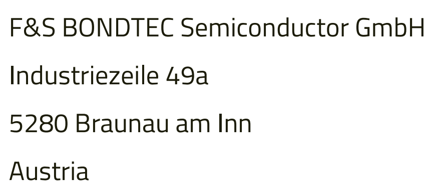
Series 56XXi

F&S BONDTEC Semiconductor GmbH

User Manual BONDSTAR 2.0



F&S BONDTEC Semiconductor GmbH

Industriezeile 49a

5280 Braunau am Inn

Austria

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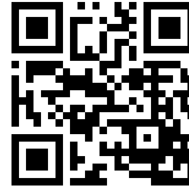
1) General Information

1.1 Applicability of this User Guide

1.1.1 Manufacturer´s Address

>> F&S BONDTEC Semiconductor GmbH
>> Industriezeile 49a
>> A-5280 Braunau
>> Austria
>> Phone: +43-7722-67 05 2 - 8270
>> Fax: +43-7722-67 05 2 - 8272
>> http://www.fsbondtec.at



1.1.2 Scope of Supply

The scope of supply is:

>> Bond head
>> Accessories (as listed on delivery note)
>> Documentation

1.1.3 Nameplate

The nameplate is located on the right-hand side of the machine. Always quote the serial number in all correspondence relating to service. The serial number appears again on a second, separate plate affixed on the same side of the machine.

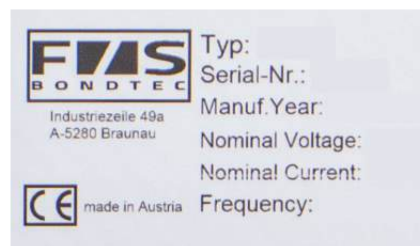


Figure 1.1. - 1 *Nameplate*

Figure 1.1. - 2 *Serial Number*

1.1.4 Guarantee, Warranty and Liability

The general terms and conditions of sale and supply of F&S Bondtec invariably apply. A copy of these general terms and conditions is placed at the purchaser's disposal on conclusion of the contract or earlier.

Claims under guarantee or warranty and claims for liability for personal injury or damage to property are inadmissible if one or more of the following is causal:

>> Utilization of the machine for other than the use as intended by the manufacturer
>> Incorrect assembly, commissioning, operation or maintenance
>> Non-compliance with the User Guide

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>> Operation of the machine despite defective or inoperational safety devices or protective facilities
>> Post-specification structural alterations
>> Post-specification changes to the drive (power, speed, ...)
>> Inadequate monitoring of machine components subject to wear
>> Incorrect repairs
>> Catastrophes, influence of foreign matter and acts of God
>> The installation of any programs
>> Network connection during operation

Alterations, additions to and conversions of the machine undertaken without the prior approval of F&S Bondtec are strictly prohibited.

Conversions always require the manufacturer's prior written consent. Structural alterations undertaken without prior written consent void your F&S Bondtec warranty.

The installation of any software, particularly anti-virus-programs, void your F&S Bondtec warranty and is absolutely forbidden.

CAUTION!

The installation of any software, particularly anti-virus-programs, local- as well as networking executed, can damage the range of functions of the machine and is absolutely forbidden! It is a machine, not a desk-top-PC!

1.1.5 Network Capability

To create backups, the machine can be connected to a network. However, this is not allowed during operation. There are no warranty or guarantee claim for any problems that occur with a connected network.

CAUTION!

The connection to a network during operation can greatly influence the functions of the machine and is the-refore strictly prohibited.

1.1.6 Copyright

F&S BONDTEC retains full copyright to machine software and documentation. No part of this documentation may be reproduced, duplicated or transmitted in any form without the express written permission of F&S BONDTEC.

1.2 Scope of Documentation

The entire documentation consists of:

>> User Manual (this manual)
>> Additional information such as List of recommended spare parts, bond head clearance, diagrams etc.
>> Please refer also to: http://www.fsbondtec.at

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2) For your Safety

Read the entire operating instructions carefully before first use and keep them safe. Non-consideration of the User Manual can be life-threatening.

2.1 User Manual

This user manual contains important instructions for the safe and proper operation of the production system. Reading and understanding this manual is therefore a prerequisite for working with this production system.

The user manual must always be available at the location of the machine / system. The user manual is part of the machine and must be handed over when reselling the machine.

The User Manual must always be observed under all circumstances.

The documentation of purchased parts is an integral part of this user manual. All safety instructions and other information contained therein must also be observed.

The rules and regulations for accident prevention and environmental protection valid for the place of use must be provided and observed by the operator.

On the even page numbers, the issue number is printed on the cover and the headers show the issue version of the user manual from which this operating manual is valid.

IMPORTANT!

If necessary, please observe the appendices of individual components of this machine, which were created after the editorial deadline of this manual.

Some illustrations and detailed descriptions in this manual may differ from the actual machine, as the machine is adapted to the customer's requirements.

F&S BONDTEC reserves the right to update this manual without prior notice and to make technical and content changes at any time.

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2.2 General Instructions for Safe Operation

Before any intervention in the working area of the machine, move the bonding head to the home position. Risk of injury!
Take care when handling cleaning agents! Observe manufacturer instructions! Do not bring in contact with eyes or mucous membranes! If this happens, rinse immediately with clear water and consult a doctor!

Do not reach into the working area of the machine during operation! Risk of injury!
There is a risk of crushing in the area of the cross table (X and Y axis) and substrate pickup!

Only operate the machine when all covers are mounted. Do not remove covers when the machine is in operation. Risk of injury!
Do not work with long, loose hair or loose-hanging jewelry (chains, etc.) on the machine. These could get stuck on moving parts as well as drives of the machine and thus lead to injuries.

When using a heater, the substrate holder becomes very hot. Risk of burns! Do not touch the substrate or substrate support when the heater is on or the substrate holder is still hot.
When the heater is switched on, change the substrate only with suitable tools (eg tweezers).

Work on the electrical supply may only be carried out by a qualified electrician in accordance with the electrotechnical regulations.
Access to the power supply must always be kept closed. Access is only allowed to authorized staff.
When working on live parts, the machine must be de-energized and secured against unintentional restart.

2.3 CE Declaration of Conformity

The machine is CE compliant. The manufacturer has prepared a CE declaration of conformity for this machine, which is attached as an asset to the machine documentation.

2.4 Intended use

Bonder of the company F&S BONDTEC are exclusively approved for bonding.

IMPORTANT!

For any consequential damages regarding compatibility or errors in the construction or modification of the construction by the buyer, the warranty claim expires.

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Permitted materials.

Depending on the type of machine, the machine is designed only for materials specified in the purchase contract.

Any other or further use is considered improper use. F&S BONDTEC assumes no liability for damage resulting from improper use of the machine or individual components.

Intended use also includes:

>> The observance of all instructions in the user manual.
>> The observation of all references of other components.
>> The timely execution of all inspection and maintenance work.

2.5 Obvious misuse

The manufacturer is not aware of any misuse.

2.6 Residual hazards

Drives / Power Unit.

Long, loose hair can be wrapped with removed covers. Risk of injury!

Hazardous Substances.

The machine contains no hazardous substances. However, hazardous substances can be used in cleaning (e.g., acetone).

When handling cleaning agents, observe the corresponding safety regulations of the manufacturer!

Heated substrate shots.

For bonding with gold wire a temperature > 100 ° C is necessary. The substrate is heated via the substrate holder.

2.7 Protective Equipment / Personal Protective Equipment

Before starting the machine, all guards must be properly installed and functioning.

Protective devices may only be removed:

>> after standstill and
>> after protection against re-starting the machine

When sub-components are supplied, the guards must be installed by the operator in accordance with regulations.

Personal protective equipment is not necessary for working with the machine.

Do not reach into uncovered areas of electronics when the machine is running. Danger of electric shock!

Only operate the machine when all covers are closed. Do not remove covers when the machine is in operation. Risk of injury!

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2.8 Parent Safety Instructions

2.8.1 Behaviour in an emergency

By operating the main switch with EMERGENCY STOP button, the machine can be stopped from any operating situation. In order to be able to start the bonder safely again, the cause of the fault must first be eliminated by authorized personnel.

2.8.2 Qualification of the staff

Only trained and instructed staff may work on the machine.

The responsibility of the staff has to be clearly defined for assembly, commissioning, operation, set-up, maintenance and repair.

Staff to be trained may only work on the machine under the supervision of an experienced person.

All persons entrusted with the installation, commissioning, operation and maintenance of the machine undertake to:

>> Read all safety instructions and warnings in this user manual carefully.

>> Observe the regulations on occupational safety and accident prevention.

>> All safety and hazard warnings on the machine / system must be observed.

2.8.3 Disposal Considerations

Ensure that the machine is disposed of in an environmentally sound manner and in accordance with local regulations, or contact the manufacturer.

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3) Technical Specifications

IMPORTANT!

The information refers to the basic model and can therefore differ from the stated values depending on the version.

3.1 Dimension and Weight

Dimensions, weight, free space, required table size

Dimension and weight

Height	ca. 700 mm
Width	ca. 700 mm
Depth	ca. 650 mm
Weight (basic equipment)	ca. 75 kg

Free space

front	free accessible
back	100 mm for maintenance 500 mm
lateral	40 mm
above	100 mm

Required table size

Width - with Monitor - with lateral placement of the monitor	 min. 780 mm min. 1100 mm
Depth	min. 750 mm

3.2 Workspace

X-, Y- and Z-Axis
Bondarea

X-Axis	102 mm / 4''
Y-Axis	102 mm / 4''
Z-Axis	60 mm

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3.3 Environmental conditions and connections

Environmental conditions

Ambient temperature - in the operationg state - during transport and storage	 +18° C to +24,5° C -10° C to +50° C
Humidity	45% +/- 10% abs. not condensing
Noise development (workplace - related emission value: noise level without external noise effect and reaction through the room)	< 70 dBA

Connection Data

Nominal voltage	90 - 260 V AC
Voltage frequency	50 - 60 Hz
Nominal current - 110 ... 120 V - 200 ... 240 V	 5A 3,15 A
Power consumption	450 W
Compressed air (oil- and water free according to DIN ISO 8573-1 goods class 2)	min. 4,5 bar (6 bar, Ø 6 mm outside)
Vacuum connection	< 300 mbar (Ø 6 mm outside)

3.4 Bondhead

5610i

Wire diameter	17 µm to 50 µm (0,7 mil to 2 mil)
Wire guide	90°
Capillary	16 mm, optional stehen andere Ausführungen zur Verfügung
Bond strength	programmable resolution 1cN

5630i

Wire diameter	17 µm bis 75 µm (0,7 mil bis 3 mil)
Wire guide	45° Standard optional 60°
Bond tool	1“ (~25,4 mm)
Bond strength	programmable resolution 1cN

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5632i

Wire diameter	17 µm to 75 µm (0,7 mil to 3 mil) in addition Ribbon Wire to 250 µm x 30 µm (10 mil x 1,2 mil)
Wire guide	90°
Bond tool	¾" (~19,05 mm) or 1" (~25,4 mm)
Bond strength	programmable resolution 1cN

5650i / 5650i HR

Wire diameter	100 µm to 500 µm (4 mil to 20 mil) 300 µm to 2000 µm (Ribbon)
Wire guide	55° Clip fixing
Bond tool	2" Standard (~50 mm) V-Groove 100 µm- 500 µm
Bond strength	programmable from 0-2000 cN / resolution 1cN at 5850 HR: to 4000 cN

3.5 Spezification

The substrate types and bonding wires to be used are specified in the purchase agreement. Other specifications - not mentioned above - are also stated in the purchase contract.

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4) Model 56XXi

Figure 4.0. - 1 Model 56xxi

IMPORTANT!

Some illustrations and detailed descriptions in this manual may differ from the actual machine if the hardware of the machine has been customized.

The following chapters assume a basic knowledge of electronics, especially of wire bonding technology.

TIP

You can find more information about wire bonding on the Internet.

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4.1 Overview of the multifunction device

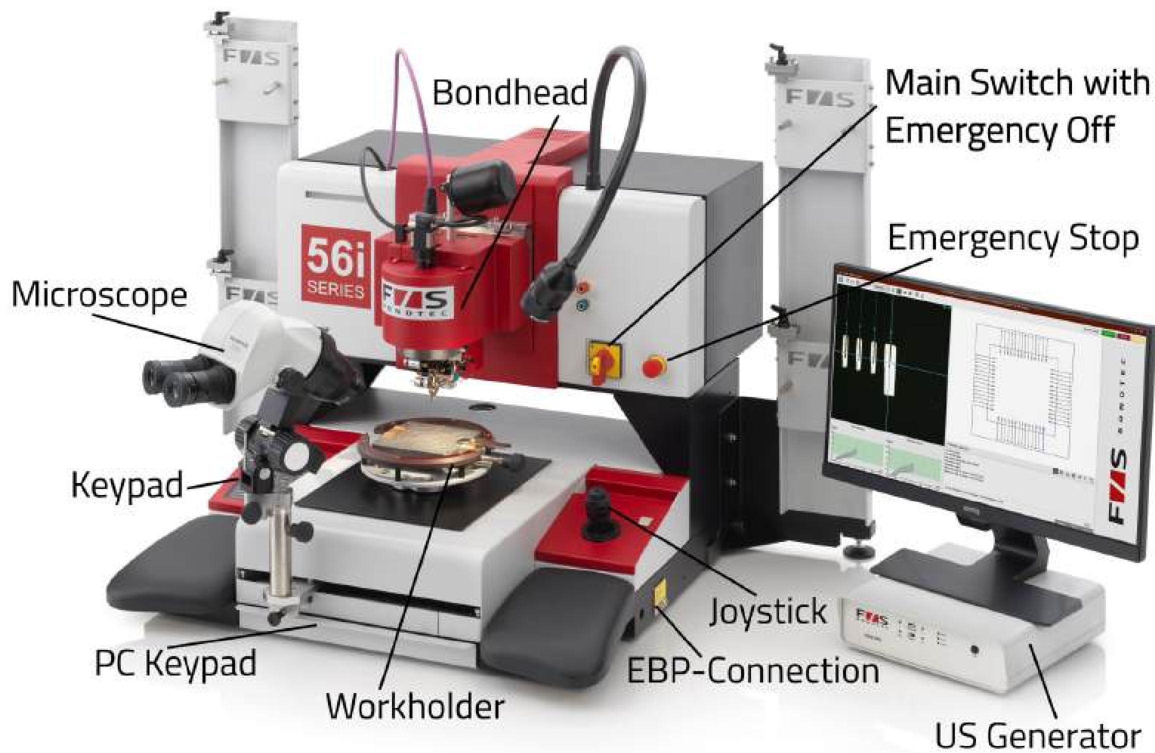

Figure 4.1. - 1 Overview multifunction device

4.2 Control Elements

4.2.1 Main switch (with emergency stop function)

Serves to switch the machine on/off.

4.2.2 EMERGENCY-STOP Button

The machine stops immediately when the EMERGENCY-STOP button is pressed.

4.2.3 Monitor

All process-relevant information is displayed to the user on the monitor.

4.2.4 Microscope

The microscope is an optical tool and is used for setup as well as for the control of the process optimization.

4.2.5 US-Generator

The US generator acts as an electrical ultrasound source.

4.2.6 Joystick

With the joystick the axes of the machine can be moved.

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4.2.7 Keypad

The machine is operated using the keys on the keypad. Process-relevant functions can be started with them.

4.2.8 PC Keyboard / Service Keyboard

Inputs can be made with the PC keyboard.

4.2.9 EBP-Connection

The user can make a conductive connection to the machine at the EBP connector to prevent the destruction of electronic components caused by electrical charges.

4.2.10 Workholder

The part holder is connected to the positioning system of the machine. The product to be processed is fixed to the component holder during the bonding process.

4.2.11 Bondhead

The bond head contains the components and calibration data required for bonding. It carries out the welding process and, together with the motion system, generates the desired wire connections via a previously defined motion sequence.

4.3 The Axes of the Motion System

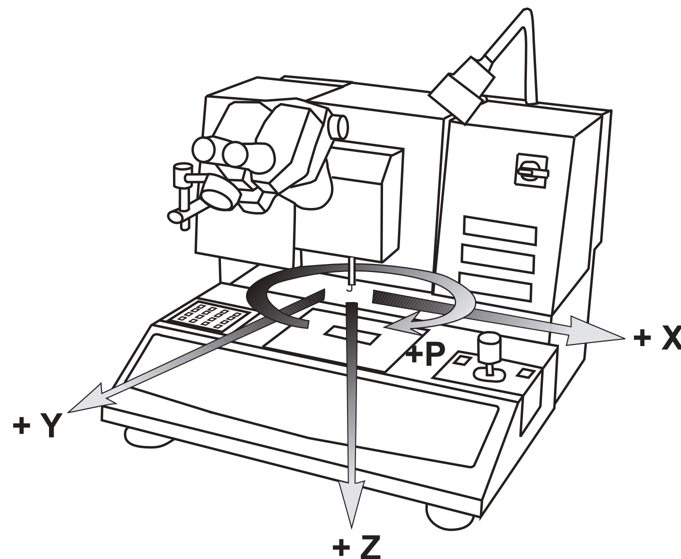

Figure 4.3. - 1 *Work Axis*

The names of the working axes follow the Cartesian coordinate system.

Positive coordinates run from left to right (X axis), back to front (Y axis), top to bottom (Z axis) and counterclockwise (P axis), so the zero position is at the back, left and top.

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4.4 Bond heads

Terminoligy

Wire spool holder	protection and support of the used wire spool.
Camera	a live camera image is used when positioning all process relevant positions.
head clamp / bond head holder	fixes the bond head to the base machine.
Wire guide	guides the wire from the wire spool to the tip of the bonding tool.
Turning head	contains those components that require a wire connection for generation
Touchdown Sensor	detects the placement of the bonding tool on the component surface; the measured values supplied by the sensor are also displayed graphically on the monitor.
Transducer	converts an electrical oscillation into a mechanical oscillation, which is used to produce a welded joint.
Bond tool	the welding tool used to create the weld transfers the energy during the bonding process.
Wire guide for 5x50, HR	leads the wire up to the tool tip is clipped to the tool
Knife	is used for cutting the bonding wire after the last bonding point when bondering in the thick wire area.

4.4.1 Bondhead 5610i

The 5610i bond head is an ultrasonic ball wedge bonder for gold wires in the thin wire range and is designed for wire diameters from 17 µm to 50 µm (0.7 mil to 2 mil).

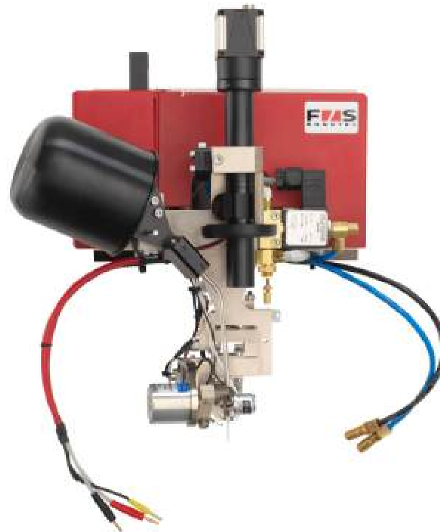

Figure 4.4. - 1 *Bonding head 5610i*

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4.4.2 5630i Thin-Wire Head

The bonding head 5630i is designed for the ultrasonic wedge-wedge welding process.

Bond wires with a diameter of 17µm to 75µm (0.7mil to 3mil) can be welded on suitable surfaces.

Figure 4.4. - 1 Thin-Wire Head 5630i

4.4.3 5632i Thin-Wire Head

The 5632i Deep Access Bond Head features a special design of the bond head. This gives the bonder a high flexibility. In contrast to the 5630i, this head is especially suited for bonding into deeper packages. Ribbon Wire from 30 µm - 250 µm (1.2 mil - 10 mil) can also be processed.

Figure 4.4. - 1 Thin-Wire Head 5632i

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4.4.4 5650i / 5650i HR Heavy-Wire Head

The heavy wire bonding head is designed for aluminum wires with a thickness of 100 µm to 500 µm (4 mil to 20 mil).

In contrast to the thin wire bonding heads, the heavy wire bonding head has a knife built in (front or back cut possible). The finished bonded wire is cut off here because the wires are too thick to tear. The cutting process is automatically integrated into the software when the 5650i head is attached.

The Heavy-Ribbon version of the 5650i bond head is an ultrasonic wedge bonder for thick aluminum strips up to 2000 x 300 µm thickness.

Figure 4.4. - 1 *Bondung Head 5650i*

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5) Transport and Installation

DANGER!

Wear safety gloves and safety shoes during transport and installation.

5.1 Transport / Packaging

The machine is delivered in its original packaging and with transport protection. For any further transport, the transport safety device (especially for bond heads) must be reattached and all moving parts must be securely fixed.

Machines or bond heads should only be shipped in the designated boxes or cases.

5.2 Storage

The following conditions must be met for proper storage:

>> Add desiccant and completely vacuum pack the machine.

>> Storage only in dry tempered rooms (max. air humidity: 70% non-condensing, max. temperature range: 0 - 50°C).

>> Storage period must not exceed ½ year.

>> Although most parts at risk of corrosion are made of stainless, chromium-plated or galvanized steel or have a protective paint coat, the bonder must be inspected for signs of corrosion after a longer storage period.

5.3 Suitable Operating Location

The following requirements must be met before the machine can be installed:

>> Select the location so that it is easily accessible from all sides.

>> Make sure that nobody can be endangered by the running machine.

>> To work with maximum accuracy, the bonder must be placed on a stable, non-vibrating table. Furthermore, the table top must be a flat surface to be able to align the bonder with the help of the adjustable feet.

>> The workplace should be designed according to the latest ergonomic guidelines.

>> Provide an earthed socket (DIN 49441) or a standard national socket, a compressed air and a vacuum connection in the immediate vicinity of the machine.

5.4 Preparatory Work for Commissioning

CAUTION!

Never operate the machine and its components with the wrong voltage. This could damage the devices.

5.4.1 Unpacking the Machine

>> Position the bonder at the intended location.

>> Check delivery for completeness (see delivery bill).

CAUTION!

Make sure that the component is not damaged during unpacking.

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IMPORTANT!

Before commissioning, make sure that the wiring is complete.

5.5 Electrical Connection

The bonder is connected to the power supply with a conventional IEC 60320-1 C 13 power cable at the backside.

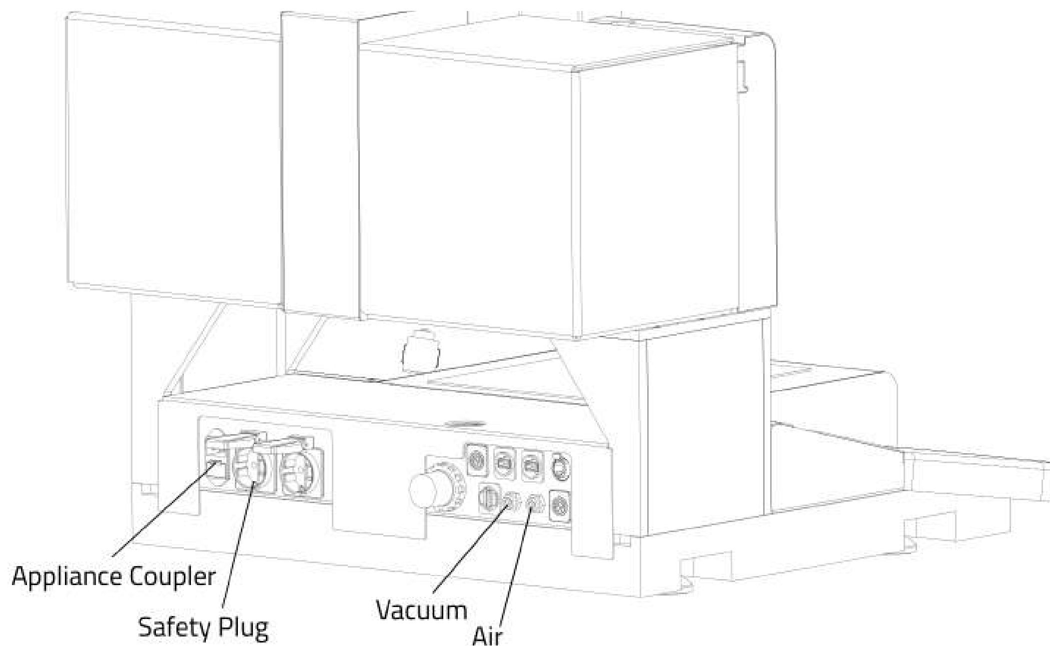

Figure 5.5. - 1 *Connections*

DANGER!

>> Work on the electrical supply may only be carried out by qualified electricians.

>> When working on live parts, the machine must be disconnected from the power supply system. Electrical lines must be installed and mounted properly.

>> Fittings, length and quality of the cables must comply with local regulations. The electrical equipment must be checked regularly. Loose and damaged cables must be replaced immediately.

DANGER!

Access to the electronics and power supply must always be kept closed. Only authorized personnel is allowed to open them.

When working on live parts, the machine must be disconnected from the power supply and secured against unintentional reconnection.

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5.5.1 Setting the Supply Voltage

Basically the operation with 2 different mains voltages is possible:

>> 115V

>> 230V

The voltage is set ex works to the specifications given in the order and may not be changed by the customer without authorization.

CAUTION!

Under no circumstances you should operate the machine or its components on the wrong voltage. The equipment could be damaged!

5.6 Vacuum Connection

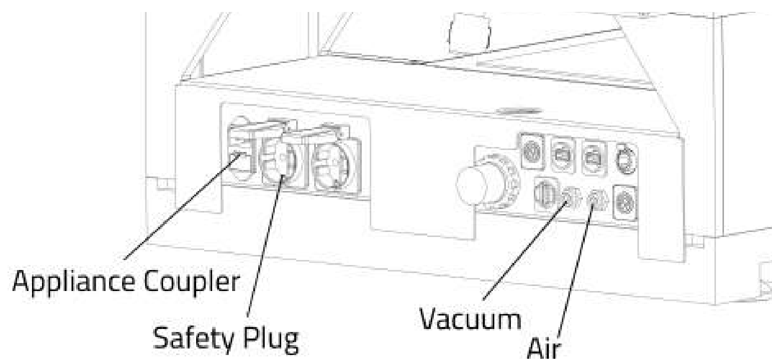

Figure 5.6. - 1 *Vacuum connection*

Figure 5.6. - 2

Connect the bonder to the vacuum net through the socket shown in the picture.

5.7 Connection of the Ultrasonic Generator

The ultrasonic generator must be connected to the corresponding connection cables of the bonder. Depending on the specified ultrasonic generator, the data connection can be either USB or RS232.

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__Figure 5.7. - 1__ Ultrasonic Generator

UUG030 Connection to machine via RS232 interface.

USG-016 / UUG050 Connection to the machine via USB interface.

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6) Basic Functions

IMPORTANT

In order to use the machine properly and safely, make sure that you have read and understood chapter 1 (General Information) and chapter 2 (For Your Safety) before.

Before each commissioning, make sure that the machine is in perfect, safe operating condition and that all safety precautions are observed!

After switching on the main switch, the operating system boots and you will find a standard Windows TM interface.

The F&S BONDTEC Bonder application can then be started from the desktop by double clicking on it.

After confirming the question "Do you want to move Home?", the (Z/P/X/Y) axes of the machine are referenced. Then the usual bonder user interface appears.

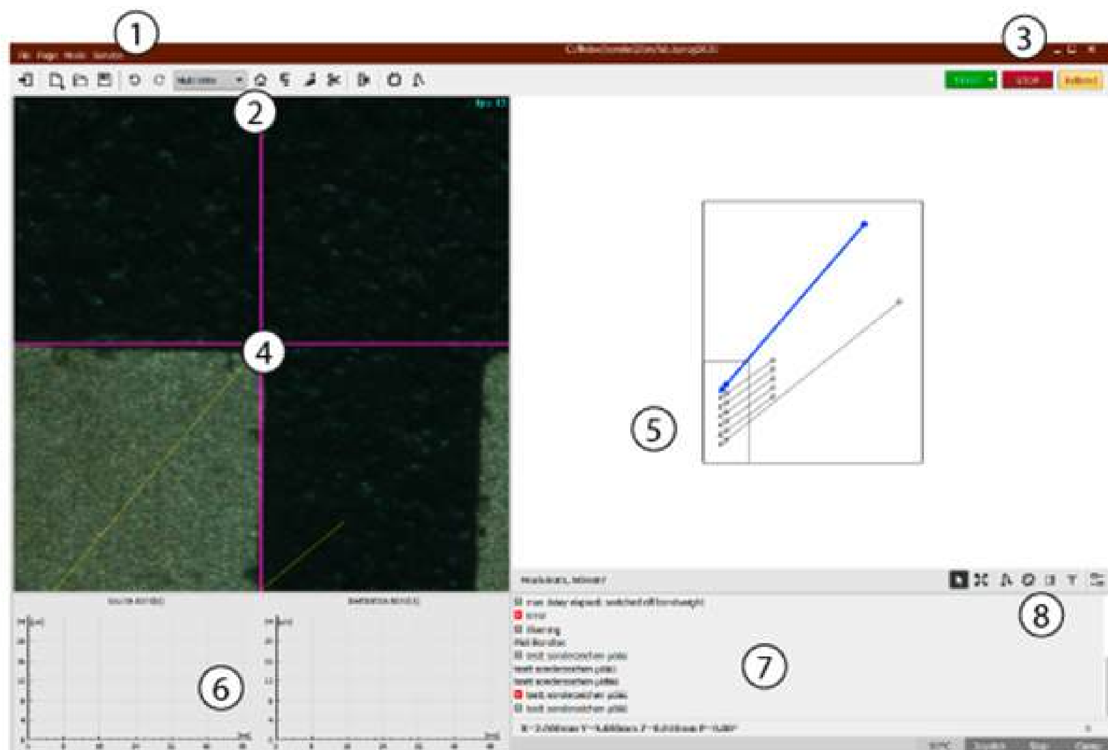

Figure 6.0. - 1 *User interface*

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User Interface

1	Main Menue
2	Main Tool Bar
3	Expiration Quick Access
4	Live Video
5	Plot Program
6	Bond Results
7	Status Console
8	Plot Program Toolbar

6.1 The Most Important Functions

6.1.1 Main Menue

File.

Load & save files, close application

Page.

Includes program specific and global machine parameters. In the menu <Page> only values are entered. However, automatic movements are never executed or actuators controlled.

Mode.

<Mode> contains functions for setting up and calibrating the machine. User-guided automatic actions and movements are performed.

Service.

Provides data and files that support the F&S customer service in processing inquiries about the machine and its function.

6.1.2 Main Toolbar

It contains buttons for quick access to the most important functions of the bonder.

Machine Mode.

In <Single Wire> mode, a single wire can be bonded. This mode is mainly used to find the parameters for a product being processed for the first time.

In <Multi Wire> mode a complex component can be processed automatically or semi-automatically.

6.1.3 Expiration Quick Access

Allows operation of the machine under production conditions.

6.1.4 Live Video

Shows the part surface and can contain additional graphical displays depending on the situation.

6.1.5 Plot Program

Graphical display of a currently used multiwire bonding program.

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6.1.6 Bond Results (DLC - Deformation Limit Control)

The deformation of the wire at the welding point created during the bonding process is graphically displayed.

6.1.7 Status and Console

Process related information and notes.

6.1.8 Plot Program Toolbar

It contains buttons which interact with the elements displayed in <Plot Program>.

6.2 Simple Actions

<u>**Manually moving the axes.**</u>

Using the <Jostick> button on the keypad, the joystick operation can be activated / deactivated.

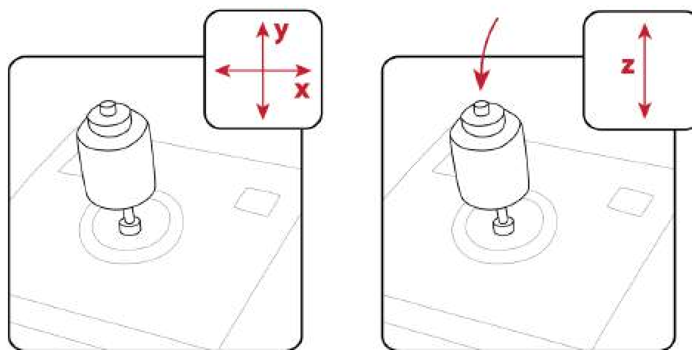

Figure 6.2. - 1 *Joystick Illustration*

Move all axes automatically to their original position with

or with the <Home> button on the keypad.

Under <Page> <Global Program Settings> in the tab <Main> you can select the X/Y direction and in the tab <Tuning> the speed of the joystick movement.

<u>**Wire Clamp.**</u>

With the button <Wireclamp> on the keypad, the wire clamp can be opened / closed.

<u>**Wire feed / FlameOff.**</u>

With head type 5X10, pressing the <Wirefeed/FlameOff> button will raise the transducer and melt a ball at the end of the wire by a spark.

On head Type 5X30, pressing this key will trigger a wire feed.

With all other bond head types this button has no function.

<u>**Device Clamp.**</u>

If the machine is equipped with vacuum-supported component clamping, the vacuum on the component holder can be activated / deactivated by pressing the <Vacuum> key or the button

to fix a component to the component holder.

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Feed in wire and bond.

The <Feed In Position> is approached with the button

In this position those functions are available, which facilitate the threading of the bonding wire.

TIP

Helpful for threading the wire is the activation of the ultrasound via the keypad. This is possible by pressing the <Enter> key on the keypad.

With the <Bond Off> function,

the wire can be bent at a predetermined position to create a tail of the correct length (for example, after feeding in).

Flame Off.

This function is only available for the bond head type 5X10.

During the bonding process the flame is automatically removed to create a ball at the end of the wire. With the button <Flame off / Wire Feed> you can start the FlameOff process manually.

The programmable FlameOff parameters can be found under <Page> <Global Program Settings> <Process>.

Depending on the wire diameter you can roughly select the power output in the <High> and <Low> range.

In addition, the fine adjustment of the ignition voltage by means of <Current> and <Time> in % is possible there.

With <Current> the ignition voltage is adjusted to the wire diameter, with <Time> the time how long the spark is held is adjusted and thus the size of the melted ball is influenced.

6.3 Frequently Returning Operation

Many subwindows have a toolbar, which often contains the following icons:

	Go back one object (also possible with <Page Backward>)
	Move one object (also possible with <Page Forward>)
	Insert an object
	Delete an object
	Further functions

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Figure 6.3. - 1 Position specification

The joystick is active in the Positions input window and can therefore be used to move to the desired position. With <Store Trace> (keypad) the current position is permanently taught in.

TIP

By simultaneously pressing the Ctrl+Shift and cursor keys on the PC keyboard, the XY axes can be moved at fine pitch intervals in <micron steps>.

With the arrow keys <UP> and <DOWN> the cursor can be moved, with <LEFT> and <RIGHT> you can jump between tabs.

Dialogs used to create repetitions may contain the tabs <Abs> and <Rel>. Here <Abs> stands for absolute positions. This allows two values (e.g. first and last repetition point) to be taught in. <Rel> stands for relative distance. If known, the distance to the next repetition in XY directions can be entered.

6.4 Create a Bond Program

With <File> <New> or

the <Create Progam> dialog is started. This dialog guides the user through the necessary basic settings in three pages before the actual creation of a bond program. Any previously loaded bonding programs are deleted from the working memory when a new bonding program is created.

Parameters for bonding are usually taken from the Single Wire dialog of the last loaded bonding program. By selecting "Create from Default Value", guide values for different wire thicknesses can optionally be loaded from the database.

The global light and camera parameters set here are used by the operator to orientate himself on the part using the image captured by the camera and displayed on the monitor.

Workheight.

Workheight is the height at which the XY table can be moved without collision.

>> for Workheight 1 over the entire component holder,

>> for Workheight 2 within a single component

Joystick Limit.

Lowest Z-position which can be moved manually with the joystick. This limit is used for example when focusing the camera, but can usually be left at the same height as Workheight 2.

Max Z Position.

Defines the lowest position that can be approached automatically with the Z axis.

6.5 Further Process Parameters

In addition to the parameters set in the Single Wire dialog, further influencing bond process parameters can be defined under <Page><GlobalSettings><Process>.

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7) The Single Wire Mode

A wire defines a joint made by friction welding, which has a welding point at the beginning and at the end and where the welding points are connected by an arc of wire. This wire arc thus creates an electrically conductive connection between the two welding points.

Several individual steps are usually required to bond a wire.

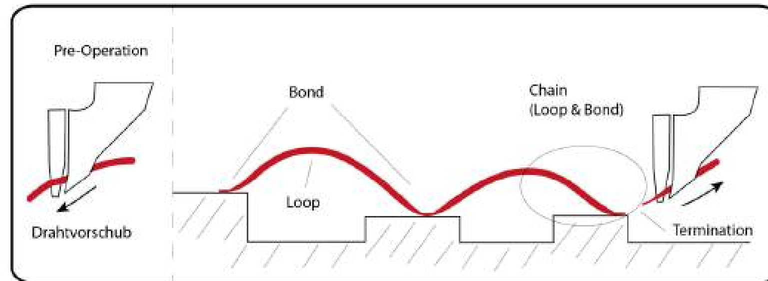

Figure 7.0. - 1 *Single Wire Illustration*

Pre-Operation .

With the Type XX10 head, a ball is flamed at the end of the wire before the first bond.

With the head Type XX30, a wire feed is performed at this point.

Bond sequence.

Then the XY position of the 1st bond point is approached, and the Z axis moves the bond head downwards until the bond tool is detected to be placed on the surface to be bonded. The welding process then begins, creating an intermetallic bond between the wire and the surface of the substrate.

Loop.

Subsequently, the bond head is moved to the next bond point in a previously defined sequence. This movement creates and forms the so-called loop.

Chain.

A loop and the welding point at the end of the loop form a chain.

After the 1st bond 0, 1 or more chains can follow.

Termination.

At the end of each bond sequence the termination is performed.

The termination defines the disconnection and thus the termination of a wire connection. At the same time, the wire for the following bond connection is prepared during termination for the bond head types 5X10, 5X30, 5X32 and 5X50.

Safe bump / Stitch on Ball.

(= Stand-Off-Stitch Bond, =SSB, =BSOB)

In XX10, the security bonds (Stitch on ball and Safe bump) also belong to the wire to which they have a physical connection.

In the <Single Wire> mode, each bond has an XY position and a separate Z height. In addition, each bond has an individually stored camera and light setting.

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7.1 Bonding in Single Wire Mode

The machine mode must be set to <Single Wire>.

Single Wire

Pressing the <Bond> key on the keypad opens the Single Wire dialog.

The individual segments of a wire connection are represented in the editing window by the respective tabs.

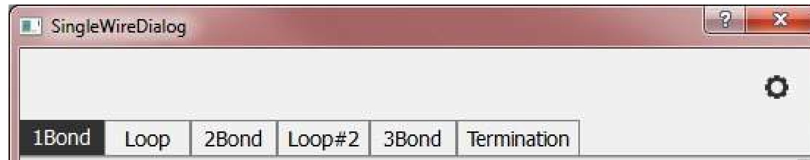

Figure 7.1. - 1 *Single Wire Dialog*

To teach the bond positions, move the cursor in the Bond tab to Bond X position or Y position.

Focus the camera image and select the light and camera settings so that the component surface is clearly visible. These settings are available in the <Light & Camera> subpage.

TIP

To focus the camera image move the bond head up/down with the joystick to get a focused live image.

Set the crosshairs to the desired bond position with the joystick.

Pressing the <Store Trace> button accepts the XY coordinates and automatically measures the part height at the selected bond position.

All bond positions must be taught in once with <Store Trace>, which also measures the height at each bond position.

Pressing <Bond> jumps to the next bond. There the light and camera settings also have to be adjusted.

You can switch to the previous or next bond position at any time using the arrow keys or by clicking on the respective tab to move the bond positions there again. The position is confirmed again with the <Bond> key.

Once all positions have been confirmed and measured, the wire can be bonded by pressing the <Bond> key at the last bond position.

After the creation of a wire, the bonder automatically moves back to Bond 1 and shows the bond position.

If you want to bond other similar wires to the same part heights, simply confirm the shift of the bond positions with the joystick by pressing the <Bond> key. After confirming the last bond position, a new bond connection is automatically created.

TIP

Use the left and right arrow keys (? ?) to switch between the individual bond points of a wire connection the position of the currently clicked bond point can also be changed in the live video by dragging with the mouse.

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7.2 Working in Single Step Mode (Step Mode)

In Step Mode, the bond process is carried out in individual steps, so that the process can be precisely analyzed and observed.

The Step Mode can be activated and deactivated at any time with the <Step> key on the keypad. If the Step Mode is activated, the automatic motion sequence is interrupted immediately.

You can activate this function in Single Wire as well as in Multi Wire mode. In Step Mode a graphic with additional information about the bonding process is displayed instead of the camera image. Furthermore, the next step in the bond process is announced.

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8) Process Optimization

If no bond was created or the shape of the bond or loop does not meet the specifications, the process settings must be changed or adjusted after the first bond attempt.

When bonding, the following parameters will be primarily decisive in terms of adhesion and the shape of the welded joint:

>> Total Bond Time

>> US Power

>> Bond Force

>> Touchdown Steps

8.1 Bond parameters

The following rules can be used as a guide, when setting these important process parameters for the first time.

8.1.1 Total Bond Time

In the thin wire range (18-75µm diameter), it can be assumed as a rule that the appropriate setting of the bonding time (for bondable surfaces) will be approximately equal to the wire diameter.

For heavy wire (100-500µm diameter), the bonding time should first be 150ms +/-50ms. It should be noted that more time means more energy for the welding process.

Thinner (heavy) wires need comparatively less energy, therefore less time than thicker wires. Therefore the time for 100µm wire diameter can be only 50 - 100ms.

8.1.2 US Power

The US Power parameter regulates how strongly the bond tool oscillates and thus how strong the weld will ultimately be.

More US Power means a stronger deformation of the welded area.

With US Burst the US Power can be changed during the bonding process (e.g. 120% US Power in the first 10ms of the bonding process).

IMPORTANT!

The frequency and power output from the US generator are configured in a special software and must match the transducer and wire diameter used.

Make sure that the US Generator is set correctly.

TIP

Important for wire bonding is always the ratio between Total Bond Time and US Power. Unfortunately, there is no generally valid setting due to the variety of materials and applications.

Some applications can be bonded well with a little more time, but comparatively less US Power. This setting avoids as much as possible the resonance of the component.

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8.1.3 Bondforce

The bondforce is primarily dependent on the wire diameter used. In the thin wire range (18-75μm diameter) one can assume that the suitable setting of the bondforce (for bondable surfaces) will be approximately equal to the wire diameter. The bondforce is constant over the entire bonding time.

For heavy wire (100-500μm diameter) the bond force should be increased continuously during the entire bonding process.

To do this, you must activate <Bondforce Ramp>. Then you can enter the time of the ramp and the force at the end of the bonding process.

You can also orientate yourself on the wire diameter used.

In most cases, the appropriate setting for Bondforce should be selected according to the wire diameter. The force at the end of the ramp should be approximately twice the wire diameter.

TIP

If the edges of the bonding area are dark colored when Al wire is bonded, the ratio of US Power and Bondforce is not correct and the edges of the bonding area will burn because the bonding tool rubs against the surface of the wire instead of rubbing the wire over the surface of the component. (too much US Power with too little Bondforce)

As a result, an Al deposit will also form very quickly on the bonding tool and premature wear of the bonding tool will occur.

8.1.4 Touchdown Steps

The TD Steps create the area to deform the wire during the bonding process. As a guideline, half the wire diameter is used.

IMPORTANT!

The rules are slightly different when it comes to ball bonding, because the wire diameter must be set on the 1st bond and half the wire diameter on the 2nd bond. This is necessary because the ball created at the end of the wire during flaming has a much larger diameter than the wire.

The TD Steps will move the Z-axis further down by the programmed distance after the bond tool has been set up. At this point the bonding tool has already touched down on the component, the entire transducer holder is lifted and a gap is created between the transducer holder and the lower stop of the transducer holder.

IMPORTANT!

The wire is not yet deformed when the Z-axis is passed over.

If the bonding process is started afterwards, the wire is deformed by the applied bonding force and by US power.

The transducer holder sinks to the bottom and the gap, that was previously created when the wire was passed over, is reduced again.

This reduction of the gap is displayed graphically on the monitor as DLC curves (DeformationsLimitControl).

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8.1.5 Deformation Limit Control

The deformation measured during bonding is displayed on the monitor as a graphic. An upper and lower limit value for the measured deformation can be defined (<Page><GlobalSettings><DLC>) and the machine can be stopped automatically if the deformation exceeds or falls below these limits. The bonder is started by the user (e.g. after a visual check of the last processed bond point).

8.2 Loop

You can choose between <Standard> and <Expert> for the loop shape.

Standard is best suited for most applications. The Expert Loop contains additional functions to bond demanding applications in the best possible way.

The motion sequence between the bond points ultimately defines the shape of the wire connection. This wire connection is also called a loop.

For better understanding, the motion sequence is also displayed in an interactive graphic. Clicking on a parameter in the graphic immediately displays the position where the parameter is effective.

The motion sequence used to create a loop differs significantly between the wedge-wedge and ball-and-wedge processes.

In the wedge-wedge process the wire is usually fed through the bonding tool at a 45° angle, but in the ball-wedge process the wire is fed through the capillary (bonding tool) at a 90° angle. This results in fundamentally different loop geometries in the bonding processes mentioned above.

8.2.1 Standard Loop

Standard Loop at Wedge-Wedge.

Typically, a loop in wedge-wedge bonding has a maximum height in relation to the length of the wire bond of approximately 1:3.

This results in basic settings that can be used as a starting point for many applications:

Loopheight	125%
Presign	40%
TurnHeight	off
XY-Loopheight Factor	50%
Z-Delay	0%

With these initial values it should be possible to create a loop in a 1:3 ratio on a flat component when using wedge-wedge bonding.

(The standard loop length for thin wire is 1.2mm, for thick wire 5mm loop length on flat substrate)

If the wire clamp is closed at the highest point, a triangular loop shape is created. If the wire clamp is left open until the second bond point has been bonded, a much rounder and flatter loop is created, since the wire can slip back into the bonding tool when the second bond point is approached due to the open clamp.

In addition, a movement against the loop direction can be activated; this additional movement is called reverse movement.

The wire can be bent (formed) by moving the XYZ axes while moving to the loop height, i.e. after the first bond joint has been set.

The shape of the loop can be strongly influenced by this reverse movement.

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IMPORTANT!

If there is too much friction on the wire during the reverse movement in the bonding tool, the wire can tear. Therefore, the heights and travels (XYZ) must be set in such a way that friction is avoided as far as possible, and the wire is bent during the reverse movement, but no other wire is pulled through the bonding tool (e.g.: set reverse height lower than presign).

The basic settings for a loop reverse movement would therefore be:

Presign	30%
Reverse Height	25%
Reverse Factor	5-20%

Reverse movement is possible, but it is not common to use wedge-wedge bonding.

Reverse motion is mainly used for very short loops (<250µm length).

Standard Loop at Ball-Wedge.

With the ball wedge the reverse movement plays an important role in forming the loop.

Therefore, <Use Reverse 1> or additionally <Use Reverse 2> should be activated for this bonding process.

TIP

In most cases it is sufficient to use a reverse movement.

In case a reverse movement is used to bend the wire slightly after about 30% of the loop length, <Use Reverse 1> can be activated and the following parameters can be used:

Loopheight	125%
Presign	30%
Turn Heigth	off
XY-Loopheight Factor	10%
Z-Delay	0%
Reverse Height	25%
Reverse Factor	30%

When using the above parameters, a bend will be created after 1/3 of the loop, which will then form the highest point of the loop.

However, if you program two reverse movements, <Use Reverse 1> can be used optionally to create an additional defined bend just above the ball.

It is recommended not to use the movement and height in % but to change the units to µm.

In this case <Presign> has to be changed to µm as well.

Presign	100µm
Reverse Height	60µm
Reverse Factor	60µm

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In this case, the second reverse movement also uses the above settings.

A second reverse movement is possible in principle, but it is also rather unusual for ball-wedge bonding.

8.2.2 Expert Loop

The Expert Loop has its own settings and it differs from the Standard Loop because, for example, the difference in height between the first and second bond points is taken into account when calculating the loop height.

For this reason, Expert Loop usually has a loop height of 60-90%.

In contrast to the Standard Loop, Expert Loop offers the following additional options:

>> Use Reverse 3
>> U-Turn instead of Turn Height
>> Use Loopheight Compensation

Use Reverse 3.

It is possible to program up to 3 reverse movements.

It is also possible to move the 2nd reverse movement in loop direction to bend the wire in the other direction. This is mostly only of interest for ball bonding, e.g. to let the loop sag down and keep the loop height as low as possible.

U-Turn instead of Turn Height.

The U-Turn may only be used if the 1st bond point is higher than the 2nd bond point and is especially suitable for applications where the height difference between the bond points is greater than the loop length.

The U-Turn offers the possibility to move behind the 2nd bond point and to prevent the bending of the wire at the first bond point and also the lateral bending to a large extent by an arc-shaped movement.

You define with <UTurn> how far the wire should be passed and with <Loop-Point 1 & 2> at which height between loop height and height of the second bond point the maximum pass position is reached or at which this pass position is left again to return to the XY position of the second bond point.

These two heights together may not exceed 80% of the loop height.

Use Loopheight Compensation.

The Loopheight Compensation should make it possible to use one loop setting for different loop lengths.

Starting from a defined loop length, which you set ideally beforehand and use as a reference afterwards, a little (%) is subtracted from the programmed loop height for longer loops and a little (%) is added to the programmed loop height for shorter loops.

The value set at <Looplength Longer> is only fully effective when the loop length is doubled! Typical values here are between 6-12%.

The value set at <Looplength Shorter> becomes fully effective at 1/3 of the loop length! Values between 25-45% are common here.

Typically the <ref. looplength> is set to 1000-1500µm for thin wire. For thick wire, however, 3000 - 5000 is usually used as the ref. looplength. But this depends mainly on the loop lengths used in the program.

IMPORTANT!

The <ref. looplength> should ideally be about half the maximum loop length in the bond program.

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8.2.3 Termination

Termination is the cutting of the wire at the end of a wire connection.

This is done in different ways in different bonding processes. In the case of the thin wire, the wire is torn, either only the clamp is moved <Feed Limiter> or XYZ moves to tear the wire <Table Tear>.

In the case of a table tear, the tail for the next bond is created at the same time.

For the thick wire, the wire is cut with a knife, but the knife is also moved with the YXZ axis before the cut behind the bond.

The mechanical adjustment of the knife (distance to the bond tool) also influences the waist length of the next bond.

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9) Multiwire Program

The Multiwire mode works similar to the Single Wire mode. However, it is possible to program several wires and to process them automatically.

A multiwire program has chips in addition to wires.

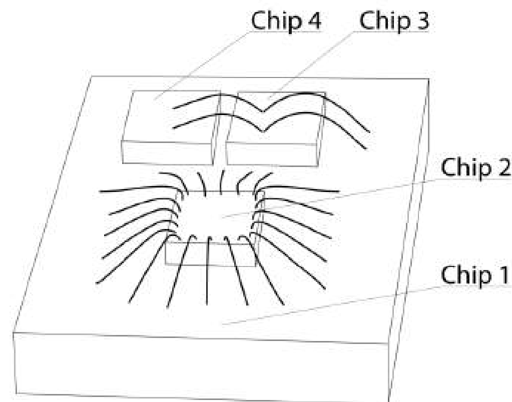


Figure 9.0. - 1 *Chips*

Chip.

A chip is a bondable flat surface with a defined position and height.

The position of a chip is defined by adjustment points.

Chip #0.

The Chip#0 (substrate) has a special position. This Chip#0 is used to define the position of the substrate in the working area of the bonder.

All chips starting with Chip#1 are located on the carrier Chip#0, Chip#0 cannot be bonded. The offset of Chip#0 also shifts the search positions of all other chips.

Modules.

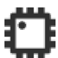
Modules simplify the processing of several identical components on one carrier. The sum of all chips from chip#1 and all wires results in module #1. Module #1 represents a template for all other modules. So, if you change any wires or chips, it will be effective on all modules. All modules are located on the carrier Chip#0.

Differences to Single Wire.

Unlike the Single Wire program, all bonds are assigned to chips on which height, light and camera settings are stored.

9.1 Creating Chips with "Learn Chip"

With <Mode> <Learn Chip> or



the dialog Learn Chip is opened.

The menu item <Light & Camera> contains light and camera settings. Here the settings can be selected so that the structure of the surface is clearly visible to the human eye.

Subsequently, in the <Training> tab, the number of reference points must be defined at <Adjustment>.

Adjustment:

>> fix coords

>> 1 Point

>> 2 Points

With <fix coords> it is assumed that the respective chip is on chip#0 and therefore moves together with chip#0.

1 2 3 4 5 6 7 8 9 10 11

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If <1 Point> or <2 Points> is selected for Adjustment, the position of the respective chip is defined by one or two Adjust Points. To do this, you have to move to a significant structure with the joystick and then save this position with <Store Trace>.

<Diagonal Tolerance> then serves as a safety check during the automatic image search. It ensures that a similar, neighboring pattern is not erroneously recognized by Pattern Recognition. This tolerance can be set individually by the operator.

The ChipHeight can be measured in <Learn Chip>. The P axis remains in its initial position. If it is not possible due to a narrow design, this process can be repeated after the wires have been created with <Mode> <measure Chipheight>.

TIP

When using 2 reference points, they should ideally be selected at diagonally opposite corners.

9.2 Creating Wires with Learn Wire

The Learn Wire function can be called up using

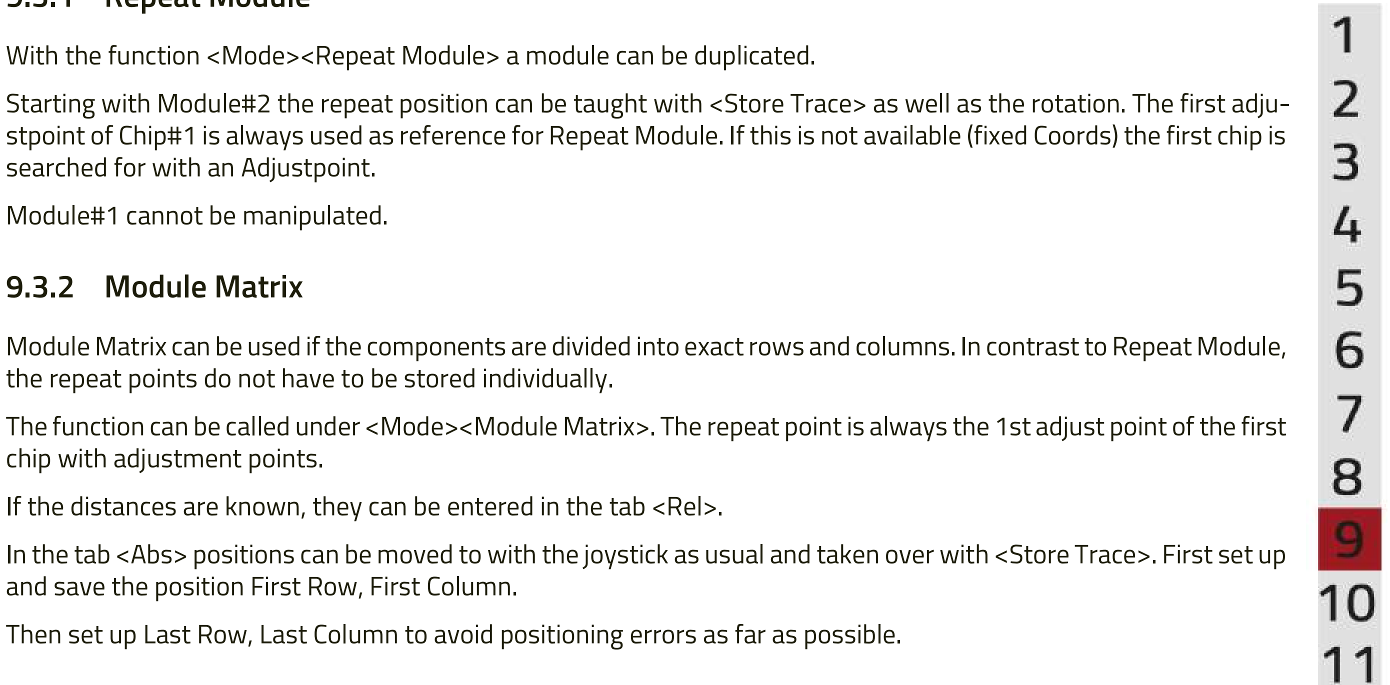
or <Mode><Learn Wire>. To teach the bond position, the chip must first be defined in the Bond tab.

Then move the cursor to Bond Position X or Y. Set the crosshairs with joystick to the desired bond position. Then press <Store Trace> to accept the XY coordinates.

TIP

As in the <SingelWire> mode, the learned wire can be bonded with the Bond button <Bond>.

9.3 Duplicating Modules



9.3.1 Repeat Module

With the function <Mode><Repeat Module> a module can be duplicated.

Starting with Module#2 the repeat position can be taught with <Store Trace> as well as the rotation. The first adjustpoint of Chip#1 is always used as reference for Repeat Module. If this is not available (fixed Coords) the first chip is searched for with an Adjustpoint.

Module#1 cannot be manipulated.

9.3.2 Module Matrix

Module Matrix can be used if the components are divided into exact rows and columns. In contrast to Repeat Module, the repeat points do not have to be stored individually.

The function can be called under <Mode><Module Matrix>. The repeat point is always the 1st adjust point of the first chip with adjustment points.

If the distances are known, they can be entered in the tab <Rel>.

In the tab <Abs> positions can be moved to with the joystick as usual and taken over with <Store Trace>. First set up and save the position First Row, First Column.

Then set up Last Row, Last Column to avoid positioning errors as far as possible.

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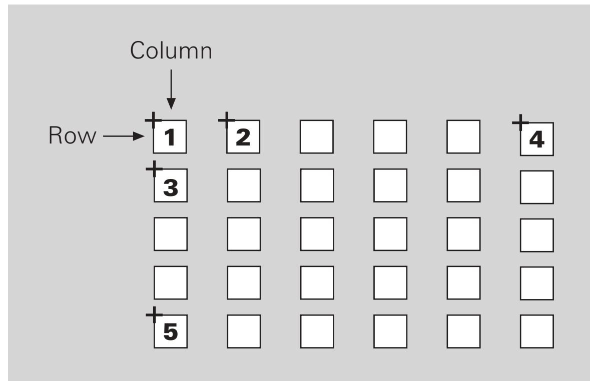

Figure 9.3. - 1 *Module Matrix*

1 Original
2 First Column
3 First Row
4 Last Column
5 Last Row

TIP

Modules can only be duplicated if the entire component is repeated several times. If only individual areas or chips on a component are identical, it is better to work with copies. See Copy Paste.

9.4 Normalize Program

With Normalize program, after an adjustment process all chip and bond positions are moved as if the program had been trained at this position. The state of the first programmed part can be restored.

This is necessary if you want to change the PRU positions of an already finished program.

>> Position changes at <Learn Wire> are possible if <Adjust> was done before.

9.5 Measure Chipheights

Measure Chipheights is used to measure missing heights if this was not possible in Learn Chip due to the component geometry.

The function is called with <Mode><Measure Chipheights>. Afterwards 'Measure All Chip Heights' or 'Measure missing chipheights' can be selected. With <Start> the process is started.

After the measuring process the heights can be saved with OK.

9.6 Move the Bond Program

9.6.1 MoveProgram XY

This function is useful if you have made changes to the part holder etc.

It can be accessed through <Mode> <Move Program XY>. Here the whole program can be moved by one offset. Teach in as usual with <Store Trace>. Then confirm with OK.

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9.6.2 MoveProgram Z

<MoveProgram Z> is used if the part holder has been changed and therefore the whole bond program has to be moved to Z It is assumed that all heights have already been measured. The function is called under <Mode> <MoveProgramZ>.

IMPORTANT!

To take over the current XY position of the component it may be necessary to first perform <Adjust> and then <Normalize>.

Afterwards the chip can be selected with <Page Forward> <Page Backward>, which is used for the measurement. With <Store Trace> this chip is measured again.

After confirming with OK all heights are recalculated.

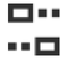
9.7 Change Bondprogram with Plot Program (Show Program)

In the Plot Program window the generated bond program is visualized in an abstract way. It serves the user for orientation and for complex changes of the program data.

The Reset Zoom function is used to fit the bond program into the window. If Show Modules is enabled, all modules are displayed, otherwise only Module#1.

With the mouse wheel you can zoom into the display. With the mouse wheel pressed, the zoomed display can be moved with the mouse.

Reset Zoom Show Mdoules



Move Bondhead To.

In this mode, the active wire is displayed in blue.

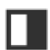
If you click on another wire, the machine will move to this wire and activate it.

If you click on a chip, the machine will move to the first adjustment point of this chip.

Select Wires.

In the <Select Wire> mode, wire segments can be marked with the left mouse button.

Invert Loop Selection .



<Invert Loop Selection> reverses the selection.

The Filter function can be used to additionally restrict the selection to properties such as loop length or 1st and 2nd bond position.

Select Chips.

<Select Chips> works like <Select Wires>, but with chips. When a chip is selected, all bonds which are placed on that

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chip are also selected.

TIP

Ctrl + mouse click: add/exclude

Ctrl + mouse drag: Invert selection in rectangle

Ctrl + Shift+ mouse drag: Select (whether it is already selected or not)

9.7.1 Change Wire Group

This function is useful if you want to change a parameter on several wires.

For this purpose activate the mode <Select Wires> in the plot program.

Then select the wire segments to be changed, right mouse button, under <Edit Wires> open the respective parameter dialogs.

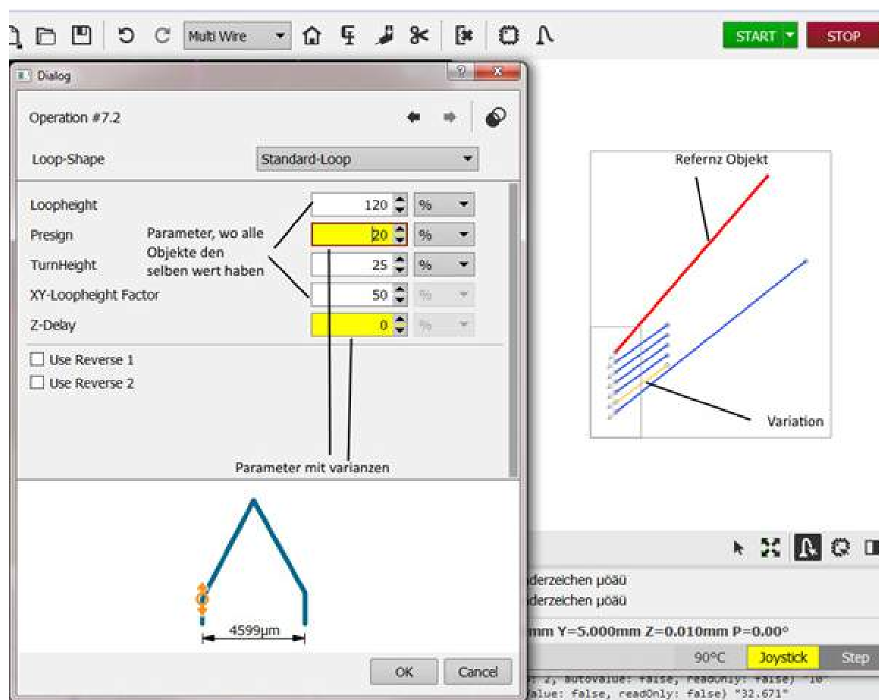

Figure 9.7. - 1 Dialog Edit Wire

The selected wire segments are displayed in blue. The reference segment is displayed in red. If a parameter is not the same for all wire segments, it is highlighted in yellow. Click on a wire segment to change the reference object.

If you select Isolate blue Operations

while the cursor is on one of the yellow fields, all yellow wires are removed from the selection.

If you change a parameter, it will be applied to all selected wire segments after confirming with OK.

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9.7.2 Save and Load Wire Parameter

If you select wires with

you can load or save parameters with the right mouse button <Edit Wires> <Load Parameters> or <Save Parameters>. Parameters can be transferred from "Single Wire" or a library.

9.7.3 Copy Paste

<Copy Paste> allows the copying of whole chips or only single wires.

In contrast to <Repeat Group> the offset of each copy has to be taught-in individually. Additionally, copies can be rotated.

In the modes

any objects can be marked, then right-click <Copy Paste>. If only a part of a wire (e.g. only the first bond) is selected, <Copy Paste> completes the selection on the whole wire to leave no orphaned bonds.

The first step is to define the position which is used for duplication. This position can be either a chip adjustment point or a wire end point. With the <Next> and <Previous> buttons can be selected.

Then the copies can be taught-in individually with <Store Trace>. With the button <Rotate> the copy can be rotated.

Confirm with OK.

9.7.4 Repeat Group

Multiple wires are automatically duplicated. Unlike <Repeat Wire>, only a single XY offset can be defined for all bond positions. The <Repeat Group> is well suited for duplicating repetitive wire sequences.

In mode

select one or more wires, then right-click <Repeat Group>.

The first step is to define the bond whose position is used for duplication. (<Next> <Previous> Buttons)

Confirm ? with <Continue>.

Enter the desired number of copies at <Repeat Count>. Move the cursor to <First X Position>, position the first repetition with the joystick and confirm with <Store Trace>. Under <Last X Position> correct last repetition with joystick and accept with <Store Trace>.

Confirm with OK.

TIP

If the distance can be seen from a Bond Plan, you can also enter the offset in the <Rel> tab.

9.7.5 Move Selected

This function is similar to <MoveProgram XY>. Here you select a subarea, which you want to move. To do this, select wires or individual bond points in the mode, then select <Move Selected> with the right mouse button. Teach the new position with <Store Trace> and confirm with OK.

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9.7.6 Repeat Wire

Ideal for duplicating a single wire. With <Repeat Wire> a separate XY offset is defined for each bond position.

To do this, activate the mode

and click on a wire. Then select <Repeat Wire> with the right mouse button or <Mode> <Repeat Wire>. Specify the number of repetitions with <Repeat Count> and train the first repetition with <Store Trace>. Correct the last repetition exactly and also enter the value with <Store Trace>.

Confirm with OK.

9.7.7 Change Bondorder

The order of the bonds can be changed. Using <Sel Down and Up> the wires can be selected and move <Up> and <Down>. Afterwards you can see where the wires have been, and where they are now, also in the <Plot Program> everything is color coded.

9.8 Production Operation

9.8.1 Execute the bond program automatically

With

the automatic processing can be started. The prerequisite for this is that Multiwire is selected and a program suitable for the product has been previously created or loaded from the database.

Afterwards the "Manual Adjust Window" appears for each adjustment point. There the component can be set up with the joystick and confirmed with <Adjust>.

After the Adjust process the program is bonded.

TIP

It is possible to activate the Step Mode at any time. So the machine can be stopped without interrupting the process.

The process can be interrupted and stopped by clicking Stop.

In the drop-down menu of the Start button, it is also possible to select whether to start from the first wire or from any selected wire.

9.8.2 Rebond

In case of adhesion problems or repairs, the rebond mode can be used. The rebond mode is started with

or <Mode><Rebond>.

As usual, coordinates can be taught in with <Store Trace>. However, taught in positions are only stored temporarily and thus the original bond program is not changed.

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TIP

It is also possible to create only single chains or only stitch on ball at 5x10 under

9.8.3 Reset Alignment

<Mode> <Reset Alignment> discards the adjustment data from the last Adjust operation. Afterwards a new adjustment can be performed.

9.9 Quality control

9.9.1 Deformation Limit Control

See Chapter 8.1.5.

9.9.2 Wedge Counter

Since the quality of the bonds also depends on the wear of the bonding tool, the number of bonds can be monitored with the Wedge Counter. If the specified value is exceeded, a warning is issued.

The Wedge Counter can be reset to <Page><Head Calibration>. Other settings <Max Counter> can also be made in <Mode> <Head Calibration>.

9.10 Pattern recognition

The pattern recognition software is used to automatically search for adjustment points.

It replaces the manual adjustment via the joystick. Models are taught in the <Learn Chip> which are then used during processing.

The pattern recognition can be activated in the <Learn Chip> mode. For this purpose < Use Pattern Recognition> is set. Afterwards two dashed rectangles and several new buttons appear in the live video.

The inner of the two rectangles is the area where the model is taught. This area can be clicked and moved with the mouse and the size can be changed.

The pen can be used to make a free-hand selection with the mouse,

which can be reset to a rectangular area using

The outer rectangle is the search area in which the model is searched. The size of this rectangle can also be changed with the mouse.

If you save an adjustment point using <Store Trace>, a model is created in addition to the coordinate.

TIP

The selected area should have contours that are as unambiguous as possible; ideally, this should already be taken into account when selecting the position.

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To ensure an exact manual positioning of the crosshairs by the operator, the adjustment points should be selected in such a way that the crosshairs run at a clearly visible corner. The model area should be moved so that a structure actually occurs only once in the search area.

9.10.1 Image Capture

In the tab <Capture> the camera and light settings are defined.

The camera settings must be selected so that the contrast of the structure to be searched for stands out as well as possible against the background. These settings are different for each substrate, so you can never make a rule of thumb.

TIP

On some surfaces, the Saturation channel sometimes works better. (such as: gold coatings on white substrate)

9.10.2 Modell Creation

In the tab <Model> you can choose between Contour or Grayscale as method.

While Contour Search looks for edges in the image, Grayscale compares the distribution of the different gray tones in the selected image section.

With Downscale the image resolution can be adjusted. For coarse structures you can work with a larger downscale to blur the image, which can be helpful in such a case.

With Countour there are two more parameters. Min Contrast defines the minimum threshold value for a detected edge. Min Length filters out shorter contour pieces.

TIP

Contours should be clear and continuous, many small short structures that do not really form a continuous structure are not well suited for a stable automatism. But if there is only one structure in the search window because it is a lonely adjustment point, it can also work quite well with short lines.

9.10.3 Control Search

In the tab <Search> you can change the minimum search quality and the search range of the contour. In this tab, the image recognition searches the set structure and indicates possible alternative finds.

TIP

Make sure that only one contour is detected and no alternative finds are made. If this is unavoidable, make sure that the set <Min Score> is significantly higher than the score achieved with the alternative finds.

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10) Calibrations

All calibrations listed here are made during commissioning by F&S Bondtec. Changes should only be made by the user after consultation with F&S Service!

IMPORTANT!

All calibrations are permanently written to the memory unit of the bond head only after closing the software.

10.1 Camera Convex Compensation

This compensation is used to establish a relationship between camera pixels and the axis system. Camera Convex compensation usually needs to be done only in large time intervals. It is absolutely necessary if an extender lens is screwed onto the camera or another zoom level is used - but this should not be done without a service technician.

The function can be started under <Mode><Camera Convex Comp>.

Follow the wizard and place the crosshairs, which are now in the upper left corner of the camera image, at a significant point. A position to be clearly identified by the operator should be selected and moved to. Small, bright reflections on the component or a previously bonded wire seem to be particularly suitable for this purpose.

Then use <Next> to switch to step 2. There the crosshairs, which are then located in the lower right corner of the camera image, must again be brought into exact alignment with the previously selected structure. The positions are saved with <Store Trace>.

10.2 Head Calibration

10.2.1 Bond Weight

Bond weight calibration is necessary to define how much current must flow through the bond weight unit to achieve the programmed bond weight. The mechanical preload is also included here.

The function can be found under <Mode> <Head Calibration>.

The bond weight calibration is usually done on a digital measuring cell. It is recommended to set <Wait Delay> and <Touchdown Steps> beforehand according to the wire diameter. <Wait Delay> is the dwell time during which the measured value can be read.

>> Before calibration, it is advisable to adjust the workheigth, as the machine rests on the measuring cell from this height.

>> Move the cursor to Weight Point 1 and press <Store Trace>.

>> The bonding tool is placed on the measuring cell.

>> Then enter the measured value at Weight Point 1.

>> Repeat the procedure at Weight Point 2.

10.2.2 P-Adjust

This function is used to set the home position of the rotation axis on the bond head. This adjustment is made during commissioning at F&S Bondtec.

10.2.3 Wedge Counter

The Wedge Counter should be reset after every tool change, just press <Reset Wedge Counter> and confirm.

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10.3 Camera Offset

Calculation of the deviation between optical axis (crosshairs) and mechanical axis (bond head, bond tool).

>> Position the crosshairs with a joystick over a free bondable area on the substrate.

>> Press Store Trace button to save the position and measure the height of the surface.

>> Press the "Bond" key.

The selected number of wires is bonded. The bonding parameters are taken from the single wire. However, the parameters can be adjusted under the corresponding tabs.

>> Adjust the size of the displayed rectangle to the actual tool size and position the rectangle over the bond area. You can also use the virtual joystick to do this.

>> Accept the position with the <Store Trace> button.

>> Repeat for all bonded wires.

The deviations are shown in a graph.

Save the entries with OK.

10.4 Axis Calibration

Since every mechanical part has a certain manufacturing inaccuracy, there can be deviations in the positions approached by the axes.

Therefore these deviations should be considered and compensated by a calibration of the XY axes. By measuring the axis with a glass scale during axis calibration, this inaccuracy can be included in the software and thus positions can be approached much more precisely.

This calibration must never be repeated by the user.

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11) Adjustment Work on the Bondhead

The following activities assume that Chapter 1 (General Information) and Chapter 2 (For Your Safety) have been read and understood.

11.1 Bonding Wire

DANGER!

Avoid any skin contact with the bonding wire and all wire-carrying parts, as contamination such as a fingerprint can lead to a bad quality of the bond.

IMPORTANT!

For thin wire bonders use only 2 wire spools. For heavy wire bonders 4 coils are suitable.

Attach wire spool.

>> Loosen and remove the clamping disk, this should also not be touched.

>> Put on the wire spool, the start (green) should be on top.

>> Put on clamping disk and secure with a threaded pin.

Change wire coil.

If the spool is not yet empty (e.g. when changing the wire thickness), cut the wire at the spool and pull the remaining wire out of the wire guide.

Thread in the Wire .

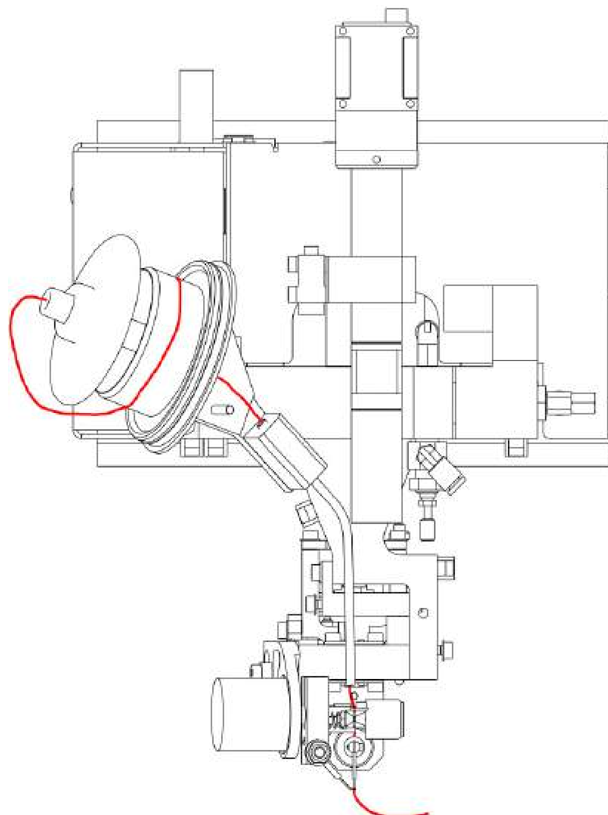

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Figure 11.1. - 1 *Wire Path 5610i*

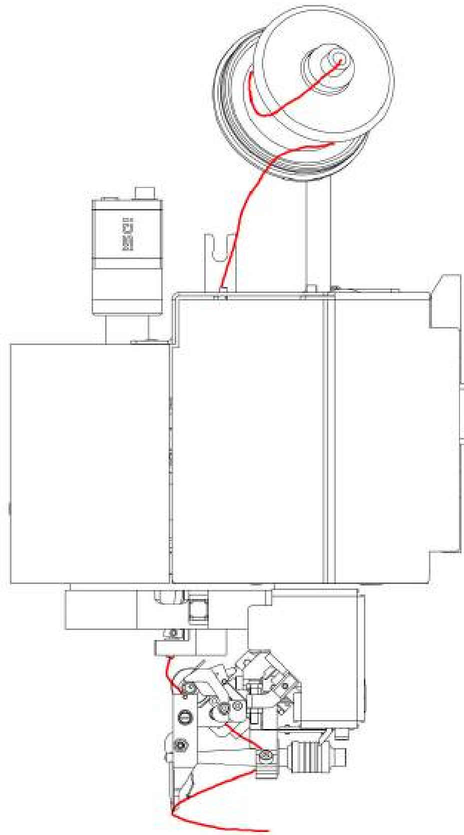

Figure 11.1. - 2 *Wire Path 5630i*

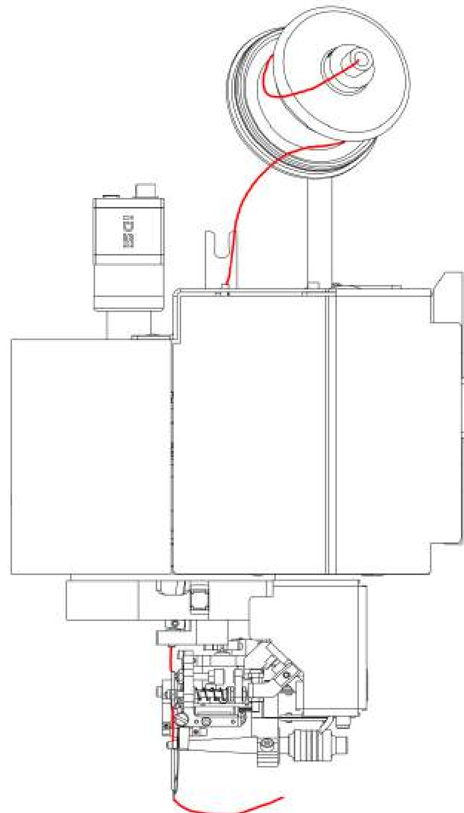

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Figure 11.1. - 3 *Wire Path 5632i*

With the 5650i heavy wire head, the wire is guided in a silicone tube up to the tool.

11.2 Bond tool

11.2.1 Bond tool Installation / Change

IMPORTANT!

The bonding tool is a consumable item and must be replaced at the latest when the bonding quality declines noticeably or after a selected number of bonds.

>> Loosen clamping screw with Allen key 0.9 mm or 1.3 mm (thin wire or thick wire). Pull the bonding tool downwards out of the transducer.

>> Insert new bonding tool into the transducer from below.

>> Align the bonding tool so that the upper edge of the bonding tool is flush with the upper edge of the transducer.

>> Tighten the clamping screw with a 18 cNm or 40cNm (heavy wire) torque wrench.

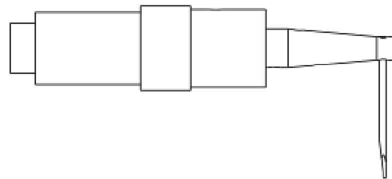

Figure 11.2. - 1 *Transducer*

>> After a change the chip heights should be measured again.

>> The camera offset calibration is also required if a significant deviation of the actual bond position from the position indicated by the crosshairs is detected.

>> For the heavy wire bonder, it may be necessary to adjust the cutheight after a tool change.

IMPORTANT!

Every fourth time the bonding tool or capillary is changed, the clamping screw must also be changed.

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11.3 Mechanical Settings

11.3.1 Bracket Settings 5610

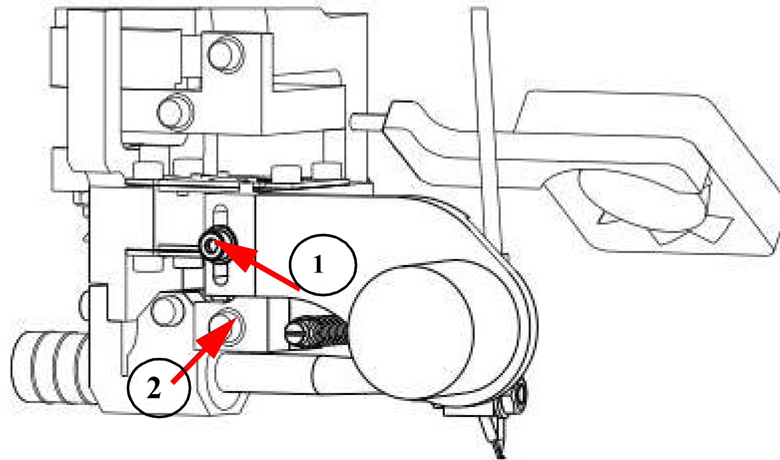

Figure 11.3. - 1 Bracket settings 5610i

1. Set FlameOff Lance vertically.

>> Release clamping screw
>> Set holder with grub screw at the top

2. Set the clamp horizontally.

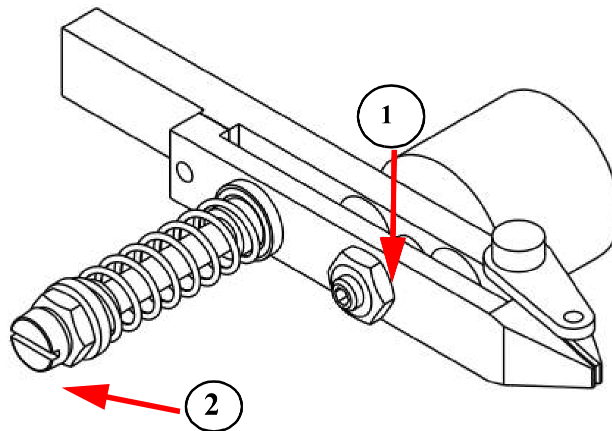

Figure 11.3. - 2 Clamp 5610i

Adjust FlameOff Lance .

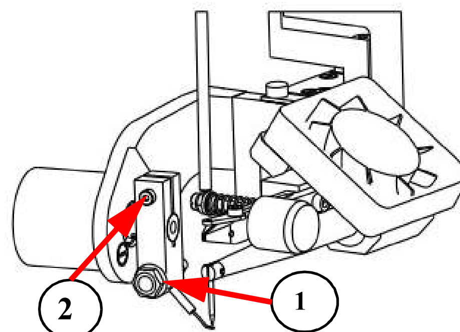

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Figure 11.3. - 3 FlameOff Lance 5610i

1. Loosen fastening screw.

>> Lance can be moved inwards and outwards

2. Loosen the clamping screws.

>> Lance holder can be moved forward and backward
>> In addition, the front position of the lance can be adjusted when the engine is swung out.

The FlameOff Lance is moved under the capillary with the rotary magnet to flame off the wire and form the ball.

DANGER!

Before working on the Flame Off Lance, switch off the bonder and pull the power plug. Danger of electric shock!

For persons with pacemaker there is danger to life.

Exercise extreme caution when working in the working area of the machine.

Do not reach into the working area of the machine during operation. Danger of injury!

11.3.2 Bracket Settings 5630i

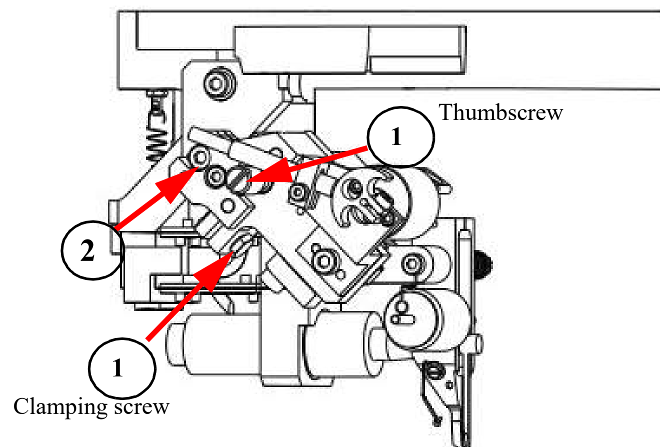

Figure 11.3. - 1 Bracket settings 5630i

1. Adjust clamp.

>> Release clamping screw
>> Use the thumbscrew to move the clamp sideways

2. Move clamp uni vertically.

>> Loosen clamping screw
>> Adjusting the height of the clamp
>> Retighten clamping screw

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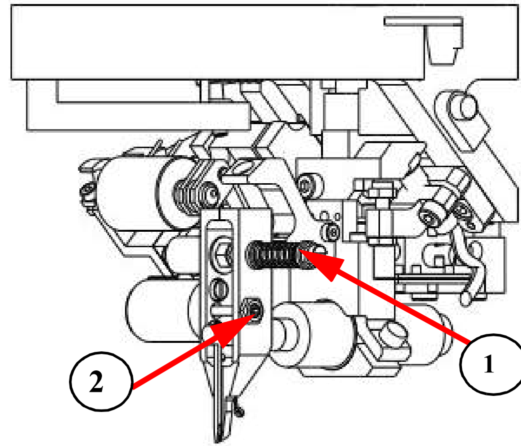

Figure 11.3. - 2 Bracket settings 5630i

Adjust opening width.

>> Loosen the locknut
>> Turn stop screw
>> Close the locknut

2. Change the clamp pressure.

>> Loosen lock nut
>> Adjust opening width as desired with grub screw

11.3.3 Bracket Settings 5632i

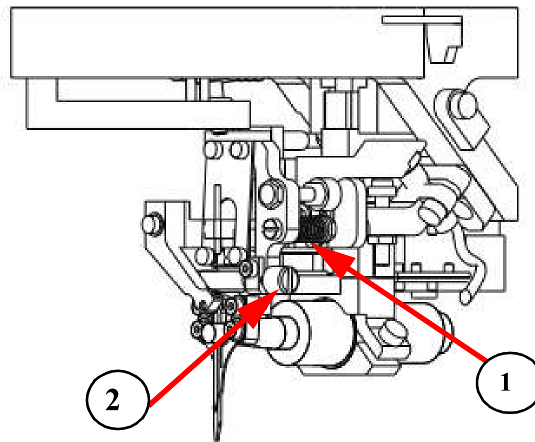

Figure 11.3. - 1 Bracket settings 5632i

1. Adjust distance of lower wire clamp.

>> Turn the fastening screw of the spring tighter/ looser

2. Adjust wire guide.

>> Loosen clamping screw of the eccentric
>> Turn eccentric
>> This changes the distance between the wire clamp and the bonding tool.

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11.3.4 Knife Settings 5650i+HR

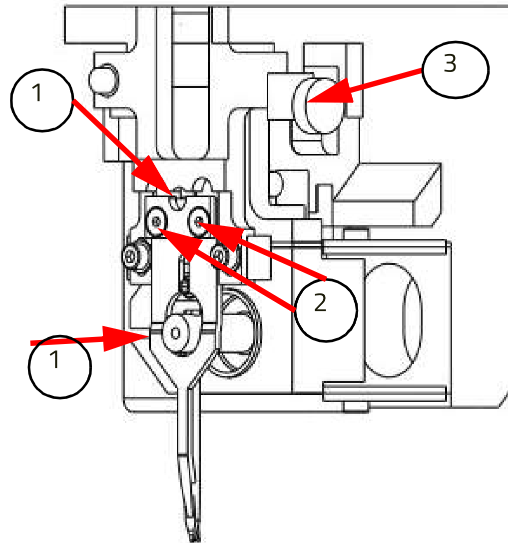

Figure 11.3. - 1   Knife settings 5650i+HR

1. Adjust the distance between the knife and the tool.

>> Adjust grub screw as desired
>> If necessary loosen the fastening of the knife

2. Adjust the height of the knife.

>> Loosen both clamping screws
>> Loosen/tighten stop screw
>> If necessary, push the knife forward
>> Tighten both clamping screws

3. Horizontal position of the knife.

>> Loosen fastening screws
>> Adjust with knurled screw

11.3.5 Bracket Settings Heavy Ribbon Kit

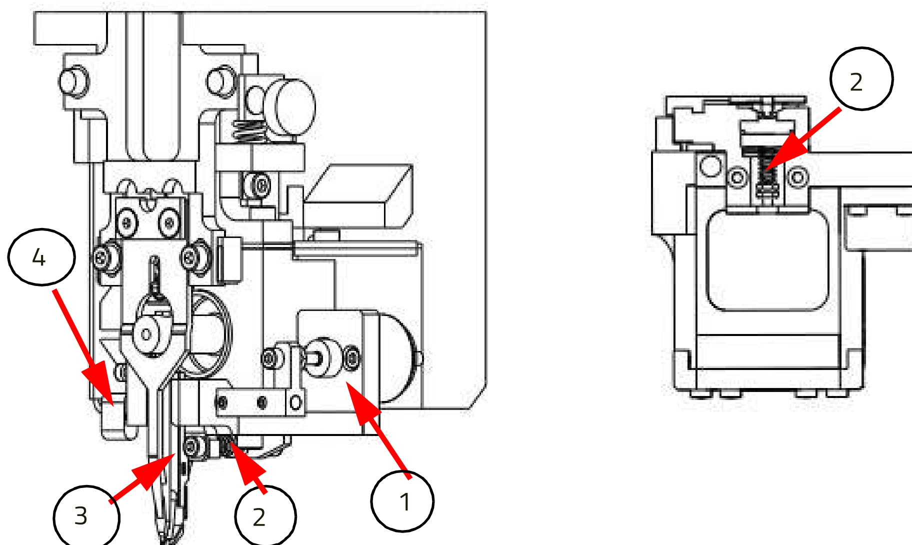

Figure 11.3. - 1   Bracket settings HR-Kit

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1. Opening width wire clamp.

>> Open locknut
>> Adjust stop

2. Adjust the force of the wire clamp.

3. Distance to the tool.

>> Loosen the fastening screws of the HR kit
>> Move the entire kit

4. Adjust the height of the wire guide.

>> Loosen brass clamping screw
>> Move guide by hand
>> The adjustable stop screw allows precise adjustment

IMPORTANT!

The clamping pressure must only be adjusted to the wire diameter if necessary!

Less pressure to avoid marks on thin wires.

Higher pressure to prevent the wire from slipping through when the wire is thick.

11.4 Cleaning of the Components

DANGER!

Never use sandpaper or abrasive cleaning agents to clean components. A lint-free cloth soaked in pure alcohol or acetone is best for cleaning all components.

11.4.1 Machine

Clean the machine and check for possible damages. Use a lint-free cloth soaked in alcohol or acetone.

After cleaning the moving parts, they may have to be lubricated again.

11.4.2 Wire Guide

The wire guide should be cleaned monthly.

>> Soak a pipe cleaner with pure alcohol or acetone.
>> Pull the pipe cleaner several times through the feed channel and the wire guide tube.
>> Pull a dry pipe cleaner several times through the feed channel and the wire guide tubes.
>> Clean the clamping disc and the feed channel on the coil holder with a lint-free cloth soaked in alcohol or acetone.

11.4.3 Wire Liner

The teflon wire guide tube is subject to wear during the bonding process due to retightening of the wire. For this reason it should be checked regularly and replaced if necessary.

11.4.4 Wire Clamp

The wire clamp should be checked monthly for deposits and cleaned if necessary. This can be done in the installed condition.

>> Open the wire clamp with the "Wire Clamp" button.
>> Soak a clean and lint-free piece of paper with pure alcohol or acetone.
>> Move the paper back and forth several times between the clamp jaws.

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>> Push a clean and lint-free piece of dry paper into the clamp and close the clamp.

>> Pull paper carefully out of the clamp.

>> Repeat the entire process several times.

11.4.5 Bond Tool

Since it is difficult to clean a bonding tool, it is better to replace the dirty tool with a new one, so the bonding quality always remains constant.

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