

Stainless Steel Glove Box (44"x29"x35") with Automatic Purification & Vacuum Flange for Li-Ion Battery (H₂O&O₂<5ppm)

VGB-7HO

[Operation manual](#)



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Safety Notes

Important Information

This manual contains important operating procedures and safety information. It is strongly recommended that the contents of this manual be read carefully for thorough comprehension prior to operating the equipment.

Warnings

To avoid electrical shock, this glove box must:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Be disconnected from the power supply before servicing.

Unpacking

1. Visually check for any physical damage to the shipping container.
2. Inspect the equipment surfaces that are adjacent to any damaged area.
3. Remove packaging materials and vacuum all dust off the exteriors of the glove box prior to use.
4. Retain the original packaging material in case returns or replacements are necessary.

Operating environment

The following points should be taken into consideration when selecting an environment for operating the machine.


1. The glove box should be placed on dry, hard and flat surface.
2. The glove box is intended for indoor use with sufficient ventilation for air to flow freely and away from direct exposure to sunlight.
3. Glove box should be placed in an environment free of dust.

Introduction

VGB-7HO stainless steel glove box with automatic moisture & oxygen purification system can provide an oilless dry gas environment with both moisture and oxygen lower than **5ppm**. It is an ideal tool for assembling Li-ion cell in R&D, such as electrolyte injection, and battery case assembly. It is also suitable for material and chemical researchers to process air sensitive materials and solutions.

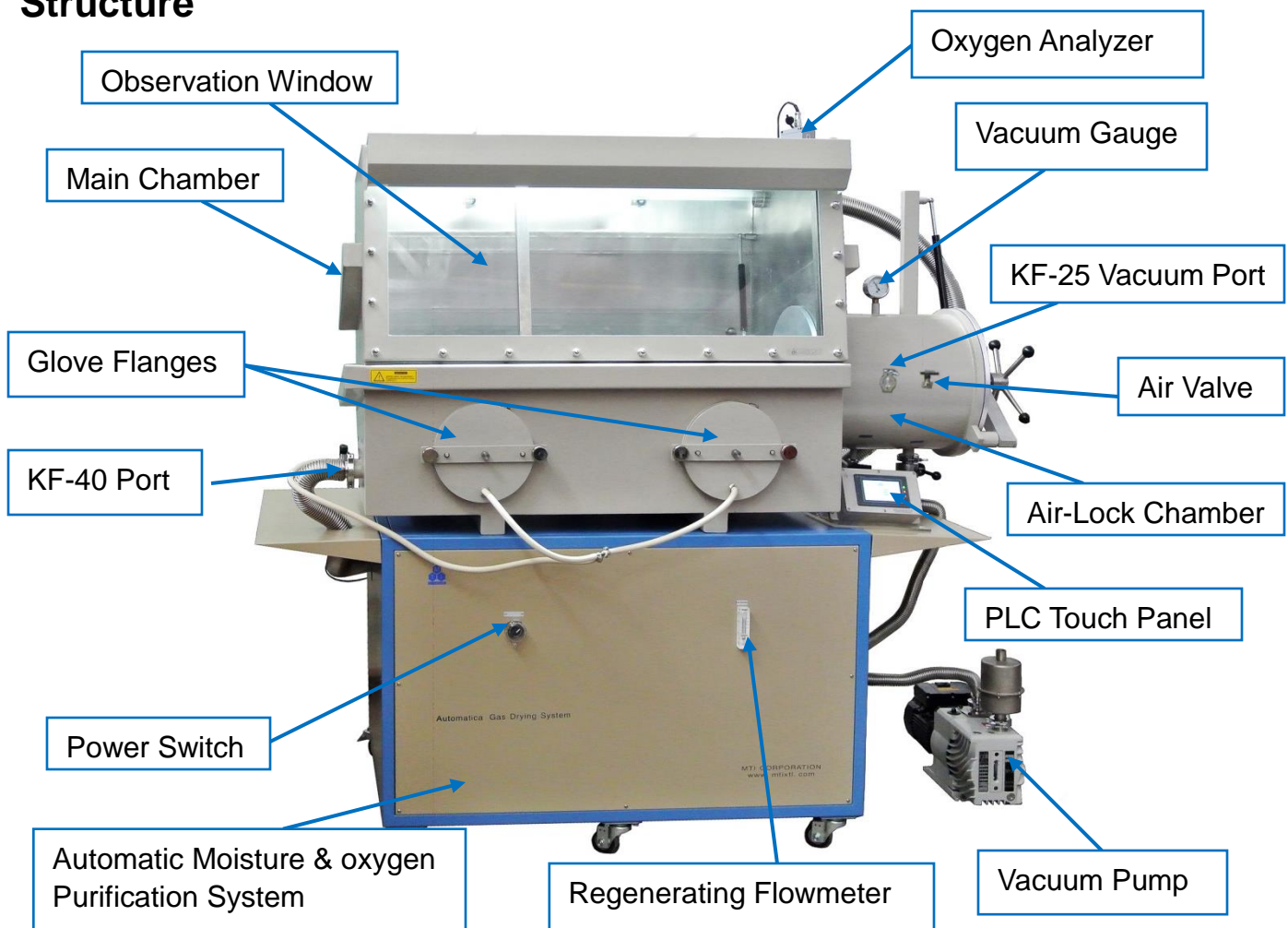
Specifications

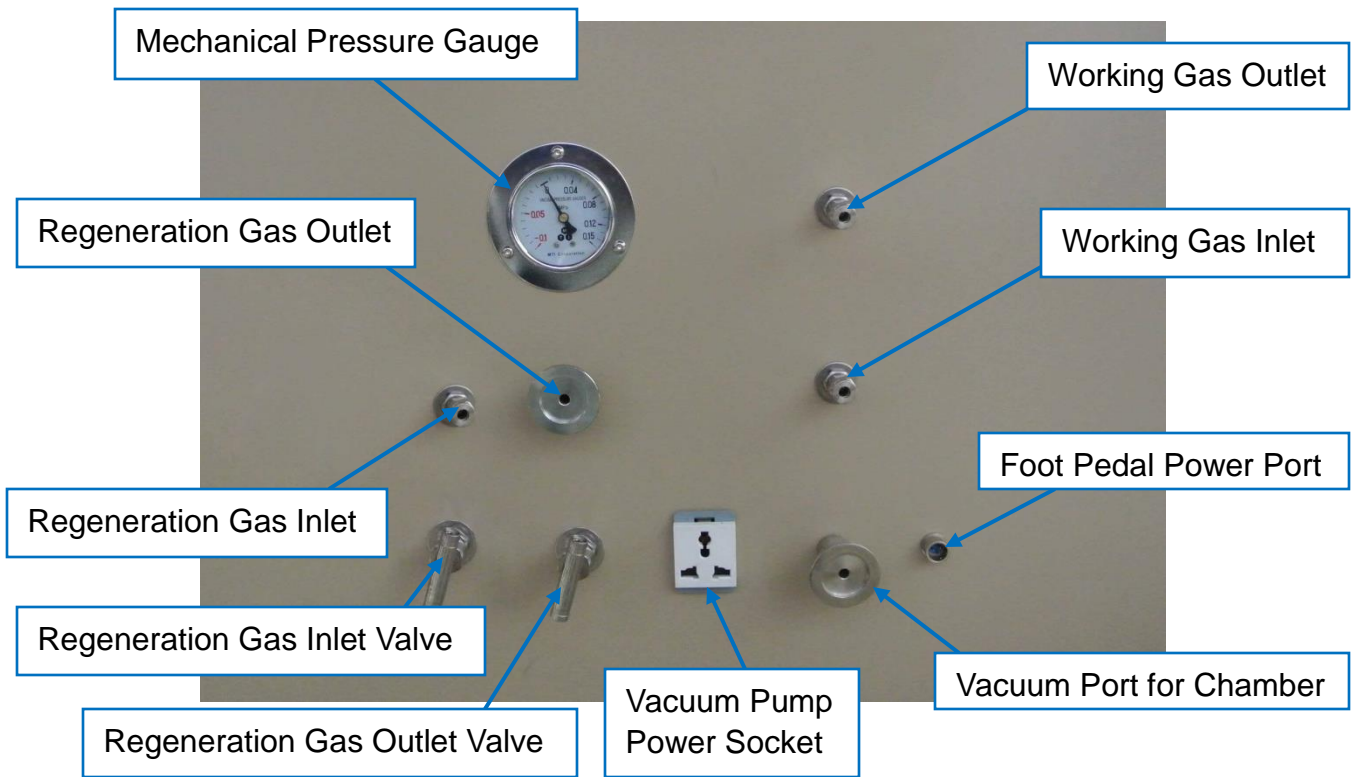
Working Voltage	220V 50/60Hz, Single Phase (110V AC is available at extra cost)
Glove Box Chamber	<ul style="list-style-type: none"> Glove Box: EQ-VGB-4A Case Material: Made of 11 gauge (3mm thickness) 304 stainless steel sheet which provide heavy duty structure for vacuum Dimensions: 1120mm(L) x 740mm(W) x 900mm(H) Max. Positive Pressure: 810 Torr (1.1 atm) <ul style="list-style-type: none"> Note: Gloves cannot work if pressure is higher than 810 Torr Max. Vacuum Level: 0.5 Torr <ul style="list-style-type: none"> Note: Stainless Steel case may deform at higher vacuum level
Air-lock Chamber with Air lift	<ul style="list-style-type: none"> Dimensions: 360mm(ID) x 435mm(L) Max. Vacuum Level: 0.05 Torr
Transparent Front Panel	<ul style="list-style-type: none"> Dimension: 1040mm(L) x 405mm(W) Removable for putting in devices
Vacuum Gauge and Valves	<ul style="list-style-type: none"> One vacuum gauge is installed in Air-lock chamber 2 sets KF25 port are built in Air-lock chamber 2 sets KF40 port are built on the both sides of the chamber 2 on/off valves are built on the left side of the chamber 2 sets KF25 port are built on the back of glove box chamber 3 sets KF40 port are built on the back of glove box chamber for connecting to gas purification system
Purification System	<ul style="list-style-type: none"> Automatic moisture remove to <5 ppm (Li-Ion battery assembling requires <11 ppm moisture) Automatic oxygen remove to < 5 ppm Precision Humidity Analyzer with KF25 Flange (0-999 ppm) is installed on the Purification System with accuracy +/- 0.1 ppm Large capacity moisture filter built in bottom of mobile cart, which can soak moisture upto 1.5kg Regeneration Temperature Controller is built in for automatically regenerating filter Automatic pressure control system is built in to keep pressure at constant level 6" color PLC touch panel is included which can set and display the humidity and pressure level. The control panel is removable, which can be placed any place for

	easy operation.
Purification Pipeline	304 stainless steel, KF40 port
Vacuum pump	<ul style="list-style-type: none"> • Heavy duty vacuum pump with filter is included for faster vacuum and removing moisture • Stainless steel vacuum bellow and valve are included
Gases Requirement	<ul style="list-style-type: none"> • Working gases: Atmospheric Gases, N2, Argon • Regeneration Gas: 90%~95%N2 and 5%~10%H2 • One float meter built in bottom of mobile cart for accurate gas filling
Leakage Rate in Glove Box Chamber	< 3 Torr/hour
Power Extension	<ul style="list-style-type: none"> • One extension socket (Max power 1500W) is installed in the glove box main chamber • Note: 110V power cord was included for immediate use. (For use under 208~240V power supply, no plug will be included)
Gloves 	<ol style="list-style-type: none"> 1. Glove Port size: 190mm(Dia.) 2. 8" Butadyl® Gloves included (with increased stretching, bending ability and tear strength, and offer strong resistance to aromatics, hydrocarbons, solvents, fats, and acids) 3. Clamps and sealing flanges included
Warranty	<ul style="list-style-type: none"> • One year limited warranty with lifetime support • Rusting and damage due to improper storage condition or maintenance is not covered by warranty
Dimensions for Glove Box	1000mm L x 2000mm W x 1100mm H
Dimensions for Gas Drying System	850mm L x 1250mm W x 830mm H; 850mm L x 1850mm W x 830mm H (with extended support installed)
Application Notes	<ol style="list-style-type: none"> 1. Always check the joints, gloves, sealing elements, and pipelines for air-tightness before and during the operation 2. Corrosive gases are prohibited as they will damage the sensors 3. The inlet and outlet of the Air-lock Chamber must not be opened at the same time to prevent contamination by the external gas 4. By closing the vacuum flange, the glove box can be vacuumed by mechanical pump upto 0.5 torr before filling inert gas, (moisture can be below 180 ppm and oxygen below 200 ppm). Then you can save at

	<p>least 1-2 tank of inert gas from purging at each operation</p> <p>5. Order N2 gas generator if you don't have gas tank in your lab from http://mtixtl.com/compactnitrogengasgeneratorwithbuiltinairpump500mlmin.aspx</p> <p>6. Please call or email us to get price and lead time for multi-pins feed through on the glove box if you need to measure the sample inside the chamber, MTI's technician can provide a solution with no impact on sealing (leaking rate is less than 6 torr/hour) in an affordable price.</p>
Shipping Dimensions	<ul style="list-style-type: none"> • Pallet #1: 78" x 40" x 58" • Pallet #2: 50" x 40" x 70"
Shipping Weight	550 kg (1200 lbs)

Structure



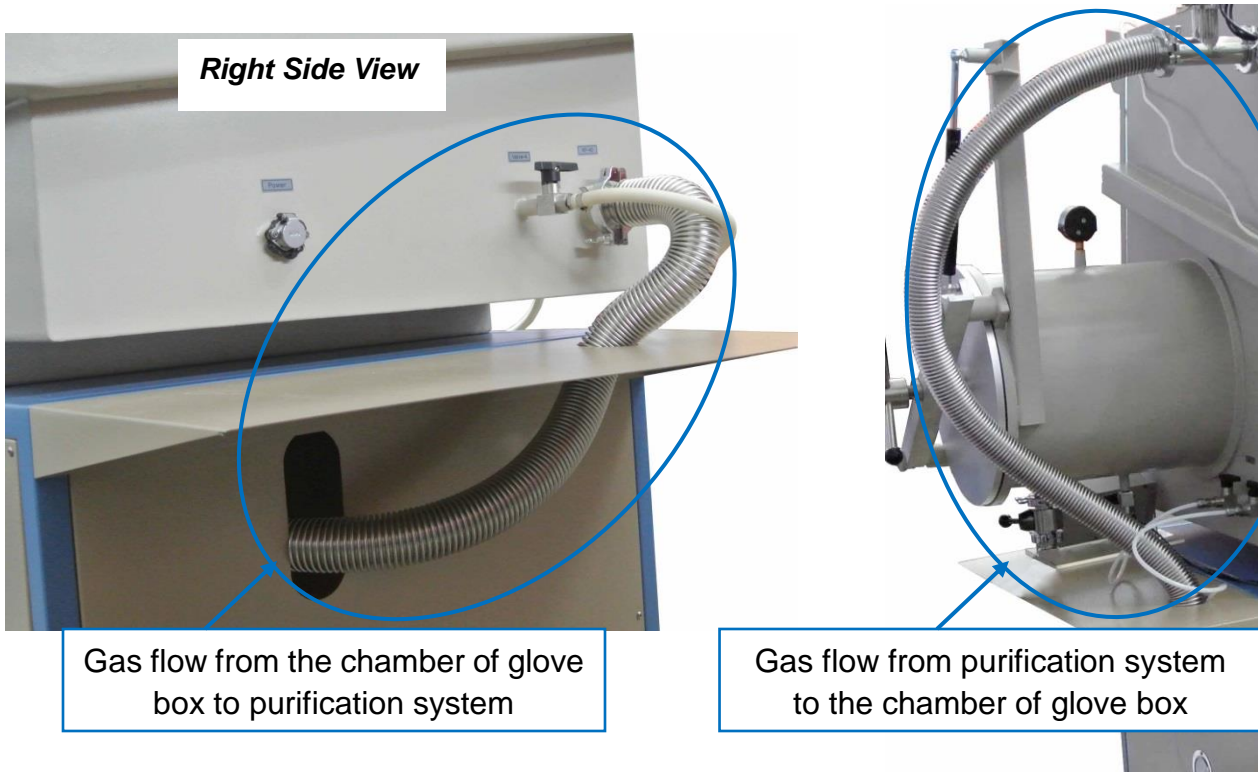


Side View of Gas Purification System (Mobile Cart)

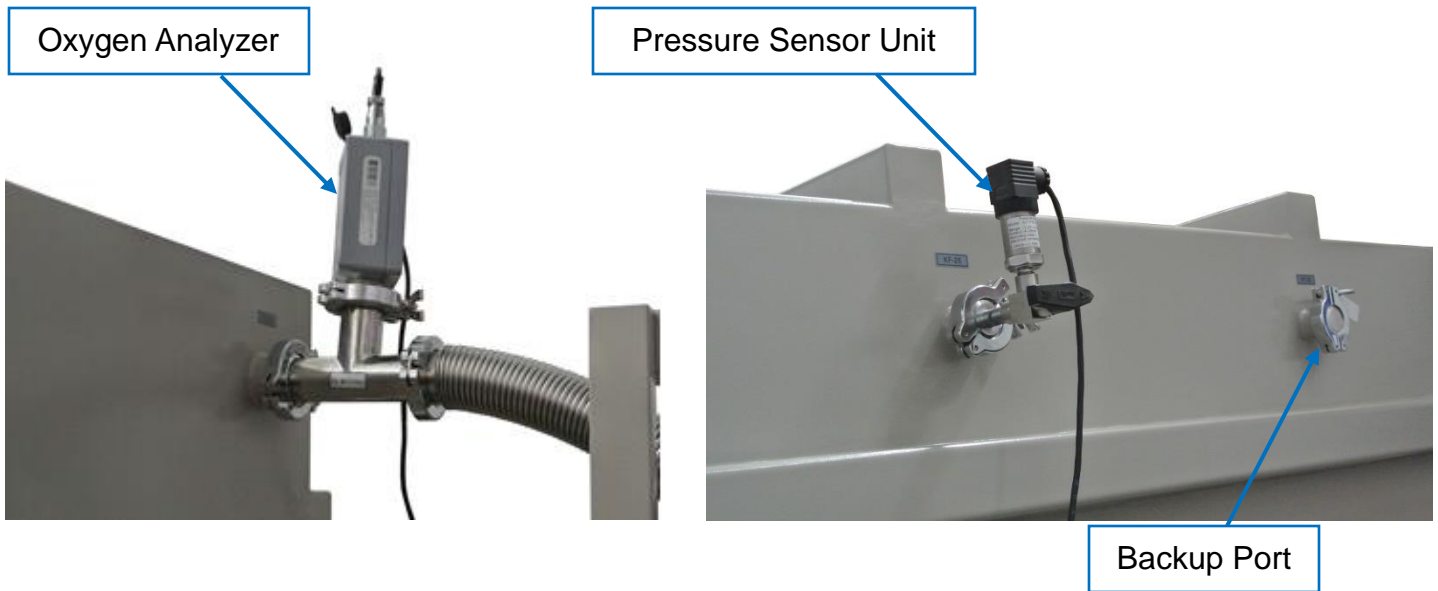
Attention: Regeneration gas valves should only be open during regeneration process.

Installation

1. Connect the Glove Box to the Gas Purification System via bellows



2. Connect to the Oxygen Analyzer and the Pressure Sensor



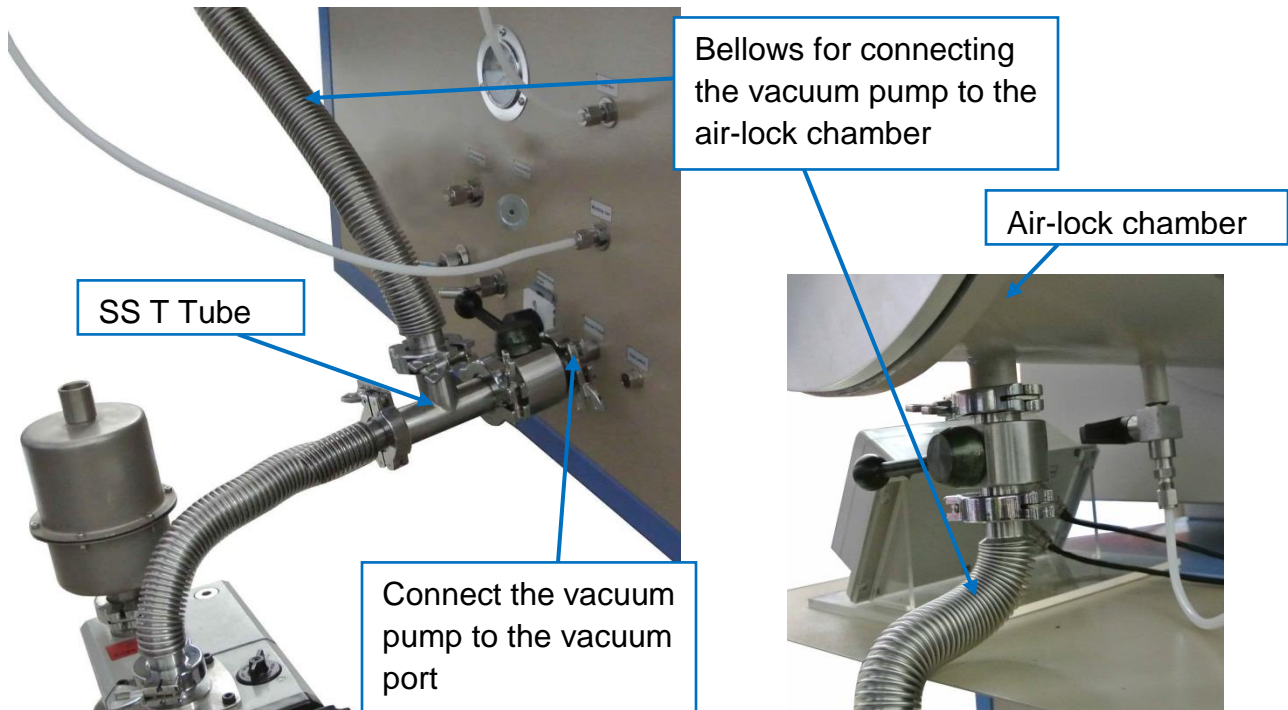
Attention:

Proper use and storage of Oxygen Analyzer

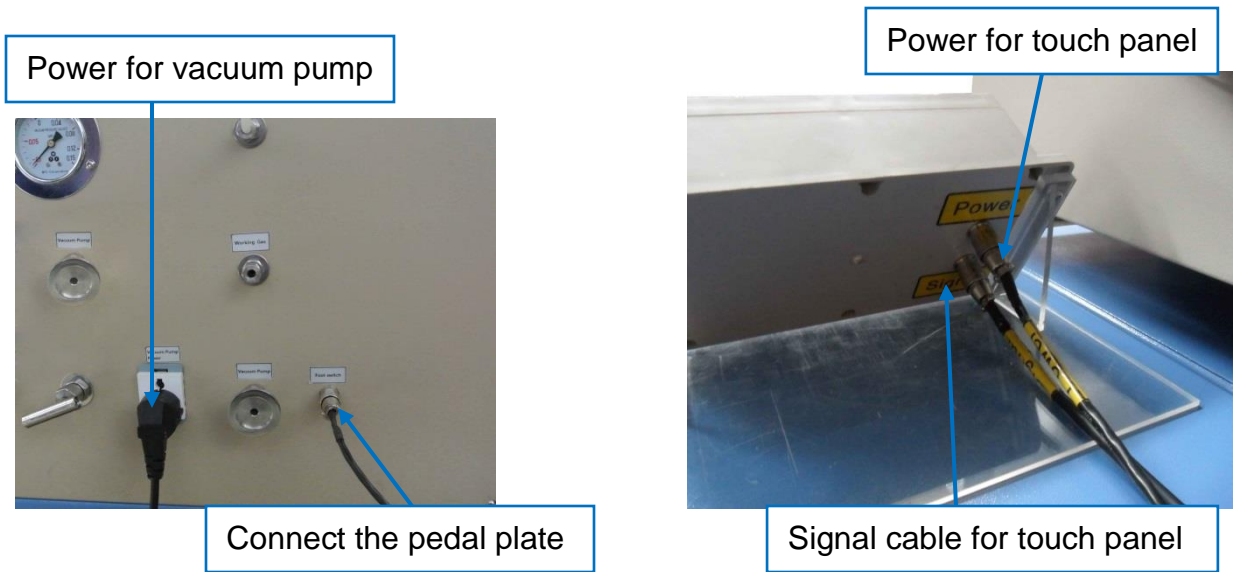
- Please seal the Oxygen Sensor head by the blank flange and quick clamp after the completion of each experiment, the Oxygen Sensor head should not expose in the air for a long period of time, otherwise its lifespan would be affected.

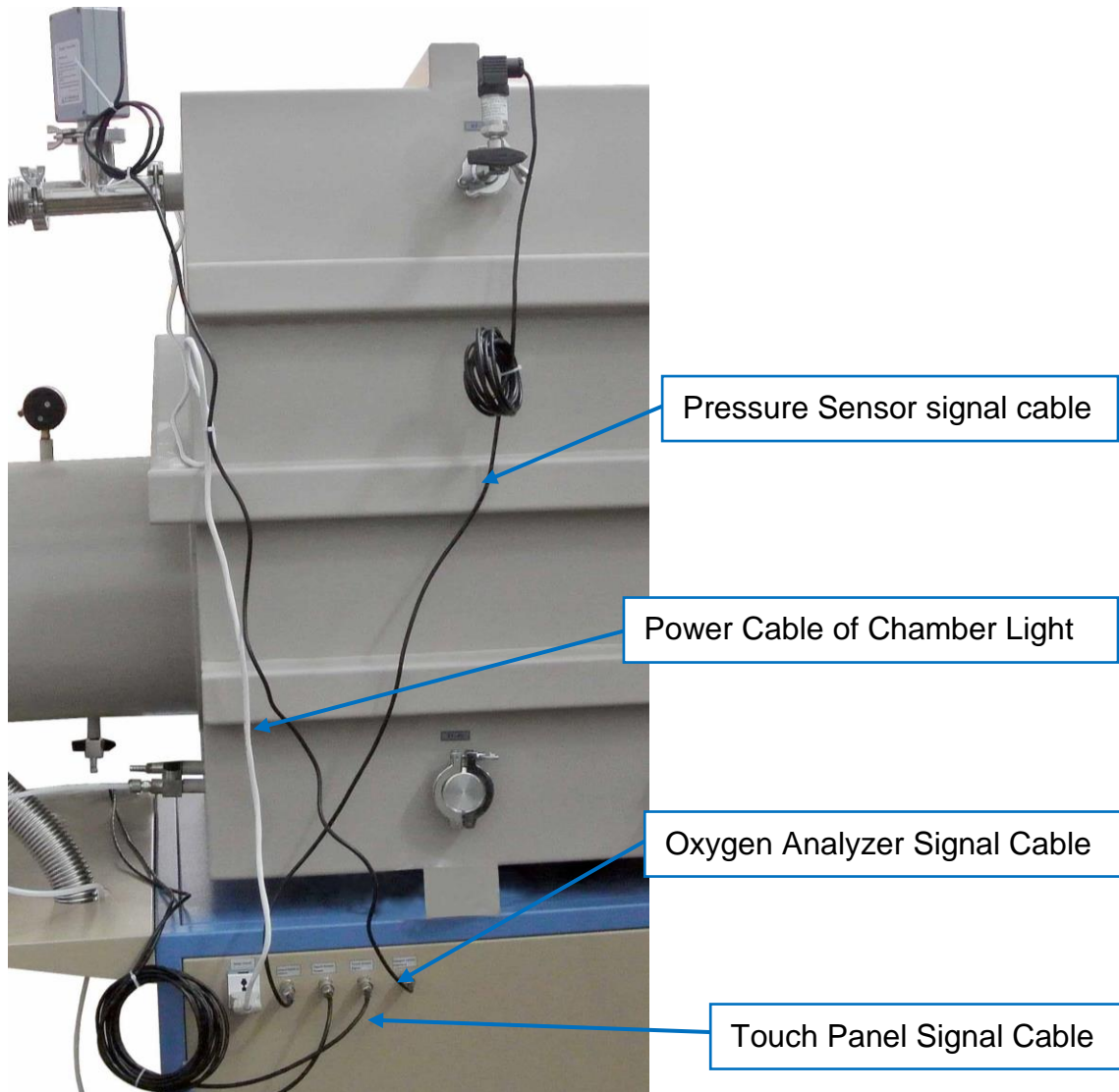
- Working pressure range is 550~950torr, pressure beyond this range is not allowed. Please use proper valve to reduce pressure when pressure is too high
- Please disconnect the Oxygen Analyzer from Vacuum devices to avoid Oxygen sensor broken
- The use of acidic gas such as CO₂ and HCl is prohibited
- If gas contain plenty of oily cent or impurity particles, please filter the gas before using
- Avoid big vibration when using

3. Connect the vacuum pump to the purification system and air-lock chamber

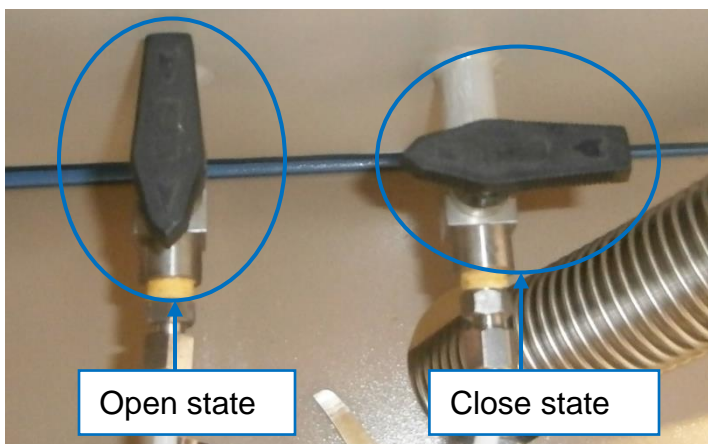


4. Connect other devices





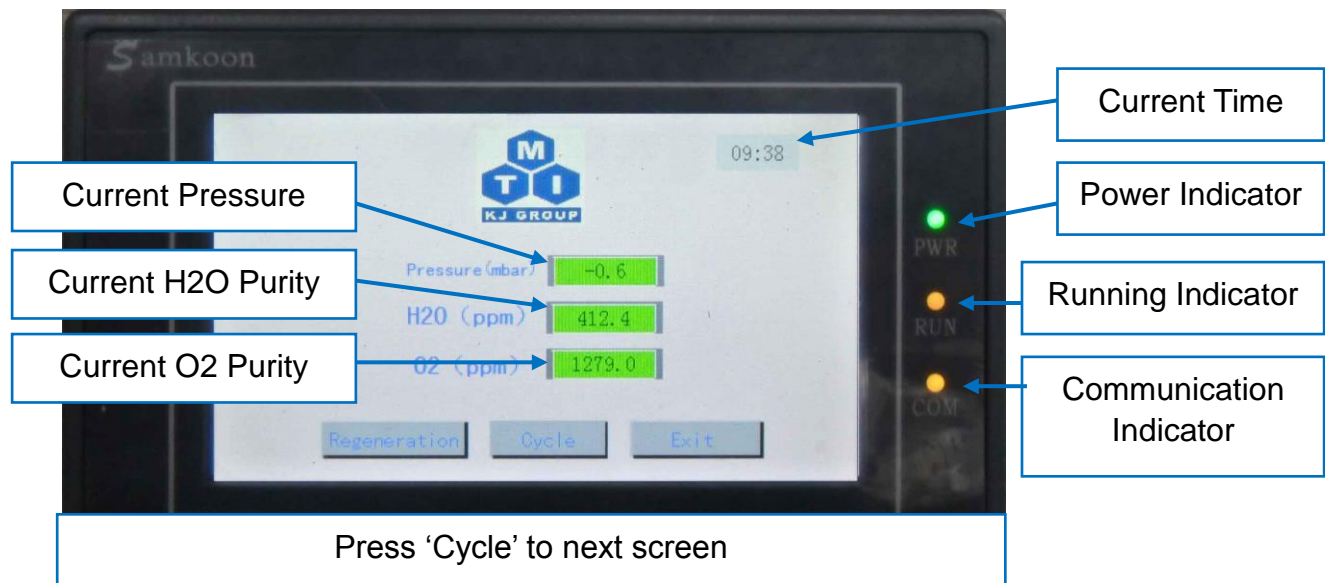
5. Usage of On/Off Valve

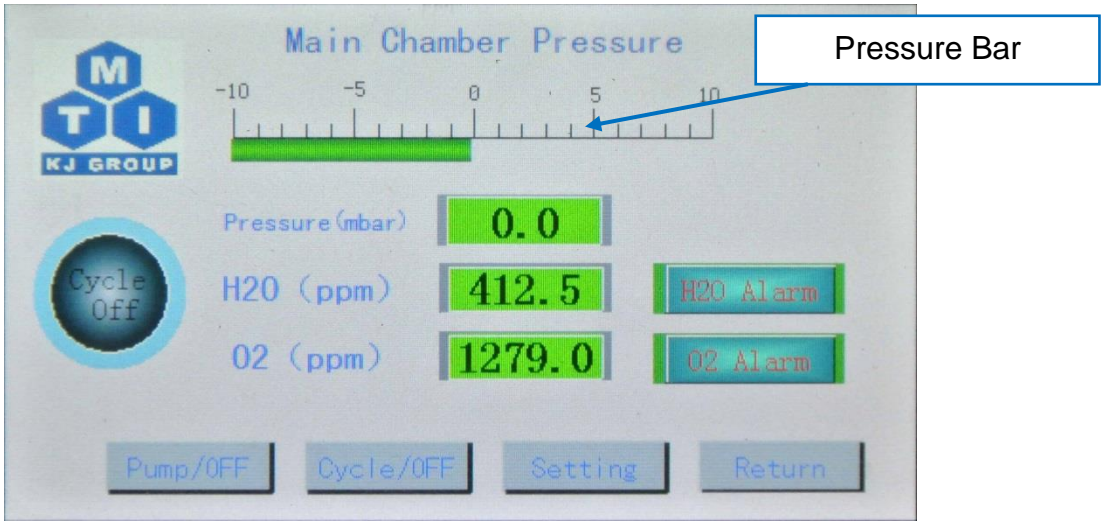


Operation

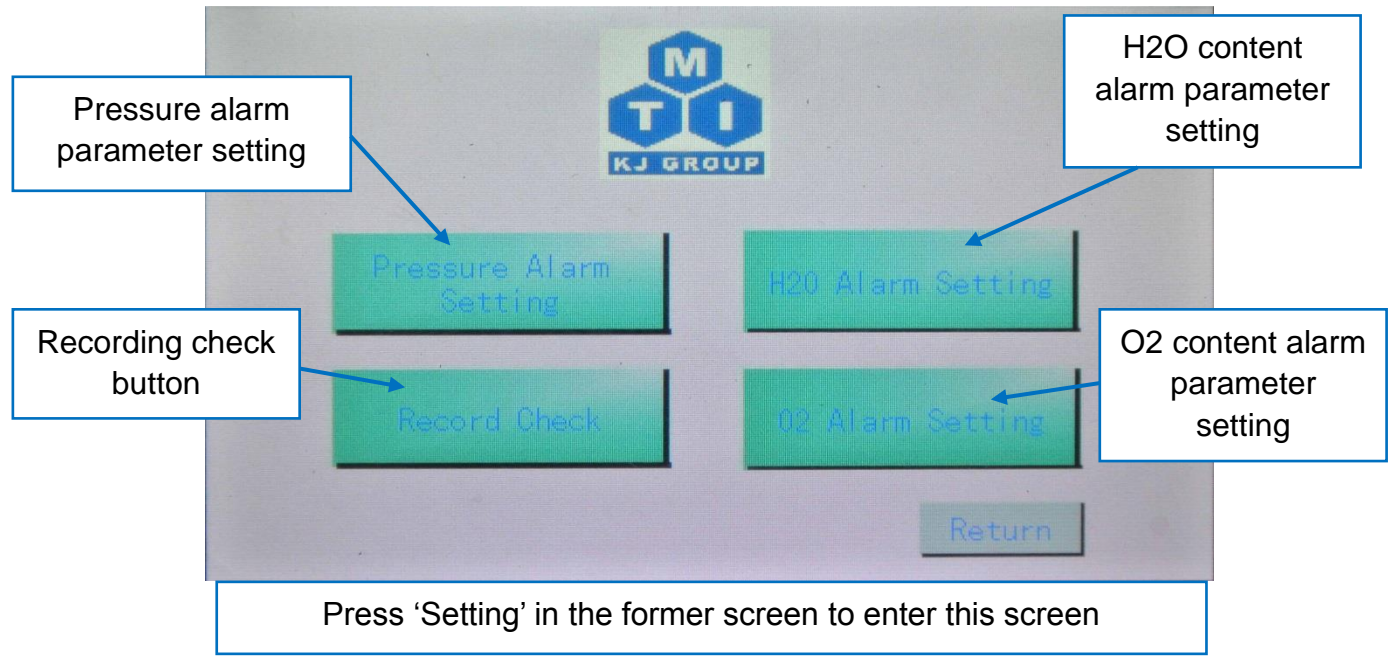
1. Operation Instruction of PLC Touch Panel

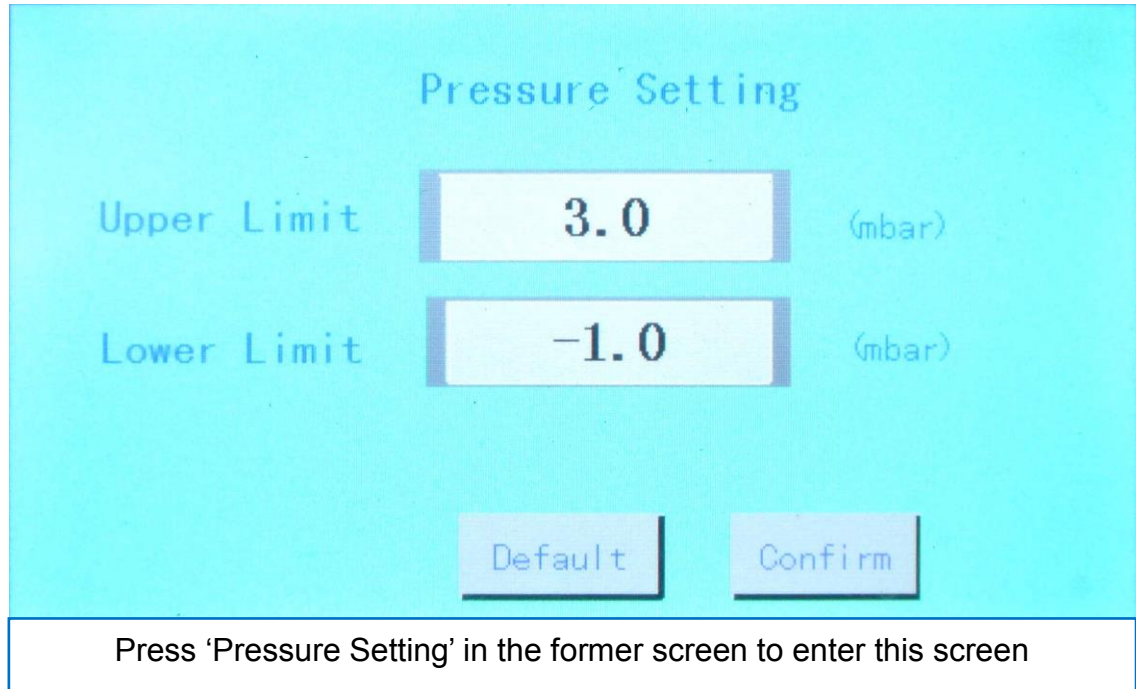
1) Introduction of the touch panel





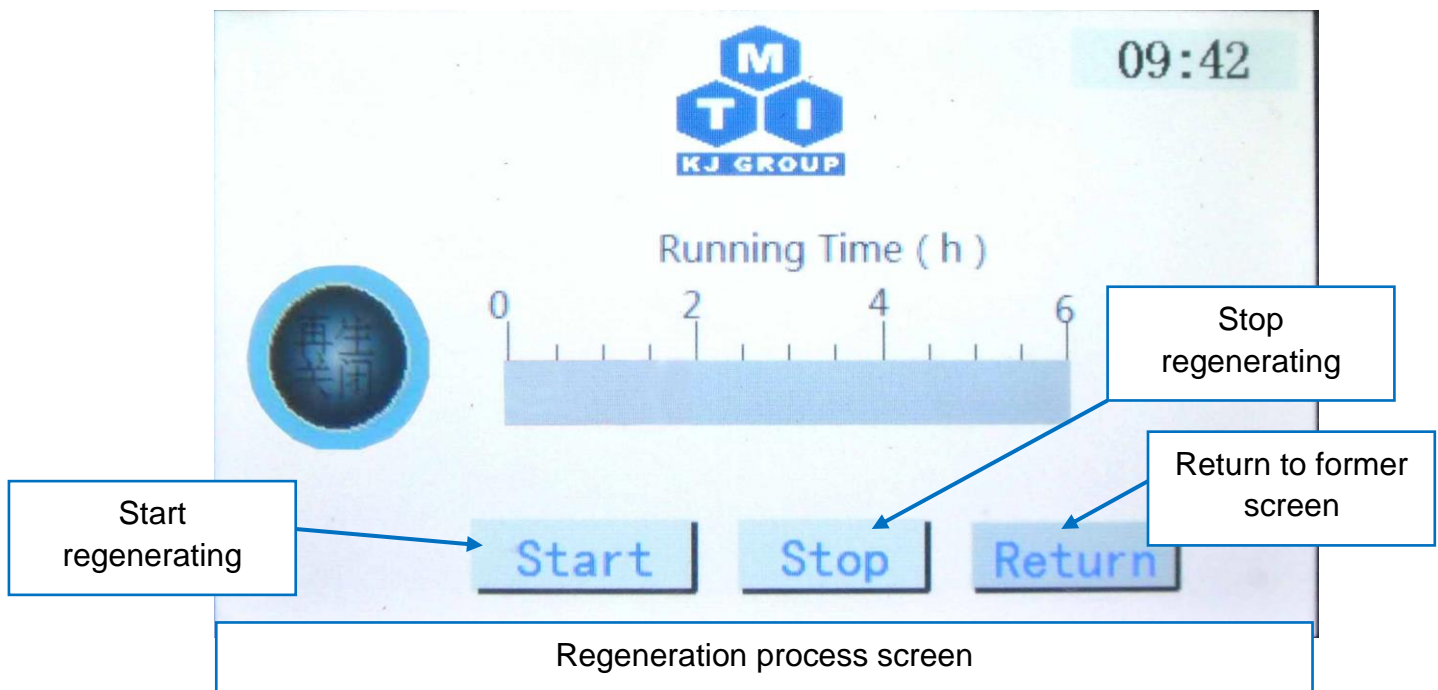
- “Pump/OFF”: On/Off button for vacuuming
- “Cycle/OFF”: On/Off button for circulation
- “Setting”: Press it to enter parameter setting screen
- “H2O Alarm”: Indicate whether the H2O content reaches the alarm limit value
- “O2 Alarm”: Indicate whether the O2 content reaches the alarm limit value





- Upper Limit: Pressure upper limit alarm value
- Lower Limit: Pressure lower limit alarm value
- Default: Factory reset
- Confirm: Press it to confirm the parameter setting

2) Operation Screen

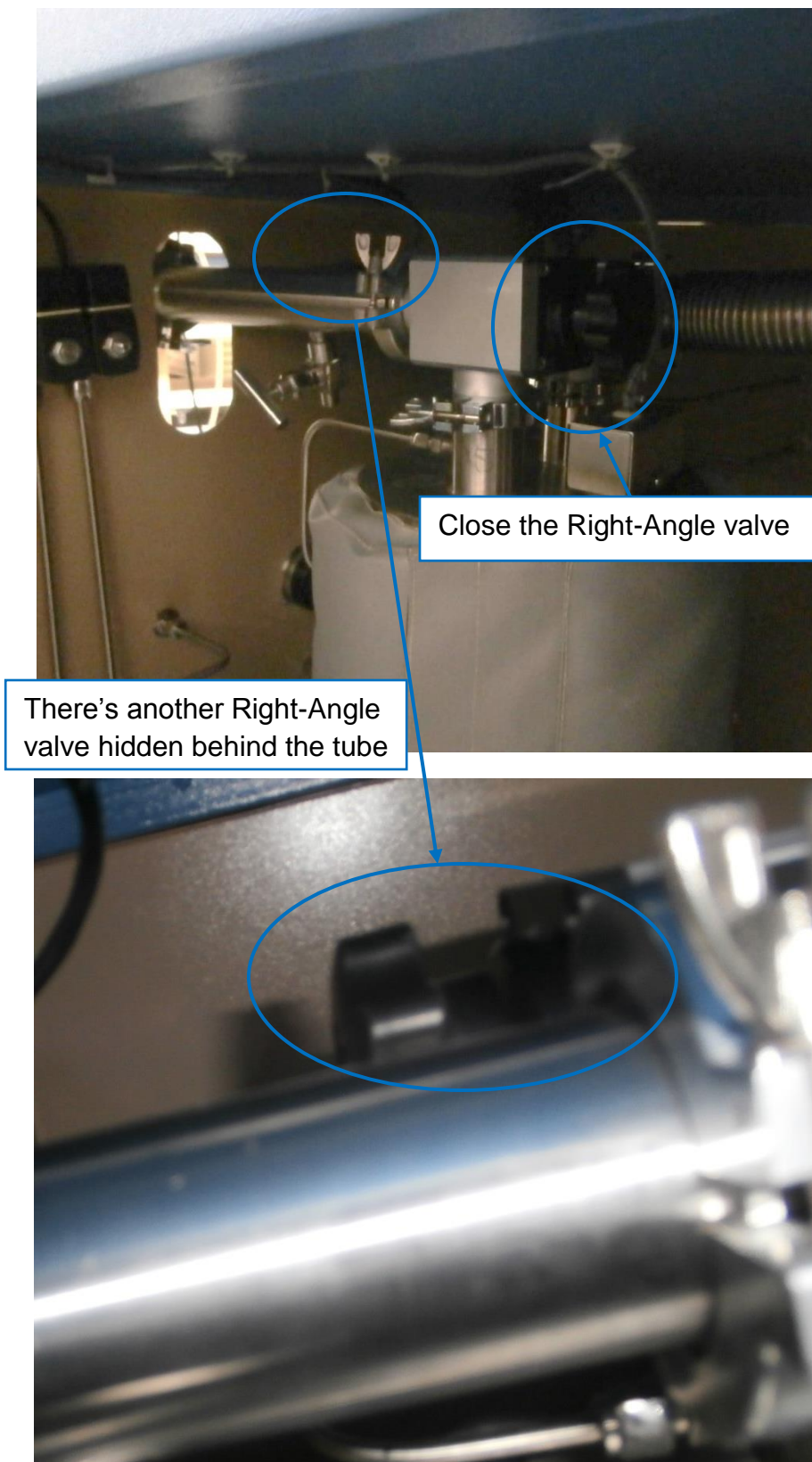


2. Chamber Purification

- 1) Leave the needle valve open completely for gas output



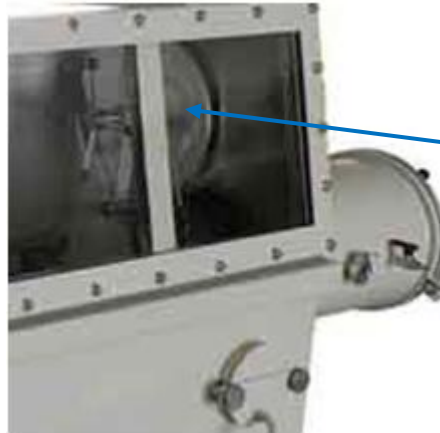
- 2) Close the Right-Angle valves inside the mobile cart (clockwise rotate for closing; anticlockwise for opening)



3) Take off the glove flanges and close the air-lock door

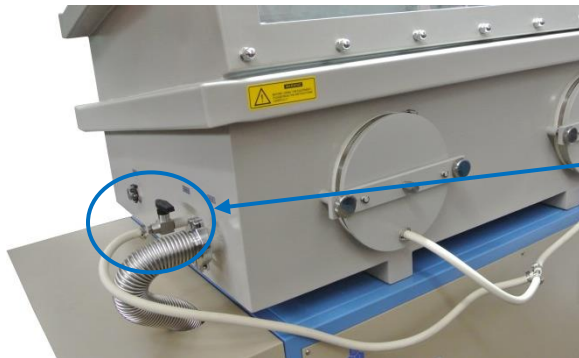


Loose the nuts and take the flange off



Close the inner air-lock door then install the flanges of glove

4) Close the On/Off valve on the right side of chamber



Close this valve

5) Open the valve to the pressure sensor



6) Close the valve '1' and '2'



Valve '1': Connect the vacuum pump to main chamber



Valve '2': Connect the vacuum pump to air-lock chamber

7) Turn on the power switch, power on the PLC touch panel



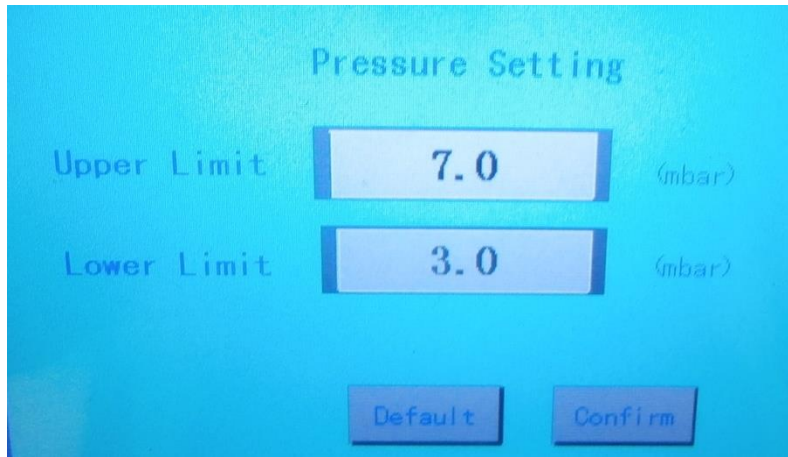
Power Switch



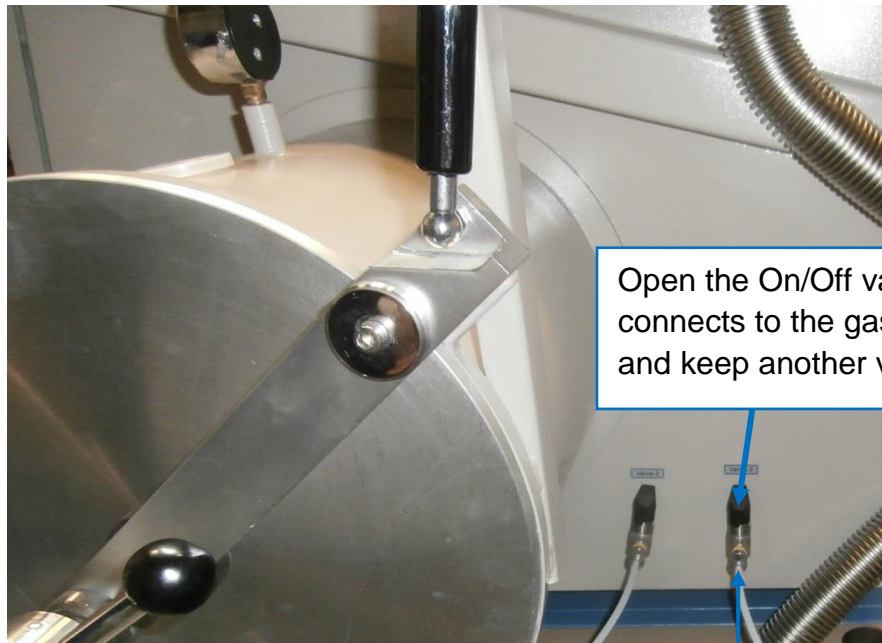
PLC touch panel first screen

8) Set the pressure alarm via PLC touch panel:

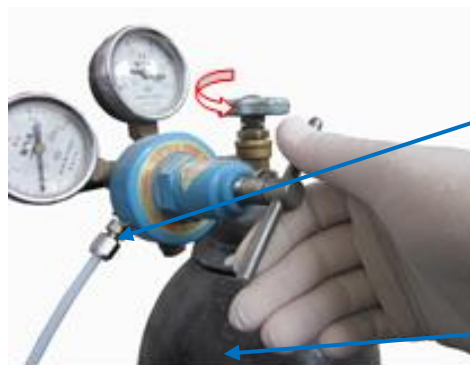
Press "Enter" → "Cycle" → "Setting" → "Pressure Alarm Setting", set the pressure limit from 3~7, then press "confirm".



9) Start Purification: Connect the gas cylinder to main chamber directly



Open the On/Off valve which connects to the gas cylinder and keep another valve close



Connect the gas cylinder to main chamber directly

Working gas: 99.99% N2

Attention: Please install the pressure release valve to the gas cylinder.



Make sure the gas flow speed is 3~5 psi

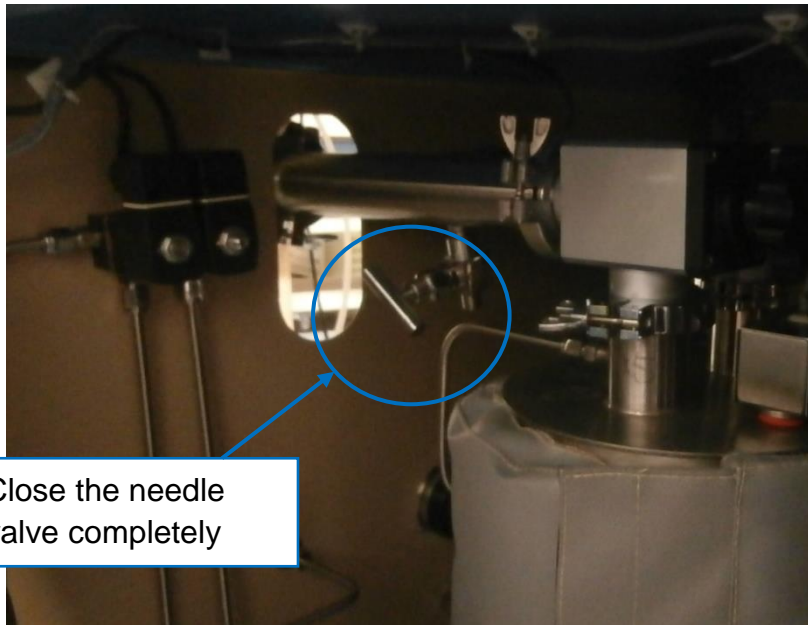
Notice: Keep all the valves off after the purification completion.

**Purification process will be finished while the H2O content<300ppm;
O2<300ppm**

3. Circulation

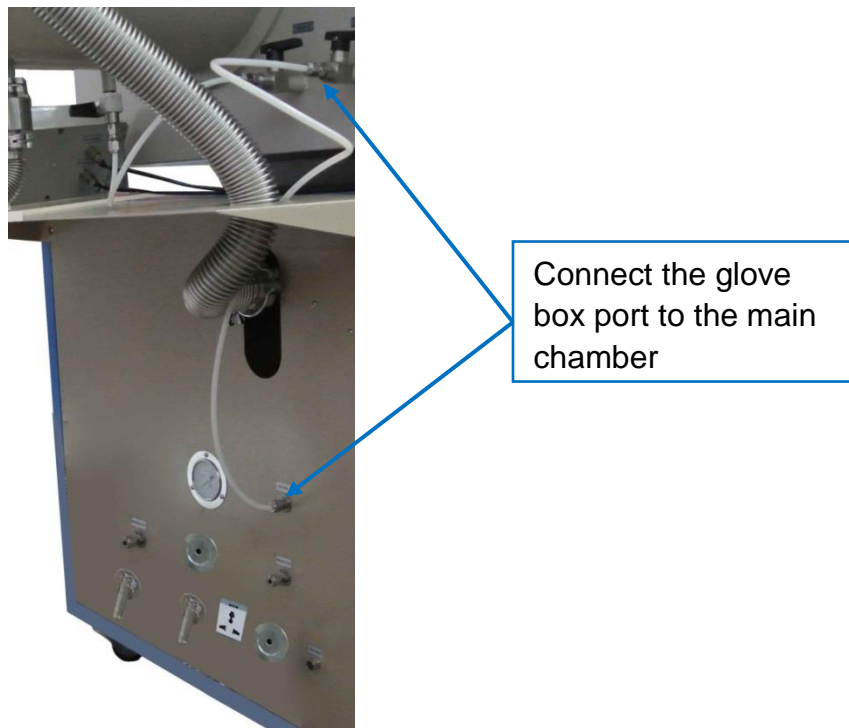
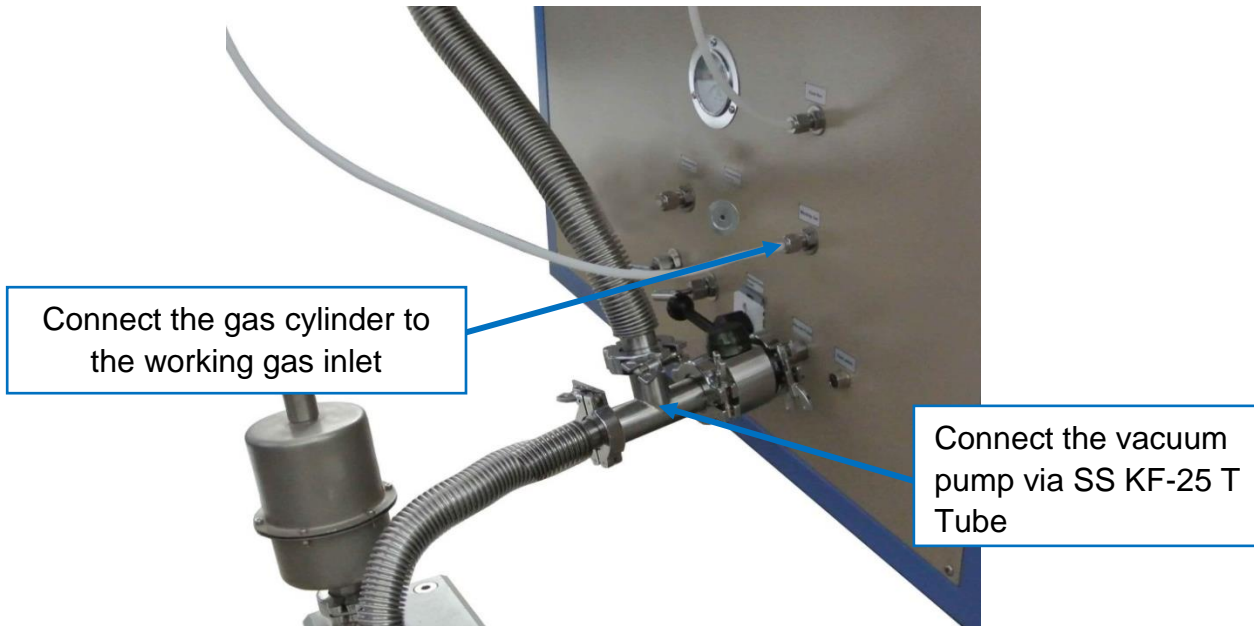
Warning: Please do not start circulation while either purification or regeneration (which will be mentioned in next chapter) is processing.

- 1) Close the needle valve shown in the picture below completely and close the regulator on gas cylinder

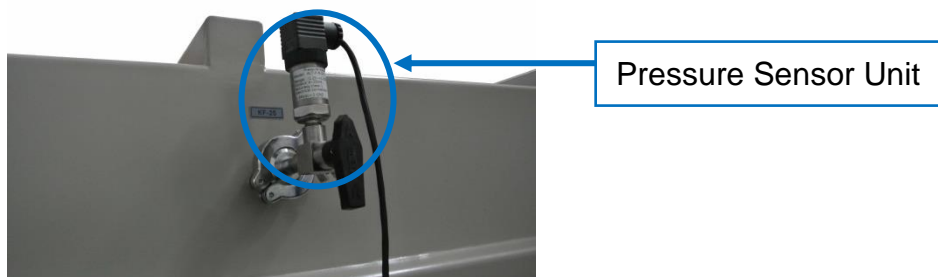


Close the needle valve completely

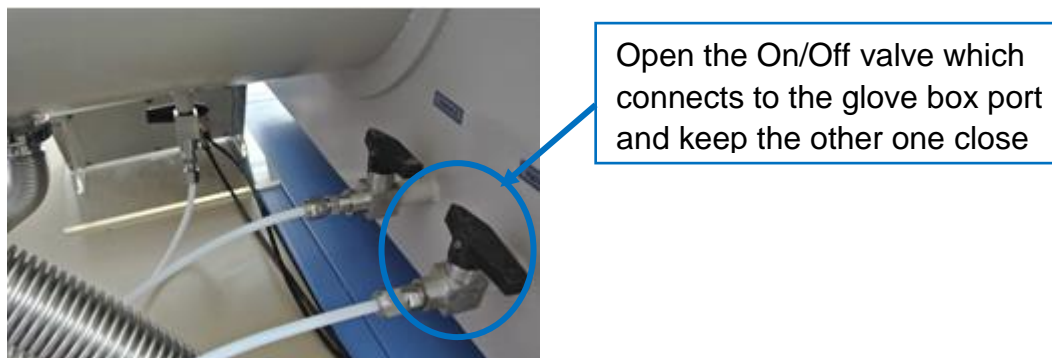
- 2) Take off the pipe line which connects the gas cylinder to the main chamber and connect the gas cylinder to the working gas inlet port on the mobile cart then connect the glove box port to the main chamber by a new pipe line.



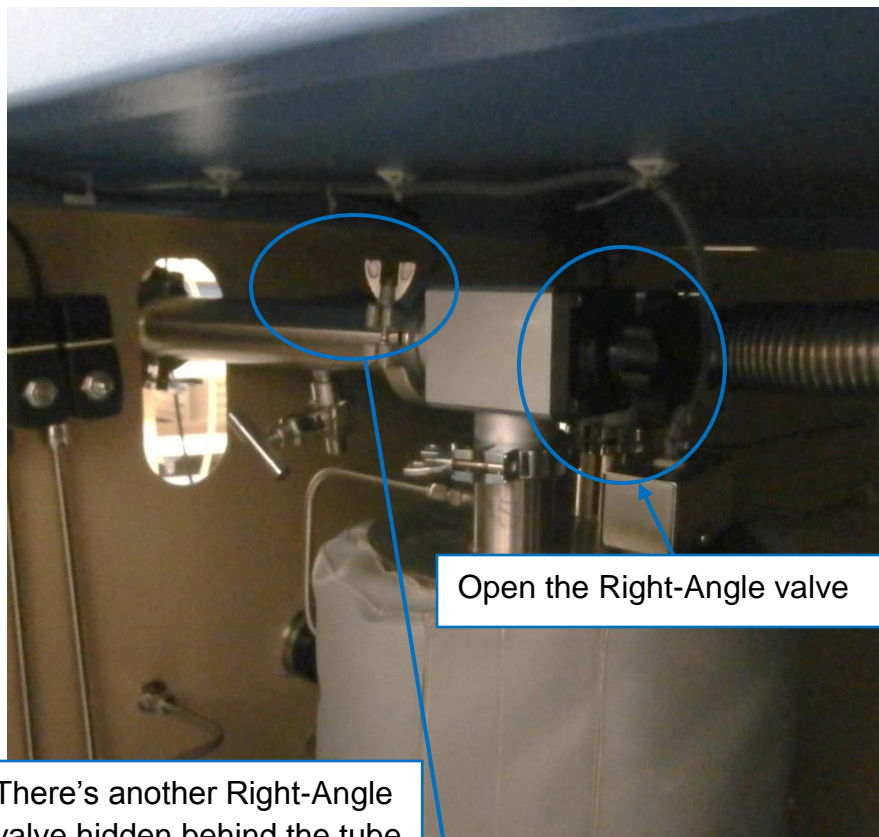
- 3) Open the pressure sensor unit valve



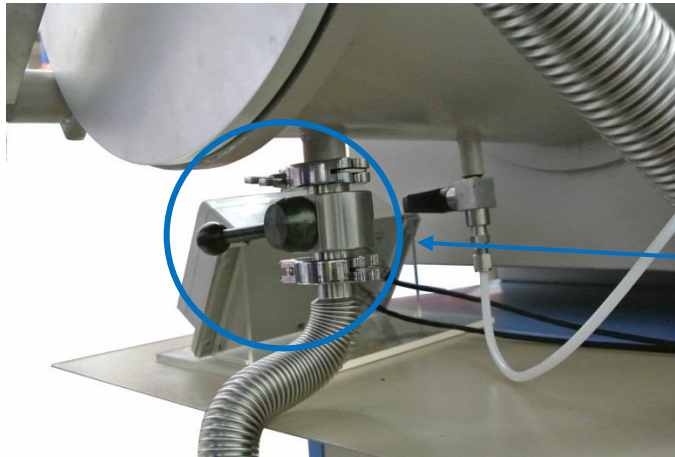
- 4) Open the On/Off valve which connects the glove box port



- 5) Open the Right-Angle valves inside the mobile cart (clockwise rotate for closing; anticlockwise for opening)



6) Close the valve show in the blue area

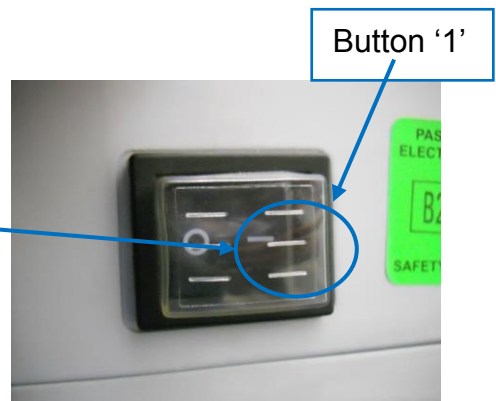


Close the valve here which connect vacuum to air-lock chamber

7) Set the pressure alarm via PLC touch panel:

Press "Enter" → "Cycle" → "Setting" → "Pressure Alarm Setting"
 → Press "Default" → Press "Confirm"

8) Keep the pump "power button" on 1, and the controller will automatically control it's on/off via power cable.



9) Start circulating via PLC touch panel:

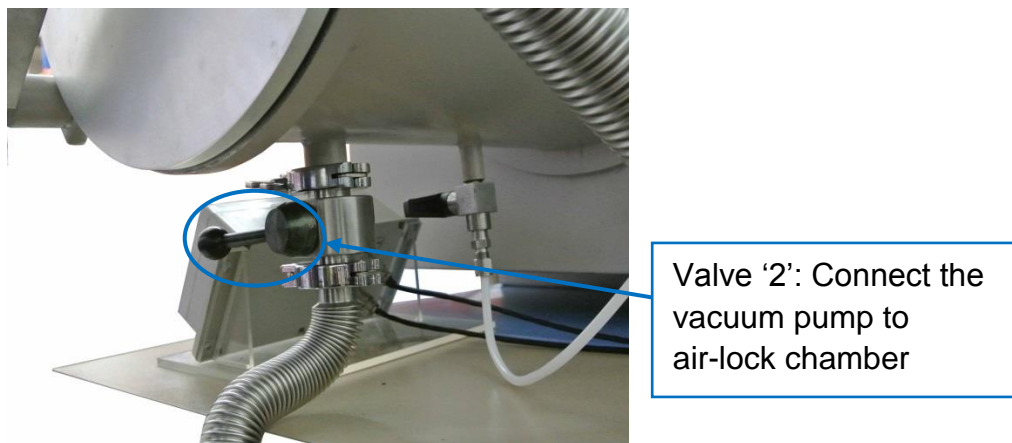
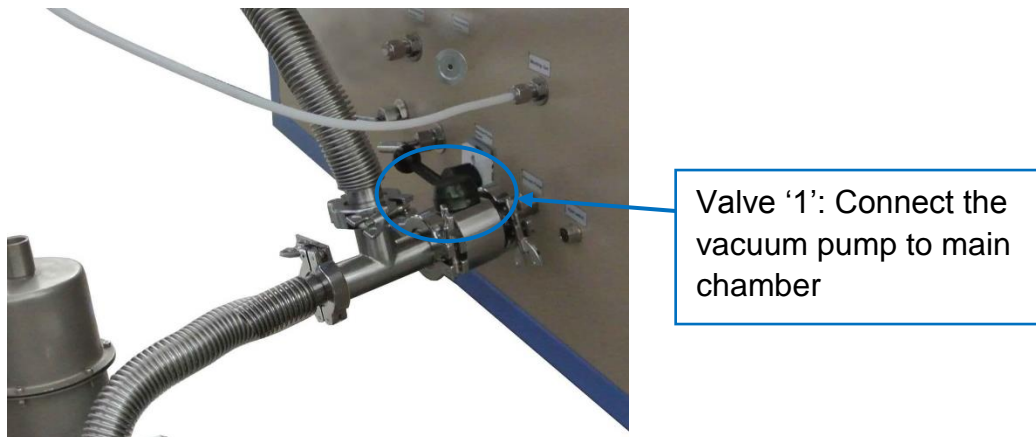
- Press "Enter" → "Cycle" → "Cycle/OFF": Start circulating
- When the percentage composition of H₂O reaches the requirement, customer can operate inside the chamber. (Normally it needs 8h for H₂O <10ppm; and it needs 16h for H₂O <5ppm. The data is only for reference)
- During the operation inside the chamber, customer can use foot pedal to control the pressure inside the chamber.



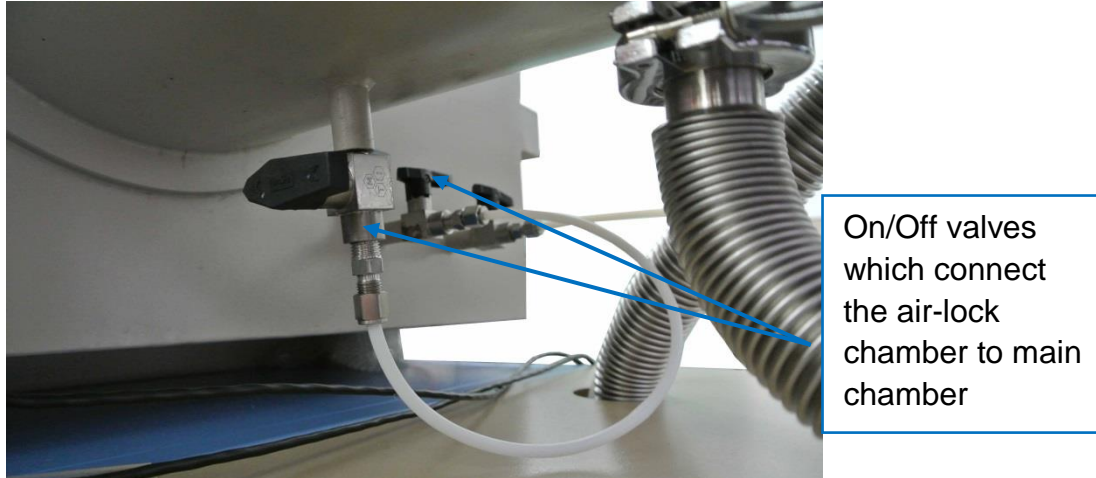
4. Sample Loading

- 1) Open the outer air-lock door and load the sample into the air-lock chamber then close the outer air-lock door
- 2) Close the valve '1', open the valve '2', then vacuum the air-lock chamber

Attention: Please connect the vacuum pump power independently in this step.



- 3) When the vacuum level reaches -0.1MPa , open the two on/off valves which connect the air-lock chamber to main chamber shown in the picture below meanwhile fill the gas into the chamber. This way will balance the pressure in both chambers.



- *It's the process of letting the gas in the main chamber get into the air-lock chamber*
- 4) When the pressure in the air-lock chamber reaches 0MPa , close the two On/Off valves and do vacuuming again. After the vacuum level reaches -0.1MPa the second time, redo the step 3) in this chapter.
 - 5) When the pressure in the air-lock chamber reaches 0MPa again, stop filling gas. Open the inner air-lock chamber door and move the sample into the main chamber then lock the inner air-lock chamber door.
 - 6) Open the valve '1' and close the valve '2' then finish sample loading



Valve '1': Connect the vacuum pump to main chamber

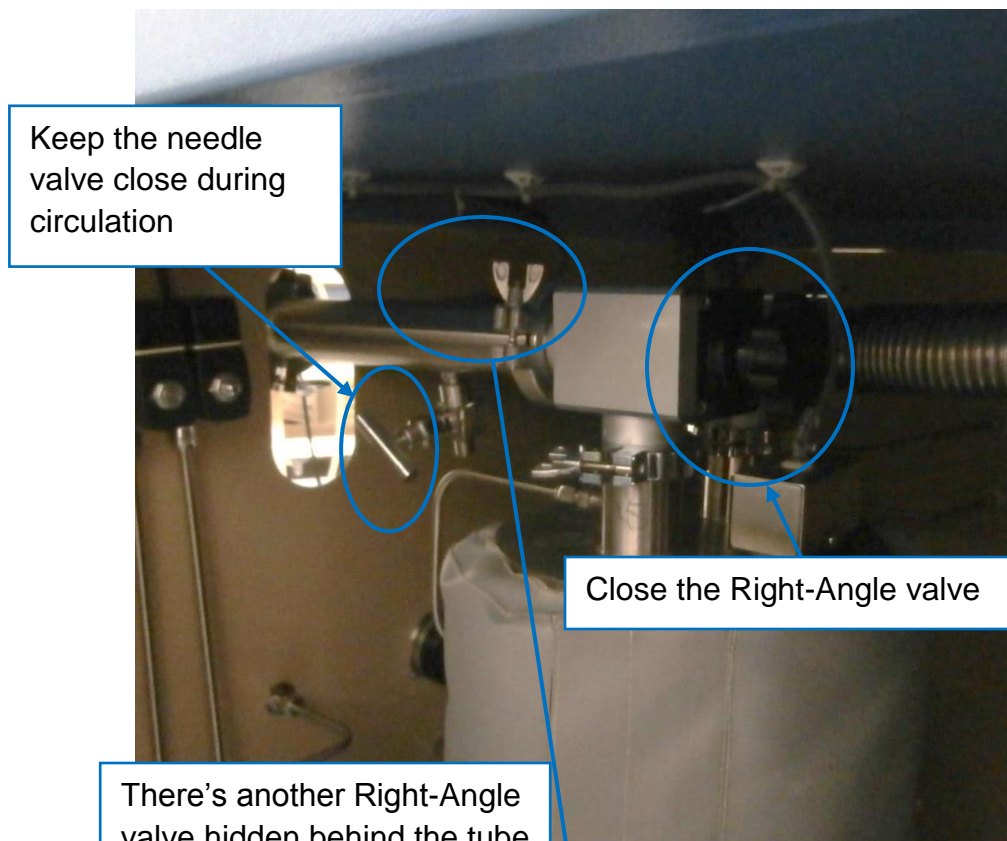


Valve '2': Connect the vacuum pump to air-lock chamber

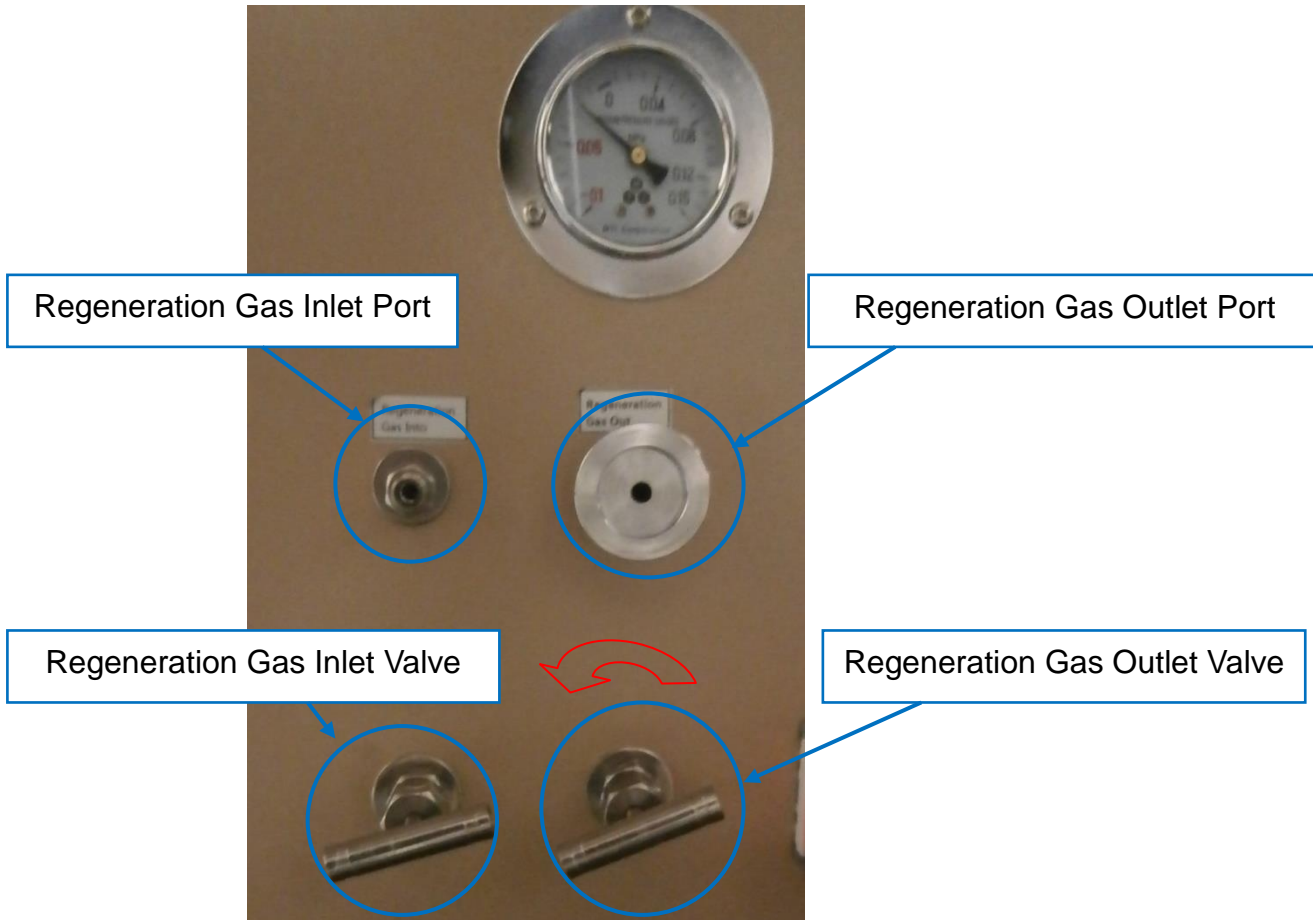
Regeneration

When the humidity and oxygen reach $< 50\text{ppm}$ during circulation, it means purge material is saturated and you may consider to do regeneration for protecting purification system.

- 1) Before regenerating, close the Right-Angle valves inside the mobile cart (**clockwise rotate for closing; anticlockwise for opening**)



- 2) Connect the 90%~95% N₂ and 5%~10%H₂ gas cylinder to regeneration gas inlet port and connect exhaust pipe to regeneration gas outlet port



- 3) Press “Enter” → “Regeneration” → “Start”: The system begins to heat, in the meantime please open the regeneration gas outlet valve to avoid over pressurization the main chamber due to gas thermo expansion from purification cylinder.
- 4) After heating 150min, open the regeneration gas inlet valve to let the regeneration gas be filled in and please continuous filling this gas for 3h.
The gas flow should be controlled between 15-20L/min shown by regeneration flowmeter. (During this process, please ensure the flow rate constant)
- 5) Close two of the regeneration gas valves and close the regulator on gas cylinder after filling the gas for 3h.
- 6) Connect the regeneration gas outlet port to vacuum pump and turn on the vacuum pump then open the regeneration gas outlet valve to allow vacuuming. When the pressure value reaches -0.1Mpa, continue vacuuming for 12h.



Attention: Please connect the vacuum pump power independently in this step.

7) After finishing vacuuming, fill in the high purity N₂ or other inert gas until the pressure reaches 0Mpa.

Warning:

- Please make sure the circulation program has been shut off.
- Please ensure a continuous regeneration process and regeneration gas.
- Do not touch the top of purification cylinder in case of scalding.
- If the regeneration process is stopped by accident, please do not perform any regeneration and circulation process in the next 6 hours, otherwise it'll damage the device.

Maintenance

1. Glove Box and Vacuum Pump

- a. If **power failure** during the process, you must press “pump” on main menu to enable the pump again after power recovery.

Note: If the above steps still can not start the pump, please disassemble the KF25 clamps to let air get into the vacuum hose, then reassemble it to restart the pump.

- b. Do not wear watch, rings or any other sharp items to keep gloves from either penetration or worn-out.
- c. Regularly check the oil level of the pump, refill the oil if the level lower than 2/3 of full scale.

2. Vacuum Pump Oil Change

- a. Run the pump for 10 minutes to decrease the pump oil viscosity which will help it be poured out more easily.
- b. Close the ball valves between the pump and glove box.
- c. Unplug the power cable from the pump and disassemble the KF25 clamp.
- d. Remove either of the two caps of oil inlet and incline the pump body to pour the oil from the oil outlet (remove the cap) to a proper container underneath.

Quick Troubleshooting

1. If the chamber leaks, check the door of the preceding chamber immediately to confirm whether it is tightened and whether the lever of the two doors of the airlock transition chamber is properly positioned into the locating slot. In case the leakage keeps on, check the vacuum gauge seat, valve, O rings of the two doors and the vacuum rubber. The O ring of the door of the airlock chamber must be regularly replaced according to the user's operation frequency.
2. If the glove blows out in pumping, check whether all the valves are open; slowly open the valves while charging inert gases, and pay attention to the condition of the glove. The gas may be pumped in or out through any one of the valve of the box.