

EYELA

Spray Dryer

Spray Dryer

SD-1010

Instruction Manual

This manual is designed to use this unit safely with the best performance.



Important

**Read carefully the chapter
[For safety operation] before operating
this unit.**




Keep this instruction manual beside the unit.

Precautions for your safety

1. Warning signal words

This unit is not explosion-proof structured.
When a flammable sample or organic solvent is used, handle it with care so that the liquid may not be spilled over.
As hydrogen gas is used, please install and use the equipment in a fume hood.
This product is used with its part being heated at high temperature for its function and characteristics.
A glass component used may get broken, if mishandled, potentially leading to an unexpected injury or accident.

However, if you know about them in advance, you can prevent most of these accidents.
For that reason, this instruction manual defines information on matters to be particularly noteworthy in terms of safety according to their risk, and indicate them with an alert mark and a signal word.
Please follow these instructions.

Alert Mark Signal word	Definition
 Warning	Indicates a 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.

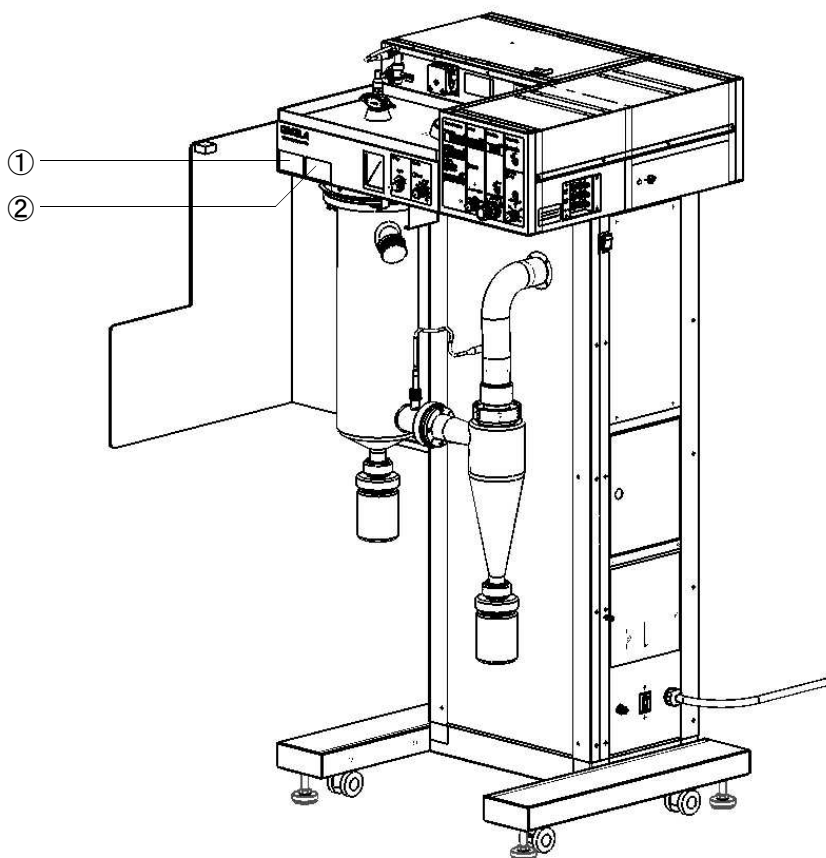
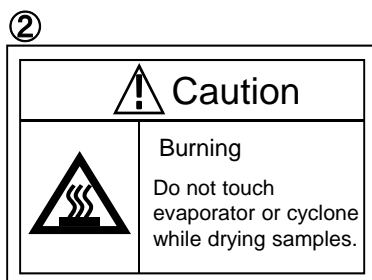
We investigate enough possible hazards during the operation, however, it is very difficult for us to find every hazardous occasion. Therefore this manual cannot describe all hazardous operations.

However, if you carry out the handling method described in this manual, you can operate and work more safely. Be sure to pay close attention to the handling of this product so that accidents and product failures will not occur.

2.Warning label

A warning label is attached to the unit to refer to the most important clause.
The attached position is shown 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, troubleshooting, maintenance/check-up, and disposal for Spray dryer model SD-1010.

Read this manual carefully before operation.

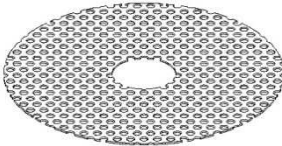
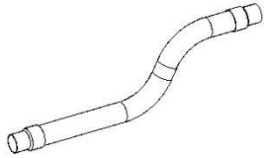
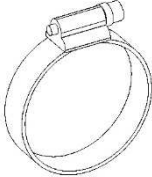
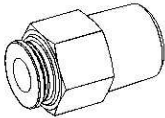
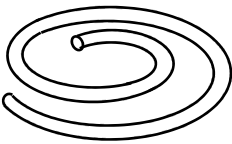

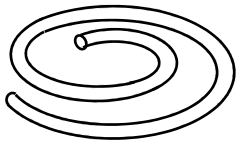
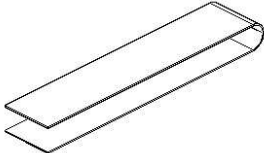

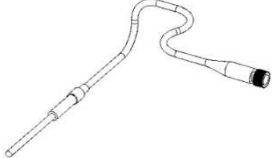
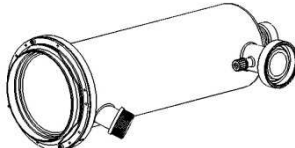
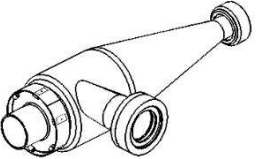
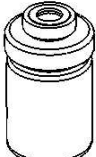
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Packaging

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

	Part name	Qty.
1	Main unit	1
2	Rectification board	1
3	Exhaust hose, cuff (2 pieces)	2.5m
4	Stainless steel diamond clamp (for exhaust hose)	2
5	Air piping connector(1/4')	1
6	Air piping tube(OD6mm)	10m
7	Stirring bar	1
8	Silicone tubing for applying sample (3.15 x 5.2)	2m
9	Silicone tubing for applying sample (3.7 x 6.1)	1m
10	Aluminum tape	10m
11	Cable for recorder(2m)	3
12	Sensor for outlet temperature	1
13	Evaporator set	1
14	Cyclone set	1
15	Collection bottle set	2
16	Instruction Manual	1
17	Warranty	1

2.Rectification board 	3.Exhaust hose,cuffs 
4.Stainless steel diamond clamp 	5.Air tube connector 
6.Air tube 	7.Stirring bar 
8,9.Silicone tubing 	10.Aluminum tape 
11.Cable for recorder 	12.Sensor for outlet temperature 
13.Evaporator set 	14.Cyclone set 
15.Collection bottle set 	

1 For safety operation

Please pay attention to safety as this product becomes hot



Warning

Do not use flammable materials such an organic solvent.

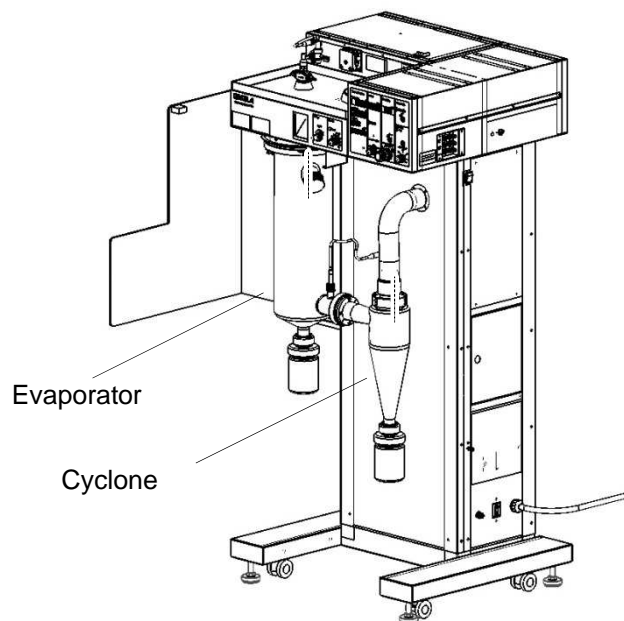
Do not use this unit to fry flammable materials such as organic solvent.
This unit has a built-in heater, so it may ignite.



Caution

While operating unit, do not touch evaporator or cyclone.

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



2 Outline

2-1 Application



Dangerous

**Do not use flammable materials
such as organic solvent.**

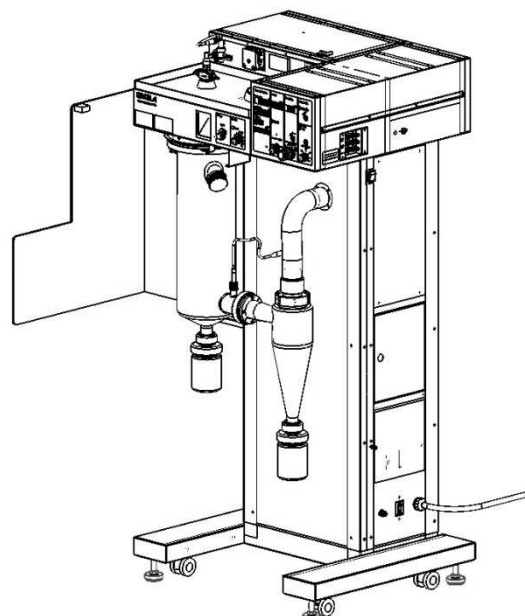
Do not use this unit to dry flammable materials such as
organic solvent.
This unit has a built-in heater, so it may ignite.



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 his unit samples are sprayed through a nozzle and
dry by headed air to make dried fine particle.

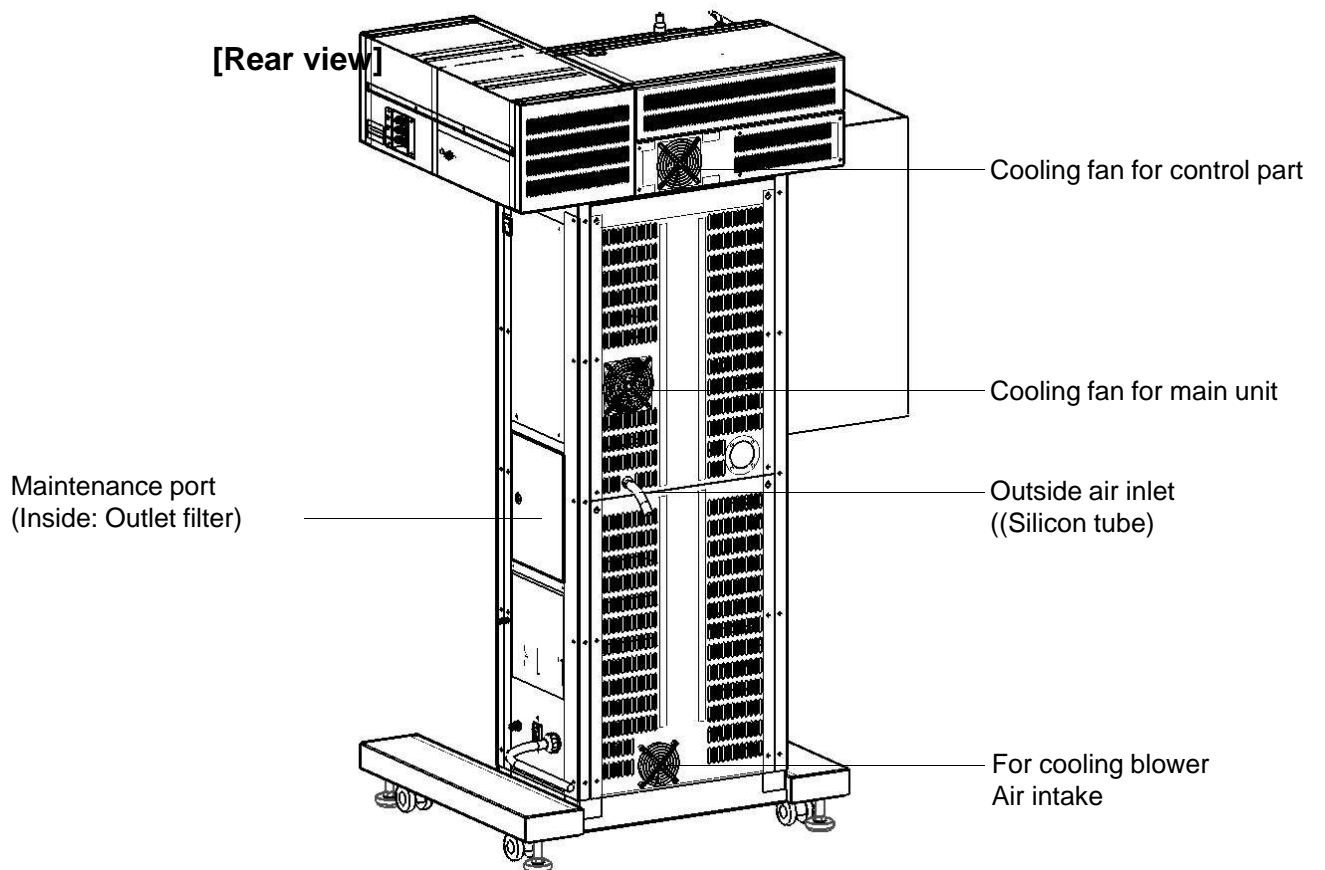
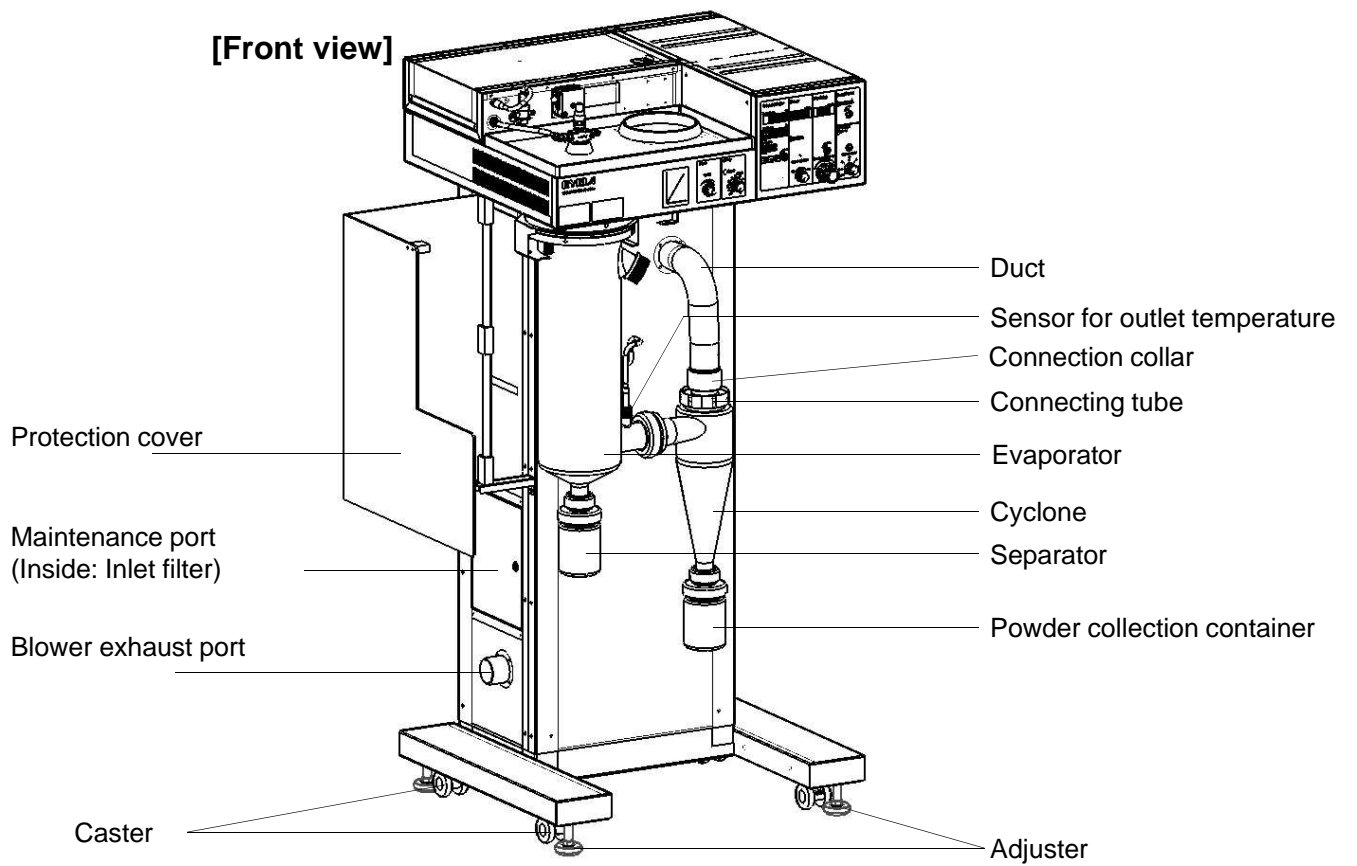
2-2 Specifications

Product name		Spray Dryer
Model		SD-1010
Performance	Evaporating rate	Max 1500ml/h
	Drying air flow rate control range and precision	40~200°C (Outlet temperature) • ±1°C
	Drying air flow rate control range	0.2~ 0.75m ³ /min
	Spraying air press. control range	20~250kPa (0.2~2.5kg/cm ²)
	Flow range of delivery pump	150~1700mL/h
	Rotation rate and capacity of sample agitator	100~1000rpm • 50mL~2L (Water) Upper agitation available (option)
Function	Inlet temperature display/Outlet temperature display	Digital display
	Drying air volume display	Digital display
	Spraying pressure display	Digital display
	Safety features	Evaporating tube protection cover, leakage/overcurrent breaker, overheat protector Manual return at blackout, self-diagnostic function (abnormal temperature, abnormal air volume, heater disconnected, abnormal pressure for solution being sent)
	Sprayed air line cleaning function	Automatic operation with interval timer
	Inlet temp. recorder output • Outlet temp. recorder output	0~10mV (at50 ~ 250°C)
	Drying air volume output	0~10mV(at0~1m ³ /min)
Composition	Heater	3kW
	Delivery pump	Tube pump
	Spray nozzle	Twin-fluid nozzle (nozzle hole diameter 0.71 mm in inside diameter) Nozzle diameter changeable (option)
	Spray air pump	Spray air compressor (option)
	Evaporating tube, cyclone, Powder collection container, separator	Hard glass
	Sample agitator motor, magnet	DC brushless motor, cobalt magnet
	Suction blower	Commutator blower
Standards	Diameter of tube used in delivery pump	ID 3.15 xOD 5.2mm
	Spray air connection bore, material	ID 4x OD 6mm, soft urethane tube Union
	Spraying air pressure	Pressure:294kPA (3kg/cm ²) , Flow rate:25L/min or more
	Exhaust port size	Exhaust port OD 50mm
	Interval timer	OFF or 1-20 min (automated intermittent time)
Ambient temperature range	5~35°C	
Ambient humidity range	30~80%RH (no condensation)	
Overall dimensions(mm)• Net weight	700W x 620D x 1500H mm • Approx.110kg	
Power consumption and power source	19.1A 4.2kVA • AC220V Single phase50/60Hz	

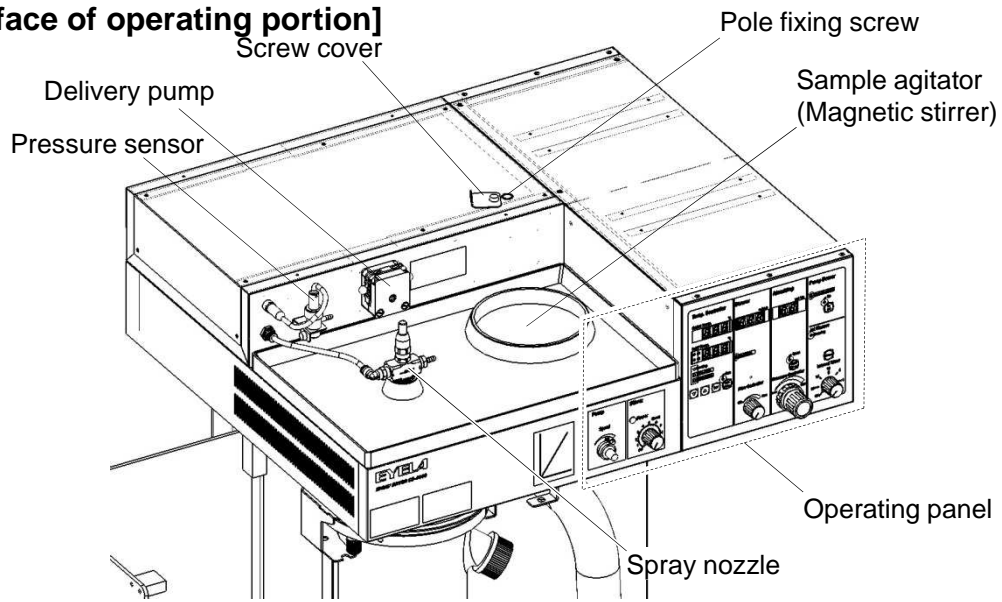
*The performance described demonstrates values "at room temperature 20°C with rated supply voltage 50Hz using potable water and a silicon tube."

*No power plug is supplied.

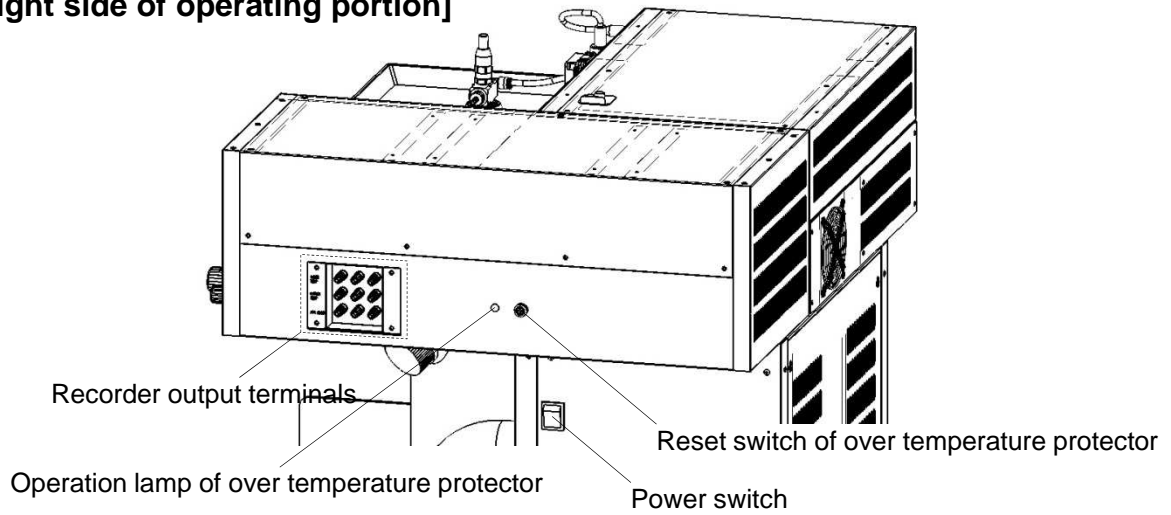
2-3 Description of each part



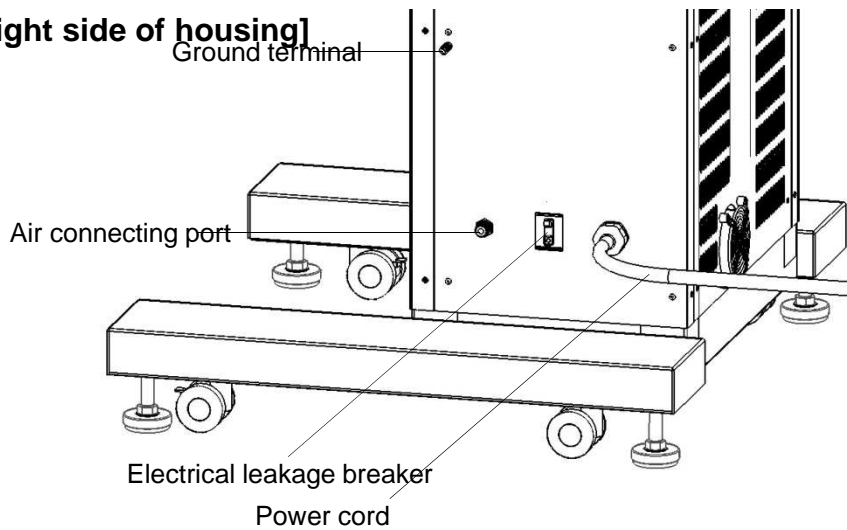
[Top face of operating portion]



[Right side of operating portion]

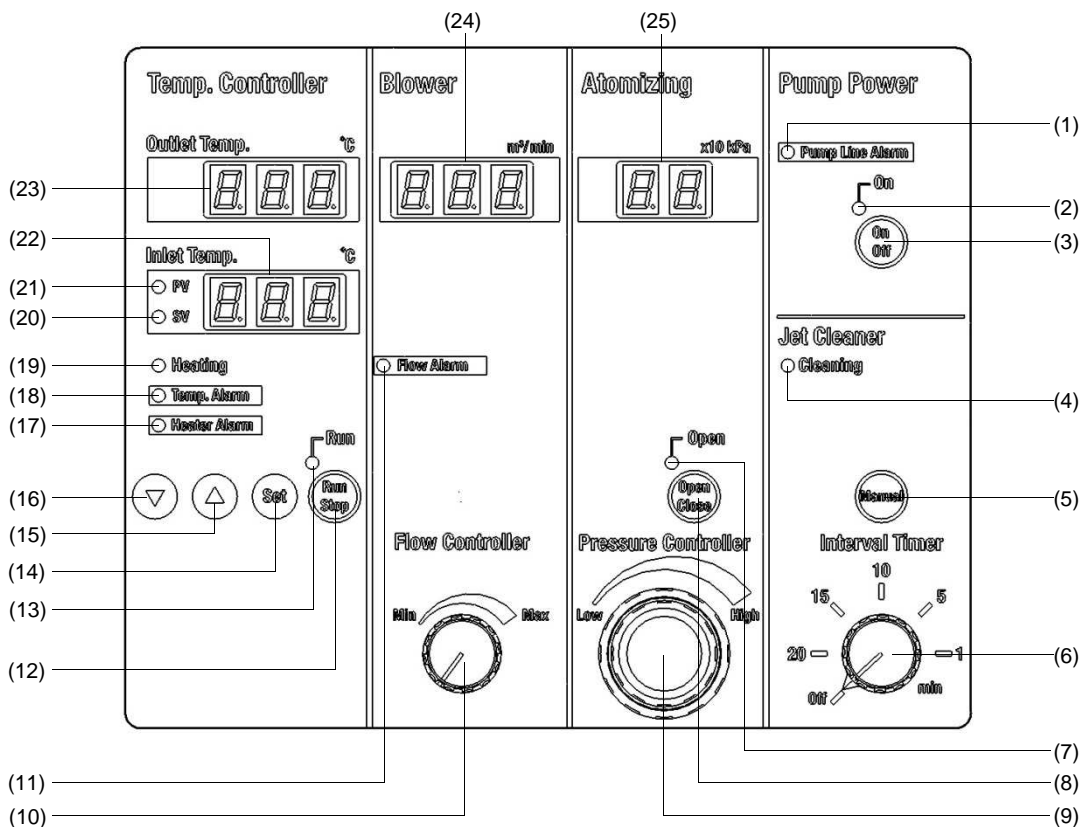


[Lower right side of housing]

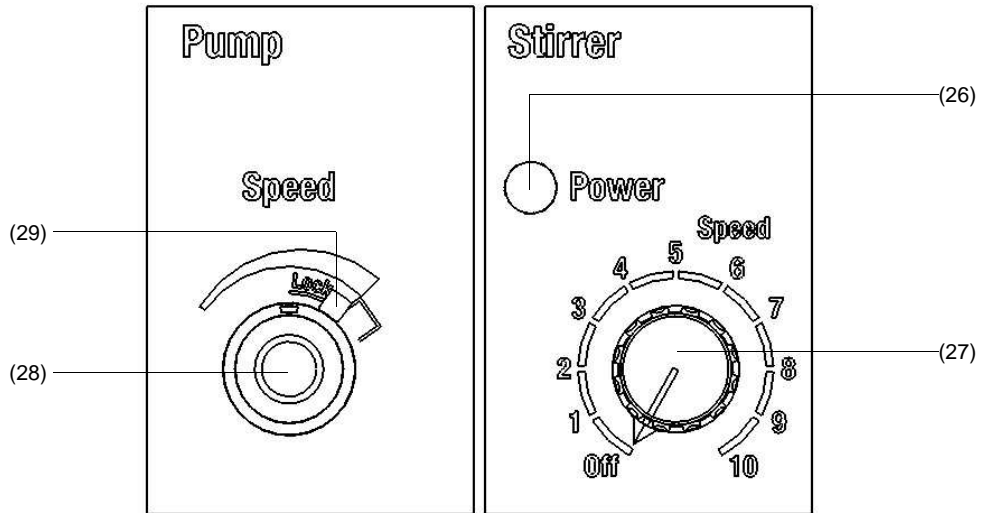


3 Descriptions and functions of the control panel

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 while the pump is running.
3	Pump ON/OFF key	Delivery pump Run/Stop
4	Jet cleaner operation lamp	It illuminates when the jet cleaner is in operation
5	Jet cleaner manual operation key	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
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	Temperature controller/blower RUN/STOP key	To run/stop temperature controller/blower
13	Temp. control and blower operation lamp	To control temperature. It illuminates when the blower is in operation
14	SET key	To determine setting values for temperature control and various parameters
15	UP key	To change setting values for temperature control and various parameters
16	DOWN key	To change setting values for temperature control and various parameters
17	Heater alarm lamp	It illuminates when the heater is disconnected
18	Temp. alarm lamp	It illuminates when the inlet temp. exceeds the band of set point
19	Heating lamp	It illuminates when the heater is active
20	Set value indication lamp	It illuminates when the set value is displayed on the inlet temp. indicator.
21	Measured value indication lamp	It illuminates when the measured value is displayed on the inlet temp. indicator
22	Inlet temp. indicator	It displays the inlet temperature of evaporating tube
23	Outlet temp. indicator	It displays the outlet temperature of evaporating tube
24	Drying air flow rate indicator	It displays drying air volume into the evaporating tube
25	Spraying pressure indicator	It displays the spraying pressure of sample.



No.	Description	Function
26	Stirrer operating lamp	It illuminates when the stirrer operates
27	Stirring speed control dial	To control stirring speed
28	Flow rate control knob	To control the flow rate of sample.
29	Flow rate lock lever	To fix the flow rate 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 [Troubleshooting] on P.18.

Safety features

Safety device	Function	Cause	Measures
Mains switch / Electrical leakage breaker	It detects an excess current of electric leakage and turns off to shut down the power.	Excess current. Or electric leakage occurred due to insulation deterioration etc. of electric parts.	Immediately stop operation and contact the company from which you purchased the unit or the nearby service center.
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	<ul style="list-style-type: none"> • Increase dry air volume. • Clean the inlet filter or replace it. <p>If the above method does not cure the problem, immediately stop the operation and contact the company from which you purchased it or the nearby service center.</p>
For blower protection Thermal relay	It detects an excess current of blower and shuts down the power for blower.	Excess current flows into the blower due to blockage, suction of rubbish, etc. of outdoor air inlet at the back side of the unit,	<ul style="list-style-type: none"> • Remove what blocks the outdoor air inlet. • Clean the exit filter or replace it.

Alarm function

Alarm name	Alarm operation	Alarm 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	The outlet temperature exceeded 100°C for more than 5 min. Outlet temperature becomes 120°C or higher.
Drying air volume alarm	Flow Alarm Drying air volume lamp illuminates	Drying air volume is 0.1m ³ /min
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 exists while the heater output is OFF.
Pump line pressure alarm	Pump Line Alarm Pump line alarm lamp blinks	Pump line pressure exceeds 100kPa for 1min. or more.
Spraying pressure alarm	[Spraying pressure] blinks.	Spraying pressure at 0kPa lasts more than 30 sec. Spraying pressure exceeds 300kPa.

*The alarm will be canceled by turning Off the power switch and turning it On again.

*In the event of alarm, all key operations become invalid.

*In the event of alarm, buzzer sounds.

To stop the buzzer sound, press "Temp. control/blower RUN/STOP key."

(This just stops the buzzer sound but the alarm state continues until the unit is rebooted)

4 Installation

4-1 Installed place

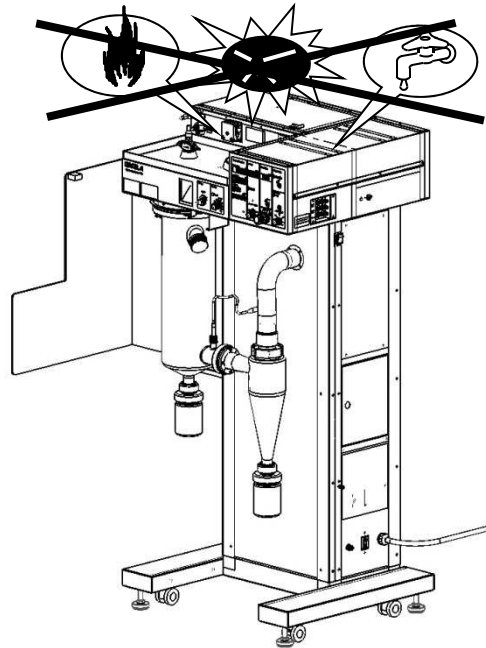
Caution

Do not install in a dangerous circumstance.

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

Place to be installed;

- The part where no hazardous materials such as flammable materials, pyrotechnic materials nearby
- Ambient temperature between 5 and 35° C.
- The part where no condensation is.
- Places with little humidity, where water drops do not reach.
- Places with little dust.
- Places not exposed to direct sunlight.
- Well ventilated place.
- A level, stable and robust place.



4-2 Environmental conditions

Caution

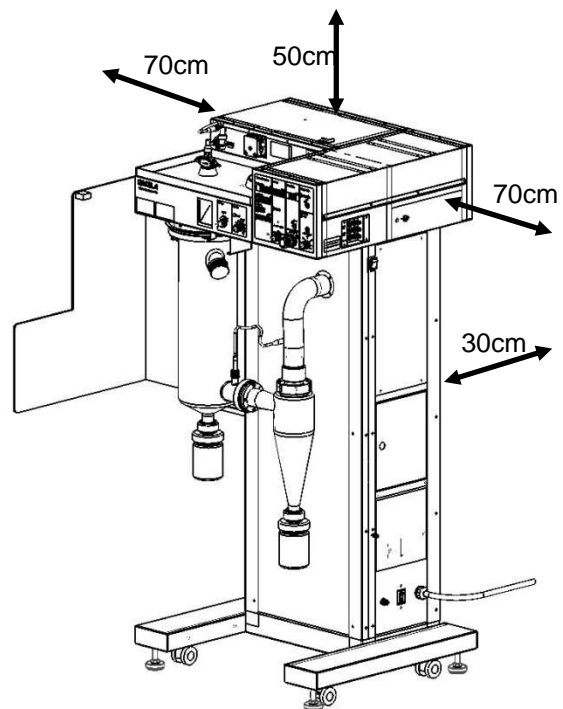
Keep good ventilation space.

The following space (See the left figure) from the ceiling surface, ceiling, etc. is required as a minimum to maintain excellent performance of the unit.

Caution

Be careful to transport unit.

Main unit approx. 110kg

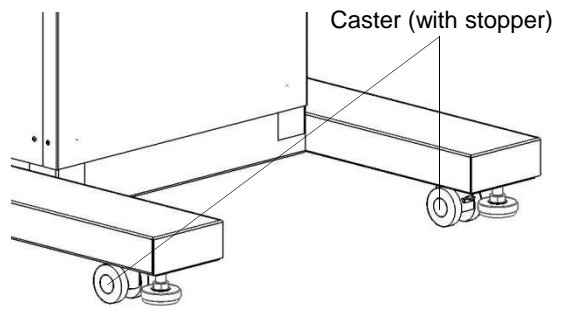


4-3 Connection of utility

1) Push up the stopper levers (2 places in front only) to unlock.

2) Move the unit to the installation place.

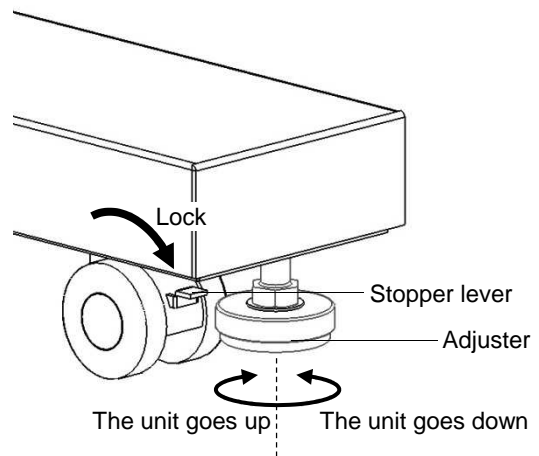
*If you move the unit on an uneven or ribbed place, excessive shock may apply to the casters and damage the unit: in this case, lift it up to move it.



3) Once the installation place is determined, push down and lock the stopper levers of the casters.

4) Adjust the level of adjusters (4) using a wrench to place the unit horizontally.

*Float the casters from the ground by lifting up the unit to fixate the unit.



4-4 Connection of utility

⚠ Warning

Check the voltage, phase and capacity of power and correctly connect the unit.

Wrong power connection may cause fire or an incident of electrical shock.

⚠ Warning

Do not use a branch socket or table tap.

Excess current may burn the cable or cause fire.

⚠ Warning

Be sure to connect a ground wire.

If a ground wire is not connected, an incident of electrical shock may occur.

⚠ Warning

Connect a ground wire correctly.

Never connect a ground wire to the gas piping or water piping to prevent an incident of electrical shock.

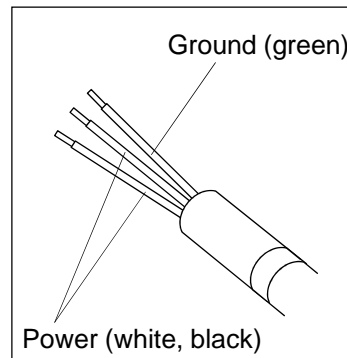
1) Check the voltage, phase and capacity of power to which the product model is connected.
Power to which the product is connected is as follows.

Product model	Power necessary for connection	
	Power	Capacity
SD-1010	AC220V single phase	30A

2) No power plug is supplied.
Directly connect to the distribution board.

*Do not connect power yet here.

Connect the ground wire of the power cord to the ground.



To AC220V single phase power

5 Operation

5-1 Preparation

Caution

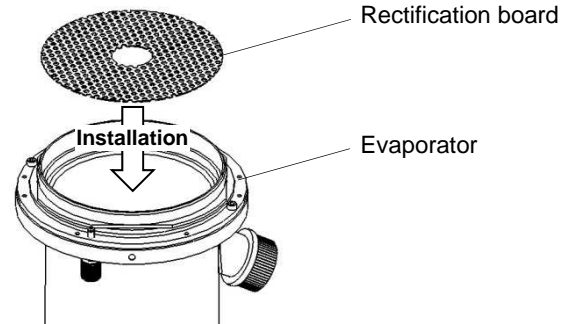
Handle glass wares carefully.

Handle glass wares carefully not to break down.

5-1-1 Attaching evaporating tube

1) Place the rectification plate to the evaporating tube.

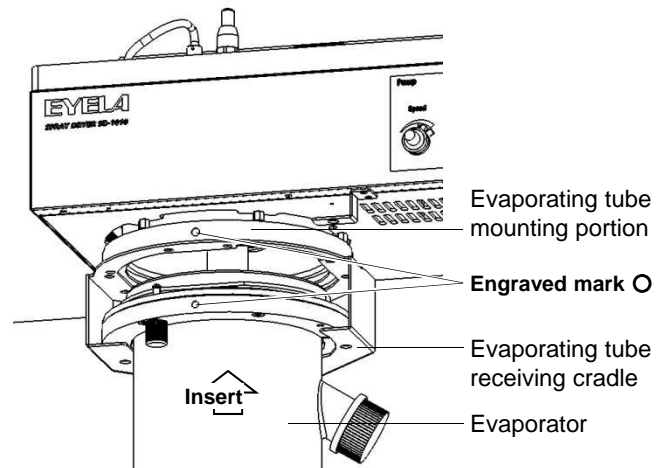
*There is no restraint etc. on direction of the current plate.



2) Install the evaporating tube on the main unit.
Match the position of engraved mark ○ on the front of the evaporating tube with the position of engraved mark ○ on the evaporating tube mounting portion of the main unit and insert the evaporating tube into the main unit.

*During installation, you may put the evaporating tube temporarily on the evaporating tube receiving cradle of the main unit.

**When insertion becomes heavy (tight), replace O ring inside the main unit.

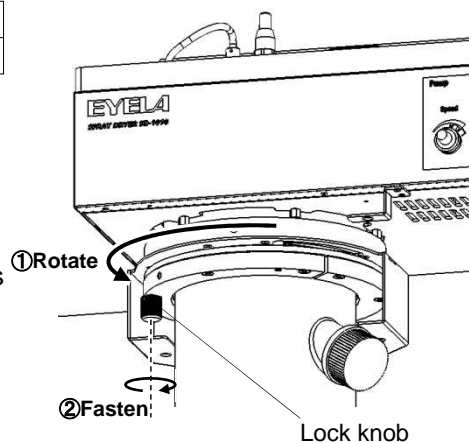


Code No.	Part name	Remarks
180210	O ring containing Si oil	G175

3) After insertion into the main unit, rotate the evaporating tube leftward at 45°.

A click on the evaporating tube mounting portion is clutched and the evaporating tube is temporarily fastened on the main unit.

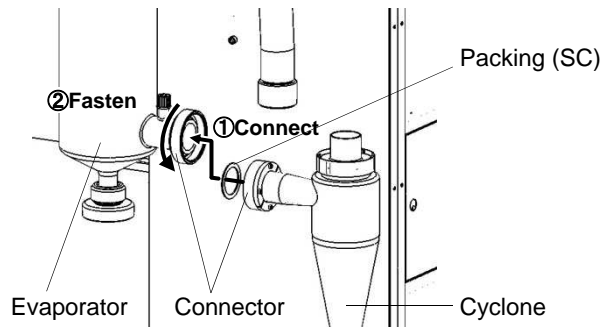
4) Tighten the lock knob with the hand.
The evaporating tube is fastened on the main unit.



5-1-2 Attaching cyclone

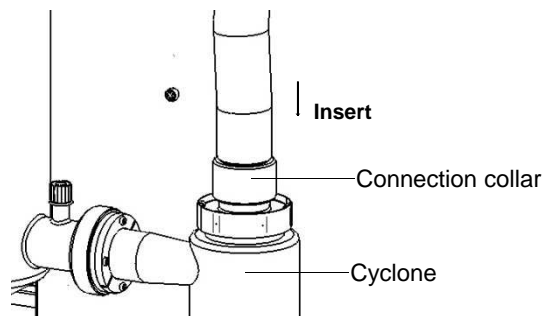
1) Fit the packing (SC) into the groove of the connector of the evaporating tube.

2) Connect connectors of the cyclone and evaporating tube, screw the connectors and fasten the cyclone on the evaporating tube.



3) Insert the connection collar in the cyclone.

*When insertion becomes loose, replace two O rings inside the connection collar.



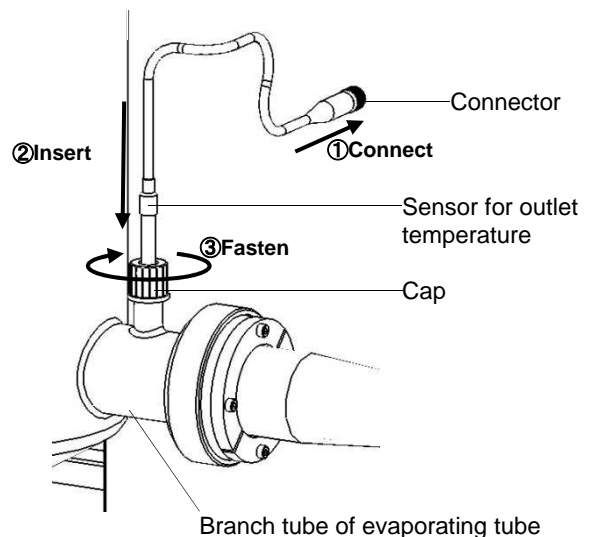
Code No.	Part name	Remarks
275510	O ring for connection collar	

5-1-3 Attaching outlet temp. sensor

1) Connect the connecting portion of outlet temperature sensor to the connector on the main unit.

2) Slightly loosen the cap on the sensor mounting port of the evaporating tube and insert the outlet temperature sensor.

3) Make adjustments so that the tip of the outlet temperature sensor is positioned in the branched tube center of the evaporating tube and then fasten the cap to fix the sensor.



*Be careful not to touch the cable of the outlet temp. sensor to the evaporating tube.

5-1-4 Attaching power collection container and separator

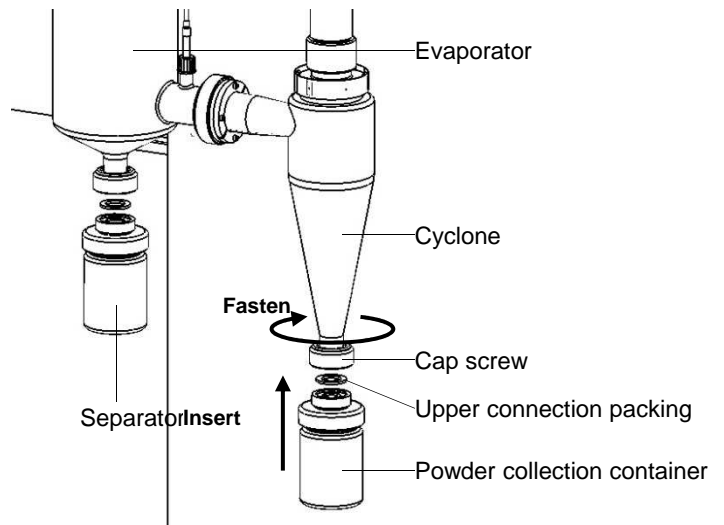
- 1) Place the upper connecting packing in the groove of the upper cap of collection bottle (powder collection container, separator).

*The collection container and upper connection packing used in powder collection container are common parts.

- 2) After connecting the collection bottle below each of the evaporating tube and cyclone, fasten the cap screw to fixate the collection bottle.

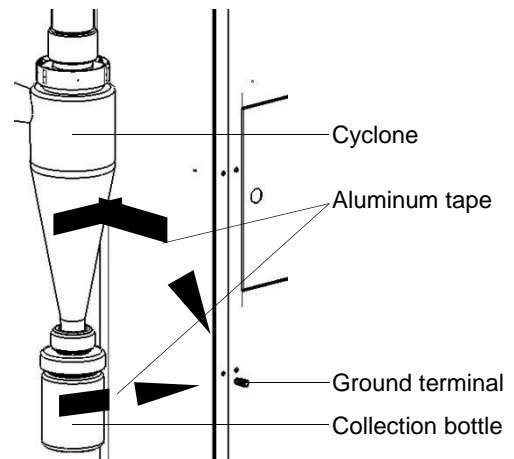
*The capacity of the supplied collection container is 600 mL. If the capacity is not enough, use an optional powder collection container (1.2 L).

Code No.	Part name	Remarks
146750	Powder collection container 600mL	Standard accessory
147940	Powder collection container 1.2L	



5-1-5 Countermeasures against static electricity

When spraying and drying a sample vulnerable to electrification of static electricity including salts in general such as sodium chloride and calcium chloride, paste aluminum tape (supplied with the product) onto the cyclone and collection bottle and connect aluminum tape to the ground terminal.



5-1-6 Attaching silicone tubing

⚠ Caution

Use a proper tubing.

Use the tubing diameter and material designated by our company for the tubing used to deliver a solution.
The use of non-designated tubing may cause degradation of performance or trouble.

- 1) After raising the lever, pull up the tube retainer immediately above and remove it from the sample delivery pump main.
 - 2) Set silicon cut in an appropriate length on the delivery pump main and fix the tube retainer.
- *Set the silicon tube (supplied with the product) "3.15 × 5.2 [mm] (ID × OD)" with the delivery pump.
- 3) Push down the lever of tube retainer and fixate the tube.
 - 4) Slightly pull the base of tube to bring it out about 2 mm.

5) Connect one side of silicon tube to the pressure sensor.

6) Joint the pressure sensor and spray nozzle with silicon tube cut in an appropriate length.

*Use a silicon tube (supplied with the product) in "3.7 × 6.1 [mm] (ID × OD)" between the pressure sensor and spray nozzle.

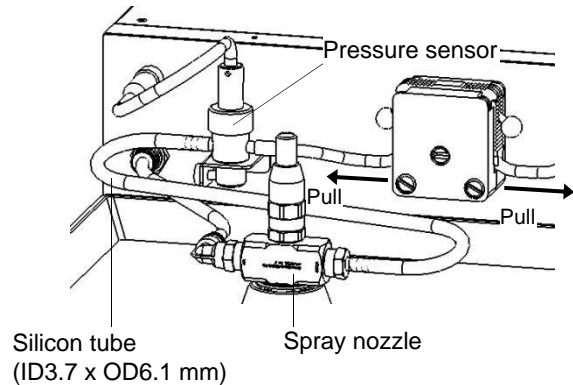
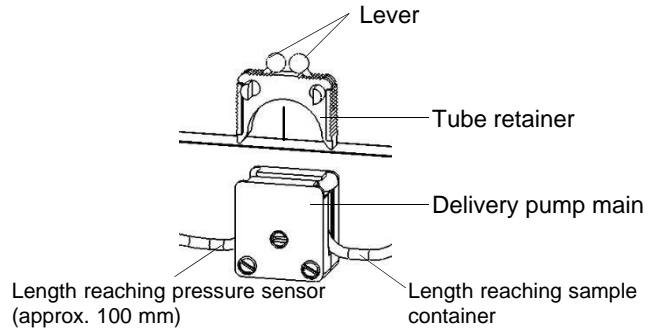
[Tube used]

Code No.	Part name	Qty.
125510	Silicon tube 3.15 x 5.2	5m
125530	Silicon tube 3.7x6.1	5m

⚠ Caution

Do not press the pressure sensor too much or do not pour water on it.

Applying unreasonable force to the pressure sensor main or cable or pouring water on it may result in failure of the pressure sensor.



5-1-7 Connecting power cord

⚠ Warning

Check the voltage, phase and capacity of power and correctly connect the unit.

Wrong power connection may cause fire or an incident of electrical shock.

⚠ Warning

Connect a ground wire correctly.

Never connect a ground wire to the gas piping or water piping to prevent an incident of electrical shock.

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).

In either case, securely connect the ground wire of power cord to the ground terminal via type D grounding work.

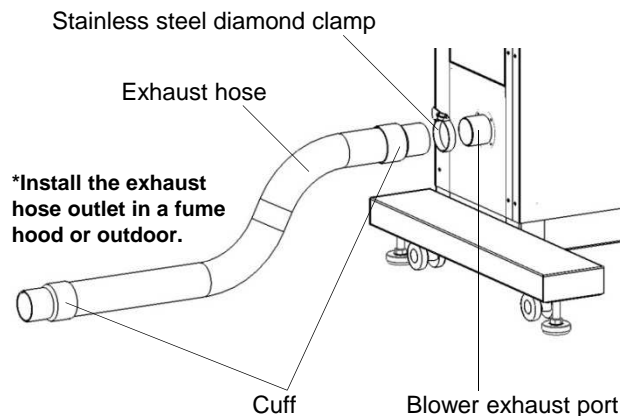
5-1-8 Connecting exhaust hose

1) Attach cuffs at both ends of exhaust hose.

2) Attach exhaust hose to the blower exhaust port and fix it with stainless steel diamond clamp.

3) Put another side of exhaust hose into a draft chamber or outside of laboratory.

*The length of supplied exhaust hose is 2.5 m. If the length is not enough, use the optional exhaust hose (10 m).



Code No.	Part name	Remarks
179980	Exhaust hose 2.5m	Standard accessory
179990	Exhaust hose 10m	

5-1-9 Connecting air tubing

1) Prepare an air compressor.

*Prepare an air compressor that satisfies the following performance.

- Control pressure: 3.5kg/cm² or more
- Discharge air volume: 25L/min or more

2) Squeeze the tube in the air piping connecting port until it hits the back for connection.

*Slightly pull the tube to check it is not pulled.

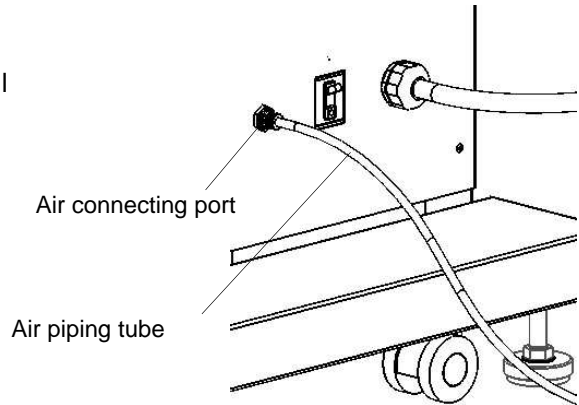
*The length of air piping tube is 10m.
Install the air compressor in the position where the tube reaches it.

3) Connect the unconnected air piping tube to the compressor.

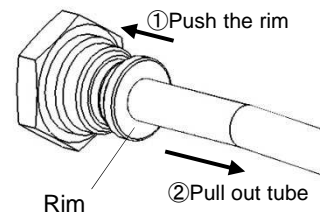
*If you use an air compressor other than the optional product, change the connecting port to the one to which OD 6mm air piping tube can connect.

(Recommendation: Tube fitting made by PISCO)

*When you remove the air piping tube, pull out the tube while pushing the rim of connecting port.



[How to remove tube]



5-1-10 Connecting recorder cable

Connecting to the recorder allows you to record data on the inlet temperature, outlet temperature and dry air volume.

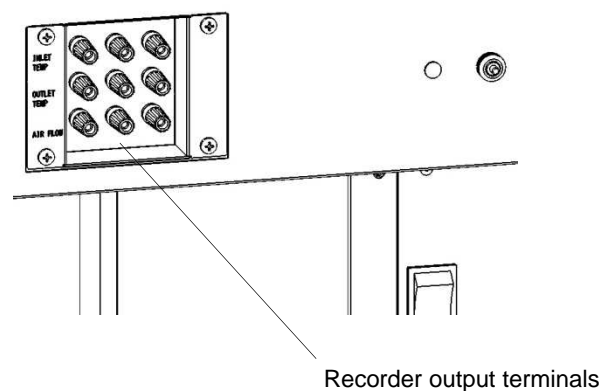
1) Connect the banana plug side of cable for recorder (supplied with the product) to terminal area in the same color of recorder output terminal on the left side of the product.

*The cable for recorder is the same for all outputs.

2) Connect a red line of Y-terminal in cable for recorder to + terminal of the recorder and a black line to - terminal, respectively.

*Output to recorder

Inlet temperature(Upper rack) :	50~250°C	→ 0~10mV
Output temperature(Middle rack):	50~250°C	→ 0~10mV
Dry air volume(Lower rack):	0.0~1.0 m ³ /min	→ 0~10mV



5-1-11 Replacing cap for nozzle

According to the sample slurry concentration, replace the gas cap, liquid cap and needle for liquid cap.

*Disassemble with reference to "Spray Nozzle Disassembly Diagram on page 34."

- 1) Rotate the retainer ring to remove it and take out the gas cap and gasket.
- 2) Remove the liquid cap by rotating it with a wrench etc.
- 3) Rotate the packing box with a wrench etc. to remove it and pull out the needle.
- 4) After replacing the gas cap, liquid cap and needle, assemble in the reverse sequence to disassembly.

●Combination table of sample slurry concentration with nozzle caps

Code No.	Part name	Nominal diameter	Sample slurry concentration	Remarks
120730	Liquid cap hole diameter ϕ 0.71	2	Slurry concentration approx. 5~30%	Standard accessory
120750	Gas cap hole diameter ϕ 1.75			
180270	Needle for liquid cap for hole diameter ϕ 0.71			
120720	Liquid cap hole diameter ϕ 0.51	2A	Slurry concentration approx. 5% Powder grain size is greater than nominal size 1	Standard accessory
120750	Gas cap hole diameter ϕ 1.75			
180260	Needle for liquid cap for needle hole diameter ϕ 0.51			
120720	Liquid cap hole diameter ϕ 0.51	1	Slurry concentration approx. 5%	
120740	Gas cap hole diameter ϕ 1.6			
180260	Needle for liquid cap for needle hole diameter ϕ 0.51			
120710	Liquid cap hole diameter ϕ 0.41	1A	Uniform solvent	
120740	Gas cap hole diameter ϕ 1.6			
180250	Needle for liquid cap for needle hole diameter ϕ 0.41			

5-1-12 Installing agitator

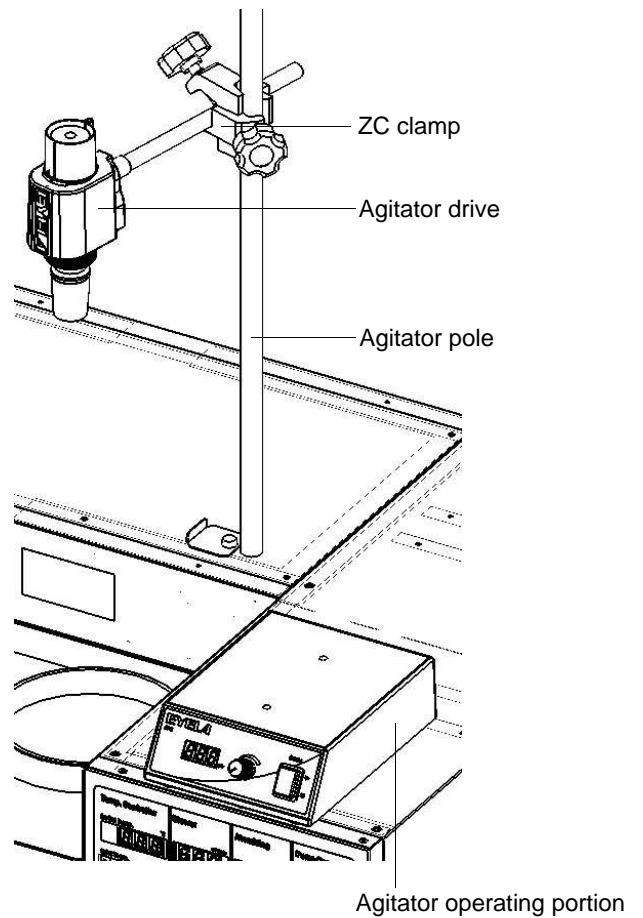
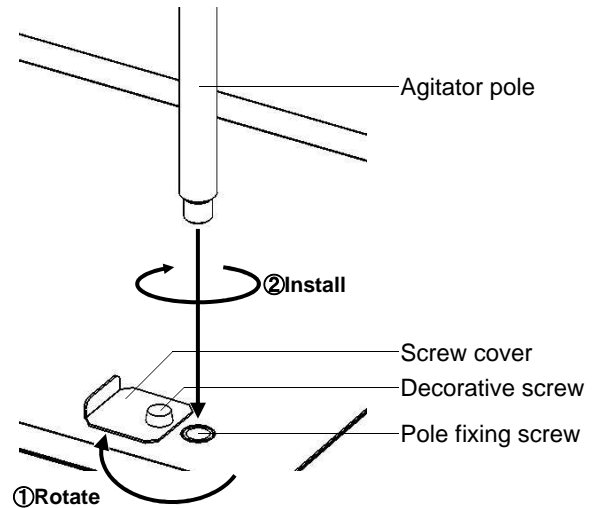
A small agitator (SPZ-2000) can be installed by using an agitator installation pole (option). (

Agitation from above allows delivery of solution without grinding crystals.

- 1) Slightly loosen the decorative screw to make the screw cover movable.
- 2) Rotate the screw cover until the pole installation screw is completely visible, fasten the decorative screw to secure the cover.
- 3) Tighten the agitator installation pole on the pole installation screw.
- 4) Mount the agitator drive on the agitator installation pole.
- 5) Place the agitator operating portion on the upper part of the main.

*See and follow the Installation Manual of the small agitator (SPZ-2000) when using it.

Code No.	Part name	Remarks
275200	Agitator installation pole	
124560	ZC clamp	
260530	Small agitator SPZ-2000	



5-2 Operation

⚠ Caution

While operating unit, and for a while after operating , do not touch heated parts.

While operating unit, and after operating, cyclone etc. 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 [Troubleshooting].

5-2-1 Preparing sample and distilled water

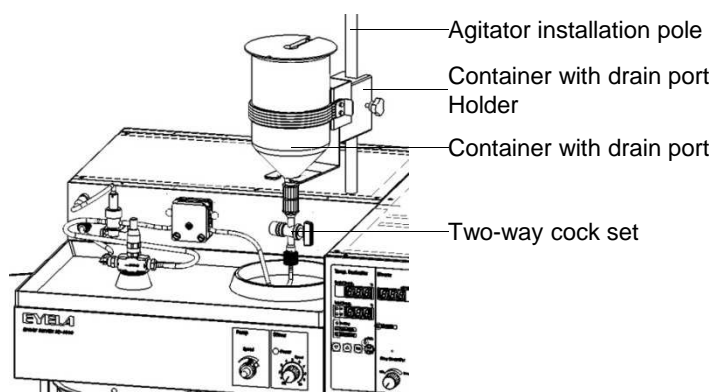
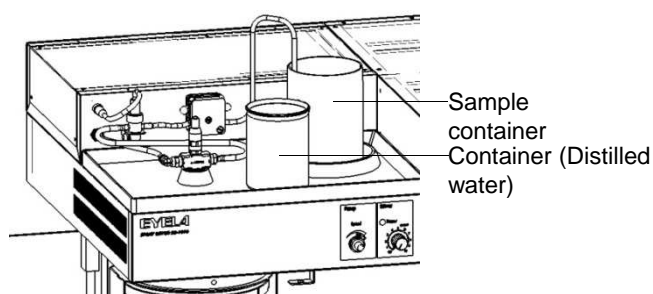
- 1) Place a sample container (beaker etc.) containing the sample solution in the sample stirring base, place the stirrer in the sample container
- 2) Prepare a container containing about 200 mL of distilled water near the sample container.

*Distilled water is used to adjust outlet temperature immediately after start of operation.

Feed the sample solution after the outlet temperature becomes stable.

*A container with drain port is made available as an option. Discharge sample from the bottom, enabling the sample to be delivered without being left in the container.

Code No.	Part name	Remarks
275200	Agitator installation pole	
275210	Container with drain port	
275220	Two-way cock set	
275230	Holder for container with drain port	

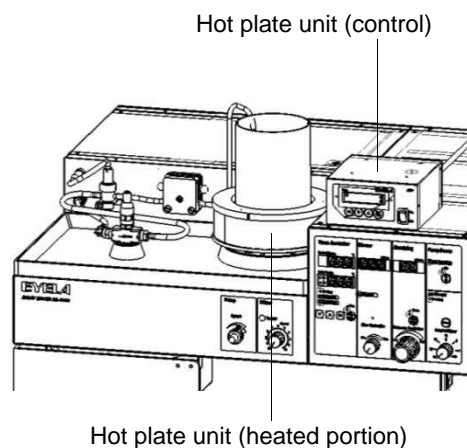


*A hot plate unit that can heat sample and keep it warm is made available as an option.

Pre-heating of sample and maintenance of sample temperature during spray drying can prevent sample from crystallizing.

The use of the outside temperature sensor can control sample temperature.

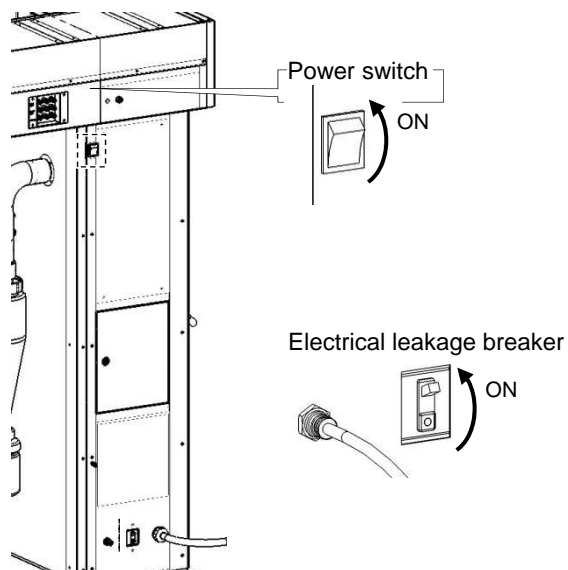
Code No.	Part name	Model
275300	Hot plate unit	HTP-1000
265680	Outside temperature sensor	
114030	Thermometer holder	



• A hot plate unit 220V can be custom-made.

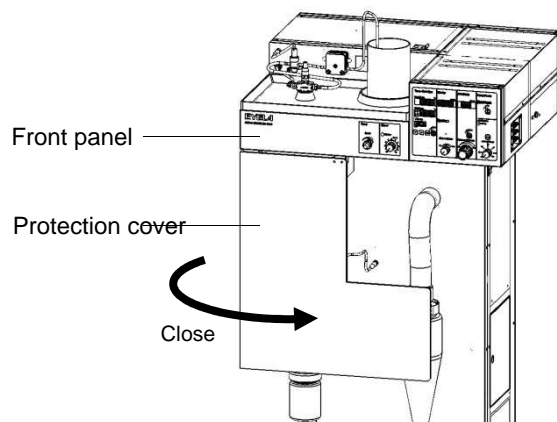
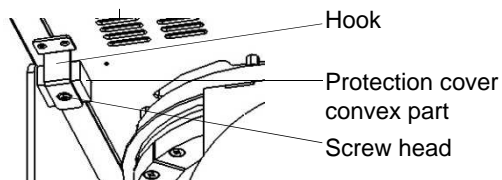
5-2-2 Operation

- 1) Turn on the distribution board breaker → leakage breaker → power switch in this order.
When power is turned ON, respective displays illuminate.



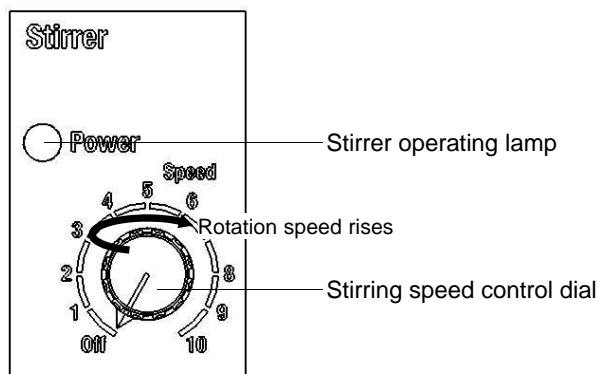
- 2) Close the protection cover.

* Close the protection cover while slightly lifting it up and hitch the screw head of the protection cover convex part to the hook hole in the lower portion of the front panel to lock.



- 3) Rotate the agitator speed adjusting knob to adjust the agitation speed of sample.

* The agitator operation lamp illuminates during agitation.



4) Press SET key.
 Illuminating part switches from the measured value display lamp to the set value display lamp and the current set temperature is displayed on the inlet temperature display.

5) Change the desired inlet temperature with UP key and DOWN key.

6) Press the SET key to confirm the set value.
 Illuminating part switched from the set value display lamp to the measured value display lamp and the current measured value (inlet temperature) is displayed on the inlet temperature display.

*The setting range of inlet temperature is 40~200°C.
 Operate the unit within the setting range.

5) Press and hold Temp. Controller/Blower RUN/STOP key (1 sec).

The temperature controller and blower start running.

*Temp. Controller/Blower operation lamp illuminates during operation of temperature controller/blower.

*The heating lamp illuminates during heating (heater turned ON)

*If the inlet temperature is heated beyond its set temperature and the set temperature +>10°C continues for 3 min, the abnormal temperature alarm works and all operations excluding agitation stop.

(The heater alarm lamp illuminates)

(Buzzer keeps ringing for 30 sec)

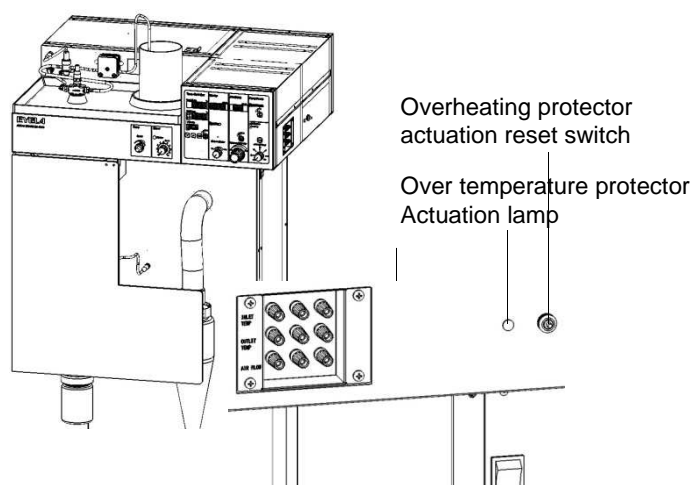
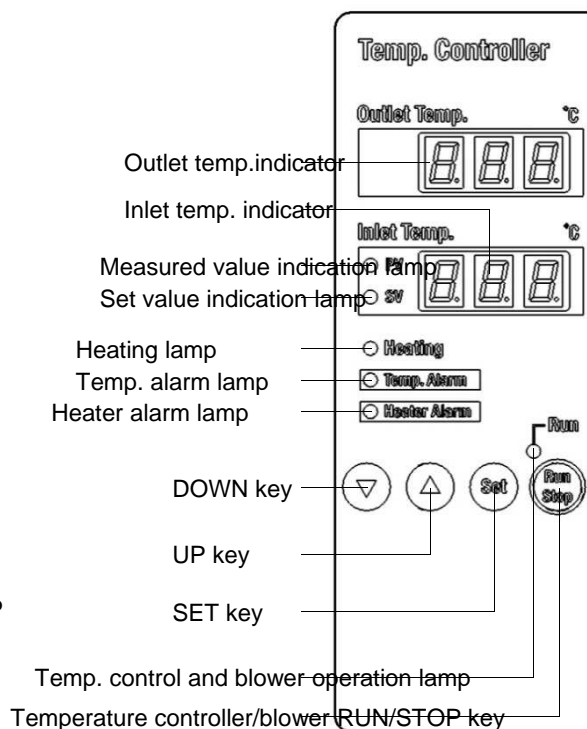
*If during heating the current flow into the heater lowers below the standard, the abnormal heater alarm works and all operations excluding agitation stop.

(The heater alarm lamp illuminates)

(Buzzer keeps ringing for 30 sec)

*If dry air volume is insufficient, the overheating protector may start up. During actuation, the overheating protector actuation lamp illuminates in the back of the left side of the unit.

To deactivate the overheating protector, increase the dry air volume with the dry air volume adjusting knob to lower the temperature at the heater and press the overheating protector actuation RESET switch. Once the heater is fully cooled down, the overheating protector actuation lamp goes out.



6) Rotate the dry air volume adjusting knob while checking the value in the dry air volume display and adjust the dry air volume.

*The setting range of dry air volume is 0.2~0.75 m³/min. Operate the unit within the setting range.

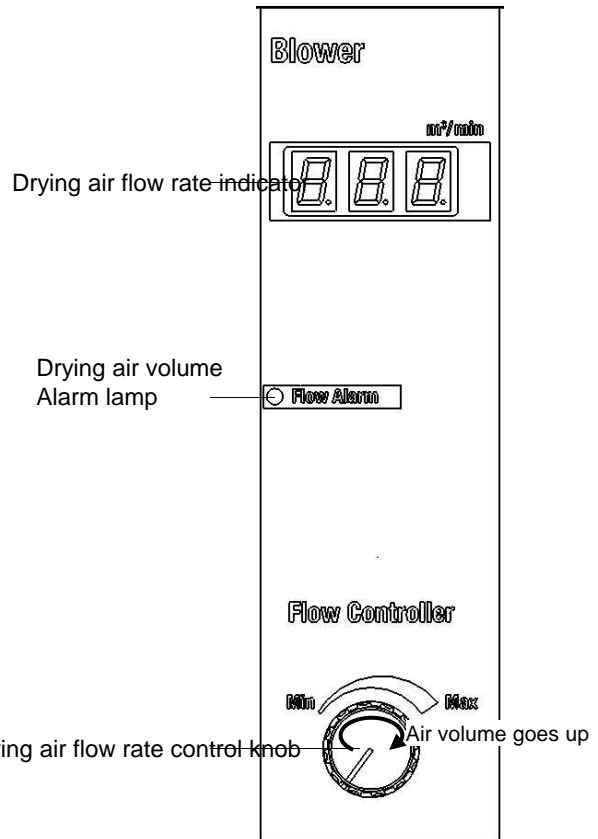
* *During spray drying the powder that cannot be collected with the cyclone adheres to the outlet filter, thereby lowering the dry air volume. If necessary, rotate the dry air volume adjusting knob to adjust the dry air volume.

*If the dry air volume is below 0.1m³/min, the abnormal dry air volume alarm works and the dry air volume alarm lamp blinks.

(The unit operation continues)
(Buzzer sounds in 1-sec periods)

If the dry air volume increases to more than 0.11 m³/min within 30 sec after the abnormal dry air volume alarm starts, the alarm will be deactivated automatically.

If the condition below 0.1m³/min continues for more than 30 sec, the dry air volume alarm lamp changes to illumination and all operations excluding agitation stop. (Buzzer keeps ringing for 30 sec)



7) Press the spray air intake key.

Spray air supply lamp illuminates and supply of spray air starts.

8) Rotate the spray pressure adjusting knob while checking the value in the spray pressure display and adjust the spray pressure.

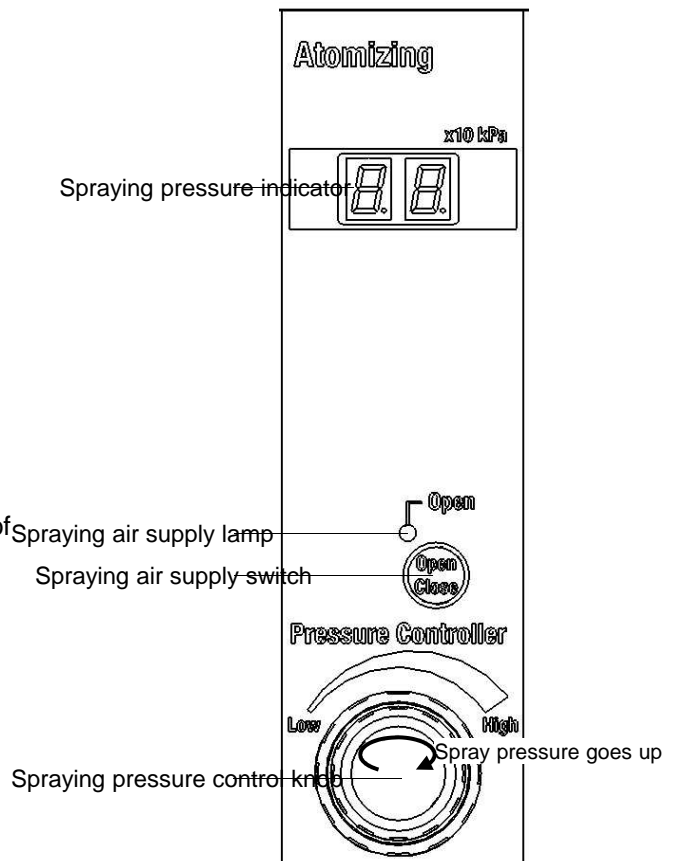
*The spray pressure adjusting knob has a locking mechanism. When adjusting pressure, lightly pull the knob to unlock before operating it.

*The setting range of spray pressure is 20~250 kPa. Operate the unit within the setting range.

**If spray pressure 0 kPa continues for 5 sec after start of spray air supply, the abnormal spray pressure alarm works and the value in the spray pressure display starts blinking.

(The unit operation continues)
(Buzzer sounds in 1-sec periods)

If the condition 0 kPa still continues for another 30 sec, all operations excluding agitation stop. (Buzzer keeps ringing for 30 sec)



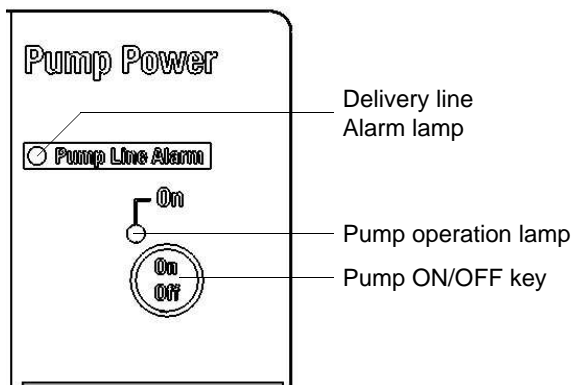
**If spray pressure goes up to 300 kPa or higher, the abnormal spray pressure alarm works and all operations excluding agitation stop. (Buzzer keeps ringing for 30 sec)

9) Press pump ON/OFF key.

The pump operation lamp illuminates and operation of the delivery pump starts.

*If pressure of delivery line goes up to >100 kPa, the delivery line abnormal pressure alarm works and the delivery pump stops.

(The delivery line alarm lamp blinks)
(Buzzer sounds in 1-sec periods)

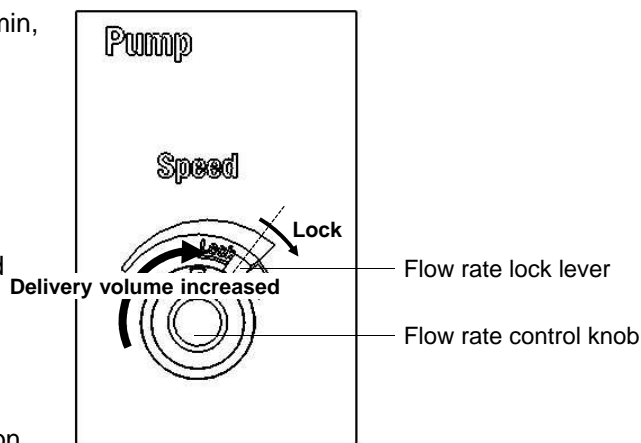


If pressure goes down to <100 kPa within one minute after the alarm or pump ON/OFF key is pressed, the alarm is lifted.

If the condition >100 kPa continues for more than 1 min, all operations excluding agitation stop.

(The delivery line alarm lamp illuminates)
(Buzzer keeps ringing for 30 sec)

10) Rotate the delivery volume adjusting knob while checking the value in the outlet temperature display and adjust the outlet temperature.



11) Once the temperature reaches the desired outlet temperature, put down the delivery volume fixing knob on the Lock side and fix the knob.

*Adjust the outlet temperature in the range not exceeding 100°C.

If the outlet temperature goes up to >100°C, the outlet temperature upper limit alarm works and the value in the outlet temperature display starts blinking. (Buzzer sounds in 1-sec periods)

If the outlet temperature goes down below 100°C within 5 min after the alarm, the alarm is lifted.

If the temperature of >100°C continues for more than 5 min after the alarm, all operations excluding agitation stop.

(Buzzer keeps ringing for 30 sec)

*If the outlet temperature is >120°C, the outlet temperature upper limit alarm works and all operations excluding agitation stop. (Buzzer keeps ringing for 30 sec)

5-2-3 Cleaning spray nozzle

If you use the jet cleaner function, the solids at the tip of spray nozzle will be removed automatically, enabling you to control deterioration of spray condition due to attachment of solids at the tip of spray nozzle resulting from continuous spray drying.

- 1) Rotate the interval timer setting knob and set the automatic operating interval of the jet cleaner (spray air line cleaning function).

If automatic operation is performed, adjust the knob to the "OFF" position.

*During jet cleaner operation, the jet cleaner operation lamp illuminates.

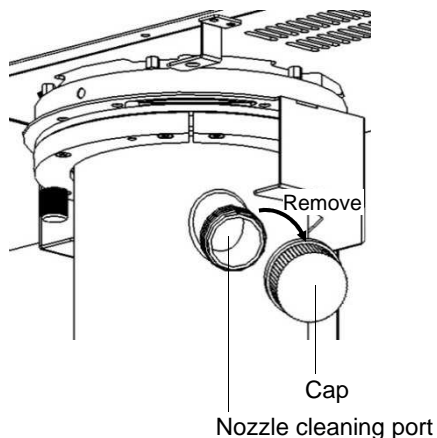
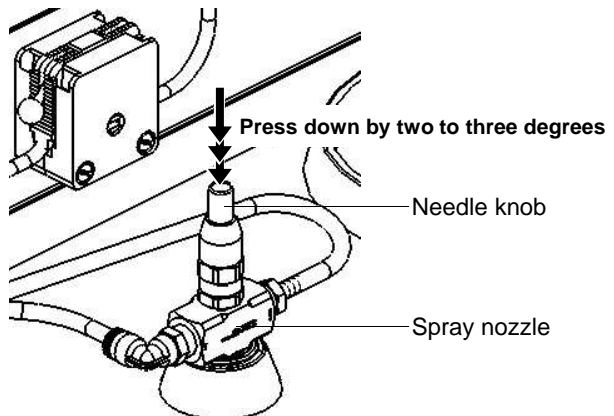
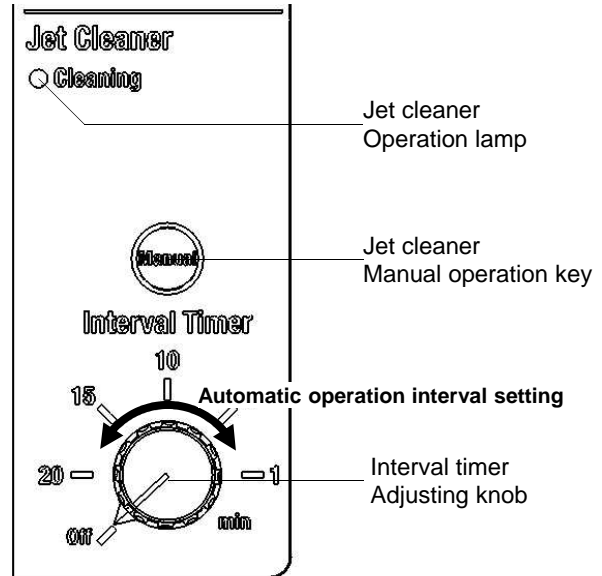
*The automatic operation interval time accumulates time after previous operation of the jet cleaner.

When adjustments were made to shorten the operation interval and if the adjusted time exceeds the current accumulated time, the jet cleaner works on the spot.

*Press the jet cleaner manual operation key, and the jet cleaner can be operated in an optional timing.—

*If the spray condition does not improve after the use of the jet cleaner, press down the needle knob of the upper portion of the spray nozzle by two to three degrees to remove solids.

*If many solids adhere to the tip of the nozzle, stop sample delivery, remove the cap at the nozzle cleaning port of the evaporating tube and clean with a spatula etc.



5-2-4 Collection of fine powder

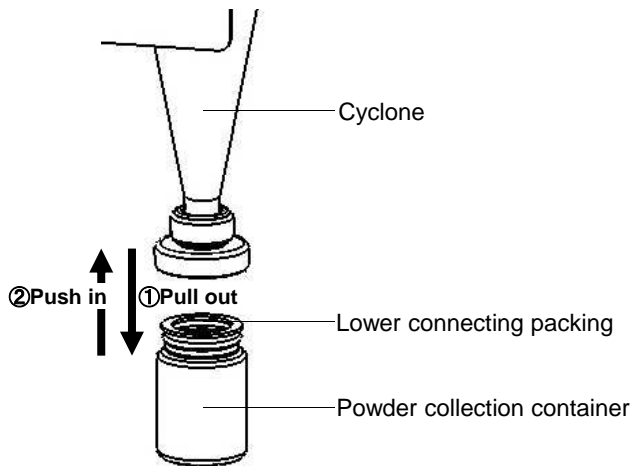
Fine powder obtained from spray drying accumulates in the powder collection container at the lower portion of cyclone.

Container can be placed or removed quickly during spray drying.

- 1) Holding a powder collection container with hands, apply force downward to pull out the container from the cyclone.

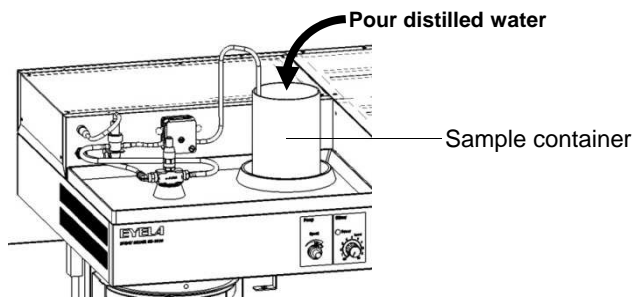
*When pulling it out, the lower connecting packing will be removed at the same time. Be careful not to lose it.

- 2) After collecting fine powder, apply the lower connecting packing to the groove of the container port and push powder collection container into the cyclone from below.



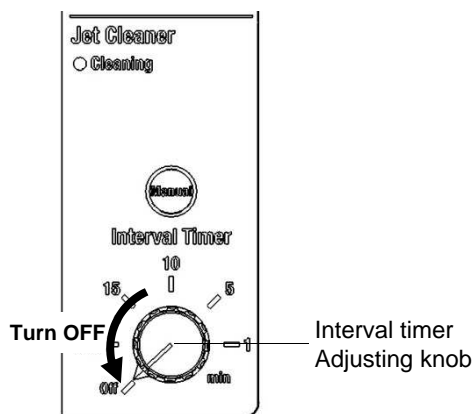
5-3 End of operation

When sample in the sample container runs out, promptly refill it with next sample or stop the operation of the unit according to the following steps.

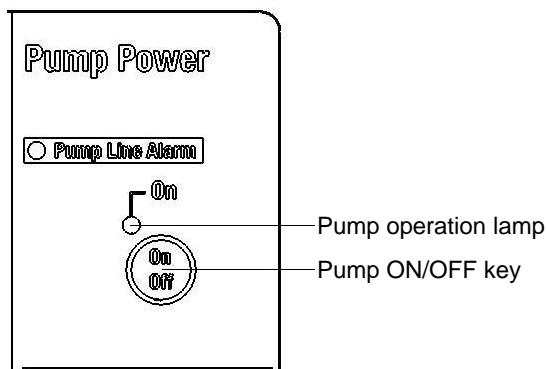


- 1) Pour and deliver 100 mL of distilled water in the empty sample container and wash the silicon tube and spray nozzle.
- 2) Adjust the interval timer adjusting knob to the "OFF" position.

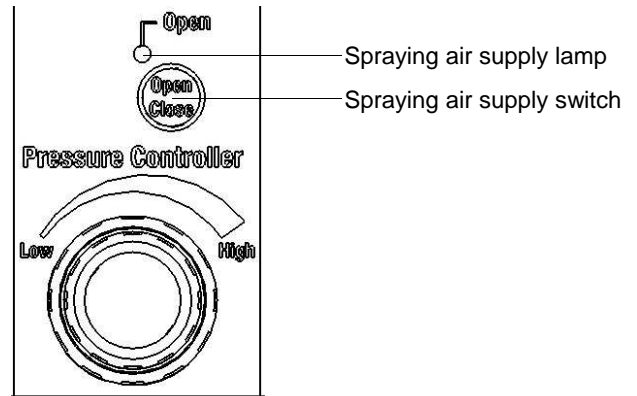
The jet cleaner operation lamp goes out and the jet cleaner function stops.



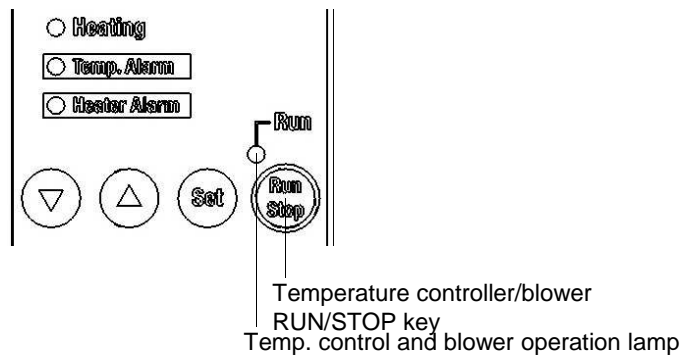
- 3) Press pump ON/OFF key. The pump operation lamp goes out and delivery stops.



4) Press spray air supply key.
The spray air supply lamp goes out and air supply stops.

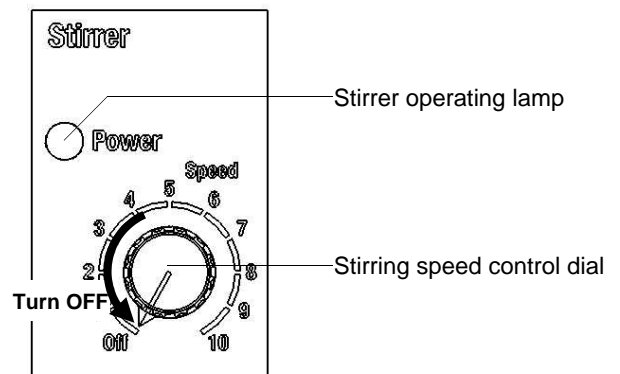


5) Press Temp. Controller/Blower RUN/STOP key.
Temp. Controller/Blower operation lamp goes out and operation of the temperature controller/blower stops.



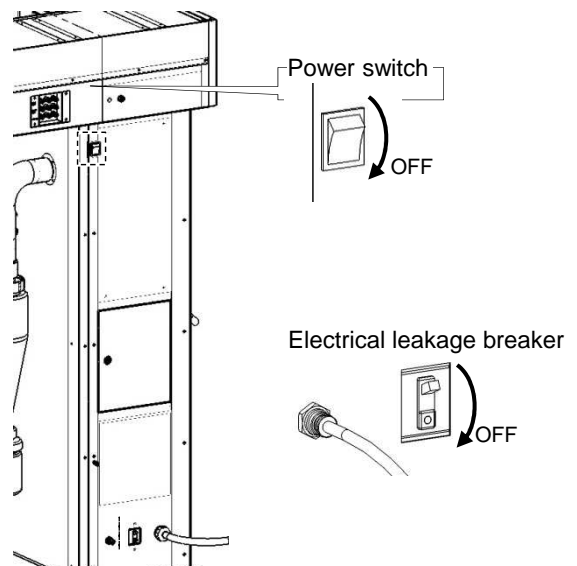
6) Adjust the agitation speed adjusting knob to the "OFF" position.

The agitator operation lamp goes out and agitation of sample stops.



7) Turn off power switch → leakage breaker in this order at the right side of the unit.

Power supply to the unit stops and all displays on the operating panel go out.



6 Troubleshooting

Contact the company where you purchased the unit or the nearby service center for any other trouble not described here.

Problem	Cause	Measures
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.
	Power switch or earth leakage breaker is out of order.	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.
	Air piping is not connected.	Connect air piping.
	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.
	The control board is broken down.	
Inlet temperature cannot be set.	The set value display lamp is not lit.	Press SET key and check that the set value display lamps illuminate.
	The value exceeds the setting range (40°-200° C).	Set a value within the range.
	The control board is broken down.	Stop operation immediately and call service.
The inlet temperature does not go up.	The set temperature is too low.	Raise the set temperature.
Press the Temp. Controller/Blower RUN/STOP key but the temperature controller/blower does not start operation. (or do not stop)	The key is not pressed and held for more than 1 sec.	Press and hold the key for more than 1 sec.
	The control board is broken down.	Stop operation immediately and call service.
The dry air volume (blower air volume) is not adjustable.	The blower does not start operating.	Press and hold Temp. Controller/Blower RUN/STOP key (for 1 sec).
	You intend to enter an air volume exceeding the set air volume range (0.2~0.75 m ³ /min).	Adjust to an air volume within the set air volume range.
	The inlet filter and outlet filter are clogged.	Clean and replace filters.
	The control board is broken down.	Stop operation immediately and call service.
Sample cannot be delivered. Flow rate of sample pump cannot be controlled.	The pump operation lamp is not lit.	Press the Pump ON/OFF key and check that the pump operation lamp illuminates.
	The tube is not correctly set on the sample delivery pump.	Set the tube correctly.
	Sample is not placed in the sample container.	Place sample in the sample container.
	Lock lever for fixing flow rate is turned to LOCK position.	Release LOCK of flow rate lock lever.
	The pump motor is broken down.	Stop operation immediately and call service.
	The control board is broken down.	
Sample cannot be stirred. The agitation speed is not adjustable.	Stirrer is not placed in the sample container.	Place a stirrer.
	Sample viscosity is too high.	Agitate with upper agitator (option).
	Agitator motor is broken down.	Stop operation immediately and call service.
Spray condition from the spray nozzle gets worse.	Solids adhere to the tip of spray nozzle.	Press the jet cleaner manual operation key.
		Press down the needle knob by two to three degrees.
		Clean the nozzle tip from the nozzle cleaning port of the evaporating tube.
	Spray air leaks from the gasket of spray nozzle.	Replace gasket.

Problem	Cause	Measures
The leakage breaker actuates during operation and power is turned off.	Excess current. Or electric leakage occurred due to insulation deterioration etc. of electric parts.	Stop operation immediately and call service.
The overheating protector works during operation and the heater is turned off. (Overheating protector operation lamp illuminates)	Temperature of the heater abnormally went up due to a decrease in the dry air volume.	Rotate the spray air volume adjusting knob and increase the air supply volume.
		Clean and replace filters.
The blower stops during operation. (The dry air volume became zero (0))	Excess current flows into the blower due to blockage, suction of rubbish, etc. of outdoor air inlet at the back side of the unit,	Remove what blocks the outdoor air inlet port.
		Clean or replace the outlet filter.
The outlet temperature display blinks and the warning buzzer sounds at intervals of 1 sec. (Operation continues)	The outlet temperature exceeded 100°C due to a decrease in the sample delivery volume and deteriorated spray condition.	Increase the sample delivery volume. Press down the needle knob by two to three degrees. Clean the nozzle tip from the nozzle cleaning port of the evaporating tube.
The dry air volume alarm lamp blinks and the warning buzzer sound at intervals of 1 sec. (Operation continues)	The dry air volume decreased to <0.1 m ³ /min due to clogging etc. of inlet filter and outlet filter.	Adjust the dry air volume to increase air volume.
The spray pressure display blinks and the warning buzzer sounds at intervals of 1 sec. (Operation continues)	The spray pressure is too low. (10 kPa or less)	Increase the spray pressure to 20 kPa or more.
The delivery pump stops, the delivery alarm lamp blinks and the warning buzzer sounds at intervals of 1 sec.	Pressure in the delivery line went up due to clogging etc. of the spray nozzle.	Press down the needle knob by two to three degrees. Clean the nozzle tip from the nozzle cleaning port of the evaporating tube.
The warning buzzer sounded for 30 sec and the alarm lamp illuminated. (All but agitation stopped)		
①The temperature alarm lamp illuminates	The inlet temperature kept 10°C higher than the set value for more than 3 min due to failure of heater control.	Stop operation immediately and call service.
(2) Temperature display displays [_ _ _] or [---]	The connector of outlet temperature sensor came off. Temperature was no longer measurable due to disconnection of the temperature sensor.	Connect the outlet temperature sensor to the connector. If this is not cured, immediately stop operation and contact the company where you purchased the unit or the nearby service center.
③Outlet temperature display blinks	Sample ran out.	Refill with sample.
	The outlet temperature kept rising to >120°C. The condition of outlet temperature above 100°C continued for more than 5 min due to spray inability.	Disassemble and clean the spray nozzle.
④The dry air volume alarm lamp illuminates	Condition of the dry air volume below 0.1 m ³ /min continued for more than 30 sec due to clogging etc. of inlet filter and outlet filter.	Clean and replace filters.
⑤The heater alarm lamp illuminates	The heater is disconnected.	Stop operation immediately and call service.
⑥The inlet temperature display displays "SSr"	SSR is broken down.	
⑦The delivery line alarm lamp illuminates	Condition of high pressure in the delivery line continued for more than 1 min due to clogging etc. of the silicon tube connecting the pressure sensor to the spray nozzle.	Disassemble and clean the spray nozzle. Replace the silicon tube.
⑧The spray pressure display displays "0" or "30" or more.	The compressor ceases to function.	Start up the compressor and supply spray air.
	The air tube came off.	Connect air piping.
	The air tube is disconnected. It is collapsed.	Replace air tube.
	The spray pressure adjuster is broken down.	Stop operation immediately and call service.

7 Maintenance and Check-up

7-1 Cleaning and care of product

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

Use proper cleaning material and method.

When cleaning or taking care of the product, do not water directly inside the housing case or never use any cleanser (polishing powder), thinner, oil, kerosene, acid and similar things. Electrical shock or damage to the product may occur.

Caution

Clean or care the unit after it is cooled enough.

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

Caution

Handle glass wares carefully.

When attaching and detaching the glass part, please pay attention to handling so that it will not be damaged during cleaning.

Turn off power and the leakage breaker and further turn off the breaker on the distribution board before cleaning or taking care of the product.

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.

After the end of operation, disassemble and wash glass parts and spray nozzle as soon as possible.

7-2 Cleaning and changing filter

Warning

Turn off the power before cleaning or changing filter.

Be sure to turn off the power switch and earth leakage breaker before cleaning / replacing the filter. Doing so while power is supplied may cause electrical shock.

Caution

Clean or care the unit after it is cooled enough.

While the unit is hot, cleaning or replacement of a filter may cause burn.

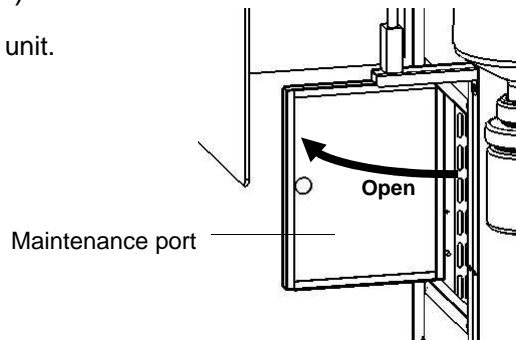
Always keep the filter clean in order to maintain performance.

*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.

If dirt does not fall even after cleaning, replace with a new filter.

7-2-1 Cleaning or changing suction (inlet) filter

1) Open the maintenance port on the left side of unit.



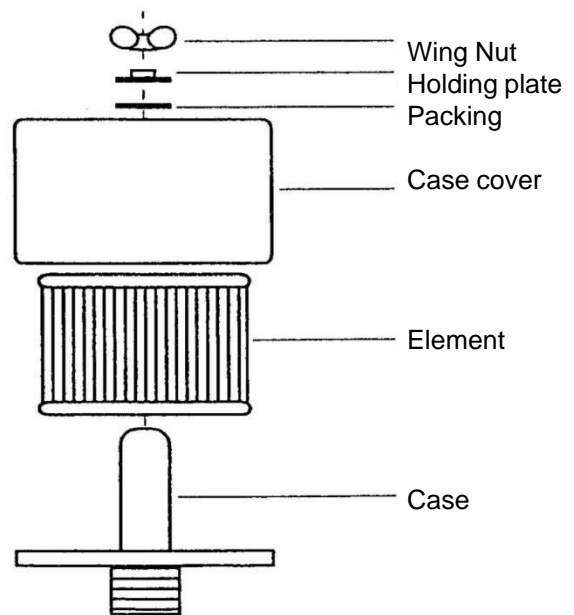
2) Remove the nut, the holder and the packing.

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,
(It cannot be washed with detergent))
Replace with new one.

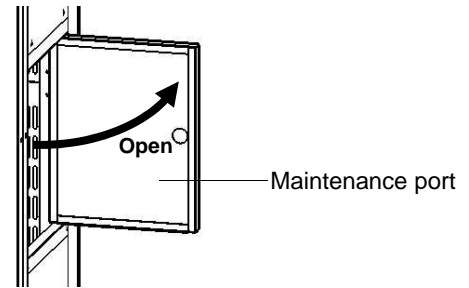
Code No.	Part name	Remarks
179950	Suction filter	



5) Assemble parts by reversing procedure.

7-2-2 Cleaning or changing suction (outlet) filter

1) Open the maintenance port on the right side of unit.



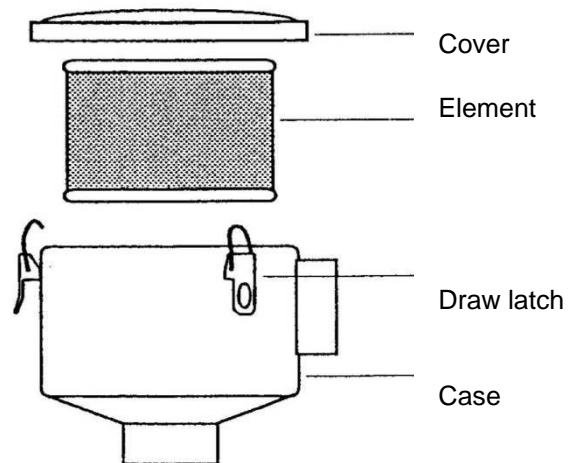
2) Release three lock holders.

3) Detach the case cover, and take out the element.

4) Tap the element, and spray air to clean it.

*If the dirt is severe, wash with a mild detergent and dry thoroughly.

*If stains are not removed or the mesh is broken, replace with a new element.



Code No.	Part name	Remarks
179960	Air filter	

5) Assemble parts by reversing procedure.

7-3 Cleaning evaporating tube and cyclone

⚠ Caution

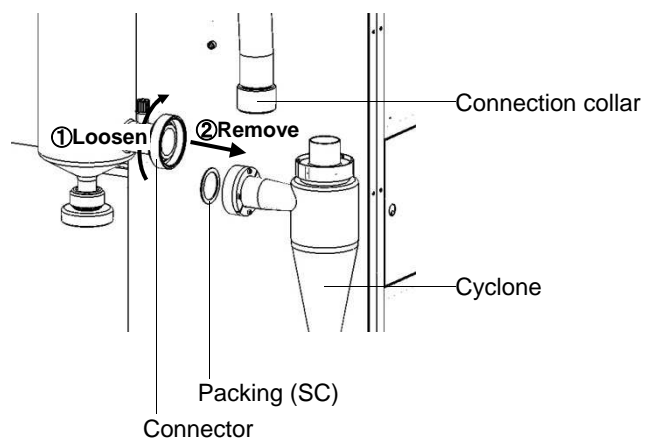
Handle glass wares carefully.

When attaching and detaching the glass part, please pay attention to handling so that it will not be damaged during cleaning.

1) Lift up the connecting collar and remove it from the cyclone.

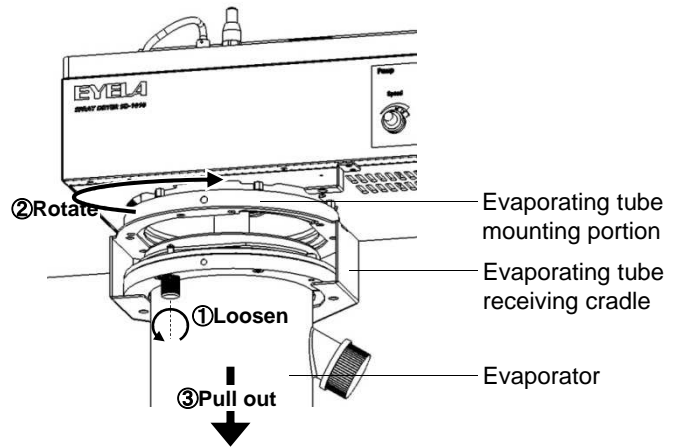
2) Loosen the connector to remove the cyclone from the evaporating tube.

*When removing it, packing (SC) may come off: be careful about the loss.



2) Remove the evaporating tube from the main unit evaporating tube installation part.

*Remove the outlet temperature sensor beforehand from the sensor installation port on the branched tube of the evaporating tube.

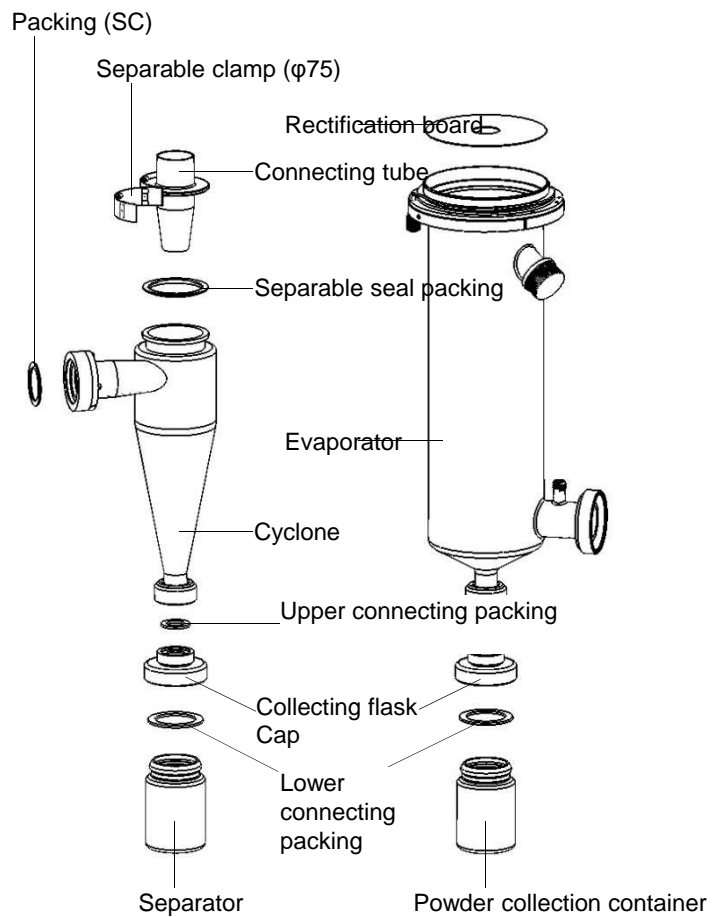


3) Disassemble and wash respective parts as illustrated in the right figure.

*Use a neutral detergent to wash glass parts.

If they are dirty, immerse them in a neutral detergent-diluted solution for about half a day before washing them.

Code No.	Part name	Remarks
180370	Rectification board	
180000	Evaporator	
147840	Upper connection packing	
146760	Collecting flask cap	
199050	Lower connecting packing	
146750	Separator, powder collection container	
116510	Separable clamp (φ75)	
180020	Connecting tube	
116530	Separable seal packing	
180010	Cyclone	
180190	Packing (SC)	



4) Assemble parts by reversing procedure.

7-4 Cleaning spray nozzle

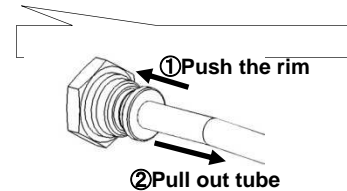
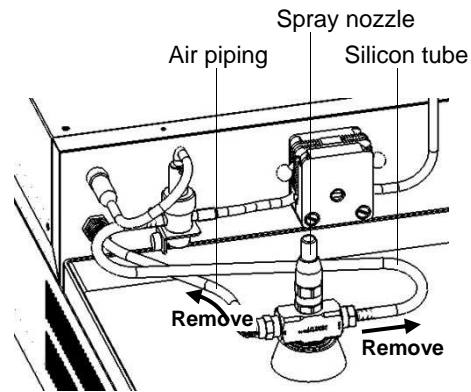
Caution

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. Also, if you leave it sticking out and hit it, the tip will bend and break, so please work with care.

- 1) Please remove the silicon tube and air piping from the spray nozzle.

*When removing the air piping tube, pull out the tube while pushing the rim of the connector.



- 2) Pull out the spray nozzle upward from the main unit

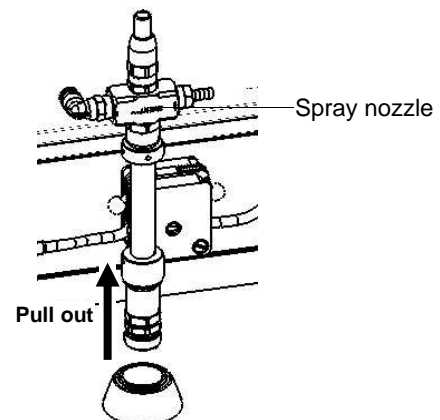
- 3) Disassemble the spray nozzle and wash respective parts in an ultrasonic cleaner etc.

*Disassemble with reference to "Spray Nozzle Disassembly Diagram on page 34."

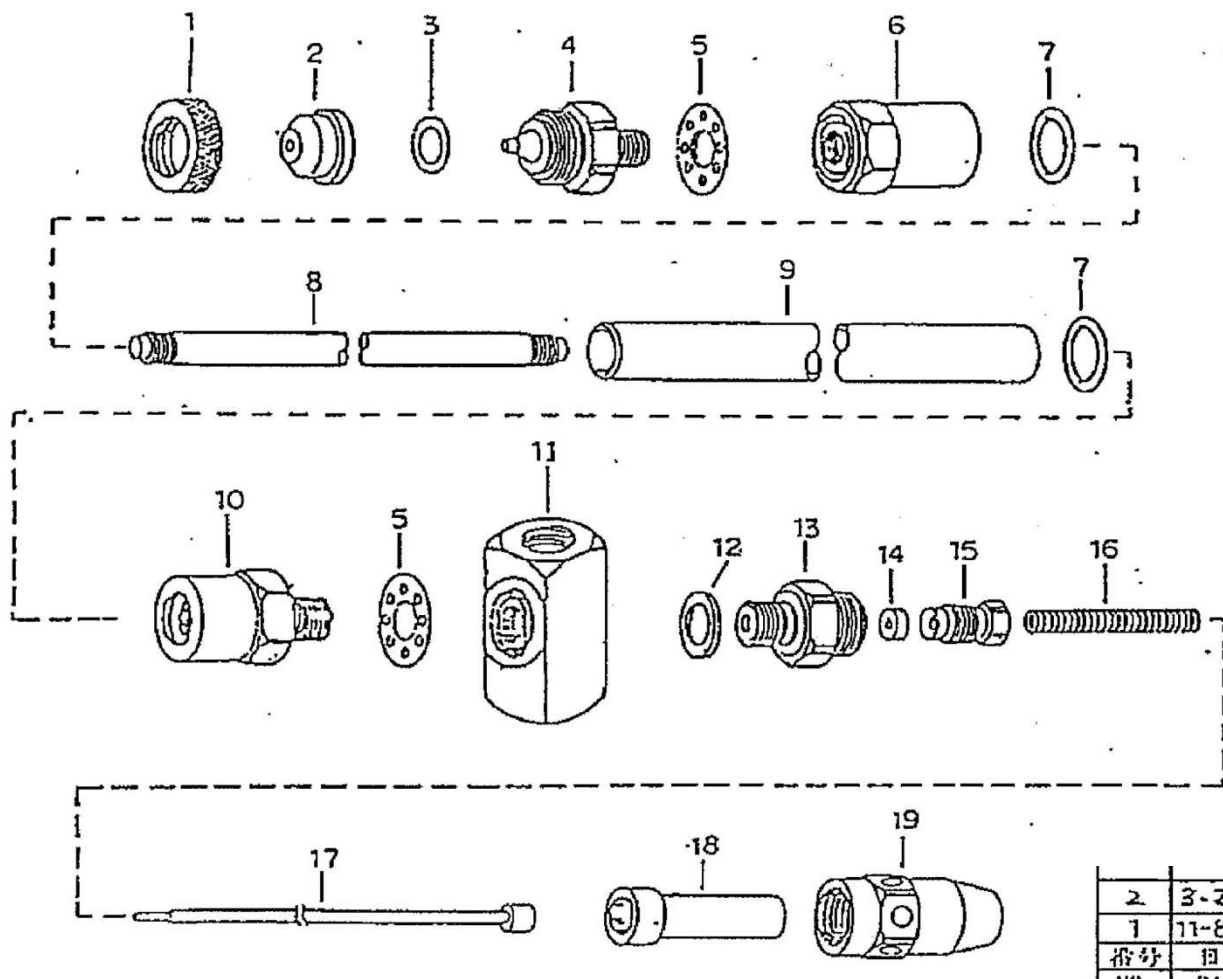
*Clean the inside wall of the inside tube, the gas cap, and the liquid cap especially carefully.

*The inner wall of the inside tube should be washed with running water using a thin brush etc.

*Replace gasket and O ring on a regular basis.



[Spray Nozzle Disassembly Diagram]

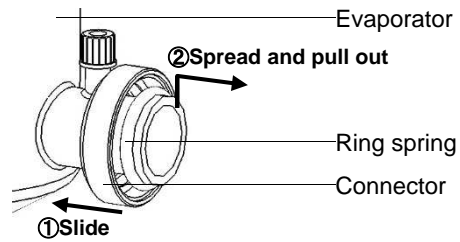


No.	Description	Model	Remarks	How to remove
1	Retainer ring	CP1158-SS		Loosen the screw
2	Gas cap	PA-70-SS	Hole diameter $\phi 1.75$	
3	Gasket for air cap	CP3205-TEF		
4	Liquid cap	YPF-2850-SS	Hole diameter $\phi 0.71$	Use a wrench (opposite side distance 21 mm) etc.
5	Gasket for field cap	CP3612-TEF		
6	Needle adapter	CP6137-SS		Use a wrench (opposite side distance 21 mm) etc.
7	O ring	CP7717-11-BU		
8	Inside tube	-		
9	Outside tube	-		
10	Body adapter	-		Use a wrench (opposite side distance 21 mm) etc.
11	Body	-		
12	Gasket for spray nozzle	CP10439-TEF		
13	Packing box	-		Use a wrench (opposite side distance 17mm) etc.
14		-		
15	Packing screw	-		No.13 to 19 will come off collectively.
16	Spring	-		
17	Needle for liquid cap	Y14293-6-1/28-SS	For hole diameter $\phi 0.71$	
18	Plunger	-		
19	Retainer	-		

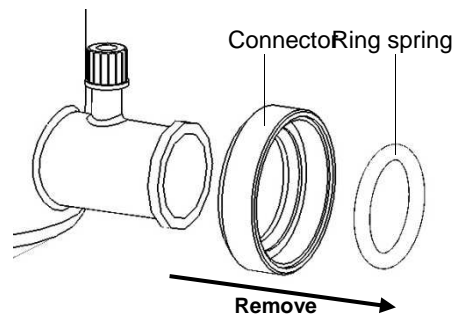
7-5 Replacing the evaporating tube and cyclone accessories

7-5-1 Replacing parts at the connection

- 1) Slide the connector of evaporating tube backward, remove the ring spring from the evaporating tube while spreading it.



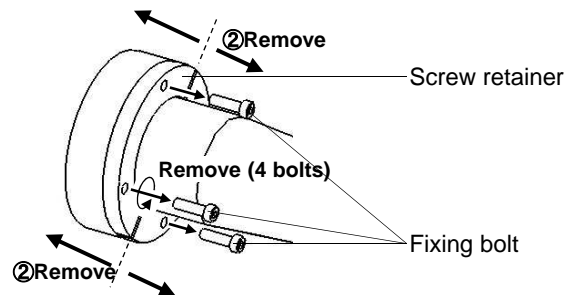
- 2) Remove the connector from the evaporating tube.



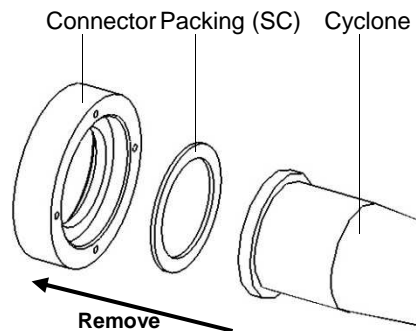
- 3) Remove four bolts that fix the connector of cyclone and remove screw retainers.

*Remove fixing bolts using a hex bar wrench (opposite side distance 3 mm).

(The hex bar wrench is not supplied)



- 4) Remove the connector of cyclone and packing (SC).

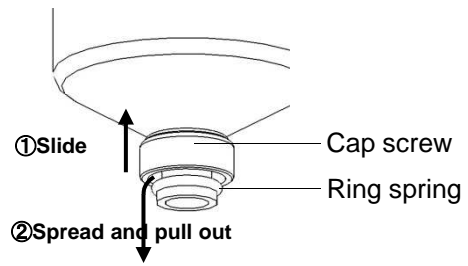


- 5) After replacing parts, assemble them according to the reverse sequence to disassembly.

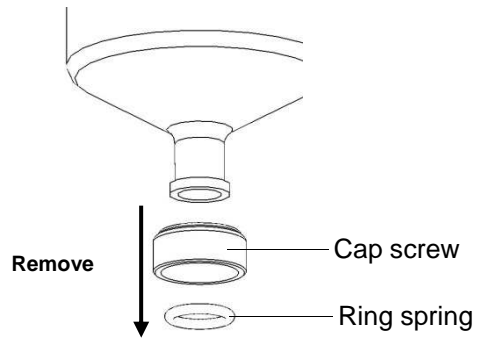
Code No.	Part name	Remarks
246810	Connecting screw/CAP set	Evaporator Cyclone connector
147770	Ring spring	IDφ50
246820	Screw retainer	
180190	Packing (SC)	

7-5-2 Replacing collection bottle fixing parts

1) Slide the cap screw upward and remove it from the glass part while spreading the ring spring.



2) Remove the cap screw from the glass part.



3) After replacing parts, assemble them according to the reverse sequence to disassembly.

Code No.	Part name	Remarks
147820	Cap screw	
147800	Ring spring	ID ϕ 30

8 Product disposition

To dispose of the product or parts, dispose of them in accordance with the disposition method.

Major components and disposition method

Component	Standard/Specification	Weight	Outer dimensions (WxDxH)	Disposal
Main unit	SD-1010	Approx. 110 kg	700mm×620mm×1500mm	Request the waste collecting vendor to dispose.

Major component	Major component	Major materials
Main unit	Housing	Stainless steel, steel plate, aluminum, chloroprene rubber
	Protection cover	PVC
	Pipes/tubes	Glass cloth, MC nylon, PVC
	Delivery pump	PPS, nylon, stainless steel, POM, silicon
	Twin-fluid nozzle	Stainless steel
	Stirrer	Samarium-cobalt magnet, steel plate
	Heater	Stainless steel
	Electric parts	Glass epoxy, rubber, ABS, polypropylene, polyester resin, Silicon, PVC, nylon, steel material, stainless steel, aluminum, nickel, Non-leaded solder, copper,
	Evaporator	Glass, stainless steel, phenol resin, silicon
	Cyclone	Glass, stainless steel, phenol resin, PTFE, silicon
Separator, Powder collection container	Glass, MC nylon, silicon	

*Please separate packing materials for each material and dispose of them.

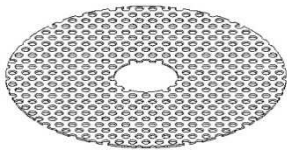
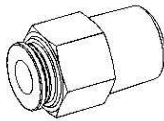
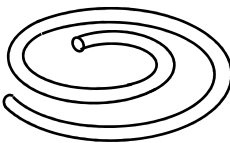
9	Post-sale service
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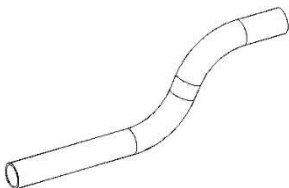
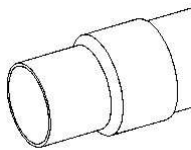
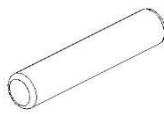
1 When the unit is not working right, first check whether it is broken down with reference to the page of Troubleshooting.

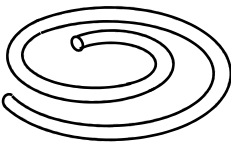
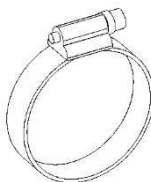
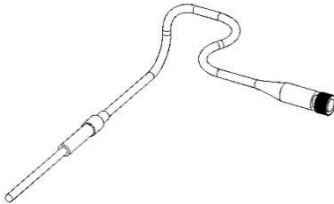
2 If it is still not working right, ask the company where you purchased it or the nearby service center for repair. Please contact your nearest service center for repair.


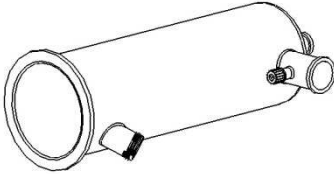
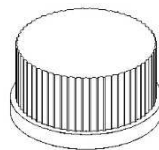
10 List of Disposable/Replacing Parts/Optional Products

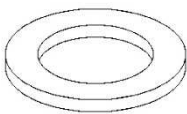
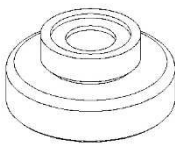
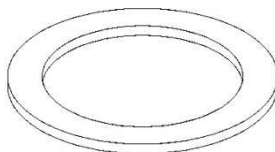
10-1 Disposable/replacing parts


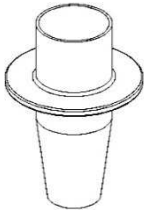
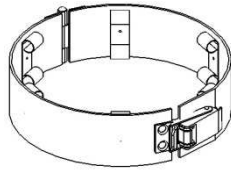
Rectification board 				Air piping connector 				Air piping tube 			
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
180370			1	180360			1	180350	φ 6		1

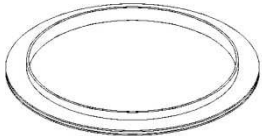
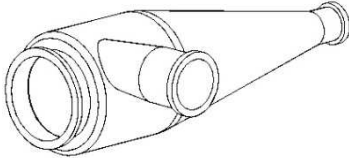
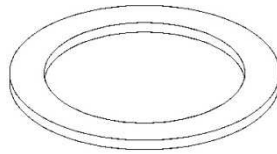
Exhaust hose 				Cuff for duct 				Stirring bar 			
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
179980	Nominal 50 mm		2.5m	180600	φ 50		1	123840	TSB-40		5
179990	Nominal 50 mm		10m								

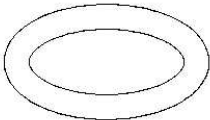
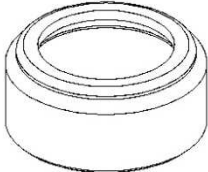
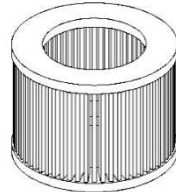
Silicon tube 				Stainless steel diamond clamp 				Sensor for outlet temperature 			
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
125510	φ 3.15 x φ 5.2	Silicon	5m	180590			1	180030			1
125530	φ 3.7 x φ 6.1	Silicon	5m								

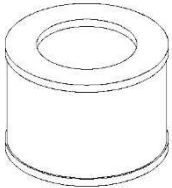
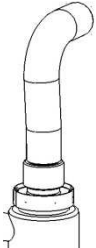
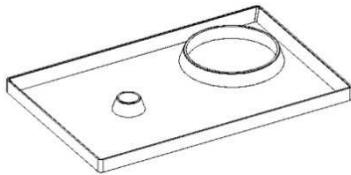
Cable for recorder 				Evaporator 				Evaporating tube cap 			
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
179970			1	180000			1	180200			1

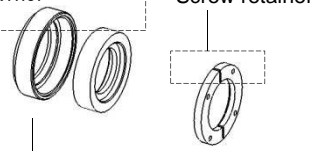
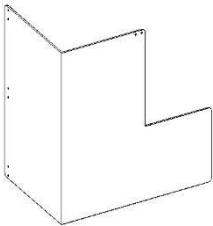
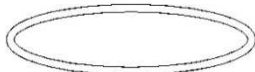
Upper connection packing 				Collecting flask cap 				Lower connecting packing 			
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
147840			2	146760			1	199050			1

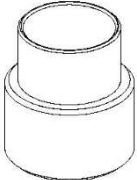

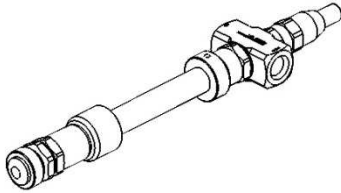
Separator, powder collection container				Connecting tube				Separable clamp (φ 75)			
											
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
146750	600mL		1	180020			1	116510			1
147940	1.2L		1								

Separable seal packing				Cyclone				Packing (SC)			
											
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
116530			1	180010			1	180190			2

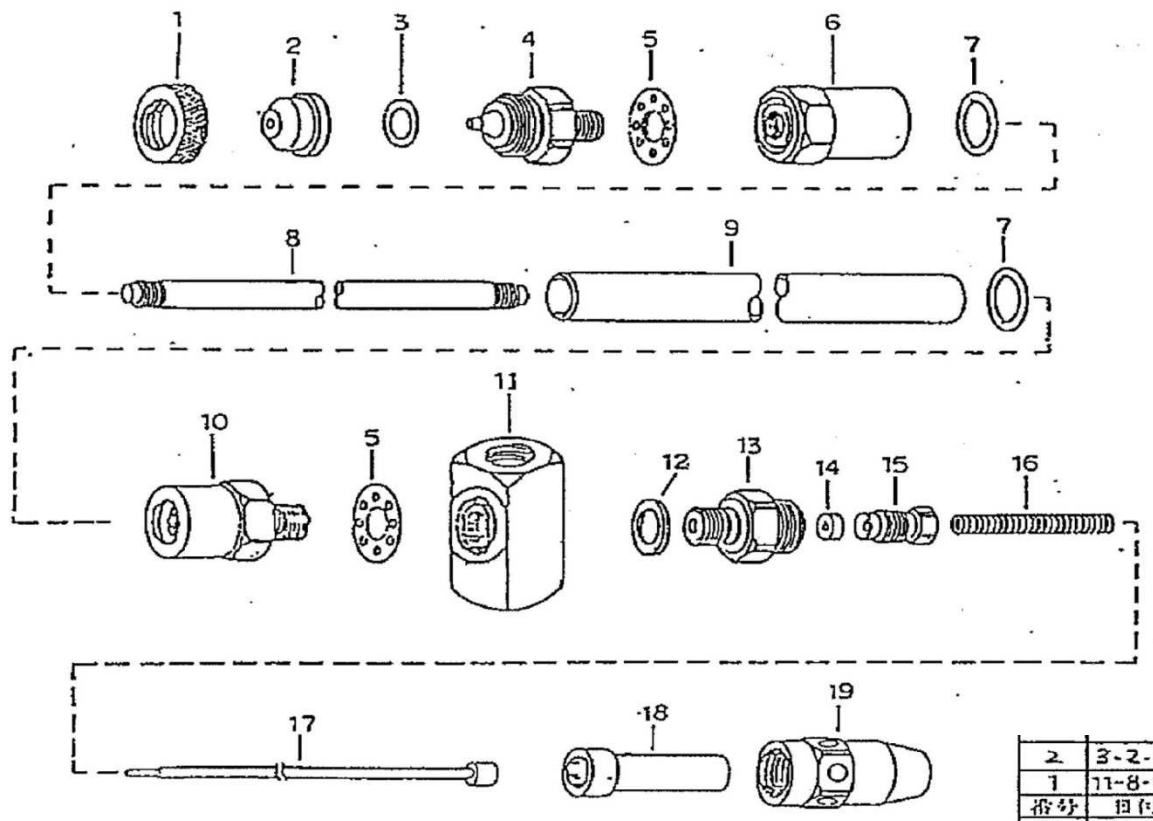
Ring spring				Cap screw				Suction filter			
											
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
147770	ID φ 50		1	147820			1	179950			1
147800	ID φ 30		1								

Air filter				Piping duct				Rubber tray			
				 *Hose only							
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
179960			1	147880			5m	180610			1

Connecting screw/CAP set Screw retainer				Protection cover				O ring containing Si oil			
											
Code No.	Product name	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
246810	Connecting screw/CAP set		1	180620			1	180210	G175		1
246820	Screw retainer		1								




Connection collar				O ring for connection collar				Spray nozzle set			
											
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
275500			1	275510			2	180380			1


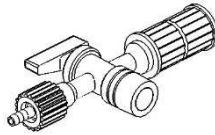
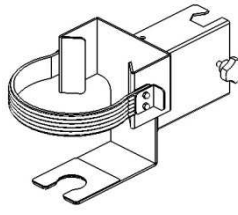
*Disposable/replacing parts of spray nozzle

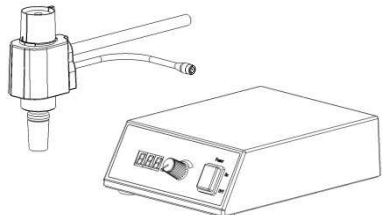
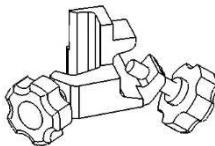
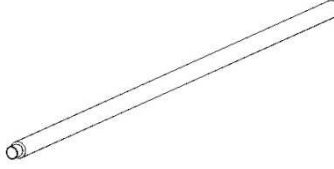


No.	Code No.	Description	Model	Qty.
1	180650	Retainer ring	CP1158-SS	1
2	120750	Gas cap hole diameter ϕ 1.75	PA-70-SS	1
	120740	Gas cap hole diameter ϕ 1.6	PA-64-SS	
3	180240	Gasket for air cap	CP3205-TEF	2
4	120730	Liquid cap hole diameter ϕ 0.71	PF-2850-SS	1
	120720	Liquid cap hole diameter ϕ 0.51	PF-2050-SS	
	120710	Liquid cap hole diameter ϕ 0.41	PF-1650-SS	
5	147851	Gasket for field cap	CP3612-TEF	2
6	180660	Needle adapter	CP6137-SS	1
7	201400	O ring	CP7717-11-BU	1
12	147852	Gasket for spray nozzle	CP10439-TEF	1
17	180270	Needle for liquid cap for hole diameter ϕ 0.71	Y14293-6-1/28-SS	1
	180260	Needle for liquid cap for needle hole diameter ϕ 0.51	Y14293-6-1/20-SS	
	180250	Needle for liquid cap for needle hole diameter ϕ 0.41	Y14293-6-1/16-SS	

10-2 Optional products

Hot plate unit				Outside temperature sensor				Thermometer holder			
											
Code No.	Model	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
275300	HTP-1000		1	265680			1	114030			2

Container with drain port				Two-way cock set				Holder for container with drain port			
											
Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
275210			1	275220			1	275230			1

Small agitator				ZC clamp				Agitator installation pole			
											
Code No.	Model	Material	Qty.	Code No.	Standards	Material	Qty.	Code No.	Standards	Material	Qty.
260530	SPZ-2000		1	124560			1	275200			1