapter [For safety operation] before operating this unit.
Keep this instruction manual beside the unit.

Tokyo Rikakikai Co., Ltd.

Precautions for your safety

1. Warning signal words

On account of the function and characteristic, some parts of this unit will be heated to high temperature.
This manual shows precautions for your safety to prevent careless injuries.

They are classified and defined according to their risk, and indicated with an alert mark and a signal word.
Please follow these instructions.

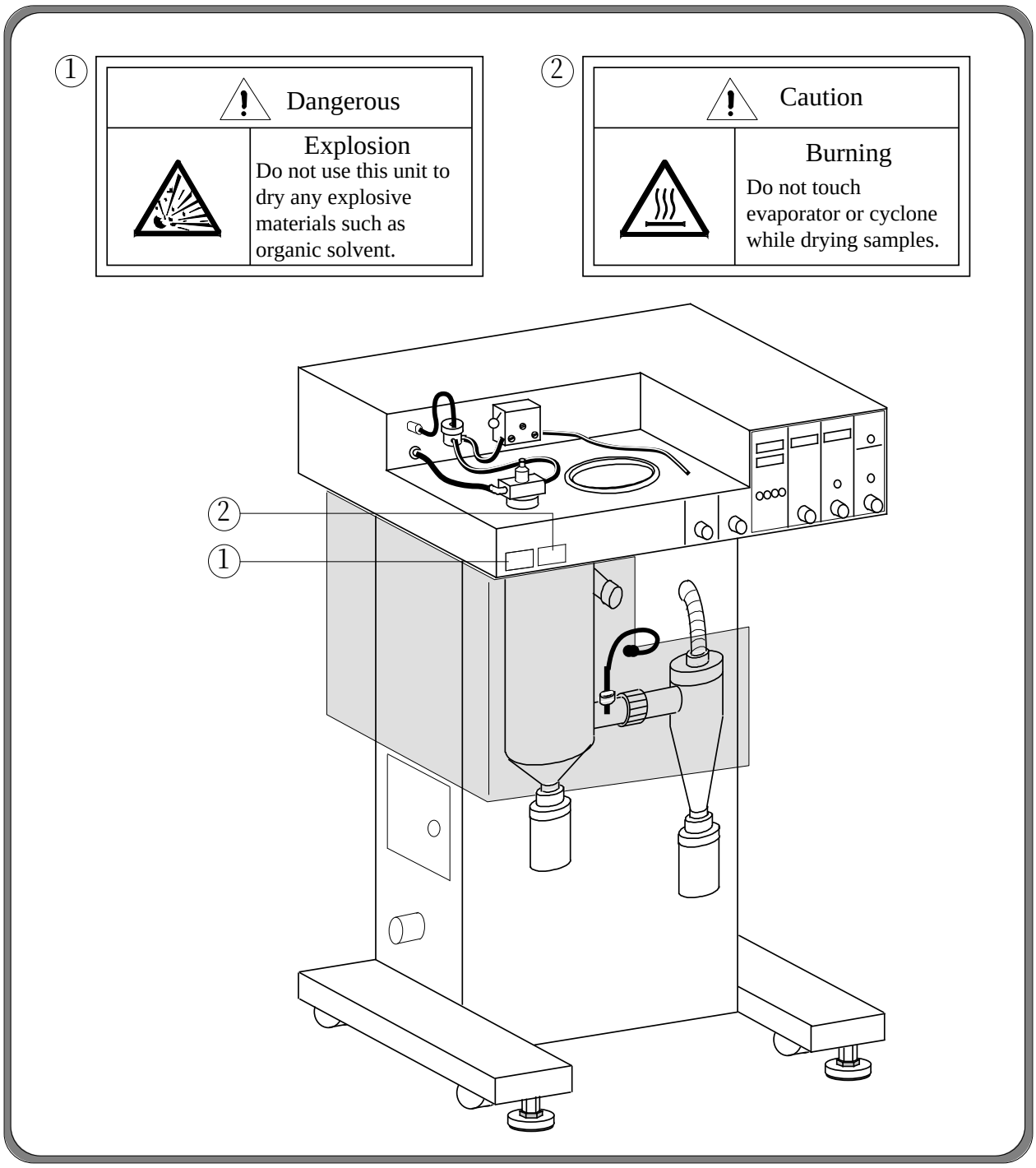
Alert Mark Signal word	Definition
 Dangerous	Indicates a strained hazardous situation which, if you use incorrectly, could result in death or serious injury.
 Warning	Indicates a potentially hazardous situation which, if you use incorrectly, could result in death or serious injury.
 Caution	Indicates a potentially hazardous situation which, if you use incorrectly, may result in injury or physical damage.

We investigate enough possible hazards during the operation, however it is very difficult for us to find every hazardous occasions.
Therefore this manual cannot describe all hazardous operations.
Please follow this manual and be careful to operate the unit, to prevent injuries or physical damages.

2. Warning label

A warning label is attached to the unit to refer the most important clause.
The attached position is shown as below.
Be careful to use the unit referring warning messages.

* When the warning label is worn and hardly show the message, change it with a new one. Please order us a new label.



Thank you for choosing EYELA products.

Introduction

This instruction manual describes the procedure of installation, operation, trouble shooting, maintenance / check-up, and disposal for Spray dryer model SD-1000. Read this manual carefully before operation.

Table of contents

Packing

This unit is packed in 2 cartons which are main unit and accessory parts.
Check quantities referring to the below table.

Main unit ---- 1

Accessory parts

1. Evaporator set ---- 1
2. Cyclone set ---- 1
3. Receiving flask, Separator set ---- 2
4. Rectification board ---- 1
5. Exhaust hose ---- 2.5 m
6. Hose band for exhaust hose ---- 2
7. Air tube connector (1/4) ---- 1
8. Air tube (OD6mm) ---- 5m
9. Stirring bar ---- 1
10. Silicone tubing for applying sample (3.15 x 5.2) ---- 2 m
11. Silicone tubing for applying sample (3.7 x 6.1) ---- 1 m
12. Aluminum tape ---- 10 m
13. Cable for recorder (2m) ---- 3
14. Sensor for outlet temperature ---- 1
15. Instruction manual for SD-1000 ---- 1

* Receiving flask is same as separator.

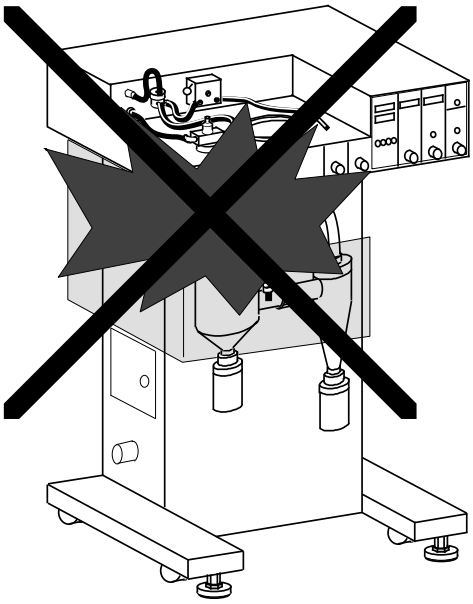
1 For safety operation

This unit is heated to high temperature. This unit is not explosion-proof structure.
Be careful to handle safely depending on characteristics of sample.

⚠ Dangerous

Do not use flammable materials such as organic solvent.

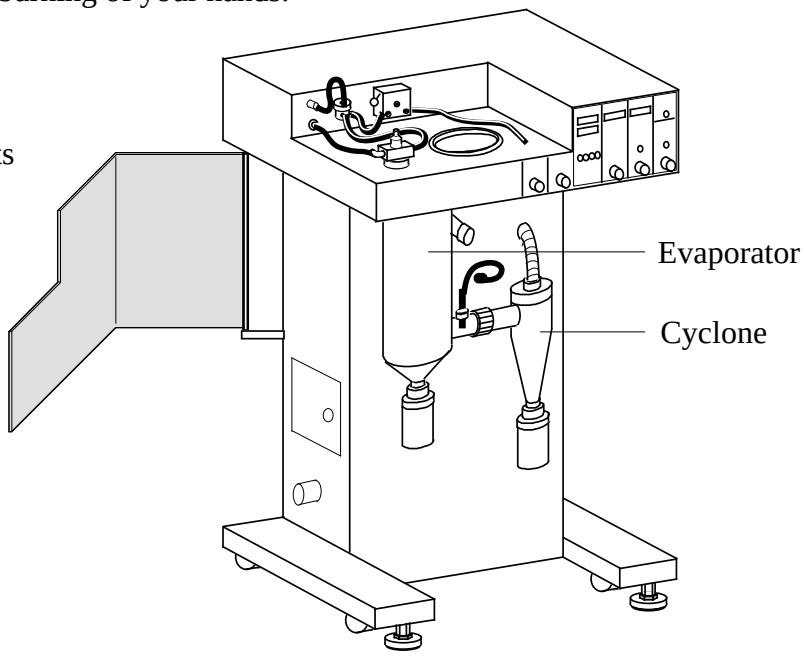
Do not use this unit to dry flammable materials such as organic solvent.
This unit has a built in heater, so it may ignite.



⚠ Caution

While operating unit, do not touch evaporator or cyclone.

While operating unit, do not touch evaporator and cyclone to prevent burning of your hands.



2 Outline

2-1 Application

⚠ Dangerous

Do not use flammable materials such as organic solvent.

Do not use this unit to dry flammable materials such as organic solvent.
This unit has a built-in heater, so it may ignite.

⚠ Warning

Do not remodel.
Do not use out of applications.

Remodeling or using out of applications may occur electric shock hazard or mechanical troubles.

In this unit samples are sprayed through a nozzle and dry by heated air to make dried fine particle.

You can choose a cap for nozzle (option).
Please prepare a compressor.

2-2 Optional accessories

• Cap for nozzle

	Diameter	Cat. No.
For liquid	0.71mm (standard)	120730
	0.51mm	120720
	0.41mm	120710
For air	1.75mm (standard)	120750
	1.6mm	120740

Cap needle for liquid	0.71mm (standard)	180270
	0.51mm	180260
	0.41mm	180250

• Concentration of sample

Ref. diameter	Combination of caps		Concentration
	Liquid	Air	
2	0.71	1.75	Slurry conc. is about 5~30%.
2A	0.51	1.75	Slurry conc is about 5%. The diameter of fine particle is larger than the ref. diameter 1.
1	0.51	1.6	Slurry conc. is about 5%.
1A	0.41	1.6	Uniform solvent.

• 1.2L receiving flask (Cat. No.147940)
A supplied flask is for 600ml.

• 10m exhaust hose (Cat. No.179990)
A supplied hose is 2.5m.

• Compressor
For this unit 3kg/cm2, 25L/min. or higher ability is required.

Model	Control press.(kg/cm2)	Flow air volume (L/min.)	Power source	Cat. No.
0.2OP-5SA	3.5 ~ 5.0	25	AC100V	180140
0.4OP-7S	5.0 ~ 7.0	45		180150
OFP-04B		47/53		180160
OFP-04BT		47/53	AC200V Single phase	180170

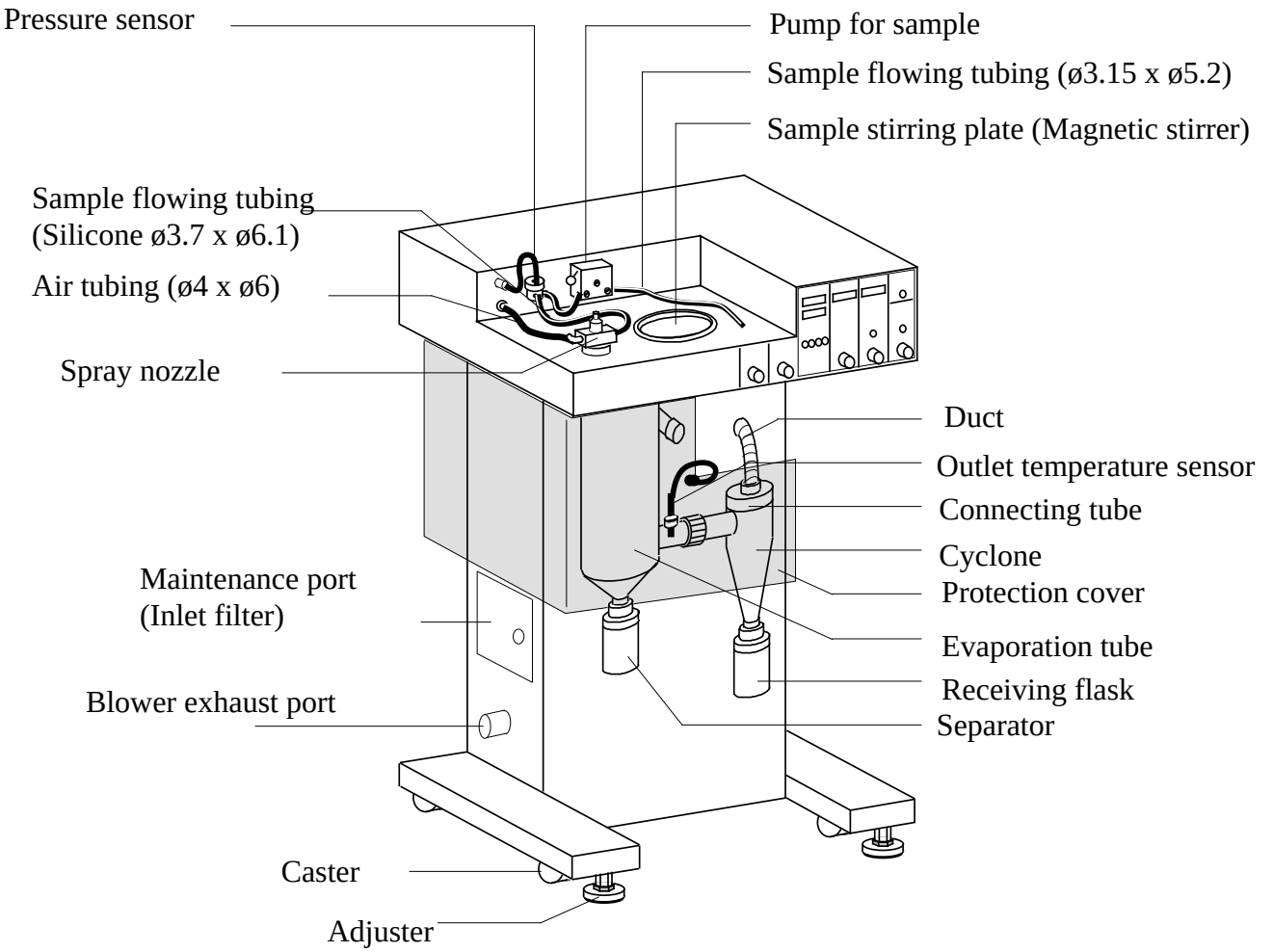
• Recorder
Enables to record inlet and outlet temperature and drying air volume.

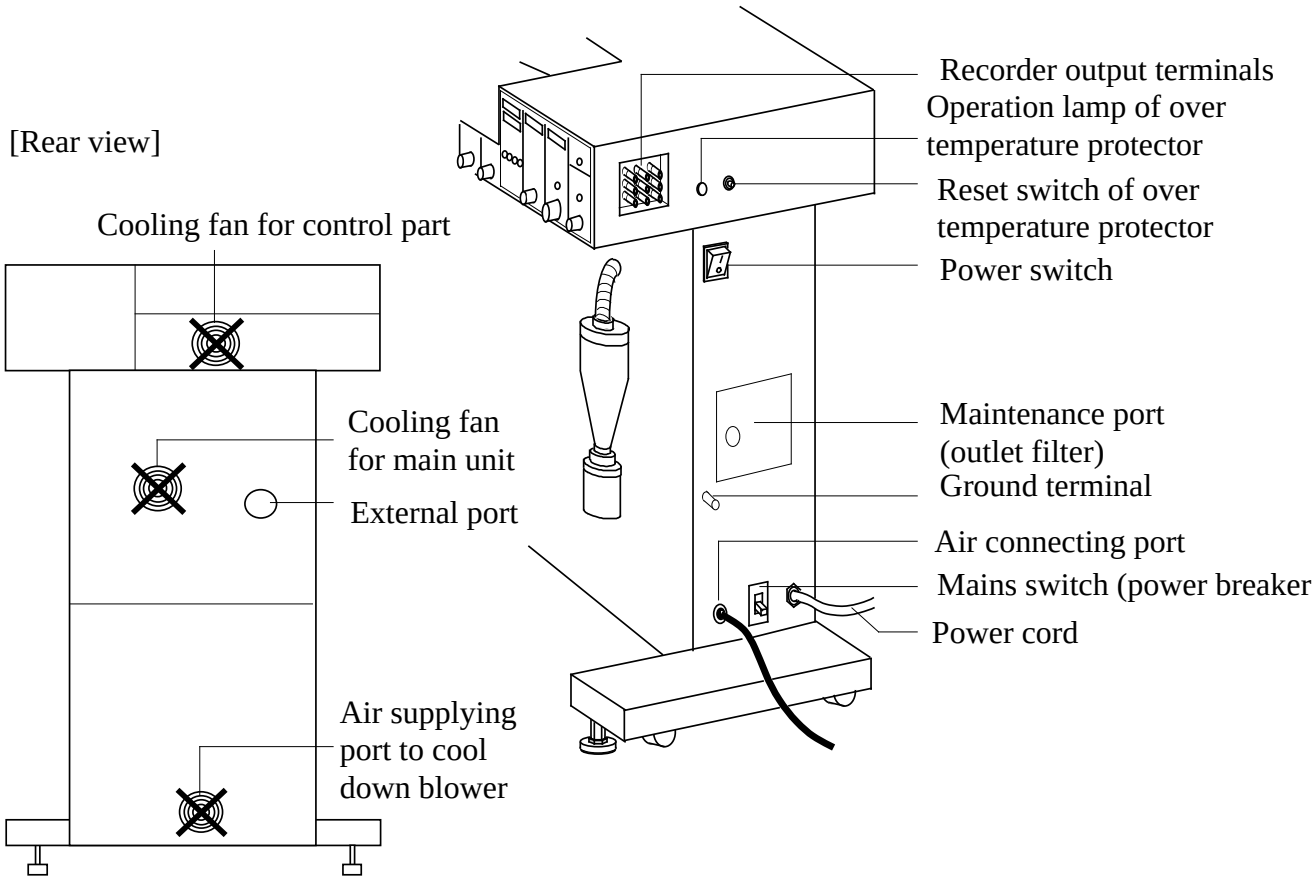
Model	SA-101PE1	ERS-106
Cat. No.	172190	172250

2-3 Specifications

	Spray dryer
Model	SD - 1000
Evaporating rate	Max 1500ml/h
Inlet temp. control range	40 ~ 200°C
Inlet temp. control accuracy	±1°C
Drying air flow rate control range	0.2 ~ 0.75 m_3/min (Flow rate is changeable by control knob)
Spraying air press. control range	49 ~ 245 kPa (0.5 ~ 2.5 kg/cm2)
Flow rate control range	150 ~ 1700 ml/h (Usable tubing : ID3.15mm x OD5.2mm
Stirring speed control range of source liquid	100 ~ 1000 rpm (Rotation speed is changeable by volume knob)
Inlet temperature display	Digital display 1 ~ 250°C
Outlet temperature display	Digital display 1 ~ 250°C
Drying air volume display	Digital display 0.2 ~ 0.95m_3/min
Spraying pressure display	Digital display 10 ~ 300 kPa
Temperature controller	PID control, zero cross output
Inlet temperature sensor	Pt 100Ω
Outlet temperature sensor	Pt 100Ω
Heater wattage and material	3 kW, SUS 316
Inlet temp. recorder output	0 ~ 10 mV (at 50 ~ 250 °C)
Outlet temp. recorder output	0 ~ 10 mV (at 50 ~ 250 °C)
Drying air volume output	0 ~ 10 mV (at 0 ~ 1 m3/min)
Spray nozzle	Double fluid nozzle (outlet size for sample : ø0.71mm)
Spraying air line Automatic cleaning system	Jet cleaner Automatic (Interval timer setting : OFF or 1 ~ 20min. / Manual
Safety feature	Excess current, power breaker, over temperature protector, manual recovering after power failure
Alarm function	Temperature alarm, Sensor alarm, Upper limit alarm for outlet temperature, Air flow alarm, Heater alarm, SSR alarm, Pump line pressure alarm, Spraying pressure alarm)
Spraying air connection port size	ID4 mm x OD6 mm (Soft urethane tube union)
Spraying air pressure	Pressure : 294 kPa (3 kg/cm2), Flow rate : 25L/min or more
Exhaust port size	OD 50 mm
Ambient temperature range	5 ~ 35°C
Overall dimensions	700W x 620D x 1500H mm
Net weight	110 kg
Power consumption	21 A, 4.2 kVA
Power source	AC 200 V Single phase, 50/60 Hz

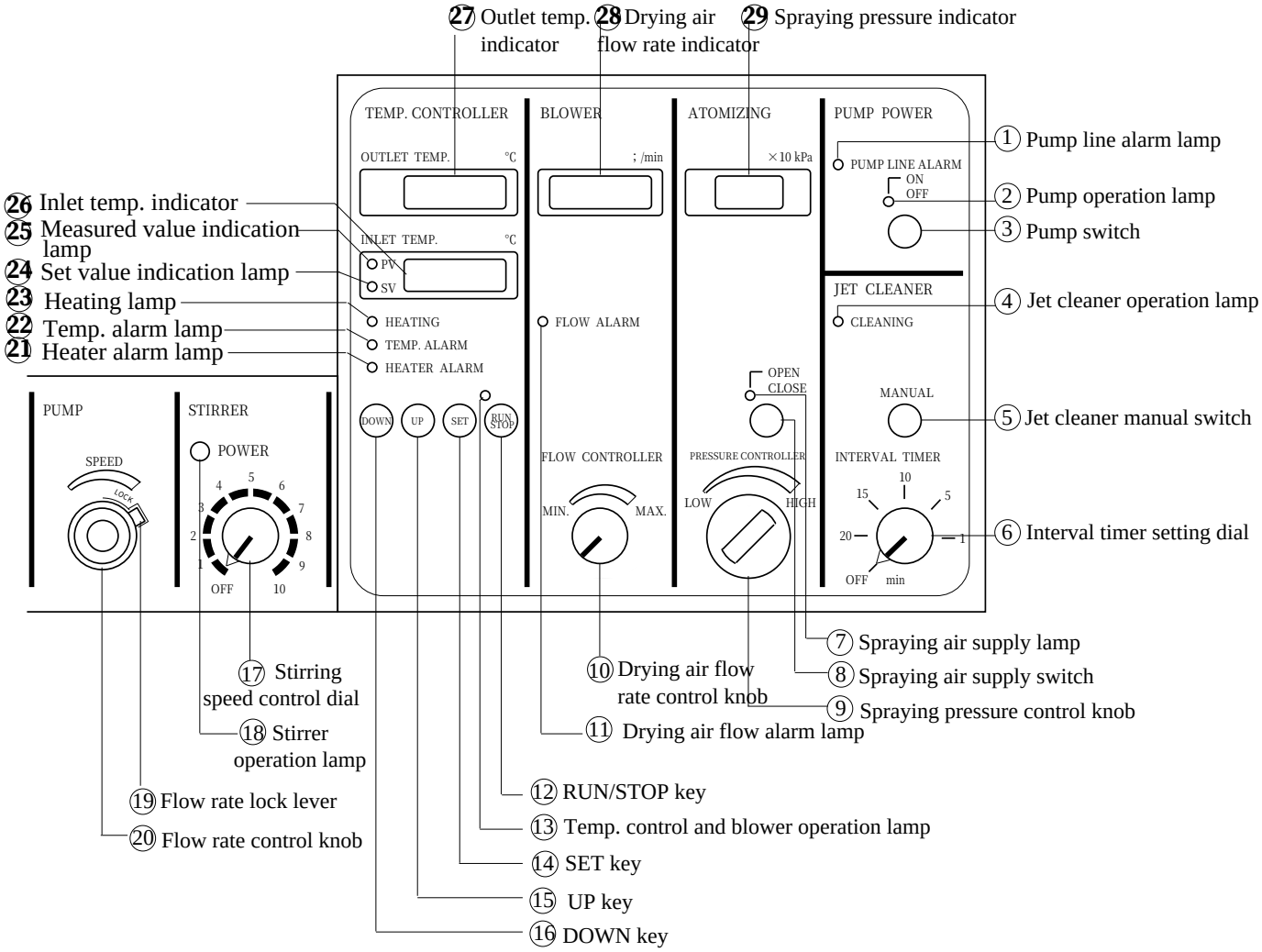
2-4 Description





3 Descriptions and functions of the control panel

3-1 Control panel



NO	Description	Function
①	Pump line alarm lamp	It illuminates when the pressure of flow line attains to a certain pressure.
②	Pump operation lamp	It illuminates the pump runs.
③	Pump switch	To start and stop the pump.
④	Jet cleaner operation lamp	It illuminates when the jet cleaner (automatic cleaning system of spraying air line) operates.
⑤	Jet cleaner manual switch	To operate manually a cycle of jet cleaning.
⑥	Interval time setting dial	To set interval time of jet cleaning.
⑦	Spraying air supply lamp	It illuminates when spraying air is supplied.
⑧	Spraying air supply switch	To open or close the air supply valve.
⑨	Spraying pressure control knob	To control spraying pressure.

NO	Description	Function
⑩	Drying air flow rate control knob	To control drying air volume.
⑪	Drying air flow alarm lamp	It illuminates when the drying air volume is lower than a certain value.
⑫	RUN/STOP key	To start and stop temperature controlling or blower operation.
⑬	Temp. control and blower operation lamp	It illuminates while temperature is controlled or blower operates.
⑭	SET key	To set temperature value or parameter values.
⑮	UP key	To change temperature value or parameter values.
⑯	DOWN key	To change temperature value or parameter values.
⑰	Stirring speed control dial	To control stirring speed.
⑱	Stirrer operating lamp	It illuminates when the stirrer operates.
⑲	Flow rate lock lever	To fix the flow rate of sample.
⑳	Flow rate control knob	To control the flow rate of sample.
㉑	Heater alarm lamp	It illuminates when the heater is disconnected.
㉒	Temp. alarm lamp	It illuminates when the inlet temp. exceeds the band of set point.
㉓	Heating lamp	It illuminates when the heater is active.
㉔	Set value indication lamp	It illuminates when the set value is displayed on the inlet temp. indicator.
㉕	Measured value indication lamp	It illuminates when the measured value is displayed on the inlet temp. indicator.
㉖	Inlet temp. indicator	It displays the inlet temperature of evaporating tube.
㉗	Outlet temp. indicator	It displays the outlet temperature of evaporating tube.
㉘	Drying air flow rate indicator	It displays drying air volume into the evaporating tube.
㉙	Spraying pressure indicator	It displays the spraying pressure of sample.

3-2 Safety and alarm functions

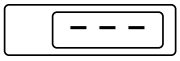
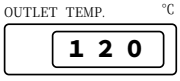
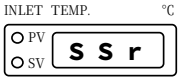
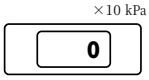
This unit has safety and alarm functions as below.

When an abnormal operation occurs, solve it referring to [Trouble shooting] on P.18.

Safety function

Safety device	Function	Cause
Mains switch (Power breaker)	It detects excess current or electric leakage and turns off to shut down the power.	Electric leakage or excess current.
Over temperature protector	It detects over heating of heater, and shuts down the power.	Heater temperature is too high because of low volume of drying air.
Thermal relay for blower protection	It detects excess current of blower, and shuts down the power for blower.	Excess current of blower is occurred by clogging of blower or air supply port.

Alarm function

Alarm	Operation	Cause
Temp. alarm	● TEMP. ALARM Temp. alarm lamp illuminates.	Inlet temperature is 10°C or higher for 3 minutes or longer time.
Sensor alarm	 [---] blinks on the temperature indicator of which sensor alarm occurs.	Sensor input value is abnormal.
Outlet temp. upper limit alarm	 [Outlet temperature] blinks.	Outlet temperature exceeds 100°C.
Air flow alarm	● FLOW ALARM Drying air volume lamp illuminates.	Drying air volume is .2m3/min or less for 30 seconds or longer time.
Heater alarm	● HEATER ALARM Heater alarm lamp illuminates.	Current of heater lowers unusually.
SSR alarm	 [SS r] is indicated on the inlet temp. indicator.	Heater current is exist while the heater output is OFF.
Pump line pressure alarm	● PUMP LINE ALARM Pump line alarm lamp blinks.	Pump line pressure exceeds 100kPa.
Spraying pressure alarm	 [Spraying pressure] blinks.	Spraying pressure is 0kPa or lower or exceeds 300kPa.

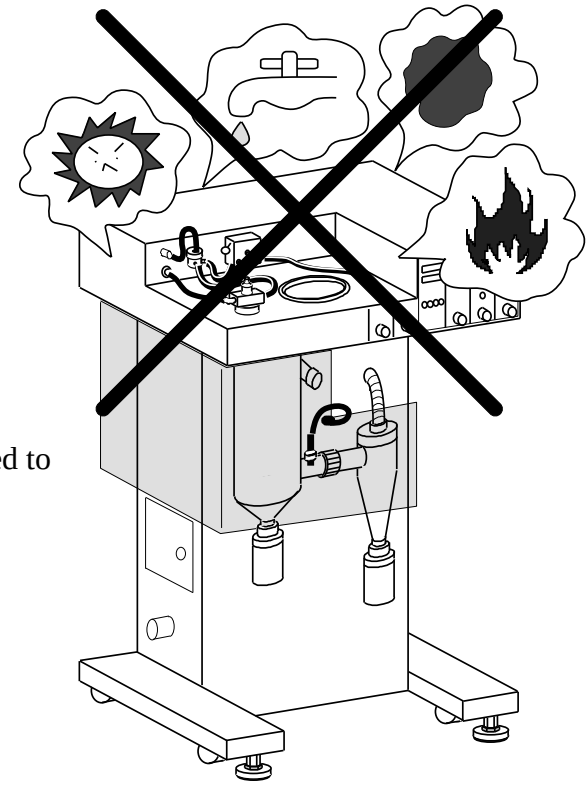
4 Installation

4-1 Installed place

Warning

Do not install at a dangerous circumstance

As this unit equips a heater, there is the fear of fire in the dangerous circumstance.



Place to be installed.

Horizontal flat low humid place where is not exposed to direct sun light, not vibrated, no explosive gas, no corrosive gas or chemical.
(Humidity less than 85% R.H. non-condensation)

Ambient temperature between 5 ~ 35°C.

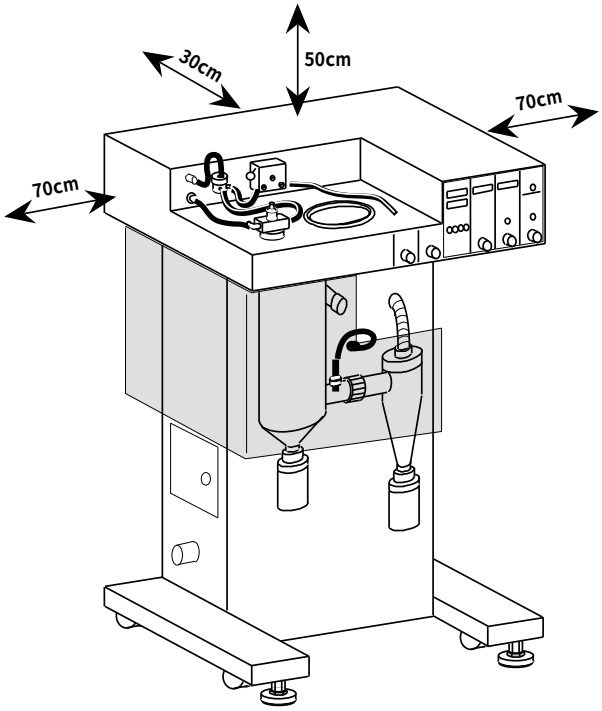
Away from heat source.

4-2 Environmental conditions

Caution

Keep good ventilation space.

The following space is required as a minimum to maintain excellent performance of the unit.



Caution

Be careful to transport unit.

Main unit 110kg

4-3 Connection of utility

Warning

Use a suitable voltage, phase, capacity and plug type.

Unsuitable power source may cause a fire or electric shock hazard.

Warning

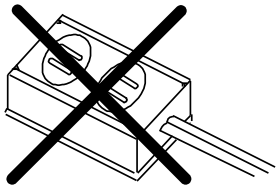
Ground this unit correctly.

Do not ground to gas or water pipe.

Warning

Do not use a multi-plug extension cord.

There is danger of a fire of cable by excess current.

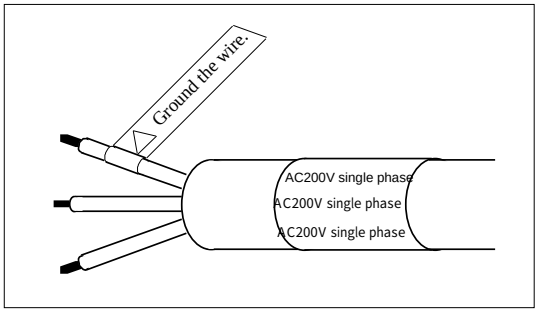


(1) Check the voltage, phase, current capacity of this unit.
It is shown in the right table.

Model	Power source	
	Voltage	Current
SD-1000	AC 200V single phase	30A

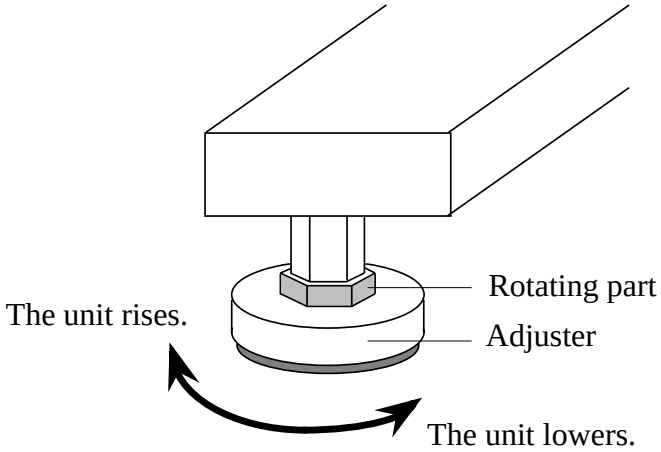
(2) Mains plug is not supplied.
Connect directly to the switch board.
(Do not connect yet .)

Mains cable



4-4 Installation

1. Adjust level of 4 adjusters by a spanner to make the unit horizontal.



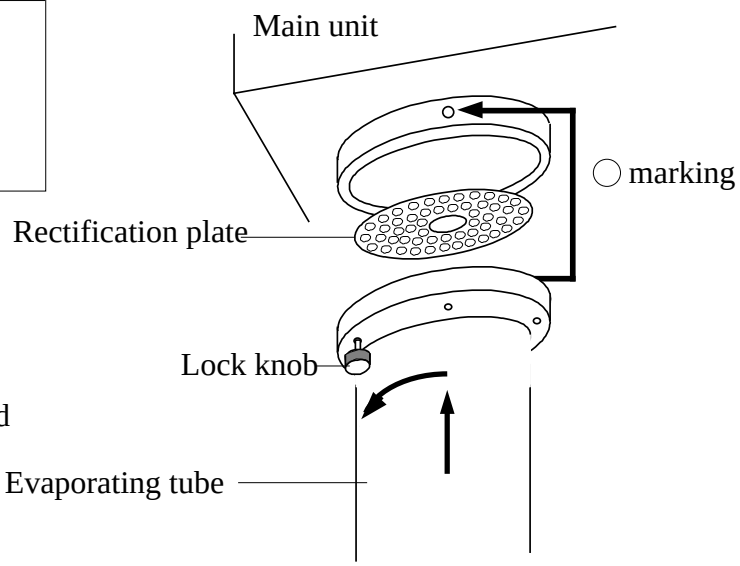
5 Operation

5-1 Preparation

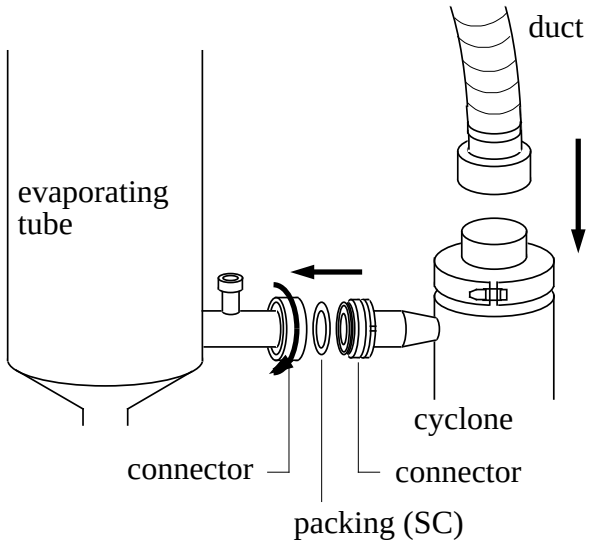
⚠ Caution

Handle glass wares carefully.

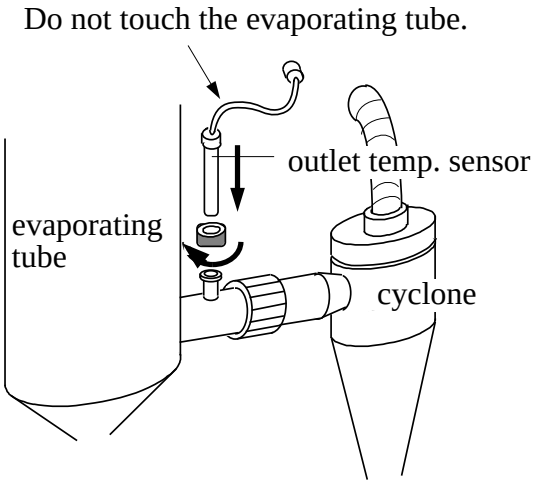
Handle glass wares carefully not to break down.



1. Attaching evaporating tube
   (1) Loosen screw of lock knob.
   (2) Place the rectification plate to the evaporating tube.
   (3) Adjust both ◯ marking positions and insert the evaporating tube into the attaching ring.
   (4) Turn the evaporating tube 45° counterclockwise.
   (5) Tighten the screw of lock knob to fix it.



2. Attaching cyclone
   (1) Insert duct into the cyclone.
   (2) Tighten both connectors each other between cyclone and evaporating tube. Then put the packing between them.



3. Attaching outlet temp. sensor
   (1) Attach the outlet temp. sensor to the sensor attaching port of evaporating tube.
   (2) Hold the tip of outlet temp. sensor at the center of sensor port tube.

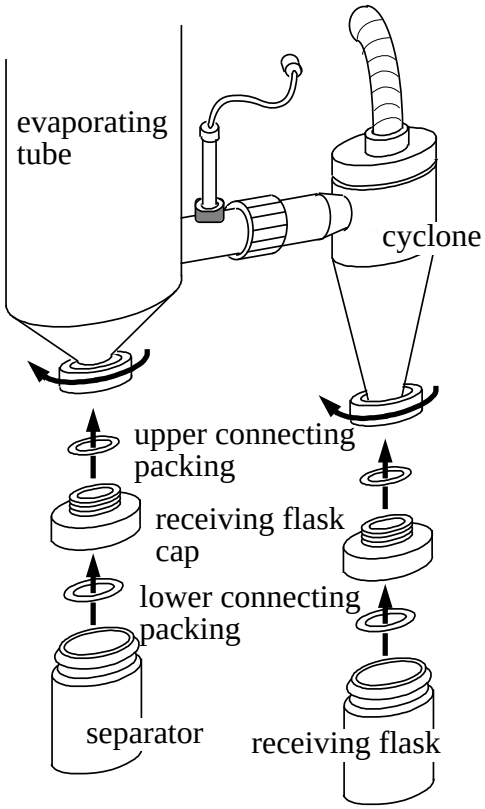
   * Be careful not to touch the lead wire of temp. sensor to the evaporating tube.

4. Attaching separator and receiving flask

(1) Attach receiving flask cap to the evaporating tube and cyclone.
(2) Attach separator and receiving flask to each receiving flask cap.

* Put upper and lower packings to each side of receiving flask cap.

*Separator is same as receiving flask.

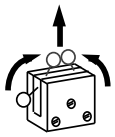


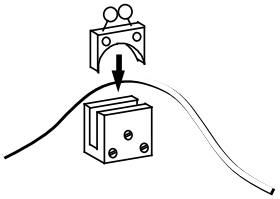
5. Attaching silicone tubing

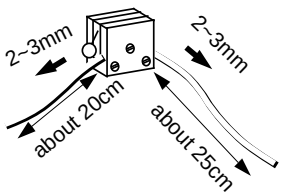
⚠ Caution
Use a proper tubing depending on unit. Usable standard tubing size and material are specified. Other tubing may not get the best performance and may cause any trouble.

⚠ Caution
Do not press the pressure sensor too much. Do not pour water to the pressure sensor.

(1) Cut about 50cm silicone tubing [ID3.15mm x OD5.2mm, supplied part] and attach it to the pump for sample.

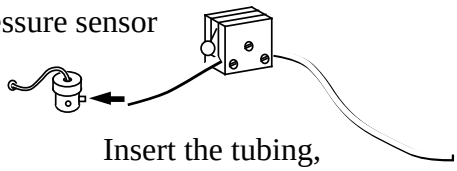

Pull the lever upward.


Attach the tubing.



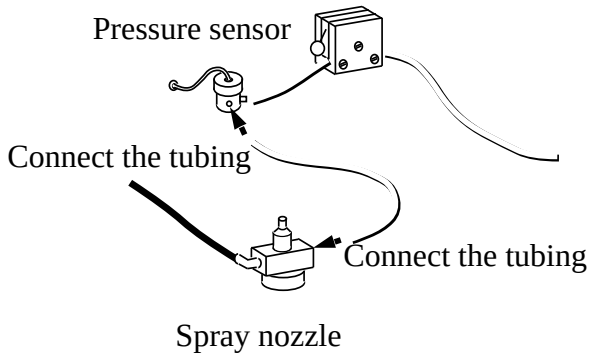
Push down the lever and pull the tubing.

(2) Connect the one side of attached silicone tubing to the pressure sensor.



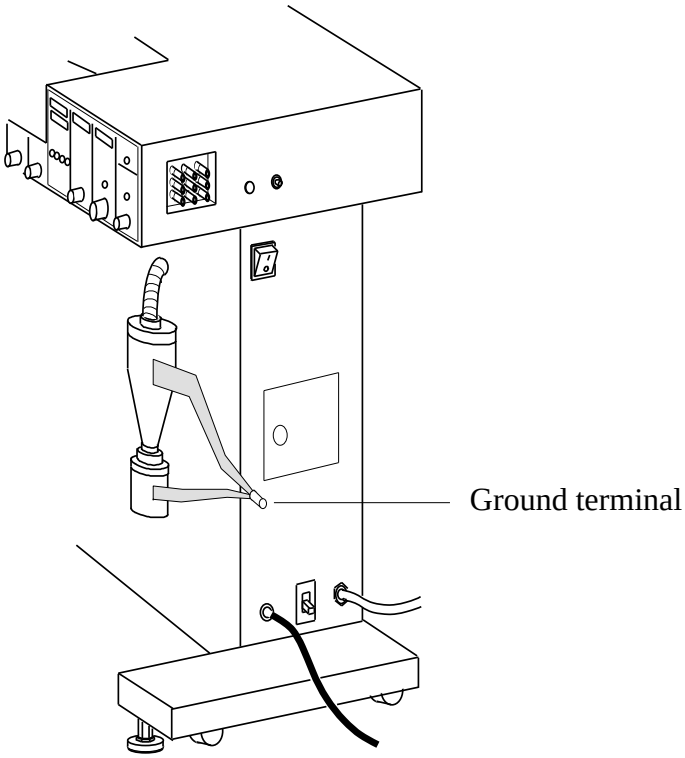
Insert the tubing,

(3) Cut 30cm of silicone tubing [ID3.7mm x OD6.1mm, supplied part], and connect it between the pressure sensor and the spray nozzle.



6. Ground for static electricity

When you use statical material such as sodium chloride, calcium chloride or other chlorides, connect the cyclone and the receiving flask to the ground terminal with a supplied aluminum tape.



7. Connecting power cord

Warning

Use a suitable voltage, phase, capacity and plug type.

Unsuitable power source may cause a fire or electric shock hazard.

Warning

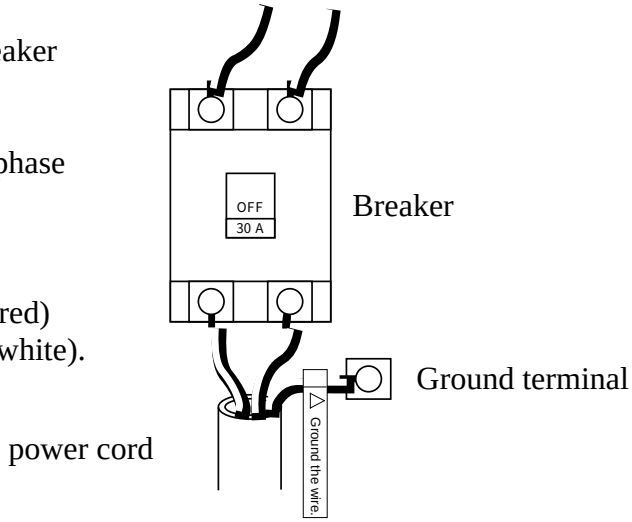
Ground this unit correctly.

Do not ground to gas or water pipe.

(1) Connect the power cord of the unit to the breaker of switch board.

The unit must be connected to AC200V, single phase (or three phase), and needs 30A or more as the capacity of breaker.

If you use three phase source, connect R phase (red) to S phase (white) or T phase (black) to phase (white).



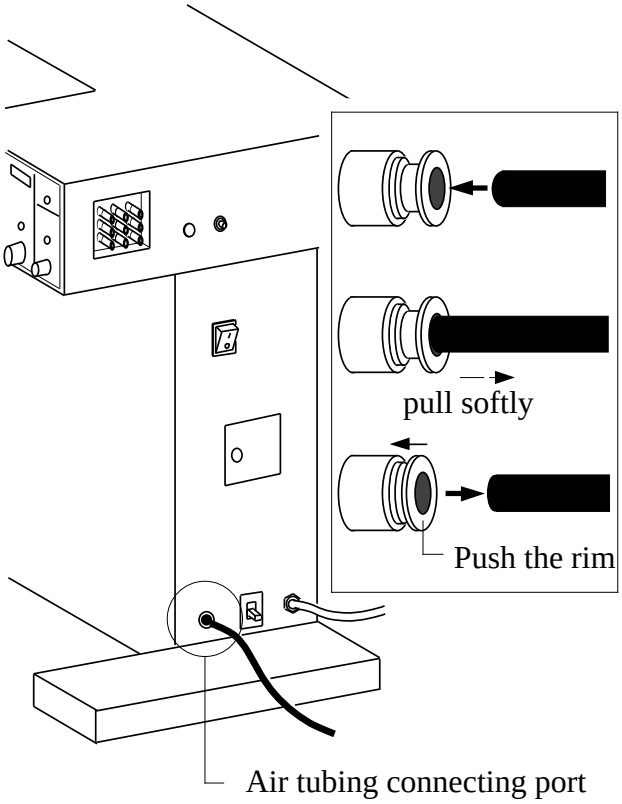
8. Connecting air tubing

(1) Prepare a compressor referring to the section 2-2 Optional accessories.

(2) Connect the supplied air tubing to the air tubing connecting port on the right surface of the unit.
Insert the tubing completely until it stops.
Pull the tubing softly to check whether the tubing attach completely.

(3) Connect the another side of tubing to the compressor.

* When you detach tubing, push and hold the lime of connecting port and pull the tubing.

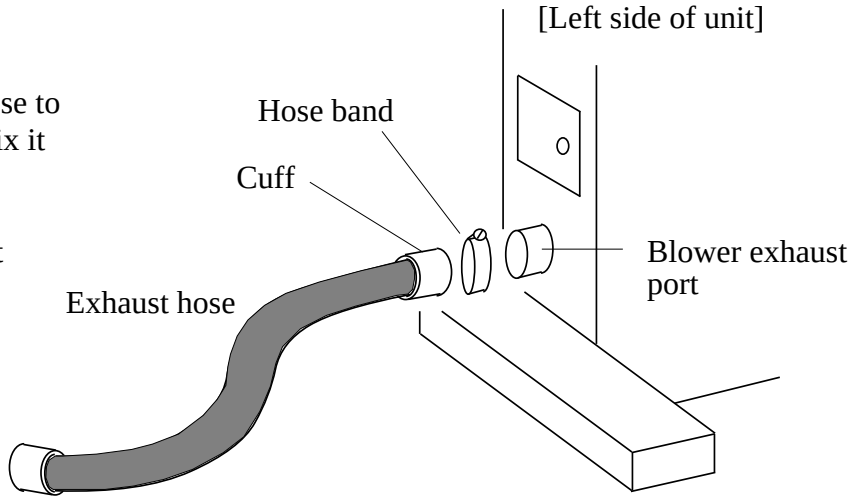


9. Connecting exhaust hose

(1) Connect a supplied exhaust hose to the blower exhaust port, and fix it with a hose band.

(2) Put the another side of exhaust hose into a draft chamber or out side of laboratory.

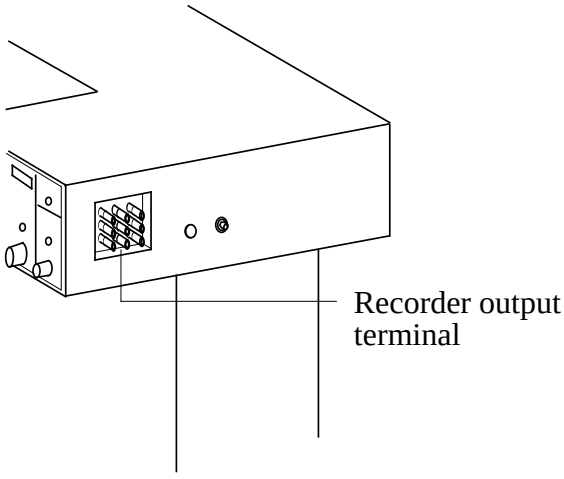
* If you need longer hose, please purchase an optional exhaust hose (10m).



10. Connecting recorder cable

(1) Connect between the recorder output terminal and a recorder with a supplied recorder cable to record data of inlet and outlet temperature and drying air volume.

When the inlet and outlet temperature is at 50~250°C, and when the drying air volume is 0~1m3/min., DC 0~10mV is output.
* Prepare a recorder. (Refer to the section 2-2 Optional accessories)



5-2 Operation

Caution

While operating unit,
do not touch heated parts.

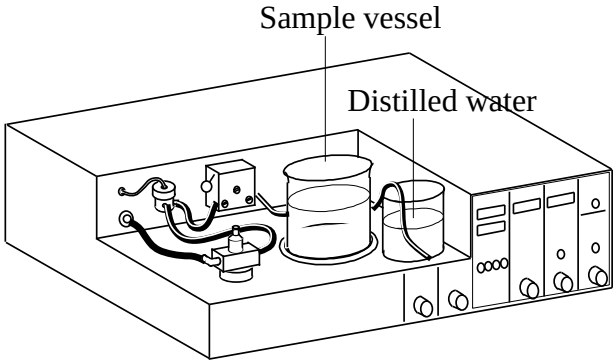
While operating unit, and after operating, the evaporating tube and cyclone are very hot. Do not touch them to prevent burning of your hands.

Caution

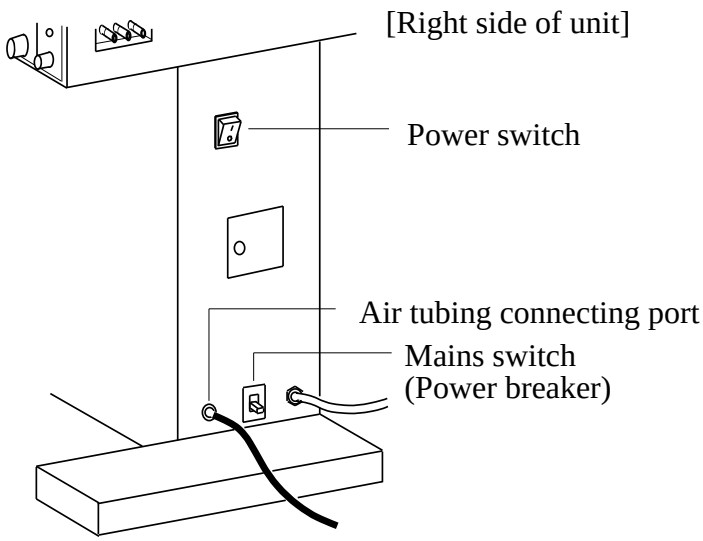
When some troubles occur,
stop operating immediately.

When some troubles occur, turn off mains switch immediately, and check the unit referring to the chapter [Trouble shooting].

This unit equips a magnetic stirrer, so magnetic vessel or magnetic materials cannot be used.



1. Preparing sample and distilled water
   Put sample vessel which is filled with sample solution on the stirring plate, then put a supplied stirring bar into the solution.
   Prepare 200ml of distilled water with a vessel.
   * Use distilled water initially for one side of tubing to control outlet temperature, and then flow sample solution after the temperature is stable.

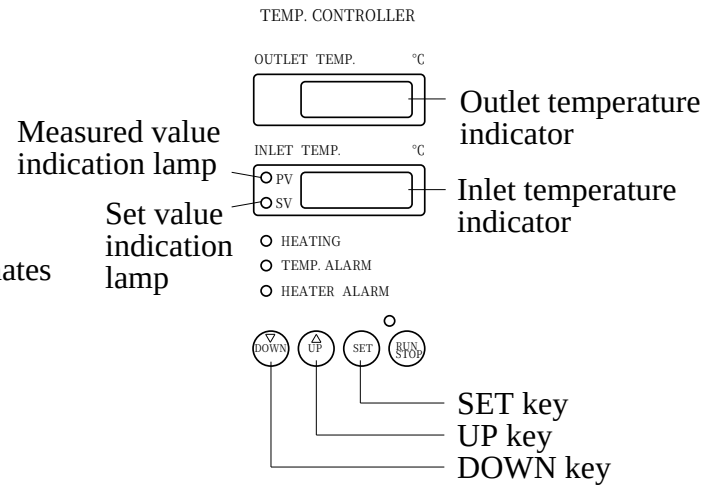


2. Turning on power
   First turn on the breaker of switch board, the breaker of main unit, and last the power switch.
   Indications illuminate.

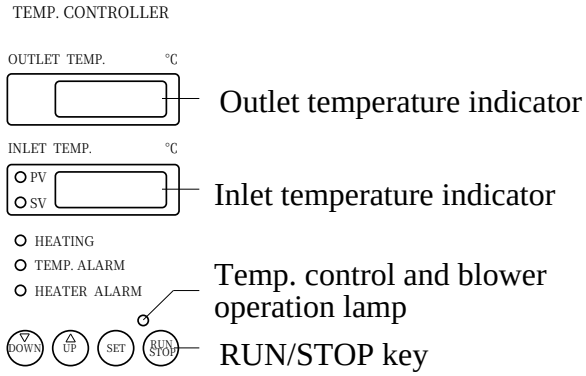
3. Setting inlet temperature

(1) Press SET key to illuminate set value indication lamp, and set inlet temperature by UP or DOWN key.
   Setting range is 4 ~ 200°C.

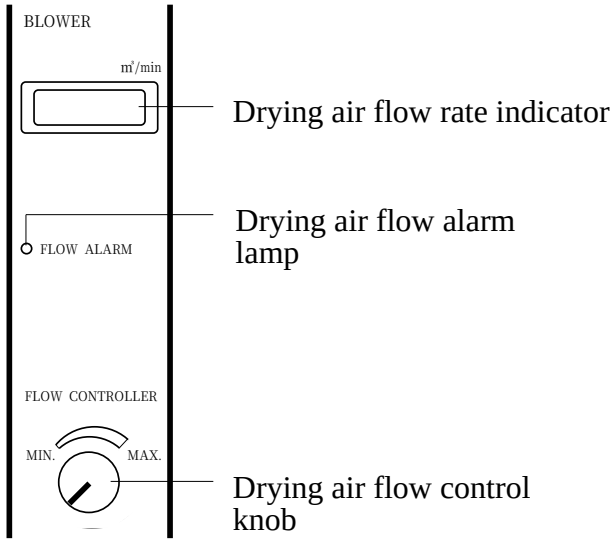
(2) Press SET key again.
   The measured value indication lamp illuminates and inlet temperature can be checked.



4. Temperature controlling and blower operation
   Press RUN/STOP key for 1 second.
   Temp. control and blower operation lamp illuminates, and temperature controlling and blower operation start.
   To stop operation, press RUN/STOP key again (for 1 sec.).

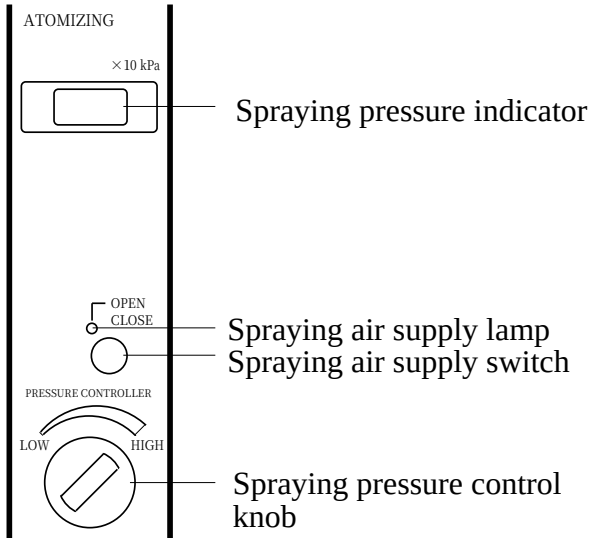


5. Controlling drying air flow rate (Blower flow rate)
   Turn the drying air flow rate control knob with checking the drying air flow rate indicator.
   Flow range is 0.2 ~ 0.75m3/min.
* If the air flow rate is less than 0.2m3/min for 30 seconds or longer, air flow alarm occurs, and the drying air flow alarm lamp illuminates.

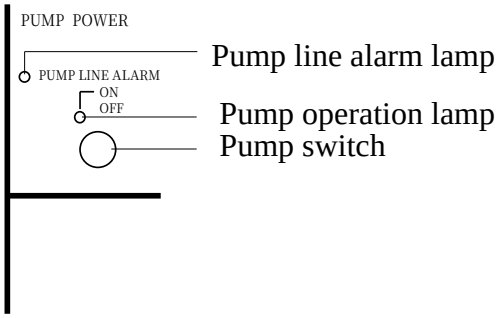


6. Supplying spraying air
   Press spraying air supply switch to supply or stop supply of drying air.
   While supplying air, the spraying air supply lamp illuminates.
   (Recommended compressor pressure : 294kPa of more)

7. Controlling spraying pressure
   Pull the spraying pressure control knob, and turn it. Check the spraying pressure indicator.
   Pressure control range is 49 ~ 245kPa.



8. Operation of sample pump
   Press pump switch to start and stop pump operation.
   While the pump runs, the pump operation lamp illuminates.
* If the pressure of pump line exceeds 100kPa, the pressure alarm of pump line occurs and the flow line alarm lamp blinks.

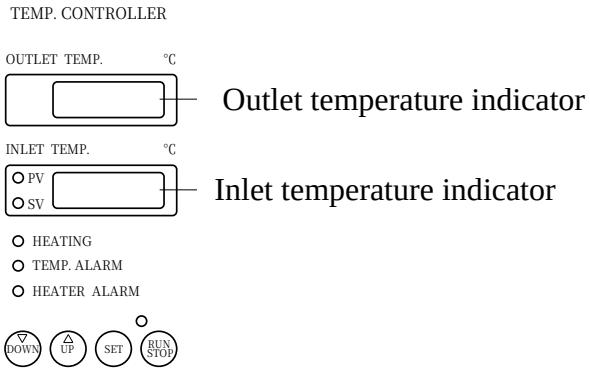


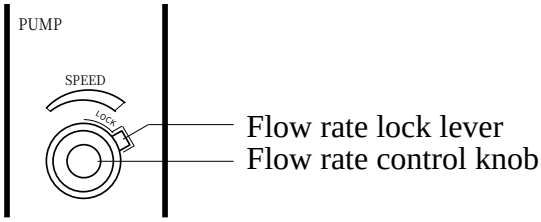
9. Setting outlet temperature
(Control of sample flow rate)

(1) Control sample flow rate by control knob with checking the outlet temperature indicator. Increase slowly the sample flow rate little by little.

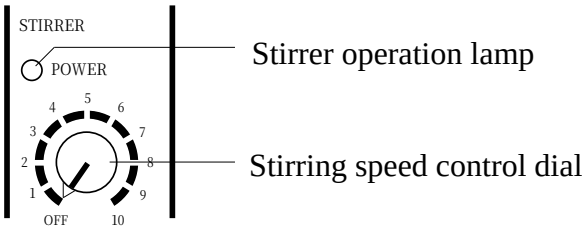
(2) When the temperature is stable at desired point, turn the lock lever for fixing flow rate to the LOCK position.

* Control the flow rate not to exceed 100°C of outlet temperature.
If the temperature exceeds 100°C, the upper limit alarm for outlet temperature occurs (ref. P8) to protect the blower.

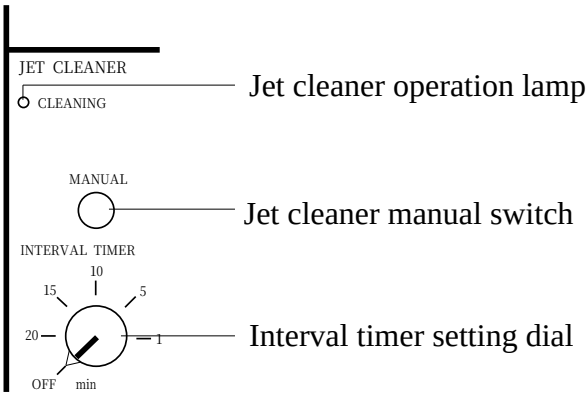




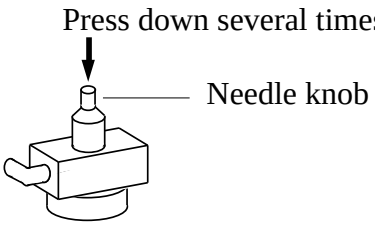
10. Controlling stirring speed of sample
Control the stirring speed of sample by stirring speed control dial.
While stirring sample, the operation lamp illuminates.



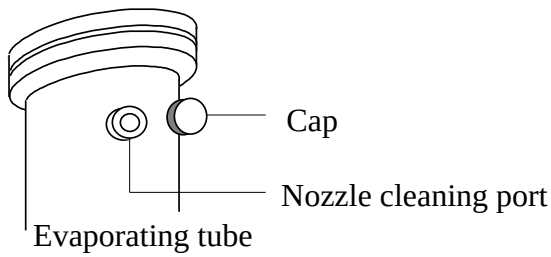
11. Setting interval timer (Jet cleaning system)
If you use jet cleaner (automatic cleaning system for spraying air line), set the interval time of cleaning by setting dial.
Setting range is 1 ~ 20 minutes or OFF.
When it is set at OFF position, the automatic cleaning is not operated.
If you run only one cycle manually, press the jet cleaner manual switch once.
While operating the jet cleaner, the jet cleaner operation lamp illuminates, and while air is sprayed, it blinks.



* When the solid attaches to the tip of nozzle even if you use the jet cleaner, press needle knob several times.



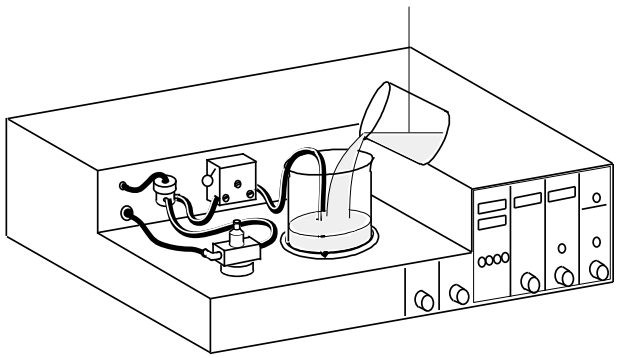
* If a lot of solid attaches to the tip of nozzle, stop pump once, detach the cap of nozzle cleaning port of evaporating tube, and then remove and clean by a stick.



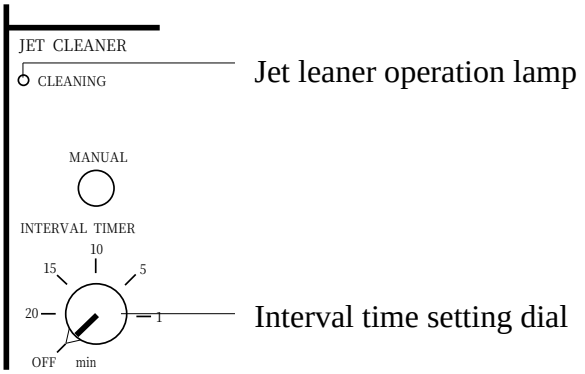
5-3 Quitting operation

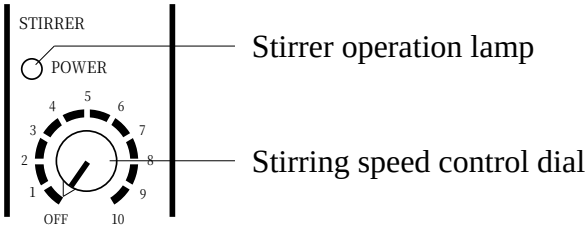
When the sample vessel is empty, apply immediately another sample, or follow the below procedure.

1. Cleaning of flow line
   Fill the empty sample vessel with distilled water (about 100ml), and run the pump continuously to clean the silicone tubing and the spray nozzle.

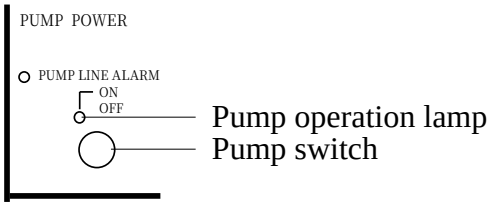


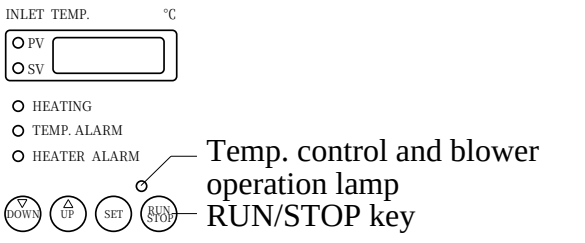
2. Stopping interval timer and stirrer
   Turn the interval time setting dial and stirring speed control dial at OFF position.





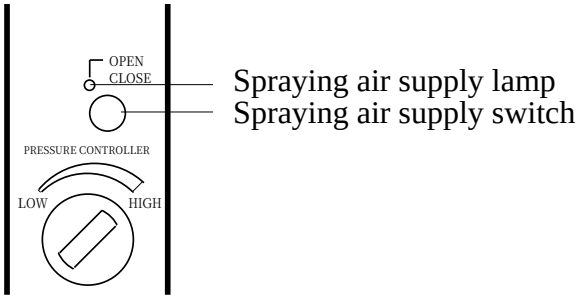
3. Stopping pump operation, temperature controlling and blower operation
   Press the pump switch and RUN/STOP key to stop each operation.





4. Stopping spraying air supply and compressor operation
   Press Spraying air supply switch to stop supplying.

5. Stopping power supply
   First turn off the power switch, the breaker of main unit, and last the breaker of switch board.



6 Trouble shooting

Problem	Cause	Remedy
Indicators do not show anything, even if the power switch is turned on.	Electric power is not supplied.	Turn on the breaker on switch board.
	Mains switch or power switch breaks down.	Stop operation immediately and call service.
Spraying air is not supplied even if the spraying air supply switch	Compressor is not started.	Start the compressor.
	Spraying pressure control knob is turned counterclockwise fully.	Turn the control knob clockwise.
	The solenoid valve of spraying air supply breaks down.	Stop operation immediately and call service.
Inlet temperature cannot be set.	The setting mode is not active.	Press SET key.
	The value exceeds the setting range(40 ~ 200°C).	Set a value within the range.
The blower operation is not started (or stopped) even if you press RUN/STOP key.	RUN/STOP key is not pressed for 1 second.	Press RUN/STOP key for 1 second.
Drying air flow rate (blower flow rate) is not controlled.	Air flow rate exceeds the control range (0.2 ~ 0.75m^3/min).	Control the air flow rate within the range.
	The filter is clogged.	Change or clean the filter.
Flow rate of sample pump cannot be controlled.	The pump switch is not pressed.	Press the pump switch, and check illumination of operation lamp.
	Lock lever for fixing flow rate is turned to LOCK position.	Release LOCK of flow rate lock lever.
Stirring speed of sample vessel cannot be controlled.	The stirring bar is not put into the vessel.	Put a stirring bar into the vessel.
Spraying condition is wrong.	Solid attaches to the tip of spray nozzle.	Push the needle knob several times or clean the tip of nozzle through the nozzle cleaning port.
	Air leaks from gasket of spray nozzle.	Change the gasket.
The outlet temp. blinks on the indicator, and alarm buzzer is heard every 1 sec.	The outlet temp. exceeds 100°C because the sample flow rate decreases, or spraying condition is wrong.	Increase the flow rate or clean the spray nozzle.
Pump line alarm lamp blinks, and the alarm buzzer is heard every 1 second.	The pump line pressure exceeds 100kPa, because the spray nozzle is clogged.	Push the needle knob several times or clean the tip of nozzle through the nozzle cleaning port.

Problem	Cause	Remedy
The power breaker turns off while operating.	Excess current or electric leakage.	Stop operation immediately and call service.
The over temperature protector functions while operating, and the heater turns off. (Operation lamp of over temp. protector illuminates.)	Temperature of heater rises extremely because drying air volume reduces.	Control air volume, or clean or change the filter. If it is not solved further, stop operation immediately and call service.
The blower operation stops suddenly while operating. (Drying air volume is "0".)	Outer air supplying port is clogged, and excess current occurs on the blower.	Remove clogging, and operate again.
The alarm buzzer is heard for 30 seconds, and then the operation stops. ◆ Alarm occurs. ◆		
◆ Temperature alarm ◆ Temp. alarm lamp illuminates.	The inlet temperature rises extremely because of breakage of SSR.	Stop operation immediately and call service.
◆Sensor alarm ◆ [---] blinks on the outlet temperature indicator.	Connector of outlet temperature sensor is disconnected or breaks down.	Connect the sensor. If it is not solved further, stop operation immediately and call service.
◆ Sensor alarm ◆ [---] blinks on the inlet temperature indicator.	Connector of inlet temperature sensor breaks down.	Stop operation immediately and call service.
◆ Upper limit alarm of ◆ outlet temperature Outlet temperature blinks on the outlet temperature indicator.	Sample vessel is empty. Tubing for sample is damaged.	Apply sample, or change the tubing.
	The spray nozzle clogs.	Push the needle knob several times or clean the tip of nozzle through the nozzle cleaning port.
◆ Flow rate alarm ◆ Drying air volume alarm lamp illuminates.	The filter clogs.	Clean or change the filter.
◆Heater alarm ◆ Heater alarm lamp illuminates.	The heater is disconnected.	Stop operation immediately and call service.
◆SSR alarm ◆ [SS r] is indicated on the inlet temperature indicator.	SSR breaks down.	Stop operation immediately and call service.
◆Pump line pressure alarm◆ Pump line alarm lamp blinks.	The spray nozzle clogs.	Push the needle knob several times or clean the tip of nozzle through the nozzle cleaning port.
◆Spraying pressure alarm ◆ [0] or [30] (x 10kPa) or higher is indicated on the spraying pressure indicator.	The compressor stops. The air tube is disconnected.	Start the compressor, and supply spraying air.
	Spraying pressure controller breaks down.	Stop operation immediately and call service.

7 Maintenance and Check-up

7-1 Cleaning and changing filter

Warning

Turn off the power before cleaning or changing filter.

You must turn off the power switch and the mains switch (power breaker) before cleaning or changing filter to prevent electric shock hazard.

Caution

Clean or care the unit after it is cooled enough.

Clean or care the unit after it is cooled enough to avoid burning your hands.

Keep clean the filter to operate the unit with the best performance.

* When the flow rate of blower is not as desired even if you turn fully the drying air volume control dial clockwise, clean the filter or replace with new one.

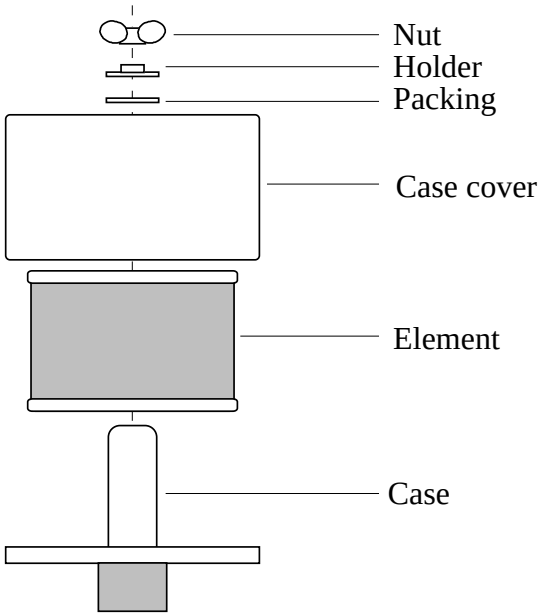
Cleaning or changing suction (inlet) filter

Clean or change the filter with closing the protection cover.

1. Open the maintenance port on the left side of unit.
2. Remove the nut, the holder and the packing.
3. Detach the case cover, and take out the element.
4. Tap the element, and spray air to clean it.

* If dust is not removed from element, replace with new one. (It cannot be washed with detergent.

5. Assemble parts by reversing procedure.

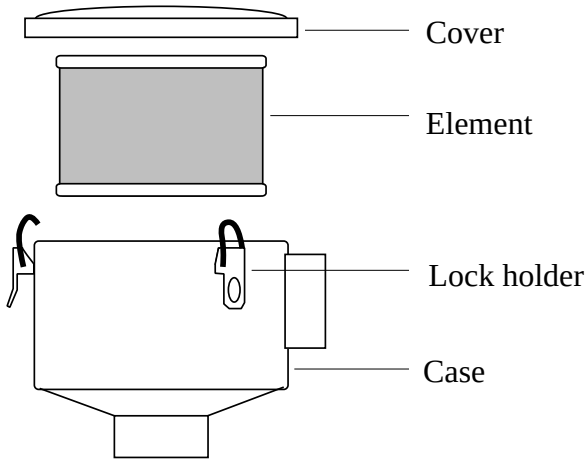


Cleaning or changing air (outlet) filter

1. Open the maintenance port on the right side of unit.
2. Release three lock holders.
3. Detach the cover, and take out the element.
4. Tap the element, and spray air to clean it.

* If dust is not removed from element, wash it with neutral detergent and dry enough.

5. Assemble parts by reversing procedure.



7-2 Cleaning spray nozzle

Caution

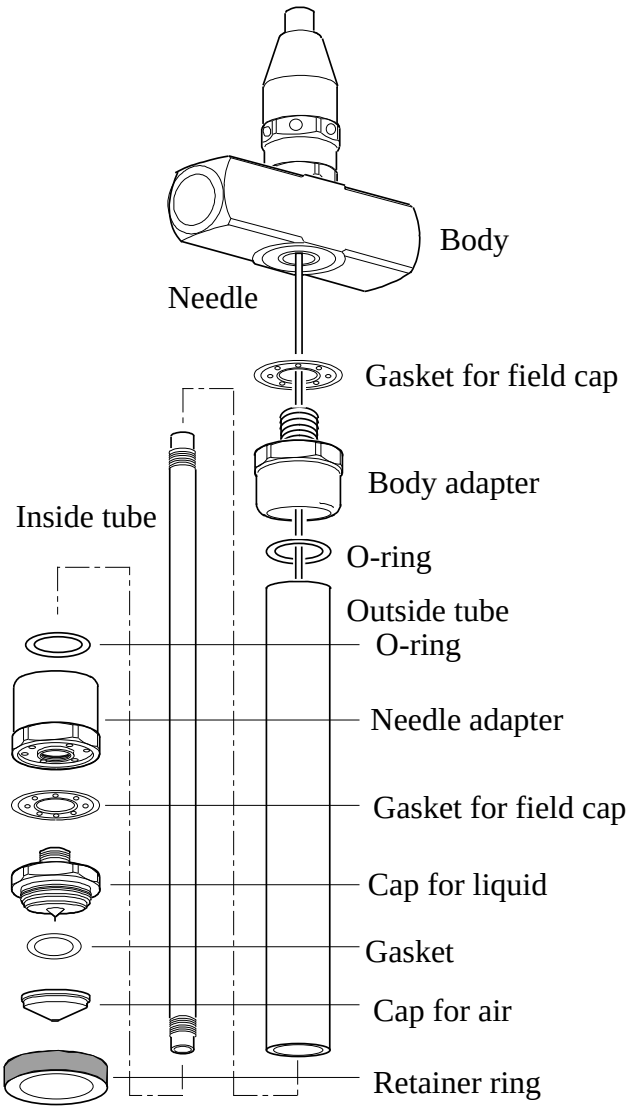
Take care of tip of needle.

The tip of needle is very sharp. Be careful not to injure or not to bend or break down it when you drop.

1. Disconnect silicone tubing and air tube from the spray nozzle.
2. Pull upward the spray nozzle to detach it.
3. Take apart as shown on the right figure, and clean them with a ultrasonic cleaner.

* Clean enough inside of inside tube, cap for air and liquid.

Use a thin brush for the inside of inside tube.



7-3 Cleaning glass wares

Caution

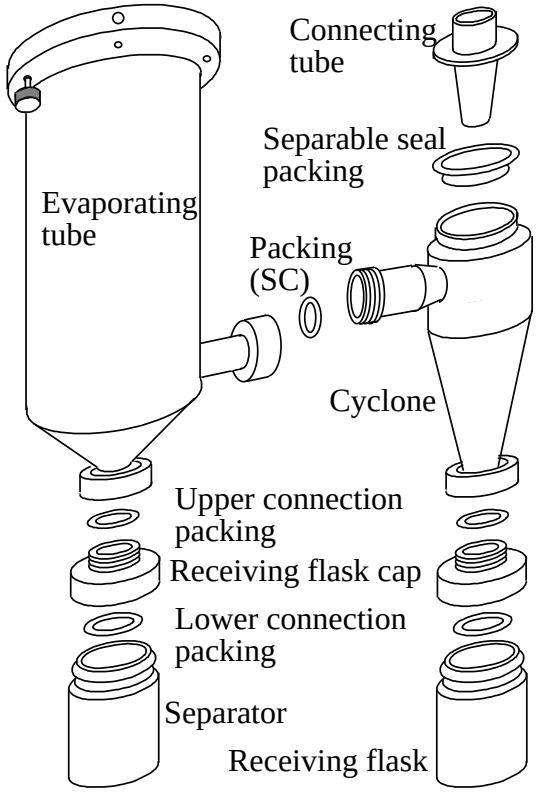
Handle glass wares carefully.

Handle glass wares carefully not to break down.

Handle glass wares carefully not to break down.

Take apart as shown on the right side figure, and then clean each part.

Wash glass wares with detergent, and if they are dirty further, soak them into diluted detergent water for about 12 hours.



7-4 Cleaning and Care

Warning

Do not take the unit apart.

There are heating part and electric parts inside of the unit.
Do not take the unit apart to prevent electric shock hazard or injuries.

Caution

Clean or care the unit after it is cooled enough.

Clean or care the unit after it is cooled enough to avoid burning your hands.

Caution

Use proper cleaning material.

Do not use cleanser, benzine acid liquid or other petroleum emulsion.
Do not pour water on the unit.

Caution

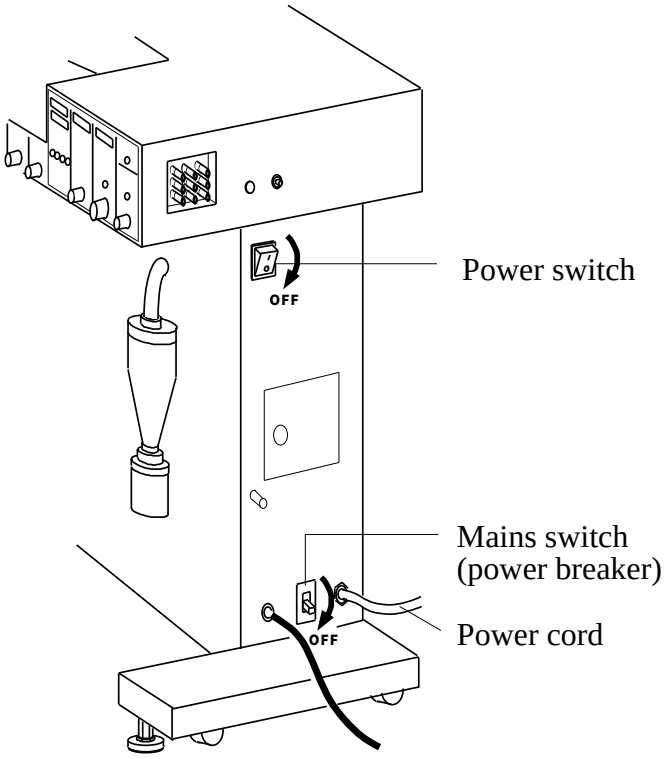
Handle glass wares carefully.

Handle glass wares carefully not to break down.

(1) Turn off the power switch, the mains switch (power breaker) and the breaker of switch board before cleaning.

(2) Clean with a soft cloth or a wet towel. If not enough, use a neutral detergent. After you use detergent, wipe with a wet towel to remove detergent.

(3) After operation take apart glass wares and spray nozzle, then clean them with detergent.



8 Disposal of unit

To dispose the unit, follow the disposal standard of your country.

	Model	Net weight	Overall dimensions	
Main unit	SD-1000	110kg	700W x 620D x 1500H mm	