Karl Suss SB6 Bonder Operation
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The technical content of this document is the responsibility of UCLA CNSI Integrated Systems Nanofabrication Cleanroom Los Angeles, CA
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1.0 Purpose
This specification defines the proper operation of the Karl Suss SB6 Bonder.

1.1 The Karl Suss SB6 Bonder is configured as a universal bonding tool.

1.2 It is capable of anodic bonding of silicon to glass, thermocompressive (adhesive) bonding and pre-bonding for subsequent direct or fusion bonding (silicon to silicon, silicon to oxide or oxide to oxide).

2.0 Scope
Instructions are for the ISNC Cleanroom.

3.0 Applicable Documents
3.1 ISNC User Guide
3.2 System Component Operation Manuals
3.3 Material and Specification Data Sheets (MSDS)

4.0 Terms/Definitions
4.1 none.

5.0 Responsibility and Authority
5.1 Responsibility
All persons involved with the Karl Suss SB6 Bonder operation and maintenance at ISNC (typically engineers, students and other users) are responsible for reading and understanding the guidelines stated within this specification.

The designated engineer is responsible for enforcing the guidelines stated within the specification.

5.2 Authority
The UCLA EH&S Department, ISNC Engineering and ISNC Management verify that the procedures and guidelines contained within this specification are appropriate and effective for safely using the Karl Suss SB6 Bonder.
6.0 **Tools, Equipment and Materials**

6.1 Bonding Chucks

6.2 Cleanroom wipers

6.3 Isopropyl Alcohol

7.0 **Special Safety Precautions**

7.1 Principles contained within the ISNC User Guide are to be followed at all times when operating this tool. Do not over-ride or bypass any safety interlocks at any time.

7.2 Only persons who are certified or are in supervised training (using this specification) may operate the Karl Suss SB6 Bonder.

7.3 Personal Protective Equipment or PPE must be worn when pouring chemicals. PPE includes safety glasses, face shield, chemical resistant apron and chemical resistant gloves. Refer to ISNC User Guide.

7.4 Open containers must not be left unattended. Open containers are not allowed outside the confines of an exhausted hood.

7.5 Always take proper care and time when working with hazardous materials. Always handle hazardous materials carefully and safely.

7.6 Chemicals must be used only as directed in process specifications and handled by only trained personnel.

7.7 To maintain vacuum integrity, it is necessary to use cleanroom wipers and isopropyl alcohol to clean work surfaces. Isopropyl alcohol is flammable. Keep away from sparks, flames or high heat source. Use only in well ventilated area.
8.0 Tool Operation

8.1 General Guidelines

8.1.1 It is necessary to maintain a low background pressure for proper operation of this equipment. To avoid contamination, these practices must be followed:

- Never touch any part(s) inside the chamber or part(s) going into the chamber with ungloved hands or contaminated gloves.
- Handle wafer and wafer piece carrier with appropriate vacuum tools or gloved hands.
- Using cleanroom wipers and alcohol, be sure to clean all areas that will come in contact with vacuum chamber parts. This includes the areas surrounding the tool like table tops, as well as parts of the tool itself.
- The vacuum chamber should not be subjected to excessive atmospheric exposure. Pre-bonding preparation should be done in an efficient and timely manner to avoid long exposure times.
- Be sure to wear cleanroom mask when the chamber is open.
- Load only clean substrates into the tool.
- Load only clean bonding chucks into the vacuum chamber.

8.1.2 For emergency shut-off, press the red Emergency owner Off (EPO) button located on the right side of the front panel of the tool.

8.2 Startup Checklist

8.2.1 Check logbook for previous entry.

- If there were no tool issues or tool issues have been addressed by ISNC Lab Staff, Continue.
- If tool issues have not been addressed, notify ISNC Lab Staff.

8.2.2 If there are any audio alarms, notify ISNC Lab Staff.
8.2.3 Verify Main Power is on.

- The large red Main Power switch is located on the center of the front panel. When the green light above the switch is illuminated, the Main Power is on.
- If the Main Power is not on, turn the red switch clockwise.

8.2.4 Verify System Power is on.

- The System Power switch is located to the left of the Main Power switch.
- If the System Power is not on, press the green button.

8.2.5 Verify computer power is on.

- Open the panel door located on the left frontside of the system.
- Press the grey button to turn on the computer.
- The Windows NT screen will appear.
- Press Ctrl-Alt-Del. When the login screen appears, enter OK.

8.2.6 Log in
• The Windows NT screen will appear.
• Press Cntrl-Alt-Del. When the login screen appears, enter OK.
• At this time, there is no password for the tool. Leave password field blank and press Enter.
• A second login screen will appear. Enter User Name and Password.
• Wait for the system software to load.
• The system is ready for use when SB6 Tool Bar appears.

8.3 Load Recipe

8.3.1 General

• At this time, there are recipe for anodic bonding, thermo-compressive bonding and pre-bonding.
• If a recipe with different process parameters is needed, see ISNC Staff.

8.3.2 From Main Toolbar, click Recipe button.

8.3.3 Recipe directory appears. Select appropriate recipe.

8.3.4 Click Edit to review recipe steps.

8.3.5 Click recipe to exit Edit mode.

8.3.6 Close the recipe window. Click Control Center on the Main Menu Toolbar.

8.3.7 A pop-up window will appear and ask Do you have a fixture in the chamber?

8.3.8 Verify that the bonding fixture is on the bonder slide, outside the tool then select No.

8.3.9 Click Download Recipe and select desired recipe.

8.3.10 For anodic bonding, use the positive polarity recipe if silicon will be the top piece.

8.4 Load Bond Fixture
8.4.1 General

- At this time, the wafer bonding fixture is used for both pieces and whole wafers.
- Loading pieces and whole wafers is done manually.

8.4.2 Pull the clamps and the lags on the bonding fixture to the outside position.

8.4.3 For whole wafer loading, be sure that sample(s) are cleaned just prior to the loading.

8.4.4 Place one of the wafers to be bonded on the bonding fixture.

8.4.5 Push the three metal flags to the inner position contacting the wafer.

8.4.6 Place the second wafer on top of the flags and align the flat with the bottom wafer flat.

8.4.7 Push the clamps to the inner position over the two wafers.

8.4.8 For piece loading, be sure that sample(s) are cleaned just prior to loading.

8.4.9 Place the larger, if pieces are different sizes, in the center of the bonding fixture.

8.4.10 Place the second piece on top of the bottom piece. At this time, there is no chuck for pieces. Therefore, the flags and clamps are not used to separate and hold the pieces.

8.4.11 Push the flags and the clamps to the inner positions.

8.5 Load Chamber
8.5.1 Place the bonding fixture on the bonder slide with the notch facing toward the chamber door. The two pins on the slide will fit into the two holes on the bonding chuck.

8.5.2 Click Load on the control center menu.

8.5.3 Follow the on-screen prompts and move the slide and fixture into the chamber. Click the move button and after the bonding fixture is loaded, pull the slide out from the chamber.

8.5.4 After the slide is completely removed from the chamber, click the finish button.

8.6 Run Recipe

8.6.1 After the chamber is sealed, the recipe can be started. Click the Start Recipe button.

8.6.2 Use the Status window to monitor the progress of the recipe.

8.7 Unload Bond Fixture

8.7.1 After the recipe has finished, click the unload button to remove the bonding fixture. The fixture cannot be unloaded until the chamber reaches atmospheric pressure. In addition, if heat was used, do not unload until the temperature is about 100°C.

8.7.2 When the chamber door opens, move the slide into the chamber and click move on the control menu.

8.7.3 Wait for the on-screen prompts and then remove the slide and the bonding fixture from the chamber.

8.7.4 After the slide is completely removed from the chamber, click the finish button.

8.7.5 Remove the bonded samples from the bonding fixture and place the bonding fixture back on the bonder slide.

8.7.6 If more samples will be bonded using the same recipe, continue to Section 8.3 Load Bond Fixture.

8.7.7 If more samples will be bonded using a different recipe, continue to Section 8.2 Load Recipe.

8.8 Shutdown
8.8.1 Select Shutdown from the Start Menu on the computer. Be sure that the tool begins the Shutdown routine. User may need to reselect Shutdown if computer did not respond to first request.

8.8.2 After the computer has shutdown, turn off the power to the tool by pushing the red button next to the light green button.

8.8.3 Turn the large red and yellow power switch counter-clockwise to the Off position.

8.8.4 Notify ISNC Lab Staff immediately if there are any problems or issues.

8.8.5 Be sure to record any problem or issue in the logbook.

8.8.6 Fill out the logbook completely.

8.8.7 Clean work area.

8.9 Time Out

8.9.1 From previous step to bonder: NO Time Out.

8.9.2 From bonder to the next operation: NO Time Out.
9.0 Tool Maintenance

IMPORTANT: Only ISNC Lab Staff are permitted to perform the tasks documented in Section 9.0.

Warning: Used wipers must be disposed in special designated red solvent waste cans.

Note: Always use chemical resistant gloves when performing acetone and isopropyl alcohol (IPA) cleans.

Note: Acetone and Isopropyl Alcohol (IPA) can be found in dispense bottles in photo area solvent cabinet.

9.1 General Weekly Clean (To be performed by Staff Only)
   9.1.1 With IPA and wiper, clean all flat surfaces.

9.2 System Alarms (To be performed by Staff Only)
   9.2.1 Check for any audio alarms.

9.3 Equipment Malfunction and Recovery Procedure
   Note: The following procedure is required each time the system is serviced by lab personnel and/or field service engineer prior to release of the tool to users.
       9.3.1 Contact ISNC Staff for Up Checklist.
10.0 Verification

10.1 Method

Periodic functionality tests are performed on the tool by ISNC Lab Staff.

10.2 Acceptability

Equipment is acceptable for use if it passes all functionality tests. If a functionality test is out of control, the user measuring the test and plotting the data is responsible for following the out-of-control guidelines.

11.0 Safety Audits

11.1 The ISNC is audited regularly for compliance to this specification. The EH&S Department performs audit on a regular basis, at least once a year.

12.0 Training

12.1 Karl Suss SB6 Wafer Bonder training requires 2 sessions.

12.2 During Initial Training session, ISNC Lab Staff or Super Users will review tool operation using this document. Typically, this training session is conducted with a group of users.

12.3 During the Qualification session, ISNC Lab Staff will observe the user run the tool. If the user operates the tool properly and according to this document, the user will be qualified the run the equipment unsupervised.
13.0 Appendix
  13.1 None.
14.0 Karl Suss SB6 Wafer Bonder - Mini Spec

Startup Checklist:

- Be sure to perform following system checks.
  - Check logbook for issues on previous run.
  - If needed, power up SB6. Turn on Main Power, System Power and Computer. Logon to Computer using User Name and Password.

Operation & Verification:

1. Load Recipe.
   - For anodic bonding, if silicon is on top, use positive polarity recipe.

2. Load Bond Fixtures – Whole Wafer
   - Pull bonding fixture clamps and lags to the outside position.
   - Place wafer on bonding fixture.
   - Push three metal flags to the inner position contacting the wafer.
   - Place the 2nd wafer on top of the flags. Align the wafer flats.
   - Push clamps to the inner position over the two wafers.

3. Load Bond Fixture – Pieces
   - Place larger piece in center of bonding fixture. Place the 2\textsuperscript{nd} piece.
   - Push the flags and clamps to the inner positions.

4. Load Chamber. Place the bonding fixture on the bonder slide with the notch facing toward the chamber door. Click Load. Follow prompts.

5. Run Recipe. Click Start Recipe. Monitor run from Status screen.

6. Unload Bond Fixture
   - Click unload button. If heat used, wait until temperature is about 100°C.
   - Move slide into chamber. Click Move. Follow prompts.
   - When slide is completely removed from the chamber, click Finish.
   - Remove the bonded samples. Replace bonding fixture back on slide.

7. Shutdown
   - Shutdown Computer, System and then Main Power.
   - Notify ISNC Lab Staff immediately if there are any problems or issues.
   - Fill out the logbook completely. Record all problems or issues.
   - Clean work area.