Organic Solvent Washing Unit
GWS410

First Edition

- Thank you for purchasing Organic Solvent Washing Unit GWS410 of Yamato Scientific Chongqing Co., Ltd.
- To use this unit properly, read this Instruction Manual thoroughly before using this unit. Keep this instruction manual around this unit for referring at any time.
- This unit is used matching with GAS410, please refer to its Instruction Manual for relevant explanation.

⚠ **Warning** Carefully read and thoroughly understand the important warning items described in this manual before using this unit.

Yamato Scientific Co.,Ltd.

Contents

1. Cautions in Using with Safety

Explanation

MEANING OF ILLUSTRATED SYMBOLS

Illustrated Symbols

Various symbols are used in this safety manual in order to use the unit without danger of injury and damage of the unit. A list of problems caused by ignoring the warnings and improper handling is divided as shown below.Be sure that you understand the warnings and cautions in this manual before operating the unit.

⚠ WARNING! If the warning is ignored, there is the danger of a problem that may cause a serious accident or even fatality.

⚠ CAUTION! If the caution is ignored, there is the danger of a problem that may cause injury/damage to property or the unit itself.

Meaning of Symbols

This symbol indicates items that urge the warning (including the caution).
A detailed warning message is shown adjacent to the symbol.

This symbol indicates items that are strictly prohibited.
A detailed message is shown adjacent to the symbol with specific actions not to perform.

This symbol indicates items that should be always performed.
A detailed message with instructions is shown adjacent to the symbol.

1. Cautions in Using with Safety

Table of Illustrated Symbols

Warning


Warning,
generally


Warning,
high voltage


Warning,
high temperature


Warning,
drive train


Warning,
explosive

Caution


Caution,
generally


Caution,
electrical shock


Caution,
scald


Caution,
no road heating


Caution,
not to drench

Caution,
water only


Caution,
deadly poison

Prohibit


Prohibit,
generally


Prohibit,
inflammable


Prohibit,
to disassemble


Prohibit,
to touch

Compulsion


Compulsion,
generally


Compulsion,
connect to the
grounding
terminal

Compulsion,
install on a flat
surface


Compulsion,
disconnect the
power plug


Compulsion,
periodical
inspection

1. Cautions in Using with Safety

Fundamental Matters of "WARNING!" and "CAUTION!"

⚠ Warning

Do not use this unit in an area where there is flammable or explosive gas

Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. Always try to assure sufficient ventilation in the room and take extreme care so that the atmospHere will not reach the explosive limit concentration. See “13. List of Dangerous Substances” on P.42 for explosive or flammable gases.

Always ground this unit

Always ground this unit on the power equipment side in order to avoid electrical shock due to a power surge.

Apply the power source of rated power

Be sure to apply the power source of rated power. Applying non-rated voltage or non-rated power supply may cause the fire or electric shock.

Prohibition of use for error

If a smoke or abnormal smell may be occurred, turn off the power switch of the main unit immediately, and turn off the original power source, and finally contact to either the dealer you purchased this unit or our sales office. Leaving the failure may cause the fire or electric shock. Since the repairing of this unit is dangerous for non-specified service person, never repair the unit by the customer himself.

Do not use the power cord if it is bundled or tangled

Do not use the power cord if it is bundled or tangled. If it is used in this manner, it can overheat and fire may be caused.

Do not damage power cord

Do not damage power cord by bending, pulling, or twisting forcedly. It may cause the fire or electric shock. Besides, operating the unit with the something put on the cord may cause overheat, and result in fire.

Substances that cannot be used

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur. (Refer to P.42 "13. List of Dangerous Substances".)

Do not disassemble or modify this unit

Do not disassemble or modify this unit. Fire or electric shock or failure may be caused.

1. Cautions in Using with Safety

Fundamental Matters of "WARNING!" and "CAUTION!"

⚠ Caution

During a thunder storm

During a thunderstorm, turn off the power key immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

After power outage

During operation, if the leakage protection switch is "off" or power cut-off due to power failure, after the power is restored, it will return to the operating state before the power failure. If it is not necessary to resume operation after the power failure, please turn the power switch to the state of "OFF".

Do not perform unattended operation during activating the unit

Do not run unattended operation. It may cause unexpected accidents.

Any people other than the qualified personnel shall never attempt to operate the unit.

Take sufficient care for the control of the unit so that any people other than the qualified personnel shall never have a chance to operate the unit.

Always check the PH value and color of the cleaning solution.

Always pay attention to the PH value of the cleaning solution to keep it in a safe range. When the PH value of cleaning solution is too high or too low, the cleaning effect will be seriously affected, resulting in the volatile acid and base turning into gas and entering the outlet pipeline, which will seriously corrode the pipelines and sensors in the rear equipment GAS410.

When the water in the storage tank becomes cloudy, discontinue use immediately to prevent damage to the spray pump and nozzle. Empty the cleaning solution in the equipment and clean it with clean water. All waste liquid should be collected to the designated waste liquid storage site.

Pay attention when opening the device after connecting to GAS410.

When opening the device after connecting to GAS410, please be sure that the oxygen concentration is restored to 21%. Please do not have your face close to the opening part.

Take care for solvents you are going to use.

The unit has been designed to use ethyl alcohol

Service lives of filter element or packing may change depending on the type of solvent used. When gas leakage or other troubles occurs inside the unit, immediately replace the defective part with a new one. Check whether a solvent can be used or not in “About applicable organic solvents” in the section 5. Handling precautions.

Take care for the use of water based solvents.

When using the water based solvent, please disconnect with GAS410 and only use ADL311S or GB210A.

When water based solvent is also used in connection with GAS410, please refer to “Restrictions by the melting point” in the section 5. Handling precautions.

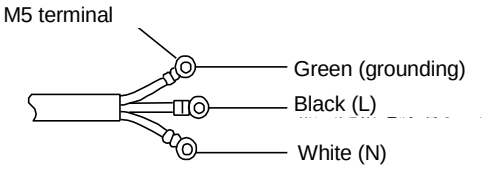
2. Before Using this unit

Requirements for Installation

⚠ Warning

1. Always ground this unit

- Be sure to connect the earth wire (the green cable of power cord) to the grounding conductor or ground terminal to prevent accidents caused by electric leakage.
- This unit uses single-pHase 220V power source (AC200V～AC240V). Please contact your local electrical contractor for power connecting work. Please according to article 19 of the electrical equipment technology standard (D grounding works under 100 Ω) to ground.
- Do not connect the earth wire to gas or water pipes. If not, fire disaster may be caused.
- Do not connect the earth wire to the ground for telepHone wire or lightning conductor. If not, fire disaster or electric shock may be caused.



- The power plug is not accessory. Please connect the ground wire correctly according to the power supply device.

2. When connecting the power cord, pay attention to the color of each core wire

When connecting the power cord, be sure to turn off the protection switch of the power supply device. The power plug is not accessory, please select the plug and terminal matching the power supply capacity according to the connected power supply device.

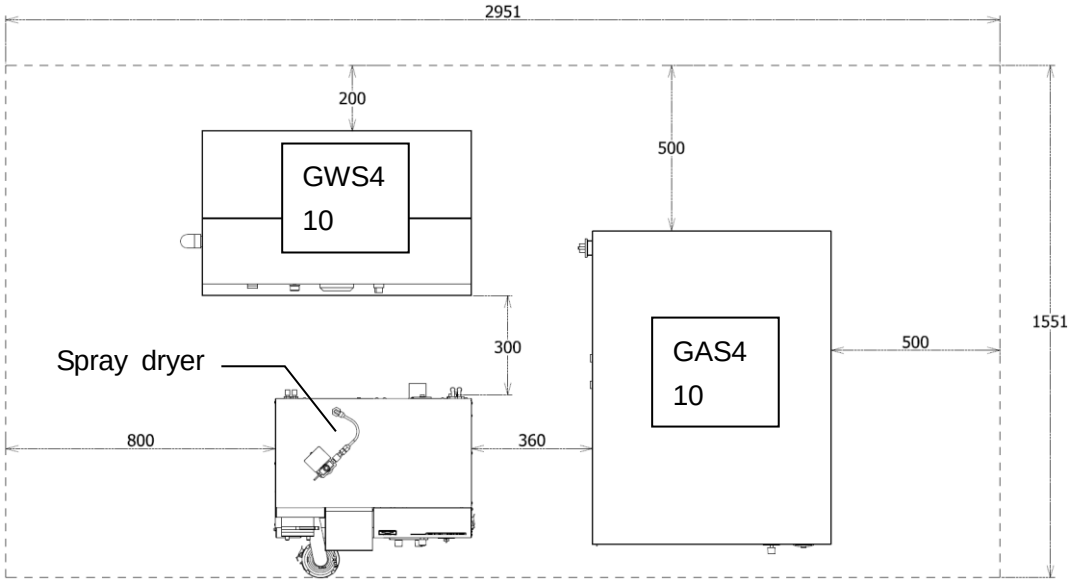
Core wire color	Indoor wiring
Black	Voltage (L)
White	Voltage (N)
Green	Grounding

3. Choose a proper place for installation

Do not install this unit in a place where:

- •Flammable gas or corrosive gas is generated
- •Ambient temperature exceeds 35℃or below 5℃
- •Ambient temperature fluctuates violently
- •There is direct sunlight
- •Rough or dirty surface
- •There is excessive humidity and dust
- •There is a constant vibration
- •There is water easily splashed

Install this unit on a stable place with the space as shown below.



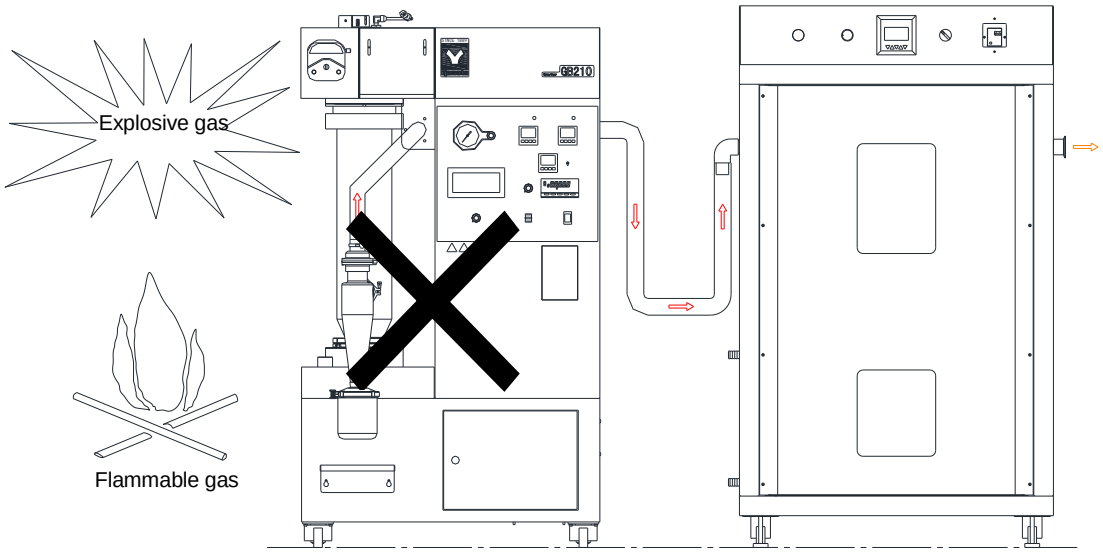
Requirements for Installation

⚠ Warning

4. Do not use this unit in an area where there is flammable or explosive gas

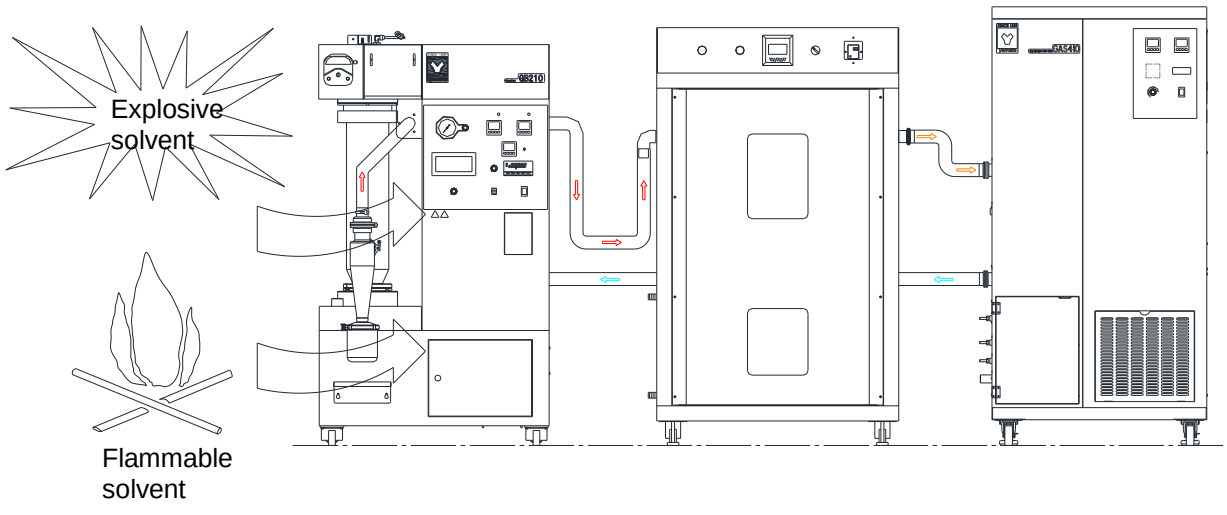
Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned ON or OFF, and fire/explosion may result.

Refer to page 43 “13. List of Dangerous Substances”.



5. Pay attention to the use of flammable or explosive solvents

Take extreme care for use of flammable or explosive solvents. Such a solvent may cause an explosion or a fire.
Check whether a solvent can be used or not in “About applicable organic solvents” in the section 5. Handling precautions.
Always monitor the oxygen concentration in the unit during operation to assure safety.



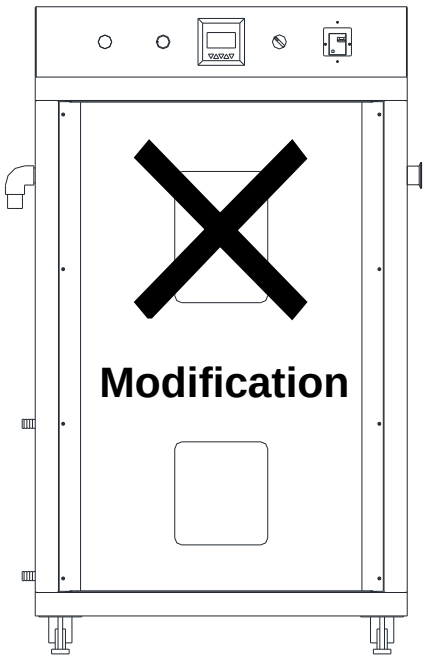
2. Before Using this unit

Requirements for Installation

⚠ Warning

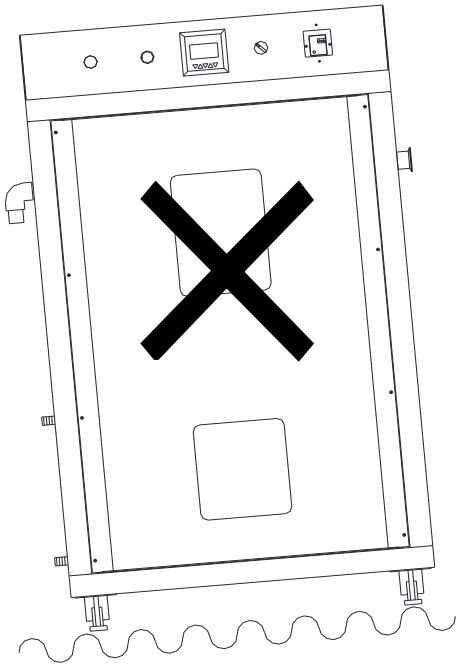
5. Do not modify

Modification of this unit is strictly prohibited. This could cause a failure.



6. Install on the horizontal surface

Set this unit to the flattest place. Setting this unit on rough or slope place could cause the vibration or noise, or cause the unexpected trouble or malfunction.



7. Choose a correct power socket

Choose a correct power socket that meets the unit's electric capacity.

Electric capacity AC220V single pHase 1A

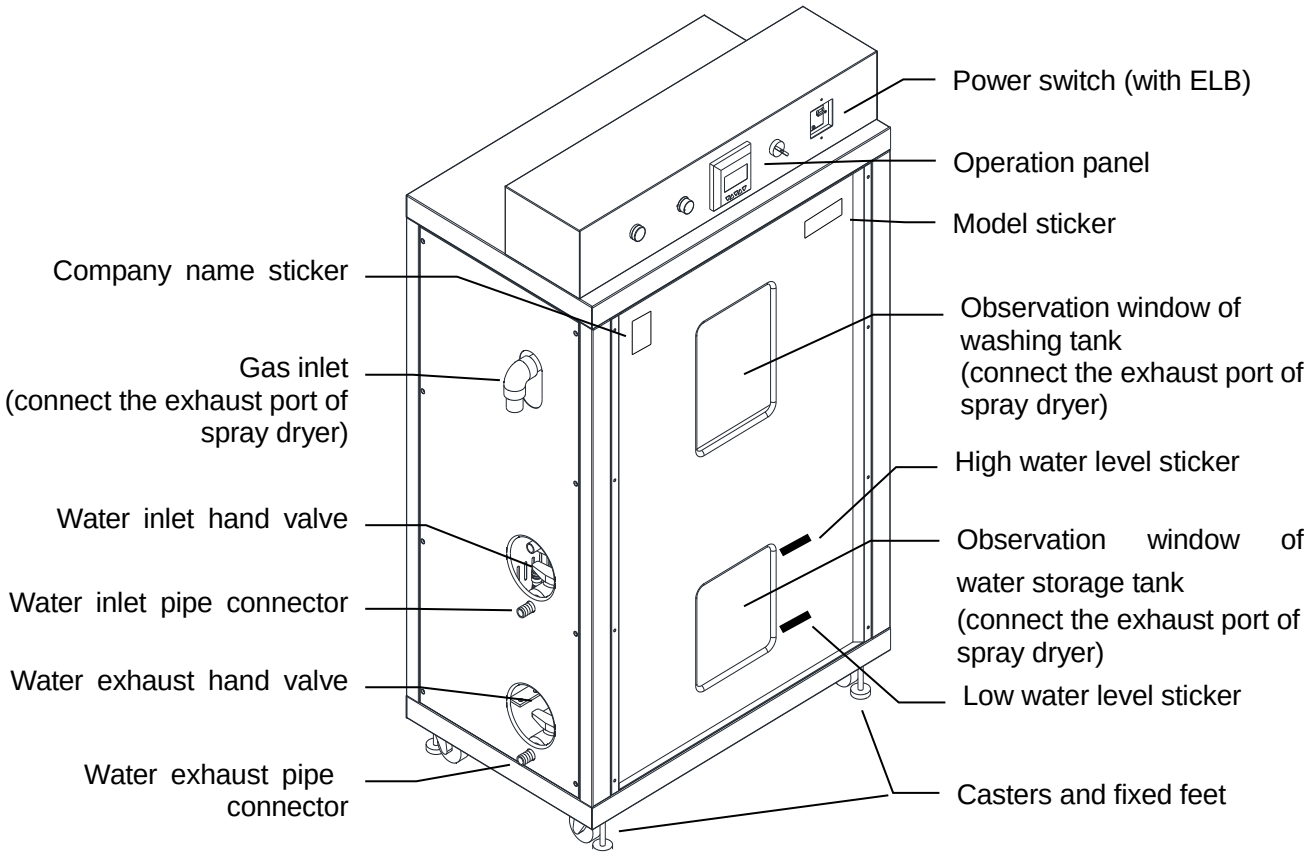
There could be the case that the unit does not run even after turning ON the power. Inspect whether the voltage of the main power is lowered than the specified value, or whether other device(s) uses the same power line of this unit. If the pHenomena might be found, change the power line of this unit to the other power line. Please consult your dealer or a local electrical contractor for the connection of devices.

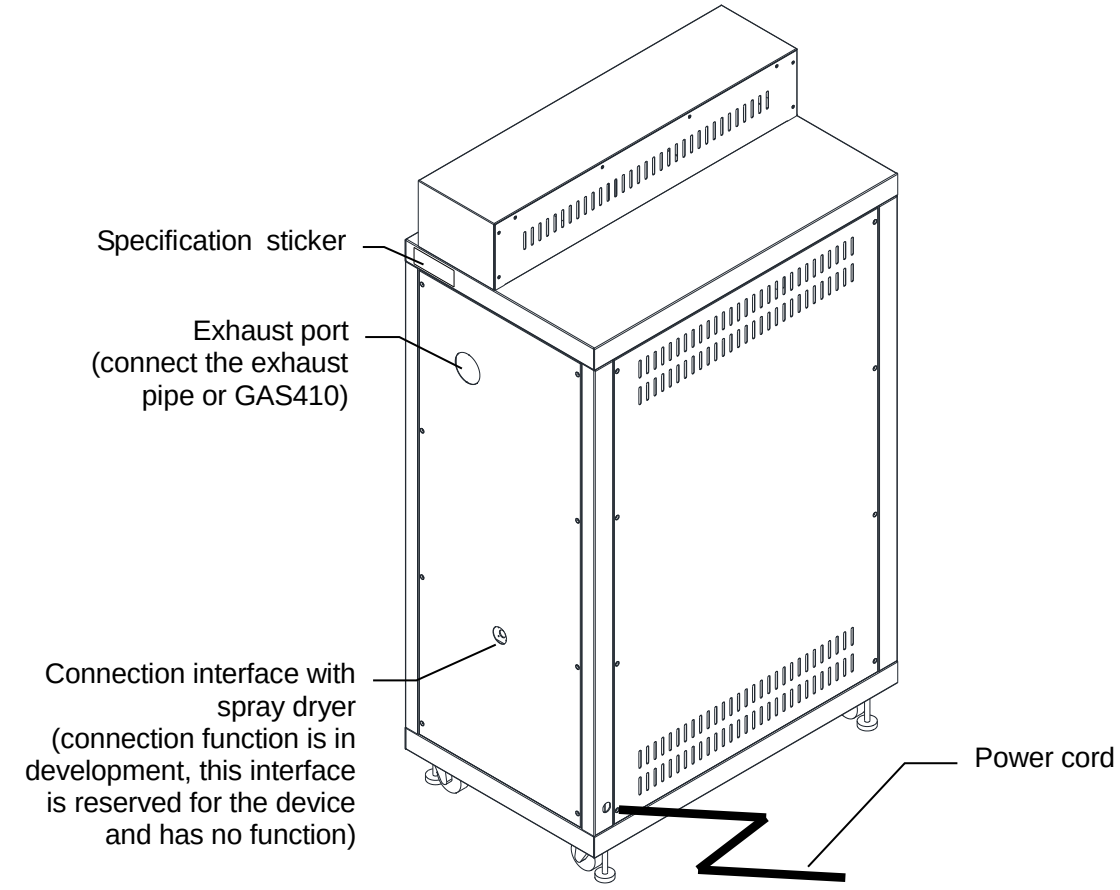
8. Handling of power cord

- Do not entangle the power cord. This will cause overheating and possibly a fire.
- Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire and electrical shock.
- Do not lay the power cord under a desk or chair, and do not allow it to be pinched in order to prevent it from being damaged and to avoid a fire or electrical shock.
- Keep the power cord away from any heating equipment such as a room heater. The cord's insulation may melt and cause a fire or electrical shock.
- If the power cord becomes damaged (wiring exposed, breakage, etc.), immediately turn off the power and shut off the main supply power. Then contact your nearest dealer for replacement of the power cord. Leaving it may cause a fire or electrical shock.
- Connect the power plug to the socket which is supplied appropriate power and voltage.

3. Description and Function of Each Part

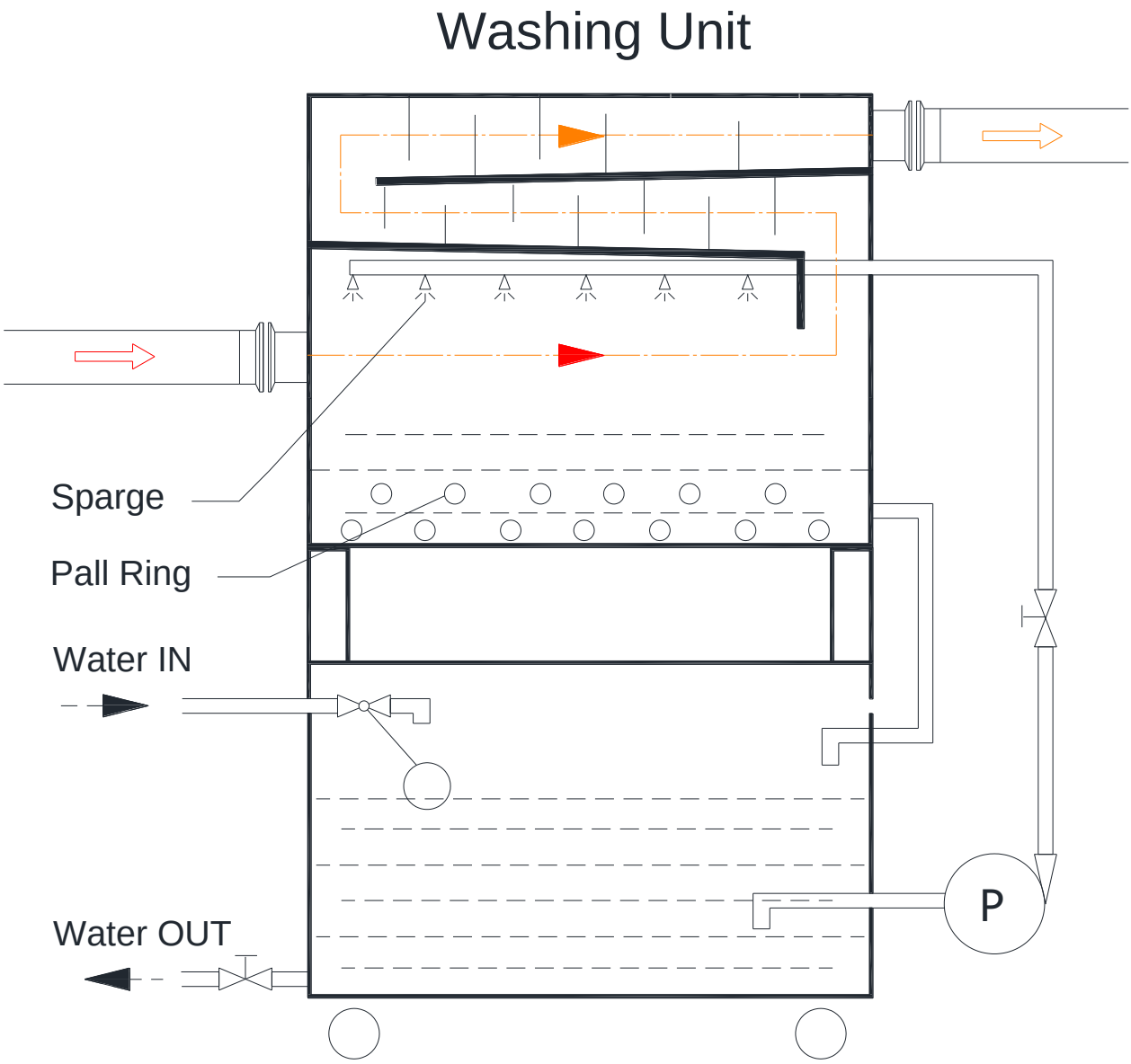
Main Unit





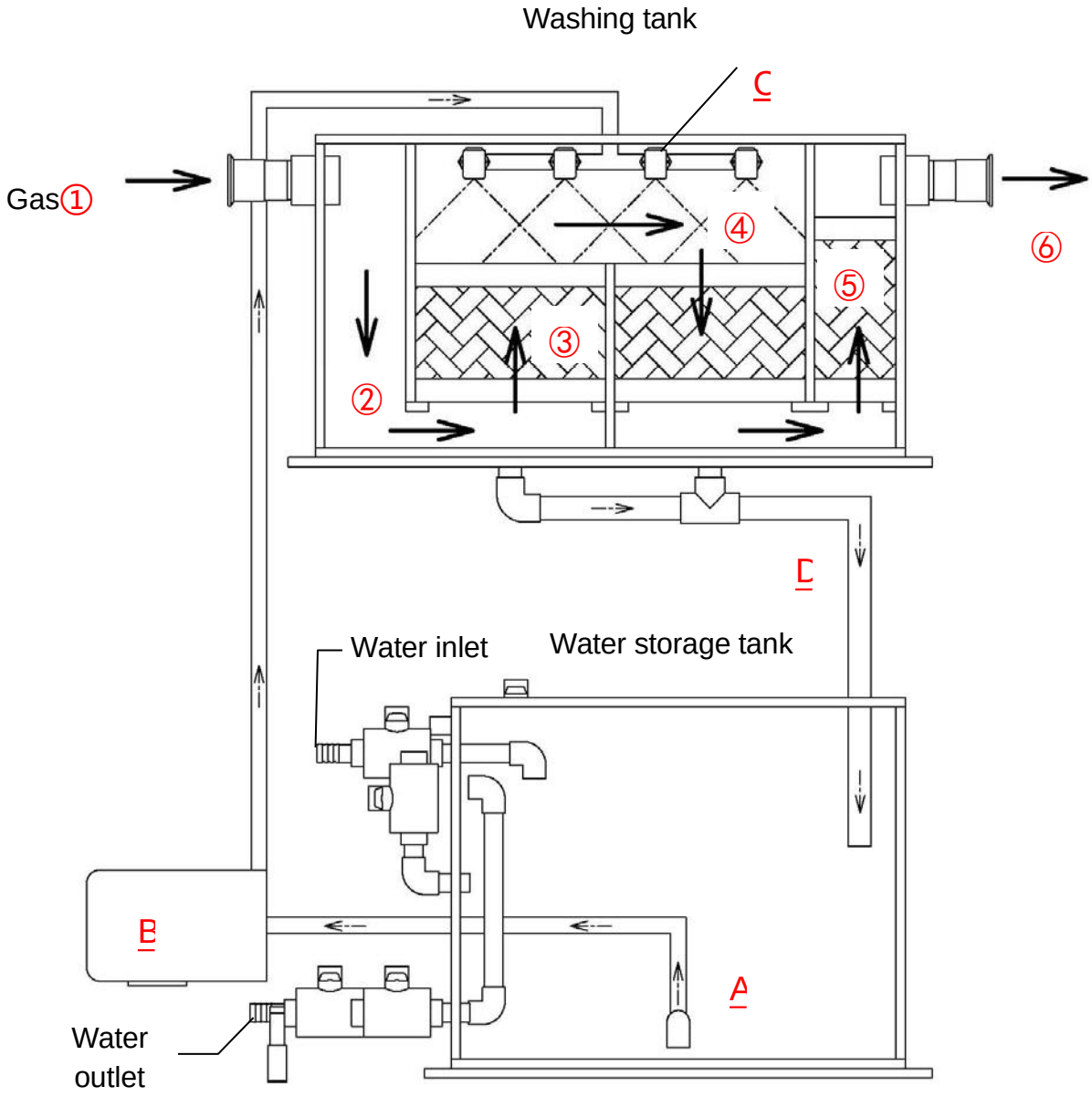
3. Description and Function of Each Part

Cleaning Schematic Diagram



3. Description and Function of Each Part

Cleaning Flow Diagram



(1) The harmful gas① from spray dryer enters into the washing tank unit.

(2) Going through ② inside the washing tank, the filling stuff③ and the cleaning solvent④ sprayed by spray nozzle, the harmful gas contacts the cleaning solvent here and the harmful substance is absorbed by the cleaning solvent.

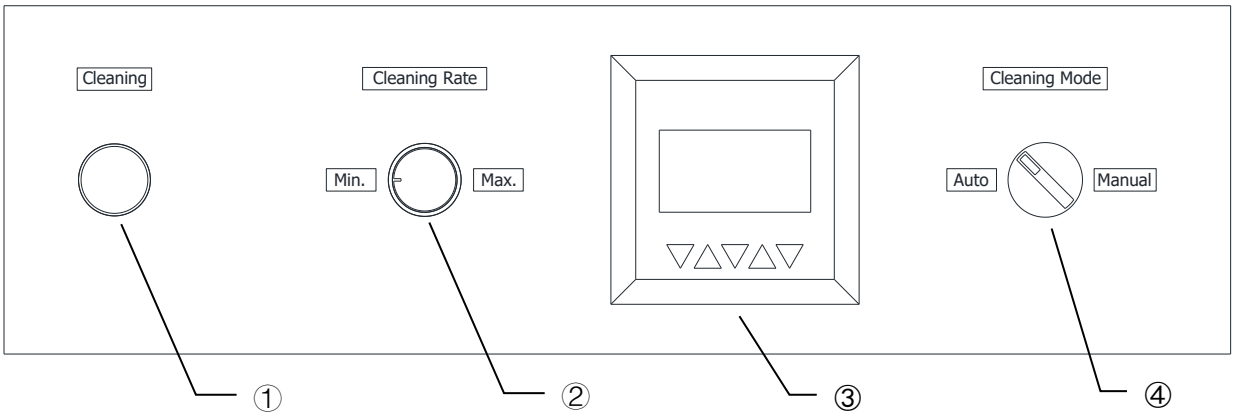
(3) Going through multiple-stage filling rooms, the gas goes through the smog collector⑤ to prevent the cleaning solvent discharging.

(4) With the function of blower, the gas goes through ⑥ to be discharged or enter into GAS410 as clean air.

(5) The cleaning solvent A from water storage tank enters into the washing tank through the circulating pump B, it spreads to the filling stuff③ by means of spray nozzle C, and then goes through pipeline D to return to the circulating tank of water storage tank.

3. Description and Function of Each Part

Operation Panel



No.	Name	Operation/action
①	Cleaning indicator lamp	Indicator lamp will light up during spray cleaning operation. Indicator lamp will blink when different cleaning rates are selected.
②	Cleaning rate selection knob	Set the cleaning rate. When the cleaning rate is selected to the minimum, the cleaning indicator lamp will not light up and no spray cleaning will be carried out. Rotate the cleaning rate selection knob, the cleaning rate becomes greater and greater, the lighting time of cleaning indicator lamp becomes longer and longer, and the duration time of spray cleaning in the washing tank becomes longer and longer. Until the cleaning rate is selected to the maximum, the cleaning indicator lamp is normally on and the spray cleaning in the washing tank is continuous.
③	Cleaning solvent PH monitor	Monitor the pH value of cleaning solvent in the water storage tank in real time. When the pH value exceeds the range, stop using immediately. Replace the cleaning solvent or add neutralizing reagent to reduce the pH value to the operating range before continuing to use.
④	Mode selection switch	Cleaning mode selection switch. Auto or Manual mode is available. Auto mode: the cleaning operation is directly controlled by the spray dryer without manual operation. (This function is in development and is unavailable currently.) Manual mode: manually rotate the Cleaning Rate knob to control the cleaning operation.

4. Operating Method

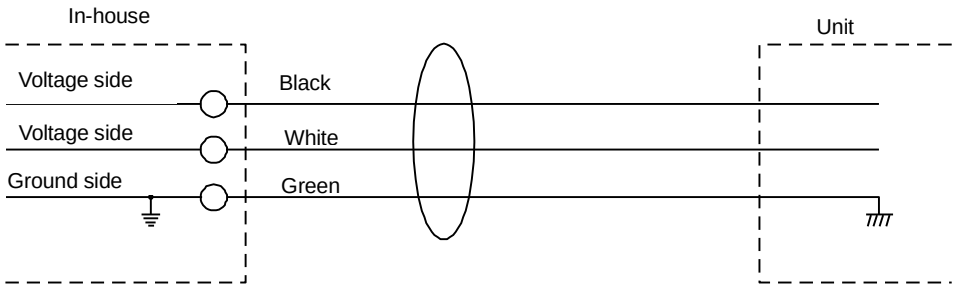
Preparations

(1) Connecting the power cord

First check that the switches of the control assembly and the ELB are OFF and then connect the power cord securely to the power supply meeting the specified voltage and current.

(2) Connecting an earth

The power cord of this unit is an earthed 3-core captire cable (VCT) that integrates an earth wire and you must earth the green wire.



(3) Connecting the exhaust pipes

When connected with the spray dryer, although this unit is used to remove most of the organic solvent and micro powder in the exhaust gas generated by spray drying, a very small amount cannot be completely absorbed and will be discharged through the exhaust port, so the exhaust port must be connected with the exhaust pipe directly leading to the outdoor, or connected to the centralized exhaust port. Do not look into the exhaust port or discharge the gas directly into the room to avoid causing danger.

When connected with the spray dryer and the organic solvent recovery unit, after the operation, the organic solvent, hot air and micro powder in the pipe can be discharged through AIR IN action. Connect the exhaust pipe which is attached to the exhaust port of the organic solvent recovery unit, and discharge to the outdoor by fume hood. Do not look into the exhaust port or discharge the gas directly into the room to avoid causing danger. The exhaust port is located at the lowest part at the left side of the organic solvent recovery unit.

(4) Connection of water inlet and outlet

The connectors of water inlet and outlet of this unit are φ20 PVC hose connectors, use hoses to connect and fix with hoops.

(5) Other connections

Please refer to P.13 ~ 21 in this manual for connection methods.

⚠ Caution: Please fasten the clamps and hoops in place, otherwise gas leakage and water leakage will occur.

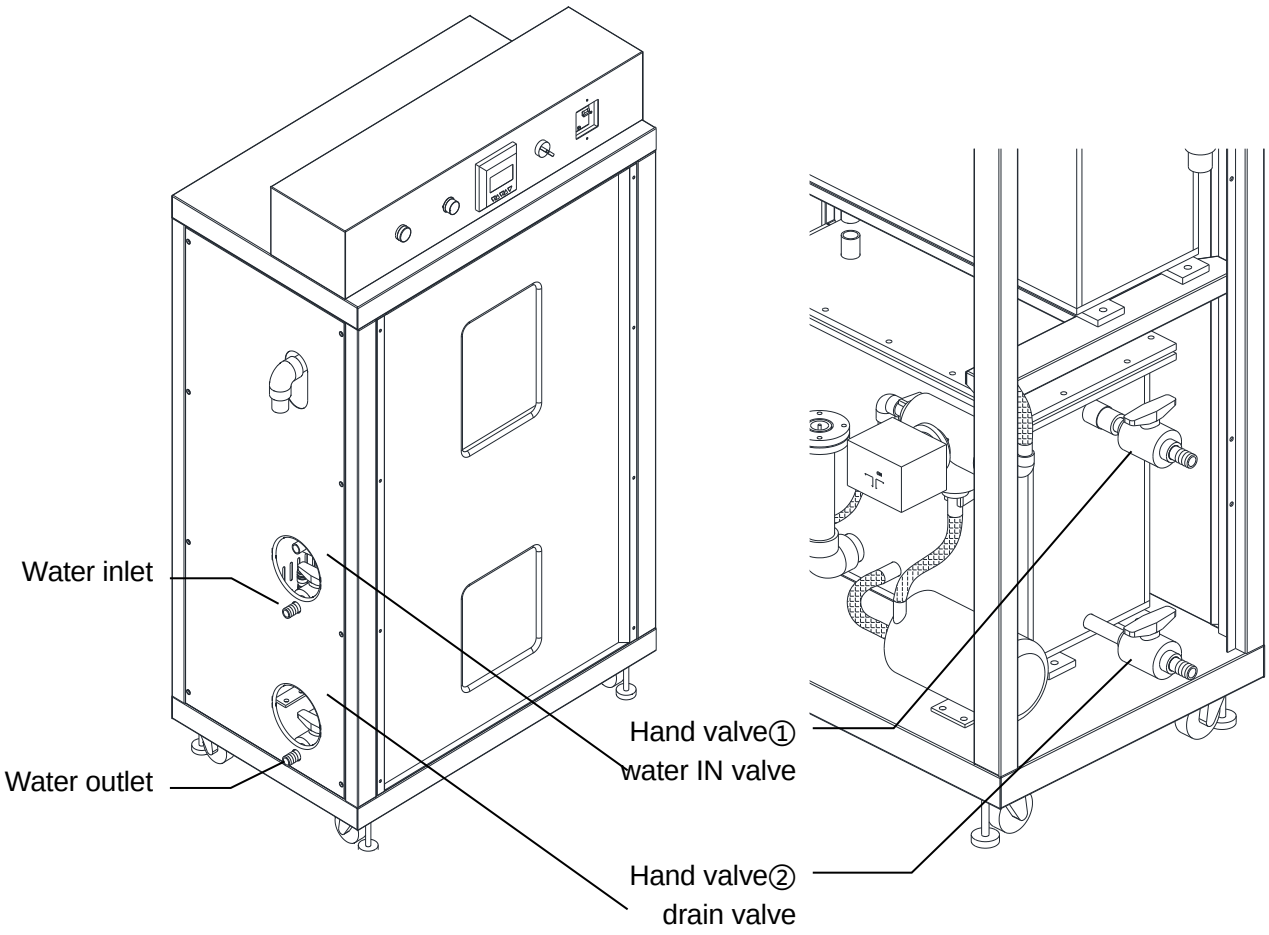
4. Operating Method

Preparations (Pour Water into Tank)

（1）Please carry out piping for the water inlet and outlet before operation, use hose to connect and hoop to fix. Please control the water supply pressure below **0.1MPa**.

（2）The hand valve① is water IN valve, connected with external water supply pipe, turning on this valve (the picture below is OFF, rotate by 90 degree to turn it on) is to pour water into the water tank.

（3）The hand valve② is drain valve, connected with external water drain pipe, turning on this valve (the picture below is OFF, rotate by 90 degree to turn it on) is to drain water.



（4）Please fill with water for the first time (the water level reaches the highest level). Before the first water pouring, please remove the back plate. During the water pouring, please observe whether there is water leakage in the water storage tank, water pump and pipeline from the back. Make sure that the water level is between the max. and min. level in operation.

（5）After pouring water, turn off the hand valve①water IN valve.

Notice: regularly check the water level, do not operate if no water or less water in the tank, or else the circulating pump may damage!

pH meter installation

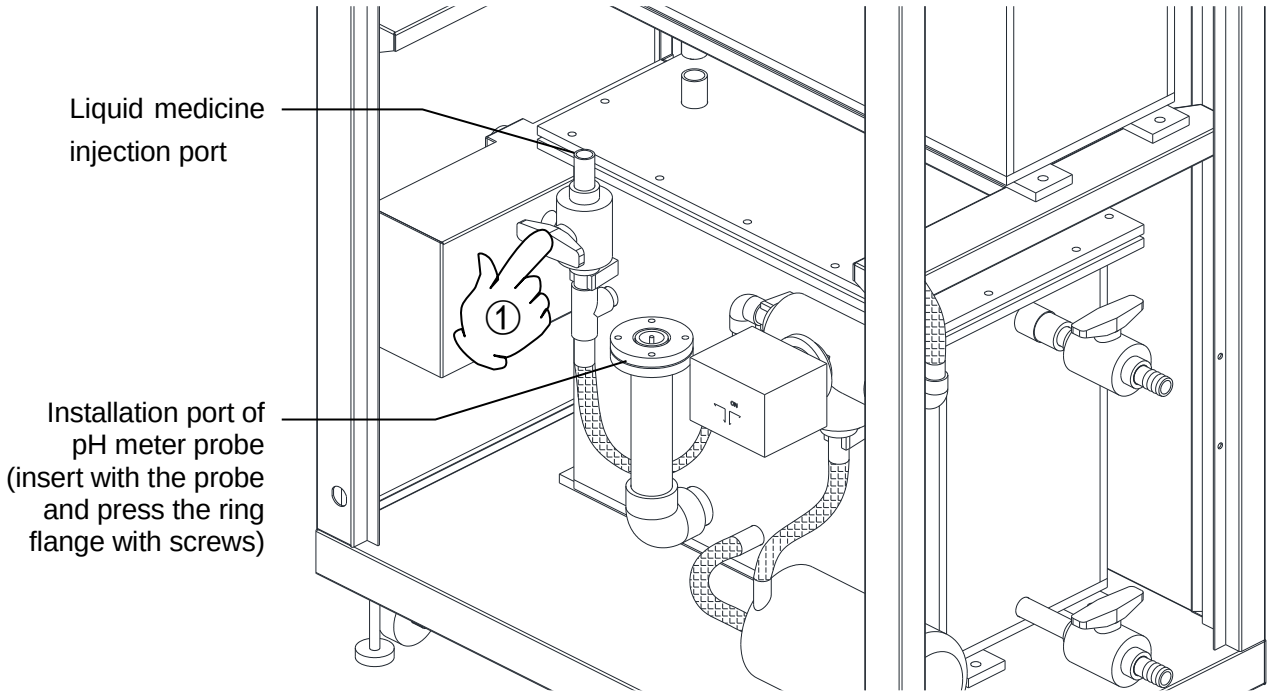
After the first pouring, remove the protective cover of pH meter probe and install it as shown in the picture. Please well keep the protective cover of pH meter probe for future use.

After the installation is completed, please conduct the manual spray test run according to Operation Method (Manual) on P.24, and observe whether the cleaning tank is spraying normally, whether there is water leakage in the cleaning tank and connecting pipeline, and whether the pH meter display is normal. When the inspection is completed, stop running and cover the back plate.

※ The pH meter probe should not be exposed to air for long time, otherwise the probe will be damaged.

Please install the pH meter probe after the water pouring is completed to reduce the exposure time of the probe to air.

When not use for a long time, please remove the pH meter probe, clean it with distilled water, and then re-package the probe with the protective cover of pH meter probe. Pour distilled water into the protective cover to submerge the probe.



Cleaning solvent addition

（1） If need to clean by liquid medicine, add cleaning solvent into water storage tank to neutralize the acid and alkali substances in gas.

（2） Before adding cleaning solvent, please dilute the liquid medicine.

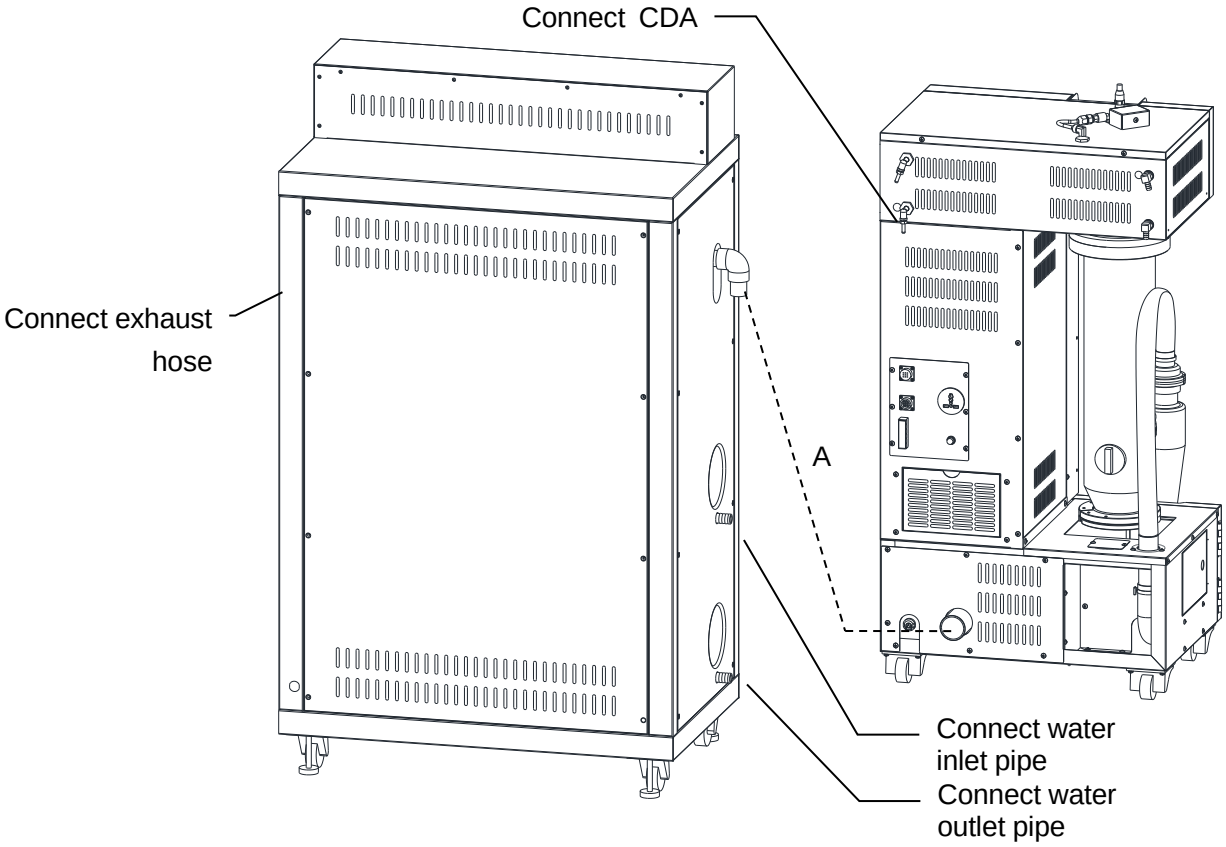
（3） When adding cleaning solvent, please open the back plate, turn on the hand valve① (the picture above is OFF, rotate by 90 degree to turn it on), and use funnel to inject the cleaning solvent into the water storage tank from the liquid medicine injection port and mix with the circulating water.

（4） After adding cleaning solvent, please add some water to clean the valve pipeline to avoid remains of cleaning solvent, finally turn off the hand valve① and cover the back plate.

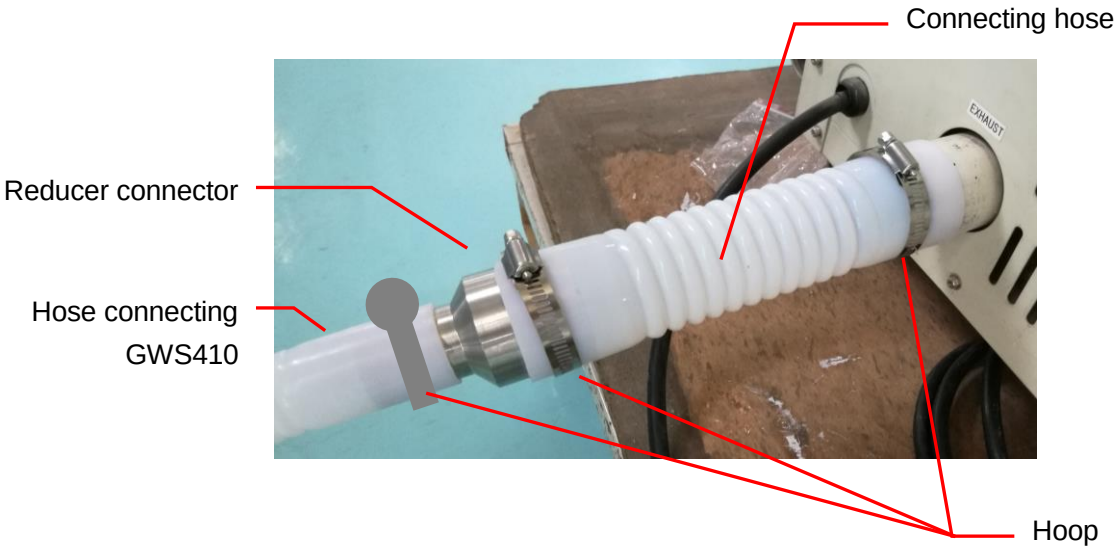
4. Operating Method

Preparations (ADL311S+GWS410)

ADL311S + GWS410



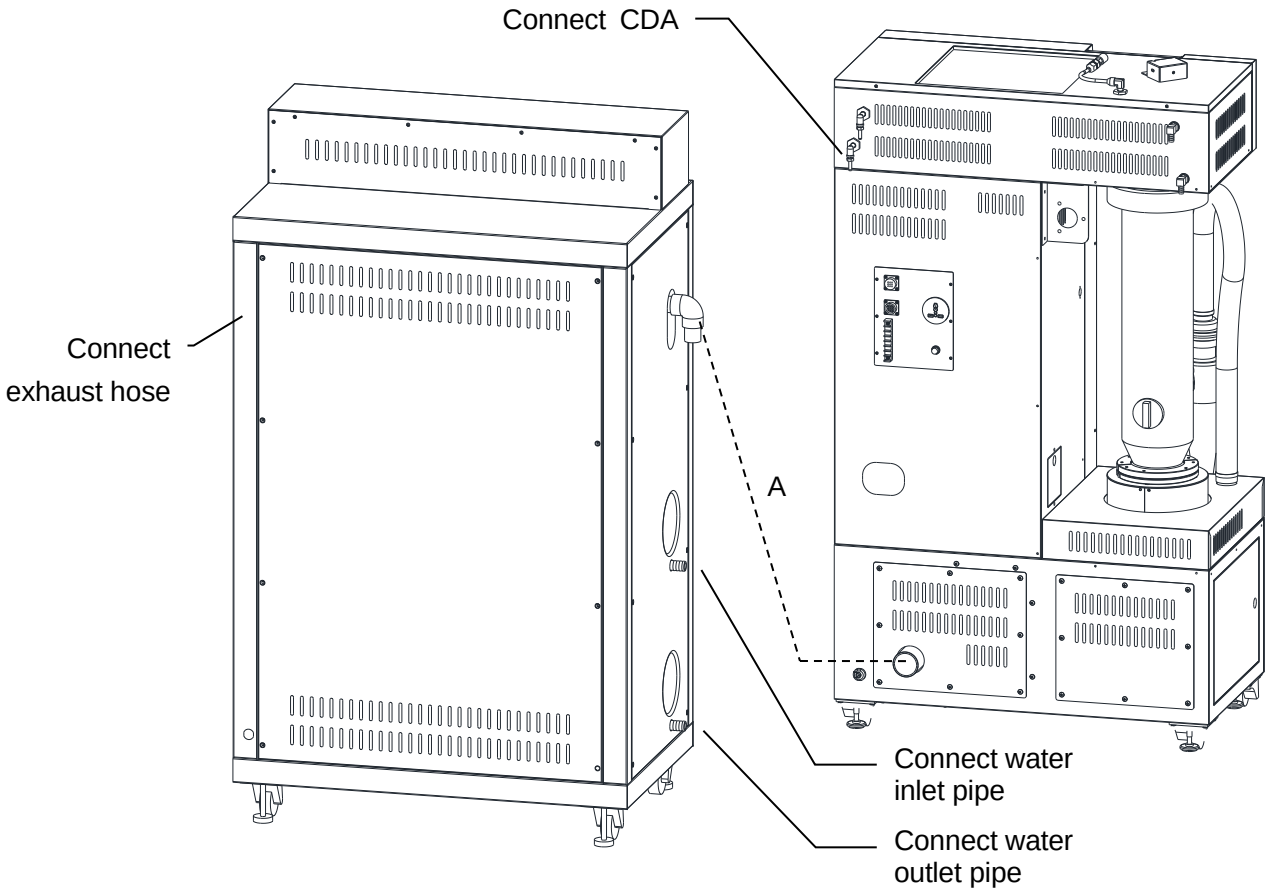
A: Connect the hose from the exhaust port of ADL311S to the gas inlet of GWS410 (please use the adapter connector on the exhaust port of ADL311S, as shown below). Please fasten the hose with a hoop when installing.



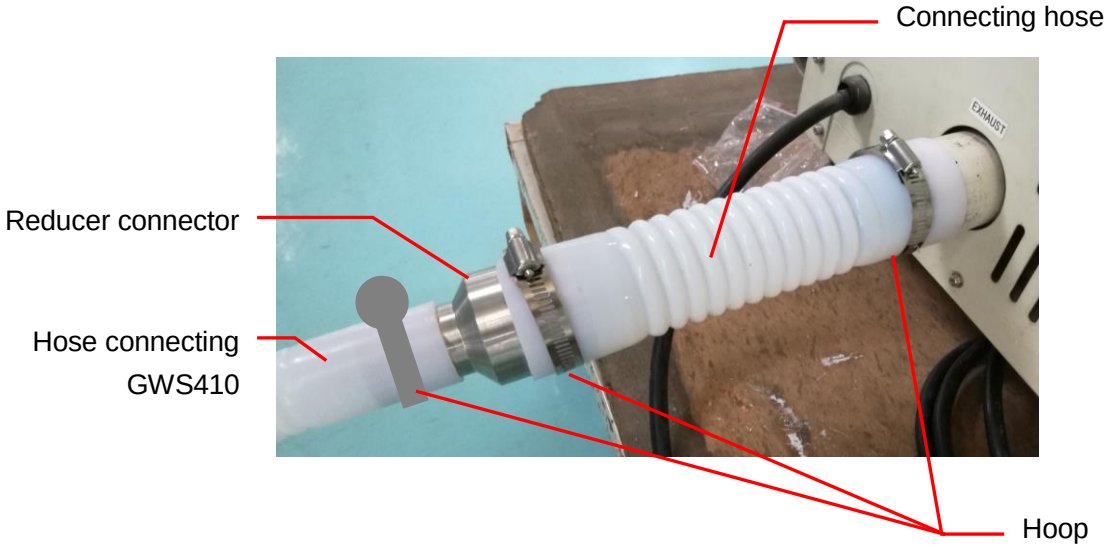
4. Operating Method

Preparations (GB210A+GWS410)

GB210A + GWS410



A: Connect the hose from the exhaust port of GB210A to the gas inlet of GWS410 (please use the adapter connector on the exhaust port of GB210A, as shown below). Please fasten the hose with a hoop when installing.



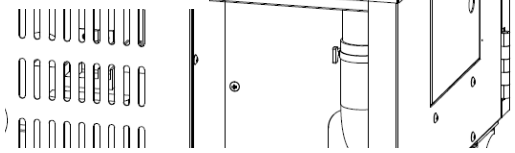
4. Operating Method

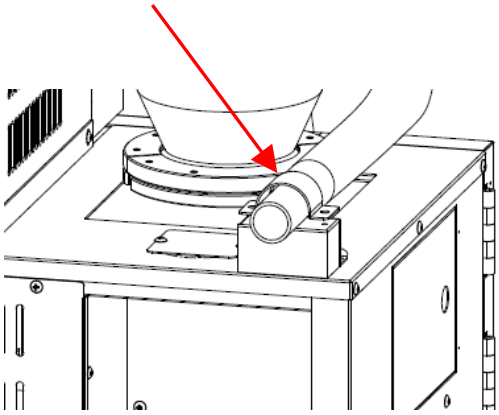
Preparations (ADL311S+GWS410+GAS410)

(1) Install the accessorial connecting pipe with M4×10 truss screws.

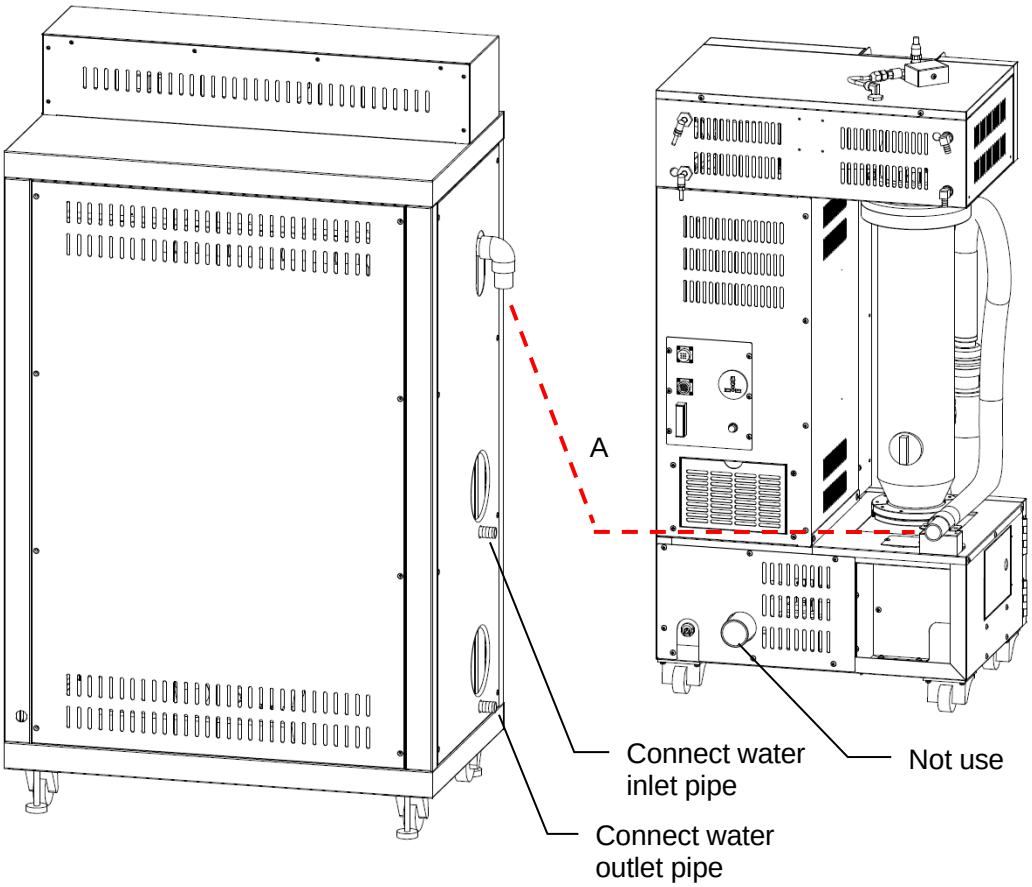
The hose from the cyclone is connected to the installed connecting pipe

Not use when connecting GAS410, please disassemble it and fix the PVC connection seat here



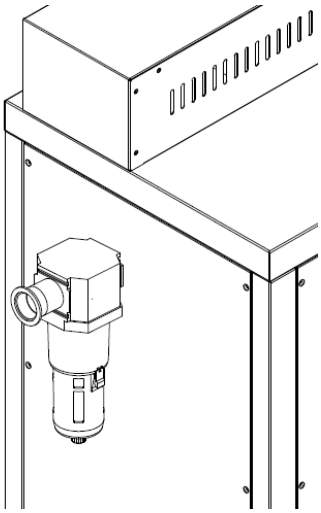


(2) Connect ADL311S and GWS410

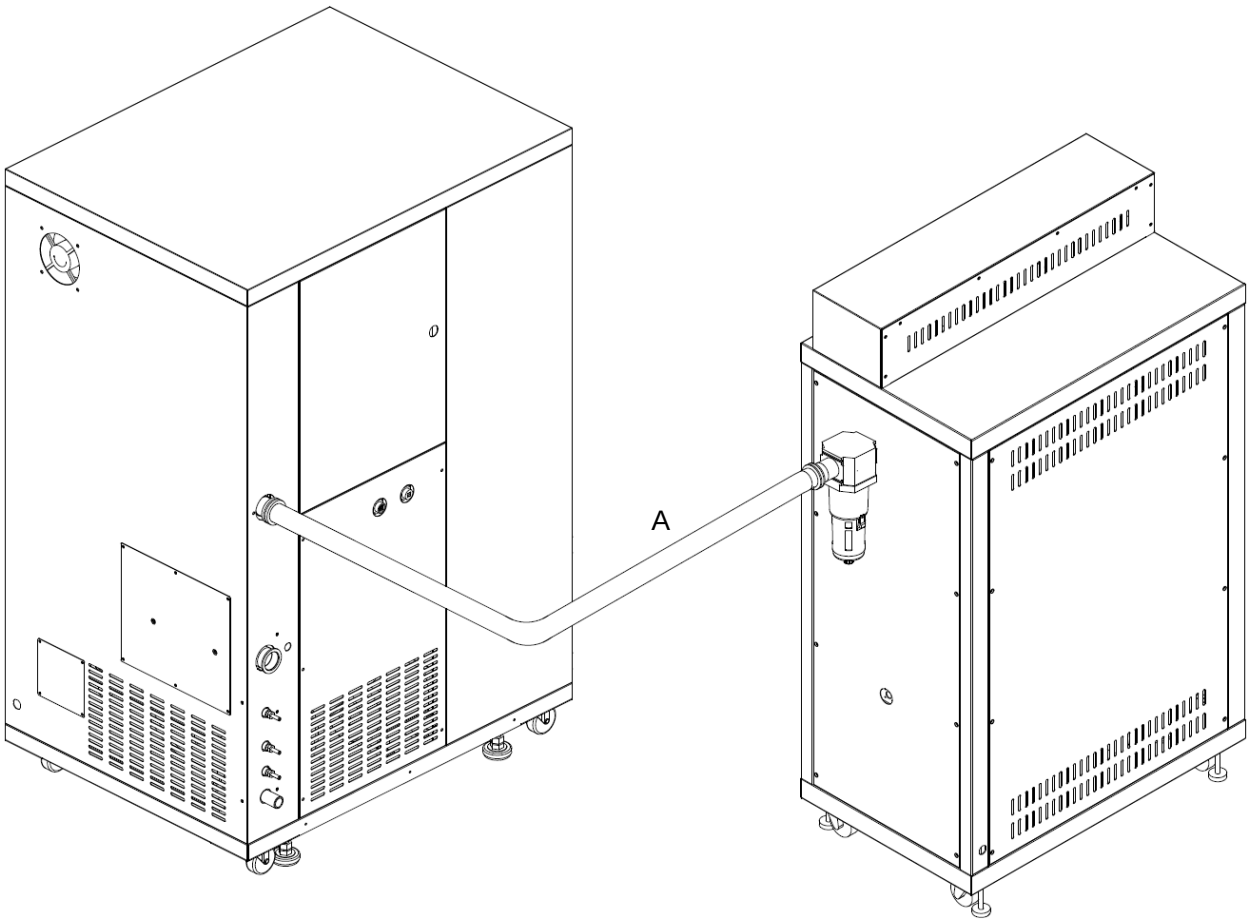


A: Connect the hose from the connecting pipe of ADL311S to the gas inlet of GWS410.
Please fasten the hose with a hoop when installing.

(3) Connect the condensate separator to the exhaust port located on the right side of GWS410.



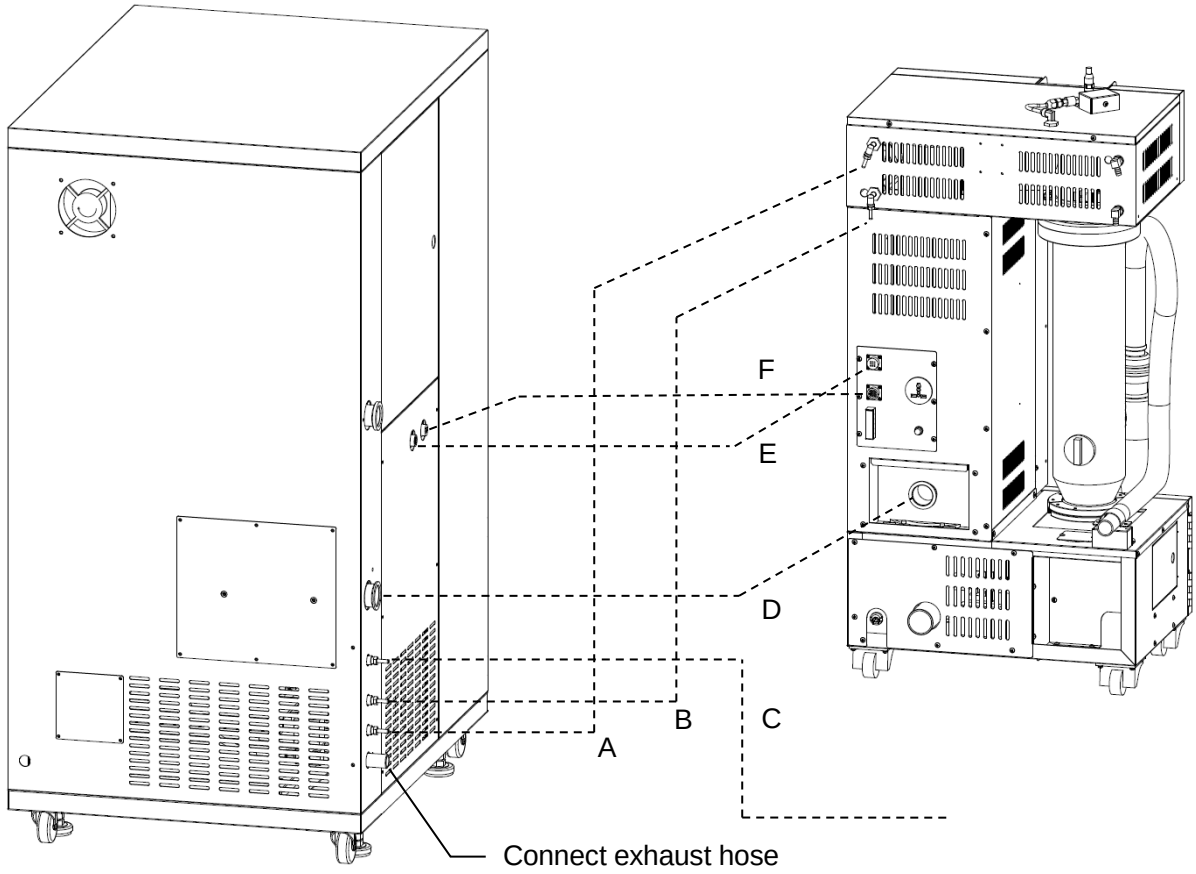
(4) Connect GWS410 and GAS410



A: Connect the hose from the condensate separator outlet of GWS410 to the filter housing inlet of GAS410.

Please fasten the hose with a hoop when installing.

(4) Connect ADL311S and GAS410



A: Connect with a fluororubber hose (milky white) and fasten with a hoop.

B: Connect with a Teflon hose and fasten with a hoop.

C: Connect a Teflon hose to N2 supply source and fasten with a hoop.

D: Connect the stainless steel corrugated hose from the heater sleeve inlet to GAS410.
Put O-ring when installing, and fasten with clamp.

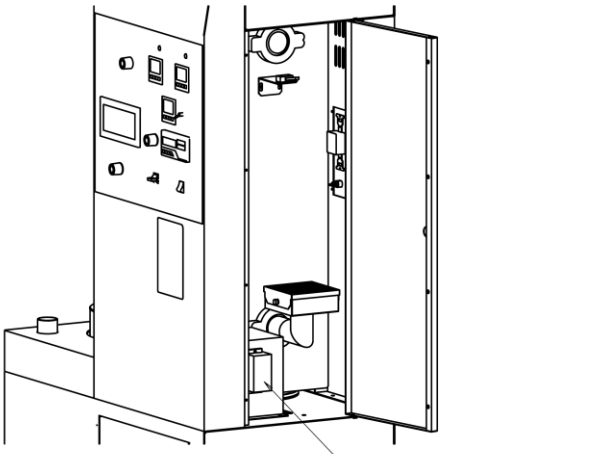
E: Connect with an interface cable.

F: Connect with an interface cable.

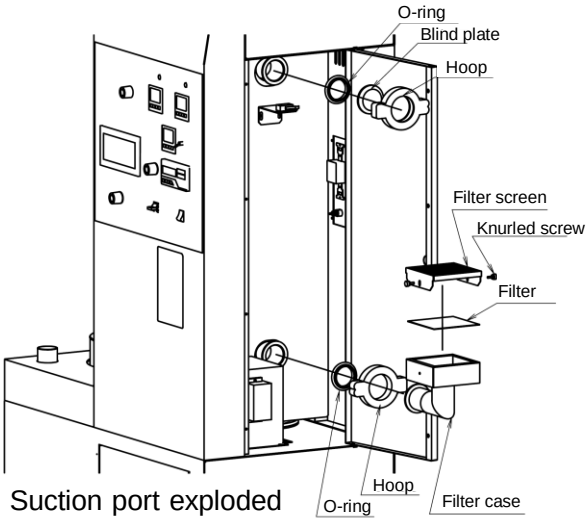
4. Operating Method

Preparations (GB210A+GWS410+GAS410)

(1) Open the right side door of GB210A, install a blind plate to the upper position of the connecting port and remove a set of filter installing parts from the lower position of the connecting port.

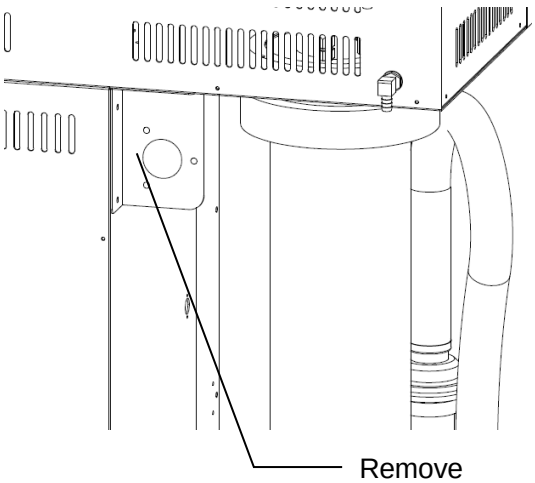


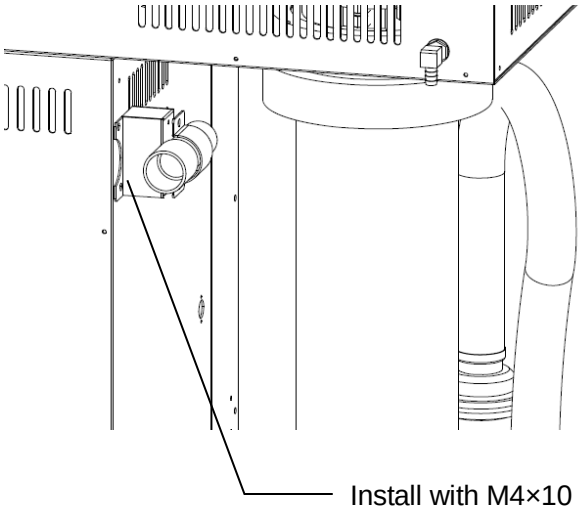
Suction port assembly drawing



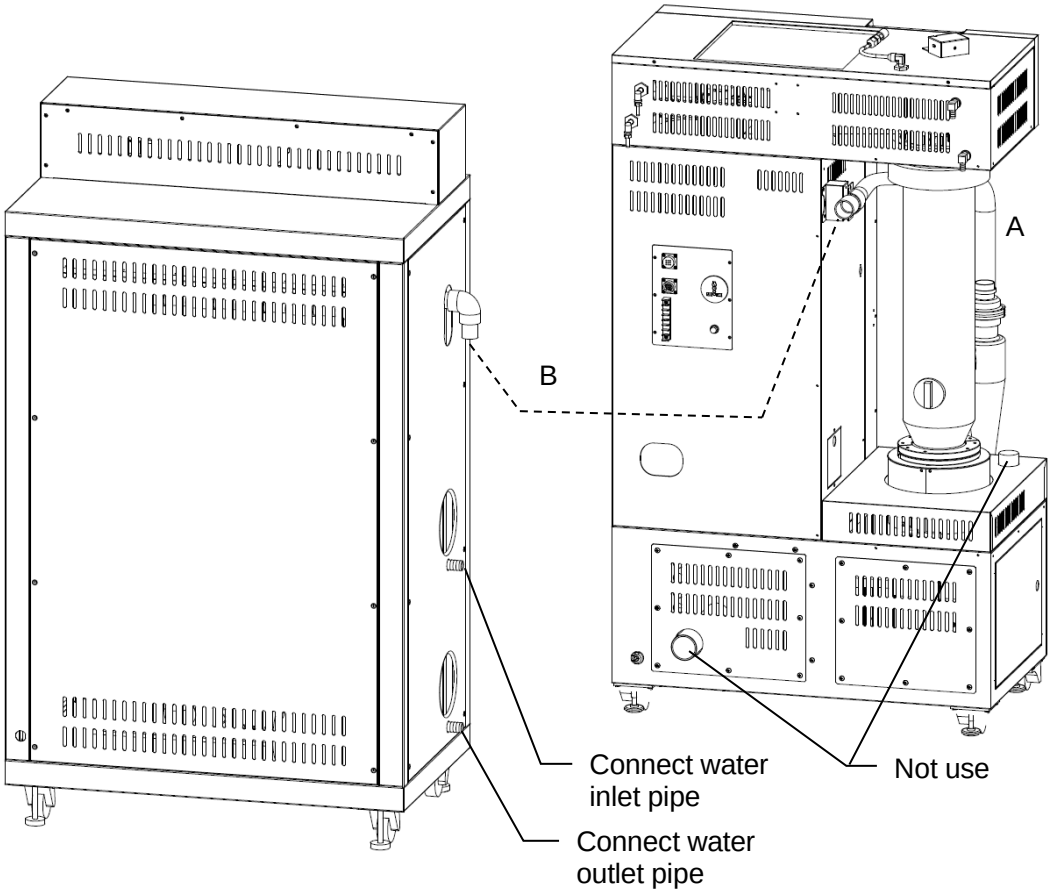
Suction port exploded drawing

(2) Remove the connecting plate attached to the unit body, and install the PVC connecting pipe with the flat head screws M4×10.





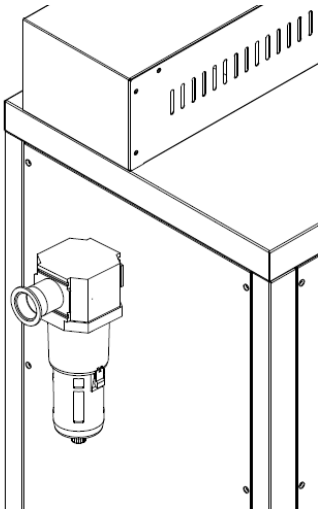
(3) Connect GB210A and GWS410



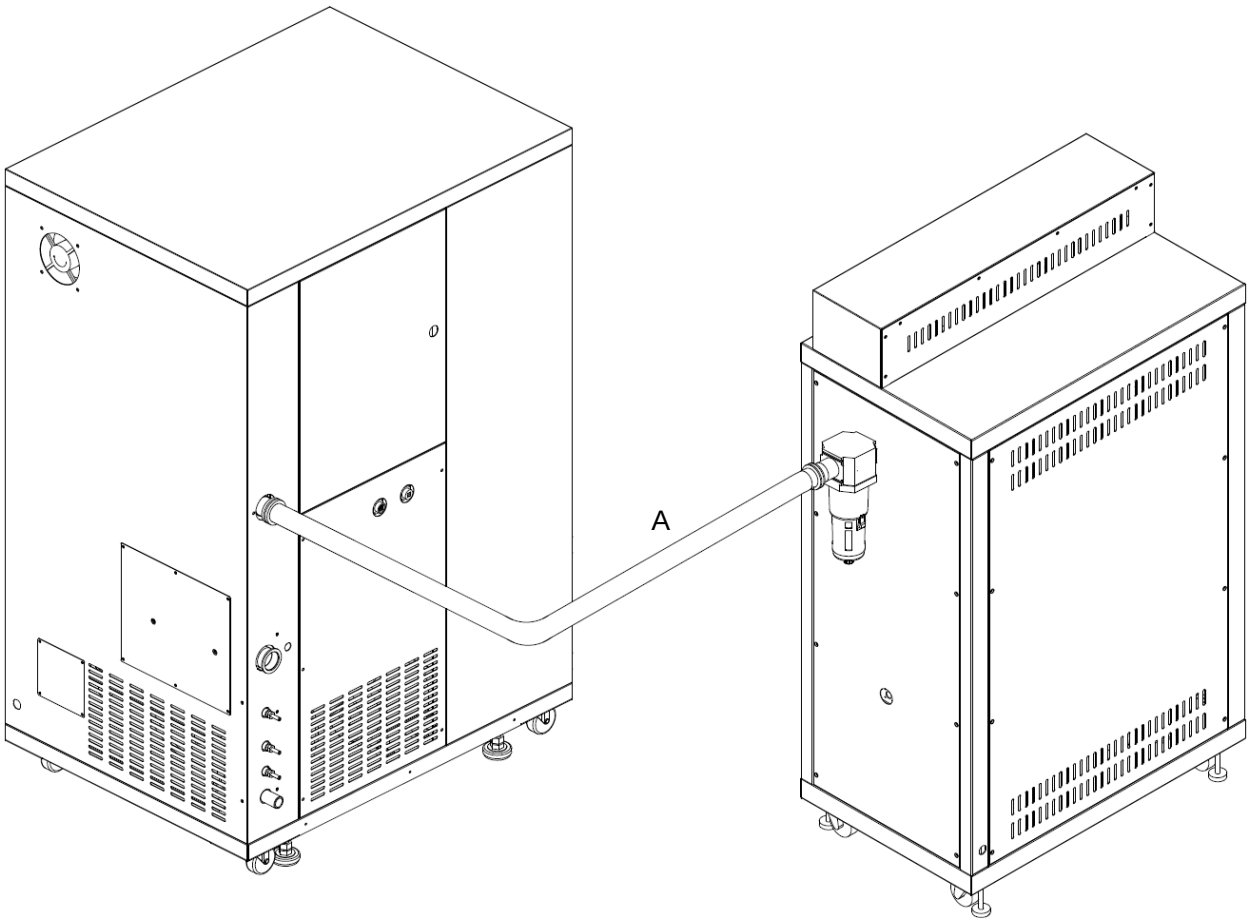
A: Connect the cyclone separator hose to the PVC connecting pipe.

B: Connect the hose from the PVC connecting pipe of GB210A to the air inlet of GWS410. Please fasten the hose with a hoop when installing.

(4) Connect the condensate separator to the exhaust port located on the right side of GWS410.



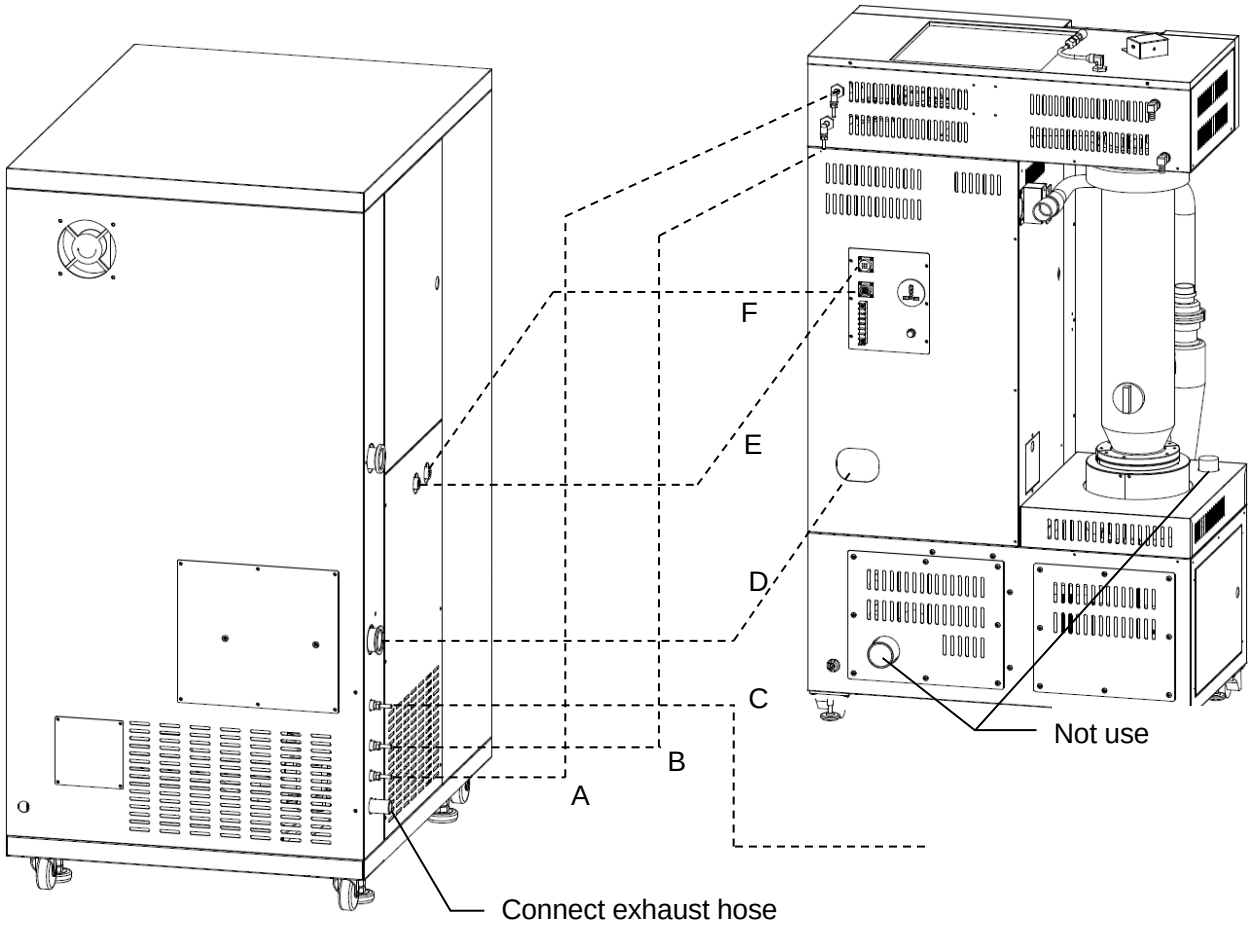
(5) Connect GWS410 and GAS410



A: Connect the hose from the condensate separator outlet of GWS410 to the filter housing inlet of GAS410.

Please fasten the hose with a hoop when installing.

(6) Connect GB210A and GAS410



A: Connect with a fluororubber hose (milky white) and fasten with a hoop.

B: Connect with a Teflon hose and fasten with a hoop.

C: Connect a Teflon hose to N2 supply source and fasten with a hoop.

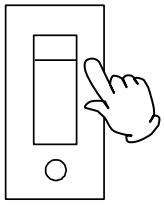
D: Connect the stainless steel corrugated hose from the heater sleeve inlet to GAS410.
Put O-ring when installing, and fasten with clamp.

E: Connect with an interface cable.

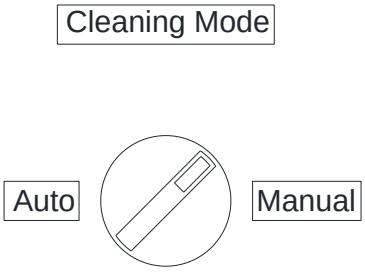
F: Connect with an interface cable.

4. Operating Method

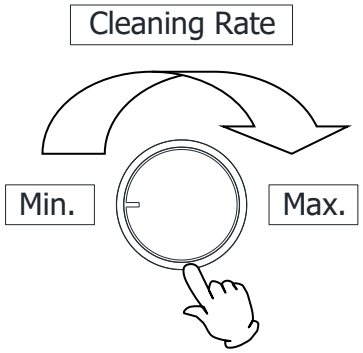
Operation Method (Manual)



(1) Turn the power switch ON at the right side of the operation panel. Each pH meter, indicator lamp and key panel will display.



(2) Turn the mode selection switch to manual mode.



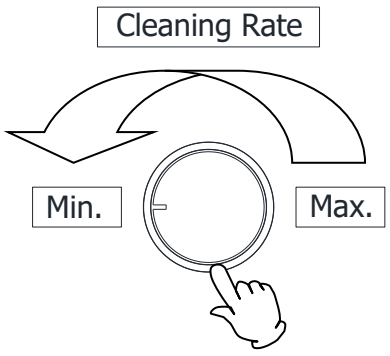
(3) CW rotate the cleaning rate selection knob, start spraying in the washing tank. the cleaning rate becomes greater and greater, the lighting time of cleaning indicator lamp becomes longer and longer, and the duration time of spray cleaning in the washing tank becomes longer and longer.

When the cleaning rate selection knob is CW rotated to the end (MAX), the cleaning rate is selected to the maximum, the cleaning indicator lamp is normally on and the spray cleaning in the washing tank is continuous.

※ The cleaning rate has 5 levels from small to large:

20%, 40%, 60%, 80% and 100%

When select to MAX, it's 100% cleaning rate.



(4) After the cleaning operation is completed, CCW rotate the cleaning rate selection knob to the end (MIN) to close the cleaning operation.

4. Operating Method

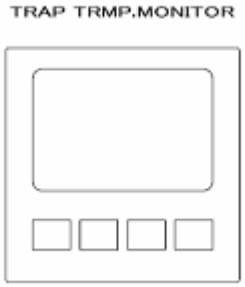
The auto run function is in development, the auto mode selection on the operation panel is the reserved hardware for future upgrade.

4. Operating Method

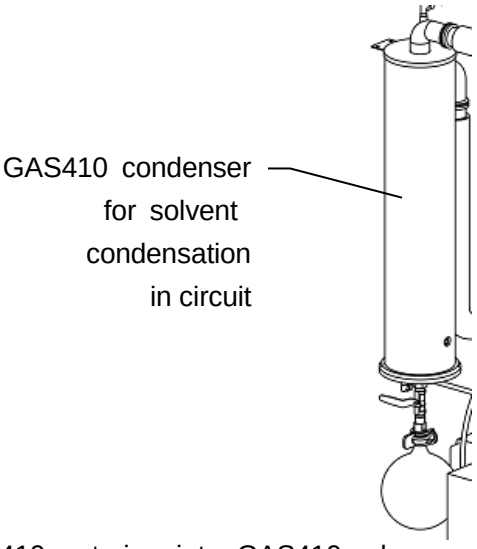
Precautions in Operation

(1) After spray dryer + GWS410 + GAS410 connection, please operate spray dryer and GAS410 firstly, refer to their instruction manuals for relevant explanation.

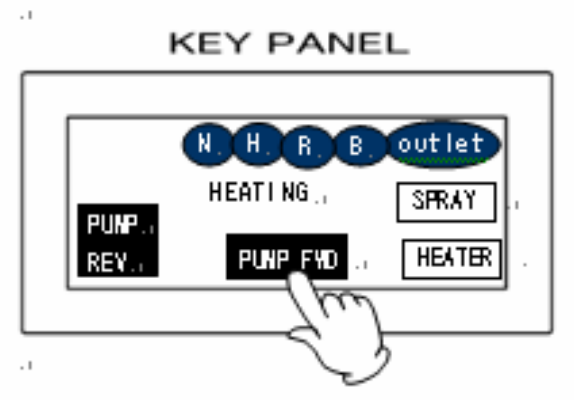
(2) When GWS410 operating, some water vapor will enter into the condenser sleeve of GAS410, if the temperature is below 0℃, it will frost in the sleeve and block the channel of circulating air to damage the machine. In order to avoid this problem, need to set the condensing temperature of GAS410 above 0℃, instrument set value 2～5℃ is recommended. If the real-time temperature of machine cannot be controlled, GAS410 must be modified, please consult Yamato agency.



GAS410 condensing temperature set instrument



(3) In order to reduce the water vapor from GWS410 entering into GAS410, please operate GWS410 when the spray dryer feeding liquid. When the spray dryer operating and showing the following diagram, operate this unit.



When the spray dryer inlet and outlet temperatures exceed the expected temperature, set the spray pressure, turn the pump FWD switch ON, carry out liquid feeding of solvent, turn on the ball valve of recovery flask, start solvent recovery, at this time operate GWS410 to use circulating water to wash the harmful gas.

(4) After spraying of the spray dryer is finished, when it starting to cool down, it's able to close GWS410 to stop circulating water washing operation.

4. Operating Method

Circulating Water Replacement

Please regularly clean the water storage tank to have its bottom without deposit or garbage.

（1）Press Stop running to turn the power OFF.

（2）Turn on the hand valve② (the picture below is OFF, rotate by 90 degree to turn it on), the circulating water in the storage tank shall be discharged from the water outlet. The discharged water shall be collected in the waste liquid collection container and then treated harmlessly.

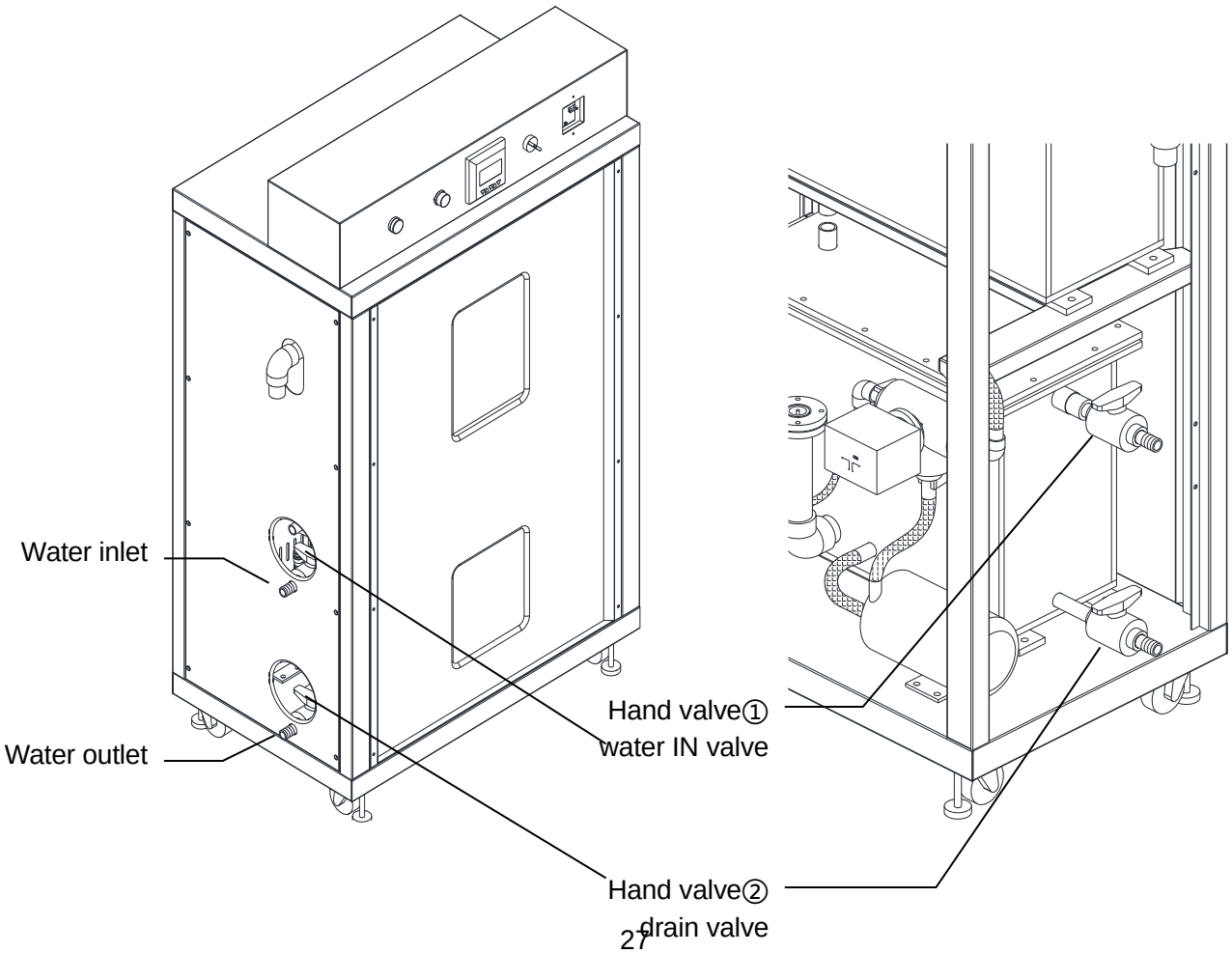
（3）Turn off the hand valve②, turn on the hand valve① (the picture below is OFF, rotate by 90 degree to turn it on), add water between the max. and min. water levels, and then turn off the hand valve①.

（4）Turn the power switch ON, please conduct the 100% cleaning operation according to Operation Method (Manual) on P.24, and then clean the cleaning tank with clean water after 5 minutes.

（5）Repeat (1) ~ (4) to clean the tank thoroughly if necessary.

（6）After cleaning, please completely drain the water storage tank, turn off the hand valve②, turn on the hand valve①, fill the water storage tank with water, and then turn off the hand valve①.

（7）If need to add cleaning solvent, please refer to Cleaning solvent addition on P.14 after completing the above 6 steps.



5. Handling Precautions

⚠ Warning

1. Substances that cannot be used

Read the instruction manual and pay much attention to the use and placement of IPA.
Such substances may cause an explosion or a fire. Whether a solvent may be used or not shall be judged according to “About applicable organic solvents” in section 5. Handling precautions.
See “13. List of Dangerous Substances” on P.42.

2. If a problem occurs

If smoke or strange odor should come out of this unit for some reason, turn off the power key right away, and then turn off the circuit breaker and the main power. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

⚠ Caution

1. Do not put anything on this unit

Do not put anything on this unit. It will cause injury if fall.

2. During a thunder storm

During a thunderstorm, turn off the power immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

3. After installation

It may cause injure to a person if this unit falls down or moves due to earthquake or impact. To prevent, take measures that the unit cannot fall down.

4. Please replace the water and clean the water storage tank regularly

In order to keep the cleaning effect continuous and stable, extend the service life of the parts and also make it more safe, please refer to "Circulating Water Replacement" on P.29 to replace the circulating water and clean the water storage tank regularly.

5. Handling Precautions

About applicable organic solvents

This unit has been designed to use IPA and ethanol. Note that the following restrictions shall apply when other organic solvents are used.

(1) Restrictions on the use of hazardous chemicals

When connected with the spray dryer, although this unit is used to remove most of the organic solvent and micro powder in the exhaust gas generated by spray drying, a very small amount cannot be completely absorbed and will be discharged through the exhaust port. Therefore, when this unit is connected with the spray dryer, cannot use the reagents that are flammable, explosive, toxic or harmful to the environment. If need to use the above reagents, please connect this unit with the spray dryer and the organic solvent recovery unit GAS410.

(2) Restrictions because of explosion limit of oxygen concentration

When connected with GAS410, N2 gas, organic solvents, and air (oxygen) are mixed, explosion will occur when the oxygen concentration is over the oxygen concentration limit and if there is an ignition source. This means that it is desirable the oxygen concentration limit of a solvent is as high as possible.

The oxygen concentration limit for this unit is 9%. Do not use any organic solvent whose oxygen concentration limit is below 9%. See “Oxygen concentration limit table” on P.25. Also, calculate limits for organic solvents not shown in the table using the “calculation method of oxygen concentration limits”.

(3) Restrictions because of the boiling point

For low boiling point solvents, without the addition of neutralizer, it may not wash adequately. See “Oxygen concentration limit table” on P.25. In fact, you do not need to set the inlet and outlet temperatures higher when using a solvent with a low boiling point. For example, you can operate the unit with lowering evaporator outlet temperature by reducing the air amount and amount of feeding liquid for solvents with a low boiling point such as methylene chloride. Reducing evaporation amount per unit time (reducing vapor concentration) and reducing vapor temperature contribute to adequate cleaning.

（Example）

Environmental temperature: 25℃	Amount of feeding liquid:1170mL/H（methylene chloride）
Air amount: 0.45m^3/min	Liquid feeding time:20 min
Outlet temperature: 38℃	Evaporator outlet temperature:14℃

(4) Restrictions because of corrosion resistance

This unit has been designed to use IPA and ethanol. When other solvents are used, care must be taken because service lives will differ from part to part. See the table of corrosion resistance on P.32. If any abnormalities such as abnormal increase speed of oxygen concentration or a gas leakage in the pipe path, replace the defective parts immediately because service life of some parts may be shortened due to solvents other than IPA and ethanol.

5. Handling Precautions

About applicable organic solvents

The liquid feeding tube is used as follows.

Silicone tube：ethanol, IPA, methanol, acetone, acetic ether

Viton tube：xylene, toluene, benzene, hexane, chloroform, methylene chloride

[Oxygen concentration limit table]

Organic solvent	Boiling point〔℃〕	Melting point〔℃〕	Oxygen concentration limit〔%〕
Xylene	(o) 144	(o) -25	(o)10.5
	(m)139.3	(m)-47.4	(m)11.5
	(p)138.5	(p) 13.2	(p)11.5
IPA	82.3	-88	9.0
Benzene	80.1	5.5	10.5
Ethanol	78.4	-114.3	9.9
Acetic ether	77.1	-83.6	10.0
Hexane	67.7	-95.3	11.4
Methanol	64.6	-97.4	9.7
Chloroform	61.2	-63.5	Non-ignitable
Acetone	56.2	-94.6	10.4
Methylene chloride	40	-97.7	23.9

Corrosion resistance table

○: Usable △: Avoid using preferably ×: Unusable for use

Material / Applicable parts	Silicone rubber	Viton (FPM)	Chloroprene rubber (CR)	Nitrile rubber (NBR)	Steel acrylic phthalic acid resin paint	POM	Phenol	Polypropylene (PP)	Vinyl chloride (hard)	Polyacetal (PA)
	Glass connecting packing Liquid sending tube Diaphragm cap for the differential pressure meter Bond to glass	O-ring Solenoid valve seal Liquid sending tube Hoses Packing for installing the oxygen concentration measurement sensor	Filter bottom packing Oxygen concentration meter (pump valve, diaphragm)	Nozzle packing Blower oil seal Pressure meter packing Needle valve packing	Blower air contact part	Needle valve BOX for installing the oxygen concentration measuring sensor	Bonding of aluminum honeycomb Hoses	Compressor cover		Tube coupler
Xylene	×	○	×	△～×	△	○	○	△	×	○
Toluene	×	○	×	△～×	△	○	○	△	×	○
Isopropyl alcohol	○	○	○	○	○	△	○	○	○	○
Benzene	△	○	×	×	△	△	○	△	×	○
Ethanol	○	○	○	○	○	○	○	○	○	○
Acetic ether	△	○	△	△～×	△	○	○	△	×	◎
Hexane	×	○	○	○	△	○	○	△	○	◎
Methanol	○	×	○	○	○	△	△	○	○	△
Chloroform	×	○	×	×	△	×	○	×	×	×
Acetone	○～△	×	○～△	△～×	△	△	○	△	×	○～△
Methylene chloride	×	○	×	×	△	×	○	△	×	×
Ethylene chloride	○～△	○	×	×	△	×	◎	○	×	×

5. Handling Precautions

List of materials

No.	Part name	Material
①	Exterior	Cold-roll steel plate, with chemical-proof surface coating
②	Cleaning tank	PVC
③	Water storage tank	PVC
④	Tank sealing strip	Expansive PTFE
⑤	Ball valve	PVC
⑥	Connecting hose	PVC
⑦	Floating ball valve	Valve seat: ABS Floating ball: PP
⑧	Circulating pump	Pump case: GFRPP Impeller: GFRPP Pump shaft: aluminum ceramic Bearing: PTFE
⑨	Air inlet corrugated hose	PFA
⑩	Hoop	SUS304
⑪	Pall ring	PP
⑫	PH meter	Housing: PC

6. Maintenance Method

Daily Inspection and Maintenance

⚠ Warning

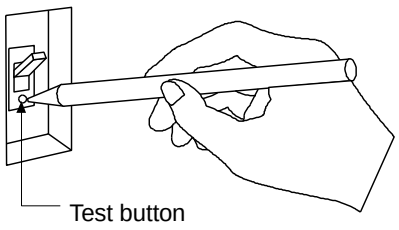
- Disconnect the power cable from the power source when doing an inspection or maintenance unless needed.
- Perform the daily inspection and maintenance after returning the temperature of this unit to the normal.
- Do not disassemble this unit.

⚠ Caution

- Use a well-drained soft cloth to wipe dirt on this unit. Do not use benzene, thinner or cleanser for wiping. Deformation, deterioration or color change may result in.

Monthly maintenance

- Check the earth leakage breaker function.
  - ・Connect the power cord.
  - ・Turn the breaker ON.
  - ・Push the red test switch by a ballpoint pen etc. If there is no problem, the earth leakage breaker will be turned off.



7. Long storage and disposal

When not using this unit for long term / When disposing

⚠ Caution	⚠ Warning
When not using this unit for long term	**When disposing**
● Turn off the earth leakage breaker and original power source for safe without fail. Also, store the glass unit after removing it from the main unit. When the glass unit is contacted with the external, it may cause damage.	● Keep out of reach of children. ● Remove the power cord.

Matters to consider when disposing the unit

Environmental protection should be considered

- We request you to disassemble this unit as possible and recycle the reusable parts considering to the environmental protection. The feature components of this unit and materials used are listed below.

Component Name	Material
Structural Parts of Main Unit	
Exterior	Steel plate, melamine resin coating, stainless steel
Insulating material	PE foamed board, ceramic fiber cotton
Condenser (evaporator) Filter housing Pipe, connector	Stainless steel
Sticker	Polyethylene (PET) resin film
Hose	Silicon rubber, Teflon, Viton
Electrical Parts	
Freezer	Stainless steel, iron, copper, aluminum, etc.
Compressor	Iron, PP, etc.
Circuit board	Composites with board, condenser, resister and transformer
Power cord & wiring materials and others	Synthetic rubber, resins
Sensor	Stainless steel and others

8. In the Event of Failure

Trouble Shooting

Symptom	Reason	Countermeasure
No power	● Leakage protection switch OFF ● Power supply failure ● Power cord disconnection ● Power switch failure	● Turn the protection switch ON ● Confirm the power circuit ● Replace the power cord ● Replace the switch
pH meter failure	● Display failure ● Sensor is not properly wired ● Sensor failure	● Repair defective parts or replace the pH meter ● According to Preparations (pH meter installation) to rewire ● Replace the pH meter probe
Spraying does not operate	● Water is not added or insufficient ● Nozzle clogging ● Poor wiring of spray pump ● Poor wiring of spray valve ● Poor wiring of cleaning rate selection knob ● Spray pump input wire disconnection ● Spray valve input wire disconnection ● Cleaning rate selection knob input wire disconnection ● Spray pump failure ● Spray valve failure ● Cleaning rate selection knob failure	● Please add water to proper level ● Clean the nozzle and water storage tank ● Connect correctly ● Connect correctly ● Connect correctly ● Replace power line ● Replace power line ● Replace power line ● Replace spray pump ● Replace spray valve ● Replace the cleaning rate selection knob
Cleaning indicator lamp does not light up	● Cleaning does not operate ● Cleaning rate selection knob is not properly wired ● Cleaning indicator lamp is not properly wired ● Cleaning rate selection knob input wire disconnection ● Cleaning indicator lamp input wire disconnection ● Cleaning rate selection knob failure ● Cleaning indicator lamp failure	● Select to manual mode, CW rotate the cleaning rate selection knob ● Connect correctly ● Connect correctly ● Replace power line ● Replace power line ● Replace the cleaning rate selection knob ● Replace the cleaning indicator lamp

◆If the error other than listed above occurred, turn off the power switch and primary power source immediately. Contact the shop of your purchase or nearest Yamato Scientific Service Office.

9. After Service and Warranty

When requesting a repair

If any trouble occurs, immediately stop operation, turn the power switch off, pull out the power plug and contact your dealer, our sales office or our customer service center.

Information necessary for requesting a repair

- Model name of the product
- Serial number
- Date (y/m/d) of purchase

} See the warranty card or the nameplate on the unit.
Refer to [3. Name and Function of Each Part] on P.8

- Description of trouble (as in detail as possible)

Be sure to show the warranty card to our service representative.

Warranty card (attached separately)

- Warranty card is given by your dealer or one of our sales offices and please fill in your dealer, date of purchase and other information and send it to our customer service center by Facsimile (03-3231-6523). Then, store it securely.

- Warranty period is one full year from the date of purchase. Repair service for free is available according to the conditions written on the warranty card.

- For repairs after the warranty period consult your dealer, one of our sales offices or our customer service center.

Minimum holding period of repair parts

The minimum holding period of repair parts for this product is seven years after end of production.
Repair parts here refer to parts necessary for maintaining performance of the product.

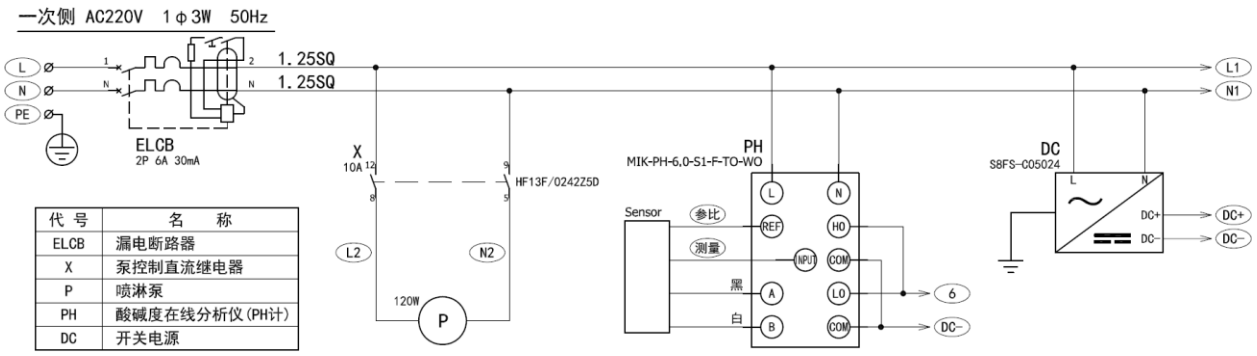
10. Specifications

Specification of the main unit

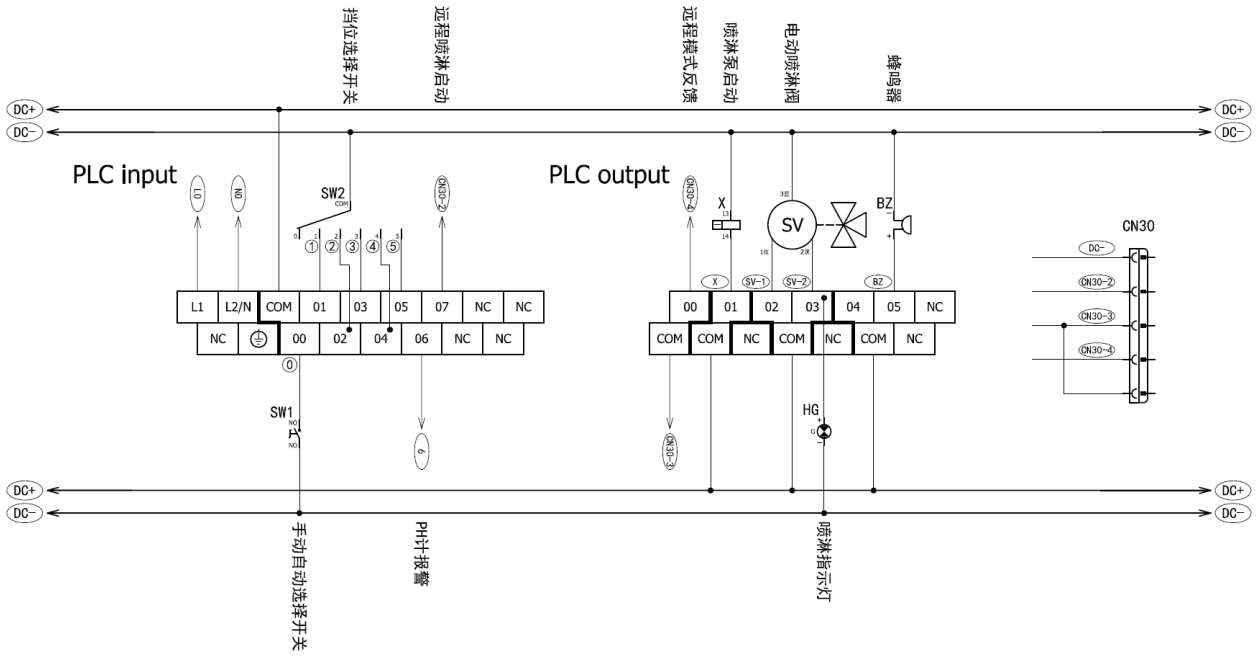
System	Spray cleaning type
Circulating gas	Air or N_2
Circulating amount	0.2～0.5m^3/min
Cleaning method	Spray cleaning + neutralizing reagent
Blower	Connect the external blower
Meters	pH value
Pump	For circulation for measuring oxygen concentration Circularly spray the cleaning solvent
Safety device	Electric leakage protection
Power supply	AC200V～AC240V　Single phase　1A
External dimensions (㎜)※ (W×D×H)	700×950×1500
Weight	Approx.130kg
Accessories	PFA corrugated hose, exhaust reducer connector, PTFE corrugated hose, adaptor pipe (PVC pipe +SUS bracket), molecular sieve assembly, molecular sieve, air filter assembly, hoop, clamp

※　External dimensions do not include the bulges.

11. Wiring diagram



代 号	名 称
ELCB	漏电断路器
X	泵控制直流继电器
P	喷淋泵
PH	酸碱度在线分析仪(PH计)
DC	开关电源



12. Replacement parts table

	Code	Part name	Spec.	Manufacturer	No.
	ELCB	Earth leakage circuit breaker	BV-DN 1P+N 6A 30mA	YSJ	A010410003
	X	Pump control DC relay	HF13F/0242Z5D	YSJ	A011001003
	P	Spray pump	MD-30RZ-220N	YSJ	A042102015
	PH	PH online analyzer (PH meter)	MIK-PH-6.0-S1-F-TO-WO	YSJ	A020707005
	DC	Power supply	S8FS-C05024	YSJ	A010801022
	PLC	PLC	CP1E-E14SDR-A	YSJ	A020300047
	SW1	Manual/auto selection switch	XB2BD21C	YSJ	A011599009
	SW2	Gear selection switch	MFR01 6 gear rotary switch	YSJ	A011599060
	HG	Spray indicator lamp	AD17-22/DC24V G	YSJ	A011101020
	BZ	Alarm buzzer	AD17-22FML/DC24V	YSJ	A011101019
	SV	Spray control electric ball valve	DN15 switch type DC24V L type reversing, operating time 10S	YSJ	A042202024
※		Molecular sieve	4A type	YSJ	A071000004
※		Condensate separator	FX1037-25-W-BW	CKD	A040300041

Note: Parts marked with ※ are consumable parts.

13. List of Dangerous Substances

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Otherwise explosion or fire may result.

Explosive substance	Explosive substance	①Nitroglycol, glycerine trinitrate, cellulose nitrate and other explosive nitrate esters
		②Trinitrobenzen, trinitrotoluene, picric acid and other explosive nitro compounds
		③Acetyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide and other organic peroxides
Flammable substances	Explosive substances	Metal “lithium”, metal “potassium”, metal “natrium”, yellow pHospHorus, pHospHorus sulfide, red pHospHorus, celluloids, calcium carbide (a.k.a, carbide), lime pHospHide, magnesium powder, aluminum powder, metal powder other than magnesium and aluminum powder, sodium dithionous acid (a.k.a., hydrosulpHite)
	Oxidizing substances	①Potassium chlorate, sodium chlorate, ammonium chlorate, and other chlorates
		② Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates
		③ Potassium peroxide, sodium peroxide, barium peroxide, and other inorganic peroxides
		④Potassium nitrate, sodium nitrate, ammonium nitrate, and other nitrates
		⑤Sodium chlorite and other chlorites
		⑥Calcium hypochlorite and other hypochlorites
	Flammable substances	①Ethyl ether, gasoline, acetaldehyde, propylene chloride, carbon disulfide, and other substances with ignition point at a degree 30 or more degrees below zero.
		② n-hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone and other substances with ignition point between 30 degrees below zero and less than zero.
		③Methanol, ethanol, xylene, pentyl acetate, (a.k.a.amyl acetate) and other substances with ignition point between zero and less than 30 degrees.
		④Kerosene, light oil, terebinth oil, isopenthyl alcohol(a.k.a. isoamyl alcohol), acetic acid and other substances with ignition point between 30 degrees and less than 65 degrees.
	Combustible gas	Hydrogen, acetylene, ethylene, methane, ethane, propane, butane and other gases combustible at 15℃ at one air pressure.

Responsibility

Please follow the instructions in this document when using this unit. Yamato Scientific has no responsibility for the accidents or breakdown of device if it is used with a failure to comply.
Never conduct what this document forbids. Unexpected accidents or breakdown may result in.

Note

- ◆ The contents of this document may be changed in future without notice.
- ◆ Any books with missing pages or disorderly binding may be replaced.

Instruction Manual
Organic Solvent Washing Unit
GWS410
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