

GENERAL PROCESS AND OPERATION SPECIFICATION

K&S 4523A Wire Bonder

I. SCOPE

- A. The K&S wire bonder uses either aluminum or gold wire to make a strong electrical connection between two points on a sample. In industry, a wire bonder makes electrical connections between the integrated circuit and its package.

II. SAFETY

- A. Always keep your hands out of the working area while the bonding head is in operation
- B. The workholder can get hot and has the potential to burn or melt objects touching it.

III. APPLICABLE DOCUMENTS, MATERIALS AND REQUIREMENTS

- A. For a table of initial POWER, TIME, and FORCE settings, refer to factory manual.
- B. AggieFab provides 1 mil and 3 mil aluminum wire as part of normal lab fees.
 - 1. Approved substrate materials are glass, Si, and PVDF (with no substrate heating)
- C. For more information about the detailed operation of this tool refer to the K&S Factory manual (Ask AggieFab staff for a copy)

IV. OPERATION

- A. Turn on the tool and prepare sample:
 - 1. Turn on the machine by flipping the red switch on the left side.
 - 2. Lower the workholder to its minimum height and set it off to the side.
 - i Avoid contacting the wedge when removing the workholder.
 - 3. Load sample
 - i The sample should sit flat and tight on the workholder. Bonds may fail if this is done incorrectly.
 - ii Don't use tape to mount samples.
- B. Rethread the wedge (If needed):
 - 1. Refer to "Appendix B".
- C. Set the stage height:
 - 1. Lower the workholder to its minimum height.
 - 2. Put the workholder underneath the wedge.
 - 3. If prompted to select 'Enable Password Mode,' select 'Yes.' If prompted to select Authorization, select 'Engineering' and enter the password 3519.
 - 4. Set the tool into automatic mode.
 - i Press the "MANUAL" button and the LED should turn off.
 - 5. Load program 1.
 - i Press "LOAD" and use the blue up and down buttons until it reads "Load Program 1" and press "ENTER".
 - ii Make sure the "Search" value is set to 1.44.
 - 6. Move the workholder so that the wedge is approximately above the lowest bond surface.
 - 7. Hold the left mouse button and look at the height of the wedge compared to the sample surface.

8. Press “Reset” (on the right)
9. Release the mouse button
10. Raise the workholder a small amount.
11. Continue adjusting the workholder height until the wedge is slightly above the lowest bond surface when the left mouse button is held.

D. Load bonding program:

1. Press “LOAD” and use the blue up and down buttons until the correct program is displayed, and press “ENTER.”
 - i Program 1 is a good starter recipe.

E. Make a bond:

1. Make sure the screen is showing the first page of bond 1 values.
2. Set the tool into manual mode.
 - i Press the “MANUAL” button and the LED should turn on.
 - ii Manual mode is suggested when performing final bonds.
3. Bond 1:
 - i While holding the mouse at the center position, move the workholder so that the wedge is above the desired bond area.
 - a Bonds are always done going towards the back of the tool. The tool will automatically move the sample based on the “Step” parameter if being used in automatic mode.
 - ii Press the black side button slowly.
 - a The wedge will slowly move down
 - b Make micro-adjustments to the bond location as needed by moving the mouse.
 - iii Eventually, the wedge will reach the bond surface. When it does, the machine will detect it and start bonding. Keep the black button and mouse still as the tool bonds.
 - a Be patient. It is important not to move the tool as it is bonding since it can ruin the bond or damage the tool.
 - iv When the bond finishes, press the black button all the way and release it.
4. Bond 2:
 - i Move the wedge above the desired bond area using either the mouse or by moving the workholder carefully.
 - ii Start pressing the black side button.
 - iii Make micro-adjustments as needed by moving the mouse.
 - iv Eventually, the wedge will reach the bond surface. When it does, the machine will detect it and start bonding. Keep the black button and mouse still as the tool bonds.
 - a Be patient. It is important not to move the tool as it is bonding since it can ruin the bond or damage the tool.
 - v When the bond finishes, press the black button all the way and release it.

F. Unload sample and turn off tool:

1. Lower the workholder and slowly move it out from under the wedge.
2. Unload sample.
3. Gently place the workholder back under the wedge.
4. Turn off the machine by flipping the red switch on the left.

V. SIGNATURES AND REVISION HISTORY

Approvals:

Technical Manager Signature: Sandra G Malhotra

Date: May 5th, 2022

Revision History:

Revision	Author	Date	Revision notes
Original Issue	Larry Rehn		
A	A. Shammai	18 June 2014	
B	Ethan Vargas	31 January 2020	
C	Mitchell Roselius	12 February 2020	
D	Elijah Colter	7 December 2021	Reflected procedures for new angled feed orientation upgrade, removed a few operation steps that were made to work around tool issues. The tool has been fixed and these are no longer necessary
E	Elijah Colter	5 May 2022	Re-wrote threading procedures and put them into Appendix B.

Appendix A – Bonding Parameters

3 mil Aluminum Wire Bonding Parameters:

Parameter	Meaning	Bond 1 Value	Bond 2 Value
Search*	Height the wedge moves to before bonding	1.44	1.44
Power	Ultrasonic bonding power.	6.03	5.09
Time	Bond time.	4.5	4.1
Force	How hard the wedge presses the wire against the bonding surface.	4.4	5.7
Step*	Distance the stage moves forward after first bond.	4.1	N/A
Kink*	Extra wire length added before going to the loop height.	0	N/A
Reverse*	Distance stage moves back after bond 2.	0	N/A
Yspeed*	Stage Speed.	1.1	N/A
Loop	Height the wedge rests at after bond 1.	4.3	N/A
Tail*	Length of wire left on sample after second bond.	N/A	1.8
Tear*	Force used to tear wire after second bond.	N/A	4.0

* Used for automatic mode

1 mil Aluminum Wire Bonding Parameters:

Parameter	Meaning	Bond 1 Value	Bond 2 Value
Search*	Height the wedge moves to before bonding	1.44	1.44
Power	Ultrasonic bonding power.	1.99	2.5
Time	Bond time.	4.0	5.0
Force	How hard the wedge presses the wire against the bonding surface.	2.0	2.0
Step*	Distance the stage moves forward after first bond.	4.1	N/A
Kink*	Extra wire length added before going to the loop height.	0	N/A
Reverse*	Distance stage moves back after bond 2.	0	N/A
Yspeed*	Stage Speed.	1.1	N/A
Loop	Height the wedge rests at after bond 1.	4.3	N/A
Tail*	Length of wire left on sample after second bond.	N/A	1.8
Tear*	Force used to tear wire after second bond.	N/A	4.0

*Used for automatic mode

Appendix B – Rethreading the Wedge

Note: Vertical feed threading is very similar except it doesn't go through the transducer and threads through the top of the wedge before threading through the tip.

1. Raise the “CLAMP” and “TOOL” lifter (left side)
2. Thread the wire through the 45° transducer hole.
3. Gently push on the back of the clamp solenoid to open it and thread the wire through clamp.
4. Thread the wire through the tip of the wedge. (Figure 1)
 - a. Make sure there is enough wire to work with (Figure 1, Step 1)
 - b. Using the tweezers, grab the wire close to its end. (Figure 1, Step 2)
 - i. Make sure the wire on the wedge side of the tweezers is straight and short.
 - c. Move the wire behind the wedge and thread it in. (Figure 1, Step 3)
 - i. If the wire kinks, it needs to be cut and straightened. Go back to step a.
 - ii. Keep in mind that the hole at the back of the wedge is at 45° and that using a different angle won't work.
 - iii. Figure 2 shows what a normal wedge looks like. The wedge on the tool may vary slightly than the figure.
 - d. A little bit of wire should be exiting the tip. (Figure 1, Step 4)
 - e. Pull the bent wire through and cut any access wire. (Figure 1, Step 5)
 - i. The tool will not feed correctly if the wire is twisted between the tip and the spool.
5. Lower the “CLAMP” and “TOOL” lifter (left side)

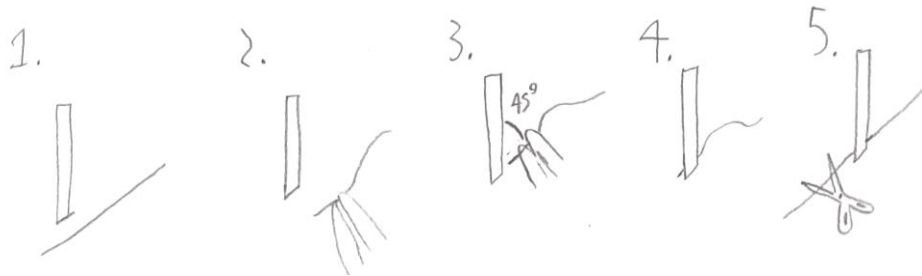


Figure 1: How to rethread the tip of the wedge

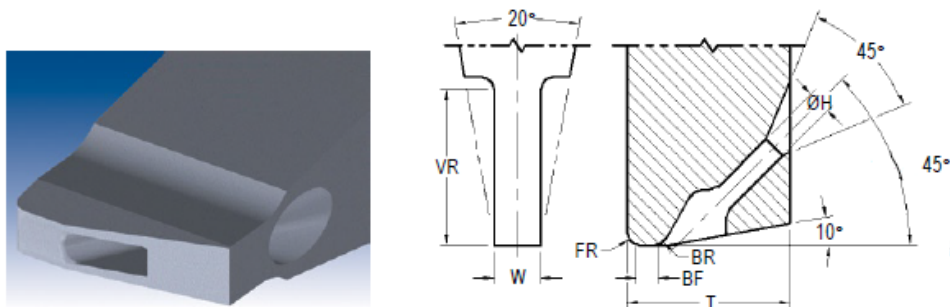


Figure 2: Wedge tip geometry