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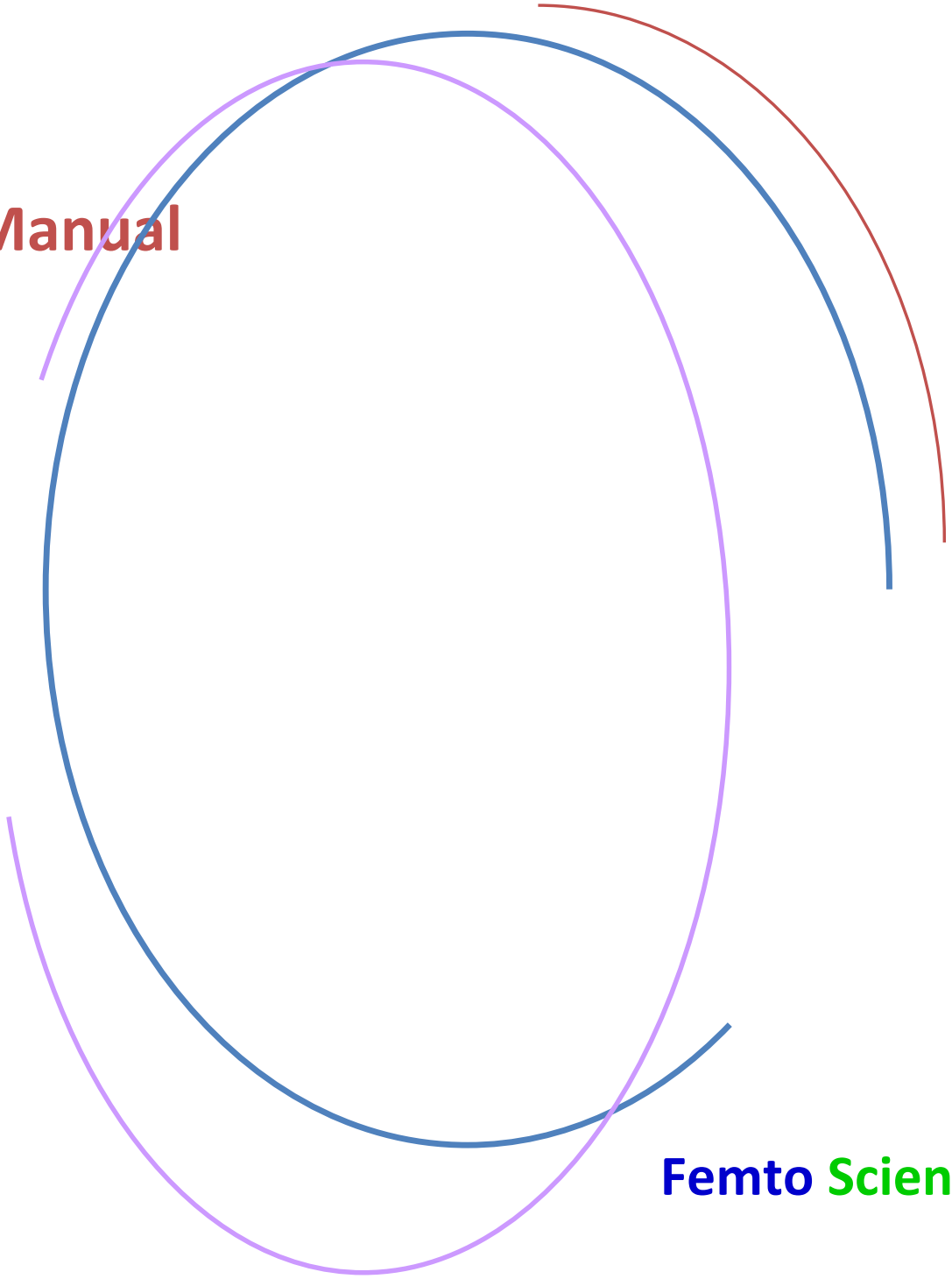
Manual



Femto Science Inc.

Model : COVANCE

Contents

1. Technical Data

1) Mode

- Reactive Neutral Domination

- The top electrode is powered and the substrate is loaded on the tray

2) Reaction Chamber

- Type : Horizontal chamber with standard door

- Material

  a. Chamber : Stainless steel

  b. Door : Aluminum

- Size : Up to 6'' wafer

- Viewport : Dia. 80mm, glass window

3) Generator

- Frequency : 20 ~ 100KHz

- Power : Up to 200W

4) Gas lines package

- Process gas line

  a. Number of channel : 1 (One) for O_2

  b. Flow control : Automatic by mass flow controller

- Gas line material : Stainless steel

- Fittings : 1/4", lok fitting

5) Pressure measurement

- Sensor type : Pirani vacuum gauge

- Measurement range : 760 Torr ~ 1 x 10^{-3} Torr

6) Pumping package

- Oil rotary vacuum pump

  a. Designed pumping speed: 150 ℓ/min @50Hz, 180 ℓ/min @60Hz

  b. Ultimate vacuum: 1.0 x 10^{-3} Torr

7) Operation control

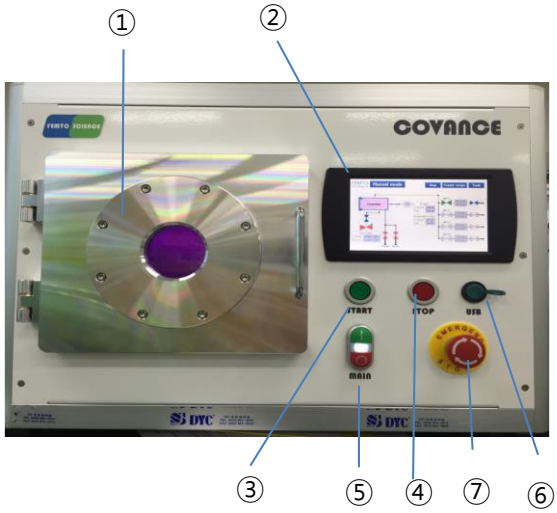
- 7" touch pannel interface for full process control

- Supporting the two mode (Auto & Manual Mode)

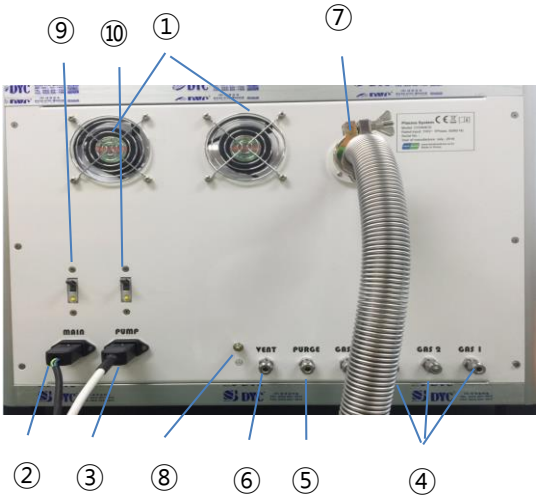
- Storing the process data

- Support the graph viewer (Including the graph control)

2. Hardware Installation



<Front>



<Rear>

① Chamber

② Touch panel

③ Start switch

④ Stop switch

⑤ Main power switch

⑥ USB Port

⑦ Emergency switch

① Exhaust fan

② Main power connection

③ Pump power connection

④ Gas connection(GAS1, GAS2, GAS3)

⑤ Purge connection

⑥ Vent connection

⑦ Vacuum pipe connection

⑧ Earth

⑨ Main power circuit breaker

⑩ Pump power circuit breaker

Functions of switches

1. Chamber

2. Touch panel

Mode, pressure, gas, and time adjustment can be viewed through this screen.

3. Start button

It starts operation in AUTO mode with the recipe you loaded and saved.

4. Stop button

In the middle of operation, you can stop all operations pressing this button.

5. Main power switch

Turning on main switch is that the system is ready to work and it also supplies the power to the pump. In case the electric power supply of your place is not stable, you may as well prepare for an emergency by reserving an separate power.

Description of the rear panel

1. Exhaust fan

This is for thermal emissions out of the device. It shall be running all the time as long as the system power is on.

2. Mains power connection

110V 1Ph or 220V 1Ph, it is susceptible to change depending on the countries. The manufacturer fabricates the mains power of the device in accordance with the user's territory. You are required to use an independent plug for this plasma system only.

3. Pump power connection

There is no need to prepare an additional plug for the pump. You can connect the power to the pump directly from the main plasma system. (But, you may prepare an additional plug for the pump, just in case.)

4. GAS connection

¼" Lok-type. SUS tube is recommended. For non-corrosive or & non-pyrophoric gases like Air Oxygen, Nitrogen and Argon, plastic tube is applicable instead of SUS tube. Before connection, please check the correspondence of the gas and the MFC.

5. Purge connection

This is the connection port with purge gas(Air or N2, ¼" Lok-type).

6. Vent connection

¼” Lok-type. SUS tube is recommended. For Nitrogen or air, plastic tube is applicable instead of SUS tube.

7. Vacuum pipe connection

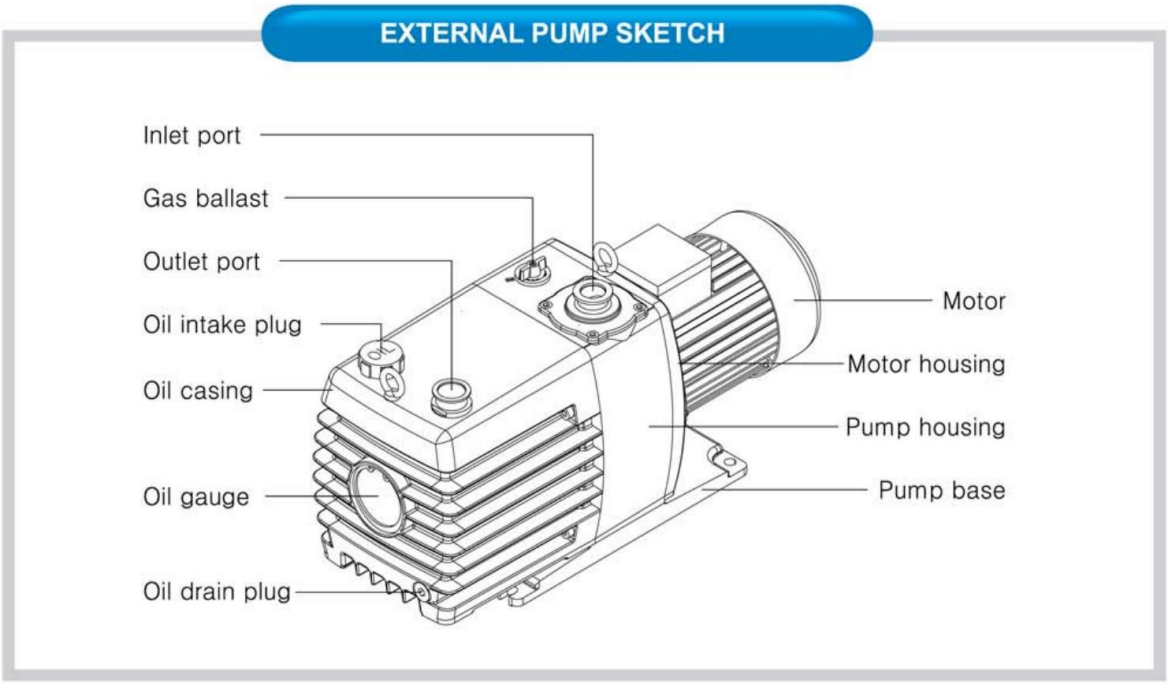
This port is connect to bellows hose of the pump.

8. Earth

Are used for equipment grounding.

9.10. Main/pump power circuit breakers

In the case of a short circuit of the main power or in the pump, the circuit breakers work and shut down the power supply immediately to protect the system from damage.

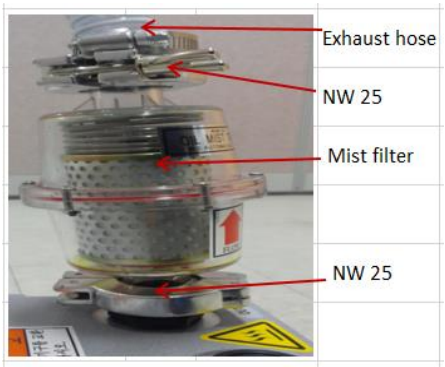


1) Connect stainless steel bellows hose to pump inlet port by using NW 25 clamp.

2) Connect the other end of bellows hose to real panel of main system.

3) Connect the mist filter to outlet port with NW 25 clamp

4) Connect exhaust hose to mist filter with NW 25 clamp



NOTICE

For a normal operation and the best throughput of the process, it is recommended to place the pump down on the floor lower than the plasma system.

3. Software

< Main screen >

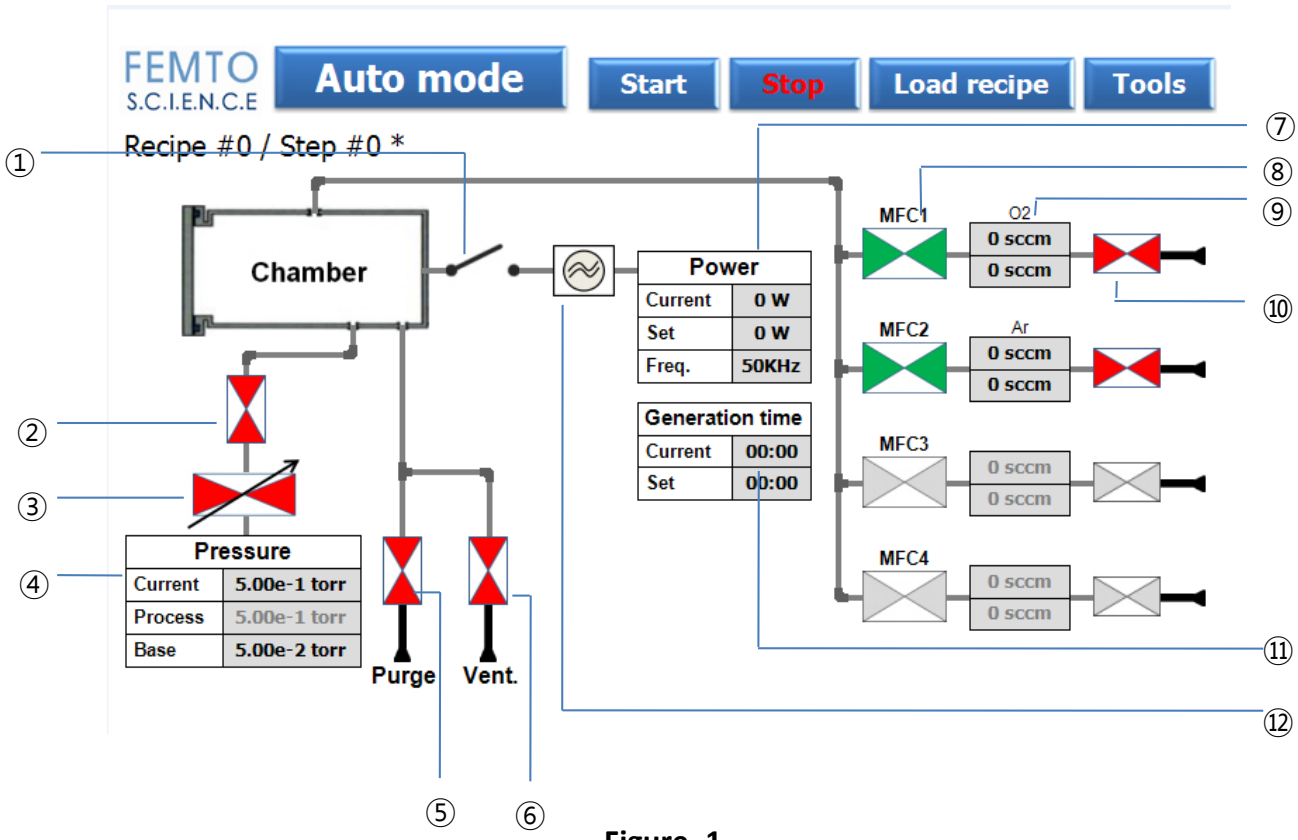


Figure. 1

① Generator power switch

② Pump valve

③ Pressure button

④ Pressure display

⑤ Purge valve

⑥ Vent valve

⑦ Generator power display

⑧ MFC setting

⑨ Gas flow display

⑩ Gas valve

⑪ Generation time display

⑫ Generation power/time controller

Functions of parts

① Generator power switch :

Control the generation power on/off.

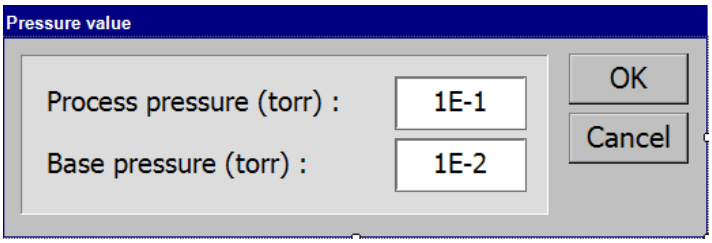
② Pump valve :

Control pump valve on/off

③ Pressure button :

User can set base pressure

and process pressure in this mode



✱ **NOTE : It is available to set the process pressure only in the PERCENT mode of MFC setting unit, not in the SCCM mode.(refer to ⑧)**

④ Pressure display :

Display current pressure, process pressure and base pressure.

⑤ Purge valve :

Control purge valve on/off

⑥ Vent valve :

Control vent valve on/off

⑦ Generator power display :

Display generation power and frequency

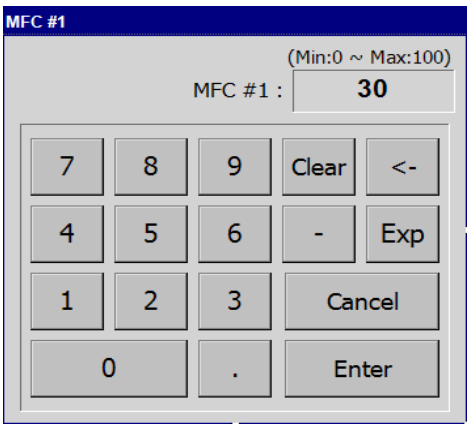
⑧ MFC setting :

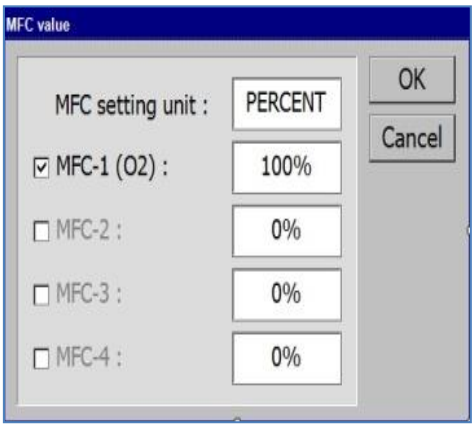
To adjust the amount of gas inflow into the chamber through each MFCs. It can be input either in PERCENT unit or SCCM unit on the following pop-up screen.

In case of PERCENT unit,

The amount of gas inflow from each MFC is automatically controlled at the ratio you have set so that the process pressure can keep stable

(the sum of percentage of MFCs should be 100%)





In case of SCCM unit,

The inflow amount of gas keeps as much as you set,

regardless of the process pressure.Press “Enter”,

and it will show you the following screen. If you set

the check box of each MFC, it begins gas inflow.

⑨ Gas flow display :

Display the amount of gas you set and the current gas amountflowing into chamber.

⑩ Gas valve :

Control gas valve on/off

⑪ Generation time display :

Display the generation time.

⑫ Generation power/time controller

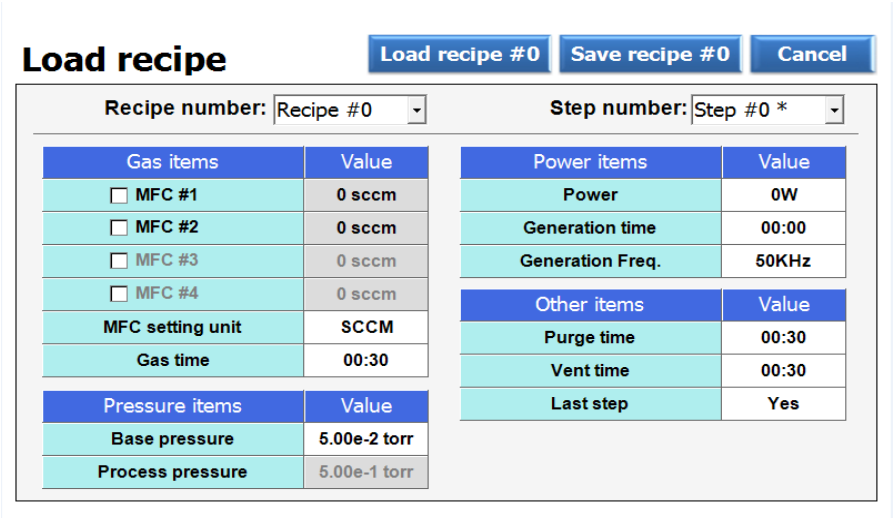
Set the generation power and time.

▶ Manual mode : Press this button, and it will shift between manual and auto mode.

▶ Stop : Click this button, it will stop all operations and return to the initial mode with the data saved.

▶ Create recipe : see the bellows

< Recipe screen>



1) All data in the last manual mode will be set in the current step.

2) Save Recipe : To save the current recipe.

3) Cancel : To close this screen.

4) Recipe number : This consists of 10 recipes (0~9), you choose one of them.

5) Step number : This consists of 10 steps (0~9), every single recipe has 10 steps each.

6) Gas items :

- MFC #1, #2, #3, #4 : to set the amount of gas flowing in through each MFCs

- MFC setting unit : to set the values in either PERCENT or SCCM unit.

  (in case of APC applied model, support only SCCM unit)

- Gas time : the gas stable time between the gas inflow and generator activate.

NOTE : Gas time is necessary to keep the chamber stable because the pressure of the chamber would be unstable for seconds at the moment the gas begins to flow in.

7) Pressure items :

- Base pressure : an appropriate pressure of the chamber required for vacuuming. This is also the indication of the moment of starting gas inflow.

- Process pressure : the required pressure for plasma operation. This is adjustable only in the case MFC setting is in PERCENT unit. (in case of APC applied model, also support this item)

8) Power items :

- Power : To set generation power.

- Generation time : To set the generation time.

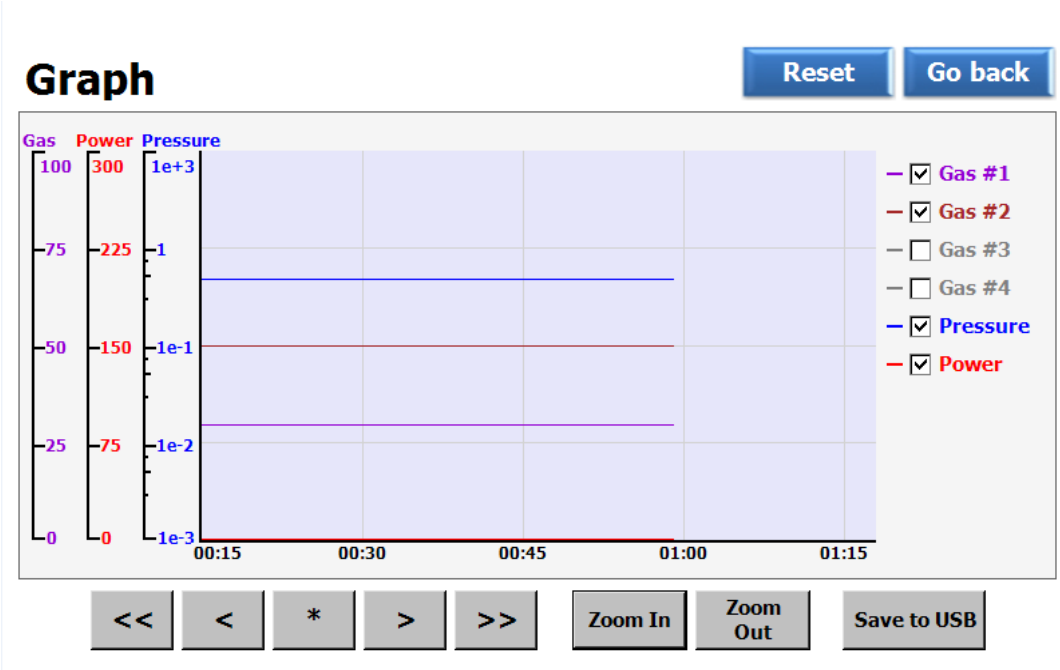
9) Other items :

- Purge time : To set purge time.

- Vent time : To set vent time.

- Last step : To set Yes or No, whether the current step is the last one or not.

< Graph screen >



1) Reset : To initialize graph data

2) Go back : To move to the precious screen

3) Channel check box : To determine the appearance on the graph by marking in the check box

4) << : To move the graph view fast to the left side

5) < : To move the graph view to the left side

6) * : To move the graph view to the end of the right side

7) > : To move the graph view to the right side

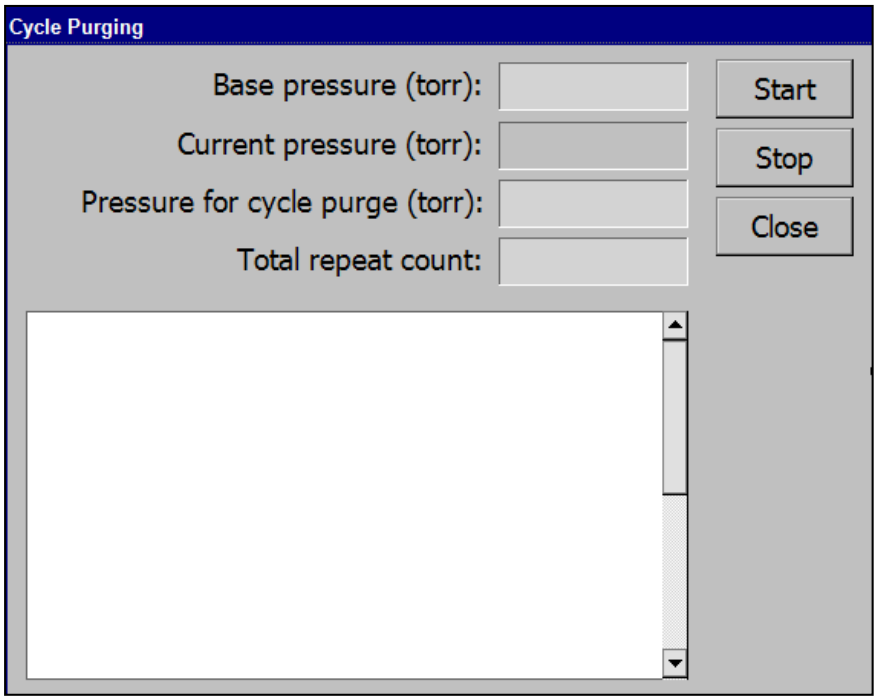
8) >> : To move the graph view fast to the right side

9) Zoom In : To zoom in the graph view

10) Zoom Out : To zoom out the graph view

11) Save to USB : To save the graph data into USB storage.

< Cycle Purging >



1) Start : To start the cycle purging.

2) Stop : To stop the current cycle purging.

3) Close : To close the current cycle purging screen.

4) Base pressure : To set the base pressure for cycle purging.

5) Current pressure : To display the current pressure of chamber.

6) Pressure for cycle purge : To set the pressure for cycle purging.

7) Total repeat count : To set the total repeat count of cycle purging.

4. Maintenance

Cleaning the chamber

The chamber should be cleaned periodically. The cleaning schedule will depend on frequency of use, type of materials processed, and choice of process gas.

The inside of the reaction chamber should be cleaned regularly with isopropyl alcohol or another suitable cleaning agent. After cleaning the chamber, always generate a pure Oxygen, Argon, or Air plasma for at least five minutes to remove any residual contamination. One means of determining chamber cleanliness in the absence of visual indications is to pump the chamber down to its minimum

achievable base pressure and record that value, then generate an Argon (or Oxygen) plasma for a 5 minute period. Pump the chamber down to its minimum achievable base pressure a second time and record that value. Compare this value to the first value. If there has been a notable decrease from the first pump-down to the second it is an indication that cleaning of the chamber has occurred while running the plasma. Repeat this process until no notable difference is noted in minimum base pressure from one test to the next.

VACUUM PUMP OIL

Many of the problems with the vacuum system are associated with the vacuum pump oil. It is important that the oil condition be checked periodically to verify that it is at the proper level and free of contaminants. Dirty or insufficient oil can result in poor vacuum pump performance. Dirty oil can also lead to possible chamber contamination due to the increased vapor pressure back streaming into the chamber from the contaminated oil.

Some plasma processes may create a larger degree of pump oil contamination than others. Additional personal protective equipment may be necessary in some cases. The end user of this equipment should conduct industrial hygiene sampling in accordance with NIOSH, or other nationally recognized standards or test procedures, during the changing of the pump oil. Do not allow this pump oil to flow down the sewer drain.

Pump oil should be changed at least once a year. If the system is getting a lot of use and the process being used creates a large amount of contamination, the oil may need to be changed as often as every two months. If the pump oil appears visually dirty, it needs to be changed. Check the pump oil at least once a month.

5. Troubleshooting

LOCATING VACUUM LEAKS

The procedure outlined below is for locating and fixing vacuum leaks. A leak may be present if the system will not pump down. Another indication of a vacuum leak is if the plasma has a redder shade than usual. The red hue would be due to the nitrogen in the air leaking into the chamber.

1. Check that the chamber O-ring gasket to see if it is in good condition and is sealing properly against the reactor chamber lid mounted on the door.
2. Tighten all external fittings.
3. Check the fittings for the process gas and pressure gauge lines at the rear of the chamber. Disconnect and check for dirt in the fitting, then reconnect using a small amount of vacuum grease.
4. Normally, when the pump isolation valve is on, the vacuum solenoid is open. When the valve is off, the solenoid is closed. If this solenoid is faulty or leaks, there will be a constant vacuum. A loud hissing noise is a symptom of this problem. To confirm a faulty valve, turn off the valve, and leave the vacuum pump on. If there is a slight vacuum at the vacuum port on the quartz tube, the solenoid must be replaced.
5. It is possible to locate a very small leak by squirting all external fittings and sealing ports, one at a time, with alcohol. When alcohol is poured over the connection that is leaking, the chamber pressure should rise slightly as the alcohol vapor is sucked into the chamber. Leaks can be repaired by replacing O-rings, chamber seals, hoses, fittings, and by replacing Teflon tape at various joints.