University of Minnesota Nano Fabrication Center
Standard Operating Procedure

Equipment Name: Karl Suss Wafer Bonder
Badger Name: sb6 **Revision Number:** 3
Model: **Revisionist**: Tony Whipple
Location: Bay 1 **Date:** 19 March 2020

1 Description

The SB6 bonder is capable of silicon fusion, anodic, and eutectic bonding. The system can handle 2-3 four inch wafers with minor z axis adjustment. There are two separate heads; one for anodic bonding, and another for fusion bonding. The anodic head is mostly setup for the machine. If a different head is needed, **arrangements need to be made 2 weeks in advance** of system use through MNC Staff.

2 Safety

a **Keep hands away from door.** Verify door is open when loading or removing the fixture.
b Be aware that the fixture and wafer may be hot when unloaded in some programs.

3 Restrictions/Requirements

a Must be a qualified user on sb6. b Wafers must be whole 4" wafers! c No more than 2 wafers at one time for typical operations. 3 wafers can be bonded with some modifications to the software. This has to be approved by staff. Check the current allowed wafer stack thickness sign on the front of the system for current settings. If a different thickness is needed write a comment in Badger requesting the needed change 48 hours in advance.

d **Handle the wafer fixture with care!**
e Fill out the log book with each use.
f Enable the system with Badger for each use.

4 Required Facilities

a Compressed air
b Nitrogen gas c
Electrical Power
d Exhaust

5 Definitions

a Fusion head: The head used in fusion and eutectic bonding. It has a membrane that comes down and applies up to 3 bar of pressure.

b Anodic head: The head used in anodic bonding. It has 2 sets of electrodes that can go up to 2000 volts.
c Fixture: What the wafers are held on. d Slide: The movable arm that holds the fixture.
e Chuck: What the wafers are loaded on to when the fixture pushed into the bonder. It can be heated to 500 degrees Celsius.

6 Setup

a Fill out log sheet after enabling the system. b Load wafers onto the fixture. Wafers can be loaded onto the fixture by two methods. i Method 1: The MA6/BA6 has a bond align feature that can align 2 silicon wafers together, 2 glass wafers together, or silicon and a glass wafer. The bond aligner will automatically place the spacers between the substrates and clamps the wafers together when they are aligned. Refer to the MA6/BA6 Wafer to Wafer Alignment SOP for instructions. Contact the MA/BA6 trainer to learn how to do this.

ii Method 2: The second method is to align the two wafers by hand. To load by hand, place the first wafer on the fixture with the flat of the wafer towards the notch. The side to be bonded should be facing up. Push the spacers onto the wafer. Place the second wafer unto the fixture on top of the first. The side to be bonded should be facing down. Align by the two wafers by sight. The wafer flat should be pointed towards the notch. Push clamps onto top wafers to hold the wafers in place. For anodic bonding, repeat the same procedure but the glass wafers needs to be on top of the silicon. Stereo microscope can help with the this type of aligning.

Bonder Fixture

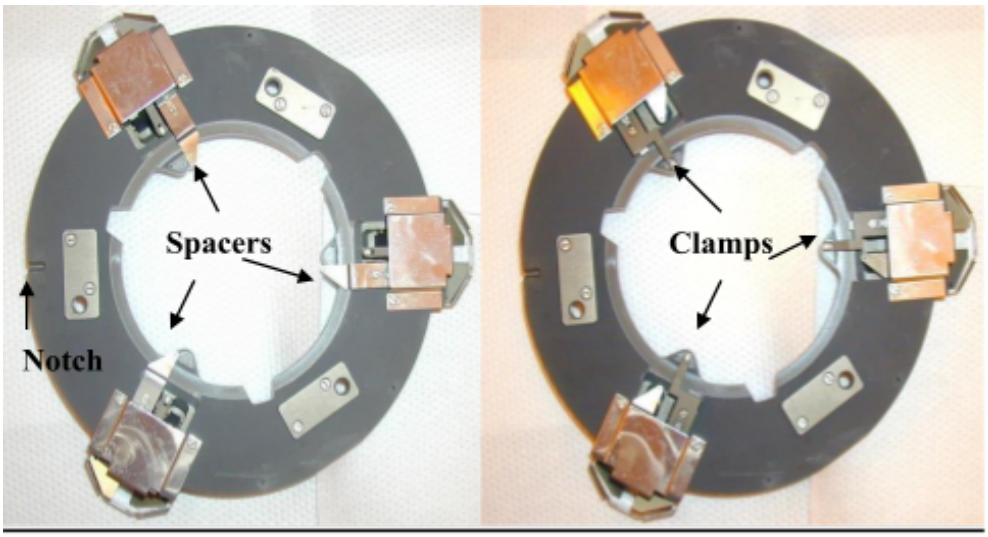


Fig 1. Clamp, Spacer and Notch location.

Loaded Fixture: Side View

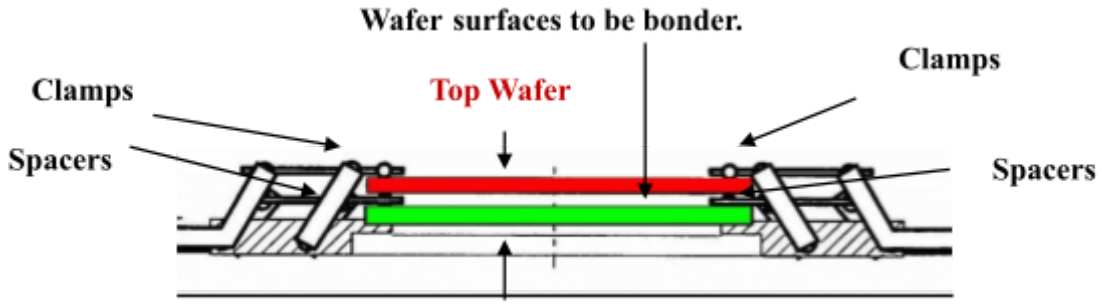


Fig 2. Side view of fixture.

iii Carefully place fixture onto mechanical slide. The notch on the fixture should point towards the machine.

7 Operating Instructions

a Click on the login. Enter the following:

User ID: **mtl**

Password **1234**

Press enter to log into the software.

b Click on the **Control Center** icon. A window will pop up with the question. **Do you have the fixture in the chamber? YES/NO** The fixture should be out so click on **NO**. If the fixture is not out, contact staff as this is not normal.

c The control center is where the programs are downloaded to the system and the load and unload sequence is done. Click on **Download Recipe**. A window will open up. Click on the desired recipe, then, click **Open**. The recipe will download to the program. The Current Recipe box should now indicate what recipe was last selected.

d Click on **Load** in the Load Sequence Box in the Control Center. The door will open and the Action Box will read: **Move slide inside.** Move the slide all the way into the system until a click is heard.

e Click on **Move** to load the fixture to the chuck. The Action box will read: **Moving to load position**: Please wait! Then, **Fixture overtaken: Move slide outside!**

f Move the slide out of the machine all the way to the end of the guide rail until a click is heard.

g The Action Box will indicate that the machine is ready to continue. Click on **FINISH** in the Load Sequence Box. The Action Box will now indicate that the machine is ready for the unload procedure. The system is now ready to start the recipe.

h Click on **Start** in the Control Center window. The Action box will indicate that the machine is running a recipe.

i To view the status of the bond, click on the **STATUS** icon on the main menu. To see specifics, click on the show graph button. A box will come up were parameters to be graphed can be selected. The top section of the graph has tabs the will allow observation of all or individual parameters. When the recipe is completed, an Unload Sequence box will be displayed.

j Click on the **Unload** button in the Control Center window. The action box will read: **Prepare for unload: Please wait!** Then **Move slide inside.** Move the slide all the way into the machine until a click is heard.

k Click on **Move**. The action box will read: **Moving to home position: Please wait!** Then **Fixture overtaken: Move slide outside.**

l Move the slide all the way out of the machine until a click is heard. Click on **Finish**. The action box will read: **Concluding unload! Plead wait!** Then **Machine ready.**

m If temperature was used in the recipe, wait until the wafers are cooled before unloading. Leave the fixture on the slide. Click on **logout**.

n Complete the log book and bar code out or card out of the system.

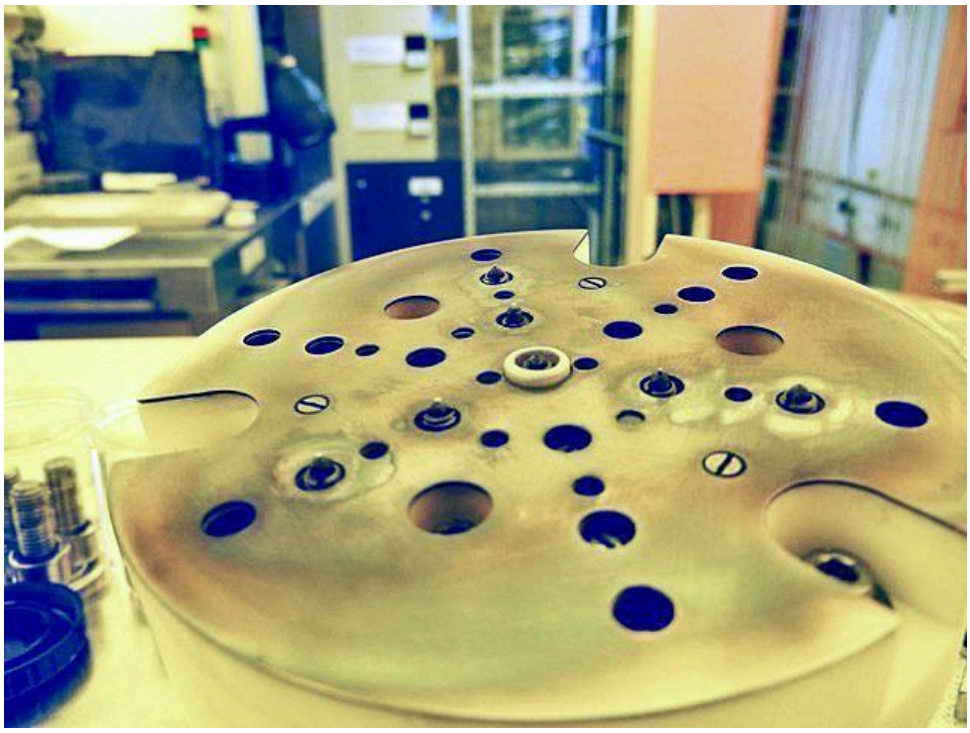
8 **Problems/Troubleshooting** a Aborting A Run i To abort a run, press the **Abort button** in the Control Center window. A question will pop up: **Do you really want to abort a running process? OK**

CANCEL

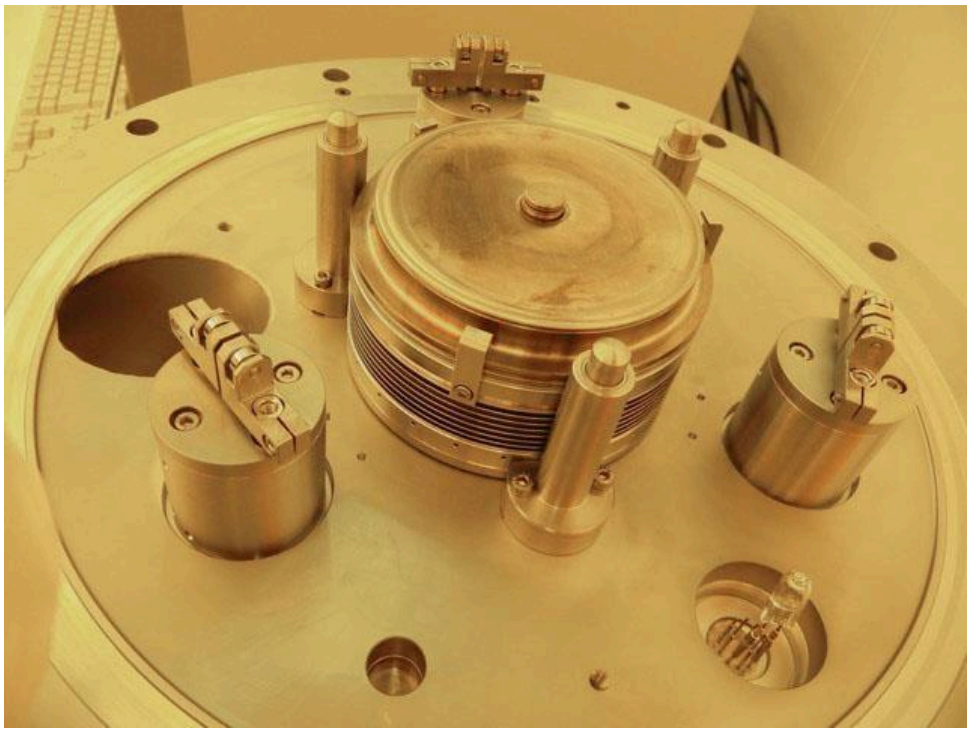
ii To cancel the abort (i.e. continue with the run) click on **CANCEL**. The run will continue as normal.

iii To abort the run Click on **OK**. The run will abort and go into unload mode. Continue with the unload procedure (see Section 7 j-m).

b Bonding heads image being installed, in this view they are upside down.



Anodic bonding head.



Fusion bonding head.