

SC-9100

(Perfect for R&D and QC Labs)
Wafer Semi-Auto Device
of Surface Trace Metal Contamination
Recovery for VPD-WSD/VPD-
WSL/ICP-MS/TXRF Treatment

Operation Manual

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0 For Your Safety

The series are high-precision, Semi-Automated Wafer Surface Contamination Recovery Systems. Specially designed for Vapor Phase Decomposition (VPD) and wafer surface liquid phase droplet scanning (WSD /WSL), these tools serve as the perfect pre-treatment / sample preparation solution for ICP-MS and TXRF trace metal analysis. Ideal cost-effective alternative for semiconductor R&D labs and foundry QA/QC pipelines seeking reliable wafer contamination control.

Thank you for purchasing SC-9100 (Perfect for R&D and QC Labs) Wafer Semi-Auto Device of Surface Trace Metal Contamination Recovery for VPD-WSD / VPD-WSL /ICP-MS/TXRF Treatment (referred to as "SC-9100" or "device"). Please read this instruction manual carefully before use, and keep this manual in a safe place where you can refer to it at any time.

SC-9100 is manufactured under strict quality control, but if you find any defects, please contact us (contact details are listed at the end of this manual) or your place of purchase.

We have taken every precaution to ensure the contents of this manual are accurate, but if you find any errors or have any concerns, please contact us or your place of purchase.

<Overview and Use of this Device>

SC-9100 collects nano contaminants from the various wafer surfaces using several hundred microliters of sampling solution.

The device is equipped with the necessary equipment for this purpose: a wafer rotation table, a sampling arm, a liquid holder stand, a petri dish to hold the sampling liquid, a vial (vial stand) to hold the sampling liquid after sampling, a pipette tip washing table used for sucking up the sampling liquid, and a syringe pump to suck up a fixed amount of the liquid.

Danger (Mishandling may result in death or serious injury.)

-Do not plug in or unplug the device with wet hands. You may get an electric shock.

-SC-9100 is mainly composed of the parts made of PVC, PTFE and PFA. The unexpected chemical reaction with particular materials may produce poisonous matter to cause damage to the human body or hardware.

*Hydrogen fluoride (HF), which is typically used for Vapor Phase Decomposition (VPD) and Contaminants Collection, is used with no problem, only when it is properly handled.

-If any chemicals come into contact with your skin, wash it off immediately with water and seek medical attention. Or please follow the procedure prescribed by your factory.

-SC-9100 has a built-in fuse for overcurrent protection, but does not include a breaker as the device is compact. Please install a breaker (5A) for this device at your factory.

-The device is designed for single-phase AC-100V only. If the power supply at your factory is not AC-100V, please prepare a voltage conversion transformer in between. The capacity of the transformer should be 500VA.

-Be sure to install a breaker with AIC10kA or higher that allows lockout /tagout after the voltage conversion transformer upstream of this device.

WARNING (Indicates a potentially hazardous situation.)

The rotation of SC series sampling arm and turntable indicates a potentially hazardous situation;

High pressure gases such as N₂ and DCA used for the SC series, indicates a potentially hazardous situation;

The use of low concentration acidic and alkaline chemicals which may be used by customers for cleaning or sampling, indicates a potentially hazardous situation.

Caution-1 (Mishandling may result in moderate injury or property damage.)

-No damage, which consequentially occurs in the process of operating SC-9100, shall be warranted by the manufacturer nor the seller, regardless of whether the injured party is the customer or any other third party and whether the situation is under normal operation or with wrong doing, unless the manufacturer is legally determined to bear the responsibility.

-Do not disassemble, modify, or repair SC-9100 without prior consent by the manufacturer.

-Any malfunction caused by above actions shall not be covered by the terms of warranty.

-Do not apply a strong shock or vibration on SC-9100 during transportation or operation, as it is a very delicate precision tool.

-Whenever any unusual event (ex. abnormal movement, heat, flame, odor, and noise) is noticed, immediately cut the power off on SC-9100, and physically unplug the power cord from electric source, and then wait for the advice by the manufacturer or the seller.

Caution-2 (Precautions for use.)

-Be sure to use gloves, aprons, arm covers, protective glasses, etc. that are compatible with the recovery and cleaning fluids used with this device, in accordance with your company's regulations.

-Please install this device in a clean draft with an exhaust interlock in accordance with SEMI S2, and secure it with earthquake-resistant brackets.

Safety Instructions (About definitions and security labels.)

<Definitions>

- Danger: Hazards related to handling the chemicals used in this device
- Warning: Prohibited items when handling this device
- Caution: Cautions regarding collisions while this device is in operation

• Security Labels

Handle chemicals with care



Warning when transporting this device



Warning for Rotating Parts



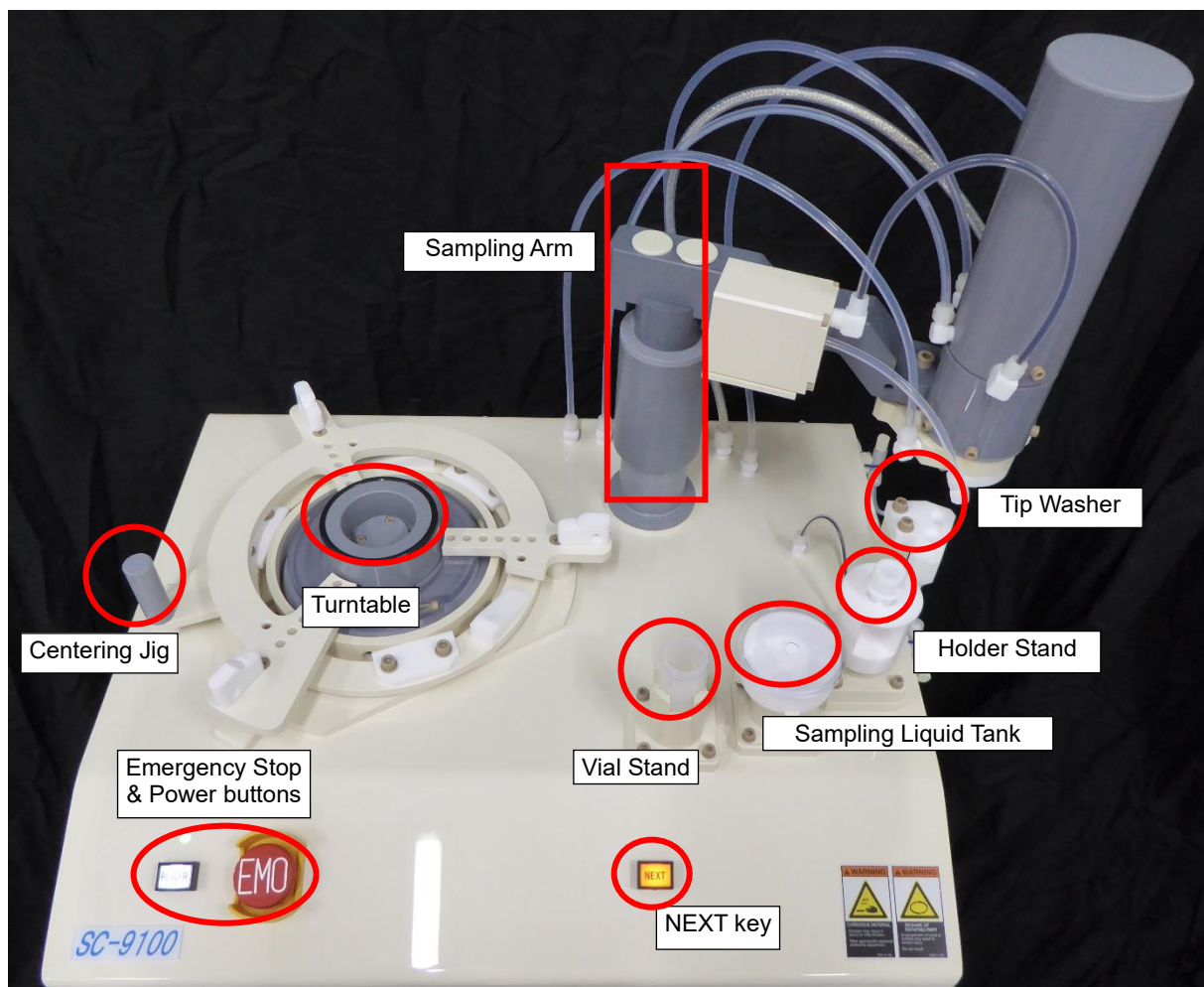
Warning for high voltage



1 System Description

*Please note that the appearance of the system may change without any notice.

1-1 Front End



- Turntable

It can rotate the wafer for sampling. Rotation speed is automatically adjusted by the radius of sampling position to make the sampling speed constant.

- Sampling Arm

It shall bring a liquid holder over the wafer for sampling, and moves by each single specified pitch after every rotation of the wafer on the turntable.

- Centering Jig

Places the wafer at the right location on the turntable, and removes the wafer out of the turntable.

The centering pins shall be set into the holes with the appropriate numbers to fit for each corresponding wafer size.

*each jig has the number to show the inch sizes of wafer, each represents

4: 100mm, 5: 125mm, 6: 150mm, 8: 200mm, and 12: 300mm

- Vial Stand

It is used to store a vial for collected chemical solution.

- Sampling Liquid Tank

A Petri dish for the sampling liquid is set here.

The sampling liquid shall be ready inside the petri dish located here and used for the sampling jobs.

- Holder (pipette tips remove) Stand

A sampling liquid holder shall be set here. By replacing the part, a pipette tip can be attached at this place.

- Tip Washer

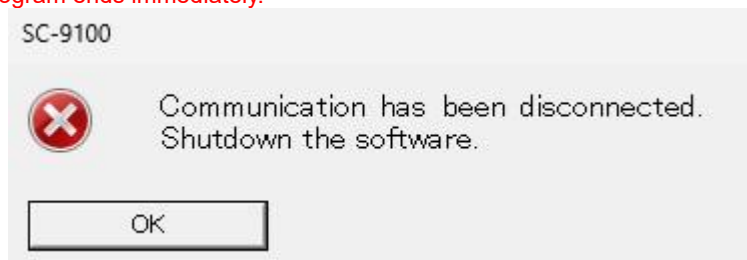
The cleaning liquid, such as pure water, shall be ready in the petri dish for cleaning a pipette tip. After the sampling job is done, the used pipette tip is cleaned here.

- Emergency Stop & Power buttons

Emergency Stop shall finish the motion of SC-9100 in case of emergency. The system in SC-9100 is locked after its activation. Restarting the system, the emergency stop button must be reset by pushing the button again.

*When you try to start the program while the lock is on, sampling cannot be done as the communication between SC-9100 and PC is not activated. To start communication with PC, please see the procedure shown in “2-5. Configuration”.

*When the system is locked by pushing the emergency stop button while the PC software is on, following message pops up, and the program ends immediately.



There is a "power button" to the left of the emergency stop switch.



- NEXT key

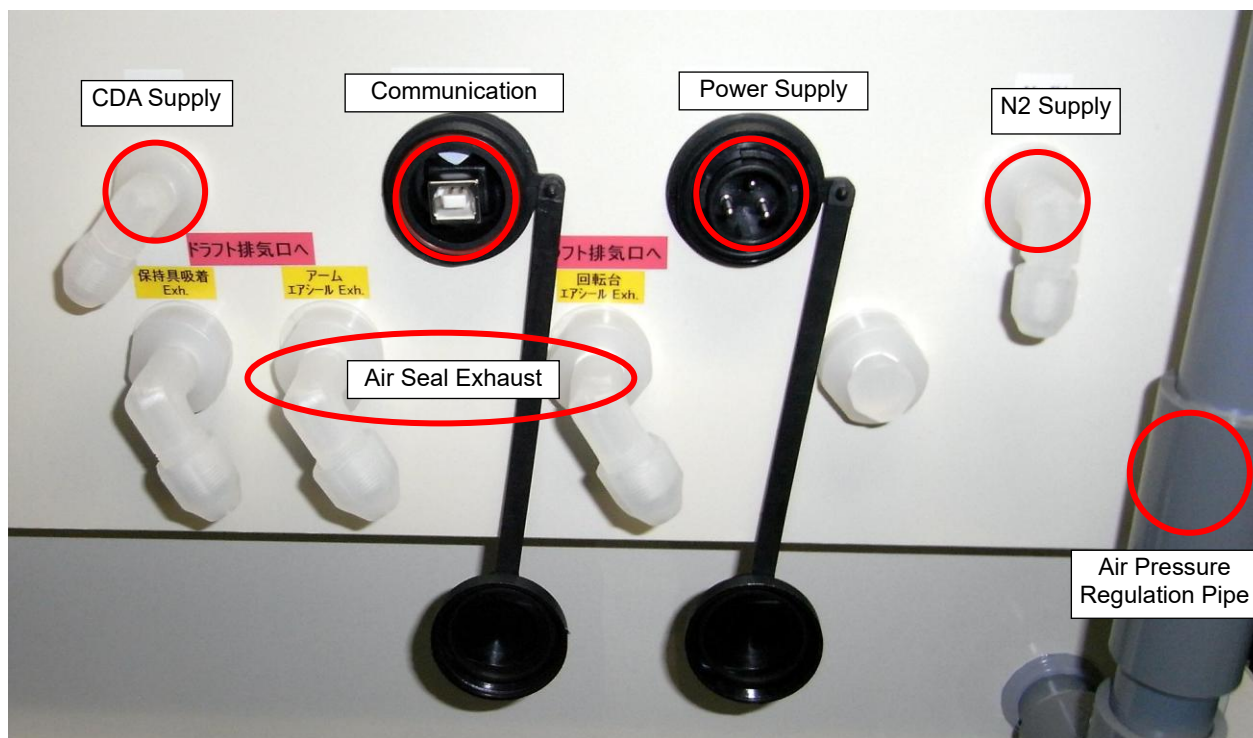
Enables the sampling to proceed to next step. When one sampling process is finished, the “NEXT” key (LED button) of SC-9100 flickers to ask if the operation shall proceed to the next step.

*You can also make the sampling proceed to the next step on a PC screen.

*At the starting stage of sampling (when the main screen is shown), LED of “NEXT” key remains on and does not flicker.

If you push “NEXT” key at this stage, it makes the same operation as the sampling start procedure.

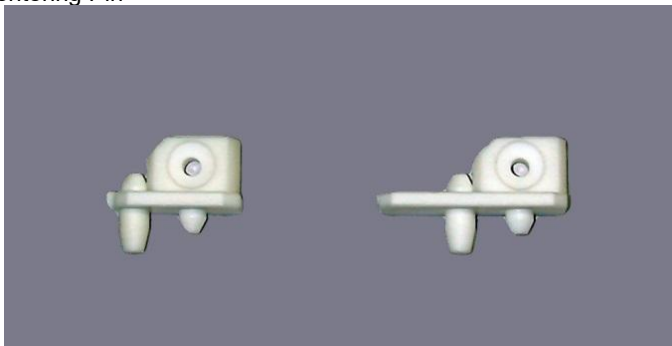
1-2 Back End



- Communication**
 Used for the connection with a PC through USB connection.
- Power Supply**
 Receives Single Phase 100VAC power. The plug uses 3 pins.
- Air Pressure Regulation Pipe**
 The pipe can keep the internal air pressure the same as the external atmospheric pressure. It also prevents acidic gas to creep inside SC-9100 through the pipe by placing the top of pipe higher than the level of sampling. Please install the pipe so that the tip of the pipe is above the operation area. Also, make sure that the acid atmosphere on the operation area does not enter the inside of the device through the pipe.
- CDA Supply**
 A tube is used to take Clean Dry Air in SC-9100 in order to control fluid within the device.
- N2 Supply**
 A tube is used to take N2 to retain the sampling liquid.
- Air Seal Exhaust**
 A tube to exhaust the air, which is used for fluid control inside SC-9100.

1-3 Accessories

- Centering Pin



(Left) Centering pin (standard) (Right) Centering pin (long)

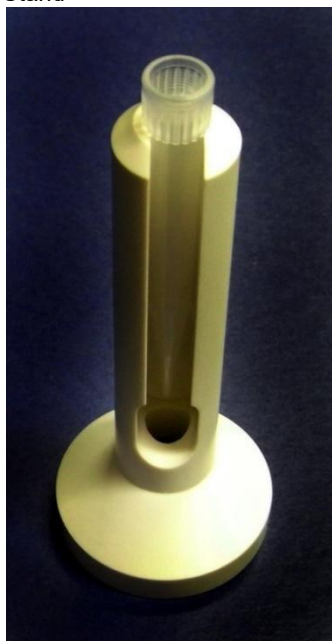
Used with the centering jig to place wafer at the proper position of turntable.
The long one will make the centering easier, but it does not handle 4 inches wafer.

- Liquid Holder, Holder Stand



The proper liquid holder shall be placed on the holder stand during sampling process.
The holder stand and the tip stand can be exchanged, if necessary.

- Tip Stand



The Tip Stand is used for replacing a pipette tip at the top of the sampling arm. The tip and the holder stands shall be placed in the same location. When using the tip stand, please remove the holder stand.

If the tip is left on this stand, the sampling arm may hit the chip, and then **sampling process cannot be performed.**

1-4 Consumables & Replacement Frequency

- Pipette tips used with this device:

Product number:2-652-23 / Model number: BMT-L
 *AS ONE Corporation

- Frequency to replace pipette tips
 When physically damaged or when contaminants are observed to be extracted.

2 System Operation

2-1 Start Up

Be sure that the emergency stop button is released (power is on), and that SC-9100 and PC are properly connected. When SC-9100 is turned on, the light above the Power Supply button will change from white to orange to green.



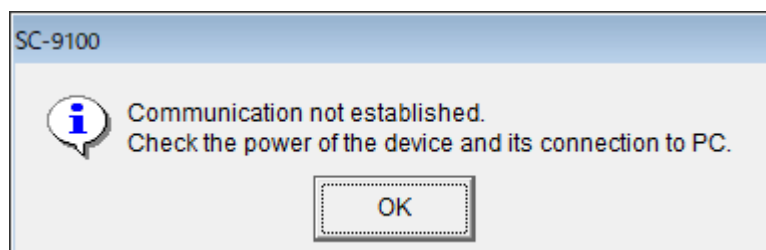
When you press the power button while the light is green as shown above, the light will change from orange to green.



With the above appears, the device is ready for operation. In this state, please start up the SC-9100 control software.

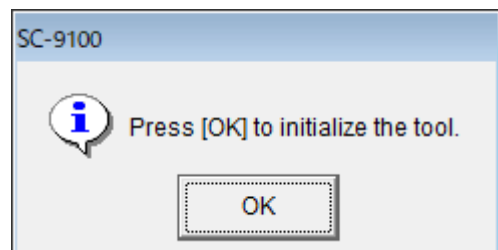


If the communication between SC-9100 and PC is not established, the message below comes up, and Software does not move forward.



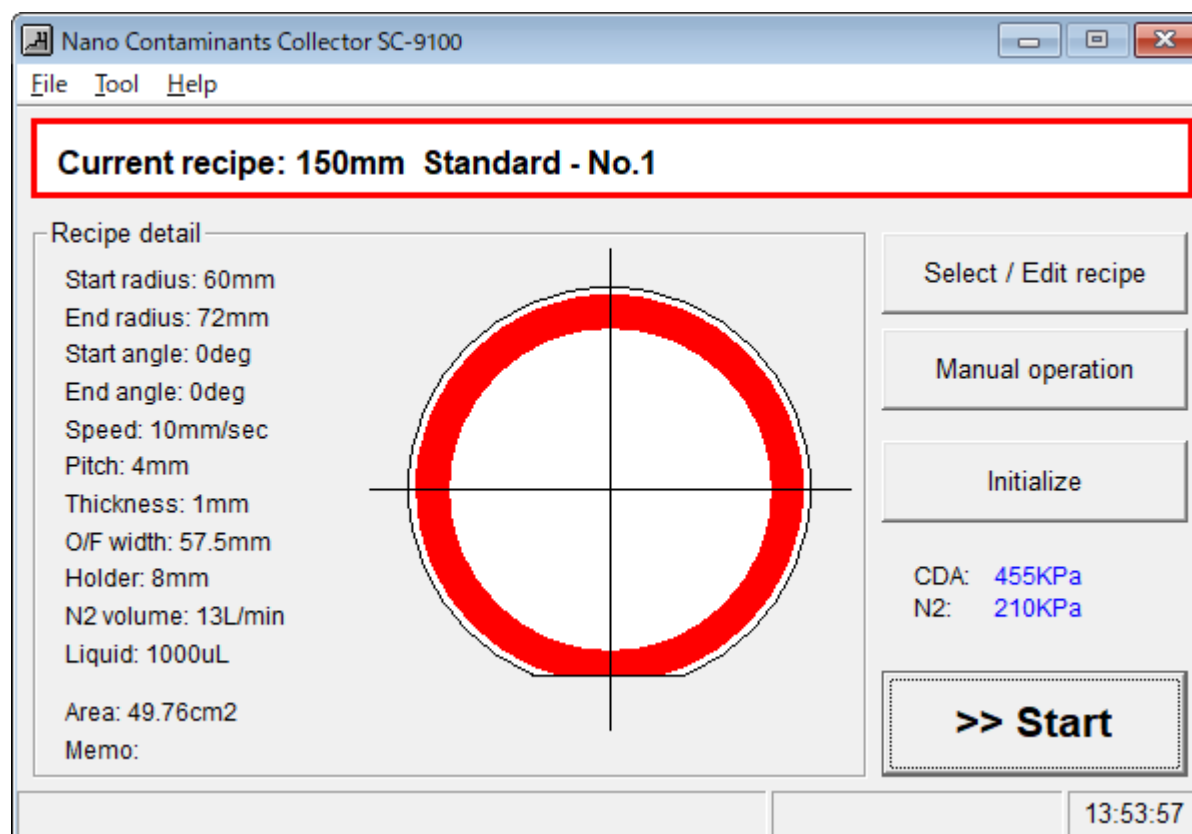
Under the circumstance that the communication is not established, Software does not operate SC-9100, though it can edit the recipe. After making sure the power is on and that the cable is properly connected, retry to start up Software.

When communication is properly established, following message comes up, and when you push either "OK" button on PC screen or "NEXT" key of SC-9100, SC-9100 takes motion to return to the starting position.



After the starting position is confirmed, the main screen comes up.

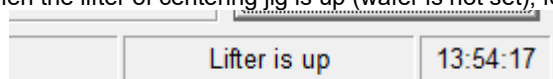
2-2 Main Screen



Main screen indicates the recipe, which is currently chosen, the calculated area of collection, and its geographic map, which appears in red. While main screen is up, the lamp of "NEXT" key is on, and pushing "NEXT" key shall command motions as same as pushing ">>Start" button on PC screen.

At the bottom of the screen, it shows the current clock time, communication status between SC-9100 and PC, and the position of the centering jig.

*When the lifter of centering jig is up (wafer is not set), following message will appear.



- **【File】-【Start sampling】** --> Sampling Procedure

You shall start sampling based on currently chosen batch.

You may click ">>Start" button on screen to command the same operation. When the communication between SC-9100 and PC is not established, it does not work.

- **【File】-【Select / Edit Recipe】** --> "2-3 & 2-4"

You can select and edit the recipe for sampling. You may click "Select / edit recipe" button on screen to command the same operation.

- **【File】-【Exit】**

You can finish Software when the command is clicked.

- **【Settings】-【Configuration】**

It shall set up the communication and sampling motions of SC-9100.

- **【Settings】-【Adjust wafer angle】**

It can adjust the angle of wafer placed on the turntable. You may touch “Adjust wafer angle” button on screen to command the same operation. When the communication between SC-9100 and PC is not established, it does not work.

- **【Settings】-【Adjust wafer height】**

It can adjust the height of the sampling arm.

This cannot be done unless communication is established between the SC-9100 and PC.

- **【Help】-【About SC-9100】**

It can show the software version, which is currently used, and optional functions you can use.

2-3 Select Recipe

You may choose a recipe for sampling, and copy its contents. Up to 100 recipes can be saved by wafer sizes and by several sampling patterns.

Select / edit recipe

Wafer size
150mm

Sampling pattern
Standard

Recipe detail
* Select recipe and double click or click the [edit] button to edit recipe.

No.	Radius	Angle	Speed	Pitch	Height	Holder	O/F width	N2 vol	Liquid	memo
>1	60mm ~72mm	0deg ~0deg	10mm /sec	4mm	1mm	8mm	57.5mm	13L/min	1000uL	
2	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
3	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
4	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
5	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
6	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
7	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
8	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
9	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL	
10	10mm	0deg	30mm	5mm	0.5mm	8mm	0mm	10L/min	200uL	

Edit

OK

Cancel

○Wafer size

You can choose wafer size out of 100mm, 125mm, 150mm, 200mm, and 300mm.

○Sampling pattern

You can select sampling pattern.

*The basic retrieval pattern is only "Standard", but if optional features sold separately are implemented, you can choose from "Square", "Rectangle", "Bevel (Side)" and "Bow" retrieval patterns.

○Recipe number

When you click one of the recipe numbers, the chosen number will have a mark of ">" in front of the number as indicated in the table above with a red circle. This recipe is what you are currently working with. You may click either left or right button of the mouse.

○Copy No. A

Copies the contents of recipe No. A.

○ Paste No. A with No.B"

Pastes the contents of No.B on recipe No. A. If there is nothing being copied, it does not work.

***When "Paste" is executed, and new contents are saved, the previous recipe No. A will never be retrieved.**

○Swap

Swaps the whole contents of copied recipe for currently open recipe. If there is nothing being copied, it does not work.

***Note: when "Swap" is executed, new contents are saved. The previous recipes will never be retrieved.**

○[Edit] button

When you click "Edit", the content of chosen recipe will move to the edit screen. If no recipe chosen, it does not work.

The same action can be achieved if you double-click the left button of the mouse, while a recipe is chosen.

○[Cancel] button

When you click "Cancel", the recipe selected screen will be closed and it will go back to the main screen.

○[OK] button

It can set the selected recipe to be used for sampling, and closes the screen and returns to the main screen.

2-4 Edit Recipe

You shall edit the recipe with this screen.

○"Wafer size", "Sampling pattern" and "Recipe No."

These items are set up in the screen of "Select recipe". No change can be made with this screen.

○[OK] button

The contents of the recipe being set up in this screen are saved in the PC, and the "Edit recipe" screen is closed.

○[Cancel] button

The recipe's contents before editing in the above screen shall remain and the "Edit recipe" screen is closed. No new data is saved.

○[Reset] button

The contents of the recipe set up before editing in this screen shall be retrieved and shown.

○Recipe setting items

The recipe contents change depending on the collection pattern. The setting range also changes depending on the wafer size.

○Memo

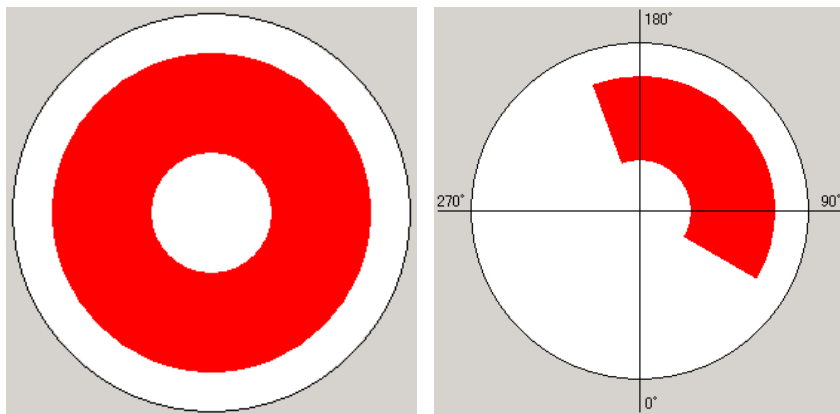
You may leave your comments for the currently open Recipe (ex. wafer size, sampling pattern)

○Area

The area of location for sampling with currently open recipe is calculated and shown.

■Recipe in detail by Sampling patterns

2-4-1 Standard



It samples inside the location defined by chosen radii & angles of start & finish with the shapes of circle, doughnut, and fan.

○Starting radius” & “Ending radius

The locations of start and finish are defined by the distances from the center of wafer. If the starting radius is larger than the ending radius, the sampling arm moves inbound, if smaller, the sampling arm moves outbound.

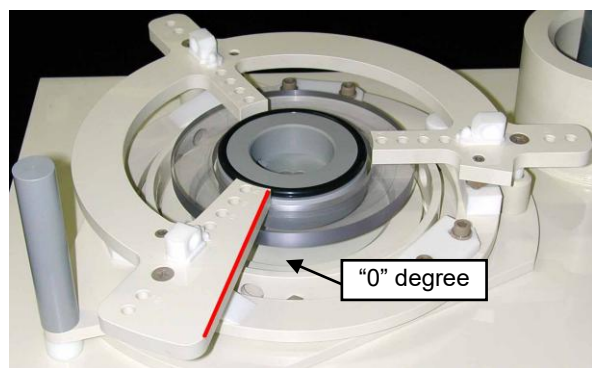
The set-up figures include the physical width of the liquid holder for collection.

*For example, in case that starting and ending radii are 30mm and 80mm respectively, and that the inner diameter of liquid holder is 8mm, the sampling arm starts collection at the point of 34mm (i.e. $30+8/2$) from the center of wafer, and finishes collection at the point of 76mm (i.e. $80-8/2$).

***When both starting and ending radii are input with the same figures, the software commands the center of the holder shall stay at that radius, and samplings are made repeatedly with the width of the diameter of the holder, centering that radius.**

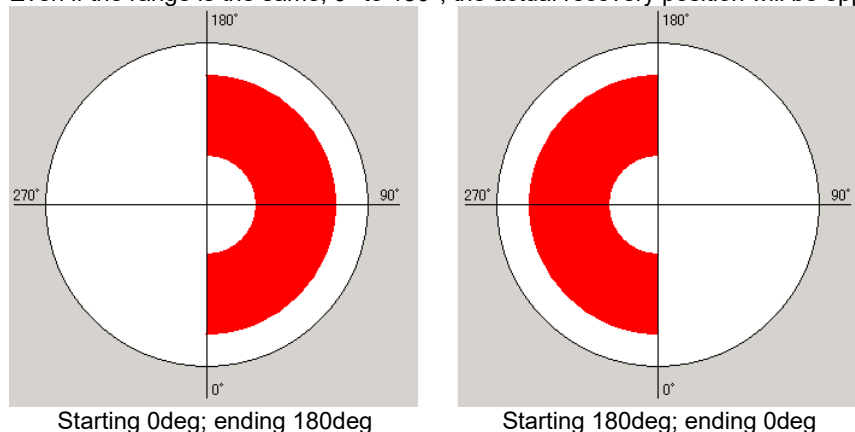
○Starting angle & Ending angle

Orientation flat adjustment position of the centering jig is defined as “0” degree, after placing the center of notch or the left edge of orientation flat here. Starting and ending angles are defined with said “0” degree.



The location or angle of collection is described **by measuring anticlockwise from starting angle.**

Even if the range is the same, 0° to 180°, the actual recovery position will be opposite depending on which start angle you set.



Starting 0deg; ending 180deg

Starting 180deg; ending 0deg

○ Sampling speed

You can define the sampling speed of collection liquid over wafer, and shall proceed the sampling process with the constant speed in accordance with the parameter defined in this screen.

Quick scanning may worsen the rate of collection, and slow collection may take too much time. If it is the case of too quick scanning, the liquid holder may lose the control of liquid, and then liquid can be left on the wafer after the holder moves on.

○ Moving pitch

It can define the distance of the sliding shift of sampling arm after every rotation of turntable. If you choose a smaller figure, you will get a better rate of collection (as the near location can be repeatedly covered), though it takes more time.

*When the starting and ending radii are the same, there is no moving pitch, and no indication is shown on the screen. The screen, though, indicates "Sampling Lap" to show how many times the samplings shall be made.

○ Wafer thickness

You can input the vague number of thicknesses of wafer. If the number is too far from the real thickness, such as 1mm input for 10mm thickness wafer, the sampling arm will have a chance to contact and damage the surface of wafer.

*In case the N2 flow is set as "0", the system performs hydrophobic mode of sampling. In this case the distance between the surface of wafer and liquid holder cannot be adjusted automatically, as there is no N2 flow to keep the height of holder. The software instead shows the box to input "Liquid Supply height" to determine the distance between the surface of wafer and liquid holder.

○ Holder diameter

It can set the figure of inner diameter of liquid holder. The standard holder has the inner diameter of 8mm.

*The bandwidth of collection area shall be at least 1mm larger than the inner diameter of liquid holder for practical sampling. If this rule is violated, following message appears and said recipe cannot be saved.

Note: it is excluded when the start and end radius values are the same.



○ Orientation flat width (Optional)

You can define the length of orientation flat of the wafer to be recognized. With this input, the course of movement of sampling arm shall be automatically adjusted so as the liquid holder not to go out of the surface of wafer at the area of orientation flat.



* The holder follows the dotted blue line originally, though it shall move along the red line by the orientation flat input.

*This function to follow orientation flat is optional. If you choose the standard specification, this function is not included.

*To enable this function, i.e. to set this figure other than 0, the starting and ending angles must be the same.

*When this function is enabled, i.e. the figure other than 0 is set, it is not possible to change the figures of start and end angles.

○ N2 flow

You can define the flow rate of N2 gas, which is discharged from the edge of sampling arm. If you choose too low figure, the liquid cannot be properly retained inside the holder, and if it is too high, the liquid inside the holder may have bubbles and prevent the proper sampling.

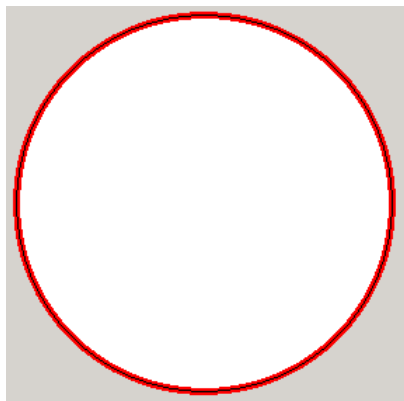
The most appropriate flow rate depends on the materials and the surface conditions of wafer, as well as the kind of chemical liquid.

*When "N2 Flow" is fixed as "0", the box to show "Wafer thickness" turns to "Liquid supply height".

○ Sampling Liquid Volume

It shall define the volume of sampling liquid in the liquid holder.

2-4-2 Bevel (Option)



Using the holder for bevel sampling, bevel contaminants are collected.

○ Contact radius & Running radius

Positioning and running diameters are measured between the center of wafer and **the center of liquid holder**.

For the sake of having good contact with the bevel wafer using sampling solution, the sampling arm shall approach the wafer to the point of "Contact radius", and wait for the liquid to make sufficient contact with the bevel. Then move the sampling arm outward to the point of "Running radius".

For the wafer to pull out a good volume of liquid from the holder, **"Running radius" shall be larger than "Positioning radius"**.

*Typical settings: "Contact radius" is wafer diameter + 2.5mm, and "Running radius" is wafer diameter + 4.5mm.

○ Sampling lap

You can choose how many samplings /scanning per wafer will be made.

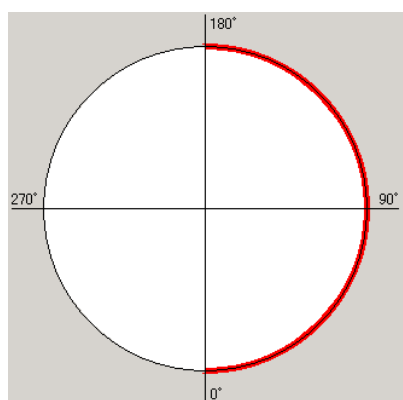
If no angle limit is applied and you choose 3, it commands to make samplings by three (3) rounds. If starting and ending angles are limited and you choose 3, it commands to make samplings by three (3) ways, i.e. one return and another one way.

○ Starting angle" & "Ending angle"

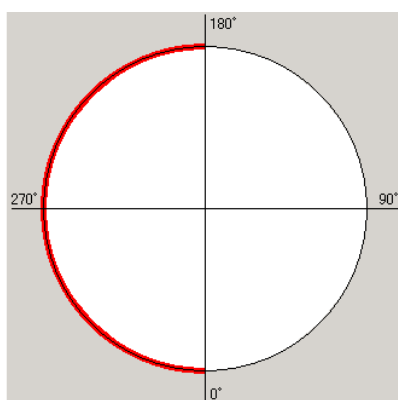
The center of notch or the left edge of orientation flat is defined as "0" degree. Starting and ending angles are defined with said "0" degree.

The location or angle of collection is described **by measuring anticlockwise from starting angle**.

If you want to define from 0 degree to 180 degree as the location of collection, please be careful which point you will choose as the starting angle, because the physical location of collection area may vary depending on which end you will choose as the starting angle.



Starting 0deg; ending 180deg



Starting 180deg; ending 0deg

- Sampling speed

It can set the sampling speed of liquid over wafer, and shall proceed the sampling process with the constant speed in accordance with the parameter defined in this screen.

Quick scanning may worsen the rate of collection, and slow collection may take too much time.

- Height adjustment

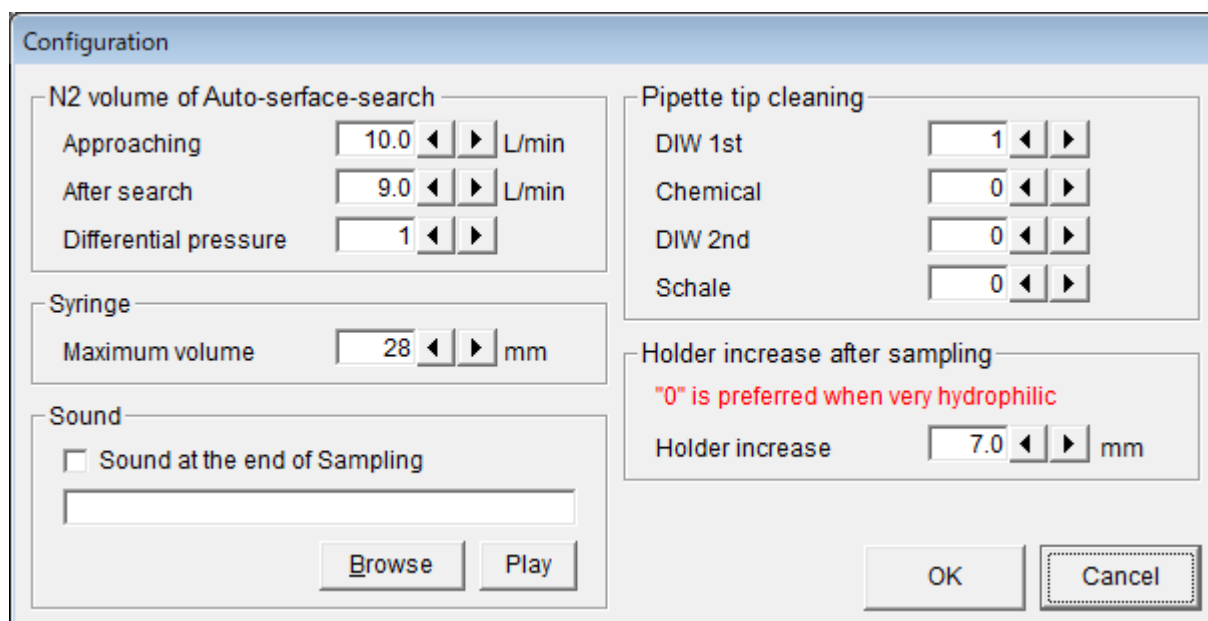
If you think to adjust the height of the holder relative to the level of wafer, you can change the height of the holder by changing the parameter of "Height adjustment". Add the number to raise the position of sampling arm, and deduct the number to pull down the position of sampling arm.

- Sampling Liquid Volume

It will define the volume of sampling liquid in the liquid holder.

For bevel liquid holder, the standard sampling liquid volume is around 170-200 μ L.

2-5 Configuration



The screen of "Configuration" is used for communication between SC-9100 and PC.

- N2 flow during auto-surface-search

To detect the distance between the edge of liquid holder and the wafer surface for sampling, sampling arm approaches the surface of wafer, while discharging N2. It shall set the N2 flow rate at this time.

If you set too low figure, the sampling arm may touch the wafer surface, and if it is too high, the arm is too far from that surface, and the liquid form may lose stability.

The most appropriate flow rate depends on the materials and the surface conditions of wafer, as well as the kind of chemical liquid. In the initial introductory period, a trial-and-error process to find the best flow rate is required.

Generally, please do not change this value except when the holder is changed to the one with a different diameter.

- N2 flow after surface-search

You can set the flow rate of N2 gas, which is discharged from the edge of sampling arm, after wafer recognition until filling chemical liquid. The N2 rate required during sampling arm and wafer still staying is relatively small. If you choose too high figure, the initial liquid drops may be blown by N2 gas pressure and go to undesired directions.

- Differential pressure

During automatic detection, please enter the reference value for when the differential pressure sensor inside the device stops the arm. As a general rule, please do not change this value.

- Syringe Maximum volume

Specifies the maximum travel distance of the motor that drives the syringe pump.

As a general rule, please do not change this value.

- Sound at the end of sampling

You will choose a sound file to generate a sound to notice the end of sampling.

- Pipette tip cleaning

A Pipette tip is cleaned every time after sampling. The DIW and cleaning liquid is used for said purpose.

Input the figures, which show the DIW and the cleaning liquid shall be replaced after how many times of cleanings. The available values are 0 through 10 each.

- Holder lift after sampling

After surface sampling is complete, specify the distance by which the tip is left near the surface and only the holder is raised to suck up the collected liquid on the wafer surface.

When working with highly hydrophilic wafers (where the collected liquid quickly disperses when the holder is lifted), we recommend setting this value to 0 to prevent the collected liquid from leaking out of the holder.

- OK button

Currently open Port Number and motion after sampling will be saved and the screen closes.

- Cancel button

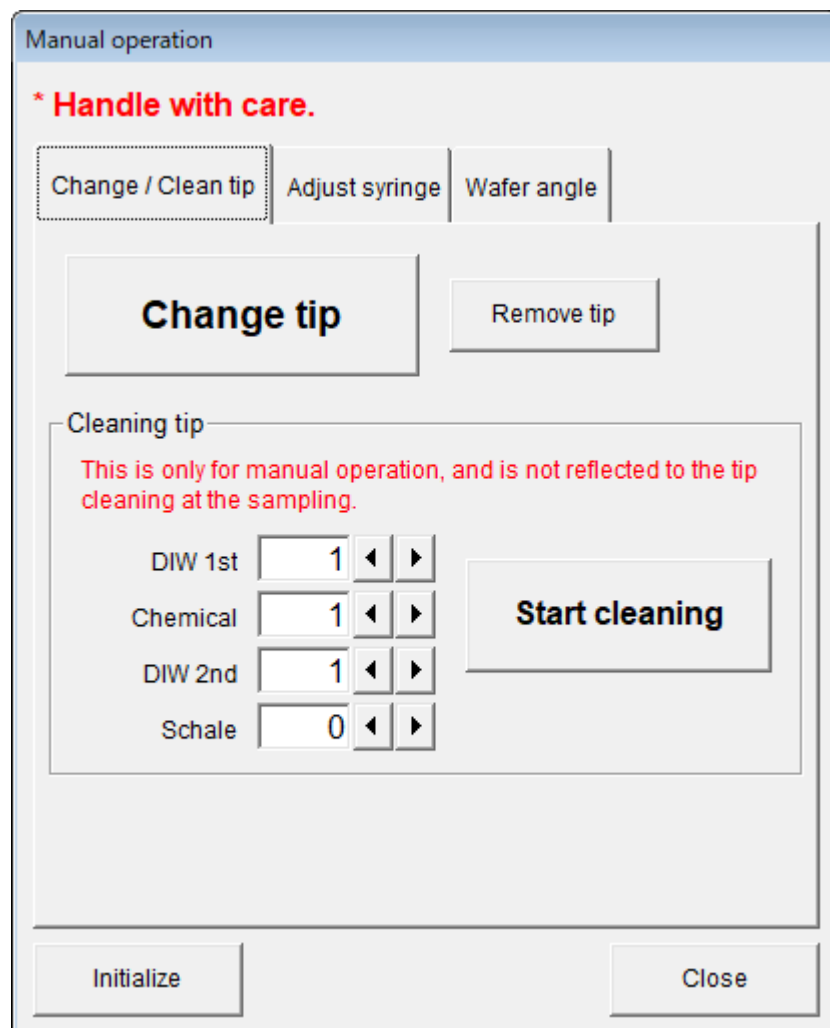
Currently open Port Number and motion after sampling will not be saved and the screen closes.

2-6 Manual operation

Each unit of this device is operated separately.

2-6-1 Change / clean tip

Replace and clean the pipette tips.



○ "Change tip" Button

A new pipette tip shall be attached to the top of sampling arm.

*Before the tip is changed, it shall be confirmed that no tip is attached on the top of sampling arm, and that a new tip is set on the Tip Change Stand.

○ Count of Cleaning with DIW and Cleaning Liquid

Tip cleaning process is that DIW is charged and discharged, then the cleaning liquid is charged and discharged, and finally DIW is again charged and discharged.

After the counts of each process being input, and by pushing "Start cleaning" button the cleaning starts.

*This is only for manual operation, and is not reflected to the tip cleaning at the sampling.

2-6-2 Adjust syringe

Adjust the amount of liquid drawn by the syringe pump.

Manual operation

* **Handle with care.**

Change / Clean tip
Adjust syringe
Wafer angle

* **Adjust it by DIW**

Syringe (mm)
0.00
Washer -> Vial 1

Schale -> Vial 1

1000uL
25.50
500uL
13.00
50uL
1.60
10uL
0.40
Save
Reset

Syringe (uL)
200
-> 5.4mm

Schale -> Vial 1 (200uL)

Initialize
Close

○ Washer -> Vial 1

The syringe pump will draw up liquid from the Tip cleaning stand in the amount indicated by the value entered in the left column and dispense it into vial 1.

○ Schale -> Vial 1

The syringe pump will draw up liquid from the dish in the amount indicated by the value entered in the left column and dispense it into vial 1.

○ [Save] button

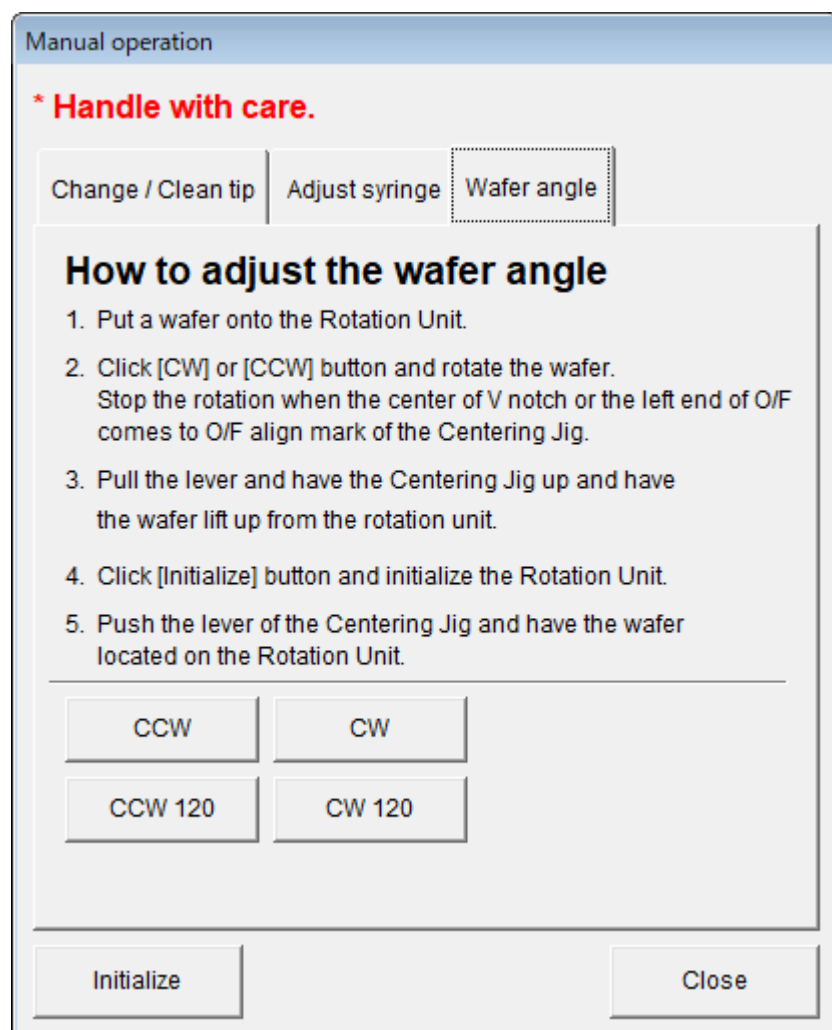
Saves the entered motor travel distance.

○ [Reset] button

The input motor travel distance is returned to the value before the change.

2-6-3 Wafer angle

Adjust the angle of the wafer placed on the turntable.



Depending on the sampling patterns, it may be necessary to adjust the position of orientation flat or notch of the wafer at the specified point before starting sampling. This screen enables you to adjust the angle of wafer on turntable.

- CCW and CW buttons

By selecting button, the turntable moves slowly to the direction of counter-clockwise (or clockwise). If you click the same button again, the motion ends.

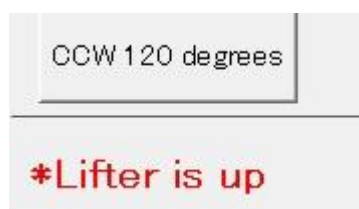
- Initialize button

By selecting button turntable moves to the starting position.

- Close button

By clicking button, the screen closes and moves to main screen.

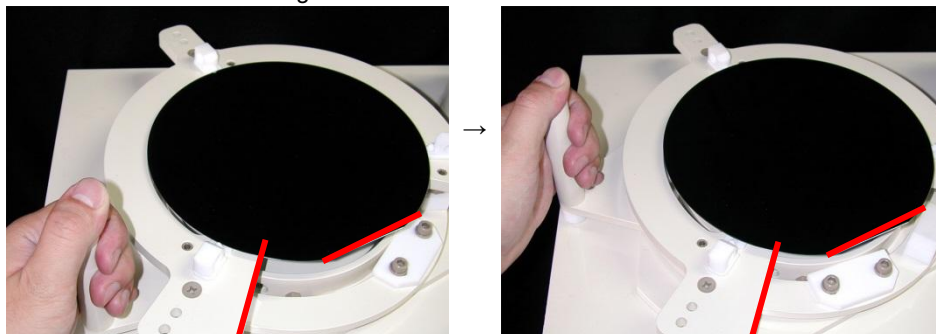
*While the lifter of centering jig is up, following message is shown in the bottom of the screen.



■ Procedure to adjust wafer angle

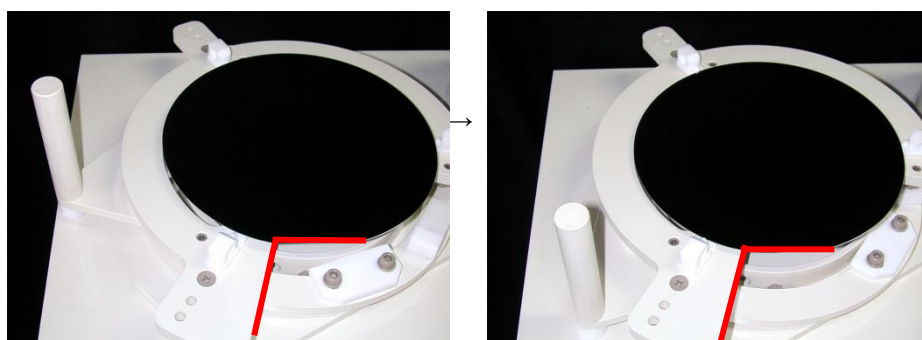
1) Put the wafer on turntable.

You do not need to set wafer angle for the orientation flat in this time.



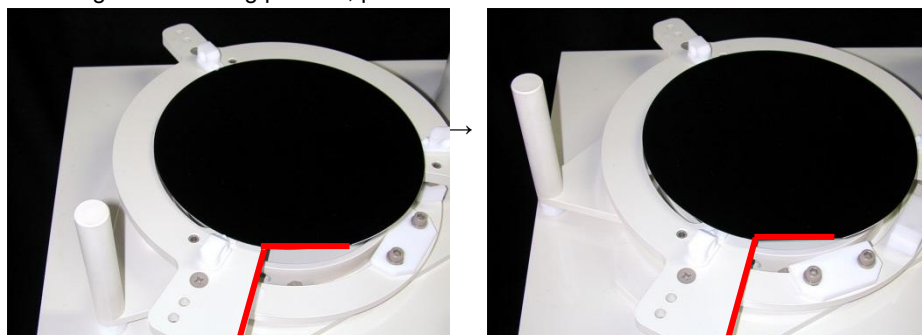
2) Use either “CCW” or “CW” button to rotate the wafer until the left edge of orientation flat or the center of notch meets the orientation flat adjustment position.

3) Lift up the wafer from turntable by the lever of centering jig.



4) While the wafer is up, push “Initialize” button and make turntable to go to the starting position.

5) After moving to the starting position, pull down the lever so as the wafer to be back on turntable.

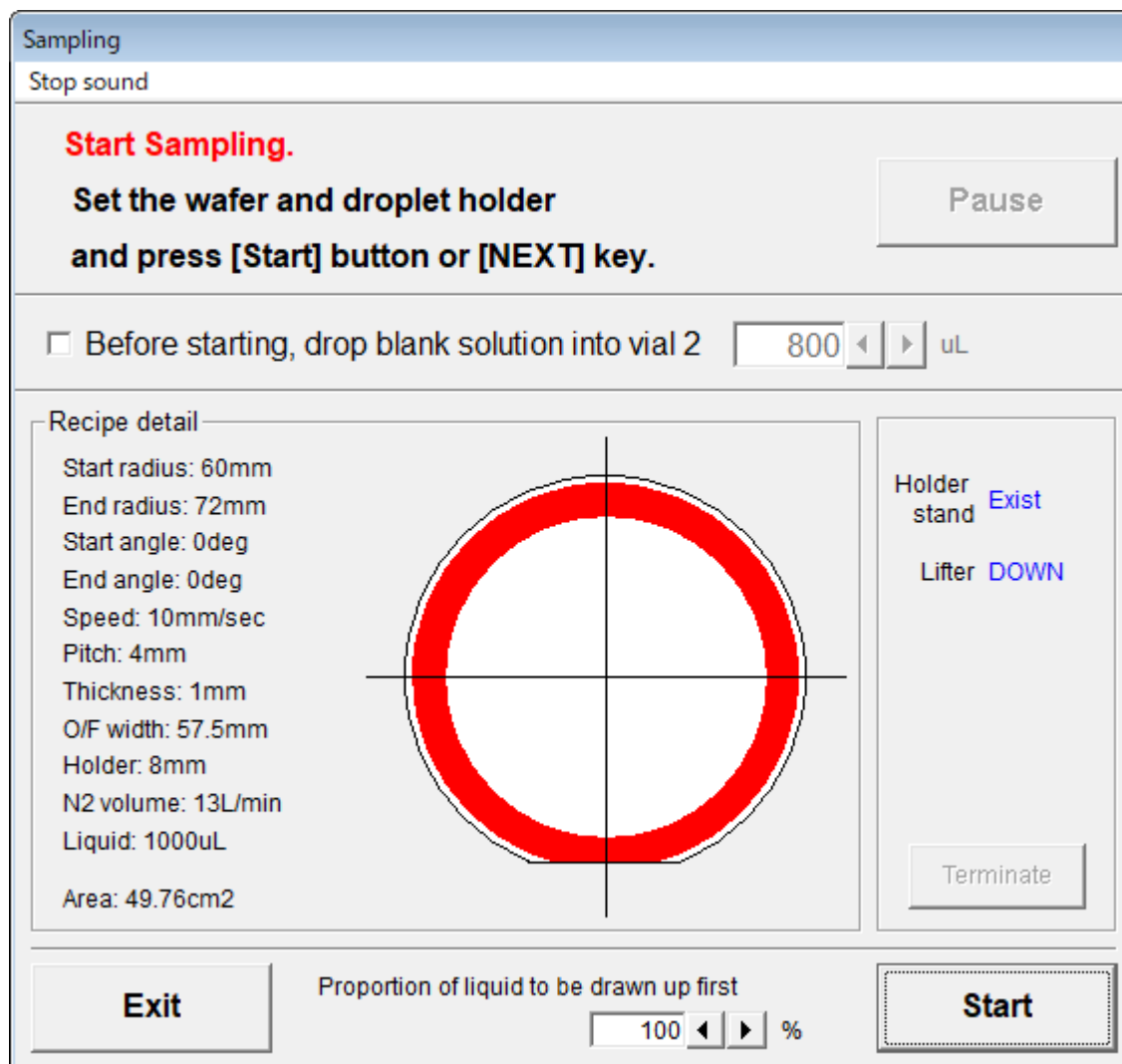


*Every time you adjust the position of wafer, ensure the lever is pulled down of centering jig.

3 Sampling Procedure

3-1 Preparation

If you choose "Sampling" from main screen, or push "NEXT" key on the unit, the sampling screen shall appear.



The screenshot shows the 'Sampling' screen with the following elements:

- Title Bar:** Sampling
- Buttons:** Stop sound, Pause, Terminate, Exit, Start.
- Instructions:** Start Sampling. Set the wafer and droplet holder and press [Start] button or [NEXT] key.
- Blank Solution Option:** A checkbox labeled 'Before starting, drop blank solution into vial 2' followed by a numeric input field set to '800' and a unit 'uL'.
- Recipe detail:**
 - Start radius: 60mm
 - End radius: 72mm
 - Start angle: 0deg
 - End angle: 0deg
 - Speed: 10mm/sec
 - Pitch: 4mm
 - Thickness: 1mm
 - O/F width: 57.5mm
 - Holder: 8mm
 - N2 volume: 13L/min
 - Liquid: 1000uL
 - Area: 49.76cm2
- Diagram:** A circular diagram with a red ring representing the sampling area, centered on a crosshair.
- Status/Controls:**
 - Holder stand: Exist
 - Lifter: DOWN
 - Proportion of liquid to be drawn up first: A numeric input field set to '100' followed by a '%' symbol.

- Blank solution

If you check this box, the specified amount of sampling solution will be dripped into vial 2 before sampling begins.

- Proportion of liquid to be drawn up first

After sampling is complete, specify the percentage of liquid to be sucked up while the holder is still close to the wafer. If the wafer surface is hydrophilic, 100% is recommended.

- [Start] button

It starts sampling operation.

- [Exit] button

It goes to the main screen.

3-2 Procedure

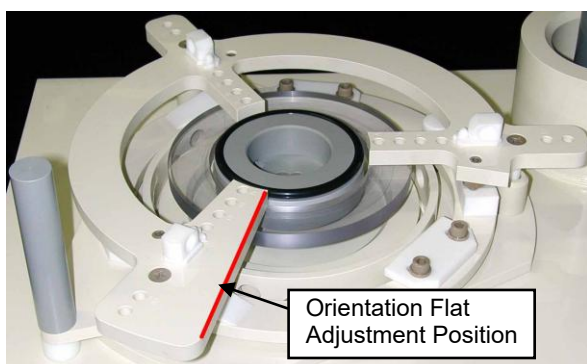
1) Make sure following items before sampling.

- Wafer is set-up with a correct angle on turntable.
- Lifter of centering jig is set down.
- The size of real wafer and the registered size in the recipe are the same.
- Be sure that the proper liquid holder is set onto the holder stand with the correct angle.



Check the wafer and the lifter

2) If the recipe specifies the angle or the orientation flat, the wafer angle shall be correctly adjusted with the position of orientation flat adjustment of centering jig.

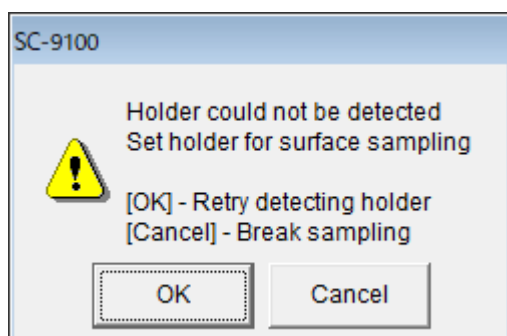


3) Sampling starts when "START" button on PC screen or "NEXT" key of SC-9100 is pressed. If the lifter of centering jig is up, following message shows up.

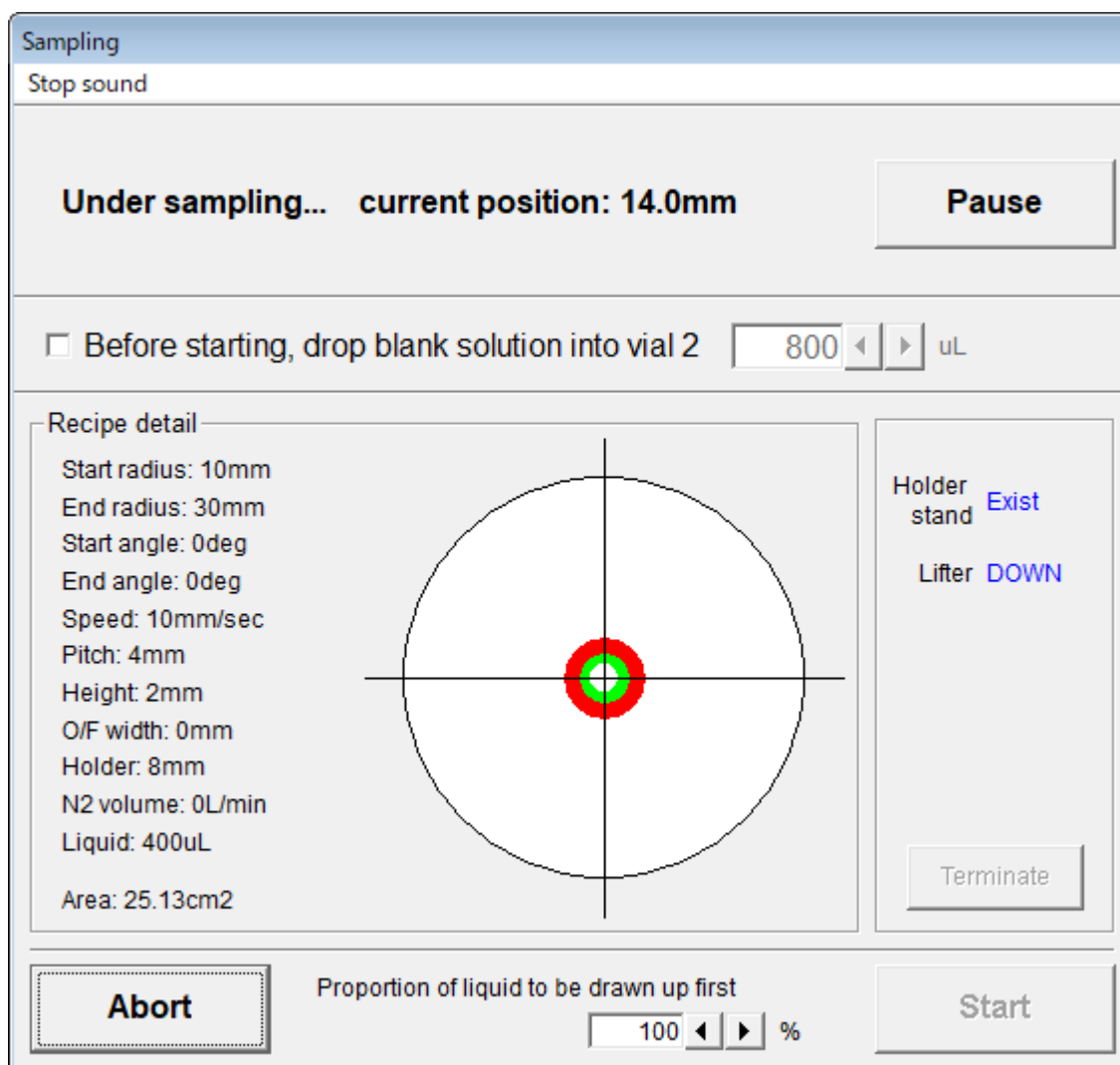


Push down the lifter, and press "OK" button.

4) If the holder stand is empty, the text below shows up; please set the stand with the proper holder, and click “OK”.



5) After pouring the sampling liquid into the liquid tank, press the [OK] or the NEXT key on the main unit to start sampling. During the sampling process, you can click the buttons shown on the screen below.



○ [Pause] button

Moving parts (ex. sampling arm, turntable) stop their motions. If the button is clicked again, the system can restart.

○[Abort] button

Sampling immediately stops, and sampling arm goes back to the starting position.

6)When the sampling ends, used holder is returned to the stand, sampling solution is dripped into the vial, and finally both the sampling arm and the turntable are returned to their origin positions.

If you want to continue sampling with the same recipe, click “Start Work”, otherwise “End Work” to return to the main screen.

4 Specification and Environmental Requirement

SC-9100 is the unit, having the specifications described below.

- (1) Product Name: SC-9100 (Perfect for R&D and QC Labs) Wafer Semi-Auto Device of Surface Trace Metal Contamination Recovery for VPD-WSD / VPD-WSL/ICP-MS/TXRF Treatment (SC Series)
- (2) Sampling Method: Constant Tangential Velocity, Quasi-concentric Sampling
- (3) Holder Capacity: More than 100μL
- (4) Wafer Size: 4"/4 inch (100mm), 5"/5 inch (125mm), 6"/6 inch (150mm), 8"/8 inch (200mm), 12"/12 inch (300mm)
- (5) Sampling Speed: 0.2 - 50mm/sec
- (6) Moving Pitch: 1 - 10mm

<Environmental Requirement>

- (7) Atmosphere
 - Temperature: 15 C° - 35 C° (Operation)
0 C° - 50 C° (Storage)
 - Humidity: 30% - 80% (Operation)
10% - 90% (Storage)

Dew condensation must be avoided under any circumstance.

- (8) Electric Power
 - Voltage: AC 100V
 - Frequency: 50Hz or 60Hz

- (9) Installation: Inside clean draft

- (10) Weight: 42Kg

- (11) Dimension: (W)650mm x (L)470mm x (H)498mm

*The height of at least 630mm is required to allow sufficient room for movement of N2 supply hose.

*The width of at least 800mm is required to keep sufficient room for handling a lifter and a regulator.

- (12) PC and Cable
 - The PC (at least Windows 10), shall be connected with SC-9100.
 - 1280x720 or higher screen resolution.
 - PC shall have 2 USB connectors.

5 Maintenance

Maintenance

We recommend annual maintenance.

The following parts shall be checked for:

- Loose screws in mechanical parts
- Wear on mechanical parts
- Heat generation in electrical parts
- Control position of moving parts, etc.

Warranty

The free warranty period for this device, which is our responsibility, is one year after delivery.

After that, we will carry out regular checks based on the maintenance contract.

Repair

If an abnormality occurs in this device, immediately stop using it, turn off the power, unplug the device from the outlet, and contact us or the place of purchase.

6 Recycling and Disposal Procedures

Recycling & Disposal Procedures

- The device body is made of PVC, so please dispose of it as non-combustible waste.
- Please contact an electrical waste disposal company to collect the mechanical parts.
- Following parts can be recycled:
 - Copper, aluminum,
 - Power cables, communication cables, and the electrical wires and copper inside the device
 - Copper and trace amounts of metal in the printed circuit boards used in the control unit

Contact address

The contact information will be shown in below.

NAS Giken, Inc.

36-7 Higashimatsubara, Hakonegasaki, Mizuho-machi, Nishitama-gun, Tokyo 190-1222, Japan

Tel: +81-42-557-5207

Fax: +81-42-557-5368

E-mail: infome-ru@nasgiken.jp

URL: <https://www.nasgiken.jp>

A. The compliance frameworks of ANSI Z535.4 & OSHA

This section is written in strictly adheres to the compliance frameworks of ANSI Z535.4 (Product Safety Signs and Labels), OSHA 100-240V, high-pressure utilities (N_2 /CDA), robotic motion elements, and hazardous chemical chemistry (HF / HNO_3).

1. Intended Use and Safety Compliance Framework

The SC Series Semi-Automated Recovery System of Nano Contaminants is designed for industrial semiconductor cleanroom applications under controlled parameters. This equipment employs high-voltage electricity, pressurized gases (N_2 and Clean Dry Air), automated kinetic mechanisms (the sampling arm and the turntable), and corrosive, toxic chemical mixtures containing Hydrofluoric Acid (HF) and low-concentration Nitric Acid (HNO_3).

Safe and reliable operation depends on strict adherence to the safety protocols outlined in this manual. The safety architecture and documentation of this equipment are engineered to satisfy the rigorous frameworks of:

- **ANSI Z535.4** – Product Safety Signs and Labels Standard
- **OSHA 29 CFR 1910** – Occupational Safety and Health Standards
- **SEMI S2** – Environmental, Health, and Safety Guidelines for Semiconductor Manufacturing Equipment

2. Definition of Safety Alert Symbols and Signal Words

Safety alert symbols and signal words are used throughout this manual and on the physical machine labels to classify the severity of hazards. In accordance with the **ANSI Z535.4** standard, always recognize and obey the following designations:

-  **DANGER** indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious irreversible injury.
-  **WARNING** indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.
-  **CAUTION** indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate personal injury, or catastrophic equipment/property damage.
-  **NOTICE** is used to address operational practices and technical procedures not related to physical personal injury.

3. Critical Safety Signs and On-Tool Labeling Map

The following safety labels are permanently mounted to the chassis of the SC Series equipment. If any label becomes defaced, peeled, or illegible, immediately suspend equipment operations and contact the manufacturer for replacements.

Label 1: Chemical Contact and Toxicity Hazard

- **Signal Word: DANGER** (White text on a solid red background)
- **Pictograms:** Corrosive Material (Chemical pouring on hand) & Acute Toxicity (Skull and Crossbones)
- **Message Panel:**

HYDROFLUORIC & NITRIC ACID HAZARD.

CONTACT WILL CAUSE SEVERE CHEMICAL BURNS, DEEP TISSUE CORROSION, SYSTEMIC TOXICITY, OR DEATH.

- Do NOT operate this equipment without wearing a complete suite of chemical-resistant Personal Protective Equipment (PPE).
- Ensure the facility exhaust is fully functional and interlocked prior to initiating automated chemistry steps.
- **FIRST AID:** In case of skin exposure to HF, flush with copious water for 5 minutes, immediately apply 2.5% Calcium Gluconate Gel to the affected zone, and seek immediate emergency medical evaluation.
- **Placement Location:** Front enclosure panel adjacent to the **Liquid Tank, Vial Stand**, and chemical introduction portal.

Label 2: Hazardous Voltage and Shock Hazard

- **Signal Word: DANGER** (White text on a solid red background)
- **Pictogram:** High Voltage (Lightning Bolt Symbol)
- **Message Panel:**

HAZARDOUS VOLTAGE INSIDE.

CAN CAUSE SEVERE ELECTRICAL SHOCK, CORNEAL BURNS, OR DEATH.

- Disconnect all primary AC electrical supply feeds and apply appropriate facility **Lockout/Tagout (LOTO)** padlocks before removing this protective service panel.
- Verify input configuration matches tool specifications (AC 100-240V).
- Never operate the power switch or disconnect cables with wet hands.
- **Placement Location:** Rear service panel covering the **Power Supply Unit (PSU)** and directly adjacent to the main AC power inlet.

Label 3: Pressurized Utility and Burst Hazard

- **Signal Word: WARNING** (Black text on a solid orange background)
- **Pictogram:** High-Pressure Gas / Projectile Hazard
- **Message Panel:**

HIGH-PRESSURE GAS HAZARD (N_2 / CDA).

SUDDEN COMPONENT RUPTURE OR LINE BLOWOUT CAN CAUSE SEVERE PHYSICAL OR EYE INJURY.

- Incoming supply pressures must remain strictly regulated within designated tool bounds.
- Isolate the facility supply gas lines and completely vent/depressurize internal pneumatic manifolds before adjusting or decoupling any fluidic/pneumatic fittings.
- **Placement Location:** Rear panel immediately adjacent to the N_2 and CDA incoming connection manifolds and main regulators.

Label 4: Moving Robotics and Pinch Point Hazard

- **Signal Word: WARNING** (Black text on a solid orange background)
- **Pictogram:** Hand Crush / Entanglement Hazard
- **Message Panel:**

PINCH POINT / MOVING MECHANISMS.

CAN CRUSH, SEVER, OR ENTANGLE HANDS AND FINGERS.

- Keep hands, fingers, hair, and loose garments entirely clear of the sampling arm and the turntable paths during active automated execution.
- **Placement Location:** On the front clear safety place overlying the **Turntable** and adjacent to the **Sampling Arm** path of travel.

4. Facility Infrastructure and Installation Requirements

1). Environmental Air Flow (SEMI S2 Compliance)

The SC Series equipment **MUST** be placed entirely within an active, certified **Clean Draft / Wet Fume Hood** equipped with a constant face-velocity exhaust monitor. The air pressure regulation exhaust line located at the rear of the machine must terminate cleanly into the facility exhaust stream above the tool to ensure toxic acid vapors do not pool or migrate back toward the operator interface.

2). Electrical Isolation and Energy Control (OSHA LOTO)

The tool utilizes a universal AC 100-240V power grid. The facility upstream branch circuit supplying power to the machine **MUST** be provisioned with a dedicated, marked circuit breaker (minimum 5A rating) that fully supports OSHA-compliant **Lockout/Tagout (LOTO)** padlock hardware to ensure safe mechanical and electrical isolation during routine servicing.

3). Seismic and Anti-Vibration Tethering

Due to the precise tolerances required for automated nano-contaminant retrieval, the equipment **MUST** be firmly anchored to the fume hood floor or table structure to prevent tipping, tipping-induced chemical spills, or kinetic misalignment during seismic events.

5. Mandatory Personal Protective Equipment (PPE)

Per **OSHA 29 CFR 1910.132**, operators prepping chemical solutions (sampling liquid, wash liquid) or maintaining the internal fluidic plumbing are required to wear specialized protective gear. **Standard cleanroom frocks and latex gloves provide zero breakthrough protection against Hydrofluoric Acid and are strictly prohibited.**

- **Eye and Face:** ANSI Z87.1-certified chemical splash goggles layered underneath an integrated,

full-length transparent chemical face shield.

- **Hand Protection (Mandatory Dual-Glove Protocol):** *Inner Layer:* High-tensile nitrile cleanroom gloves.
 - *Outer Layer:* Heavy-duty, long-cuff **Butyl or Viton chemical-resistant gloves** certified for a minimum breakthrough duration of >480 minutes against Hydrofluoric and Nitric Acid mixtures.
- **Body Protection:** Full-length chemical-resistant rubber/synthetic apron or vest over cleanroom garments, coupled with integrated sleeve guards.
- **Medical Emergency Preparedness:** At least two unexpired tubes of **2.5% Calcium Gluconate Gel** must be stored in a clearly marked first-aid station within 20 seconds or 50 feet of the tool workspace.

6. Emergency Shutdown Procedure (EMO)

In the event of a sudden chemical leak, mechanical collision, or electrical fire:

- 1). **Smash the Emergency Off (EMO)** button located on the front panel interface immediately. Actuating the EMO instantly cuts all auxiliary line power to the sampling arm and the turntable mechanism.
- 2). Evacuate the immediate vicinity if a toxic chemical cloud or fluid spill is detected.
- 3). Do not attempt to clear errors or reset the PC controller software until a qualified EHS specialist has fully evaluated and stabilized the system.