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1.0 Description

1.1 This operation procedure is intended for persons that have had at a minimum the basic Disco field training class. Operating the machine without training can result in damage to the machine and/or injury to the operator.

1.2 For in-depth explanation of terms and procedures refer to the appropriate section of the Disco Operations or Maintenance manuals.

2.0 Safety

2.1 Do not open the saw section without making sure the spindle has stopped rotating. Untrained persons are not permitted access to the inner workings of the machine.

2.2 This machine presents the following hazards:
   2.2.0 Electrical shock.
   2.2.1 Moving parts/pinch points.
   2.2.2 Bladed edges.
   2.2.3 Compressed dry air.
   2.2.4 Pressurized water spray.

2.3 The following PPE is required for routine operation:
   2.3.0 Eye protection.
   2.3.1 Gloves.
   2.3.2 Other as required by task

2.4 Tools required for standard maintenance:
   2.4.0 Disco toolset.
   2.4.1 Glass cutting blade (as needed).
   2.4.2 Matching dresser board (as needed).
   2.4.3 Matching flange assembly (as needed).
3.0 Requirements/Restrictions

3.1 Contact Paul Logan or Kevin Chambers to obtain a copy of the Dicing Saw FAQ document before the initial meeting.

3.2 Consult with Paul Logan or Kevin Chambers to discuss the exact nature of the work.

3.3 The following information is required to get a reservation:
   3.3.0 Wafer or sample size
   3.3.1 Composition of substrate and all layers
   3.3.2 A map of the wafer face and pattern to be cut
   3.3.3 Total sample thickness
   3.3.4 Depth of desired cut
   3.3.5 Sensitivity to water and pressurized spray
   3.3.6 Specific dimensions of any die
       Agree on a time for the work to be done.
   3.3.7 Make a reservation for the agreed time.
   3.3.8 The applicant should enter the cleanroom from the main door by swiping his/her card to enter the cleanroom.
   3.3.9 Applicant will go to the tool site with his/her wafer(s).
   3.3.10 The application should bring safety glasses, tweezers, and a die carrier.
   3.3.11 The applicant should stay with their sample at all times.
   3.3.12 When dicing is finished the wafer(s) will be given back to the applicant.
   3.3.13 Applicant will exit from the main door by swiping his/her card.
   3.3.14 You must comply with all safety requirements.

4.0 Startup Procedure

4.1 Turn on water, CDA, exhaust.

4.2 Turn on the key switch.
4.3 Check air pressure at the regulator and make sure it is at least 80-85 PSI.

4.4 Turn the key switch.

4.5 Check the air pressure on the virtual gauge. It should be at least 0.5 MPa.

4.6 Check the flow rate of the Spindle Coolant Water on the flowmeter on the right rear of the machine.

4.7 Initialize the tool and confirm that the spindle begins rotating.

4.8 Activate cutting wafer and confirm water spray.

4.9 Check the flow rate with the flowmeter on the front of the machine.

4.10 Let the tool sit idle for about 30 minutes to warm up.

4.11 Perform Sensor Calibration setup per the Operation Manual.

4.12 Perform Non-contact Blade setup per the Operation Manual.

4.13 Perform microscope Focus Maintenance procedure per the Operation Manual.

5.0 Operating Procedure

5.1 The following instructions are abbreviated. Due to the saw’s inherent flexibility and the infinite variety of samples and possible operations, refer to the Operation or Technical Manual(s) for full instructions.

5.2 Manually dicing unpatterned wafer
   5.2.0 Select and register the recipe
   5.2.1 Set work in place and activate chuck vacuum
   5.2.2 Select Manual Operation, Cutting Auto, Manual Align
5.2.3 Adjust light and focus
5.2.4 Make alignments for Channel 1, followed by Channel 2.
5.2.5 Select initial dicing point, press Start.
5.2.6 After dicing completes, remove work from chuck.

5.3 Manually cut single channel
5.3.0 Follow above procedure
5.3.1 Allow the user to select the cut location
5.3.2 Make the alignment and cut as above but for a single channel only.

5.4 Manually cut multiple channels with Y-Axis offsets
5.4.0 Follow the above procedure
5.4.1 Allow the user to select the cut locations for each cut.
5.4.2 Make all alignments and cuts as above but use the measurement function per the Operation Manual to determine the exact cut location.

6.0 Glass Blade Dressing Procedure

6.1 Preparation for operation:
6.1.0 Mount a glass blade onto the spindle.
6.1.1 Initialize the system.
6.1.2 Press Blade Setup.

6.2 Setting the dresser board:
6.2.0 Obtain the dresser board that matches the blade.
6.2.1 Perform a setup per Section 7.0 of the Operation Manual.
6.2.2 The board has beveled edges on two opposing sides; these need to be aligned in the direction of the blade travel.
6.2.3 Load the dresser board on the chuck table.

6.3 Go to the Blade Maintenance screen:
6.3.0 Press the Dress button.
6.3.1 On the Dress Data List, select the dress data needed.
6.3.2 Press Enter to go to the Blade Dress Program screen.
6.3.3 Confirm that the data on the Dress Program screen matches what is needed.

6.4 Perform a Single-channel Alignment:
6.4.0 Press Manual Align to go to the alignment screen.
6.4.1 Adjust lighting as needed and press Exit.
6.4.2 Adjust focus as needed and press Exit.
6.4.3 Execute a theta alignment along the edge of the board.
6.4.4 Designate the start position.
6.4.5 Use arrow keys to move inward slightly away from the edge of the board.
6.4.6 Press the underlined arrow button.
6.4.7 Press Enter to register the cut position.
6.4.8 Designate the cutting direction.
6.4.9 Press Enter.

6.5 Execute dress cutting.
6.5.0 On the Blade Dress Program screen, press Start.
6.5.1 The machine will make the dress cuts per the instruction provided in the Blade Dress Program screen.
6.5.2 After completion of the cutting process the message ‘Cutting completed’ appears.
6.5.3 Perform a setup manually if the system does not do do it automatically.
6.5.4 Press Exit.

6.6 Remove the dresser board from the chuck and clean before placing back in storage.

6.7 Press Exit back to the Main Menu.

7.0 Blade Replacement Procedure
DISCO DAD3220 DICING SAW STANDARD OPERATING PROCEDURE

7.1 Call up BLADE REPLACEMENT screen:
   7.1.0 Save existing blade data if it is to be used again.
       7.1.0.0 Press Data Save.
       7.1.0.1 Enter an ID name or number for the used blade.
       7.1.0.2 Press Enter.
       7.1.0.3 Confirm the used blade appears on the Used Blade List.

7.2 Remove wheel cover:
   7.2.0 Make sure spindle is locked.
   7.2.1 Open the splash cover.
   7.2.2 Remove wheel cover.

7.3 Remove the Blade Breakage Detector (BBD):
   7.3.0 Loosen the retainer screw.
   7.3.1 Retract the sensor head all the way up.
   7.3.2 Unclamp the sensor block and remove it.

7.4 Remove the blade:
   7.4.0 Hubbed blade:
7.4.0.0 Attach the lock nut demounting jig to the lock nut.
7.4.0.1 Insert the torque driver bit into the jig and rotate CCW.
    7.4.0.1.0 Turn the nut demounting jig and remove the lock nut.
    7.4.0.1.1 Remove the blade and place it in its protective case.
7.4.0.2 If switching to a flanged blade, refer to Section 9.0 for instructions on removal of the hub mount.
7.4.1 Flanged blade:

7.4.1.0 Attach the nut demounting jig to the lock nut.
7.4.1.1 Insert the torque driver bit into the jig and rotate CCW.
    7.4.1.1.0 Turn the nut demounting jig and remove the lock nut.
    7.4.1.1.1 Remove the B flange and blade and place them in the protective case.
7.4.1.2 If switching to a hubbed blade, refer to Section 8.0 for instructions on removal of the A flange.
7.5  Installing the new blade:
   7.5.0  Hubbed blade.
      7.5.0.0  Place the new blade on the hub mount.
      7.5.0.1  Retrieve the nut demounting jig and thread the Lock Nut back on the spindle.
      7.5.0.2  Use the torque driver to tighten down the demounting jig and Lock Nut.
      7.5.0.3  Remove the torque driver and demounting jig from the spindle and assembly.
   7.5.1  Flanged blade:
      7.5.1.0  Place the new blade on the flange A.
      7.5.1.1  Install flange B on the assembly.
      7.5.1.2  Retrieve the nut demounting jig and thread the Lock Nut back on the spindle.
      7.5.1.3  Use the torque driver to tighten down the demounting jig and Lock Nut.
      7.5.1.4  Remove the torque driver and demounting jig from the spindle and assembly.

7.6  Adjust the Blade Breakage Detector:
   7.6.0  Reinstall the BBD into its bracket and secure with the clamp.
   7.6.1  Press the BBD Adjustment button.
   7.6.2  Check the sensitivity level.
      7.6.2.0  If <90%, clean the sensor emitters.
      7.6.2.1  If cleaning doesn’t improve to =>90%, adjust the emitter power.
   7.6.3  Lower the sensor head until sensitivity is between 7 and 15%.
   7.6.4  Tighten the retaining screw.
   7.6.5  Close the splash cover.
   7.6.6  Press System Initialize.
7.7 Register the data for the new blade:

7.7.0 New Blade

7.7.0.0 Go to the Blade Maintenance screen.

7.7.0.1 Go to the Blade Replacement screen.

7.7.0.2 Press the Blade Selector button.

7.7.0.3 Select the spec that matches the new blade.

7.7.0.3.1 If the blade is not in the list, go to the Blade Replacement screen and enter the data manually.

7.7.0.4 Press Enter to register the new blade.

7.7.0.5 Press Exit and go to the Blade Replacement screen.

7.7.0.6 Confirm the selected blade data is now displayed.

7.7.0.7 Select “New” in the “New/Used” column

7.7.0.8 Enter the reason for the change

7.7.0.9 Press Enter and wait for the “Data updated” notice appears.

7.7.0.10 Press Exit to go to the Blade Maintenance screen.

7.7.0.11 Go to 7.8.

7.7.1 Used Blade

7.7.1.0 Go to the Blade Maintenance screen.

7.7.1.1 Go to the Blade Replacement screen.

7.7.1.2 Press the Used Blade List button.

7.7.1.3 Highlight the ID of the blade you are using.

7.7.1.4 Press Enter.

7.7.1.5 Confirm that the Used Blade Data Load screen shows the correct blade.

7.7.1.6 Press Enter.

7.7.1.7 Go to the Blade Replacement screen.

7.7.1.8 Check the data displayed.
7.7.1.9 Make sure that “Used” is displayed in the “New/Used” column.

7.7.1.10 Wait for the “Data updated” notice to appear.

7.7.1.11 Press Exit to go to the Blade Maintenance screen.

7.8 Perform Hairline Alignment:

7.8.0 Go to the Blade Maintenance screen

7.8.0.1 Set a dummy workpiece (preferably patterned) on the chuck.

7.8.0.2 Press the Hairline Alignment button.

7.8.0.3 Verify the displayed data

7.8.0.4 Adjust lighting and focus as needed.

7.8.0.5 Execute theta alignment on landmarks if possible.

7.8.0.6 Press Enter.

7.8.0.7 Press Start/Stop.

7.8.0.8 After the cut is made, use the arrow keys to align the hairline with the cut line.

7.8.0.9 Press Enter.

7.8.0.10 Exit out to the Main Menu.

7.8.0.11 Remove the workpiece from the chuck.

7.9 Perform a Non-Contact Setup:

7.9.0 Perform a setup to detect and set the Z-axis position relative to the chuck table.

7.9.1 Confirm the RPM and Blade O. D. information on the NCS table is correct.

7.9.2 If the blade outside diameter is incorrect, go to the Data Setting section.

7.9.3 If the RPM setting is incorrect, contact the vendor.

7.10 Perform a Sensor Calibration Setup:
7.10.0 Go to the Sensor Calibration screen:
7.10.1 Confirm the Blade O. D. information on the SCS table is correct.
   7.10.1.0 If the blade outside diameter is incorrect, go to the Data Setting section.
7.10.2 Confirm the chuck table information or the RPM is correct.
   7.10.2.0 If errors exist, contact tech support.

7.11 Commence SCS:
7.11.0 Press Start.
7.11.1 When ‘Setup Completed’ appears, press Exit.

8.0 Flange Removal Procedure
8.1 Call up the Blade Replacement screen.
8.2 Make sure the spindle is stopped and locked.
8.3 Press the Disco icon to lock the touch screen.
8.4 Open the splash cover
8.5 Per the instructions in 7.4.1 remove the flange B lock nut, flange B, and the blade.
8.6 Insert the torque driver bit into the center of the lock bolt.
8.7 Rotate CCW to remove the lock bolt and washer.
8.8 Screw the removing jig into flange A until the jig reaches the head of the spindle.
8.9 After contact gently give another turn of the jig to pull the flange A off of the spindle.

8.10 Inspect the spindle front cap and clean as needed.

8.11 Refer to Section 10.0 for mounting a flange or a hub.

9.0 Hub Mount Removal Procedure

9.1 Call up the Blade Replacement screen.

9.2 Make sure the spindle is stopped and locked.

9.3 Press the Disco icon to lock the touch screen.

9.4 Open the splash cover.

9.5 Remove the hub lock nut and blade.

9.6 Insert the torque driver bit into the center of the lock bolt.

9.7 Rotate CCW to remove the lock bolt.

9.8 Insert the pin of removing jig A into the hub.
9.9  Screw the removing jig A into the hub a little more than twice.
9.10 While holding jig A so it does not turn, screw jig B into the tap hole at the tail of jig A.

9.11 Still holding jig A securely, turn jig B CW until the hub mount comes off of the spindle.

9.12 Inspect the spindle front cap and clean as needed.
9.13 Refer to Section 10.0 for mounting a flange or a hub.

10.0  Flange or Hub Mount Mounting Procedure
10.1  Make the spindle ready for flange or hub mounting by removing the flange (Section 8.0) or hub mount (Section 9.0).
10.2  Mount the new flange or hub mount onto the spindle.
   10.2.0  Use the flange A for nonhubbed blades.
   10.2.1  Use the hub mount for hubbed blades.
10.3  Install the lock bolt into the spindle.
10.3.0 For the flange A, you must include the steel washer.

10.3.1 For a hub mount, do not use the steel washer.

10.4 Use the torque driver to tighten the lock bolt to the proper torque setting.

10.5 Close the splash cover.

10.6 Release the touch screen.

10.7 Initialize the system.

10.8 Turn on the spindle.

10.8.0 Maximum speed for 2” blade is 40,000 min⁻¹.

10.9 Turn off the spindle.

10.10 Call up the Blade Replacement screen.

10.11 Lock out the touch screen.

10.12 Open the splash cover.

10.13 Retorque the lock bolt.

10.14 Release the touch screen.

10.15 Perform a conditioning operation per the manual.

10.16 Install the blade.

10.16.0 Refer to 7.0 (Blade Replacement).

10.17 Close the splash cover.

10.18 Initialize the system.
11.0 Parts drawings

11.0 Hubbed blade parts:

![Hubbed Blade Parts Diagram]

11.1 Flanged blade parts:

![Flanged Blade Parts Diagram]