Wire Bonder HB10 / HB16

Operation Manual

Version V10.0
www.tpt.de

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2. Safety Instruction

CE marking

The Eurasian Conformity mark.

1. Read Instruction:
   All the safety and operation instructions should be read before the Bonder is operated.

2. Do not remove Safety Instructions from User Manual

   a. When carrying the Bonder around, do not subject the Bonder to heavy shock or vibration. Two people are needed for the Transportation.

3. The Bonder should be installed on a solid horizontal base

4. Power Sources: The Bonder can be operated only from the power source indicated on the marking label.
   The Bonder is equipped with a three-wire grounding plug.
   Do not defeat the safety purpose of the grounding plug.
   Make sure the grounding cable is connected.

5. Protection Circuitry: The Bonder is equipped with two power line fuses at the power connector and one fuse inside behind the power connector SI 5 A,

6. The Cover should only be opened after powering down the machine and removing the power cord from the wall outlet

7. Do not put your hand or fingers on the bondhead or X-Y-table while the machine moves. Keep your hands and fingers clear.

8. Laser Spotlight, Attention!
   Don't stare into the beam. Direct viewing into the Beam can cause permanent eye damage. Please note regulations according to EN 60825-1 and VBG 93 Laser class 1, P = 1 mW

9. Hot machine parts:
   The maximum temperature of the heated Work holder is 250°C.
   Allowing parts to cool down before replacing the heated Work holder, Illumination lamps or any other hot machine part.

10. EFO (Electronic Flam Off) Only If Bonder is equipped with an EFO System
    Do not touch the electrode or the wire during bonding or when manually firing the EFO.

    The System produces a high-voltage spark. The potential shock hazard is not usually considered life-threatening. However, TPT recommends that those people with abnormal heart conditions or artificial heart stimulation devices (e.g. pacemakers) should not be permitted to operate or service this Bonder.

11. Bonding Tools have sharp edges; beware of touching them.

12. Trained, authorised personnel should perform all service and maintenance.

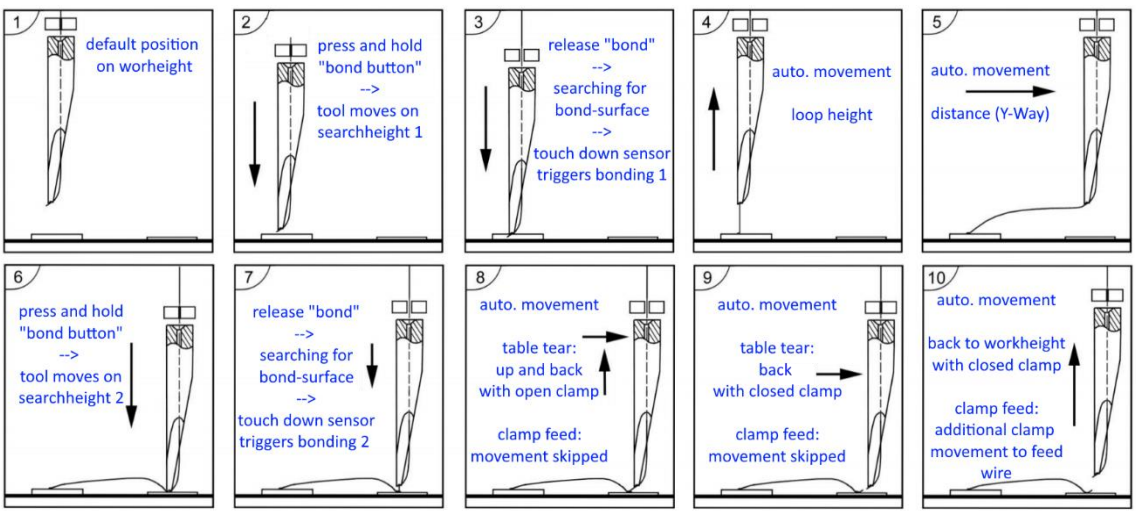
2.1. Power-On

Before plugging the power cord into the A.C. power source, check the HB Bonder's rear label. Do not plug in the power cord if the label does not agree with the available AC power. Check the AC power socket for correct wiring.
THE POWER ON/OFF Switch is on the back left side,
TFT Display light indicates that POWER is on.

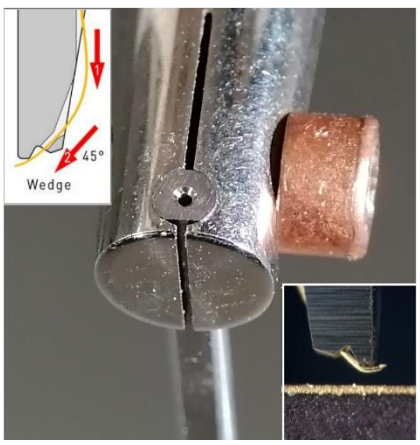
- All values/green numbers can be adjusted by double-clicking the corresponding button
- **Bond Button**: **Press and hold** to move the bonding tool to “Search height”. After releasing, the tool moves slowly downward, and bonding is triggered by surface contact.
- **Up Button**: lifts the clamp to shorten the tail.
- **Down Button**: Lowers the clamp to extend the tail.
- **Reset Button**: To reset the bonding sequence, release the bonding button while the reset button is held.
- **Optional Addon Manual Z**: enables the “manual bonding mode” while connected to the bonder. Thereby, all loop parameters and the search heights are **deactivated**. The operator performs all movements (X-Y-Z-direction). The manual Z must be **entirely released after the 2nd bond to start the “tailing**”. Switch from “Semi-automatic” **to “Manual Mode”.**
- **Optional Addon Dynamic Search Box**:
  - Black stitch button: enables stitch bonding if pressed and held when the bond button is pushed.”
  - Green up button: lifts the bond tool while on search height
  - Red down button: lowers the bond tool while on search height

Bonding Sequence

The figure shows the “wedge bonding” sequence. Only minor changes apply to the ball bonding sequence, which does not influence the operator's handling.



The tool installation is crucial for the performance and reproducibility of the bonding process. Therefore make sure that both tool types (ball capillary and wedge bonding tools) are flush on the top side of the transducer drilling and that the Copper screw is tightened with 35 cNm by using the torque wrench. Furthermore, the wedge tool requires a “circular” alignment, ensuring that the flat tool part is perpendicular to the transducer gap. The manual has detailed information about wire installation (p.11).



TPT on YouTube
How to thread Wire to wedge tool

https://www.youtube.com/watch?v=-Ez8a4g_K-E.

Sample installation

The sample has to be mounted to the heater stage (or similar working stage). It can be fixed by either the internal clamping mechanics, by vacuum, or by screwing. As long as the sample does not move or wobble in any way, the fixation method belongs to the user's preferences. Please note that every movement, despite the “intended bonding movement (Ultrasonic and Bondhead movement), may have bad influences on the bonding performance and reliability.

Height Setup

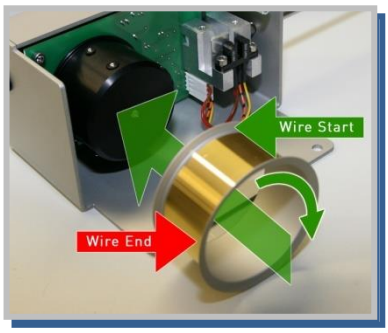
Please perform a height setup after changing the bonding height (e.g., a new type of sample, a new tool installation, or a height change of the heater stage). Press the “height setup” button on the touchscreen (bond tab). Afterwards, the bonder measures the heights for the 1st and 2nd bond locations and the EFO distance while in ball bonding mode. All measurements are stated separately by pressing the “bond” button.

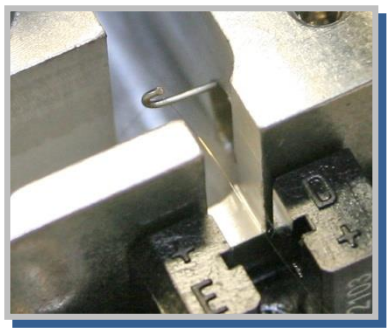
Parameter and Process optimization

Four main bonding parameters are set. Ultrasonic power, bonding time, and force are set separately for the first and second bonds. The temperature of the TPT heater stage can be set in the “bond tab.” Up to 150°C is recommended for gold bonding temperatures, as there are no technical limitations.
More information is available in the “Bonding Process Optimization Guide.”

3. Quickstart

1. Switch on
Built-in PC boot DOS and load software.
The software checks motors and sets clamps in the middle position.
Bonder can be switched off anytime; the last settings are saved.

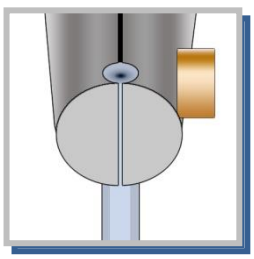


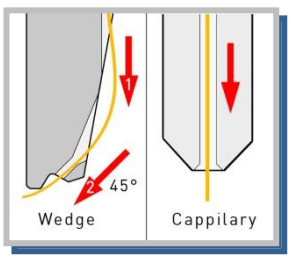


2. Loading wire to motorised wire spool

Thread wire to a metal tube with the
the aid of thick wire with a hook

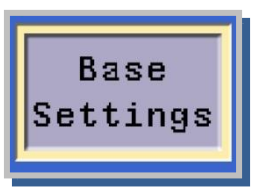
Then thread wire to glass tube at bondhead





3. Install a Wedge Tool or Capillary
The tool must be flush with the top of the transducer
Tighten the tool with a torque of 35 cNm

4. Thread wire to bond tool.



5. Tail adjustment
Set the bonder to Ball or Wedge bonding and check the Tail parameter.

6. Height and Y-way settings
Go to the menu „Axis Setup."
Press „setup" and press the bond button (start button) on the control puck to measure the bond heights: set Loop height and Y-way parameters.
If you change parameters in the „axis setup" menu, press „enter" to save the change.

7. Place substrate to work holder
Make sure your bonding part is adequately held and plain to the surface.

8. Go to the menu „Bond"
set parameters for the first and second bonds.
Move to the first bond surface and press and hold the bond button on the control puck; hold the button to stay at the search height (200 µm over the surface), and then you can target precisely.
Release the button to bond.

4. Bonding Process

Sample Preparation:

A high-performing and reliable bonding process depends on suitable surfaces and solid preparation. The bonding process might be sensitive to ageing (e.g., oxidation), dirt, vibrations, and tilted parts (angle of attack). Therefore, a reliable and optimised assembly process will significantly benefit the bonding process (parameter optimisation).
Finally, the sample must be fixed to the heater stage. Therefore, ensure the sample is in the best possible contact with the top plate and is properly fixed so it does not move in any direction. The top plate can be exchanged and customised.

Adjustable parameters:

Ultrasonic power:
Ultrasonic power (US) is the primary parameter for Ultrasonic wire bonding. It ensures the wire's deformation and connection to the pad. Varying the US might have the biggest impact on the bonding performance.

Time:
Time is one of the most difficult parameters to optimise due to its highly non-linearity. Therefore, the impact of changes is hard to predict, and it is recommended to stick to a time setting and focus on US, force, and temperature.

Force:
The applied force ensures the proper contact between the tool, wire, and substrate, resulting in sound US transmission. Furthermore, the resulting pressure is essential for the welding process. Therefore, it should not be too low (min.: 200 mN for 25 µm gold wire). Ensure that the applied force is not too high not to cut the wire.

Temperature:
Most applications using Au-wires will benefit from a temperature increase while bonding. Generally, the ideal temperature for Au-wires is between 80°C and 150 C. Please consider the application's maximum temperature, and that some parts (eg. glue) may soften at high temperatures, which may decrease the bonding performance.

Tail:
With “table tear” and “clamp feed”, there are two modes to choose from. While using “table tear”, the wire will be “pulled out of the tool. Therefore, the wire must be slightly connected to the 2nd bond. “clamp feed” will create the tail by pushing the wire with the clamp after returning to the “default position” after the 2nd Bond. For wedge bonding, the tail should be a bit longer than the foot of the used bonding tool, and for ball bonding, “500” is a decent starting value. Unreliable tails are often caused by too high parameters (Bond 2). Reduce the US-Power and or try the other tailing mode.

Loop:
The loop shape may influence the bonding parameters of Bond 2. Have a look in the manual to get some ideas on how to create different loop shapes.

5. Finding parameters

Depending on the used application, finding the best suiting parameters may be difficult. One way to establish a reliable process is by doing parameter sweeps for each parameter. Starting with sweeping the US-Power followed by the bonding force and temperature and ending with time has proven to work fine. During the sweeps observe the process, its results, and the changes happening due to parameter carefully. The listed starting parameters are initially low, to reduce over bonding.

Starting parameters			
	17 µm	**25 µm**	**33 µm**
USG-Power	100 (HB05=80)	120 (HB05=100)	140 (HB05=120)
Time	Gold: 200 & Alu:80		
Force	200 (HB05=20)	240 (HB05=24)	300 (HB05=30)
Temp	Gold: 80°C & Alu: Room temperature		

Parameter-Sweep			
	US-Sweep	Force-Sweep	Temperature-Sweep
Trigger	No decent connection	Damaged wire/pad during US-Sweep	Damaged wire/pad during Force-Sweep
Action 1	Increase the power by 10 or 20	Reset US-Power to initial value	Reset US-Power and force to initial values
Action 2	-	Increase force by 20 (HB05=2)	Increase temperature by 20
Action 3	-	Redo the US-Sweep	Redo the US-Sweep and Force Sweep

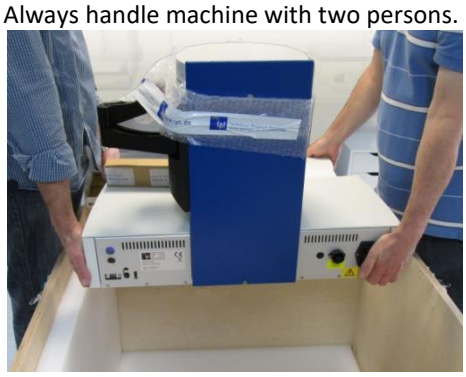
Troubleshooting			
The wire gets cut while bonding or the pad is damaged	Reduce US-Power by ~10-20%	Reduce force by ~10-20%	
The wire gets cut or the pad is damaged regularly	Reduce the US-Power by up to 10%	Reduce the force by ~10%	
The wire is cut/There are pad lift-offs from time to time.	Reduce US power slightly	Reduce force slightly	
There are bond lift-offs from time to time	Increase US-Power slightly	Increase force slightly	
Wire lifts occur regularly. The wire is deformed only a little bit	Increase US-power by up to 10%	Increase force by up to 10%	
The wire does not connect to the pad. Wire lifts off immediately after bonding.	Increase US-Power by ~10-20%	Increase force by ~10%-20%	
Unreliable tail/ball	Check for a decent working clamp (gap; force; alignment)		
	ensure reliable loop	Reduce US power	Reduce US power and increase force
	Change tail parameters and/or tail mode		
	Parameter sweep for Bond 2		

6. Unpacking and Packing Instructions

Unpacking Bonder

Remove accessory boxes and foam material

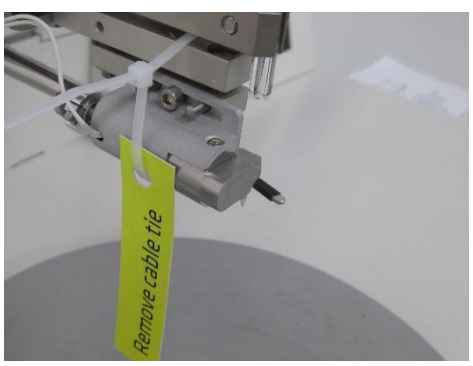
Always handle machine with two persons.



Do not touch bondhead!

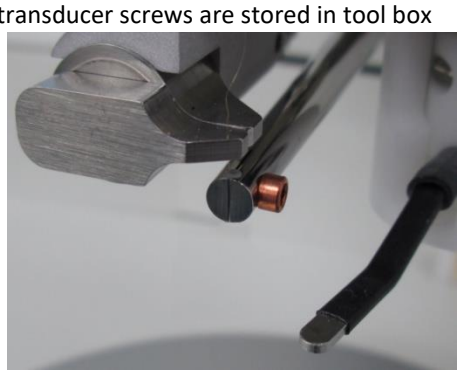
Remove lock screw

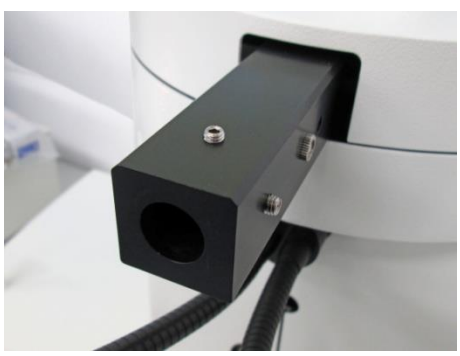
Remove cable tie from clamp



Remove protection foam

Allen keys, microscope holder screws and transducer screws are stored in tool box





Now you are ready for installation → see manual page 8.

7. Introduction

The HB06-16 ultrasonic wire bonder is characterised by the vertical feed of wire or ribbon, manual X-Y control of the workpiece, HB08/08/10 is equipped with motorized control of the Z-Axis.
HB12/14/16 is equip with motorized control of the Z & Y Axis
All HBXX Bonder have the exclusive TFT Touch Panel Operation System.

This manual is designed to provide the operator with an understanding of the equipment's operation, the bonder's characteristic features, the adjustments available to ensure the best results in wire bonding, and troubleshooting procedures for fault isolation and malfunction correction.

lt is strongly recommended that all operations and maintenance people read this manual thoroughly, and obtain hands-on operating experience with the bonder. The precision and ease of operation of the equipment, and quality of the bonding will be better appreciated by using the bonder. Familiarity will also facilitate expeditious introduction of the equipment in production and enhance productivity.

HB06/12 is a manual/ semiautomatic thermo sonic wire or ribbon wedge bonder. This bonder was designed to make 0.5 to 3.0 mil gold or aluminum wire or up to 1.0 x 10. 0 mil gold or aluminum ribbon electrical interconnections on a wide range of microelectronic packages.

HB08/14 is a manual/ semiautomatic thermosonic wire ball bonder. This bonder was designed to make 0.7 to 2 mil gold wire electrical interconnections on a wide range of microelectronic packages.

HB10/16 is a manual/ semiautomatic thermosonic wire bonder for Wedge bonding,
Ball bonding and Ball Bumping.

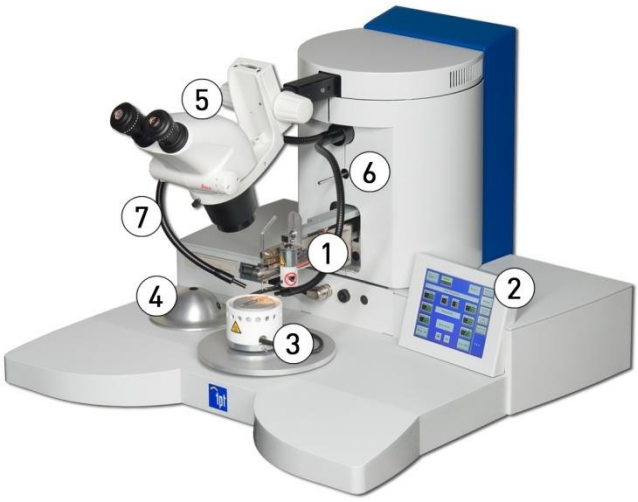
The HB Bonder is characterized by a precision mechanism for manual X-Y control of the work platform and workpiece, a semiautomatic Z & Y control of the bonding tool, and electronic control of the bonding variables (Force, Ultrasonic, Temperature and Time). Standard features designed into the HB include a Leica 6:1 Zoom Stereo-microscope with 20X eyepieces, an area illuminator, and a work stage with mechanical or vacuum clamping provisions. All Bond parameters and programs are operated with 6,5” TFT Touch Panel Display. A variety of options are available to enhance operability in special applications.

The design considerations were operator comfort and ease of operation, reliability of the bonding system, low inertial impact of the bonding tool, and operator safety. The mechanical assembly of the bonder consists of close tolerance bonder parts for precision operation and control. The electrical assembly is composed of highly reliable electronic components integrated into a modular assembly to facilitate ease of adjustment and troubleshooting.

8. Overview

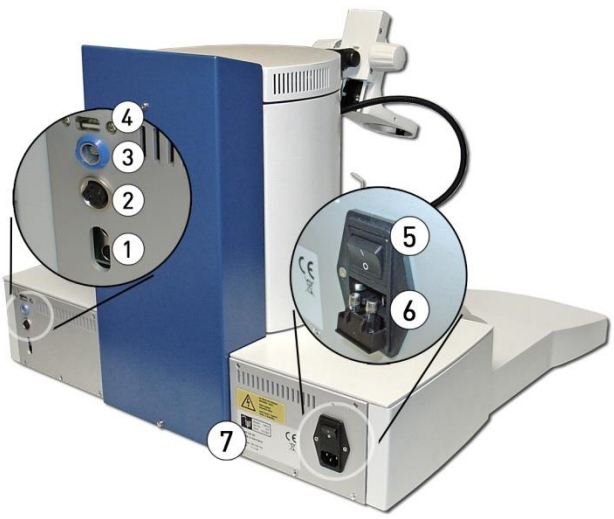
8.1. Front view

1. Bond head
2. 6,5“ TFT Touch Panel Operator System Dual
3. Heater Stage
4. Control - Puck
5. Microscope
6. Motorized Wire-Spool
7. Fiber Optic Illuminator



8.2. Back view

1. PC Keyboard and Mouse Connector
2. Manual Z- Connector (Option) see Page 38
3. Foot switch Stitch bonding
4. USB Connector
5. On / Off Switch
6. Power Connector AC 100V - 230V T 6,30 A Fuse
7. Serial number and Bonder type



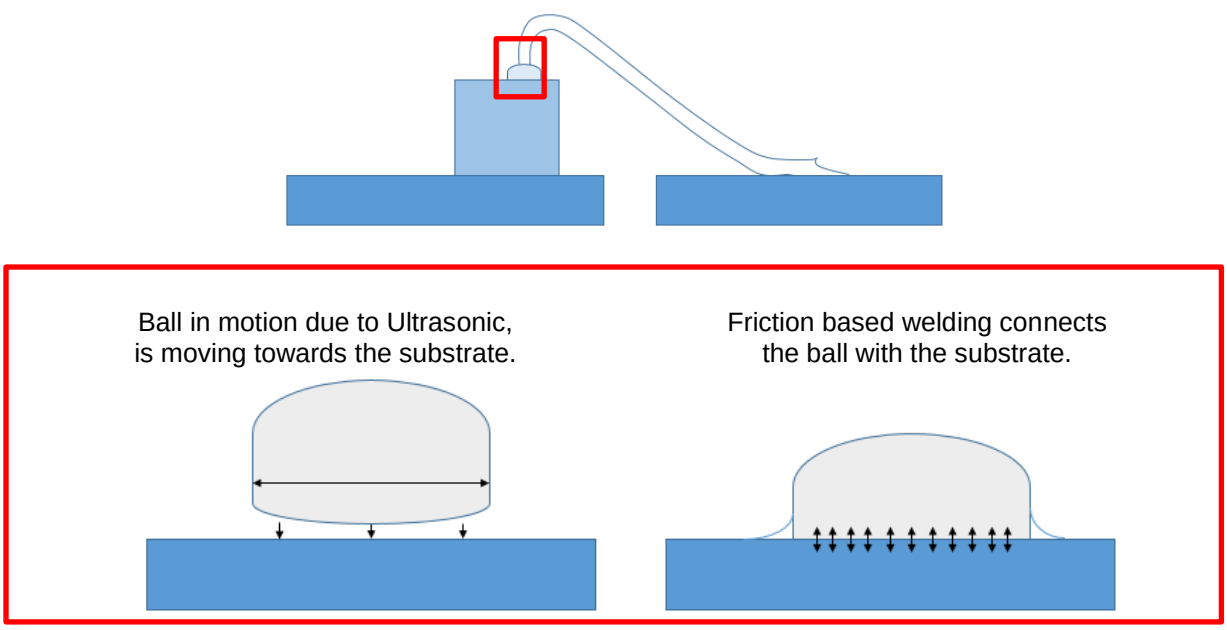
Detailed view on Bondhead

9. Basic Ultrasonic Bonding & Bond Modes

All TPT Bonders utilize the basic ultrasonic bonding method. Bonding two types of metals using the ultrasonic method results from three variables: force, ultrasonic power and time. If the HB16 is used for gold wire bonding, heat is used as a fourth variable. At this point these parameters will be explained briefly. The outcome of altering the variables will be explained in the referenced chapters.

- The force supports the plastic deformation and facilitates the coupling between the bonding tool, the wire and the substrate.
- The scrubbing effect of Ultrasonic (63,3kHz) displaces the contaminants on the surface and ensures metal to metal coupling. When using the Ballbond or Ball Bump option, altering the Ultrasonic also changes the size of the ball.
- The time has to be set sufficiently long to cause solid state diffusion.
- The heat support the ultrasonic. With more heat is less ultrasonic necessary.

Ultrasonic Bonding is a type of friction based welding, but it is not a process which uses high temperatures to fusion 2 metals. To connect the wire with the substrate, it is pressed onto the surface, while being moved laterally according to the settings of the ultrasonic, as shown in the illustrations below. If heat is used as a fourth variable the process is called Thermosonic Bonding



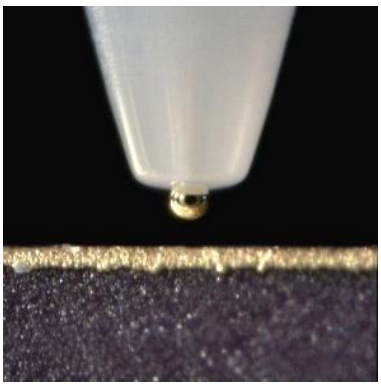
Capillary

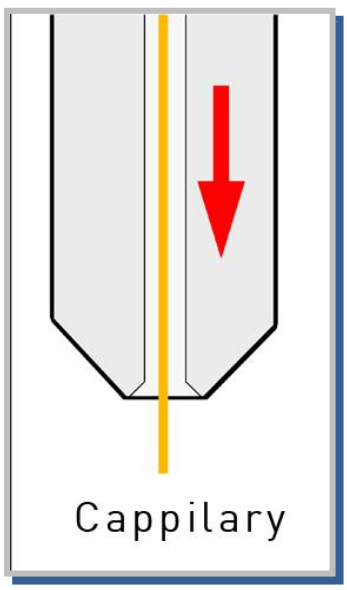
- used to perform Ballbonds and Ball Bumps
- conic shape
- can be characterized by e.g. Hole Diameter, Tip Diameter, Chamfer Diameter
- use a suitable Capillary, considering the Wire Diameter, Wire type and Bond Diameter
- the wire diameter is a key factor to determine the optimized hole diameter it is necessary to utilize the optimized hole diameter to reach a high quality first bonding and loop

Wedge Tool

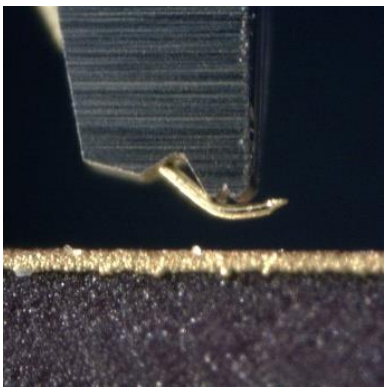
- used to perform Wedgebonds
- can be characterized by e.g. Hole Diameters, and angle
- there are different angles for the second hole, 30°,45°,60°
- 45° is the most common angle
- use a suitable Wedge Tool, considering the Wire Diameter, Wire type and Bond size
- the wire diameter is a key factor to determine the optimized hole diameter

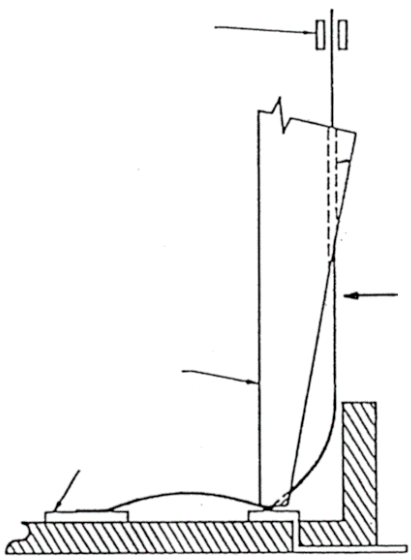
Capillary



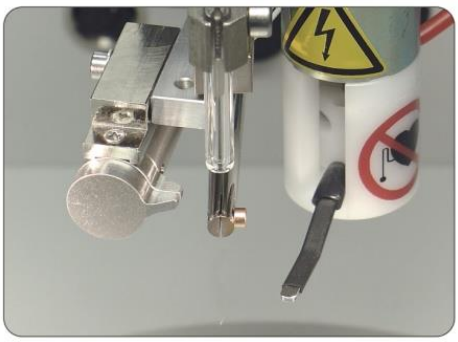


Wedge Tool



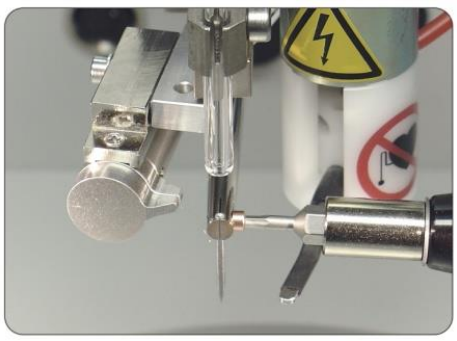


11.Tool Installation

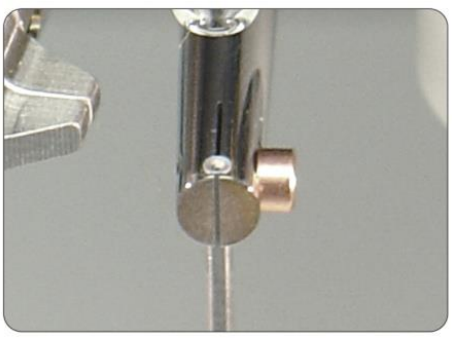


Remove the wire and carefully move the Clamp to the left side. It is recommended to use your right hand to push while buffering the movement using your left hand.

If there is already a Capillary or Wedge Tool in the transducer, make sure to secure it when you loosen the screw. Place the new tool in the transducer.



Tighten the screw using the Torque Wrench 35 cNm after you made sure that the tool is flush with the top of the transducer. To ensure high quality bonding it is mandatory that the tool is in a perfect position. If the tool is not fixed correctly, Ultrasonic vibrations may not be forwarded properly from the transducer into the tool, causing heavy bonding mistakes. Also make sure to only use original components of TPT.



When installing a Wedge Tool the positioning of the tool is an important factor. The spike of the tool has to face the user, the holes for the wire have to face the machine. It is recommended to use the microscope for an accurate adjustment. Carefully move the clamp back to its original position

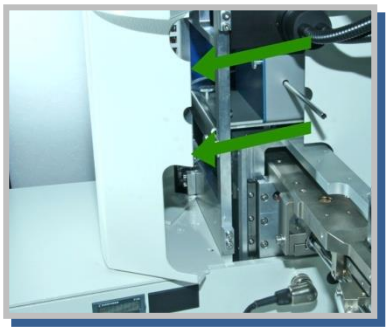
The bonding tool is fitted into the 1/16 inch diameter hole in the ultrasonic transducer.
The top of the wedge tool must be flush with the top of the transducer.
Secure by tightening the special set screw with Torque Wrench **35 cNm.**

Wedge bonding Tool: 1/16" dia. x 0.750 long bonding wedge with a '45 wire or ribbon feed angle is ecommended.

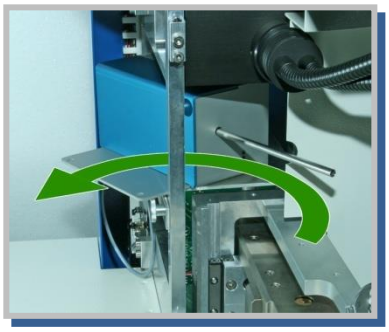
Ball Bond Tool : Capillary 1/16" dia. x 0.450 long is recommended

Refer to your tool supplier catalogue for the tool suitable for the specific application.

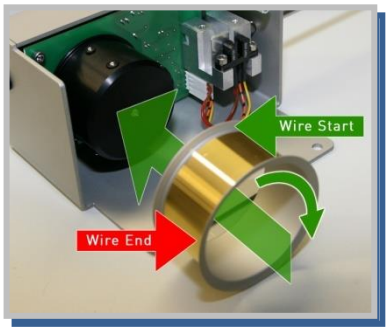
12.Loading Wire to Motorized Wire Spool



Open left cover

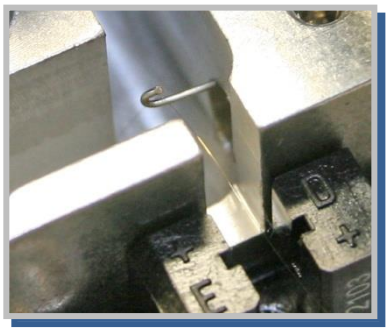


loosen set screws and
remove Wire spool

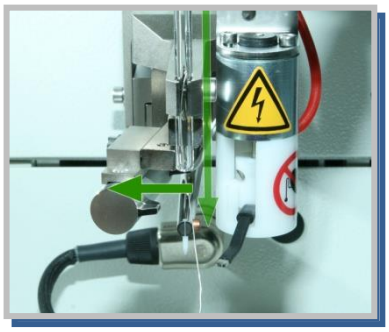


slide wire spool at holder
watch out for right spool orientation

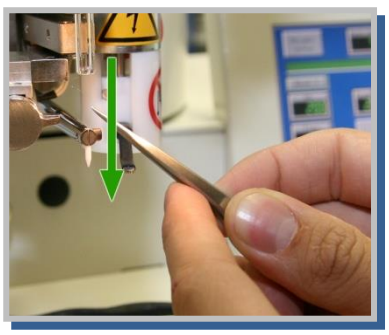
Lift up sensor bar to thread wire



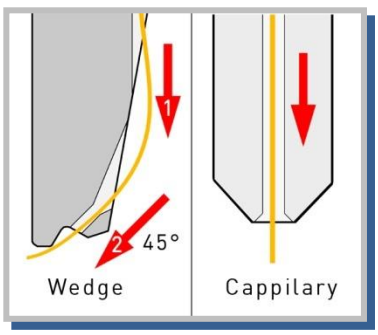
use hook from toolbox
to pull wire through tube

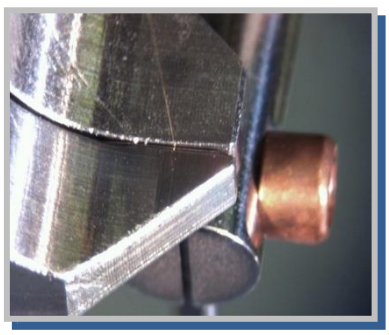


move clamp aside and
pull wire through glass tube



Use booth hands to tread wire
through bond tool.

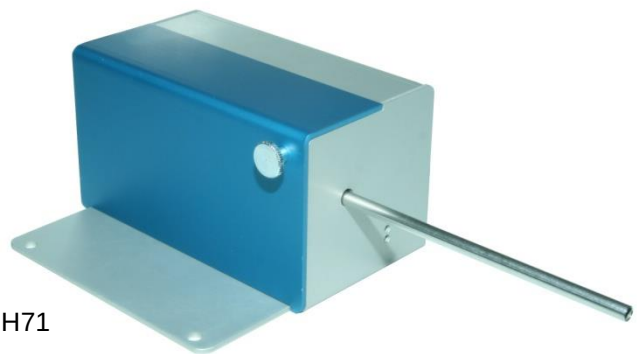




move clamp back
make sure wire is in clamp

Explanation Video on Youtube:
"How to thread wire in wedge tool" https://youtu.be/-Ez8a4g_K-E

H71 motorized Wire Spool	maximum Wire diameter is 50µ / Ribbon until 100 x 20µ
H72 manual wire Spool	maximum Wire diameter is 100µ / Ribbon until 250 x 25µ

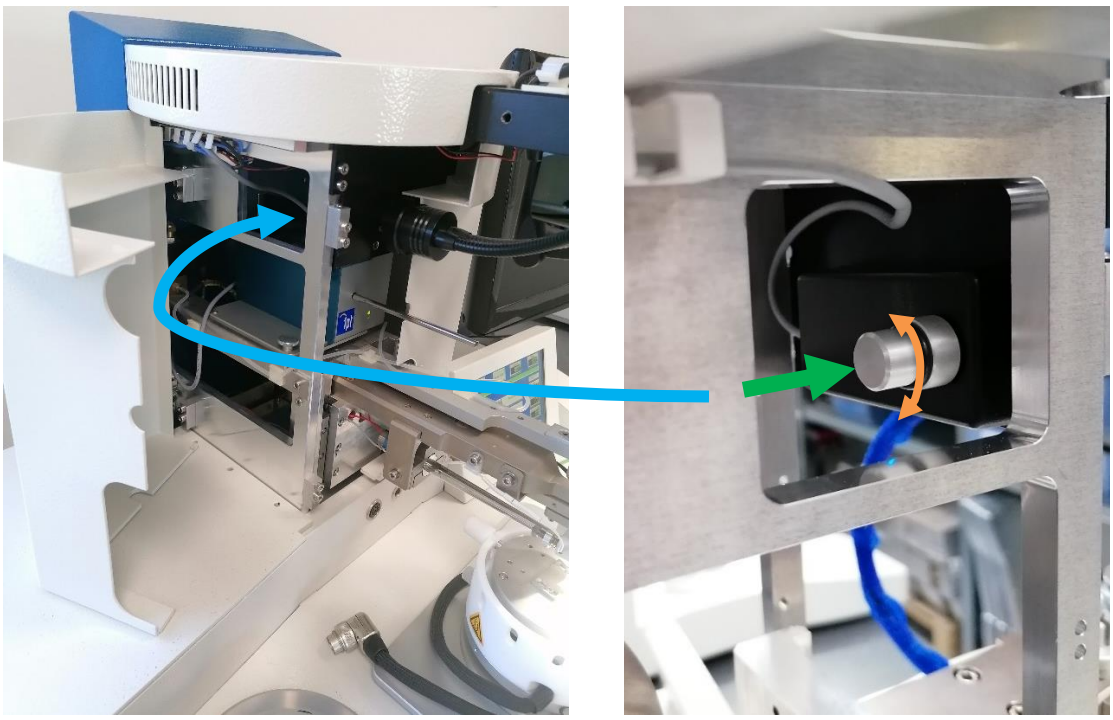


H71

H72

13.LED-Light

The Bonder is equipped with a LED-Light.
The intensity of the LED can be adjusted with a **rotary knob** on the back of the light.



For reaching the knob, open the left side of the bonder.

Turning the knob **clockwise increases** the intensity, **counterclockwise decreases** the intensity.

To **save** the setting for the LED **press** the knob for **3 seconds**.
The LED will flash twice to show that the setting is saved.

14.Control Puck

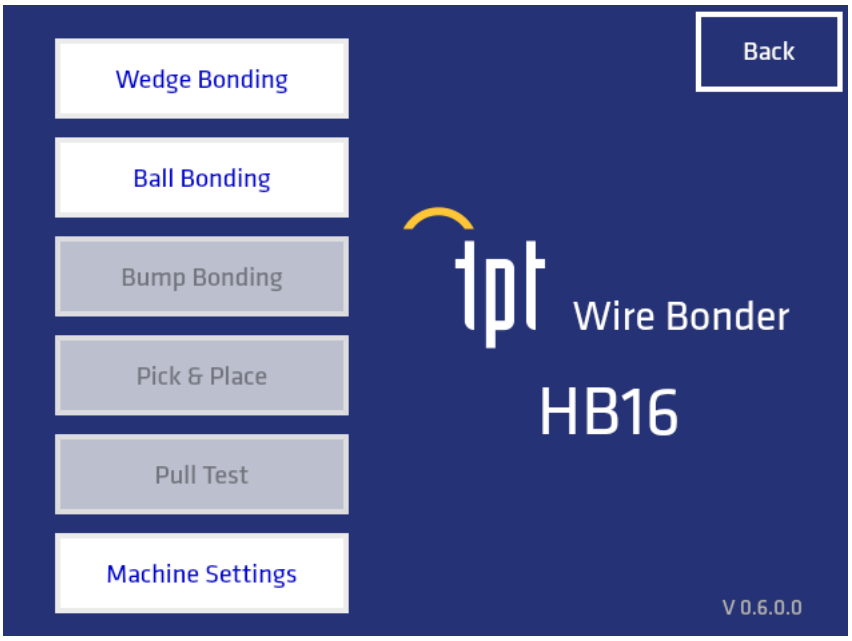
Figure 15 Control Puck

1. Bond Start button
2. Tail feed upwards
3. Tail feed downwards
4. Reset after first bond, by search height or after height setup

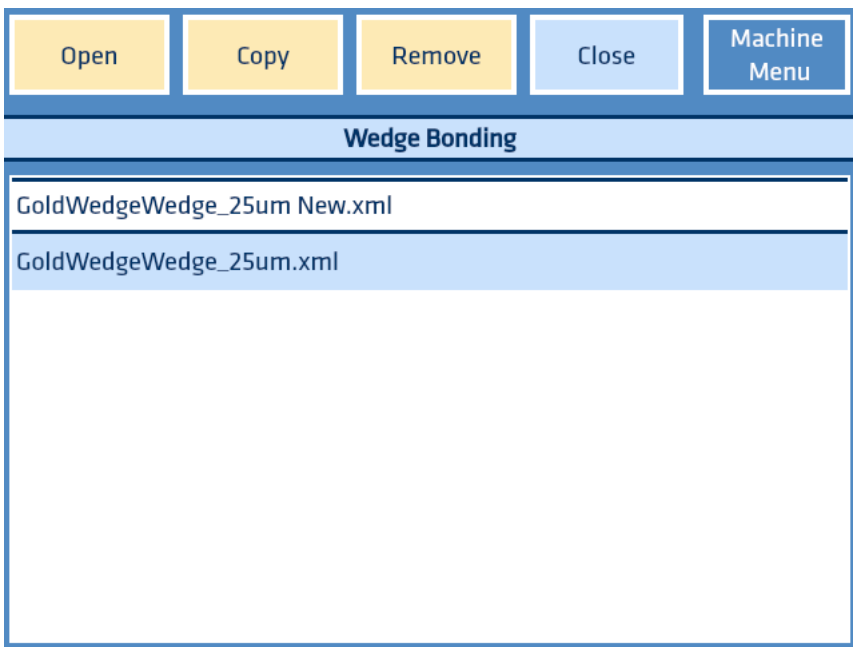
Control Puck "X-Y" Axis Control - 6 :1 ratio manipulator

15.Machine Menu

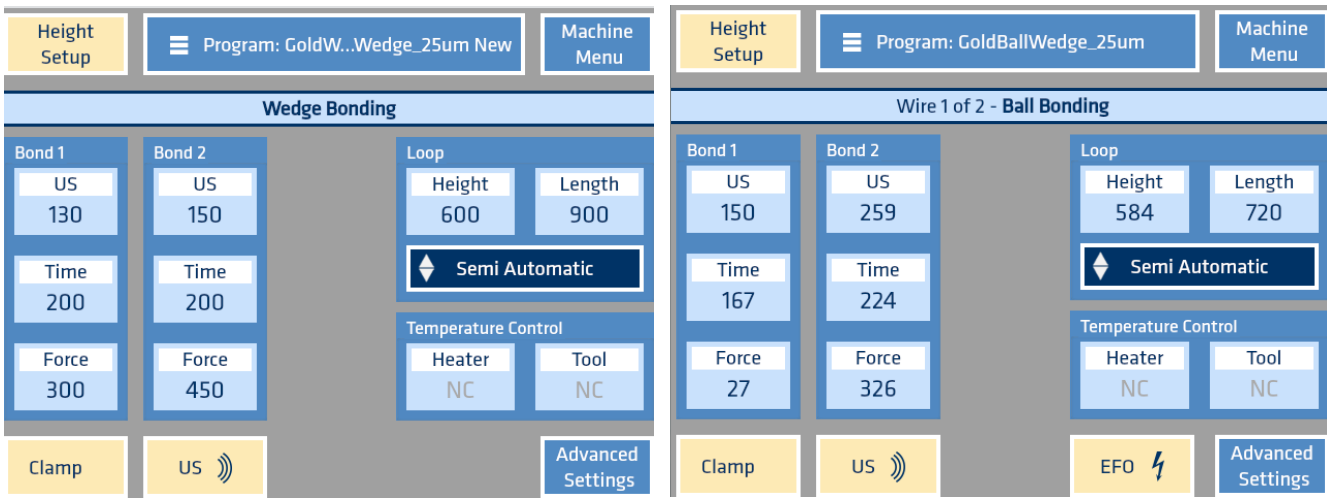
The first time you start the HB16 it shows you the machine menu page. The menu grants access to all available bonding operating modes and the machine settings.



After choosing an operating mode, all available programs will be displayed. Each program can be opened, copied or removed. Use “close” to get back to the previously operating program.



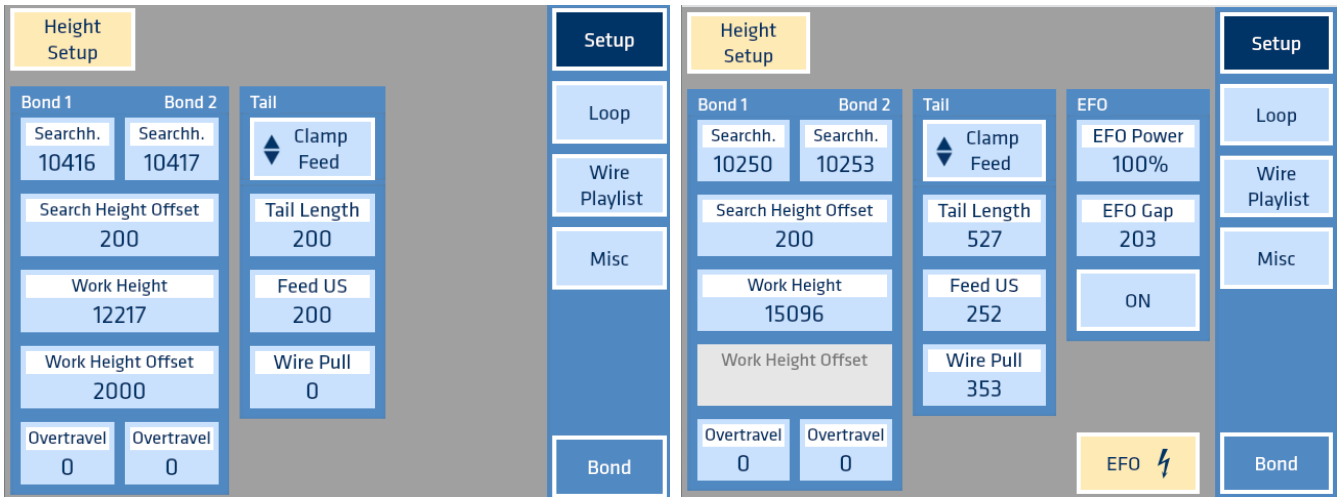
16.Bond Menu



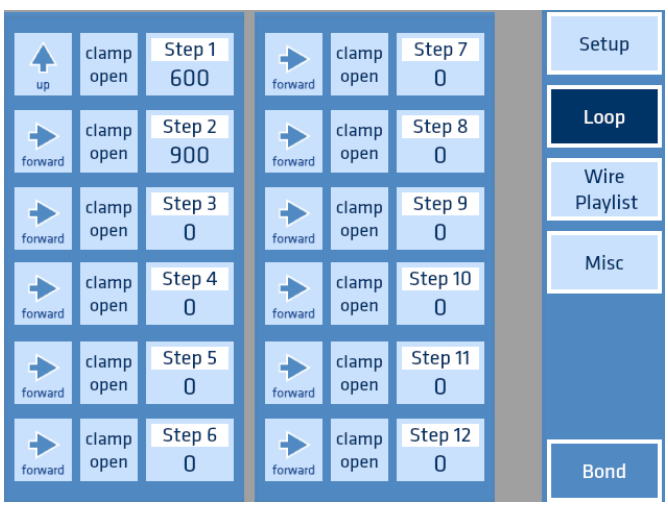
Height Setup	button for Auto height Set Up.
Program	shortcut to all available programs of the current operating mode
Machine Menu	Return the machine menu
Status bar	provides the status of the bonding program (bonding mode/wire playlist/etc.)
Bond 1	Bonding parameters for the 1st bond (ultrasonic power; Bonding time; bonding force)
Bond 2	Bonding parameters for the 2nd bond (ultrasonic power; Bonding time; bonding force)
Loop	shortcut for the first two loop parameters (default: height and length) Change the bonding mode (automatic; semi-automatic; manual mode)
Temp. control	sets the temperature of the heater stage and tool heat, if available.
Clamp	push to open/close the clamp
US	activates the ultrasonic while in default position
EFO	activates the EFO
Advanced Settings	parameter for Setup, Tail, Loop and other Settings

All changes are saved to the current program.

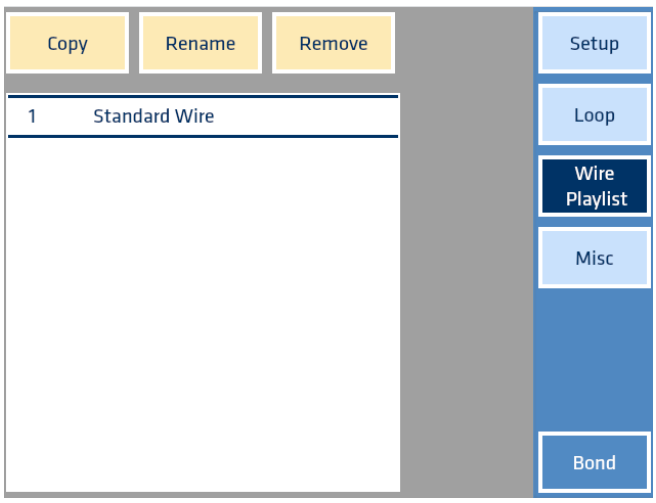
17. Advanced settings



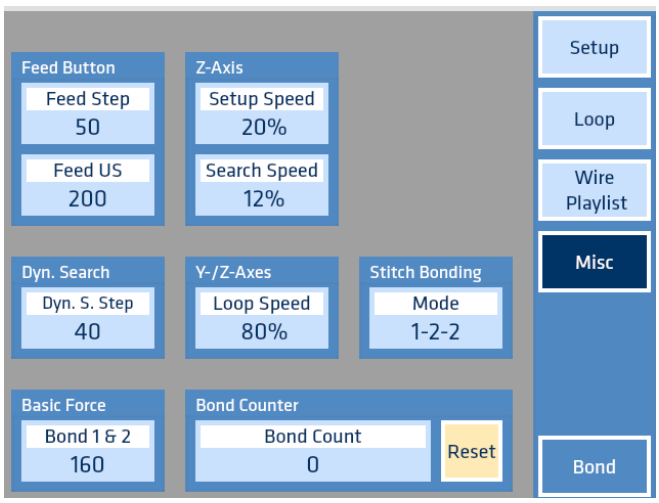
Searchh	Searchheight defines the search height for the 1st and 2nd bond. Adjustable by double tab.
Searchh. Offset	defines the searchheight in relation to the sample height
Workheight	default position of the bond head
Workh offset	defines the work height in relation to the higher search height
Tail	toggle clamp feed and table tear tailing mode Defines the tail length and the used US-power during the tailing sequence
EFO power	defines the power used for the electric flame off
EFO gap	defines the distance from the EFO lever to the tool tip
On/off	toggles the automatic EFO after the tailing sequence
EFO button	activates the EFO
Overtravel	Down movement of bondhead after touchdown. This helps to deform the wire before applying bonding parameters (recommended for wires >50µm)



Arrows	defines the movement direction of the selecte loop step
Clamp open/closed	defines if the clamp is open/close during the selected loop step
Number	defines the displacement of the selected loop step



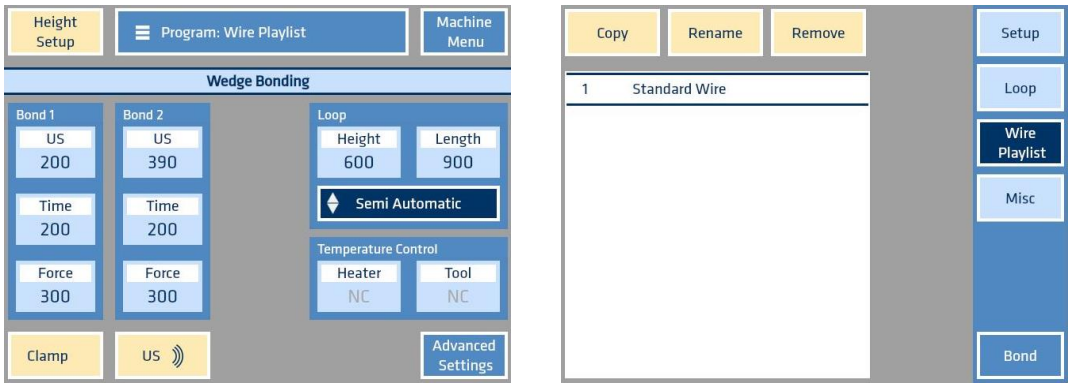
Select a wire from the list to copy, rename or remove it from the playlist. Each wire in the playlist can be assigned with different bonding, looping and tailing parameters. The wires will be “activated” according to the list. By pressing the reset button on the “UFO-controller” the previous wire can be selected.



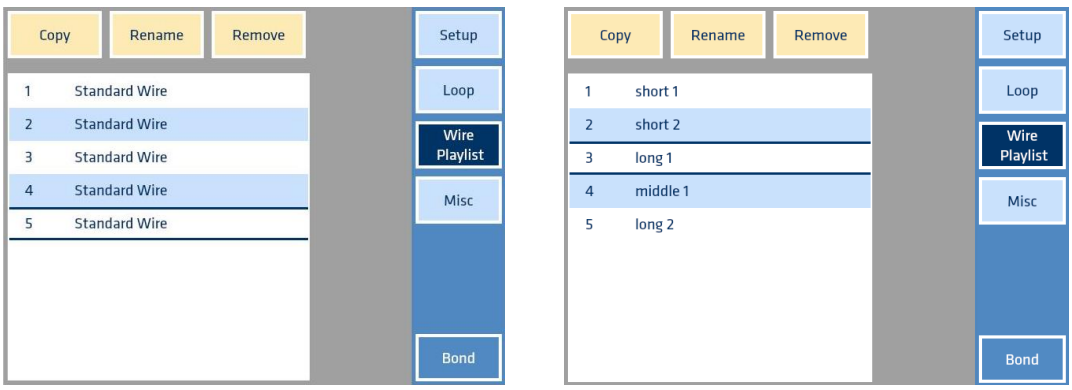
Feed Button	defines the clamp movement per up/down click in the “Ufo controller”
Z-axis	defines the movement speed of the Z-axis
Dyn Search step	defines the movement per up/down click on the dynamic search box
Y-/Z-Axes	defines the motor speed during the loop sequence
Stitch bonding	defines the bonding parameter sets using stitch bonding
Basic force	defines the basic bonding force (touch-down force) for the 1st and 2nd bond
Bond counter	each bond made is counted and can be reset by pressing the button

18.Wire Playlist

With the HB16 (also HB10-HB30) it is possible to create programs with any number of wires, each with individual parameters. This is especially helpful for recurring samples and small productions.
Every wire can be adjusted meaning they can have different bonding parameters, tail parameters, loop parameters and different search heights.

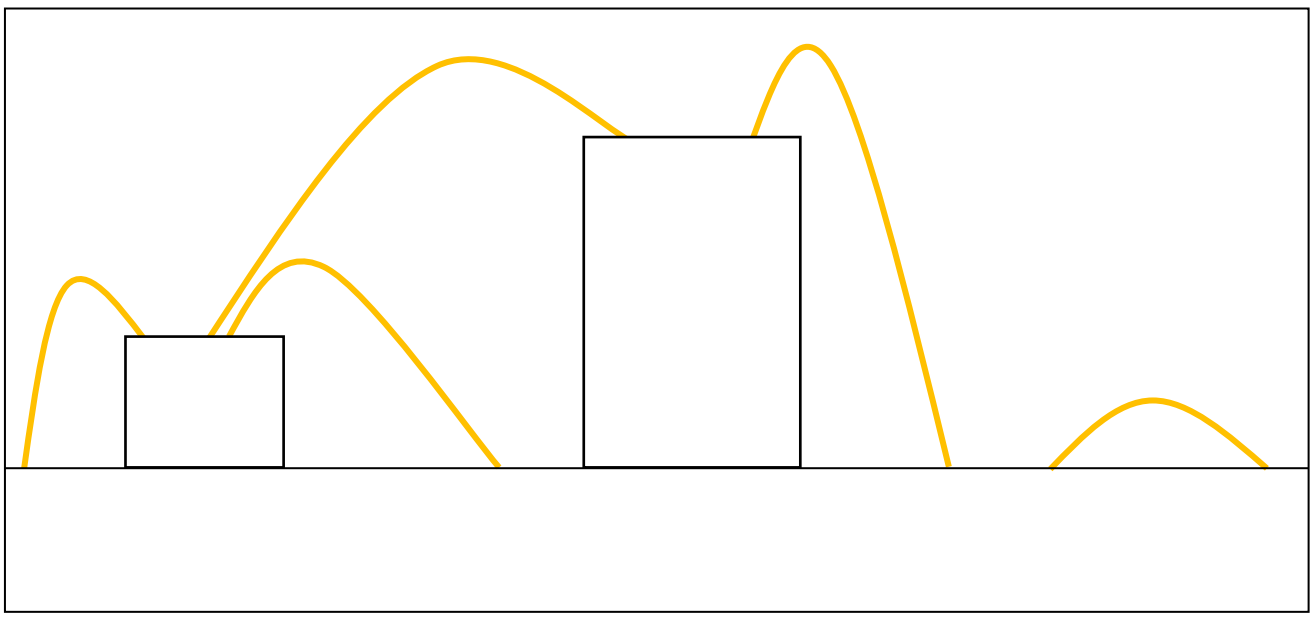


Under ***Advanced Settings*** is the option for ***Wire Playlist***. To add/remove wires, press ***Copy***/***Remove***. Each wire can be ***renamed*** so it is easier to distinguish them.



Select the wire you want to change, in the example above wire 3.

For this selected wire, you can change the bonding parameters, loop parameters, tail parameters and also the different heights by doing a ***Height Setup***. This is especially helpful when you have a device with different modules on it (example below).



After finishing bond 1 and bond 2 of the first wire, the program continues with the next wire. Pressing *reset* on the control puck stops the ongoing wire. Pressing *reset* again starts the wire playlist from the beginning. By selecting a wire from the playlist menu you can start there und continue with the next wires.

19. Bonding Mode

1. Full Automatic : After **press and hold** Bond Button
Bond Tool is moving to 1st Bond Search Height.
After release Bond Button wire Bond is automatic made.
No possibility to correct position on 2nd Bond

2. Semi Automatic : After **press and hold** Bond Button
Bond Tool is moving to 1st Bond Search Height.
After release Bond Button 1st Bond is made and tool is moving
To Loop Height and Y-Distance .
After **press and hold** Bond Button
Bond Tool is moving to 2nd Bond Search Height
After release Bond Button 2nd Bond is made and Tool is moving
To Start Position (Work Height)

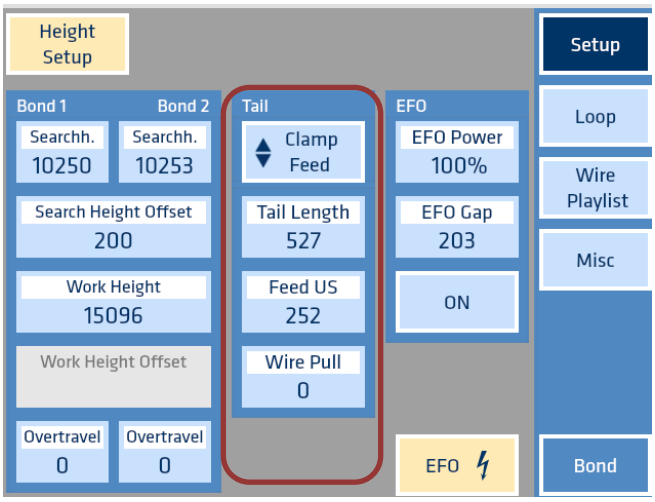
3. Step – Mode: With Bond Button Tool will be Step thru Tail Sequence
and Loop Sequence if any programmed

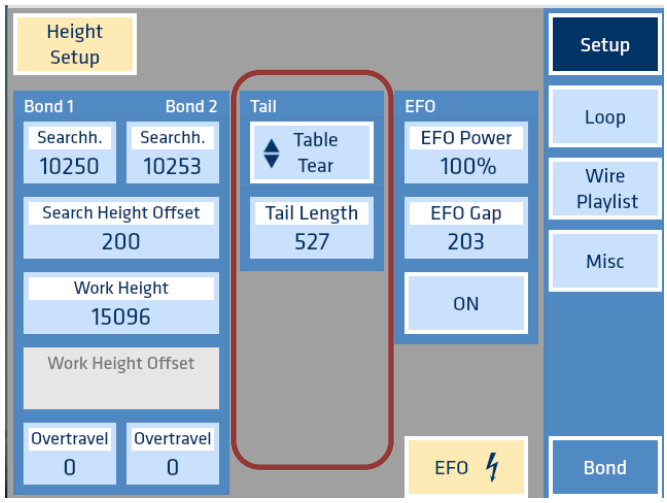
4. Manual Mode: **Only with Option H51 Manual Z-Control**
The Operator using Manual Z-Control to move Bond Tool to Bond surface.
After touching Bond surface 1st Bond is made automatically and Tool is rising 100 Microns.
Then Operator is moving Bond Tool by using Manual Z control
and X-Y Manipulator to 2nd Bond Position.
After touching Bond Surface 2nd Bond is Made and Tool is move back to Start Position
Please note that the height setup does not work while manual mode is active

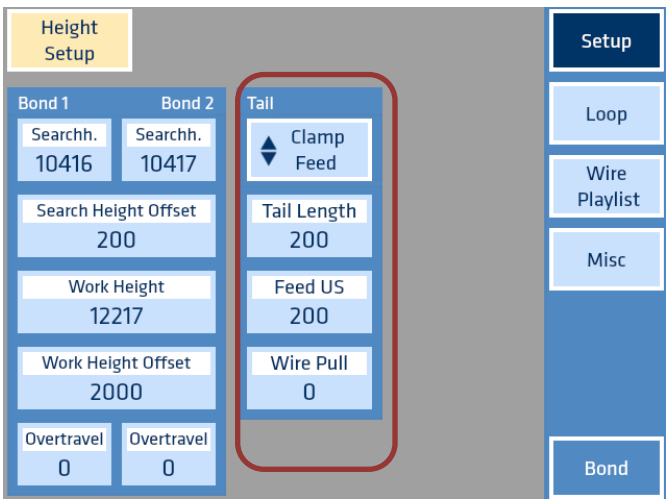
20. Tailing mode

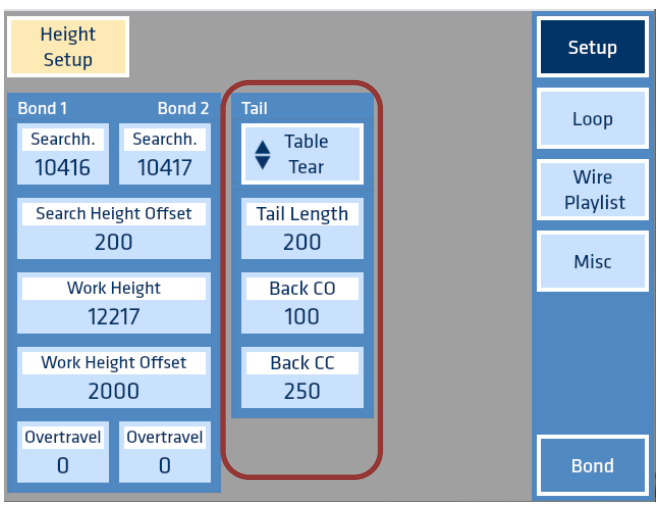
The bonder provides two different tailing modes. You can choose between the clamp mode and the table tear. While using the clamp feed mode, the clamp will push a defined length of wire through the tool when the bonder reaches its default position after a full “bonding sequence”. The clamp closes immediately after the 2nd bond and pulls the wire perpendicular to the bonding surface. The Table tear mode will pull some wire from the tool by moving the Y- and Z-axes with an open clamp. During ball bonding, the wire is pulled perpendicular to the bonding surface, but during wedge bonding, the wire is pulled backwards. The angle of attack is related to the tailing settings (“tail length” and “back CO”).

To adjust the tailing, navigate to the “setup” tab in the advanced settings. The tailing parameters are displayed in the centre of the screen. Choose between “clamp feed” and “table tear mode”.









Tailing mode	Ball Bonding	Wedge Bonding
Table tear	The clamp remains open after the 2nd bond. Tail length: defined upward movement with an open clamp to pull out the wire/tail. Cuts wire by moving to default position with an open clamp	The clamp remains open after the 2nd bond. Tail length: defined upward movement with an open clamp to pull out the wire/tail. Back CO: defined backward movement to change the angle of attack Back CC: defined movement with a closed clamp to cut the wire in backward direction
Clamp feed	The clamp closes after the 2nd bond. Tail length: clamp movement after reaching the default position, resulting in a free tail sticking out of the tool Feed US: US-Power applied during clamp movement. Wire Pull. Clamp movement after 2nd bond. Tensions/Cut the wire while the tool is still in contact with the 2nd bond	

21. Dynamic Search and Stitch function (Option H52)

Dynamic Search adjustment:
Function only in Semiautomatic Mode
if Bonder is in the search height position,
Search height can be changed with button down/up

Dynamic bond length adjustment:
if Bonder is in Loop height position, Bond length (Y-Way) can be changed with button down/up

Stitch function:
Stitch button has same function like foot switch

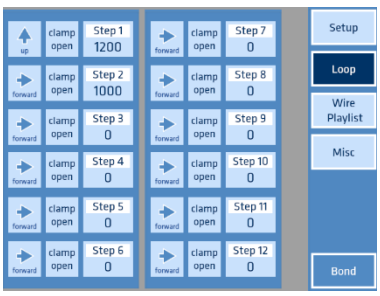
22. Loop Profile Samples

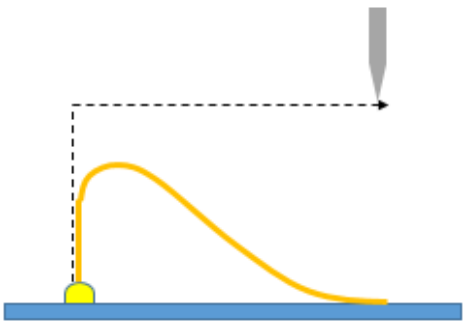
Different applications require different loop shapes. To perform the desired loop, it is necessary to fill in suitable values in the Advanced Settings - Loop Parameter Menu. Different shapes lead to different characteristics of the bond, for example increasing its stability. We will now provide you different Loop Shapes from basic settings to a more complex program of a bond. Therefore, this manual displays the path of the capillary, the necessary settings to perform that path and the Loop Shape as the programming output.

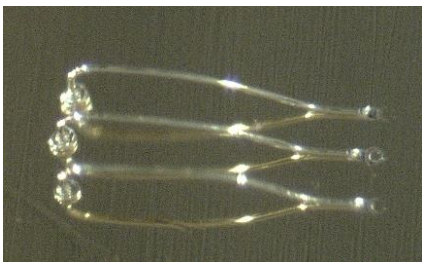
To get repeatable loop shapes, it is necessary for the right bonding tool, wire and bonding parameters.
These loop shapes are examples to explain the method.

1. Basic Loop

The operator will perform a Basic Loop by programming the capillary movement upwards and to the front. Increasing the value of way 2 will lead to a longer loop. Be aware that this may also cause increasing tension between the ball and the wire because the angle between those has also been changed. Aside from the tension, the longer the loop will be the more stability will be lost. The loop's height can be adjusted by altering the value of way 1.

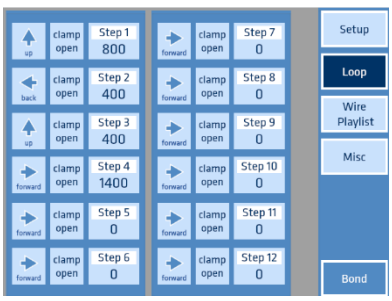


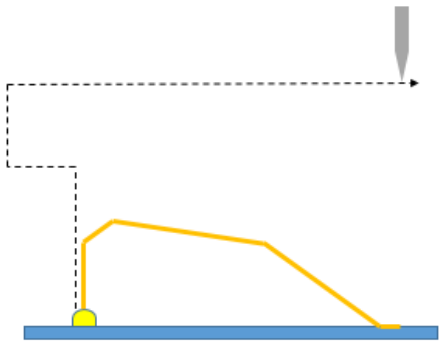


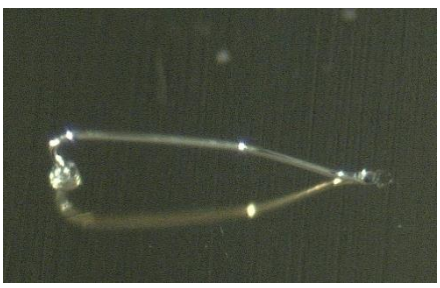


Reverse Loop

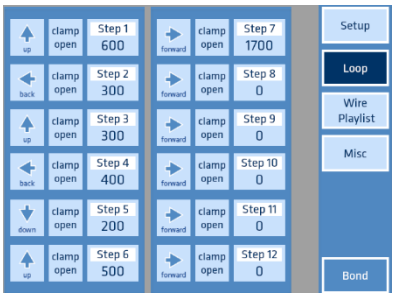
In addition to the Basic Loop, the capillary moves backwards before it reaches its desired height. The loop gets a more stable shape, provided by the new set of angles of the wire. With this shape it is possible to realize longer loops without losing its stability.

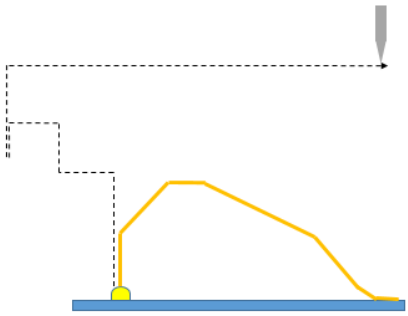


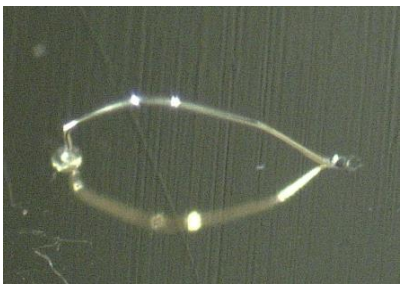




Double Reverse Loop
By adding another 3 steps it is possible to perform the



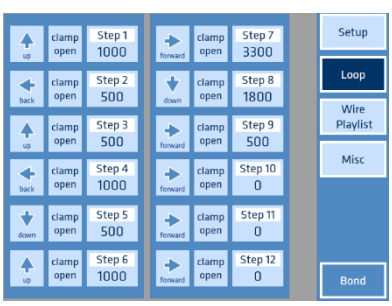


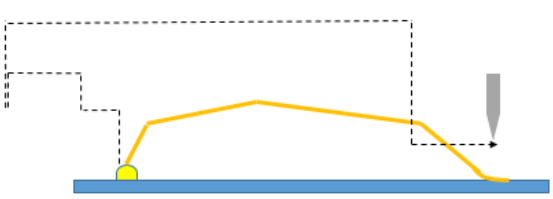


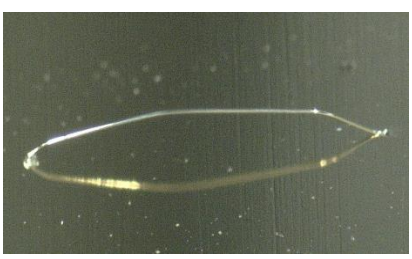
Double Reverse Loop. This loop is characterised by its curved shape. It is a very stable loop and also lowers the tension between the ball and the wire. This shape is also suitable for loops with a height gap between bond 1 and bond 2.

Value	*Changes*	*Effect*
Way 1	increasing	Loop height, same length
	decreasing	Flat loop, same length
Way 2	increasing	Loop is strained backwards, shorter length
	decreasing	Flat and longer loop, loss of angles
Way 3	increasing	Loop is strained backwards; more wire on same length
	decreasing	Flat loop, loss of angles
Way 4	increasing	Loop is strained backwards, bulbous and shorter loop
	decreasing	Longer and flat loop
Way 5	increasing	Flat loop, more tension between ball and wire
	decreasing	Higher loop
Way 6	increasing	Loop is strained backwards, bulbous loop, loss of angles
	decreasing	Flat loop, loss of angles
Way 7	increasing	Longer loop, tension between ball and wire increases
	decreasing	Loop is strained backwards and shorter

Long Loop
The Long Loop can be performed by moving the capillary downwards and to the front as the last program steps. This ensures a pulling effect on the bond, performing a long and flat loop. At the same time the added angles provide stability to the loop. However, the flatness causes tension between the ball and the wire. The flat shape of the loop is a result of a pulling effect (Way 9) on a very low Z-Level (determined by Way 8). By keeping all values unchanged and increasing the pulling variable, the loop becomes longer and more flat. If you desire a longer loop with the same characteristics, please make sure to adjust the other values.







19mm Wedge Bond tool
16 mm deep access
165 mm deep reach transducer
90° Bond Tool

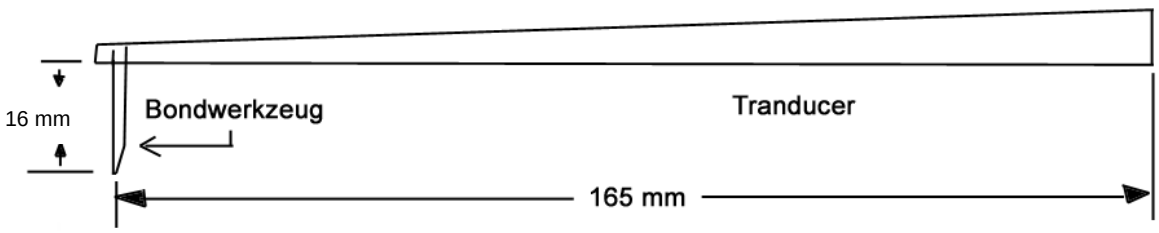


Figure 12

24. Pitch and Pad Size

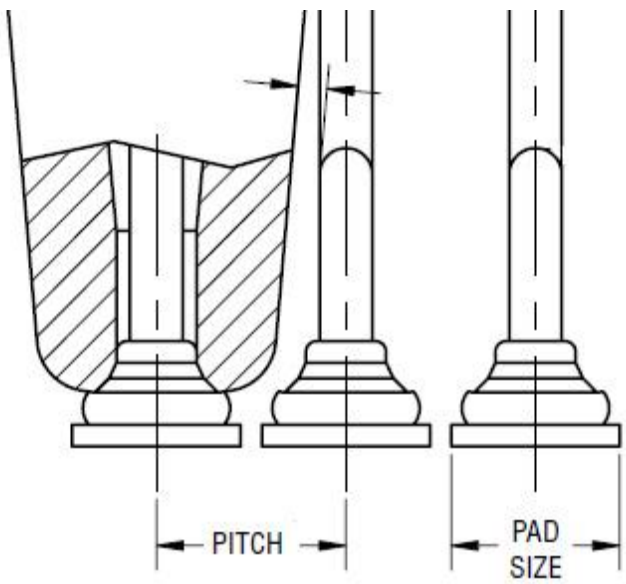
Pitch means the distance between the middle point of one bond to the next bond.

Notice: bonding is easier with bigger pitch and pad size.

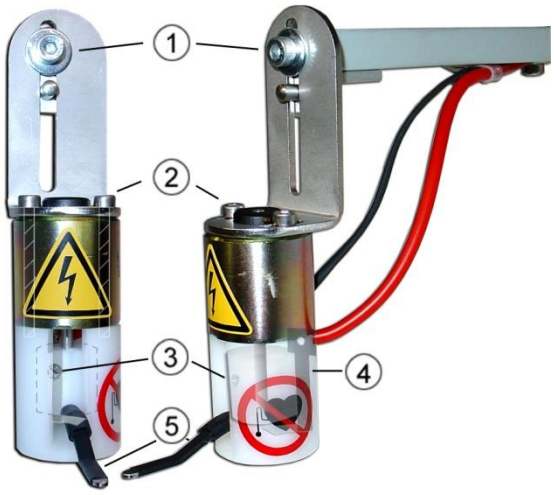
Smaller pitch and pad size is possible but you need special tools and optimize all conditions of parameter.

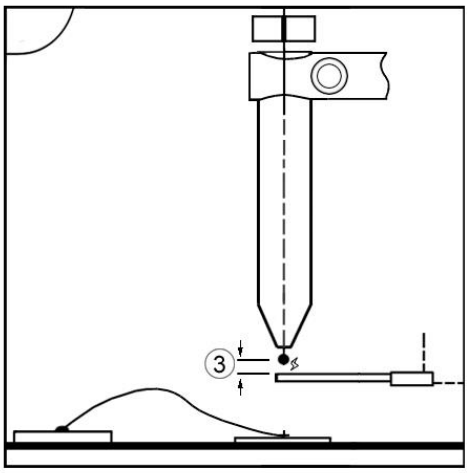
Standard Tools			
	Tool No.	Minimal Pad Size	Minimal Pitch
Ball 17µm	1572-10-437 GM	60µm Ø	120µm
Ball 25µm	1572-15-437 GM	100µm Ø	150µm
Wedge 17µm	4445-1515-3/4-CG-F-TIC	25µm x 38µm	80µm
Wedge 25µm	4445-1520-3/4-CG-F-TIC	40µm x 50µm	100µm

Fine Pitch Tools			
	Tool No.	Minimal Pad Size	Minimal Pitch
Ball 17µm	1732-10-35-437 CZ3	45µm Ø	50µm
Ball 25µm	1732-15-35-437 CZ3	80µm Ø	90µm
Wedge 17µm	4445-1307-3/4-CG-F-DSR(003x008)-W=0025-TIC	20µm x 18µm	64µm
Wedge 25µm	4445-1507-3/4-CG-F-DSR(003x008)-W=0025-TIC	30µm x 25µm	64µm



25.EFO System (only Ball Bonding HB08/10/14/16)





For Automatic adjustment press Setup Button in Menu Axis Setup
(only at Ball Bond Mode, see also page 30)

1. EFO Wand height adjustment
2. EFO Wand side adjustment
3. set screw for white small cylinder in the inside
4. plate spring for EFO power
5. EFO lever

gap between wire and EFO Wand
should be 100µ to 300µ

DANGER: Do not touch EFO Wand , 2000V discharge

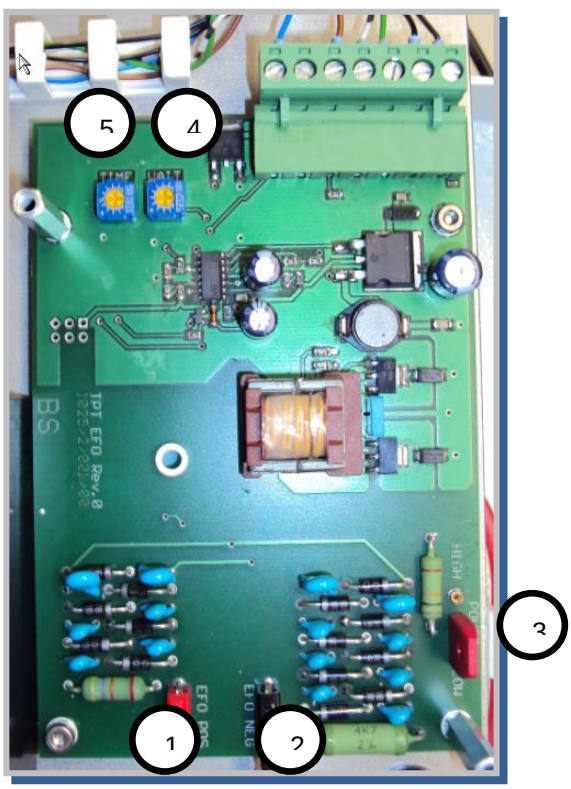
1. Positive EFO
use for 33µ wire 60% power

2. Negative EFO
use for 25µ wire 100% power

3. Jumper for High and Low Voltage

4. Wait
set a delay for EFO spark

5. Time
set the msec for EFO Power



26.Work Stage connector and Height Adjustment

1. **Switch off** the machine, then plug the work stage cable into the matching connector.

TPT optional work stage H26 is a heated work stage with provisions for both vacuum clamping and mechanical clamping. Mechanical clamping provisions allow the clamping of workpieces with dimensions of up to 40mm. Mechanical clamping adjustments are accomplished with the adjustable backstop. When the vacuum clamping provision is used, a vacuum hose must be attached to the work stage vacuum tube to provide a vacuum in the hole in the work stage top plate.

1. Mechanical clamping
2. Lose the clamping bolt to change stage height screw the bottom plate up or down
3. Vacuum Hose

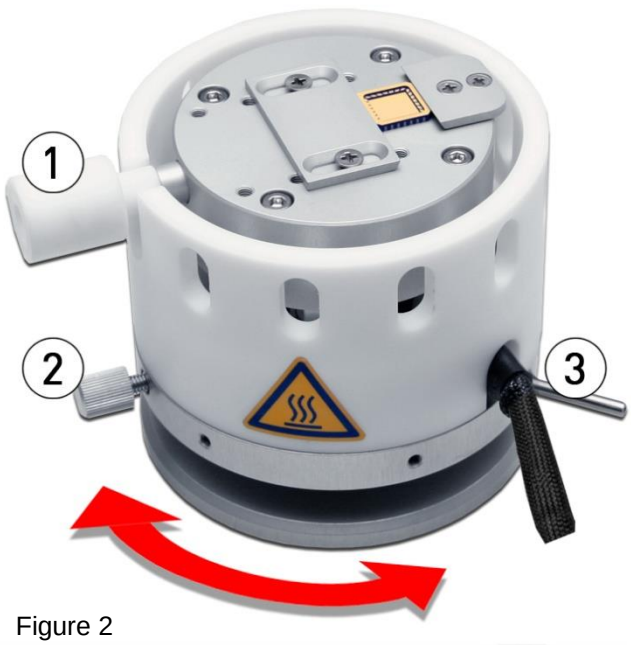
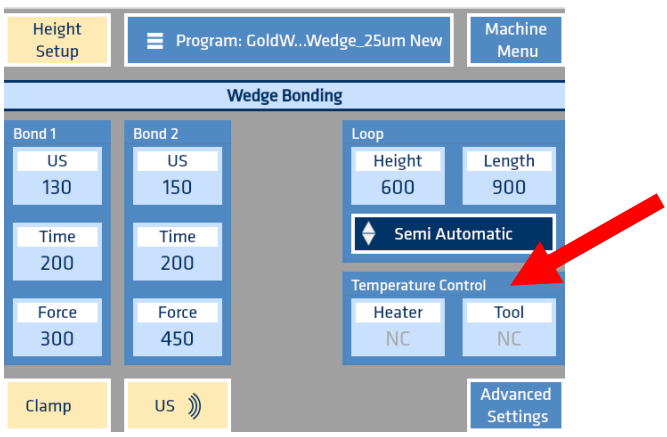


Figure 2

26.1. Temperature Controller for Work Stage & Tool Heater

To set work stage temperature (only used by Gold Wire) 120°C – 150°C



CAUTION!

The heater stage is only grounded while plugged into the bonder!

Never connect two heater stages in parallel in the front and back connectors!

Connect or disconnect the heater stage only by switching off the machine!

27.Adjust Bonding Parameter in Menu “Bond”

Ultrasonic
You can adjust the Ultrasonic settings by altering the values in the bar “U/S” in the Bond Menu. The settings can be adjusted from **0 to 2000,** displaying the relative strength of the U/S signal to the tool. The shape and the characteristics of the first and second bond differ depending on the settings. Finding the optimal ultrasonic settings, based on your application and substrate, is key to achieving good bonding performance. If the U/S is set with very low values, the strength of the U/S may not be enough to perform a bond, or it will perform a very weak bond. By increasing the U/S, the diameter of the Bond will increase too. However, setting the U/S value too high will damage the substrate.

Time
The time control sets the time for applying force and ultrasonic energy during the bond cycle. The bond time ranges from 15 milliseconds to 2000 milliseconds. However, time is not a key factor for manual bonding. For most applications, setting the time value unchanged to 200 is recommended.

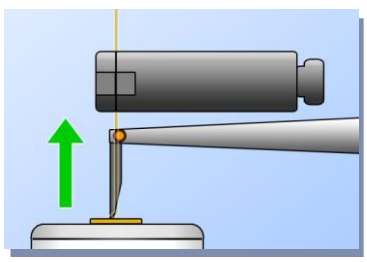
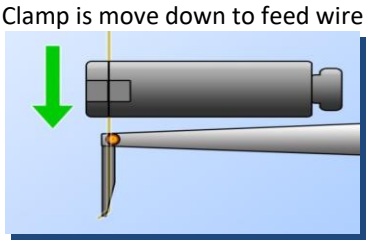
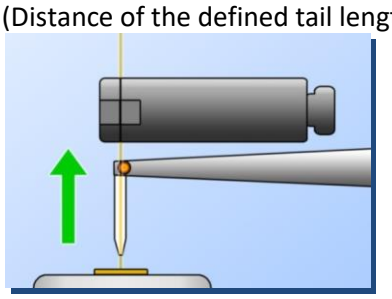
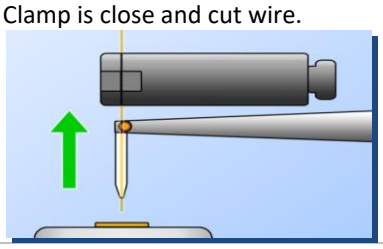
Force
The force control sets the force that will be applied to the bonding tool during the bonding cycle. The purpose of the force is to support the plastic deformation. Having set the force with too low values, it may not be enough to perform a bond. The force needed for an accurate bond also depends on the utilised wire. Therefore, we recommend starting with the force values in the “Recommended Starting Parameters” chapter. The first and second bond forces are adjustable from **15 to 150 grams**. The force generator provides current to affect the bond force. On signal from the logic control circuit, the current is supplied to the force solenoid in a cramped fashion until the set level is reached. At this level the power is held until the bond time is over. The force level and bond time can be set using the Bond Menu of the touch panel controls. To measure the static bond head force, use a gram gauge. Place the point or arm of the gram gauge at the end of the transducer. Slowly raise the gauge until the transducer lifts to determine the actual applied force.

28.Find Bonding Parameters

The next page will find start parameters for different wire sizes and bonding methods. In general, ultrasonic power has the most influence on the bond. Always start modifying US-Power first, then the Force parameter. Important is that your sample is well fixed by mechanical clamping or vacuum holder. Generally, the recommended bonding parameters can vary for the following reasons: - Bonding Tool (manufacturer, bonding foot length, wear and tear)- Epoxy (for the DIE). Bonding surface (material, roughness, surface layers) - Age of surface material (oxidation, cleanliness)- Age of aluminium wire- also, Transducer all have slight variations in frequency and resistance

28.1. Tail Parameters

Tail parameters are in the “Advan. Settings” menu.

	Clamp Feed	Table Tear
Recommended for	Wedge bonding	Ball bonding
Tail length	140-220 for Wedge bonding	400 -500 for Ball bonding
Function	After second bond clamp is close. Bondhead move up and cut wire  Clamp is move down to feed wire 	After second bond clamp is open. Bondhead move up. (Distance of the defined tail length).  Clamp is close and cut wire. 

Wedge bonding:
“Table Tear” mode for wedge bonding is useful to prevent:
Lift off of the second bond. Wire feed problems, in case wire, is stuck into wedge tool.
It can happen that aluminium wire sticks to the tooltip after bonding.
To cut wire in a backward movement, make sure the wire is straight.

Ball bonding:
For ball bonding also, the „clamp feed „mode can be used,
but the „table tear“mode delivers more repeatable results.
A case where the “clamp feed” mode may be useful is when the wire tears off after the second bond.

Ribbon bonding
If possible, use “Table Tear” mode to cut the ribbon. This prevents the second bond from lifting off and tearing the wire to the tool.

“Table Tear” for wedge bonding is only available in HB16 Bonder

Parameter Adjustment

Focusing on changing one parameter at a time is helpful, especially in the "**green**" area.

	1st action	2nd action
The wire gets cut while bonding, or the pad is damaged	Reduce the US-Power by ~10-20% regarding to the damage	Reduce the force by ~10-20%
The wire gets cut or the pad is damaged regularly	Reduce the US-Power by up to 10%	Reduce the force by ~10%
The wire is cut from time to time. There are pad lift offs from time to time.	Reduce the US power slightly	Reduce the US power slightly
The bond is well-shaped, and there are no defects or damage to either the wire or the pad.	Optimal Parameters	
There are wire lift off from time to time	Increase the US-Power slightly	Increase the force slightly
Wire lifts occur regularly. The wire is deformed only a little bit	Increase the Us-power by up to 10%	Increase the force by up to 10%
The wire does not connect to the pad. Wire lifts off immediately after bonding.	Increase the US-Power by ~10-20% regarding to the damage	Increase the force by ~10% -20%

Temperature
Most applications, using Au-wires, will benefit from a temperature increase while bonding. In general, the ideal temperature for Au-wires is between 100°C and 150 C. Please consider the applications maximum temperature, and that some parts (eg. glue) may soften at high temperature, which may decrease the bonding performance.

Ultrasonic power
The Ultrasonic power (US) is the major parameters for Ultrasonic wire bonding. It ensures the deformation of the wire and its connection to the pad.

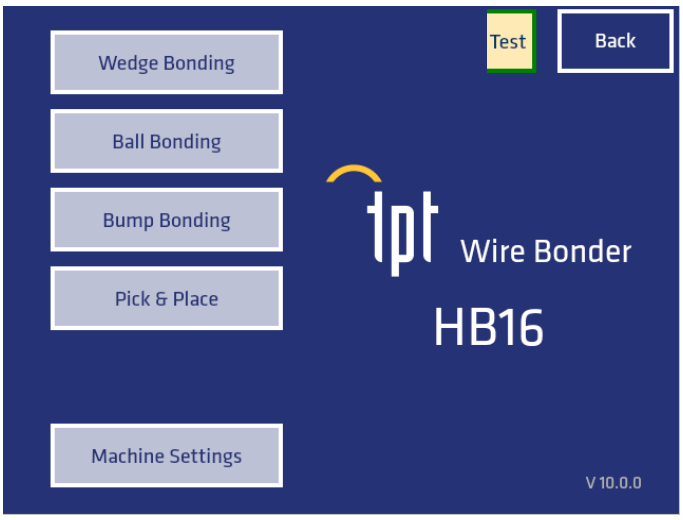
Time:
Time is one of the most difficult parameters to optimize, due to its highly non-linearity. Therefore, it is recommended to stick to a time setting and focus on US, force, and temperature.

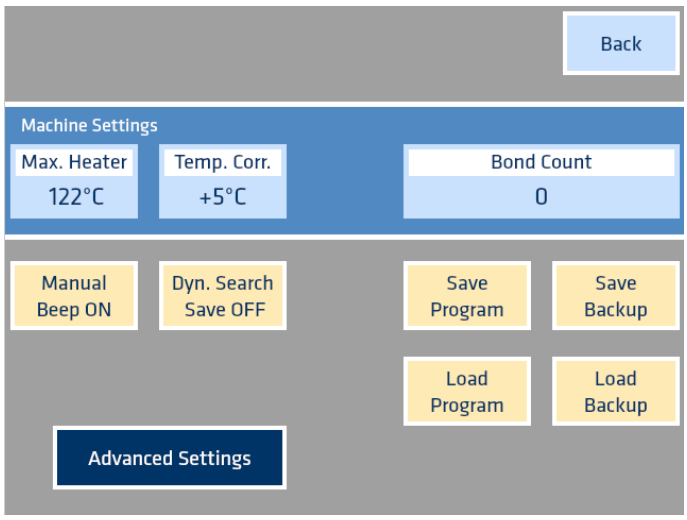
Force:
The applied force ensures the proper contact between tool, wire and the substrate, which results in good transmission of the US. Therefore, it should not be too low (min.: 200 mN for 25 µm gold wire). Make sure that the applied force is not too high, to not cut the wire.

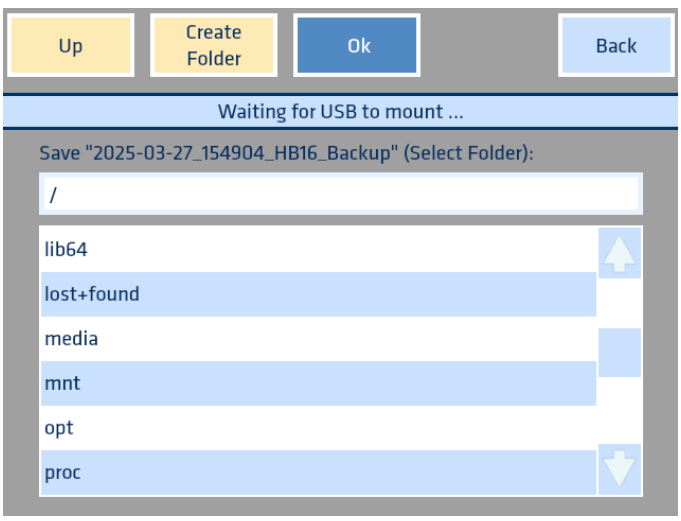
29.Program Backup

The HB16 can save/load single bonding programs or a complete list of all programs on an external USB.

The USB goes in the back of the machine.

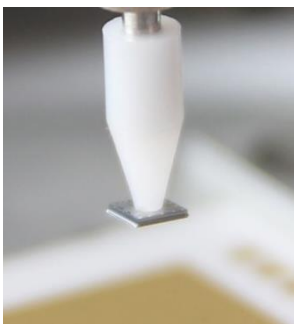




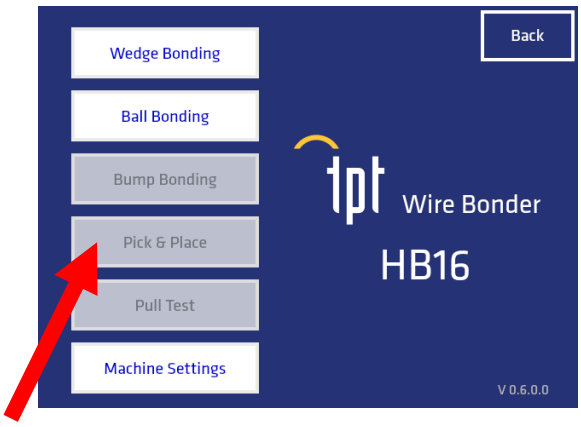


In the machine menu you can go to the machine settings and toggle on the advanced settings.
To save/load the program/backup you to go to **/mnt/usb** and click “OK”.

30. Option H80 "Pick and Place"



Switch Bond Mode to "Pick and Place" and connect Vacuum Pump Tube



31. Epoxy Stamping Pot

adjusting Blade height
Loosen set screw

Turn screw to adjust Blade height

360° turn is 500µm
180° turn is 250µm
90° turn is 125µm

Clean
Loosen set screw

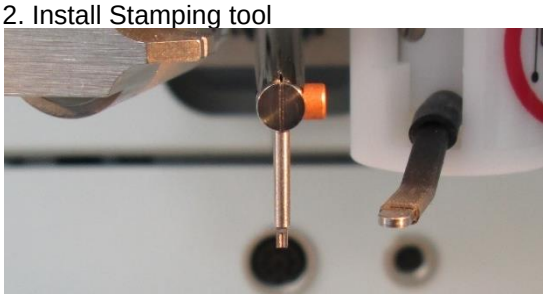
remove cam to clean

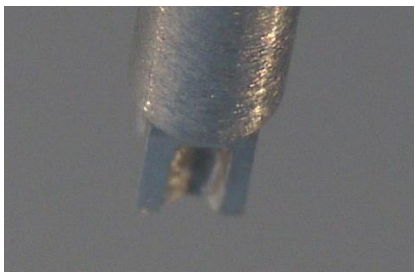
It is possible to clean the aluminum pot with acetone and other solvents.
It is also possible to remove the pot complete for cleaning.

32. Pick and Place sequence

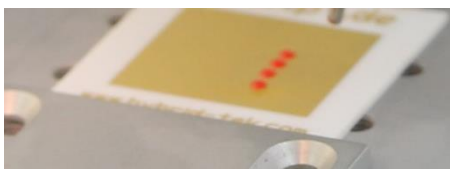
1. Prepare holder and fill glue to epoxy pod.

2. Install Stamping tool

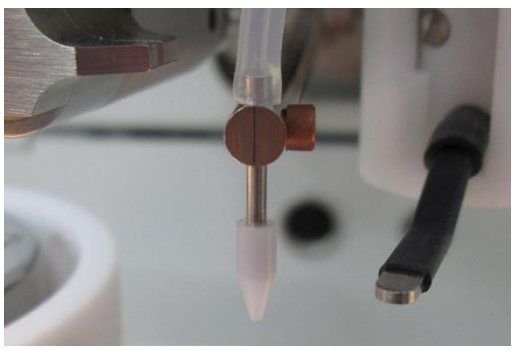




3. Make Height setup from epoxy to surface.
4. Stamp epoxy to your surface. Stamping is possible with „semiautomatic“ and „manual“ mode.

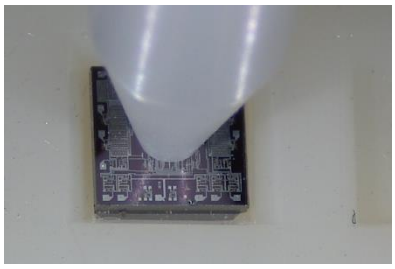


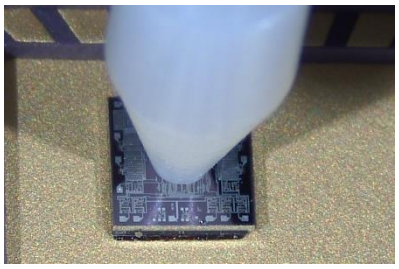
5. Install Pick and Place tool and connect vacuum tube



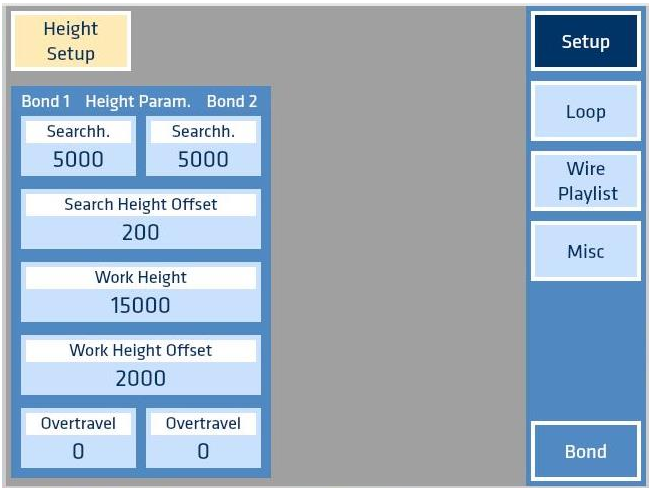
6. Check parameters: .
Important: loop height have to be high enough (4000µm) and Y-way is "0"

7. Make Height setup from chip to surface. **Important: add chip height to surface height.**





8. Pick and Place is with "semiautomatic" and "manual" mode possible
Important: "Full Automatic" mode is not working



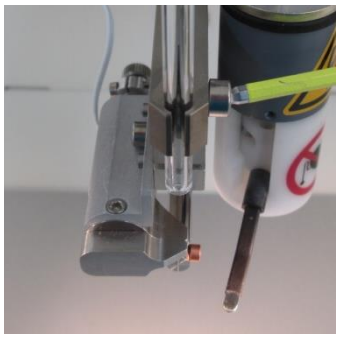
The Parameters are the same as wire-bonding, although ultrasonic energy is only needed to vibrate the die into the epoxy (normally not needed).

33. Option H53 "Pull Tester"

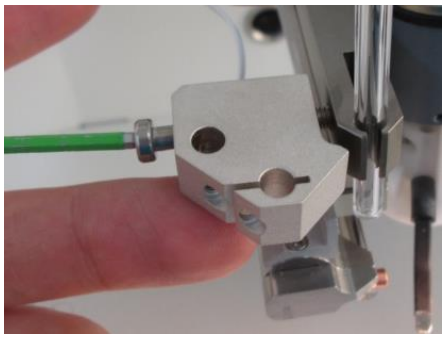
Mechanical pull tester for destructive bond tests
Installation on bond head with easy take on & off
Works on the complete bonder range HB02 - HB16
Measurement gauges max.15g or 30g

Installation Holder for Pull Tester

Remove screw at glass tube



Install holder with long screw

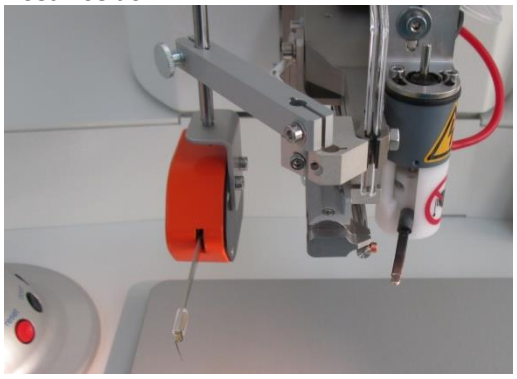


Secure glass tube with M4 nut

attach Pulltester arm to holder and tighten M2 screw

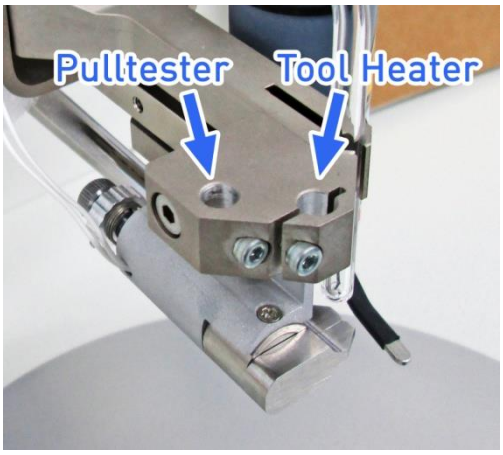
Test Position

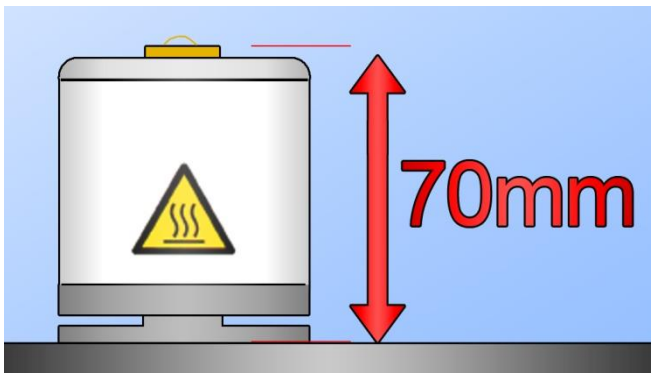
Rest Position



Installation of Pull-Tester

1. Mount the pull-tester like shown on the pictures
2. The pull-hook has to be adjusted close below the bonding tool.
3. Set height from stage to 70mm.

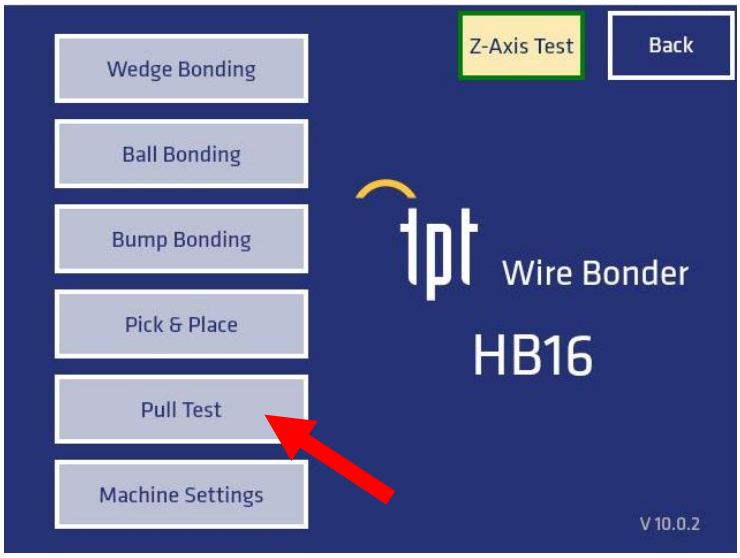


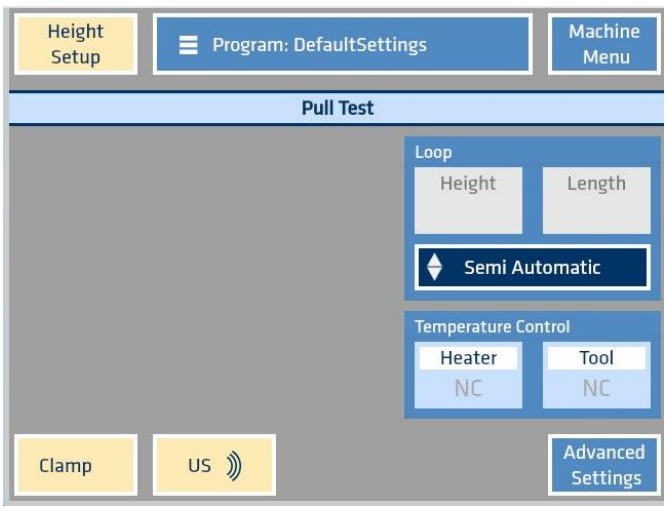


Operation of Pull Tester with manual-Z (HB10/HB16) or Z lever (HB05)

1. The pull-hook is moved with H51 manual-Z (HB10/HB16 only) or the Z lever (HB05).
2. Move it below your wire bond
3. Then move carefully up until the wire breaks.
4. Now you can read the breaking load at the force gauge. The unit is grams.
5. Finally reset the clock by returning the red pointer back to zero.

Operation of Pull Tester without manual-Z or Z lever





1. Switch bond mode to “**Pull Test**” in machine menu.
2. Enter the value for the Searchheight (height setup is only possible with bonding tool).
3. Pressing the “Bond” button on the puck will move the bondhead to the **Searchheight.**
4. You can move the bondhead with the **“Up”** and **“Down”** button on the **puck**.
   (or with the H52 Dynamic Search)
5. When the pull hook is under the bond press the “**Bond**” button again.
6. The bondhead will go back to **Work Height** and you can read the beraking load on the gauge.

34. Option 85-1 "Digital Camera"

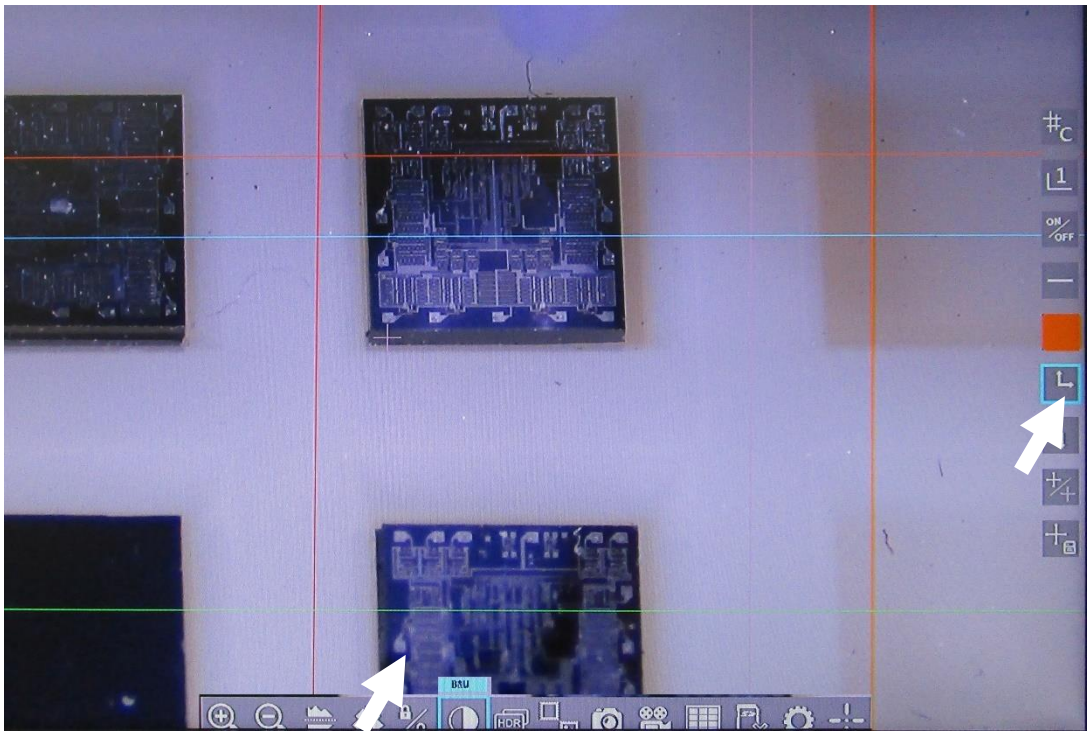
Functions:

- Full HD resolution
- Make pictures to SD cards
- Make videos to SD cards
- Crosshair for targeting
- Full control of camera settings
- Works also as USB camera

Connect a mouse to USB.

Move with mouse to lower screen border to open function menu.

If you switch on cross hair you can adjust settings at the left screen border.



35. Bump bonding

You can use standard Ball bonding tool for making Bumps.
The Ball size depends at Tail length, EFO power and wire size.
Recommended are: 400 Tail length, EFO power 90%

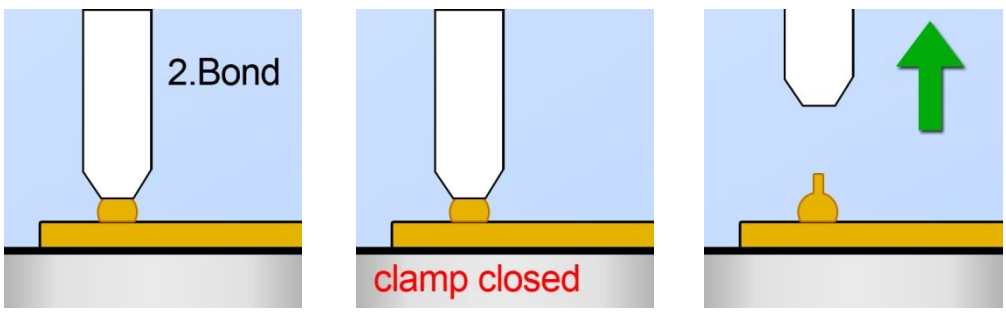
The ball size will never be smaller than three times wire size.
Example: for 25µ wire diameter it is minimal 75µ diameter Ball
The final Bump size depends to the bond parameters and bump tool.
In any case it will be bigger than the Ball size before bonding.

The Pitch (distance from Bump to Bump) depends to the bond tool.
There are special Bump tools for fine pitch and easy targeting.
Recommended tool: H61-17B 1732-10-16-437 for Bump bonding

There are two possibilities to make Bumps:

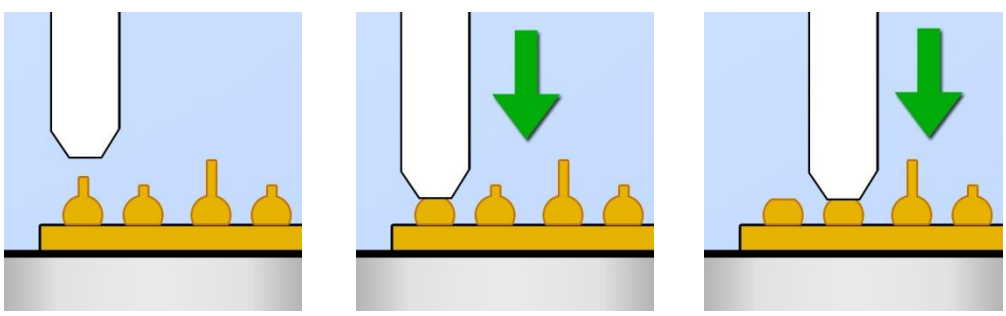
a) Bump with Tail and Coin Tool.

Change bondmode to "**Ball Bump**".
Then you can do only the second Bond.
Now at second Bond are the parameters for the Bump bond.
After the Bump bond the wire will be cut and the next Ball will be made.



The wire will be break near above the Ball.
Some wires like **HD6** from Hereaus are more constant about break point.

If you need flat Bumps you have to use a coin tool after making the Bumps.
Coin tool is complete flat, with no hole.
It depends at your application if you need a tail above the Bumps.



36.Bumps without tail.

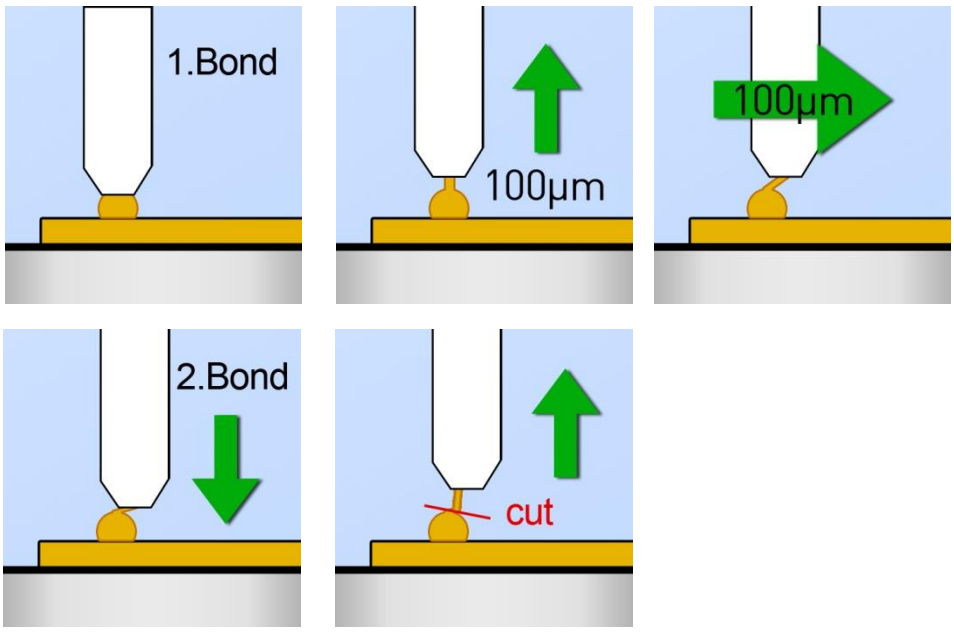
Go to standard Ball bond mode and program a standard Ball-Wedge bond.

To get a Bump without a tail you have to make a small groove to the wire at tip of the ball.
To get this small grove you have to make the second bond with very less parameters on the Ball.

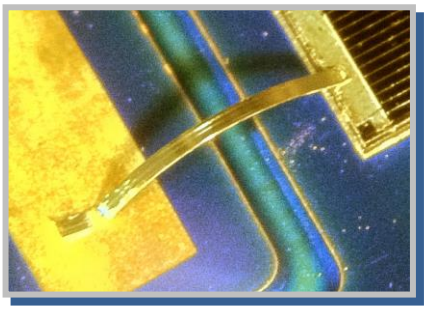
Use a Tail between 400 and 500 and **TableTear Mode**.

Parameters for second Bond: 80 US / 200 Time / 150 Force
Use a Loop Program with: 100 Up / 100 Forward
Loop Program can be varied. Up to: 140 Up / 120 Forward

Second Bond parameters are critical for Bump height.
You have to try different Loop parameters and bond parameters to get a good and constant result.



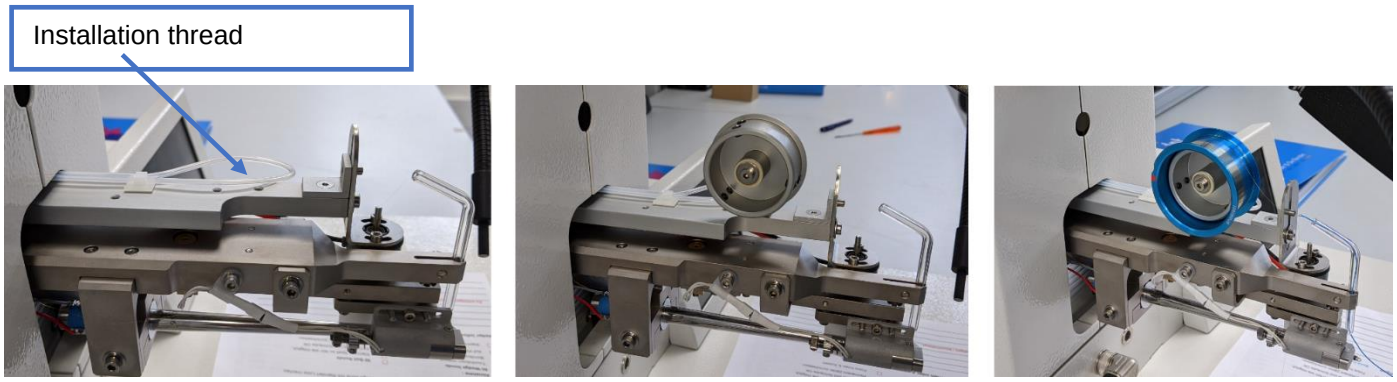
37.Ribbon bonding



Ribbon bonding is kind of wedge bonding, therefore please use a wedge bonding-program on your TPT bonder to process ribbon wires. In addition to the ribbon wire, a matching ribbon tool is required.

37.1. Preparation:

It is recommended to use the manual ribbon spool adapter (H72-2).
The wire adapter will be installed on the lever the EFO is attached to.



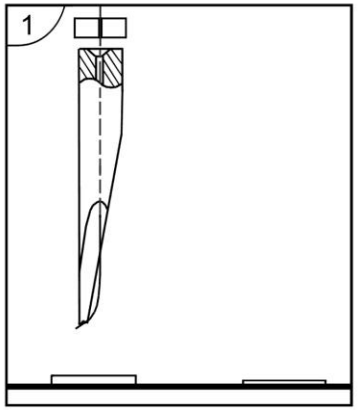
After screwing the adapter to the installation thread, please attach the ribbon spool to the adapter. Make sure the wire rolls of from the top side. Pull the ribbon through the glass tube by using the hook.
The ribbon tool is installed like any other wedge tool. Make sure that the flat surface is perpendicular to the transducers gap and flush on the top side (see Manual p.10).
Feed the ribbon wire through the tool, please note that the guide on the tool tip is a rectangular and not a whole like on standard tools. Therefor it is important to watch for the ribbon's orientation.

37.2. Parameter

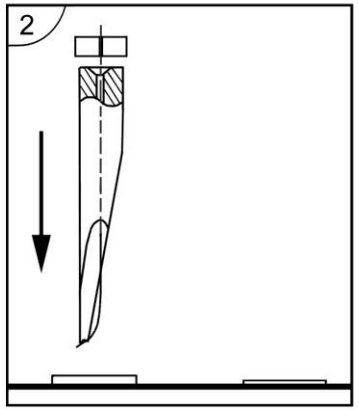
The parameters are highly dependent on the application as well as the used ribbon wire and tool combination. As starting parameters, you can choose the following.

Gold ribbon	13x76 µm²		20x200 µm²		25x250 µm²	
	1st Bond	2nd Bond	1st Bond	2nd Bond	1st Bond	2nd Bond
USG	600	700	1500	1700	1800	1900
Time [ms]	200	200	200	200	200	200
Force [mN]	450	450	750	800	800	900
Temperature [°C]	100		100		100	

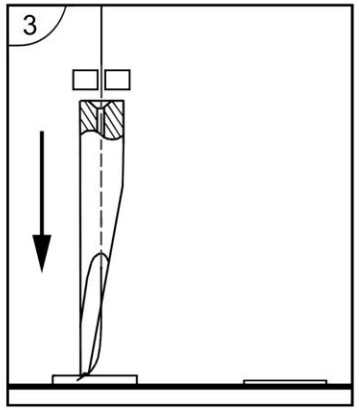
The listed parameters are only starting values and can differ in both directions. Please check for bonding performance and adjust the parameters if needed.



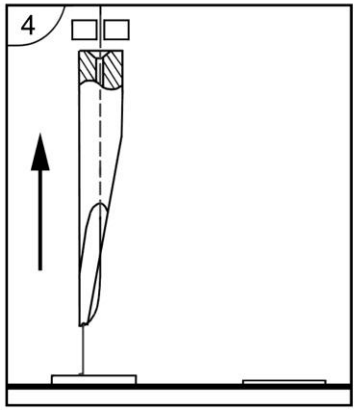
1. Start Position
Operator positions target under spotlight. Clamp is closed



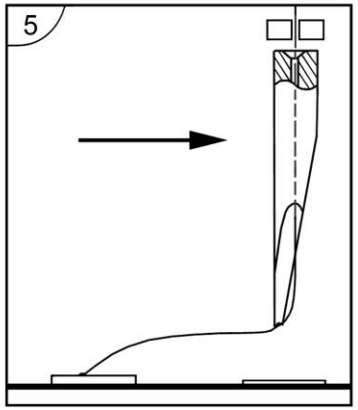
2. Operator holds down Control Puck Start button
Bond Head travels down to 1st.search height
Operator repositions target if necessary.



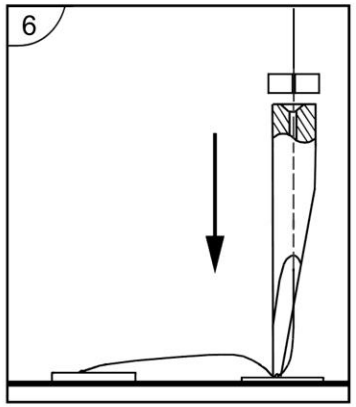
3. Operator releases Control Puck Start button
Bond tool descends to 1st. Bond TDSW activate all Bond Parameters



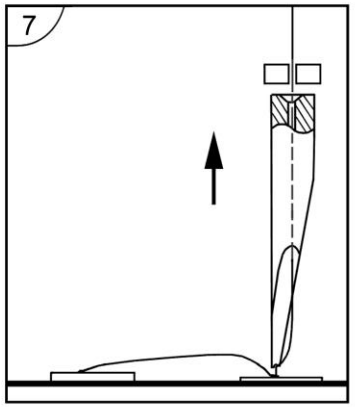
4. clamp opens and tool rise to loop height



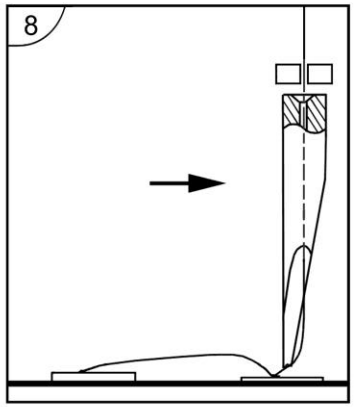
5. Operator positions 2nd target under spotlight
and/or Y-Table moves to programmed position



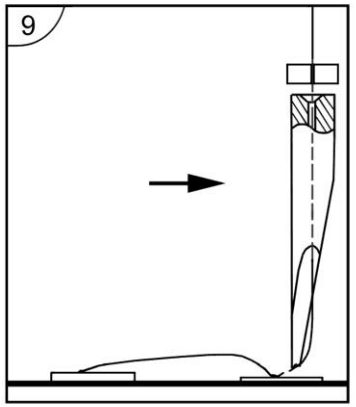
6.Operator holds down Control Puck Start button. Bond Head travels down to 2nd .search height. Operator repositions target if necessary..
Operator releases Control Puck Start button. Bond tool descends to 2nd Bond .TDSW activate all Bond Parameters



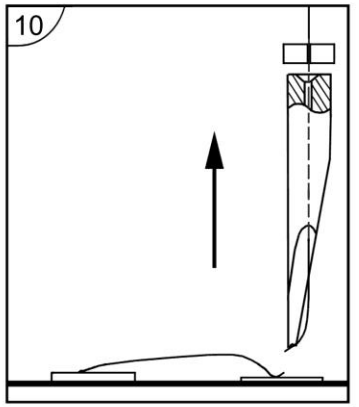
7.Tool rise to programmed Tail up (clamp open) position



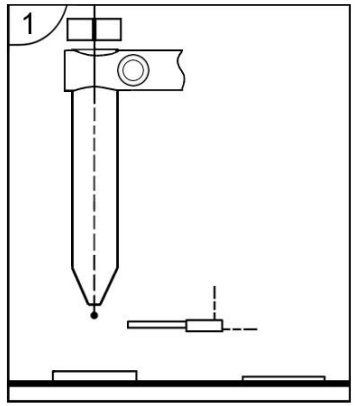
8. Tool moves to programmed Tail y-way (clamp open) position



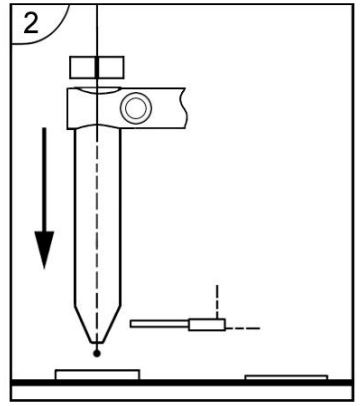
9. Tool moves to programmed Tail y-way (clamp closed) position



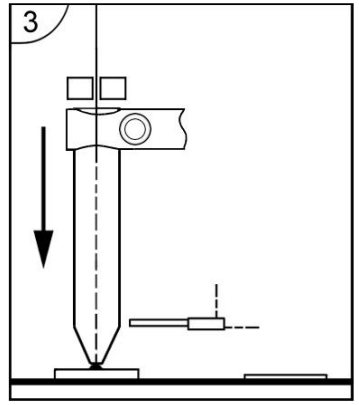
10. Tool moves to programmed Work height position



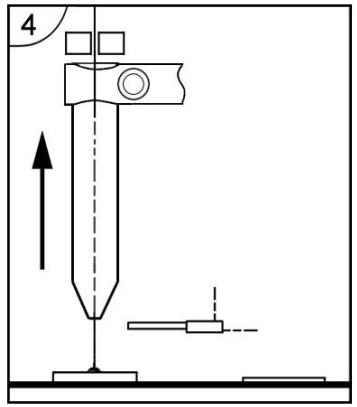
1. Start Position
Operator positions target under spotlight. Clamp is closed



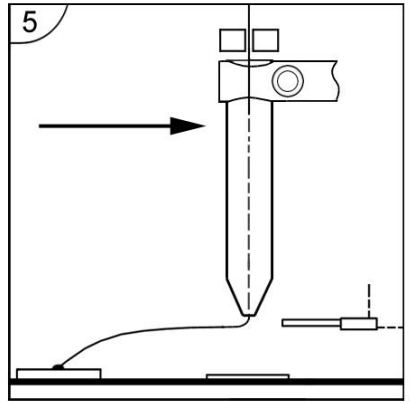
2. Operator holds down Control Puck Start button , Clamp opens
Bond Head travels down to 1st.search height
Operator repositions target if necessary.

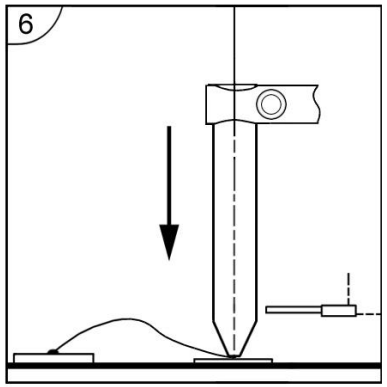


3. Operator releases Control Puck Start button
Bond tool descends to 1st. Bond
TDSW activate all Bond Parameters

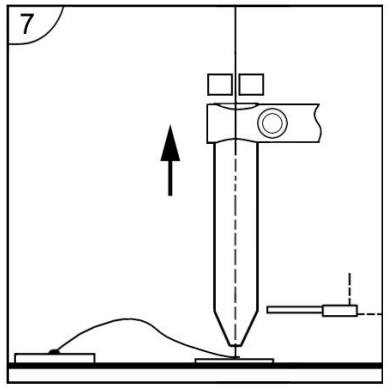


4. after Bond tool rise to loop height

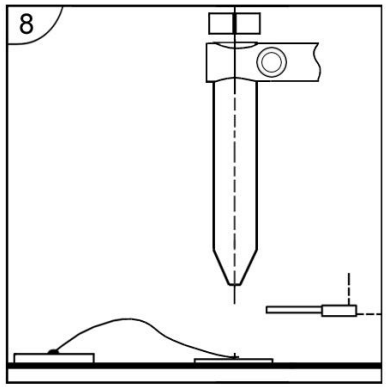




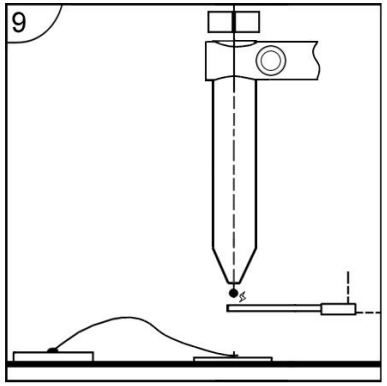
6. Operator holds down Control Puck Start button
Bond Head travels down to 2nd .search height
Operator repositions target if necessary.
Operator releases Control Puck Start button
Bond tool descends to 2nd Bond
TDSW activate all Bond Parameters



7. Tool rise to programmed Tail up (clamp open) position



8. Tool moves to programmed Work height (clamp closed) position



9. **EFO Wand moves under Tail (Wire end)** and forms Ball

39. Ultrasonic Generator

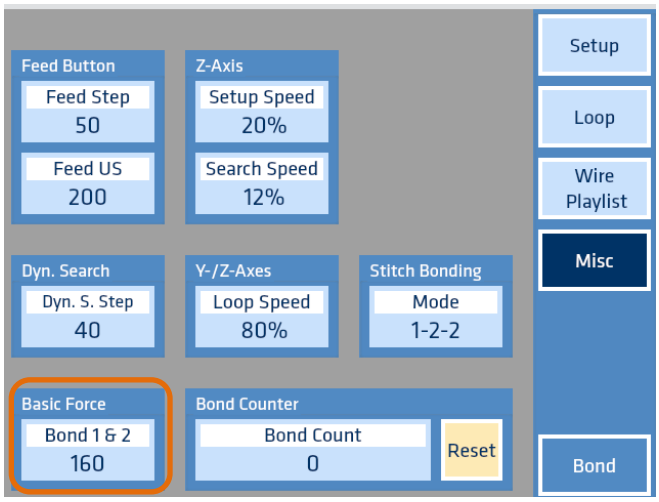
The signal from the logic control circuit, the ultrasonic generator provides 62 kHz power to the transducer at a level set on program. The ultrasonic energy is applied until the bond time is complete. (PLL) phase loop lock system is provided to insure work piece coupling, and to maintain transducer operation at the specified frequency.

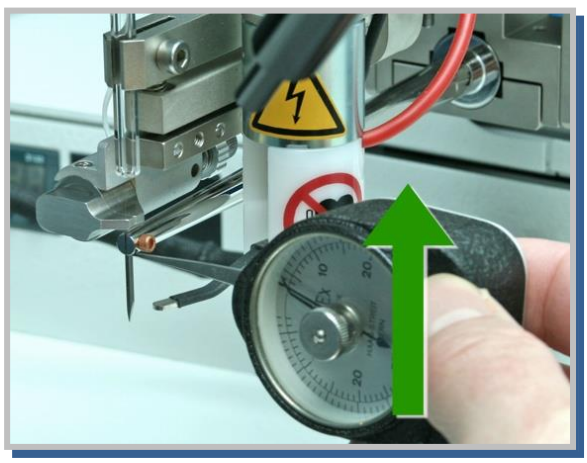
40. Force System

The force generator provides current to effect the bond force. On signal from the logic control circuit, the current is provided to the force solenoid in a ramped fashion until the preset level is reached. At this level the power is held until the bond time is over. The front touch panel controls preset the force level and bond time.

41. Basic force adjustment

The basic force (force which is applied during touch down) can be adjusted directly in the bonders software. Please navigate to the “Misc” tab in the advanced settings section. The button is in the left bottom corner, and the force is given in [mN]

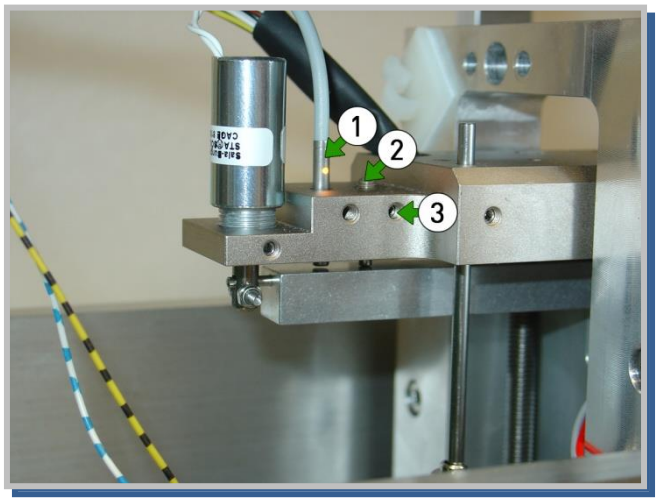




A gram gauge is used to measure the static bond head force. Place the point or arm of the gram gauge at the end of the transducer. Slowly raise the gauge until the transducer lifts and a gauge reading is required to force.

42. TDSW Touch Down Switch adjustment

If Z-movement does not work please check TDSW (touch-down-switch).
Yellow light must be on, that means ready for bond (no touchdown).



1. TDSW Touch Down Switch
2. Stop screw
3. Set screw for stop screw

Figure 23 TDSW Touch Down Switch

To adjust TDSW open set screw (3) screw and adjust stop screw (2) until light is shine from TSDW (1)

43.Stitch Bonding with foot switch or Dynamic Search

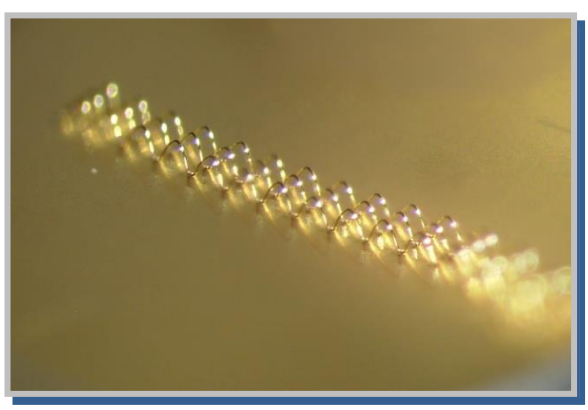
Stitch Bonding is option H58

The wire bonder has basic 1-2-2 and 1-2-1 and 1-1-2 bond parameter capability. In 1-2-2 stitching mode, the first bond parameters are applied for the first bond, and second bond parameters are applied at subsequent bonds. Stitch Foot switch is connected on back of Bonder.
I

When the Foot switch is actuated **after first bond**, the bonder will not terminate the bonding cycle after Foot switch is released.

Footswitch

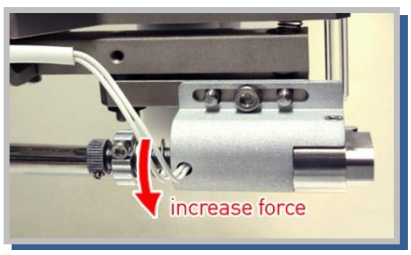
Stitch bonding

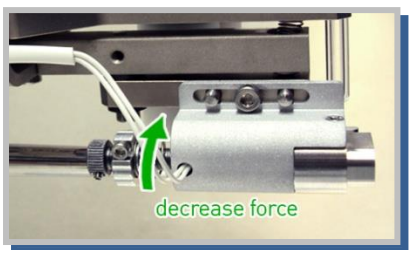


44. Wire Clamp

There is no convenient way to measure the clamp force. The user must therefore be alert to deformation of the wire to identify excess force. When force is inadequate, the wire clamps will not hold the wire in the tool during closed clamp conditions or will not break the wire after second bond.

Clamp force adjustment





Clamp gap adjustment

Clamp is not open.
- open set screw for gap adjustment and increase the gap size.
- check clamp connector

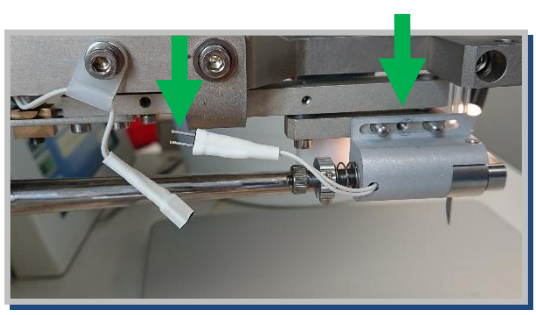
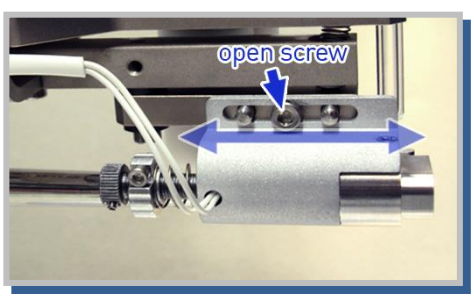
Clamp is not closing
- check clamp force, increase clamp force
- open set screw for gap adjustment and increase the gap size

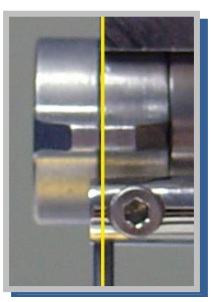
Clamp is damaging the wire
-Please decrease clamp gap to the smallest possible size.

To clean wire clamp increase gap to 2mm, use alcohol or acetone to soak a clean paper, put this paper in clamp gap, close clamp and pull the paper down, repeat that 5 times.

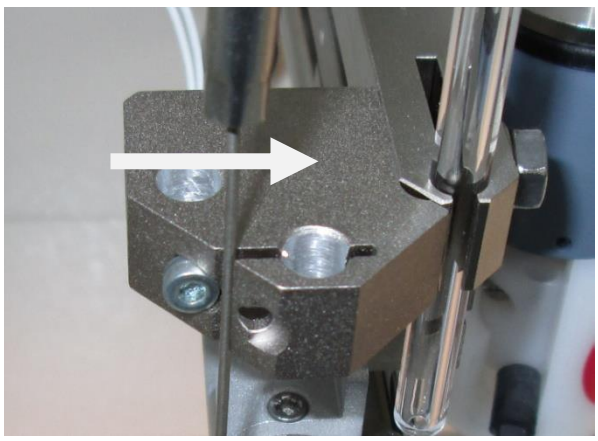
Exchange wire Clamp
- disconnect clamp wire connector
- open screw

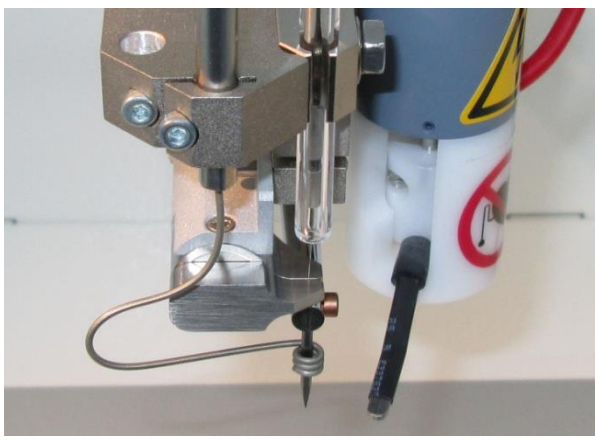
-exchange wire clamp
-align clamp to center of bonding tool
-the wire need to be straight between clamp and bonding tool.

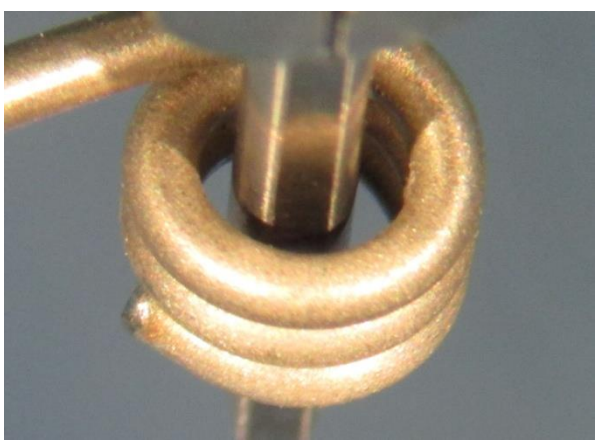


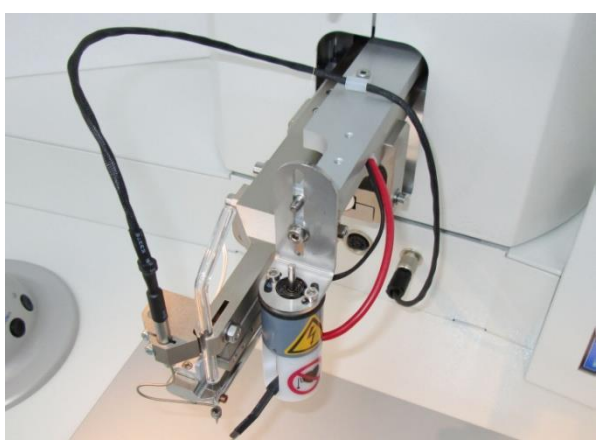
- Mount the Tool Heater Holder like shown on the pictures.
- Remove screw and install tool heater.

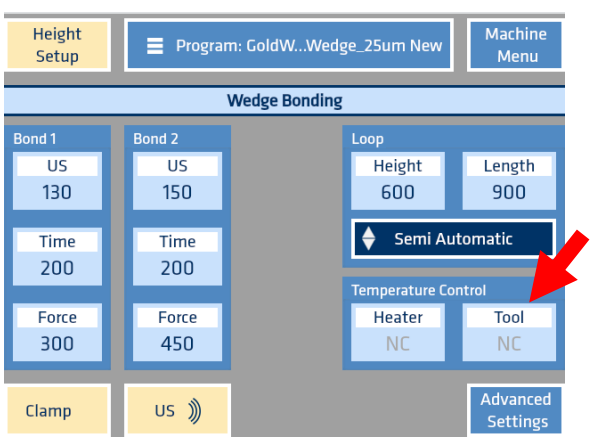




- Make sure Heater Coil is not touching bond tool.







Connect Tool Heater to connecter and program temperature in TFT Display

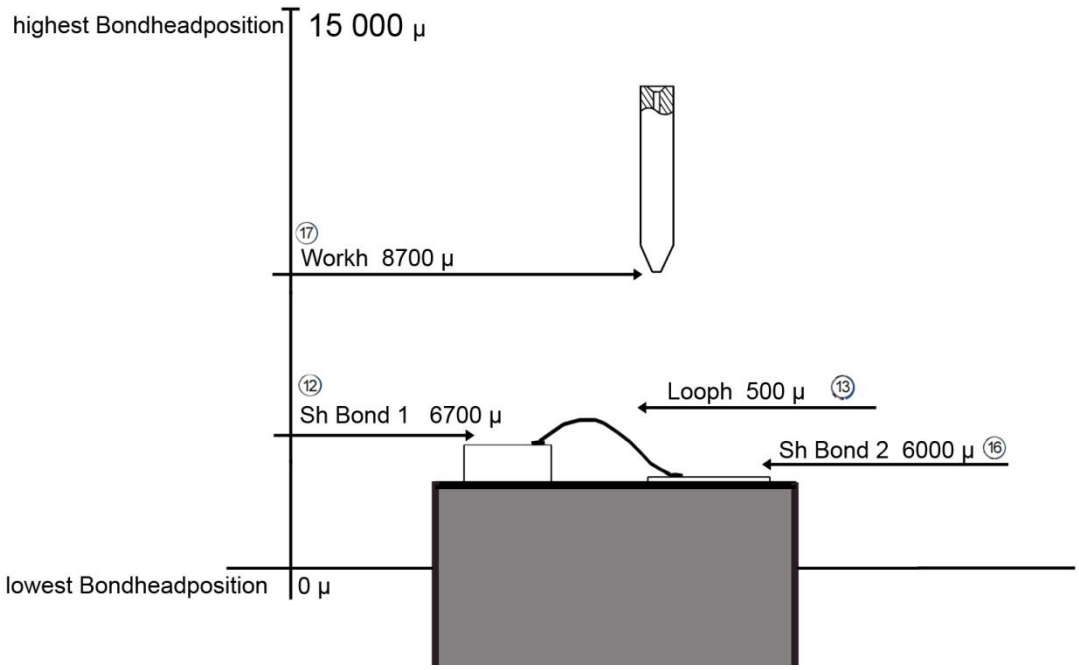
46.Troubleshooting

Troubleshooting for bonding problems see section
“Wire Bond Technology”

HB Bonder technical problems:

Symptom / Error Message	**Cause / Corrective Action**
A. No Bond Head movement Adjust TDSW switch (Page 29)	switch Bonder Off/On Switch to Menu “Bond”
B. No Ball after Bond	Check if ON/OFF in Menu Config Tail is ON Check gap between wire and EFO Wand (for 25µ wire 100 to 400 µ)
C: Low EFO Power (Page 19)	EFO Board has No Ground screw
D: Tail is moving sideways under Wedge Tool	Tool longer as 19 mm Hole in Wedge to big Clamp defect Wedge defect
E: Error no USG found using Demo Mode	Transducer not connected on US Board US Board Defect D-Sub Connect Bond head not connected 24V missing Motherboard Defect
F: Set up error, using defaults	Bond level to deep
G. “Setup. Offset.WB” not found in File	Wrong Software in use

47. Height Setup in Menu Bond and Setup



Height Setup Button is used to find automatically
Search height for 1st and 2nd Bond and Work height.

Setup procedure:

1. Press Height Setup Button (Page 11)

2. Press Start Button on Control-Puck (Page 23 Figure 15-1)
Bondtool is moving to 1st Bond level .
Measured Height plus 200 is Displayed in “Sh Bond1 “ in Menu Setup

3. Press Start Button on Control-Puck (Page 23 Figure 15-1)
Bondtool is moving to 2nd.Bond level
Measured Height plus 200 is Displayed in Sh Bond 2 in Menu Setup

4. *At Ball bonding Mode Press Start Button again*
Work-Height = Measured EFO Arm distance to Bondtool

5. Loop Height will not change at Setup procedure
6. Work-Height is set automatic to 2000 after Bond level

Set up procedure can be done every time

All changed program values are automatically saved in the displayed program.

90° Wedge Tool

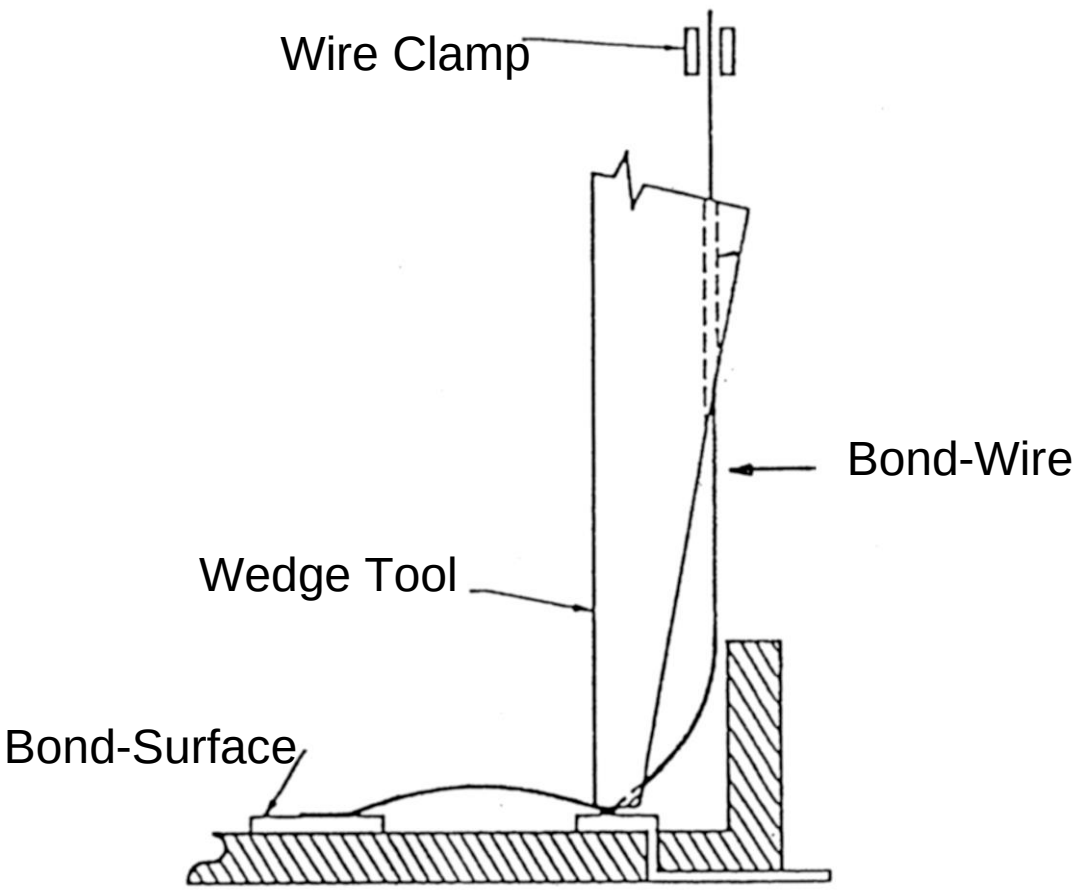


Figure 11

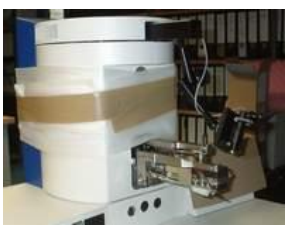
49. Packing Instructions

1. Remove from Bonder:

A. Bondtool (wedge, Capillary)
B. Bond Wire
C. Glass wire Guide
D. Dual Fiber Optic Illuminator
E. Microscope with Holder
F. Laser Spotlight targeting system
G. Heater Stage
H. Remove Control - Puck
I. and any other options from Bonder.

2. Secure the work plate by inserting the Table Lock Screw. Tighten softly the screw to secure the work plate.

3. Secure Display with Carton
4. Secure Tower-Cover with soft foam
5. Secure between Transducer and clamp with foam



6. Carefully move Bonder in wooden box

Pack accessories (i.e., work stage, microscope, illuminator, eyepieces, etc.)
Position these items at suitable locations around the sides Of the bonder so that they are secure from movement and so the to foam cover can be installed.

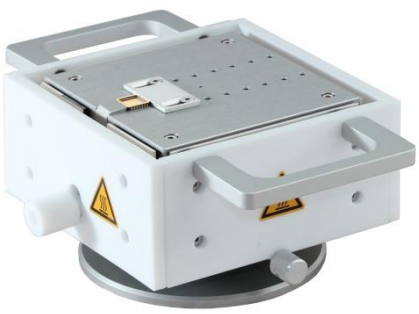
Place the foam cover around and over Bonder .

7. Position and bolt the wooden cover on to the crate.

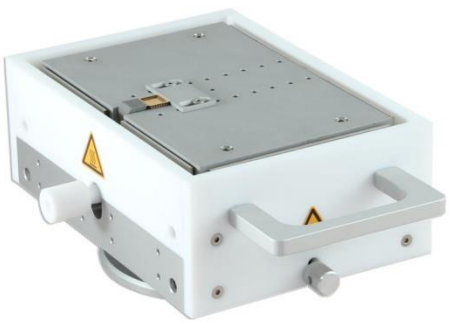
50. Heater Stage

H26
hot plate: 60mm diameter
temperatur range: until 250°C
height adjustable from 65mm to 80mm
dimesion: 75 mm diameter

H29
hot plate: 90mm diameter
temperatur range: 250°C
height adjustable



H21-250
heating plate 100 x 100 mm
temperature range until 250°C
height adjustable from 65 to 80 mm
dimension 125x125mm height 65-80mm



H22-250 hot plate 100 x 150 mm

temperature range until 250°C
height adjustable from 65 to 80 mm

51. Laser Spotlight (Option H50)

Mount the Spotlight holder on the Microscope holder Figure 1 (3)
Beam-Distance to Bondlevel is about 100 mm
ATTENTION ! Don't stare into the beam. Direct viewing into the beam or reflected beam can cause permanent eye damage. Laser class 2 / Po = 1 mW / r = 635 nm

Adjust Spotlight focus
Switch light off to locate Laser spotlight.
Loose Knob (1) for rough adjustment.
If you don't find a red point the distance from laser to surface is wrong.
If the point too big adjust the distance by move laser up or down.
(picture 1 / 2)

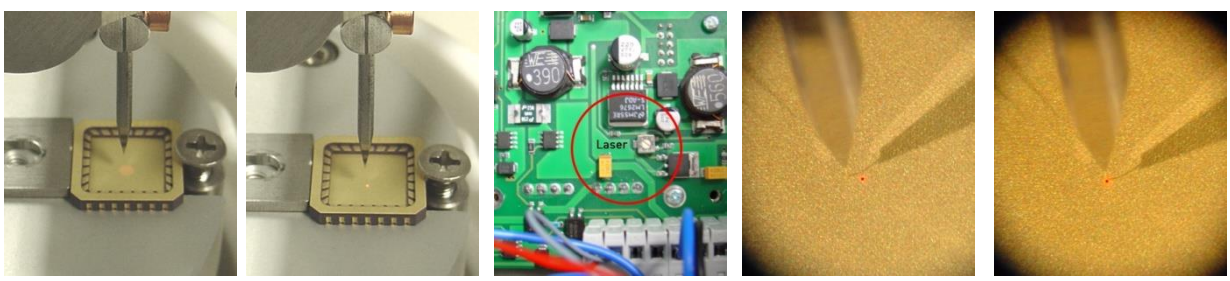
If necessary adjust voltage on power supply for more or less brightness. (picture 3)

Adjust Spotlight to correct position
Do first bond without y-way and
adjust with screws (2 /3) Laser Point to the Bond.
(picture 4 / 5)

To focus spot adjust knurled screw (4)

If you do not can find the laser point, please darken the room.
The Laser has the focus point on 100mm. Move from the laser surface with the laser up, around 100mm you should see a tiny dot.

Picture 1 Picture 2 Picture 3 Picture 4 Picture 5



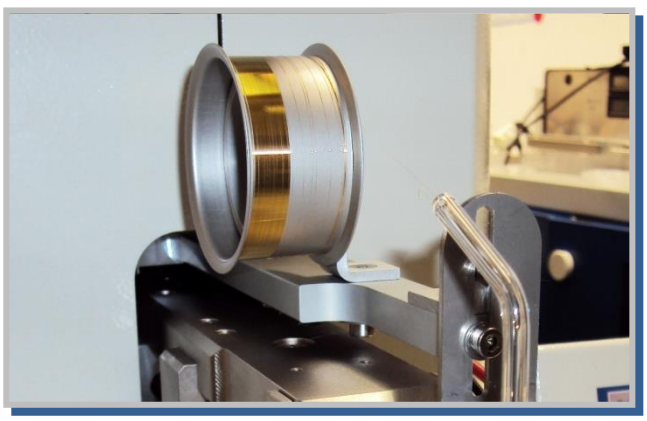
52. Manual Wire Spool 1/2" and 2"

1/2" manual Wire Spool (Option H72-1)

please install spool holder like the picture shows.

2" Manual Wire Spool (Option H72-2)

please install spool holder like the picture shows.

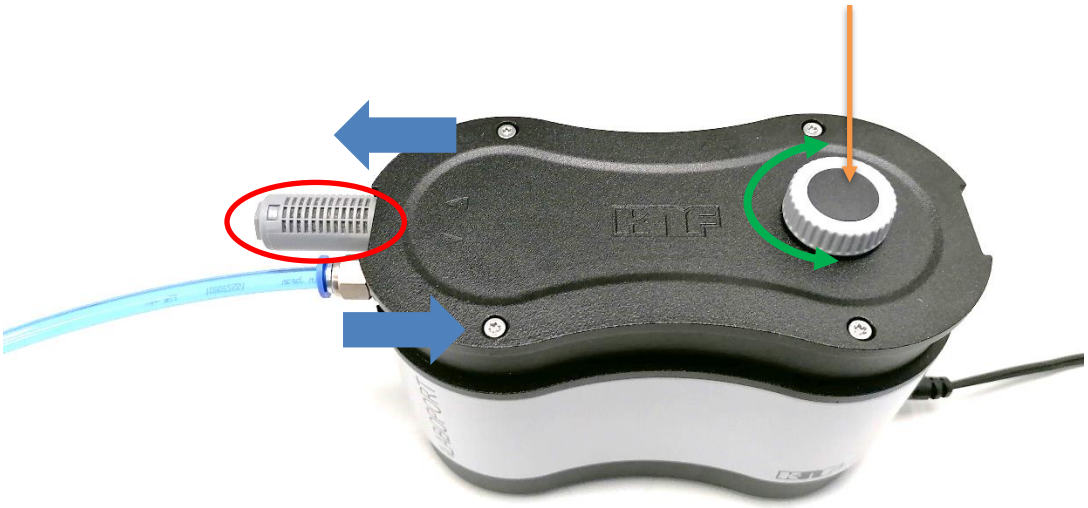


52.1. USB Stick

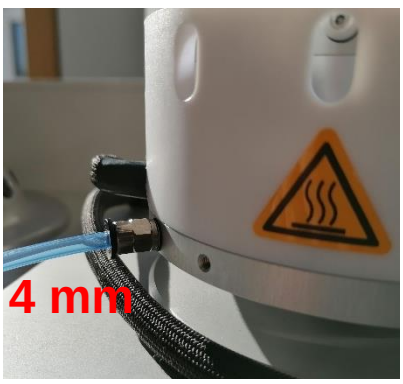
1. USB Stick must insert before Power ON Bonder
2. Only Remove USB Stick after Power OFF Bonder
3. Use only USB Stick with max. 1 GB
4. USB Stick must be 1.1 compatible

53.Vacuum Pump (option H76)

The vacuum pump is optional and can be used for all standard heater stages or for the Pick and Place option H80.



The pump can be used for **vacuum or pressured air**, has a **silencer**, and can be regulated by a **rotating knob**.
To **turn on/off** the pump press the rotating knob.



The tube coming out of the **pump** has an outer diameter of **6mm**. The **Pick and Place** option needs the same size of tube (**6mm** outer diameter). The **Heater Stages** need a tube with outer diameter **4mm**.