

SC-9200
(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 Safe Use

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-9200 (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-9200" 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.

This device is manufactured under strict quality control, but in the unlikely event of a malfunction, please contact us (contact information is listed at the end of this document) or please contact the place where you purchased the item.

While we have taken every precaution to ensure the accuracy of this book, if you find any errors or have any concerns, please contact us or your point of purchase.

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

Do not plug or unplug the power cord with wet hands. There is a risk of electric shock.

The enclosure of this device is mostly constructed from PVC, Teflon (PTFE), and PFA.

Using chemicals that are incompatible with these materials may cause a chemical reaction, potentially generating toxic gases or other harmful substances.

*The use of hydrogen fluoride solution (HF), which is mainly used in gas phase decomposition, is not a problem.

If the chemical comes into contact with your skin, wash it off immediately with water and seek medical attention right away. Alternatively, follow the procedures specified within the factory.

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 (Improper handling may result in moderate injury or property damages.)

We are not liable for any damages incurred by the customer or a third party as a result of using this device, or for any damages incurred as a result of incorrect use of this device.

Therefore, except in cases where liability for damages is recognized under the law, we cannot accept any responsibility whatsoever. Please understand this in advance.

Do not disassemble, modify, or repair this device without our permission.

We will not provide any warranty coverage for malfunctions caused by these actions, even within the free warranty period.

This device is a precision instrument, so please take extra care to avoid strong vibrations or impacts during transportation.

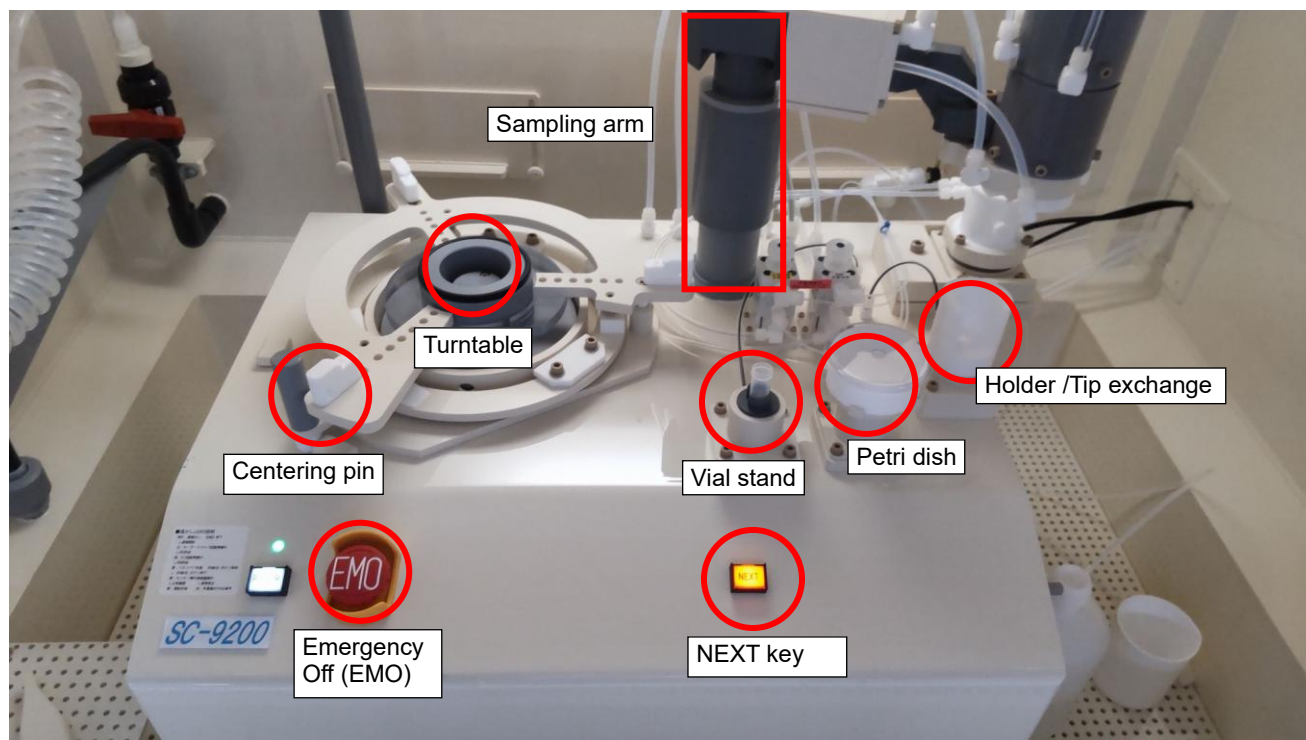
If you notice any abnormality in this device (abnormal operation, overheating, fire, unusual odor, unusual noise, etc.), immediately turn off the power switch.

Please be sure to unplug the power cord from the outlet and contact us or your place of purchase.

1. Names and Functions of Each Part of the Device

*The appearance of SC-9200 may change without any notice. Please be aware of it in advance.

1-1 Front of Device



- Turntable

It is used to rotate a wafer placed in the center and perform sampling /scanning.
To maintain a constant tangential velocity, the rotation speed is varied according to the radius of the retrieval position.

- Sampling arm

This arm is used to move the set liquid holder /scan tube and operate sampling.
Each time the wafer rotate on the turntable, it moves laterally by the set feed pitch.

- Centering pin

It is used to center the wafer to be sampled on the turntable and also used to remove it from the turntable.
Please set the centering pins in the holes with the corresponding numbers (*) before placing the wafer on the turntable.
*The numbers engraved on the jig are in inches and correspond to the following sizes:

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

- Vial stand

This stand is used to place the vial containing the sampled solution.

- Petri dish stand

The chemical solution to be used for sampling is placed in this petri dish and then drawn up during sampling operation.

- Holder (tip) exchange stand

During sampling process, the liquid holder is moved from cleaning stand to this stand at first.

By changing the parts on the exchange stand, a pipette tip can also be attached to the tip of the sampling arm.

- Holder cleaning stand

Normally, the holder is placed on this stand after the sampling and continuously cleaned with running water (DIW).

A cleaning solution can be also supplied instead of DIW. We also clean the tip of the pipette at this point.

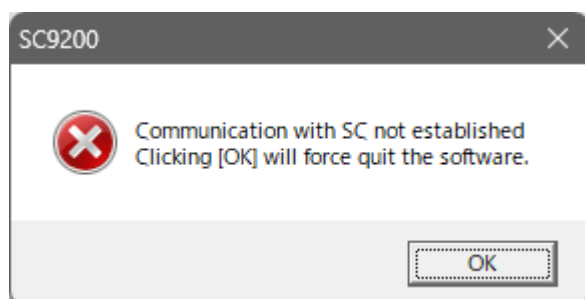
- EMO button

It is used in emergencies such as malfunctions. This is a locking type, so please reset the EMO when restoring functionality.

*If the software of SC-9200 is launched while the EMO button is locked, communication between the device and the PC will not be established, then sampling cannot be performed.

To establish communication, **please select "Basic Settings" (→2-5 [Sampling]) in this software** .

***After the software is launched, if the EMO changes from an unlocked to a locked state (the emergency off button is pressed),**



The message above will appear, and the software will immediately terminate.

- NEXT key

You will proceed to the next step in the sampling process.

The LED inside the button will blink when you are prompted to confirm the transition.

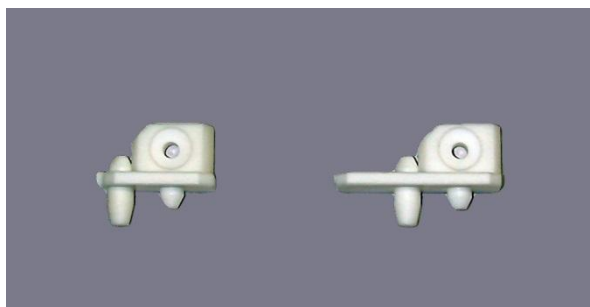
*You can also proceed to the next step by pressing buttons on your PC.

*When sampling is ready to begin (when the main screen is displayed), the LED will be lit up, not blinking.

Pressing the NEXT key in this state will perform the same action as pressing the [Start Sampling] button on the main screen.

1-3 Accessories

- Centering pin



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

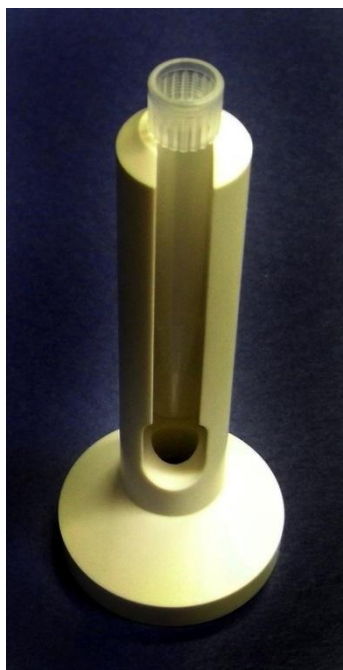
The pins are set in the centering jig and used to align the center of the wafer with the center of the rotation unit. The long, horizontal pin (right) is designed to make it easier to set the wafer, but it cannot be used with 4-inch wafers.

- Liquid holder / exchange stand



When sampling, you need to use the appropriate holder placed on the exchange stand. The holder replacement stand can be used in place of the pipette tip replacement stand.

- Pipette tip replacement stand



This stand is used when changing the pipette tip at the top of the sampling arm. The stand can be used interchangeably with the liquid holder replacement stand.

Sampling cannot be performed while the pipette tip replacement stand is in place.

Pipette tips for use with this device can be purchased from TGK (Tokyo Glass Instruments Co., Ltd.).
Model number: FT-L

2 Screen Operation

2-1 Startup /Return to Origin

Make sure that the EMO button is released (power is on) and that the PC and the main unit are connected via an RS-232C cable, then start the SC-9200 control software (**hereinafter referred to as "software"**).



At this time, if communication is not established between the device and the PC, the message below will appear, and then you will no longer be able to control this device from software.



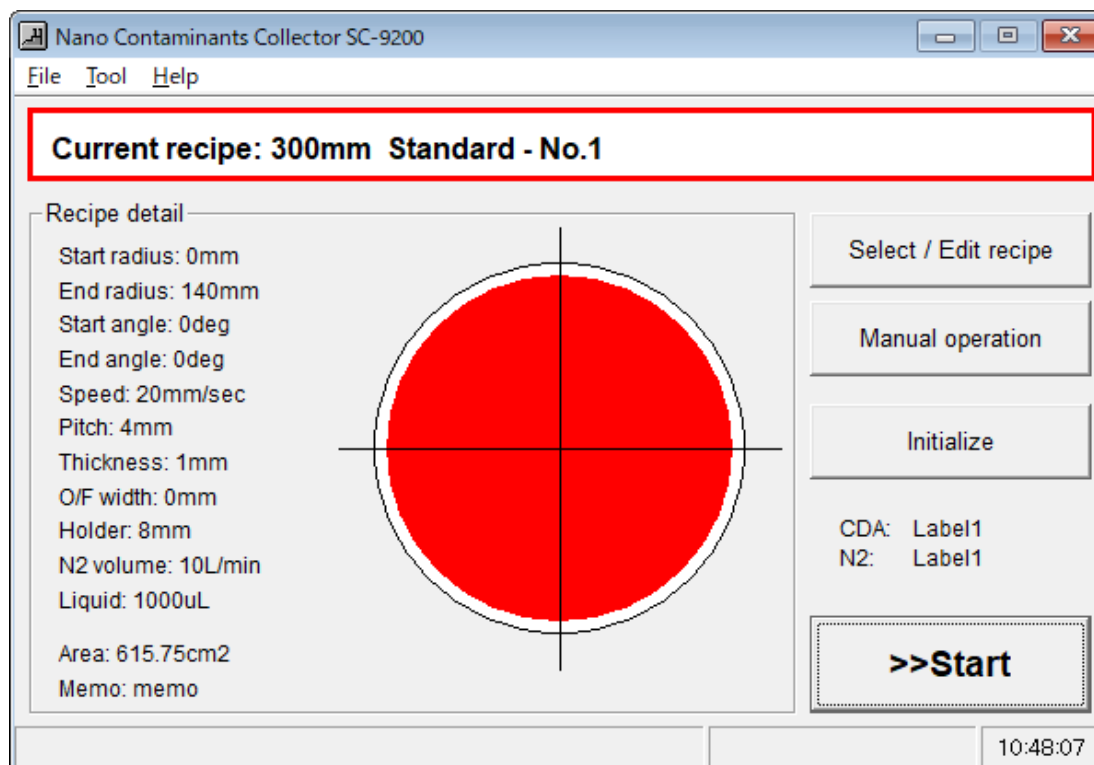
While you can edit recipe batches when communication is not established, you cannot directly operate the device. Please check the power supply and communication cable connections of the device, and then restart software.

Once the communication connection is successfully established, the message below will appear. If you press the [OK] button or the NEXT key on the device, it will start the process of returning each part of the device to its original position.



Once the return to the origin is complete, the main screen will be displayed.

2-2 Main Screen



The main screen displays the following information:

- Data for each currently selected recipe
- Sampling /scanning area diagram (the area is drawn in red)
- Total sampling area

While the main screen is displayed, the NEXT key on the device will light up. Pressing this key will perform the same action as selecting [Sampling].

The bottom of the screen displays the current time, the communication status between the device and the PC, and the position of the centering jig.

*If communication is not established between the device and the PC, the following message will come up.

Check the power of the device and its connection to PC.

*When the centering pin's lifter is raised (the wafer is not on the turntable), the following message will appear.

Lifter is up

10:49:07

○[File]-[Sampling] (→ See [3 Sampling])

It will perform sampling based on the currently selected batch and the [Sampling] button works similarly. This process cannot be executed unless communication is established between the device and the PC.

○[File]-[Select/Edit Recipe] (→ See [2-3 Select Recipe])

You can select or edit the recipe to be used for sampling. The [Select/Edit Recipe] button functions similarly.

○[File]-[Exit]

You can close the software.

○[Settings]-[Basic Settings] (→ See [2-5 Basic Settings])

It allows you to configure RS-232C settings and settings related to sampling.

○[Settings]-[Manual Operation] (→See [2-6 Manual Operation])

You can adjust the angle of the wafer on the turntable. The [Wafer Angle Adjustment] button functions similarly. This process cannot be executed unless communication is established between the device and the PC.

○[Help]-[About]

It displays the software's version number and the implemented operational options.

2-3 Select Recipe

This involves selecting recipes to use for sampling and copying the recipe contents.
You can save up to 100 recipes for each wafer size and each recovery pattern.

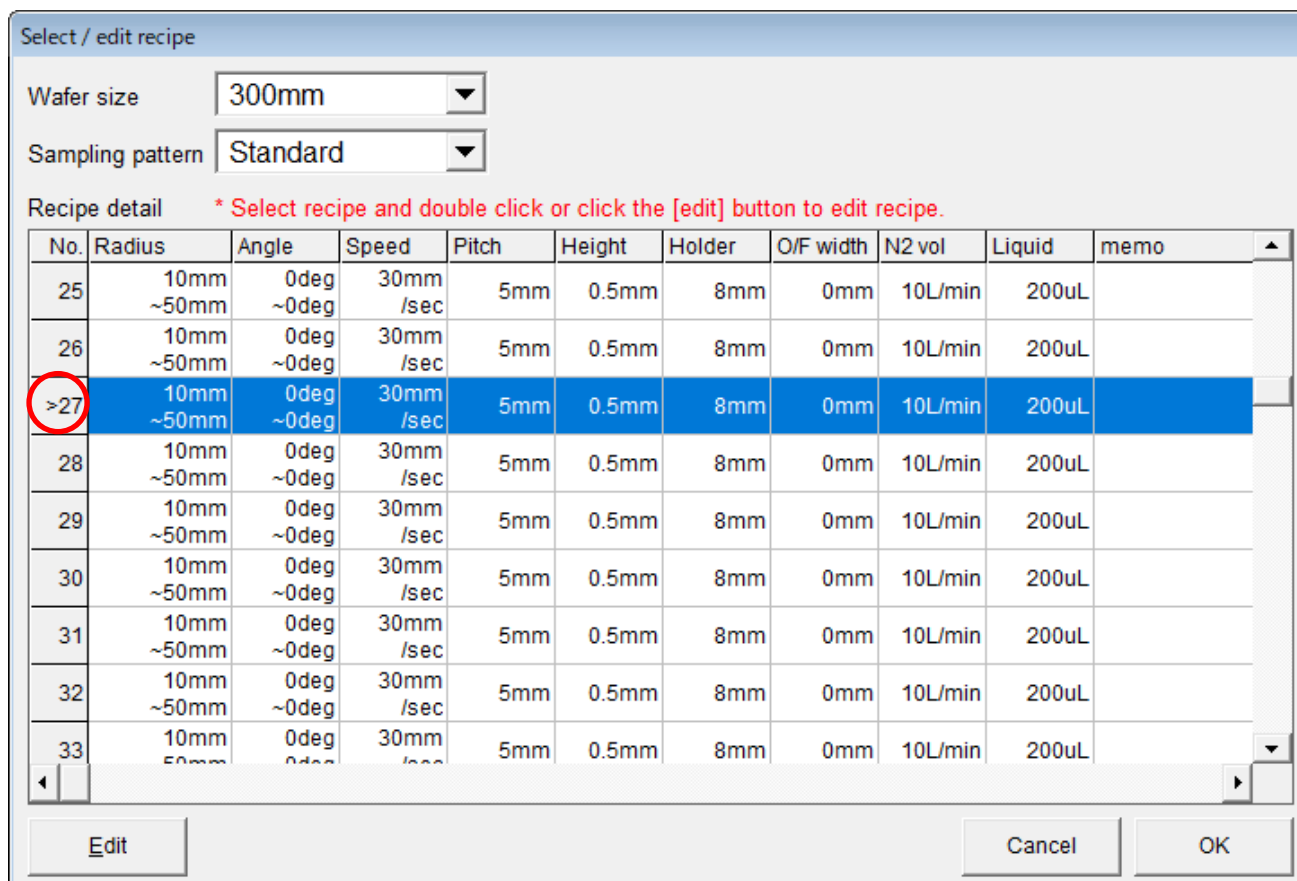


Figure 1

- Wafer size

You can decide the wafer size from 100mm, 125mm, 150mm, 200mm, or 300mm.

- Sampling pattern

You can set a sampling pattern.

*The basic pattern is only "Standard," but if you purchase option separately, there are other patterns available (ex. bevel).

- Recipe number

When you click on a recipe, ">" appears next to the number (red circle in Figure 1), indicating that this recipe is currently selected.

You can select by clicking with either the left or right button, but if you click with the left, the selected recipe will be highlighted in blue (as shown in Figure 1), while clicking the right button will not highlight the recipe but will display a submenu as shown in Figure 2.

26	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL
>27	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0	Copy No.27 Paste Swap		10L/min	200uL
28	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0			10L/min	200uL
29	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0			10L/min	200uL
30	10mm ~50mm	0deg ~0deg	30mm /sec	5mm	0.5mm	8mm	0mm	10L/min	200uL

Figure 2

- Copy the contents of No.■

You can copy the recipe contents (■) of the selected number.

- Paste the contents of No.▲ into No.■.

The copied recipe content (▲) will be pasted over the recipe content (■) of the selected number.

This cannot be executed without copying the recipe contents.

***When you paste the recipe, the content will be saved automatically, and the recipe content of the original paste destination (No.■) will be permanently lost.**

- Swap the contents of No. ▲ with the contents of No. ■.

You shall replace the copied recipe content (▲) with the recipe content of the selected number (■).

This cannot be executed without copying the recipe contents.

- [Edit] button

It will take you to a screen where you can edit the contents of the selected recipe.

This cannot be executed without selecting a recipe.

You can also edit the recipe by double-clicking it on the left.

- [Close] button

You can close the recipe selection screen and return to the main screen.

2-4 Edit Recipe

You can edit the contents of the selected recipe.

Edit recipe

Wafer size: 300mm
Pattern: Standard
Recipe No: 1

Start radius: 0.0 (0°150mm)
 End radius: 140.0 (0°150mm)
 Start angle: 0 (0°359deg)
 End angle: 0 (0°359deg)
 Speed: 20.00 (0.1°50mm/sec)
 Pitch: 4 (1°8mm)
 Thickness: 1.0 (0.1°20mm)
 Holder: 8.0 (3°8mm)
 O/F width: 0.0 (0°100mm)
 N2 vol: 10.0 (0°20L/min)
 Liquid: 1000 (0°1000uL)
 Memo: memo

Area: 615.75cm²

Buttons: UNDO, OK, Cancel

Figure 3

- Wafer size, Sampling pattern and Recipe number

These items are determined on the "2-3 Select Recipe" (or batch editing screen). They cannot be changed on the screen above.

- [OK] button

You can save the configured recipe settings to your PC and close the edit recipe screen.

- [Cancel] button

This will revert the recipe settings to their previous state and close the edit recipe screen. Any contents that you change will not be saved if you click [Cancel].

- [Undo] button

It will revert each value in the recipe back to its original value.

- Recipe setting items

The recipe details change depending on the sampling pattern. The setting range changes depending on the wafer size.

- Memo

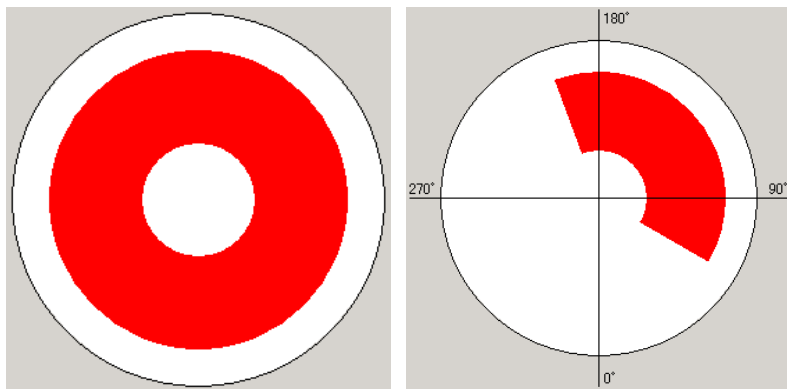
You can add and save comments about that recipe in each recipe.

- Sampling area

It can display the area to be collected during sampling process.

■ Detailed recipe contents by Sampling pattern

2-4-1 Standard



This function retrieves a circular, donut-shaped, or sector-shaped area composed of arbitrary radii (r_1 to r_2) and arbitrary angles (θ_1 to θ_2).

○Starting radius / Ending radius

The start and end positions are defined by a radius from the center of the wafer.

If the starting radius is greater than the ending one, sampling will proceed from the outside to the inside; if it is smaller, sampling will proceed from the inside to the outside.

*The radius that can be set is **the outer/inner side of the liquid holder**.

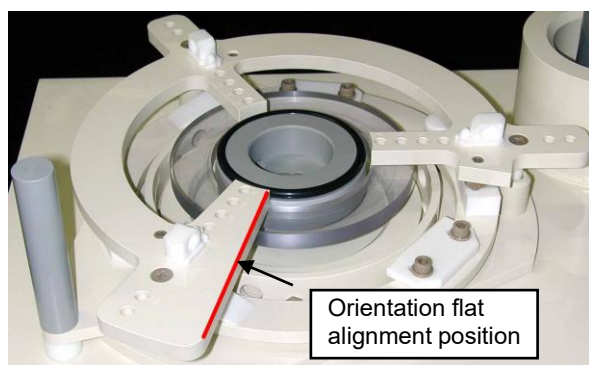
If the sample range is "start 30mm" to "end 80mm" and the inner diameter of the holder is 8mm, the sampling arm will start sampling with its center at a point of $30 + (8 \div 2) = "34\text{mm}"$ and end at a point of $80 - (8 \div 2) = "76\text{mm}"$.

* If the starting radius and ending radius values are the same, the movement will repeatedly trace only the circumference of the specified radius.

If the sample range is "start 50mm" to "end 50mm" and the inner diameter of the holder is 8mm, the sampling arm will rotate with its center fixed at a point with a radius of 50mm, so it will collect samples in the range from $50 - (8 \div 2) = "46\text{mm}"$ to $50 + (8 \div 2) = "54\text{mm}"$.

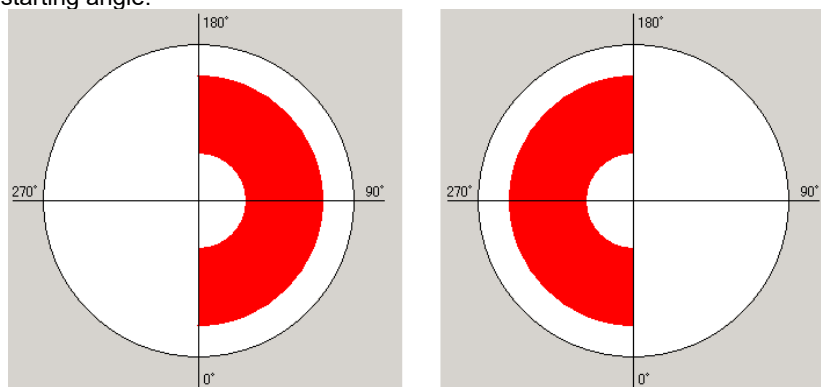
○Start angle and end angle

You can set the orientation flat alignment position of the centering jig (see diagram below) to 0°, align the center of the notch or the left edge of the orientation flat to this point, and set the start and end angles of the sample range.



The sample range (angle) is always **the area obtained by moving counterclockwise from the starting angle**.

Even within the same 0° to 180° range, the actual sample area will be completely opposite depending on which angle is set as the starting angle.



Start 0° to end 180° Start 180° to end 0°

○Tangential speed (written as "Speed" in Figure 3)

It shall set the tangential velocity between the wafer being sampled and the sampling /scanning solution. The turntable and sampling arm perform scanning while maintaining the tangential velocity set by this parameter.

If the speed is too fast, the sampling rate will decrease. Also, it may not be possible to keep the liquid within the liquid holder (the liquid may drop on the wafer).

On the other hand, if the scan speed is too slow, it will take a long time to complete sampling.

○ Feed pitch (written as "Pitch" in Figure 3)

You can determine the distance where the sampling arm moves with each rotation of the turntable.

The smaller this number, the higher the sampling rate (because the arm traces the same spot multiple times), but it also takes more time to scan the area.

*If the starting radius and ending radius are the same, no track change will occur, so this item does not exist.

Instead, a new item called " **Number of Scans** " comes out, which determines the number of times the object travels around the same circumference.

○ Wafer thickness (written as "Thickness" in Figure 3)

You shall set the approximate thickness of the wafer. If this value is significantly less than the actual thickness (for example, setting it to 1mm for a 10mm thick wafer), the sampling arm may collide with it.

* If the N2 flow (described later) is 0, "hydrophobic surface sampling" is performed without using N2 discharge from the arm tip. In this case, as the device can no longer determine the distance between the arm tip and the wafer, a new item called "liquid supply height" is introduced instead of wafer thickness, and the distance must be set manually.

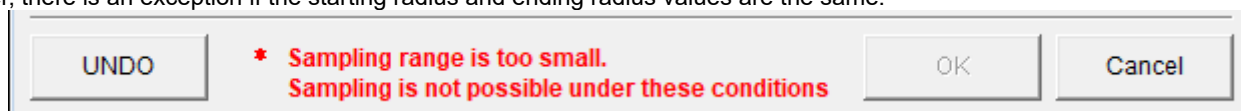
○ Liquid holder diameter (written as "Holder" in Figure 3)

It can set the inner diameter of the liquid holder to be used. The holder for this device is, in principle, manufactured with an inner diameter of 8 mm.

*The sample range (the difference between the starting radius and the ending radius) must be at least 1 mm larger than the holder diameter.

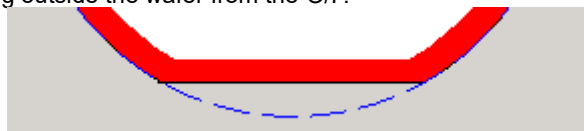
If the collection area is too small, the following message can appear, and you cannot save the recipe.

However, there is an exception if the starting radius and ending radius values are the same.



○ Orientation flat width (optional) (written as "O/F width" in Figure 3)

You can set the wafer orientation flat width. During sampling, the sampling arm's trajectory is recalculated and modified to prevent the liquid holder from moving outside the wafer from the O/F.



*Normally, the holder passes along the blue dashed line at the bottom, but if the orientation flat width is set, the orbit will be changed to sample only the portion shown in red.

*This O/F avoidance function is optional and is not included in the basic functions.

*When the start and end angles values are not the same, you cannot change the O/F width value (to something other than 0).

*When the orientation width value is not 0, the start and end angles values cannot be changed.

○ N2 flow rate (written as " N2 vol" in Figure 3)

This setting controls the flow rate of N2 discharged from the tip of the sampling arm. If this value is too low, the liquid cannot be held in the holder. If it is too high, the N2 will cause the liquid in the holder to foam, affecting the scan process.

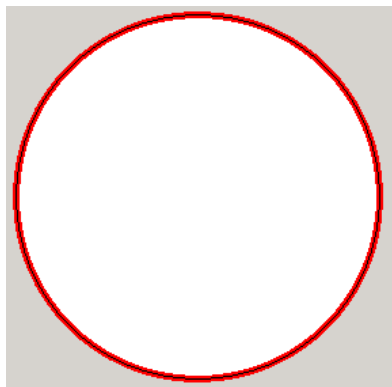
The appropriate N2 flow rate varies depending on the wafer material, surface condition, and type of scanning solution.

*If this value is set to 0, the "wafer thickness" setting will change to "liquid supply height."

○ Liquid supply amount (written as "Liquid" in Figure 3)

You can set the amount of sampling /scanning liquid to be dropped onto the wafer.

2-4-2 Bevel



A specialized liquid holder is used to sample contamination only from the side /bevel of the wafer.

○ Retraction radius and Scanning radius

The retraction and scanning radii are set as radii from the wafer center. These set radii values will be **the center of the holder**.

To extract the sampling liquid from within the holder, the sampling arm first moves from the outside of the wafer to the position specified by the "retraction radius," bringing the scan solution within the holder into contact with the wafer. Next, it moves to the position specified by the "scanning radius." To ensure the wafer draws the scan liquid out of the holder, set the **scanning radius value to be larger than the retraction radius value**.

*Setting the retraction radius to "wafer radius + 2.5 mm" and the scanning radius to "wafer radius + 4.5 mm" works well.

○ Number of scans

Set the number of laps required for retrieval.

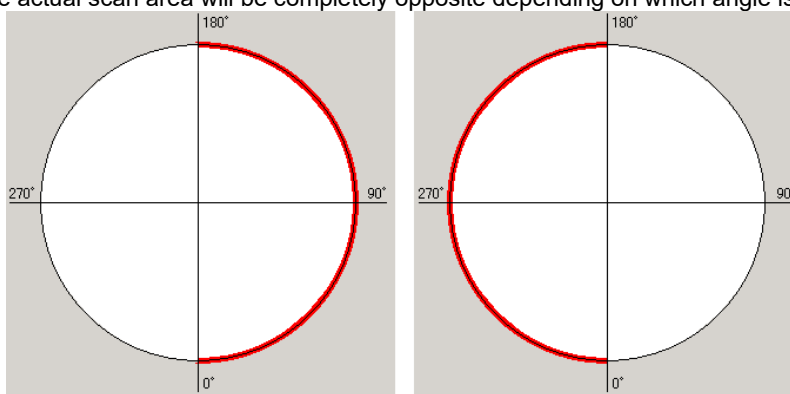
If no angle is specified (circumference), the number of laps will be (3 if the set value is 3), and if an angle is specified (arc), the outward/return journey will be...

Each movement counts as one round trip (if the setting is 3, it's one and a half round trips).

○ Start angle and end angle

The start and end angles of the sample range are set with the center of the notch or the left edge of the orientation flat as 0°.

The sample range (angle) is always **the range obtained by moving counterclockwise from the starting angle**. Even within the same 0° to 180° range, the actual scan area will be completely opposite depending on which angle is set as the starting angle.



Start 0° - End 180° Start 180° - End 0°

○ Tangential speed

You can set the tangential velocity between the wafer being sampled and the scan solution. The turntable and sampling arm will perform retrieval while maintaining the tangential velocity set by this parameter.

If the speed is too fast, the sampling rate will decrease, but if it's too slow, it will take too long to complete sampling.

○ Height correction

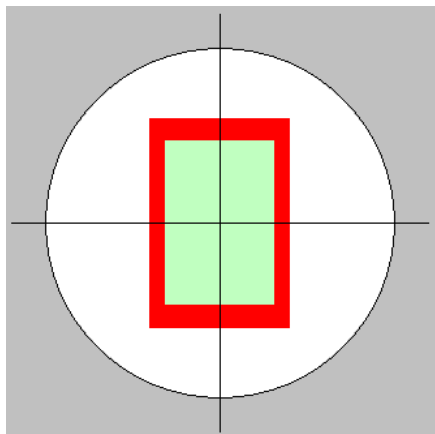
Adjust the relative height of the bevel wafer and the holder. A positive value causes the sampling arm (liquid holder) to rise, while a negative value causes it to fall.

○ Liquid supply amount

You shall set the amount of scan liquid to be dropped onto the wafer.

***For bevel sampling holder, the appropriate liquid volume is 170–200 µL.**

2- 4-3 Rectangle

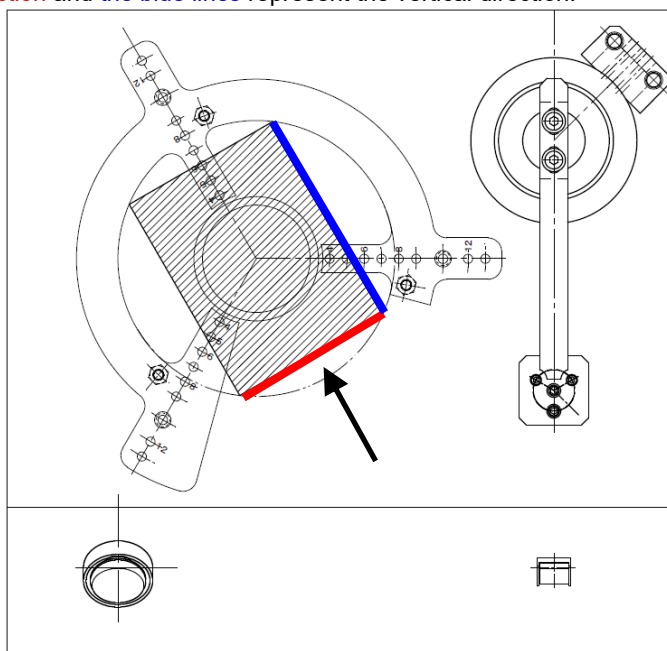


Contamination can be recovered from a rectangular area with sides of varying lengths on a square wafer. An angle adjustment adapter matching the wafer size will be required.

○Outer perimeter (vertical and horizontal)

You can set the outer dimensions of the rectangular area.

When setting a wafer on the SC-9200 in the orientation shown in the diagram below, **the red lines represent the horizontal direction** and **the blue lines** represent the vertical direction.



It is recommended to set it so that **the longer side is in the vertical direction** (the reason will be explained below).

○ Diagonal

You can set the length of the diagonal of the rectangular area. This value will change depending on the degree of corner rounding, even for wafers with the same side length. If this value is incorrect, you may end up dropping the scan solution near the corners during sampling.

○ Sampling width

You shall set the sampling range (width of the red band). Please enter the value as it appears when viewed from the front side of the wafer (in the direction of the arrow in the diagram above).

○Sampling from the outside /inside

Choose whether to start the sampling process from outside the range or from inside.

○Tangential speed

You can set the tangential velocity between the wafer being sampled and the scan solution. The turntable and sampling arm perform sample while maintaining the tangential velocity set by this parameter.

If the speed is too fast, the recovery rate will decrease, but if it's too slow, it will take too long to finish scanning. Additionally, if the speed is too high, it may not be possible to maintain the liquid within the holder (the liquid may be dragged across the wafer).

○ Feed pitch

This setting determines the distance the sampling arm moves with each rotation of the turntable. The smaller this number, the higher the sampling rate (because of tracing the same spot multiple times), but it also takes more time to scan the data.

○ Wafer thickness

You can set the approximate thickness of the wafer (the material to be sampled).

If this value is significantly less than the actual thickness (for example, setting it to 1mm for a 10mm thick object), the sampling

arm may collide with it.

* If the N2 flow rate (described below) is 0, "hydrophobic surface sampling" will be performed without using N2 discharge from the sampling arm tip.

Because the device cannot determine the distance between the arm tip and the wafer, a new item called "liquid supply height" is introduced instead of wafer thickness, and the distance must be set manually.

○Liquid Holder diameter

You shall set the inner diameter of the holder to be used. The liquid holder for this device is, in principle, manufactured with an inner diameter of 8 mm.

○N2 flow rate

This setting determines the flow rate of N2 discharged from the tip of the sampling arm. If this value is too low, the liquid cannot be held in the holder, but if it is too high, the scanning liquid in the holder will foam due to N2 gas, affecting the scan process.

The appropriate flow rate varies depending on the wafer material, surface condition, and type of sampling solution.

*If this value is set to 0, the wafer thickness item will be changed to "liquid supply height".

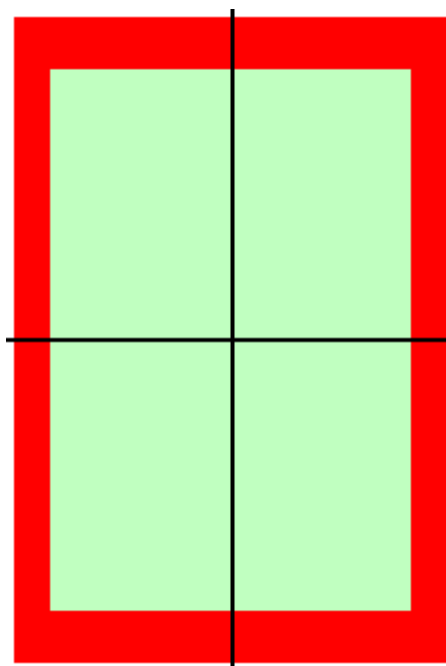
○Liquid supply amount

Set the amount of sampling /scanning liquid to be dropped onto the wafer.

★Relationship between differences in side length and sampling width/feed pitch

Rectangular sampling is a sampling method that repeatedly draws similar rectangles (120mm wide and 180mm high in the diagram below) with varying sizes, based on the outer dimensions specified by the rectangle's perimeter.

Therefore, the sampling width and feed pitch values set for the vertical direction will be different from those for the horizontal movement.



Outer circumference (horizontal): 120mm

Outer circumference (vertical): 180mm

Sampling width (vertical): **15mm**

Feed pitch (vertical): **6mm**

In this case, the dimensions of the inner rectangle are:

rectangle are:

Inner circumference (vertical): $180 - 15 \times 2 = 150\text{mm}$

Inner circumference (horizontal): $120 \times (150 / 180) = 100\text{mm}$

Sampling width (horizontal): $(120 - 100) / 2 = \mathbf{10\text{mm}}$

The amount of the feed pitch follows the ratio of vertical to horizontal:

Feed pitch (horizontal): $6 \times (120 / 180) = 4\text{mm}$

This value is always displayed on the recipe settings screen.

If you set the wafer so that the longer side is facing horizontally, the horizontal feed pitch will be larger than the input value, which may result in a poor recovery rate.

Please try to position the wafer so that the longer side is facing vertically whenever possible.

2 -5 Basic Settings

Configuration

N2 volume of Auto-surface-search

Approaching: 9.0 L/min

After search: 9.0 L/min

Differential pressure: 1

Pipette tip cleaning

DIW 1st: 1

Chemical: 0

DIW 2nd: 0

Schale: 0

Holder increase after sampling

"0" is preferred when very hydrophilic

Holder increase: 7.0 mm

Syringe

Maximum volume: 28 mm

Sound

☐ Sound at the end of Sampling

Holder cleaning

Chemical supply time: 3 sec

Chemical dip time: 5 sec

Holder cleaning before sampling

Chemical supply time: 3 sec

You can set the operation of this device.

○N2 flow rate during automatic wafer detection

To detect the optimal distance between the holder and the wafer surface for sampling (hereinafter referred to as "automatic detection"), the sampling arm approaches the wafer surface while discharging N2. This setting determines the N2 flow rate.

If this value is too low, the sampling arm and wafer may come into contact during automatic detection.

Conversely, if it is too high, the distance between the sampling arm and the wafer will be too wide, resulting in unstable liquid retention during sampling.

Please do not make any changes as a general rule.

○N2 flow rate after automatic detection

After automatic detection is complete, you need to set the N2 flow rate while waiting for the chemical solution to be dispensed into the liquid holder.

While the sampling arm and wafer are stopped, the N2 flow rate required to hold the liquid is not as high as when the system is in operation.

Conversely, if the flow rate is too high, the first few drops of the added chemical may be agitated by the N2 and splatter in unintended directions.

Please do not make any changes as a general rule.

○ Approach/Stop differential pressure

During automatic detection, the differential pressure sensor inside the device inputs a value that serves as the criterion for stopping the arm.

Please do not make any changes as a general rule.

○ Amount of rise of the liquid holder after sampling is complete

After sampling is complete, determine the amount to raise the arm to assist in suctioning the scanned liquid.

Please do not make any changes as a general rule.

○ Maximum syringe movement

Determine the maximum travel distance (maximum liquid suction volume) of the motor used to draw up the liquid in the syringe pump.

Please do not make any changes as a general rule.

○ Sound at the end of sampling

Specify an audio file to notify those nearby that sampling has finished.

○ Number of times to wash the tip

After drawing up the recovered liquid from the wafer, you can set how many times to use pure water and chemical solution to wash the pipette tip (1 to 10 times each) .

○ Cleaning of the liquid holder

After sampling is complete and the holder is returned, you can input the time for supplying the cleaning solution to the holder

washing stand and the time for immersing the holder in the cleaning solution.

- Cleaning of the holder before starting sampling

Enter the time to supply cleaning solution to the holder cleaning stand before sampling begins.

- [OK] button

Save the changed settings and close the basic settings screen.

- [Cancel button]

The basic settings screen will be closed without updating the settings.

2-6 Manual Operation

2-6-1 Move Holder

You can move liquid holders and operate the valve on the cleaning stand.

- Move buttons: [Washer to Stand], [Stand to Washer]

You can move the liquid holders. These buttons cannot be used to move the object unless the Stand is set up.

- Holder Cleaning Stand: [Get holder], [Put holder] buttons

At the Holder Cleaning Stand, you shall pick up and put down the liquid holders.

- DIW ON / OFF

This controls the supply of DIW to the Holder Cleaning Stand.

- Pump ON / OFF

This controls the supply of cleaning solution to the Holder Cleaning Stand.

- Drain ON / OFF

You can operate the drain valve on the Holder Cleaning Stand.

- Holder stand: [Get holder], [Put holder] button

At the holder stand, you shall pick up and put down the liquid holders.

- Position info: [Set "Exist"], [Set "Not exist"] buttons

When you move a holder using this software, it records its current location based on the result.

Since the software cannot track the position of a holder moved manually, if you move the holder manually for any reason, you will need to use this button to match the actual position information with the position information on your PC.

2-6-2 Change / Clean Tip

We will replace and clean the pipette tip.

Manual operation

*** Handle with care.**

Move holder **Change / clean tip** Adjust syringe Wafer angle

Change tip Remove tip

Cleaning tip

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

DIW 1st 2 ◀ ▶

Chemical 2 ◀ ▶

DIW 2nd 2 ◀ ▶

Schale 0 ◀ ▶

Start cleaning

☒ Move holder to stand before cleaning

☒ Move holder to washer after cleaning

Initialize Close

- [Change tip] button

You can attach a new pipette tip to the tip of the sampling arm.

Before attaching, please make sure that there is no pipette tip attached to the top of the sampling arm and that the new pipette tip is placed on the tip changing stand.

- [Remove tip] button

When you click the button, the sampling arm shall move to the position for tip removal.

- Cleaning tip

Specify the cleaning solution and the number of cycles to use, then press the [Start cleaning] button to begin cleaning the pipette tips.

"Move holder to stand before cleaning" option is checked, the holder will be moved to the holder stand before cleaning begins.

"Move holder to washer after cleaning" option is checked, the holder will be returned to the washer stand after the cleaning.

2-6-3 Adjustment Syringe

You can adjust the amount of liquid drawn up with the syringe pump.

- [Washer to vial], [Schale to vial] buttons

The amount of liquid specified in the "Syringe (mm)" field will be drawn up from the washer stand or petri dish and dispensed into the vial.

This operation cannot be performed if a vial is not placed on the vial stand.

- 500 μ L /1000 μ L /50 μ L

The setting determines the pulse motor movement (mm) when drawing up 500 μ L, 1000 μ L, or 50 μ L of liquid with a syringe pump .

- [Save], [Reset] buttons

The values specified above (10 μ L-1000 μ L) will be written to/read from the PC.

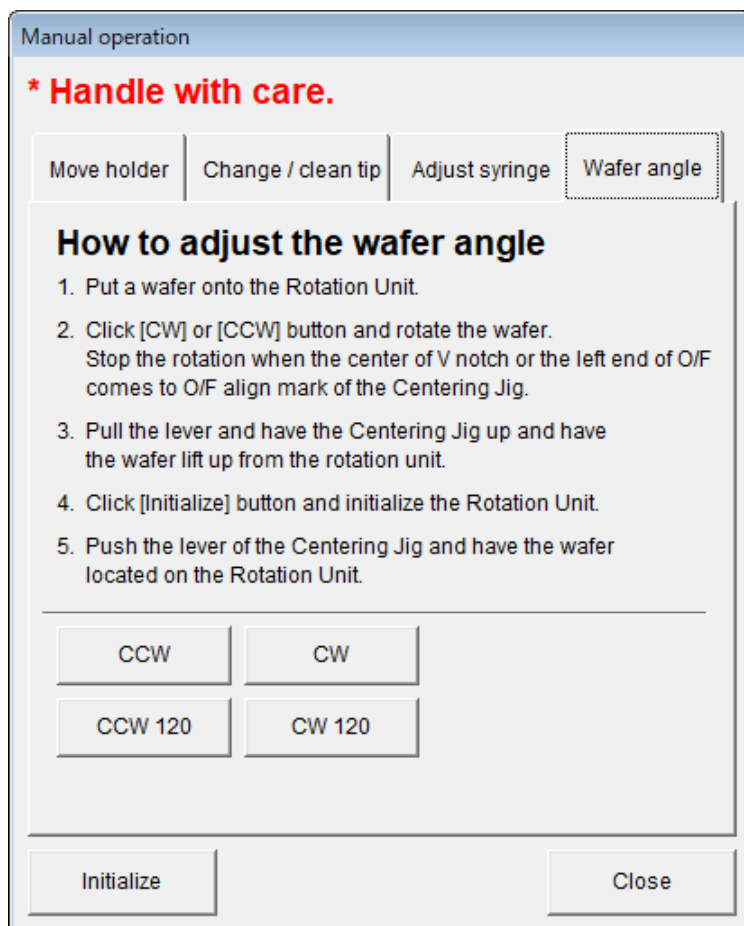
From now on, when drawing up liquid with a syringe pump, these values will be used as the reference.

- Amount of absorbed liquid [syringe (μ L)]

When you enter the amount of liquid you want to draw up with the syringe pump, the amount of syringe pump movement required to draw up that amount of liquid will be displayed.

2-6-4 Wafer Angle Adjustment

You shall adjust the angle of the wafer placed on the turntable.



- [CCW], [CW] buttons

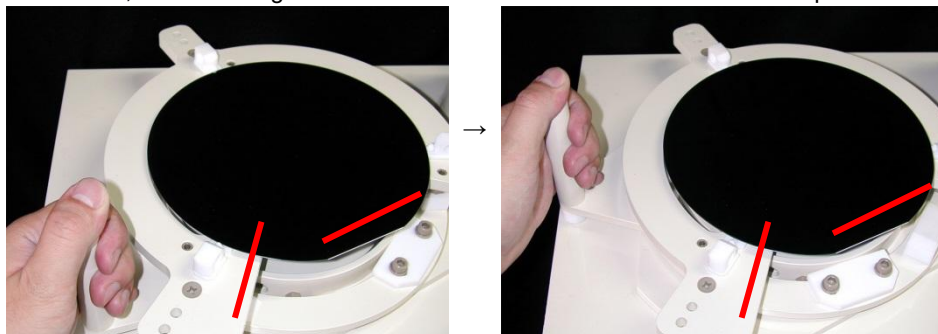
Rotate the turntable at a low speed, turning it counterclockwise (or clockwise).
If you press the same button again, the device will stop the turntable.

- [CCW 120], [CW 120] buttons

Rotate the turntable 120 degrees at a time.

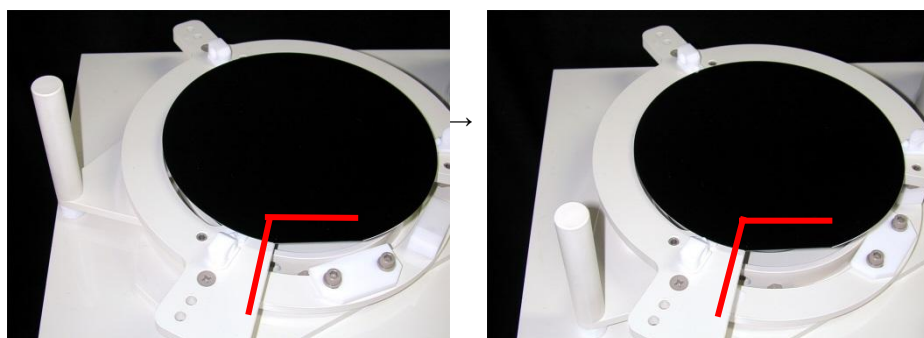
■ Angle adjustment procedure

- 1) Place the wafer on the turntable.
At this time, the wafer angle does not need to be set with the orientation flat position.



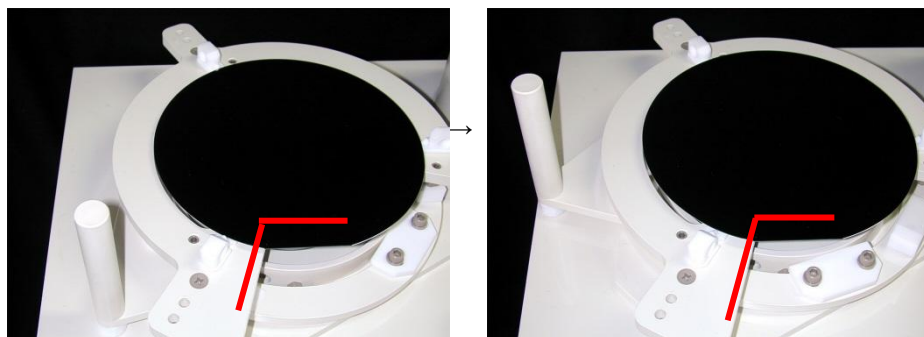
- 2) Use the [CCW] and [CW] buttons to rotate the wafer and align the angle between the orientation flat (notch) and the orientation flat alignment position.

- 3) Lift the lever on the centering jig to remove the wafer from the turntable.



- 4) While still holding it up, press the [Initialize] button to return the turntable to its home position.

- 5) Once the initialization is complete, lower the lever and place the wafer onto the turntable.



*After adjusting the position, please lower the lever on the centering jig. If not, it may damage the wafer.

3 Sampling

3-1 Preparations before the Start

You can access the sampling screen by selecting "Sampling" from the main screen or by pressing the NEXT key on the device itself.

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

- Sound stop** (text at the top)
- Start Sampling.** (red text)
- Set the wafer and droplet holder and press [Start] button or [NEXT] key.** (instructions)
- Pause** button (top right)
- Recipe detail** section:
 - Start radius: 0mm
 - End radius: 140mm
 - Start angle: 0deg
 - End angle: 0deg
 - Speed: 20mm/sec
 - Pitch: 4mm
 - Thickness: 1mm
 - O/F width: 0mm
 - Holder: 8mm
 - N2 volume: 10L/min
 - Liquid: 1000uL
 - Area: 615.75cm²
- Circular diagram** (center): A red circle with a black outline and a black crosshair.
- Holder stand** and **Lifter** status:
 - Holder stand: Not exist
 - Lifter: Not exist
- Terminate** button (bottom right of recipe detail)
- Exit** button (bottom left)
- Initial liquid intake ratio** (80 %) (bottom center)
- Start** button (bottom right)

○ [Start] button
Sampling will begin.

○ an [Exit] or a [Terminate] button
You can return to the main screen.

3-2 Sampling Procedure

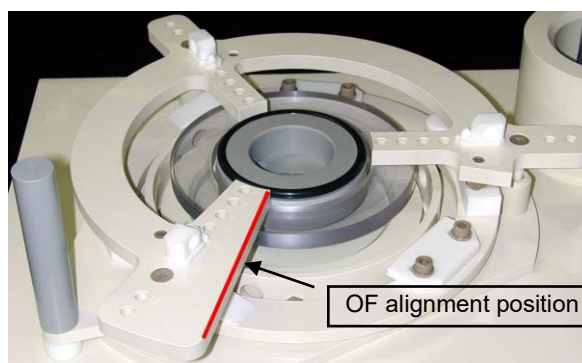
1) Before starting sampling, please check the following items.

- Ensure the wafer is set at the correct angle on the turntable.
- The lifter of the centering jig is lowered.
- The wafer size specified in the recipe matches the size of the wafer actually placed on the turntable.
- Ensure that the holder mounting base and the holder of the appropriate shape for the sampling type are set at the correct angle.



Wafer and lifter verification

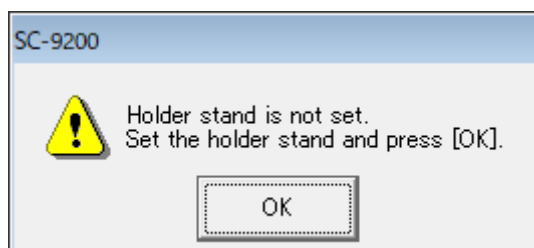
2) When performing sampling using a recipe that specifies angle and orientation flat width, please adjust the wafer angle using the orientation flat alignment position of the centering jig.



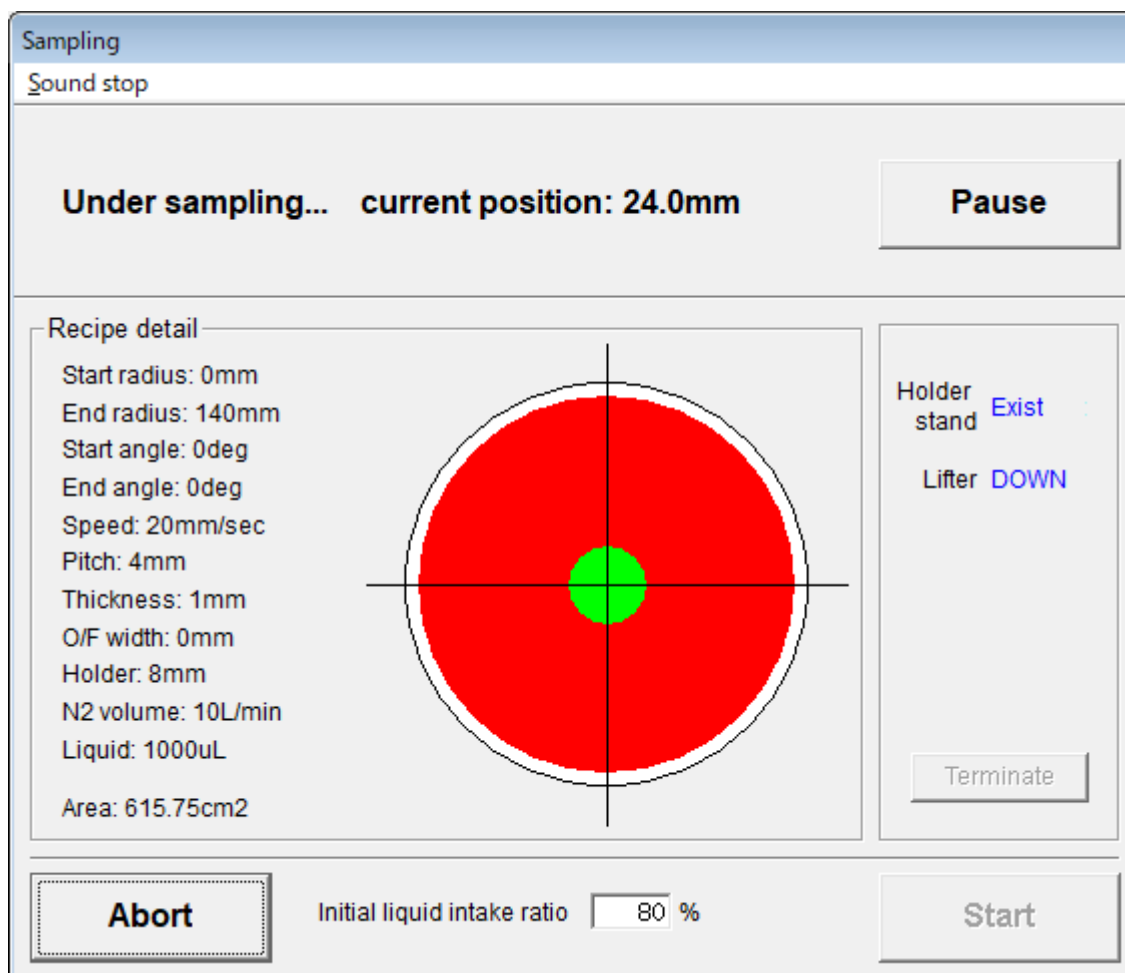
3) Press the [Start] button or the NEXT key to begin sampling. If the lifter of the centering jig is raised at this time, the following message will be displayed. Please lower the lifter and then press the [OK] button.



Additionally, if the holder stand is not in place, the following message will be displayed. Please place the liquid appropriate holder on the holder stand and press the [OK] button.



4) The following buttons will become available during sampling.



- [Pause] button

The sampling arm and the turntable will pause in place. If you press the button again, the device will resume the sampling process.

- [Terminate] button

This button can only be pressed while paused, and pressing it will interrupt and terminate sampling immediately, regardless of the device's status.

- [Abort] button

Sampling process is stopped immediately, and the sampling arm is returned to its origin.

4 Specifications

● Main unit

Product Name:	SC-9200 (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)
Sampling method:	constant tangential velocity, quasi-concentric sampling
Droplet holder holding capacity:	100μl to 1000μL
Applicable wafer sizes:	4"/4 inch(100mm), 5"/5 inch(125mm), 6"/6 inch(150mm), 8"/8 inch(200mm), 12"/12 inch(300mm)
Tangential speed:	0.2 to 50 mm/sec
Feed pitch:	1 to 16 mm
Usage environment	
Temperature:	15°C - 35°C (during operation)/0°C~50°C (during storage)
Humidity:	30% to 80% (during operation)/10% to 90% (during storage) * Avoid condensation.
Power supply	
Voltage:	AC100V
Frequency:	50Hz or 60Hz
Installation location:	Inside a clean bench
Weight:	45Kg
Size:	800mm(W) x 470mm(D) x 498mm (H)

*Due to the routing of the N2 supply hose, please ensure a working space height of at least 630mm. Additionally, please ensure a workspace width of at least 1000mm for operating the lifter and regulator.

● PC System Requirements

- The PC on which Windows 10 runs without problems.
- Screen resolution of 640x480 or higher (800x600 or higher recommended)
- There are USB connectors

5. After-Sales Service

Warranty and Maintenance

The free warranty period for this device, under our responsibility, is one year from the date of delivery. From now on, we will conduct regular checks based on the maintenance contract.

Repair

In the event that this device malfunctions, immediately stop using it, turn off the power, and unplug it from the outlet. Please contact us or your point of purchase.

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.