

Dicing Saw

Standard Operating Procedure

Faculty Supervisor: Prof. Robert White, Mechanical Engineering (x72210)

Safety Office: Peter Nowak x73246 (Just dial this directly on any campus phone.)
(617)627-3246 (From off-campus or from a cell phone)

Tufts Emergency Medical Services are at x66911.

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Warnings:

The cutting blade is fragile. Do not touch it, or allow it to touch the chuck during operation.

The Standby button should be pushed if there's any problem during operation. This will stop the spindle and bring the blade back to home position.

Surface of substrate will get dirty. It can be protected by spinning on and hardbaking a standard DQN photoresist prior to dicing. This protective coating can then be stripped off the chips in acetone and isopropanol after dicing.

Stage 1: Mount your substrate on dicing film:

1.0 Material Requirements

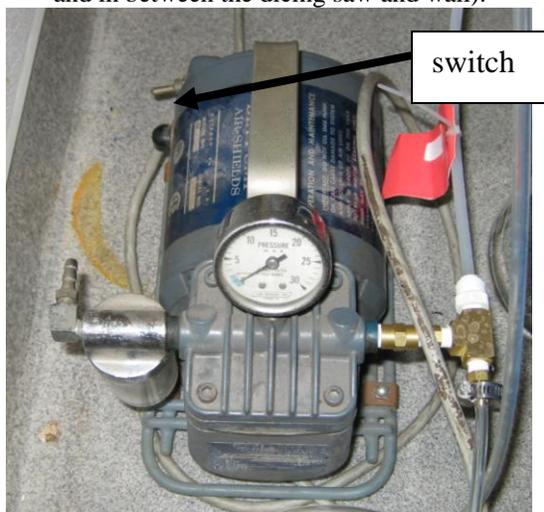
1.1 Equipment: Substrate, Wafer tweezers

1.2 Personal Protective Equipment: Nitrile gloves, Safety glasses

2.0 Procedure:

Turn on the tool:

1. Turn on the Mounting Station using the switch on the back of the tool.
2. Wait for the surface to heat up to 65deg.C. The light on the front right of the tool will turn off when it has reached this operating temperature.
3. Turn on the high pressure air (located on the wall next to the dicing saw) and vacuum pump. Make sure the valve is open for the air pressure valve next to the dicing saw as well (located to the right of the dicing saw and in between the dicing saw and wall).



Mounting a Substrate:

1. Place a mounting bracket on the mounting station using the alignment pegs for guidance.
2. Mount the wafer substrate on the green center of the tool, with the polished side facing down.
3. Turn the vacuum on with the switch on the front of the wafer mounter, and verify that the substrate is held in place. If the vacuum is low, check that the stopper and tubes seal well into th flaske top.
4. Pull the blue tape toward the user and attach it to the nearest edge of the tool without letting the tape touch the substrate.
5. Use the roller to press the tape to the wafer. Start at the nearest edge to the user, and minimize trapped air bubbles. Small rolling motions may be useful to decrease the amount of bubbles rather than one large pass with the roller.
6. Lower the frame.
7. Use a razor blade to cut the tape around the frame, and remove the excess tape.
8. Raise frame.
9. Turn off the vacuum and press the Air Release button to separate the mounted substrate from the mounting station. If the air release button does not release the wafer/tape/mounting bracket structure, use the regulator on the back right of the tool to adjust the air pressure.
10. Lift the frame out with the mounted substrate attached. NOTE: Wafer frame will be warm.

Turn off the tool:

1. Turn off the Mounting Station using the switch at the back of the tool.
2. Turn off the vacuum and air pressure value on the wall (unless the Dicing Saw will be used shortly afterwards, in which case see Dicing Saw SOP).
3. Close the valve that leads from the air compressor to the wafer mounting tool.(The valve is next to the wall and to the right of the tool)
4. Allow the tool to cool.
5. Wipe off the tool surface with Isopropanol.

Stage 2: Dice your substrate

1.0 Material Requirements

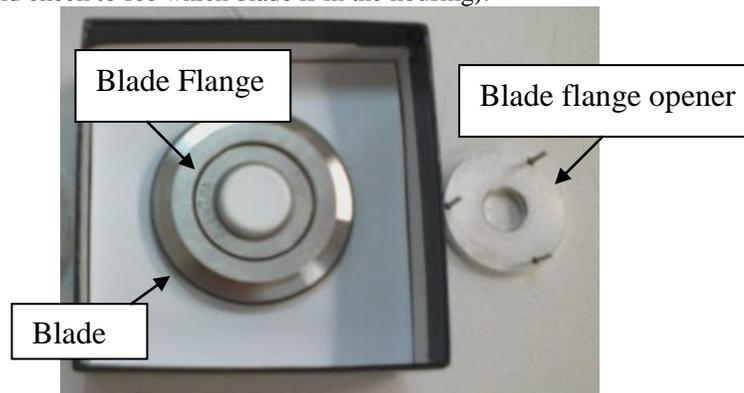
- 1.1 Equipment: Mounted substrate (See Mounting Station SOP), Wafer tweezers
- 1.2 Personal Protective Equipment: Nitrile gloves, Safety glasses

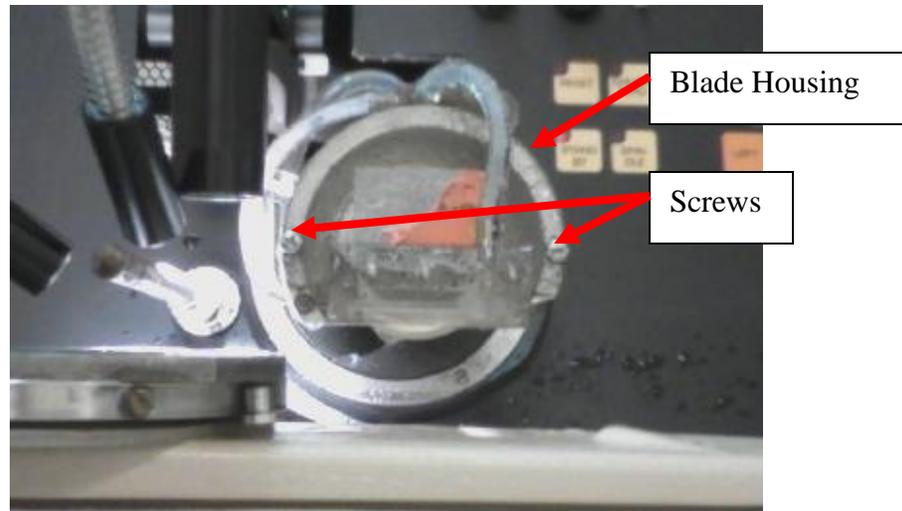
2.0 Procedure:

Changing the blade:

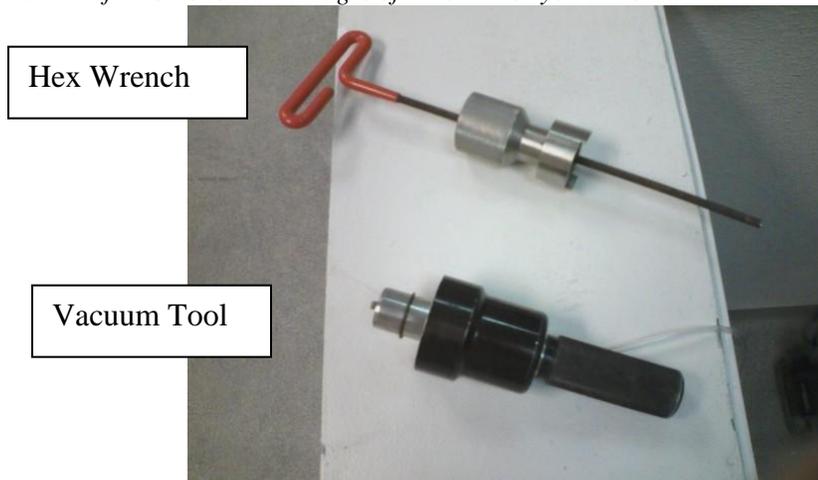
Currently (as of the date of the SOP), we have a silicon blade and a glass blade. Prior to June 2011, the silicon blade was a single piece. As of June 2011, both the silicon blade and glass blade now look very similar – they are both Thermocarbon blades with a blade flange (see image below).

1. Check to see which blade is installed in the blade housing area (remove cover over housing and remove screws on housing and check to see which blade is in the housing).





2. If necessary, remove the previous blade flange by using the long hexagonal wrench attached to the removal chuck (see picture) to loosen the nut, then remove the nut and pull out the blade flange. The vacuum tool may be used to take the blade flange out. The switch for the vacuum is under the machine on the left hand side. *Be careful not to touch the edges of the blade or you will break it!!*



3. Insert the new blade flange into the housing (*make sure not to hit the edges of the blade on the housing as this will probably break the blade*).
4. If the blade breaks or needs a new blade due to degradation, take another blade and use the three prong flange opener piece and push on the center of the flange to open it up. Throw away the old blade, and put a new blade in its place. Carefully squeeze the flange back together and *make sure it is fully closed (check all around the edge for gaps)*. Push the flange together hard – make sure it is closed all the way!!
5. Insert the desired blade flange into the tool with the writing facing out.
6. Replace housing components.

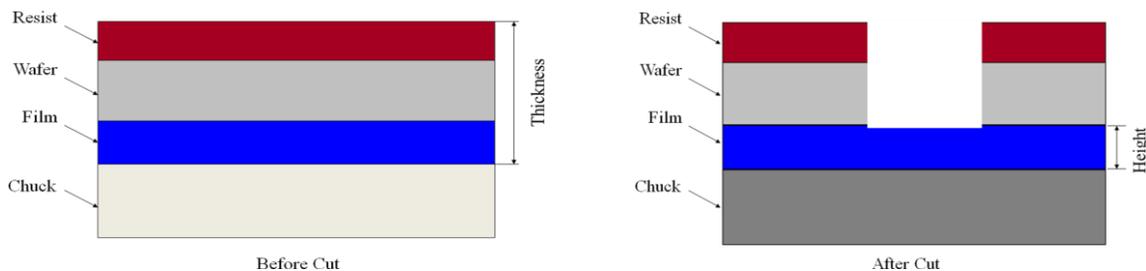
Turn on the tool:

1. Turn on the facilities that support the equipment. These include the high pressure air, vacuum pump and cold water.
2. Turn on the dicing saw by pressing the red power button.
3. Press Reset to bring the blade back to home position before proceeding.

Program the dicing saw:

1. Press the Prog button to put the dicing saw in program mode.

2. Press the toggle button to select units as Eng or Met. The English unit is thousandths of an inch (mils), and the Metric unit is millimeters. The selected unit will have a red light illuminated next to it.
3. Press the toggle button to select SCR or DICE mode. Use the DICE option to cut a substrate. The selected unit will have a red light illuminated next to it.
4. Press the Mode button on the left of the instrument panel to select single or multiple pass cuts. (A single pass cut will cut the entire depth of the cut at once. A multiple pass cut will perform the cut in depth increments that will be specified later.) Enter "10" for single pass, or "60" for multiple pass cuts. Press Enter to complete this programming step. *Note: Always program "60", or for multiple pass cuts. This will help prevent substrate breakage or saw damage.
5. Press the 1st Index button to enter the distance between subsequent cuts. These will be cuts parallel to the blade in home position. In automatic cut mode (specified later) the cuts will start near the user and move away. Press Enter to complete this programming step.
6. Press the 2nd Index button to enter the distance between cuts that are made after the substrate is rotated by a user-programmed angle. This angle will be programmed in a later step. Press Enter to complete this programming step.
7. Press the Thickness button to enter the total thickness of the wafer, film, photoresist and an extra safety distance of approximately 50 microns. For example, the blue mounting film is approximately 100 microns thick, so the proper thickness setting for a 500 micron thick wafer would be 650 microns, or 0.650mm. **See illustration below for clarification on this important setting.** After the thickness value is entered, press Enter to complete this programming step.
8. Press the Height button to enter the height that the blade will be above the chuck after the cut is complete. Height should always be greater than 50 microns, or 0.050mm. It is crucial that the blade does not touch the chuck, so take care to enter this value properly. **See illustration below for clarification on this important setting.** After the height value is entered, press Enter to complete this programming step.



9. Press the Angle button to program the angle between the 1st and 2nd Indices. Enter the desired value, and press Enter to complete this programming step.
10. Press the Diameter button to enter the diameter of the substrate. Enter the correct value, and press Enter to complete this programming step.
11. Press the Cut Count button and set to "0" by pressing enter. Press the Stop Count button if you want the tool to automatically make a designated number of cuts, offset by the Index numbers. Enter the desired value, and press Enter to complete this programming step.
12. Press the Speed button to enter the rate of blade speed along the x-axis. This speed will be entered in mm/sec if the tool is in metric mode, and in/sec if the tool is in inches mode. A reasonable speed may be in the range of 200 mil/sec or 5mm/sec for a 500micron thick Si wafer. Enter the desired speed and press Enter to complete this programming step. Slower speeds should be used for glass.
13. Press the "0" on the number keypad to program the depth of each individual cut for a multiple pass cut. This corresponds to the "60" Mode setting that was selected in step 4. Enter the desired depth (0.15mm (150 μ m) is recommended) and then press Enter to complete this programming step. The tool has certain preset values for this setting, and it will default to the value that is nearest the number you enter.
14. Press the Prog button again to leave the programming mode of the tool.
15. Press the Read button to review the program entered above. Press each button to see the programmed value. Always perform this step before running the machine. Make sure that the thickness is above the substrate and the height is sufficient to prevent the blade from touching the chuck. Press the Read button again to leave the read mode.

Zero the tool:

1. Place the thick calibration wafer on the chuck.
2. Press the Chuck Lock button to apply vacuum to the chuck. Touch the wafer and check the gauge on the right of the tool to verify that there is vacuum.
3. Press the Spindle button to start the spindle spinning. The light on the button will flash until the spindle reaches its operating speed, which is approximately 30k RPM.
4. Press the Chuck Zero button to bring the spindle over, where it will touch down on the wafer and return to home position. The light will stay lit to indicate that the tool has been calibrated.
5. Press the Unlock Chuck button to remove the calibration wafer.

Perform cutting operation:

1. Load the mounted substrate onto the chuck. Use the alignment pins to seat the substrate properly.
2. Press the Chuck Lock button to apply vacuum to the substrate. Check the substrate and the vacuum gauge to ensure vacuum has been applied.
3. Turn on the TV and light on the top right of the tool to visualize the substrate and align the blade to features. If the spacer is used with the Si blade or the glass blade is used (NO SPACER!), the camera should be in close alignment with the blade upon setup (as long as this was the case with the previous user). You may have to adjust your lights for each cut (in manual mode) as the spindle may move the lights as it adjusts.
4. Press the Align or Index button, depending on the mode of movement desired. Selecting Align will allow the user to move the spindle around manually, but very slowly. Selecting Index will allow the user to move the spindle by the programmed Index values. (The spindle will move by the 1st Index value if the substrate has not yet been rotated, and by the 2nd Index value if it has. The user may choose to go back into the program mode by pressing the Prog button in order to change the 1st or 2nd Index value to facilitate the desired movement. If so, remember to press the Prog button again to leave programming mode, and go back and change the Index values after the chuck is aligned.)
5. The chuck itself can also be rotated using the CW (clockwise) or CCW (counterclockwise) buttons. The chuck will rotate by the programmed angle value. This will cause the tool to use 2nd Index values, and the display will read "Pass 2" to reflect this.
6. Once the chuck is in place, turn the water on for the chuck by flipping a switch underneath the tool on the left side. **Note: The flask in line with the vacuum pump traps water that would otherwise go into the vacuum line and damage the pump. Keep an eye on the flask, and if it is getting full shut down the vacuum (not while you are cutting!!!) and empty the water down the floor drain..*
7. Select the Single Cut button to make one complete cut (including all multiple passes) or Auto Cut to continue cutting until the Stop Cut count has been reached.
**Note: Auto Cut mode will move back by one Index value before it begins its first cut.*

Shut Down the Tool:

1. Select align mode and manually move the chuck all the way to the left.
2. Press the Chuck Unlock button to release the substrate vacuum. NOTE: This will not work if not in align mode.
3. Press the standby button
4. Turn off the tool and facilities.
5. Dry the tool thoroughly. Take care to not touch the blade.
6. Leave a couple of towels on the chuck under the water rail.