

STANDARD OPERATING PROCEDURE FOR DISCO DICING SAW



POWER ON

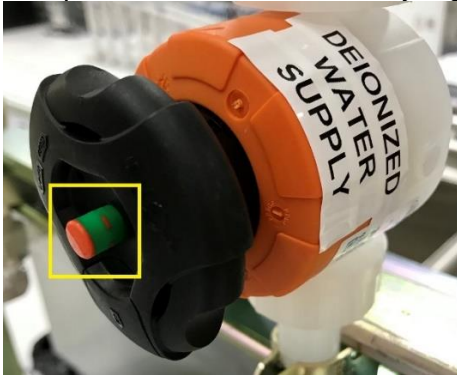
1. **Activate the Dicing Saw on Nemo.**
2. Check log book for any issues and record current usage date.
3. Check DI Water level in the nearby tank. DI Water should be just below the pipe hole in the tank.



4. If the DI Water level is low, follow Steps 5-9 to add DI. If the DI Water level is too high, contact Staff.
5. **ATTENTION! DO NOT FILL ABOVE THE WATER LEVEL IN PHOTO BELOW. FILLING THE WATER LEVEL TOO HIGH WILL FLOOD THE CLEANROOM TRENCHES.**



6. Locate the valve labelled “**DEIONIZED WATER SUPPLY**” and turn the valve counter-clockwise to open it. Do **NOT** open or close a different or unlabeled valve! If you are unsure, contact staff. An opened valve is indicated by a green cylinder in the center of the valve.



7. Locate the valve on the left side of the DI Water System and turn the valve counter-clockwise 90° or until it is parallel to the line to open it. DI Water will begin refilling the tank. Do **NOT** leave the tank unattended while DI water is refilling.



8. When the DI Water level is sufficient, turn the valve clockwise 90° or until it is perpendicular to the line to close it. Make sure DI Water stopped flowing into the tank.



9. Return to the valve labelled “**DEIONIZED WATER SUPPLY**” and turn the valve clockwise to close it. Do **NOT** open or close a different or unlabeled valve! A closed valve is indicated by only a red center.



10. If the DI Water level is sufficient, turn the DI Water system on.



11. Turn the DI Water system Supply Pump to Auto



12. Turn Power Key clockwise to Start position and release.



13. The application software will boot up automatically if the  CAUTION page appears.



14. If the tool boots straight to Windows, you will need to click on the Taskbar Icon to restart the computer. You may need to do this restart once or twice for the application software to boot up.
15. When the application interface has booted up, Press System Initial button and wait for initialization to complete.



16. Proceed to Install Blade section to install a blade.

INSTALLING BLADE

1. After initialization, press **F4 Blade Maintenance Button**.



2. Press **F1 Blade Replacement**. You must be in the Blade Replacement page or the spindle will not lock to installing/removing blade.
3. Open Blade Change Door.
4. Locate the **Cover** and **Blade Removal Tool** with a **Lock Nut** attached nearby the tool.



5. Push the Compartment Door below the top surface to open the compartment.



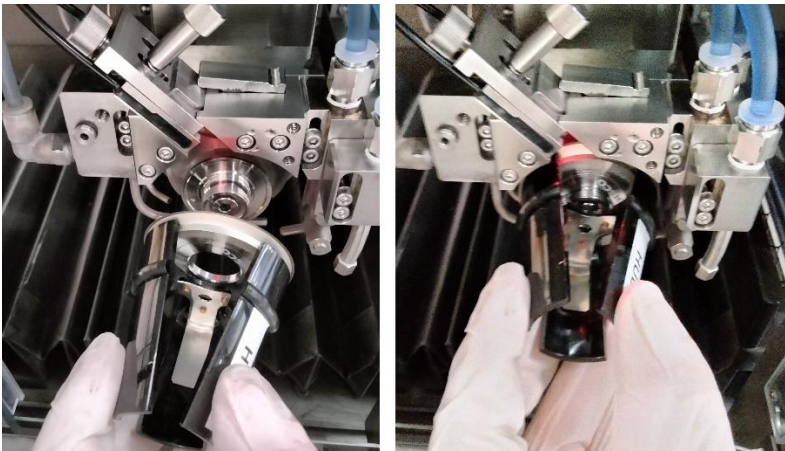
6. Locate the **Blade Holding Jig** and **Torque Wrench**.



7. Use the Blade Holding Jig to pick up desired blade.



8. Slide Blade onto Axle.



9. Release the Blade and set the Blade Holding Jig on the table nearby.

10. Use Blade Removal Tool screw on Lock Nut onto Axle until you feel a resistance. Do **NOT** tighten with your hand.

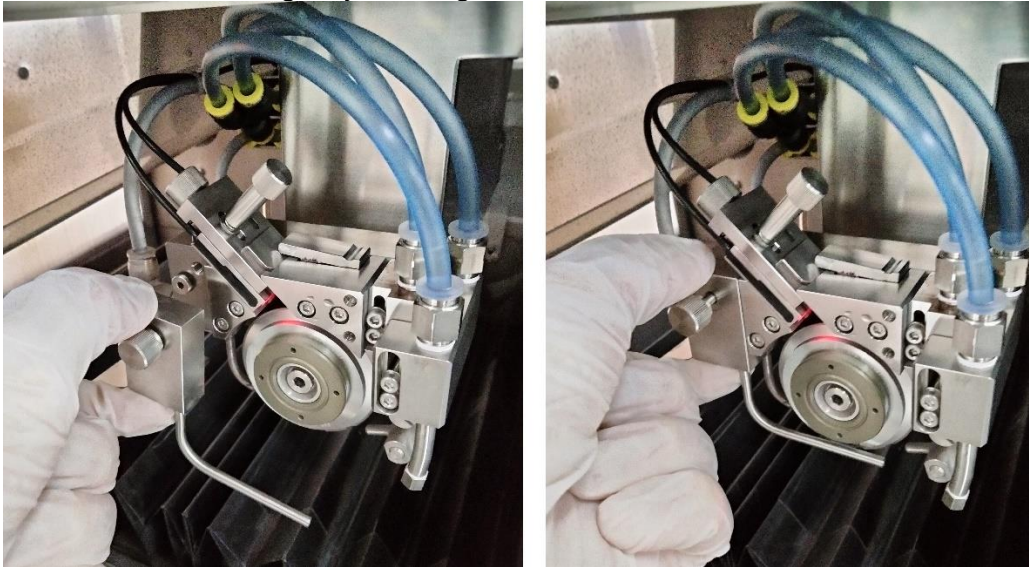
11. Keep the Blade Removal Tool on the Lock Nut and fully Insert the Torque Wrench into the Blade Removal Tool. Do **NOT** insert the Torque Wrench into the Lock Nut by itself.



12. Use the Torque Wrench to tighten until two clicks.

13. While holding the Blade Removal Tool, gently pull out the Torque Wrench.

14. Push in the center of the Blade Removal Tool and gently pull the outer black plastic to release and remove the Blade Removal Tool. Do **NOT** pull the plastic piece without holding the center.
15. Install the Cover and gently hand tighten the Cover screw.



16. Close Blade Change window
17. Press F5 Blade Selector.



18. If you are using a DISCO Blade, proceed with Steps 19 – 25.
19. Press F10 DISCO Blade.



20. Refer to Blade Container to select a DISCO blade with pre-loaded parameters.
Example: For blade name "ZH05-SD2000-N1-70EE," choose "27HEEE"

EE defines last two letters of blade name inside Blade Selector list.

All names start with 27HE for 55mm Blade or 35HE for 76mm Blade



21. Press Enter.
22. Input a Lot ID for your blade.

23. Input Hub Exposure in mm. The Hub Exposure in μm is displayed on the Blade Container.



24. Input Blade Thickness in mm. The Blade Thickness in μm is displayed on the Blade Container.



25. Select New or Used blade

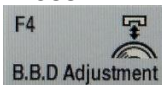
26. If you are using a Non-DISCO Blade, you must input the exact Blade O.D., Blade Thickness, Hub Exposure on the Blade Replacement page before you can proceed to prevent damage to the tool, your blade, or your samples.

27. Press Enter. Data will be updated.

28. Unselect all tabs on the bottom-right.



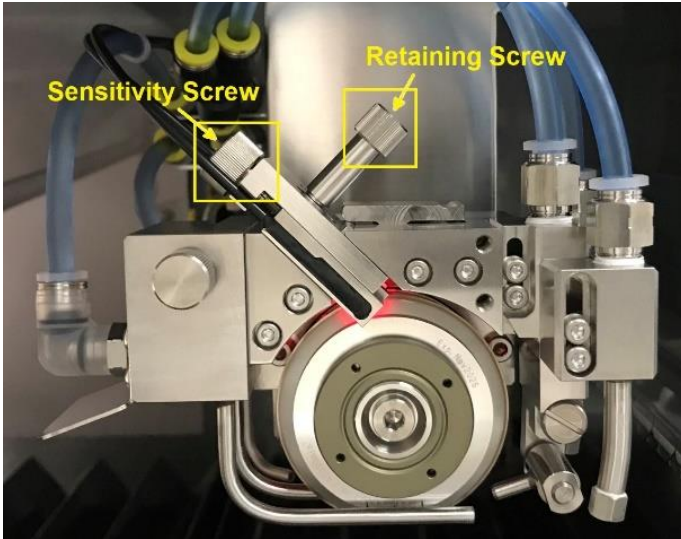
29. Press F4 B.D.D Adjustment.



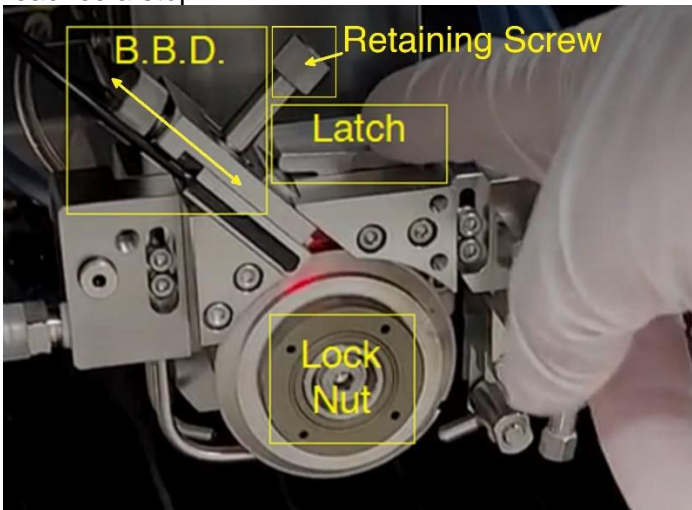
30. Message Area will ask "Confirm Jig has been removed. If OK, press button to continue."

31. Press F4 B.D.D Adjustment again to confirm.

32. Loosen B.B.D Retaining Screw by turning CCW.



33. Turn the Sensitivity Screw CW three full turns to lower the risk of the B.B.D. making physical contact with your blade.
34. While monitoring the Sensitivity, push down on the right side of the Latch and use other hand to slowly lower the B.B.D. towards bottom-right direction. **Make sure the Sensitivity does not reach 1% as the B.B.D. may come into physical contact and damage the blade.** If the Sensitivity Percentage is dropping below 10%, turn the Sensitivity Screw CW three more full turns and continue to slowly lower the B.B.D. towards bottom-right direction again until it reaches a stop.



35. Adjust B.B.D Sensitivity Screw located at the top-right end of the B.B.D. to move B.B.D up or down. Turn **CW to increase sensitivity** or turn **CCW to decrease sensitivity**.
36. When Sensitivity is between 9-10%, Gently retighten B.B.D Retaining Screw by turning CW.
37. Press Exit button twice to return to Main Menu.

BLADE SETUP

1. Press F4 Blade Maintenance.



2. Press Blade Setup
3. Press F3 Non-Contact Setup



4. Press Start on the top-right. The Non-Contact Setup will be automatic.



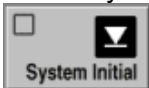
5. If you encounter NCS Sensor Cover error after the Non-Contact Setup is complete. You will need to manually close the NCS Sensor Cover. Proceed to Steps 6 – 10.

V1044 NCS Cover close error.

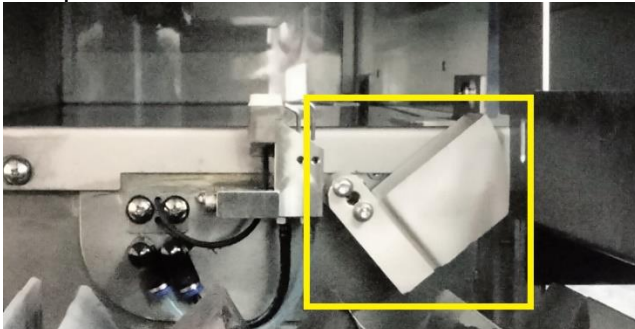
6. Press Alarm Clear on the top-right.



7. Exit to Main Menu.
8. Press System Initial.



9. Make sure Blade Spindle is off. Open the Blade Change Cover
10. Close the NCS Sensor Cover by pushing it to the left. You do not need to repeat Non-Contact Setup.



WARM UP

1. Allow the spindle to run under cutting water for 30 minutes prior to operation.
2. Press the Spindle button to turn spindle on.



3. Press the Cutting Water button to turn cutting water on.



4. Allow spindle to run with cutting water for 30 minutes.
5. **Do NOT leave the tool unattended while Spindle is running.**
6. Proceed to Loading Sample Steps on Page 8 during this wait time.
7. Turn off Cutting Water.
8. Turn off Spindle.

DRESSING BLADE

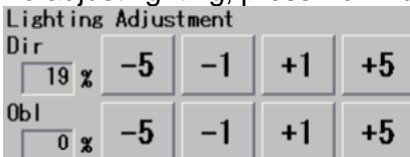
1. If you are skipping the Warm Up Steps or have installed a new blade, perform dressing blade.
2. Press F4 Dress.



3. Load Steel Frame with Dresser Board facing up.
4. Press C/T Vacuum and verify that Dresser Board is secured on chuck table.



5. Press Dress button.
6. Select Recipe 0.
7. Set Spindle revolution at 30,000/min (For Blade: ZH05-SD2000-N1-70)
8. Choose A for cut mode.
9. Input Work Thickness = 1.075 mm
Dresser board (1 mm) + tape (0.075 mm) = 1.075 mm
10. Input Blade Height = 0.850 mm.
11. Press Manual Align.
12. To adjust lighting, press - or + buttons to decrease or increase Direct and/or Oblique lightning.



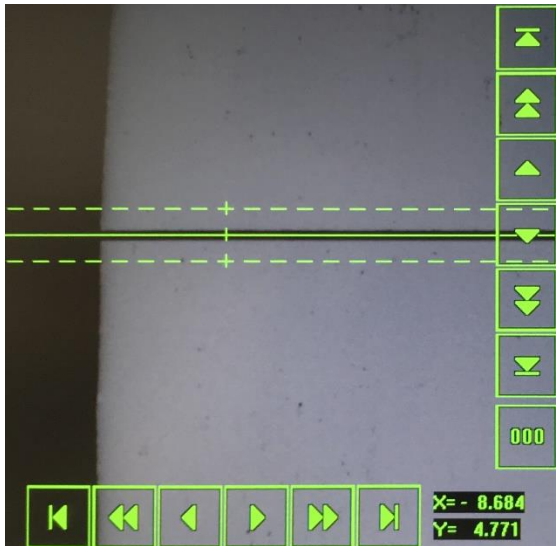
13. To focus Dresser Board, press Focus and then Auto Focus. Press Exit.



14. Press F10 Change Magnif button to change to LO magnification.



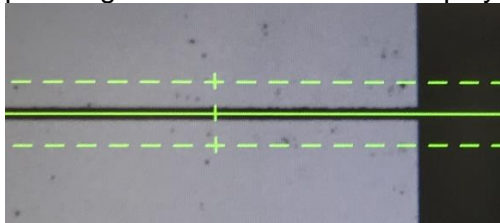
- 15.
16. Rough align Solid Hairline to the left side of previous cut line of a used dresser board or to the bottom-left edge of a new dresser board by pressing the screen or pressing the Arrow buttons on live display.



17. Press F5 Align θ .

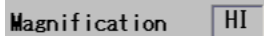


18. Rough align Solid Hairline to the right side of the Dresser Board by pressing the screen or pressing Arrow buttons on live display.

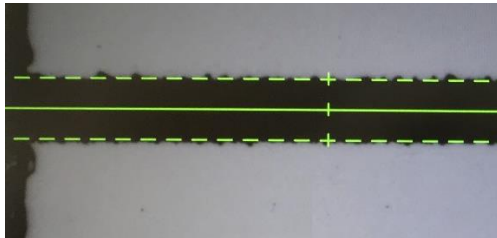


19. Press F5 Align θ again move Microscope back to left side of Dresser Board and confirm LO magnification adjustment.

20. Press F10 Change Magnif button to change to HI magnification.



21. Fine align Solid Hairline and adjust Dashed Hairlines until hairlines are on top and bottom edge of cuts.



22. Press F5 Align θ and fine align Solid and Dashed Hairlines again.

23. Press F5 Align θ again to confirm alignment and complete HI magnification adjustment

24. Press Enter.

25. Click Rear to index cuts towards rear of tool or Front to index cuts towards front of tool.



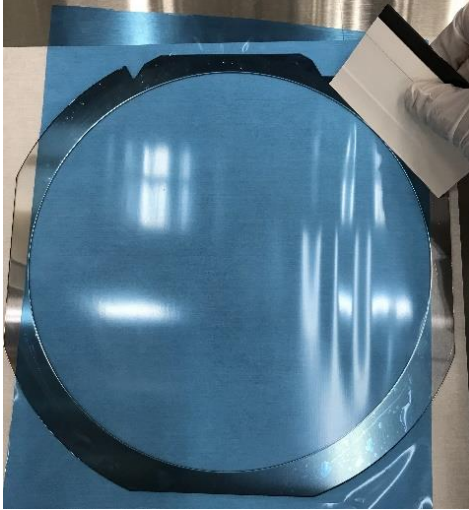
26. Press Enter. Message will show data is updated.
27. Press Start.
28. When dressing completes, press C/T Vacuum.



29. Use Nitrogen gun to blow excess water off.
30. Unload Steel Frame with Dresser Board.

LOADING SAMPLE

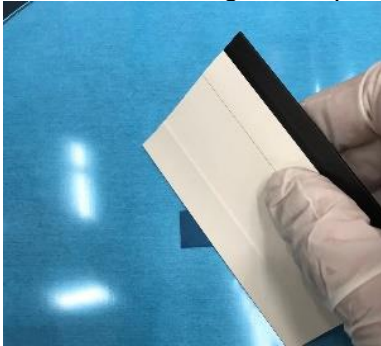
1. Lay Steel Frame on the stainless steel table.
2. Cover Steel Frame with Blue Tape.
3. Use Hand Applicator to remove air pockets from the tape.



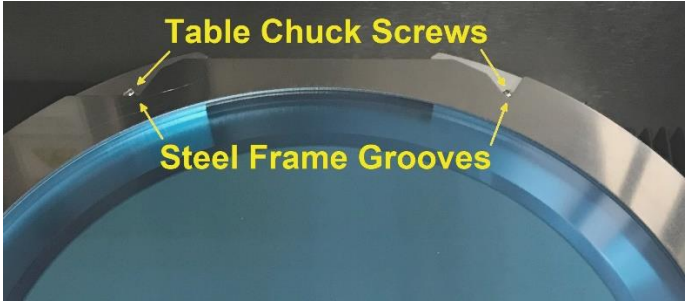
4. Use Razor Blade to cut and remove Blue Tape areas that extend beyond the Steel Frame.



5. You may Pull/Stretch Blue Tape to flatten its area of contact with Steel Frame as much as possible.
6. Flip Steel Frame over.
7. Place Sample in center of Blue Tape and gently press Sample down if possible.
8. Flip Steel Frame over.
9. Use Hand Applicator to remove air pockets from the contact area of Sample and Blue Tape. Use Roller for larger Samples.



10. Load Steel Frame onto the Table Chuck with sample facing up. Position the Rear Grooves of frame to partially enclose the Rear Screws of the Table Chuck.

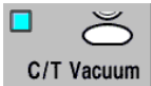


ALIGN SAMPLE AND MEASURE DISTANCE

1. Load Steel Frame with sample facing up.
2. Press Direct button to display operation keyboard.



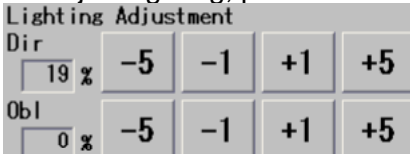
3. Press C/T Vacuum.



4. Press Measure button.



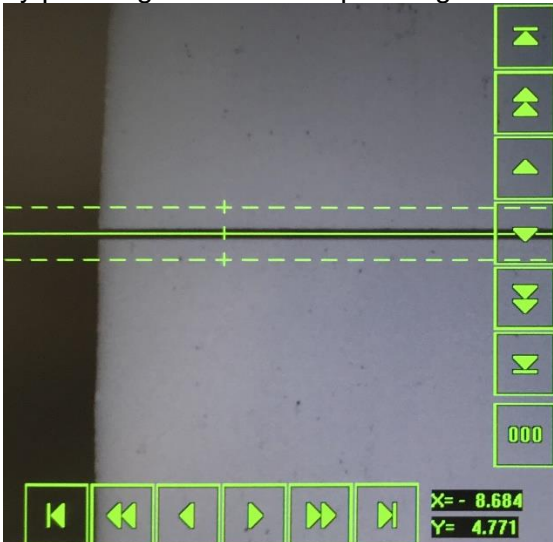
5. To adjust lighting, press - or + buttons to decrease or increase Direct and/or Oblique lightning.



6. Press Exit.
7. Press F10 Change Magnif button to change LO magnification.



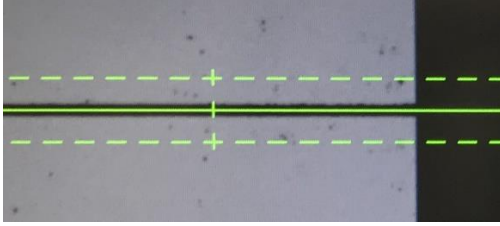
1. Rough align Solid Hairline to the left side of a pattern on the sample or a flat on a blank wafer by pressing the screen or pressing the Arrow buttons on live display.



8. Press F5 Align θ .



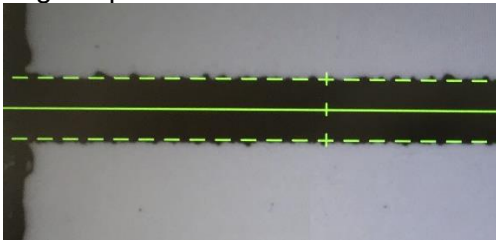
9. Rough align Solid Hairline to the right side of a cut/pattern on the sample or a flat on a blank wafer by pressing the screen or pressing the Arrow buttons on the live display.



10. For greater measurement precision, perform alignment under HI magnification. Press F10 Change Magnif button to change HI magnification.



11. Fine align Solid Hairline on the left side of sample.
12. Use the F4 Narrow Hair and F9 Widen Hair buttons to align Dashed Hairlines to top and bottom edge of patterns.



13. Press F5 Align θ and fine align Solid Hairline on the right side of sample.
14. Use the F3 Narrow Hair and F8 Widen Hair buttons to align Dashed Hairlines.



15. Press F5 Align θ again to confirm alignment and move back to left side of sample.
16. Move to Crosshair to reference point.
17. Press 000 button on the live display to clear X and Y values to 0.



18. Move Crosshair to measure point and read X or Y values.

CREATING RECIPE

1. From Main Menu, Press F3 Device Data.
2. Press Create Directory button to make personal folder.
3. Name personal folder and press Enter.
4. Select Root Folder. Two factory recipes are present. Do not delete these recipes.
5. Select 000.
6. Press Copy.
7. Select Folder to Copy recipe.
8. Name Recipe and press Enter.
9. Select Recipe and press Enter.
10. Select Work piece (sample) shape.
11. Input Dimensions (100 mm for 4inch wafer, 76.2 mm for 3inch wafer).
12. Input Work Thickness (sample thickness).
13. Input Tape Thickness (0.075 mm for blue tape).
14. Input Spindle rev. (30,000 rpm for Blade used to cut Si).
15. Input values for Ch.1 (cutting horizontally):
 - a. Deg: 0.000.
 - b. Cut Mode A (blade rotates clockwise). Select Cut Mode A for most cuts.
 - c. Cut Dir: Select Rear if alignment is done at the front of wafer.
 - d. Cut: Input number of lines to index and cut
 - e. Offset Y: 0.000.
 - f. Noncut F: distance from front edge to pattern that does not require cutting.
 - g. Noncut R: distance from rear edge to pattern that does not require cutting.
 - h. Blade height: input half of thickness of blade into tape.
For Blue Tape Thickness = 0.075 mm. Half Thickness of Blade = 0.0175 mm,
Blade Height = Blue Tape Thickness – Half Thickness of Blade
Blade Height = 0.075 mm – 0.0175 mm = 0.0575 mm
 - i. Feed Speed: 20 mm/s for Si.
 - j. Y-index: space between each cut.
 - k. Repeat Times: Set to 1. Set to 0 will cut entire wafer.
16. Input values for Ch.2 (cutting vertically).
17. Press Process Control.
18. Set Seq 1 to ALI and Seq 2 to CUT.
19. Press Exit to return to recipe selection.
20. Press Enter to reselect recipe.
21. Press Enter again to update data.

OPERATION

The user can make alignments along several channels and the automation will perform cutting operations for the selected channels according to recipe setting.

2. Press System Initial button.



3. Load Sample and press C/T Vacuum button.



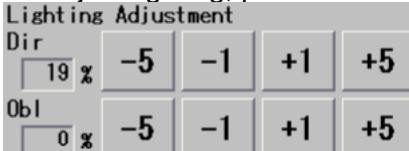
4. Verify Blade settings and Device Data settings.
5. From Main Menu, Press F2 Manual Operation button
6. Press F3 Cutting -Auto- for cuts along multiple channels. For cuts only along Channel 1, use F4 Cutting -SemiAuto-.



7. Press F4 Manual Align



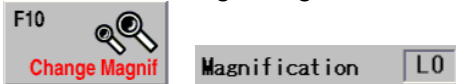
8. To adjust lighting, press - or + buttons to decrease or increase Direct and/or Oblique lightning.



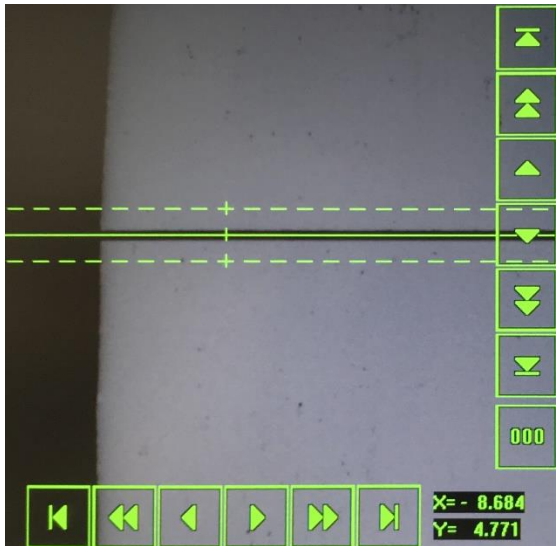
9. To focus sample, press F8 Focus and then Auto Focus. Press Exit



10. Press F10 Change Magnifi button to change to LO magnification.



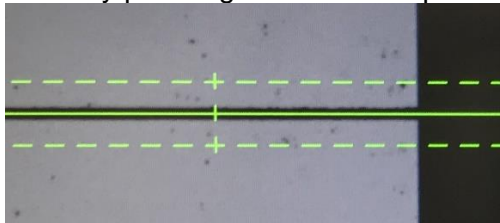
11. Rough align Solid Hairline to the left side of a pattern on the sample or a flat on a blank wafer by pressing the screen or pressing the Arrow buttons on live display.



12. Press F5 Align θ

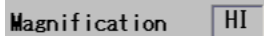


13. Rough align Solid Hairline to the right side of a cut/pattern on the sample or a flat on a blank wafer by pressing the screen or pressing the Arrow buttons on the live display.



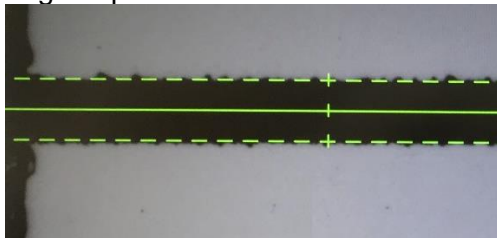
14. Press F5 Align θ again move Microscope back to left side of sample and confirm LO magnification adjustment.

15. Press F10 Change Magnif button to change to HI magnification.



16. Fine align Solid Hairline on the left side of sample.

17. Use the F4 Narrow Hair and F9 Widen Hair buttons to align Dashed Hairlines to top and bottom edge of patterns.



18. Press F5 Align θ and fine align Solid Hairline on the right side of sample.

19. Use the F3 Narrow Hair and F8 Widen Hair buttons to align Dashed Hairlines.



20. Press F5 Align θ again to confirm alignment and complete HI magnification adjustment

21. Move the Solid Hairline to desired starting position for Channel 1.

22. Press Enter.

23. Tool will prompt user to do theta adjustment for 90° position (Channel 2)

24. If you don't have second pattern or flat edge, press F5 Align θ twice. Otherwise, repeat steps 10-20.
25. Move the Solid Hairline to desired starting position for Channel 2.
26. Press Enter to return to Auto Cut setup
27. The tool will start the cutting position where Hairlines are currently lined up. Index the cut by pressing Wafer Index button and Press Up button to index up once. You can also use the Up or Down screen buttons to move Hairlines to starting point.
28. Press Wafer Index button again to exit.
29. Press Start twice to begin initial cut.
30. After initial cut, the tool will prompt to do Hairline alignment and an alarm will sound.
31. Press Alarm/Clr to acknowledge alarm.



32. Adjust Hairlines.
33. Press Hairline ADJ.
34. Press Start again and recipe will continue until the end.
35. Press System Initial button and wait for initialization to complete



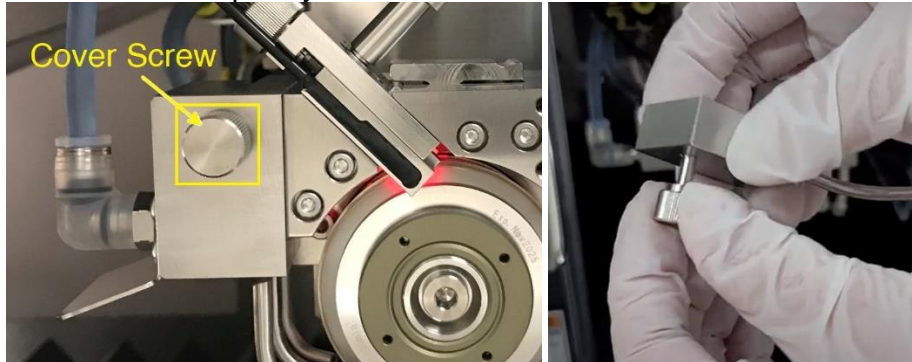
36. Press C/T Vacuum.



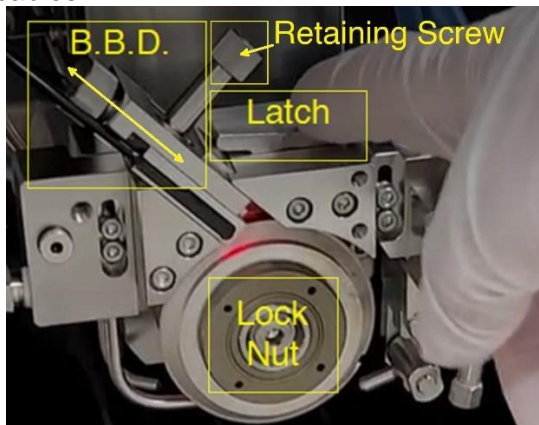
37. Use Nitrogen gun to blow excess water off.
38. Unload Steel Frame with Sample.
39. Refer to the Blade Change section to remove your blade. Users who have installed a Flange blade mount **MUST** change back to a Hub blade mount.

REMOVING BLADE

1. Press **F4 Blade Maintenance** button from Main Menu.
2. Press **F1 Blade Replacement**. You must be in the Blade Replacement page or the spindle will not lock to installing/removing blade.
3. Open Blade Change Door
4. Remove Cover by loosening the top-left Cover screw and then pulling the Cover off. The Cover screw will not completely detach from the Cover.



5. Move Blade Breakage Detector (B.B.D.) up by pushing down on the right side of latch and sliding the B.B.D. up towards the top-left direction. Be careful not to snap black fiber optic cables.



6. Push in the Blade Removal Tool to expose the teeth and four pins



7. Insert the four pins into four holes located on the Lock Nut.
8. Insert Torque Wrench into center of Blade Removal Tool and turn CCW once to loosen.
9. Do **NOT** insert the Torque Wrench into the Lock Nut by itself.



10. While holding the Blade Removal Tool, gently pull out the torque wrench.
11. Continue turning the Blade Removal Tool CCW by hand to remove Lock Nut from Axle. Leave Lock Nut in Blade Removal Tool.
12. Squeeze the three handles of the Blade Holding Jig to hold and remove blade from axle.



38. Store the **Cover** and **Blade Removal Tool** with a **Lock Nut** attached in front of the Blade Change Door.

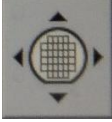


39. Store the **Blade Holding Jig** and **Torque Wrench** in the Compartment.



CLEAN UP AND POWER OFF

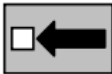
1. Press System Initial button and wait for Initialization to complete.
2. Make sure Spindle and Cutting water are off.
3. Press the Chuck Table control tab at bottom-right.



4. Press Right Arrow button of the axis control keyboard to move chuck table to the Right until it reaches Right end.



5. Make sure no parts are moving inside the tool and open Microscope Section Door
6. Use air gun to blow particles from bellows located to the left of the chuck table.
7. Close Microscope Section Door
8. Press Left Arrow button of the axis control keyboard to move chuck table to the Left until it reaches the Left end.



9. Use air gun to blow particles from the bellows located to the left of the chuck table.
10. Close Microscope Section Door. Press System Initial button.



11. Turn on Spindle and Cutting Water to let spindle run for a minimum of 5 minutes with the cutting water. Use the handheld timer if needed. **Do NOT leave the tool unattended while Spindle is running.**



12. Turn off the Cutting Water and let Spindle run free for a minimum of 15 minutes.



13. Turn off the Spindle.



14. Turn the Power Key to OFF.



15. Turn the DI Water system Supply Pump to OFF



16. Turn the DI Water system Power to OFF



17. Record any issues in log book. Otherwise, write OK.

18. Deactivate the Dicing Saw on Nemo.

Contributors	Revised Date
Joey Vo	04/13/2022
Joey Vo	07/17/2023