FK DELVOTEC



Bonder series M17

F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

1 GENERAL INFORMATION 1-1

2 SAFETY 2-1

3 BASIC MACHINE 3-1

4 BOND HEAD 4-1

5 WIRE SPOOL 5-1

6 US GENERATOR 6-1

7 X/Y UNIT 7-1

8 Z/P UNIT 8-1

9 INDEXER 9-1

10 LIFTS 10-1

11 HEATER 11-1

12 SOFTWARE 12-1

13 TROUBLESHOOTING AND SERVICE 13-1

14 APPENDIX A-1

1
2
3
4
5
6
7
8
9
10
11
12
13
A

1 GENERAL INFORMATION

1.1 Validity of this User Guide

1.1.1 Manufacturer's address

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
D-85521 Ottobrunn
Germany
Phone: +49 (0)89.629 95-0
Fax: +49 (0)89.629 95-100
http://www.fkdelvotec.com

Branches and distributors

USA

F&K Delvotec Inc.
27182 Burbank Ave
Foothill Ranch, CA 92610
USA
Phone: +1.949.595-2200
Fax: +1.949.595-2207

Asia

F&K Delvotec Singapore PTE Ltd.
483B Alexandra Road
Block B Alexandra Technopark Unit
No # 06-12
Singapore 119968
Phone: +65-6779-5055
Fax: +65-6779-5655

1.1.2 Nameplate / serial number

See the section dealing with the basic machine for details of the position of the nameplate.

1.1.3 Guarantee, warranty and liability

The General Terms and Conditions of Sale and Supply of F&K Delvotec invariably apply. A copy of these General Terms and Conditions is placed at the owner-operator'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:

- Utilisation for other than the manufacturer's designated use
- Incorrect installation, assembly, commissioning, operation or maintenance
- Non-compliance with the User Guide
- Operation of the bonder 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.

Alterations, additions to and conversions of the bonder undertaken without the prior approval of F&K Delvotec GmbH are strictly prohibited.

Conversions invariably require the manufacturer's prior written consent. Structural alterations undertaken without prior written consent void your F&K Delvotec warranty.

1.1.4 copyright

F&K Delvotec retains full copyright to the documentation package and all its parts. No part of this documentation may be reproduced or distributed in any form or by any means whatsoever without the prior, express, written consent of F&K Delvotec.

1.1.5 Additional manufacturer-supplied information

Manufacturer's manuals, if enclosed, contain additional information on the individual components.

- Vision System®, PatMax® and PatQuick® and the associated logos are registered trademarks of Cognex Corporation©
- PICMG®, CompactPCI® and their logos are registered trade marks of the organization PCI© (Industrial Computer Manufacturers Group).
- Adobe Reader® and their logo is a registered trademark of Adobe®

FK DELVOTEC



Bonder series M17

Safety

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

2 SAFETY 2-1

2.1 Safety at work 2-1

2.1.1 Symbols and notes on safety 2-1

2.2 residual hazards 2-2

2.3 Protective equipment / personal protective gear . . . 2-2

2.4 operation. 2-3

2.4.1 notes on safety 2-3

2.4.2 Work on electrical equipment 2-7

2.4.3 EBP. 2-9

2.5 Higher-priority notes on safety 2-9

2.5.1 EMERGENCY STOP (what to do in an emergency). 2-9

2.5.2 User Guide. 2-10

2.5.3 Personnel qualification 2-10

2.5.4 obligations undertaken by the owner-operator 2-11

2.5.5 Operating modes 2-12

2.5.6 Protective door / maintenance door. 2-14

2.6 Sources of danger 2-15

2.6.1 Warning signs and notifiers 2-16

2 SAFETY

2.1 Safety at work

2.1.1 Symbols and notes on safety

User Guide

The notational conventions employed to draw the reader's attention to warnings and notifiers in this User Guide are as follows:

D A N G E R !

This symbol draws attention to an imminent hazard.

Death, severe physical injury or considerable damage to property will occur if the corresponding precautions are not taken.

High risk of physical injury and/or damage to property.

W A R N I N G !

This symbol draws attention to a potential hazard.

Death, severe physical injury or considerable damage to property can occur if the corresponding precautions are not taken.

Medium risk of physical injury and/or damage to property.

C A U T I O N !

This symbol draws attention to a hazard.

Slight to moderate physical injury or damage to property can occur if the corresponding precautions are not taken.

Low risk of physical injury and/or damage to property.

N O T E !

This symbol draws attention to a possibly dangerous situation.

Damage to property can occur if the corresponding precautions are not taken.

Obligation to behave in a certain way or perform an activity for safety in handling or working with the machine.

This symbol does not draw attention to a risk of injury.

I M P O R T A N T

Draws attention to tips and useful information that will help extract maximum benefit from the machine.

Symbols used in the text

The symbols used in the text to emphasize lists and instructions on how to act are as follows:

- ▶ The arrowhead indicates an instruction
- ■ The square indicates an item in a list
  - The dash in a list indicates an item in a subordinate list

2.2 residual hazards

Residual hazards are risks that cannot be reduced to zero or to a minor level by the implementation of protective measures.

IMPORTANT

Always comply with the instructions in the other user guides for the production facility.

magnetic fields

The linear drives generate strong magnetic fields which can interfere with electronic and precision-engineered equipment in their proximity. Health hazard for persons with cardiac pacemakers or metal implants; risk of damage to watches and data carriers of all kinds.

Heated device workholder

The temperature of heated device workholders can exceed 60 °C. Burn hazard.

Conveyor

The conveyors of the index systems can cause injury. Crush hazard.

bond head

When working with long loose hair, the hair may become tangled or pulled into the drive band of the bond head. Moving machinery hazard.

The movement of the bond head results in the danger of crushing or jolting!

Above the base plate

Above the base plate, the bonder is enclosed by a protective housing. This reduces the risks that can result from moving parts and electric voltages.

NOTE!

In certain operating modes, in which the protective door is open, there is a risk of injury. The movement of the bond head results in the danger of crushing or jolting! The operating personnel must be trained accordingly before being tasked with work of this kind.

2.3 Protective equipment / personal protective gear

Before starting the machine, always make sure that all protective devices are installed and are in full working order.

It is permissible to remove protective devices and covers only:

- after the machine has been shut down,
- after it has been adequately locked to prevent restart, and
- switch off the main switch and by means of the lockout system, ensure it cannot be switched on again

When shipping sub-assemblies, the owner-operator must install the protective devices and covers in the prescribed manner.

The owner-operator must supply the requisite personal safety equipment.

DANGER!

Do not open the case unless the machine is disconnected from the electricity supply.

Always make sure that the main switch is OFF before changing fuses.

Keep well clear of exposed parts of the printed-circuit board when the machine is switched on. Electric shock hazard.

The safety of the equipment is ensured only when all protective devices are correctly installed and fully operational.

Operate the machine only with all covers and doors closed. Do not remove covers while the machine is in operation. In particular, this is possible in "inspection mode", because in this mode the safety mechanisms are partially disabled. The owner-operator is responsible for ensuring that maintenance work is carried out correctly. Fatal-injury hazard.

It is permissible to remove protective devices only when the main switch is locked in the OFF position.

On completion of repair work, correctly re-install all safety devices and check that they are in full working order.

2.4 operation

2.4.1 notes on safety

Safety at work

Bonding machines from the company F&K Delvotec represent the state of the art and comply with safety regulations.

D A N G E R !

Use the bonder only

- **in compliance with the manufacturer's intended use**
- **in perfect safety-related working order**

Incorrect use means risk of fatal injury to the user and others and can cause damage to the machine and property. Have safety-related defects repaired immediately by trained, qualified specialists.

Do not open the case unless the machine is disconnected from the electricity supply.

Life-threatening hazard for persons with cardiac pacemakers.

The linear drives generate strong magnetic fields. Persons with cardiac pacemakers and/or metal implants, therefore, must keep well clear of the machine.Health hazard.

Only F&K Delvotec customer services technicians or appropriately trained and authorised personnel are permitted to work on the X/Y unit (solenoids, linear motors, etc.).

Notes on safety for operation

D A N G E R !

Keep well clear of the working zone of the machine and conveyor system while the equipment is in operation. Moving machinery hazard.

The bond head moves fast. Do not hold your head into the operating range of the bond head! Moving machinery hazard.

The safety of the equipment is ensured only when all protective devices are correctly installed and fully operational.

Operate the machine only with all covers and doors closed. Do not remove covers while the machine is in operation. In particular, this is possible in "inspection mode", because in this mode the safety mechanisms are disabled. The owner-operator is responsible for ensuring that maintenance work is carried out correctly. Fatal-injury hazard.

It is permissible to remove protective devices only when the main switch is locked in the OFF position.

Do not work with the machine with long hair hanging loose or when wearing dangling items of jewellery (necklace, chain, etc.). Your hair or jewelry could be trapped by the moving parts of the machine and cause injury.

Take great care while working inside the machine.

Always return the bond head to its home position before penetrating the machine's working zone.

Moving machinery hazard.

Always comply with the manufacturer's instructions when handling purging gas, forming gas, etc.

D A N G E R !

The uninterruptible power supply means that the PC is not de-energised immediately when the machine is switched off. This also applies when the emergency stop button is pressed to stop the machine. Wait for 30 seconds after switching the machine off before opening it. Electric shock hazard.

The device carrier becomes very hot when a heater is in use. Burn hazard. Do not touch the device or the device carrier when the heater is on or while the device carrier is still hot.

When working with a manual station keep your fingers clear of the chuck – moving machinery hazard.

Do not work on the machine at the same time as other persons.

Improper access or repair work may affect the integrated safeguarding and safety functions including the electromagnetic behaviour of this device and cause function interruptions on the device, personal injury and damage to connected machines or system ranges.

Immediately disconnect the equipment from the power supply if you smell burning or if overheating occurs.

Substandard maintenance work can lead to physical injuries.

Only qualified maintenance specialists are permitted to carry out maintenance work on the equipment.

Danger due to undetected damage to components.

At regular intervals, check the components for damage.

Have damage repaired immediately by specialists authorised by the manufacturer.

C A U T I O N !

Crush hazard. Take care not to injure fingers and hands.

Always use only the grip provided for the purpose when opening and closing the loading door.

Before closing the loading door, always make sure that no-one's fingers or hands can be trapped.

Some servicing operations might require people to reach inside the working chamber with their hands.

Always make sure that no-one's fingers or hands can be trapped.

Risk of hot surfaces burning the hands.

The workpiece can be hot after the working process.

Allow the workpiece to cool down prior to removal from the working chamber.

Never touch hot parts with your naked hands; always wear the gloves provided for the purpose.

Environmental protection laws strictly regulate the disposal of waste materials and used cleaning agents.

Bring all waste materials and used cleaning agents to the designated collection point for hazardous waste.

If cleaning agents are accidentally spilled immediately scatter the spillage with plenty of binding agent, allow the agent to bind the spilled substance and then dispose of it as hazardous waste.

Implement suitable precautions for controlling spillages (spillage trays, spillage membranes, etc.).

N O T E !

Read this User Guide completely before you start working with the production facility for the first time.

N O T E !

Single-head and double-head bonders. Do not position the microscope and microscope holder in the working zone of the bond head – Crash hazard. The danger zone is covered by a protective housing. The owner-operator is responsible for ensuring that maintenance work is carried out correctly.

The linear drives generate strong magnetic fields. Keep watches and data carriers of all kinds (this includes the magnetic strips on cheque cards and ID cards) well clear of the X/Y unit. Risk of destruction or data corruption.

After any modifications to the device holder ensure that the movement limits exclude the possibility of collision with the bonding tool.

Define a sufficiently high Z-axis limit for setup and testing applications. At the same time, make sure that the programming of the X/Y axes excludes the possibility of a collision when the Z-axis limit is reset – machine damage hazard.

Notes on safety for setup, maintenance and cleaning operations

I M P O R T A N T

Always save the current program with "File > Save" before maintenance work or cleaning work is carried out on the bonder.

D A N G E R !

On completion of repair work, correctly re-install all safety devices and check that they are in full working order.

This work is life-threatening for people with cardiac pacemakers!

The linear drives generate strong magnetic fields. Persons with cardiac pacemakers and/or metal implants, therefore, must keep well clear of the machine.Health hazard.

Always exercise care when handling cleansing agents. Always follow the manufacturer's instructions.

Prior to maintenance work, the machine must be de-energized and secured against unintentional restart by means of lockout/tagout.

N O T E !

Keep the machine clean at all times. Do not use cleansing agents or lubricants not expressly recommended by F&K Delvotec.

Forgotten tools can damage the equipment.

As soon as you finish maintenance work, remove all tools from the equipment and check that nothing has been forgotten or mislaid.

F&K Delvotec recommends having the machine serviced every 7,000 operating hours approximately, or every 2 years at the latest.

N O T E !

Remove components only when the machine is switched OFF.

Switch the machine off

Prior to maintenance work, the main switch has to be turned to position "0". In this position the main switch has to be fixed by attaching a padlock (lockout). After the main switch has been secured, it can not be turned to position "I".

▶ Turn main switch to position "0"



fig. 2 - 1 Main switch > Position 0

▶ Pull out the red insert on the main switch



fig. 2 - 2 Main switch > red insert

I M P O R T A N T

As soon as the red insert of the main switch is pulled, the main switch cannot be turned to position "I" any longer.

▶ Secure main switch with padlock on red insert



fig. 2 - 3 Main switch > padlock

I M P O R T A N T

Attach a conspicious labelling (tagout) to the lockout device indicating that the machine is switched off for maintenance purposes.

Use only lockout- /tagout-devices that fit to the machine. In the case of the main switch pull the red insert and secure it in position "0".

Security Interlocks

The verification of security interlocks must be carried out at least once a year.

- When pressing the EMERGENCY STOP button, the moving axes must be actively braked and may not continue to coast along. The software must be shut down safely (Battery Mode). Restarting in battery mode must not be possible. (LED flashes alternately yellow/green.) Switch on the machine, move axes to their home positions.

I M P O R T A N T

If the machine has more EMERGENCY STOP buttons, they must be tested in the same way.

- To check the safe switching off of all axes, disconnect the GinLink cable on the "motion controller": all axes must go to the STO. The axes are to be actively braked and may not continue to coast along.
- If the protective door or the maintenance doors are opened the machine must be automatically and immediately switched to the service mode

IMPORTANT

Every door must be checked individually!

- To check if the Inspection Mode is running, turn the main switch from position "0" to position "I". There must be no change to Inspection Mode. After a waiting period of 30 Seconds, the message on the "GUI" must disappear. Even if the RFID card is held to the RFID reader, no change is allowed to the Inspection Mode. Only when the key switch is turned from position "0" to position "I" and the RFID card is held to the RFID reader within 30 seconds, the bonder switches to the Inspection Mode (LED flashes blue). If the protective door is opened, the machine remains in the Inspection Mode. If the protective door is closed, the machine switches to Production Mode.
- To check if the inspection mode ends:
  - each maintenance door must be opened individually. The machine must switch to Service Mode.

IMPORTANT

Every door must be checked individually!

  - the key switch has to be turned from position "I" to position "0". The machine must switch to Service Mode if at least one of the doors is opened. If all doors are closed, the machine switches to Production Mode. In both cases the LED changes from flashing blue to green ON.

To ensure that during maintenance no media leaks from the connections for compressed air, forming gas and vacuum, the customer has to safeguard them using lockable, manually operated valves.

WARNING!

To prevent ignition of the forming gas ensure the concentration of hydrogen (H2) is below 5.7%!

2.4.2 Work on electrical equipment

Risk of fatal injury if live parts are touched.

DANGER!

Only authorised, trained and qualified electricians are permitted to work on the electricity supply.

Trained and qualified means that the person has received the appropriate trade-related training and has the knowledge and experience of the applicable requirements (particularly VDGUV Regulation 3 or the national equivalent) to assess the work which he or she is commissioned to undertake and can recognise potential hazards.

Keep the electrical components correctly covered at all times. Only authorised persons are permitted to access the electrical components.

Always make sure that the main switch is OFF before changing fuses.

The power supply unit might carry residual voltage after the bonder has been switched off. After switching off the machine wait at least 30 seconds before opening the case of the bonder. Electric shock hazard.

D A N G E R !

Always make sure the machine is disconnected from the mains supply and de-energised before work on potentially live components commences, and make sure that the machine is secured in such a way that it cannot be re-energised without your knowledge and consent.

Danger to life by electrocution if a device is operated with a defective mains cable. Never start up a device which is damaged or has a defective mains cable!

Also comply with the following:

- **Never touch the mains power plug with wet hands.**
- **Never pull on the supply lead to remove the mains power plug from the wall socket-outlet, always grip the mains power plug directly.**
- **Keep the device, the mains power plug and the mains cable away from naked flames and hot surfaces.**
- **Check the device and cables regularly for damage.**

Keep switchgear cabinets and device enclosures closed at all times. Only authorised persons are permitted to access the switchgear cabinets.

Do not attempt to work on electrically live parts.

Immediately change loose connections and damaged, scorch-marked or scorched through cables. Carry out work only when the main switch is OFF and secured so that it cannot be switched on without your knowledge and consent.

Do not trap or pinch cables. Always route cables in such a way that they do not constitute trip hazards and cannot be damaged.

Work on the electrical systems only when the main switch is OFF and secured with a padlock so that it cannot be switched on without you knowledge and consent.

Lines, connectors

I M P O R T A N T

Before switching on, always check all cables to ensure that:

- All connectors are securely connected.
- There is no visible damage to the lines, connectors and connector locking devices.

The lines must be routed in such a way as to ensure that they are safeguarded as follows:

- Safeguarded against tensile forces acting on the connectors
- Strain-relief devices must prevent loads in the direction of the plug-in contacts
- Safeguarded against kinking
- Safeguarded against crushing and shearing

I M P O R T A N T

All electric lines / equipment must be safeguarded against contact with water and other conductive liquids.

The entire system is de-energised after the main switch has been switched off.

2.4.3 EBP



fig. 2 - 4 Earth bonding point, EBP (example shown: single-double MC)

The operator must have a conductive connection to the machine in order to prevent electronic components being damaged by electrostatic discharge. This connection is made to the EBP (Earth Bonding Point), which prevents the static charge passing from the operator to the machine.

N O T E !

Components can be damaged if you work without a connection to the EBP. Always put on the grounding ribbon before touching components.

- Always wear the earthing strap in such a way that it remains in contact with your skin.
- Plug the cable connected to the grounding ribbon into the bonder's EBP.

2.5 Higher-priority notes on safety

2.5.1 EMERGENCY STOP (what to do in an emergency)

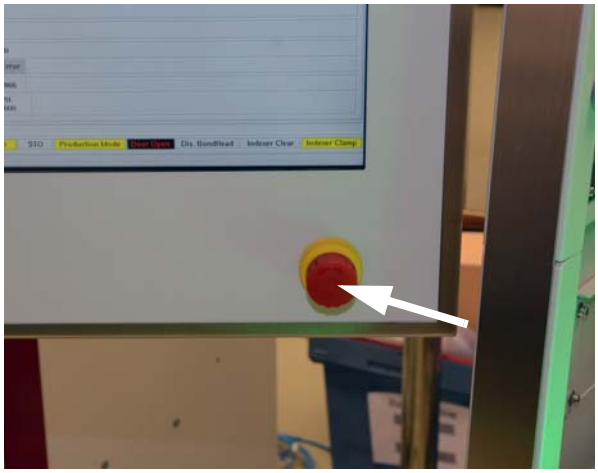


fig. 2 - 5 EMERGENCY STOP button at the monitor

You can stop the bonder and the indexing systems in any operating situation by pressing the EMERGENCY STOP button. The button latches in the depressed position.

N O T E !

Faults must be rectified by trained, qualified personnel working in compliance with all safety precautions.

- Press the EMERGENCY STOP button to bring the machinery to an immediate standstill. All components are de-energised and axes of movement are automatically braked to a complete stop.
- Have the fault rectified by authorised personnel.

To restart the bonder after an emergency stop:

- Make sure that the fault which lead to actuation of the EMERGENCY STOP button has been rectified.
- Unlock the EMERGENCY STOP button.

2.5.2 User Guide

This User Guide contains important notes on safe operation of the production system and use as intended by the manufacturer. It is, therefore, imperative to read and understand this User Guide in order to work with this production system.

The User Guide must be kept readily accessible in the immediate vicinity of the machine/plant at all times.

The User Guide is part of the machine and must accompany it if it is sold to a third party.

The documentation for other-vendor parts - particularly the notes on safety in that documentation - is an integral part of the User Guide. Compliance with the notes on safety and other information in the documentation for other-vendor parts is also mandatory.

All local and national rules and regulations concerning safety at work, accident prevention and environmental protection applicable at the bonder's place of use must be obtained by the owner-operator. Compliance with said rules and regulations is mandatory.

IMPORTANT

If printed cards are attached to individual components of this machine, they bear instructions compiled after this User Guide went to press: compliance with these instructions, too, is mandatory.

The bonder configuration is customisable to customer requirements, so the system as delivered might not be exactly as illustrated and described in this User Guide.

F&K Delvotec reserves the right to update and make technical changes and changes to the content of this User Guide at any time without prior notice.

2.5.3 Personnel qualification

Only adequately trained persons who have been familiarized with its use are permitted to work with the machine.

This device is not intended for use by persons with restricted physical, sensory or mental capabilities or persons lacking experience and/or knowledge, unless they are supervised by a person responsible for their safety while using the machine. The person authorised to issue instructions to these individuals bears responsibility for their safety.

Responsibilities must be clearly defined for installation, commissioning, operation, setup, maintenance and repair.

Permit trainees to work on the machine only under the supervision of an experienced person.

All persons charged with the installation, commissioning, operation and maintenance of the machine undertake

- To read carefully all notes on safety and warnings in this User Guide.
- To comply with the regulations relating to work safety and accident prevention.
- To comply with all safety instructions and warnings on the machine/plant.
- To be at least 18 years of age.

2.5.4 obligations undertaken by the owner-operator

The owner-operator/customer must supplement the User Guide with the following:

- National accident-prevention regulations
- Hazardous substances ordinance
- Instructions for environmental protection
- Owner-operator/customer's internal standard operating procedures and safety regulations.
- Supervisory and reporting obligations providing for special operational circumstances, e.g. as regards work organisation, work practices and personnel.

The owner-operator undertakes to allow only such persons to work on the machine as

- have read and understood all notes on safety and warnings in this User Guide and have confirmed their compliance with this requirement by means of their signature.
- are familiar with the applicable work-safety and accident-prevention regulations and have received instruction on using the machine.
- are unrestrictedly capable of working on the machine.

IMPORTANT

Permit access to the immediate working area of the machine only to persons authorised by the owner-operator. This also applies when the machine is at a standstill.

The owner-operator must supply the requisite personal safety equipment.

Always check all safety devices and facilities before starting work.

Compliance with all safety-related requirements in work practices on the part of the operating personnel must be checked and ascertained at regular intervals.

2.5.5 Operating modes

Roles

- Operator
- Technician
- Engineer
- Safety officer

Operating modes

- Production mode
- Service mode
- Inspection mode

Summary as table

Operating modes	Protective door	Maintenance doors	Axis speed	Roles
Production mode	All closed		Not monitored	All
Service mode	At least one open		SLS - max. 40 mm/s (X/Y/Z) max. 264 deg/s (P)	All
Inspection mode	Open	Closed	SLS - max. 250 mm/s (X/Y/Z) max. 520 deg/s (P)	Safety officer

There are 3 different modes (with correspondingly different risks)

- **Production mode:** In this mode - with protective door and maintenance doors closed - the bonder operates with all functions and non-monitored axis speeds. No relevant monitoring by the safety system, except monitoring of the closed state of the doors. If a door is or doors are opened during operation in this mode, the machine instantly and automatically switches to service mode.
  - Roles: All 4 roles can use this mode.
- **Service mode:** For the operator for simple tasks such as threading in the wire, changing the wedge or adjusting, setting clamps, etc.
  - Access to this mode: When the "Service" button in the user interface is pressed, the ongoing bonding process (e.g. a wire bond) is completed. Movement of the motors ceases and axis speed limitation (SLS - Safety Limited Speed) is activated. When they have been unlocked by the safety system, the protective door can be opened. SLS means separate monitoring of each individual axis. In other words, if the maximum speed set in the safety system is unexpectedly exceeded, all motors are de-energised (STO - Safe Torque Off). This mode is also implicitly activated when for example "FEED-IN mode" is activated via the user interface.
  - Roles: All 4 roles can use this mode.
  - Ending service mode: This mode is ended when all the doors are closed or, if no door was opened beforehand, by again pressing the "Service" button in the user interface.
- **Inspection mode:** This mode can be accessed by the safety officer and requires the use of the hardware key and the authorised RFID key. The RFID key of the "F&K employee" is authorised once by the safety officer using their RFID key (which qualifies this individual as safety officer), if not yet authorised in the bonder software.

IMPORTANT

Note that on account of the risks involved, liability resides with the safety officer. Explicitly, provision of the hardware/RFID keys and authorisation for the use of this mode are permitted only to individuals who have completed

training for the inspection mode. Monitoring of reduced axis speeds (SLS) by the safety system is activated in this mode.
After appropriate training, the safety officer is issued with the RFID key and the hardware key after signing for full assumption of liability.
In this mode it is possible to observe the process through an opened protective door. The maintenance doors must remain closed.

- Access to this mode: This mode is always initiated by turning the hardware key from the "0" to the "1" position. The system will then prompt for input of the safety officer's RFID key. The safety officer has 30 seconds in which to authenticate their identity. Only then is this mode activated. The ongoing bonding process (e.g. a wire bond) is completed. Movement of the motors ceases and axis speed limitation (SLS) is activated. When they have been unlocked by the safety system, the protective door can be opened. This means clearance for an continuation of the process at high, but limited, speed with the protective door opened. This mode ends automatically after 30 minutes and service mode is activated, or the RFID key can be re-entered after 25 minutes and the mode extended for another 30 minutes - a prompt to this effect appears in the user interface after 25 minutes. This can be repeated any number of times. This time limit of max. 30 minutes is a permanent preset in the safety system and it cannot be changed.
- Roles: Only the last role can use this mode. The safety officer authenticates their identity by entering the RFID key and assumes full liability for the risks. The bonder software logs this mode with the relevant data in a log file.
- Ending inspection mode: This mode is ended when the protective door is closed or when the hardware key is turned from position 1 to 0, or on expiry of the 30-minute period allowed for the mode.

IMPORTANT

Do not forget to remove the hardware key as soon as the mode is ended.

DANGER!

Again explicitly, liability for the risks is assumed by the safety officer, because production with axis speeds up to 250 mm/s with the protective door open is possible in this mode.
Fatal-injury hazard.

2.5.6 Protective door / maintenance door

Electrical connections

IMPORTANT

It is imperative to connect the protective mechanisms listed below in accordance with the instructions. If they are not connected the machine cannot be operated.

If the bonder is incorporated into a production line and is delivered without protective enclosure or with no more than partial protective enclosure, responsibility for establishing the electrical connections resides with the customer.

Protective door

The protective door is monitored by a safety system. For all four axes (X, Y, Z and P), maximum speed is limited (SLS - Safety Limited Speed) as soon as the protective door is opened. The speeds are also monitored by a safety system. As soon as any one axis exceeds the maximum speed, all axes are de-energised (STO - Safe Torque Off).

Speed limits for the axes see 2.5.5 "Operating modes" on page 2-12.

It is not absolutely necessary to monitor latched closure of the protective door by a safety system, because this is for process protection and not for the protection of persons against injury.

If this process protection is not implemented, axis speed changes instantly when the door is opened, which means that the quality of the wire currently being bonded when the door is opened cannot be guaranteed.

IMPORTANT

Safety is ensured by the sensor.

Latched closure of the door is for process protection and not for the protection of persons against injury.

ELECTRONIC SENSOR

A suitable electronic sensor has two OSSD signals, which have to be connected as shown in the sketch. Latched closure (e.g. solenoids) is also connected in accordance with the sketch. Latched closure is recommended for the purpose of process protection.

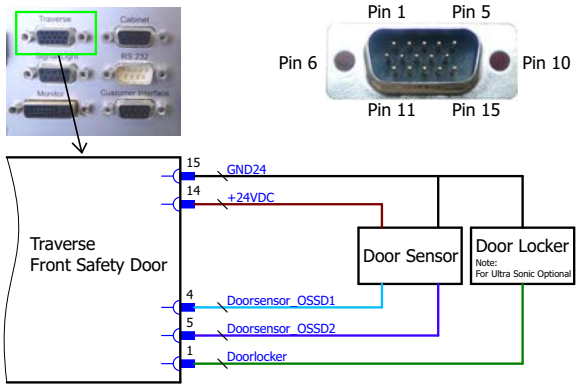


fig. 2 - 6 Protective door > electronic sensor

MECHANICAL SENSOR

Passive switches can be used if they have two-channel connection with closed pulses, in accordance with the sketch below. Latched closure (e.g. solenoids) is also connected in accordance with the sketch and is recommended for the purpose of process protection.

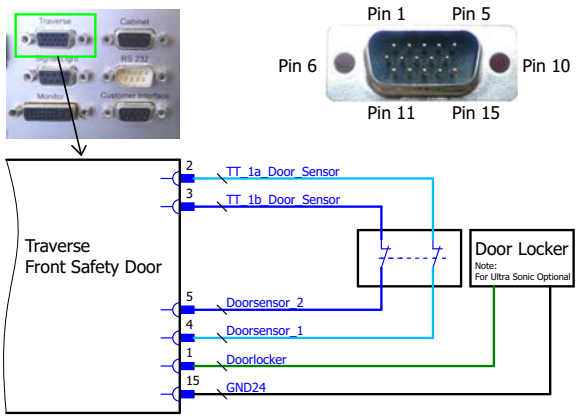


fig. 2 - 7 Protective door > mechanical sensor

Maintenance door

The maintenance door is or the maintenance doors are monitored by a safety system. For all four axes (X, Y, Z and P), maximum speed is limited (SLS - Safety Limited Speed) as soon as any one maintenance door is opened. The speeds are also monitored by the safety system. As soon as any one axis exceeds the maximum speed, all axes are de-energised (STO - Safe Torque Off).

Speed limits for the axes see 2.5.5 "Operating modes" on page 2-12.

Electronic sensor

A suitable electronic sensor has two OSSD signals, which have to be connected as shown in the sketch.

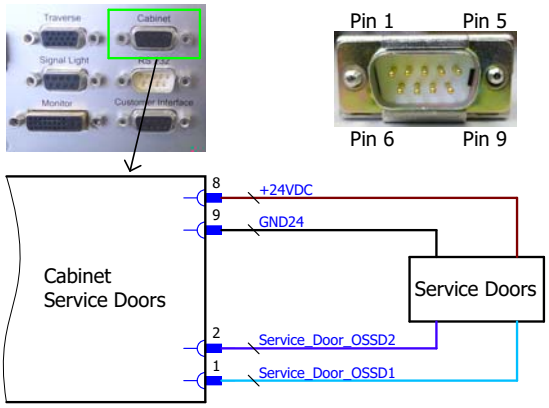


fig. 2 - 8 Maintenance door > electronic sensor

Mechanical sensor

Passive switches have to be connected as shown in the sketch.

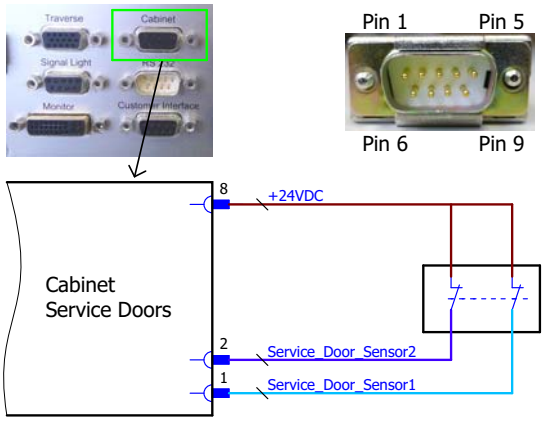


fig. 2 - 9 Maintenance door > mechanical sensor

External EMERGENCY STOP

An external EMERGENCY STOP system has to be connected as shown in the sketch.

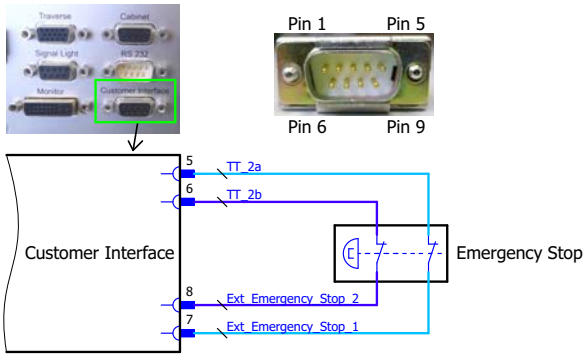


fig. 2 - 10 External EMERGENCY STOP

2.6 Sources of danger

General safety regulations require appropriate warning signs and notifiers to the affixed to the machine at the appropriate positions. They include, for example:

- Indicators drawing attention to terminals for protective conductors:
  On all grounded components of the machine, including for example all x/y table levels, frame, base plate, controls, doors, etc.
- Indicators drawing attention to strong solenoids:
  On the x, y and z axes, the warning signs have to be affixed in the vicinity of the solenoids.
- Indicators drawing attention to potential sources of danger: Crush hazard due to rotary drives (belts) or translatory drives.

2.6.1 Warning signs and notifiers

D A N G E R !

It is essential to comply with the regulations that belong to the warnings and notifiers.

Warning signs and notifiers (machinery indicators), which vary depending on the configuration, have to be affixed to the machine at sources of danger to draw attention to the risk of injury.

They are printed on soft PVC film and are abrasion-resistant, non-fading and resistant to water and weathering.

I M P O R T A N T

Warning signs and notifiers in accordance with the configuration are affixed to the machine. Do not remove the adhesive warning labels and immediately replace labels which have become damaged, faded or illegible. Make sure that the symbols are clean and clearly legible at all times.

Note the stickers affixed to the machine:

Warning and notifier	description
	Electric shock hazard warning. Unplug from mains electricity supply before opening.
	Electric shock hazard warning.
	Burn hazard warning.

Warning and notifier	description
	Warning of strong permanent-magnet fields inside the machine. **D A N G E R !** **Life-threatening hazard for persons with active implants (e.g. cardiac pacemaker, insulin pump, defibrillator).** **Hazard for persons with ferromagnetic passive metallic implants (e.g. plates, screws).** **N O T E !** **Keep all metallic objects clear of the danger zone.**
	Risk of injury to the hands warning.
	Crush hazard warning.
	Safe operation of the machine. **N O T E** *Familiarity with and compliance with the user guide and the safety instructions are prerequisites for safe operation of the machine.*
	Moving parts warning.
	Laser-light hazard warning (class 1 laser).

Warning and notifier	description
	Wear protective gloves.
	Protective earth plug (PE) symbol 60417-IEC-5019

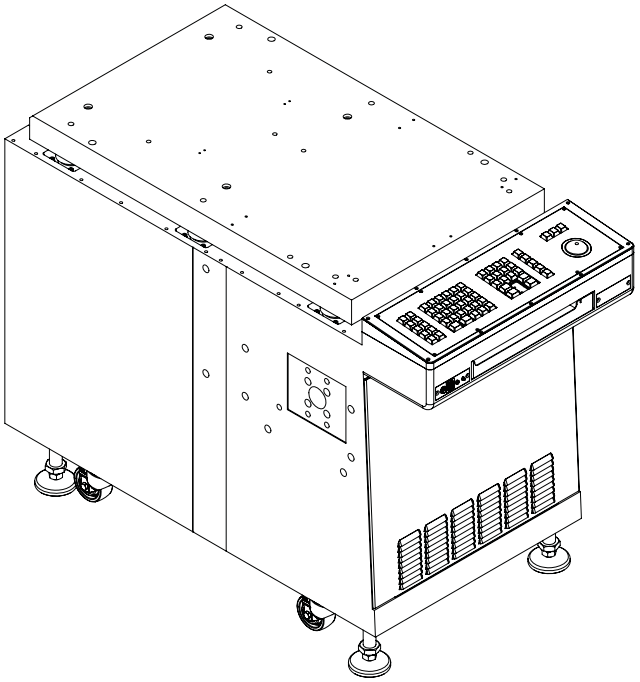
LIST OF ILLUSTRATIONS

fig. 2 - 1	Main switch > Position 0	2-6
fig. 2 - 2	Main switch > red insert	2-6
fig. 2 - 3	Main switch > padlock	2-6
fig. 2 - 4	Earth bonding point, EBP (example shown: single-double MC)	2-9
fig. 2 - 5	EMERGENCY STOP button at the monitor	2-9
fig. 2 - 6	Protective door > electronic sensor	2-14
fig. 2 - 7	Protective door > mechanical sensor	2-14
fig. 2 - 8	Maintenance door > electronic sensor	2-15
fig. 2 - 9	Maintenance door > mechanical sensor	2-15
fig. 2 - 10	External EMERGENCY STOP	2-15

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

Basic machine SINGLE

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

3 BASIC MACHINE SINGLE 3-1

3.1 scope of supply 3-1

3.2 Nameplate 3-1

3.3 Use as intended by the manufacturer 3-2

3.3.1 Avoiding misuse 3-2

3.4 technical data 3-2

3.4.1 specifications 3-2
3.4.2 line concept 3-2
3.4.3 Ambient conditions and connections 3-3
3.4.4 CPU. 3-3
3.4.5 pattern recognition system 3-3
3.4.6 Dimensions and weight. 3-4

3.5 Description of the bonder 3-5

3.5.1 pattern recognition 3-6
3.5.2 signal light 3-6
3.5.3 controls 3-6

3.6 Transport and installation 3-10

3.6.1 Transport / packaging 3-10
3.6.2 storage 3-11
3.6.3 Suitable operating location? 3-11
3.6.4 Preparation work for commissioning 3-12
3.6.5 Connecting to power supply. 3-15

3.7 Notes on safety for adjustments 3-17

3.8 Hardware rack/plug-in boards 3-18

3.8.1 opening the cover panels 3-18
3.8.2 Overview 3-19
3.8.3 Power supply 3-20
3.8.4 electronics rack 3-25
3.8.5 Motion Controller 3-32
3.8.6 Ethernet switch 3-33
3.8.7 Fuse panel 3-34
3.8.8 Terminal board 3-36
3.8.9 Cassette 3-38

3.9 Hardware inside the rack 3-42

3.9.1 Quadruple power amplifier 3-42
3.9.2 Fan (PCB) 3-43
3.9.3 Light panel 3-44
3.9.4 Cartridge terminal. 3-46

3.10 Hardware, protective enclosure 3-47

3.10.1 Cabinet terminal 3-47

3.11 maintenance 3-48
3.11.1 Notes on safety for maintenance 3-48
3.11.2 Preventive maintenance 3-48
3.11.3 maintenance schedule 3-48
3.11.4 Cleaning tasks 3-49
3.12 Material list 3-49
3.13 Warning signs and notifiers 3-50
3.13.1 Keyboard 3-50
3.13.2 Frame 3-50
3.13.3 Doors/racks 3-51

3 BASIC MACHINE SINGLE

3.1 scope of supply

The scope of supply is:

- bonder
- 1 x Monitor
- 1 x signal light
- Microscope
- Small items
- Accessories case
- Documentation

3.2 Nameplate



fig. 3 - 1 Nameplate

The nameplate is affixed to the frame on the bottom left at the rear of the bonder.

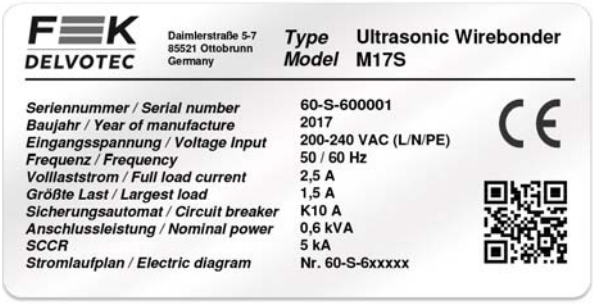


fig. 3 - 2 Nameplate for machine with CE declaration

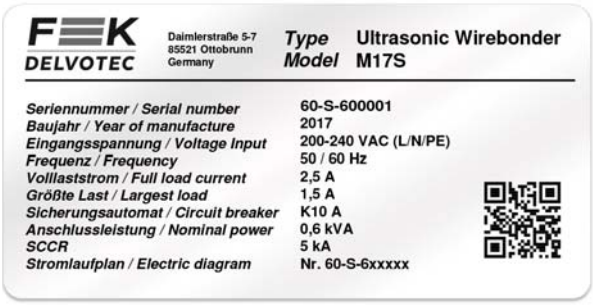


fig. 3 - 3 Nameplate for machine with installation declaration

N O T E

The difference in nameplates depends on the protective enclosure.
- CE: with protective enclosure
- Installation declaration: without protective enclosure

3.3 Use as intended by the manufacturer

Bonding machines from the company F&K Delvotec are approved exclusively for bonding in industrial applications.

IMPORTANT

The manufacturer refuses to accept liability for consequential damage due to incompatibility; errors in installation on the part of and modifications to the structural design by the purchaser void the guarantee.

Other usage or usage above and beyond the scope defined above is not use as intended by the manufacturer. F&K Delvotec refuses to accept liability for damage, injury or loss arising from utilisation of the production facility or individual components for use other than as intended by the manufacturer.

Use as intended by the manufacturer also includes:

- compliance with all notes, warnings and instructions in this User Guide.
- compliance with all notes, warnings and instructions applicable to other components.
- Compliance with the schedule for all inspection and maintenance work.

3.3.1 Avoiding misuse

The manufacturer is unaware of any practicable application for which the system could be misused.

3.4 technical data

IMPORTANT

The specifications relate to the basic model and depending on the version can therefore deviate from the specified values.

3.4.1 specifications

Number of bonds/program	≥50000 depending on storage capacity
Positioning accuracy	±5 µm at 3σ
Automation interfaces	SMEMA standard 1.2 (comprises mechanical and electrical specification), SECS/GEM (SEMI E30), HSMS
Other interfaces	USB, Ethernet
Connection	Inline or standalone
Transportation height - as per SMEMA (standard)	940 mm to 965 mm (~37" to ~38")

3.4.2 line concept

The bonder can be linked to:

- input and output stations
- post-bond inspection
- ovens
- buffer and repositioning stations, and
- with other bonders.

The systems can communicate with each other by SMEMA or Ethernet. All the modules receive the data they require from a common computer. Suitable interfaces permit connectivity with a higher-order data-processing system.

3.4.3 Ambient conditions and connections

ambient conditions	
Room temperature - in operating condition	+20°C to +30°C
- during transport and storage	- 10°C to +70°C
relative humidity	45% ±10% abs., no condensation
Permissible site altitude	up to 3000m amsl
Noise emission (emission level at the work-place: noise level without extraneous noises and noise returned from room)	< 70 dB (A)
Operating period	>10 years

Connecting to power supply	
Rated voltage 230-V mode	200-240 VAC
frequency	50 / 60 Hz
rated current	2.5 A
installed load	0.6 kVA
fuses	See the fuses plan in the appendix
Permissible voltage dip (hold-up time)	min. 20 msec
Cable	recommended minimum diameter: 2.5 mm²

Pneumatics	
Compressed air (free of oil and water)	Connecting tube, outside Ø 6 mm Minimum 5 bar (rel.) nominal 6 bar (rel.) maximum 8 bar (rel.)
vacuum	Connecting hose outside Ø 12 mm Minimum < -0.8 bar (rel)
Forming gas (optional)	Connecting tube, outside Ø 6 mm Minimum 2 bar (rel.) nominal 4 bar (rel.) maximum 6 bar (rel.)

WARNING!

To prevent ignition of the forming gas ensure the concentration of hydrogen (H2) is below 5.7%!

3.4.4 CPU

Technology	CompactPCI®
Processor	Core 2 Duo > 1.8 GHz
RAM	> 3 GB
Hard disk	> 160 GB
Special features	No fan, hard disk suitable for 24/7 operation

3.4.5 pattern recognition system

System	Cognex® CVL® (Cognex Vision Library)
Search algorithms	PatMax® PatQuick®
Search time	5 – 10 ms
Image size	659x494 pixels
Resolution	Better than 0.1 pixel

3.4.6 Dimensions and weight

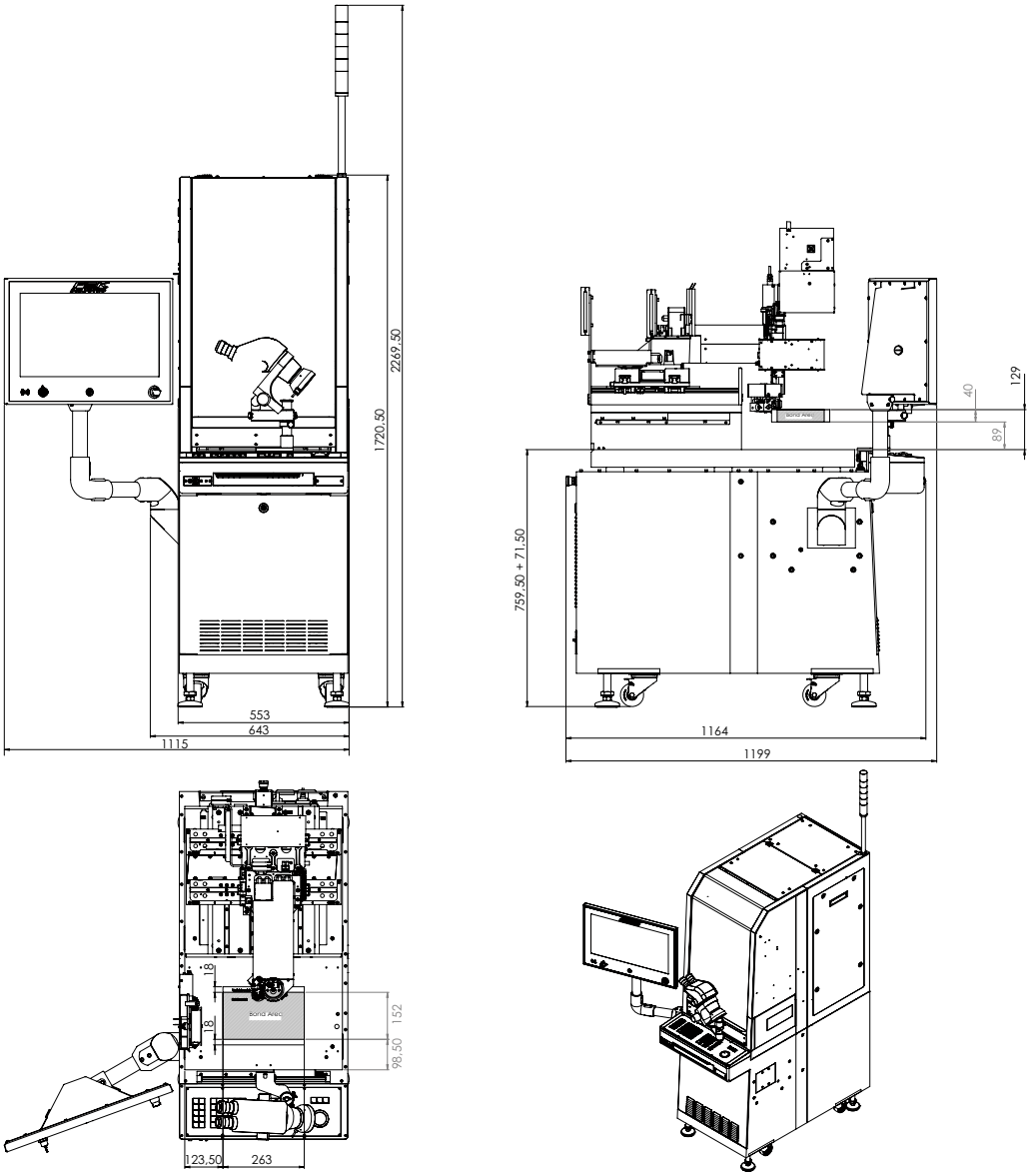


fig. 3 - 4 Dimensions and weight

Dimensions and weight	
Hight - without signal light - with signal light	 approx. 1721 mm approx. 2270 mm
Width - without monitor - with monitor	 approx. 553 mm approx. 1115 mm
Depth	approx. 1199 mm
Weight (basic configuration with manual working station)	approx. 816 kg

space required (additional clearances)	
Front	freely accessible
Rear	500 mm
Each side	100 mm for service: 500 mm
Top	100 mm

N O T E

The drawing shows the version with CE declaration of conformity. The version with installation declaration can differ.

3.5 Description of the bonder

This section contains a description of the basic machine to the base plate, including safety enclosure. See the corresponding sections for the descriptions of other components.

The fully automatic bonder M17 from F&K Delvotec is an ultrasonic bonder for aluminium and gold wires.

Because of the conversion function of the two bond heads, the range of application is highly diverse and features both hybrid and all standard applications in the thin and heavy wire ranges. This conversion function makes special requirements of the bond head, the bonder being convertible with just a few hand movements from thin wire to heavy wire and vice versa. In this way the bonder can be adapted to the most diverse applications. In view of the conversion option, this User Manual contains several descriptions of the bond head types. Please refer to the description relevant to your application.

Modular and designed for the utmost versatility, the fully automatic bonder has a rotating bond head enabling it to manufacture bonds of any orientation and a wide range of loop geometries.

The ribbon width ranges from hybrid applications in the thin wire sector to leadframe applications (power devices) with heavy wire.

The graphical user interface ensures easy, intuitive access to a multiplicity of machine and application parameters. Teach-in work processes are conducted in an interactive dialogue, ensuring reliable operation and a high level of productivity.

The special design of the bond head and the random programmability of all relevant parameters provide the bonder with a high degree of flexibility with regard to its adaptation to material and application.

The stereo zoom microscope is ideal for precision adjustment and visual inspection of the bonds, offering magnification of the bond surface and three-dimensional viewing.

IMPORTANT

The bonder configuration is customisable to customer requirements, so the system as delivered might not be exactly as illustrated and described in this User Guide.



fig. 3 - 5 General overview

3.5.1 pattern recognition

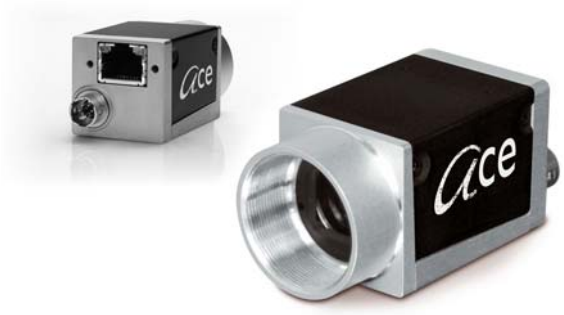


fig. 3 - 6 Cognex and CCD High-Speed Camera

The pattern recognition unit (PRU) uses the signals of the CCD camera to calculate the position of the dice and carrier medium. In the process any taught-in patterns are recognized or certain structures (edges) are found. The image of the CCD camera is displayed on screen. This camera view can be used for precision manual positioning, for example in a teach-in session or for entering machine parameters such as offsets, etc.

The contrast and brightness of the CCD camera can be set, so that optimum functioning is ensured in all light and material conditions.

A camera can be replaced if its imaging system is defective.

3.5.2 signal light

fig. 3 - 7 Signal light



The signal light indicates the present status of the machine. Assignment of the signals is randomly programmable .

At the foot of the signal light there is a buzzer, which emits an acoustic warning sound. This is adjustable by means of a volume controller.

3.5.3 controls

There are control modules available for the bonders. Each of these modules has a control panel in front of the monitor, two USB ports at the rear of the monitor, an EBP below the keyboard, a machine keyboard, a trackball and a service keyboard inside a drawer.

The trackball and the machine keyboard are connected to a USB port of the CPU. The PC keyboard is separately connected to a second USB port of the CPU.

Control panel

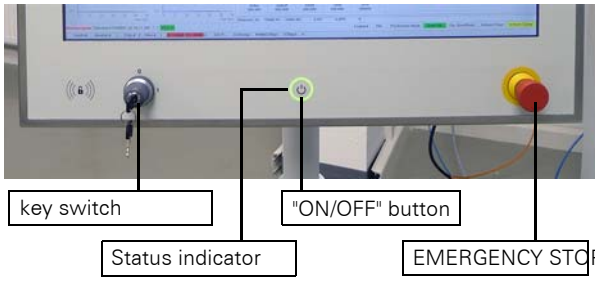


fig. 3 - 8 Control panel

The control panel has a key switch (see Section 2, Operating modes, process observation mode), an ON/OFF button,an EMERGENCY STOP button (see Section 2, EMERGENCY STOP (what to do in an emergency)) and an RGB LED, which is the status indicator for current machine status.

Status indicator (RGB LED)

- **Yellow ON:** Bonder off and ready for switch-on (standby)
- **Yellow flashing (frequency 2 Hz):**
  - EMERGENCY STOP button and/or external EMERGENCY STOP button actuated
- **Yellow/green flashing (frequency 1 Hz):**
  - Bonder switched on, axes not initialised
  - Bonder is powering down in battery mode
- **Green ON:** Bonder ready for operation
- **Green flashing (frequency 1 Hz):**
  Bonder ready for operation
  - Bonder powered by external battery
- **Blue flashing (frequency 1 Hz):**
  - Bonder is in inspection mode
- **Blue flashing (frequency 7 Hz):**
  - Inspection mode has been active for 28 minutes and has to be re-activated within the next 2 minutes, if applicable. Inspection mode is ended automatically after 30 minutes.
- **Red flashing (frequency 4 Hz):**
  - A contactor in the rack is not OK.

USB connections



fig. 3 - 9 USB connection

At the rear of the monitor there is a USB port on each side so that a software update can be imported from USB memory stick, for example.

EBP



fig. 3 - 10 EBP

The Earth Bonding Point (EBP) below the keyboard is for connecting an earthing strap to prevent damage to the device for bonding being caused if an electrostatic charge were to build up.

For more information see Section 2, Earth Bonding Point (EBP).

machine keyboard

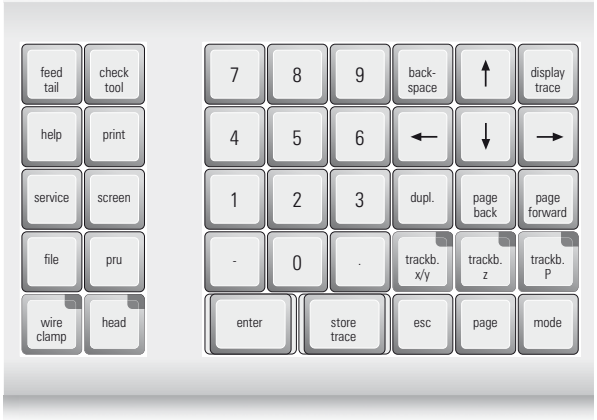


fig. 3 - 11 Keyboard module - left section

- **Help**: Opens the help function
- **Print**: Prints a screen dump of the dialog currently open
- **Service**: Opens the service menu
- **Screen**: Toggles between the man machine interface (MMI) and the "BPC screen"
- **File**: Press to open items from the "File" menu
- **Pru**: Invokes the help function for image processing
- **wire clamp**: Activation of the wire clamp
- **Head**: Switching heads, focus change
- **Numbers 0 to 9**: Buttons for numeric input
- **Minus**: Is for inputting a minus sign
- **Point**: Is for inputting a decimal point
- **Enter**: Accept inputs
- **Store trace**: Saves position coordinates, teaches in images
- **Backspace**: Deletes inputs in steps
- **Display trace**: Press to call up monitor-assisted entry of search and reference ranges. The desired size can be set via the cursor keys while the process is being followed on screen
- **Arrow keys**: Press to control cursor movements
- **Duplicate**: When programming chips or wires transfer the value last entered to the following input page
- **Page backward / page forward**: Press to page up or down in the chip / wire program. Moves the wire in mode 11
- **trackb. x/y/z and p**: The trackball traverses the bond head along the appropriate axes
- **esc**: Press to exit the current program function. A stop function during bonding, immediately interrupts the automatic bonding procedure
- **Page**: Press to open items from the "Page" menu
- **Mode**: Press to open items from the "Mode" menu

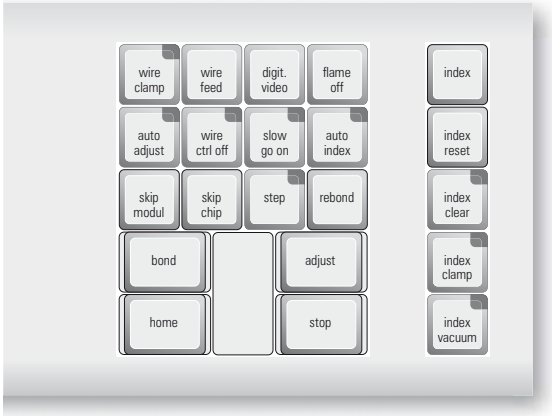


fig. 3 - 12 Keyboard module - right section

- **wire clamp**: Activation of the wire clamp
- **wire feed**: Activate the wire feed
- **digit. video**:
  - If PRU has error status, the error can be displayed on screen
  - Selection of saved images in mode 1
- **Flame off**: Move to flame-off height and trigger fame-off. Only in connection with a flame off unit (NEFO)
- **Auto adjust**: Switches on and off the PRU support for positioning
- **Wire ctrl off**: Switches the wire control on and off
- **Slow go on**: Switches on and off operation at low speed
- **Auto index**: On machines with a transport segment switches the indexer?s automatic operation on and off
- **Skip module**: Skips the module
- **Skip chip**: In the alignment process: skip a chip. Alignment is continued at the next chip
- **Step**: Press to proceed step by step through the bonding process. Each time the button is activated a step is executed
- **Rebond**: Press to call the "Rebond" mode directly. This mode is for the manual post-bonding of a wire connection
- **Bond**:

- Bonding onto the originally saved position, if the reference images have not been searched for before
- Press "bond" after a rebond to start the automatic bonding sequence at the next wire
- Press "bond" after pressing the "step" key to start the automatic sequence

- **Adjust**: Press to start the machine. Alignment is started if the "auto adjust" function is activated. Bonding is performed, if the search is successful
- **Home**: Move all axes to their home positions (initialisation position). After this the machine is in start status
- **Stop**: Press to interrupt the automatic bonding procedure. However, the commenced bond is still completed
- **Index**: Executes an indexing cycle for machines with a transport segment
- **Index reset**: Reset the index cycle to the start state
- **Index clear**: On activation the indexing system takes no new material from the input conveyor system (indexing system is "run empty")
- **Index clamp**: Switches on and off the clamping function for fixing the material carrier
- **Index vacuum**: Switches on or off the vacuum function for fixing the material carrier

trackball



fig. 3 - 13 trackball

The corresponding axes of the drive system can be easily and exactly positioned with the aid of the trackball.

The trackball is used as a mouse, if no X/Y/Z/P position field is marked. Under these circumstances:

- Left additional button as mouse button for clicking.
- The middle additional button is for locking the X axis for moving position with the trackball, hold the additional button down to achieve this effect.
- The right additional button is for locking the Y axis for moving position with the trackball, hold the additional button down to achieve this effect.

Service keyboard (PC keyboard)



fig. 3 - 14 PC keyboard

The PC keyboard is a USB keyboard that is located in the drawer pull-out on the front side of the bonder.

This keyboard is used when saving an application only to enter a program name or to use the function buttons.

3.6 Transport and installation

3.6.1 Transport / packaging

The bonder is shipped to receiver in the original packaging. Always repack the equipment in this original packaging for subsequent shipment. Obtain packaging instructions from F&K Delvotec if the machine has to be repacked after expiration of the guarantee period.

D A N G E R !

Always secure the transportation locking devices to the X/Y unit and the Z/P unit before shifting the machine.

Pack the microscope very carefully before shifting or shipping the machine – risk of breakage.

Make sure the machine is adequately secured for transportation.

If you use rollers to transport the machine take care to keep your feet well clear of the rollers.

The machine must always stand on a strong base. Make sure that the floor is of sufficient load-bearing strength.

The following dimensions and weights are for consignment by air freight or truck:

Shipping crate[1]	
Depth	approx. 1100 mm
Width	approx. 1400 mm
Height	approx. 2040 mm
Weight including shipping crate (basic configuration with manual working station)	approx. 962 kg

1.The data quoted here are for the basic machine. Actual dimensions and weights may be more, depending on the accessories and configuration. Accessories can be packaged separately.

3.6.2 storage

The preconditions for correct storage of the bonder are as follows:

- The bonder must be fully enclosed within an airtight sealed envelope.
- Store only in dry rooms at the correct temperature (air humidity: 45% ± 10% abs. non-condensing, max. temperature range: -10 to +70°C)
- The storage time must not exceed half a year.

Although most corrosion-endangered parts are made of non-rusting, chrome-plated or galvanised steel or have a protective paint finish, it is important to check the bonder for signs of corrosion if it has been in storage for a prolonged period of time.

It is particularly important to check the condition of all:

- Screws, bolts and nuts
- spindles
- Guides

IMPORTANT

Please consult F&K Delvotec Customer Services if you discover signs of corrosion on the machine.

3.6.3 Suitable operating location?

DANGER!

Before the bonder is installed, the operator must ensure that the supporting base is of adequate load-bearing capacity (see 3.4.6 "Dimensions and weight" on page 3-4).

Also remember to take the weight of the packaging into account when installing the machine(see 3.6.1 "Transport / packaging" on page 3-10).

NOTE!

Consult F&K Delvotec if there is a sprinkler system at the intended location of the machine.

The preconditions for correct installation of the bonder are as follows:

- The bonder must stand on a rigid, vibration-free base.
- The system must be readily accessible from all sides.
- Make sure that no-one can be endangered by the machine when it is in operation.
- Avoid direct sunlight at the installation site.
- The bonder may only be operated in closed rooms. Optimum results can only be achieved when the bonder is operated in a clean room.
- A suitable electrical supply, a compressed-air supply and a vacuum port must be available in the immediate vicinity of the machine.

3.6.4 Preparation work for commissioning

D A N G E R !

Wear protective gloves and protective footwear at all times when moving and installing the bonder.

Unpacking the bonder

N O T E !

Take care not to damage the component when unpacking it.

If the bonder is crated on delivery:

- Remove the Spax screws from the crate and open the crate.
- Remove the aluminium bag, insulating material and desiccant.
- Remove the cord strap.
- Check the shipment and make sure nothing is missing (compare with delivery note).
- Remove the screws securing the machine to the pallet.

D A N G E R !

Place wooden slats on the forks if you use a forklift to lift the bonder. Secure the machine so that it cannot topple off the forks.

- Carefully raise the machine clear and remove the pallet from underneath.

I M P O R T A N T

Make sure that nothing is damaged during unpacking.

Installing the bonder

- Place the machine in position.

I M P O R T A N T

Ensure that the required space around the machine is complied with . See the corresponding sections for information about the space required for additional components such as input/output conveyor systems.

See the corresponding sections for information on installing the additional components.

- Screw down the legs of the machine until the transport rollers are clear of the floor and use a spirit level to level the machine in the X and Y directions. The base plate provides the reference.

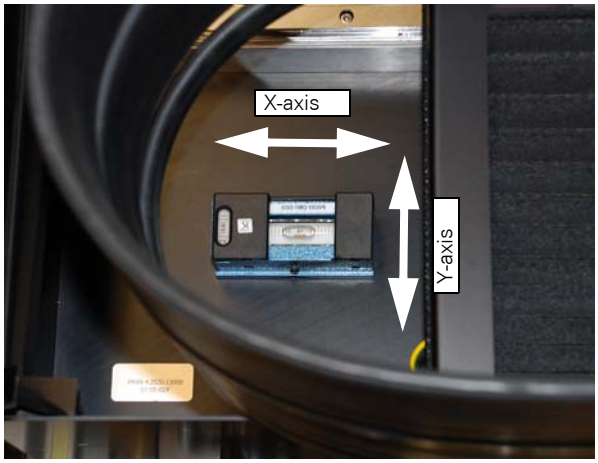


fig. 3 - 15 Installation - Alignment with a spirit level

W A R N I N G !

Hazard for persons with active implants (e.g. cardiac pacemaker, insulin pump, defibrillator).

Hazard for persons with ferromagnetic passive metallic implants (e.g. plates, screws).

N O T E !

Keep all metallic objects clear of the danger zone.

Earthquake protection (option)

A device providing protection against seismic events is available. It is available on request from F&K Delvotec.

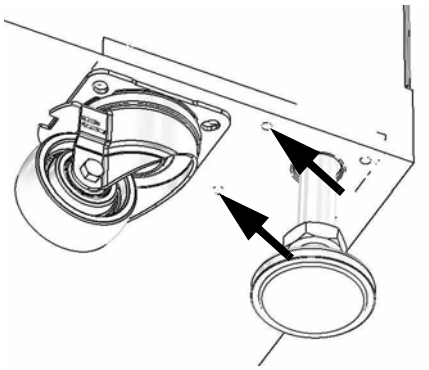


fig. 3 - 16 Position for attachment

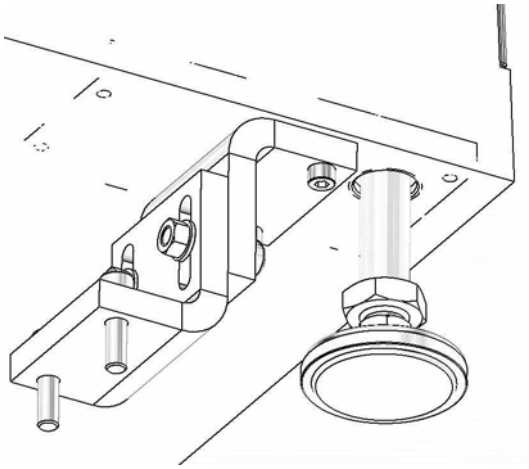


fig. 3 - 17 Device for earthquake protection

- Screw down the legs of the machine until the transport rollers are clear of the floor, if this has not been done already. Use a spirit level to level the machine in the X and Y directions. The base plate provides the reference.
- Remove the transport rollers.
- Install the brackets as shown in the "Device for earthquake protection" graphic. Install the screws in the threaded holes, indicated by the arrows, between the legs and the rollers.

Preparing the bonder

IMPORTANT

Check the bonder for signs of corrosion (screws, nuts and bolts). If contaminated, clean the machine before commissioning .

- Connect the pneumatic system . To do so:
  - Connect the vacuum hose to the appropriate port at the rear of the bonder.
  - Connect the compressed-air hose to the appropriate port at the rear of the bonder.
  - If applicable, connect the tube for forming gas to the appropriate port at the rear of the bonder.

Removing transport securing devices

X/Y AXES

- Remove the transport securing devices of the X/Y axes.

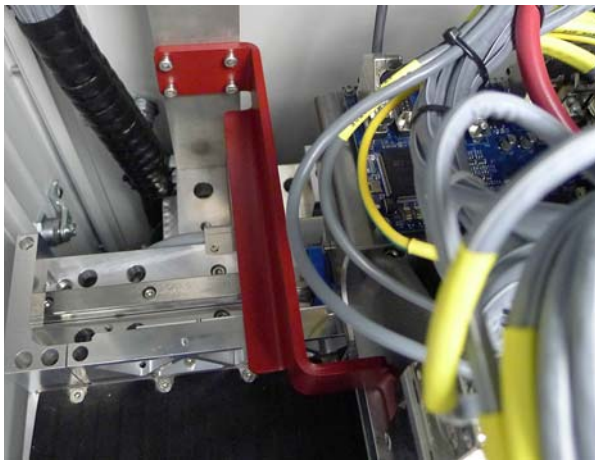


fig. 3 - 18 Transport securing device, X/Y-axes

Z/P AXES

- Remove the transport securing devices of the Z/P axes.



fig. 3 - 19 Transport securing device, Z/P-axes

installing signal light

- Secure the signal light with the nut and washer as shown on the protective enclosure.



fig. 3 - 20 Fastening the signal light

- Connect the plug of the signal light to "signal light" on the bonder's terminal board.

Attaching and setting up the microscope

N O T E !

Do not position the microscope and microscope holder in the working zone of the bond head – Crash hazard.
The danger zone is covered by a protective housing. The owner-operator is responsible for ensuring that maintenance work is carried out correctly.

- Insert the holding spigot of the microscope holder from above into the workholder provided for this purpose and tighten the knurled screw.

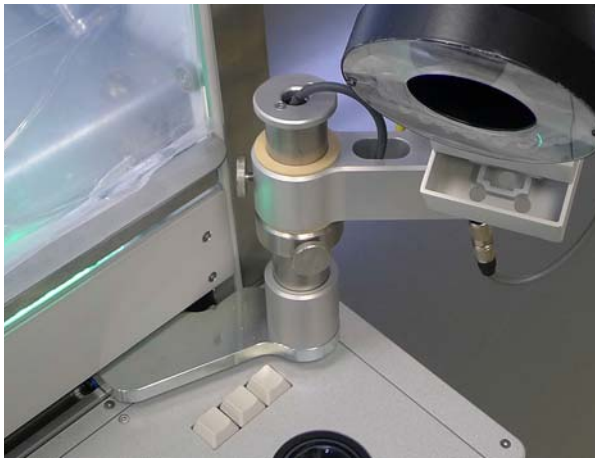


fig. 3 - 21 Microscope holder

- Plug the microscope into the microscope bracket and tighten the clamp screw.
- Attach the ring lighting to the microscope and secure using the clamp screw.

▶ Route the cable of the ring lighting and connect it as shown in the illustration.

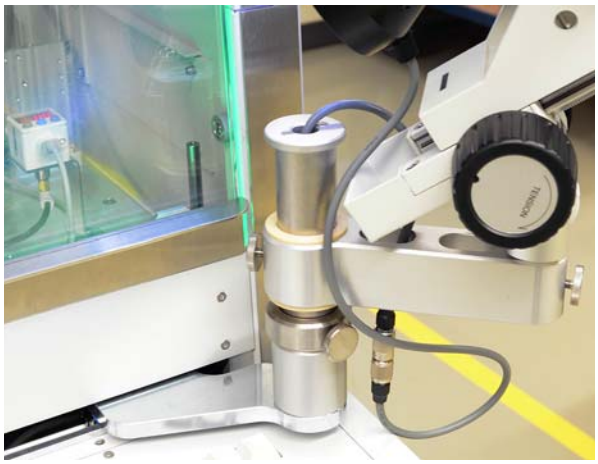


fig. 3 - 22 Cable routing of the ring lighting

▶ Adjust the microscope so that the desired image detail is in sharp focus. In the process:
- To adjust height, slacken the knurled knob at the locking ring.
- You can adjust the microscope's angle of tilt by slackening the socket-head screw at the microscope articulation.
- Adjust the two eyepiece holders to the correct interocular distance.
- Turn the small knob to select the magnification factor.
- Turn the large knob to focus the microscope.

▶ Tighten all screws after adjusting the microscope to your satisfaction.

3.6.5 Connecting to power supply

D A N G E R !

Keep the electrical and electronic components correctly covered at all times. Only authorised persons are permitted to open the covers.

Always make sure the machine is disconnected from the mains supply and de-energised before work on potentially live components commences, and make sure that the machine is secured in such a way that it cannot be re-energised without your knowledge and consent.

Work on the electricity supply must always be carried out by a trained, qualified electrician in compliance with the applicable electrotechnical rules and regulations.

Trained and qualified means that the person has received the appropriate trade-related training and has the knowledge and experience of the applicable requirements (particularly VBG 4 or the national equivalent) to assess the work which he or she is commissioned to undertake and can recognise potential hazards.

Have the electrical wiring checked at regular intervals. Have loose and damaged cables replaced immediately.

The power supply cable is routed through the box on the left side of the main switch (rear of the machine) (see fig. 3 - 23 "Connecting to power supply").



fig. 3 - 23 Connecting to power supply

The circuit diagram of the cable shows the conductor (line L), the neutral conductor (line N) and the protective earth (PE). See the nameplate for details of voltage and rated power (see fig. 3 - 24 "Connecting to power supply > circuit diagram of the cable" on page 3-16).



fig. 3 - 24 Connecting to power supply > circuit diagram of the cable

Conductor L and neutral conductor N are connected to the main switch. PE is connected to the frame (see fig. 3 - 25 "Connecting to power supply > PE" on page 3-16).

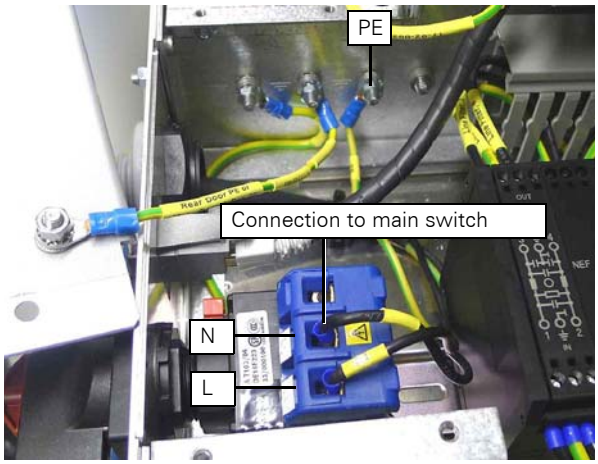


fig. 3 - 25 Connecting to power supply > PE

IMPORTANT

See the corresponding sections for information about connecting additional components such as input/output conveyor systems.

3.7 Notes on safety for adjustments

D A N G E R !

Do not open the case unless the machine is disconnected from the electricity supply.

Always make sure that the main switch is OFF before changing fuses.

Keep well clear of exposed parts of the printed-circuit board when the machine is switched on. Electric shock hazard.

The power supply unit might carry residual voltage after the bonder has been switched off. After switching off the machine wait at least 30 seconds before opening the case of the bonder. Electric shock hazard.

Work on the electricity supply must always be carried out by a trained, qualified electrician in compliance with the applicable electrotechnical rules and regulations.

Trained and qualified means that the person has received the appropriate trade-related training and has the knowledge and experience of the applicable requirements (particularly VBG 4 or the national equivalent) to assess the work which he or she is commissioned to undertake and can recognise potential hazards.

The uninterruptible power supply means that the PC is not de-energised immediately when the machine is switched off. This also applies when the emergency stop button is pressed to stop the machine. Wait for 30 seconds after switching the machine off before opening it. Electric shock hazard.

Life-threatening hazard for persons with cardiac pacemakers.

The linear drives generate strong magnetic fields. Persons with cardiac pacemakers and/or metal implants, therefore, must keep well clear of the machine.Health hazard.

D A N G E R !

Only F&K Delvotec customer services technicians or appropriately trained and authorised personnel are permitted to work on the X/Y unit (solenoids, linear motors, etc.).

Improper access or repair work may affect the integrated safeguarding and safety functions including the electromagnetic behaviour of this device and cause function interruptions on the device, personal injury and damage to connected machines or system ranges.

For use of the gold bond head

Before performing work on the flame off electrode, shut off the bonder and disconnect the power plug.
Electric-shock hazard. This work is life-threatening for people with cardiac pacemakers!

N O T E !

Keep the machine clean at all times. Do not use cleansing agents or lubricants not expressly recommended by F&K Delvotec.

F&K Delvotec recommends having the machine serviced every 7,000 operating hours approximately, or every 2 years at the latest.

Remove components only when the machine is switched OFF.

I M P O R T A N T

Always save the current program with "File > Save" before starting to make adjustments to the bonder.

See the corresponding sections for instructions on adjusting the components.

3.8 Hardware rack/plug-in boards

3.8.1 opening the cover panels



fig. 3 - 26 Cover panel > Lock

- Use the special key (supplied with the bonder) to unlock the cover panel.
- Disconnect the PE connector.
- Pull the cover panel out of the locating holes at the bottom and move it aside.

3.8.2 Overview

The bonder is controlled by a PC. The following racks/plug-in boards are integrated at the front and rear, underneath the base plate.

Front

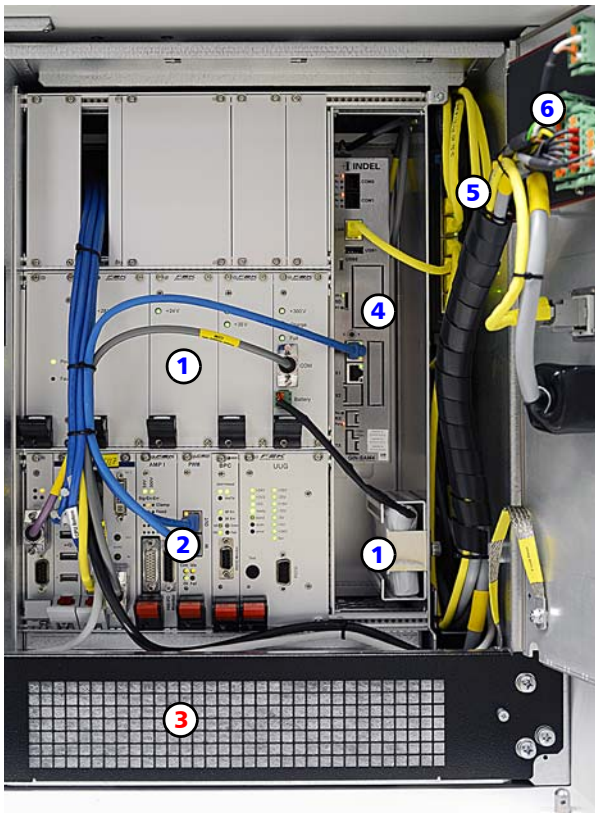


fig. 3 - 27 Overview of rack (front)

- **1 Power supply** (see 3.8.3 "Power supply" on page 3-20)
- **2 Electronics rack** (see 3.8.4 "electronics rack" on page 3-25)
- **3 Air intake:** Described in further detail only in the section dealing with maintenance
- **4 Motion Controller (GIN-SAM4)** (see 3.8.5 "Motion Controller" on page 3-32)
- **5 Ethernet switch** (see 3.8.6 "Ethernet switch" on page 3-33)
- **6 Fuse panel** (see 3.8.7 "Fuse panel" on page 3-34)

Rear



fig. 3 - 28 Overview of rack (rear)

- **7 Terminal board** (see 3.8.8 "Terminal board" on page 3-36)
- **8 Fan module:** Not described in further detail below.
- **9 Cassette** (see 3.8.9 "Cassette" on page 3-38)
  - **9a Encoder / motor connection panel**
  - **9b PNE unit**
- **10 Power supply** (see 3.6.5 "Connecting to power supply" on page 3-15)

3.8.3 Power supply

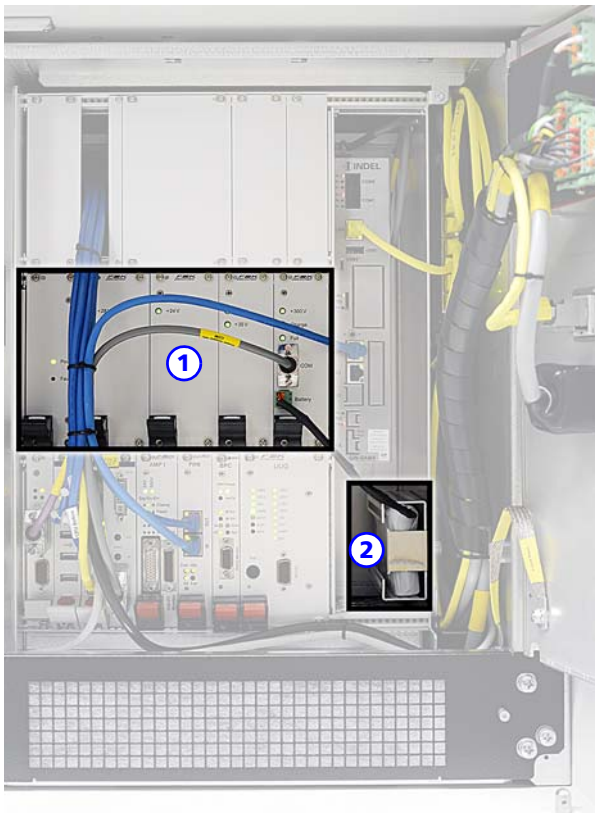


fig. 3 - 29 Power supply, installation position

The functions of the boards of the power supply are described below.

N O T E !

Only F&K Delvotec Service engineers or specially trained persons are permitted to replace the printed circuit boards.

- **1:** Printed-circuit boards (PCBs)
- **2:** Battery for the UPS

The PCBs that supply power to the bonder:

- generate the operating voltages the machine needs from the incoming line voltage.
- show the status of the operating voltages by means of LEDs.
- in the event of a power failure or actuation of the EMERGENCY STOP button, act as an uninterruptible power supply (UPS) to prevent the loss of data. The data is saved and the computer in the machine is powered down. The battery is seated in slot (2).

Overview of the printed-circuit boards of the power supply

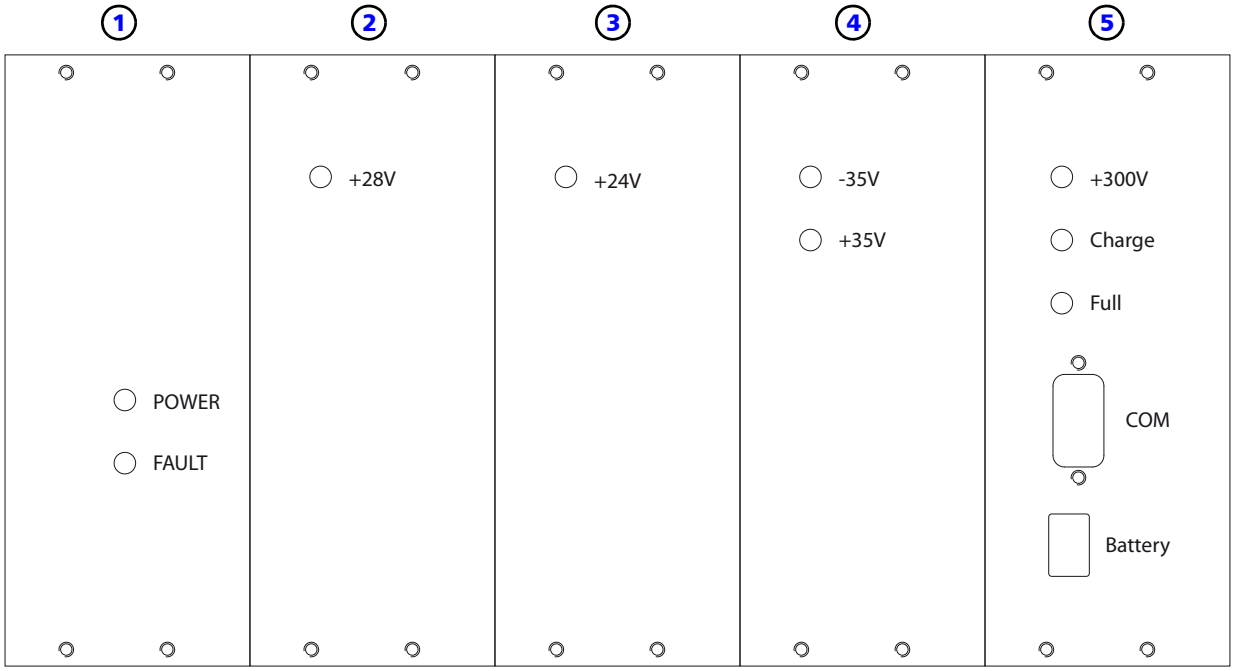


fig. 3 - 30 Power supply - overview

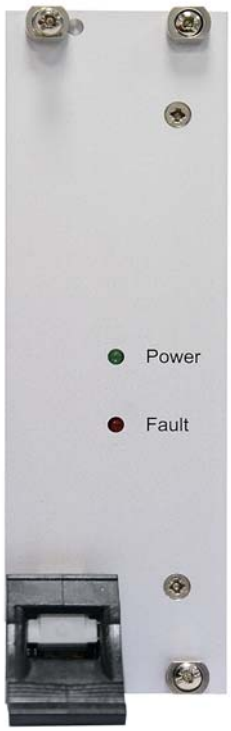
- **1:** See "cPCI power supply" on page 3-22
- **2:** See "Power supply module +28V" on page 3-22
- **3:** See "Power supply module +24V" on page 3-23
- **4:** See "Power supply module +/-35V" on page 3-23
- **5:** See "Power supply module +300 V + UPS" on page 3-24

cPCI power supply

Installation position see fig. 3 - 38 "Electronics rack, overview" on page 3-26.



fig. 3 - 31 cPCI power supply



The power supply uses the voltages necessary for the cPCI unit.

- Power On: +28 V input voltage - power supply
- Battery mode +22 V input voltage - battery

Indicators

The meanings of the LEDs:

- **Power (green):** Lights up when the input voltage is OK.
- **Fault (red):** Lights up when the +12V, +5V, +3.3V voltages drop below 90 %.

Power supply module +28V

Installation position see fig. 3 - 38 "Electronics rack, overview" on page 3-26.

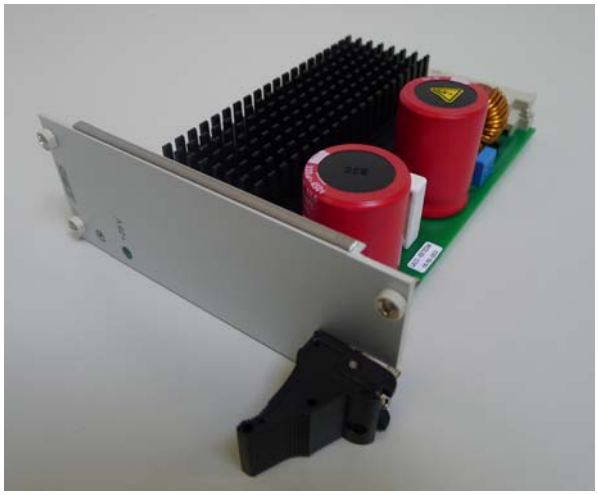


fig. 3 - 32 cPCI power supply



The power supply uses an input voltage of 90 - 250V AC to output +28V DC.

Indicators

The meanings of the LEDs:

- **+28 V (green):** Lights up when the +28 V output supply is OK

Power supply module +24V

Installation position see fig. 3 - 38 "Electronics rack, overview" on page 3-26.

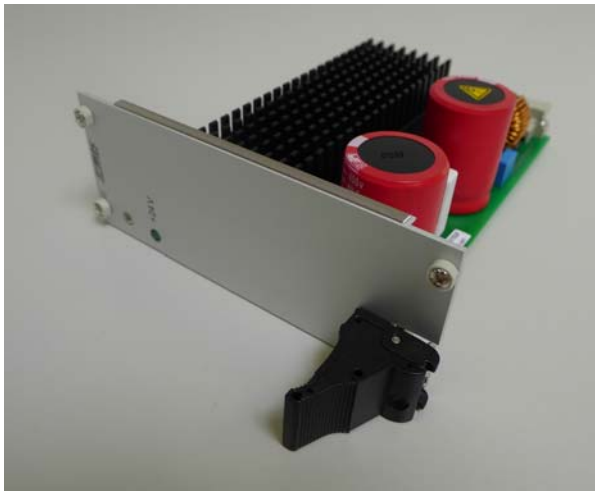


fig. 3 - 33 cPCI power supply



+24V DC for machine voltage.

Indicators

The meanings of the LEDs:

- **+24 V (green):** Lights up when the +24 V output supply is OK

Power supply module +/-35V

Installation position see fig. 3 - 38 "Electronics rack, overview" on page 3-26.



fig. 3 - 34 cPCI power supply



+/- 35 V DC for ultrasonic system.

Indicators

The meanings of the LEDs:

- **-35 V (green):** Lights up when the -35 V output supply is OK
- **+35 V (green):** Lights up when the +35 V output supply is OK

Power supply module +300 V + UPS

Installation position see fig. 3 - 38 "Electronics rack, overview" on page 3-26.



fig. 3 - 35 cPCI power supply



+300 V DC for piezo drives.

Indicators

The meanings of the LEDs:

- **+300 V (green):** Lights up when the +300 V output supply is OK
- **Charge (yellow):** Lights up to indicate that the battery is being charged
- **Full (green):** Lights up to indicate that the battery is fully charged

N O T E

One of the "Charge" and "Full" LEDs must show green, but if both show at the same time this is indicative of a fault in the battery unit.

connection

- **COM:** The host communicates with the battery unit via this interface. The host queries the battery status and can shut down the battery, if necessary
- **Battery:** Connection for the battery

Battery

Installation position see fig. 3 - 38 "Electronics rack, overview" on page 3-26.



fig. 3 - 36 Battery

The battery supplies 22 V and is connected to the "Battery" connection of the "Power supply module +300 V + UPS" board. The battery is seated in a separate slot.

3.8.4 electronics rack



fig. 3 - 37 Electronics rack, installation position

The functions of the boards in the electronics rack are described in the following.

N O T E !

The boards may be replaced only by F&K Delvotec's service department or trained personnel.

Overview of printed circuit boards in the electronics rack

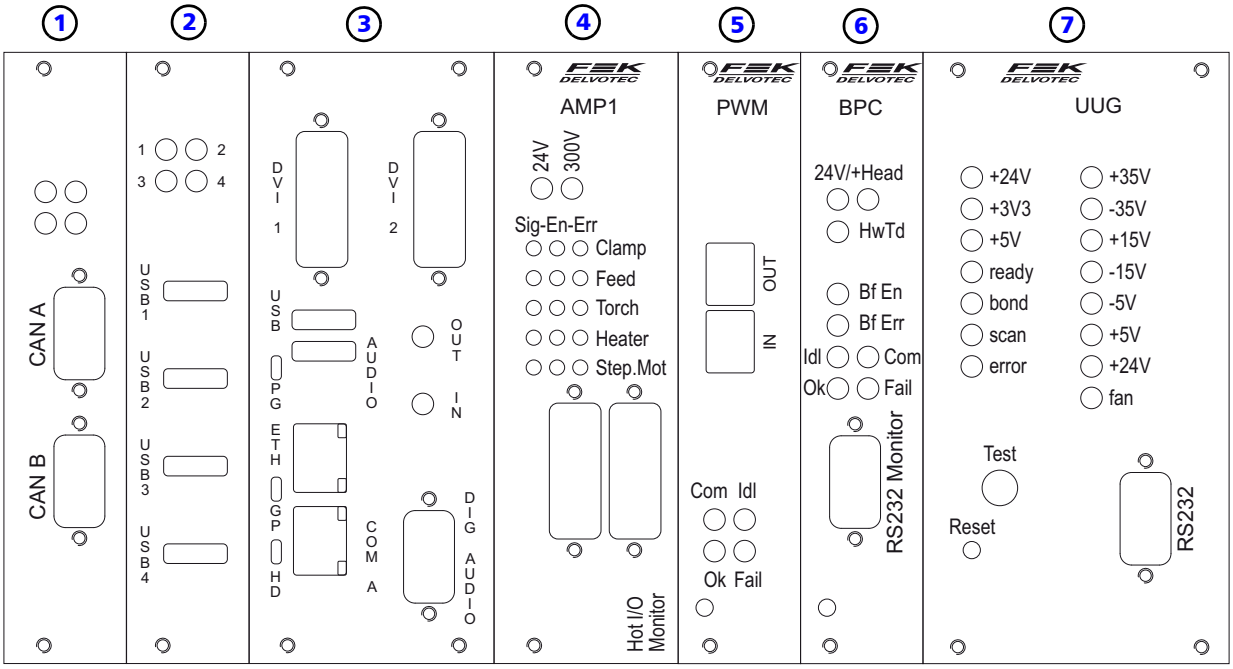


fig. 3 - 38 Electronics rack, overview

- **1:** See " cPCI dual CAN interface" on page 3-27
- **2:** See "cPCI 5-port USB interface" on page 3-27
- **3:** See "cPCI CPU" on page 3-28
- **4:** See "Amplifier" on page 3-29
- **5:** See "GIN link interface" on page 3-30
- **6:** See "Bond process control (BPC)" on page 3-31
- **7:** See Section 6, US generator

cPCI dual CAN interface

Installation position see "Overview of printed circuit boards in the electronics rack" on page 3-26.



fig. 3 - 39 cPCI dual CAN interface



This printed circuit board accommodates two opto-decoupled CAN controllers. The board controls the machine's two CAN buses.

connections

- **CAN-A1 (top):** CAN bus, internal bus for CAN components
- **CAN-A2 (bottom):** Not used

Indicators

The meanings of the LEDs:

- **Red:** Lights up when a system error occurs
- **Yellow:** Lights up to indicate that the board is on stand by, all functions OK.

cPCI 5-port USB interface

Installation position see "Overview of printed circuit boards in the electronics rack" on page 3-26

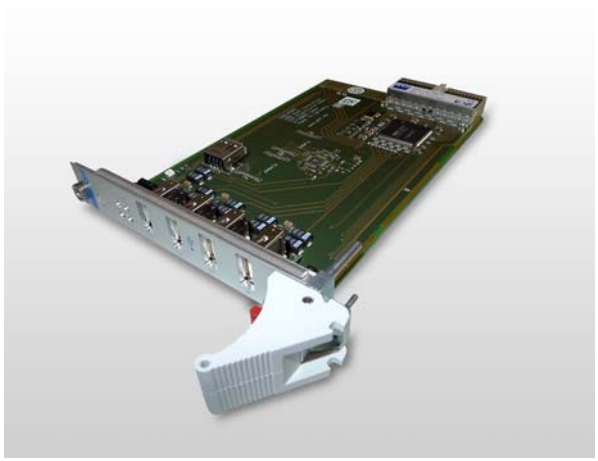


fig. 3 - 40 cPCI 5-port USB interface



The cPCI 5-port USB interface has 5 downstream USB 2.0 ports with a transmission rate of 480 Mbps. Four of the ports are in the front panel and one port is on the board.

connections

- **USB 1-4:** Front side ports USB 2.0
- **USB 5:** On-board port

Indicators

The meanings of the LEDs:

- **1 to 4 (green):** Lights up when the corresponding USB port is in use

cPCI CPU

Installation position see "Overview of printed circuit boards in the electronics rack" on page 3-26.





fig. 3 - 41 CPCI CPU

This board is the heart of the industry PC. All the principal components of a Pentium PC are combined on this board.

- Intel® Core 2 Duo microprocessor up to 2.26 GHz (and higher when available)
- >3GB DDR SDRAM
- 2 GB Ethernet interface
- Two front USB 2.0 ports
- >160GB 2.5" high-availability SATA hard disk
- Extended temperature range -40 °C to +85 °C
- Passive heat sink solution

IMPORTANT

Soldered onto the cPCI CPU is a lithium battery for the real-time clock. This battery has an unlimited service life. If nevertheless it has to be replaced, this work must be done by F&K Service.

The hard disk contains sensitive unencrypted data! It is recommended to destroy the hard disk after replacing it.

connections

- **DVI 1 / DVI 2:** Connection to the monitor.
- **USB:** 2x USB 2.0 port (connection to the user panel).
- **Gigabit Ethernet ETH-1 (top):** Network interface for external connectivity (LAN).
- **Gigabit Ethernet ETH-2 (bottom):** Is used for internal purposes.
- **COM A:** UPS function and serial diagnostics interface.

Indicators

The meanings of the LEDs:

- **PG (Power Good):** Status display
  - LED Off: Standby
  - LED lit red: Hardware error
  - LED flashes red: software error
  - LED yellow: Management status
  - LED green: Operating state

The status is differentiated by two LEDs as follows:

Status	description	LED GP	LED HD
S3	RAM is suppressed	OFF	ON
S4	Disk is suppressed	ON	OFF
S5	Standby	ON	ON

- **GP (General Purpose):** Lights up in the event of a general error or a BIOS fault
- **HD (Hard Disk Activity):** Lights up when the hard disk is accessed.
- **Speed (Upper LED):** Indicates the Ethernet speed.
- **Link (Lower LED):** Lights up upon communication via the relevant Ethernet port.

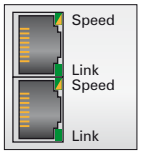


fig. 3 - 42 LEDs on the Ethernet port (Speed, Link)

Amplifier

Installation position see "Overview of printed circuit boards in the electronics rack" on page 3-26.

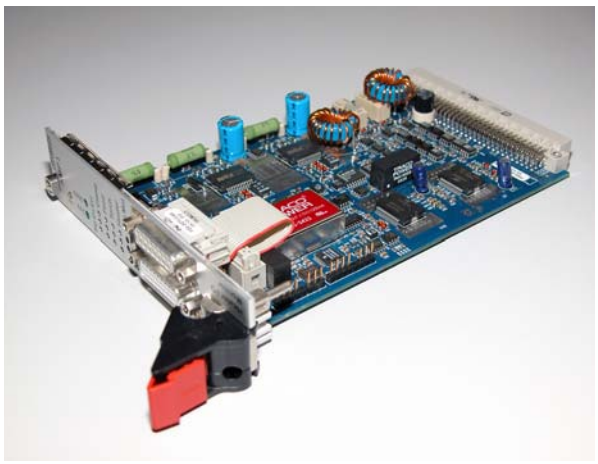


fig. 3 - 43 amplifier



The "Amplifier" printed circuit board accommodates the power amplifiers for the actuators of the bond head.

The following actuators are driven via their respective power amplifiers:

- wire clamp
- Wire feed
- Torch motor
- Optional wedge heater

connections

- **HOT I/O:** Not used.
- **Monitor:** An oscilloscope, for example, can be connected to this interface.

Indicators

The meanings of the LEDs:

- **+24V (green):** Lights up when the board is supplied with +24 V (fuse F1 is OK).
- **+300V (green):** Lights up when the board is supplied with +300 V (fuse F2 is OK).
- **Sig-Clamp:** Lights up when the wire clamp is activated. The brightness of the LED depends on the level of the input signal.
- **En-Clamp:** Lights up when the amplifier is energised.
- **Err-Clamp:** Lights up in the event of an amplifier error.
- **Sig-Feed:** Lights up when the wire feed is activated. The brightness of the LED depends on the level of the input signal.
- **En-Feed:** Lights up when the amplifier is energised.
- **Err-Feed:** Lights up in the event of an amplifier error.
- **Sig-Torch:** Lights up when the flame off electrode is activated. The brightness of the LED depends on the strength of the input signal.
- **En-Torch:** Lights up when the amplifier is energised.
- **Err-Torch:** Lights up in the event of an amplifier error.
- **Sig-Heater:** Lights up when a valid signal is present at the input of the amplifier that controls the wedge heater. The brightness of the LED depends on the level of the input signal.
- **En-Heater:** Lights up when the amplifier is energised.
- **Err-Heater:** Lights up in the event of an amplifier error.

GIN link interface

Installation position see "Overview of printed circuit boards in the electronics rack" on page 3-26.





fig. 3 - 44 GIN link interface

Pulse width modulator I/O interface with 16 digital inputs and 16 opto-decoupled digital outputs.

The board provides the following functions:

Signals

PWM signals from 10 kHz to 40 kHz with up to 12-bit resolution

Drive for the following actuators. (The power amplifiers are on the printed circuit boards in brackets).

- Bond force (power amplifier on the BPC pcb)
- Wire clamp (power amplifier on the Amplifier pcb)
- Wire feed (power amplifier on the Amplifier pcb)
- Torch motor (power amplifier on the Amplifier pcb)

Optional

- Wedge heater (power amplifier on the Amplifier pcb)

16 digital input signals, for example:

- Software touchdown (SW_TD)
- Hardware touchdown (HW_TD)
- Bond done (BONDDONE)
- Bond error (BONDERROR)
- Wire spool OK (WSCGOOD)

16 digital output signals (opto-decoupled), for example:

- Start bond (STARTBOND)
- Start touchdown (STARTTD)
- Wire spool trigger (WSCTRIGGER)

connections

- **GIN link IN**
- **GIN link OUT**

Indicators

The meanings of the LEDs:

- **Com:**
  - Startup-Phase: Flashes four times during startup after a power-on reset (normal boot sequence).
    Distinction:
    Download sequence - normal boot sequence.
  - ISR (interrupt service routine): Is switched on in the ISR for communication and off again after processing.

I M P O R T A N T

ISR is activated for reception only, in other words when the PC sends and the node receives.

- **Idle:**
  - Startup-Phase: Flashes four times during startup after a software reset (normal boot sequence).
    Distinction: Download sequence - normal boot sequence.
  - Idle phase: Flashes at a frequency of approximately 2 Hz
- **Ok:**
  - Lights up at half brightness in ICSP mode (download mode) along with the "fail" LED.
  - During the startup phase, lights up at half brightness along with the "fail" LED.
  - Lights up after the startup phase if there is no fault in the system ("serial number module" and "EEPROM" and "CAN" valid).
- **Fail:**
  - Lights up at half brightness in ICSP mode (download mode) along with the "OK" LED.
  - During the startup phase, lights up at half brightness along with the "OK" LED.
  - Lights up after the startup phase if there is a fault in the system ("serial number module" or "EEPROM" or "CAN" not valid).

Bond process control (BPC)

Installation position see "Overview of printed circuit boards in the electronics rack" on page 3-26.



fig. 3 - 45 bond process control



The bonding process control controls the power and duration of the ultrasound and the bond force during the bonding procedure.

Ultrasonic energy is regulated as a function of wire deformation. This ensures optimum bonding.

connections

RS232 Monitor:
A computer can be connected to this interface for service purposes.

Indicators

The meanings of the LEDs:

- **24V:** Lights up when the board is supplied with +24 V (fuse F1 is OK).
- **+Head:** Lights up to indicate that the voltage supply for the bond head is OK (fuses F1 and F2 are OK).
- **HwTd:** Lights up when a hardware touchdown has been detected.
- **Bf En:** Lights up when the power amplifier for bond force is energised.
- **Bf Err:** Lights up if a hardware fault occurs in the power amplifier for bond force.
- **Idle:**
  - Startup-Phase: Flashes four times during startup after a software reset (normal boot sequence).
    Distinction: Download sequence - normal boot sequence.
  - Idle phase: Flashes at a frequency of approximately 2 Hz
- **Com:**
  - Startup-Phase: Flashes four times during startup after a power-on reset (normal boot sequence).
    Distinction:
    Download sequence - normal boot sequence.
  - ISR (interrupt service routine): Is switched on in the ISR for communication and off again after processing.

IMPORTANT

ISR is activated for reception only, in other words when the PC sends and the node receives.

- **Ok:**
  - Lights up at half brightness in ICSP mode (download mode) along with the "fail" LED.
  - During the startup phase, lights up at half brightness along with the "fail" LED.
  - Lights up after the startup phase if there is no fault in the system ("serial number module" and "EEPROM" and "CAN" valid).
- **Fail:**
  - Lights up at half brightness in ICSP mode (download mode) along with the "OK" LED.
  - During the startup phase, lights up at half brightness along with the "OK" LED.
  - Lights up after the startup phase if there is a fault in the system ("serial number module" or "EEPROM" or "CAN" not valid).

3.8.5 Motion Controller



fig. 3 - 46 Motion controller (GIN-SAM4), installation position



fig. 3 - 47 Motion Controller (GIN-SAM4), component

Overview, Motion Controller (GIN-SAM4)

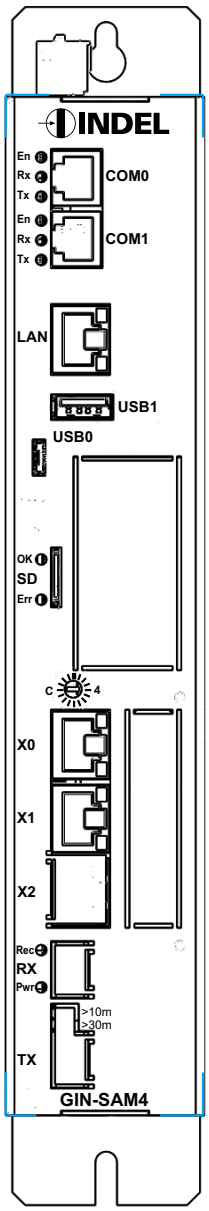


fig. 3 - 48 Motion Controller (GIN-SAM4), overview

The Motion Controller is a high-performance CPU board for use as fieldbus master and it is one of the most powerful CPU boards. The Motion Controller is therefore ideal for high-speed applications with high technical requirements.

connections

- **1x RS232 (COM0):** for debug purposes
- **1x Gigabit Ethernet (LAN):** network interface for host CPU
- **2x GinLink (X0, X1):** ?bus system

3.8.6 Ethernet switch

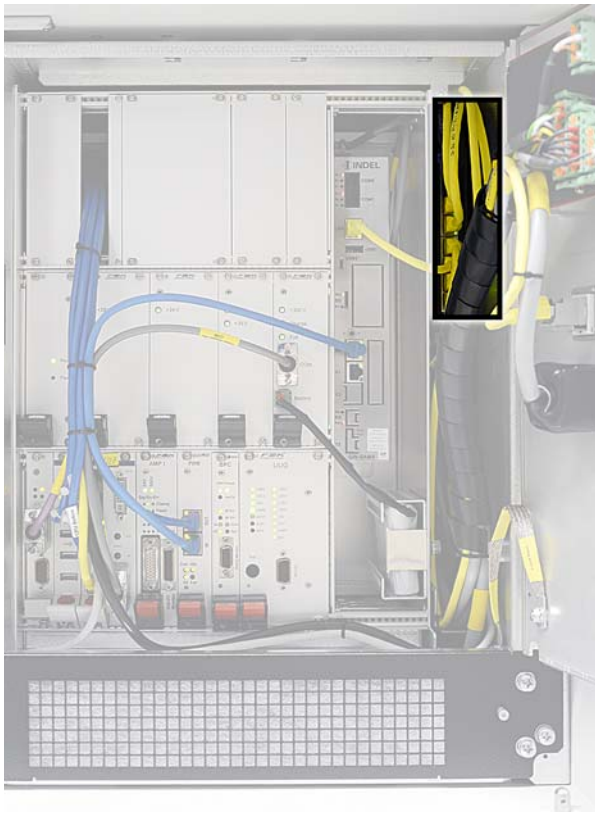


fig. 3 - 49 Ethernet switch, installation position



fig. 3 - 50 8-port Ethernet switch, component

The bonder has an 8-port Ethernet switch.

The component is not described in further detail below.

3.8.7 Fuse panel



fig. 3 - 51 Fuse panel, installation position

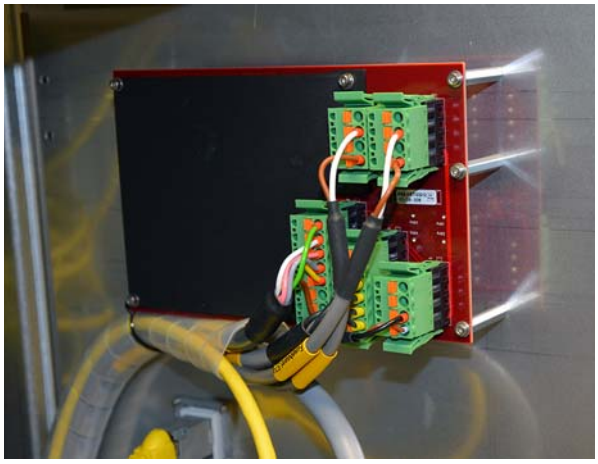


fig. 3 - 52 Fuse panel, front door open



fig. 3 - 53 Fuse panel, component

This board carries the fuses for the rack.

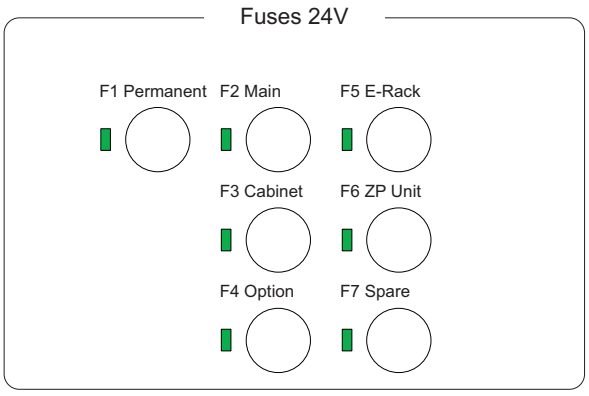


fig. 3 - 54 Fuse panel, overview on front door

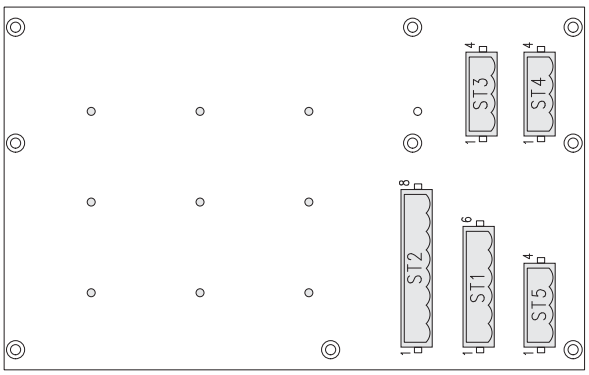


fig. 3 - 55 Fuse panel, overview, rear

Fuses

- **F1:** Protects the permanent 24V supply (1 A, slow-blow).
- **F2:** Protects the 24V supply to the mainboard (5 A, slow-blow).

- **F3:** Protects the 24V supply to the protective enclosure (5 A, slow-blow).
- **F4:** Protects the 24V supply to options (5 A, slow-blow).
- **F5:** Protects the 24V supply to the electronics rack (5 A, slow-blow).
- **F6:** Protects the 24V supply to the Z/P unit (5 A, slow-blow).
- **F7:** Is not used.

Indicators

There are 10 LEDs on the fuse panel.

- **LEDs 1 to 7:**
  - Lights up green when the fuse for the corresponding 24V supply is OK.

connections

- **ST1:** Connection for the backplane.
- **ST2:** Connection for the protective enclosure and the electronic rack.
- **ST3:** Connection for the Z/P interface.
- **ST4:** Is not used.
- **ST5:** Connection for the PNOZ.

3.8.8 Terminal board



fig. 3 - 56 Terminal board, installation position

Overview of the terminal board

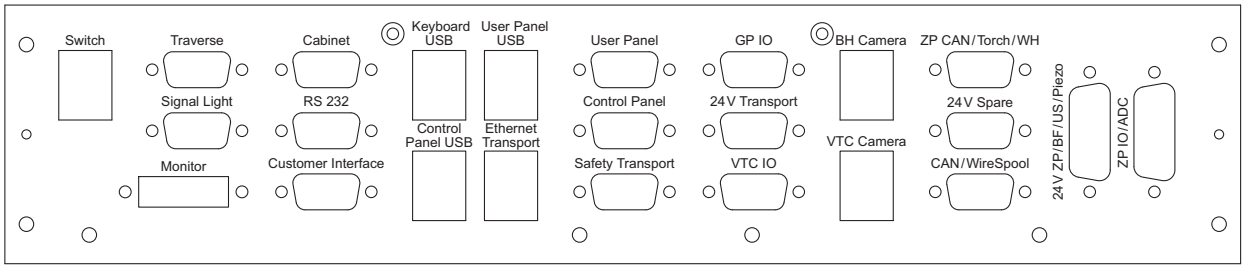


fig. 3 - 57 Terminal board, overview

The following connections are provided:

- **Switch:** Optional device
- **Traverse:** Cabinet terminal
- **Signal Light:** Signal light
- **Monitor:** Monitor
- **Cabinet:** Protective enclosure
- **RS232:** Serial port
- **Customer Interface:** Customer-specific IO and/or external EMERGENCY STOP
- **Keyboard USB:** Keyboard
- **Control Panel USB:** Control panel
- **User Panel USB:** User panel
- **Ethernet Transport:** Conveyor system
- **User Panel:** User panel
- **Control Panel:** Control panel
- **Safety Transport:** Safety device for the conveyor
- **GP IO:** IOs for different purposes, such as manual station, for example
- **24V Transport:** Conveyor
- **VTC IO:** Tool detection

- **BH Camera:** Bond head camera
- **VTC Camera:** Tool detection camera
- **ZP CAN/Torch/WH:** Z/P interface of the Z/P unit
- **24V Spare:** Optional +24V component
- **CAN/WireSpool:** Wire spool
- **24V ZP/BF/US/Piezo:** Z/P interface of the +24V Z/P unit
- **ZP IO/ADC:** Z/P interface of the Z/P unit

3.8.9 Cassette



fig. 3 - 58 Terminal board, installation position

Overview, cassette

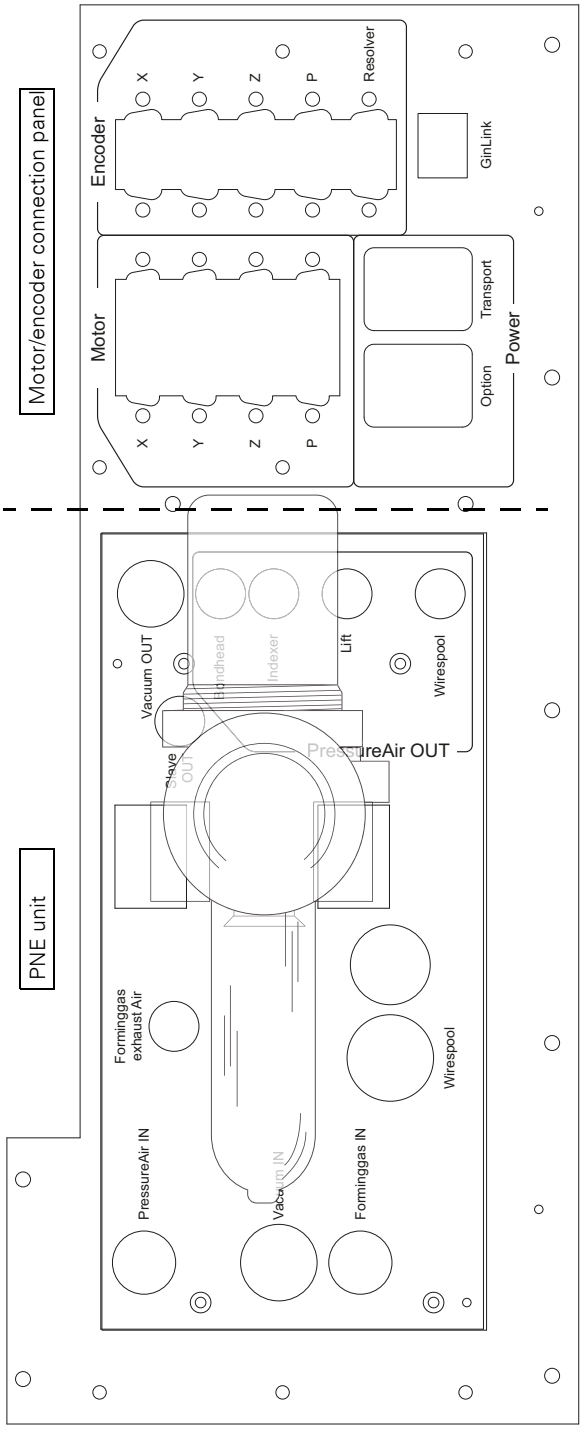


fig. 3 - 59 Cassette, overview

Motor/encoder connection panel

The motor/encoder connection panel is for connecting the corresponding cables, which are interfaced inward. The connection panel is not described in further detail below.

PNE unit

The PNE unit discharges the following functions:

- Distribution and control of compressed air, vacuum and, optionally, forming gas.
- Control of from 1 to 3 heaters is optional.

The PNE unit incorporates the pneumatic unit, the printed circuit boards heater controllers 1 to 3 and the pneumatic controller. The number of heater controllers installed depends on the number of heaters used.

Compressed air (Air), vacuum (Vacuum) and the optional forming gas (Forming Gas) are carried from the PCU unit to the pneumatic unit in the PNE unit. The sensors on the pneumatic terminal (in the pneumatic unit) monitor the relevant pressure or vacuum and are read out by the pneumatic controller. Solenoid valves carry the mediums to the base plate.

The "Main Air Pressure Adjust" screw is for adjusting the operating pressure of the machine's compressed-air supply.

The water that condenses out of the compressed air is trapped in the water separator. Check the water separator; empty as necessary. Maintenance interval.

N O T E !

The boards may be replaced only by F&K Delvotec's service department or trained personnel.

PNE unit without connection for forming gas

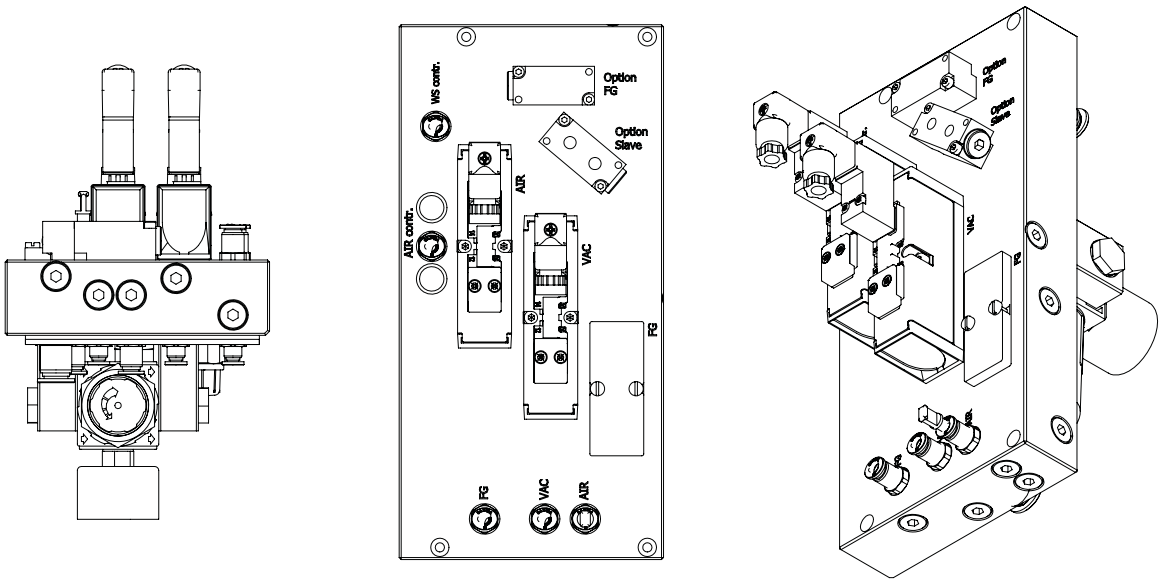


fig. 3 - 60 PNE unit without connection for forming gas, component

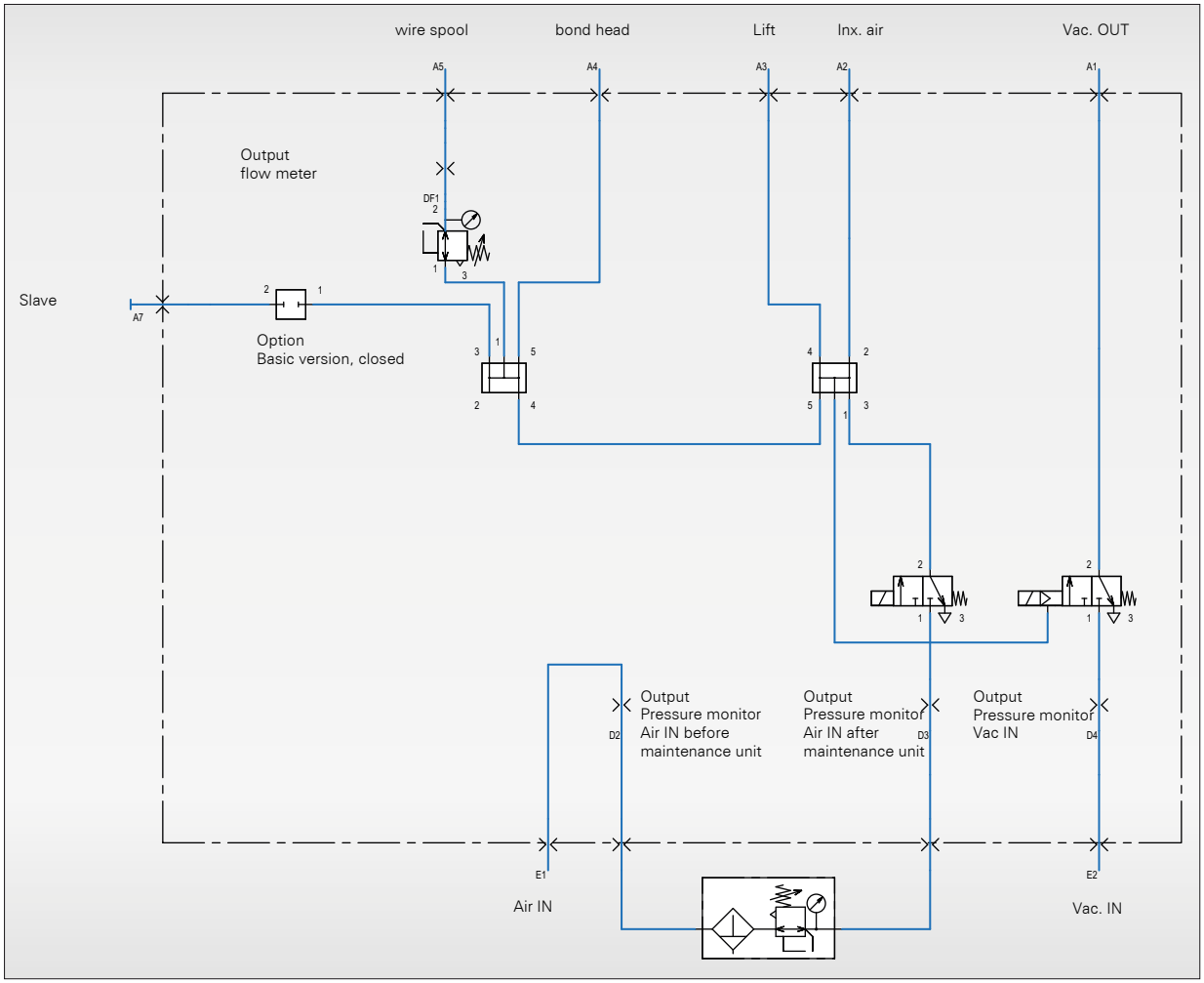


fig. 3 - 61 PNE unit without connection for forming gas, pneumatics diagram

PNE unit with connection for forming gas

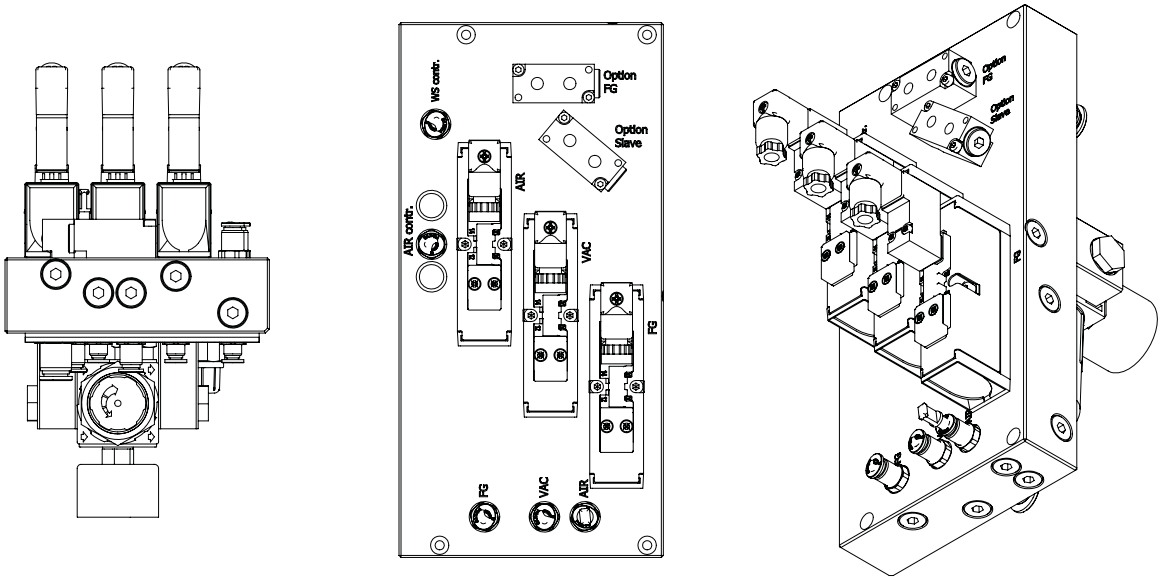


fig. 3 - 62 PNE unit with connection for forming gas, component

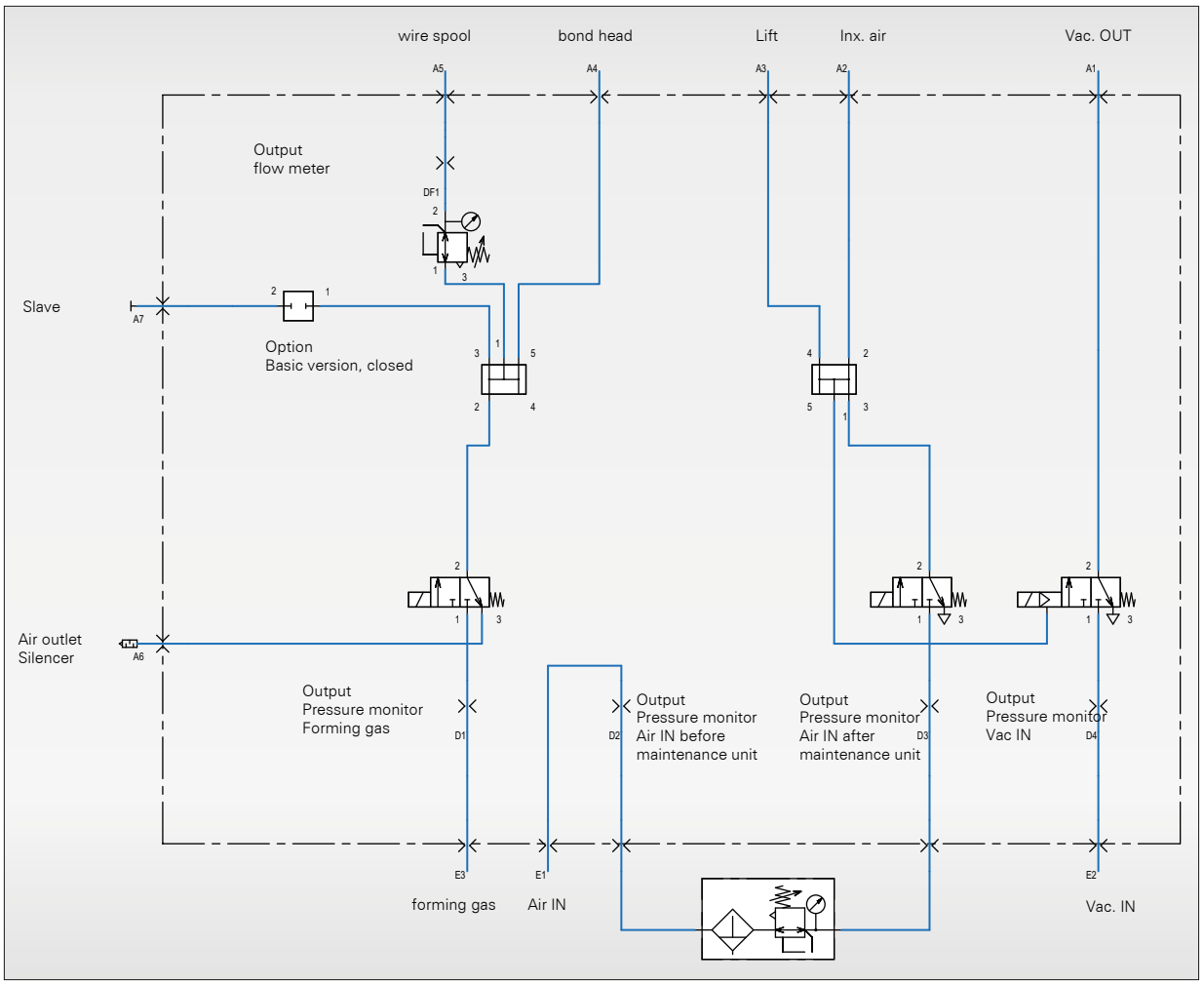


fig. 3 - 63 PNE unit with connection for forming gas, pneumatics diagram

3.9 Hardware inside the rack

3.9.1 Quadruple power amplifier

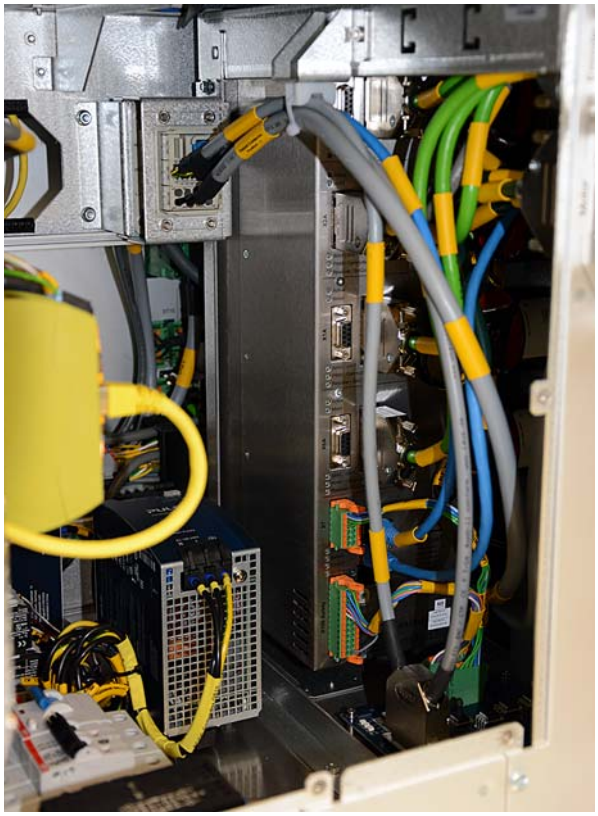


fig. 3 - 64 Quadruple power amplifier (GIN-SAC4x4 FS), installation position



fig. 3 - 65 Quadruple power amplifier (GIN-SAC4x4 FS), component

Overview of quadruple power amplifier (GIN-SAC4x4 FS)

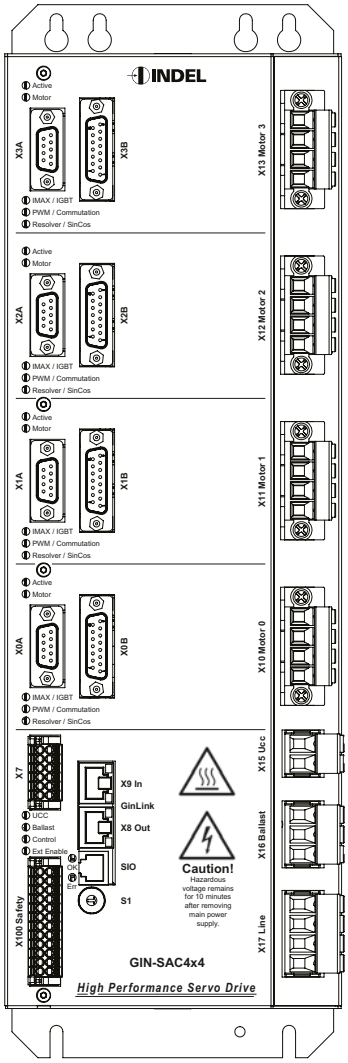


fig. 3 - 66 Quadruple power amplifier (GIN-SAC4x4 FS), overview

The GIN-SAC4x4 FS is the ideal motor power amplifier for high-end applications.

Four motors can be operated by this board. It also supports simultaneous data acquisition and evaluation of four independent sensor systems.

The high CPU power means that complex algorithms can be implemented directly in the servo-drive.

The power amplifier has safety functions. Our bonders use the function:

- STO (Safe Torque Off)
- SLS (Safety Limited Speed)
- SS1 (Safe Stop 1)

connections

- **X8/X9 (2x GinLink):** Internal bus system
- **X7:** Power supply (logic) +24V DC
- **X100:** Safety connection
- **X17:** Power supply (power) +230 V AC
- **X16:** Connection for discharge resistor
- **X10:** Connection for X-axis motor

- **X11:** Connection for Y-axis motor
- **X12:** Connection for Z-axis motor
- **X13:** Connection for P-axis motor
- **X0B:** Connection for read head, X axis
- **X1B:** Connection for read head, Y axis
- **X2B:** Connection for encoder, Z axis
- **X3B:** Connection for encoder, P axis

IMPORTANT

See the manufacturer's documentation for more information.

3.9.2 Fan (PCB)

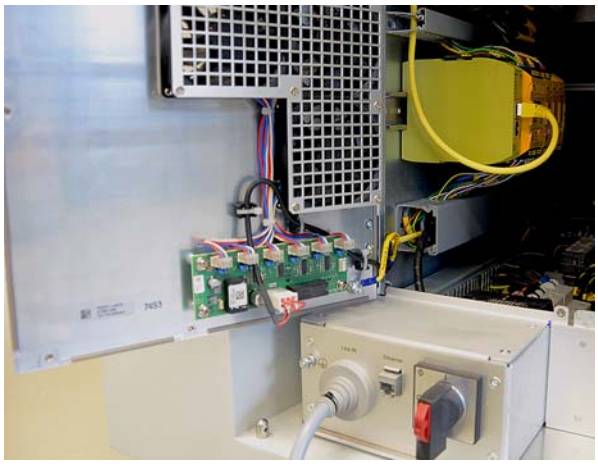


fig. 3 - 67 Board fan, installation position

The component is not described in further detail below.

3.9.3 Light panel

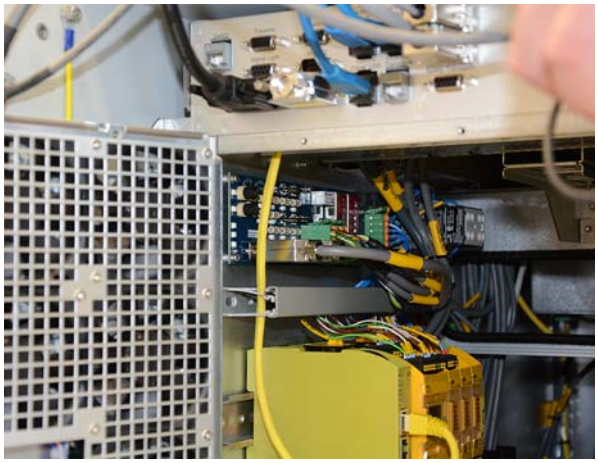


fig. 3 - 68 Light panel, installation position

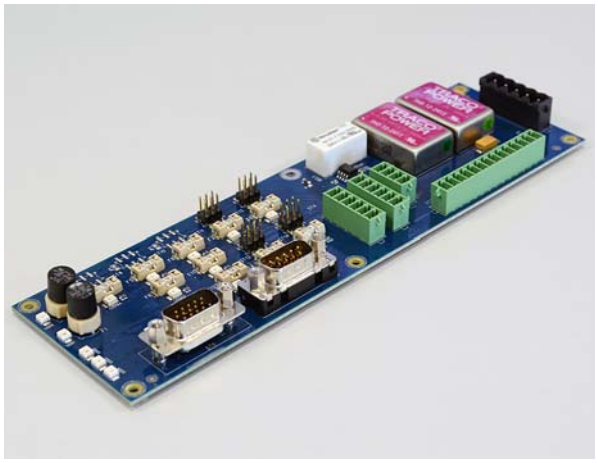


fig. 3 - 69 Light panel, component

Overview, light panel

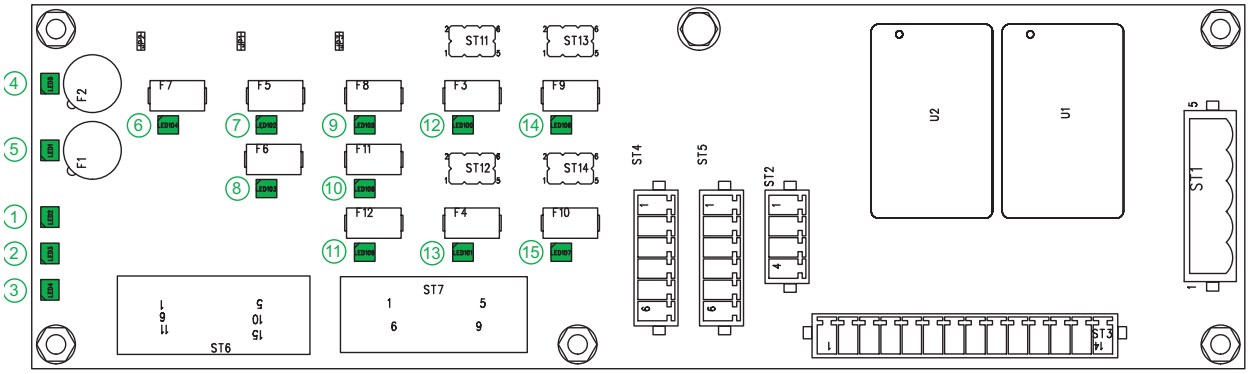


fig. 3 - 70 Light panel, overview

Fuses

- **F1:** Protects the +12V DC supply.
- **F2:** Protects the +5V DC supply.
- **F3:** Protects the power supply of the light 1 VTC (master).
- **F4:** Protects the power supply of the light 2 VTC (master).
- **F5:** Protects the power supply of the light at the cabinet (right).
- **F6:** Protects the power supply of the light at the cabinet (left).
- **F7:** Protects the power supply of the light at the microscope.
- **F8:** Protects the power supply of the red light at the safety door.
- **F9:** Is not used.
- **F10:** Is not used.
- **F11:** Protects the power supply of the green light at the safety door.
- **F12:** Protects the power supply of the blue light at the safety door.

Indicators

There are 15 LEDs on the light panel.

- **1:** Lights up green when the +24V supply voltage, optional, is OK.
- **2:** Lights up green when the +24V supply voltage, protective enclosure, is OK.
- **3:** Lights up green when the +24V supply voltage, mainboard, is OK.
- **4:** Lights up green when the +5V supply voltage is OK.
- **5:** Lights up green when the +12V supply voltage is OK.
- **6:** Lights up green when the light at the microscope is activated.
- **7:** Lights up green when the light at the cabinet (right) is activated.
- **8:** Lights up green when the light at the cabinet (left) is activated.
- **9:** Lights up green when the red light at the safety door is activated.
- **10:** Lights up green when the green light at the safety door is activated.
- **11:** Lights up green when the blue light at the safety door is activated.
- **12:** Lights up green when the light 1 VTC (master) is activated.
- **13:** Lights up green when the light 2 VTC (master) is activated.
- **14:** Is not used.
- **15:** Is not used.

Jumper

- **ST11:**
  - 1/2: 24V power supply for the light 1 VTC (master).
  - 3/4: 12V power supply for the light 1 VTC (master).
  - 5/6: 5V power supply for the light 1 VTC (master).
- **ST12:**
  - 1/2: 24V power supply for the light 2 VTC (Master).
  - 3/4: 12V power supply for the light 2 VTC (Master).
  - 5/6: 5V power supply for the light 2 VTC (Master).

Connections

- **ST1:** Connection for power supply.
- **ST2:** Connection for the customer interface.
- **ST3:** Connection for the cabinet and the traverse.
- **ST4:** Connection for the „VTC (master)“.
- **ST5:** Is not used.
- **ST6:** Connection for the „GIN link interface“ (master).
- **ST7:** Is not used.

3.9.4 Cartridge terminal



fig. 3 - 71 Cartridge terminal, installation position

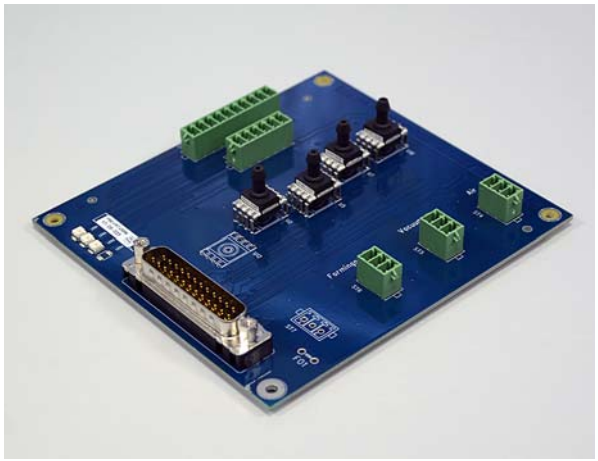


fig. 3 - 72 Cartridge terminal, component

Overview, cartridge terminal

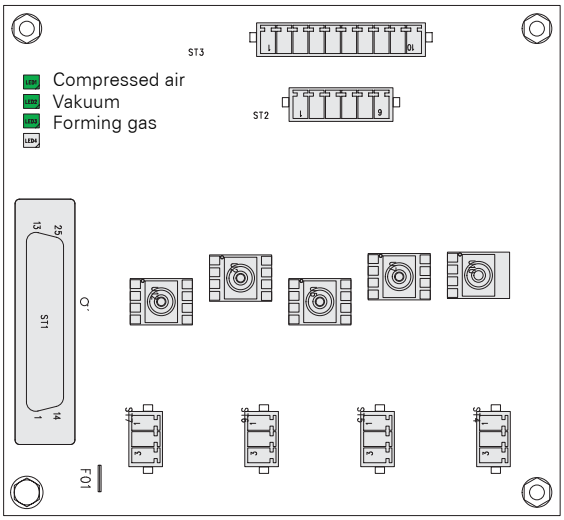


fig. 3 - 73 Cartridge terminal, overview A

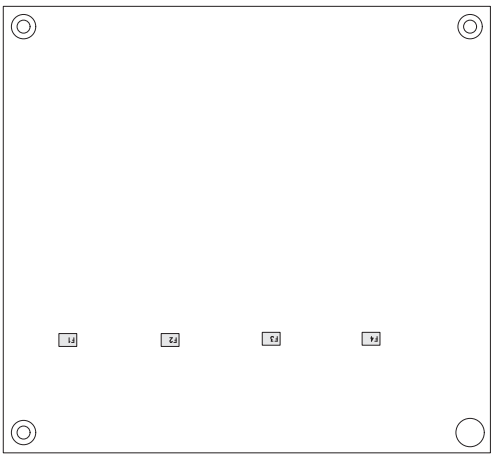


fig. 3 - 74 Cartridge terminal, overview B

Fuses

- **F1:** Protects the controller for compressed air (not changeable, reversible).
- **F2:** Protects the controller for vacuum (not changeable, reversible).
- **F3:** Protects the controller for forming gas (not changeable, reversible).

Indicators

- **LED1 (green):** Lights up when the compressed air supply is safe.
- **LED2 (green):** Lights up when the vacuum supply is safe.
- **LED3 (green):** Lights up when the forming gas supply is safe.

connections

- **ST1:** Machine connection
- **ST2:** Connection for voltage and IOs for the SAC4x4 FS
- **ST3:** Connection for the safety signals of the SAC4x4 FS
- **ST4:** Connection for the solenoid valve of the compressed air supply
- **ST5:** Connection for the solenoid valve of the vacuum supply
- **ST6:** Connection for the solenoid valve of the forming gas supply
- **ST7:** Is not used
- **U2:** Connection for the input compressed air
- **U5:** Connection for the input vacuum
- **U7:** Connection for the input forming gas

- **U10:** Connection for the machine compressed air
- **U12:** Is not used

3.10 Hardware, protective enclosure

3.10.1 Cabinet terminal



fig. 3 - 75 Cabinet terminal, installation position

Overview, cabinet terminal

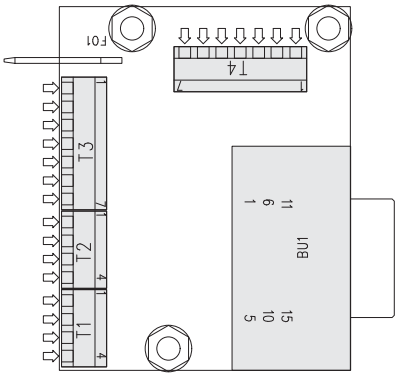


fig. 3 - 76 Cabinet terminal, overview

connections

- **BU1:** Machine connection
- **T1:** Connection for the safety function at the door
- **T2:** Connection for RGB strip
- **T3:** Connection for the sensor.
- **T4:** Optional, is not sent

3.11 maintenance

3.11.1 Notes on safety for maintenance

D A N G E R !

Prior to maintenance work, the machine must be de-energized and secured against unintentional restart by means of lockout/tagout (see chapter 2 „Switch the machine off“).

I M P O R T A N T

The notes on safety for maintenance are the same as those for adjustments.

3.11.2 Preventive maintenance

The wire bonders are designed to need no more than minimum maintenance. The most important maintenance task consists of cleaning the bonder and removing wire ends, which can cause short circuits. These can damage both the machine itself and the devices produced with it. We recommend placing a small container for the wire ends next to the machine.

I M P O R T A N T

Daily cleaning and removal of wire ends is important.

Always save the current program with "File > Save" before starting to carry out maintenance work on the bonder.

See the corresponding sections for instructions on maintenance of the components.

3.11.3 maintenance schedule

For information about the X/Y axes and the Z/P unit see the relevant sections of the component descriptions.

Part	Interval	Procedure / specification	Auxiliary materials / required material	Done by
Rack	Six-monthly	Check the function of the fans		Customer
- UPS battery	3 years	Replace the battery		Customer
- Fan board	Monthly	Replace filter		Customer
cPCI CPU - Hard Disk	4 years	Replace the hard disk		F&K Service
Gen.	As required	Clean all reachable places with a vacuum cleaner	Vacuum cleaner	Customer
Water separator	As required	Unscrew and empty		Customer

3.11.4 Cleaning tasks

- Clean the bonder and check for damage. Use a lint-free cloth dipped in pure alcohol or acetone for cleaning.

D A N G E R !

Always exercise care when handling cleansing agents. Always follow the manufacturer's instructions.

I M P O R T A N T

Make sure that the agents used to clean the bonder are disposed of in an environmentally friendly manner, particularly if solvents or other chemical agents are used. Always comply with the manufacturer's instructions.

N O T E !

Always comply with the manufacturer's instructions for handling lubricants suitable for use in cleanroom conditions.

3.12 Material list

Component	Material
Frame	Mineral casting
Hood	Mineral casting
Base plate	Steel (S355J2G3)
Base plate XL	Aluminium (3.3547)

3.13 Warning signs and notifiers

D A N G E R !

It is essential to comply with the regulations that belong to the warning and notifiers.

3.13.1 Keyboard

Warning and notifier	description	Position	
	Safe operation of the machine.		Above the keyboard.

3.13.2 Frame

Warning and notifier	description	Position	
	Risk of injury to the hands warning.		On the frame of the protective housing above the keyboard.
	Protective earth plug (PE) symbol 60417-IEC-5019		Diverse positions for earthing on the frame or between frame parts.
	Trashcan symbol for the electronic and electrical equipment scrap disposal regulation.		On the frame on the right, beside the nameplate.

3.13.3 Doors/racks

Warning and notifier	description	Position	
	Electric shock hazard warning. Switch off the main switch before opening.		On the front rack door.
			At the rear of the machine, on the rear rack door.

LIST OF ILLUSTRATIONS

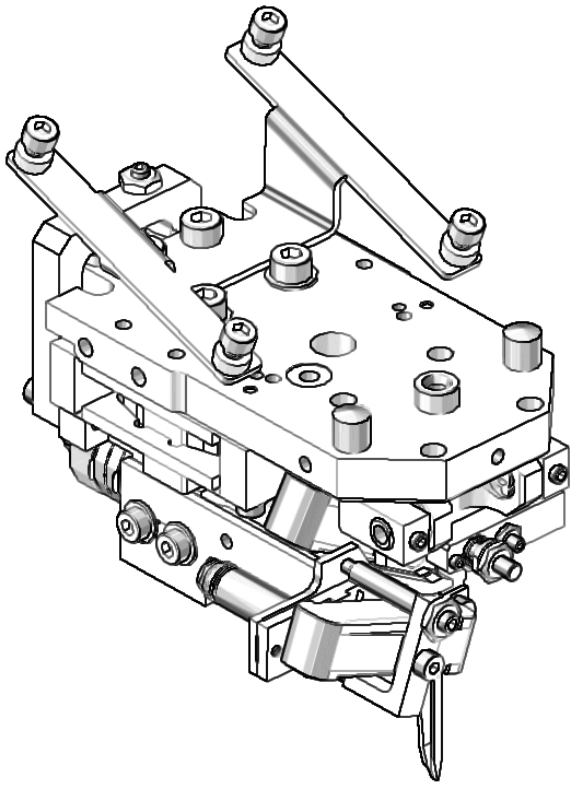
fig. 3 - 1 Nameplate . . . 3-1
fig. 3 - 2 Nameplate for machine with CE declaration . . . 3-1
fig. 3 - 3 Nameplate for machine with installation declaration . . . 3-1
fig. 3 - 4 Dimensions and weight . . . 3-4
fig. 3 - 5 General overview . . . 3-5
fig. 3 - 6 Cognex and CCD High-Speed Camera . . . 3-6
fig. 3 - 7 Signal light . . . 3-6
fig. 3 - 8 Control panel . . . 3-6
fig. 3 - 9 USB connection . . . 3-7
fig. 3 - 10 EBP . . . 3-7
fig. 3 - 11 Keyboard module - left section . . . 3-8
fig. 3 - 12 Keyboard module - right section . . . 3-8
fig. 3 - 13 trackball . . . 3-9
fig. 3 - 14 PC keyboard . . . 3-10
fig. 3 - 15 Installation - Alignment with a spirit level . . . 3-12
fig. 3 - 16 Position for attachment . . . 3-13
fig. 3 - 17 Device for earthquake protection . . . 3-13
fig. 3 - 18 Transport securing device, X/Y-axes . . . 3-13
fig. 3 - 19 Transport securing device, Z/P-axes . . . 3-14
fig. 3 - 20 Fastening the signal light . . . 3-14
fig. 3 - 21 Microscope holder . . . 3-14
fig. 3 - 22 Cable routing of the ring lighting . . . 3-15
fig. 3 - 23 Connecting to power supply . . . 3-16
fig. 3 - 24 Connecting to power supply > circuit diagram of the cable . . . 3-16
fig. 3 - 25 Connecting to power supply > PE . . . 3-16
fig. 3 - 26 Cover panel > Lock . . . 3-18
fig. 3 - 27 Overview of rack (front) . . . 3-19
fig. 3 - 28 Overview of rack (rear) . . . 3-19
fig. 3 - 29 Power supply, installation position . . . 3-20
fig. 3 - 30 Power supply - overview . . . 3-21
fig. 3 - 31 cPCI power supply . . . 3-22
fig. 3 - 32 cPCI power supply . . . 3-22
fig. 3 - 33 cPCI power supply . . . 3-23
fig. 3 - 34 cPCI power supply . . . 3-23
fig. 3 - 35 cPCI power supply . . . 3-24
fig. 3 - 36 Battery . . . 3-24
fig. 3 - 37 Electronics rack, installation position . . . 3-25
fig. 3 - 38 Electronics rack, overview . . . 3-26
fig. 3 - 39 cPCI dual CAN interface . . . 3-27
fig. 3 - 40 cPCI 5-port USB interface . . . 3-27
fig. 3 - 41 CPCI CPU . . . 3-28
fig. 3 - 42 LEDs on the Ethernet port (Speed, Link) . . . 3-28
fig. 3 - 43 amplifier . . . 3-29
fig. 3 - 44 GIN link interface . . . 3-30
fig. 3 - 45 bond process control . . . 3-31
fig. 3 - 46 Motion controller (GIN-SAM4), installation position . . . 3-32
fig. 3 - 47 Motion Controller (GIN-SAM4), component . . . 3-32
fig. 3 - 48 Motion Controller (GIN-SAM4), overview . . . 3-32
fig. 3 - 49 Ethernet switch, installation position . . . 3-33
fig. 3 - 50 8-port Ethernet switch, component . . . 3-33
fig. 3 - 51 Fuse panel, installation position . . . 3-34
fig. 3 - 52 Fuse panel, front door open . . . 3-34
fig. 3 - 53 Fuse panel, component . . . 3-34
fig. 3 - 54 Fuse panel, overview on front door . . . 3-34
fig. 3 - 55 Fuse panel, overview, rear . . . 3-34
fig. 3 - 56 Terminal board, installation position . . . 3-36
fig. 3 - 57 Terminal board, overview . . . 3-36
fig. 3 - 58 Terminal board, installation position . . . 3-38
fig. 3 - 59 Cassette, overview . . . 3-38
fig. 3 - 60 PNE unit without connection for forming gas, component . . . 3-40
fig. 3 - 61 PNE unit without connection for forming gas, pneumatics diagram . . . 3-40
fig. 3 - 62 PNE unit with connection for forming gas, component . . . 3-41
fig. 3 - 63 PNE unit with connection for forming gas, pneumatics diagram . . . 3-41
fig. 3 - 64 Quadruple power amplifier (GIN-SAC4x4 FS), installation position . . . 3-42

fig. 3 - 65 Quadruple power amplifier (GIN-SAC4x4 FS), component 3-42
fig. 3 - 66 Quadruple power amplifier (GIN-SAC4x4 FS), overview 3-42
fig. 3 - 67 Board fan, installation position 3-43
fig. 3 - 68 Light panel, installation position. 3-44
fig. 3 - 69 Light panel, component 3-44
fig. 3 - 70 Light panel, overview 3-44
fig. 3 - 71 Cartridge terminal, installation position 3-46
fig. 3 - 72 Cartridge terminal, component 3-46
fig. 3 - 73 Cartridge terminal, overview A 3-46
fig. 3 - 74 Cartridge terminal, overview B 3-46
fig. 3 - 75 Cabinet terminal, installation position 3-47
fig. 3 - 76 Cabinet terminal, overview. 3-47

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

Bond head thin wire HD

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

4 BOND HEAD THIN WIRE HD 4-1

4.1 Function of the unit 4-1

4.1.1 transducer 4-1
4.1.2 Bond force 4-2
4.1.3 wire clamp 4-2
4.1.4 bonding tool 4-2
4.1.5 Touchdown sensor 4-3

4.2 technical data 4-3

4.3 adjustments 4-3

4.3.1 preparation. 4-3
4.3.2 Overview 4-5
4.3.3 setting regulations 4-6

4.4 Bond force calibration 4-11

4.4.1 Preparation for calibration. 4-12
4.4.2 Calibration parameters and calibration process 4-12

4.5 head terminal 4-14

4.6 maintenance 4-16

4.6.1 Maintenance schedule 4-16
4.6.2 Cleaning tasks 4-17

4.7 Instructions for component replacement 4-18

4.7.1 Replacing the bonding tool 4-18

4.8 Material list 4-18

4.9 Warning signs and notifiers 4-19

1
2
3
4
5
6
7
8
9
10
11
12
13
A

4 BOND HEAD THIN WIRE HD

4.1 Function of the unit

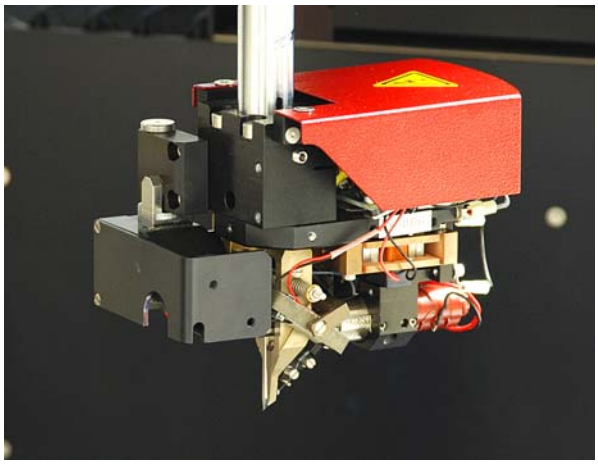


fig. 4 - 1 Bond head HD

The bond head is made up of the following components:

- Transducer, which converts the high frequency signals of the ultrasonic generator into the mechanical oscillation required for the ultrasonic welding.
- Voice coil motor for controlling the bonding force.
- Wire clamp for holding the bonding wire when it is torn off after the destination bond.
- Bonding tool, which transfers the oscillations to the bond position.
- Wire guide, which guides the bonding wire to the tip of the bonding tool.
- Touchdown sensor, which detects contact between the bonding tool and the device and measures deformation.
- Indirect light (diffused): is located in the bond head

4.1.1 transducer

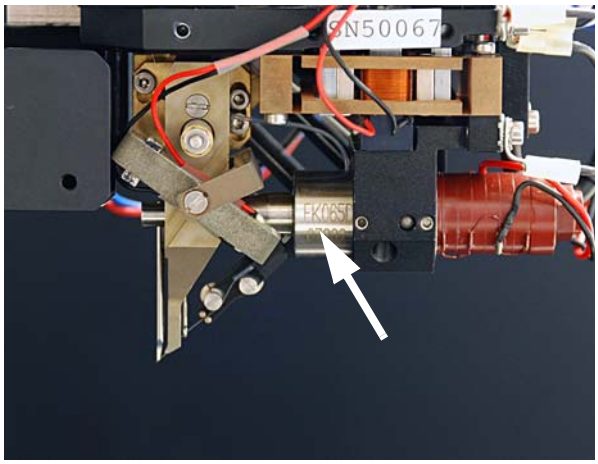


fig. 4 - 2 transducer

The transducer contains the piezos that convert the electrical oscillation generated by the ultrasonic generator into the mechanical vibration required for thermosonic welding. The bonding tool transmits these vibrations to the bond position.

4.1.2 Bond force

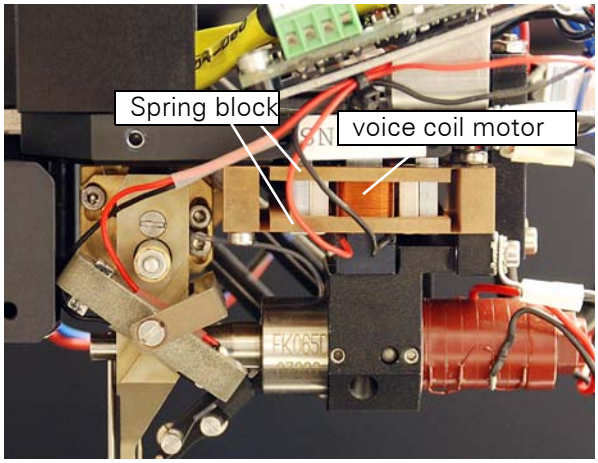


fig. 4 - 3 Bond force (spring block with voice coil motor)

The bond force consists of two components (mechanical and electrical):

- The mechanical base force that is specified using the spring block or parallel springs in the bond head. They determine the mechanical bond force range.
- An additional force, that can be applied by a voice coil motor, and that can be programmed separately for source bond and destination bond.

The bond force required for bonding is set as the sum of the mechanical basic force plus the programmable force. In other words, the aggregate force with which the wire is pressed against the device for the bonding process.

IMPORTANT

Setting of the mechanical basic force may be performed only by trained skilled personnel.

4.1.3 wire clamp

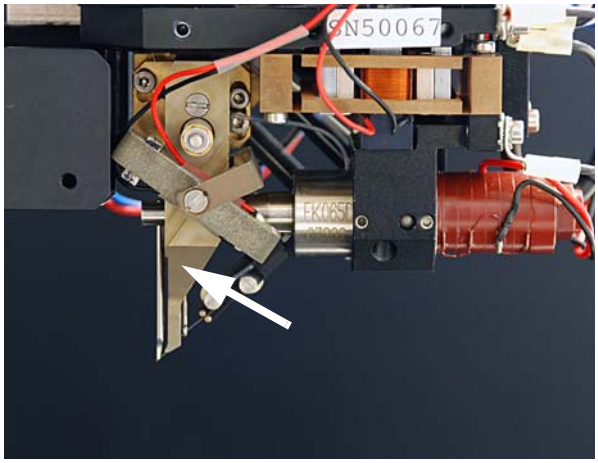


fig. 4 - 4 wire clamp

The wire clamp holds the bonding wire for tear-off after the destination bond. It is opened by a piezo and closed by spring action.

4.1.4 bonding tool

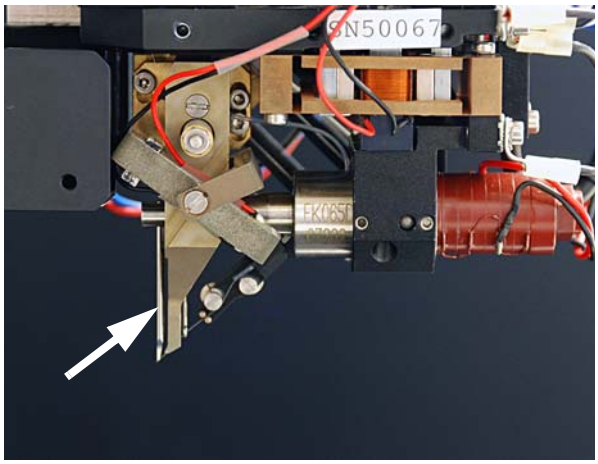


fig. 4 - 5 bonding tool

The bonding tool transfers the oscillation required for the welding to the bond position. The bonding tool has to be selected to suit the bond wire and the device.

A further distinction has to be drawn between bonding tools for aluminium-wire and gold-wire applications. For transmission of the ultrasonic vibrations to the bond position mainly the following are used on ultrasonic bonders from F&K Delvotec:

- a wedge for aluminium wires and
- a wedge with a cross groove or capillary in the case of gold wires

4.1.5 Touchdown sensor

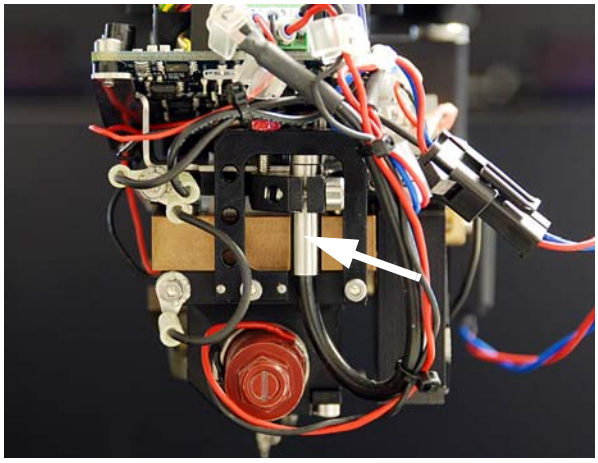


fig. 4 - 6 touchdown sensor

The touchdown sensor notifies the bonder controller when it detects contact between the bonding tool and the device and it also measures deformation during the bonding process.

4.2 technical data

Wire diameter	17 µm to 75 µm (0.7 mil to 3 mil)
wire guide	45° standard and 60°
bonding tool	25.4 mm / 1? standard at 45° and 60° wire guide
Bond force	Programmable from 10-250 cN / resolution 1cN

IMPORTANT

Also consult all the descriptions in other sections and in particular, comply with the notes relating to your safety and the safety of the machine.

4.3 adjustments

IMPORTANT

Always save the current program with "File > Save" before maintenance work or cleaning work is carried out on the bonder.

4.3.1 preparation

Test preparations/test structure

The following are needed for the test:

- Digital multimeter (e.g. Fluke 75 or similar) for resistance metering
- Micrometer, e.g. Mitutoyo with a measuring range of 150 mm
- Transducer setting gauge
- Feeler gauge, 0.1 mm
- Torque wrench 10..60 cNm
- Spring scale 10...100 cN
- Allen key

0.9 mm	2.0 mm
1.3 mm	2.5 mm
1.5 mm	3.0 mm

- Fork wrenches

4.0 mm	5.0 mm



fig. 4 - 7 Digital multimeter



fig. 4 - 8 Feeler gauge



fig. 4 - 9 Micrometer



fig. 4 - 10 Transducer setting gauge (thin wire)



Bit for tool screw:	Bit for transducer clamp:
0.9 mm	1.5 mm



Bit for tool screw:	Bit for transducer clamp:
1.27 mm	1.5 mm

fig. 4 - 11 Torque wrench (10..60 cNm)



fig. 4 - 12 Spring scale (10..100 cN)

4.3.2 Overview

3D view of the thin wire bond head.

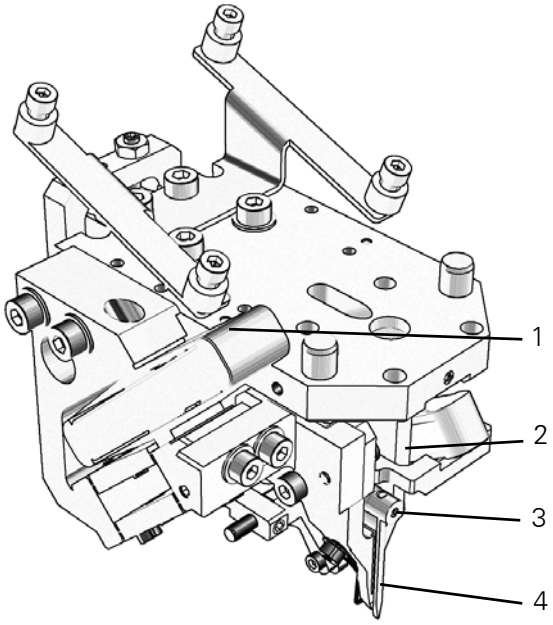


fig. 4 - 13 Thin wire bond head - Overview

- 1. Wire feed piezo (feed)
- 2. Wire clamp
- 3. Tool screw
- 4. Wedge (e.g. 1" standard)

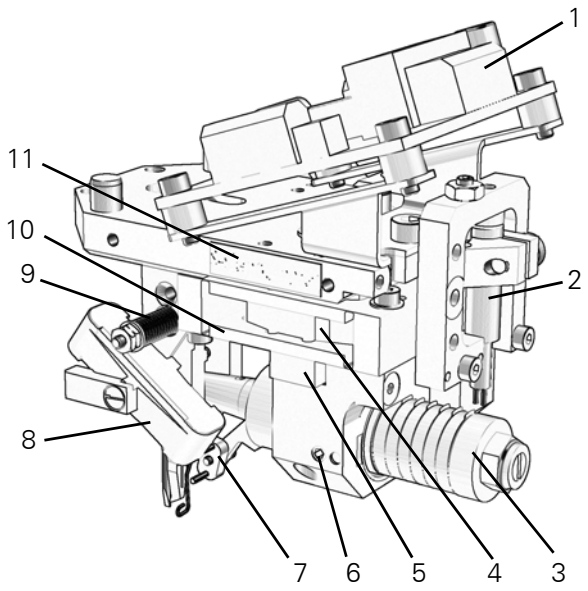


fig. 4 - 14 Thin wire bond head - Overview

- 1. Head terminal lite
- 2. Touchdown sensor
- 3. Transducer
- 4. Voice coil motor (solenoid)
- 5. Voice coil motor (coil)
- 6. Transducer clamping threaded pin
- 7. Wire guide tube (45° and 60°)
  (45°: Standard)
  (60°: Option)
- 8. Clamp piezo (clamp)
- 9. Compression spring
- 10. Spring block
- 11. Serial number

4.3.3 setting regulations

Voice coil motor (moving coil)

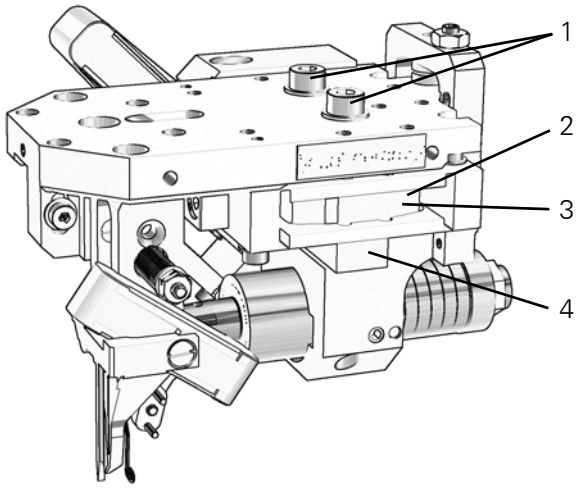


fig. 4 - 15 Thin wire bond head - voice coil motor

- 1. Fastening screws and washers
- 2. Voice coil motor (solenoid)
- 3. Voice coil motor (coil)
- 4. Gap width

Adjust the coil (3) of the voice coil motor by means of feeler gauges to 0.55 mm (4) centrically to the solenoid (2).

- For adjustment, the two fastening screws (1) have to be loosened from the top. The screws have to be loosened with an Allen key.

After adjustment, the transducer suspension must move smoothly and easily.

IMPORTANT

Make sure that the spring block is installed without load.

- Check the winding resistance of the voice coil motor with the multimeter (R=19.7 ±1 Ω).

transducer

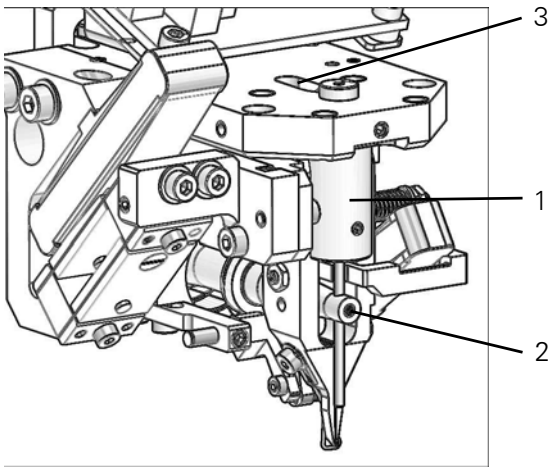


fig. 4 - 16 Thin wire bond head - Transducer

- 1. Setting gauge for the transducer
- 2. Transducer
- 3. Wire guide

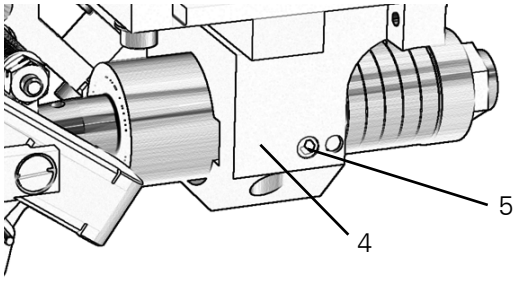


fig. 4 - 17 Thin wire bond head - Transducer holder

- 4: Transducer holder
- 5: Transducer clamp screw

Only one M3 clamp screw is needed when the transducer holder is used. This screw is tightened to a torque of 55 cNm.

- To install the setting gauge (1), the wire clamp (Clamp) and wire guide (3) must be removed from the bond head.
- By means of the setting gauge (1) the transducer (2) is adjusted both in slope and in depth centrically to the bond head axis.
- Then the transducer clamp screw is tightened to a torque of 55 cNm.
- Finally the setting gauge can be removed again and the wire guide fitted.

wire clamp

The wire clamp can be set in planes X, Y and Z. It has to be checked for parallelism and any foreign particles/contamination.

Adjustment in plane X

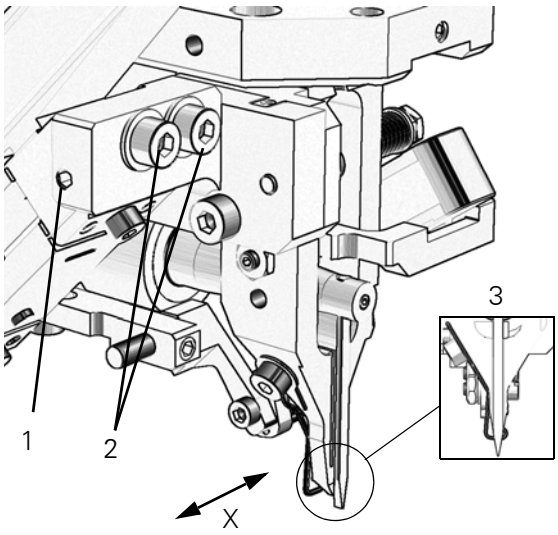


fig. 4 - 18 Thin Wire Bond Head - Wire Clamp (adjustment X direction)

- 1. Adjusting screw
- 2. Fastening screw
- 3. Wire clamp centrical to wedge

This illustration shows the adjustment in plane X.

- First, the fastening screw (2) must be loosened slightly so that the clamp can then be adjusted in X direction with the set screw (1) centrical to the wedge (3).
- Check the adjustment with a mirror.

Adjustment in plane Y

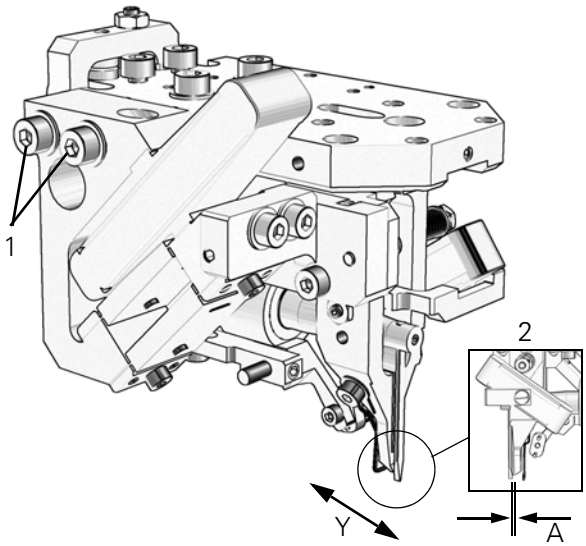


fig. 4 - 19 Thin Wire Bond Head - Wire Clamp (adjustment Y direction)

- 1. Fastening screws
- 2. Clearance A = 0.55 - 0.60 mm
- Mount the wedge flush with the transducer horn

This illustration shows the adjustment in plane Y.

- First, the two fastening screws (1) must be slightly loosened to then adjust the clamp in Y direction to the wedge with clearance A (2).
- The fastening screws (1) must be tightened with a torque not exceeding 130 cNm.

Adjustment in plane Z

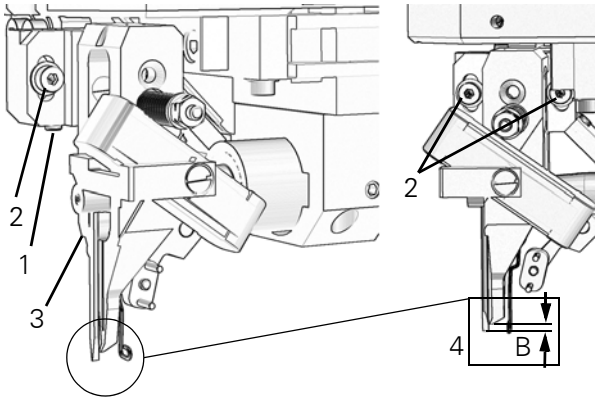


fig. 4 - 20 Thin Wire Bond Head - Wire Clamp (adjustment Z direction)

- 1. Adjusting screw
- 2. Fastening screws
- 3. Wedge fitted flush
- 4. Clearance B = 1.20 mm

This illustration shows the adjustment in plane Z.

- First, the three fastening screws (2) behind the wire clamp must be loosened slightly to then use the adjusting screw (1) to adjust the clamp in Z direction to the wedge with clearance B (4). To do so the wedge has to be fitted flush (3) with the transducer.

When the adjusting screw (1) is turned clockwise the wire clamp (1) moves downwards.

Adjustment of the clamp force

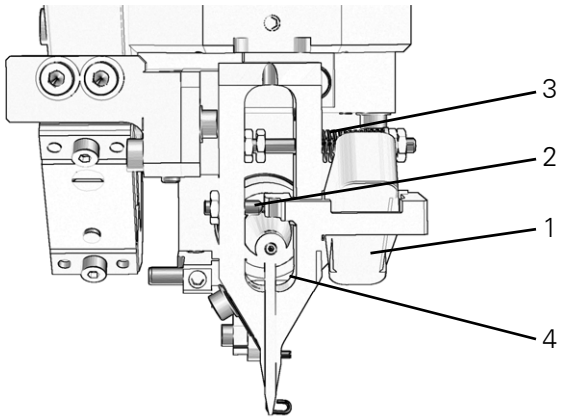


fig. 4 - 21 Thin wire Bond Head - Wire Clamp (adjustment of clamp force)

- 1. Clamp piezo
- 2. Limit stop
- 3. Compression spring
- 4. Application point for the spring scale

- Turn the adjusting screw of the clamp to the limit stop (less than 0.02 mm) (2).
- Set the clamp force by adjusting the compression spring (3) to 140 cN.

TABLE OF WIRE THICKNESSES WITH CORRESPONDING CLAMP FORCES

(measured at the application point by means of the spring scale)

Wire thickness	Clamp force ±1 %
17 µm (0.7 mil)	=> 110 cN
25 µm (1 mil)	=> 140 cN
32 µm (1.28 mil)	=> 148 cN
38 µm (1.52 mil)	=> 155 cN
50 µm (2 mil)	=> 170 cN
60 µm (2.4 mil)	=> 182 cN
75 µm (3 mil)	=> 200 cN

wire guide

Tube

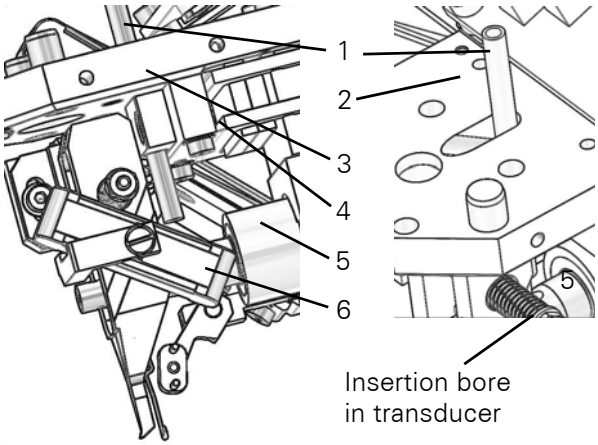


fig. 4 - 22 Thin wire bond head - Wire guide

- 1. Tube
- 2. Bond head frame
- 3. Guide block
- 4. Protrusion approx. 10 mm
- 5. Transducer
- 6. Wire brake

▶ Push the tube (1) of the wire spool through the insertion bore in the bond head frame (2) and through the guide block (3) (tube end approx. 10 mm below the guide block). Then feed in the wire through the opening in the transducer (5) and finally over the wire brake (6).

Wire brake

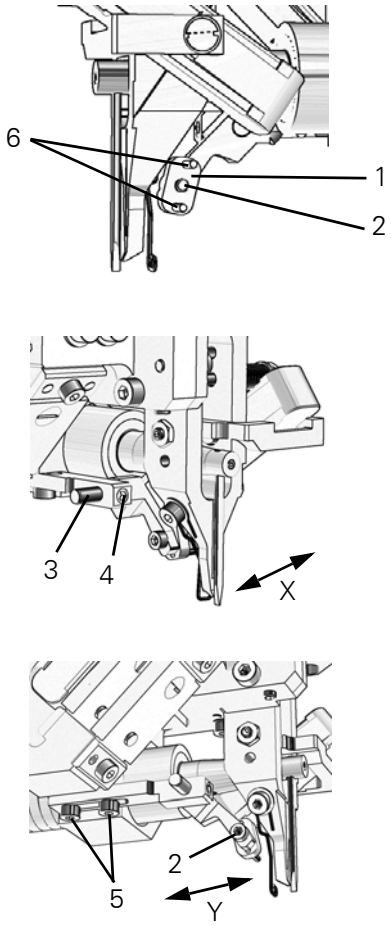


fig. 4 - 23 Thin wire bond head - Wire guide

- 1. Wire brake
- 2. Screw, M1.6 x 5, for wire feed angle setting
- 3. Parallel pin, 2.5 x 14, for adjustment in X direction
- 4. Set screw M3 x 3 for adjustment in X direction
- 5. Screw, M2x6, for adjustment in Y direction
- 6. Parallel pins, 1 x 6, for the drape point

The redirection of the wire is adjusted with the aid of two parallel pins (6). The larger the redirection, the stronger the brake effect.

Bond force

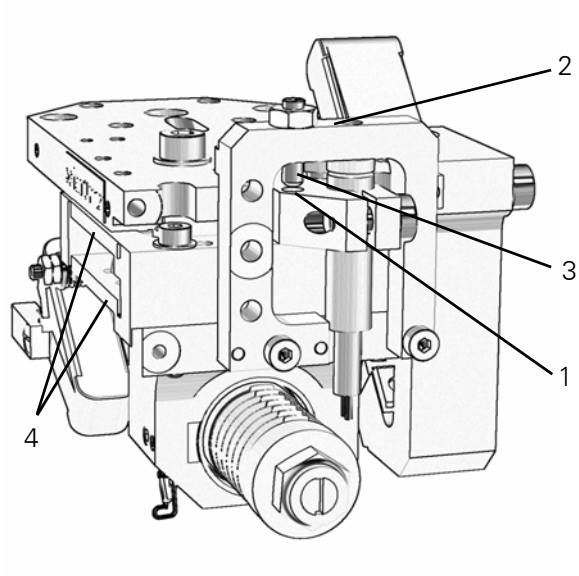


fig. 4 - 24 Thin Wire Bond Head - Bond Force

- 1. Limit stop
- 2. Locknut
- 3. Set screw
- 4. Spring block

The mechanical bond force is set by adjusting the Z limit stops up to the limit stop (mechanical bond force 70 +/-2 cN).

- ▶ This entails slackening the locknut (2) so that the set screw (3) can be turned to set the necessary preload of the spring block (4) (adjust to the limit stop).
- ▶ Finally, the locknut (2) and set screw (3) must be painted with red safety paint.

IMPORTANT

In particular free movement of the voice coil motor has to be ensured!

Touchdown sensor

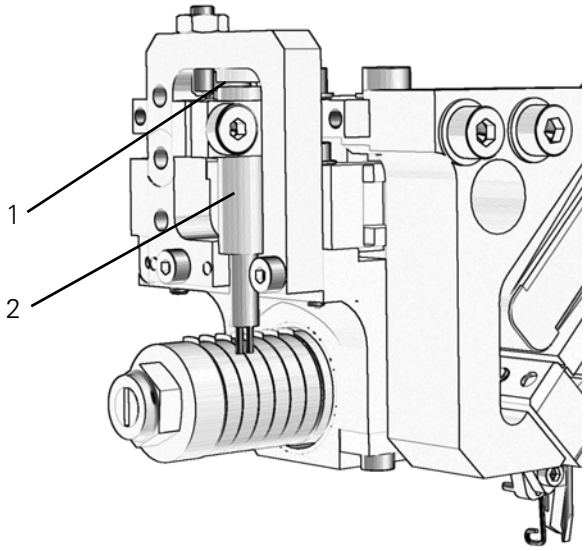


fig. 4 - 25 Thin Wire Bond Head - Touchdown Sensor

- 1. Clearance
- 2. TD sensor

- ▶ The clearance (1) of the TD sensor (2) has to be set to 0.1 mm +0.05 / -0.00.
- ▶ Check the screws for firm seating.

earth to clamp & transducer

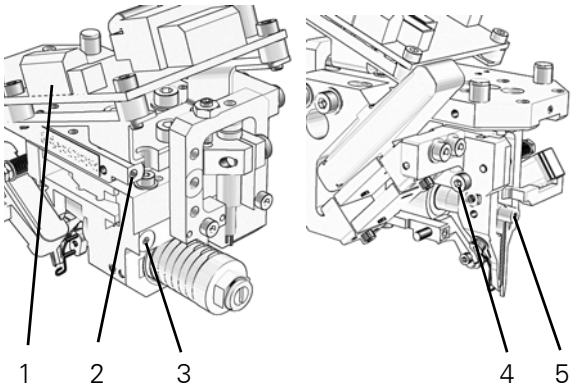


fig. 4 - 26 Thin Wire Bond Head - Earth on Clamp & Transducer

- 1. Head terminal lite
- 2. Protective earth connection on the bond head frame
- 3. Connection on the transducer holder
- 4. Terminal on the wire clamp
- 5. Measuring point on the transducer

IMPORTANT

To avoid electrostatic charging the fixed part of the wire clamp (4) must have a secure electrical connection with a ring terminal and a contact washer to the protective earth connection (2) on the bond head.

The bracket of the transducer (3) must also have a secure electrical connection to the protective earth connection of the bond head frame (2).

The corresponding contact surfaces and threads must be free of anodization.

The ohmic resistance must be checked between the protective earth connection (2) and wire clamp (4) or transducer (5) and must be R < 0.005Ω.

- In both cases, use the contact washers.
- The earth connection of the head terminal (1) is connected directly to the bond head frame (2).

4.4 Bond force calibration

A special measuring instrument is necessary for the bonding strength calibration. It consists of a load cell and a digital display. The digital display connects to the machine's serial interface.

IMPORTANT

The digital display must be configured depending on the load cell used.

The mechanical bond force (corresponds with the pretension of the spring block or parallel springs) is greater than the minimum bond force to be reached that is required for bonding. For this reason the electrical power can be negative or positive.

Due to the calibration the bond force can be entered directly in cN units.

In mode 43 the calibrated values are shown in the form of a table.

The wire bonder is usually set to "Bond force mapping in use" and the bond programs are all programmed in cN.

The actual value depends on the mechanical preload of the spring block or the parallel springs of the bond head and on the bond force needed during production.

In calibration, the force during touchdown must be close to the mechanical preload of the spring block or parallel springs.

In mode 44 the value is specified in digits.

To obtain exact calibration the value for the TD force must be determined.

The list provides starting values that can, however, deviate from the values for other applications.

Bonder type	Min. BF [cN]	Max. BF [cN]	Default BF [cN]	BF range during production [cN]	TD threshold [µm]
Thin wire	-360	490	80	10-30	10-30

4.4.1 Preparation for calibration

No new wedge is used for the calibration.

IMPORTANT

For the calibration do not use a bond tool made of ceramics (the danger then exists of destroying the bond tool).

Bond head, 45 ° standard wire clamp:

- Remove the wire from the bond tool.
- Remove the good bond tool and replace it with the used bond tool.

Connection of the calibration unit to the bonder

- The load cell must be clamped mechanically on a flat device holder. This is then positioned by a vacuum on the bonding table.
- Connect the data cable to the machine's serial interface.
- Connect the load cell to the sensor amplifier.
- Connect the display to the line voltage.
- Press the "Tara" button to zero the reading.

4.4.2 Calibration parameters and calibration process

The "Engineer level" password has to be entered to enable access to modes 42, 43, 44 and 45.

- Enter the wire diameter used on page 1.
- Change to mode 42 and traverse the bonding tool over the load cell. For precision height-positioning of the bonding tool, set the cursor on the parameters of the z-axis and use the trackball to move the bond head down.
- When the bonding tool is centred on the load cell, set the cursor in the XY parameters and hit "Store Trace" to save the position.

Before the height of the load cell is measured, the force of the touchdown (20 cN) and the threshold value (10-30) can be programmed.

- Set the cursor on the parameters of the z-axis and press "Store Trace". The bond head will move down and measure the current Z position above the load cell.
- Enter zero as the value for the p-axis.
- In mode 44 enter the following recommended values. They depend on the bonder and the bond head.

	45° standard wire clamp
Use BF-Mapping	Switches off automatically, when calibration is commenced
Use TD-Moving	on
TD thres. [digit]	15 (during the bonding procedure)
TD force [digit]	-75
Max. Step [cN]	5
Value Tolerance [cN]	10
Start Calib. Digit	-150
Really Start Digit	-150
End Digit	1000
Digit Step	10
Setting time [ms]	2000
Readings per entry	3
TD ramp [µm]	300
TD steps [µm]	0

- Activate the button "Calibrate". The calibration process starts automatically, but can be interrupted by means of the button "Stop" at any time.

After the calibration process the result can be confirmed and hence accepted or discarded. After confirmation the values are automatically adopted in the calibration table in mode 43. The flag "Use bond force mapping" on Page 1 is set automatically upon completion of calibration.

Verification of the individual bond force value in mode 42

To check the individual bond force values:

- Change to mode 42 and measure position Z of the load cell.
- "Use TD" now has to be activated and the threshold value entered. "TD-Force" (digits change to cN) and "TD-Steps" are taken from Mode 44.

- Enter in cN the bond force that is to be used for the test.
- When you hit "Move to Z-Pos", the bond head moves down to the load cell and stays there until you press "Escape" or enter a new value for the test.

Checking the actual bond force in mode 45

The parameters for the checking process are adopted from mode 44.

In mode 45 the minimum and maximum force is displayed in cN. These figures are from the calibration last used. Now enter the bond force range that is to be checked.

IMPORTANT

Do not enter a negative value for this check.

The parameters Force Steps [cN], Tolerance [cN], Setting time [ms], Readings per point have the same meaning as in mode 44.

- Now activate the button "Verify". The checking process starts automatically, but can be interrupted by means of the button "Stop" at any time.

The diagram displays to you the deviation between the specified and the real calibrated values.

4.5 head terminal



fig. 4 - 27 Head terminal, components

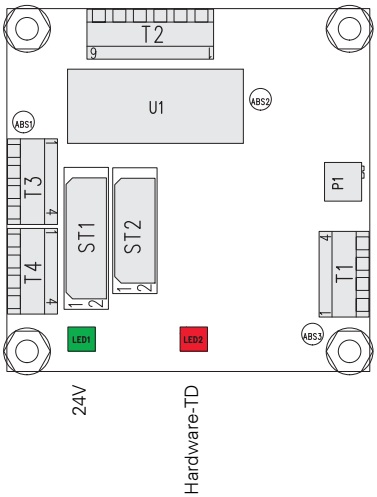


fig. 4 - 28 Head terminal, overview



fig. 4 - 29 Head terminal "Flex", components

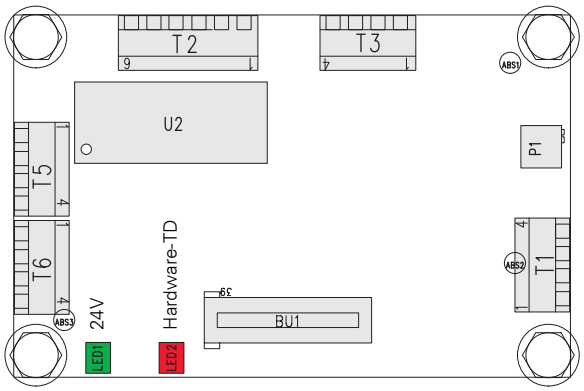


fig. 4 - 30 Head terminal "Flex", overview

The measuring amplifier for the touchdown sensor is positioned on this board.

Also on this board are the terminals for connection of the actuators/sensors of the bond head.

N O T E

The "Flex" version of the head terminal is used on Large-series bonders.

connections

- **ST1 / ST2 (except head terminal "Flex"):** The bond axis cable connects to these terminals.
- **BU1 (only head terminal "Flex"):** The bond axis cable connects to this terminal.

- **Terminal T1:**
  - PINs 1/2 are for connection of an LED range light (12 V)
  - A high-power LED can be connected to PINs 3/4 (5 V)
- **Terminal T2:**
  - The touchdown sensor is connected to PIN 1/2
  - The voice coil motor is connected to PIN 3/4 (24 V)
  - The transducer is connected to PIN 5/6 (115 V)
- **Terminal T3:**
  - A high-power LED can be connected to PIN 1/2 (5 V)
  - The PIN 3/4 combination offers an optional output, e.g. for a wedge heater (24 V)
- **Terminal T4:**
  - The piezo for the wire feed connects to PINs 1/2 (150 V).
  - The piezo for the wire clamp connects to PINs 3/4 (150 V)

Indicators

Meanings of the LEDs:

- **24V display:** The LED (LED1) lights up green, if the head terminal is supplied with 24V
- **Hardware touchdown display:** The hardware touchdown LED (LED2) shows red when a hardware touchdown has been triggered or if there is an open circuit in the wiring of the touchdown sensor

controls

- The potentiometer (P1) is for the purpose of adjusting the threshold value for the hardware touchdown.

4.6 maintenance

The wire bonders are designed to need no more than minimum maintenance. The most important maintenance task consists of cleaning the bonder and removing wire ends, which can cause short circuits. These can damage both the machine itself and the devices produced with it. We recommend placing a small container for the wire ends next to the machine.

IMPORTANT

Daily cleaning and removal of wire ends is important.

Always save the current program with "File > Save" before starting to carry out maintenance work on the bonder.

4.6.1 Maintenance schedule

Part	Interval	Procedure / specification	Auxiliary materials / required material	Done by
Adjusting screws	Six-monthly	Replace all frequently used adjusting screws at regular intervals	See "Bond head, overview"	F&K Service
Bond force calibration	Monthly or when the voice coil motor is changed	See "Bond force"	Case with load cell, 1KG	Customer

4.6.2 Cleaning tasks

D A N G E R !

Always exercise care when handling cleansing agents. Always follow the manufacturer's instructions.

I M P O R T A N T

Make sure that the agents used for cleaning are disposed of in an environmentally friendly manner, particularly if solvents or other chemical agents are used. Always comply with the manufacturer's instructions.

Cleaning the bonding tool

Automatic bonding tool cleaning, see also "Tool Clean Mode 122".

I M P O R T A N T

The bonding tool is a wear part and should therefore be cleaned or replaced if there are any detectable deposits or indentations and the reduction in bonding quality associated with this.

Manual bond tool cleaning

The following procedure must be applied when cleaning by hand:

- 1. Clean the bonding tool in a special plastic container. To avoid damaging the bonding tool, each bonding tool should be cleaned either individually or without contact with the other tools.
- 2. Clean the bonding tool with a 20% caustic soda solution (NacOh) at room temperature. Do not use anything else! Repeat the procedure if the first attempt does not achieve the desired result.
- 3. After cleaning, remove all residual traces of the deposits and of the caustic soda solution by rinsing the bonding tool in de-ionised water. As a contingency measure if de-ionised water is not available, use tap water for rinsing. The bonding tool then has to be dried with compressed air.

N O T E

If used and cleaned properly, bonding tools can perform up to 500,000 bonds without any quality loss, before a change needs to be made. Excessively worn bonding tools reduce the bonding quality and should be replaced by a new equivalent type.

The cleaning duration is influenced by the temperature of the caustic soda solution. An increase in temperature has the effect of reducing the time needed for cleaning. Make sure, however, that a temperature of 80 °C is not exceeded, because higher temperatures could damage the bonding tool.

No other cleaning agent, e.g. acetone, ethyl alcohol, methanol, styrene, Freon or suchlike may be used, because these can cause faster wear and an accumulation of aluminium associated with the latter.

Cleaning the wire clamp

The wire clamp should be cleaned whenever the wire spool is changed. It is not necessary to remove the wire clamp for this purpose.

N O T E !

Never use sandpaper or abrasive cleaning agents for cleaning. Pure alcohol or acetone are the most suitable cleansers.

- Press "wire clamp" to open the wire clamp.
- Dip a piece of clean, lint-free paper in pure alcohol or acetone.
- Pull the paper repeatedly back and forth between the jaws of the clamp.
- Slip a piece of clean, dry, lint-free paper between the jaws of the clamp and close the clamp.
- Gently draw the paper out of the clamp.
- Repeat the entire procedure several times.

If the wire clamp cannot be cleaned satisfactorily in this way, it must be renewed.

4.7 Instructions for component replacement

4.7.1 Replacing the bonding tool

IMPORTANT

The bonding tool is a wear part and should therefore be cleaned or replaced if there are any detectable deposits or indentations and the reduction in bonding quality associated with this.
It is important to remember, too, that the choice of bonding tool depends on the diameter of the wire, so it might be necessary to change the bonding tool if the bond wire is changed.

Use the following procedure when changing the bonding tool:

- Open Mode 16 "Feed In" and execute the "Change Tools" command.
- Slacken the bonding-tool clamping screw and pull the bonding tool down and out of the transducer. Insert the new bonding tool into the transducer from below.
- Align the bonding tool in such a way that the top edge of the bonding tool is flush with the top of the transducer.
- Use a torque wrench to retighten the clamping screw to 18 Ncm.

NOTE!

Be sure to install the original clamping screw, as otherwise the transducer will not function correctly.

IMPORTANT

Replace the clamping screw every fourth time the bonding tool is changed. Failure to comply with this precaution can result in fluctuations in bond quality.

Each time the bonding tool is changed, the position of the new bonding tool can differ minimally from that of the old bonding tool. Consequently, you must repeat the offset routines in order to restore positioning accuracy. See "Corr Offset" (Mode 3). In addition, the bond height must be remeasured . See "Bond Height" (Mode 4).

These steps are necessary to be able to continue to use the existing bonding programs. If a different program is loaded, the bond height must also be remeasured.

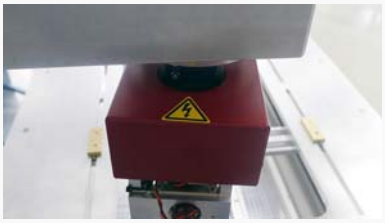
4.8 Material list

Component	Material
Bond Head	Aluminium (1060-H16, 3.3535, 3.3545, 3.3547)
	Stainless Steel (1.4305, 1.4310, 1.4112, 1.4016)
	Tungsten carbide
	Polyetheretherketone

4.9 Warning signs and notifiers

D A N G E R !

It is essential to comply with the regulations that belong to the warning and notifiers.

Warning and notifier	description	Position	
	Electric shock hazard warning.		On the bond head cover.

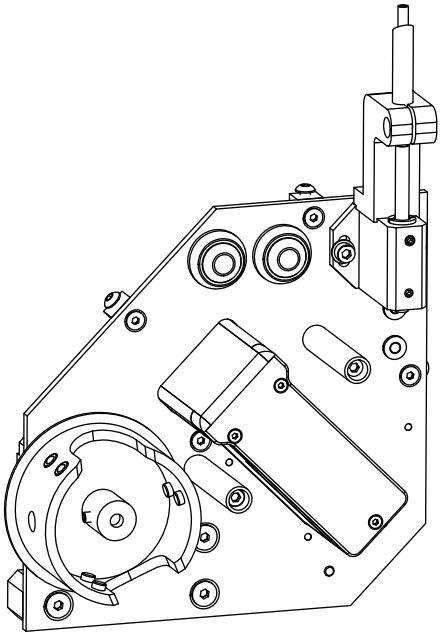
LIST OF ILLUSTRATIONS

fig. 4 - 1 Bond head HD 4-1
fig. 4 - 2 transducer 4-1
fig. 4 - 3 Bond force (spring block with voice coil motor) 4-2
fig. 4 - 4 wire clamp 4-2
fig. 4 - 5 bonding tool 4-2
fig. 4 - 6 touchdown sensor 4-3
fig. 4 - 7 Digital multimeter 4-3
fig. 4 - 8 Feeler gauge 4-4
fig. 4 - 9 Micrometer 4-4
fig. 4 - 10 Transducer setting gauge (thin wire) 4-4
fig. 4 - 11 Torque wrench (10..60 cNm) 4-4
fig. 4 - 12 Spring scale (10..100 cN) 4-4
fig. 4 - 13 Thin wire bond head - Overview. 4-5
fig. 4 - 14 Thin wire bond head - Overview. 4-5
fig. 4 - 15 Thin wire bond head - voice coil motor 4-6
fig. 4 - 16 Thin wire bond head - Transducer 4-6
fig. 4 - 17 Thin wire bond head - Transducer holder 4-6
fig. 4 - 18 Thin Wire Bond Head - Wire Clamp (adjustment X direction) 4-7
fig. 4 - 19 Thin Wire Bond Head - Wire Clamp (adjustment Y direction) 4-7
fig. 4 - 20 Thin Wire Bond Head - Wire Clamp (adjustment Z direction) 4-8
fig. 4 - 21 Thin wire Bond Head - Wire Clamp (adjustment of clamp force) 4-8
fig. 4 - 22 Thin wire bond head - Wire guide 4-9
fig. 4 - 23 Thin wire bond head - Wire guide 4-9
fig. 4 - 24 Thin Wire Bond Head - Bond Force 4-10
fig. 4 - 25 Thin Wire Bond Head - Touchdown Sensor 4-10
fig. 4 - 26 Thin Wire Bond Head - Earth on Clamp & Transducer 4-11
fig. 4 - 27 Head terminal, components 4-14
fig. 4 - 28 Head terminal, overview. 4-14
fig. 4 - 29 Head terminal "Flex", components 4-14
fig. 4 - 30 Head terminal "Flex", overview 4-14

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

Automatic THIN-WIRE SPOOL SINGLE/DOUBLE

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

5 AUTOMATIC THIN WIRE SPOOL SINGLE/DOUBLE . . 5-1

5.1 Function of the unit 5-1
5.1.1 Controls and indicators 5-2
5.1.2 Wire spool box 5-2

5.2 Technical data. 5-2

5.3 Adjustments 5-3
5.3.1 Overview 5-3
5.3.2 Mechanical systems 5-3

5.4 Description of the hardware 5-7
5.4.1 wire spool control 5-7
5.4.2 Wire spool terminal 5-8
5.4.3 WireSpool CCD 5-9
5.4.4 WireSpool spot 5-9

5.5 Maintenance, thin wire/heavy wire spool 5-10
5.5.1 Notes on safety for maintenance of the wire spool. . . . 5-10
5.5.2 Maintenance schedule 5-10

5.6 Material list. 5-10

1
2
3
4
5
6
7
8
9
10
11
12
13
A

5 AUTOMATIC THIN WIRE SPOOL SINGLE/DOUBLE

5.1 Function of the unit

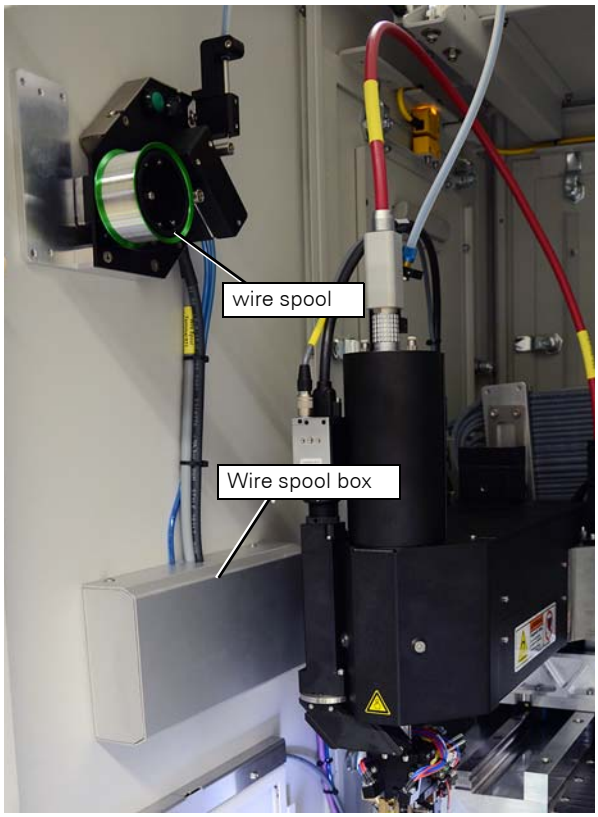


fig. 5 - 1 wire feed

D A N G E R !

Take great care while working inside the machine.

Keep well clear of the working zone of the machine and conveyor system while the equipment is in operation. Moving machinery hazard.

Do not work with the bonder with long hair hanging loose or when wearing dangling items of jewelry (necklace, chain, etc.). Your hair or jewelry could be trapped by the moving parts of the bonder and cause injury.

D A N G E R !

Never put you head into the working zone of the machine while the machine is switched on, not even if it switched on and at a standstill.

I M P O R T A N T

As regards software configuration, note the corresponding Wire Spool dialog.

The wire spool winds on or unwinds the wire under control so as to ensure in this way the optimal feeding of the wire from the spool to the bonding tool.

The heart of the wire spool is a CCD line sensor that detects the position of the wire and actuates a stepping motor when needed to unreel the wire from the spool or reel it on to the spool, as necessary.

To thread the wire in, an air valve is activated (feed button), which conveys the wire to the bond head.

N O T E !

The wire-feed mechanism is set ex-works: do not tamper with these settings.

5.1.1 Controls and indicators

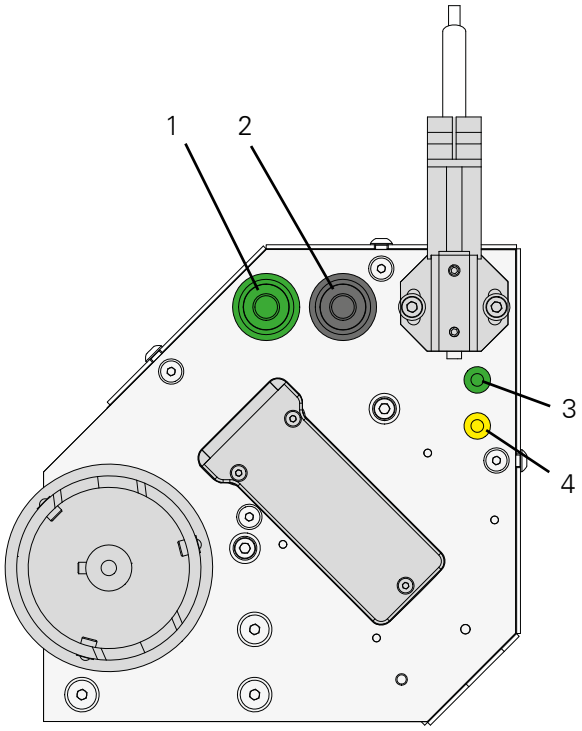


fig. 5 - 2 Controls and indicators

- **1:** Button (green) Run Mode / Service Mode toggle.
  - Run Mode: controlled mode
  - Service Mode: uncontrolled mode
- **2:** Button (black) Feed Start/Stop: Operation of the conveyor motor for feeding in the wire.
  - Pressed: Start feed
  - Not pressed: Stop feed
- **3:** LED (green) lights up when Run Mode is active
- **4:** LED (yellow) lights up when Feed Mode is active

N O T E

"Feed Mode" can be activated only when the wire spool is in "Service Mode".

5.1.2 Wire spool box

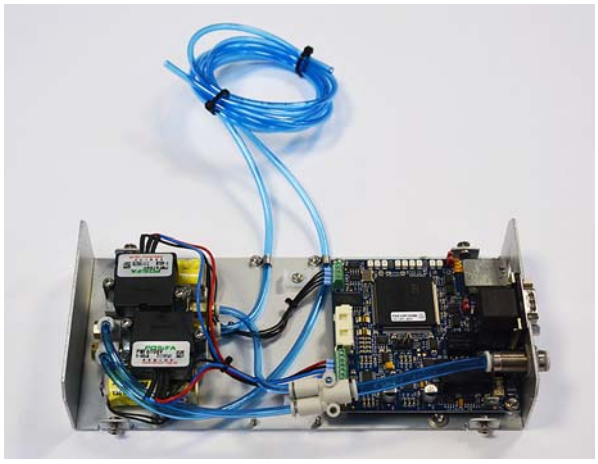


fig. 5 - 3 Wire spool box

The wire spool box houses the WireSpool Control and the pneumatic unit.

See 5.4.1 "wire spool control" on page 5-7

5.2 Technical data

Wire diameter	17 µm to 75 µm (0.7 mil to 3 mil) 50.8 mm / 2? coil
Wire feed	Stepping motor, resolution 99 µm
Wire sensor	CCD line sensor
Special features	Missing wire detection

5.3 Adjustments

5.3.1 Overview

3D view of the thin wire wire spool.

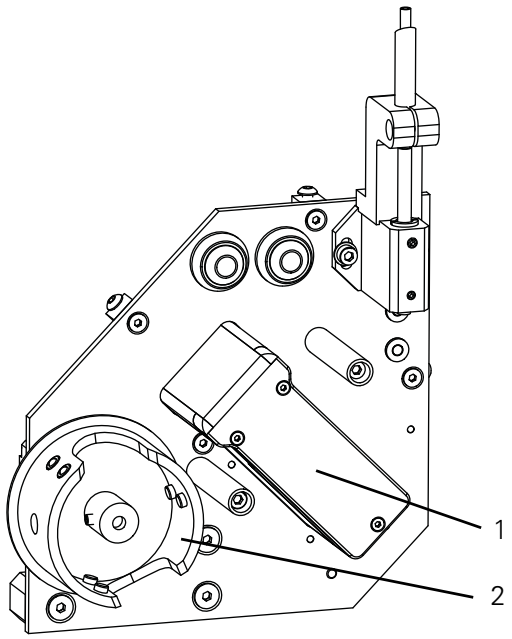


fig. 5 - 4 Thin wire spool, overview

- 1. Detection unit with air cushion
- 2. Spool holder

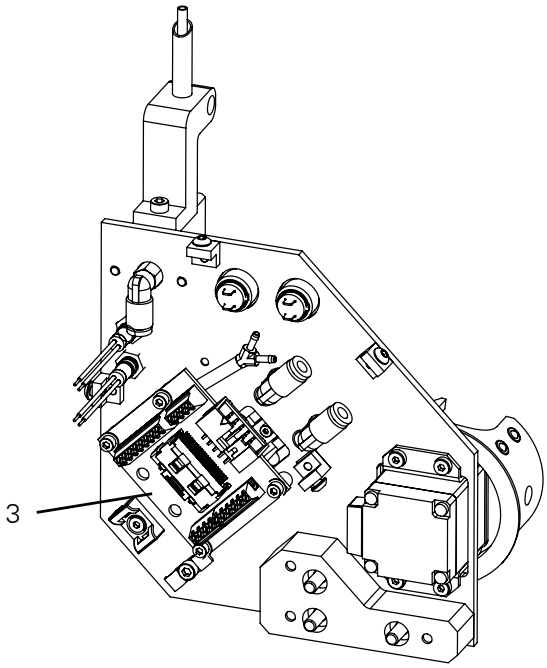


fig. 5 - 5 Thin wire spool, overview

- 3. Wire spool terminal

5.3.2 Mechanical systems

preparation

Test preparations/test structure

The following are needed for the test.

- Digital multimeter (e.g. Fluke 179 or similar) for resistance metering



fig. 5 - 6 Digital multimeter

Cleanliness of wire-retaining components

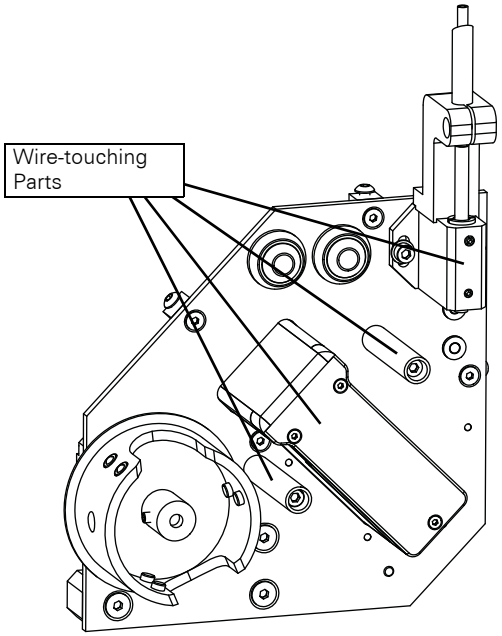


fig. 5 - 7 Thin wire spool, cleanliness of wire-retaining components

IMPORTANT

Care must be taken that all wire-conducting parts and the air distributors are completely clean. These parts must not have any signs of grease residue or emulsion deposits. Otherwise clean wire routing is not possible, because the wire would "catch" on the surfaces.

- The parts have to be cleaned several times in an ultrasonic bath. In addition any sealing agent residue must be removed.

Measuring and checking the contact resistance

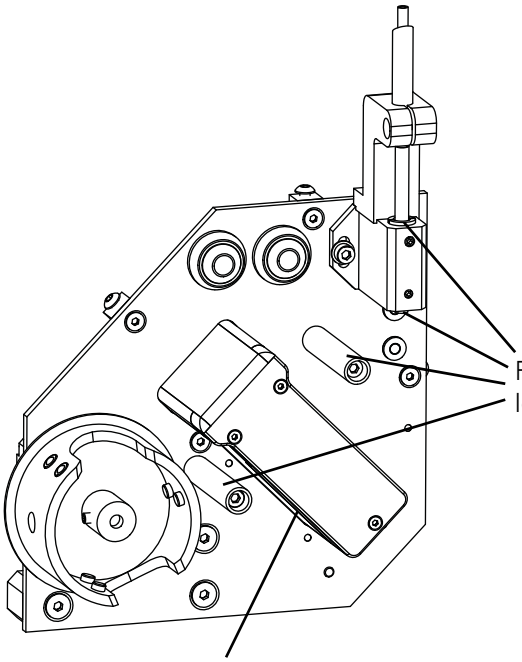


fig. 5 - 8 Thin wire spool, resistance measurement

The parts concerned are free of anodisation at the corresponding areas, which means that these areas are electrically conductive.

Use an ohmmeter to measure the resistances.
Value: max. 0.3 ohm

Hose routing of the pneumatic parts

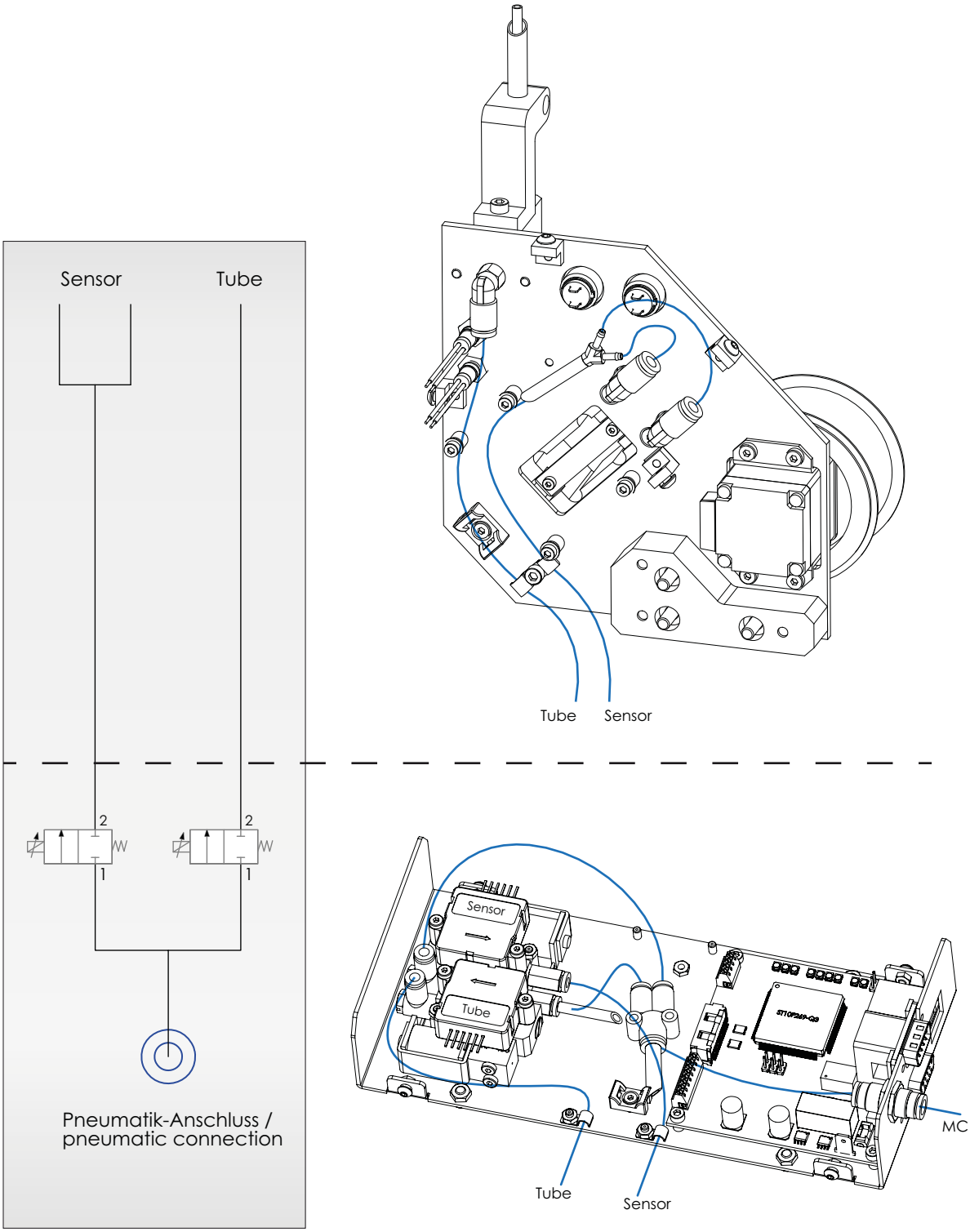


fig. 5 - 9 Automatic thin wire coil - Piping of pneumatic parts

In the case of the hose routing it has to be ensured that the hose lengths are selected so that a compact system is created. Use "standard" blue PU hosing.

5.4 Description of the hardware

5.4.1 wire spool control



fig. 5 - 10 WireSpoolControl, component

The board carries the electronics for control of the wire spool and it is housed inside the wire spool box.

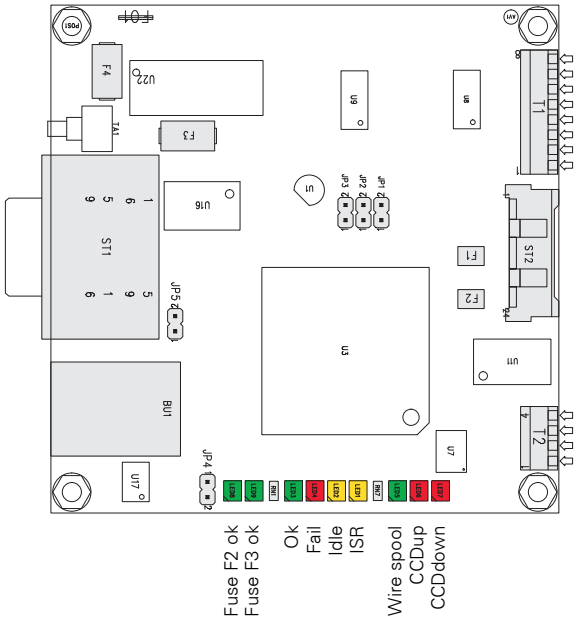


fig. 5 - 11 WireSpool Control, overview

Fuses

- **F1:** Soldered fuse (not changeable, reversible)
- **F2:** Soldered fuse (not changeable, reversible) wire spool)
- **F3:** Protects the 24V power amplifiers (T1A SMD)
- **F4:** Protects the 24V onboard (T1A SMD)

Indicators

There are 9 LEDs on the WireSpool Control.

- **LED1 (ISR, yellow):**
  - Startup-Phase: Flashes four times during startup after a power-on reset (normal boot sequence).
    Distinction:
    Download sequence - normal boot sequence.
  - ISR (interrupt service routine): Is switched on in the ISR for communication and off again after processing.

IMPORTANT

ISR is activated for reception only, in other words when the PC sends and the node receives.

- **LED2 (Idle, yellow):**
  - Startup-Phase: Flashes four times during startup after a software reset (normal boot sequence).
    Distinction: Download sequence - normal boot sequence.
  - Idle phase: Flashes at a frequency of approximately 2 Hz
- **LED3 (OK, green):**
  - Lights up at half brightness in ICSP mode (download mode) along with the "fail" LED.
  - During the startup phase, lights up at half brightness along with the "fail" LED.
  - Lights up after the startup phase if there is no fault in the system ("serial number module" and "EEPROM" and "CAN" valid).
- **LED4 (Fail, red):**
  - Lights up at half brightness in ICSP mode (download mode) along with the "OK" LED.
  - During the startup phase, lights up at half brightness along with the "OK" LED.
  - Lights up after the startup phase if there is a fault in the system ("serial number module" or "EEPROM" or "CAN" not valid).
- **LED5 (green):** Lights up when the wire spool is in controlled mode

- **LED6/7 (CCD up/down, red):**
  - If there is no wire in the line sensor after the startup phase (boot phase), both LEDs flash (unknown state).
  - If the wire is present at the target position of the line sensor, both LEDs are out.
  - Depending on the position of the wire in the line sensor the relevant LED lights up to a greater or lesser extent.
  - After a timeout, both LEDs are lit.
- **LED8 (green):** Lights up when fuse F2 is OK
- **LED9 (green):** Lights up when fuse F3 is OK

Jumpers

- **JP1:**
  - Open: Left wire spool
  - Closed: Right wire spool
- **JP2:**
  - Open: heavy wire spool
  - Closed: Thin wire spool
- **JP3:** Not relevant
- **JP4:** Must stay open.
- **JP5:**
  - Open: No CAN terminator
  - Closed: CAN terminator

connections

- **BU1:** Serial port (debug)
- **ST1:** Consists of two DSUBs connected 1:1 (male and female), carrying the power supply, HOT-Wire and CAN signals. One connection is to the machine and the other is for connecting other CAN nodes (e.g. second wire spool) as necessary
- **ST2:** The wire spool is connected via this connector
- **T1:** Connection for the pneumatic sensors
- **T2:** Connection for the pneumatic valves

5.4.2 Wire spool terminal

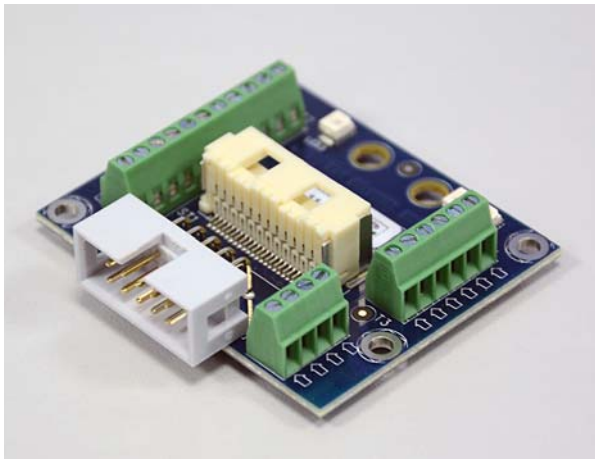


fig. 5 - 12 Wire spool terminal, component

The board is in the wire spool.

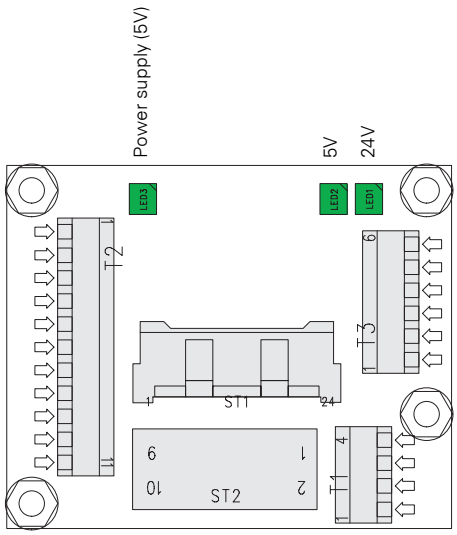


fig. 5 - 13 Wire spool terminal

Indicators

There are 3 LEDs on the wire spool terminal.

- **LED1 (green):** Lights up when 24 V supply is applied.
- **LED2 (green):** Lights up when 5 V supply is applied.
- **LED3 (green):** Lights up when the power supply (5 V) for the lighting is applied.

Connections

- **ST1:** The controller is connected via this connector
- **ST2:** Connection for the WireSpool CCD

- **T1:** Connection for a stepping motor
- **T2:** Connection for the controls
- **T3:** Connection for the indicators and the WireSpool spot

5.4.3 WireSpool CCD

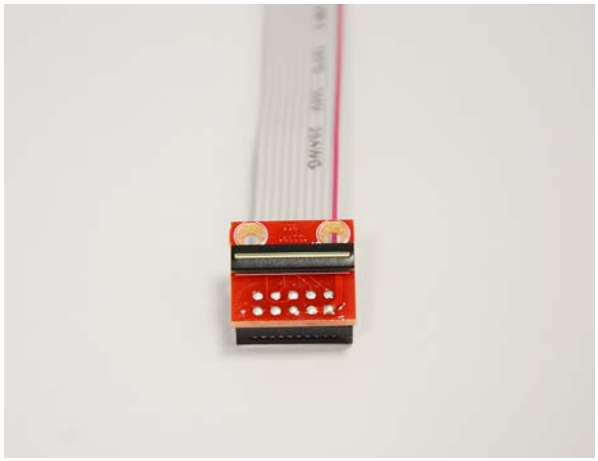


fig. 5 - 14 WireSpool CCD, component

The board is in the wire spool. It detects the position of the wire and is connected to the WireSpool terminal.

5.4.4 WireSpool spot

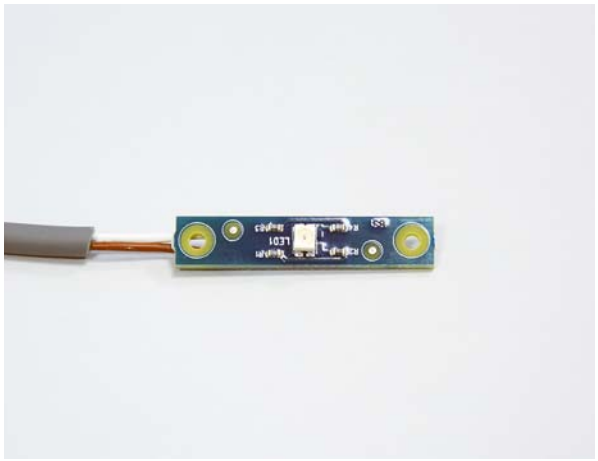


fig. 5 - 15 WireSpool spot, component

The board is in the wire spool. It supplies the light for the WireSpool CCD and it is connected to the WireSpool terminal.

5.5 Maintenance, thin wire/ heavy wire spool

5.5.1 Notes on safety for maintenance of the wire spool

IMPORTANT

The notes on safety for maintenance are the same as those for adjustments.

5.5.2 Maintenance schedule

Part	Interval	Procedure / specification	Auxiliary materials / required material	Done by
Wire Spool	Six-monthly	Remove the hood of the detection unit, check for the presence of foreign-matter particles on the CCD line sensor and clean the sensor. ***IMPORTANT*** *Recalibration necessary: > Buttons > Calibrate CCD*	CCD line sensor Distilled spirit or isopropanol Cloth	F&K Service

5.6 Material list

Component	Material
Wire Spool	Aluminium (3.3547)
	Stainless Steel (1.4305, 1.4310)
	Polyoxymethylene

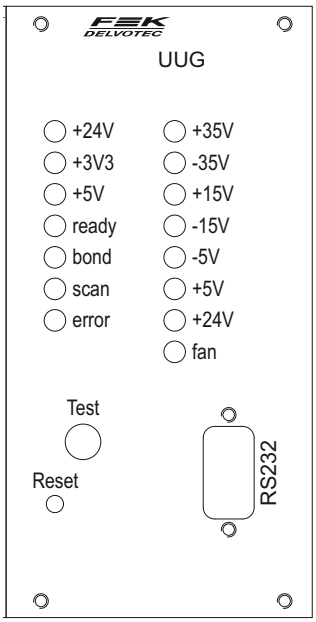
LIST OF ILLUSTRATIONS

fig. 5 - 1	wire feed	5-1
fig. 5 - 2	Controls and indicators	5-2
fig. 5 - 3	Wire spool box	5-2
fig. 5 - 4	Thin wire spool, overview	5-3
fig. 5 - 5	Thin wire spool, overview	5-3
fig. 5 - 6	Digital multimeter	5-3
fig. 5 - 7	Thin wire spool, cleanliness of wire-retaining components	5-4
fig. 5 - 8	Thin wire spool, resistance measurement	5-5
fig. 5 - 9	Automatic thin wire coil - Piping of pneumatic parts	5-6
fig. 5 - 10	WireSpoolControl, component	5-7
fig. 5 - 11	WireSpool Control, overview	5-7
fig. 5 - 12	Wire spool terminal, component	5-8
fig. 5 - 13	Wire spool terminal	5-8
fig. 5 - 14	WireSpool CCD, component	5-9
fig. 5 - 15	WireSpool spot, component	5-9

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

FEK DELVOTEC



Bonder series M17

US generator

F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

6 US GENERATOR 6-1
6.1 The ultrasonic generator UUG-030 6-1
6.2 Technical data 6-1
6.3 Description of the hardware 6-2

6 US GENERATOR

6.1 The ultrasonic generator UUG-030

NOTE

For details of the installation position see the "Boards in the electronics rack" section in the description of the basic machine.



fig. 6 - 1 ultrasonic generator

The ultrasonic generator (USG) generates the high-frequency oscillations needed for bonding in the form of an electric signal, which the transducer converts into mechanical vibrations.

The USG, which is designed on the basis of a digital signal processor (DSP), is equipped with a PLL (*phase locked loop*) control, which ensures that the transducer is always operated in resonance.

Power and frequency of the USG must always be aligned with the transducer to ensure optimal coupling and a reproducible bond quality.

The duration and power of the ultrasonic vibration are set in the bonding program.

test

When the test button is pressed the USG is activated at half power.

6.2 Technical data

Frequency range	30 kHz - 250 kHz
Output power - thin wire	 60 kHz - 150 kHz P_{sine} 7 W at 20 Ω 150 kHz - 200 kHz P_{sine} 3 W at 20 Ω 200 kHz - 250 kHz P_{sine} 1.5 W at 20 Ω
- heavy wire	30 kHz - 60 kHz P_{sine} 40 W at 20 Ω
Output voltage	max. $115V_{pp}$
Operating modes	Voltage-regulated, current-regulated, power-regulated

6.3 Description of the hardware





fig. 6 - 2 digital ultrasonic generator

The digital ultrasonic generator generates an electric sine-wave signal which the transducer converts into mechanical vibrations.

The parameters for the ultrasonic generator are set by means of the bonding program.

Bond process control regulates the parameters for the ultrasonic generator on the fly, in order to optimise each individual bond.

For safety reasons, the ultrasonic pulse is limited to a duration of 2 seconds. Pulses longer than this limit cause the generator to shut down and set its status to "fault". The fault status can be cancelled by pressing the reset button on the generator, or it can also be cancelled by the bonding program.

The "Bond Process Monitoring" program enables the ultrasonic generator to transmit the bonding data (including current, voltage, frequency and impedance progression, as well as date and time) to a bonding data base.

Suspect bonds are flagged in the bond database.

connections

RS232: (RS232 interface) An external computer can be connected to this interface for service purposes.

controls

- **Test button:** This button is primarily for quick testing of the operability of the ultrasonic system. The generator is actuated at half ultrasonic power when the button is pressed. This ultrasonic output is sustained until the button is released (max. 2 seconds).

N O T E !

Holding the button down for longer than 2 seconds can result in damage to the ultrasonic system.

Indicators

The meanings of the LEDs:

- **3V3 to 35V:** The appropriate LED lights up to indicate that the voltage is OK.
- **Ready:** Lights up when the ultrasonic generator is ready for bonding.
- **Bond:** Lights up when bonding is in progress.
- **scan:** Lights up when the scan function for the resonance frequency is activated.
- **error:** Lights up when a fault occurs.
- **fan:** Not used

N O T E

An uprated ultrasonic generator is available as an option for ribbon wire. The description is similar.

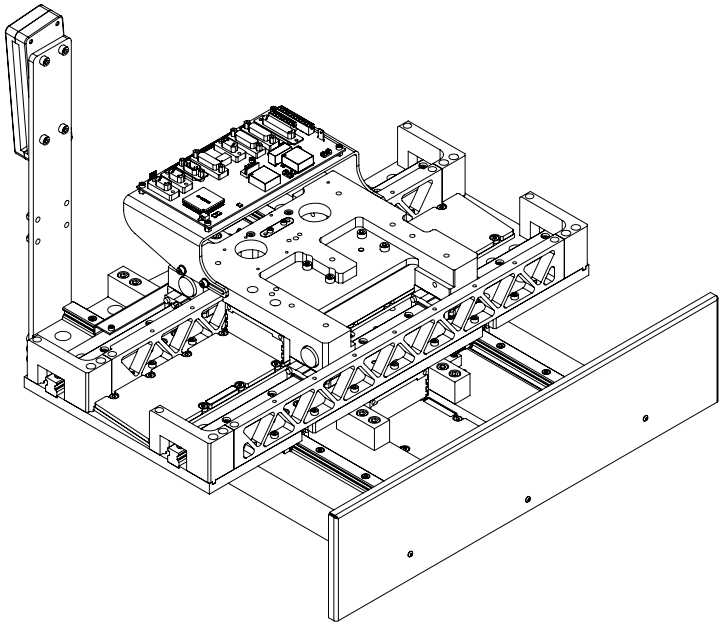
LIST OF ILLUSTRATIONS

fig. 6 - 1 ultrasonic generator 6-1
fig. 6 - 2 digital ultrasonic generator. 6-2

F&K Delvotec Bondtechnik GmbH
Daimlerstrasse 5-7
D-85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

X/Y UNIT SINGLE-/DOUBLE

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

7 X/Y UNIT SINGLE/DOUBLE 7-1

7.1 Function of the unit 7-1

7.1.1 Axes of the positioning system 7-1

7.2 Notes on safety 7-1

7.3 Technical data. 7-2

7.4 adjustments 7-2

7.4.1 preparation. 7-2

7.4.2 Overview 7-3

7.4.3 installation regulations and directions 7-4

7.4.4 testing and measuring 7-6

7.5 maintenance 7-9

7.5.1 Preventive maintenance 7-9

7.5.2 Maintenance schedule 7-9

7.5.3 Cleaning tasks 7-10

7.6 Material list. 7-10

7.7 Warning signs and notifiers 7-11

1
2
3
4
5
6
7
8
9
10
11
12
13
A

7 X/Y UNIT SINGLE/DOUBLE

7.1 Function of the unit

The unit contains the X and Y axes, which are actuated by the power amplifier.
The X and Y axes are powered by linear motors and are actuated by the power amplifiers in the electronics rack. The axes consist of linear motors that are characterized by their high speed and exact positioning.

7.1.1 Axes of the positioning system

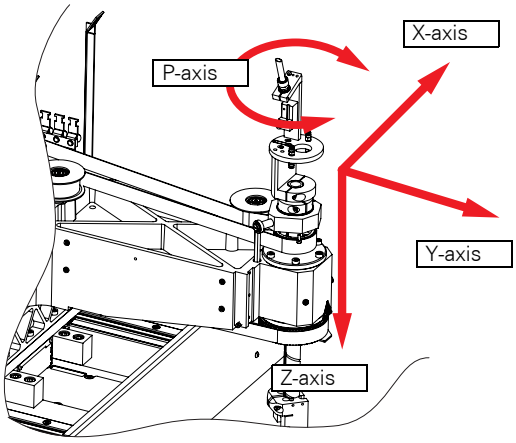


fig. 7 - 1 coordinates

The working axis designations are taken from the Cartesian system of coordinates.

The bonder's absolute zero position is rear left.

Positive coordinates increment from left to right (X axis), from back to front (Y axis), from top to bottom (Z axis) and in the clockwise direction (P axis).

7.2 Notes on safety

D A N G E R !

Only F&K Delvotec customer services technicians or appropriately trained and authorised personnel are permitted to work on the X/Y unit (solenoids, linear motors, etc.).

Improper access or repair work may affect the integrated safeguarding and safety functions including the electromagnetic behaviour of this device and cause function interruptions on the device, personal injury and damage to connected machines or system ranges.

N O T E !

Keep the machine clean at all times. Do not use cleansing agents or lubricants not expressly recommended by F&K Delvotec.

F&K Delvotec recommends having the machine serviced every 7,000 operating hours approximately, or every 2 years at the latest.

Remove components only when the machine is switched OFF.

I M P O R T A N T

Always save the current program with "File > Save" before maintenance work or cleaning work is carried out on the bonder.

7.3 Technical data

X and Y axes	
Drive	Linear motors (3-phase)
Max. acceleration	24 m/s²
Bonding area	
- X-axis - Y-axis	263 mm (~10") 152 mm (~6")
Linearity	
- X-axis - Y-axis	max. range of travel ±0.025 mm max. range of travel ±0.025 mm
Static magnetic field	outside machine ≤ 0,35 mT inside machine ≤ 60 mT

Positioning system (relative, sin/cos)	
Grid pitch (steel rule)	20 µm
Resolution, theoretical <10 nm	1 µm

7.4 adjustments

7.4.1 preparation

Test preparations/test structure

The following are needed for the test:

- Digital multimeter (e.g. Fluke 179 or similar) for resistance metering.
- Diagnostics set for adjusting and checking the length measurement systems. The documents headed "Operating instructions, PWT18" and "Assembly instructions, LIDA48" are not part of these setup instructions, but they are included in the scope of supply of the individual devices.
- Oil in the precision metering unit 55 ml.



fig. 7 - 2 Digital multimeter



Photo: Heidenhain

fig. 7 - 3 Diagnostics set



fig. 7 - 4 Oil in the precision metering unit 55 ml

7.4.2 Overview

3D view of the X/Y unit

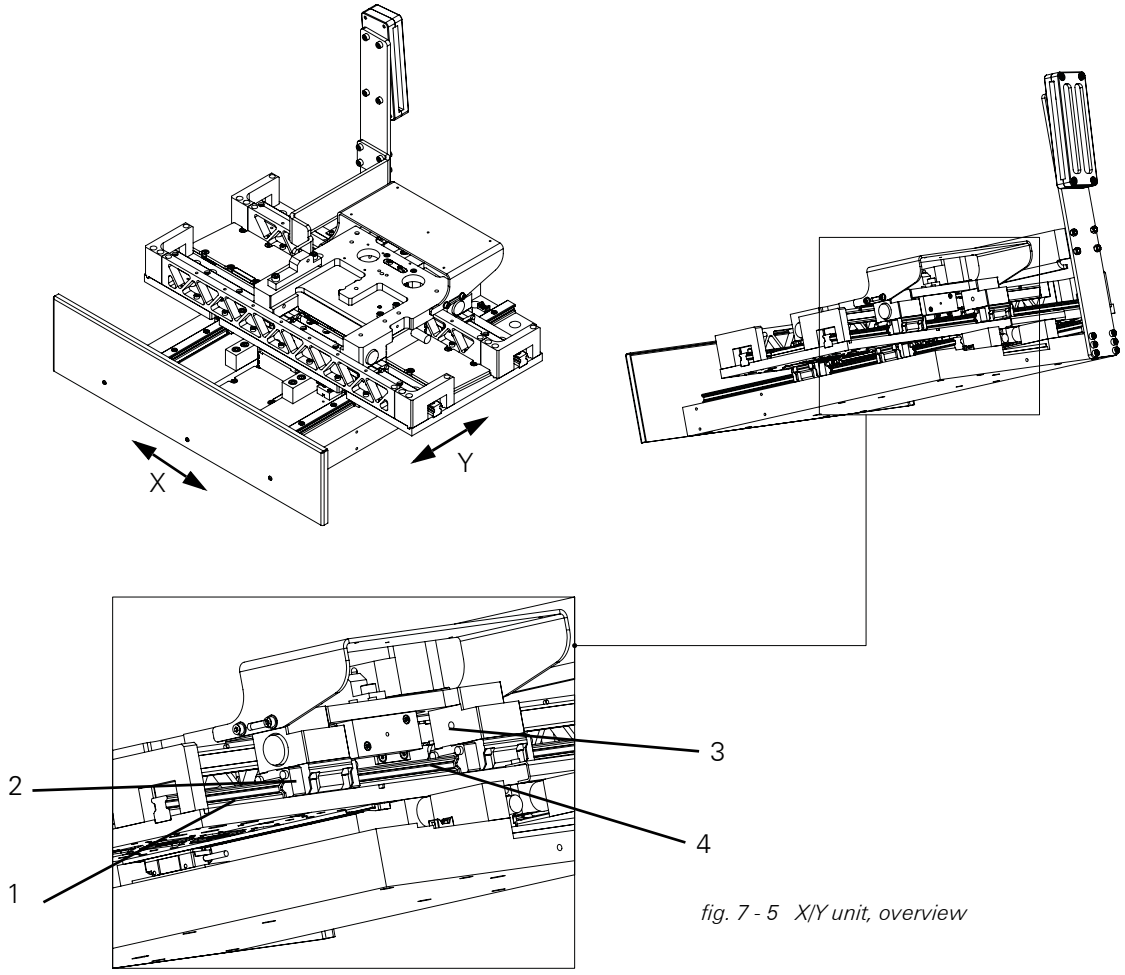


fig. 7 - 5 X/Y unit, overview

- 1. Read head, X-axis
- 2. Measuring tape, X-axis
- 3. Read head, Y-axis
- 4. Measuring tape, Y-axis

7.4.3 installation regulations and directions

linear guides

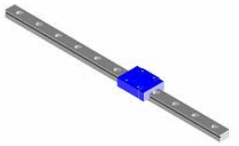


fig. 7 - 6 linear guides

- Remove visible remnants of grease and dirt from the linear guides.

N O T E !

Move the unit in the X and Y directions to the maximum retracted damper position on both sides. Make sure that there is no collision at any point in the entire range of travel.

adjustment of the dampers

Damper, X-axis

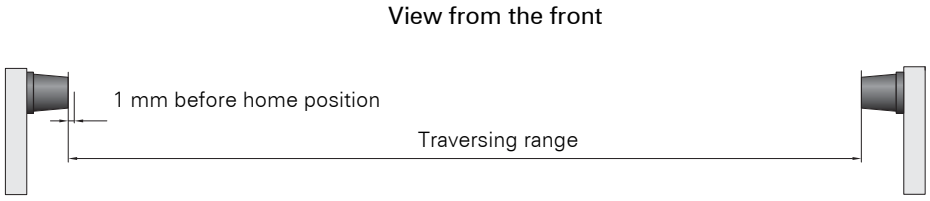


fig. 7 - 7 Damper, X-axis

Damper, Y-axis

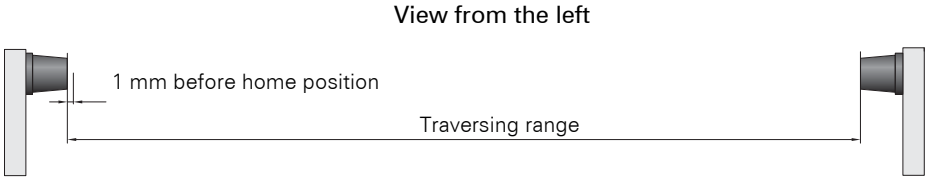


fig. 7 - 8 Damper, Y-axis

Length measuring systems (LMS)

X measuring tape

- Insert the measuring tape flush into the measuring tape carrier.

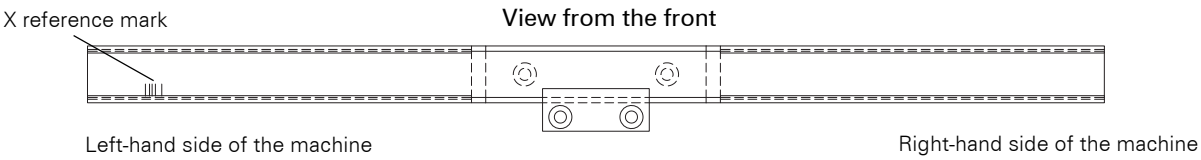


fig. 7 - 9 X measuring tape

Y measuring tape

- Insert the measuring tape flush into the measuring tape carrier.

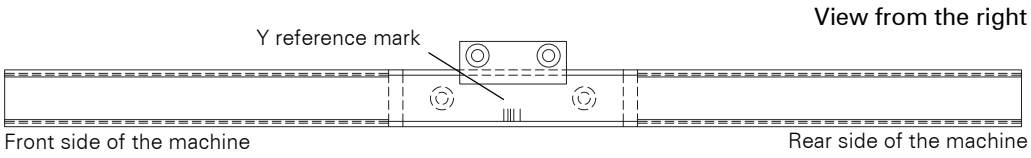


fig. 7 - 10 Y measuring tape

NOTE

Adjust the measuring tape so that the distance between damper and home position is approx. 1 mm.

7.4.4 testing and measuring

scanners

Measuring principle

The scanner has two analog outputs offset by 90° el., each with 1 V_{pp} (sine/cosine output).

The PWT18 measures on the principle that the amplitudes of the two signals can be ratioed in such a way that when the scanner is in ideal adjustment, the image shown by a 2-channel oscilloscope will be a circle (→ Lissajous curves).

Both the diameter and the shape of the circle are criteria for aligning the scanner.

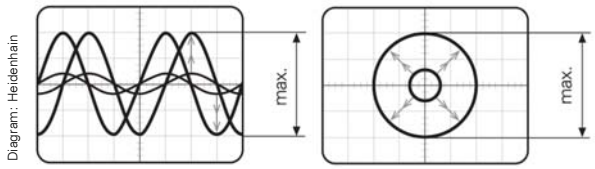


fig. 7 - 11 Measuring principle

The following criteria can be checked with the measuring instrument "PWT18":

- Signal amplitude
- Signal quality
- Position of the reference mark
- Width of the reference mark

Adjustment of the scanners

The diagnostics set is used to adjust the LIDA48 scanners.

The installation instructions with the relevant setting regulations are enclosed with the scanner.

A calibration film 0.15 mm in thickness acts as the "spacer" between the measuring tape and the scanner.

Amplitude of analog signals

The output signals must be optimized to the largest possible amplitude by turning the scanner.

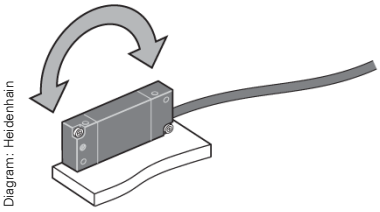


fig. 7 - 12 Amplitude of analog signals, scanner

A signal amplitude of 1 V_{pp} is ideal.

The tolerance range is: ± 0.1 V_{pp}.

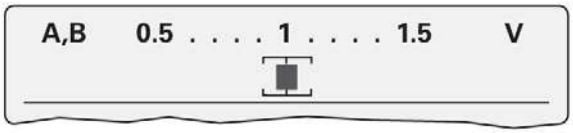


fig. 7 - 13 Tolerance band (ideal)

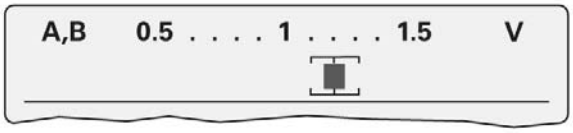


fig. 7 - 14 Tolerance band (no longer acceptable)



fig. 7 - 15 Tolerance band (unacceptable)

Reference mark (home)

The reference marks are adjusted by slightly turning the reference marks.

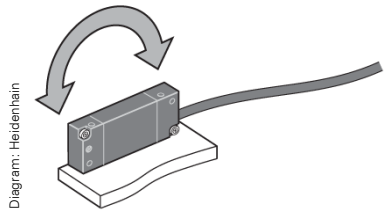


fig. 7 - 16 Reference marks, scanner

The peak of the reference mark signal should be flush with the peak of the total signal.

IMPORTANT

Make sure that the analog signals (sin/cos) do not get smaller.

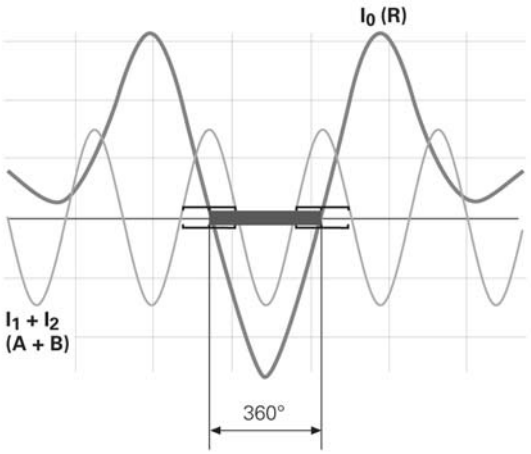
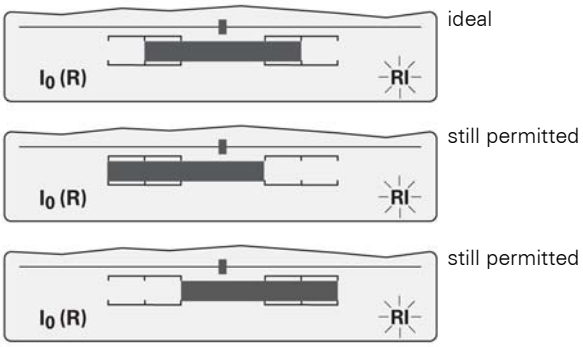
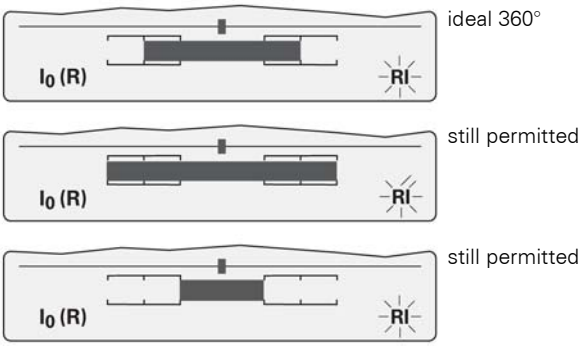


fig. 7 - 17 Reference marks, incremental signals

Position



Width



not permitted

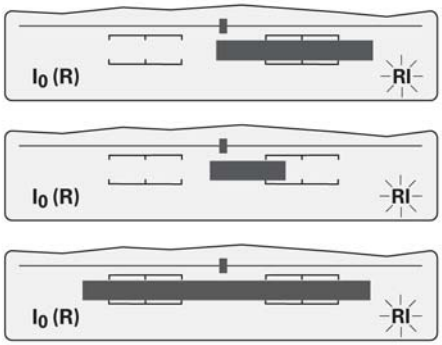


fig. 7 - 18 Reference marks, analog signals

motor winding

After installation of the motor wiring, check all the connections to make sure there are no short-circuits.

A digital multimeter is necessary (see test preparations) for the resistance metering.

The pinout is as follows:

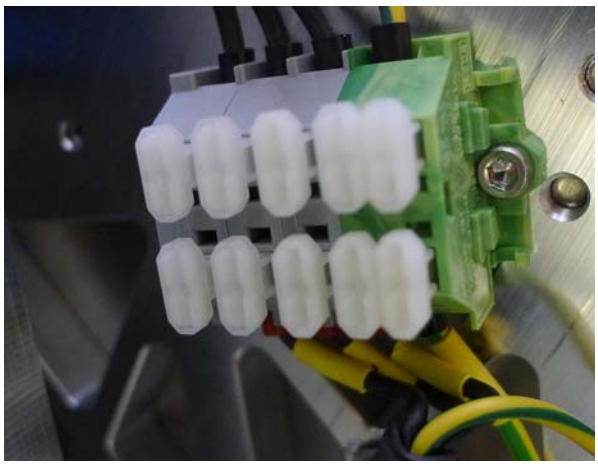


fig. 7 - 19 Pinout of the clamp

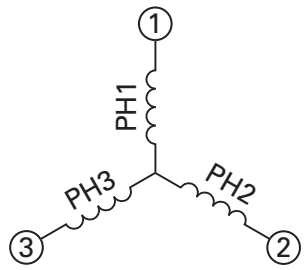


fig. 7 - 20 motor winding

- Motor phase 1
- Motor phase 2
- Motor phase 3

X-axis

The winding resistance of the X motor coils at an ambient temperature of 20 °C is:
$R_{20} = 4.8\ \Omega$.

The measured value must be within the following range: $4.8 \pm 0.5\ \Omega$

It is then measured whether one of the phases 1, 2 or 3 has a short-circuit on PE.

Y-axis

The winding resistance of the Y motor coils at an ambient temperature of 20 °C is:
$R_{20} = 4.8\ \Omega$.

The measured value must be within the following range: $4.8 \pm 0.5\ \Omega$

It is then measured whether one of the phases 1, 2 or 3 has a short-circuit on PE.

7.5 maintenance

7.5.1 Preventive maintenance

The wire bonders are designed to need no more than minimum maintenance. The most important maintenance task consists of cleaning the bonder and removing wire ends, which can cause short circuits. These can damage both the machine itself and the devices produced with it. We recommend that a small container be placed next to the machine so that the operators have the possibility of disposing of the wire ends during and after use of the bonder.

IMPORTANT

Regular cleaning and removal of the wire ends are important.

Always save the current program with "File > Save" before starting to carry out maintenance work on the bonder.

7.5.2 Maintenance schedule

Part	Interval	Procedure / specification	Auxiliary materials / required material	Done by
Linear guide x/y	Six-monthly	Periodical inspections of the system for presence of foreign particles. ***IMPORTANT*** *Steel measuring tapes and scanner heads must remain lubricant-free.*		Customer
Read heads / steel measuring tape	Six-monthly	Visual inspection (scratches on the steel measuring tape, contamination); clean if necessary Check the read heads	Distilled spirit or isopropanol (see the assembly instructions for the scanner) Lint-free cloth	Customer
Cable	Six-monthly	Check for firm seating and abrasion		Customer

N O T E !

Clean measuring tapes for the length measuring system (x- and y-axes) - only if visibly fouled or coated with grease (fingerprints also) - carefully with distilled spirit or isopropanol.

If nitrogen is used instead of compressed air, the seals on the nitrogen-retaining parts must be replaced annually.

7.5.3 Cleaning tasks

- Clean the guides and check for damage. Use a lint-free cloth dipped in pure alcohol or acetone for cleaning

D A N G E R !

Always exercise care when handling cleansing agents. Always follow the manufacturer's instructions.

I M P O R T A N T

Make sure that the agents used to clean the bonder are disposed of in an environmentally friendly manner, particularly if solvents or other chemical agents are used. Always comply with the manufacturer's instructions.

N O T E !

Always comply with the manufacturer's instructions for handling lubricants suitable for use in cleanroom conditions.

7.6 Material list

Baugruppe	Material
X/Y-Base	Aluminium (3.3547, 3.4365.71)
	Stainless Steel (1.4301)

7.7 Warning signs and notifiers

D A N G E R !

It is essential to comply with the regulations that belong to the warning and notifiers.

Warning and notifier	description	Position	
	Warning of strong permanent-magnet fields inside the machine.		On the cover.

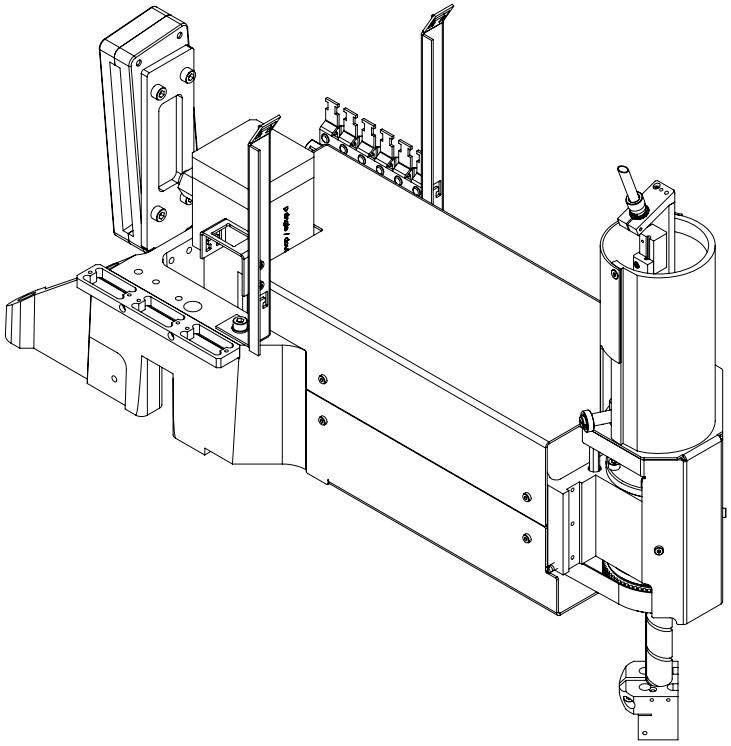
LIST OF ILLUSTRATIONS

fig. 7 - 1	coordinates	7-1
fig. 7 - 2	Digital multimeter	7-2
fig. 7 - 3	Diagnostics set	7-2
fig. 7 - 4	Oil in the precision metering unit 55 ml	7-3
fig. 7 - 5	X/Y unit, overview	7-3
fig. 7 - 6	linear guides	7-4
fig. 7 - 7	Damper, X-axis	7-4
fig. 7 - 8	Damper, Y-axis	7-4
fig. 7 - 9	X measuring tape	7-5
fig. 7 - 10	Y measuring tape	7-5
fig. 7 - 11	Measuring principle	7-6
fig. 7 - 12	Amplitude of analog signals, scanner	7-6
fig. 7 - 13	Tolerance band (ideal)	7-6
fig. 7 - 14	Tolerance band (no longer acceptable)	7-6
fig. 7 - 15	Tolerance band (unacceptable)	7-6
fig. 7 - 16	Reference marks, scanner	7-7
fig. 7 - 17	Reference marks, incremental signals	7-7
fig. 7 - 18	Reference marks, analog signals	7-7
fig. 7 - 19	Pinout of the clamp	7-8
fig. 7 - 20	motor winding	7-8

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

Z/P UNIT SINGLE-/DOUBLE

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

8 Z/P UNIT SINGLE/DOUBLE 8-1

8.1 Function of the unit 8-1

8.1.1 Axes of the positioning system 8-1

8.2 Notes on safety 8-1

8.3 Technical data. 8-2

8.4 adjustments 8-3

8.4.1 preparation. 8-3

8.4.2 Overview 8-4

8.4.3 Installation regulations and directions 8-4

8.5 Description of the hardware 8-15

8.5.1 Z/P interface 8-15

8.6 maintenance 8-18

8.6.1 Preventive maintenance 8-18

8.6.2 Maintenance schedule 8-18

8.6.3 Cleaning tasks 8-19

8.7 Material list. 8-19

8.8 Warning signs and notifiers 8-20

8 Z/P UNIT SINGLE/DOUBLE

8.1 Function of the unit

Drive for the Z and P axes is by a combined lift and rotation module. The axes are actuated by the power amplifier. These are servomotors equipped with absolute encoders.

Mechanical connection of the servomotors to the combined lift and rotation module is by belts.

8.1.1 Axes of the positioning system

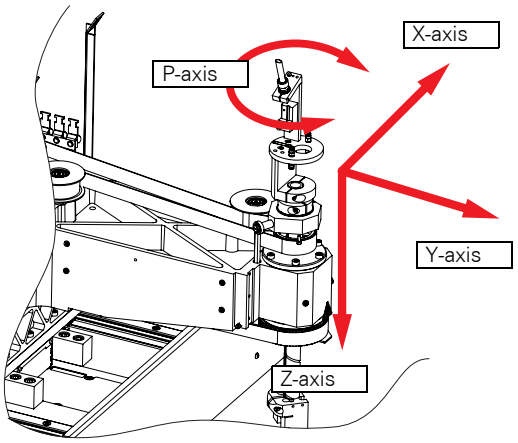


fig. 8 - 1 coordinates

The working axis designations are taken from the Cartesian system of coordinates.

The bonder's absolute zero position is rear left.

Positive coordinates increment from left to right (X axis), from back to front (Y axis), from top to bottom (Z axis) and in the clockwise direction (P axis).

Drive for the Z and P axes is by a combined lift and rotation module. The axes are actuated by the power amplifier in the electronics rack. These are servomotors equipped with absolute encoders.

Mechanical connection of the servomotors to the combined lift and rotation module is by belts.

8.2 Notes on safety

N O T E !

Keep the machine clean at all times. Do not use cleansing agents or lubricants not expressly recommended by F&K Delvotec.

F&K Delvotec recommends having the machine serviced every 7,000 operating hours approximately, or every 2 years at the latest.

Remove components only when the machine is switched OFF.

I M P O R T A N T

Always save the current program with "File > Save" before maintenance work or cleaning work is carried out on the bonder.

8.3 Technical data

Z and P axes	
Drive	Servomotors (3-phase)
Max. acceleration	
- Z axis	approx. 40 m/s²
- P axis (angular acceleration)	approx. 96 U/s²
Bonding range - z-axis	40 mm, optional 60 mm
- p-axis	±200°
Static magnetic field	outside machine ≤ 0,35 mT inside machine ≤ 60 mT

Positioning system (absolute, sin/cos)	
Interface	EnDat 2.1
Resolution - Z axis, theoretical <10 nm - P axis, theoretical <10 µ°	 1 µm 0.1°

8.4 adjustments

8.4.1 preparation

Test preparations/test structure

The following are needed for the test:

- Digital multimeter (e.g. Fluke 179 or similar) for resistance metering
- Belt tension gauge
- Hook wrench with pins for securing the optics
- Lubricant grease AFF.GRS 30 ml



fig. 8 - 2 Digital multimeter



Photo: Heidenhain

fig. 8 - 3 Diagnostics set



fig. 8 - 4 Belt tension gauge



fig. 8 - 5 Hook key with pivot



fig. 8 - 6 Lubricant AFF.GRS

8.4.2 Overview

3D view of the Z/P axes.

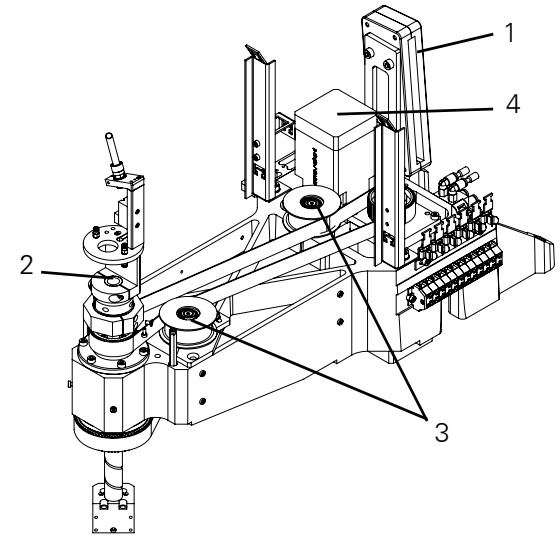


fig. 8 - 7 description

- 1. Connection, bond head cable
- 2. Hollow shaft for bond axis cable
- 3. Tensioning roller
- 4. P-axis motor

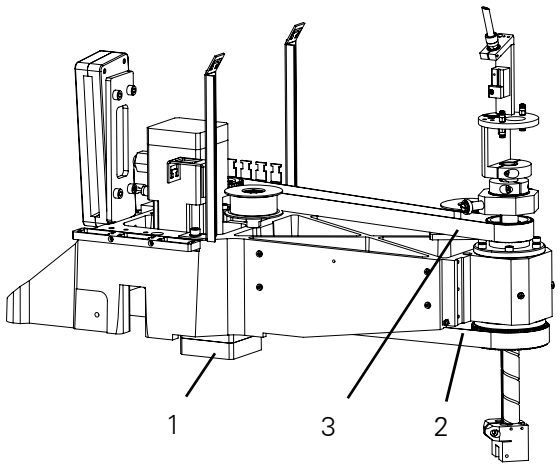


fig. 8 - 8 description

- 1. Z-axis motor
- 2. P-axis toothed belt
- 3. Z toothed belt

8.4.3 Installation regulations and directions

Install motor and encoder cable as shown in the pictures.

Z motor and encoder cable

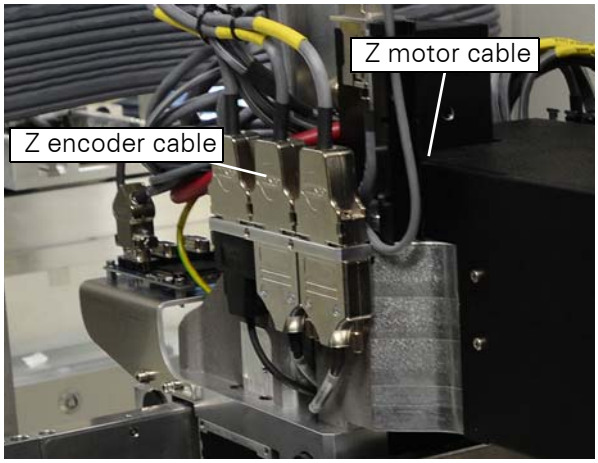


fig. 8 - 9 Connection, Z motor and encoder cable

P motor and encoder cable

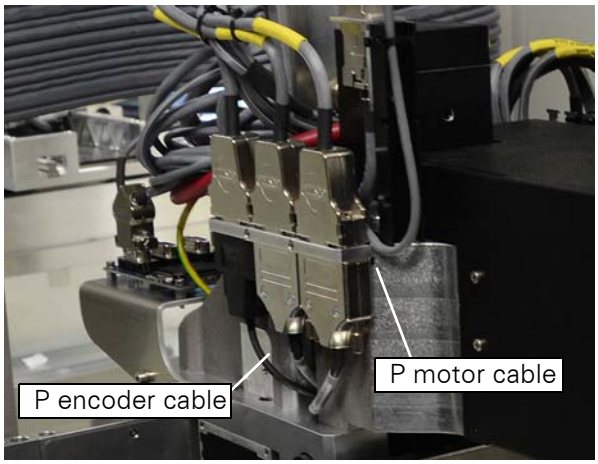


fig. 8 - 10 Connection, P motor and encoder cable

Checking the scanners / encoders

Measuring principle

The scanner has two analog outputs offset by 90° el., each with 1 V_{pp} (sine/cosine output).

The PWT18 measures on the principle that the amplitudes of the two signals can be ratioed in such a way that when the scanner is in ideal adjustment, the image shown by a 2-channel oscilloscope will be a circle (→ Lissajous curves).

Both the diameter and the shape of the circle are criteria for aligning the scanner.

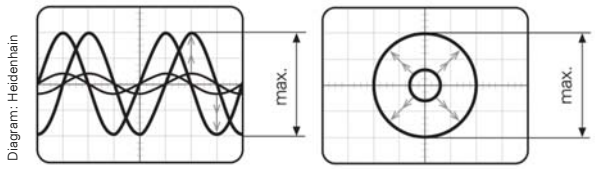


fig. 8 - 11 Z/P encoder measuring principle

The following criteria can be checked with the measuring instrument PWT18:

- Signal amplitude
- Signal quality
- Position of the reference mark
- Width of the reference mark

Checking the encoders

The rotary encoders are encapsulated and preset ex-works.

Only the signal amplitude has to be checked.

The EnDat interface of the encoder cannot be checked with the PWT 18.

An output signal is obtained by turning the axis.

N O T E !

When the Z and P belts are installed there is an increased danger of collision of the bond head with the mounting, if one of the two axes is turned by hand.

A signal amplitude of 1 Vpp is ideal.

The tolerance range is: ± 0.1 Vpp.

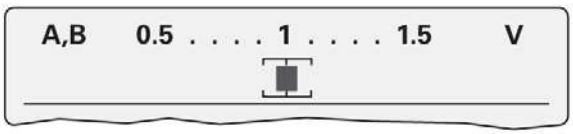


fig. 8 - 12 Z/P encoder - tolerance range (ideal)

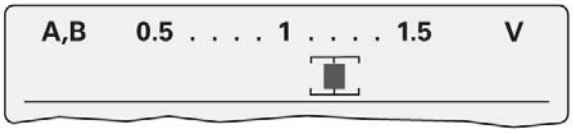


fig. 8 - 13 Z/P encoder - tolerance range (no longer permissible)



fig. 8 - 14 Z/P encoder - tolerance range (not permissible)

Should the display leave the permissible range during the turning of the axis, the encoder and the wiring have to be checked .

motor winding

After installation of the motor wiring, check all the connections to make sure there are no short-circuits.

A digital multimeter is necessary (see test preparations) for the resistance metering.

The pinout is as follows:

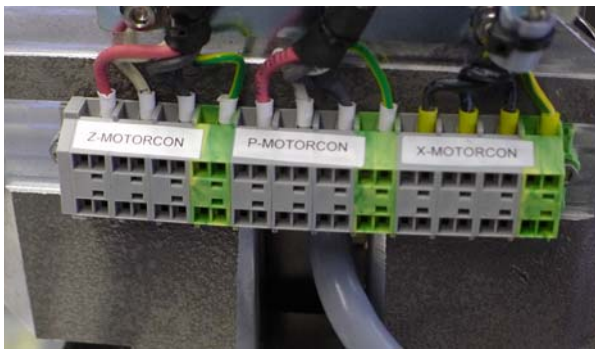


fig. 8 - 15 Pinout of the clamp

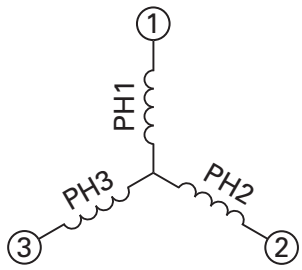


fig. 8 - 16 motor winding

- Motor phase 1
- Motor phase 2
- Motor phase 3

Z motor

The winding resistance of the Z motor spools at an ambient temperature of 20 °C is:
R20 = 17.5 Ω.

The measured value must be within the following range: 17.5 ± 0.5 Ω.

P-axis motor

The winding resistance of the P motor spools at an ambient temperature of 20 °C is:
R20 = 17.5 Ω.

The measured value must be within the following range: 17.5 ± 0.5 Ω.

bond axis cable

The bonding axis cable is passed through the hollow shaft and screwed into the cable holder, then the contacts are inserted in the female connectors (see bond head signals). In the process attention has to be paid to the correct terminal assignment.

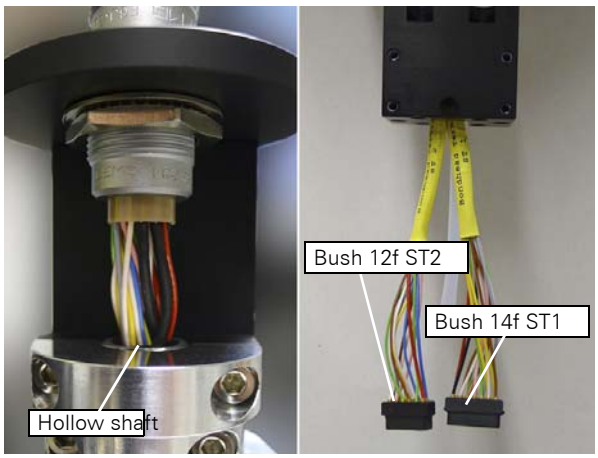


fig. 8 - 17 bond axis cable

Routing bond head cable and camera cable

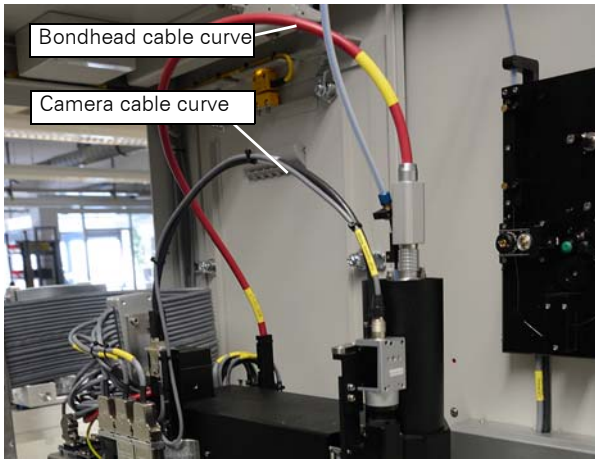


fig. 8 - 18 Routing, bond head and camera cables

Adjustment of the belts

The belts have to be tensioned so that free revolution is ensured.

The belts have to be used with tensioning rollers made of Delrin, as otherwise the belts will be subjected to increased wear and tear (abrasion).

Belt, z-axis (top)

The belt for the z-axis is tensioned by a tension roller (front). The rear roller is for deflection purposes only. The belt tension can be set to the desired value by means of an eccentric on the front tension roller.

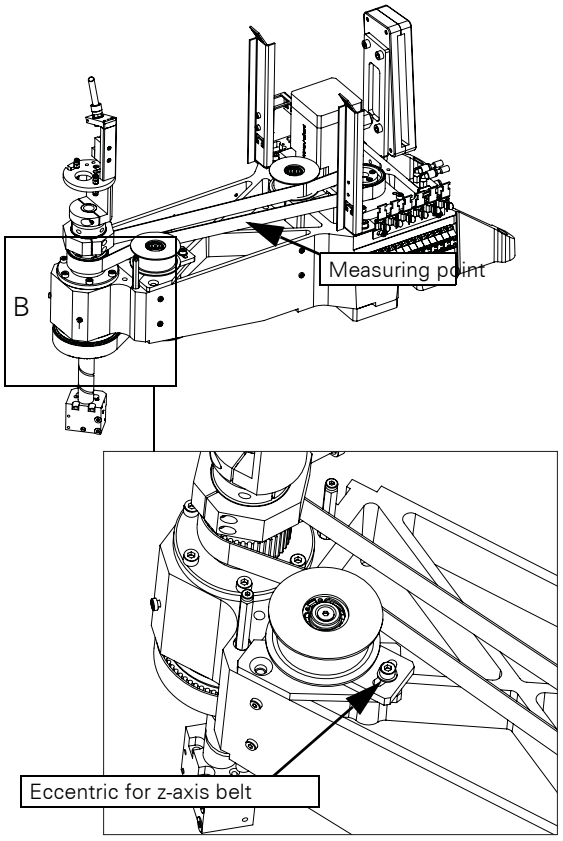


fig. 8 - 19 Adjustment of belt for z-axis (measuring point)

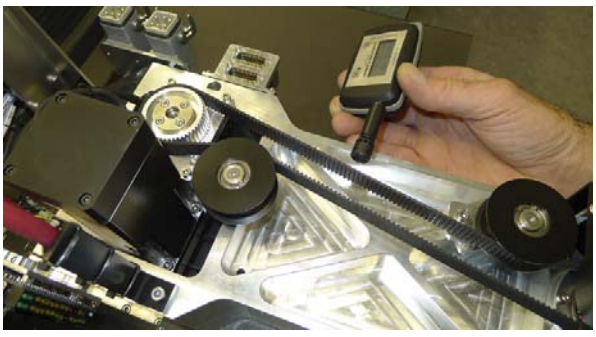


fig. 8 - 20 Adjustment of belt for z-axis (belt tension measuring device)

Belt tension is measured on the longest unsupported run of the belt. Measurement must be performed in the centre of the belt, because the best results are achieved there.

- The frequency measured on the Z belt must be within the tolerance range 80 ± 2 Hz.

Belt, p-axis (bottom)

The P-axis belt is tensioned by a tensioning roller. The belt tension can be set to the desired value by means of an eccentric on the tension roller.

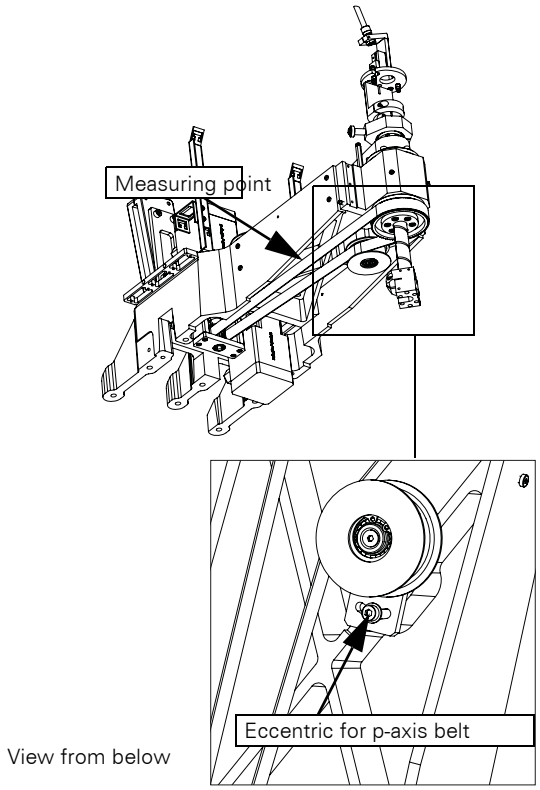


fig. 8 - 21 Adjustment of the P-axis belt

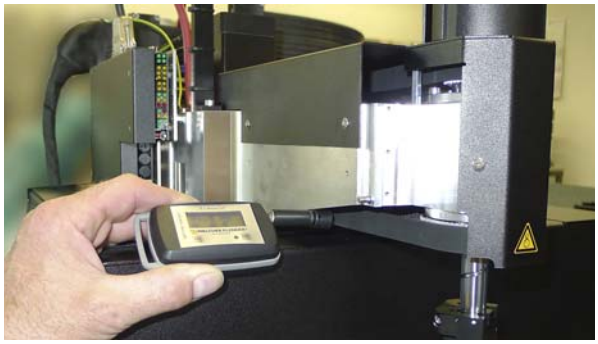


fig. 8 - 22 Adjustment of the P-axis belt (belt tension measuring device)

This time measurement of the belt tension is performed from below, again on the longest unsupported run.

- The frequency measured on the P belt must be within the tolerance range 80 ±2 Hz.

Adjustment of the spindle (thin wire)

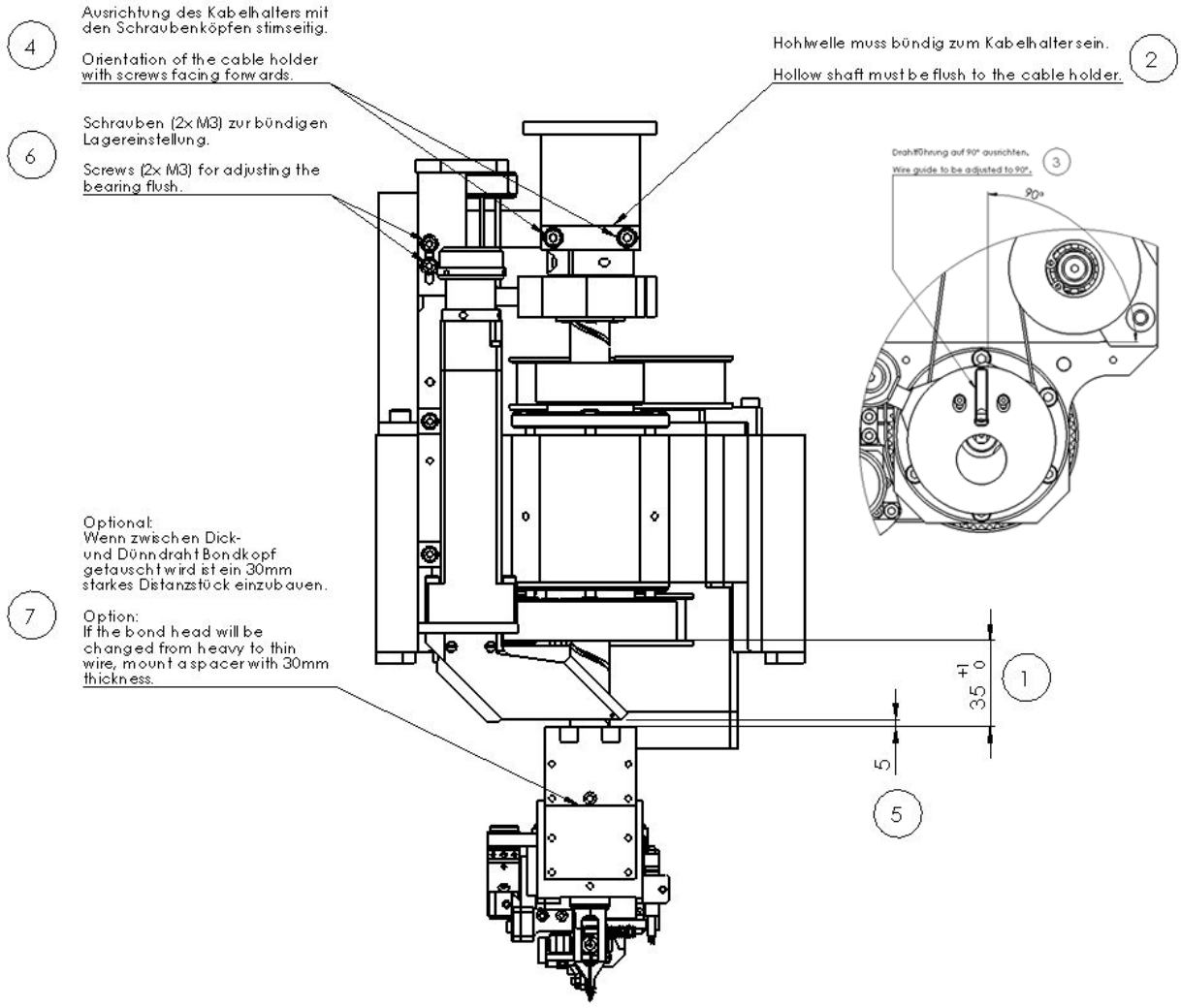


fig. 8 - 23 Adjustment of spindle (overview of thin wire bond head)

Adjustment of the spindle (heavy wire)

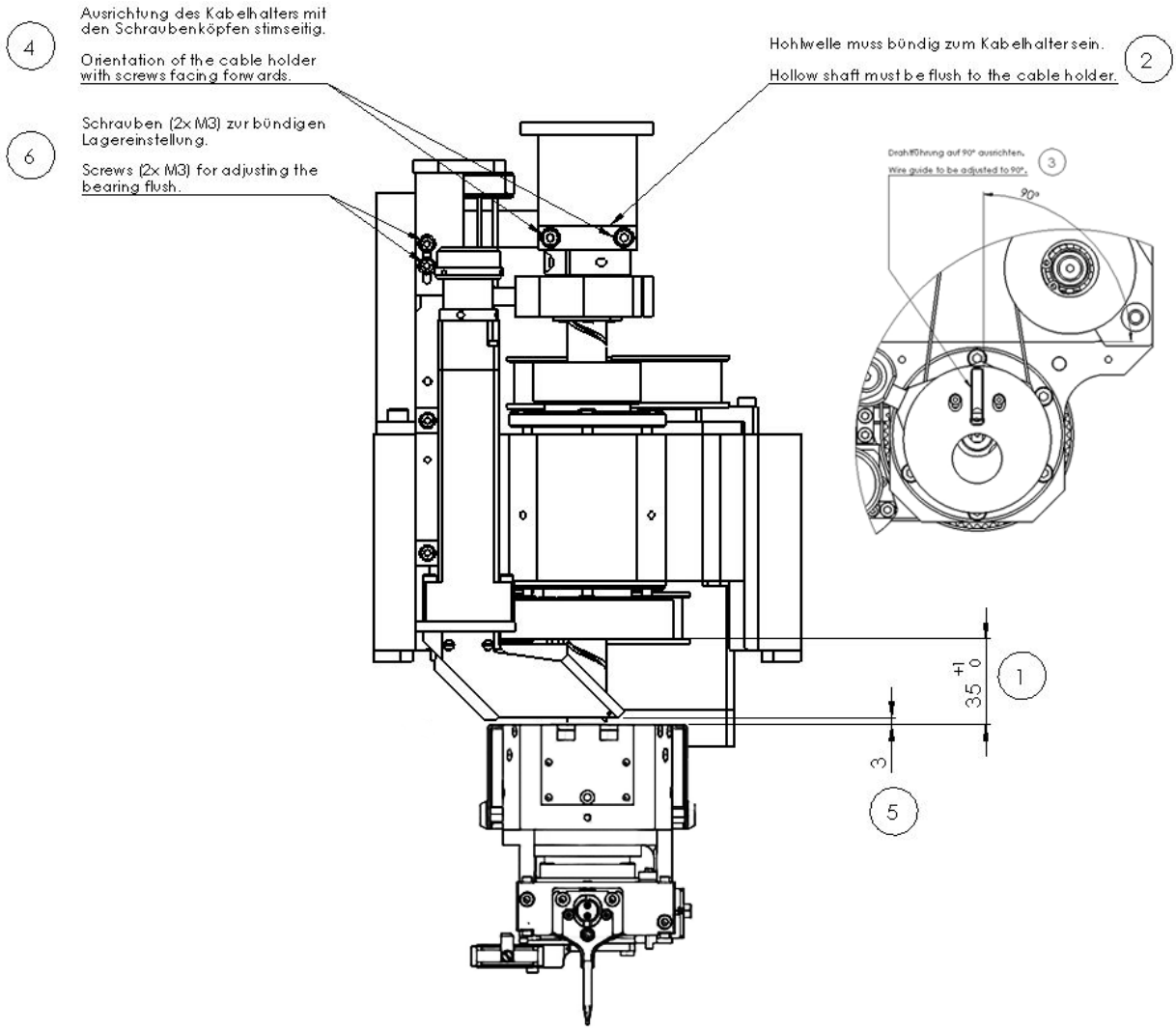


fig. 8 - 24 Adjustment of the spindle (overview of heavy wire bond head)

1. Distance between belt wheel and bond head adapter

First set the distance between belt wheel and bond head adapter (see illustration) to 35 mm + 1.0 mm (initial position, z-axis 500 µm).

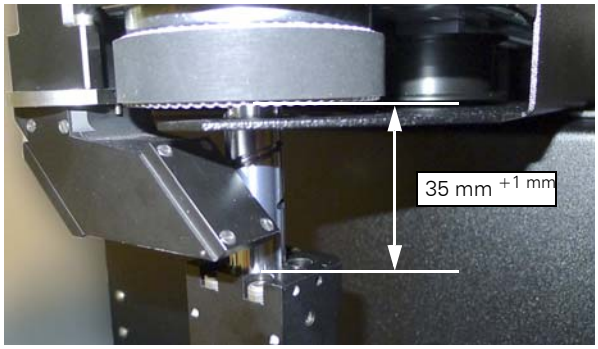


fig. 8 - 25 Adjustment of the spindle, distance between belt wheel and bond head adapter

2. Z/P spindle setting

As the second step the Z/P spindle has to be adjusted flush with the cable holder.

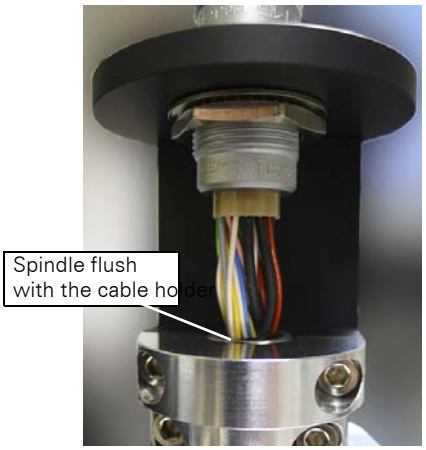


fig. 8 - 26 Adjustment of spindle, Z/P spindle setting

3. Wire guide tube outlet

In the "0" position (bond head aligned), the cable holder has to be installed in such a way that the outlet of the wire guide tube is toward the rear (y=0).

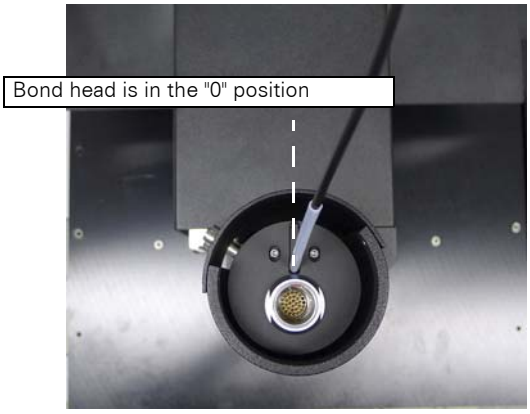


fig. 8 - 27 Adjustment of the spindle, wire guide tube outlet

4. Alignment of the cable holder

The fastening screws of the cable holder point forwards in this position.



fig. 8 - 28 Adjustment of spindle, alignment of cable holder

5. Setting camera guide / optics

A 3 mm gauge has to be "clamped" between the bond head adapter and the topics and at the top the camera guide has to be set flush with the driver.

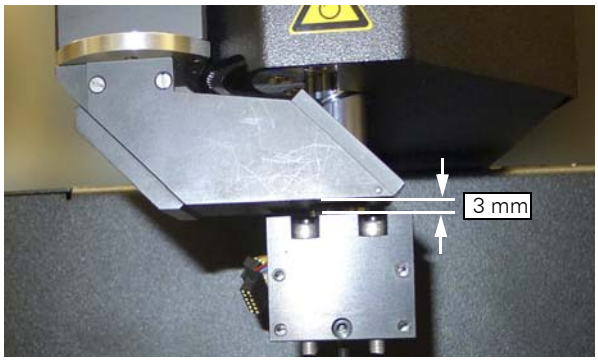


fig. 8 - 29 Adjustment of spindle, camera guide/optics

6. Setting of the bearing (camera guide)

The screws on the holder are for the purpose of adjusting the bearing.

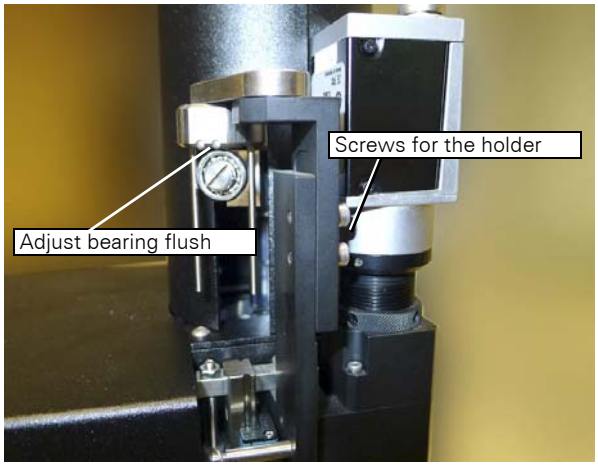


fig. 8 - 30 Adjustment of spindle, setting the bearing (camera guide)

adjusting the spindle with straight optics (alternative)

The Z/P axis can be equipped with straight optics on customer request.

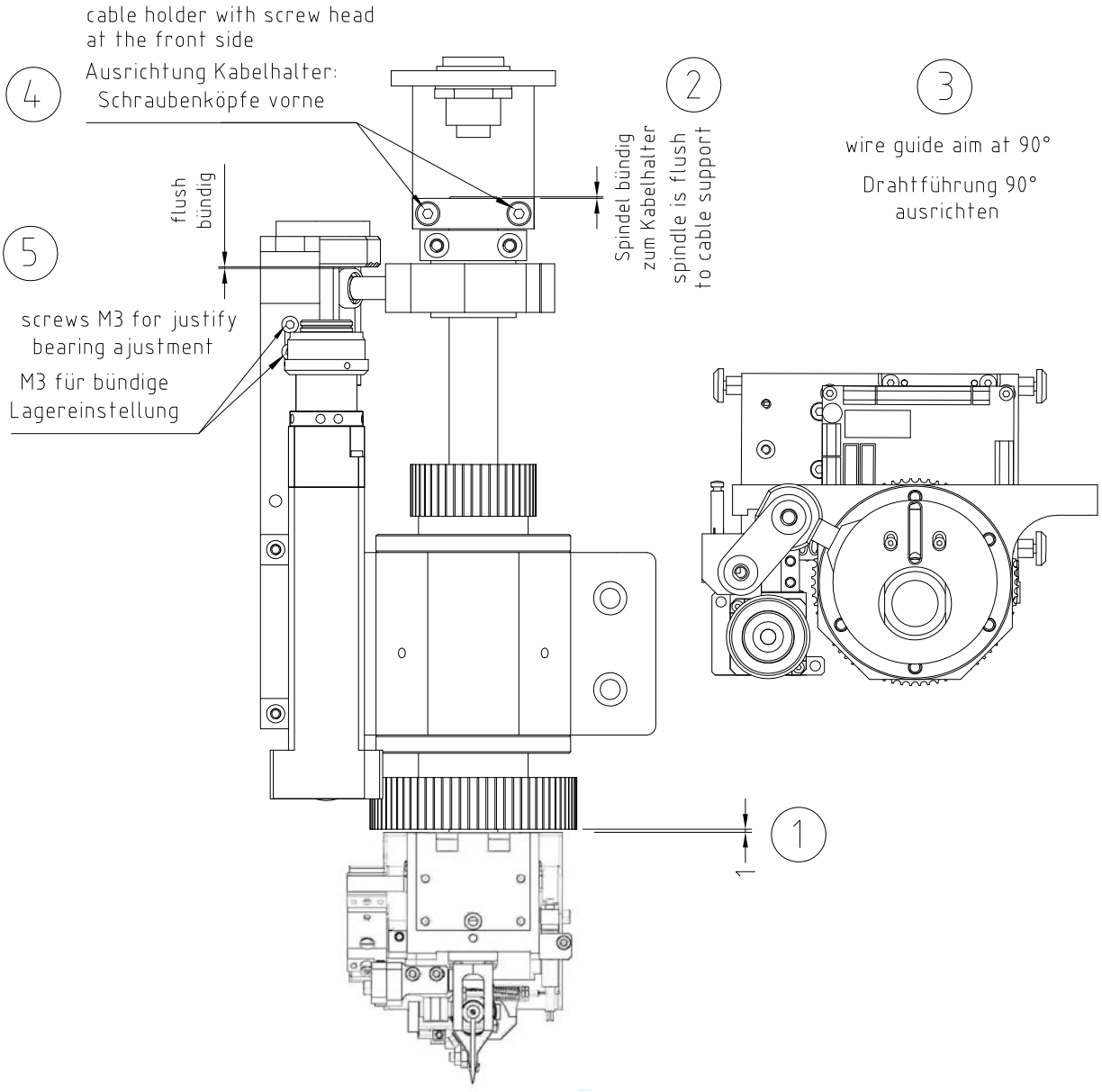


fig. 8 - 31 Adjustment of spindle (overview, straight optics)

1. Distance between belt wheel and bond head adapter

The first step is to set the distance between belt wheel and bond head adapter (see illustration) to 1 mm (initial position, z-axis 500 µm).

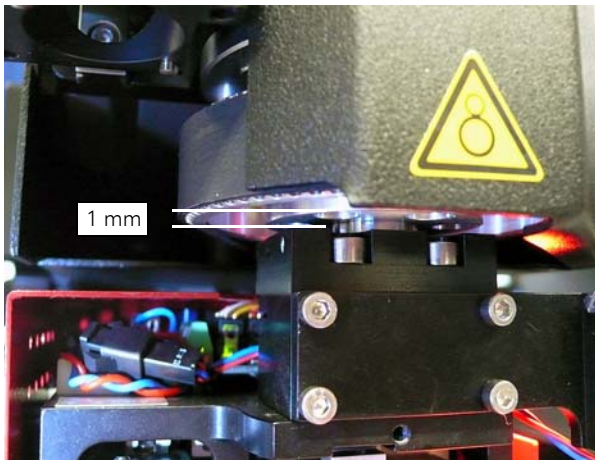


fig. 8 - 32 Adjustment of spindle (straight optics), distance between belt wheel and bond head adapter

IMPORTANT

Items 2 to 4 can be derived from the above description .

5. Setting of the bearing (camera guide)

The screws on the holder are for the purpose of adjusting the bearing.

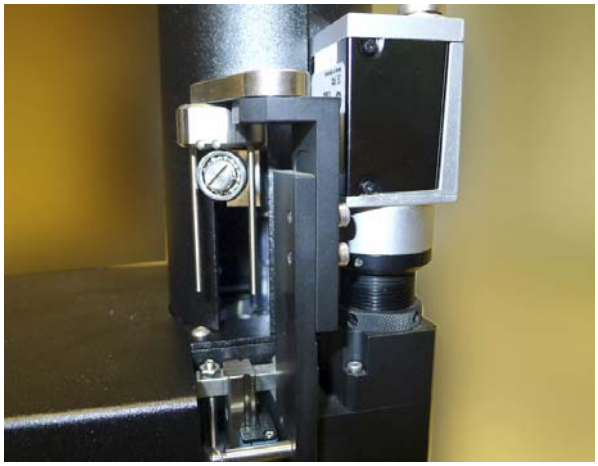


fig. 8 - 33 Adjustment of spindle (straight optics), setting the bearing (camera guide)

8.5 Description of the hardware

8.5.1 Z/P interface

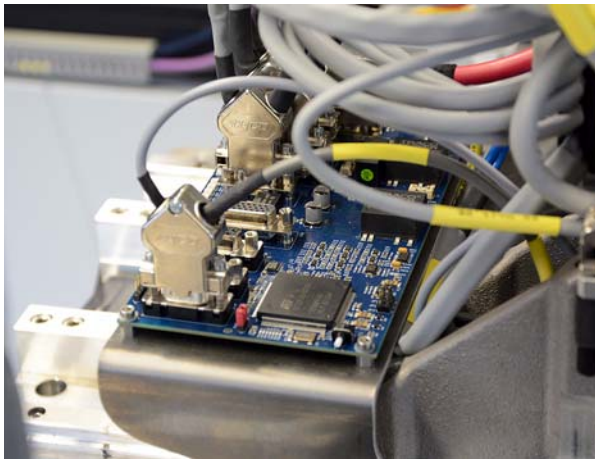


fig. 8 - 34 Z/P interface, installation position



fig. 8 - 35 Z/P interface, component

This board has two fundamental functions. This board serves as a terminal and adapter for all signals coming from the hybrid band cables and routed toward the bond head, wire spool and optional connections. All the light sources required on the bond head are also activated from here.

Terminal and adapter

Three connectors distribute the actuation signals of the bonder (hybrid band cable) to the bond head and the wire spool.

Lighting power amplifiers

In all there are six 5-volt power amplifiers, one 12-volt power amplifier and one 24-volt power amplifier.

Only three of these 8 power amplifiers are wired to the bond head.

Overview, Z/P interface

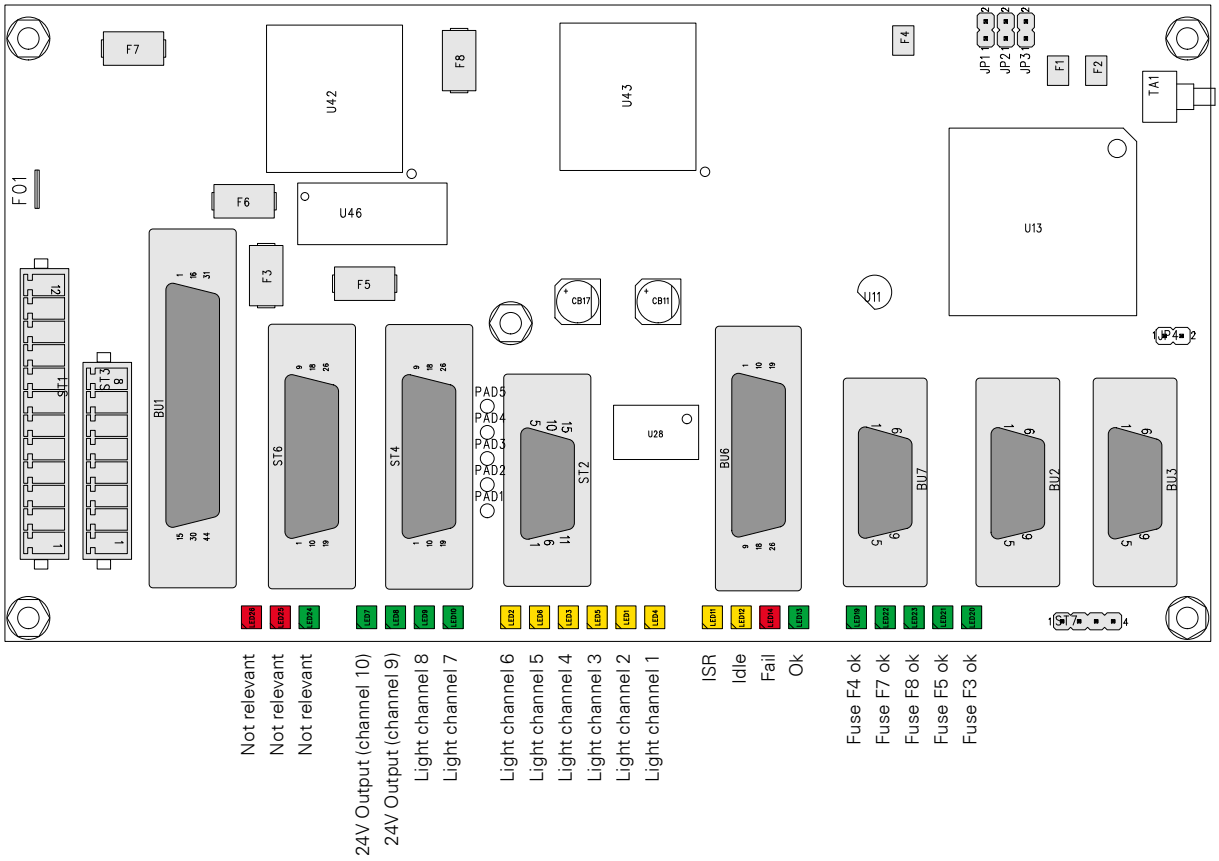


fig. 8 - 36 Z/P interface, overview

Fuses

- **F1:** Soldered fuse (not changeable, reversible)
- **F2:** Soldered fuse (not changeable, reversible)
- **F3:** Protects the 24V at the bond head (T375mA SMD)
- **F4:** Soldered fuse ((not changeable, reversible), wire spool)
- **F5:** Protects the 24V power amplifiers (T1A SMD)
- **F6:** Protects the 24V onboard (T2A SMD)
- **F7:** Protects the power supply for the lights (T2A SMD)
- **F8:** Protects the 12V camera (T500mA SMD)

Indicators

There are 22 LEDs on the fuse panel.

- **LED1 (yellow):** Indicates the modulation of light channel 2 (5V, dimmed, i.e. small modulation dark LED!)
- **LED9 (green):** Indicates the modulation of light channel 8 (24V, dimmed, i.e. small modulation dark LED!)
- **LED2 (yellow):** Indicates the modulation of light channel 6 (5V, dimmed, i.e. small modulation dark LED!)
- **LED3 (yellow):** Indicates the modulation of light channel 4 (5V, dimmed, i.e. small modulation dark LED!)
- **LED4 (yellow):** Indicates the modulation of light channel 1 (5V, dimmed, i.e. small modulation dark LED!)
- **LED5 (yellow):** Indicates the modulation of light channel 3 (5V, dimmed, i.e. small modulation dark LED!)
- **LED6 (yellow):** Indicates the modulation of light channel 5 (5V, dimmed, i.e. small modulation dark LED!)
- **LED7 (green):** Lights up to indicate that the 24V output (channel 10) is switched on
- **LED8 (green):** Lights up to indicate that the 24V output (channel 9) is switched on

- **LED10 (green):** Indicates the modulation of light channel 7 (12V, dimmed, i.e. small modulation dark LED!)
- **LED11 (ISR, yellow):**
  - Startup-Phase: Flashes four times during startup after a power-on reset (normal boot sequence).
    Distinction:
    Download sequence - normal boot sequence.
  - ISR (interrupt service routine): Is switched on in the ISR for communication and off again after processing.

IMPORTANT

ISR is activated for reception only, in other words when the PC sends and the node receives.

- **LED12 (Idle, yellow):**
  - Startup-Phase: Flashes four times during startup after a software reset (normal boot sequence).
    Distinction: Download sequence - normal boot sequence.
  - Idle phase: Flashes at a frequency of approximately 2 Hz
- **LED13 (OK, green):**
  - Lights up at half brightness in ICSP mode (download mode) along with the "fail" LED.
  - During the startup phase, lights up at half brightness along with the "fail" LED.
  - Lights up after the startup phase if there is no fault in the system ("serial number module" and "EEPROM" and "CAN" valid).
- **LED14 (Fail, red):**
  - Lights up at half brightness in ICSP mode (download mode) along with the "OK" LED.
  - During the startup phase, lights up at half brightness along with the "OK" LED.
  - Lights up after the startup phase if there is a fault in the system ("serial number module" or "EEPROM" or "CAN" not valid).
- **LED19 (green):** Lights up when fuse F4 is OK
- **LED20 (green):** Lights up when fuse F3 is OK
- **LED21 (green):** Lights up when fuse F5 is OK
- **LED22 (green):** Lights up when fuse F7 is OK
- **LED23 (green):** Lights up when fuse F8 is OK
- **LED24 (green):** Not relevant
- **LEDs25/26 (red):** Not relevant

connections

- **BU1:** This port is used for the bond head cable
- **BU2:** Not used
- **BU3:** Connection for the bond head camera
- **BU6:** Not used
- **BU7:** Not used
- **ST1:** Optional connection for the lights (channels 1 to 6, see LEDs)
- **ST2:** Hybrid band cable connection (torch, wedge, CAN)
- **ST3:** Optional connection for the lights / outputs (channels 7 to 10, see LEDs)
- **ST4:** Hybrid band cable connection (bond head ADC, IO)
- **ST6:** Hybrid band cable connection (piezo, transducer, bond force, 24V)
- **ST7:** Serial port (debug)

Jumpers

- **JP1:** Not relevant
- **JP2:** Not relevant
- **JP3:** Not relevant
- **JP4:** Must stay open.

8.6 maintenance

8.6.1 Preventive maintenance

The wire bonders are designed to need no more than minimum maintenance. The most important maintenance task consists of cleaning the bonder and removing wire ends, which can cause short circuits. These can damage both the machine itself and the devices produced with it. We recommend that a small container be placed next to the machine so that the operators have the possibility of disposing of the wire ends during and after use of the bonder.

IMPORTANT

Regular cleaning and removal of the wire ends are important.

Always save the current program with "File > Save" before starting to carry out maintenance work on the bonder.

8.6.2 Maintenance schedule

Part	Interval	Procedure / specification	Auxiliary materials / required material	Done by
Spindle	Six-monthly	Check for foreign particles, clean and lubricate where necessary. For procedure see manufacturer?s information	Description of the lubricant: Lubricant AFF.GRS	Customer
Belt	Six-monthly	Check for wear. Change as required Check the belt tension	For the procedure see manufacturer?s information	F&K Service
Belt tightener	Six-monthly	Check for concentric running (bearing damage) and abrasion; replace if necessary	Tensioning roller	F&K Service
Bond-head cable	Annually	More frequent replacement might be necessary, depending on the application and the number of operating hours. Inspect for wear; replace if damaged		Customer
Flame-off cable (only when a gold bond head is used)	Annually	Inspect for wear; replace if damaged. The replacement interval is shortened, depending on the hours of operation.		Customer

Part	Interval	Procedure / specification	Auxiliary materials / required material	Done by
Camera guide	Six-monthly	So-called "maintenance free guides" are used; however, we recommend periodical inspections of the system with regard to foreign particles. When necessary (dry), lubricate the guides.	Description of the lubricant: Oil in the precision metering unit 55 ml	Customer

8.6.3 Cleaning tasks

Procedure

- Use a clean, lint-free cloth for spindle cleaning.
- Z direction (lubricated at the top):
  - Use a spatula to apply a grease very sparingly to the spindle in the direction of the spiral (approx. 1 revolution).
- P direction (lubricated at the bottom):

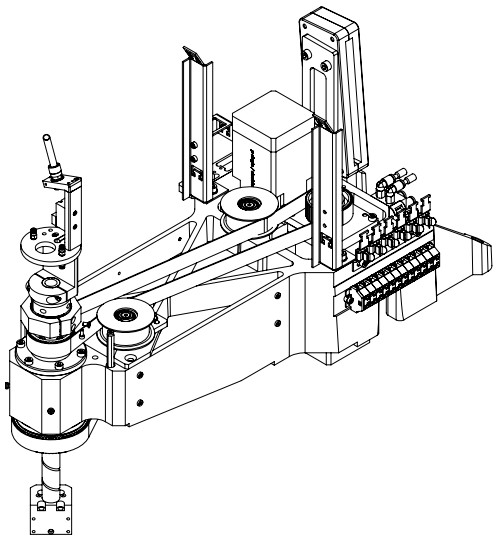


fig. 8 - 37 Cleaning the bonder

- Use a spatula to apply a grease very sparingly to the spindle in the longitudinal direction (approx. 30 mm). In total 3x2 longitudinal slideways.
- Manually execute a complete stroke several times so that the grease can be picked up by the guideways. The process can be repeated once depending on the take-up of the grease.

N O T E !

When moving the spindle by hand, take care not to cause collision with workholder, bond station etc.

8.7 Material list

Baugruppe	Material
Z/P-Base	Aluminium (AlSi10Mg St6, 3.3547, 3.3535) Stainless Steel (1.4301, 1.4305)

8.8 Warning signs and notifiers

D A N G E R !

It is essential to comply with the regulations that belong to the warning and notifiers.

Warning and notifier	description	Position	
	Moving machinery hazard warning.		On the cover of the Z/P unit.

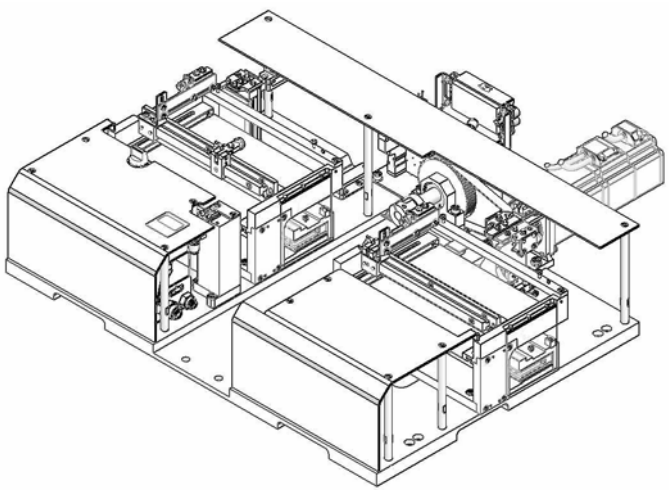
LIST OF ILLUSTRATIONS

fig. 8 - 1 coordinates . . . 8-1
fig. 8 - 2 Digital multimeter . . . 8-3
fig. 8 - 3 Diagnostics set . . . 8-3
fig. 8 - 4 Belt tension gauge . . . 8-3
fig. 8 - 5 Hook key with pivot . . . 8-3
fig. 8 - 6 Lubricant AFF.GRS . . . 8-3
fig. 8 - 7 description . . . 8-4
fig. 8 - 8 description . . . 8-4
fig. 8 - 9 Connection, Z motor and encoder cable . . . 8-4
fig. 8 - 10 Connection, P motor and encoder cable . . . 8-4
fig. 8 - 11 Z/P encoder measuring principle . . . 8-5
fig. 8 - 12 Z/P encoder - tolerance range (ideal) . . . 8-5
fig. 8 - 13 Z/P encoder - tolerance range (no longer permissible) . . . 8-5
fig. 8 - 14 Z/P encoder - tolerance range (not permissible) . . . 8-5
fig. 8 - 15 Pinout of the clamp . . . 8-6
fig. 8 - 16 motor winding . . . 8-6
fig. 8 - 17 bond axis cable . . . 8-6
fig. 8 - 18 Routing, bond head and camera cables . . . 8-6
fig. 8 - 19 Adjustment of belt for z-axis (measuring point) . . . 8-7
fig. 8 - 20 Adjustment of belt for z-axis (belt tension measuring device) . . . 8-7
fig. 8 - 21 Adjustment of the P-axis belt . . . 8-8
fig. 8 - 22 Adjustment of the P-axis belt (belt tension measuring device) . . . 8-8
fig. 8 - 23 Adjustment of spindle (overview of thin wire bond head) . . . 8-9
fig. 8 - 24 Adjustment of the spindle (overview of heavy wire bond head) . . . 8-10
fig. 8 - 25 Adjustment of the spindle, distance between belt wheel and bond head adapter . . . 8-11
fig. 8 - 26 Adjustment of spindle, Z/P spindle setting . . . 8-11
fig. 8 - 27 Adjustment of the spindle, wire guide tube outlet . . . 8-11
fig. 8 - 28 Adjustment of spindle, alignment of cable holder . . . 8-11
fig. 8 - 29 Adjustment of spindle, camera guide/optics . . . 8-12
fig. 8 - 30 Adjustment of spindle, setting the bearing (camera guide) . . . 8-12
fig. 8 - 31 Adjustment of spindle (overview, straight optics) . . . 8-13
fig. 8 - 32 Adjustment of spindle (straight optics), distance between belt wheel and bond head adapter 8-14
fig. 8 - 33 Adjustment of spindle (straight optics), setting the bearing (camera guide) . . . 8-14
fig. 8 - 34 Z/P interface, installation position . . . 8-15
fig. 8 - 35 Z/P interface, component . . . 8-15
fig. 8 - 36 Z/P interface, overview . . . 8-16
fig. 8 - 37 Cleaning the bonder . . . 8-19

F&K DELVOTEC Bondtechnik GmbH
Daimlerstrasse 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K DELVOTEC Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

Indexer section

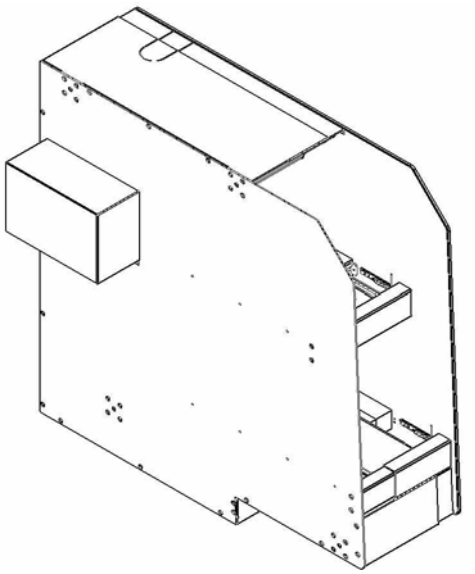
F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

9 INDEXER

Not relevant for this machine.

FK DELVOTEC



Bonder series M17

Lifts

F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

10 LIFTS

Not relevant for this machine.

FK DELVOTEC

Bonder series M17

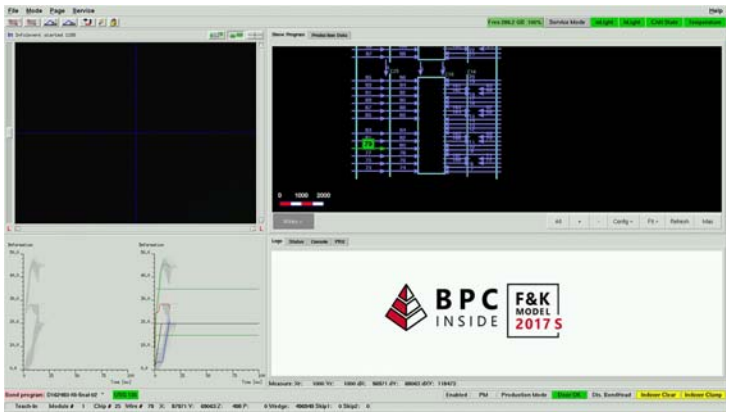
Heating

F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

11 HEATER

Not relevant for this machine.



Bonder series M17

SOFTWARE THIN WIRE

F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

12 SOFTWARE THIN WIRE 12-1

12.1 Background knowledge bonding procedure 12-1
12.1.1 A to Z of terms used 12-1
12.1.2 The bonding procedure 12-3

12.2 user interface 12-6

12.3 Dialog-based man-machine interface 12-7

12.4 Context-sensitive help 12-7

12.5 keyboard functions 12-7

12.6 Main menus 12-8

12.7 Controls 12-8

12.8 Extra functions 12-9
12.8.1 Help - Show Manual 12-9
12.8.2 Help - Manual Setup 12-9
12.8.3 Print dialog 12-9
12.8.4 wizard 12-10
12.8.5 CAN state 12-10
12.8.6 temperature 12-11
12.8.7 safety door 12-12

12.9 Software reference 12-12
12.9.1 Show program 12-12
12.9.2 File (main menu) 12-18
12.9.3 Mode (main menu) 12-27
12.9.4 Page (main menu) 12-82
12.9.5 Service (main menu) 12-131

12.10 rebond 12-148
12.10.1 Rebond Wire Parameters 12-148

12.11 Bond process control (BPC) 12-150
12.11.1 General description 12-150
12.11.2 Additional function Impedance monitoring 12-151
12.11.3 Description of the BPC user interface (PDViewer) . . . 12-152
12.11.4 Setting up bond process control 12-157

12.12 Pattern recognition unit (PRU) 12-158
12.12.1 General description 12-158
12.12.2 setting the camera 12-159
12.12.3 calibrating the optics 12-159
12.12.4 Selecting a structure for pattern recognition 12-159
12.12.5 Adjusting the lighting 12-161

12.13 FTP access 12-162
12.13.1 Export of bond program 12-162
12.13.2 Import of bond program 12-162

12.14 Instruction Manual Programming Basic Programs 12-163

12.14.1 Use of old bond program 12-163
12.14.2 Setting up bonder without bond program in memory . 12-164
12.14.3 Setting up starting parameter set with Mode 11 "single wire". 12-164
12.14.4 Setting the camera offset "Mode 3" 12-169
12.14.5 Camera Scale factors. 12-169
12.14.6 Creation of a Bond Program 12-170
12.14.7 Programming wires in Mode 2 "Learn Wire" 12-172
12.14.8 Repeat Wire in the Mode 2 "Learn Wire" menu 12-173
12.14.9 Measuring bond height in the (automatic) bond program Mode 4 "Bond Height" 12-174
12.14.10 Bonding in automatic mode after program creation . . 12-174
12.14.11 Mode 17:module matrix 12-175
12.14.12 Multi Stitch wires 12-175
12.14.13 Reference chip in Mode 1 "Learn Chip" 12-176
12.14.14 Adjust Parameters in Mode 2 "Learn Wire" 12-177
12.14.15 Bond process control (BPC) 12-178

12.15 Setup Tool - The configuration program . . . 12-181

12.15.1 The Setup Tool 12-181
12.15.2 Background knowledge, software 12-181
12.15.3 Software reference 12-183
12.15.4 Login 12-183
12.15.5 Setup Tool 12-184

12 SOFTWARE THIN WIRE

12.1 Background knowledge bonding procedure

Bonds are fully programmable and can be created with a variety of loop shapes.

The standard work area is a rectangle measuring 10" x 6".

The "Cognex" image-processing system is used to permit precision positioning of the bonds. Once the user has configured the bonding application, all P- X-, Y- and Z-axis movements can be performed step-by-step, semi-automatically or fully automatically. The P-axis can be rotated through ±200 °.

While production is in progress, the bond process control system operates online to ensure that the bonds are set optimally and constantly. In addition the quality is reliably monitored and displayed without destructive testing.

12.1.1 A to Z of terms used

Important terms that recur frequently in the text are explained below:

Flame-off position (only when a gold bond head is used)

The position where the wire protruding from the capillary is safely flamed off and the bond ball is created.

tear-off movement

After the destination bond, the wire is torn off by a defined movement of the x, y, and z axes.

Tear off speed

In the case of bumping bonds: The speed at which the bond head tears off the wire at the weakpoint after the bumping bond and the subsequent "tear off height, tear-off movement, go to tail length" movements.

Tear off height

In the case of bumping bonds: Distance Z of the torn-off gold wire from the device.

Bond force

Programmable bond force applied during the bonding process.

bumping bond

With bumping bonds, only bond balls are bonded to the pad.

bond height search zone

Range in which the device surface can be detected. Within this zone the touchdown speed applies, as does the "touchdown force". The upper limit is defined by the ramp steps as a function of the bond height measured beforehand. The lower limit is defined by the "TD-Overdrive" parameter.

Carrier (work piece carrier)

Adapters for supporting and carrying the material for bonding.

Carrier is a synonym for a device carrier (boot, MCM etc.) that is used in connection with a controlled material follow-up. A single carrier generally carries multiple devices.

chip 0

Chip 0 is not assigned wires in multicopying, because this chip cannot be copied. It is programmed only for correcting the angular offset of a device. Chip 0 can be assigned wires if no copies are made.

chips

Each surface to be bonded is known as a 'chip'.

destination bond

Second Bond

device

Each unit on a carrier is a device.

wire length

Length of wire used for the loop.

focus

Z position above the device at which the image is in focus. The degree of magnification is determined by the lens, but magnification can be adjusted mechanically.

Speed

Speed of movement when the machine moves to the programmed positions, Z workheight and start position.

home position

Position for initialising the axes (sequence is: Z - P - Y - X).

When the X axis has reached its absolute zero position, all the axes move to the init positions programmed on Page 1. You can also press "home" to move the axes to these positions.

Leadframe

Unit of contiguous materials to be bonded.

loop speed

Speed of the X/Y/Z-axes during the loop movement.

loop height

Height of the bonding tool above the device up to which the loop is drawn.

Loop distance

Length of the wire between the source and destination bonds (also known as source and destination bonds).

PCI

PCI is a consortium of more than 500 industry-computer product vendors who co-operatively develop specifications for PCI-based systems and modules for use in industry and telecommunications.

source bond

First
Bond

Source and destination US power

Programmed power of the ultrasonic energy needed for the source bond and the destination bond.

- Value range: 0-255 [digit]

Source and destination US time

Programmed time for which the generator outputs ultrasonic energy for the bond.

Source and destination bond force

Programmable bond force applied during the bonding process.

Source and destination search height

Height above the device as of which the bond height is measured for the source bond and the destination bond.

Tail length

The length of wire withdrawn from the bonding tool after the destination bond.

TD (touchdown)

The action of the bonding tool contacting the device.

TD speed

Speed of the bond head (Z-axis) when it moves between TD ramp and TD overdrive.

TD ramp

Transient before the measured bond height is achieved, over which the z-speed changes from fast to slow. The movement is executed with the slower Z speed prior to touchdown, so that the touchdown can be reliably measured. Touchdown is active once this position is reached. The bond height can alter when changing the devices on account of the production tolerances of the board manufacturer.

The current bond height is recognised in the touchdown ramp. This is determined by
a) the ramp and
b) the touchdown overdrive (downward travel).

These two values determine where touchdown is active (range in which the bond height can vary). If the actual bond height is outside this range the bonding process is stopped and a "Chip too high" or "Chip too low" error message is issued, as applicable.

teach-In

The process of teaching the different positions into the relevant wire bonder software.

touchdown force

The force with which the bonding tool contacts the chip. This force, too, is crucial in terms of deformation prior to cutting; make sure it is not excessive as otherwise the wire would be pre-deformed to such an extent that it could not be ultrasonically welded with the result that the bond would not hold and the wire would, in fact, be ruined before bonding could even take place. The touchdown force is usually more or less equal to the initial bond force.

Touchdown threshold

Defines the threshold value (sensitivity) of the TD signal.

US power (source/destination)

The programmable power of the ultrasonic energy for the source or destination bond, as applicable (selectable in the range from 0 to 255 ("low" and "high" amplitudes).

UPS (uninterruptible power supply)

The integrated UPS can maintain the supply of power to the bonder's PC for a brief period in the event of a mains-supply failure, so that the data can be saved and the

operating system correctly powered down. The machine then has to be switched off.

An external UPS, capable of supplying enough power to sustain operation and bridge a main-supply outage, is available as an option.

Wire Spool

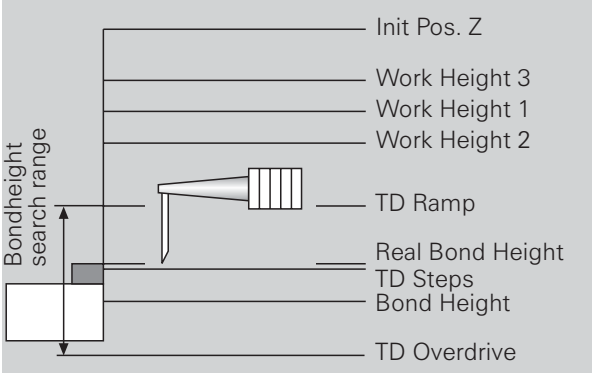
The task of the wire spool is to wind on and unwind the wire from the wire spool under control.

12.1.2 The bonding procedure

In touchdown bonding, the bonding tool moves toward the device with reduced speed as of a definable height (TD ramp). As soon as the bonder registers touchdown, the bond head (Z-axis) moves lower by the programmed TD steps, and bonding as such takes place. The bond-height search range is defined by the 'TD Ramp' and 'TD Overdrive' parameters with reference to the bond height measured in mode 4.

fig. 12 - 1 Sequence of operations in touchdown bonding (only when a gold bond head is used)

fig. 12 - 2 Sequence of operations in touchdown bonding



(when a thin wire/heavy wire bond head is used)

Basic settings for touchdown bonding

The table below shows the principal basic settings for touchdown bonding:

Parameters (mode 1/2)	Touchdown
TD Flag	*1*
TD ramp	*150 ... 500*
TD Overdrive	*150 ... 500*
TD Steps	*0.5 times the wire diameter*

The illustrations below show, in diagrammatic form, how the wire bonder bonds a wire.

Step 1

- The bonder positions the wire with the closed wire clamp at the first bond position as taught in beforehand.

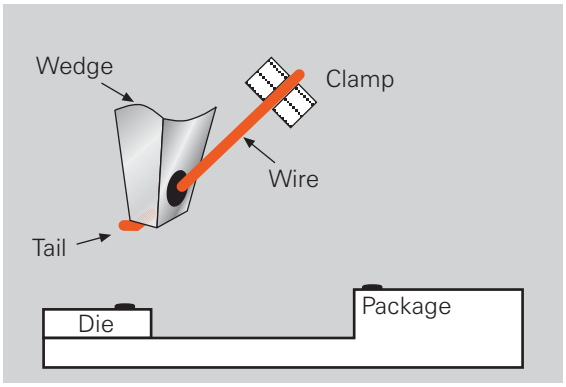


fig. 12 - 3 Bonding procedure, thin wire bond head - moving to the first bonding position

Step 2

- The bond head brings the wire into contact with the device with a defined force. This force deforms the wire, ready for bonding to the device by ultrasonic waves.

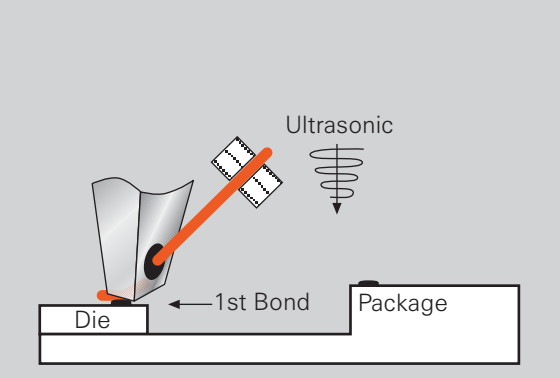


fig. 12 - 4 Bonding procedure, thin wire bond head - performing the source bond

Step 3

- Loop movement: The clamp that holds the wire in position opens so that the wire unwinds as it traverses to loop height.

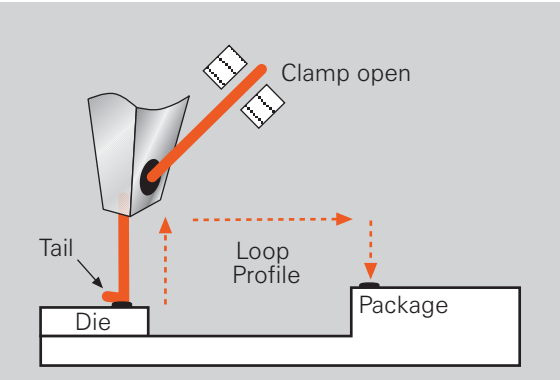


fig. 12 - 5 Bonding procedure, thin wire bond head - moving to loop height

Step 4

- The bonder then executes a defined movement, bringing it to the second bond position. Tracking this movement, the wire forms the loop (see "Types of loop" on page 12-41).

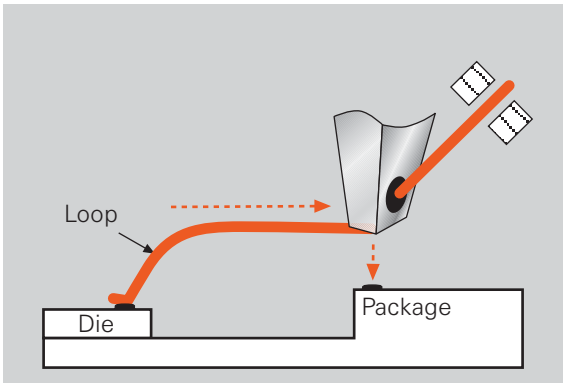


fig. 12 - 6 Bonding procedure, thin wire bond head - moving to the second bond position

Step 5

- At the second bond point the bond head again brings the wire into contact with the device with the defined force, and ultrasonically welds the wire to the surface.

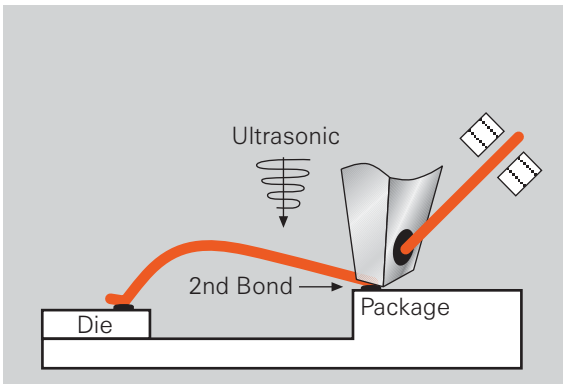


fig. 12 - 7 Bonding procedure, thin wire bond head - performing the destination bond

Step 6

There are two possibilities for tear-off:

- Clamp tear: The wire clamp is closed. A forward and backward movement of the wire clamp tears off the bonding wire directly behind the bond.
- Table tear: With the wire clamp open, the bond head moves in the Z direction to "Tail Height" and the axes then move simultaneously to the defined "Tail Len.1" and "Tear Height". To deform the tear, at this position the number of Z movements set in "Tear Counter" are performed. The wire clamp is then closed and the "Tail Len.2" movement is performed to tear off the wire.

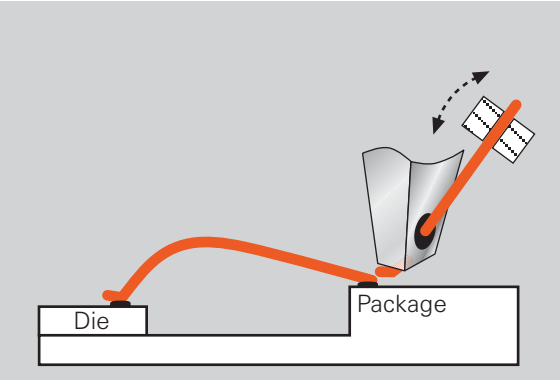


fig. 12 - 8 Bonding procedure, thin wire bond head - tearing off the wire

- The bond head returns to the workheight, ready for the next bonding operation.

IMPORTANT

Extensive knowledge and investigations are necessary, in order to ensure that bonds of this nature evince the specified characteristics. Broadly speaking, there are three ranges of parameters, all of which interact:

- *Machine parameters, e.g. speeds, movements*
- *Process parameters, e.g. bond force, bond time, ultrasonic energy*

Application, e.g. layer properties of the device, bonding wire

12.2 user interface

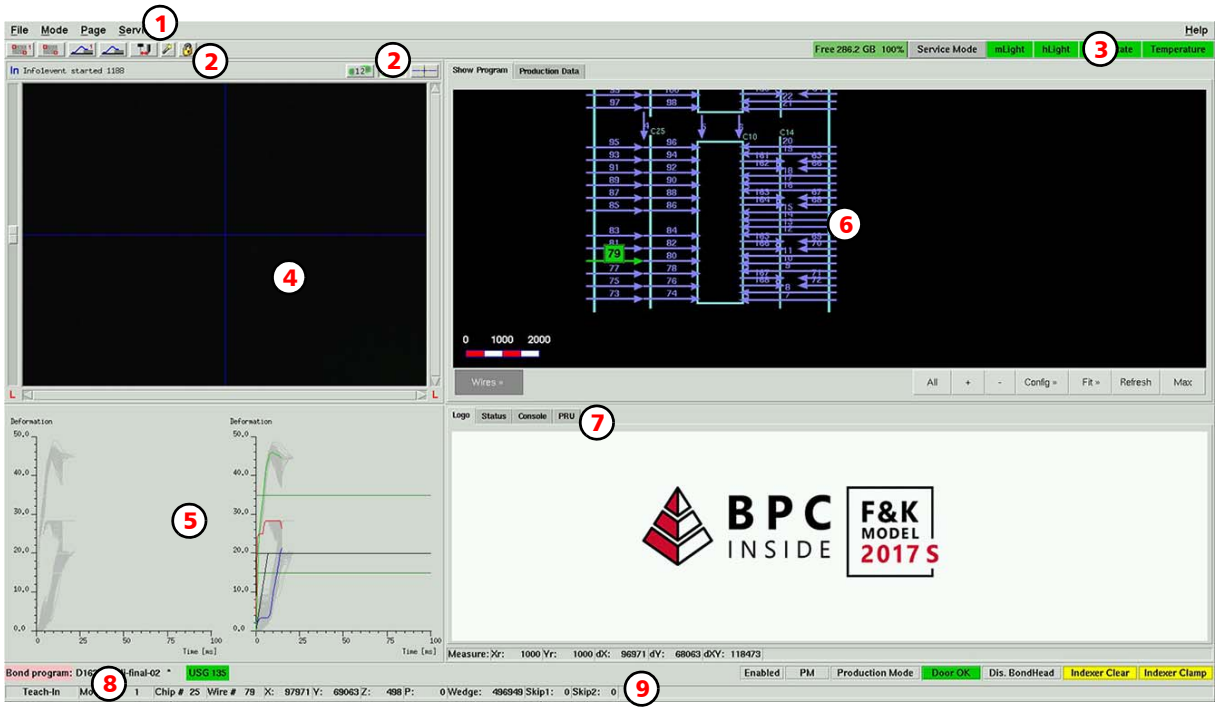


fig. 12 - 9 user interface

After the program is started, the user interface will be displayed indicating the information that is relevant for the production.

- **1:** Main menus (see 12.6 "Main menus" on page 12-8)
- **2:** Controls; buttons for fast access to various functions (see 12.7 "Controls" on page 12-8)
- **3:** Extra functions (see 12.8 "Extra functions" on page 12-9)
- **4:** Camera image that is being processed at the moment by the PRU (Pattern Recognition Unit–)
- **5:** Deformation diagrams of the 1st and 2nd bonds See "BPC screen" on page 12-23 and see "BPC - Display Options (page 100)" on page 12-120
- **6:** Show program; graphic display of the bond program loaded or created at present (see 12.9.1 "Show program" on page 12-12)
- **7:** Display options
  - **Logo:** Version of the bonder software
  - **Status:** Machining status of the function groups
  - **Console:** Log; displays information about the last steps that have been initiated by the user or by the software
  - **PRU:** Status display of the pattern recognition unit
    - Live Video: Activation/deactivation of Live Video
    - Frame Display: Outline display of the search models
    - Cross& Reticle Display: Display/blanking of the cross-hairs
    - Result Display: Display/blanking of the search results
    - Wire Display: Display/blanking of the wires
    - Tool Position Display: Activation/deactivation of the tool cursor
    - Tool Tolerance Display: Activation/deactivation of the Tool Tolerance display
- **8:** The name of the bond program currently loaded is shown above the status bar
- **9:** Status information

12.3 Dialog-based man-machine interface

The user dialogs are called up by means of the menus or the keyboard. The cursor buttons or the mouse can be used for navigating in the dialogs. There are two input modes:

- Hitting "enter" saves the entries in all input fields.
- All positions reached by means of the crosshair cursor are saved when you press the "store trace" key by way of confirmation.

Use the backspace key and the cursor left/right keys to make changes to entries in the input fields.

Input fields can be saved with additional colours in addition to the default colour gray:

- Yellow, to show that globally defined values from the "Learn Chip" mode do not match the locally defined values from "Learn Wire".
- Green, copying mode is then active.

As soon as the cursor moves clear of the coordinate field in the monitor, the trackball behaves exactly like a mouse.

12.4 Context-sensitive help

Information about the currently active dialog element is shown at the bottom part of the dialog, as follows:

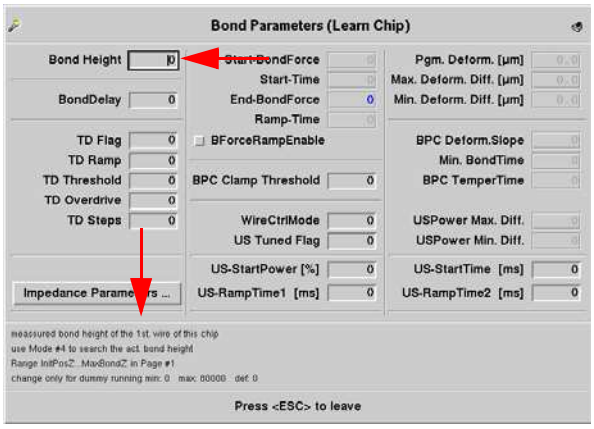


fig. 12 - 10 Context-sensitive help

- Short function description of the dialog? element
- Valid input range
- Minimum/Maximum input value
- Current default value

12.5 keyboard functions

You will frequently have to use the keys on the keyboard when you program bonding sequences (in the documentation for the basic machine, see > "Controls").

12.6 Main menus

You can choose one of the following main menus from the menu bar:

- **File (Alt+F):** Commands for management of the bonder operating system and of all bond programs (see 12.9.2 "File (main menu)" on page 12-18)
- Mode **(Alt+M):** Parameters to rate the bonding procedure for a specific application (see 12.9.3 "Mode (main menu)" on page 12-27)
- **Page (Alt+P):** Setting parameters such as speeds and delays, usually set for all applications (see 12.9.4 "Page (main menu)" on page 12-82)
- **Service (Alt+S):** General information, settings for incorporating the bonder into a production facility and/or a network (see 12.9.5 "Service (main menu)" on page 12-131)

NOTE

The range in which values can be entered appears in the tables under "Value range, unit".

12.7 Controls

Buttons for fast access to various functions.

 *fig. 12 - 11 Learn chip (mode 1)*

1st chip in the bond program; opens the "Learn Chip" dialog.

 *fig. 12 - 12 learn chip*

Co-selection of the chip; opens the "Learn Chip" dialog.

 *fig. 12 - 13 Learn Wire (mode 2)*

1st wire in the bond program; opens the "Learn Wire" dialog.

 *fig. 12 - 14 learn wire*

Co-selection of the wire; opens the "Learn Wire" dialog.

 *fig. 12 - 15 Corr Offset (Mode 3)*

Opens the "Corr Offset (Offset Step 1)" dialog.

 *fig. 12 - 16 Wire numbers*

Display wire numbers in the live picture.

 *fig. 12 - 17 Wire fade-in*

Switches on and off display of the programmed wires in the live image.

 *fig. 12 - 18 Cross hairs*

Switches on and off the cross hairs in the live image.

12.8 Extra functions

Operator-assistance functions are grouped at the top right in the dialogs.

12.8.1 Help - Show Manual

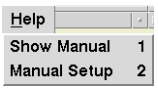


fig. 12 - 19 help

The user manual that is preset under "Show Manual" in the "Manual Set-up" submenu can be opened using the Help menu. The associated viewer (Adobe Reader®) will thereby start automatically.

Adobe Reader®

Familiarize yourself with the functions of the Adobe® Reader.

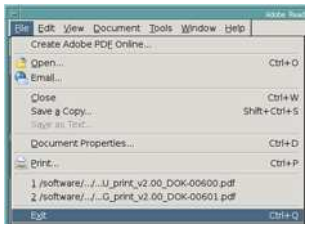


fig. 12 - 20 Help > File - Exit

The viewer can be closed using File>Exit or the keyboard shortcut Ctrl+Q.

12.8.2 Help - Manual Setup



fig. 12 - 21 Help > Manual Set-up

Preselection of the user manual version that should open after calling up "Show Manual".

- Language: Preselection of a stored language variant.
- Manual setup
  - F&K Manual: If active, the defined database manual is opened
  - Customer Manual: If active, a new manual can be loaded from a storage medium into the database using the "Load Customer Manual from USB" button.
  - Load Customer Manual from USB: Function to load further PDF documents such as e.g. a company-internal procedural instruction from an external data medium via USB into the database.
  - Delete Customer Manual: Deletes a PDF document from the database. To this end the documents additionally integrated in the database are displayed and the document to be deleted is marked using the Select function.
- F&K Manuals: Preselection for the manual to be opened.
- Show Manual: Opens the preset manual.

12.8.3 Print dialog



fig. 12 - 22 Print dialog

Prints out a copy of the dialog currently displayed on the monitor, or exports this information in the form of a file. This function can be configured by selecting "Service" > "Set Printer Format" (see "Set Printer Format (Service 3)" on page 12-134).

12.8.4 wizard



fig. 12 - 23 wizard

Makes further functions available depending on the respective dialog.

Micron <=> Mil

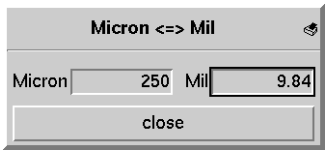


fig. 12 - 24 Wizard > Micron <=> Mil

Enables the conversion from Micron to Mil and vice versa.

save dialog position

Saving of the current dialog position.

reload original position

Resets the values to the last saved status.

calculator



fig. 12 - 25 Wizard > Calculator

Makes available a calculator in which the valves can be adopted in the active parameter.

save to library

Saves the values of the respective dialog of Loop Parameters, Bond Parameters and Tail, Tear or Cut Parameters (Mode 1, Mode 2 and Mode 11) to the program library.

load from library

Loads the values of the respective dialog of Loop Parameters, Bond Parameters and Tail, Tear or Cut Parameters (Mode 1, Mode 2 and Mode 11) from the program library.

Copy Data, Paste Data and Undo Paste

Copying and cutting out of data. Second point can also be reversed with "Undo Paste".

12.8.5 CAN state

Opens the CAN dialog (Controller Area Network) as a CAN status overview page. The special thing about this is the automatic display of the total status of all monitored errors of all CAN nodes.

The CAN page is solely for information purposes. An ongoing production process is not automatically stopped by an error display (see "CAN (Page 88)" on page 12-110).

12.8.6 temperature

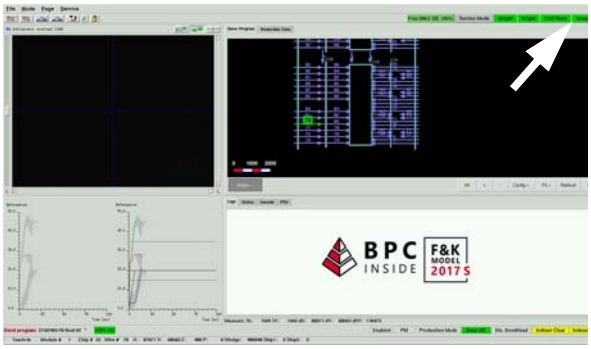


fig. 12 - 26 User interface > Temperature

Following confirmation by a click on the "Temperature" button above the "Show Program" window, the "Temperature Information" dialog opens. This dialog is for monitoring the most important temperatures inside the machine. Most of the temperatures are monitored automatically, so if a temperature goes too high the "Temperature" button shows red. When all the temperatures are below their corresponding predefined maximum limits, the "Temperature" button shows green.

Under these circumstances the "Temperature" dialog is solely for information purposes. Ongoing production will not be interrupted.

IMPORTANT

This dialog is not to be confused with the heating-control temperature page, which shows process temperatures that are configurable within defined min/max ranges.

As a general rule, no changes should be made to the basic settings that appear in the "Temperature Information" dialog.

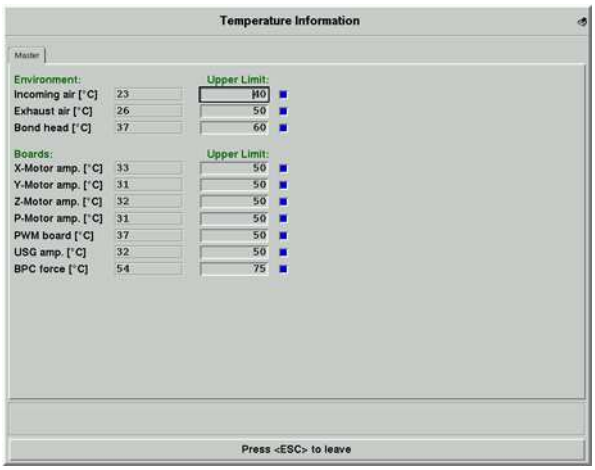


fig. 12 - 27 temperature

UpperLimit (Edit)

In this dialog the current temperature is displayed to the right of the corresponding component.

The relevant allowed maximum temperature can be entered under "UpperLimit". The input field has a direct effect on the configuration parameter of the corresponding unit and changes are saved permanently when the dialog is exited.

UpperLimit (check button)

The monitoring is active only if the relevant check button is activated.

IMPORTANT

If a temperature overshoots the limit, it is advisable to check whether the elevated temperature is caused by a generally higher ambient temperature.
In the first case the limit could be shifted upwards (maximum +10 degrees).

12.8.7 safety door

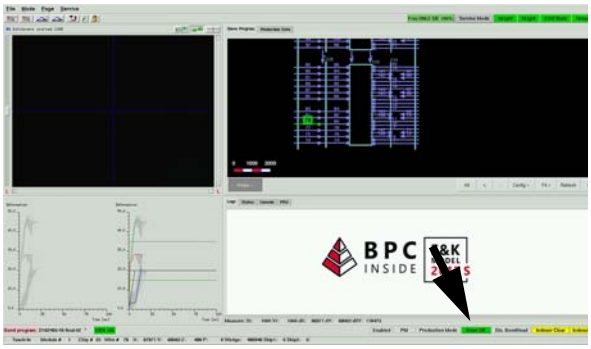


fig. 12 - 28 User interface > Door OK

The following dialog appears when the "Safety Door" function is actuated. Prior to production start, different states can be defined in this dialog for the situation of an open door or in the event of an interruption of a light beam curtain.

Also see the information on the protective door / maintenance doors in the section headed "Safety".



fig. 12 - 29 User interface > Door OK (Setting)

Bondhead Emergency Stop Mode

Response for:

- No Checking: No status query is made
- Checking before starting motors (1): Check carried out before an axis movement.
- Stop all motors during Moving (2): Motors are stopped during an axis movement.
- Stop all motors immediately during Moving and Bonding (3): Motors are stopped immediately during an axis movement or a bonding procedure.
- Force Production Checking: "Bond Head Emergency Stop Mode 3" is automatically activated in the event of a change in the "Production Mode".

Indexer Emergency Stop Mode

Response for:

- Stop: Indexing procedure is stopped.
- No Checking: No status query is made.

12.9 Software reference

IMPORTANT

The following section explains all menus and their parameters. Read this section carefully and familiarise yourself with its contents before you start bonding.

12.9.1 Show program

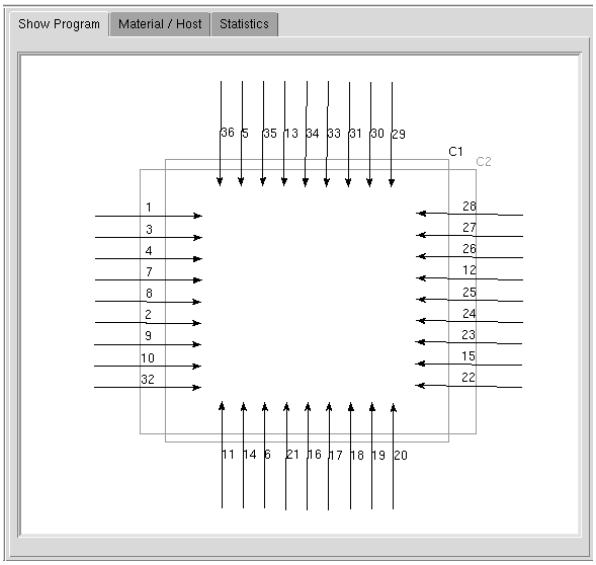


fig. 12 - 30 Show Program > Example of a graphic illustration

The bond program display provides a graphic display of the currently loaded bond program in a window. With a double click the display is set to Edit mode, which facilitates comfortable access to a large number of parameters and functions.

information bar



fig. 12 - 31 Show Program > Information bar

When the mouse pointer is moved to a wire/chip, data associated with the object are displayed in the information bar.

- M: Module number
- C: Chip number
- S: Chip number of the first bond
- D: Chip number of the second bond
- W: Wire number
- G: Wire group

Function bar



fig. 12 - 32 Show Program > Function bar

- All: Selects all objects (wires or modules)
- Last: Loads the last selection
- +: Enlarges the size of the view
- -: Reduces the size of the view
- Fit: Selects a zoom function which shows all the objects
- Refresh: Refreshes the display, zoom function is retained
- Config: Opens configuration dialog
- Min/Max: Fully screen and normal display
- CLOSE: Exits the Edit mode

Selection bar



fig. 12 - 33 Show Program > Selection bar

Modules

- Selection between Module and Wire modes
- Module mode is used to edit modules.
- Wire mode is used to edit wires.

Overlapping

- Selection between Overlapping and Enclosing modes
- In Overlapping mode an object is selected when it is touched by the selection rectangle.
- In Enclosing mode an object must be completely enclosed for it to be selected.

All modules

- Selection between All Modules and 1st Module
- All Modules displays all the modules
- 1st Module displays only the first module

None

- Selection of the filter - the filter is used for limitation purposes in the selection of wires
- None - no filter active
- Group - only wires belong to the same group are selected
- Src - wires must have the same source chip
- Dest - wires must have the same destination chip
- Src & Dest - wires must have the same source and destination chip

Left mouse button

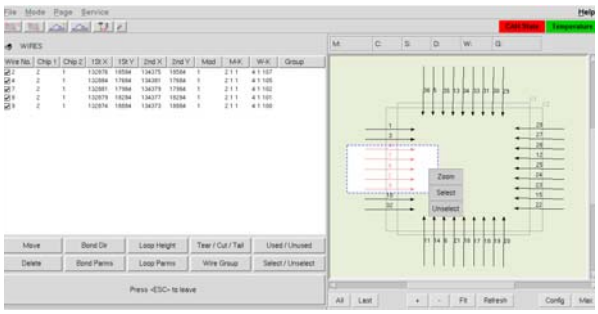


fig. 12 - 34 Show Program > Left mouse button

With a double click Edit model is activated, while further double clicks switch between large and small display. The display content is moved when the key is pressed and the mouse pointer is moved at the same time. With a mouse click on an object (wire or module) this object is selected and with a further click the selection is cancelled. A group of objects is highlighted by dragging a rectangle. The highlighted objects are shown in colour (magenta) and listed in a dialog which provides various functions for editing. A click next to an object opens the rectangle - a further click closes the rectangle. The right mouse button resets the rectangle.

Middle mouse button

Opens position highlighting, which centres, enlarges or reduces the display excerpt at the specified position. Position highlighting is closed with a click in the centre circle.

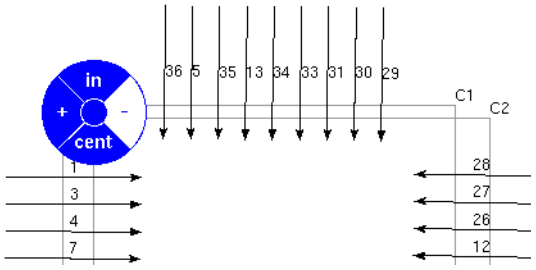


fig. 12 - 35 Show Program > Middle mouse button

Right mouse button

The right mouse button opens functions for editing settings for individual wires or chips. The following menu is opened with a click on a wire or chip:

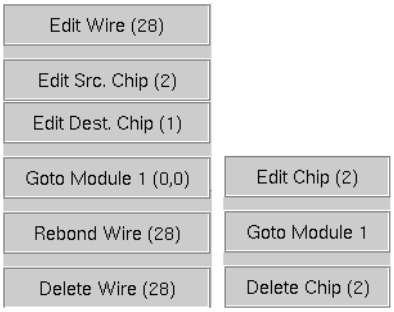


fig. 12 - 36 Show Program > Menu right mouse button

- Edit Wire: Opens the "Learn Wire" dialog (see "Learn Wire (mode 2)" on page 12-45).
- Edit Src. Chip / Edit Dest. Chip: Opens the "Learn Chip" dialog for the source chip or destination chip (see "Learn chip (mode 1)" on page 12-29).
- Edit Chip: Opens the "Learn Chip " dialog (see "Learn chip (mode 1)" on page 12-29).
- Goto module: Moves the bond head to the position of the selected module.
- Delete Chip: Deletes the selected chip.
- Delete Wire: Deletes the selected wire.
- Rebond Wire: Opens the "Rebond" dialog (see 12.10.1 "Rebond Wire Parameters" on page 12-148).

Bond program display

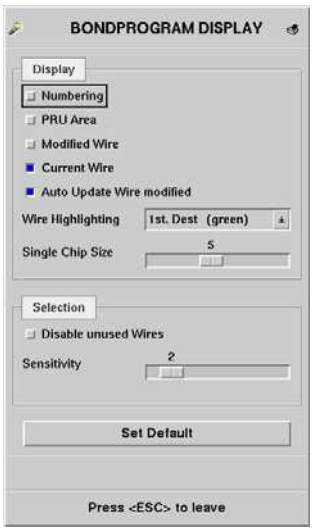


fig. 12 - 37 Show Program > Bond program display

The dialog contains the configuration parameters for bond program display.

Display

- Numbering: Activates the display of wire/chip numbers
- PRU Area: Activates the insertion of the current PRU view range
- Modified Wire: Activates the colour coding (blue) for modified wires.
  Modified wires differ in the Bond, Tear or Loop parameters of their chips.
- Current Wire: Activates the colour coding (Orange) of the wire that is currently being edited.
- Auto update wire modified: Activates a simultaneous display of the modified changes.
- Wire Highlighting: Specifies which bond chip correlation display has the higher priority.
  - Destination Bond Chip correlation is shown in green
  - Source Bond Chip correlation is shown in red
- Single Chip Size: Specifies the size for chips with only one adjustment point.

Selection

- Disable unused Wires: Disables the selection of wires which are highlighted as "Unused".
- Sensitivity: Specifies the sensitivity of the mouse. A small value means that the object must be focussed very accurately to select it.

Set Default

Loads the default setting.

Wire list selection

This dialog lists the wires highlighted in the bond program display and makes available different functions for editing. The wires can be removed from or added again to the selection using the check/tick symbols in the left-hand column.

IMPORTANT

The bond program display must be in Wire mode (see "Modules" on page 12-13).

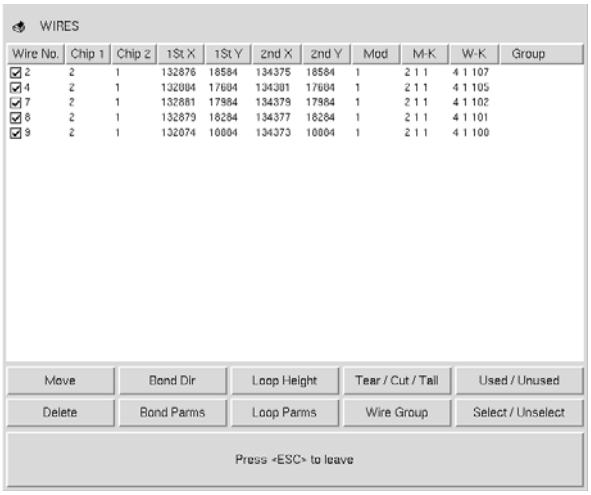


fig. 12 - 38 Show Program > Wire list selection

- Move: Opens the dialog for moving the wire positions (see "Change Wire Position" on page 12-15).
- Delete: Deletes the selected wires.
- Bond Dir: Reverses the bond direction of the selected wires.
- Bond Parms: Opens the dialog for changing the bond parameters (see "Bond Parameters 1st./2nd. Bond (Learn Wire)" on page 12-47).
- Loop Height: Opens the dialog for changing the loop height (see "Loop Parameters (Learn Wire)" on page 12-49).
- Loop Parms: Opens the dialog for changing the loop parameters (see "Loop Parameters (Learn Wire)" on page 12-49).
- Tear / Cut / Tail: Opens the respective dialog for changing the tear / cut / tail parameters (see "Single Wire (mode 11)" on page 12-63).
- Wire Group: Grouping and naming of wires (see "Wire Group" on page 12-17).
- Used/Unused: Sets the Unused flag for the selected wires. Wires marked with the Unused flag will be shown with a broken line and ignored during the production process.
- Select/Unselect: Activates or deactivates the selection of all wires.

Change Wire Position

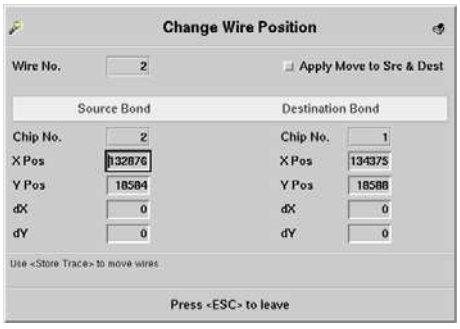


fig. 12 - 39 Show Program > Change Wire Position

The coordinates of the selected wires can be changed in this dialog. Use the "Page forward" and "Page backward" buttons to view and move to the coordinates of the selected wires. The position can be moved with the trackball and applied to all wires with the "Store Trace" key. "Escape" closes the dialog without making changes.

- X Pos/ Ypos: Coordinates of the source or destination bond (trackball active).
- dX/dY: Instead of moving the wires with the trackball, there is the option here of specifying a movement for X and/or Y.
- Apply Move to Src & Dest: Applies the movement to the source and also destination bond.

change bond parameter

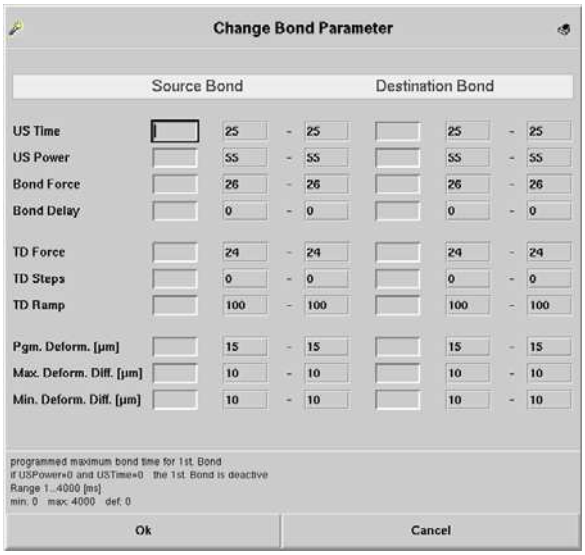


fig. 12 - 40 Show Program > Change Bond Parameter

This dialog offers the option of changing different bond parameters for source and destination bond. The changed values are applied to all selected wires. A blank input field will leave the parameter unchanged. The range in which the current parameters move is displayed next to the input field. The individual parameters are explained in more detail in " Learn Wire (mode 2)" on page 12-45".

loop height correction

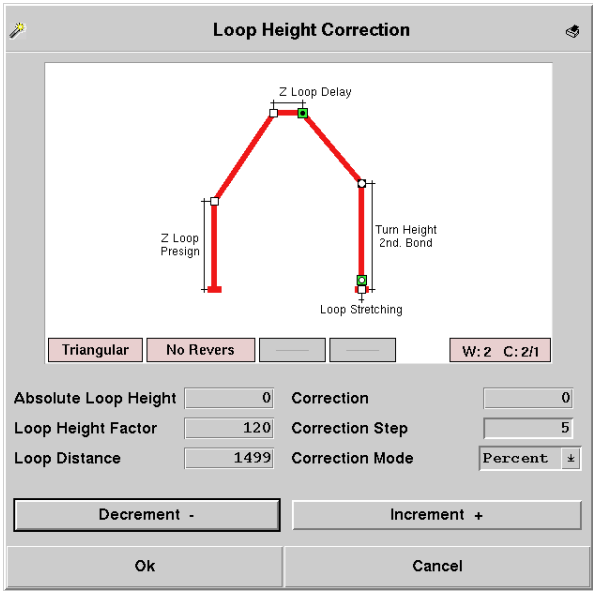


fig. 12 - 41 Show Program > Loop Height Correction

The loop height of the selected wires can be corrected in this dialog. Use the "Page forward" and "Page backward" buttons to browse through the wires. The correction applies equally to all wires and absolute or relative loop heights are taken into consideration accordingly.

- Absolute Loop Height: Shows the current absolute programmed loop height.
- Loop Height Factor: Displays the currently programmed loop height factor.
- Loop Distance: Shows the loop distance.
- Correction: Shows the current correction value.
- Correction Step: Correction of step width (depending on "Correction Mode" in per cent or in micrometres).
- Correction Mode: Selection of the mode for correction (percent or micrometre).
- Decrement/Increment: Changes the ?Loop height by "Correction Step".

loop parameters

The loop parameters of the selected wires can be changed in this dialog. Use the "Page forward" and "Page backward" buttons to view the loop parameters of the selected wire. All the changes highlighted in colour for all wires are adopted with the "OK" key. The "Duplicate" key adds further parameters, "Duplicate All" highlights all the parameters. "Escape" closes the dialog without adopting changes. The individual parameters are explained in more detail in " Loop Parameters (Learn Wire)" on page 12-49".

Wire Group



fig. 12 - 42 Show Program > Wire Group

Wire Group offers the option of combining individual wires into a group. This simplifies the renewed selection of the wires. Wire Group association only works if the Filter Group is activated in the selection list (see 1.3).

module list selection

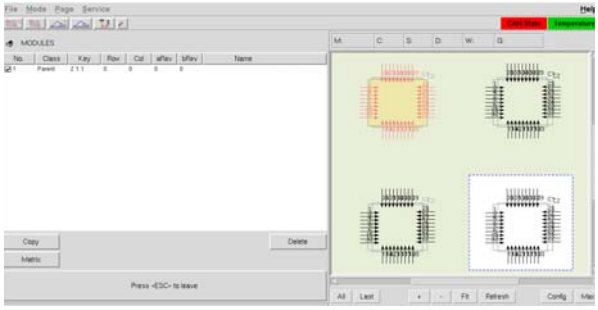


fig. 12 - 43 Show Program > Module list selection

This dialog lists the modules highlighted in "Show Program" and makes available different functions for editing them. The wires can be removed from or added again to the selection using the check/tick symbols in the left-hand column.

IMPORTANT

The bond program display must be in Module mode (see "Modules" on page 12-13).

- Copy: Opens a dialog for copying the modules
- Matrix: Opens a dialog for matrix copying the modules
- Delete: Deletes the selected modules

copy modules

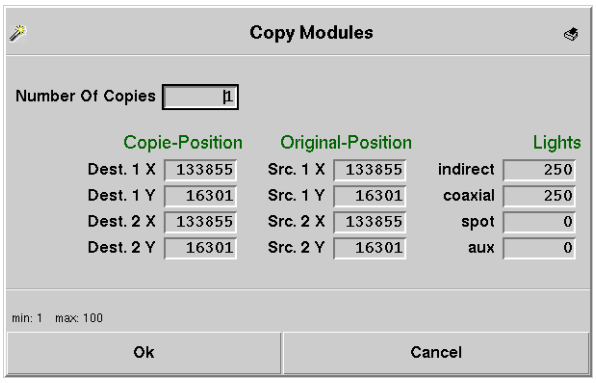


fig. 12 - 44 Show Program > Copy Modules

Copy Modules generates one or more client copies of the currently selected modules.

- Number of Copies: Number of copies
- Copy Position: Coordinates of a point in the copy
- Original Position: Coordinates of the (same) point in the original

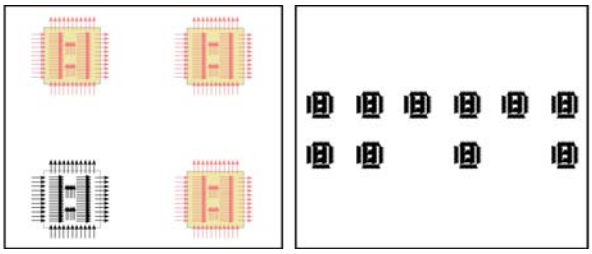


fig. 12 - 45 Show Program > Copy Modules (Original>Copy)

module matrix

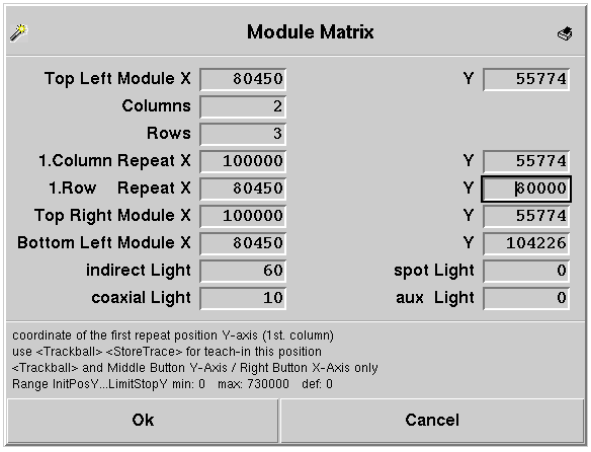
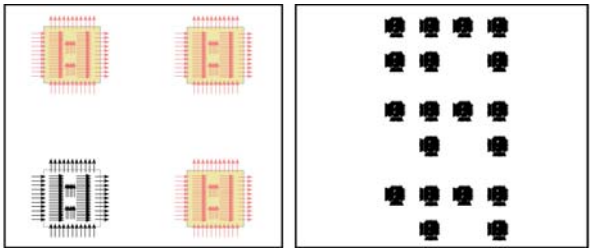


fig. 12 - 46 Show Program > Module Matrix

Module Matrix generates one or more client copies in a grid.



Original

Copy 2 columns, 3 rows

fig. 12 - 47 Show Program > Copy Modules (Original>Copy)

12.9.2 File (main menu)

Commands for managing the bonder operating system and all bonding programs.

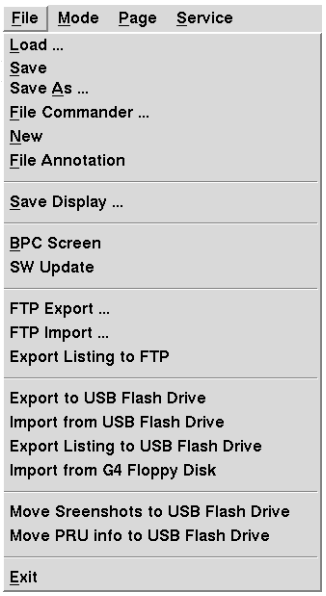


fig. 12 - 48 File menu

- **Load:** Load the existing program from the program library (see "load..." on page 12-19)
- **Save / Save as:** Save a copy of the currently active program in the program library (see "Save / Save as ..." on page 12-21)
- **File Commander:** Management of the bond programs (see "file commander" on page 12-21)
- **New:** Creates a new bond program (see "new" on page 12-22)
- **File Annotation:** Saves comments on the currently loaded bond program (see "file annotations" on page 12-23)
- **Save Display:** Save the last camera image in the customer-accessible (via FTP) part of the hard disk (see "Save Display" on page 12-23)
- **BPC Screen:** Switch over to the bonding process control monitor (see "BPC screen" on page 12-23)
- **SW Update:** Software updates via USB stick (see "SW update" on page 12-24)
- **FTP Export...:** (FTP: File Transfer Protocol) Export a bond program from the program library to the customer-accessible (by FTP) part of the hard disk (see "FTP Export..." on page 12-24)

- **FTP Import...:** (FTP: File Transfer Protocol) Import a bond program from the customer-accessible (by FTP) part of the hard disk to the program library (see "FTP import..." on page 12-25)
- **Export Listing to FTP:** Generates a list of the bond program with all the parameters for export via FTP
- **Export to USB Flash Drive:** Exports a bond program from the program library onto a USB stick connected to the machine (see "Export to USB Flash Drive" on page 12-25)
- **Import from USB Flash Drive:** Imports a bond program from a USB stick connected to the machine into the program library (see "Import from USB Flash Drive" on page 12-26)
- **Export Listing to USB Flash Drive:** Generates a list of the bond program with all the parameters for export via USB
- **Move Screenshots to USB Flash Drive:** Moves the screenshots stored on the server to a USB stick (see "Move Screenshots to USB Flash Drive" on page 12-26)
- **Move PRU info to USB Flash Drive:** Moves the stored additional information from Mode 1, Mode 2 and Mode 11 to a USB stick (see "Move PRU info to USB Flash Drive" on page 12-26)
- **Exit:** Runs the software down, usually to be able to switch off the bonder subsequently without data loss (see "Exit" on page 12-27)

load...

Load the existing program from the program library.

When you load a program from the library or when you write a new program, focus height and bond height are set to "500 µm" in order to avoid collision with a higher device.

Entries you made beforehand are lost if you did not already save them in a bonding program. That is why a confirmation request follows.

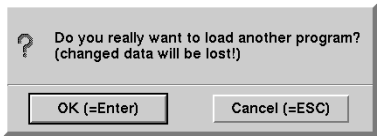


fig. 12 - 49 File > Load: Confirmation prompt

- Press "enter" (OK): Load a new program (or press "escape" (Cancel): Do not load the new program, e.g. in order to first save the program in the bonder's cache memory (see "Save / Save as ..." on page 12-21).

To load a new program:

- Select the directory under "Directory".
- Select the desired bond program from the program library with the cursor keys.

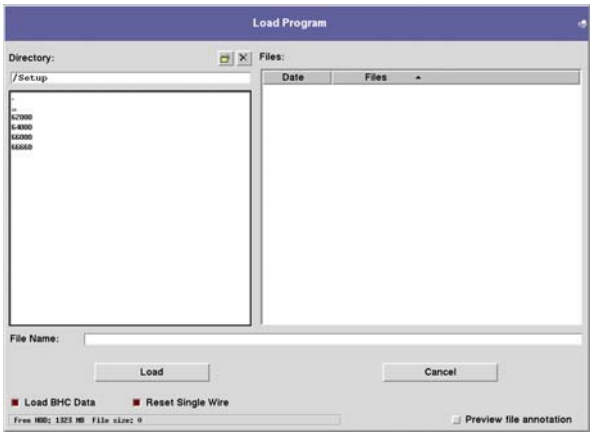


fig. 12 - 50 File > Load: Program library

When the bond program has been selected a layout preview is displayed on the left side.

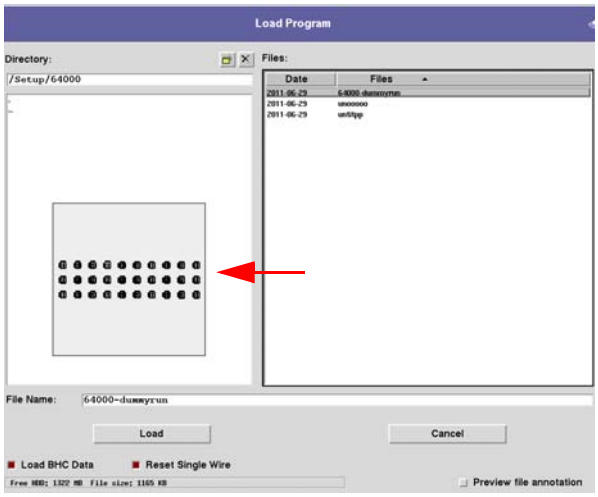


fig. 12 - 51 File > Load: Program library (layout preview)

- Activating "Preview file annotation" enables you to see a comment, if any, about the selected bond program.

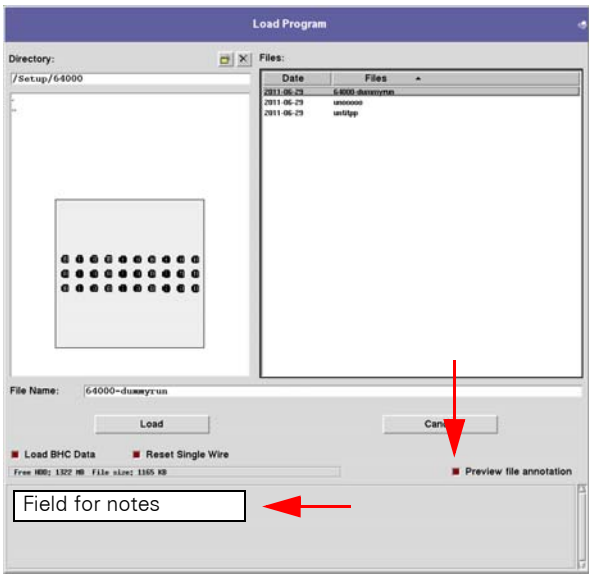


fig. 12 - 52 File > Load: Program library with saved note

Check buttons

- Load BHC Data: Activates adoption of the hardware parameters (see "BHC Parameters (page 1)" on page 12-83) from the bond program to be loaded. Usually the hardware parameters from the product-specific bond program are loaded. When the function is deactivated only the module, chip and wire parameters are adopted.
- Reset Single Wire: When active, the bond heights and focus heights are reset and must then be set again. This function should be activated if the heights of the device holder can change in the case of a change of product in order to avoid bond head collisions. If there is no change in height, this function can be deactivated.

Save / Save as ...

Save the active program in the program library. Use the keyboard to assign the program a suitable, characteristic name.

You must comply with the following naming conventions: maximum 254 characters, no special characters and no blanks.?File names are shown only to a maximum length of 60 characters, but you can spool the name through the field.

Proceed as follows:

- Create a directory for the filing under "Directory".

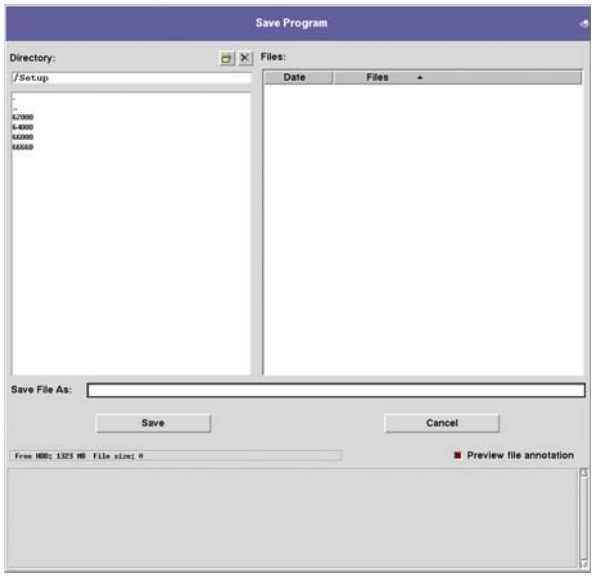


fig. 12 - 53 File > Save as...: Program library

- Enter the name of the file in the "Save File As" field.
- Press "Save": Save, or press "Cancel": Cancel the save procedure).

If a file with the same name already exists, the following confirmation prompt is issued:

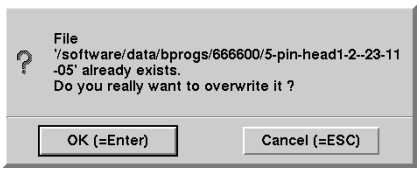


fig. 12 - 54 File > Save as...: Are you sure? query

- Press "enter" (OK): Save (file is overwritten) or press "escape" (Cancel): Cancel the save procedure.

The "Save" function can be used for renewed saving.

file commander

Management of the bond program.

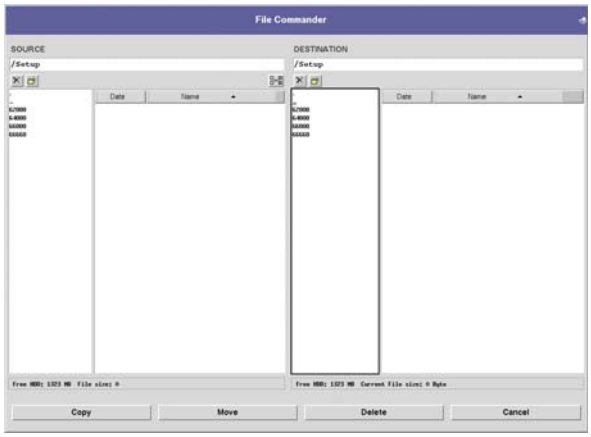


fig. 12 - 55 File > File Commander

You can use "File Commander" to copy or move bond programs in the directory tree of the program library, create new directories and delete bond programs and empty directories.

Proceed as follows to copy, move and delete the bond programs:

- Use the mouse or the cursor key and the "Enter" key to select the program or programs you want in the left column. The button on the right over the left column makes it possible to select or deselect all programs in the current directory at the same time.
- If you want to use the "Copy" or "Move" function, you have to select a target directory in the right column.
- Press the function button:
  - **"Copy" button:** Copies the bond program selected on the left to the directory selected on the right
  - **"Move" button:** Moves the bond program selected on the left to the directory selected on the right
  - **"Delete" button:** Deletes the bond program selected on the right
  - **"Cancel" button:** Aborts the process.

The operations on the directory level will be performed using the two buttons next to the "Directory" label above the bond program displays.

Incidentally this also functions for "Load" and "Save As" in the same way!

- Click on the left button to create a new subdirectory. A dialog opens so that you can enter a name for the new subdirectory. Confirming (pressing "OK") will create the new directory while the process can be aborted using the "Cancel" button.
- The right button deletes the selected subdirectory, but only if it is empty.

IMPORTANT

The active bond program cannot be deleted. Deleted bond programs are moved to the recycling bin and if these are deleted from this folder, they are deleted finally.

new

Creates a new bond program. All program-specific values are reset to the defaults so that you can start programming.

Entries you made beforehand are lost if you did not already save them in a bonding program (see "Clear Program (Mode 52)" on page 12-79). You are therefore prompted for confirmation:

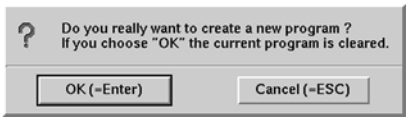


fig. 12 - 56 File > New: Confirmation prompt

- Press "enter" (OK): Create a new program (or press "Escape" (Cancel): Cancel the process).

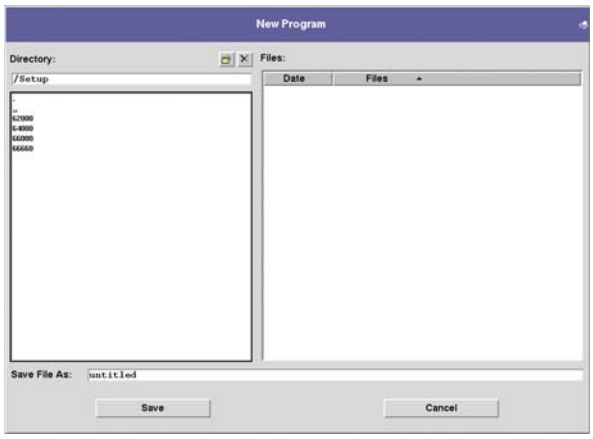


fig. 12 - 57 File > New: Program library

- Select or create a folder for the filing under "Directory".
- Enter the name of the file in the "Save File As" field.
- Press "Save": Save, or press "Cancel": Cancel the save procedure.

file annotations

Saves a comment relating to a loaded or created bond program.

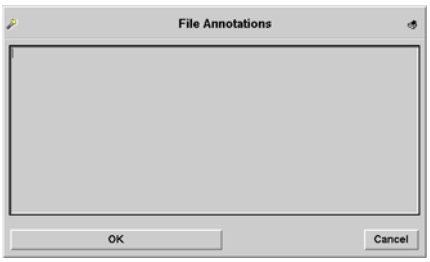


fig. 12 - 58 File > File Annotation

- Create a bond program or load one from a library.
- Select "File Annotations".
- Enter or amend a comment for the loaded bond program.
- Click on "OK": Comment is saved (or press "Cancel": Cancel the process).

Save Display

Save the last camera image in the customer-accessible (via FTP) part of the hard disk.

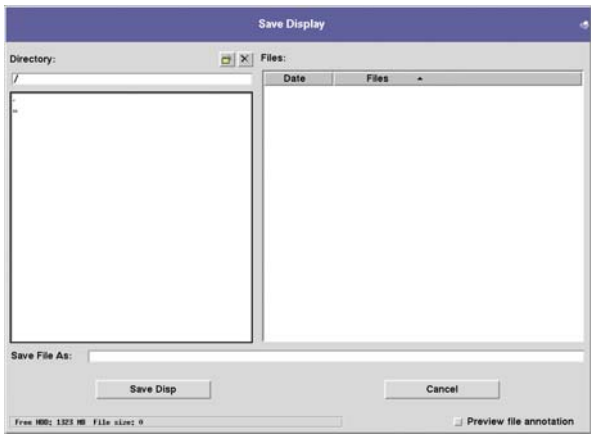


fig. 12 - 59 File > Save Display

A "File Save" dialog opens (see "Save / Save as ..." on page 12-21). The file name of the image can be defined by this means.

BPC screen

Switch to the bond process control monitor. Bond process control is an autonomous program that outputs up-to-date information on the bonding process and bonding quality while production is in progress (see 12.11 "Bond process control (BPC)" on page 12-150).

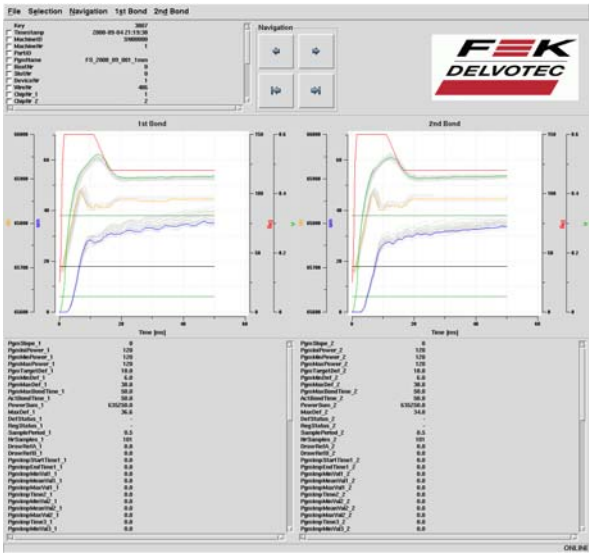


fig. 12 - 60 File > BPC Screen

To exit the BPC screen:

Press "stop" or use the trackball to select "File > Bonder Screen" from the menu.

SW update

Software updates via USB stick. Software updates can be downloaded from a USB memory stick with this function. A terminal window opens, in which the progress of the update is displayed. Please follow the instructions shown here.

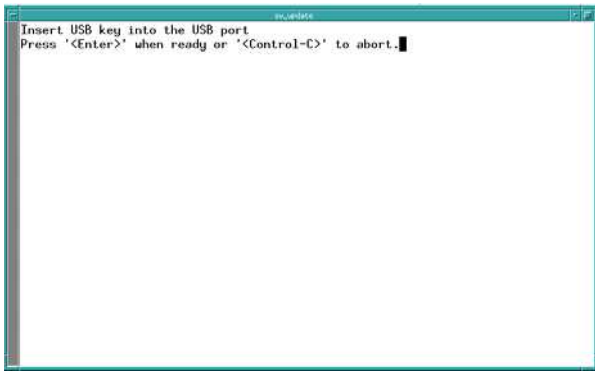


fig. 12 - 61 File > SW Update

- To perform a software update, plug in the USB stick containing the software update, wait 5 seconds and then press "Enter".
- Activate "Ctrl-C" after the update to return to the default user interface (GUI).
- Restart the bonder software. In the File menu, select "File">"Exit" and press "Enter".

FTP Export...

Export a bond program from the program library to the customer-accessible (by FTP) part of the hard disk.

A dialog very similar to the "File Load" dialog opens; the only difference is that much like the left column in "File Commander", you can select multiple files.

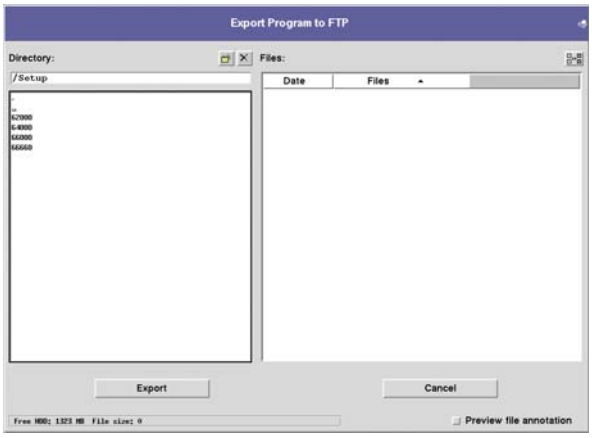


fig. 12 - 62 File > FTP Export...

Select the bond programs of your choice in the usual way and click on the "Export" to copy them to the "/pub/export/bprogs" directory of the local FTP server (see 12.13 "FTP access" on page 12-162).

These files can be accessed by FTP from another computer in the network.

FTP import...

Import a bond program to the program library to the customer-accessible (by FTP) part of the hard disk.

A window similar to that of the "File Commander" opens, with the directories and programs of our local FTP area listed on the left and the directories and programs of the program library on the right (see 12.13 "FTP access" on page 12-162).

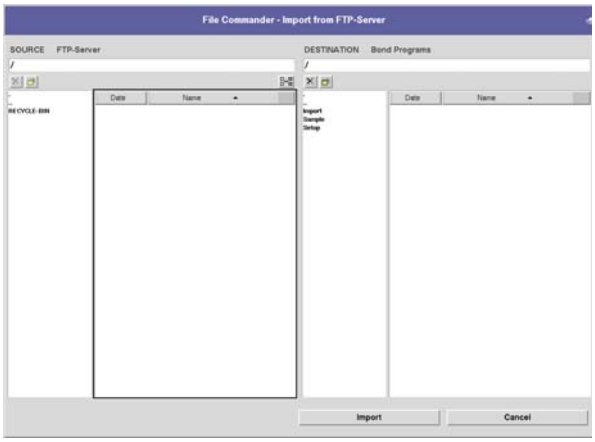


fig. 12 - 63 File > FTP Import...

Once one or several programs have been marked on the left-hand side, they can be imported into the directory selected on the right by activating the "Import" button.

Pressing "Escape" on the keyboard or hitting the "Cancel" button ends the dialog.

Export to USB Flash Drive

Copies a bond program from the program library to a USB stick that is connected to the machine.

Much as in with "FTP Export", a dialog very similar to the "File" > "Load" dialog opens; the only difference is that much like the left column in "File Commander", you can select multiple files.

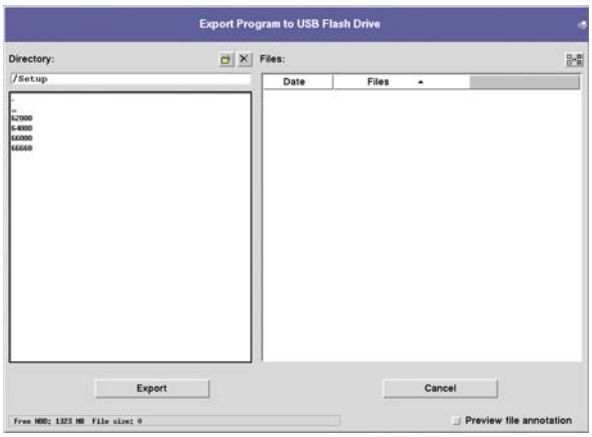


fig. 12 - 64 File > Export to USB Flash Drive

By this means the desired bond program is selected as usual. Access to the USB stick is not attempted until you click on the "Export" button. If it is missing or problems with accessing occur, error messages appear at this juncture for the first time.

As usual, you can press "Escape" on the keyboard or hit the "Cancel" button to end the procedure.

Import from USB Flash Drive

Copies a bond program from a USB stick connected to the machine to the program library.

Next an attempt is made to access a USB stick connected to the machine. If this succeeds, a "File Commander" window opens:

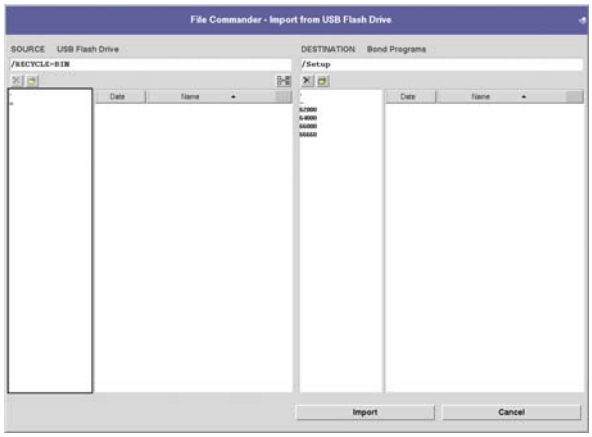


fig. 12 - 65 File > Import from USB Flash Drive

On the left-hand side the directories and bond programs on the USB stick are displayed, on the right next to this the bond programs and directories of the program library.

Once one or several programs have been highlighted on the left-hand side, they can be imported into the directory selected on the right by activating the "Import" button.

Pressing "Escape" on the keyboard or hitting the "Cancel" button ends the dialog.

Move Screenshots to USB Flash Drive

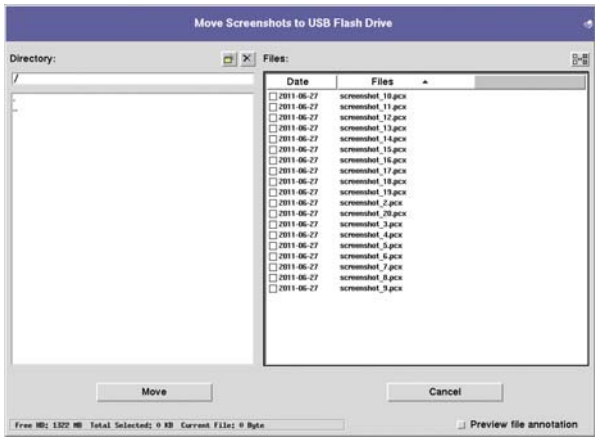


fig. 12 - 66 File > Move Screenshots to USB Flash Drive

Moves the screenshots stored on the server to a USB stick.

Move PRU info to USB Flash Drive

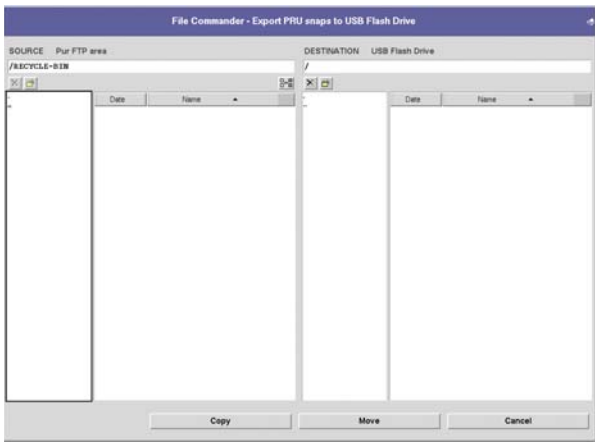


fig. 12 - 67 File > Move PRU info to USB Flash Drive

Moves the stored additional information from Mode 1, Mode 2 and Mode 11 to a USB stick (see "Additional information" on page 12-30).

Exit

Runs down the software, usually to be able to then switch off the bonder without data loss or for a restart after a software update.

You may want to save the program in the bonder's main memory before you call the Exit command (see "Save / Save as ..." on page 12-21).

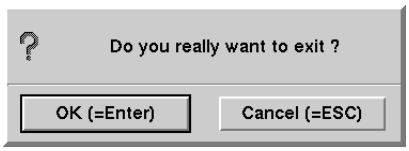


fig. 12 - 68 File > Exit: Security question 1

- Press "enter" (OK): Exit the program (or press "escape" (Cancel): Cancel quitting the program).

If the program has no longer been backed up after the last amendment, a confirmation request appears once again.

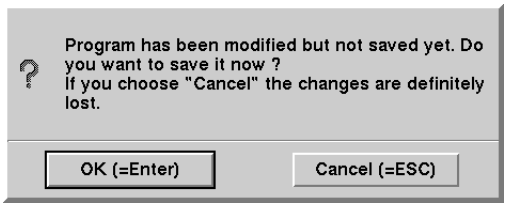


fig. 12 - 69 File > Exit: Security question 2

- Press "enter" (OK): Save the program before running down (or press the "Escape" key (Cancel): runs down without saving the bond program).

IMPORTANT

If the "Cancel" button is activated, all program changes since the last save are irreversibly lost!

12.9.3 Mode (main menu)

All modes for programming the bonding procedure.

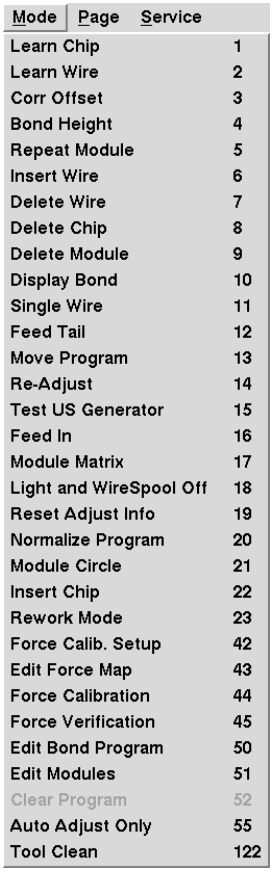


fig. 12 - 70 Mode menu

- **Learn Chip:** Input of the programming chip and module designation (see "Learn chip (mode 1)" on page 12-29)
- **Learn Wire:** Programming of the bond points (see "Learn Wire (mode 2)" on page 12-45)
- **Corr Offset:** Mode for calculating the discrepancy between the optical axis (crosshairs) and the mechanical axis (bond head, bonding tool) (see "Corr Offset (Mode 3)" on page 12-56)
- **Bond Height:** Determination of the bond height (see "Bond Height (Mode 4)" on page 12-58)
- **Repeat Module:** Manual module replication (see "Repeat Module (mode 5)" on page 12-59)
- **Insert Wire:** Add a wire (see "Insert Wire (Mode 6)" on page 12-60)
- **Delete Wire:** Remove wire from the program (see "Delete Wire (mode 7)" on page 12-61)
- **Delete Chip:** Removes chips from the program (see "Delete Chip (mode 8)" on page 12-61)

- **Delete Module:** Remove module from the program (see "Delete Module (mode 9)" on page 12-62)
- **Display Bond:** Displays the bond position to check its positioning precision (see "Display Bond (mode 10)" on page 12-62)
- **Single Wire:** Defines parameters to be able to bond individual wires (see "Single Wire (mode 11)" on page 12-63)
- **Feed Tail:** Makes a defined tail length after a wire change, threading or after manual feeding (see "Feed Tail (mode 12)" on page 12-66)
- **Move Program:** Move an existing bond program along the XY-axis (see "Move Program (mode 13)" on page 12-67)
- **Re-Adjust:** Readjustment of the module position, for example after device removal (see "Re-Adjust (Mode 14)" on page 12-68)
- **Test US Generator:** Checks the US generator, bond force and TD sensor (see "Test US Generator (mode 15)" on page 12-68)
- **Feed In:** Approaches a suitable position for threading the wire or changing the tools (see "Feed In (mode 16)" on page 12-70)
- **Module Matrix:** Make a meandering copy of the modules by specifying columns and rows (see "Module Matrix (mode 17)" on page 12-71)
- **Light and WireSpool Off:** StandBy mode (see "Light and WireSpool Off (mode 18)" on page 12-72)
- **Reset Adjust Info:** By means of this function the saved reference point shifts are reset (see "Reset Adjust Info (mode 19)" on page 12-72)
- **Normalize Program:** Use the last detected material position (shift all coordinates in the bond program) (see "Normalize Program (mode 20)" on page 12-73)
- **Module Circle:** Circular duplication of the modules (see "Module Circle (mode 21)" on page 12-73)
- **Insert Chip:** Defines additional chips (see "Insert Chip (Mode 22)" on page 12-76)
- **Force Calib. Set-up:** Setting for calibration of the bond force (for advanced users (process engineers) and F&K Delvotec Service Technicians only) (see "Force Calib. Setup (mode 42)" on page 12-76)
- **Edit Force Map:** Amendment of the calibration table (see "Edit Force Map (Mode 43)" on page 12-77)
- **Force Calibration:** Automatic calibration of the bond force (see "Force Calibration (mode 44)" on page 12-77)
- **Force Verification:** Checking of the bond force calibration (see "Force Verification (mode 45)" on page 12-77)
- **Edit Bond Program:** Displays and changes the wire list of the bond program in the form of a list (see "Edit Bond Program (Mode 50)" on page 12-78)
- **Edit Module:** Displays and changes modules of the bond program in the form of a list (see "Edit Modules (Mode 51)" on page 12-78)
- **Clear Program:** Resets the currently loaded bond program file (see "Clear Program (Mode 52)" on page 12-79)
- **Auto Adjust Only:** Serves as a cycle for the new detection of the wires of the entire bond program. This is required to repair individual wires which are then bonded using the Rebond function
- **Tool Clean:** Automatic tool cleaning (see "Tool Clean (Mode 122)" on page 12-79)

Learn chip (mode 1)

Enter the designations for the chip and module you want to program:

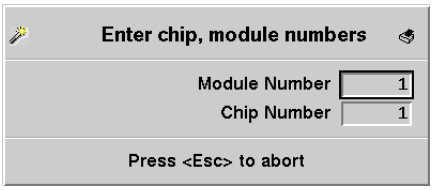


fig. 12 - 71 Mode > Learn Chip (Mode 1)

Parameter (Learn Chip)	Description / *Value range, unit*
Module number	Number of the module on which the chip is programmed. (Start at "1" when assigning numbers; the system will not accept "0" as an entry for the module number.)
Chip Number	Number of the chip to be programmed. (Assign numbers from "1"; Chip "0" can be used as component recognition, but it can not be duplicated to other modules).

▶ Press "Enter" to confirm your entries.
The Learn Chip menu appears on the display.



fig. 12 - 72 Mode > Learn Chip (Mode 1)

Parameter (Learn Chip)	Description / *Value range, unit*
Chip No.	Number of the chip to be programmed.
1st. Adjust. X 1st. Adjust. Y	Coordinates of the first adjust point. *µm*
Ref. Pict. 1	The reference pattern number (assigned automatically) that matches the adjust point.
Ref.-Chip No.	Reference chip number that bonding-position correction will be referenced to if "Use Ref.-Chip" is activated.
Ultrasonic Time	Ultrasonic time; you can determine these values beforehand in single-bond mode 11 or enter them as empirical values. *1 ... 255*
Bond Force	Programmed bond force (see "BHC Parameters (page 1)" on page 12-83) *cN or digit*
Clamp Flag	Clamp parameter *0: Clamp closes at loop?height* *1: Clamp closes at ramp position of the destination bond.* *2: Clamp closes only after bonding at bond height.* *3: Clamp closes at loop height, absolute wire length is selected. Wire consumption is kept constant, loop height is variable.* *Press the right mouse button for more options. These options will be shown in the graphic display.*
focus	Z coordinates at which the images taken can be sharply detected. As soon as the cursor is in the menu field, the bond head can be moved by means of the trackball in axis Z up to limit Z (page 1). *µm*
2nd. Adjust. X 2nd. Adjust. Y	Coordinates of the second adjust point *µm*

Parameter (Learn Chip)	Description / *Value range, unit*
Ref. Pict. 2	The reference pattern number (assigned automatically) that matches the adjust point.
Use Ref.-Chip	Activation or deactivation of bonding-position correction referenced to some other (target) chip.
Ultrasonic Power	US-power; the power to be set is dependent on the wire diameter and bonding material used. *0 ... 255*
TouchDown Force	The force with which the bonding tool contacts the chip. *cN or digit*
Abs. Loop Height	0: Automatic loop height specification of the wire length (is specified using the loop height factor (XYLoopHFct.)). Input > 0: Absolute loop height travelled over the source bond. *µm*
Chip Name	Text description of the chip (max. 30 characters).
Diag. Tolerance	After the adjustment the (absolute) difference between the distance that was found and the distance that was programmed for the two adjustment points will be compared. An error message is issued if the difference is outside the selected tolerance range. *µm (0 = no check)*
MCP Device #	For machines in lines only: Assignment of numbers to chips in order to identify the subordinate bonding programs.

- **PRU Parameters:** PRU parameters of the image processing (see "PRU Parameters 1st./ 2nd. Adjust Point (Learn Chip)" on page 12-31)
- **Bond Parameters:** Bonding parameters for each individual chip. (see "Bond Parameters (Learn Chip)" on page 12-34)
- **Adjust:** Alternative adjust points (see "Adjust (Learn Chip)" on page 12-37)
- **Loop Parameters:** Loop parameters for each individual chip. (see "Loop Parameters (Learn Chip)" on page 12-37)
- **Tear Parameters:** (see "Tear Parameters (Learn Chip)" on page 12-44)

Proceed as follows to bring the image on the monitor into focus:

- If applicable, switch on the lighting.
- Use the trackball to move the crosshairs over the device.
- Position the cursor in the focus menu field (this automatically activates the Z axis) ad use the trackball to focus the image.
- Position the cursor in the 1. Adjust. X menu field and use the trackball / crosshairs to position accurately on this adjust point.
- Press "Store Trace" to save the coordinates (if "autoadjust" is bright to show that this function is activated, the machine saves the reference pattern at the same time).
- Press "Escape" (Cancel): Exit the menu.

Additional information

Option of saving additional display analysis information for service purposes in the FTP area.



fig. 12 - 73 Save Single Task

Information on the current image processing task



fig. 12 - 74 Save Display

Saves the camera image and graphs



fig. 12 - 75 save image

Saves the camera image from the image processing system (raw image)

Special functions

- digit. video: Inserting the trained search pattern into the video display
- Adjust: Executing the programmed pattern recognition for test purposes
- Pru: Deleting the last result display in the video display

PRU Parameters 1st./2nd. Adjust Point (Learn Chip)

You can set the PRU parameters for image processing in the Learn Chip menu. PRU parameters 1st. comprise the values for the first adjust point.

The values of the second adjust point are selected with the right-hand button "PRU Parameters". The parameter definitions and programming of the second adjust point comply with the description of adjust point 1 with the exception of the (optional) "DoubleSearch" points.

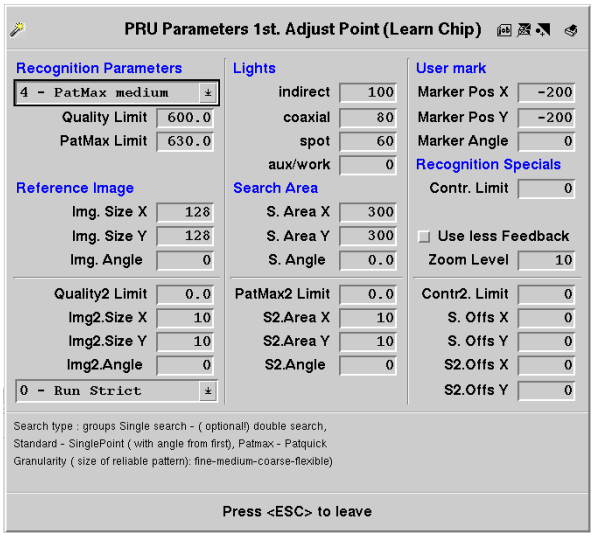


fig. 12 - 76 Mode > Learn Chip (Mode 1) > PRU Parameters

IMPORTANT

See the notes on pattern recognition (see 12.12 "Pattern recognition unit (PRU)" on page 12-158).

SINGLEPOINT SEARCH - STANDARD SEARCH

If the bond position is after the search pattern there is no need for a second search, because the angle offset is taken directly from the first search pattern.

PATMAX - PATQUICK

PatQuick is the basic step of PatMax. Quicker but less precise due to a lower resolution (resolution or evaluation resolution 0.2 pixels). A finer sample search is attained with the new type of setting PatMax due to the higher resolution (resolution or evaluation resolution 0.02 to 0.05 pixels).

GRANULAR CONDITION - FINE, MEDIUM, COARSE, FLEXIBLE

This classification defines the quality of the optical image:

- fine: fine, reliable structures
- medium: standard method
- coarse: unreliable/random fine structures with (only) assertive larger element orientations (e.g. granular prints).
- flexible: the standard method medium serves as the basis, but with additionally allowed X and/or Y scaling.

SINGLESEARCH - DOUBLESEARCH (OPTIONAL)

SingleSearch with a centred search sample has to be regarded as the standard process. Several situations, however, allow a time-saving expanded solution by DoubleSearch:

- 301 - Double PTM med (PatMax medium): small chip - both corners visible
- 302 - Free Dbl PTM m (PatMax medium): simulation of a free second chip sample or an alternative model (see also Drop-Down DoubleSearch).
- 303 - D-Reduced PTQ m (PatQuick medium), 304 - D-Reduced PTM m (PatMax medium): One sample is sufficient. Both (identical) search samples are set automatically so that evaluation is made first of all with the small search range and, if needed, with the large search range.

Parameter (PRU param.)	Description / *Value range, unit*
Recognition Parameters	
Drop-Down Menu	Possible search processes Fast or rough search 0 - PatQuick fine 1 - PatQuick medium 2 - PatQuick coarse High resolution search 3 - PatMax fine 4 - PatMax medium 5 - PatMax coarse 7 - PatMax med-flexible Fast or rough single point search 10 - SP PatQuick fine 11 - SP PatQuick medium 12 - SP PatQuick coarse High resolution single point search 13 - SP PatMax fine 14 - SP PatMax medium 15 - SP PatMax coarse 17 - SP PatMax med-flexible Gray value range search 101 - AREA NSearch 102 - AREA N_CNL 103 - AREA ASearch 105 - AREA NONLIN Optional search processes 301 - Double PTM med 302 - Free Dbl PTM m 303 - D-Reduced PTQ m 304 - D-Reduced PTM m
Quality Limit	Minimum permissible quality of the sample evaluation for a successful search/detection. *min: 0‰; max: 1000‰* *def: 400‰*
PatMax Limit	Optional additional quality requirement for a successful search/detection that PatMax also performs. *min: 0‰; max: 1000‰* *def: 400‰*
Reference Image	
Img. Size X	Size of the reference image
Img. Size Y	*0 ... 220 pixels*
Img. Angle	Rotation of the search window. This hides critical structures. *Unit: 0.1 °*
Lights	See 12.12.5 "Adjusting the lighting" on page 12-161
indirect	Exposure value for the diffuse lighting (metal plate as deflector unit). *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
coaxial	Exposure value for the coaxial lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
spot	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
aux	Exposure value for optional lighting on the bond head. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
Search Area	
S. Area X	Search area of the reference pattern. *0 ... 440 pixels*
S. Area Y	
S. Angle	Maximum permissible angle twisting relative to the taught-in reference image. *Unit: 0.1 °*
User Mark	
Marker Pos X	Positions X and Y of the definable marking for "Manual Alignment". *+/- 120 pixels*
Marker Pos Y	
Marker Angle	Setting of a possible twisting of the definable marking for "Manual Alignment". *° (degrees)*

Parameter (PRU param.)	Description / *Value range, unit*
Recognition Specials	
Contr. Limit	Auxiliaries for selection of the model contrast transitions with difficult samples. To be used only if the automatic system is not sufficient. *0 ... 255*
Use less Feedback	Upon activation of this option the information additionally superimposed on the video screen is limited to a minimum.
Zoom Level	Factor from -10 to +10 used to enlarge or reduce the video picture. This zoom setting is also used for the display of bond positions that are assigned to this detection point.
Quality2 Limit	Search function for the optional 2nd search. These functions with the associated parameters for the double search are only active after installation of the optional search processes 301 to 304.
PatMax2 Limit	
Contr2. Limit	

Parameter (PRU param.)	Description / *Value range, unit*
Drop-Down Menu	Double search 0 - Run strict: Both searches must be successful, otherwise the sample search counts as being defective. BPS (Bond Program Sequencer) uses both results for Adjust 1 and Adjust 2. 1 - Run All: Both samples are searched for, BPS (Bond Program Sequencer) selects the qualitatively better result. 2 - Run first OK: The search is commenced with the first sample. If both models fail, a manual adjust procedure must be performed. 3 - Run Reverse OK: The search is commenced with the second sample. Should both models fail, a manual adjust process has to be performed. 4 - Run Last Success: First of all the sample last successful sample is searched for. In the event of an error the next search changes automatically to the other sample. Should both models fail, a manual adjust process has to be performed.

You can enter the values for the reference area using the number keys or with the aid of the "display trace" key. If you use the "display trace" key, the procedure is as follows:

- Position the cursor in the desired menu field.
- Press "display trace".
- Use the cursor keys to select the size of your choice.
- Press "Enter" to save your settings.
- Press "Escape" (Cancel): Exit the menu.?

You can program the search area in the same way. Always define a search area that is larger than the size of the reference image.

Bond Parameters (Learn Chip)

This is where you set all bonding parameters for each individual chip, for example bond height, touchdown and BPC values and the ultrasonic power for welding.

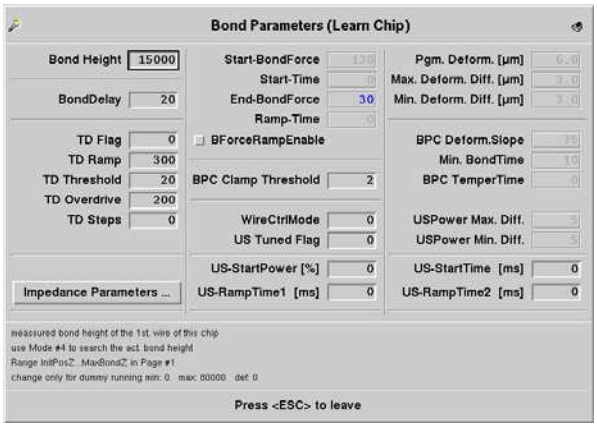


fig. 12 - 77 Mode > Learn Chip (Mode 1) > Bond Parameters

Parameter (Bond param.)	Description / *Value range, unit*
bond height	The measured bond height from mode 4 is entered automatically. *µm*
Bond Delay	Delay before US power is started. *ms*
TD Flag	Touchdown parameter; leave the setting at TD Flag 1, because TD Flag 0 is only for adjustment during testing. *0: Without touchdown, bond head moves to preset bond height* *1: Software touchdown*
TD ramp	Height above measured bond height at which the change to TD search speed takes place; applicable only if "TD Flag 1" is set. *10 ... 500 µm; def. 200 µm*
TD Threshold	Sensitivity of the touchdown sensor. *1 ... 200*

Parameter (Bond param.)	Description / *Value range, unit*
TD Overdrive	Max. distance travelled below measured bond height over which touchdown is still active. *150 ... 500 µm for TD Flag 1*
TD Steps	Touchdown steps are used only in conjunction with flag 1. TD steps to ensure that the wire can still be deformed during bonding. Standard setting: approx. 0.5 fold wire diameter. Precondition: TD Flag is 1 (software touchdown, searches for threshold of TD offset). *µm*
Start-Bond Force	Bond force effective directly after the ultrasonic generator starts and for the duration of the start time. This parameter is set on Page 1 *cN or digit*
Start-Time[1]	Time during which the start bond force is effective directly after the ultrasonic generator. Maximum value: Min. Bond-Time *0 ... 250 ms*
End-Bond Force	Value to which the bond force is increased during the ramp time. This parameter is set on Page 1 *cN or digit*
Ramp Time [1)]	Time in which the start bond force is increased to the end bond force. *Min. BondTime ms*
BForceRamp-Enable	Monitoring of the bonding force during the bonding process is enabled if this checkbox is ticked (see "Check box "BForce Ramp Enable"" on page 12-35). This parameter is set on Page 1

Parameter (Bond param.)	Description / *Value range, unit*
BPC Clamp Threshold	Sets an additional threshold for the TD sensor; as soon as this threshold is reached opening of the wire clamp starts, even though the bond head is still executing the touchdown movement. *0: The clamp is opened after the end of the braking phase*
WireCtrlMode	Parameter for wire control *0: without deformation control* *1: with deformation control* *2: with bond process control (control of US power and bond time)*
US-Tuned Flag	Parameter for ultrasonic generator *0: no control when generator is US-locked* *1: Automatic check that generator is US-locked (generator-dependent function)*
Pgm. Deform.	Programmed deformation. When this value is reached, ultrasonic power goes to minimum until expiry of the additional "Temp Time". *µm*
Max. Deform. Diff. Min. Deform. Diff.	Maximum / minimum deformation. Difference values for deformation control. If one of these values is reached an error message is output and the bonding process is stopped.
BPC Deform.Slope	Defines a US power slope Ultrasonic power is adjusted to achieve harmony between programmed and actual wire deformation. *0 °: no US regulation* *10 ... 89°*
Min. BondTime	Minimum bond time
BPC Temper Time	Time in which the wire is tempered with the minimum ultrasonic power after achieving programmed deformation. *0 ... 250 ms*

Parameter (Bond param.)	Description / *Value range, unit*
USPower Max Diff USPower Min Diff	Difference between maximum and minimum ultrasonic power. Value to be added to or deducted from the initialized US value.
US-Start Power	Target value for US power after the first ramp phase (US Ramp Time 1). *%; value=0, global setting*
US-Ramp Time1	Duration of the first ramp phase, during which US power is ramped up from 0 to the "US-Start Power" value.
US-StartTime	Time during which US power is held steady at the "US-Start Power" value.
US-Ramp Time2	Duration of the second ramp phase, during which US power is changed from the "US-Start Power" value to the target value set in the wire parameters. If bonding is performed with ultrasonic control, automatic control begins at the end of this phase.

1.) The sum of the two values must not exceed 100% of US Time. If it does the two times are automatically set to half of USTime and Min. BondTime.

Check box "BForce Ramp Enable"

Bond force course; when "BForceRampEnable" is selected, the bond force will be increased according to the following pattern.

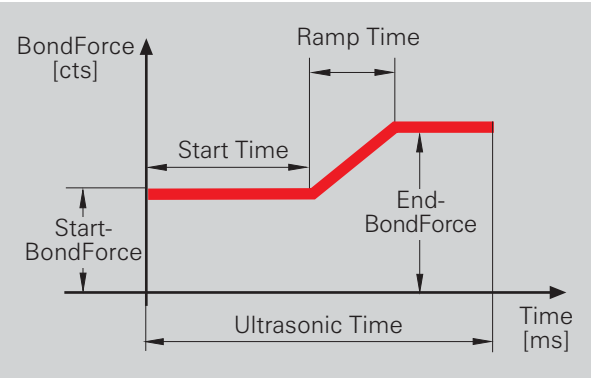


fig. 12 - 78 Mode > Bond Force Progression

Impedance Parameters

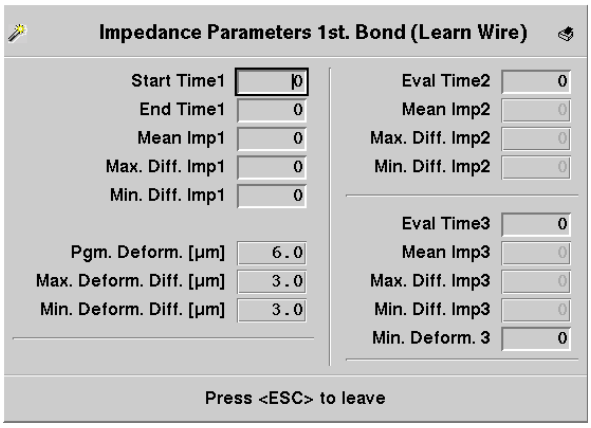


fig. 12 - 79 Mode > Learn Chip (Mode 1) > Bond Parameters > Impedance Parameters

The impedance control is a function that is used to additionally monitor the bond process. See also "12.11.2 Additional function Impedance monitoring" on page 12-151"

Parameter (Impedance param.)	Description / *Value range, unit*
Start Time1	1. Point in time or starting point of the 1st time range, when Start Time1 and End Time1 have the same value, then only the 1st point in time will be analysed. *ms*
End Time1	1st end point or end point of the 1st time range. *ms*
Mean Imp1	Target value of the 1st point in time or the 1st time range.
Max. Diff. Imp1	Upper limit of the 1st point in time or the 1st time range.
Min. Diff. Imp1	Lower limit of the 1st point in time or the 1st time range.
Pgm. Deform	The value is taken from the "Bond Parameters" dialog. *µm*
Max. Deform. Diff. Min. Deform. Diff.	The value is taken from the "Bond Parameters" dialog. *µm*
Eval Time2	2nd point in time when the curve that is displayed falls down. *ms*
Mean Imp2	Target value of the 2nd point in time or the 2nd time range.
Max. Diff. Imp2	Upper limit of the 2nd point in time or the 2nd time range.
Min. Diff. Imp2	Lower limit of the 2nd point in time or the 2nd time range.
Eval Time3	3rd point in time when the curve that is displayed falls down. *ms*
Mean Imp3	Target value of the 3rd point in time or the 3rd time range.
Max. Diff. Imp3	Upper limit of the 3rd point in time or the 3rd time range.
Min. Diff. Imp3	Lower limit of the 3rd point in time or the 3rd time range.
Min. Def. 3	Minimum deformation at the 3rd point in time.

Adjust (Learn Chip)

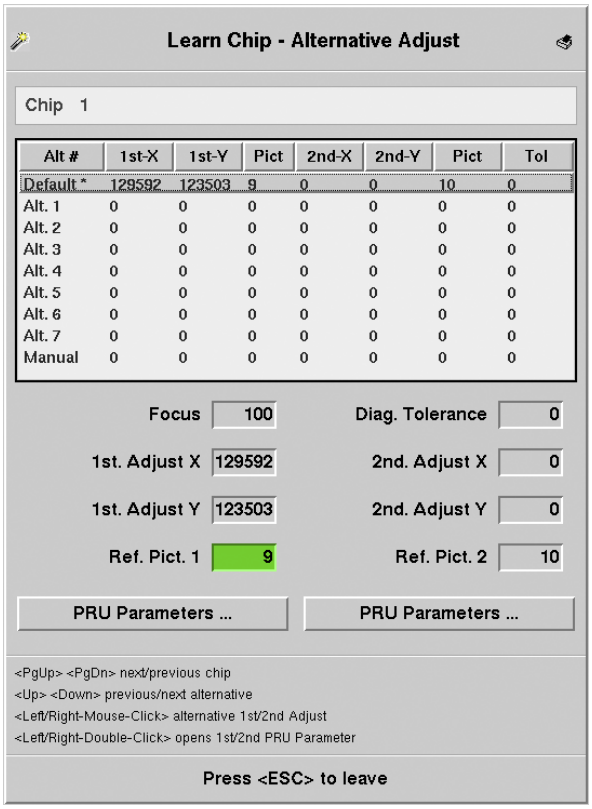


fig. 12 - 80 Mode > Learn Chip (Mode 1) > Adjust (Default)

Alternative adjust points.

One or two adjust points are programmed for each chip (default). With this function it is possible to define alternative adjust points which are resorted to if the default adjust points are not found by pattern recognition (Alt 1 bis 7). In addition, a specific position can be defined for manual alignment using the cross-hairs. In the case of automatic recognition, an attempt it made to recognize all the programmed alternatives as long as up to one recognition is successful. If no automatic recognition is successful, the user is prompted to carry out a manual alignment.

IMPORTANT

Adding alternative adjust points can only be carried out if the bond program was normalized beforehand after successful automatic or manual recognition with the function "Normalize Program" Mode 20.

Loop Parameters (Learn Chip)

Loop parameters, individually programmable for each individual chip. The loop parameters are valid as the default for all wires, the source bond of which is on this chip.

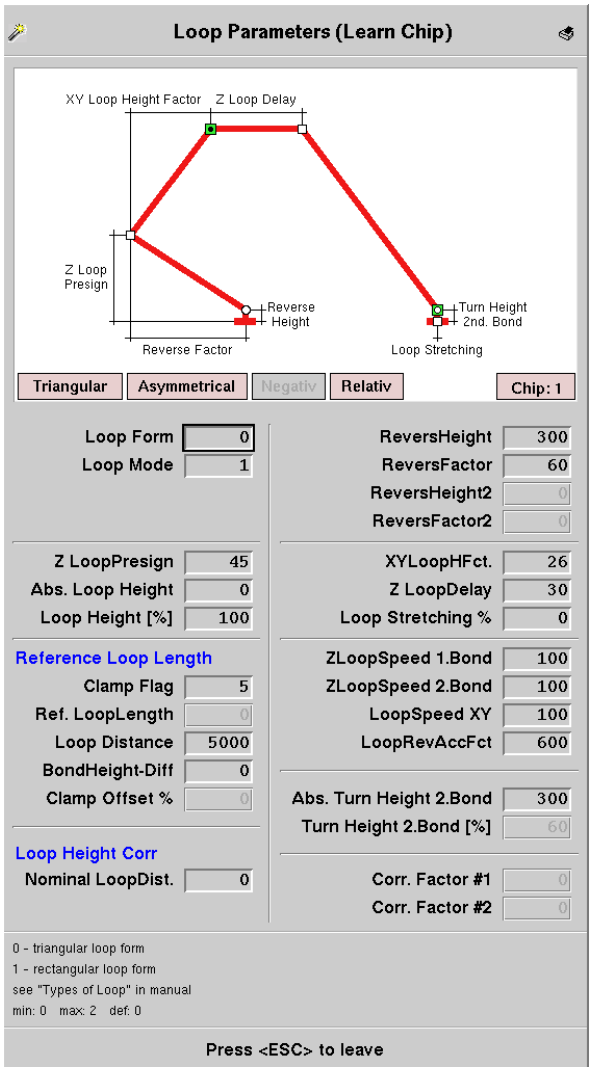


fig. 12 - 81 Mode > Learn Chip (Mode 1) > Loop Parameters

Parameter (Loop param.)	Description / *Value range, unit*
Graphic illustration	Schematic display of the bond head movement when pulling the wire according to the currently set parameters. The corner points can also be moved manually with the mouse. The parameter settings in the dialog change accordingly. *The following loop pre-sets are thereby available:* *- Rectangle / Triangle* *- Asymmetrical / Symmetrical* *- Positive / Negative / no Reverse* *- Absolute / Relative*
loop form	Loop form parameter *0: Triangular loop form* *1: Rectangular loop form* See "Types of loop" on page 12-41
loop mode	Loop mode parameter (this parameter in conjunction with the loop form parameter defines the loop). *0: Standard loop (without reverse)* *1: Positive reverse loop asymmetric, reverse factor in % of loop distance* *2: Positive reverse loop symmetric, reverse factor in % of loop distance* *3: Negative reverse loop symmetric, reverse factor in % of loop distance* *11: Positive reverse loop asymmetric, reverse factor absolute in µm* *12: Positive reverse loop symmetric, reverse factor absolute in µm* *13: Negative reverse loop symmetric, reverse factor absolute in µm* See "Types of loop" on page 12-41

Parameter (Loop param.)	Description / *Value range, unit*
Z LoopPresign	Percentage of loop height over which after the source bond only the Y-axis is in motion, before motion along the other axes starts. Reverse loop: Z LoopPresign is the height reached in reversing. *0 ... 300% of loop height*
Abs. Loop Height	0: Automatic loop height specification of the wire length (is specified using the loop height factor (XYLoopHFct.)). Input > 0: Absolute loop height travelled over the source bond. *µm*
Loop Height	Loop height as a function of loop distance. *5 ... 300 % of loop distance*
Reference Loop Length	
Clamp Flag	Clamp parameter *0: Clamp closes at loop?height* *1: Clamp closes at ramp position of the destination bond* *2: Clamp closes only after bonding at bond height.* *3: Clamp closes at loop height, absolute wire length is selected. Wire consumption is kept constant, loop height is variable.* *Press the right mouse button for more options. These options will be shown in the graphic display.*
Ref. LoopLength	Optional Absolute loop distance to calculate the position where the clamp is connected (only active when ClampFlag = 3 is set). *µm*
Loop Distance	Distance between the source and destination bonds (also known as source and destination bonds) in the X/Y plane. This value can be set here in order to achieve a display of the loop sequence with correct proportions.

Parameter (Loop param.)	Description / *Value range, unit*
BondHeight-Diff	Display of the distance between the source and destination bonds in the Z plane. This value can be set here in order to achieve a display of the loop sequence with correct proportions.
Clamp Offset	Offset of the clamp closing time in per cent of the Z-Loop-Delay. *%*
Loop Height Corr	Perform distance-dependent correction of achieved loop height.
Nominal LoopDist.	Defines the nominal distance of the two bond positions if the value … 0. If the value = 0, loop height correction is deactivated.
Corr. Factor #1	Assuming Nominal LoopDist. … 0 (correction is ON), the loop height achieved is reduced proportionately if actual distance is less than the nominal distance. *Only relevant if "XYLoopHFct." is used. Otherwise, the value under "Nominal Loop Distance" must be increased for a longer distance or reduced for a shorter distance.*
Corr. Factor #2	Assuming Nominal LoopDist. … 0 (correction is ON), the loop height achieved is increased proportionately if actual distance is greater than the nominal distance. *Only relevant if "XYLoopHFct." is used. Otherwise, the value under "Nominal Loop Distance" must be increased for a longer distance or reduced for a shorter distance.*
ReversHeight	Z-height achieved after the source bond before motion in XY direction commences. *Only relevant if "XYLoopHFct." is used. Otherwise, the value under "Nominal Loop Distance" must be increased for a longer distance or reduced for a shorter distance.* *µm*

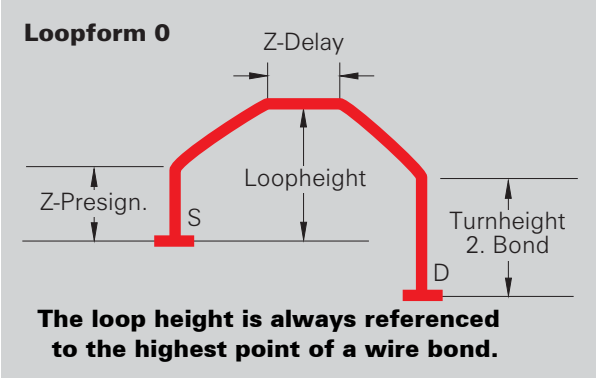
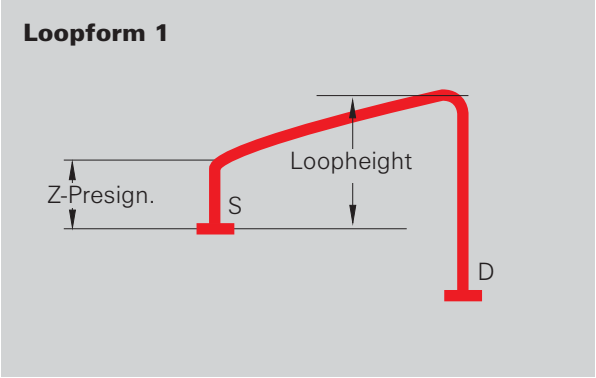
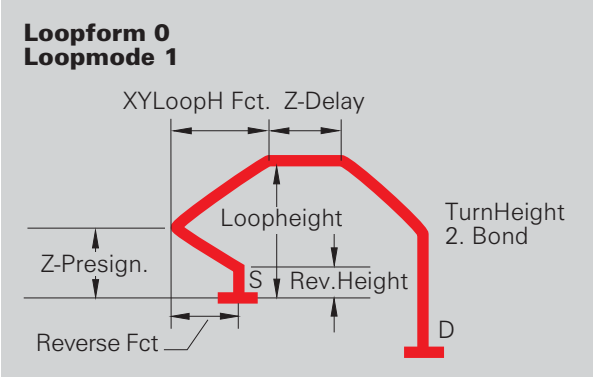
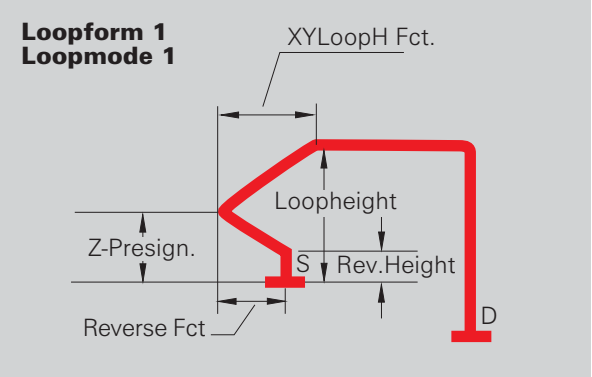
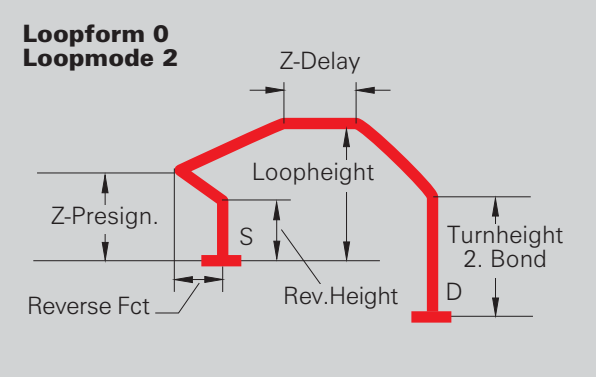
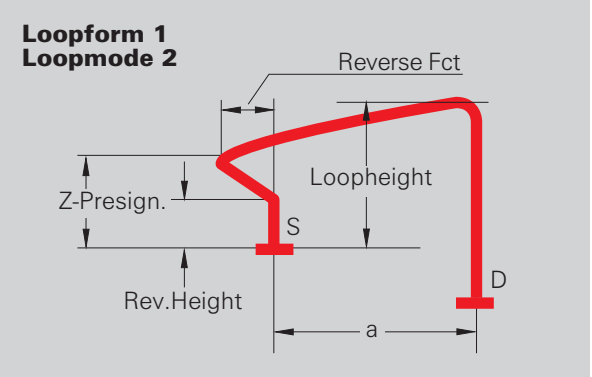
Parameter (Loop param.)	Description / *Value range, unit*
ReversFactor	Percentage of loop distance over which the x/y axes reverse after reaching the Rev.Height. *0 ... 100% (Loop mode 1, 2, 3)* *µm (Loop mode 11, 12, 13)*
ReversHeight 2 ReversFactor 2	Insertion of a second reverse point similarly to ReversHeight and ReversFactor.
XYLoopHFct.[1]	Set this parameter for asymmetric reverse loops only: percentage of total loop distance at which peak of the asymmetric loop is reached. *0 ... 100%*
Z LoopDelay [1)]	Percentage of loop distance for which the Z-axis remains at loop height, while the X- and Y-axes are in motion (triangular loop only). *0 ... 100% of the loop distance*
Loop Stretching	Parameter for compensating the influence of loop distance on loop form. *%*
ZLoopSpeed source bond	Speed of the Z axis after the source bond to loop height. *1 ... 100%*
ZLoopSpeed destination bond	Speed of the Z axis from loop height to TD ramp. *1 ... 100%*
LoopSpeed XY	XY loop speeds during the loop as a function of maximum speed. *1 ... 100% of maximum speed*
LoopRevAccFct	Adjustment factor for the acceleration during the reverse movement. *‰*

Parameter (Loop param.)	Description / *Value range, unit*
Sec. Turn Height Destination Bond	Height at which an additional bond head turn may occur at the end of the loop movement. 0: Automatic determination of the "Turn Height" in % of the ?loop height. Input > 0: the absolute "Turn Height" above the destination bond. *0 ... 50000*
Turn Height destination bond	Percentage of the loop height for the calculation of the "Turn Height", if "Abs. Turn Height Destination Bond" = 0. *%*

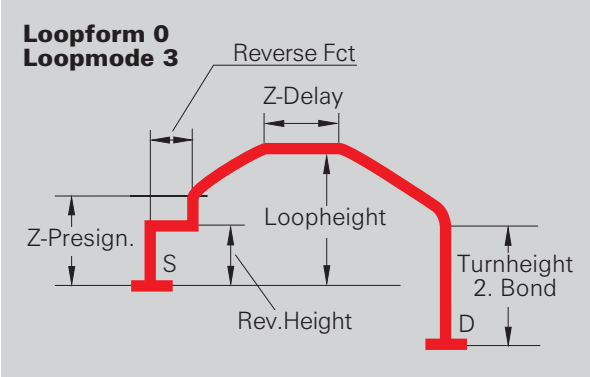
1.) The sum of the two values must not exceed 100% of loop distance.

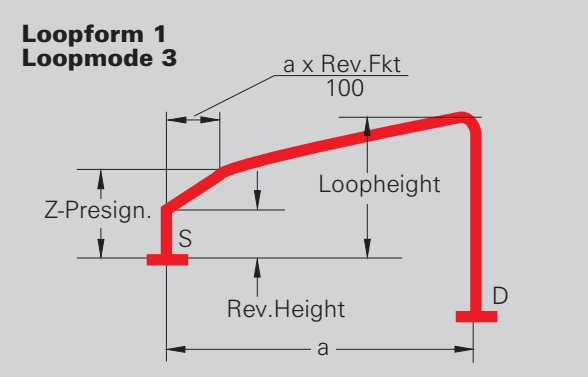
Types of loop

The reverse factor is programmed as a percentage of loop distance for loop modes 1 and 3. In the case of certain short loops, it is easier to optimise the loop if this reverse movement is programmed as an absolute value. The reverse factor can be programmed as an absolute (in μm) for loop modes 11 and 13.

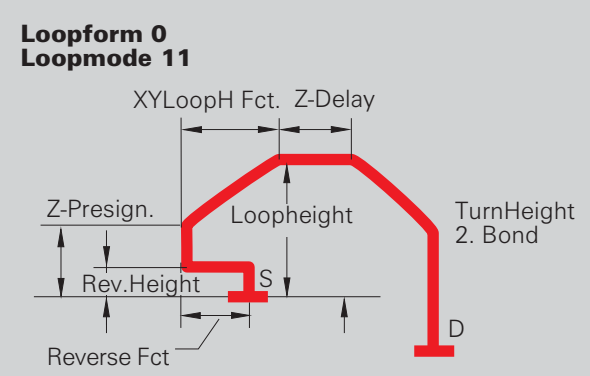
Triangular loops (loop form 0)	**Rectangular loops (loop form 1)**
Triangular loop	Rectangular loop
	
Asymmetric reverse triangular loop	Asymmetric reverse rectangular loop
	
Reverse triangular loop	reverse rectangular loop
	

Triangular loops (loop form 0)	Rectangular loops (loop form 1)
Negative Reverse Triangular Loop	Negative Reverse Rectangular Loop

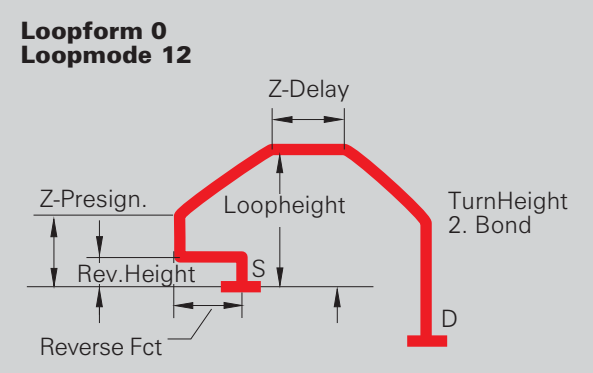




Asymmetric reverse triangular loop (absolute reverse factor)



Reverse triangular loop (absolute reverse factor)



Triangular loops (loop form 0)	Rectangular loops (loop form 1)

Negative reverse triangular loop (absolute reverse factor)

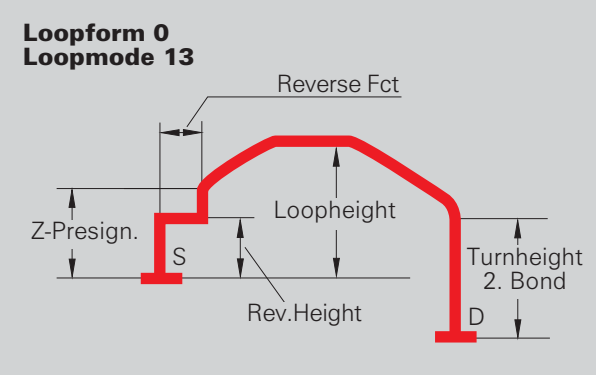


fig. 12 - 82 types of loop

Tear Parameters (Learn Chip)

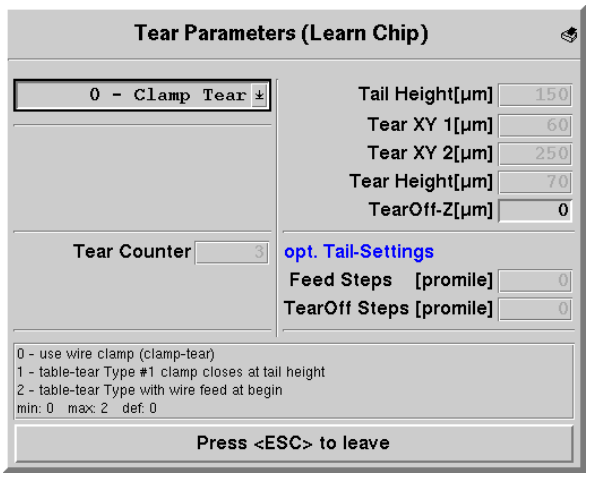


fig. 12 - 83 Mode > Learn Chip (Mode 1) > Tear Parameters

Tear-off parameters always refer to the destination bond.

Parameter (Tear Parameters)	Description / *Value range, unit*
Tear Flag (Drop-Down Menu)	Tear parameters *0: Test run without tail building. Wire is torn off after the destination bond with a clamp* *1: Table tear-off at Z position "Tail Height" and at X/Y position "Tear XY 2" (this parameter must be set).* *2: Table tear off at Z position "Tear Height" and at X/Y-position "Tear XY 1"*
Tear Counter	Number of movements in the Z direction performed before wire tear-off.
Tail Height	Height of travel in order to form the tail. *µm*
Tear XY 1	Traversing path in XY up to tearing at tail height. *µm*
Tear XY 2	Traversing path in XY up to tearing at tear height. *µm*
Tear Height	Tear off height = tail length *µm*
TearOff-Z	Length of an additional Z movement when tearing off. If the value = 0, the additional movement is not executed. *µm*
opt. Tail Settings	
Feed Steps	Additional level control of the feed piezo for tail building. *‰*
Tear-off Steps	Additional level control of the feed piezo when tearing. *‰*

Learn Wire (mode 2)

This is the mode in which you program all bond points. The bond direction always runs from the source bond (source bond) to the 2nd bond (destination bond).

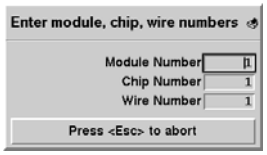


fig. 12 - 84 Learn Wire (Mode 2) - Module, Chip and Wire Selection



fig. 12 - 85 Mode > Learn Wire (Mode 2)

The values for US-time, ultrasonic power, bond force and loopheight are imported automatically from mode 1 as soon as you enter the corresponding chip number.

In this mode the inputs programmed in mode 1 for can be changed individually for each wire, e.g. bonding with or without touchdown, a greater ramp range, a greater overrun range etc. If you change the values, the corresponding field is given a yellow background.

Parameter (Learn Wire)	**Description / *Value range, unit***
Wire Number	Number of the wire to be programmed.
1st. Bond X 1st. Bond Y	Coordinates of the 1st bond point. *µm*
1st. Bond Chip	Assignment of the bond to the chip.
ID	Extra identifier for a single wire, e.g. in accordance with a defined bond plan regardless of the numbering of the wires. This value has no influence on the control of the bond sequence.
US Time	Ultrasonic time; you can determine these values beforehand in single-bond mode 11 or enter them as empirical values. *1 ... 255*
US Power	US-power; the power to be set is dependent on the wire diameter and bonding material used. *0 ... 255 (for two stages "Low" and "High")*
Bond Force	Programmed bond force. Dependent on page 1 Parameter "Bond Force Mapping". To use unit cN a calibration in accordance with mode 44 is required. *cN or digit*
Clamp Flag	Clamp parameter *0: Clamp closes at loop?height* *1: Clamp closes at ramp position of the destination bond.* *2: Clamp closes only after bonding at bond height.* *3: Clamp closes at loop height, absolute wire length is selected. Wire consumption is kept constant, loop height is variable.* *Press the right mouse button for more options. These options will be shown in the graphic display.*

Parameter (Learn Wire)	Description / *Value range, unit*
Wire in Stitch Sequence	Defines the wire as a continuation of a stitch bond (multi-stitch). The bond position and parameters are identical to those of the 2nd bond of the preceding wire.
Abs. Loop Height	0: Automatic loop height specification of the wire length (is specified using the loop height factor (XYLoopHFct.)). Input > 0: Absolute loop height travelled over the source bond. *µm*
2nd. Bond X Y	Coordinates of the 2nd bond point. *µm*
2nd. Chip	Assignment of the bond to the chip
Cur. LoopDist. XY	Distance between source and destination bond.
US Time US Power Bond Force	Parameter of the 2nd bond (see top of table for description).
Priority	Execution according to priority *0: Wire priority is not used (default)* *1: Wires are bonded in the order of their wire priority. Order: 1,2,3,4,5,6,0*
Group	Name of the wire group which is assigned to this wire (see "Wire Group" on page 12-17).
Stitch Flag	Indicates that the next wire is a stitch bond (multi-stitch). The wire is not torn off after the destination bond.

Parameter (Learn Wire)	Description / *Value range, unit*
Start from ?Work-height	Upon deactivation the bond height is measured from the highest possible Z position. Upon activation the height measurement begins at the programmed work height no. 3 (page 4). ***IMPORTANT*** *An incorrect setting of this value will result in a risk of collision!*
Unused	Excludes a wire from the applicable selection.

- **Bond Parameters:** Parameters of the bonding process and wire control (see "Bond Parameters 1st./2nd. Bond (Learn Wire)" on page 12-47)
- **Loop Parameters:** In this menu the chipwise programmed parameters can be adapted to random wires. (see "Loop Parameters (Learn Wire)" on page 12-49)
- **Tear Parameters:** (see "Tear Parameters (Learn Wire)" on page 12-52)
- **Adjust Parameters:** (see "Adjust Parameters (Learn Wire)" on page 12-54)
- **Repeat Wire:** Mode for making copies of the current wire with different spacing for the source and destination bonds (see "Repeat Wire (Learn Wire)" on page 12-55)
- **Measure Height:** Enables measurement of the bond height for the source and/or destination bond. This function is needed for bonding immediately after the wire programmed here (button is: Bond)

Offset correction and direct bonding

- During programming of a wire, you can bond the wire immediately by pressing the <Bond> key. You also have the option of activating stepped operation by pressing "Step".

N O T E

The bond positions are based on the adjustment according to the last applicable detection run and the currently calibrated correction of the Camera Tool Offset. Both should be checked for accuracy prior to carrying out this function.

- Point-by-point optimisation of the camera tool offset is possible in this dialog. Depending upon whether the machine was set up for an offset correction on the first or second bond (see "Corr Offset (Mode 3)" on page 12-56), the position of the first or second bond will be selected after the bonding procedure. Use "Adjust" to start the offset correction mode. The crosshair is now positioned over the last bonded bond foot and the position is confirmed with "Adjust". The calibration of the camera tool offset is now optimized for the current turning position based on this specification.
- Use the "File" button to copy the parameters of the wire currently displayed to the "Single Wire" function (Mode 11).

Bond Parameters 1st./2nd. Bond (Learn Wire)

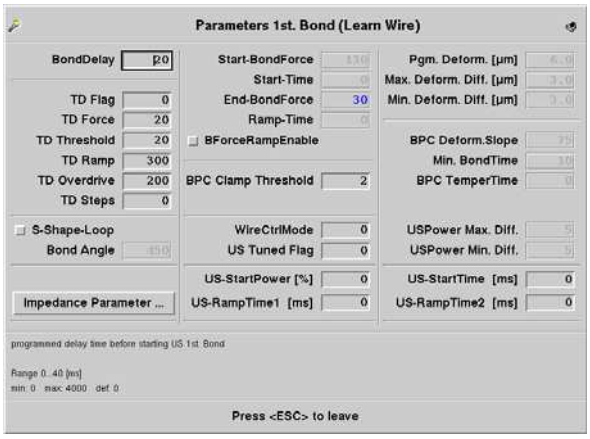


fig. 12 - 86 Mode > Learn Wire (Mode 2) > Bond Parameters

All the parameters for bond process control and wire control are grouped here for each individual wire.

The button on the left is for the source bond, the button on the right is for the destination bond.

Parameter (Bond param.)	Description / *Value range, unit*
Bond Delay	Delay after touchdown, before US power is applied. *10 ... 50 ms*
TD Flag	Touchdown parameter; leave the setting at TD Flag 1, because TD Flag 0 is only for adjustment during testing. *0: Without touchdown, bond head moves to preset bond height* *1: Software touchdown*
TD Force	The force with which the bonding tool contacts the chip. *cN or digit*
TD Threshold	Sensitivity of the touchdown sensor. *1 ... 200*
TD ramp	Height above measured bond height at which the change to TD search speed takes place; applicable only if "TD Flag 1" is set. *10 ... 500 µm; def. 200 µm*

Parameter (Bond param.)	Description / *Value range, unit*
TD Overdrive	Max. distance travelled from measured bond height over which touchdown is still active. *150 ... 500 for TD flag 1*
TD Steps	Touchdown steps are used only in conjunction with flag 1. TD steps to ensure that the wire can still be deformed during bonding. Standard setting: approx. 0.5 fold wire diameter. Precondition: TD Flag is 1 (software touchdown, searches for threshold of TD offset). *µm*
S-Shape-Loop	Turning movement on the Turn Height destination. (0) Default loop in line. (1) Loop with programmed bracket between source and destination bond.
Bond Angle	Bracket at which the current bond will be set. *cts*
Start-BondForce	Bond force effective directly after the ultrasonic generator starts and for the duration of the start time. *cN or digit*
Start-Time[1]	Time during which the start bond force is effective directly after the ultrasonic generator. Maximum value: Min. Bond-Time *0 ... 250 ms*
End-BondForce	Value to which the bond force is increased after expiry of the ramp time. *cN or digit*
Ramp Time [1)]	Time in which the start bond force is increased to the end bond force. *Min. BondTime ms*
BForceRamp-Enable	Monitoring of the bond force during the bonding procedure is enabled if this checkbox is ticked (defined on Page 1).

Parameter (Bond param.)	Description / *Value range, unit*
BPC Clamp Threshold	Sets an additional threshold for the TD sensor; as soon as this threshold is reached opening of the wire clamp starts, even though the bond head is still executing the touchdown movement. *0: The clamp is opened after the end of the braking phase*
WireCtrlMode	Parameter for wire control *0: without deformation control* *1: with deformation control* *2: with bond process control (control of US power and bond time)*
US Tuned Flag	Parameter for ultrasonic generator *0: no control when generator is US-locked* *1: Automatic check that generator is US-locked (generator dependent function)*
Pgm. Deform.	Programmed deformation. When this value is reached, ultrasonic power goes to minimum until expiry of the additional "Temp Time". *µm*
Max. Deform. Diff. Min. Deform. Diff.	Maximum / minimum deformation. Difference values for deformation control. If one of these values is reached an error message is output and the bonding process is stopped.
BPC Deform.Slope	Defines an angle of ascent. Ultrasonic power is adjusted to achieve harmony between programmed and actual wire deformation. *0 °: no US control* *10 ... 89°*
Min Bond Time	Minimum bond time
BPC Temper Time	Time in which the wire is tempered with the minimum ultrasonic power after achieving programmed deformation. *0 ... 250 ms*

Parameter (Bond param.)	Description / *Value range, unit*
USPower Max. Diff.	Difference between maximum and minimum ultrasonic power.
USPower Min. Diff.	
US-Start Power	Target value for US power after the first ramp phase (US Ramp Time 1). *%; value=0, global setting*
US-Ramp Time1	Duration of the first ramp phase, during which US power is ramped up from 0 to the "US-Start Power" value.
US-StartTime	Time during which US power is held steady at the "US-Start Power" value.
US-Ramp Time2	Duration of the second ramp phase, during which US power is changed from the "US-Start Power" value to the target value set in the wire parameters. If bonding is performed with ultrasonic control, automatic control begins at the end of this phase.

1.) The sum of the two values must not exceed 100% of US Time. If it does the two times are automatically set to half of USTime and Min. BondTime.

- **Impedance Parameters:** Opens the "Impedance Parameters" dialog (see "Impedance Parameters" on page 12-36).

Loop Parameters (Learn Wire)

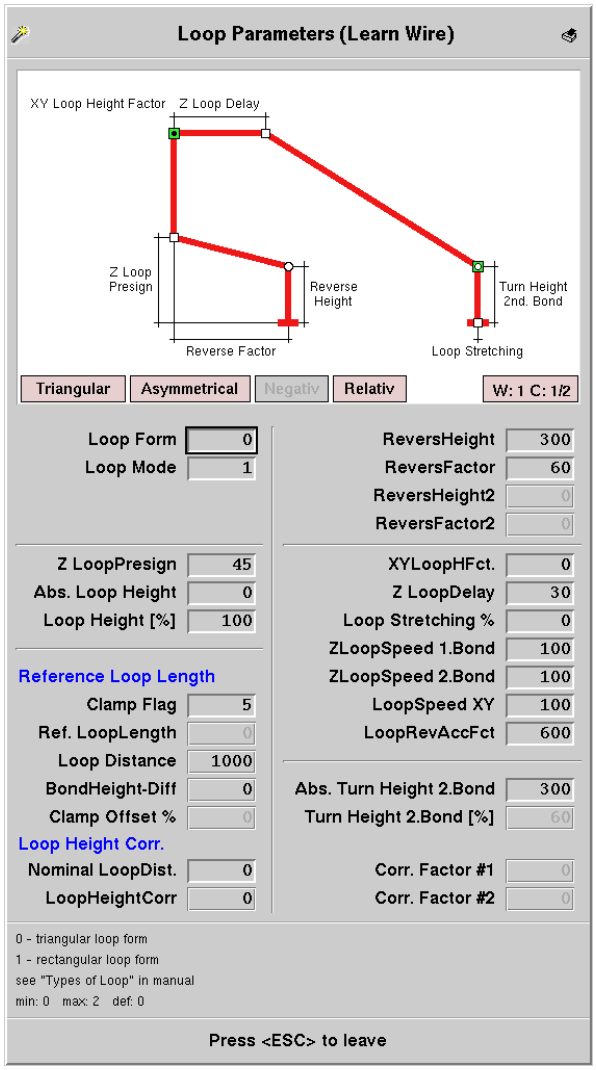


fig. 12 - 87 Mode > Learn Wire (Mode 2) > Loop Parameters

Parameters programmed for specific chips can be adjusted to suit wires of your choice in this menu.

Parameter (Loop param.)	Description / *Value range, unit*
Graphic illustration	Schematic display of the bond head movement when pulling the wire according to the currently set parameters. The corner points can also be moved manually with the mouse. The parameter settings in the dialog change accordingly. *The following loop pre-sets are thereby available:* *- Rectangle / Triangle* *- Asymmetrical / Symmetrical* *- Positive / Negative / no Reverse* *- Absolute / Relative*
loop form	Loop form parameter *0: Triangular loop form* *1: Rectangular loop form* See "Types of loop" on page 12-41
loop mode	Loop mode parameter (this parameter in conjunction with the loop form parameter defines the loop). *0: Standard loop (without reverse)* *1: Positive reverse loop, asymmetric* *2: Positive reverse loop, symmetric* *3: Negative reverse loop* *11: Positive reverse loop asymmetric, reverse factor absolute* *12: Positive reverse loop symmetric, reverse factor absolute* *13: Negative reverse loop symmetric, reverse factor absolute* See "Types of loop" on page 12-41

Parameter (Loop param.)	Description / *Value range, unit*
Z LoopPresign	Percentage of loop distance over which after the source bond only the Y-axis is in motion, before motion along the other axes starts. Reverse loop: Z LoopPresign is the height reached in reversing. *0 ... 300% of loop height*
Abs. Loop Height	0: Automatic loop height specification of the wire length (is specified using the loop height factor (XYLoopHFct.)). Input > 0: Absolute loop height travelled over the source bond. *µm*
Loop Height	Loop height as a function of loop length. *5 ... 300 % of loop distance*
Reference Loop Length	
Clamp Flag	Clamp parameter *0: Clamp closes at loop?height* *1: Clamp closes at ramp position of the destination bond* *2: Clamp closes only after bonding at bond height.* *3: Clamp closes at loop height, absolute wire length is selected. Wire consumption is kept constant, loop height is variable.* *Press the right mouse button for more options. These options will be shown in the graphic display.*
Ref. LoopLength	Optional Absolute loop distance to calculate the position where the clamp is connected (only active when ClampFlag = 3 is set). *µm*
Loop Distance	Distance between the source and destination bonds (also known as source and destination bonds) in the X/Y plane.
BondHeight-Diff	Display of the distance between the 1source t and destination bonds in the Z plane.

Parameter (Loop param.)	Description / *Value range, unit*
Clamp Offset	Offset of the clamp closing time in per cent of the Z-Loop-Delay. *%*
Loop Height Corr	Perform distance-dependent correction of achieved loop height.
Nominal LoopDist.	Defines the nominal distance of the two bond positions if the value … 0. If the value = 0, loop height correction is deactivated.
Corr. Factor #1	Assuming Nominal LoopDist. … 0 (correction is ON), the loop height achieved is reduced proportionately if actual distance is less than the nominal distance. *Only relevant if "XYLoopHFct." is used. Otherwise, the value under "Nominal Loop Distance" must be increased for a longer distance or reduced for a shorter distance.*
Corr. Factor #2	Assuming Nominal LoopDist. … 0 (correction is ON), the loop height achieved is increased proportionately if actual distance is greater than the nominal distance. *Only relevant if "XYLoopHFct." is used. Otherwise, the value under "Nominal Loop Distance" must be increased for a longer distance or reduced for a shorter distance.*
LoopHeightCorr	Displays the absolute change of the loop height that results from the loop height correction.
ReversHeight	Z-height achieved after the source bond before motion in XY direction commences. *Only relevant if "XYLoopHFct." is used. Otherwise, the value under "Nominal Loop Distance" must be increased for a longer distance or reduced for a shorter distance.* *µm*

Parameter (Loop param.)	Description / *Value range, unit*
ReversFactor	Percentage of loop distance over which the x/y axes reverse after reaching the Rev.Height. *0 ... 100% (Loop mode 1, 2, 3)* *µm (Loop mode 11, 12, 13)*
ReversHeight 2 ReversFactor 2	Insertion of a second reverse point similarly to ReversHeight and ReversFactor.
XYLoopHFct.[1]	Set this parameter for asymmetric reverse loops only: percentage of total loop distance at which peak of the asymmetric loop is reached. *0 ... 100%*
Z LoopDelay [1)]	Percentage of loop distance for which the Z-axis remains at loop height, while the X- and Y-axes are in motion (triangular loop only). *0 ... 100% of loop distance*
Loop Stretching	Parameter for compensating the influence of loop distance on loop form. *%*
ZLoopSpeed source bond	Speed of the Z axis after the source bond to loop height. *1 ... 100%*
ZLoopSpeed destination bond	Speed of the Z axis from loop height to TD ramp. *1 ... 100%*
LoopSpeed XY	XY loop speeds during the loop as a function of maximum speed. *1 ... 100% of maximum speed*
LoopRevAccFct	Adjustment factor for the acceleration during the reverse movement. *‰*

Parameter (Loop param.)	Description / *Value range, unit*
Sec. Turn Height Destination Bond	Height at which an additional bond head turn may occur at the end of the loop movement. 0: Automatic determination of the "Turn Height" in % of the ?loop height. Input > 0: the absolute "Turn Height" above the destination bond. *0 ... 50000*
Turn Height destination bond	Percentage of the loop height for the calculation of the "Turn Height", if "Abs. Turn Height Destination Bond" = 0. *%*

1.) The sum of the two values must not exceed 100% of loop distance.

Tear Parameters (Learn Wire)

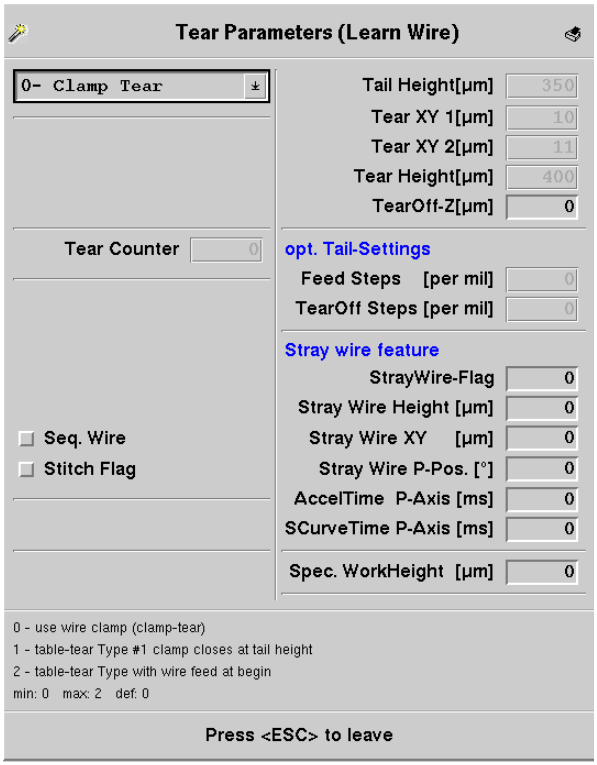


fig. 12 - 88 Mode > Learn Wire (Mode 2) > Tear Parameters

The chip-by-chip programmed tear-off parameters can be adapted to random wires in this menu.

Parameter (Tear Parameters)	Description / *Value range, unit*
Tear Flag (Drop-Down Menu)	Tear parameters *0: Wire is torn off with clamp after destination bond.* *1: Table tear-off at position Z "Tail Height" and at position X/Y "Tear XY 2" (this parameter must be set)* *2: Table tear off at Z position "Tear Height" and at X/Y-position "Tear XY 1"*
Tear Counter	Number of movements in the Z direction performed before wire tear-off.
Seq.Wire	Next wire
Stitch Flag	Default for bond position of the wire.
Tail Height	Height of travel in order to form the tail. *µm*

Parameter (Tear Parameters)	Description / *Value range, unit*
Tear XY 1	Tail length; the length of the wire end that is pulled out after the second bond. *µm*
Tear XY 2	Tear-off movement dimensioned from the bond position. *µm*
Tear Height	Tear off height *µm*
TearOff-Z	Length of an additional Z movement when tearing off. If the value = 0, the additional movement is not executed. *µm*
opt. Tail Settings	
Feed Steps	Additional level control of the feed piezo for tail building. *‰*
Tear-off Steps	Additional level control of the feed piezo when tearing. *‰*
Stray wire feature	This functions inserts an additional X/Y/Z/P movement after the tear-off movement to ensure that no overlong wire residues are taken over onto the next device, should a defective bond not have been detectable. ***IMPORTANT*** *Normally this function is not required and should be used only in accordance with defaults from F&K Delvotec.*
Stray Wire-Flag	0 = StrayWire function switched off 1 = StrayWire function switched on
Stray Wire Height	Approached position Z relative to the touchdown position of the 2nd bond.

Parameter (Tear Parameters)	Description / *Value range, unit*
Stray Wire XY	X/Y length of the forward/back movement performed in the wire direction.
Stray Wire P-Pos	Additional relative rotational angle.
AccelTime P-Axis	Acceleration time for movement P. *ms*
SCurveTime P-Axis	S share of the P acceleration (normal 50% of the acceleration time). *ms*
Spec. WorkHeight	Coordinate of the Z axis for XY-axis travel between two wires on a chip. Input > 0: This parameter is used for the current wire instead of the WorkHeight 2 from Page 4. *µm*

Stitch Bonds

The "Seq. Wire" and "Stitch Flag" check boxes have to be activated for wires that will be stitch-bonded. Exceptions to this rule are:

- The first wire of the stitch bond: The "Seq. Wire" check box is not activated, but the "Stitch Flag" check box is activated.
- The last wire of the stitch bond: The "Seq. Wire" check box is activated, but the "Stitch Flag" check box is not activated.

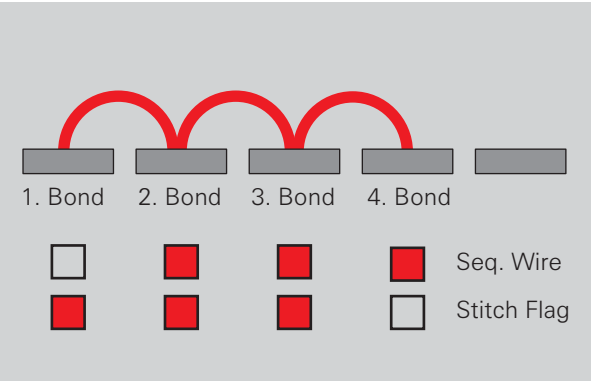


fig. 12 - 89 Mode > Learn Wire (Mode 2) > Stitch-Bonds

Adjust Parameters (Learn Wire)



fig. 12 - 90 Mode > Learn Wire (Mode 2) > Adjust Parameters

Settings for the programming of stitch bonds. The type of chip detection is supposed to avoid rotations of the bond head during the loop movement.

Parameter (Adjust Param.)	Description / *Value range, unit*
Adjust flag	Wire parameter *0: use the 1st chip for the 1st bonding and the 2nd chip for the 2nd bonding* *1: use the 1st chip for both bonds* *2: use the 2nd chip for both bonds* *3: use further chip(s) for both bonds*
1st. DeltaYRef 2nd. DeltaYRef	The distance from the reference position stipulated by adjust mode.
1st. / 2nd. Adjust Chip	Chip number of the 1st and 2nd adjust point (only with Adjust Flag = 3).
1st. / 2nd. Adjust Mode	Adjust mode of the 1st and 2nd adjust point (only with Adjust Flag = 3). *0: Both coordinates* *1: Coordinate X (includes rotation of the original chip)* *2: Coordinate Y (includes rotation of the original chip)* *3: Coordinate X (without rotation of the original chip)* *4: Coordinate Y (without rotation of the original chip)*

See the programming example.

Repeat Wire (Learn Wire)

Mode for making copies of the current wire with different or equal distances of the 1st and 2nd bond.

- If the cursor is in one of the "First" fields and the bond head is moved with the trackball and stored with "Store Trace", the values in the "First" field and in the "Last" field change.
- If the cursor is in one of the "Last" fields and you use the trackball to move the bond head and then press "Store Trace" to save, the values in the "First" field and in the "Last" field change.
- If the cursor is in one of the "Last" fields and you press PageForward/PageBackward, the number of copies is increased/decreased, respectively and the bond head automatically moves to the postulated last copy.

I M P O R T A N T

If you position the cursor on one of the "Last" fields, you can press "PageForward" or "PageBackward" to move the bond head to the corresponding calculated position. This is a way of checking the accuracy of the copies. Move the production mask, if necessary.

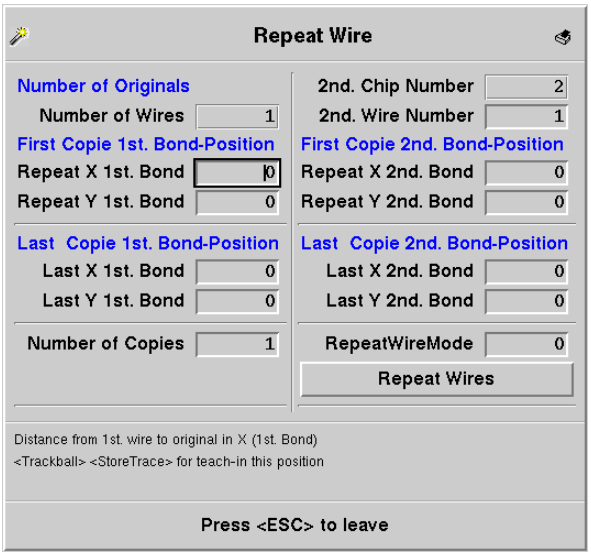


fig. 12 - 91 Mode > Learn Wire (Mode 2) > Repeat Wire

Parameter (Repeat Wire)	Description / *Value range, unit*
2nd. Chip Number	Display of which chip the second bond lies on.
2nd. Wire Number	Wire number as of which the copies are counted during feeding.
Number of Originals	
Number of Wires	Definition of the reference wire.
First Copy 1st. Bond-Position	
Repeat X 1st. Bond	Distance of the first copy to the original with source bond in X or Y. *µm*
Repeat Y 1st. Bond	
First Copy 2nd. Bond-Position	
Repeat X 2nd. Bond	Distance of the first copy to the original with destination bond in X or Y. *µm*
Repeat Y2nd. Bond	
Last Copy 1st. Bond-Position	
Last X 1st. Bond	Distance of the last copy from the original for source bond. *µm*
Last Y 1st. Bond	
Last Copy 2nd. Bond-Position	
Last X 2nd. Bond	Distance of the last copy from the original for destination bond. *µm*
Last Y 2nd. Bond	
Number of Copies	Number of copies to be made.
RepeatWireMode	Determines the way in which the coordinates of the bonding positions are calculated. *0: the wires are fed in compliance with the alignment.* *1: Coordinates will be incremented.*
Repeat Wires	Saving of the values entered (no copies are made until now).

▶ Move the trackball/crosshairs to the repeat-point coordinates of the source bond and save

the X/Y positions by pressing "store trace" for each.

- Move the trackball/crosshairs to the last repeat point of the source bond and save the X/Y positions by pressing "store trace" for each.
- Enter the desired number of copies.
- Define the repeat-point coordinates for the destination bond in the same way.
- Click on "Repeat Wire"; the system saves the coordinates.

IMPORTANT

Stitch bonds can be easily duplicated with this function.

Corr Offset (Mode 3)

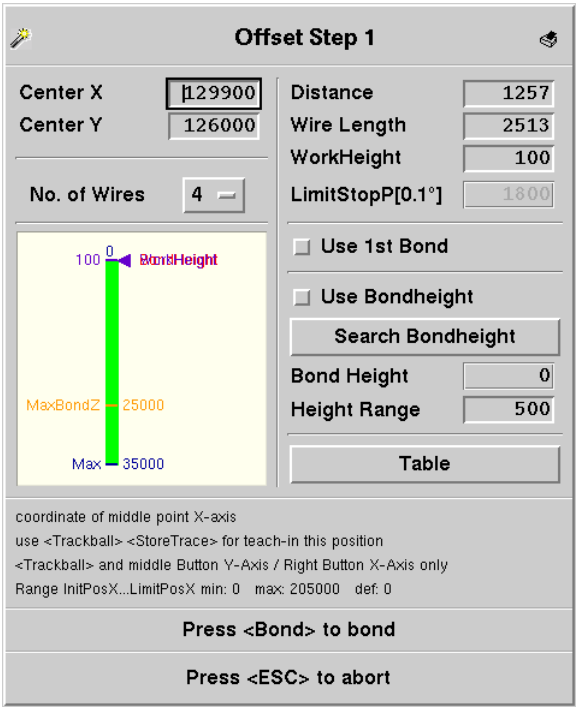


fig. 12 - 92 Mode > Corr Offset (Mode 3)

IMPORTANT

First of all ensure that bonding can be performed in mode 11 (adapt coordinates X/Y, bond height...).

Mode for calculating the discrepancy between the optical axis (crosshairs) and the mechanical axis (bond head, bonding tool). The parameters of mode 11 (Single Wire) are used in this.

The bonder bonds up to 36 wires (default = 4 wires) and the crosshairs focus on either the source or the destination bond of each so that the offset can be calculated.

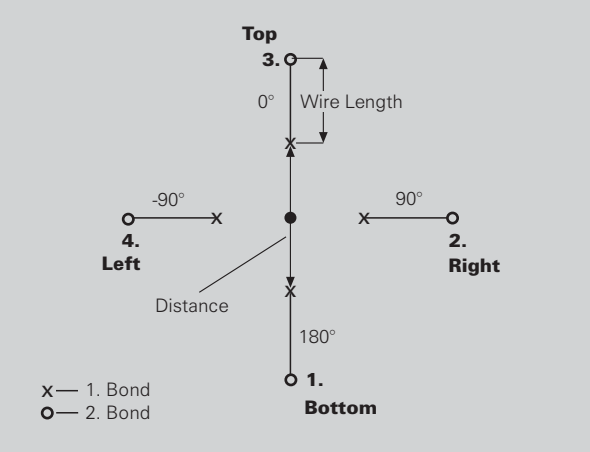


fig. 12 - 93 Mode > Corr Offset (Mode 3) > Diagram

IMPORTANT

Distance = 2x wire length
The setting is automatically adopted by mode 11 and can be manually altered here.

Parameter (Corr Offset)	**Description / *Value range, unit***
Center X	Centre of the bonded cross.
Center Y	Bond position. *µm*
Distance	Distance between the source and destination bonds (also known as source and destination bonds) in the X/Y plane.
Wire Length	Length of the bonded wires. 0: Only the destination bond is bonded (e.g. if space is insufficient)
Work Height	Position Y can be set here, on which the bond head travels for the movements from wire to wire. The preset is InitPos-Z from Page 1 (see "Init/Limit Setting (BHC Parameters)" on page 12-88). A lower, safer traversing height can also be selected to reduce the procedure.
Limit StopP	Location of the angle range for offset determination (only active with 62000)
No. of Wires	Number of wires: Offset can be programmed more accurately if there are multiple wires. *4 ... 36*
Use 1st Bond	Switch to source bond For an application the determination of the camera tool offset should always be performed either with the first or second bond, because the results can differ slightly. *Default 2nd bond (destination bond)*
Use Bondheight	Height-dependent offset correction. The camera tool offset must be determined at different heights in succession for this purpose.
Search Bondheight	Measurement of the current bond height. This value is adopted in the parameter Bondheight.
bond height	Bond height to which the currently measured offset value applies.
Height Range	The range relative to the bond height value in which the currently measured bond height value is valid.
Table	Display of the various currently stored height-dependent offset corrections.

The procedure for defining the offset is as follows:

- In mode 11, determine the bond height and the bonding parameters for the current device.
- Call mode 3
- Check and, if necessary, correct the setting of the "Wire Length" parameter.
- Position on an empty area and press the "bond" key.

N O T E !

The machine executes the procedure for bonding in the x and y directions when you press the "bond" key – consequently, always make sure that sufficient space is available before you start this function.

- After finishing all the bonds, position the crosshairs over the destination bond of the first wire and press "store trace" to save the offset.
- Position the crosshairs over the destination bond of the second wire and press "store trace", and so on.

I M P O R T A N T

The offset for up to 36 wires can be calculated by means of this procedure.

- Press "enter" to confirm the corrections and accept the offset.
- Press "Escape" (Cancel): Exit the menu.

Bond Height (Mode 4)

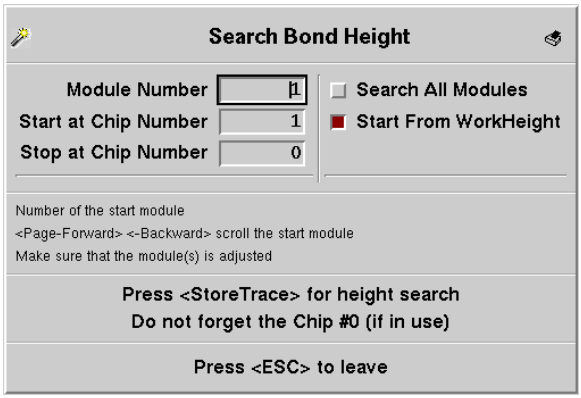


fig. 12 - 94 Mode > Search Bond Height (Mode 4)

Bond height for which the current value is determined. Mode 4 starts automatic bond-height measurement, a procedure for which you can define the start chip.
Precondition: The height can be measured only if wires have already been programmed for the chip in question.

- Enter the module and chip numbers for starting and stopping. If the check box "Search All Modules" is activated, the bond heights in all modules are determined.
- Press "Store Trace" to start the subroutine.

The bond head automatically moves down to the bond height. When the bond height has been acquired, it is automatically entered in the mode 1 bond parameters.

- Press "Escape" (Cancel): Exit the menu.

Alternatively, you can start a selective search for the bond height of a particular chip added at a later time, for example.
The following steps are necessary for this:

- Enter the chip no. at "Start at Chip Number" and "Stop at Chip Number".
- Press "Store Trace" (height is measured).
- Press "Stop" while height is being measured (machine stops).

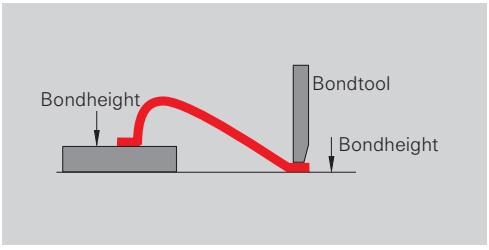


fig. 12 - 95 Mode > Search Bond Height (Mode 4) > Diagram

Repeat Module (mode 5)

Manual module repeat.

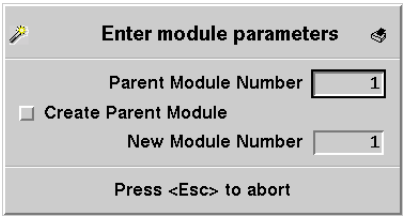


fig. 12 - 96 Mode > Repeat Module (Mode 5)

Parameter (Repeat Module)	Description / *Value range, unit*
Parent Module Number	Number of the module for which the duplication is programmed.
Create Parent Module	Images, positions and settings can be modified, and these changes can subsequently be copied on other modules, for example with mirrored devices, two-row leadframes ...). Modules with different wires are possible.
New Module Number	Number of the new module.

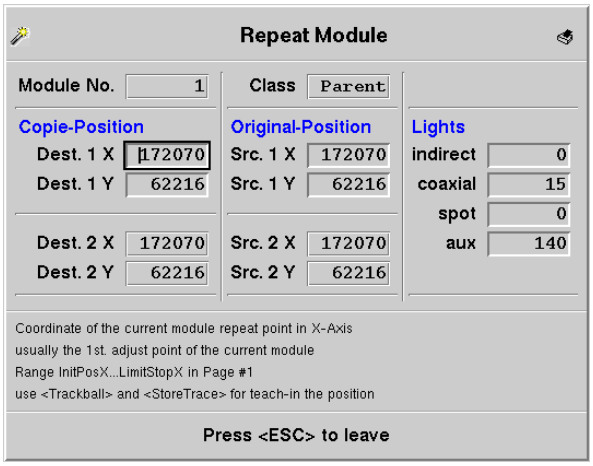


fig. 12 - 97 Mode > Repeat Module (Mode 5)

Parameter (Repeat Module)	Description / *Value range, unit*
Module No.	Number of the module for which the duplication is programmed.
Class	The "parent" is the original of a module and amendable, and a "child" can be created from it. A "Child" is thus a copy and is not amendable.
Copy Position	
Dest. 1 X	Coordinates of the current module repeat point.
Dest. 1 Y	
Dest. 2 X	This value is calculated by the bonding program.
Dest. 2 Y	
Original position	
Src. 1 X	Coordinates of the first module repeat point.
Src. 1 Y	
Src. 2 X	This value is calculated by the bonding program.
Src. 2 Y	
Lights	See 12.12.5 "Adjusting the lighting" on page 12-161
indirect	Exposure value for the diffuse lighting (metal plate as deflector unit). *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*

Parameter (Repeat Module)	Description / *Value range, unit*
coaxial	Exposure value for the coaxial lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
spot	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
aux	Exposure value for the optional spot lighting on the microscope. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*

- Move the trackball/crosshairs to the repeat-point coordinates and save the position by pressing "store trace".
- To create another module: Press "page forward", move to the last repeat point of the source bond and save the position by pressing "store trace" (repeat the procedure as often as necessary).
- Press "Escape" (Cancel): Exit the menu.

IMPORTANT

Each module has to be created individually here. However, if you want to replicate multiple modules with rectangular position, you can do so more efficiently in Mode 17 "Module Matrix" (see "Module Matrix (mode 17)" on page 12-71).

Insert Wire (Mode 6)

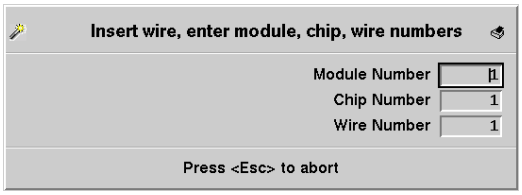


fig. 12 - 98 Mode > Insert Wire (Mode 6)

This function inserts an additional wire.

Parameter (Insert Wire)	Description / Value range, unit
Module number	Number of the module on which the chip is programmed. (Start at "1" when assigning numbers; the system will not accept "0" as an entry for the module number).
Chip Number	Number of the chip on which you want to insert the wire.
Wire Number	Wire number of the wire to be duplicated and that will define the defaults for the wire to be inserted.

- Enter module, chip and wire numbers.
- Press "enter": Perform the insertion. "Learn Wire Mode 2" then appears
- Press "page forward" (to go to the copy)
- Move the source bond position with the trackball/crosshairs and save the position by pressing "store trace".
- Move the destination bond position with the trackball/crosshairs and save the position by pressing "store trace".
- Press "Escape" (Cancel): Exit the menu.

The inserted wire is a copy of the previous one and is automatically transferred to all duplicated modules. You then have to adapt the positions and, if applicable, the parameters in the "Learn Wire" dialog.

IMPORTANT

For the chip on which wires have been inserted a renumbering is performed automatically. The inserted wire is inserted automatically into all duplicated modules. Note the "Renumber Mode" setting on Page 4.

Delete Wire (mode 7)

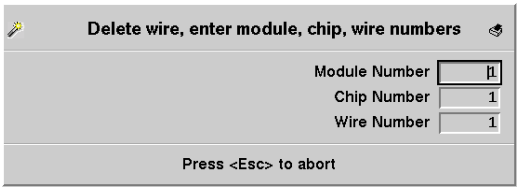


fig. 12 - 99 Mode > Delete Wire (Mode 7)

Remove wire from the program.

Parameter (Delete Wire)	Description / *Value range, unit*
Module number	Number of the module on which the bonding position is to be displayed.
Chip Number	Number of the chip on which you want to delete the wire.
Wire Number	Number of the wire to be deleted.

- Enter the chip number and the wire number of the wire.
- Press "enter"

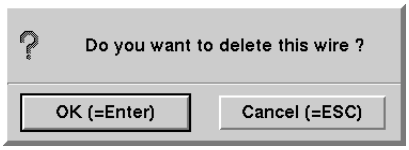


fig. 12 - 100 Mode > Delete Wire (Mode 7) > Confirmation prompt

- Press "enter" (OK): Wire is deleted (or press "escape (Cancel): Cancel the process)

IMPORTANT

Chips on which wires are removed are automatically renumbered. The wire you removed is automatically removed from all repeated modules. Note the "Renumber Mode" setting on Page 4.

Delete Chip (mode 8)



fig. 12 - 101 Mode > Delete Chip (Mode 8)

Remove chips from the program. This also deletes all the wires assigned to the chip in question.

Parameter (Delete Chip)	Description / *Value range, unit*
Module number	Number of the module in which the chip is to be deleted.
Chip Number	Number of the chip to be deleted.

- Enter the module number and the chip number.
- Press "enter":

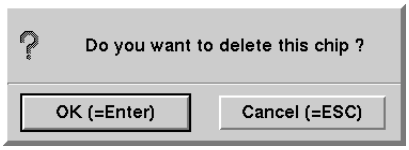


fig. 12 - 102 Mode > Delete Chip (Mode 8) > Confirmation prompt

- Press "enter" (OK): Chip is deleted (or press "escape (Cancel): Cancel the process)

IMPORTANT

All wires and reference images relating to the chip are deleted.

Delete Module (mode 9)

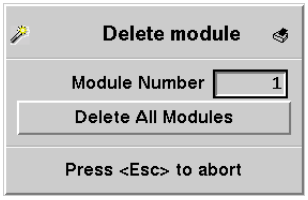


fig. 12 - 103 Mode > Delete module (Mode 9)

Remove module from the program. Select the module you want to delete.

- Enter the module number (to delete all modules activate the button "Delete All Modules", only module 1 is retained).
- Press "enter":

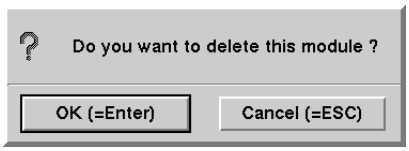


fig. 12 - 104 Mode > Delete Module (Mode 9) > Confirmation prompt

- Press "enter" (OK): Module is deleted (or press "escape (Cancel): Cancel the process)

Display Bond (mode 10)

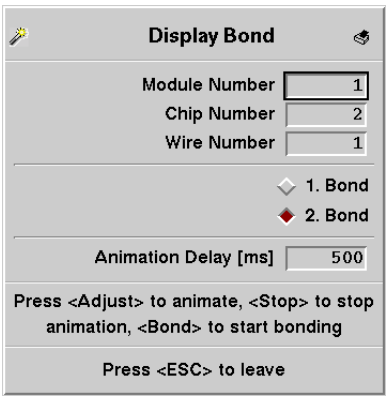


fig. 12 - 105 Mode > Display Bond (Mode 10)

Displays the bond position for checking its positioning precision after completed pattern recognition

Parameter (Display Bond)	Description / *Value range, unit*
Module number	Number of the module on which the bonding position is to be displayed.
Chip Number	Number of the chip which you want to view.
Wire Number	Number of the wire which you want to view.
Source / Destination Bond	Selection of either the source or destination bond for visualisation in browsing.
Animation Delay	Automatic passage step-by-step. Delay is the time during which the bond head remains over the respective position. ***IMPORTANT*** *You can switch on this function on Page 4 "Animate after Alignment".* *ms*

- If you want to view the bond position on a given module, press "page forward" to go through the bond positions one by one.

Alternatively: Use the "rebond" button to move to the positions; you can simultaneously start production in this way.

Single Wire (mode 11)

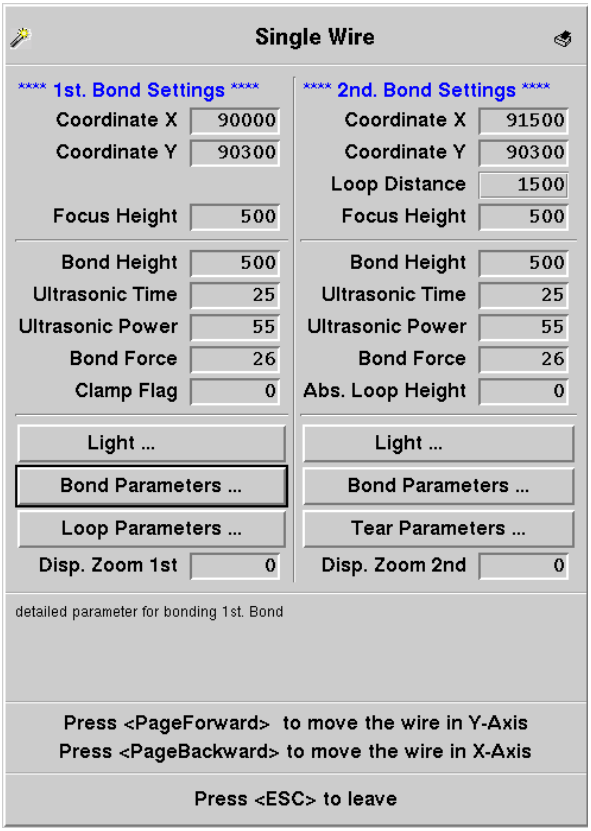


fig. 12 - 106 Mode > Single Bond (Mode 11)

The single-bond mode is the basis for numerous subprograms. This is where you define all the parameters necessary for bonding a single wire. In so doing you set time, power, force, and so on so that the bonder can produce bonds (see "Learn Wire (mode 2)" on page 12-45).

The parameters and buttons on the left-hand side of the dialog apply to the source bond, while those on the right-hand side of the dialog are for the destination bond.

Parameter (Single wire)	Description / *Value range, unit*
1st. Bond Settings / 2nd. Bond Settings	
Coordinate X	XY coordinates of the bonds.
Coordinate Y	*µm*
Loop Distance	Distance between the source and destination bonds (also known as source and destination bonds) in the X/Y plane.
Focus Height	Z focus position: Presetting 500 *µm* to avoid a collision (to be set for 1st and 2nd bonding positions). Automatic value from InitPos.Z in Page 1, (see "Init/Limit Setting (BHC Parameters)" on page 12-88). *cts*
bond height	Highest bond position: Presetting 500 *µm* to avoid a collision (to be measured for source and destination bond). Automatic value from InitPos.Z in Page 1, (see "Init/Limit Setting (BHC Parameters)" on page 12-88). *cts*
Ultrasonic Time	Ultrasonic time; you can determine these values in this mode or enter them as empirical values. *1 ... 255*
Ultrasonic Power	Ultrasonic power; the power to be set is dependent on the wire diameter and bond material used. *0 ... 255 (for two stages "Low" and "High")*
Bond Force	Programmed bond force *cN or digit*
Clamp Flag	Clamp parameter *0: Clamp closes at loop?height* *1: Clamp closes at ramp position of the destination bond.* *2: Clamp closes only after bonding at bond height.* *3: Clamp closes at loop height, absolute wire length is selected. Wire consumption is kept constant, loop height is variable.* *Press the right mouse button for more options. These options will be shown in the graphic display.*

Parameter (Single wire)	Description / *Value range, unit*
Abs. Loop Height	0: Automatic loop height specification of the wire length (is specified using the loop height factor (XYLoopHFct.)). Input > 0: Absolute loop height travelled over the source bond. *µm*

The subprograms for lights, bond parameters, and tear parameters correspond to those of mode 2. Value or coordinate changes in this mode have no effect on mode 1 and mode 2.

Subordinate pages

- **Light:** See "Bond Light 1st./2nd. Bond (Single Wire)" on page 12-64
- **Bond Parameters:** See "Bond Parameters 1st./2nd. Bond (Single Wire)" on page 12-65
- **Loop Parameters:** See "Loop Parameters (Single Wire)" on page 12-65
- **Tear Parameters:** See "Tear Parameters (Single Wire)" on page 12-66

Bond Light 1st./2nd. Bond (Single Wire)

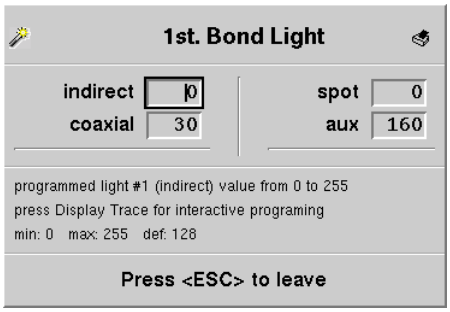


fig. 12 - 107 Mode > Single Wire (Mode 11) > Light

Parameter (Light)	Description / *Value range, unit*
indirect	Exposure value for the diffuse lighting (metal plate as deflector unit). *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
coaxial	Exposure value for the coaxial lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
spot	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
aux	Exposure value for optional lighting on the bond head. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*

See 12.12.5 "Adjusting the lighting" on page 12-161

Bond Parameters 1st./2nd. Bond (Single Wire)

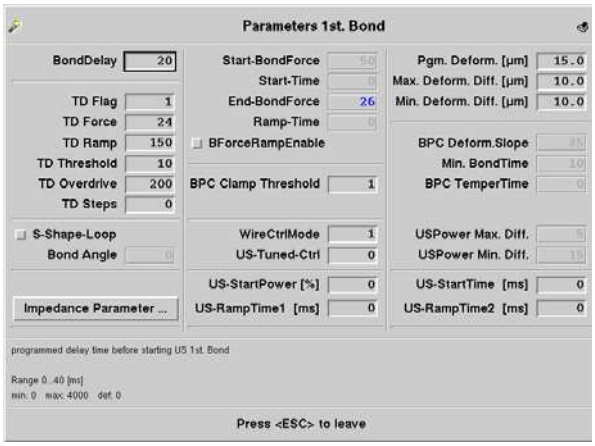


fig. 12 - 108 Mode > Single Wire (Mode 11) > Bond Parameters

Parameter descriptions see "Bond Parameters 1st./2nd. Bond (Learn Wire)" on page 12-47.

Loop Parameters (Single Wire)

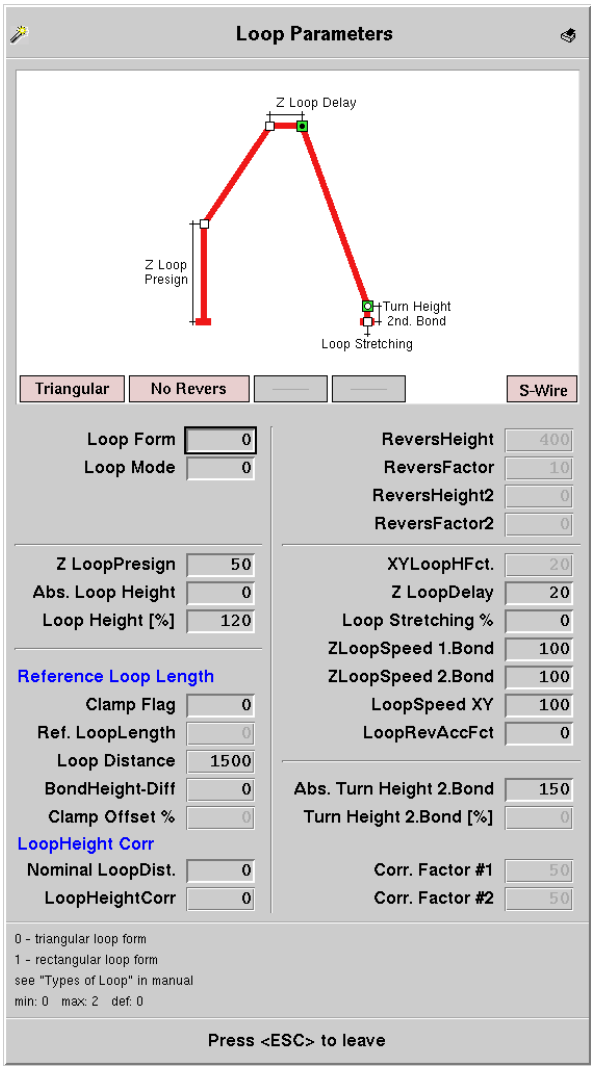


fig. 12 - 109 Mode > Single Wire (Mode 11) > Loop Parameters

Loop parameters, individually programmable for each individual chip.

Parameter descriptions see "Loop Parameters (Learn Wire)" on page 12-49.

Tear Parameters (Single Wire)

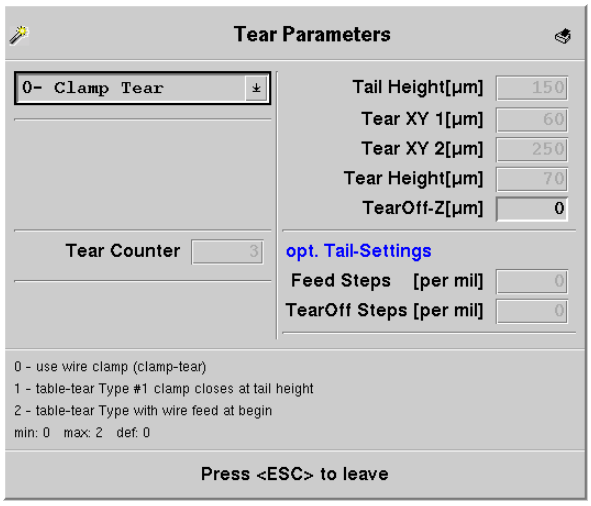


fig. 12 - 110 Mode > Single Wire (Mode 11) > Tear Parameters

Tear-off parameters always refer to the destination bond.

Parameter descriptions see "Tear Parameters (Learn Wire)" on page 12-52.

Feed Tail (mode 12)

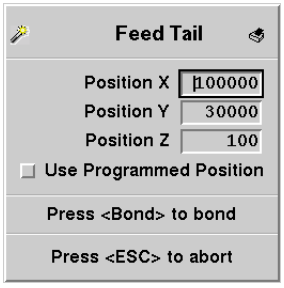


fig. 12 - 111 Mode > Feed Tail (Mode 12)

Define a length for the tail after a wire change, after wire insertion or after manual feed. Only the destination bond will be carried out based on the parameters from Mode 11.

Initially, the length of wire projecting from the bonding tool is undefined; it is torn off with the destination bond.

After the destination bond, the bond tool will move to tail height, the wire clamp will close and the wire is torn off at the destination bond.

Production can then resume.

Parameter (Feed tail)	Description / *Value range, unit*
Position X	Position for the destination bond in the X axis.
Position Y	Position for the destination bond in the Y axis.
Position Z	Height for the destination bond.
Use Programmed Position	Use positions of the X/Y and Z axes.

Move Program (mode 13)

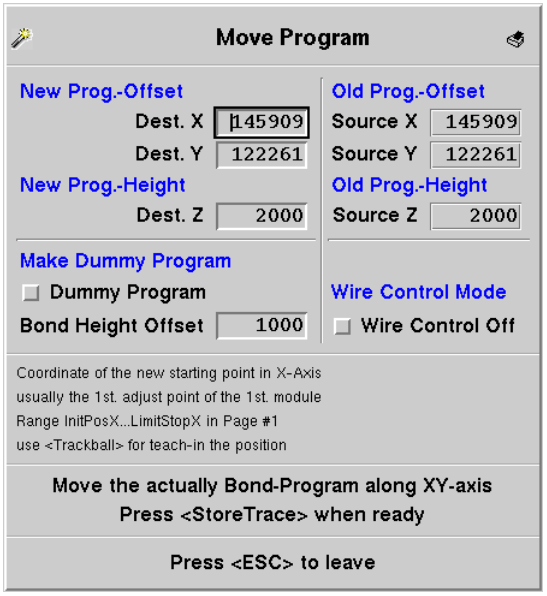


fig. 12 - 112 Mode > Move Program (Mode 13)

Move an existing program along the XY-axis. A positional change of the device is one reason that could render a shift of this nature necessary. You define a new starting point. "Chip 1" and all subsequent chips are moved by the same offset in the XY directions.

Parameter (Move Program)	Description / *Value range, unit*
New Prog.-Offset/ Height	
Dest. X	Coordinates after the change of position.
Dest. Y	
Dest. Z	*µm*
Old Prog.-Offset/ Height	
Source X	Coordinates before the change of position.
Source Y	
Source Z	*µm*
Make Dummy ?Program	
Dummy Program	Allows a dummy bond program to be generated from the current bond program.
Bond Height ?Offset	When a dummy bond program is generated, all the bond heights are corrected in the upward direction by this value so that there is no contact between the bonding tool and the material. ***IMPORTANT*** *The TD function is automatically deactivated in a dummy bond program.* ***DANGER!*** **In the event of an incorrect setting the bond head is subject to the risk of collision.**
Wire Control Mode	
Wire control off	Deactivation of the function for wire monitoring (deformation, impedance).

- Move to the transformation position with the trackball/crosshairs (first reference position) or enter the values in numeric form.
- Press "Store Trace": Start transformation.
- Press "Escape" (Cancel): Exit the menu.

Re-Adjust (Mode 14)

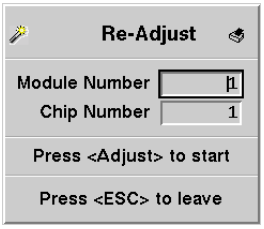


fig. 12 - 113 Mode > Re-Adjust (Mode 14)

Readjustment of the module position, for example after device removal. If the device is removed for testing, for example, and then re-inserted, it is no longer in exactly the same bond position as it was originally. This is the reason why this recognition program has to be started.

Parameter (Re-Adjust)	Description / *Value range, unit*
Module number	Number of the module at which the bonding procedure was interrupted.
Chip Number	Number of the chip at which bonding was interrupted.

- Enter the module number and the chip number.
- Press "Enter" to confirm your entries.
- Press "adjust".

The bond head moves to the position corresponding to your entries, starts the PRU, adjusts itself accordingly, and resumes bonding at this position.

N O T E !

This procedure always starts at the first bonding wire. If automatic pattern recognition has already detected wires, stop the procedure and use the "Rebond" button to go back to the 1st bond position and start bond. Then press "Bond" to continue bonding.

Test US Generator (mode 15)

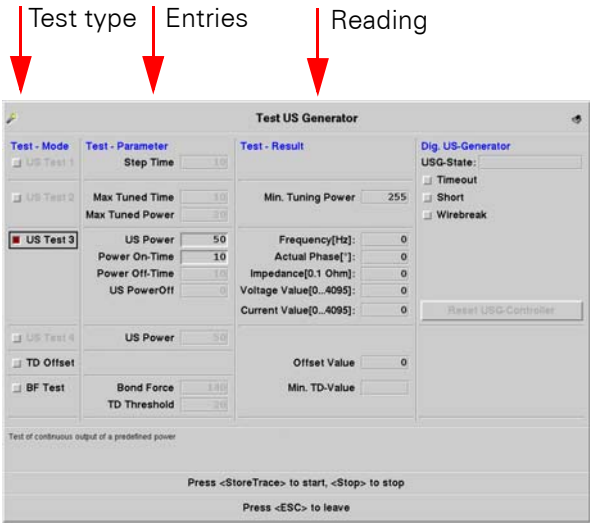


fig. 12 - 114 Mode > Test US Generator (Mode15)

The US generator, bond force and TD sensor can be checked here.

N O T E

The US Test 1, US Test2 and US Test 4 test modes are only relevant if no F&K Delvotec generator is connected. These parameters are deactivated for the default configuration.

Parameter (Test US Generator)	Description / *Value range, unit*
US Test 1	Test to ascertain whether the ultrasonic generator locks in and whether all 8 bits are output by the generator. Indicator on display of the ultrasonic generator.
Step Time	The step time is used to specify the number of milliseconds by which the output is increased from 0 to 255 in steps (bits); the effect is visible on the generator. *ms*
US Test 2	Minimum power for tuning (special function with the use of third-party US generators).
Max Tuned Time	US Test 2 only
Max Tuned Power	*The values are wire- and generator-specific.*
Min. Tuning Power	

Parameter (Test US Generator)	Description / *Value range, unit*
US Test 3	Test with clocked power.
US Power	higher power value
Power On-Time	Time for US Power
Power Off-Time	Time for US PowerOff
US PowerOff	Low power value
Frequency [Hz]	Display of the resonant frequency to which the generator has set itself in this test. *Hz*
Actual Phase	Display of the phase angle of current and voltage to which the generator has set itself in this test. °
Impedance [0.1 Ohm]	Impedance of the transducer. Ω
Voltage Value	Display of the voltage value frequency to which the generator has set itself in this test. Display is performed without indication of the unit, but can be converted to the unit Volt if the generator configuration is known.
Current-Value	Display of the current value to which the generator has set itself in this test. Display is performed unitless, but can be converted to the unit ampere if the generator configuration is known.
US Test 4	Test, for output of a continuous fixed power. ***IMPORTANT*** *Reserved for F&K Delvotec service engineers. The transducer can be damaged if the value is too high and output is sustained for too long.*
US Power	Constant power
TD Offset	Test the set value for the touchdown sensor
Offset Value	Only with TD Offset and BF Test. *1 ... 255; default 100*
BF Test	Checks the settings with a spring scale (see "Setting bond force").
Bond Force	Bond force; for determination of the bond force in grammes a curve recording is recommended in mode 42 and mode 43 (only possible by F&K Delvotec service and authorized personnel). *-2047 ... +2047 digits or cN, when calibration was performed and activated.*
TD Threshold	Sensitivity of the touchdown sensor. *1 ... 200*
Min. TD-Value	Lowest value at which a touchdown was reported.
Dig. US-Generator	
USG State	Status message of the ultrasonic generator
Timeout	Ultrasonic generator is in a fault state because an attempt was made to output US power for more than 2 seconds.
Short	The US generator reports a short-circuit at the output (transducer).
Wire break	Transducer output has no load (open).
Reset USG Controller	HW reset of the ultrasonic generator, if an error is pending.

Feed In (mode 16)

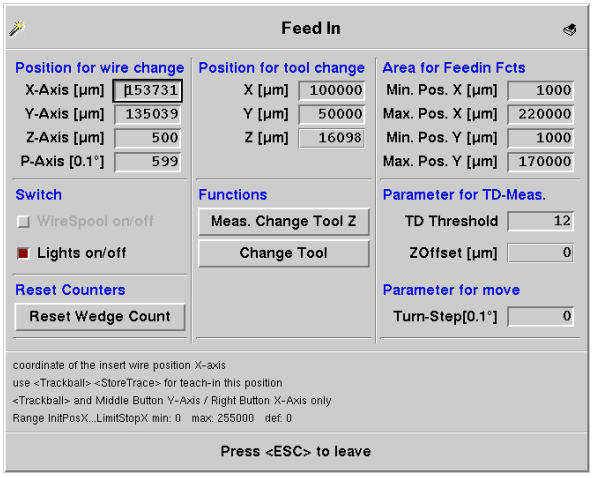


fig. 12 - 115 Mode > Feed In (Mode 16)

Due to the different customer-specific versions, the displayed dialog may differ slightly from the actual dialog.

Suitable position for threading in the wire or changing the tools.

Parameter (Feed In)	Description / *Value range, unit*
Position for wire change	
X	Coordinates of the thread-in position.
Y	
Z and P	Automatic Z value from Init-Pos.Z on page1, (see "Init/Limit Setting (BHC Parameters)" on page 12-88). *µm*
Position for tool change	
X	Position for the tool change.
Y	*µm*
Z	
Area for FeedIn Fcts	Also refer to " Init/Limit Setting (BHC Parameters)" on page 12-88"
Min. FeedIn for X-Axis	Bond head position range in X for the function in this dialog. Restricts the permitted range of movement, if this is necessary on account of the mechanical arrangement of the device holder. *µm*
Max. FeedIn for X-Axis	
Min. FeedIn for Y-Axis	Bond head position range in Y for the function in this dialog. Restricts the permitted range of movement, if this is necessary on account of the mechanical arrangement of the device holder. *µm*
Max. FeedIn for Y-Axis	
Parameter for Meas.	
TD Threshold	Sensitivity of the touchdown sensor. *1 ... 200*
ZOffset	Contour value for manual correction of the wedge change position. Is displayed only! (see "BHC Parameters (page 1)" on page 12-83) *µm*
Parameter for move	
P-Turn-Step [0.1°]	To simplify operation, the bond head can be turned by pressing the "page forward" and "page back" buttons. This parameter determines the succession of the rotation. *0.1 °*
Reset Counters	
Reset Wedge Count	Resets the counter for wedge uses after a change of bonding tool (see "Checking Flags (BHC Parameters)" on page 12-86).
Functions	
Meas. Change Tool Z	Determines and saves the reference position of the Z tool.
Change Tools	Approaches reference position for the tool change.
Switch	
WireSpool on/off	Activate compressed air for wire feed, to facilitate the process of threading in the wire.
Lights On/Off	Switches on the lighting as a threading aid.

Activation of this mode will activate the trackball.

Approach thread position

- Use the trackball / crosshairs to move the bond head to the desired thread-in position. To simplify operation, the bond head can be turned by pressing the "page forward" and "page back" buttons.
- Press "Store Trace" to accept this position.

Bond tool change with height measurement

Normally bond tool must be fitted flush with the top side of the transducer. Mode 16, "Feed In" provides a way of precision-positioning a new bond tool.

- Check the "TD threshold".
- Place the cursor on "Position for change tool X-Axis" or "Y-Axis". Move the bond head to a free position above the device holder.
- Still with the old tool, position the cursor on "Meas. Change Tool Z" and press "ENTER".
- The bond tool is lowered and measures the tool height. The exact value is displayed in "Position for change tool Z".
- Press "ESC", press "Mode 16". The head rises.
- Remove the old bond tool and insert the new one so that the top part of the shank is lying approx. 0.5 mm over the edge of the transducer.
- Place the cursor on "Change Tool" and press "ENTER".
- The head moves down to the height measured by "Meas. Change Tool Z" on the Z plane.
- Remove the adjusting screws, replace them and lower the bonding tool until it touches the device.
- Fix the bond tool with the torque screwdriver.
- Press "ESC" and then "HOME".
- In "mode 11" perform a test bonding.
- Redetermine the camera offset in mode 3.

Module Matrix (mode 17)

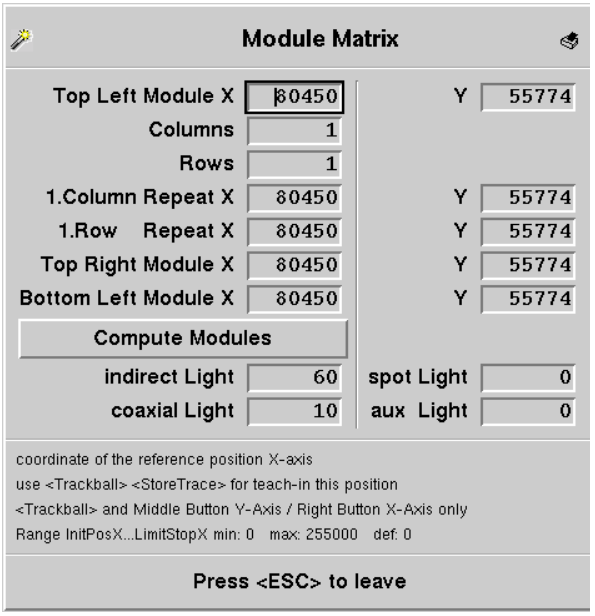


fig. 12 - 116 Mode > Module Matrix (Mode 17)

Make a meandering copy of the modules by specifying columns and rows.

Parameter (Module Matrix)	Description / *Value range, unit*
Top Left Module X	Coordinates of the module to be replicated (first reference position).
Y	*µm*
Columns	Number of columns
Rows	Number of rows
1. Column Repeat X	X/Y coordinates of the first column repetition.
Y	*µm*
1 Row Repeat X	X/Y coordinates of the first row repetition.
Y	*µm*
Top Right Module X	X/Y coordinates of the top right module.
Y	*µm*
Bottom Left Module X	X/Y coordinates of the bottom left module.
Y	*µm*

Parameter (Module Matrix)	Description / *Value range, unit*
Indirect Light	Exposure value for the diffuse lighting (metal plate as deflector unit). See 12.12.5 "Adjusting the lighting" on page 12-161 *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
Coaxial Light	Exposure value for the coaxial lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
Spot Light	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
aux Light	Exposure value for optional lighting on the bond head. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*

Press the "Compute Modules" button to save the settings and then press "enter" to confirm: The number of modules calculated appears in the status line as "Module #".

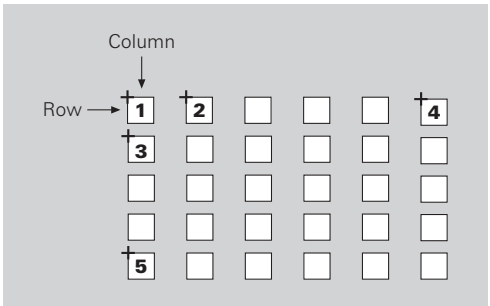


fig. 12 - 117 Mode > Module Matrix (Mode 17) > Diagram

- 1: Top left module
- 2: 1st column repeat
- 3: 1st row repeat
- 4: Top right module
- 5: Bottom left module

Light and WireSpool Off (mode 18)

In the home position, switches off the light and the air purging of automatic wire unreeling for standby.

Reset Adjust Info (mode 19)

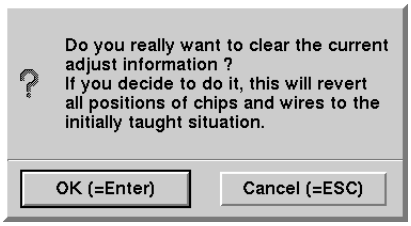


fig. 12 - 118 Mode > Reset Adjust (Mode 19)

For each detection procedure ("Adjust") the coordinates of the found reference points are stored and all bond positions are displayed transformed in compliance with the reference position shift.

With this function the saved reference point shifts are reset, i.e. the bond positions are displayed in the originally defined place again.

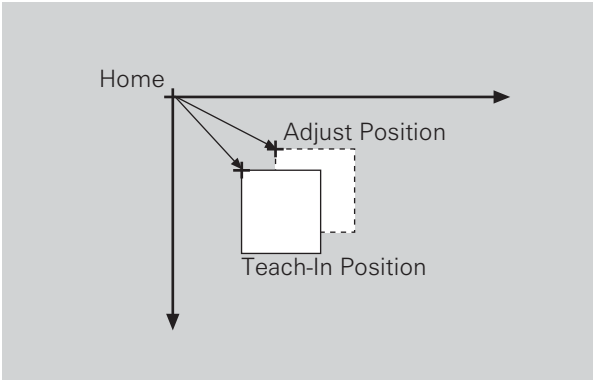


fig. 12 - 119 Mode > Reset Adjust (Mode 19) > Diagram

Normalize Program (mode 20)

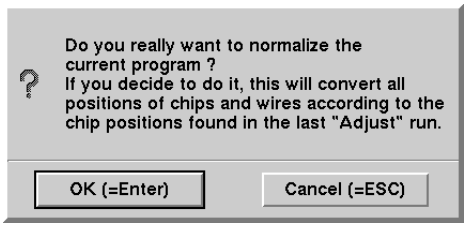


fig. 12 - 120 Mode > Normalize Program (Mode20)

All reference points and bonding positions are set in the positions in which they had been found in the last detection procedure. The shifts are reset by the position recognition. The bond program now appears as though it had been learnt with the last detected device. After execution of "Normalize Program", e.g. the reference points of the pattern recognition can be shifted without the positions of the bonds being influenced.

Module Circle (mode 21)

Circular duplication of the modules by specifying the rows and columns for using the FlipChip function.

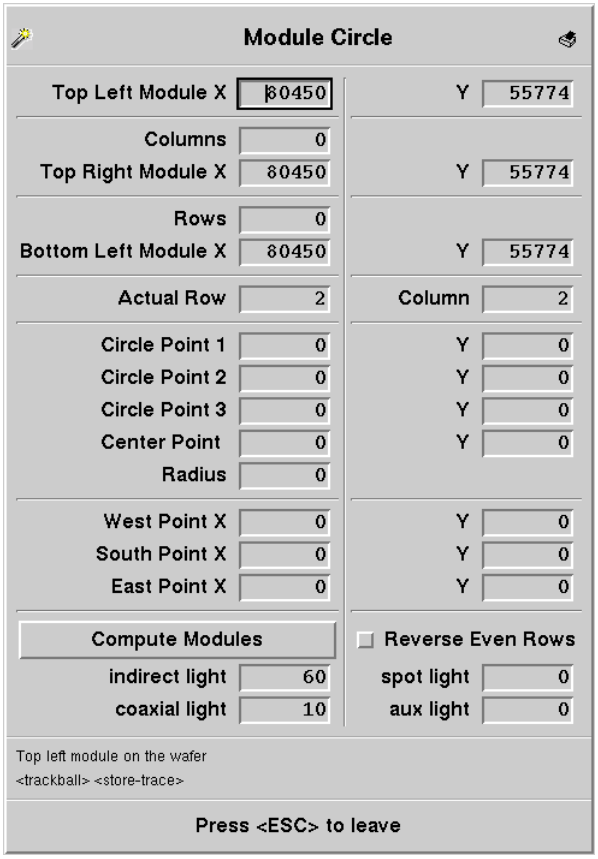


fig. 12 - 121 Mode > Module Matrix (Mode 21)

Circular duplication of modules.

Parameter (Module Circle)	Description / *Value range, unit*
Top Left Module X Y	X&Y coordinates of the top left module to be duplicated (first reference position). The same corner point of the module must always be used. *µm*
Columns	Number of columns to be duplicated
Top Right Module X Y	X/Y coordinates of the top right module. The same corner point of the module must always be used. *µm*
Rows	Number of rows to be duplicated

Parameter (Module Circle)	Description / *Value range, unit*
Bottom Left Module X Y	X/Y coordinates of the bottom left module. The same corner point of the module must always be used. *µm*
Actual Row Column	Tests the position of the respective module in the row and column for checking whether the correct chip has been approached.
Circle Point 1 Y	Move to the first circle point and press "store trace" to save the coordinates.
Circle Point 2 Y	Move to the second circle point and press "store trace" to save the coordinates.
Circle Point 3 Y	Move to the third circle point and press "store trace" to save the coordinates.
Center Point Y	X/Y coordinates of the centre of the circle are calculated and approached.
Radius	Radius of the circle is calculated and displayed.
West Point X Y	Enter the position of the column furthest left.
East Point X Y	Enter the position of the column furthest right, which should, however, be on the same row as "West Point X/Y".
South Point X Y	Enter the position of the column furthest below, which should, however, be on the same column as "Top Left Module".
Reverse Even Rows	An even number of rows and columns are bonded with the reverse wire list.
indirect	Exposure value for the diffuse lighting (metal plate as deflector unit). *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
coaxial	Exposure value for the coaxial lighting *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
spot	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
aux	Exposure value for optional lighting on the bond head. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*

Press the "Compute Modules" button to save the settings and then press "enter" to confirm: The number of modules calculated appears in the status line as "Module #".

Procedure

To duplicate modules Mode 21 uses the same functionality from Mode 17 (Matrix). In addition, a circle is learned in to remove the modules outside of the circle (wafer) from the bond program.

First of all the distances between the chips are taught in.

- 1. Teach in (Chip 0/0) "Top Left Module X/Y"
  - The software suggests to teach in the first adjust point; however, any point can be used on the chip (e.g. the top left corner of the chip, but also the top right corner).
  - Any point can be approached with the trackball
  - The value is accepted with Store trace
- 2. Select columns
  - 2 Enter
  - Select columns again
  - With the trackball traverse to chip 1/0
  - Approach the same reference point as for chip 0/0 and save with Store trace
  - With Page Forward traverse to the next chip in line 0 (the software increases the value in columns and calculates the coordinates)
  - Correct the position with trackball and Store trace
  - Continue to the last chip in line 0 (in this example chip 0/5)
- 3. Select the row
  - 2 Enter
  - Select the row again
  - With trackball traverse to the chip 0/1

- Approach the same reference point as for chip 0/0 and save with Store trace
- With Page Forward traverse to the next chip in column 0 (the software increases the value in the columns and calculates the coordinates)
- Correct the position with trackball and Store trace
- Continue to the last chip in line 0 (in this example chip 10/0)

The distances between the chips are now entered. By means of Actual Row and Column any chip can be approached in order to visually check the position.

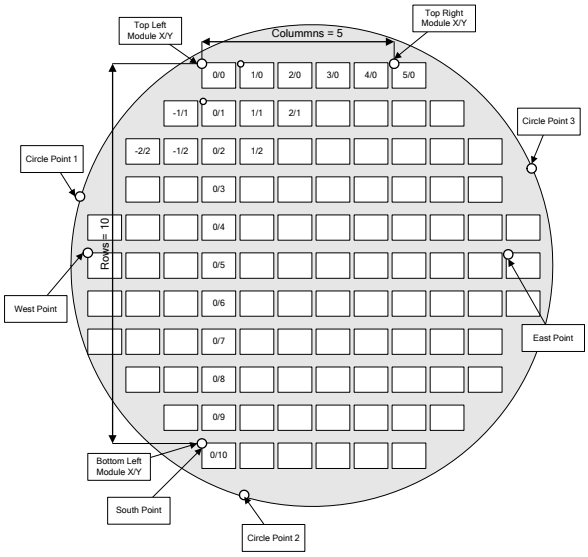
- 4. Teach-in of the circle (wafer)
  - Enter Circle Point 1, Circle Point 2 and Circle Point 3
  - The SW calculates the radius and centre point of the circle.
  - All chips (modules) outside of the circle will later be excluded from the bond program. Centre Point is used to visually control the calculated centre point of the circle.

- 5. Teach in West Point, South Point and East Point
  - Use the same reference point as for chip 0/0
  - These points are for the purpose of excluding other chips (modules) from the program

IMPORTANT

West Point and East Point must be in the same line, because their distance is incorporated in the calculation of the distance between the chips.

The wafer is now taught in. Press "Compute Module" to create the modules.



Insert Chip (Mode 22)

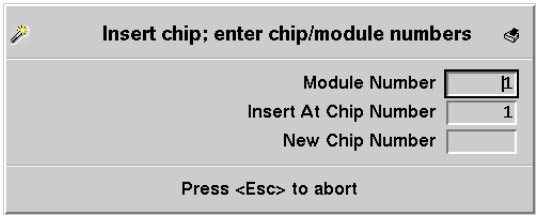


fig. 12 - 122 Mode > Insert Chip (Mode 22)

This function inserts an additional chip.

Parameter (Insert Chip)	Description / *Value range, unit*
Module number	Number of the module on which the chip is programmed. (Start at "1" when assigning numbers; the system will not accept "0" as an entry for the module number).
Insert At Chip Number	Number of the chip after which the new chip will be inserted.
New Chip Number	Entering the number for the new chip.

- Enter the chip number.
- Press "enter": Perform the insertion.

IMPORTANT

A multiple assignment of the same chip number should be avoided.

Force Calib. Setup (mode 42)

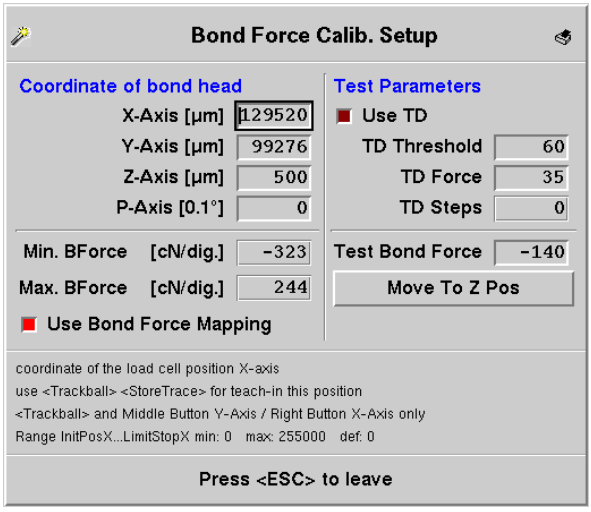


fig. 12 - 123 Mode > Force Calib. Set-up (Mode 42)

Calibration setting of bond force (for advanced users (process engineers) and F&K Delvotec Service Technicians only).

Parameter (Force Calib. Set-up)	Description / *Value range, unit*
Coordinate of bond head	
X-Axis	Coordinates for the calibration position. *µm*
Y-Axis	
Z-Axis	
P-Axis	
Min. BForce	Display of the minimum and maximum bond force (see "Bond Force Setting (BHC Parameters)" on page 12-91).
Max. BForce	
Use BondForce Mapping	Activation of BondForce Mapping.
Test Parameters	
Use TD	Activation of test parameters.
TD Threshold	Sensitivity of the touchdown sensor. *1 ... 200*
TD Force	The force with which the bonding tool contacts the chip. *cN or digit*

Parameter (Force Calib. Set-up)	Description / *Value range, unit*
TD Steps	Touchdown steps are used only in conjunction with flag 1. TD steps to ensure that the wire can still be deformed during bonding. Standard setting: approx. 0.5 fold wire diameter. Precondition: TD Flag is 1 (software touchdown, searches for threshold of TD offset). *µm*
Test Bond Force	Input parameters to determine the bond force.
Move To Z Pos	After actuation, the bond head moves downwards with the value set under "Test Bond Force" to the load cell.

Edit Force Map (Mode 43)

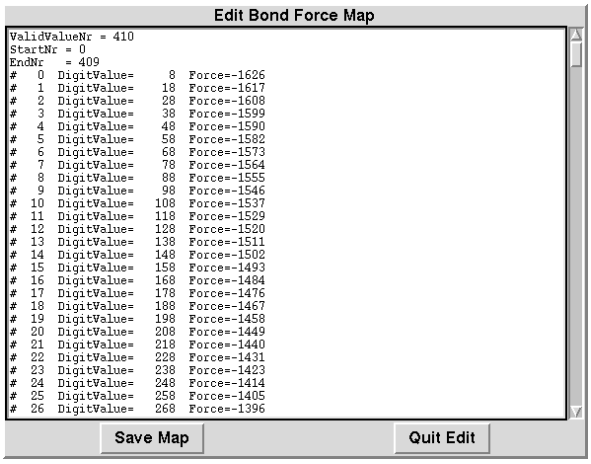


fig. 12 - 124 Mode > Edit Force Map (Mode 43)

Calibration of the bond force (for advanced users (process engineers) and F&K Delvotec Service Technicians only).

Individual values can be viewed and changed for ?Diagnostic purposes.

Force Calibration (mode 44)

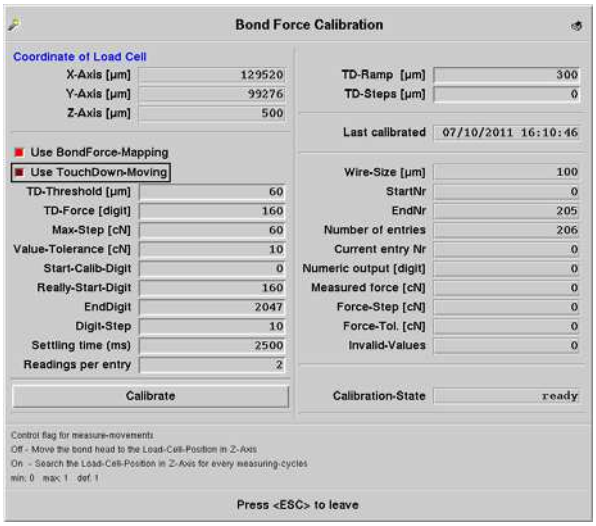


fig. 12 - 125 Mode > Force Calibration (Mode 44)

Automatic calibration of the bond force (for advanced users (process engineers) and F&K Delvotec Service Technicians only).

Force Verification (mode 45)



fig. 12 - 126 Mode > Force Verification (Mode 45)

Check of bond force calibration (for advanced users (process engineers) and F&K Delvotec Service Technicians only).

Edit Bond Program (Mode 50)

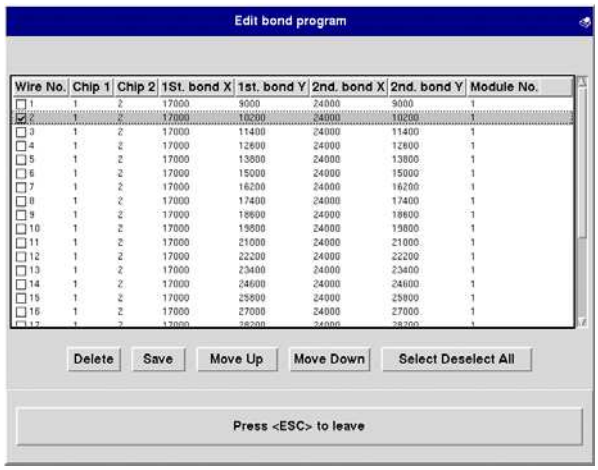


fig. 12 - 127 Mode > Edit Bond Program (Mode 50)

In this dialog the wires of the bond program can be viewed in list form and changed. The wires to be processed are marked by clicking on the tick box in the first column.

- Delete: Deletes the marked wire from the bond program. Before the function is executed, a confirmation prompt is issued:

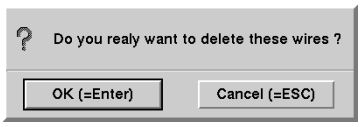


fig. 12 - 128 Mode > Edit Bond Program > confirmation request (Mode 50)

- Save: Saves the changes made in this dialog.
- Move up: Moves all the marked wires in the bond program forwards by one position.
- Move down: Moves all the marked wires in the bond program backwards by one position.
- Select Deselect all: Selects all wires or cancels the wire selection.

Edit Modules (Mode 51)

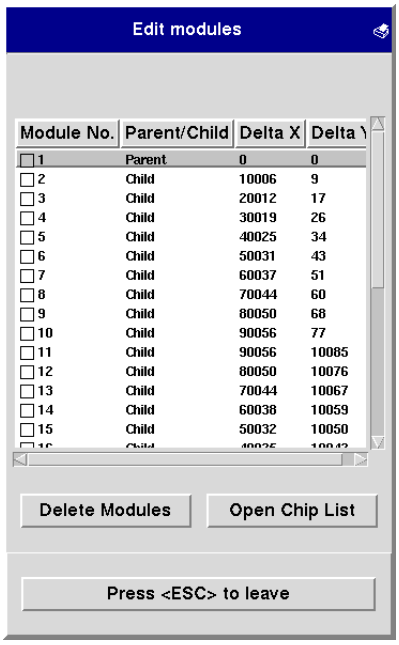


fig. 12 - 129 Mode > Edit Modules (Mode 51)

In this dialog the modules of the bond program can be viewed in list form and changed. The modules to be processed are marked by clicking on the tick box in the first column.

- Delete Modules: The selected modules are deleted.
- Open Chip List: The list of all the chips assigned to the selected module is displayed.

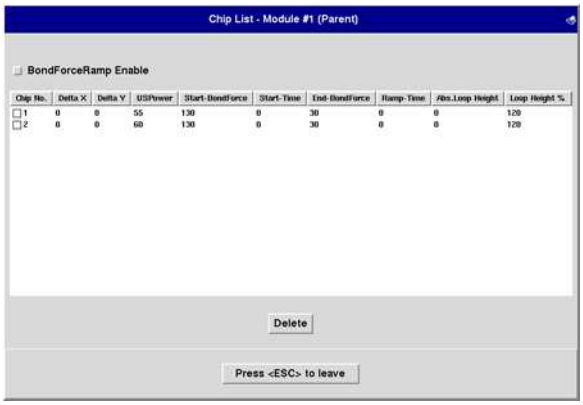


fig. 12 - 130 Mode > Edit module > Get Chips (Mode 51)

- Delete: Deletes the marked chips from the bond program. Before the function is executed, a confirmation prompt is issued:

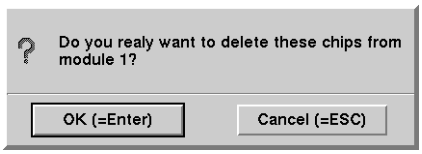


fig. 12 - 131 Mode > Edit module > Get Chips > confirmation request (Mode 51

IMPORTANT

The ensuing chip numbers are correspondingly reassigned.

Clear Program (Mode 52)

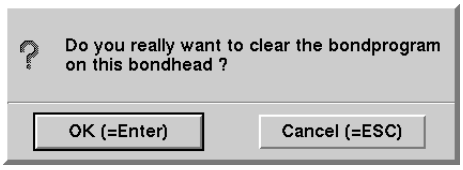


fig. 12 - 132 Mode > Clear Program (Mode 52)

Under "Clear Program" the content of the currently loaded bond program file is reset. The bond program file continues to apply as being loaded though.

In contrast to this, although the internal bond program memory is also reset under "File" > "New", here the bond program file is entirely deleted from memory with this function.

Auto Adjust Only (Mode 55)

This mode executes an automatic pattern recognition without then starting the bond sequence.

The function is useful for preparing for repairs or further programming.

Tool Clean (Mode 122)

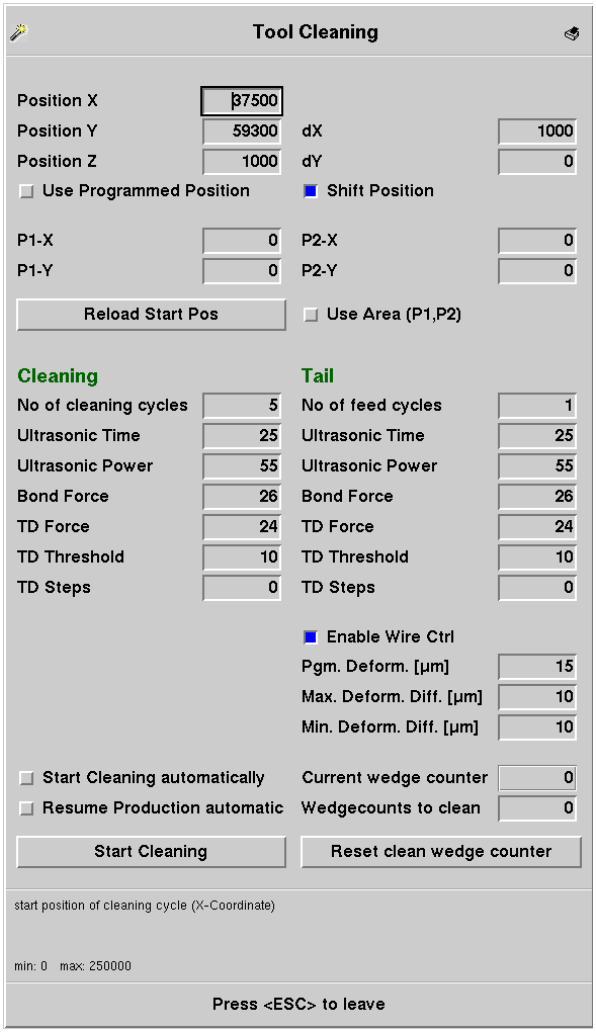


fig. 12 - 133 Mode > Tool Cleaning (Mode 122)

Automatic tool cleaning is used to remove accumulations from the wedge after a number of bonds, which is to be specified.

- The wire is pulled out of the tool by hand.
- Some bond cycles are performed without wire; deposits remaining on the substrate are removed in the process.
- The wire will be reinserted into the tool: A tail is generated and the production is continued.

IMPORTANT

The number of bond cycles after which the tool should be cleaned depends on the material to be bonded.

The "Wedge counts to clean" parameter specifies the number of bond cycles after which the tool will be cleaned. The user dialog opens automatically when the value is reached.

When the "Start Cleaning automatically" field is checked, the cleaning process will start automatically. Otherwise, the operator must intervene.

The "Start Cleaning" button is used to start the cleaning process.

When the cleaning cycle is finished, the Tool Clean Wedge Counter will be reset and production will continue depending on "Resume Production automatic".

The data for tool cleaning corresponds with that of Mode 11 and may be adjusted to "Cleaning" and "Tail" as needed.

The cleaning position is specified using the X, Y and Z coordinates, whereby the bond head performs a position change after every touchdown by "dX", "dY". The changed position data is transferred with "Shift Position" and the next cleaning process begins shifted accordingly.

Parameter (Tool Cleaning)	**Description / *Value range, unit***
Positions	
Position X	Start position cleaning process (X coordinate). *0 ... 250 000*
Position Y	Start position cleaning process (Y coordinate). *0 ... 210 000*
Position Z	Start position cleaning process (Z coordinate). *0 ... 70 000*
Use Programmed Position	When this field is enabled, the values from Mode 11 will be transferred. Otherwise, the necessary values must be entered.
dX	Delta X position *0 ... 2000*
dY	Delta Y position *0 ... 2000*
Shift Position	Enables shifting the X and Y position.

Parameter (Tool Cleaning)	**Description / *Value range, unit***
P1-X	Definition of a range which facilitates a repeated execution around the work area.
P1-Y	
P2-X	
P2-Y	
Use Area (P1-P2)	Activates processing of the work area.
Reload Start Pos.	Renewed processing of the work area.
Control parameter	
No. of cleaning cycles	Number of cleaning cycles. *1 ... 100*
No. of feed cycles	Number of wire feed cycles. *1 ... 10*
Current wedge counter	Indicates the current value of the Cleaning Wedge Counter.
Wedge counts to clean	Number of wedge cycles after which the cleaning process was started. If the value 0 is displayed, the cleaning process was not started.
Start Cleaning automatically	Enables the automatic start of the cleaning process.
Resume Production automatically	Enables automatic resuming of production after ending the cleaning process.
Bond parameters	
Ultrasonic Time	Programmed ultrasonic time. *0 ... 4000 ms*
Ultrasonic Power	Programmed ultrasonic power. *0 ... 255 digits*
Bond Force	Programmed bond force. Only used when the bond force ramp is not activated. Min. … Max. (digit/cN) Page 1 *0 ... 5000 digits*
TD Force	Programmed Touch Down Force. Min. … Max. (digit/cN) Page 1 *0 ... 2047 digits*
TD Threshold	Programmed Touch Down Threshold. *1 ... 200 digits*

Parameter (Tool Cleaning)	Description / *Value range, unit*
TD Steps	Programmed TD steps. *1 ... 400*
Enable Wire Ctrl	Enables the Wire Control Mode for Tail Bond.
Pgm. Deform.	Programmed deformation for Tail Bond. *0 … 250 µm*
Max. Deform.	Maximum deformation for Tail Bond. *0 … 250 µm*
Min. Deform.	Minimum deformation for Tail Bond. *0 … 250 µm*
Commands	
Start Cleaning	Starts the cleaning process.
Reset Clean Wedge Counter	Resets the cleaning process to zero.

12.9.4 Page (main menu)

Page	Service
BHC Parameters	1
Program Status	2
Motor Data	3
Machine Setup	4
Delays and Indexer Data	5
Processdata Setup	6
Processdata PartID	7
PRU Parameters	8
BHC Outputs	9
Trackball	10
Init Motion Controller	11
De-Init Motion Controller	12
Indexer	80
US-Generator	81
Production Times	86
CAN	88
Calibration	89
BPC - Display Options	100
InHead Pulltest	103
Light Tower Setup	117
Wire Spool	144
Operator Check List	150
Edit Op. Check List	151
Heater	200
Default-Parameter	300

fig. 12 - 134 Page Menu

These data pages enable you to set additional speeds and delays. The parameters are global, in other words these settings apply to all bonding operations.

- **BHC Parameters:** Sets the movement speed and limits of the bond head (see "BHC Parameters (page 1)" on page 12-83)
- **Program Status:** Quantity of the modules, chips and wires in memory (chip 0 is also counted!) and statistics on the quantity of processed modules and bonds (see "Program Status (page 2)" on page 12-92)
- **Motor Data:** Motor data of the bonder (see "Motor Data (page 3)" on page 12-93)
- **Machine Setup:** General settings of the bonder and indexer (see "Machine Setup (Page 4)" on page 12-94)
- **Delays and Indexer Data:** Indexer parameters (see "Delays and Indexer Data (page 5)" on page 12-97)
- **Process data Set-up:** Configuration of current data collection (see "Process data setup (page 6)" on page 12-98)
- **Process data PartID:** Manual entry of part ID (see "Process data PartID (page 7)" on page 12-99)
- **PRU Parameters:** Important information for pattern recognition (see "PRU Parameters (Page 8)" on page 12-100)
- **BHC Outputs:** Check boxes for marking individual functions and then testing for function (see "BHC Outputs (page 9)" on page 12-103)
- **Trackball:** trackball speed (see "Trackball (page 10)" on page 12-103)
- **Init Motion Controller:** Initialisation of the motor control system (see "Init Motion Controller (page 11)" on page 12-104)

IMPORTANT

Once initialisation has completed, it is essential to home the axes.

- **De-Init Motion Controller:** Switches off drives so that the bond head can be traversed by hand (see "De-Init Motion Controller (page 12)" on page 12-104)

NOTE!

In this mode the bond head moves freely, so take care not to cause a collision that could result in severe damage, for example if the bond head is allowed to collide with the indexer.

- **Indexer:** Service page for the indexer settings (see the section on the indexer) (see "Indexer (Page 80)" on page 12-104)
- **US generator:** See "US-Generator (page 81)" on page 12-104
- **Production Times:** Display of the production times (see "Production Times (page 86)" on page 12-110)
- **CAN:** Management of the individual CAN nodes in and outside of the machine (see "CAN (Page 88)" on page 12-110)
- **Calibration:** Calibration process (see "Calibration (Page 89)" on page 12-114)

- **BPC - Display Options:** Setting for the diagrams that are displayed on the monitor (see "BPC - Display Options (page 100)" on page 12-120)
- **Light Tower Setup:** Setting status of the signal light (see "Light Tower Setup (Page 117)" on page 12-122)
- **WireSpool:** Setting for wire feed (see "Wire Spool (page 144)" on page 12-122)
- **Operator Check List:** Manual check of the list created in "Edit Op. Check List" (see "Operator Check List (page 150)" on page 12-125)
- **Edit Op. Check List:** Creation of the program specific and general check list (see "Edit Op. Check List (Page 151)" on page 12-126)
- **Default Parameters:** Creation and management of a parameter data base (see "Default - Parameter (page 300)" on page 12-127)

BHC Parameters (page 1)

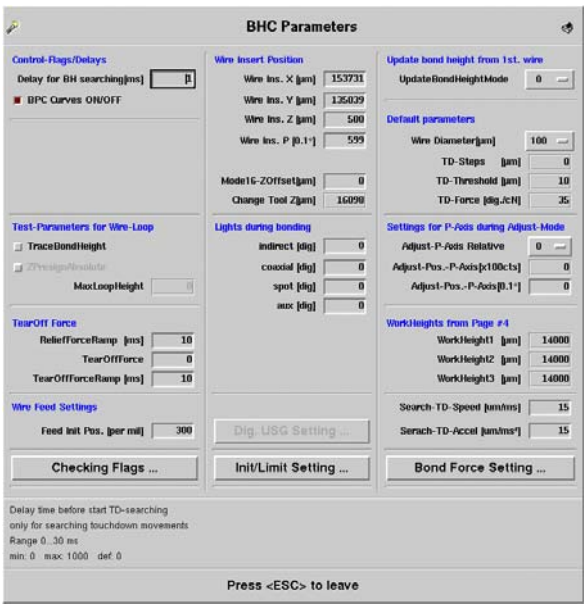


fig. 12 - 135 BHC Parameters (page 1)

Globally sets the movement speed and limits of the bond head between bond search height (ramp height) and touchdown.

Parameter (BHC Parameters)	Description / *Value range, unit*
Control Flags/ Delays	
Delay for BH searching [ms]	Delayed interrogation of the TD signals in order to avoid air touchdown. *0 ... 10 ms*
BPC Curves ON/ OFF	The generation of series of measuring data from the BPC can be switched on and off here. When deactivated, no further deformation data are displayed.
Test Parameters for Wire Loop	
TraceBondHeight	Measured bond heights are also described in the log file. This mode is for the purpose of error analysis.

Parameter (BHC Parameters)	Description / *Value range, unit*
ZPresignAbsolute	If "Z-PresignAbsolute" is activated, the specifications of the Z presign in micrometres are valid. If it is deactivated, the value is calculated by Z presign in compliance with the defaults for the loop parameters. This flag is usually switched off.
MaxLoopHeight	Specification of the maximum loop height. The value is usually default 0.
TearOff Force	
Relieve Force Ramp [ms]	Time of switching from "Bond Force" to "Relieve Force" (relief force for cutting; this force is achieved after x ms).
TearOffForce	Force during tear-off movement from "CUT XY 1" to "CUT XY 2".
TearOffForce Ramp [ms]	Time of switching from "Relieve Force" to "TearOffForce (full tear-off force is achieved after X ms).
Wire Feed Settings	
Feed Init Pos.	Activation of the feed piezo (exciter voltage) for home/wire thread-in. *‰*
Wire Insert Positions	
Wire Ins. X	Coordinate position for wire feed-in (mode 16)
Y	
Z	*µm*
P	Angular deflection for wire feed-in (Mode 16). *0.1 °*
Mode 16-ZOffset	Adjustment of the bonding tool *µm / cts*
Change Tool Z	Z position for the tool change. *µm / cts*

Parameter (BHC Parameters)	Description / *Value range, unit*
Lights during bonding	See 12.12.5 "Adjusting the lighting" on page 12-161
indirect	Exposure value for the diffuse lighting (metal plate as deflector unit). *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
coaxial	Exposure value for the coaxial lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
spot	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
aux	Exposure value for optional lighting on the bond head. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
Update bond height from 1st. wire	
UpdateBondHeightMode	Define the mode of bond-height updating for each 1st wire per chip. *0: Bond height is not updated* *1: Bond height is updated for the source bond* *2: Bond height is updated for the destination bond* *3: Bond height is updated for both bonds*
Default parameters	
Wire Diameter	Wire diameter; should always be set in compliance with the application. *µm*

Parameter (BHC Parameters)	Description / *Value range, unit*
TD Steps	Display of Touchdown steps during bond force calibration. Programming is performed in Mode 44. *µm*
TD Threshold	Sensitivity of the touchdown sensor. Programming is performed on Page 44 *1 ... 200*
TD Force	The force with which the bonding tool contacts the chip. Programming is performed on page 44. *cN or digit*
Settings for P-Axis during Adjust-Mode	
Adjust P-Axis Relative	Relative or absolute P-axis position in the 'Adjust Pos.-P-Axis' parameter. *0: Absolute position* *1: Relative position*
Adjust Pos.-P-Axis [x100cts]	Display of the value of "Adjust Pos. P Axis" in machine increments. *cts*
Adjust Pos. P Axis [0.1°]	Position of the P axis while the adjust is in progress. *0.1 °*
WorkHeights from Page #4	
WorkHeight1	Display the absolute coordinate of the Z axis for XY-axis travel between two chips. Programming is performed on page 4. *µm*
WorkHeight2	Display the absolute coordinate of the Z axis for XY-axis travel between two wires on a chip. Programming is performed on page 4. *µm*
WorkHeight3	Display the absolute coordinate of the Z axis for XY-axis travel between two modules. Programming is performed on page 4. *µm*
Search-TD-Speed	Speed for the TD measurement. *µm/ms*
Search-TD-Accel	Acceleration for the TD measurement. *µm/ms*

N O T E !

When there is a change of device, check the limits of travel in order to exclude the possibility of damage to the bond head.

Subordinate pages:

- **Checking Flags:** Defines various check functions (see "Checking Flags (BHC Parameters)" on page 12-86).
- **Dig. USG Setting:** Selection of ultrasonic generator and configuration profiles (see "Dig. USG Setting... (BHC Parameters)" on page 12-88)
- **Init/Limit Setting:** Positions for initialisation and maximum work areas (see "Init/Limit Setting (BHC Parameters)" on page 12-88).
- **Bond Force Setting:** Setting for bond force (see "Bond Force Setting (BHC Parameters)" on page 12-91).

Checking Flags (BHC Parameters)



fig. 12 - 136 BHC Parameters (Page 1) > Checking Flags

Various check functions are configured in this dialog.

Parameter (Checking Flags)	Description / *Value range, unit*
Counting for bond wedge	
Max. Wedge Count	Number of bonds before the bonder requests a bonding-tool change. *0 = No check*
Warning Wedge Count	If the bonding tool counter reaches this value, it is displayed via the signal light. However, the bonder is not yet stopped to request a change of bonding tool. This does not take place until the "Max. Wedge Count" is reached.
Act. Wedge Count	Counter for the quantity of bonds with this bonding tool.
Ignore Wedge Count	If the check box is marked, no request to change the bonding tool is displayed upon reaching the preset maximum bond number.
Reset Wedge Count	Resets the counter for wedge uses after a change of bonding tool.

Parameter (Checking Flags)	Description / *Value range, unit*
Wedge count for Auto-cleaning	
Max. Clean Wedge Count	Number of bonding procedures after which the "automatic tool cleaning" function is executed (see "Tool Clean (Mode 122)" on page 12-79).
Act. Clean Wedge Count	Display of the current count of the counter for automatic tool cleaning.
Checking Z Crash Switch	Depends on whether or not a crash sensor is installed. ***IMPORTANT*** *Do not change this value*
Motor Wire Spool Control Flag	Setting, whether an automatic wire unwind is available. *0: activates no wire spool* *1: Motor Wire Spool: automatic wire unwind (F&K Delvotec)*
Control Mode	Checking facility as to whether the wire spool unwinds correctly during the loops. *0: No checking* *1: Checking before the second bond* *2: Checking after the second bond*
Act Wire Spool Skip Cnt	Current number of wire-check errors.
Wire Spool Skip Count	Number of wire-check errors at which production is stopped and an error message is issued.
Reset Act Wire Spool Skip Cnt	Resets the counter for wire control defects.
Checking Bondhead Door switch	See "Bondhead Emergency Stop Mode" on page 12-12
Bond Station Air Control Flag	Indexer-dependent. If a heater is installed: *1: Air flow is continuous (select this option if temperatures are high)* *2: Air off in home position*

Parameter (Checking Flags)	Description / *Value range, unit*
Checking indexer vacuum	Activation and deactivation of monitoring for device clamping. If activated, no bonding can be performed as long as their is not a sufficient vacuum in the device clamp. Indexer-dependent. ***IMPORTANT*** *Do not change this value*
IndexVacuumDelay	Additional delay after activation or deactivation of the vacuum in the device holder.
Checking Indexer Clamp	Activation and deactivation of monitoring for device clamping. If activated, the bond head cannot be moved as long as the device clamp is in the range of movement. Indexer-dependent. ***IMPORTANT*** *Do not change this value*
Indexer Information	
Indexer Type	Display of the indexer type. You cannot change this value.
Indexer Name	Display of the indexer name. You cannot change this value.
Deformation Control Settings	
Act. Deform Skip Cnt	Number of consecutive bonds that are not correctly executed on account of deformation defects without stopping the machine.
Deformation Skip Count	Maximum number of bonding procedures that are allowed to be consecutively executed incorrectly before the machine is stopped with an error message.
Reset Act Deform. Skip Cnt	Resets deformation error counter.

Parameter (Checking Flags)	Description / *Value range, unit*
Impedance Control Settings	
Act. Imp. Skip Cnt	Number of consecutive bonds that are not correctly executed on account of impedance defects without stopping the machine.
Impedance Skip Count	Maximum number of bonding procedures that are allowed to be consecutively incorrectly executed before the machine is stopped with an error message.
Reset Act. Imp. Skip Cnt	Resets the counter for impedance defects.
Buzzer Control Flag	Activate acoustic warning. Only if a buzzer is installed.
Main Pressure Air Control Flag	Mode for monitoring and control of the main compressed air supply. *0: No monitoring* *1: compressed air switched on in operation* *2: main air pressure is switched off when parking the bond head in Home position.*

Dig. USG Setting... (BHC Parameters)

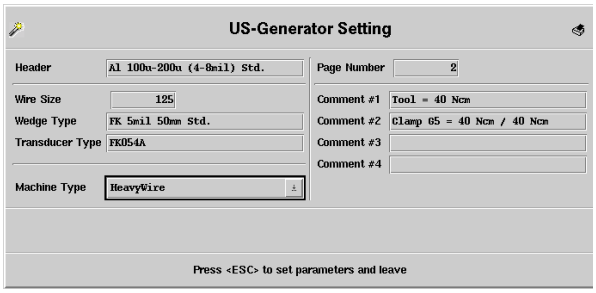


fig. 12 - 137 BHC Parameters (Page 1) > Dig. USG Setting...

Usually the settings of the ultrasonic generator are stored permanently in the device. Should it be necessary for an application to perform bonding with different configurations of the ultrasonic generator, various generator profiles can be stored in a data base by F&K Delvotec, e.g. for various wedge types. This dialog offers a choice of these profiles. Select by browsing with "page forward" and "page back". Once you have selected the data set you want, press "Escape" on the keyboard to close the dialog.

IMPORTANT

Enabled only when the ultrasonic generator is set for parametrisation in the "Per bond program" mode.

Init/Limit Setting (BHC Parameters)

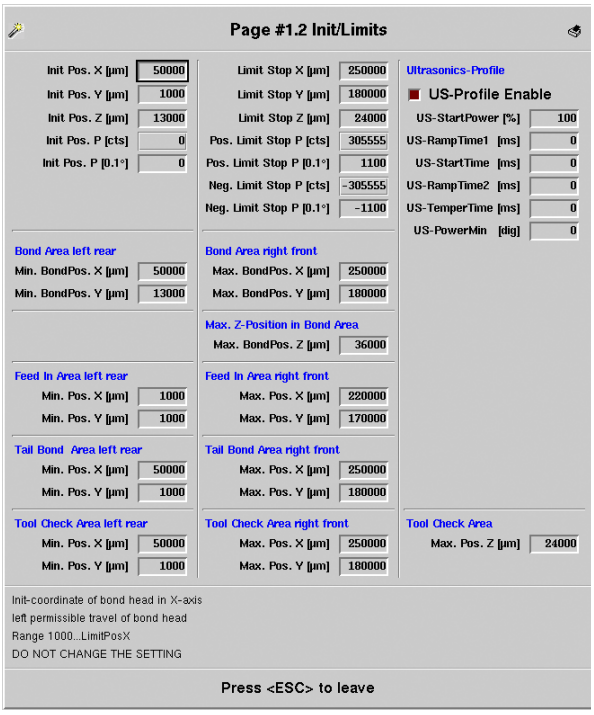


fig. 12 - 138 BHC Parameters (Page 1) > Init/Limit Setting

Positions for initialisation and maximum work areas. Also refer to " Feed In (mode 16)" on page 12-70"

Parameter (Init/Limit Setting)	Description / *Value range, unit*
Init Pos. X Init Pos. Y Init Pos. Z	Initialisation coordinates (position to which the bonder moves when the "home" key is pressed). *µm*
Init Pos. P	Display of the value of "Init Pos. P" in machine increments. *cts*
Init Pos. P [0.1°]	Fine setting of 0° position of the bond head. *0.1 °*
Limit Stop X Limit Stop Y Limit Stop Z	Maximum travel in the three coordinate directions. *µm*
Pos. Limit Stop P	Display of the value of "Pos. Limit Stop P" in machine increments. *cts*

Parameter (Init/Limit Setting)	Description / *Value range, unit*
Pos. Limit Stop P [0.1°]	The maximum permissible rotational angle in positive direction. *0.1 °*
Neg. Limit Stop P [cts]	Display of the value of "Neg. Limit Stop P" in machine increments. *cts*
Neg. Limit Stop P [0.1°]	The maximum permissible rotational angle in negative direction. *0.1 °*
Bond Area left rear	
Min. BondPos. X	Minimum permissible bonding coordinates. *µm*
Min. BondPos. Y	
Bond Area right front / Max. Z-Position in Bond Area	
Max. BondPos. X	Maximum permissible bonding coordinates. *µm*
Max. BondPos. Y	
Max BondPos. Z	
Ultrasonics Profiles	
US-Profile Enable	Activate ultrasonic profile
US-Start Power	Target value for US power after the first ramp phase (US Ramp Time 1).
US-Ramp Time1	Duration of the first ramp phase, during which US power is ramped up from 0 to the "US-Start Power" value.
US-StartTime	Time during which US power is held steady at the "US-Start Power" value.
US-Ramp Time2	Duration of the second ramp phase, during which US power is changed from the "US-Start Power" value to the target value set in the wire parameters. If bonding is performed with ultrasonic control, automatic control begins at the end of this phase.
US-TemperTime	Time after the end of the bond phase for which a minimal US power is still output.
US-PowerMin	Value for the US power output during the "US-Temper Time".
Feed in Area left rear	At this position, a maximum movement range is specified for the bond head to perform the "Mode 16 / Feed In" function. The bond head cannot be moved beyond this range during wire and tool changing. If desired, this may be used to prevent actions to be carried out while the bond head is located above the production material.
Min. Pos. X	Upper left corner of the range for Mode 16 / "Feed in" X coordinate. If this limitation is not desired, the same value as "Init Pos X" must be entered here.
Min. Pos. Y	Upper left corner of the range for Mode 16 / "Feed in" Y coordinate. If this limitation is not desired, the same value as "Init Pos Y" must be entered here.
Feed in Area right front	
Max. Pos. X	Upper right corner of the range for Mode 16 / "Feed in" X coordinate. If this limitation is not desired, the same value as "Limit Stop X" must be entered here.
Max. Pos. Y	Upper right corner of the range for Mode 16 / "Feed in" Y coordinate. If this limitation is not desired, the same value as "Limit Stop Y" must be entered here.

Parameter (Init/Limit Setting)	Description / *Value range, unit*
Tail Bond Area left rear	At this position, a maximum movement range is specified for the bond head to perform the "Mode 12 / Feed Tail" function. The bond head cannot be moved out of this range for bonding. If desired, bonding to production material can thereby be prevented.
Min. Pos. X	Upper left corner of the range for "Mode 12 / Feed Tail" X coordinate. If this limitation is not desired, the same value as "Init Pos X" must be entered here.
Min. Pos. Y	Upper left corner of the range for "Mode 12 / Feed Tail" Y coordinate. If this limitation is not desired, the same value as "Init Pos Y" must be entered here.
Tail Bond Area right front	
Max. Pos. X	Upper right corner of the range for "Mode 12 / Feed Tail" X coordinate. If this limitation is not desired, the same value as "Limit Stop X" must be entered here.
Max. Pos. Y	Upper right corner of the range for "Mode 12 / Feed Tail" Y coordinate. If this limitation is not desired, the same value as "Limit Stop Y" must be entered here.
Tool Check Area left rear	At this point the maximum range of movement of the bond head is determined to execute the function "Mode 56 / Tool Check". This range can thus be defined outside the normal bond work area.
Min. Pos. X	Top left corner of the range for "Mode 56 / Tool Check" X coordinate.
Min. Pos. Y	Top left corner of the range for "Mode 56 / Tool Check" Y coordinate.
Tool Check Area right front	
Max. Pos. X	Bottom right corner of the range for "Mode 56 / Tool Check" X coordinate.
Max. Pos. Y	Bottom right corner of the range for "Mode 56 / Tool Check" Y coordinate.
Tool Check Area	
Max. Pos. Z	Maximum Z position within the defined Tool Check Area. This position may be greater than Max. Bond Pos. Z and can only be approached in the defined range.

N O T E !

Exercise great care when setting the device- and chip-dependent movement-limit coordinates X, Y and Z, in order to preclude the possibility of damage occurring when the axes are moved. Collision hazard.

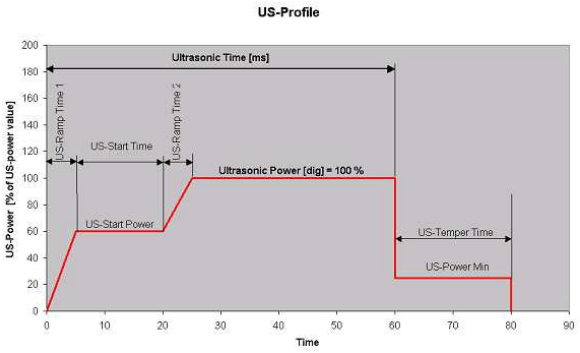


fig. 12 - 139 BHC Parameters (Page 1) > Ultrasonic Profiles

Bond Force Setting (BHC Parameters)

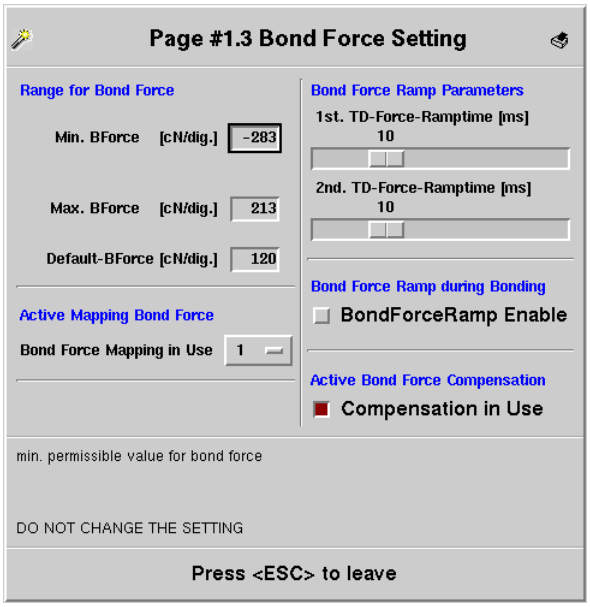


fig. 12 - 140 BHC Parameters (Page 1) > Bond Force Setting

Setting of the bond force in digits. After calibration of the bond force the bond force is specified in cN.

Parameter (BondForce Setting)	Description / *Value range, unit*
Range for Bond Force	
Min. BForce	Minimum bond force that can be set. *cN if bond force mapping = 1, otherwise digits.*
Max. BForce	The highest bond force that can be set *cN if bond force mapping = 1, otherwise digits.*
Default BForce	Default bond force. Used if no other bond force is defined (e.g. for loop). *cN if bond force mapping = 1, otherwise digits.*
Active Mapping Bond Force	
BondForce Mapping in Use	Display the bond force. *0 = display in digit* *1 = display in cN*
Bond Force Ramp Parameters	
1st. / 2nd. TD-Force Parameters	Duration of a step when using the ramp function for the bond force for the applicable bond. *ms*
BForce Ramp during Bonding	
BondForceRamp Enable	Activate the ramp function of bond force control, in other words the bond force is incremented step by step from minimum to maximum. Ramp parameters are defined in mode 1, mode 2 and mode 11. *0 = Ramp function deactivated* *1 = Ramp function activated*
Active Bond Force Compensation	
Compensation in Use	Compensates the mechanical force increase of the transducer suspension. ***IMPORTANT*** *This function may be activated only with valid calibration (see "Calibration (Page 89)" on page 12-114)*

Program Status (page 2)

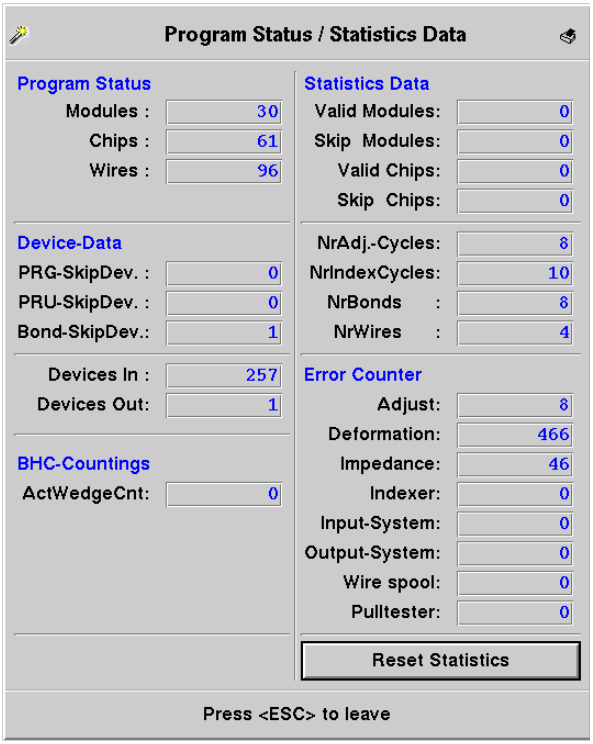


fig. 12 - 141 Program Status (Page 2)

Number of modules, chips and wires in memory (this count includes chip 0) and statistics on number of modules and bonds.

Parameter (Program Status)	Description / *Value range, unit*
Program Status	
Modules	Number of the modules in the current bond program. There is at least one module.
chips	Number of chips in the current bond program. Invariably, a device (Chip 0) is counted, regardless of whether or not bonds are placed on it.
Wires	Number of wires per module in the current bond program.
Device-Data	
PRG-SkipDev	Devices skipped because a preceding process step had already supplied information to the effect that the devices were unusable. Only in conjunction with additional software that is not part of the standard software.
PRU-SkipDev	Number of devices not fully processed on account of pattern-recognition errors.
Bond-SkipDev	Number of devices not fully processed on account of bond errors (deformation errors, wire monitor).
Devices In	Number of devices that have been transferred to the machine for processing.
Devices Out	Number of devices that have been processed successfully by the bonder.
BHC-Countings	
ActWedgeCnt	Counter for the number of bonds that have been executed to date with this tool (reset in mode16).
Statistics Data	
Valid Modules	Modules processed correctly since the most recent reset.
Skip Modules	Modules not processed correctly since the most recent reset.
Valid Chips	Chips processed correctly since the most recent reset.
Skip Chips	Chips not processed correctly since the most recent reset.
NrAdj.-Cycles	Number of adjust cycles (pattern recognition).
NrIndexCycles	Number of index steps since the most recent reset.
NrBonds	Number of bonds since the last reset, independent of the quality.
NrWires	Number of wires since the last reset, independent of the quality.
Error Counter	Display the number of errors.
adjust	Number of detection errors since the last reset.
Deformation	Number of deformation defects since the last reset.
Impedance	Number of impedance defects since the last reset.
indexer	Number of faults of the indexer.

Parameter (Program Status)	Description / *Value range, unit*
Input System	Number of faults in the input system (e.g. lift) since the last reset.
Output System	Number of faults in the output system (e.g. lift) since the last reset.
Pulltester	Number of errors of the NDPT (Non Destructive Pull tester).
Wire Spool	Number of wire spool errors occurred since the last reset.
Reset Statistics	Resets the statistics counter

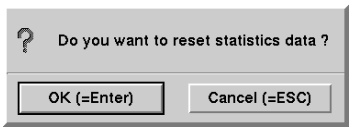


fig. 12 - 142 Program Status (Page 2) > Reset Statistics > confirmation request

I M P O R T A N T

Device-Data: The counters for "Devices" are based on the assignment of "MCP Device" numbers in mode 1. By means of this the actual products can be defined independently of the structures of the bond program. This function is also implemented in the series without material tracking installed.

BHC-Countings: "ActWedgeCnt", "ActWireGuideCnt" and "ActCutterCnt" are not reset with "Reset Statistics", but in mode 16 / FeedIn (or page 1 / page 4).

Motor Data (page 3)

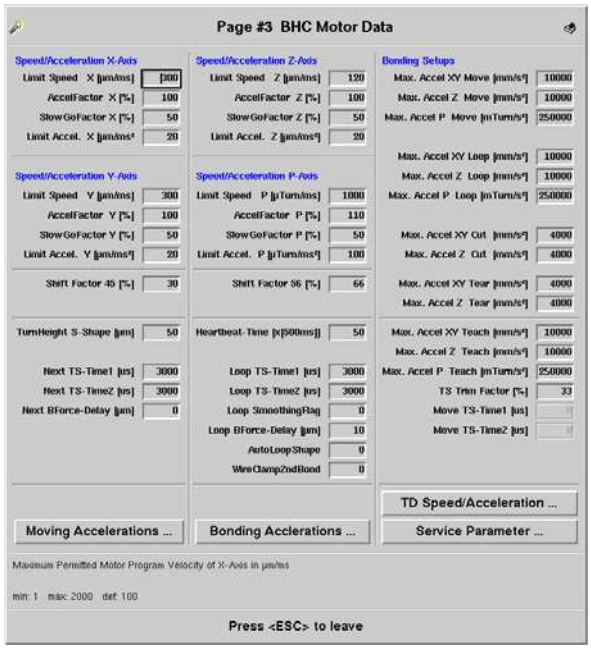


fig. 12 - 143 Motor Data (page 3)

This parameter page contains the elementary setting data of the machine. The data require detailed technical knowledge of the structure and function of the control unit. Changes to these settings may be performed only by specially authorized personnel or in accordance with specification by F&K Service.

N O T E !

Erroneous settings can cause serious damage to the machine.

I M P O R T A N T

Reserved exclusively for the "Engineer" user level.

Changes should be effected only after consultation with F&K Delvotec or by trained personnel.

Machine Setup (Page 4)



fig. 12 - 144 Machine Setup (Page 4)

On this page the current Offset Data are displayed, Workheights 1, 2 and 3 are set and Auto Skip Mode activated.

It also includes general settings for the bonder and the indexer.

Parameter (Machine Setup)	Description / *Value range, unit*
Workheights	**N O T E !** *Risk of collision if these values are not correctly set!*
Workheight 1	Absolute coordinate of the Z-axis for XY-axis travel between two chips. *µm*
Workheight 2	Absolute coordinate of the Z axis for XY-axis travel between two wires on a chip. *µm*
Workheight 3	Absolute coordinate of the Z-axis for XY-axis travel between two modules. *µm*

Parameter (Machine Setup)	Description / *Value range, unit*
rel. WHeight 2	Relative coordinate of the Z axis for XY-axis travel between two wires on a chip to the preset bond height. *µm*

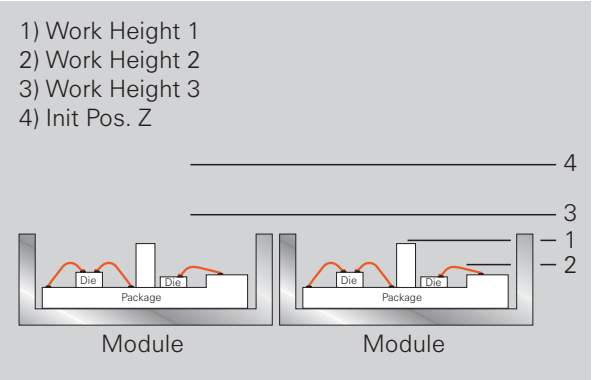


fig. 12 - 145 Work Height 1 to 3

Parameter (Machine Setup)	Description / *Value range, unit*
Adjust Settings	
Production Mode	Sequence for processing *0: Search forward, bond forward* *1: Search forward, bond backward* *2: Search and bond immediately* *3: Like 1, but the wire list is processed from back to front*
Adjust Mode	Mode for adjust cycle *0: Always go to taught position* *1: Go to last found position or taught position if adjust not yet performed* *2: Use first chip in module to correct the other chips (function of chip No. 0 for each module)*
Auto Skip	When this box is checked, the chip will automatically be skipped following search errors of the PRU.
Auto Skip Mode	Skip module and skip chip for PRU eject.

Parameter (Machine Setup)	Description / *Value range, unit*
Auto Skip Count	Maximum number of chips to be skipped in succession.
Auto Adjust Retrys	Maximum number of auto-adjust retries after PRU eject.
Wedge Count Settings	
Reset Wedge Count	Reset Bond Tool Counter.
Ignore Wedge Count	If the check box is checked, no request to change the bonding tool is displayed upon reaching the preset max. bonding quantity.
Optimization of P-Axis	
Optimization Mode	This flag controls the optimized bonding sequence for processing of the wires. To do so a wire priority must be programmed in the wire data (mode 2) (see "Priority" on page 12-46).
Camera Offset Parameter	
Number of Points	Display only. Number of measuring points used to calculate the angular rotation dependent camera tool offset (see "Corr Offset (Mode 3)" on page 12-56).
Delta X Delta Y Radius Elliptic Proportion	The values are entered automatically after mode 3 is called; these entries cannot be changed. *Angle P cts* *µm*
Reset Camera Offset	Delete the offset of the camera (camera-offset data set to 0; risk of collision!)
Increments for Single Wire	
X / Y Incr. Single Wire	Position change in X and Y directions when the page forward / page backward keys are pressed in mode 11. *µm*

Parameter (Machine Setup)	Description / *Value range, unit*
Further Parameters	
Renumber Mode	Mode of the wire numbering *0: numbering of the wires ?chip by chip* *1: consecutive numbering ?of the wires*
Index Mode	Change indexer mode *0: Standard* *2: Double-head machine*
Skip Devices mode	Display for the type of monitoring for material tracking (Option). *0: No monitoring*
Animate After Align	The positions to be bonded are shown on the monitor after the search run. Bonding does not start automatically.
Animate Always	After activation the positions to be bonded are displayed after each search; otherwise only once when automatic production is started.
Animation Delay	Dwell time at each bond position. *ms*
DoubleCheckFor Move	Activating / deactivating an additional query when starting the production sequence. This is a way of preventing unwanted movements in the event of accidental actuation of the "Bond"and "Adjust" buttons.
Double CheckFor StoreTrace	Activate / deactivate an additional query when "Store Trace" is pressed. This is a way of preventing unwanted changes to the programmed settings in the event of accidental actuation of the button.
Wire Clamp Settings	
Wire Clamp Delay [ms]	Delay for opening/closing of the clamp.
Clamp Open Delay	Delay before the clamp opens. *0 ... 255 ms*
Open Ramp Time	Ramp time when opening. *ms*

Parameter (Machine Setup)	Description / *Value range, unit*
Wire Clamp Open-Pos.	Activation of the clamp piezo (exciter voltage) for closed clamp.
Open Ramp Time	When unequal 0: Control of the clamp piezo with linear ramp during opening. *0: changeover only* *ms*
Wire Clamp Close-Pos.	Activation of the clamp piezo (exciter voltage) for closed clamp.
Close Ramp Time	When unequal 0: Control of the clamp piezo with linear ramp during closing. *0: changeover only* *ms*
opt. Wire Clamp Settings	
Clamp Open-Pos.	Activation of the clamp piezo (exciter voltage) for closed clamp. *per mil*
Open/Close Ramp Time	Ramp time when opening/closing. *ms*
Wire Feed Settings	
Wire Feed Mode	Setting for the use of the parameters for tail building. They are: "Wire Feed Steps" and "Tear Off Steps". *0: The settings from this page (Machine Set-up) are used for all bonding procedures.* *1: The settings are individually specified for each wire in the bond program.*
Feed Init Pos.	Activation of the feed piezo (exciter voltage) for home/wire thread-in. *‰*
Wire Feed Steps	Activation of the feed piezo (exciter voltage) for wire feed. *‰*
Wire Feed Delay	Delay for the mechanical feed movement (wire feed). *ms*
Feed Ramp Time	When other than 0: Control of the feed piezo with linear ramp during feed. *0: changeover only* *ms*
Wire Tearing Settings	
Tear-off Delay1	Delay prior to the tear-off movement. *ms*
Tear Off Steps	Activation of the feed piezo (exciter voltage) for the tear-off movement. *‰*
tear-off Delay2	Delay after the tear-off movement. *ms*
TearOff Ramp Time	When other than 0: Control of the feed piezo with linear ramp during tear-off. *0: changeover only* *ms*
Indexer Test-Mode	
Disable Bondhead	Dual-head machines: Disabling of a bond head.

N O T E !

Always check that the bond head's work area is free of obstruction before you press the "Clear Camera Offset" button. Collision hazard.

explanation of auto skip

If the 'Auto Skip' checkbox is not activated, the bonding process is stopped in the event of an error and the operator has to decide on what to do next. Options include using "skip chip" to skip the chip in question, or "skip module" to skip the entire module. Another option is to use the trackball for manual detection. Skipped devices are not marked.

If the Auto Skip checkbox is checked, the Auto Skip Count parameter can be used to define how many chips have to be identified as errored before the system goes automatically to the next module.

- Press "enter": Save parameters.
- Press "Escape" (Cancel): Exit the menu.

Delays and Indexer Data (page 5)

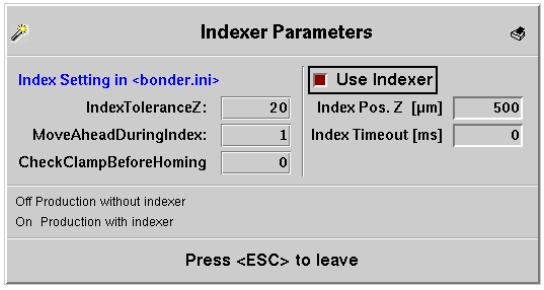


fig. 12 - 146 Delays and Indexer Data (page 5)

Indexer parameters

Parameter (Delays and Indexer Data)	Description / *Value range, unit*
Use Indexer	An indexer is used if this check box is activated.
Index setting in <bonder.ini>	
IndexToleranceZ	Tolerance reading for the position of the Z axis at which indexing can be started. *µm*
MoveAheadDuringIndex?	Define whether or not the bond head can be moved while material is being transported. ***IMPORTANT*** *Caution danger of collision!*
CheckClampBeforeHoming	Determines whether the indexer clamp may be checked before the bond head is homed.
IndexPos. Z	Coordinate to which the Z axis moves before indexing can be started. *µm*
IndexTimeout	Delay before the error message is issued. *0 ... X ms*

- Press "enter": Save parameters
- Press "Escape" (Cancel): Exit the menu

Process data setup (page 6)

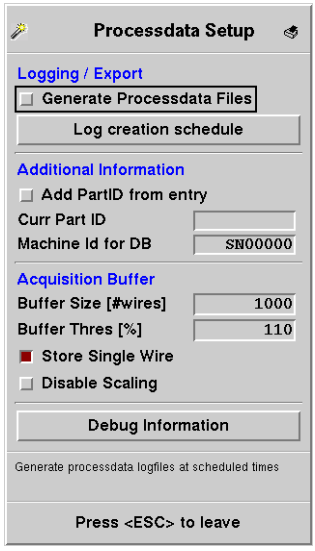


fig. 12 - 147 Process data Set-up (Page 6)

The machine continuously records parameters and measuring and quality data for each bond connection during the production operation. The data of the last bonded wires is always available in an online buffer. This data can be viewed using the "Process Data Viewer" or "BPC Screen" program. The data may also be exported to the FTP range of the machine (so-called log files) manually or automatically with time control for archiving purposes or further analysis. This dialog is for configuring ongoing data acquisition.

NOTE

These functions are also used by additional customer specific software modules for quality data collection and line integration.

If a module of this type is installed, do not change the settings in this dialog for productive operation.

NOTE

Double head machine: The measured data is collected separately for each bond head and must be configured separately for each bond head.

Parameter (Process Data Set-up)	**Description / *Value range, unit***
Logging / Export	
Generate Process Data Files	Activating / deactivating the automatic export of measured data to files (log files).
Log creation ?schedule	This button opens the setup dialog for timed data export.
Additional ?Information	
Add PartID from entry	Activates / deactivates the transfer of a manually specified part identification. This text appears in the records of all wires that are bonded in the sequence and may be used to find the data for a device again.
Curr Part ID	Currently defined text for the part identification (see "Add PartID from entry").
Machine ID for DB	Option to specify an application related identification for the machine that is transferred to the records of all wires bonded in the sequence. It can later be used to assign the data from the log files to a machine or a specific configuration.
Acquisition Buffer	
Buffer Size	Number of wires for which the data is provided in the online buffer. If the "Automatic Export" function is used, the buffer must be large enough so that all wires that can be bonded between two export times fit into the buffer.
Buffer Thres	As soon as the defined number of records has been created in the online buffer, the older records will be deleted. Indication in % of "BufferSize".

Parameter (Process Data Set-up)	Description / *Value range, unit*
Store Single Wire	Activation / deactivation of storage of data from bonding that is not defined with the product program (so-called "Engineering Bonds"). These are bonds that are created with Mode 3 (Offset), Mode 12 (Bonding) or Mode 11 (Single Wire). This data is usually not relevant for quality assessments during production operation.
Disable Scaling	The recorded measuring values are normally already scaled into SI units (by A, Hz) internally. This conversion can be temporarily disabled for diagnostics purposes. ***I M P O R T A N T*** *The unit conversion cannot be added later to the recorded data. If production related data is collected, scale may not be disabled under any circumstances.*
Debug Information	Display of settings and status information for service purposes.

Log creation schedule

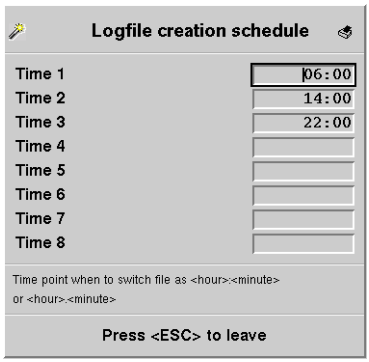


fig. 12 - 148 Process data Set-up (Page 6) > Log creation schedule

Up to 8 times may be defined at which an automatic file export will be performed when "Generate Process Data files" is activated.

Process data PartID (page 7)

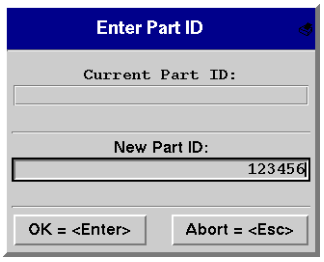


fig. 12 - 149 Process data PartID (Page 7)

Dialog for manual entry of device detection, as described for "Add PartID from entry" and "Curr Part ID".

N O T E

This is the same entry as "Curr. Part ID" on Page 6.

If entry is entirely manual, the configuration dialog can be disabled for the operator in user administration. The entry of the device identification during production can then occur here.

PRU Parameters (Page 8)

Important information for pattern recognition.

If an error status occurs, the "digit video" button in the block shows the error on the monitor. The "auto adjust" button toggles PRU assistance for positioning on and off. The LED in the key lights up to indicate that automatic positioning is active.

PRU General

PRU General defines the basic settings such as tool cursor, tool tolerance, wire display and cursor range.

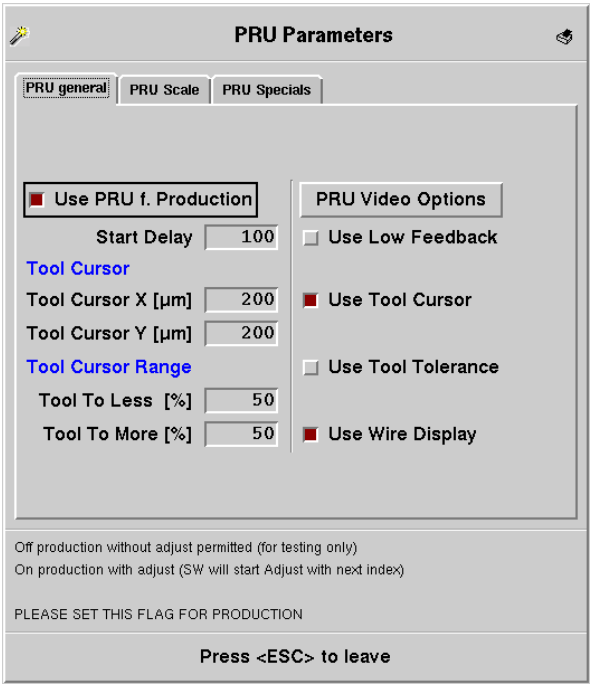


fig. 12 - 150 PRU Parameters (Page 8) > PRU General)

Parameter (PRU Parameters)	Description / *Value range, unit*
Use PRU f. Production	Activation and deactivation of pattern recognition for production. Deactivate this monitoring function for test purposes only.
Use Low Feedback	Upon activation of this option the information additionally superimposed on the video screen is limited to a minimum.
Start delay	Delay before a new picture search. *Range 0 ... 50 ms* *min: 0; max: 1000 ms*

Parameter (PRU Parameters)	Description / *Value range, unit*
Tool Cursor	
Use Tool Cursor	Global activation/deactivation of the function "Tool Cursor X/Y".
Tool Cursor X Tool Cursor Y	Determination of the tool circle size in the X and Y axes. By way of different values the tool circle can also be a vertically or horizontally orientated ellipse. *0 ... 1000 µm*
Tool Cursor Range	
Use Tool Tolerance	Global activation/deactivation of the function "Tool to Less" and "Tool to More".
Tool to Less	Size definition of the smaller tool circle as a tolerability aid. *Range 0 ... 95 %*
Tool to More	Size definition of the larger tool circle as a tolerability aid. *Range 0 ... 95 %*
Use Wire Display	Global activation/deactivation of the function "Wire Display".

Pr8 Video Options

The "Pr8 Video Options" button under "PRU General" opens the following dialog.

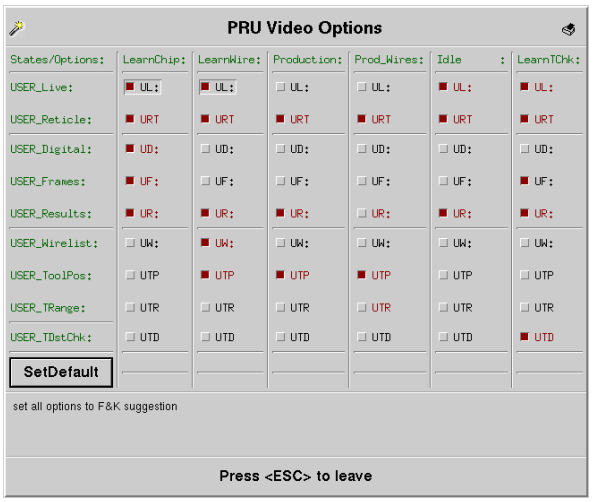


fig. 12 - 151 PRU Parameters (Page 8) > PRU General > Pr8 Video Options

The settings included here allow control of the graphics in defined situations in a type of matrix. The configuration for texts shown in red complies with the recommendations of F&K Delvotec. The pressed-in actuators are active and the relevant activation sample is stored in the bonder configuration. In addition the Wire list, Tool position and Tool range are controlled by the global switches on the PRU page "General".

The "SetDefault" button enables a quick return to F&K Delvotec's recommendations.

PRU Scale

This tab shows a summary of data for determining the camera-dependent scaling values. Press "Store Trace" to start measurement, at the end of which new values can be accepted or rejected.

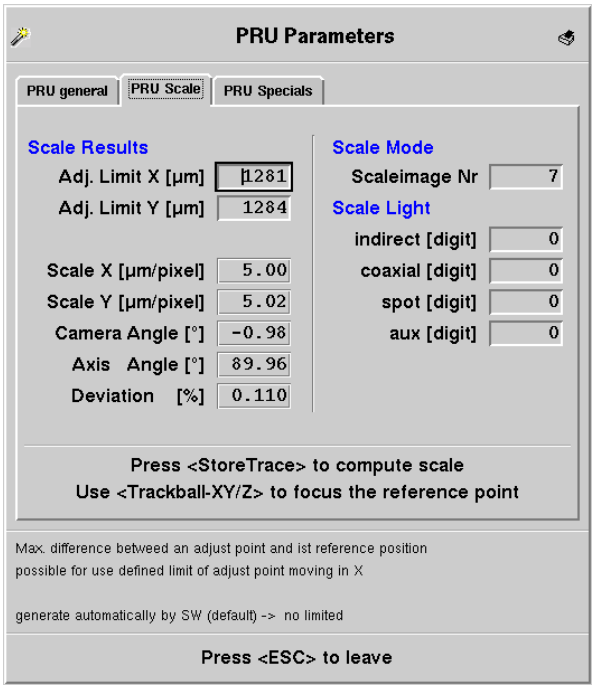


fig. 12 - 152 PRU Parameters (Page 8) > PRU Scale

Parameter (PRU Parameters)	Description / *Value range, unit*
Scale Results	
Adj. Limit X Adj. Limit Y	Max. value by which an adjust point can deviate from its reference position. ***IMPORTANT*** *Upon adoption of new scale values the pre-assignment is effected analogously to the visible PRU range.* *µm*
Scale X Scale Y	Value is entered automatically after calculation. *µm/pixel*
Camera Angle	Camera bracket *Unit: 0.1 °*

Parameter (PRU Parameters)	Description / *Value range, unit*
axis Angle	Bracket of the axis *Unit: 0.1 °*
Deviation	Deviation (tolerance) from the programmed bond positions of the X and Y axes. *%*
Scale Mode	
Scale Image Nr	Reference image number whose configuration is uses to measure the camera scale.
Scale Light	See 12.12.5 "Adjusting the lighting" on page 12-161
indirect	Exposure value for the diffuse lighting (metal plate as deflector unit). *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
coaxial	Exposure value for the coaxial lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
spot	Exposure value for the optional spot lighting. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*
work-spot	Exposure value for the optional spot lighting on the microscope. This function can be used for illuminating awkward devices. *0 = Lowest light intensity* *255 = Highest light intensity* *0 ... 255 digits; def. 128 digits*

PRU Specials

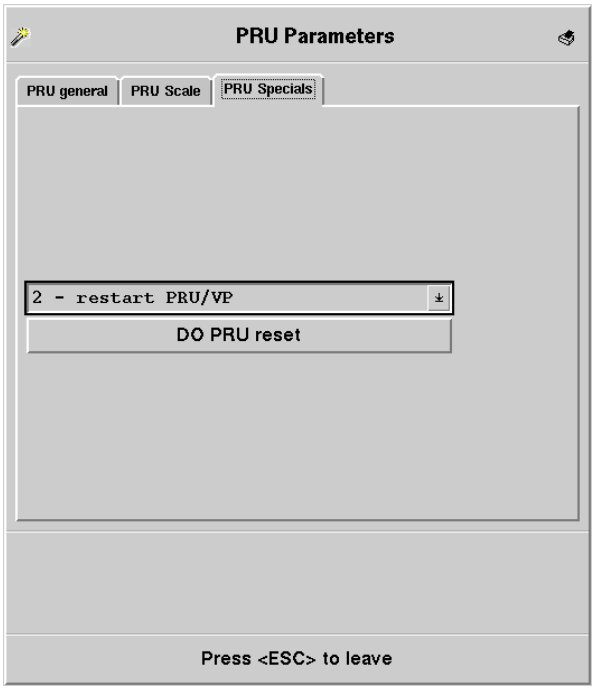


fig. 12 - 153 PRU Parameters (Page 8) > PRU Specials

Only for the service department of F&K Delvotec and authorized personnel.

BHC Outputs (page 9)



fig. 12 - 154 BHC Outputs (page 9)

In this dialog you can switch individual output stages of the bond head controller on and off independently of the function sequence (columns 1+2). At the same time the status of the input stages of the bond head control is displayed (column 3). This function serves as a help position for the checking of basic functions, e.g. in the event of a fault.

Trackball (page 10)

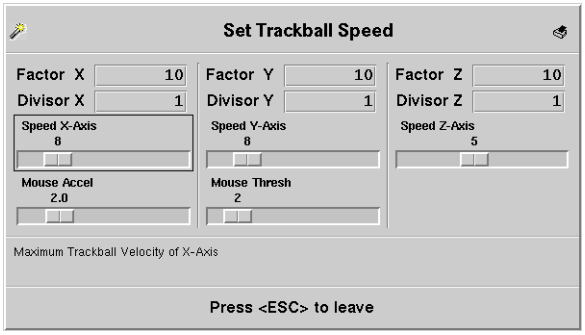


fig. 12 - 155 Trackball (page 10)

Trackball speed .

Parameter (Trackball)	Description / *Value range, unit*
Factor X/Y/Z	Preset values that cannot be changed.
Divisor X/Y/Z	
Speed X/Y/Z Axis	The trackball speed settings for the individual axes. *1 (slow) ... 50 (fast)*
Mouse Accel	Acceleration factor for the mouse cursor.
Mouse Thresh	Mouse speed as of which the acceleration sets in.

IMPORTANT

The speed for traversing the motor is derived from the speed of the mouse cursor. It is therefore recommended that the mouse cursor speed be set for pleasant working on the graphic interface. Only then should the motor speeds be adjusted with the trackball for movement adapted to the application.

Init Motion Controller (page 11)

Initialisation of the motor control system.

IMPORTANT

Once initialisation has completed, it is essential to home the axes.

De-Init Motion Controller (page 12)

Switch off drives so that the bond head can be moved by hand.

NOTE!

In this mode the bond head moves very easily, so take care not to cause a collision that could result in severe damage, for example if the bond head is allowed to collide with the indexer.

Indexer (Page 80)

IMPORTANT

Depending on machine configuration.

Manual station

Service page for a hand station (see the section dealing with the conveyor system).

Indexer xxx (Page 80)

See the section dealing with the conveyor system.

US-Generator (page 81)



fig. 12 - 156 US-Generator (Page 81)

This page depicts the current state of the US generator and its settings.

Parameter (US-Generator)	Description / *Value range, unit*
State	Display of the current state.
Version	Version of the US generator.
SN Controller SN Amplifier	Serial numbers of control unit and power amplifier.
T-Amplifier	Temperature at the output power amplifier (typically 30-50°C).
T-Controller	Temperature at the control unit (typically 20-35°C).
Current Limit	Current has exceeded standard measurement range of the 1:1 transformer.
Voltage Limit	Maximum gain reached.
Timeout	Maximum bond time exceeded.
Short	Short circuit at the output.
WireBreak	Output is open.
ReadError	US-power read error.

Parameter (US-Generator)	Description / *Value range, unit*
General	
Program Page No.	Number of the selected USG database. The colour indicates whether the dialog values match the database values. *Green: Dialog and database match.* *Red: Dialog and database do not match.* *Grey: Global Data Mode is active.*
Header	Database page header.
Power Information	Display of the maximum US-power that can be called up.
Max US-Power [dig]	Maximum US-power in digit (255)
Max Upp, Max Ipp, Max electrical Power	Resulting electrical variable.
Measured Values	Display of the measured values of the current US pulse.
Frequency [Hz]	Frequency in Hz.
Phase [°]	Phase shift
Impedance [Ohm]	Impedance
Voltage PP [V]	Tension +/- amplitude
Current PP[A]	Current +/- amplitude
El. Power [W]	Electric power
Vib Horn PP [nm]	Resulting vibration at transducer horn +/- amplitude.
Test Function	Output of a test pulse
Test US-Power [dig]	US-power specification for test pulse
Controller Value Upp	Corresponding control value (Upp, Ipp or P) depending on control type.
Test Time [ms]	Duration of test pulse.
Comments and Remarks	Comments, remarks, wire diameter, control type.
Functions	
Curve Display	Graphic display of data.
Calibration	Calibration of transducer.
Select Program Page No.	Selection and processing of a data record.
Import Database from USB	Import of data records from the USB interface.
Generate Analyze Data	Generation of Analyze Data.
Export/Delete Analyze Data	Export of Analyze Data to USB interface, deletion of data from the hard disk.

Select Program Page No.

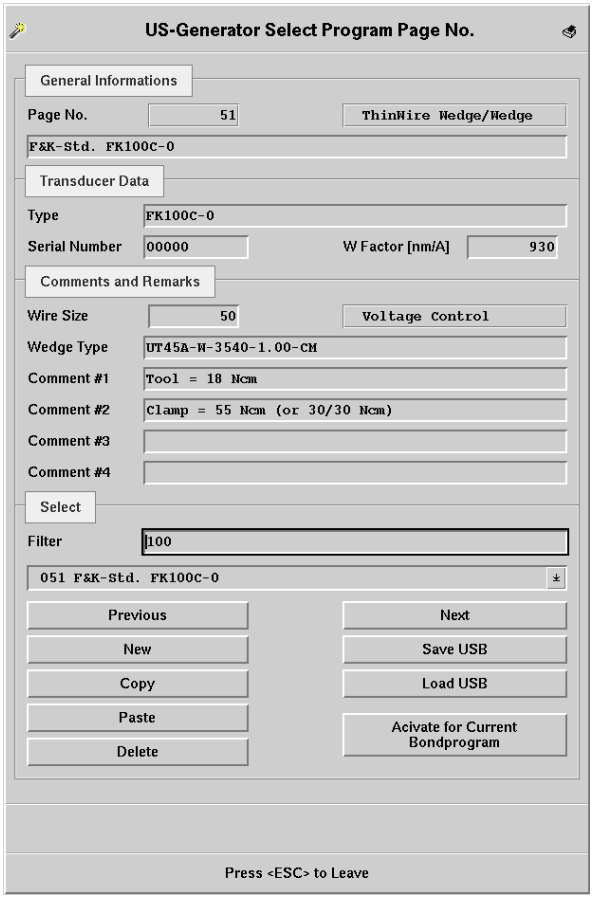


fig. 12 - 157 US-Generator (Page 81) > Select Program Page No.

Assignment of the USG data record (Page No.) to the current bond program is performed in this dialog.

IMPORTANT

The page is disabled if the ultrasonic generator is in the global parameter mode. Only one single data record exists on the US generator.

Data records 1-80 are intended for the user, data records 81-200 are F&K standards and cannot be changed.

Of the data records sorted by bond head type (Thin, Heavy, Gold), only those corresponding to the current bond head are listed.

The Select selection list selects a data record directly. The content of the selection list can be narrowed down using the Filter function. Example: Selection list contains only data records that feature "100".

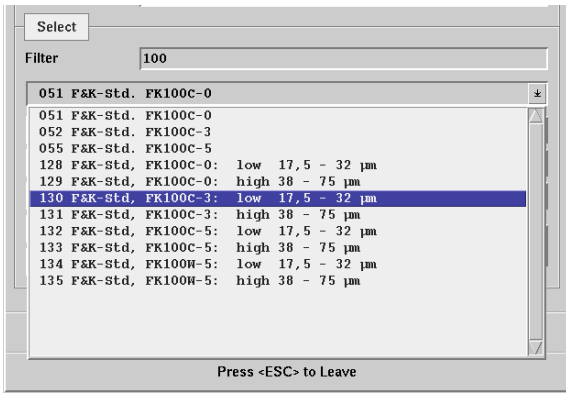


fig. 12 - 158 US-Generator (Page 81) > Select Program Page No. > Filter function

Functions (button)

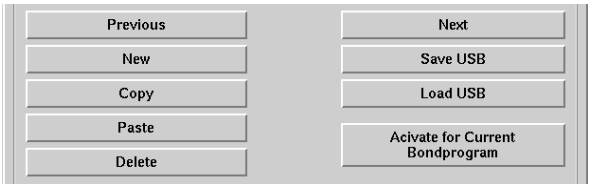
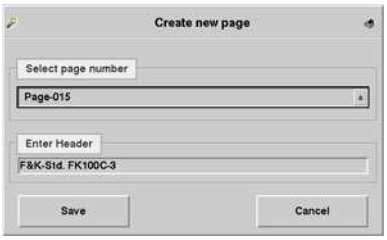


fig. 12 - 159 US-Generator (Page 81) > Select Program Page No. > Functions

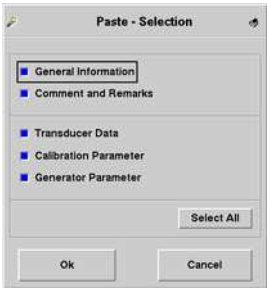
Parameter (Select Program Page No.)	Description / *Value range, unit*
Previous / Next	Switch to a different data record.
New	Creates a new data record.
Copy	Copies the content to the clipboard.
Paste	Retrieves the content from the clipboard.
Delete	Deletes a data record from the database.
Load / Save USB	Content of a data record from a USB storage medium is loaded or saved.
Activate for Current Bondprogram	Accepts the current data record in the bond program.

Creating data record for an application

- 1. In "Select" select a data record from the F&K standards which corresponds to the transducer used and the desired application.
- 2. Copy the content to the clipboard with "Copy".
- 3. Create a new data record with "New".
- 4. Determination of "Page Number" and "Header".



- 5. Select the content of the clipboard with "Paste".
- 6. Select the data to be copied (Select All).



- 7. Activate a new data record for the current bond program with the "Activate for Current Bondprogram" button.



- 8. The new data record is created and activated. Close the dialog with Escape.
- 9. Open the "Calibration" dialog to calibrate the USG/transducer.

Calibration Voltage Control

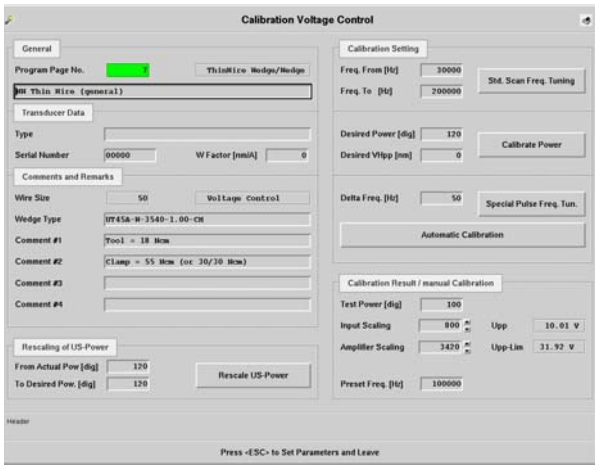


fig. 12 - 160 US-Generator (Page 81) > Calibration Voltage Control

The ultrasonic system is calibrated in the Calibration dialog. The dialog may differ slightly from the dialog pictured, depending on the control mode (Voltage, Power, Current).

Parameter (Calibration Voltage Control)	**Description / *Value range, unit***
General	Changes the header for the current data record.
Transducer Data	
W Factor [nm/A]	This factor is taken from the transducer record and is required for calibration.
Transducer Serial Number	The serial number is specified on the transducer and in the transducer record. **N O T E !** *Please remember to enter the serial number as the Program Page No. and the serial number form the key for the database.*
Comments and Remarks	Comments, remarks, wire diameter, control type
Rescaling of US-Power	The scaling factors of the USG are adapted in such a way that Actual Power with the current scaling factors and Desired Power with the newly calculated scaling factors produce the same output value.
Calibration Settings	Requirements: *- Free tool (in the air)* *- Opened wire guide* *- Correctly entered transducer data as per transducer record* *- Heavy wire rotary head: removed wire guide*
1. Std. Scan Freq. Tuning	This function searches for the resonant frequency in the range "Freq. From [Hz]" - "Freq. To [Hz]". The determined frequency is used as the standard start frequency.
2. Calibrate Power	Determines the scaling factors in such a way that when "Desired Power" is specified the tip of the transducer horn is subject to an excursion of "Desired VHpp". The excursion is obtained from the product of measured current and W factor.
3. Special Pulse Freq. Tuning	The start frequency is fine-tuned with this method. A test pulse is output over 40 ms with the current specifications for "Desired Power" and "Preset Freq.". The standard start frequency is then obtained from the sum of measured frequency and delta frequency.
Automatic Calibration	Executes steps 1-3.
Calibration Result/ Manual Calibration	Display and manual fine tuning of the calibration values "Input Scaling", "Amplifier Scaling" and "Preset Frequency".
Upp-Lim	Displays the maximum output voltage (Amplifier Scaling).
Upp	Output voltage (Test Power, Input and Amplifier Scaling).

Calibration Power Control

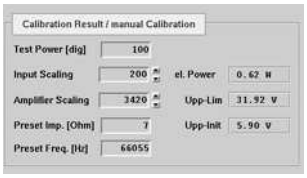


fig. 12 - 161 US-Generator (Page 81) > Calibration Power Control

Description of the dialog differences of the Calibration Result/Manual Calibration area.

Parameter (Calibration Power Control)	Description / *Value range, unit*
Preset Imp. [Ohm]	Expected impedance for determining the start output voltage Upp-Init.
el. Power	(Expected) electric power at the input f (US-Power, Input Scaling)
Upp-Init	(Start) output voltage (el. Power, Preset Imp., Amplifier Scaling).

Calibration Current Control

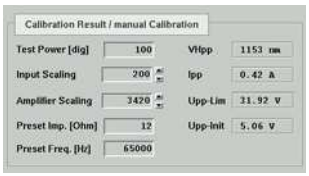


fig. 12 - 162 US-Generator (Page 81) > Calibration Current Control

Description of the dialog differences of the Calibration Result/Manual Calibration area.

Parameter (Calibration Current Control)	Description / *Value range, unit*
Ipp	(Expected) current at the input (US-Power, Input Scaling).
VHpp	Expected excursion of the transducer tip (Ipp, W factor).
Upp-Init	(Start) output voltage (Preset Imp., Ipp, Output Scaling).

Import Database

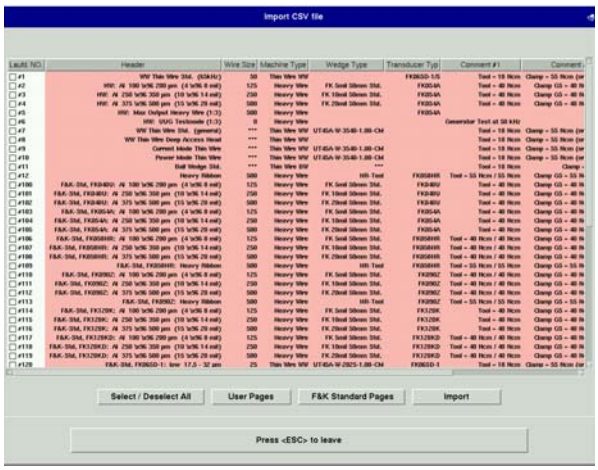


fig. 12 - 163 US-Generator (Page 81) > Import CSV File

Import Database imports the USG database or individual data records from a USB storage medium.

Data records highlighted in red indicate differences. Individual data records can be selected in the left column. User Pages selects all the user data records (1-80). F&K Standard Pages selects data records 81-200.

Curve Display

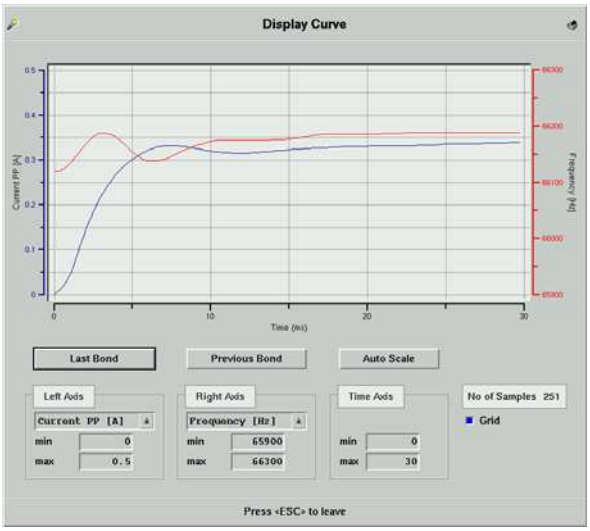


fig. 12 - 164 US-Generator (Page 81) > Curve Display

Graphic display of the last two US pulses. The physical variables are calculated with the USG scaling factors.

Parameter (Curve Display)	Description / *Value range, unit*
Last Bond	Loads the curve of the last US pulse.
Previous Bond	Loads the curve of the last US pulse but one.
Autoscale	Calculates a sensible axis scaling.

Export Analyze Data

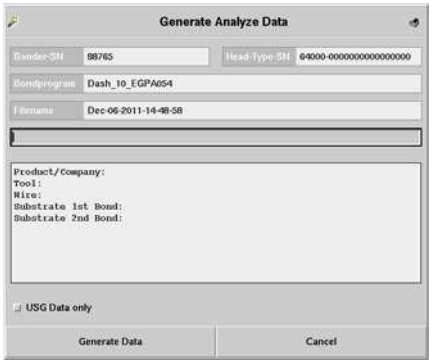


fig. 12 - 165 US-Generator (Page 81) > Export Analyze Data

Export Analyze Data generates data from the last bonding procedures for analysis by F&K.

The data are stored in the directory /pub/export/ubpc, from where they can be exported by means of ftp or USB interface (Export Analyze Data USB).

Parameter (Curve Display)	Description / *Value range, unit*
Filename	File name. The analysis data are stored in this file. Date and time are automatically added. Comments on the analysis data can be added in the text field.
USG Data only	Confines the analysis data to the USG.

Production Times (page 86)

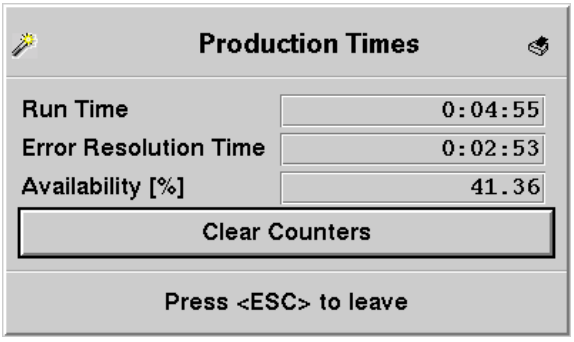


fig. 12 - 166 Production Mode (Page 86)

Display of the production times.

Parameter (Production Times)	Description / *Value range, unit*
Run Time	Run time in automatic production mode.
Error Resolution Time	Time the machine has waited for a user intervention until error elimination.
Availability	Ratio of time in automatic production mode to the total time elapsed.
Clear Counters	Reset of production time measurements.

CAN (Page 88)

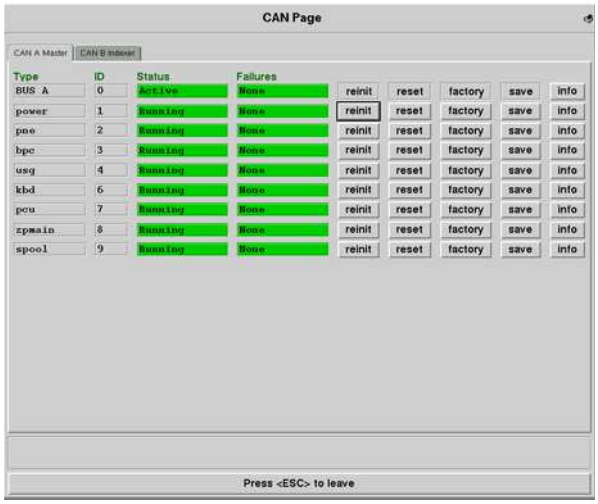


fig. 12 - 167 CAN (page 88) > CAN A master)

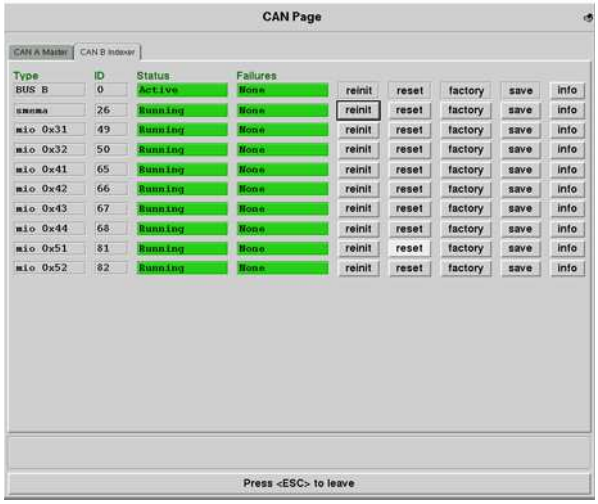


fig. 12 - 168 CAN (page 88) > CAN B Indexer

The CAN page is for the purpose of managing the individual CAN nodes in and outside of the machine.

Peripheral systems that are connected via a CAN bus to a central PC of the machine are designated as CAN nodes. Buses are systems that interconnect electronic and electric components.

A single-head machine thereby has two separate bus systems and a dual-head machine has even three separate bus systems.

The CAN nodes assume a broad range of tasks. It has to be differentiated between general (generic) and specific functions. The general functions can be referred to on the main page and on the info pages (Info Button) "System State" and "Node Info".

In addition, each CAN node has its own specific fault state, described in more detail on the "Failures" information page.

Furthermore, there is a status page "State" for individual CAN modes, which can be useful for service purposes.

IMPORTANT

The configuration page "Config" should be operated only after consultation with F&K Delvotec, because it can alter the behaviour of the CAN node.

The description of the info pages is not described fully because this is reserved for F&K Delvotec and authorized persons.

Info fields

- Type: Each CAN node has a type designation. Furthermore, with an external bus (CAN B) you usually have the same CAN nodes, which function via the hex switch (see Hardware) with a uniquely defined address in the bus system. The hex address (hexadecimal system) is specified behind the type name.
- ID: The node address in decimal form extends from 0 to 256, the ID = 0 being in a special position because this is reserved for the bus itself.
- Status: It is differentiated between various node statuses that the node can assume. "Running" is the status that means operational. All other statuses are temporary and there is no intention to describe them any further here.
- Failures: This info field provides overriding information about the monitored defect statuses of the individual node. These can be viewed in detail via the info button. A node status other than "Running" is also logged as an error.

Commands (Button)

As a rule all buttons with the exception of the button "Factory" can be executed without any problem. However, after this there should always be followed by a home run because this recreates the correct operating status.

After a software reset, for example, all non-storable configurations are reset.

- Reinit: Triggers re-initialisation of the node. When there is a communication error, as with the SW reset it is attempted to put the nodes back into operating mode.
- Reset: Triggers a software reset.
- Factory: Sets the configuration that is just active to the ex-factory settings. After a "Save" these are also stored permanently. For important parameters please refer to the info pages under "Config".

IMPORTANT

With some devices settings that are important for operation can get lost due to this. Therefore never perform the action Factory without a reason! Ensure that you have all the information at your disposal to recreate the settings.

- Save: Saves the configuration data that is active at present permanently to its own EEPROM. The CAN node retains its configuration even after a restart (HW reset or SW reset).
- Info: Opens the information pages of the applicable CAN node.

IMPORTANT

If any inexplicable problems exist with a CAN node, proceed in the following order.

- 1. The "Reinit" button attempts to reactivate the node without affecting the configuration.
- 2. Button "Reset" triggers a software reset. Any current configurations that have not already been saved are lost.
- 3. The reset button on the hardware triggers a hardware reset. In a dramatic error case (hardware or firmware problem) this may be the final possibility of reactivating the node without switching off the power supply.

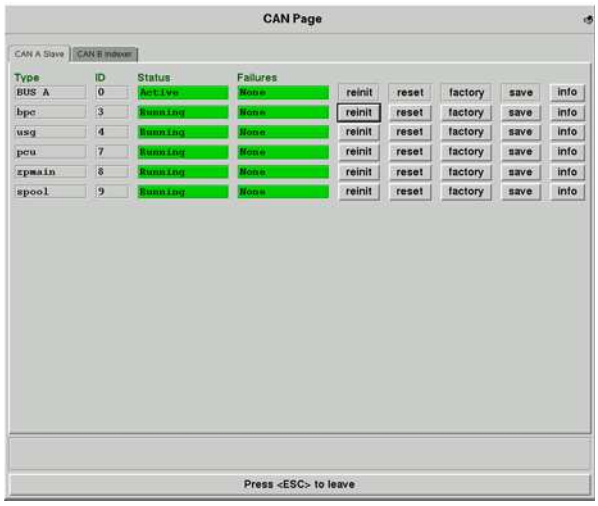


fig. 12 - 169 CAN (page 88) > CAN A Slave

This dialog shows the setup options for a dual-head machine.

N O T E

The pages below provide examples of the sub-ordinate dialogs of the "Info" button.

System State

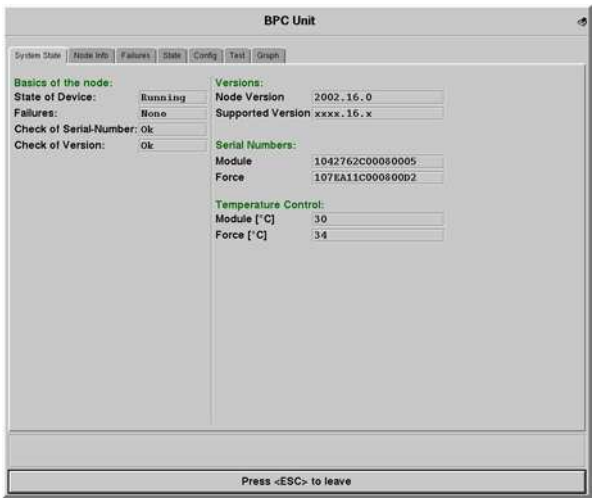


fig. 12 - 170 CAN (page 88) > Info > System State

Shows overview information, version designation and serial number.

Node Info



fig. 12 - 171 CAN (page 88) > Info > Node Info

Shows further information for service purposes.

- Clear Counter: With this button the error counter can be reset to zero.

Failures

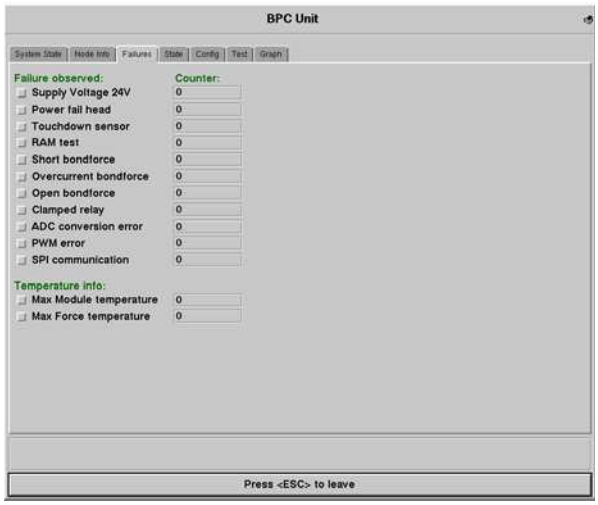


fig. 12 - 172 CAN (page 88) > Info > Failures

Each CAN node has its specific error statuses that are displayed on this page.

In the process an error that has been set does not have to indicate a genuine error, but can also be caused by incomplete hardware equipment.

State

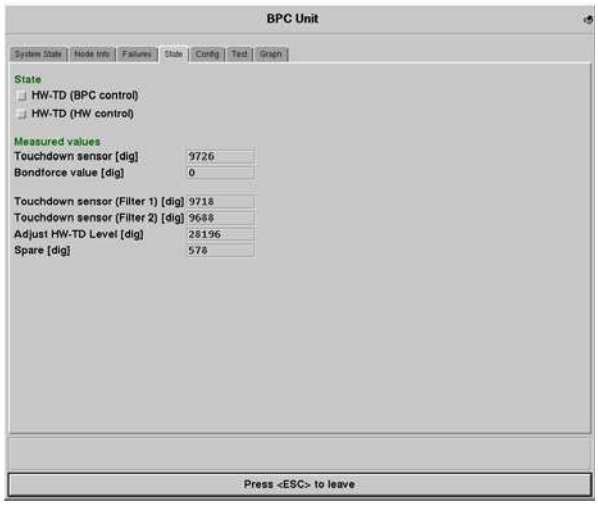


fig. 12 - 173 CAN (page 88) > Info > State

If implemented, this function shows the current status of the operating parameters that can be useful for service purposes.

Config

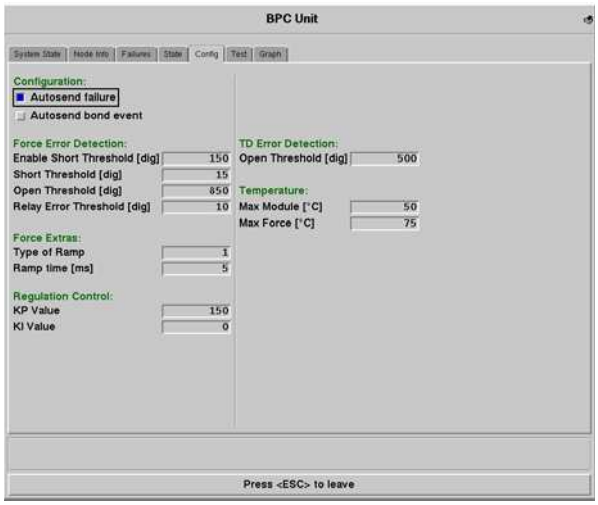


fig. 12 - 174 CAN (page 88) > Info > Config

If available, it displays the most important configuration parameters.

However, these are saved permanently only if "Save" has been executed on the main page.

The configuration page "Config" should be operated only after consultation with F&K Delvotec, because it can alter the behaviour of the CAN node.

test



fig. 12 - 175 CAN (page 88) > Info > Test

Individual outputs and inputs can be monitored on this page as part of a system diagnosis.

Graph

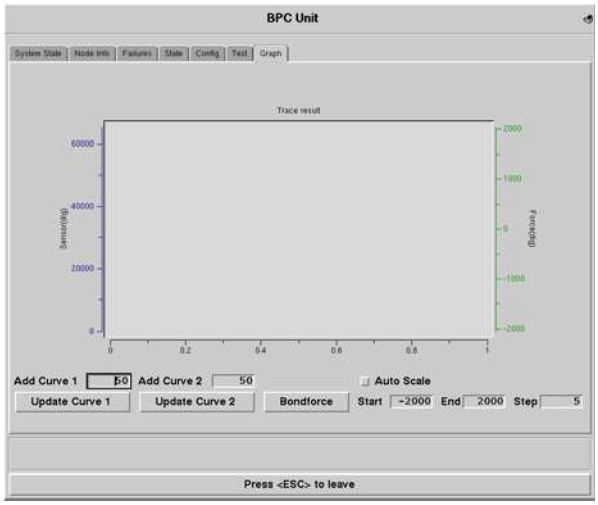


fig. 12 - 176 CAN (page 88) > Info > Graph

Different measuring values from the "BPC Unit" can be shown on this page during a system diagnosis.

Calibration (Page 89)

Mechanical

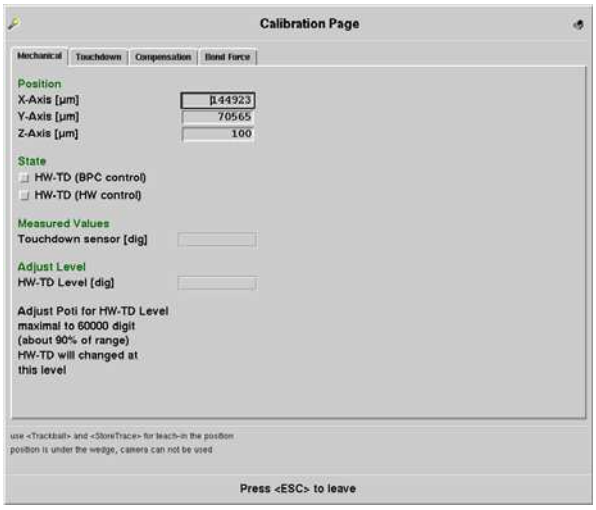


fig. 12 - 177 Calibration (Page 89 > Mechanical)

For the calibration you begin on the first subpage (mechanical) and then follow with the other subpages in ascending order.

As a presetting with or without bond program, select "Compensation in Use" (Page #1.3) if you want to work independently of the TD-Steps. This compensates the mechanical force increase of the transducer suspension.

Parameter (Mechanical)	Description / *Value range, unit*
Position	
X-axis Y-axis Z-axis	Coordinates for setting the HW-TD Level (Hardware Touchdown). For safety, the Z axis is always preset to the Z-Init-Position for the first time. By activating the trackball button the position directly under the bond tool can be reached (without camera offset). StoreTrace assumes the new positions in the input fields. X and Y coordinates remain stored. *µm*

Parameter (Mechanical)	Description / *Value range, unit*
State	
HW-TD (BPC control) HW-TD (HW control)	Detection of the hardware touchdown. If the touchdown-sensor value exceeds the HW-TD Level of the preset potentiometer, the hardware on the head terminal and the BPC simultaneously detect the limit of the maximum work area of the bonding tool. From here onwards the motors are stopped immediately in the event of an operating error in order to avoid any further damage. The potentiometer is located on the head terminal (see 10.8.2 "(KRT-03125xKRT-03099x/KRT-03132x) Head Terminal" on page 10-66). In addition, a hardware touchdown is indicated by a red LED on the head terminal and on the BPC board.
Measure Values	
Touchdown sensor	Is for the purpose of information about the current displacement of the bond tool. *dig*
Adjust Level	
HW-TD Level	The "HW-TD Level" is read from the BPC and displayed here. The "HW-TD Level" provides the head terminal with a detection threshold.

Mechanical and electrical work

a) Mechanical setting of the TD offset: (see also setting instructions)

- Set the mechanical Z limit stop to a preload force of 60 cN (+10 / - 10).
- Set the TD sensor gap to 0.10 mm (+0.05 / - 0.00).

b) Electrical setting of the "HW-TD Level":

Set the thresholds correctly with the aid of the potentiometer on the head terminal. Please take heed of the instructions on this page.

IMPORTANT

"HW-TD Level" depends on the sensor, the amplification and the necessary work area and can typically assume a value in the range 30000 - 60000 dig.

The HW-TD Level can also be set to a lower value if the work area does not have to be large for relatively thin wires. That would have the advantage that the motor would have sufficient spare capacity with a fast safety stop.

The following must be ensured: The red LEDs have to light up reliably outside the work area and the mechanical system must still have a small amount of upward play.

Touchdown

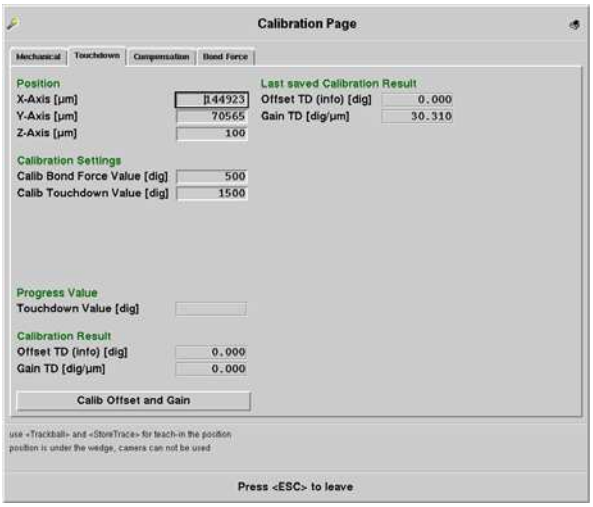


fig. 12 - 178 Calibration (Page 89 > Touchdown)

Parameter (Touchdown)	Description / *Value range, unit*
Position	
X-axis Y-axis Z-axis	Coordinates for calibration of the touchdown sensor. For operator control of the fields the same information as on the first subpage applies. *µm*
Calibration Settings	
Calib Bondforce Value	The bond force is activated in digits without mapping or compensation. Zero digits result from the force from the mechanical pretensioning. The default setting (200 dig) provides a little additional force. The exact setting is not critical.
Calib Touchdown Value	The touchdown sensor value serves as a default for the touchdown process. In the process the touchdown threshold is calculated in [µm] from the later calibration result. TD [µm] = TD [dig] / Gain TD [dig/µm] Select about 25 µm (corresponding value, typically 1000 dig, thin wire) for the touchdown. *dig*

Parameter (Touchdown)	Description / *Value range, unit*
Progress Values	
Touchdown value	Displays the current value during the calibration. *dig*
Calibration Result	
Offset TD (info) [dig] Gain TD [dig/µm]	The offset in idle and the gain about the touchdown are determined (the former for information only) from the calibration process (gain - ratio of [dig] to [µm]). Once the motor has stopped, running is continued by 100 µm after the 1st measurement and the gain is calculated from the 2nd measurement. In calibrated condition the deformation in µm can then be calculated from the gain. *Deform [µm] = Deform [dig] / Gain TD [dig/µm]*
Last saved Calibration Result	
Offset TD (info) [dig] Gain TD [dig/µm]	The last calibration data saved are displayed and can be updated with the new calibration data.
Calib Offset and Gain	Starts the calibration process, which takes roughly 5 secs.

Mechanical Working

1. Keep the bond tool ready without the wire under it or remove the wire guide.

I M P O R T A N T :

In the touchdown process braking is initiated at the threshold, whereupon the motor stops several microns later. This depends on touchdown speed for the source bond (Page #3.4, source bond TD-Speed) and brake time (Page #3.4, TA Touchdown brake).

Settings

- 1st Bond TD-Speed: 5 µm/ms (2 - 5 µm/ms)
- TA touchdown brake: 10 ms (6 - 10 ms)

After successful calibration, the "Calib Touchdown Value" can be changed so that work can proceed with about 50 µm (+-25 %) touchdown threshold.

After this the calibration should be repeated.

25 µm corresponds to typ. 1000 dig for thin wire and is a good setting for the other subordinate pages.

The calibration settings and positions are saved together as a user input.

Compensation



fig. 12 - 179 Calibration (Page 89 > Compensation)

Parameter (Compensation)	Description / *Value range, unit*
Position	
X-axis Y-axis Z-axis	Coordinates for calibration of the bond force compensation. For filling in the fields the same information applies as on the first subpage. *µm*
Calibration Settings	
Calib Bondforce Value Calib Touchdown Value	For filling in the fields the same information applies as on the first second subpage. The parameter should already be selected correctly here. *dig*

Parameter (Compensation)	Description / *Value range, unit*
Progress Values	
Bondforce Value Touchdown Value	Displays the current values during the actual calibration. *dig*
Calibration Result	
Max work area [µm] Vertical Axis BF [dig] (only info) Average BF/TD [dig/dig] Deviation (only info)	The maximum work area and some important parameters for measurements are calculated as the result of calibration. The deviation provides information as to whether all measured values have been acquired correctly. If this value is greater than 1.0 at the end of the process, you should repeat the calibration. The most important characteristic value is the mean value of the measurements (average BF/TD). *Deform [µm] = Deform [dig] / Gain TD [dig/µm]*
Last saved Calibration Result	
Vertical Axis BF [dig] (only info) Average BF/TD [dig/dig]	The characteristic values of the calibration data last saved are displayed and can be updated with the new calibration data.
Calib Compensation	Starts the calibrating process and takes several minutes. The "Max work area" is calculated first, and then several compensation values are calculated.

Mechanical Working

- ▶ Remove the wire guide from the bonding tool or release it only from the bonding tool (because the wire can exert only a slight force)
- ▶ Check whether the bonding tool can move unhindered up to actuation of the HW TD.

I M P O R T A N T

For correct running of the calibrating process the bonding tool must not be hindered in the entire working range by a wire guide or any other mechanical obstacles.

The touchdown parameters should be set as for the touchdown subpage.

Touchdown speed for the source bond (Page #3.4, 1st Bond TD-Speed) and brake time (Page #3.4, TA Touchdown brake).

Settings

- 1st Bond TD-Speed: 5 µm/ms (2 - 5 µm/ms)
- TA touchdown brake: 10 ms (6 - 10 ms)

Bond force

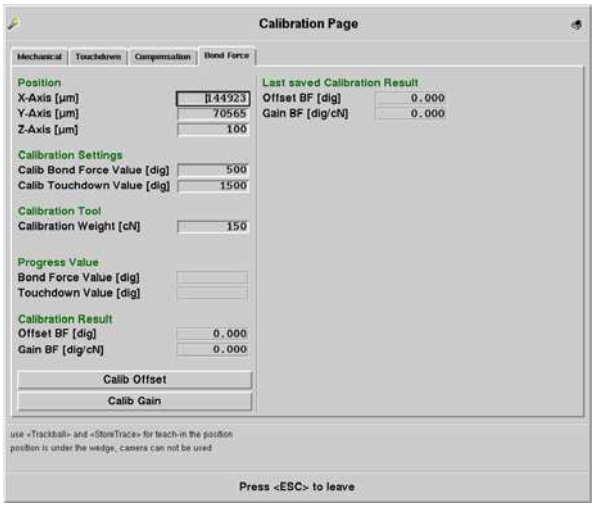


fig. 12 - 180 Calibration (Page 89 > Bondforce)

Parameter (Bond Force)	Description / *Value range, unit*
Position	
X-axis Y-axis Z-axis	Coordinates for calibration of the bond force compensation. For filling in the fields the same information applies as on the first subpage. *µm*
Calibration Settings	
Calib Bondforce Value Calib Touchdown Value	For filling in the fields the same information applies as on the first second subpage. The parameters should be correctly selected here. *dig*
Calibration Tool	
Calibration Weight	Force that is used to calibrate the gain. *cN*
Progress Values	
Bondforce Value Touchdown Value	Displays the current values during the actual calibration. *dig*

Parameter (Bond Force)	Description / *Value range, unit*
Calibration Result	
Offset BF [dig] Gain BF [dig/cN]	The offset in the mechanical stop and the gain are determined from the calibration process (gain - ratio of [dig] to [cN]). In calibrated condition the bond force in [cN] can then be calculated from the gain. *Bond force [cN] = bond force [dig] / Gain BF [dig/cN]*
Last saved Calibration Result	
Offset BF [dig] Gain BF [dig/cN]	The last calibration data saved are displayed and can be updated with the new calibration data.
Calib Offset Calib Gain	Pressing the "Calib Offset" button starts calibration for offset calculation; this process takes about 15 seconds to complete. Pressing the "Calib Gain" button starts calibration for gain calculation; this process takes about 15 seconds before the system prompts for attachment of a calibration weight. A measurement that takes 15 secs. is then performed again.

Mechanical Working

- ▶ Remove the wire guide from the bonding tool or release it only from the bonding tool (because the wire can exert only a slight force).
- ▶ Check whether the bonding tool can move unhindered up to actuation of the HW TD.

Application

Subject to the prerequisite that calibrating weights are available, this function makes it possible to check activation of the bonding weight.

A calibrated load cell is required for the actual bonding strength calibration.

This is intended only for the service department of F&K Delvotec and authorized personnel.

Bonding force calibration with help

- Force Calib. Set-up (Mode 42)
- Edit Force Map (Mode 43) (for information)
- Force Calibration (mode 44)
- Force Verification (Mode 45) (for checking)

IMPORTANT

For correct functioning of the calibrating process the bonding tool must not be hindered in the entire working range by a wire guide or any other mechanical obstacles.

BPC - Display Options (page 100)

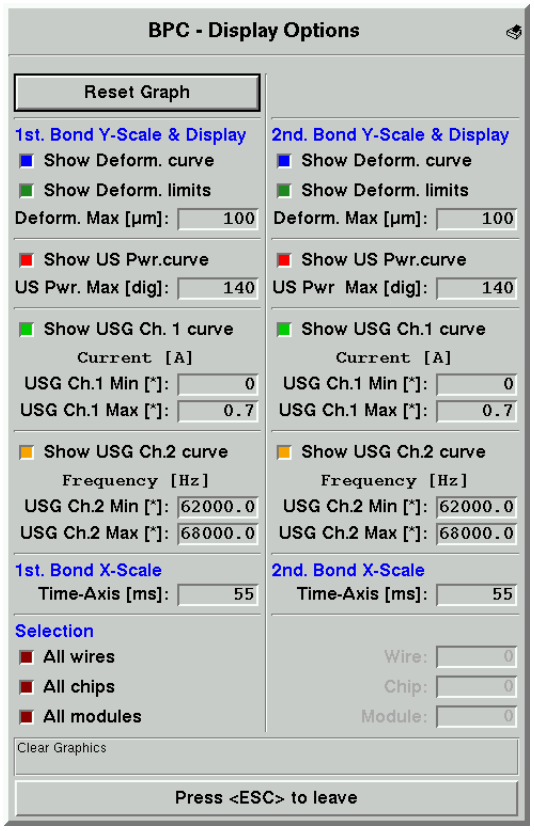


fig. 12 - 181 BPC - Display Options (page 100)

Setting for the diagrams that are displayed on the monitor. Up to four measuring values are recorded and shown on the main page of the user interface for each bond:

- Deformation
- US Power

will always be recorded. Other measuring values from the ultrasound generator, such as transducer current, impedance, frequency, etc. may also be recorded. This assignment of measuring values to the measuring channels is performed application and customer specific in the ultrasound generator.

This dialog configures the presentation of the measured values on the main page of the user interface.

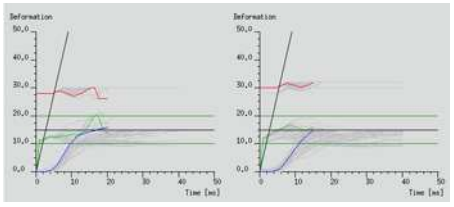


fig. 12 - 182 BPC - Display Options > Deformation diagram

N O T E

The time basis of measuring value sampling is the same for all data series. An explicit scale is indicated in the diagrams on the main page for the deformation only. The remaining measuring values are qualitatively mapped on the character range based on the configuration below.

Parameter (BPC - Display ?Options)	**Description / *Value range, unit***
Reset Graph	Deletes the deformation curve.
1st. / 2nd. Bond Y-Scale & Display	
Show Deform. curve On/Off	Activating / deactivating the display for deformation measuring values. (The colour of the check button corresponds with the colour of the curve in the display)
Show Deform. limits On/Off	Activating / deactivating the display of deformation limit values (min. max. deformation). (The colour of the check button corresponds with the colour of the curve in the display)
Deform. Max	Scaling the display: Deformation value that corresponds with 100% of the display scale. This value should be defined so that the maximum deformation that may occur in all applications of the machine can be shown with sufficient resolution. *µm*
Show US Pwr. curve ON/OFF	Activating / deactivating the display for US-Pwr values. These are the values to activate the ultrasound generator. (The colour of the check button corresponds with the colour of the curve in the display)

Parameter (BPC - Display ?Options)	Description / *Value range, unit*
US Pwr. Max	Scaling the display: US-Pwr value that must correspond with 100% of the display scale. This value must be defined so that the maximum number of values occurring in all applications of the machine can be shown with sufficient resolution. *digits*
Show USG Ch. 1 curve	Activating / deactivating the display of measuring values from measuring channel 1 of the ultrasound generator. The measuring value and unit used to actually activate this channel is shown below. (The colour of the check button corresponds with the colour of the curve in the display)
Current	
USG Ch. 1 Min.	Scaling the display: Measuring value to be mapped on the 0 line of the diagram.
USG Ch. 1 Max	Scaling the display: Measuring value to be mapped on the 100% line of the diagram.
Show USG Ch. 2 curve	Activating / deactivating the display of measuring values from measuring channel 1 of the ultrasound generator. The measuring value and unit used to actually activate this channel is shown below. (The colour of the check button corresponds with the colour of the curve in the display)
Frequency	
USG Ch. 2 Min	Scaling the display: Measuring value to be mapped on the 0 line of the diagram.
USG Ch. 2 Max	Scaling the display: Measuring value to be mapped on the 100% line of the diagram.
1st. / 2nd. Bond X-Scale	
Time Axis	Scaling the time range of the display (horizontal). This value must be defined so that the maximum number of values occurring in all applications of the machine are shown with sufficient resolution.
Selection	
All wires	Activated: All measuring series for all wires will be shown Deactivated: Only measuring series for wires will be displayed for which the wire number matches the value in the "Wire" field.
All chips	Activated: All measuring series for all chips will be shown. Deactivated: Only measuring series for wires will be displayed for which the chip number matches the value in the "Chip" field.
All modules	Activated: All measuring series for all modules will be shown. Deactivated: Only measuring series for wires will be displayed for which the module number matches the value in the "Module" field.

Light Tower Setup (Page 117)

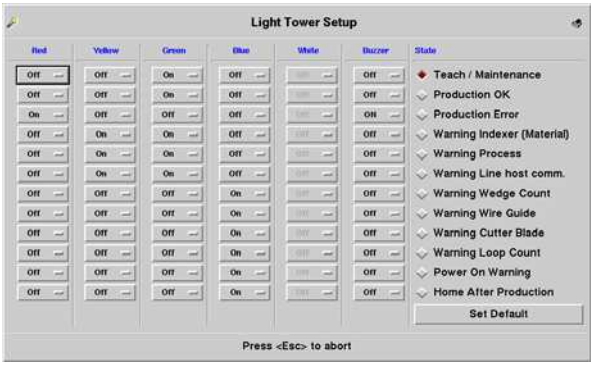


fig. 12 - 183 Light Tower Setup (Page 117)

On this page the setting condition of the signal light is assigned to the different machine statuses.

- Enter the desired setting in the drop-down menu by selecting On, Off or Flash (flash function).

Preset Standard Display



fig. 12 - 184 signal light

- **Red:** Machine is not in production mode. Fault pending.
- **Yellow:** Machine is not in production mode. No fault pending. The machine is waiting, e.g. for the start command.
- **Green:** The machine is in production mode. No fault pending.
- **Blue:** No preset function. After the function has been activated, the system can issue notification of the upcoming need for a component change (e.g. bonding tool change). The machine is in production mode.

Wire Spool (page 144)

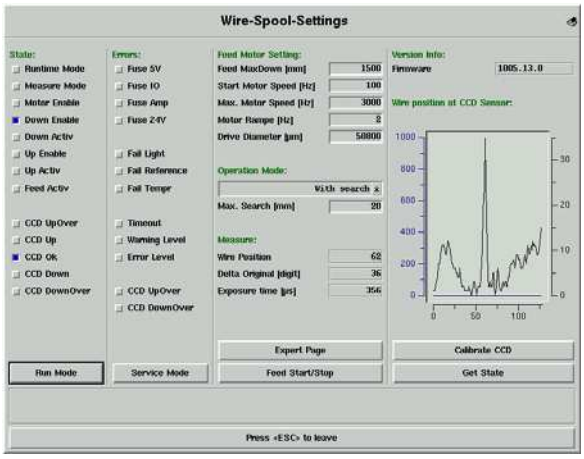


fig. 12 - 185 Wire Spool (Page 144)

See 4.9 "Automatische Drahtspule" on page 4-15 and see 10.8.3 "(KRT-03094x) Drahtspulensteuerung" on page 10-69.

State

- Runtime Mode: Wire spool is in controlled mode
- Measure Mode: Wire consumption measurement is active (this function is not supported by the current hardware)
- Motor Enable: The motor is energized
- Down Enable: The motor can unwind
- Down Active: The motor unwinds
- Up Enable: The motor can wind on
- Up Active: The motor winds on
- Feed Active: Wire is threaded
- CCD UpOver: The wire has left the sensor upwards (too much wire consumed)
- CCD Up: Wire is in the top sensor area
- CCD Ok: Wire is in the desired area
- CCD Down: Wire is in the bottom sensor area
- CCD DownOver: The wire has left the sensor downwards (too much unwound)

Errors

- Fuse 5 V: Reversible 5V fuse has triggered
- Fuse IO: Fuse of the digital IO defective
- Fuse Amp: Fuse of the stepping motor output stage defective
- Fuse 24 V: Reversible 24V fuse of the main current supply has triggered

- Fail Light: Exposure value under the preset threshold (Expert Page, Min Light [digit])
- Fail Reference: Analysis of CCD measuring values with regard to the calibrated reference measuring values does not have an excessive deviation (Expert Page, Max Delta [digit])
- Fail Tempr: Excessive temperatures of the stepping motor output stage
- Timeout: Motor was unable to feed the wire to the desired area
- Warning Level: Absolute wire consumption has exceeded the warning threshold (this function is not supported by the current hardware)
- Error Level: Absolute wire consumption has exceeded the failure threshold (this function is not supported by the current hardware)
- CCD UpOver: Wire has left the sensor upwards (this function is not supported by the current hardware)
- CCD DownOver: Wire has left the sensor downwards (this function is not supported by the current hardware)

Parameter (Wire Spool)	Description / *Value range, unit*
Feed Motor Setting	
Feed MaxDown [mm]	Default values should be retained as the basic settings.
Start Motor Speed [Hz]	
Max. Motor Speed [Hz]	
Motor Ramp [Hz]	
Drive Diameter [µm]	

Parameter (Wire Spool)	Description / *Value range, unit*
Operation Mode	
Operation Mode	There are 5 possible settings: *0: Everything is evaluated as an error if the wire is not in the line sensor range.* *1 - Ccd Down over: An attempt is made to move the wire upwards into the visible range of the line sensor.* *2 - Ccd Up over: An attempt is made to move the wire downwards into the visible range of the line sensor.* *3: Ccd Down over and Up over An attempt is made to move the wire both upwards and downwards into the visible range of the line sensor.* *4: Every attempt is made to move the wire into the visible range of the line sensor.*
Max Search [mm]	If operation mode is with search, unwinding can be performed up to maximum length.
Measure	
Wire Position	Position of the wire in the line sensor *(1- 128 or 1-256)*
Delta Original [digit]	Change of the mean of the measured values to the calibrated reference curve.
Exposure time	Shows the current exposure time of the CCD line sensor. *µs*
Version Info	
Firmware	Description of the firmware version.
Wire position at CCD Sensor	The green reference curve (left vertical axis) and blue curve (right vertical axis) are shown for wire detection (Delta values).

Buttons

- Run Mode: Puts the wire spool in controlled mode. The same action is executed by the bond process control in production mode.

- Service Mode: Puts the wire spool in uncontrolled mode. The mechanical system can now be operated by hand for service purposes (de-energised condition). The same action is executed by the bond process control in home position.
- Expert Page: Opens the expert subpage
- Feed Start/Stop: Operation of the conveyor motor for feeding in the wire in start/stop mode. The same thing is possible with the middle button on the wire spool.
- Calibrate CCD: Determines a new reference curve to reset deviations in the system back to zero. You should calibrate at the latest when the wire spool is no longer working correctly. Calibration takes place in Service mode and without wire in the area of the line sensor.

  The last calibration process is always stored. The reference curve should have a relatively uniform shape. The Delta values for the wire detection are below 5 pixels
- Get State: Requests an update of all measured values and of the graphs. This can take place in service mode or run mode

Expert Page

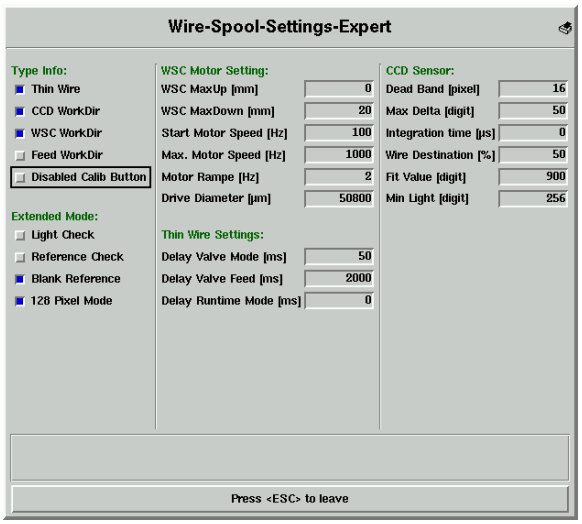


fig. 12 - 186 Wire Spool (Page 144) > Expert Page

Type Info

- Thin Wire: The configuration shows whether you are dealing with a heavy wire or thin wire spool
- CCD WorkDir: The configuration shows the setting for the working direction of the CCD sensor
- WSC WorkDir: The configuration shows the setting for the working direction of the motor (Wire Spool Control)
- Feed WorkDir: The configuration shows the setting for the working direction of the conveyor motor
- Disabled Calib Button: The configuration defining whether the 3rd button for manual calibration is deactivated. The calibration should not be permitted as a presetting

Extended Mode

- Light Check: Exposure values of the lighting unit are checked
- Reference Check: The deviation of the current measurement from the reference curve is checked
- Blank Reference: The reference curve is displayed as a zero line
- 128 pixel mode: Illustration of the wire is standardized at 128 pixels

Parameter (Wire Spool)	**Description / *Value range, unit***
WSC Motor Setting	
WSC MaxUp [mm]	Default values should be retained as the basic settings.
WSC MaxDown [mm]	
Start Motor Speed [Hz]	
Max. Motor Speed [Hz]	
Motor Ramp [Hz]	
Drive Diameter [µm]	
Thin Wire Settings	
Delay Valve Mode	Defines the delay when switching on the "Hold" air after the "Wire" air has been switched on. *ms*
Delay Valve Feed	Defines the delay in unwinding the wire after the "Feed" air has been switched on. *ms*
Delay Runtime Mode	Defines the delay, i.e. the time that the wire spool waits in addition until controlled mode is reported. *ms*
CCD Sensor	
Dead Band	Defines the range in which the motor does not control. *pixels*
Max Delta	Defines the threshold for a faulty deviation from the reference curve. *digits*
Integration time	Exposure time of the CCD sensor. This is dependent on the current hardware and should not deviate from the default value. *(128 pixels: 15 µs, 256 pix: 200 µs)*
Wire Destination	Target position to which the wire is controlled. *%*
Fit Value	Defines the upper limit of the largest exposure value. *digits*
Min Light	Defines the lower limit of the largest exposure value. *digits*

Operator Check List (page 150)



fig. 12 - 187 Operator Check List (Page 150)

This functions enables a manual check of the list that was created in "Edit Op. Check List". If the "Require all checks" function is not active, an individual check may be performed.

Edit Op. Check List (Page 151)

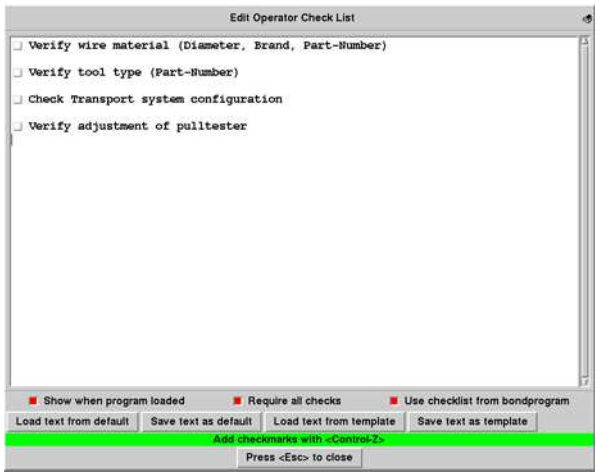


fig. 12 - 188 Edit Operator Check List (Page 151)

This dialog is for creating the content of both the program-specific and the general checklists.

This function may be used if the bonder must frequently be prepared for a new product with the same steps in addition to the machine? software such as the use of a specific work holder or adjustment of the machine. The operator check-list has been integrated to provide the operator with some tips for such tasks. Whenever a new bond program is loaded, the check-list indicates the points that must be tested and confirmed. Since these tasks are application dependent and can therefore not be assigned to the machine software, the check-list can be prepared for a specific customer. However, the bonder provides a general default list and an individual list for each bond program.

The editor enables the creation of the customer specific check-list with conventional entries. Test marks can be created with the keyboard shortcut <Ctrl+Z>.

Parameter (Edit Op. Check List)	Description / *Value range, unit*
Show when program loaded	On activation the checklist is displayed after a new bond program is loaded. ***IMPORTANT*** *If the bond program was run automatically by a conveyor system, on "startup" in other words, or if there was an automatic program change implemented by a conveyor system, the check-list is not shown.*
Require all checks	After being activated, the dialog cannot be closed until all the points have been highlighted and therefore checked. The operator cannot continue with his work until he has confirmed the completion of all points.
Use check-list from bond program	After activation, the check-list content of the loaded bond program will be used and without activation the default content will be used. If this setting is changed, the content of the mask editor will be reloaded.
Load text from default	After actuation, the ?default content of the system will be loaded for this bond program. This function is always available after "Use check-list from bond program" has been activated.
Save text as default	After actuation the current content of the editor will be saved to the system wide default check-list. This function is always available after "Use check-list from bond program" has been activated.
Load text from template	Load or save the adjusted template for this bond program.
Save text as template	

Default - Parameter (page 300)

Create and administrate a parameter database. Bond, Loop and Tear parameters can be transferred from the SingleWire menu (Mode 11) and then saved. Similarly, parameters from a user database you created beforehand or the F&K Delvotec database can be copied to the SingleWire menu, if you want to use them for all chips.

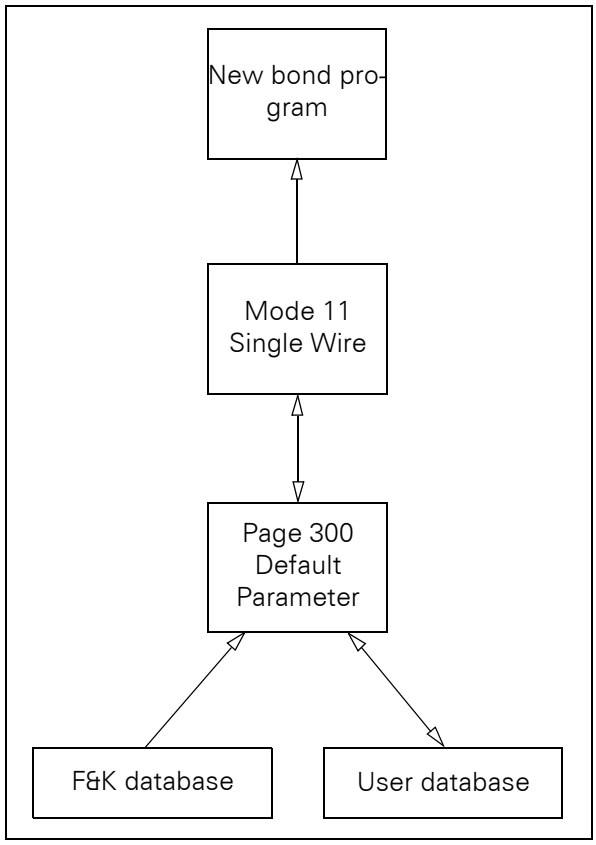


fig. 12 - 189 Default - Parameter (Page 300)

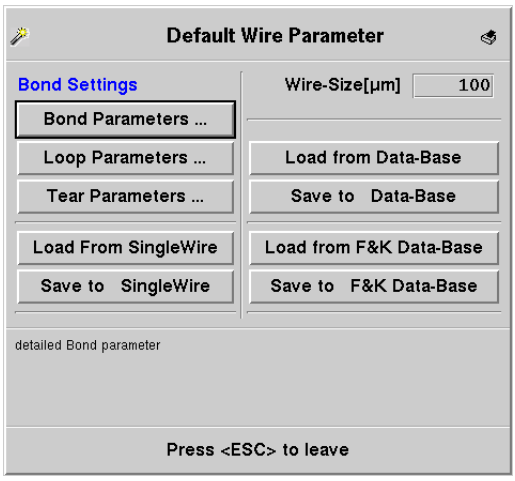


fig. 12 - 190 Default - Parameter (Page 300)

Parameter (Default - Parameter)	Description / *Value range, unit*
Wire size	Wire diameter. The data is saved under this name. This value is programmed on Page 1.

Subordinate pages

- **Bond Parameters:** See "Bond Parameters (Default Parameter)" on page 12-128
- **Loop Parameters:** See "Loop Parameters (Default Parameter)" on page 12-128
- **Tear Parameters:** See "Tear Parameters (Default Parameter)" on page 12-128
- **Load from Single Wire:** See "Load from Single Wire (Default Parameter)" on page 12-128
- **Save to Single Wire:** See "Save to Single Wire (Default Parameter)" on page 12-129
- **Load from Data-Base:** See "Load from Data Base (Default Parameter)" on page 12-129
- **Save to data base:** See "Save to Data Base (Default Parameter)" on page 12-129
- **Load from F&K Data-Base:** See "Load from F&K Data Base (Default Parameter)" on page 12-129
- **Save to F&K Data Base:** See "Save to F&K Data Base (Default Parameter)" on page 12-130

Bond Parameters (Default Parameter)

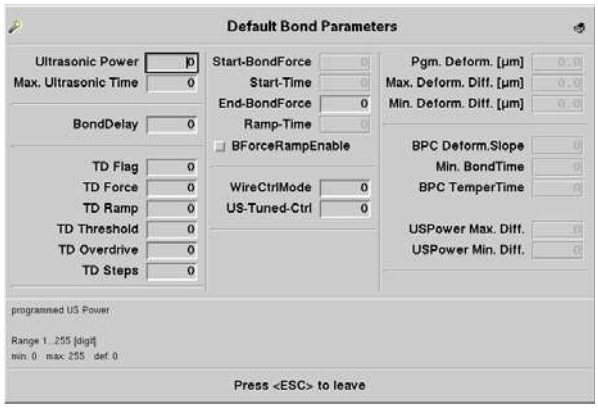


fig. 12 - 191 Default - Parameter (Page 300) > Bond Parameters

Values for bond parameters. The meanings of the individual parameters: See "Learn chip (mode 1)" on page 12-29

Loop Parameters (Default Parameter)

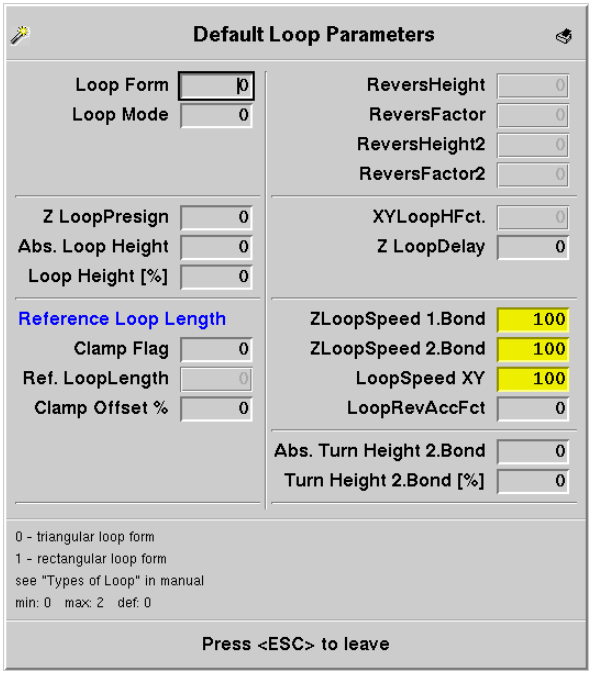


fig. 12 - 192 Default - Parameter (Page 300) > Loop Parameters

Values for loop parameters. The meanings of the individual parameters: See "Learn chip (mode 1)" on page 12-29

Tear Parameters (Default Parameter)

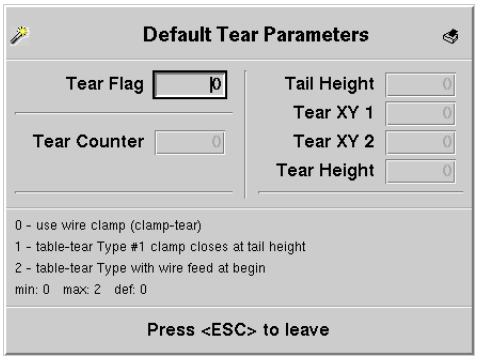


fig. 12 - 193 Default - Parameter (Page 300) > Tear Parameters

Default values for Tear Parameter. The meanings of the individual parameters: See "Learn chip (mode 1)" on page 12-29

Load from Single Wire (Default Parameter)

Once all the parameters have been entered or calculated in the Single Wire menu they can be copied so that they can then be saved in a data base:

- Press the "Load from Single Wire" button. The entries are overwritten. You are therefore prompted for confirmation:

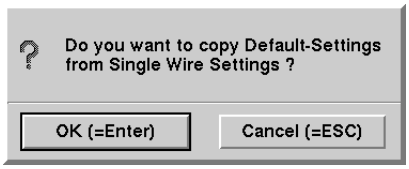


fig. 12 - 194 Default - Parameter (Page 300) > Load from Single Wire

- Press "enter" (OK): Parameters are loaded from the Single Wire menu
  (or press "Escape" (Cancel): Cancel the process)

Save to Single Wire (Default Parameter)

Once the parameters have been loaded from a data base they can be copied into the Single Wire menu:

- Press the "Save Single Wire" button. The values entered beforehand in the Single Wire menu are lost. You are therefore prompted for confirmation:

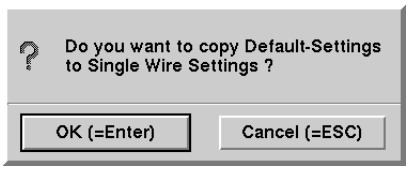


fig. 12 - 195 Default - Parameter (Page 300) > Save to Single Wire

- Press "enter" (OK): Parameters are copied from the Single Wire menu
  (or press "Escape" (Cancel): Cancel the process).

Load from Data Base (Default Parameter)

Load data from the user database.

- Enter the name of the data in Page 1 (Wire Size) for loading and press the "Load from Data-Base" button to confirm. The entries are overwritten. You are therefore prompted for confirmation:

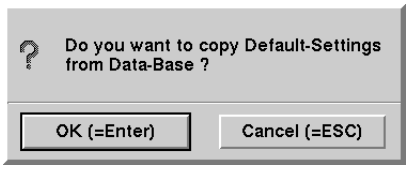


fig. 12 - 196 Default - Parameter (Page 300) > Load from Data Base

- Press "enter" (OK): Default parameters are loaded from user database
  (or press "Escape" (Cancel): Cancel the process).

Save to Data Base (Default Parameter)

Save all parameters to the user database.

- Enter the name under which you want to save the data in Page 1 (Wire Size) and press the "Save to Data-Base" button to confirm. Parameters saved beforehand in the database under the name you enter are overwritten. You are therefore prompted for confirmation:

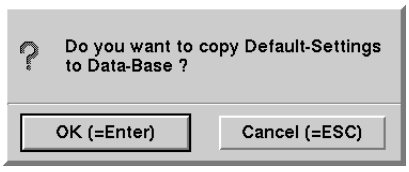


fig. 12 - 197 Default - Parameter (Page 300) > Save to Data Base

- Press "enter" (OK): Parameters are saved to the user database
  (or press "Escape" (Cancel): Cancel the process).

Load from F&K Data Base (Default Parameter)

Load data from the F&K Delvotec database.

- Enter the name of the data in Page 1 (Wire Size) for loading and press the "Load from F&K Data-Base" button to confirm. The values entered beforehand are lost. You are therefore prompted for confirmation:

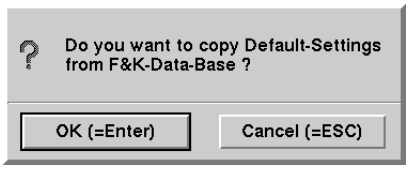


fig. 12 - 198 Default - Parameter (Page 300) > Load from F&K Data Base

- Press "enter" (OK): Default parameters are loaded from the F&K database
  (or press "Escape" (Cancel): Cancel the process).

Save to F&K Data Base (Default Parameter)

Save all parameters in the F&K Delvotec database.

I M P O R T A N T :

The F&K Database should not be overwritten: this is the reason why it is password-protected. Create a user database of your own for your default parameter settings.

- Enter the name under which you want to save the data (Wire Size) and press the "Save to F&K Data-Base" button to confirm. Parameters saved beforehand in the database under the name you enter are overwritten. You are therefore prompted for confirmation:

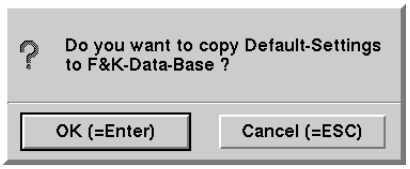


fig. 12 - 199 Default - Parameter (Page 300) > Save to F&K Data Base

- Press "enter" (OK): Default parameters are saved to the F&K database
(or press "Escape" (Cancel): Cancel the process).

12.9.5 Service (main menu)

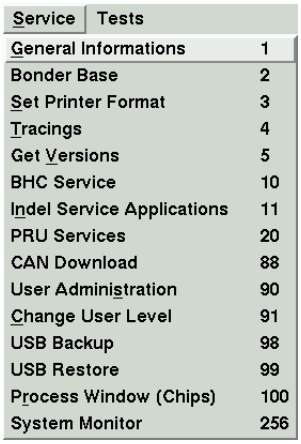


fig. 12 - 200 Service Menu

General information, settings for incorporating the bonder into a production facility.

- **General Information:** Display of general information and start of basic setup (see "General Information (Service 1)" on page 12-132)
- **Bonder Base:** Configuration of the basic settings (see "Bonder Base (Service 2)" on page 12-132)
- **Set Printer Format:** Sets the printer settings (see "Set Printer Format (Service 3)" on page 12-134)
- **Tracings:** Switching on and off of expanded tasks for problem analysis (see "Tracings (Service 4)" on page 12-135)
- **Get Versions:** View version numbers of the software components installed on the system (see "Get Versions (Service 5)" on page 12-135)
- **BHC Service:** Motor control of the main axes and their encoders (see "Motion Controller (Service 10)" on page 12-136)
- **Indel Service Applications:** Maintenance settings of the hardware (see "Indel Service Application (Service 11)" on page 12-142)
- **PRU Services:** For the service department of F&K Delvotec and authorized personnel (see "PRU Service (Service 20)" on page 12-143)
- **Devices Setup (optional):** Subdivide the material on the supports into devices (basis for material tracking).
- **Line Host (optional):** Sets up communication with the line host computers
- **CAN Download:** Downloads a firmware update by means of CAN download (see "CAN Download (Service 88)" on page 12-143)
- **User Administration:** Sets up the user management and access rights (see "User Administration (Service 90)" on page 12-144)
- **Change User Level:** Changes the registered user (see "Change User Level (Service 91)" on page 12-145)
- **USB Backup:** Backs up the data stock on a USB stick (see "USB Backup (Service 98)" on page 12-145)
- **USB Restore:** Restores the data stock from a USB stick (see "USB Restore (Service 99)" on page 12-146)
- **Process Window (Chips):** Determines limits for the parameter values of the chip data structures (see "Process Window - Chip (Service 100)" on page 12-146)
- **System Monitor:** Manual setting of the switch status of the safety doors and the amplifiers (see "System Monitor (Service 256)" on page 12-147)

General Information (Service 1)

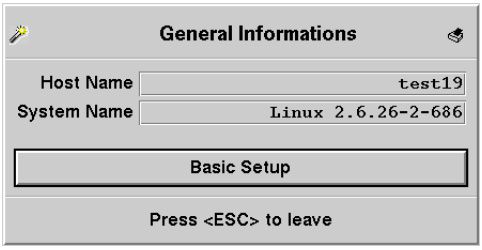


fig. 12 - 201 General Information (Service 1)

Display of the host name and operating system version. The "Basic Setup" button has no function.

Bonder Base (Service 2)

single machine

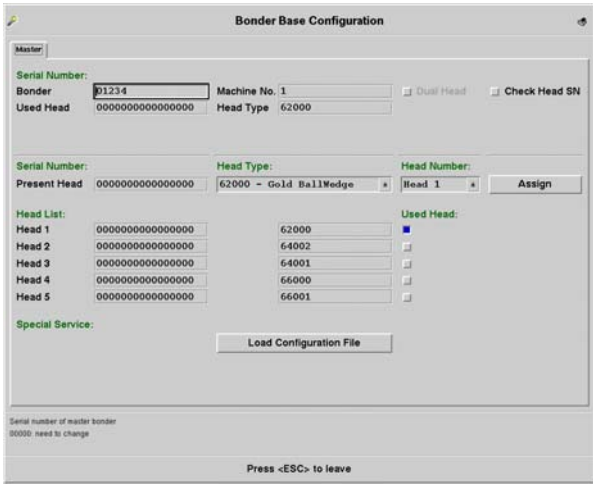


fig. 12 - 202 Bonder Base (Service 2)

Double head machine

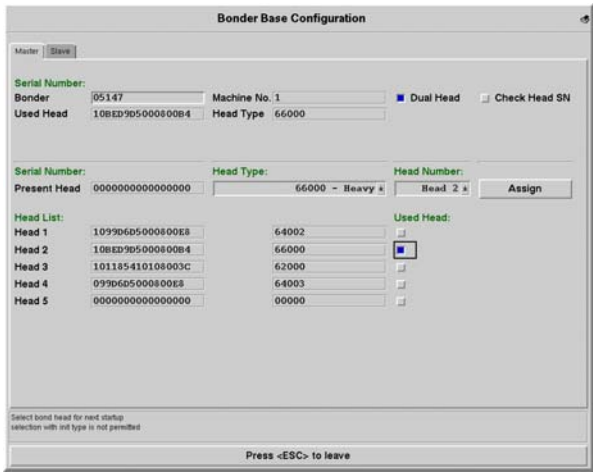


fig. 12 - 203 Bonder Base - master side (Service 2)

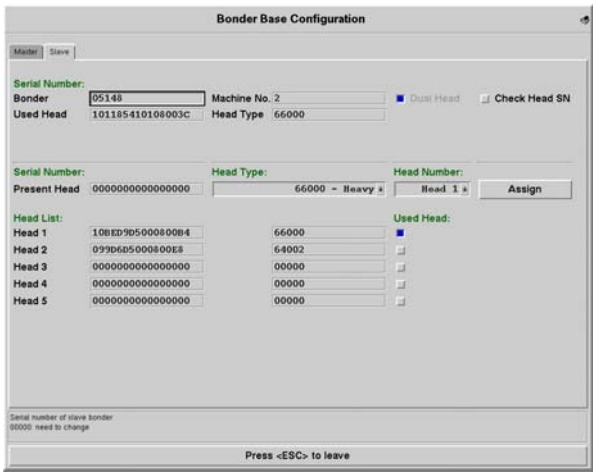


fig. 12 - 204 Bonder Base - slave side (Service 2)

IMPORTANT

The following instructions describe the software conversion of the bond head type. Also take heed of the hardware change associated with this (see 8.8 "Dünn-/Dickdrahtvariante wechseln" on page 8-76).

The bonder base is for the purpose of easy configuration of the basic settings from the menu.

Overview questions of this page

- How many bonders does the overall machine consist of?
- With which bond head is the bonder operated?
- Shall bond head serial number monitoring be active?

Knowledge as to whether the entire machine on is a single or double machine is of primary importance. A double machine consists of two single bonders, each with a unique serial number. The setting in the setup tool defines whether the entire machine is structured as a double machine.

On a secondary level but equally important is the knowledge as to which bond head type is used in each case.

SETTINGS

bond head	Number
Thin wire	64000
Thin Wire Deep Access	64001
Thin Wire HD	64002
Thin Wire Deep Access HD	64003
Heavy wire	66000
Heavy Wire Ribbon Wire	66001
Ball Wedge	62000

In addition, checking the bond head serial number makes it possible to change between two identical bond head types without losing the calibration data. Note that "Check Head SN" has to be activated.

The serial number is read off the head terminal board on the bond head. Communication then takes place via the Z/P main board and can be read via CAN page 88.

Configuration

- Bonder: Serial number of the single bonder. This must not be equal to "00000"; otherwise it has no functional effect on the application. This is displayed on the version page.
- Used Head: Serial number of the bond head currently installed; only when "Head Check" is activated. Otherwise the serial number is not used.
- Machine No: Informative machine number 1 or 2.
- Head Type: Bond head type that is active the next time the application is started.
- Dual Head: Activated when the entire machine is operated as a dual machine.
- Check Head SN: The serial number of the bond head is taken into account when starting the application. Loading of the machine data, calibrating data and user settings are assigned to this serial number by this means.

IMPORTANT

Check Head SN must be performed prior to the first assignment because the calibration data will otherwise be lost.

- Load Configuration File: Loads the fundamental configuration data for service applications.

Assign List

- Serial Number - Present Head: Displays the serial number of the bond head that is installed.
- Head Type: Indicates the mounted bond head type.
- Head Number: Number to be assigned to the selected bond head type.
- List Head 1-5:
  - A list of the bond heads available per individual bonder can be drawn up here.
  - For a bond head change only the relevant check button next to the list entry has to be activated.
  - Only a valid bond head type should be selected. Otherwise, the application will expect a valid bond head type after restart.
- Assign (Button): The list of all possible bond heads can be expanded, changed or deleted here. Deletion is achieved by the Init type.

IMPORTANT

The bond head type must be configured very carefully considering the currently installed bond head type. The application should have been started with the wrong bond head it is best to not load any bonding program and to correct the specifications on this page only or to swap the bond head accordingly. After this nothing should be stored and the application should be restarted.
The bond head type can be checked by viewing the large icon in the status window on the lower right.

Set Printer Format (Service 3)

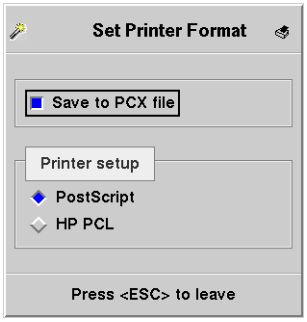


fig. 12 - 205 Set Printer Format (Service 3)

Sets the printer format.

If the check button "Save to PCX File" is active, the print tasks are diverted to files. The files are created in the directory "/pub/pictures" of the local FTP server and can be collected from there by the user by means of an FTP client (->See FTPAccess).

When the print job is sent a dialog opens and you can enter the name of the file created by the function.

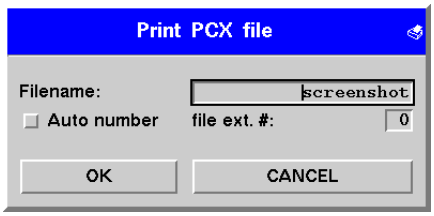


fig. 12 - 206 Set Printer Format (Service 3) > Print dialog button

Parameters of the dialog (conventional):

- **File name:** The suffix ".pcx" is appended automatically to the file name.
- **Auto number:** Activates two types; firstly, the number after "file ext. #" is automatically appended to the file name, also, this number is automatically increased by 1 after each printout.
- **file ext. #:** If the check button "Auto number" is active, the number entered here is appended to the file name.
- **Ok:** Confirms the procedure
- **Cancel:** Aborts the procedure

Tracings (Service 4)

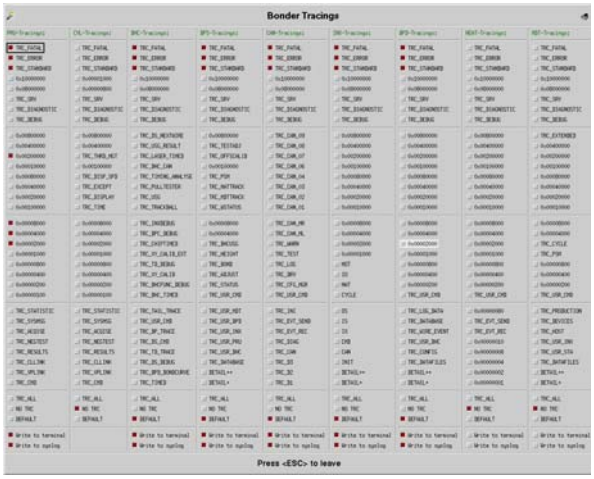


fig. 12 - 207 Tracings (Service 4)

Switches on and off expanded outputs for problem analysis.

IMPORTANT

These settings should be performed only by agreement with the personnel of F&K Delvotec, because wrong settings can distinctly slow down the machine.

Get Versions (Service 5)

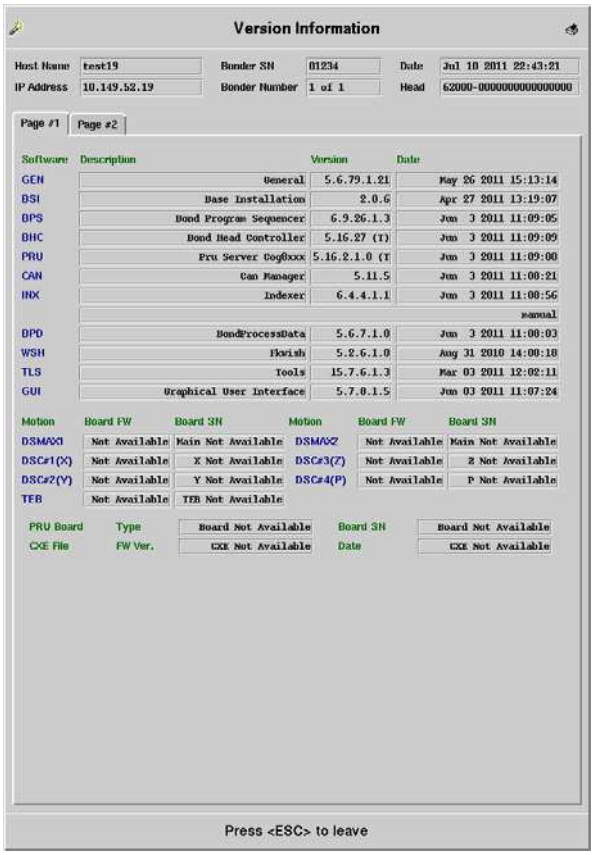


fig. 12 - 208 Get Versions (Service 5) > Page #1

View version numbers of the software components installed on the system.

The first tab ("Page #1") shows the version numbers of the basic components, the motion system and the pattern recognition system.



fig. 12 - 209 Get Versions (Service 5) > Page #2

The second tab ("Page #2") shows the firmware versions of the CAN nodes built into the system: These are peripheral systems which are connected via the CAN bus to the central PC of the machine. See "CAN (Page 88)" on page 12-110 and see "CAN Download (Service 88)" on page 12-143.

Motion Controller (Service 10)

Motor control of the main axes and their encoders. By main axes is meant the axes designated up to now x, y, z and p.

D A N G E R !

Only for the service department of F&K Delvotec and authorized personnel.

If the machine is not operated in compliance with the intended use, the machine can execute movements despite the installed safety devices such as the light beam curtain. Danger for man and machine!

N O T E !

The functions in this dialog enable the drive system to be put into states other than the state for use as intended by the manufacturer. There are additional dangers for the operator and the machine!

BHC Service

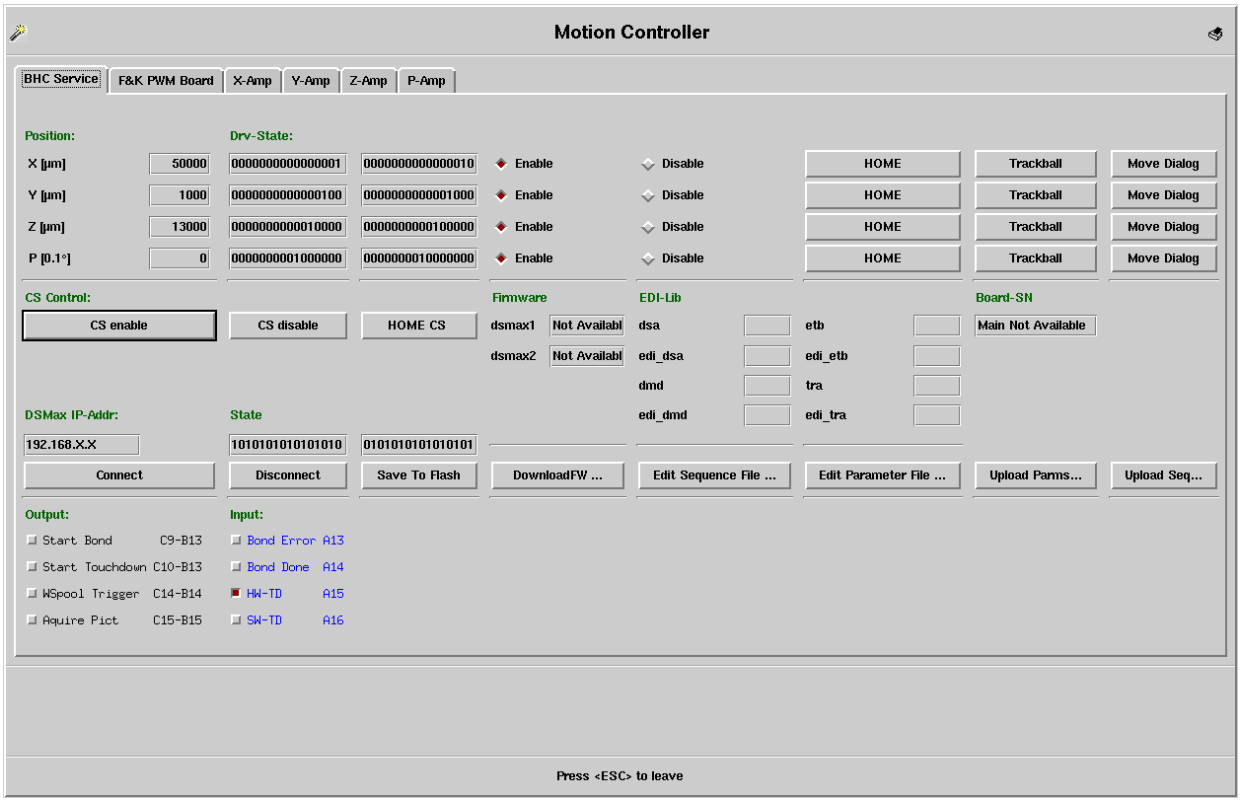


fig. 12 - 210 BHC Service (Service 10)

	X	Y	Z	P
Movement type	linear	linear	linear	rotatory
Motor type	linear	linear	rotatory	rotatory
mechanical ratio	none	none	Ratio: 1:1 1 Rotation = 16 mm	Ratio: 1:3.6
encoder	incremental encoder, sine-cosine $1V_{pp}$ grid division 20 µm	incremental encoder, sine-cosine $1V_{pp}$ grid division 20 µm	absolute encoder sine-cosine $1V_{pp}$ number of bars 512 4096 revolutions	absolute encoder sine-cosine $1V_{pp}$ number of bars 512 4096 revolutions
	- Preset resolution: 1µm = 409.6cts	- Preset resolution: 1µm = 409.6cts	- Preset resolution: 1µm = 262.14cts	- Preset resolution: P_{20}: 1deg = 41943cts
	- Commanded ?Resolution: 1ct = 1µm	- Commanded ?Resolution: 1ct = 1µm	- Commanded ?Resolution: 1ct = 1µm	- Commanded ?Resolution: 1ct = 1mdeg

Position

Indicates the current position of the 4 main axes x, y, z and p in user units (µm for linear axes x, y and z and 0.1° for rotation axis P).

Drv-State

Indicates the status of the axis motors SD1 and SD2. (See Etel DSC2P manual for detailed description).

Enable / Disable (check buttons)

This function enables the 4 axes to be energised and de-energised (command buttons, not status buttons). In other words, when an axis is de-energised by the corresponding button the button remains in this position and shows no change, even if the axis in question is energised by some other means (e.g. "Home").

home

In this way you can reset the axles individually to Home position. When any one axis is disabled, pressing the HOME button energises all the axes. The axis then traverses to Home position.

trackball

With this function individual axes can be traversed by means of the trackball.

Move dialog

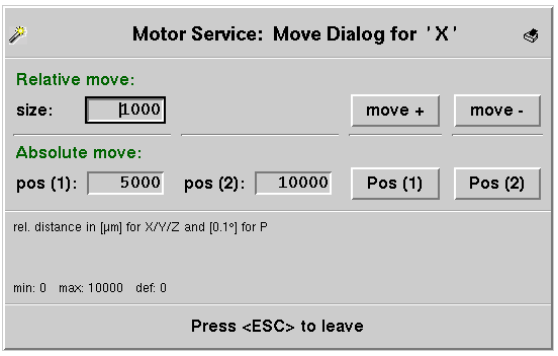


fig. 12 - 211 BHC Service (Service 10) > Move dialog

Defined movements of individual axes can be executed with this function.

CS Control

For the purpose of controlling the coordinate system (X,Y,Z,P).

- CS enable: Energizes all axes in the coordinate system
- CS disable: De-energizes all axes in the coordinate system
- HOME CS: Homes all axes in the coordinate system in the sequence z, p, y, x

Firmware

Displays the current DSMax1 firmware in the machine.

EDI-Lib

Shows the current firmware of Etel Device Interface: dsa, edi_dsa, dmd, edi_dmd, etb, edi_etb, tra, edi_etra. (see EDI Users Manual for detailed description).

Board-SN

Shows the serial number of the DSMax card.

DSMax IP-Addr

Shows the currently configured IP address of the DSMax card.

State

Shows DSMax status bits, 32 bits in 2 by 16-bit field. (see Etel DSMax user's manual for detailed description).

Connect / Disconnect

Enable and disable communication between host and DSMax. The presettings for DSMax are regenerated on "Connect" (automatic download of DSMax parameters and DSMax sequences in the background).

Save to Flash

Saves the currently set DSMax parameters of the DSMax card.

DownloadFW ...

Opens die page Download Firmware to Motion Controller. There is a choice of dsmax1 or dsmax2 firmware (click on the corresponding firmware name) and then download to DSMax (by clicking on the "Download" button).

IMPORTANT

After downloading dsmax2 firmware it is absolutely necessary that you switch the machine off and back on.

Edit Sequence File

Opens the page Load File, where a sequence file with the corresponding directory can be opened and edited. The possibility then exists of editing, saving and quitting the file, and downloading DSMax.

Edit Parameter File

Opens the "Load File" page, where a parameters file with the corresponding directory can be opened and edited. The possibility then exists of editing, saving and quitting the file, and downloading DSMax.

Upload Params

Opens the page Upload Parameters from the motion controller, where you can save the DSMax parameters currently set in accordance with the desired names in selected directories (on the host face). This is useful if you are performing changes to DSMax parameters, but afterwards would still like to have the original setting at your disposal.

Upload Seq...

Not yet implemented.

Output/Input

In this dialog you can switch individual output stages of the bond head controller on and off independently of the function sequence (columns 1+2). At the same time the status of the input stages of the bond head control is displayed. This function serves as a help position for the checking of basic functions, e.g. in the event of a fault.

F&K PWM Board (Service 10)

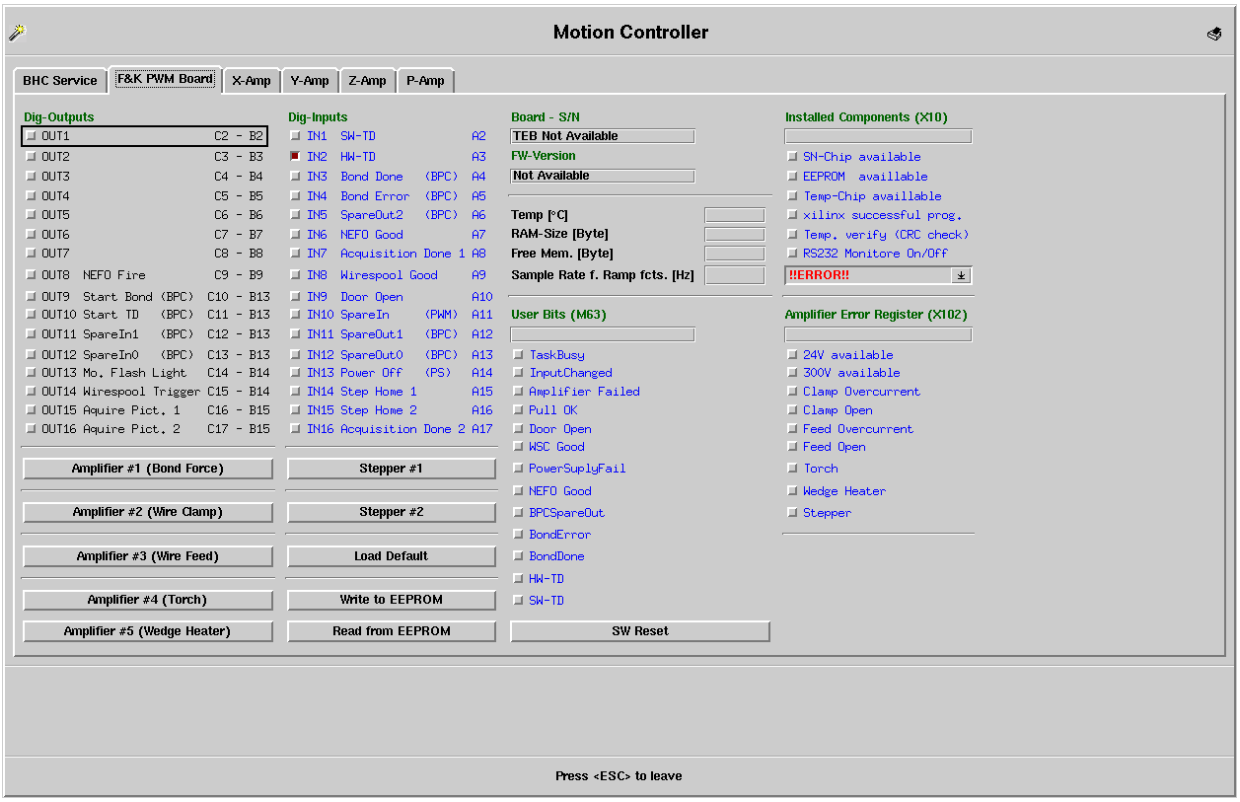


fig. 12 - 212 F&K PWM Board (Service 10)

In this dialog you can switch individual output stages of the bond head controller on and off independently of the function sequence (columns 1+2). At the same time the status of the input stages of the bond head control is displayed. This function serves as a help position for the checking of basic functions, e.g. in the event of a fault.

X-Amp, Y-Amp, Z-Amp, P-Amp (Service 10)

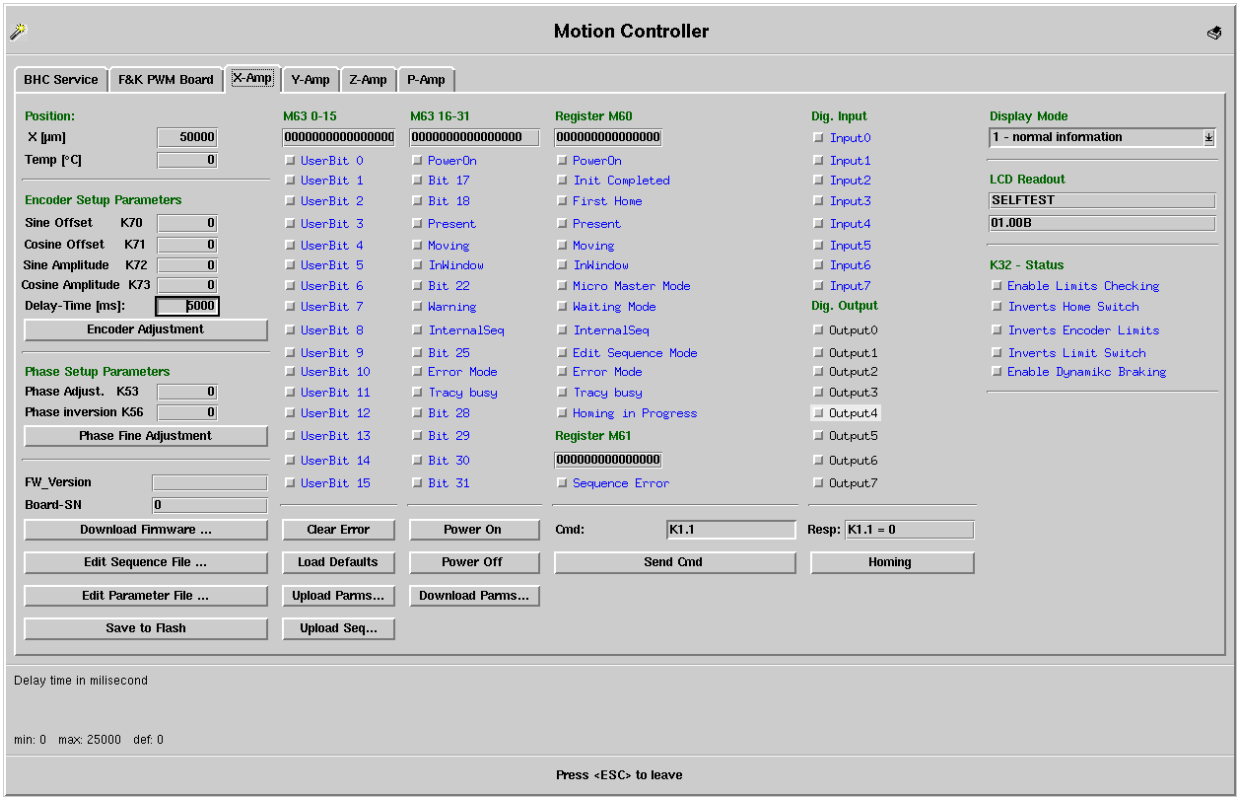


fig. 12 - 213 X-Amp (Service 10)

The layout of the pages for the X, Y, Z and P axes is identical. The X-Amp page is described here by way of example.

This page shows the most important information about the amplifier of the X axis (parameters, status, firmware version, inputs, outputs ...), and it contains the most Important functions for configuring the axis, setting parameters .... and also the save, upload, and download functions for firmware or parameters.

Indel Service Application (Service 11)



fig. 12 - 214 Indel Service Application (Service 11)

Maintenance settings of the hardware.

IMPORTANT

Only service specialists have access to the individual dialogs.

PRU Service (Service 20)



fig. 12 - 215 PRU Service (Service 20)

IMPORTANT

Only for the service department of F&K Delvotec and authorized personnel.

CAN Download (Service 88)

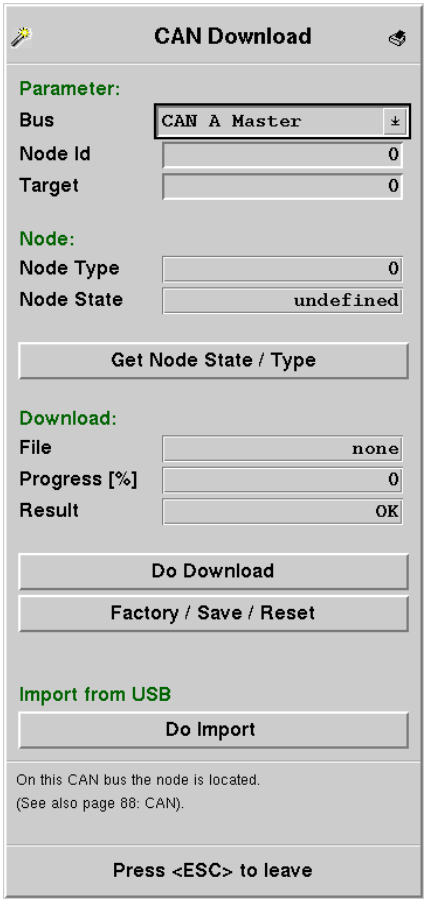


fig. 12 - 216 CAN Download (Service 88)

This page provides the possibility of updating the firmware of the CAN nodes installed in the system. Peripheral systems that are connected via a CAN bus to the central PC of the machine are designated as CAN nodes. See "CAN (Page 88)" on page 12-110 and see "Get Versions (Service 5)" on page 12-135.

IMPORTANT

Only for the service department of F&K Delvotec and authorized personnel.

Do Download

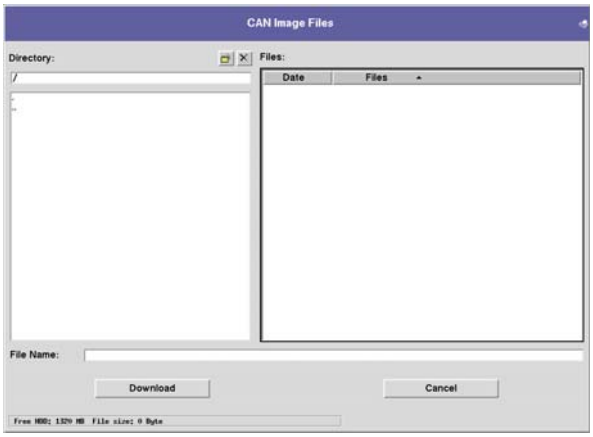


fig. 12 - 217 Can Download (Service 88) > Do Download

This option should be performed only after consultation with F&K Delvotec and is not documented any further here.

IMPORTANT

An incorrect firmware download can cause the machine to no longer function!

User Administration (Service 90)

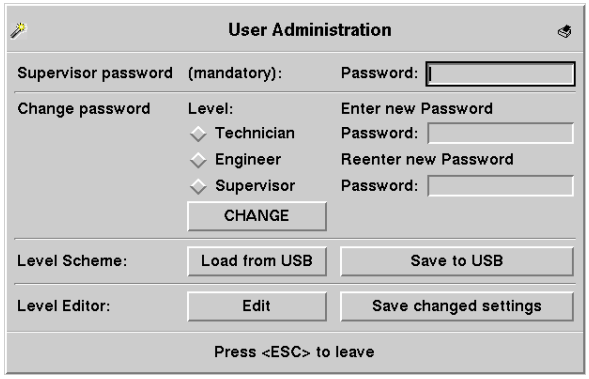


fig. 12 - 218 User Administration (Service 90)

Access to machine functions and the definition of parameters are restricted for various user groups. Authentication for a user group is obtained by entering the associated password (see "Change User Level (Service 91)" on page 12-145).

Three user groups can be selected:

- operator: semi-skilled temporary worker (lowest access rights)
- Technician: technically trained and qualified worker
- Engineer: engineer authorized to issue instructions (high access rights)

This dialog enable the passwords of the user groups to be changed and the software to be set to a special state - known as "Level Editor" - in which it is possible to set the access rights for individual elements of the user interface.

Another password is necessary for access to this central page of the user management, the "Supervisor" password.

For this password please refer to a separately supplied part of the documentation (besides the supervisor password and the preset passwords for the user groups this document also contains the FTP access data).

To change the password for a user group, proceed as follows:

- Enter the supervisor password.
- Select via the radio button the password to be changed.
- Enter the new password twice.
- Activate the button "CHANGE PASSWORD".

To use "Level Editor" mode:

- The "Level Editor" is started on this page):
- Enter the supervisor password.
- Button Level Editor: Activate "Edit".
- Close the "User Administration" page by pressing "Escape" on the keyboard or hitting the appropriate button.
- With the mouse approach the entry field or the menu entry that is to be adapted. Right-click to open a dialog in which the settings for the access rights can be changed:

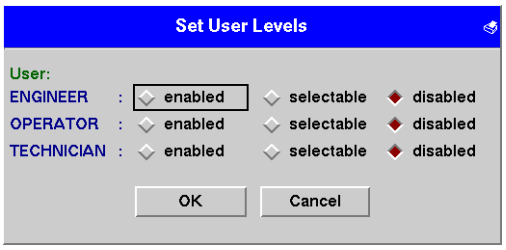


fig. 12 - 219 User Administration (Service 90) > Access Rights

- disabled: The field is not accessible for this user group
- selectable: The field is selectable for the user group, but cannot be changed.
- enabled: The user group obtains full access to this field.

Level Scheme

An authorization scheme can be saved or loaded on a USB stick with this function.

The last step is repeated for all fields whose access entitlement is to be changed. The "Level Editor" is terminated on this page:

- Enter the supervisor password.
- Button Level Editor: Activate "Save changed settings".
- Close the "User Administration" page by pressing "Escape" on the keyboard or hitting the appropriate button.

IMPORTANT

The level editor is ended automatically if no input activities are performed for 30 seconds. Any changes already made are listed, because they are not automatically saved.

Change User Level (Service 91)

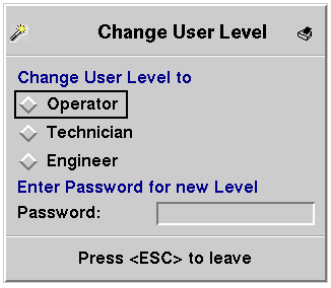


fig. 12 - 220 Change User Level (Service 91)

Changes the registered user.

For the preset passwords please refer to a separately supplied part of the documentation (besides these passwords and the supervisor password this document also contains the FTP access data). Also refer to " User Administration (Service 90)" on page 12-144".

Changing the user group.

- Select the user group
- Enter the relevant password
- Press "Enter" to confirm
- Activate the "Escape" button to change the user group and quit the menu

USB Backup (Service 98)

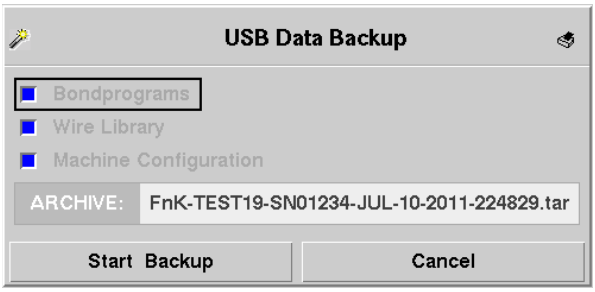


fig. 12 - 221 USB Backup (Service 98)

Saves the machine's entire data stock on a USB stick.

USB Restore (Service 99)

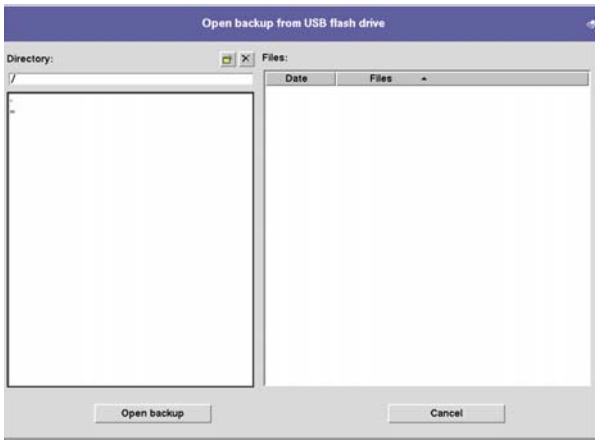


fig. 12 - 222 USB Restore (Service 99)

Restores the machine's last saved data stock from a USB stick.

IMPORTANT

The data last saved may only be established on the same machine. Otherwise this step will result in functional problems.

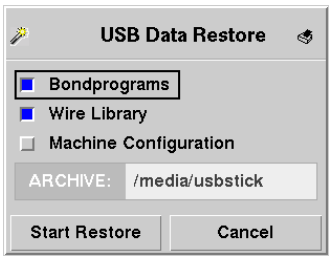


fig. 12 - 223 USB Restore (Service 99)

Selects the data to be established.

Process Window - Chip (Service 100)

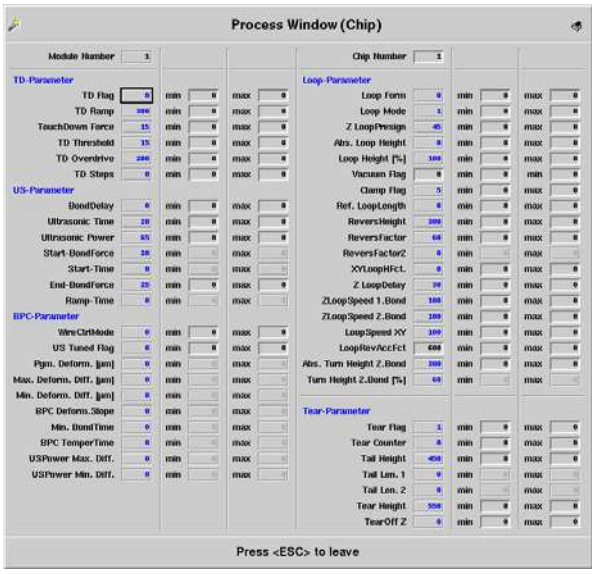


fig. 12 - 224 Process Window (Chip) (Service 100)

Input limits can be defined for the parameter values of the chip data structures here. During production, the operating personnel can change these parameter settings only within the predefined limits. Assignment can be made individually for each chip in the bond program.

A minimum and maximum value can be defined for each value (see "Learn chip (mode 1)" on page 12-29). The following rule applies in this: If the limit value is 0, no checking of the specifications takes place. If the value differs from 0, any values entered are checked and rejected if necessary. The values coloured blue represent the present setting.

Select by browsing with "page forward" and "page back". Once you have selected the data set you want, press "Escape" on the keyboard to close the dialog.

System Monitor (Service 256)

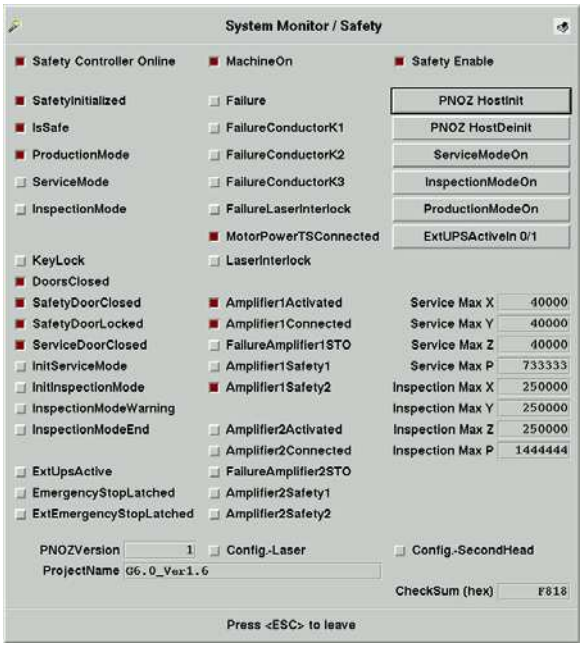


fig. 12 - 225 System Monitor (Service 256)

This function permits manual setting of the switch status of the safety doors and the amplifiers.

IMPORTANT

Only service specialists have access to the individual dialogs.

12.10 rebond

12.10.1 Rebond Wire Parameters

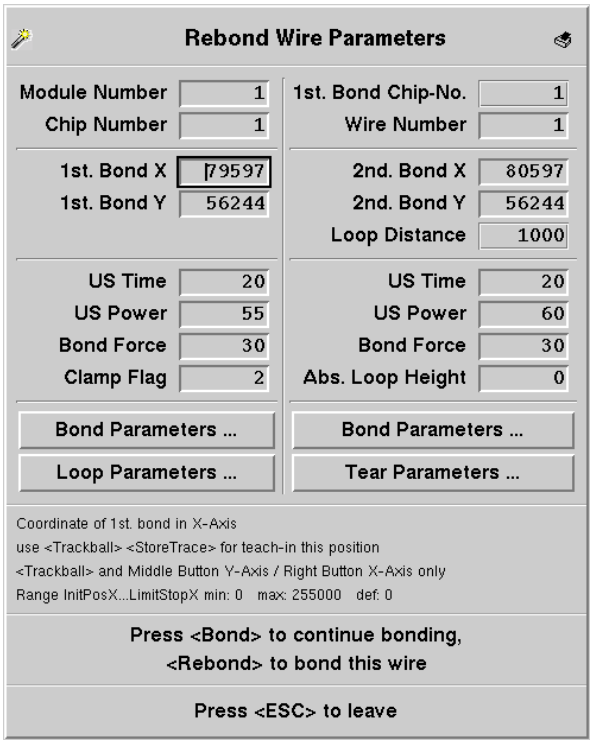


fig. 12 - 226 Rebond Wire Parameters

The "rebond" function enables the repetition of an individual wire. This function is called by means of the "Rebond" button.

Parameter (Rebond Wire P)	Description / *Value range, unit*
Module number	Number of the module on which the chip is programmed.
Chip Number	Number of the chip on which the wire is to be repeated.
1st. Bond X 1st. Bond Y	Coordinates of the 1st bond point. *µm*
US Time	Ultrasonic time; you can determine these values beforehand in single-bond mode 11 or enter them as empirical values. *1 ... 255*
US Power	US-power; the power to be set is dependent on the wire diameter and bonding material used. *0 ... 255*
Bond force	Programmed bond force. Dependent on page 1 Parameter "Bond Force Mapping". To use unit cN a calibration in accordance with mode 44 is required. *cN or digit*
Clamp Flag	Clamp parameter *0: Clamp closes at loop height.* *1: Clamp closes at ramp position of the destination bond.* *2: Clamp closes only after bonding at bond height.* *3: Clamp closes at loop height, absolute wire length is selected. Wire consumption is kept constant, loop height is variable.* *Press the right mouse button for more options. These options will be shown in the graphic display.*
1st. Bond Chip-No.	Chip number on which the first bond is located.
Wire Number	Wire number of the wire that is to be bonded.
2nd. Bond X Y	Coordinates of the 2nd bond point. *µm*
Loop Distance	Distance between the source and destination bonds (also known as source and destination bonds) in the X/Y plane.
US Time US Power Bond force	Parameter of the 2nd bond (see top of table for description).
Abs. Loop Height	0: Automatic loop height specification of the wire length (is specified using the loop height factor (XYLoopHFct.)). Input > 0: Absolute loop height travelled over the source bond. *µm*

Bond Parameters (Rebond Wire Parameters)

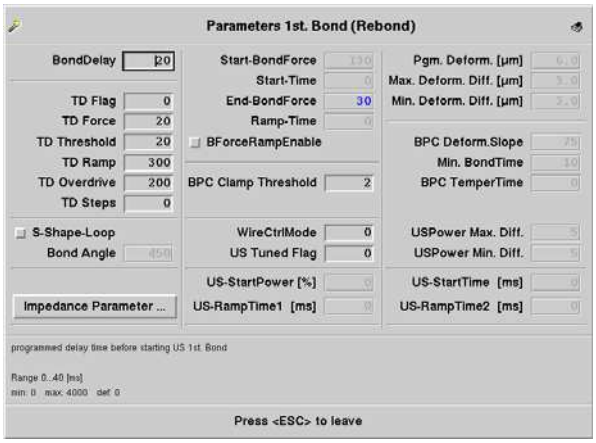


fig. 12 - 227 Rebond Wire Parameters > Bond Parameters

Parameter descriptions see "Bond Parameters 1st./2nd. Bond (Learn Wire)" on page 12-47.

Loop Parameters (Rebond Wire Parameters)

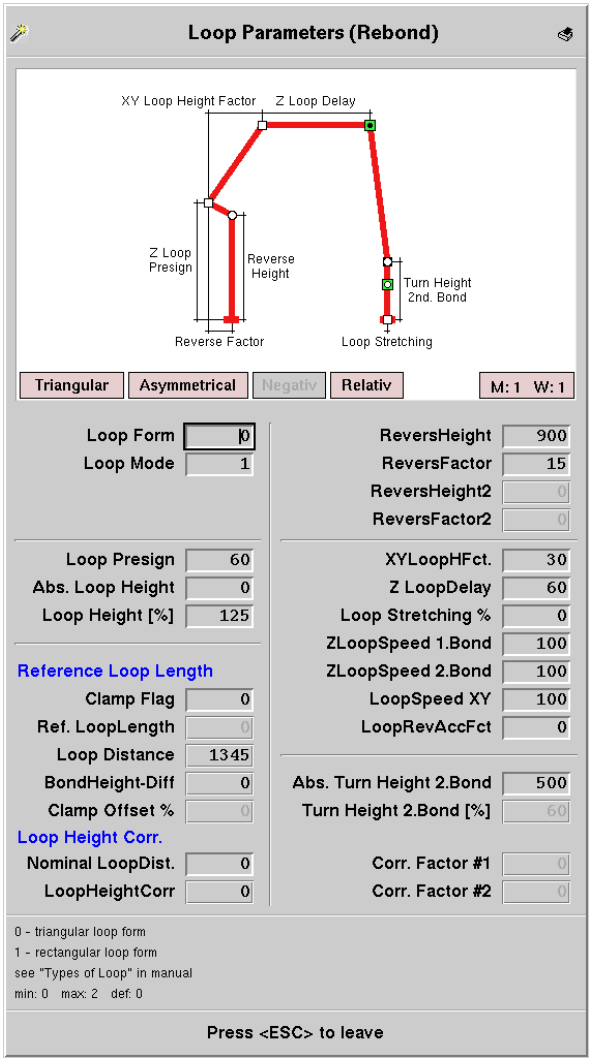


fig. 12 - 228 Rebond Wire Parameters > Loop Parameters

Parameter descriptions see "Loop Parameters (Learn Wire)" on page 12-49.

Tear Parameters (Rebond Wire Parameters)

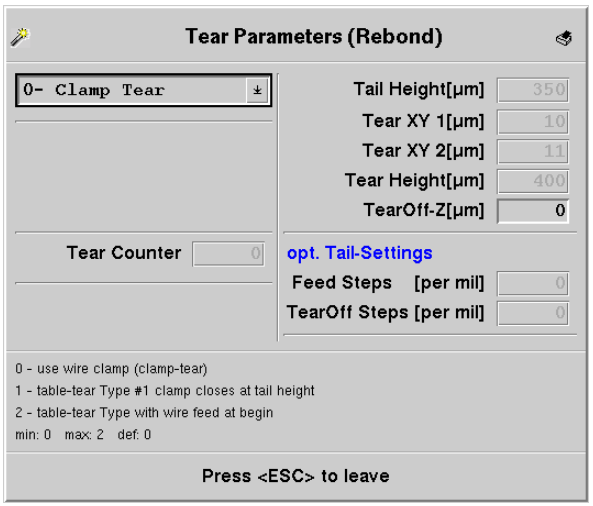


fig. 12 - 229 Rebond Wire Parameters > Tear Parameters

Parameter descriptions see "Tear Parameters (Learn Wire)" on page 12-52.

12.11 Bond process control (BPC)

Also see the section on bond process control in the programming instructions.

12.11.1 General description

Bond process control (BPC) is a tool that uses ultrasonic power to regulate wire deformation. Wire deformation is measured during the bonding process.

Ultrasonic power is regulated as a function of the measured wire-deformation curve in accordance with a predefined slope of the curve.

Once the predefined wire deformation is achieved, the ultrasonic power is reduced to the minimum and the bonding process is terminated after a tempering period.

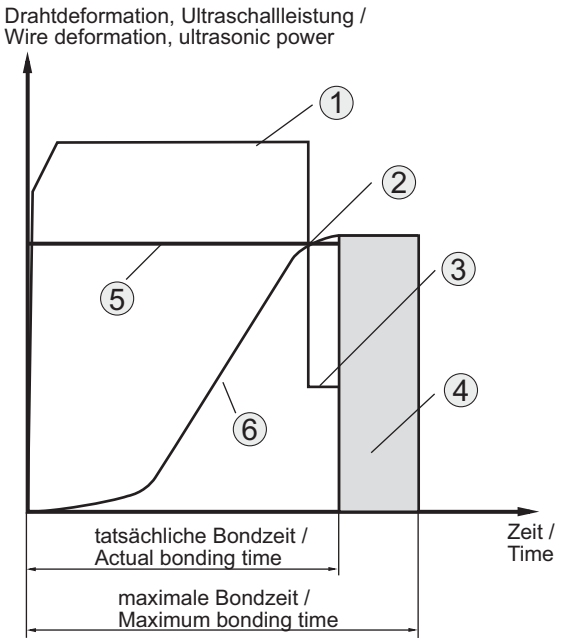


fig. 12 - 230 Control procedure for bonding with bond process control.

- 1: controlled US power
- 2: Desired wire deformation achieved
- 3: tempering time
- 4: no further ultrasonic energy is supplied to wire in the grey range
- 5: deformation threshold
- 6: wire deformation

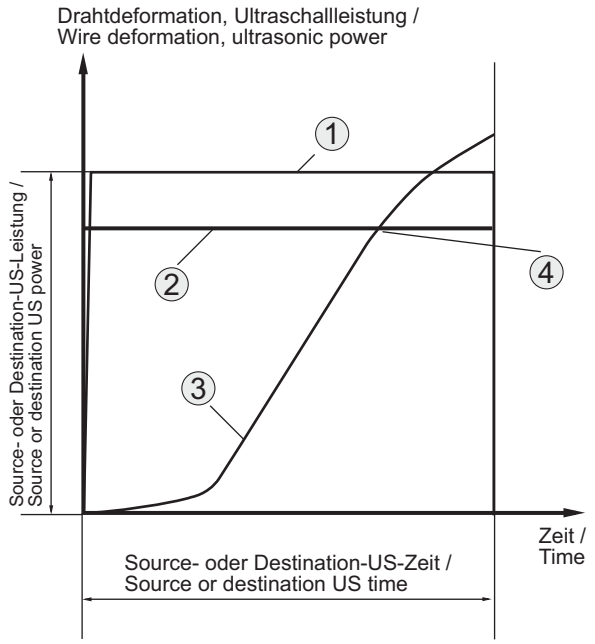


fig. 12 - 231 Control process of the bonding sequence without bonding process control

- 1: US power not controlled
- 2: deformation threshold non-functional
- 3: wire deformation
- 4: desired wire deformation achieved. However, ultrasonic energy continues to be supplied to the wire.

12.11.2 Additional function Impedance monitoring

The impedance control is a function that is used to additionally monitor the bond process. The electrical properties of the ultrasonic transducer are drawn on, which change depending on the mechanical coupling of the bond tool during the welding process.

This requires that the data channel #1 of the ultrasound generator was configured to output current or impedance measuring values.

This configuration must be performed by the F&K Service personnel.

Because of the more favourable value ranges during the measurement it is recommended to include the transducer current instead of the physical unit impedance for the analysis.

First, the characteristic data and limit values must be calculated for the applicable application. The PDViewer program must be used to perform this task. The limit values, when found, are entered in the parameter dialogs (chip / wire). As soon as one of these limit conditions is violated with subsequent bonding procedures, the machine will stop with an error message.

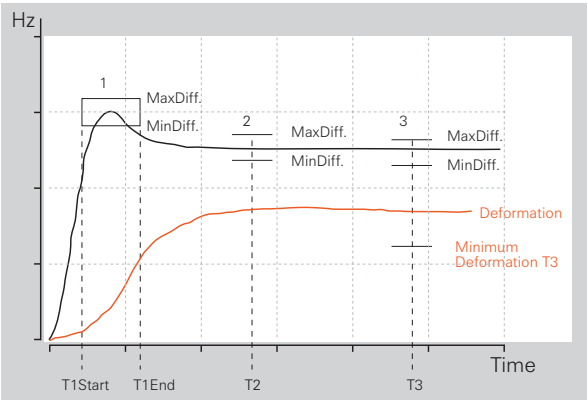


fig. 12 - 232 impedance monitoring

12.11.3 Description of the BPC user interface (PDViewer)

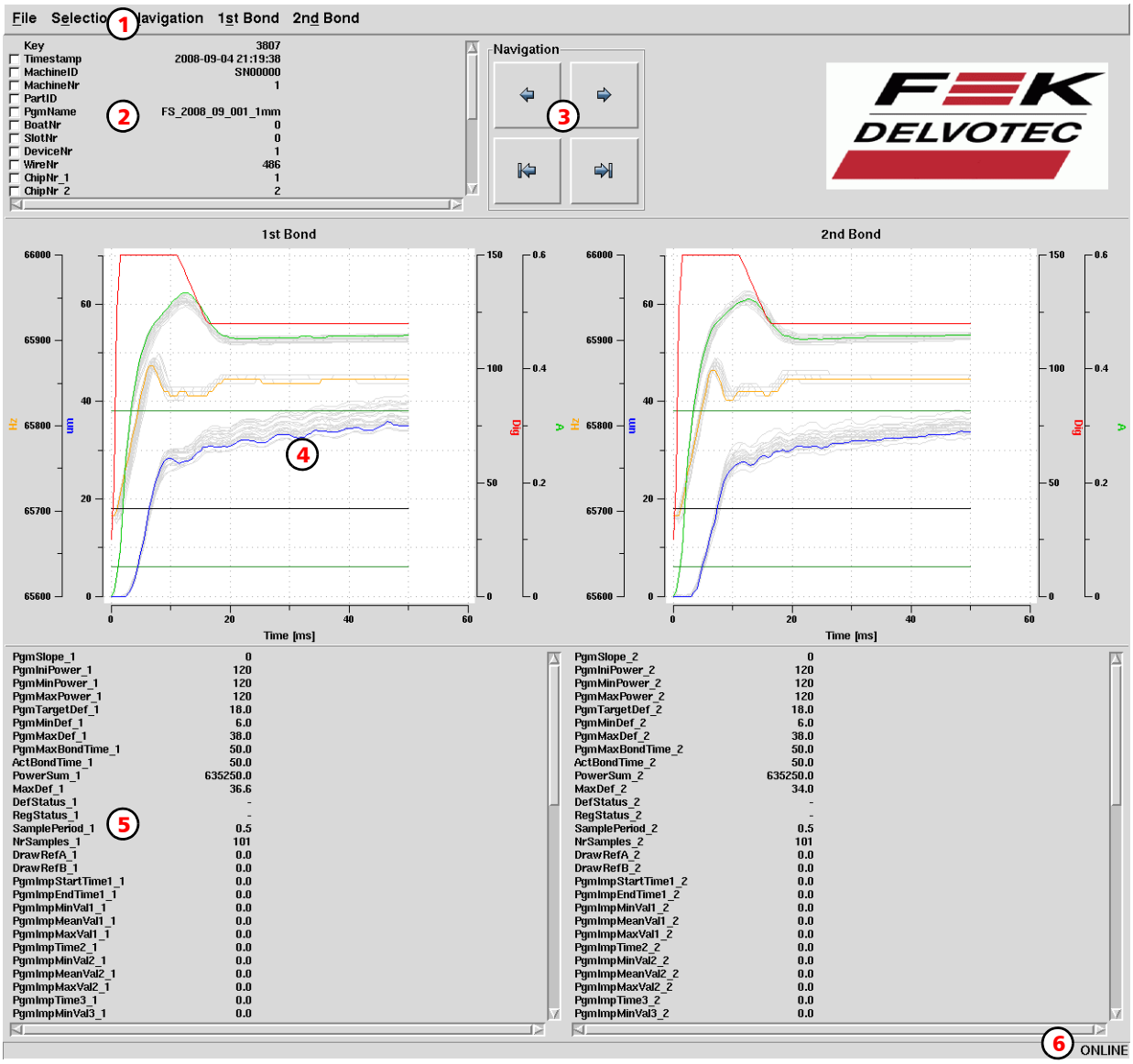


fig. 12 - 233 File > BPC Screen

While bonding, the machine will collect data for the individual bonds / wires in an online buffer (buffer size will be defined on Page 6).

- **1:** main menus
- **2:** Classification/Info - Order data for the applicable wire record
- **3:** Quick navigation
- **4:** Measuring data graphic: Time rows of measuring values are shown in a graphic
- **5:** Individual values - Measuring data and preset values that are not time rows
- **6:** Online/Offline: Online - the data delivered by the bonder are continuously updated.

N O T E S

Name+_1 = first bond (source bond)
Name+_2 = second bond (destination bond)
One wire with two bonds is always stored in the database as a record. In special cases (Bump Bonds, stitch bond, interruptions) such record may only contain the data for one bond.

The "Process Data Viewer" (PDV) program is also available for external operation under

Windows (2000/XP/Vista). Records that were exported by the bonder can thereby be viewed offline with the same method.

An adjusted ODBC driver can be used to import the records to any ODBC capable software for further processing.

A special driver DLL can be used to directly import the exported data to a self-created software.

F&K Delvotec provides a CD containing the required software components. Contact your representative to request a CD.

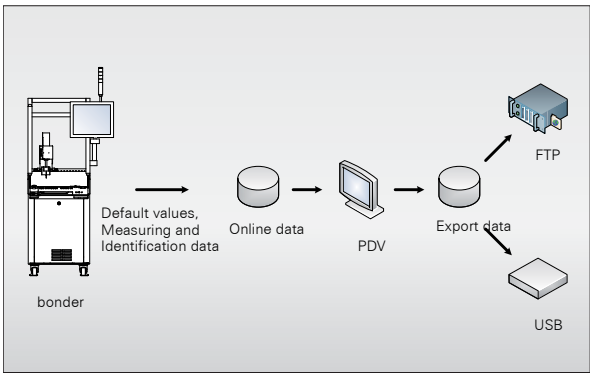


fig. 12 - 234 BPC Screen > Process Data

File (main menu)

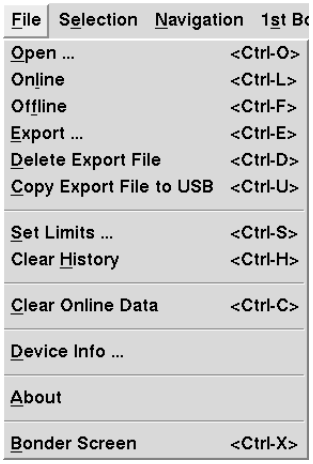


fig. 12 - 235 BPC Screen > File

Open

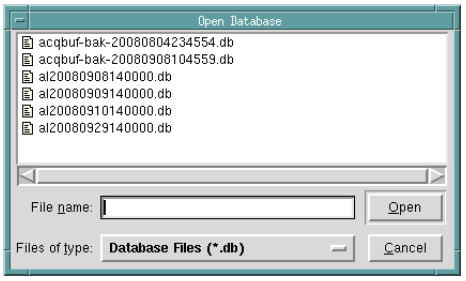


fig. 12 - 236 BPC Screen > File > Open

Opening an (existing) database that was created to collect process data.

Online

Switching the viewer to the online database of the bonder. The last bonded wire is always displayed.

This function is only available during operation of the program on the bonder, but not in the Windows version.

Offline

Disabling the online update (in the bonder only). Data of newly bonded wires is no longer displayed automatically. (See ONLINE/OFFLINE) status on the lower right edge of the screen. Data is still collected and saved during operation.

Export

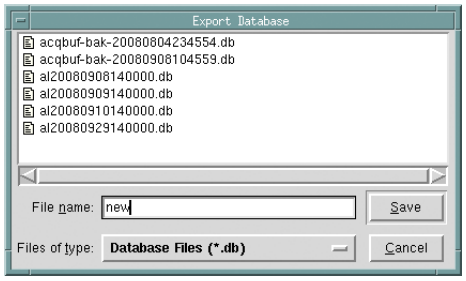


fig. 12 - 237 BPC Screen > File > Export

The content of the online database of the bonder is exported to a file. This file is available in the FTP download range of the bonder and can be downloaded for further evaluation or for archiving purposes to the extend that the bonder is connected to a suitable network. See also " Copy Export File to USB" on page 12-154".

Delete Export File

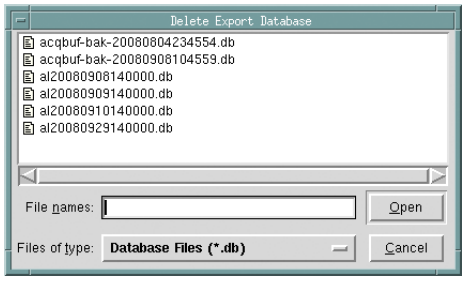


fig. 12 - 238 BPC Screen > File > Delete Export File

This function is used to delete export files that were created with the Export function from the hard disk of the bonder.

N O T E

Files that are no longer needed can also be deleted using the FTP access to the extent that the bonder is connected to a suitable network.

Copy Export File to USB

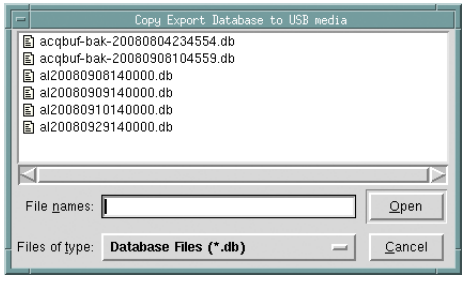


fig. 12 - 239 BPC Screen > File > Copy Export File to USB

This function is used to copy export files that were created with the Export function to a USB memory stick.

Set Limits

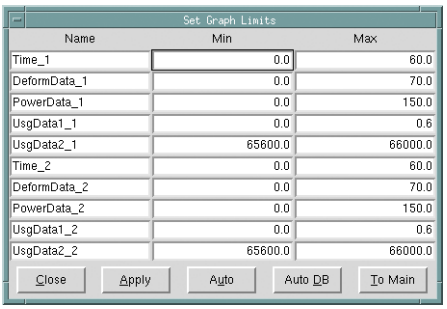


fig. 12 - 240 BPC Screen > File > Set Limits

Setting value ranges on the scales of the graphic display: Scales for which values have not been entered (blank field), will be adjusted according to the displayed data. However, for visual comparability of the data it is often more beneficial to select fixed scaling for the display, which covers the value ranges that actually occur in the corresponding application of the machine.

N O T E

These settings correspond with the settings on Page 100 of the main user interface of the bonder.

The limit values that are set up here will be linked with the name of the bond program in the process data database. Different settings can thereby be assigned to different products. The applicable current settings are also transferred when the data is exported so that it is available in the same way in the offline viewer.

CLOSE

Close dialog (Important: First "Apply").

APPLY

Apply the changes → graphic to be updated.

AUTO

Deleting all specified scaling, which means the scales will be adjusted according to the data.

AUTO DB

Suitable scaling values are suggested based on the data that currently exists in the database that is viewed.

To Main

Defined values are transferred to the main interface (Page 100) (not Windows Version).

Clear History

Clearing the display history (comparison curves) when 1st/2nd Bond
"1Line w/ history" is set up in the menu.

Clear Online Data

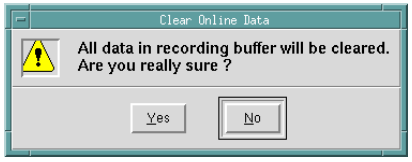


fig. 12 - 241 BPC Screen > File > Clear Online Data

Deleting the entire online database.

N O T E

When customer specific software is used to collect product data (material tracking) deleting the online database may result in an unwanted loss of data. This function is disabled in such configurations.

Device Info

When customer specific software is used to collect product data (material tracking), additional information is usually available in the process data database. For example: Customer specific serial numbers or allocations of devices within a panel or production batch. To the extent that such information exists, it can be displayed here. If such information is not available, this menu item won't have a function.

About

Display of the currently installed software version of the PDV. Keep this version description on hand for support inquiries.

Bonder screen

Return to the main user interface of the bonder.

Selection (main menu)



fig. 12 - 242 BPC Screen > Selection

The limits for the displayed data are entered in this menu. Setting a selection in this menu corresponds with setting a selection in the classification/information field.

Navigation (main menu)

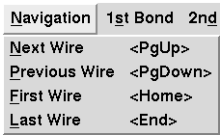


fig. 12 - 243 BPC Screen > Navigation

- Next: Next wire, <up> button (Page Up)
- Previous: Preceding wire, <down> button (Page Down)
- First: First / oldest wire <Pos1> button (Home)
- Last: Last / most recent wire <End> button (End)

These functions correspond with the button fields.

1st Bond / 2nd Bond (main menus)

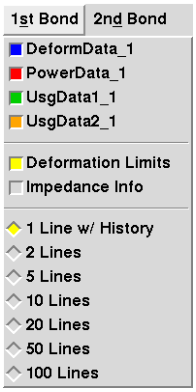


fig. 12 - 244 BPC Screen > 1st Bond

Display options for 1st Bond / 2nd Bond:

- Deformdata_1/_2: Selection whether the deformation data is displayed in the graphic
- PowerData_1/_2: Selection whether the US-Power data is displayed in the graphic
- USG_Data_1/_2: Selection whether the data for the ultrasound generator channel 1 is displayed
- USG_Data2_1/_2: Selection whether the data for the ultrasound generator channel 2 is displayed
- Deformation Limits: Selection whether limit values and references (to the extent that they are programmed for the applicable wire) are displayed.
- Impedance Info: Selection whether limit values and references of impedance monitoring (to the extent that they are programmed for the applicable wire) are displayed.

Comparison data in the graphic:

- 1 Line w/ History: A wire is displayed in colour. These curves will remain as a gray shadow while "paging". This will result in a set of curves while paging, similar to the display on the main operating interface.
- 2Lines 5Lines ... 100Lines: In addition to the currently displayed wire, 2 - 100 older records that meet the same selection criteria are displayed in gray(see "Selection (main menu)" on page 12-155).

Classification/Info

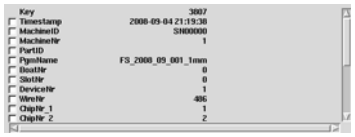


fig. 12 - 245 BPC Screen > Classification/Info

Special selection function.

Left mouse button shows all existing values. Setting the check mark will limit the display to those records that match the selection.

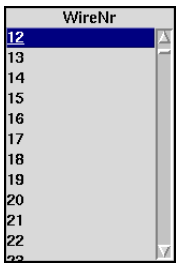


fig. 12 - 246 BPC Screen > Classification/Info > Selection function

Example: Wire No.12 - Only records containing wire numbers with the value 12 will be displayed.

Distribution

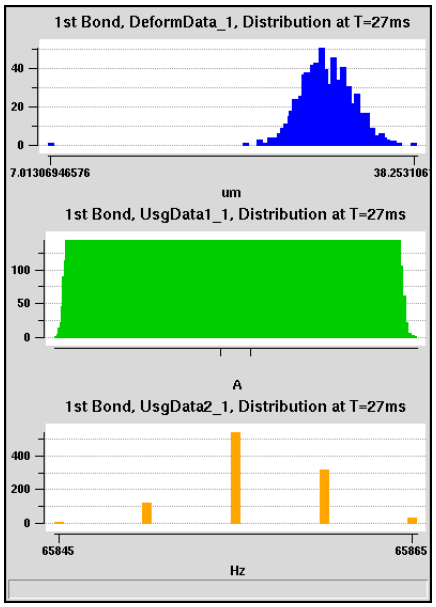


fig. 12 - 247 BPC Screen > Distribution

Specific selection function of the measuring value display.

Activating the right mouse button on a time in the graph or a value will display a history diagram of values from the database.

12.11.4 Setting up bond process control

The procedure for setting up bond process control is as follows:

- Ensure that the calibration of the TD sensor was performed correctly.
- Make sure that bond process control is deactivated. To do so select "Mode 1, Bond Parameter" and set "Wire Control Mode" to 0 or 1.

Wire control (mode1) monitors deformation issues an error if deformation is outside the window defined by the limits. Bond time and US power corresponds to the set values.

- Bond a series of test bonds without bond process control.
- Vary the values of the individual bond parameters.
  The values of the parameters belonging to the displayed bond are shown on the screen.
- By means of pull and shear tests or measuring the individual bonds determine the curve that provides the best result.
- Set the appropriate deformation value.

Experience shows that the best deformation value is generally slightly below maximum deformation; this value can vary depending on the requirements to which the bond is subject.

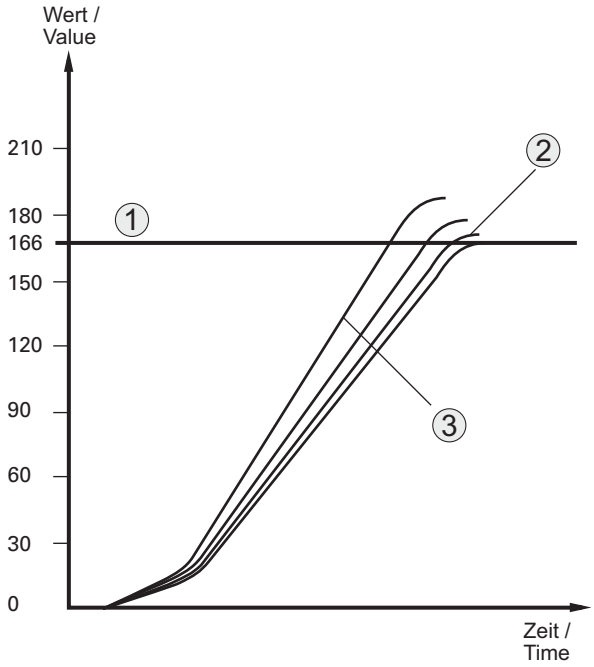


fig. 12 - 248 Setting up BPC

- 1: Required deformation threshold

- 2: Selected curve
- 3: Wire deformation curve of the test bonds

▶ Switch on bond process control. (Mode 1/2: Set wire control to 2) US Power and US time still have to be adapted in mode 1.

▶ Enter the deformation value for the source and destination bonds in the "Pgm. Deform." parameter in mode 1 "Learn Chip" or mode 2 "Learn Wire" (for all wires); as a rule no subsequent change in the curve scale factor will be necessary.

▶ Reduce "US Power" by the value of "US Power Max Diff".

▶ Increase "US Time". (This is now max. bond time)

This establishes the same conditions as applied when the settings were obtained.

IMPORTANT

After bond process control has been activated (WireControl Flag 2), you should recheck the bond force settings with a bond force ramp. It must be possible to achieve maximum bonding force within the "minimum bond time". The values for "Start Time" and "Ramp time" might have been changed automatically. Readjust these settings if necessary.

12.12 Pattern recognition unit (PRU)

12.12.1 General description

The pattern recognition unit, being an independent computer unit, uses the signals of the CCD camera to calculate the position of the dice and carrier medium. In the process taught-in patterns are recognised or certain structures (edges) are found. The image of the CCD camera is displayed on screen. This camera view can be used for precision manual positioning, for example in a teach-in session or for entering machine parameters such as offsets, etc.

The contrast and brightness of the CCD camera can be set, so that optimum functioning is ensured in all light and material conditions.

Schematic layout

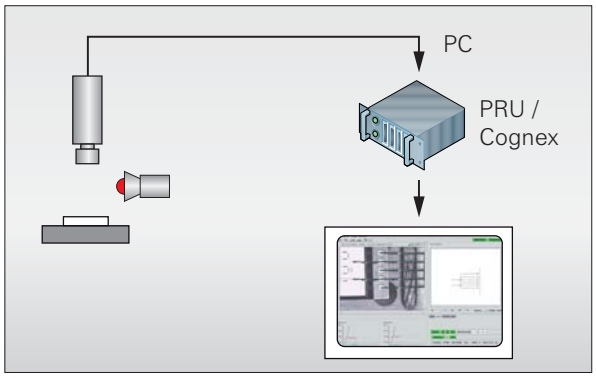


fig. 12 - 249 PRU > diagram layout

- 1: Part
- 2: lighting
- 3: CCD camera
- 4: PC with image-processing software

Learning mode

You use learning mode to save a pattern, which should be as clear and unequivocal as possible, for subsequent recognition during productive operation.

Production

During automatic production, the table moves to the adjust point trained in learning mode. There is generally a discrepancy between the adjust point trained in this way and the adjust point on the chip. The pattern recognition unit computes this deviation, so that it can be compensated by a suitable offset.

12.12.2 setting the camera

Always try to achieve a balanced ratio of gain to incident light. A poorly lighted image cannot be compensated by an over proportionate increase in gain. By the same token, reducing gain will not compensate for excessively bright lighting in an image.

12.12.3 calibrating the optics

The resolution of the pattern recognition system is directly dependent on the enlargement of the camera optics:

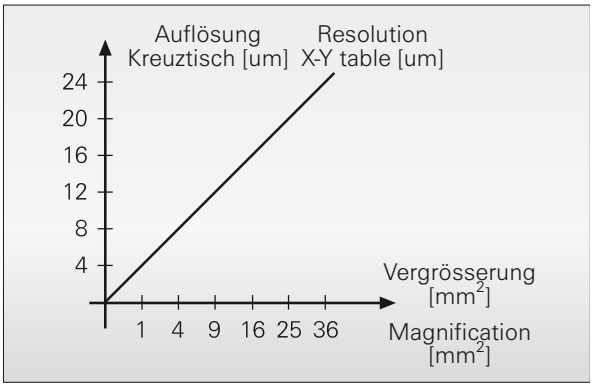


fig. 12 - 250 PRU > Calibrating the optics

The higher the magnification, the better the accuracy of positioning. As soon as you make a change to magnification (for example in order to show surface structures more clearly), you must activate the scale function to have the system recalculate the relationship between the resolution of the pixel camera and the resolution of the X/Y axes. Proceed as follows:

- Open Page 8
- Position the bond head at a significant point with good contrast.
- Press "Store Trace": the machine calibrates itself automatically.

12.12.4 Selecting a structure for pattern recognition

Bear the following in mind in order to achieve the best possible pattern-recognition results.

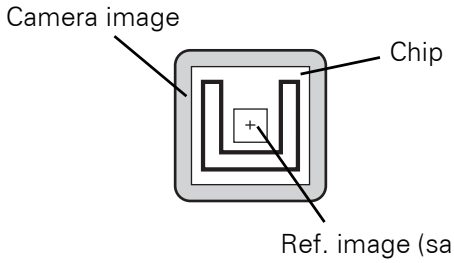


fig. 12 - 251 PRU > Image detail > Explanation for the following graphics

- Mechanically set the correct magnification midway

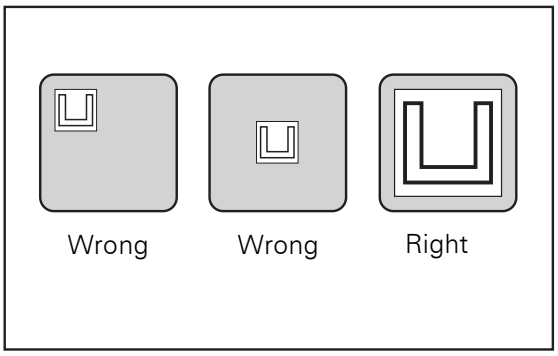


fig. 12 - 252 PRU > Image detail > Zoom

- Use the best possible contrast

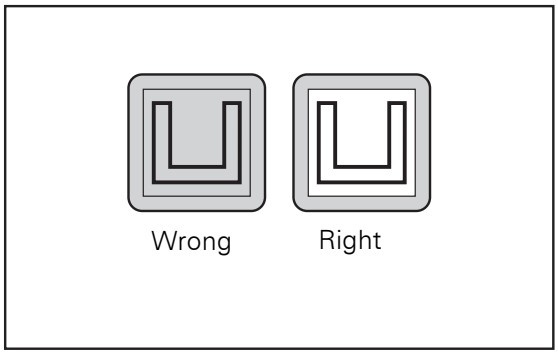


fig. 12 - 253 PRU > Image detail > Contrast

- Use unambiguously identifiable structures evincing both horizontal and vertical features

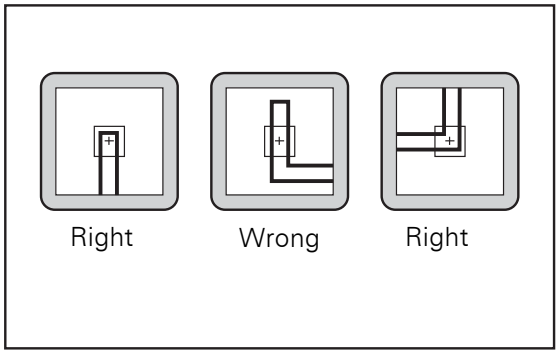


fig. 12 - 254 PRU > Image detail > Unequivocal structure

- Make sure that lighting is uniform

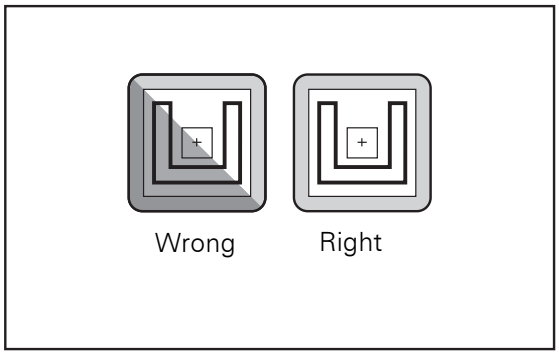


fig. 12 - 255 PRU > Image detail > Lighting

- Utilise shadow effects if the device is lacking in unambiguous characteristics

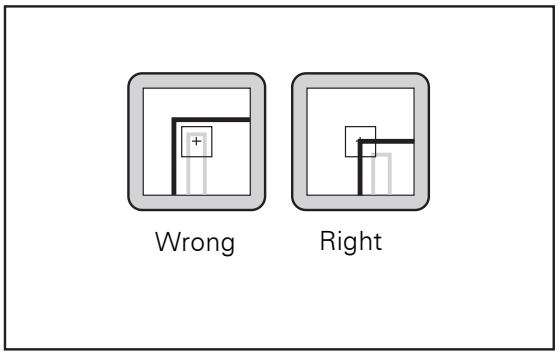


fig. 12 - 256 PRU > Image detail > Shadow effects

12.12.5 Adjusting the lighting

The choice of lighting depends on the structure of the surfaces you want to image. It is often a good idea to combine various types of lighting:

- Incident light (coaxial):
  Reflective surfaces appear bright.

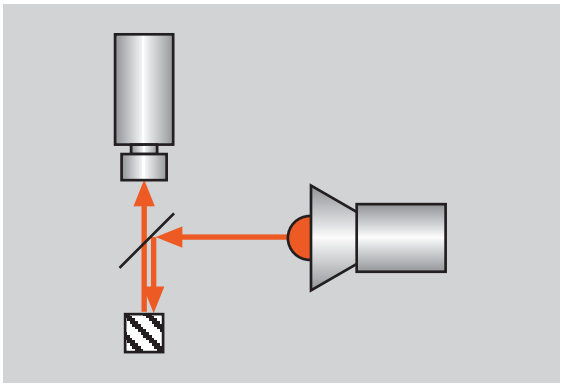


fig. 12 - 257 PRU > lighting > incident light (coaxial)

- Spot light (lateral):
  Reflective surfaces appear dark, because most of the incident light is not reflected into the camera duct.

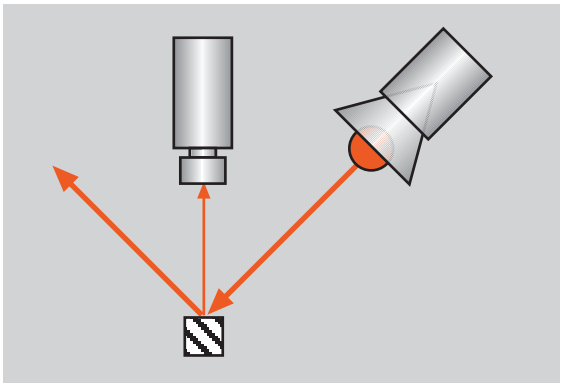


fig. 12 - 258 PRU > lighting >spot light (lateral))

- Diffused lighting (indirect):

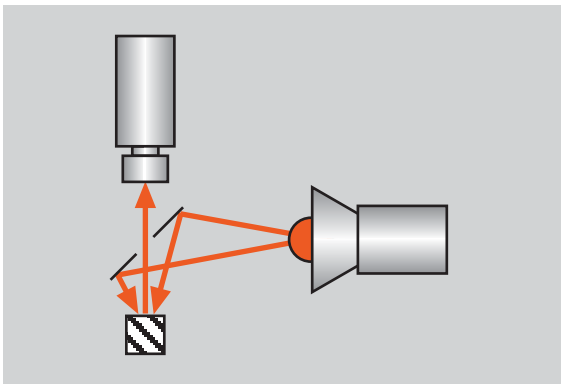


fig. 12 - 259 PRU > lighting > diffused lighting ?(indirect)

The best lighting for a particular device has to be ascertained by trial and error. The applicable criteria are as follows: The surface:

- is smooth and reflective (e.g. thin-film metallisation); angle of incidence = angle of reflection, best type of lighting: Incident light possibly with the support of diffused light.
- is rough (e.g. thick layer of paste); reflection is non-directional. Best type of lighting: diffused light or side light.
- is irregular and evinces edges which throw shadows. Best type of lighting: direct side light.

12.13FTP access

An FTP server runs on the wire bonder, which can be used by other computers in the same network. Can be used, for instance, to fetch bond programs from the wire bonder (Export), archive them and subsequently recover them when needed (Import).

IMPORTANT

Please note that fundamental questions on networking (especially relating to the IP address and the network mask/screen) must always be clarified with the local IT system administration first.

If the wire bonder is networked in a local network with other computers, a random FTP client can be used to access the FTP server of the wire bonder. Popular personal computers provide basically at least 2 integrated FTP clients, namely Internet Explorer (IE) and a command line program "ftp". However, there are many other FTP clients that are easier to use, such as Filezilla

Access with the aid of Internet Explorer is explained below. In the example we assume that the wire bonder has the IP address 10.11.12.13.

- ▶ To obtain FTP access to the machine, start Internet Explorer and enter the following in the address line: ftp://10.11.12.13
- ▶ A dialog opens, prompting for a user name and password. For the two items of information please refer to a separately supplied part of the documentation (besides the FTP access data this document also comprises the preset passwords for access control of the machine and the supervisor password).
- ▶ After successful login, navigate to the subdirectory "pub". It contains at least the following subdirectories (lower levels in the hierarchy are indented correspondingly):
  - bdata: (bond process data)
  - bpdata: (internal use only)
  - export: (export directory)
    - bprogs: (bond program)
    - pru_exchange: (camera display images)
  - import: (import directory, for programs etc.)
    - bprogs: (bond program)
  - logfiles: (not yet in use)
  - pictures: (Export directory for monitor photos)

12.13.1 Export of bond program

A bonding program is exported in two steps:

- 1.) Use "FTP Export ..." from the wire bonder's File menu to copy the bond program from the program library to the "/pub/export/bprogs" directory in the FTP section.
- 2.) By means of an FTP client the bond program can be copied onto another computer and archived there.

IMPORTANT

The transfer must take place in the "binary" mode of FTP! This setting must be made in the FTP client. (IE executes this correctly with unchanged standard settings).

The name of an archived bond program must not be changed, otherwise a (re-) import is impossible!

12.13.2 Import of bond program

The (re-) import of archived bonding programs functions analogously to export in two steps again (in the reverse order):

- 1.) An FTP client has to be used to copy the archived bond program to the "/pub/import/bprogs" directory of the FTP area on the wire bonder.

IMPORTANT

The transfer must take place in the "binary" mode of FTP!

- 2.) Use "FTP Import ..." from the wire bonder's File menu to copy the bond program from the "/pub/import/bprogs" directory in the FTP section to the program library.

12.14 Instruction Manual Programming Basic Programs

N O T E !

Performing the programming instructions does not replace reading the complete user manual.

Intention of this section is to provide the minimum information to come to a working bonding program. These further-reaching programming instructions will help the user create bonding programs for the machines of this series.

Achieving optimum bonding requires experience, plus a certain amount of optimisation by varying the interacting parameters and program-specific bonding parameters such as bond force, US power and US time.

Base of operations

- Vorgeschlagener Drahtdurchmesser: 30 µm Al/Si 99/1% mittlerer oder harter Qualität
- Vorgeschlagenes Bondtool: SPT UT45A-W-2525-1.00-C

N O T E

Other values may apply when using other components!

When changing the bond height, the focus and workheight may also need to be changed.

Even when actual values are used in these instructions, they may not be viewed as default values. On the contrary, the values have to be adjusted every time the material is changed. Therefore, it cannot be guaranteed that these values will yield the optimum on each bonder.

- Install the bonder as described in the manual. Always comply with the notes on safety.
- Connect the bonder to the 50/60 Hz 100-240 Volt line network .

I M P O R T A N T

The bonder automatically selects the correct line voltage setting.

Switching the Bonder on

- Press the green "POWER ON" button. The system will power up.

12.14.1 Use of old bond program

If a program is available in the memory then after booting the question will be asked "LOAD LAST PROGRAM".

- Press "ENTER" to confirm. Bonding can now take place as described in the section headed "12.14.9 Measuring bond height in the (automatic) bond program Mode 4 "Bond Height"" on page -174".

If there is no program in the memory, the "MOVE BOND HEAD TO THE INIT POSITION" message will be displayed.

- Press "ENTER" to confirm. Bond head will move to the "INIT" position. A new bond program can be created as described in the sections "12.14.3 Setting up starting parameter set with Mode 11 "single wire"." on page -164" to "12.14.11 Mode 17:module matrix" on page -175".

Switching off the bonder

I M P O R T A N T

You must shut down the operating system before you switch off the bonder.

You may want to save the program in the bonder's main memory before you call the Exit command .

- Activate "HOME" to move the bond head to the home position.
- Click on "FILE".
- Click on "EXIT". Wait until the "Do you really want to exit" prompt appears.
- Press "ENTER" to power down the bonder software (or "ESC" if you want to cancel the operation). Wait for the computer to power down and message "SYSTEM HALTED" is shown.
- Now the red "POWER OFF" button can be pressed to switch off the main circuits of the bonder. The low voltage start circuitry will remain on indicated by the yellow control light.

12.14.2 Setting up bonder without bond program in memory

Start up as described in section.„12.14.1 Use of old bond program".

Before a new bond program can be created the User access level needs to be set to "ENGINEER". See section " Setting the access "User Level"" on page -164"

It is advisable to start with test wires in Mode 11 "SINGLE BOND" before proceeding to program chips and wires. The reason is that the parameters used in Mode 11 can subsequently be downloaded to the chip and wire data (see 12.14.3 "Setting up starting parameter set with Mode 11 "single wire"." on page -164).

Setting the access "User Level"

- Click on "Service" to open the associated menus.
- Click on "CHANGE USER LEVEL" to change the authorization of access.
- Set the flag Engineer.
- Enter the relevant password in accordance with the password list.
- Press "ESC" to leave the "Change user level" and the "Service" menu.

12.14.3 Setting up starting parameter set with Mode 11 "single wire".

In Mode 11 test wires can be bonded. The parameter set contains all required parameters. Independent bond height levels may be used for the first and the second bond. The parameters in Mode 11 are for creating calibration data for the camera offset in Mode 3 (see 12.14.4 "Setting the camera offset "Mode 3"" on page -169).

- Click on "Mode 11".
- Place the cursor on "First Bond X or Y" coordinates.
- Roughly move the bond head above the first bond position using the trackball.
- Then press "STORE TRACE" to enter the coordinates in the X and Y fields of the menu.

No image may be seen on the monitor as focus and light are not yet set.

- Place the cursor on first bond "LIGHT" and then click on "LIGHT".

Light settings for the source bond

The first "Bond Light" menu opens. Four light options can be programmed:

- Indirect Light: Diffused light, ideal for devices or rough surfaces.
- Coaxial Light: The light is vertical to the camera axis, ideal for chips or other strongly reflecting surfaces.
- Spot Light: Side light source (optional).
- Aux: Alternative light source (optional).

All light settings are programmable from 0-255. You can program the intensity either directly, by typing in the value, or interactively.

- Click on one of the light selection boxes, then press the "DISPLAY TRACE" button and use the arrow buttons to adjust the brightness.
- Adjust so, that some (unfocused) image can be seen. Then press 'ENTER' to store the setting and then press 'ESC' to return to the Mode 11 menu.

Focus settings for the source bond

- Place the cursor on "FOCUS" and set the focus for sharp image using the trackball. If the position is not the desired one, position the cursor on the X and/or Y coordinates again, correct the position with the trackball and store the new position with "Store Trace". Then repeat the setting for the focus and the X and Y positioning until everything is set correctly.

Light and focus setting for the destination bond

After finding the first bond position clearly on the monitor, the second bond position, light and focus settings have to be programmed. It is usually a good idea to enter the light and focus settings found for the first bond position for the second bond position as well.

Finding the second bond position

The second bond position can be set by placing the cursor on the second bond X or Y coordinate and then moving the trackball. If the bond head is far from the wanted second bond position, but the second bond position is close to the already programmed first bond position (or visa versa), it is faster to place the cursor on the second bond X or second bond Y position coordinates then type in a ZERO then press "ENTER". Then place the cursor on the first X or Y coordinates and the bond head then moves to this first position. Then place the cursor again on the second X or Y coordinate. "The bond head is not moving". Now the second position can be found by moving the trackball. Store this new position press "Store Trace".

Moving in X or Y direction only

Trackball movement in X direction only is done by pressing the right trackball button once. The arrow symbol on the monitor now only shows the X direction movement.

Pressing the right trackball button again (for the second time) restricts movement to the Y direction; the arrow symbol on the monitor shows the new status. Returning to X-Y motion is done by pressing the right trackball button again, the symbol will indicate four arrow directions.

IMPORTANT

In general, you save positions found by trackball movements by pressing "Store Trace". Numbers are given in by pressing "Enter".

Bond force, US duration and US power

Bond force, US duration and US power are set for the first and second bonds in the main menu of Mode 11.

	Erster Bond	Zweiter Bond
Ultrasonic Time	30	30
Ultrasonic Power	40	40
Bond Force	30	30

In this screen also the Clamp Flag "0" can be set to help making the wire loop. The wire clamp will thereby close at loop height.

Bond parameters

The bond parameters are set of data that controls the touch down, and the BPC Bond process control data.

This is an independent sub menu for the first and for the second bond of mode 11.

Bond parameters first bond

Place the cursor on the field "Bond Parameters" below the first bond coordinates on the screen and press "Enter".

Now give in following values:

Parameter	Wert
Bond Delay	20
TD Flag	1
TD Force	30
TD Ramp	500
TD Threshold	15
TD Overdrive	150
TD Steps	0
BPC Clamp Threshold	5
Wire Control Mode	0
US Tuned Ctrl	0

Bond parameters second bond

Place the cursor on the field "Bond Parameters" below the second bond coordinates on the screen and press "Enter".

Now give in following values:

Parameter	Wert
Bond Delay	20
TD Flag	1
TD Force	30
TD Ramp	500
TD Threshold	15
TD Overdrive	150
TD Steps	0
BPC Clamp Threshold	3
Wire Control Mode	0
US Tuned Ctrl	0

Loop parameters

The loop parameters are a set of data that control the bond head motion from the first bond to the second bond.

Set following parameters:

Parameter	Wert
Loop Form	0
Loop Mode	0
Z Loop Presign	60
Abs. Loop Height	0
Loop Height Factor	110
Z Loop Delay	30
Z LoopSpeed 1. Bond	50
Z LoopSpeed 2. Bond	50
LoopSpeed XY	50
Turn Height 2. Bond	500

Tear Parameter in Mode 11

Die Tear Parameter bestimmen den Abschluss der zweiten Bondung. Es kann zwischen „second bond wire clamp termination“ und „second bond table tear termination“ gewählt werden.

Tear Parameter, mit Second Bond Wire Clamp Termination

Um den Draht mittels der Klammer abzureißen (Clamp Tear), setzen sie das Tear Flag auf 0. Alle anderen Parameter dieses Dialogs werden dann nicht benutzt.

Die folgenden Einstellungen finden Sie unter „Machine Setup“.

Wire Clamp Settings

Parameter	Wert
Wire Clamp Delay (ms)	0
Wire Clamp Open-Pos.	2000
Open Ramp Time (ms)	5
Wire Clamp Close/pos	0
Close Ramp Time (ms)	5

Wire Feed Settings

Parameter	Wert
FeedInitPos. (cts)	150
Wire Feed Steps	350
Wire Feed Delay	0
Feed Ramp Time (ms)	30

Wire Tearing Settings

Parameter	Wert
Tear-Off Delay 1 (ms)	0
Tear-Off Steps	150
Tear-Off Delay 2 (ms)	0
Tear-Off Ramp Time (ms)	30

Tear Parameter, second bond table tear termination

Für „table tear termination“ setzen Sie das Tear Flag auf 1.

Parameter	Wert
Tear Flag	1
Tail Height (µm)	120
Tear XY 1 (µm)	125
Tear XY 2 (µm)	300
Tear Height (µm)	100
Tear Off Z (µm)	100

CutMeasuring the Bond height in Mode 11

Before any bonding can start, the bond height of the first and the second bond have to be measured.

- ▶ Click on first or second bond "Bond Height".
- ▶ Press "Store Trace".

The bond head will turn to the requested position and then press onto the first and second bond positions.

The newly found bond heights are displayed in the "Bond Height" boxes in the Mode 11 dialog.

The distance is measured in µm from the true "Home" (reference) position of the z-axis.

After a cold start of the bonder or when a bond program is loaded, "Focus" and "Init/Limit" are set as described on Page 1 fr "Init pos. Z-Level".

IMPORTANT

This procedure prevents the tool from colliding with devices that are higher.

Bonding in Mode 11

To make test bonds in Mode 11:

- ▶ Ensure that all components have been installed correctly.
- ▶ Press "BOND".

The wire will be bonded.

The bonding can be repeated with random frequency to determine the first and second bonding positions.

Click on the field "Coordinate X" or "Coordinate Y" and move the position with the trackball then activate "Store Trace" to confirm the new bond position.

For many test wires the "Page Fwd" and "Page Bwd" key can be use to move the first and second bond in X or in Y.

The offset in the X and Y directions can be programmed on Page 4 "Increment for Single Wire".

- ■ X Incr. Single wire (µm)
- ■ Y Incr. Single wire (µm).

For more accurate viewing of the bonding Step Mode can be used.

- ▶ After bonding, immediately press "Step" to change to the Step mode.
- ▶ After each work step, you have to press "Step" to proceed to the next step.
- ▶ Press "Slow Go On" to make the bond head move more slowly. The "Slow Go On" mode will remain on until switched off.

12.14.4 Setting the camera offset "Mode 3"

The camera offset needs to be programmed so that the bonds will be made on the position shown by the cross hair.

To correct this position Mode 3 "Corr. Offset" is used.

For this offset bonding all the data set in Mode 11 will be used.

- Click on Mode 3 "Corr. Offset"

A minimum of 4 and a maximum of 36 wires can be bonded with this offset setting.

- Move to an open position and use StoreTrace to save the new XY position. Set "Distance" to the diameter of inner circle and then hit "Enter" to confirm your entries.
- Indicate the number of wires to be bonded (e.g. 8 wires) and the bond on which the offset should be corrected. Most of the time, a bond with a high required accuracy is selected for this.

Einstellungen

Parameter	Wert	Beschreibung
Distance	2000	Der Durchmesser des inneren Kreises der gebondeten Drähte
Wire Length	1000	Die Drahtlänge entspricht dem Wert aus Mode 11
Work Height	500	Die Startebene des Z-Antriebes zwischen den Drähten
1st Bond		Der Offset kann für die erste oder zweite Bondung programmiert werden

- Press 'BOND' to start bonding the other wires.

After bonding, the hair cross must be programmed for the bonding of the wire that is displayed on the screen.

- Use the trackball to correct the position.
- Press 'Store Trace' to confirm the position.
- When all bonds have been corrected the new offset is calculated and has to be stored in the machine: by pressing "Enter" when requested by the screen message.

12.14.5 Camera Scale factors

The camera scale factor sets the relation between the camera pixel size and the motion system. The unit is Pixels per μm for X and Y.

Setting the scale factors

- Put a device (if possible with a chip with a strong contrast) on the tool holder.
- Click on "PAGE".
- Click on "Page 8".
- Open menu " PRU Scale".
- Press 'Trackball X Y' and move the bond head to the device using the trackball.
- Press "Track Ball Z" twice (the LED will light) and bring the chip in focus using the trackball. Light settings can be changed for optimal image.
- Press "Trackball X Y" twice (the LED lights up) and adjust the crosshairs on the device or the chip.

If Adj. Limit X or Y is 0 set these values to 2000 to allow the machine to measure the correct values of the Adj. Limits.

- Press "Store Trace".

The machine learns the picture and moves the head several times, then records the picture again and calculates the movement in μm in order to determine the factors.

The results will be displayed on the PRU scale on the screen.

IMPORTANT

This test has to be repeated after each modification on the camera system.

- Press 'HOME' to traverse the head back to reference position (initialization position) and remove the test device.

On Page 8 you can also set the shape of the crosshair cursor by setting the "Use Tool Cursor" flag and selecting the size of the cursor in μm for X and Y.

12.14.6 Creation of a Bond Program

Bond program File

The bond program is handled as a file in the computer system.

When a new program is created, the new file has to be named and stored in the root directory or in a subdirectory.

- The basis of a bonding program is formed by the chips (devices are also treated as chips): Mode 1.
- The data from the chip are used as default for the wire data: Mode 2.

▶ Place the cursor on "FILE".

▶ Place the cursor on "NEW".

The current program will be erased from RAM memory but the MODE 11 data will remain.

Mode 1 "Learn Chip"

▶ Place the cursor on "Mode"

▶ Place the cursor on "Mode 1": 'Learn Chip' and press 'Enter' or click the left track ball key.

▶ Enter: "Module 1"; "CHIP 0" for the automatic use of the defined parameters that are set up in Mode 11 (or CHIP 1, if the parameters from Mode 11 cannot be used.)

Chip 0 can only be used in a program as a base device. It cannot be used as part of a module and therefore has to be repeated in a module matrix.

Now the Focus height (not copied from Mode 11) has to be set in chip 0 as default parameters for all subsequent chips.

▶ Place the cursor on "2nd Adjust X" or "2nd Adjust Y" coordinates. DO NOT press "Store Trace".

▶ Roughly move the bond head above the first bond position using the trackball.

Since the focus and exposure have not yet been set up, there may not be an image on the monitor.

▶ Place the cursor on "PRU PARAMETERS" and then press "ENTER".

▶ Adjust the lighting as in Mode 11 or use interactive adjustment.

▶ Press the "Display Trace" and set the light intensity, using the arrow cursors so, that some image (UNFOCUSED) can be seen. Then press 'ENTER' to store the value and 'ESC' to return to the Mode 1 menu.

▶ Place the cursor on" Focus" and set the focus for sharp image using the trackball. If the position is not the required one than move the cursor again to the X or Y coordinates, correct the position using the track ball, then repeat the Focus setting and X-Y positioning until correct. "Indirect Light" or "Spot Light" can be used for device bondings. "Coaxial Light" achieves a better result only with strongly reflective chip surfaces.

After finding the second adjust position default light parameters, the first adjust position default light parameters have to be programmed.

The first adjust position can be set by placing the cursor on the "1st adjust X" or "1st adjust Y" coordinate and then moving the trackball as done for the second adjust position; however if the bond head is far from the wanted position, program a ZERO in X or Y then press "ENTER". The position the cursor on the "2nd Bond X" or "2nd Bond Y" coordinates. The bond head moves to the position. Now position the cursor on "1st Adjust X" or "1st Adjust Y"; the bond head does not move. Now the first position can be found easier by moving the trackball. If chip 0 (default for all following chips) is not used for the program, do not enter positions in the X and Y coordinate fields. Do not press "Store Trace" when the cursor is at the X or Y coordinate. Otherwise, Chip 0 would be used as basic device for modules, and the X and Y positions would have to be entered with "Store Trace". If you want automatic adjustment, activate "Auto Adjust" before you press "Store Trace"; this will generate the image and save the position at the same time.

For Track ball movement in X direction only press the right trackball button once. The arrow symbol on the monitor now only shows the X direction movement.

Pressing the right trackball button again cancels the restriction of movement to the Y direction and again the arrow symbol on the monitor shows the new status. Returning to X-Y motion is done by pressing the right trackball button again, the symbol will indicate four arrow directions.

IMPORTANT

In General, positions found by trackball movements are given in to the memory by pressing "Store Trace". Numbers are given in by pressing "Enter".

After setting the needed default parameters the real chips can be programmed.

- Press "Pg Fwd"
  - MODULE 1
  - CHIP 1 create chip 1: Press" ENTER".
- Switch on the "AUTO ADJUST" (led will light) key to program automatic adjustment (and train the images). AUTO ADJUST off means that the alignment (adjusting) of the chips will be done manually by the operator.

The bond head will remain in position as all X-Y data are zero's.

- Set the cursor on "1st Adjust X" or "1st Adjust Y".

Move the bond head to the second adjust point on the chip using the trackball. If required, change the focus height and light settings (In PRU Menu). Press 'Store Trace' to program the position and the image (AUTO ADJUST on).

- Position the cursor at "2nd Adjust X" or "2nd Adjust Y"
- Move the bond head to the second adjust point on the chip using the trackball. If required change the focus height and light settings (In PRU Menu). Press 'Store Trace' to program the position and the image (AUTO ADJUST on).
- Press "PAGE FORWARD"
  - MODULE 1
  - CHIP 2 create chip 2: Press" ENTER".
- Set the cursor on "1st Adjust X" or "1st Adjust Y".
- Move the bond head to the second adjust point on the chip using the trackball. If required change the focus height and light settings (In PRU Menu). Press 'Store Trace' to program the position and the image (AUTO ADJUST on).
- Set the cursor on "2nd Adjust X" or "2nd Adjust Y".
- Move the bond head to the second adjust point on the chip using the trackball. If required change the focus height and light settings (In PRU Menu). Press 'Store Trace' to program the position and the image (AUTO ADJUST on).
- Continue for all the chips and press ESC when finished.

PRU parameters

The procedure described above will deliver good results for most applications; however, the PRU system is higher performing.

- Click on "PRU Parameters" or set the cursor on "PRU Parameters" and press "Enter".

PRU menu shows fields.

Reference Image

This is the size of the picture in PIXEL in X and Y direction, which the PRU system creates from the original model as reference for all subsequent parts.

The "Img. Angle" allows the operator to rotate the image in 1/10 of degrees.

The 'S Angle' is the maximum angle of the image (in tenths of a degree) that the PRU attempts to adapt to and thus measures the rotation of the part shown.

Search Area

This is the size (in pixels) of an area in X-Y in which the (PRU system attempts to find the image. If an image is found at the edge or outside the window of the search area, the system issues an "Image not found" message which authorises the user to align the part manually or to skip the image automatically if the "Skip" parameter was set on Page 4.

"Recognition Parameters"

The PRU system can be set to different working modes, depending on the application.

Quality Limit sets the quality limit of the found image that will be accepted for positioning. 999 represent a perfect match. Numbers programmed lower than 400, may result in acceptance of an image, only looking like the trained image. This might result in wrong positioning of the bonds.

To prevent any wrong images are accepted during alignment always set the Diagonal Tolerance in the Learn Chip Menu.Use minimal value for the Diagonal Tolerance. Chips can do with lower 10-30 μm, thick film will need higher tolerance 30-60 μm.

"Recognition Parameters" can be selected for optimal recognition reliability.

The number of the reference image (Ref Picture) is stored in the PRU system, which contains the PRU data for each adjusting point.

The Ref Picture number can be found in the Learn Chip menu. and is automatically assigned to each Adjust Point for each chip.

If more chips are identical, the same reference number may be used for more than one chip.

IMPORTANT

When all chips have been programmed, the wire data Mode 2 "Learn Wire" has to be programmed.

12.14.7 Programming wires in Mode 2 "Learn Wire"

- Click on "MODE"
- Click on "MODE 2" "Learn Wire"
- Give in "Module 1"
  - "CHIP 1"
  - "WIRE 1"

The "Learn Wire" menu will be opened.

Next step is to program the number of the first chip on which the first and second bondings are to be made.

- Set the cursor on "1st Bond X" or "1st Bond Y"
- Move the bond head to wire 1 first bond position and press "Store Trace".
- Set the cursor on "2nd Bond X" or "2nd Bond Y".
- Move the bond head to the second bond position of the first wire and press "Store Trace" to confirm.
- Press "Pg Fwd" to program the next wire.

IMPORTANT

Make very sure that the next bonding wire is always bonded on the same chip as the preceding wire; otherwise, program the chip number for the first and/or second bond in the "1st (bond on) Chip No #" box or "2nd (bond on) Chip No #".

- Set the cursor on "1st Bond X" or "1st Bond Y"
- Move the bond head to the first bond position of wire # and press "Store Trace"
- Set the cursor on "2nd Bond X" or "2nd Bond Y".
- Move the bond head to the second bond position of wire # and press "Store Trace" to confirm
- Press "Pg Fwd" to program the next wire.
- Repeat until all wires are programmed.
- After programming the last wire, press "ESC" instead of "Pg Fwd".

IMPORTANT

Pay careful attention to be sure that the chip numbers of all bonds are correct. The machine will correct the bond positions according to the programmed chip numbers.

The bond head will move to the last programmed bond position of each chip for easy location of the next bond pad.

In many applications the pitch between the wires (bond pads) will be identical. You can use the "Repeat wire" function to make programming faster and more accurate.

12.14.8 Repeat Wire in the Mode 2 "Learn Wire" menu

- Go to the Mode 2 "Learn Wire" dialog of the first wire pattern that you want to repeat.
- Set the cursor to the field "Repeat Wire".
- Enter the step width of the first bondings of wires in the X and Y directions in "Repeat X 1st Bond" and "Repeat Y 1st".
- Enter the step width of the first bondings of wire X and plane X in the fields "Repeat X 2nd Bond" and "Repeat Y 2nd".
- Enter the required number of copies in the "Number of Copies #" field or position the cursor in either the "Last X 1st Bond" or the "Last Y 1st Bond" field. Press "Pg Fwd"; the number of copies increases by 1 each time you press this button.

IMPORTANT

With the cursor on any "Last X" or "Last Y" field, you can correct the last bond position with the trackball and then confirm your changes with "Store Trace". Trackball changes (or position changes by direct entry of a number) in the "Last X 1st Bond" or "Last Y 1st Bond" fields or "Last X 2nd Bond" or "Last Y 2nd Bond" fields change the positions of all preceding bond wire positions and average the change. the new calculated pitch will be shown.

- After programming the appropriate number of copies, with their positions, move the cursor to the "Repeat Wires" field in this dialog and press "Enter" to save all wires in the machine.

IMPORTANT

Once the wires have been created in (normal or) "Repeat Wire" mode all wires and wire parameters can be edited in "Mode 2" "Learn Wire" at any time.

The fields "2nd Chip Number" and "2nd Wire Number" are used for repeating groups of wires and stitch bonds.

- After programming all the bonding wires and bond positions, press "Esc" to return to the main menu.

12.14.9 Measuring bond height in the (automatic) bond program Mode 4 "Bond Height"

Before bonding the chip height levels have to be measured in Mode 4 "Bond Height".

- Click on "Mode".
- Click on " Mode 4".
- Press "Store Trace" to start the measurement of all the programmed chip heights, starting with module # 1 and chip number # 1.

IMPORTANT

If more modules are created the measured chip heights are valid for all modules.

When the flag "Search All Modules" is activated each chip in each module is measured individually.

After the height measurement the bond head will move to the HOME (init) position.

In addition, the bond heights in the bond parameters can now be checked and then the work-heights can be adjusted on Page 4. This speeds up the bond process, because the sequence of movements of the z-axis is optimised.

12.14.10 Bonding in automatic mode after program creation

Adjust and Bond

Press "Adjust" to start the "Adjust and bond" process. The machine will start the adjust alignments and bonding will follow.

Adjusting

In some adjust evaluations it is useful to stop after adjust without bonding.

On Page 4, "Machine Setup", you can set the "Animate after align" flag to run through all the bond positions without bonding. The delay can be set in ms in the field "Animation Delay".

To bond without alignment, press "BOND and enter the start position. This starting method means that all next modules will also be bonded without alignment.

Starting the Adjust at another Module than Module 1

In the case of alignment with a module other than module 1, adjustment starts with Mode 14 "Readjust". Enter the module number and activate "Adjust" to start.

Rebond repair program

For repairs the "Rebond" mode can be used.

- Press "Rebond" and enter the necessary module, chip and wire numbers. Bonding of the indicated wire: Press "Rebond" again to bond the wire.
- Press "Pg Fwd" to go to the next wire in the program. Press "Pg Bwd" to go back to the wire last bonded.
- In "Rebond Mode", the bond position can also be changed temporarily with the trackball; in this case confirm with "Store Trace".

After "Pg Bwd" or "Pg Fwd" the bond position is as in taken from the bond program again. To continue after a repair, press "Bond" to resume automatic bonding at the next wire.

12.14.11Mode 17:module matrix

If more parts fit on the work holder or in a boat these can be programmed as Modules. The original program (Module 1) will be repeated for each module (copy).

Chip 0 cannot be copied and can be used as a base device of the modules for a rough alignment.

- Top Left Module X #, Y #: This is the zero position for copies (normal adjustment 1 on chip 1 module 1; on original).
- Columns #: Number of columns (vertical).
- ▶ Enter the number of columns (vertical) and press "ENTER".
- Rows #: The number of lines (horizontal).
- ▶ Enter the number of rows (horizontal) and press "ENTER".
- 1 Column Repeat X #, Y #: This is the start position for the first new copy in column 2 (distance X between the copies). Adjust 1 of chip 1 of module 2. Use the trackball to position and press "Store Trace".
- 1 Row Repeat X #, Y #: This is the zero position for the first new copy in the second row (Y distance between the copies)
- ▶ Use the trackball to position and press "Store Trace".
- Top Right Module X #, Y #: This is the zero position for the last copy in the top right column, top line.
- ▶ Use the trackball to position and press "Store Trace".
- Bottom Left Module X #, Y #: This is the zero position of the last copy in the column on the very left, bottom line.
- ▶ Use the trackball to position and press "Store Trace".

At the entry of the Top Right Module and the Bottom Left Module the machine will average the pitch between all modules to prevent accumulation of first pitch errors.

The lights may be set for easy recognition by the PRU system.

When these data have been entered, click on the field "Compute Modules".

The machine calculates the positions of all the modules.

12.14.12Multi Stitch wires

Example

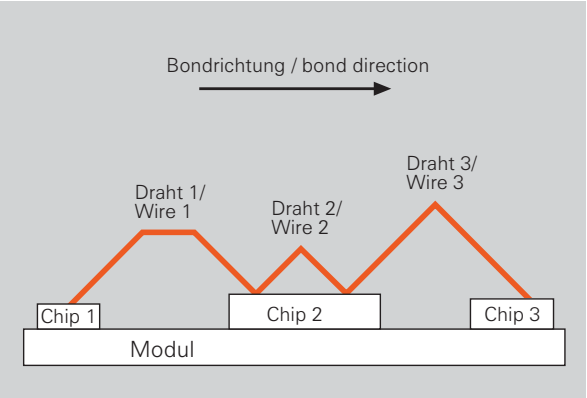


fig. 12 - 260 Multi Stitch wires

The flags in Mode 2 "Learn wire":

Wire No.	1st Bond on Chip	2nd Bond on Chip	Tear Parameter flags in wire	
			Stitch Flag	Seq. Wire Flag
Wire #1	1st Bond Chip #1	2nd Bond Chip #2	X	-
Wire #2	1st Bond Chip #2	2nd Bond Chip #2	X	X
Wire #3	1st Bond Chip #2	2nd Bond Chip #3	-	X

▶ Then position the bonds starting with wire 1, 1st bond; wire 1, 2nd bond; wire 2, 2nd bond; wire 3, 2nd bond.

IMPORTANT

Only the second bonds of consecutive wires have to be edited.

Repeat of multi stitch wires

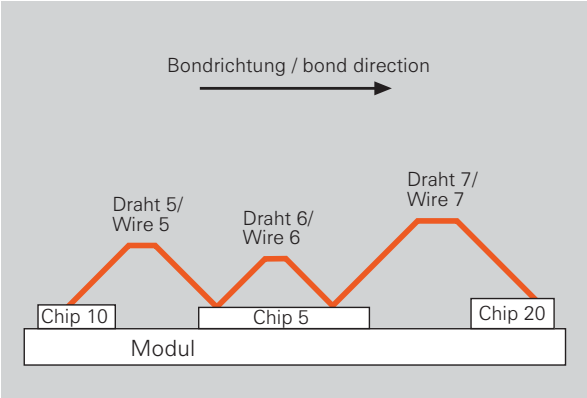


fig. 12 - 261 Repeat of multi stitch wires

- Create the original wires as follows - In Mode 2 Give in:

Wire No.	1st Bond on Chip	2nd Bond on Chip	Tear Parameter flags in wire	
			Stitch Flag	Seq. Wire Flag
Wire #5	1st Bond Chip #10	2nd Bond Chip #5	X	-
Wire #6	1st Bond Chip #5	2nd Bond Chip #5	X	X
Wire #7	1st Bond Chip #5	2nd Bond Chip #10	-	X

- Then position the bonds starting with wire 1, 1st bond; wire 1, 2nd bond; wire 2, 2nd bond; wire 3, 2nd bond to repeat the programming of stitch wire.
- In wire 5 click on "Repeat Wire".
- Position the cursor in the "2nd Wire Number # 1" field.
- Press "Pg Fwd"; (2nd Wire Number # 2; 2nd (Bond) Chip Number # 5)
- Press "Pg Fwd"; (Wire Number # 3; 2nd (Bond) Chip Number # 20)
- Give in the pitch for the first bonds of the first wire of the stitch group in X and Y direction in the fields "Repeat X 1st Bond" and "Repeat Y 1st Bond".
- Give in the pitch for the last bonds of the last wire of the stitch group in X and Y direction in the fields "Repeat X 2nd Bond" and "Repeat Y 2nd Bond".
- Give in the number of copies needed in the field "Number of Copies #", or place the cursor on any of the fields "Last X 1stBond" or "Last Y 1st Bond" and push "Pg Fwd" to increase the number of copies by one each time "Pg Fwd" is pressed.
- With the cursor on any of the fields "Last X 1st Bond" or "Last Y 1st Bond", the "Last positions" can be corrected with the trackball and confirmed with "Store Trace". Trackball changes, or changes by entry of a number in the "Last X 1st Bond" or "Last Y 1st Bond" fields or "Last X 2nd Bond" or "Last Y 2nd Bond" fields replace all preceding bond wire positions and average the changes; the newly calculated grid is then displayed.

12.14.13 Reference chip in Mode 1 "Learn Chip"

If applications have several groups of wires, starting at the same source chip, they can be programmed as follows.

The source chip can be programmed more than once with only one time adjust actions needed.

The chip will receive more numbers, one chip number is nominated as reference chip, no further data needs to be entered for the reference chip (the mother chip).

The child chips refer to the reference (mother) chip when following data is set:

1st Adjust X = 0	2nd Adjust = 0
1st Adjust Y = 0	2nd Adjust = 0
Ref.-Chip No X	Use Ref.-Chip

X = the chip number to refer to (the mother chip).

Each "child" chip has its own "Bond Parameters", "Loop Parameters" and "Tear Parameter" set; only the coordinates are copied from the parent chip (after alignment has been corrected).

12.14.14 Adjust Parameters in Mode 2 "Learn Wire"

An adjustment during alignment measures the position offset of a chip. The offset in X, Y and the rotation are used to calculate the bond position. The Adjust function in Mode 2 changes the relation a bond to chip numbers.

The chip number of 1st and 2nd bond in a wire attaches the bond to the chip and the corrections calculated during adjust.

Some applications require further bonding positions for the positioning for bonding. They must relate to a chip other than the chip on which the bond is located. High-frequency power modules need this option.

- Nominal chip placement and desired wire form:

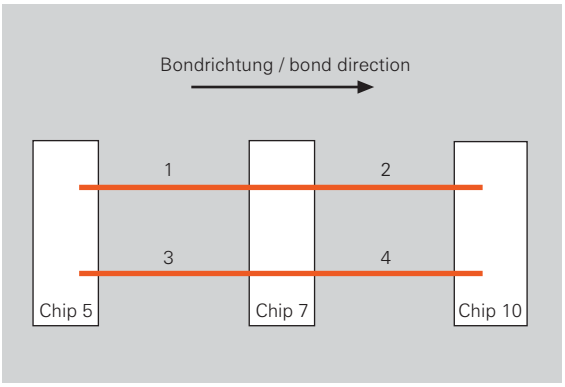


fig. 12 - 262 Nominal chip placement

A straight wire is connected from chip 5 to 7 to 10.

- Actual chip placement will result in wire shape as indicated:

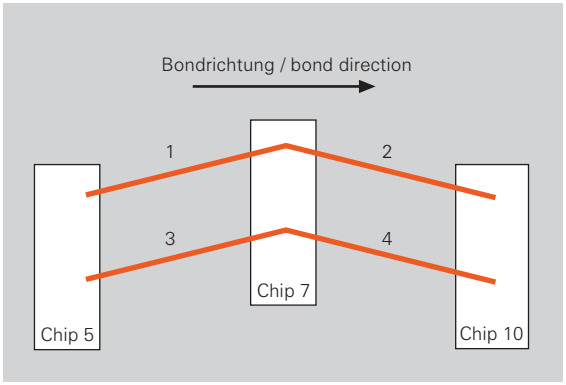


fig. 12 - 263 Actual chip placement

A not straight wire is connected from chip 5 to 7 to 10.

- Advanced "Adjust Parameter Mode 2" will allow:

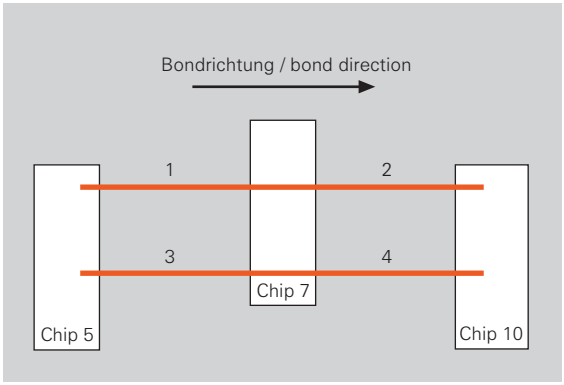


fig. 12 - 264 Advanced Adjust Parameter Mode

A straight wire connects chips 5 to 7 and 10.

Wires 1 and 3, first bonding, take place on chip 5, wires 1 and 3, second bonding, take place on chip 5 in Y direction, but chip 7 in the X direction, wires 2 and 4, second bonding, take place on chip 5 in Y direction and chip 10 in X direction.

The most critical bond position will be alignment target; this can be any of the chips.

The "fig. 12 - 263 Actual chip placement" on page -177" is used as example for the parameter settings.

▶ In Mode 2 "Wire 1", position the cursor on the "Adjust Parameters" field.

Wire 1 and 3 (Adjust Flag 3)		Wire 2 and 4 (Adjust Flag 3)	
1st (Bond) Adjust Chip	5	1st (Bond) Adjust Chip	--
1st (Bond) Adjust Mode	0	1st (Bond) Adjust Mode	--
2nd (Bond) Adjust Chip	5	2nd (Bond) Adjust Chip	5
2nd (Bond) Adjust Mode	2 or 4	2nd (Bond) Adjust Mode	2 or 4

The functions of Adjust Flags and Adjust Modes are indicated in the green "Help" instructions.

- Adjust flag
  - 0: use the 1st chip for the 1st bonding and the 2nd chip for the 2nd bonding
  - 1: use the 1st chip for the two bonds.
  - 2: use the 2nd chip for the two bonds.
  - 3: use further chip(s) for both bonds.
- Source Bond Adjust Mode
  - 0: both coordinates.
  - 1: X coordinate (including rotation of the original chip)
  - 2: Y coordinate (including rotation of the original chip)
  - 3: X coordinate (without rotation of the original chip)
  - 4: Y coordinate (without rotation of the original chip)
- Destination Bond Adjust Mode
  - 0: both coordinates.
  - 1: X coordinate (including rotation of the original chip)
  - 2: Y coordinate (including rotation of the original chip)
  - 3: X coordinate (without rotation of the original chip)
  - 4: Y coordinate (without rotation of the original chip)

12.14.15Bond process control (BPC)

For optimal bond repeatability the BPC can be used. Each bonding is checked with regard to uniform deformation and the device tolerances and ambient conditions are compensated to a large extent. This system (F&K Patented) controls the progress of the deformation to follow a programmable slope. If a steeper angle comes next, the system starts reducing ultrasonic power in small steps (down to the original start power - the minimum difference from US power). Because the decrements in this process of correction are small, the ultrasonic power used for bonding remains adequate.

If the transient follows an angle that is not as steep as the programmed slope, the system starts increasing ultrasonic power in small steps (up to the original start power plus the maximum difference from US power). Because the increments in this process of correction are small, the ultrasonic power used for bonding remains adequate.

The ultrasonic power is switched off when the programmed deformation is reached.

A programmable, minimum ultrasonic time is always used even if the programmed deformation was exceeded; naturally this time has to be shorter than the time needed to make a bond.

The maximum time that a bonding can take is equal to the time selected in mode 1, 2 or 11.

A tempering time can be set for heavy wire bonding. It begins after the programmed deformation is reached.

The accepted deformation window is programmed by setting a positive and negative deformation difference, counted from the programmed deformation.

The slope of the deformation curve is set in µm in the Y direction and in msec in the X direction. This setting is made on Page 100.

The bonding of soft materials or of devices in carriers or boots that bend during bonding can lead to inaccuracies of the BPC function, because the bending of these materials can be misinterpreted as bond deformation. In this case "Wire Control Mode 1" can be programmed. However, monitoring of the deformation limit can still be used to indicate the presence of bonding wire under the bonding tool and to instigate a machine stop if the wire has been lost. The automatic ultrasonic correction is not activated in "Wire Control Mode 1".

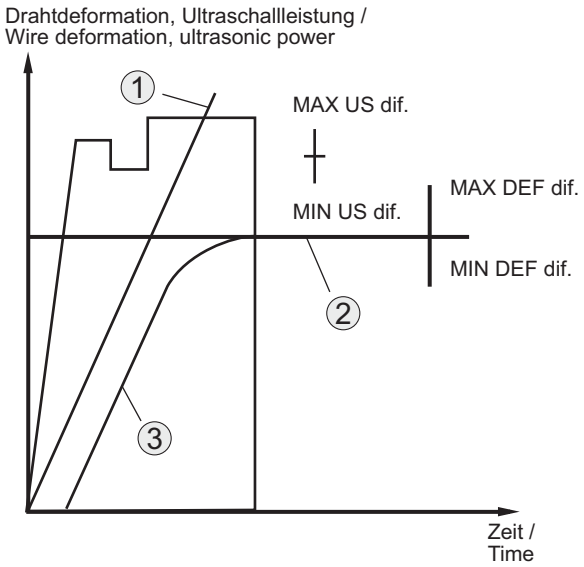


fig. 12 - 265 Control procedure for bonding with slope angle

- 1: Angle of inclination
- 2: deformation threshold
- 3: Desired wire deformation achieved

12.15 Setup Tool - The configuration program

12.15.1 The Setup Tool

The user can use this Program to make network settings, hardware changes and machine-specific driver updates, and back up the software.

The following functions are covered by the Setup Tool:

Elementary operation processes

- Startup, shutdown and restarting the operating system
- Backing up the hard disk
- Installing software updates

Configuration settings

Network (TCP/IP)

- Basic settings of:
  - Computer name
  - IP address
  - Network mask
- IP routing
  - Default gateway
  - Two different additional routes
- NTP configuration
  - Time synchronization with a server

Hardware

- Basic configuration of the operating system
  - Graphics card
  - Monitor
  - User panel
- Printer (Berkley Spooling)
  - No printer connection
  - Network printer
- Bond head type

N O T E !

Each bonder is supplied with a correct configuration. Unauthorized changes to the configuration settings may result in malfunctions or failure of the machine. Do not make any settings that you do not understand. In particular, only make settings to the hardware configuration and to the internal network only after consulting F&K Service.

12.15.2 Background knowledge, software

Screen layout

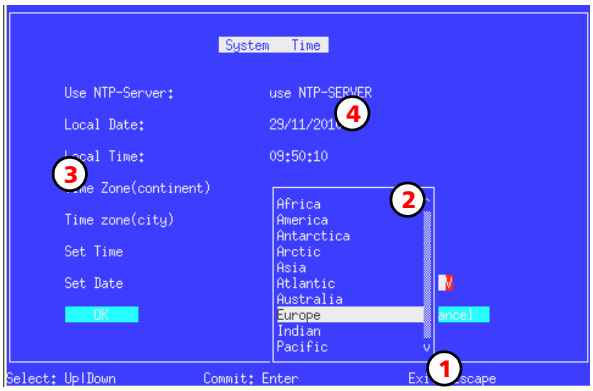


fig. 12 - 266 Example display - Screen layout

- 1: Help line
- 2: Drop-down settings
- 3: Parameter
- 4: Input fields

The layout of the elements of the Setup Tool is shown in the example display. The help bar at the bottom edge of the user screen provides the user with useful information on navigation.

The drop-down settings provide for a predefined selection of points.

The selection is confirmed with the "Enter" key. Use the cursor keys ← ↓ → ↑ and tab key to navigate within the parameter dialogs.

Data can be easily entered in the input fields and confirmed with the "Enter" key. The input data can then be saved in a variable for further processing.

IMPORTANT

The following section explains all the functions of the Setup Tool software delivered to you. Familiarize yourself with this information before putting the bonder into operation.

Changes should be effected only after consultation with F&K Delvotec or by trained personnel.

Integration in the machine sequence

Many configuration settings can only be changed when the bonder control software is not active. For this reason, the Setup Tool runs as an alternative to the control software.

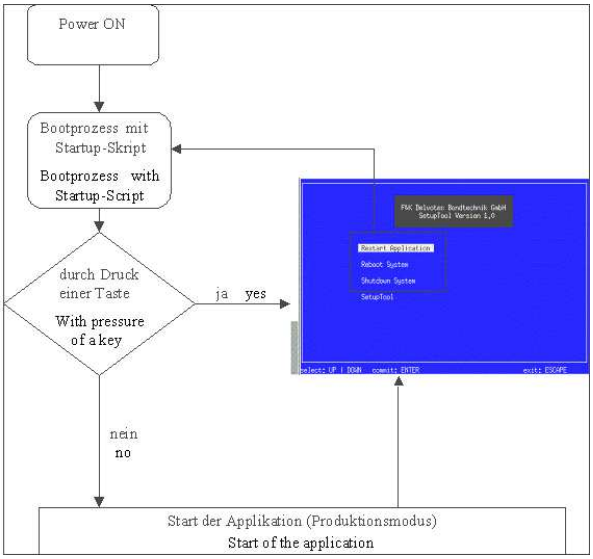


fig. 12 - 267 Setup Tool sequence during the booting process

Embedding the Setup Tool is examined in closer detail in this illustration. How to start up the operating system is explained in greater detail in the following.

The booting process of the production machine starts after the machine is switched on (Power ON).

The Setup Tool is called up by pressing any key after the prompt "Press any key...". Otherwise the control software's normal starting process is continued. The Setup Tool is called up again when the control software is exited with "File - Exit".

12.15.3 Software reference



fig. 12 - 268 Main level

- **Restart Application:** Starts the Machines software. The machine starts in standard mode.
- **Reboot System:** The Setup Tool is exited and the system is restarted. If no key is pressed during the initialization process, the system does not branch to the Setup Tool, but instead the actual booting process is continued.
- **Shutdown System:** Initiates a system shutdown immediately. The system is properly shut down in order to ensure data integrity on the internal hard disk. The machine can then be switched off.

N O T E

Normally the machine can be switched off after any necessary altered settings have been saved. Shutdown is then performed with the aid of the internal emergency power supply. This function must then be used if the emergency power supply cannot be guaranteed for example in the event of a flat battery.

- **Setup Tool:** The Setup Tool functions can be individually activated or deactivated via a login mechanism consisting of two user levels.
  The passwords for the individual users can be changed after login in the menu item "Change Password for User".

12.15.4 Login

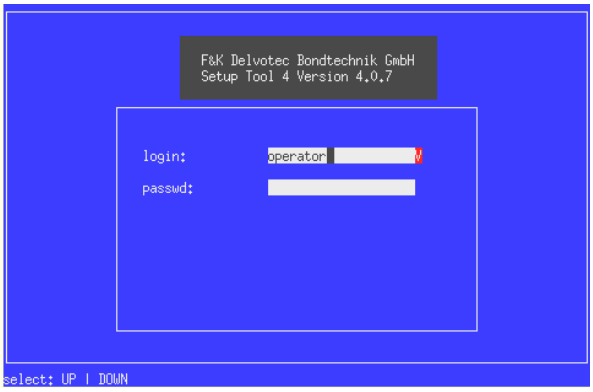


fig. 12 - 269 Login

The Setup Tool selection window is accessed via a login mechanism with two user levels.

- operator: No password is assigned as standard. Functions highlighted in black in the selection screen cannot be accessed. Only basic operations which have no influence on the machine's operational capability (e.g. data backup) can be performed in Operator mode.
- admin: All the functions can be accessed after the correct password has been entered.

I M P O R T A N T

The passwords for the individual users can be changed after login in the menu item "Change Password for User" (see fig. 12 - 290 "Sublevel - Change Password for User" on page -194)".

The passwords are communicated in the password letter.

12.15.5 Setup Tool



fig. 12 - 270 Main level of Setup Tool

After successful authentication the user-accessible functions of the Setup Tool are enabled.

- **System Time:** Permits settings such as time and date (see "System Time" on page -184).
- **Software Configuration:** Used to update software update and back up data (see "Software Configuration" on page -185).
- **Hardware Configuration:** Option of changing the basic hardware configuration and the driver configuration for the machine-specific additional hardware (see "Hardware Configuration" on page -187).
- **Networking:** Settings for the network (see "Networking" on page -188).
- **Printer Configuration:** Permits printer administration and settings (see "Printer Configuration" on page -193).
- **Change Password for User:** Option of changing the password for the logged-in user (see "Change Password for User" on page -194).

System Time

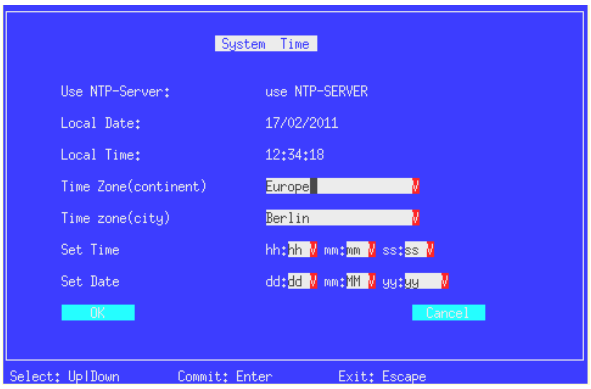


fig. 12 - 271 Sublevel - System Time

- Local Date/Time: Displays the current date and system time
- Time Zone (Continent/City): Select first the continent and then the name of the relevant city from the list. Confirm selection with "OK", reject with "Cancel".
  Continent:
  - Africa
  - America
  - Antarctic
  - Arctic
  - Asia
  - Atlantic
  - Australia
  - Europe
  - India
  - Pacific
- Set Time/Date: If "no NTP-SERVER" appears in the first line, the desired time must be selected in the list.

N O T E

The time zone must always be set in accordance with the relevant location. This ensures an automatic changeover to summertime (if this is required at the relevant location). This setting is important if production data have to be assigned on a time basis.

Software Configuration



fig. 12 - 272 Sublevel - Software Configuration

Used to update software and back up the Setup Tool.

- **Change Bond Head Type:** Changes the machine type (see "Change Bond Head Type" on page -185).
- **Install Software Update:** A software update of the Setup Tool and new software components are facilitated in this menu item. (see "Install Software Update" on page -186).
- **System Backup:** Permits a full system backup, i.e. all the operating system and user data are backed up for a rapid restoration of the production system (see "System Backup" on page -186).
- **Export Logfiles To USB:** Exports the logfile to the USB (see "Export Logfiles To USB" on page -187).

Change Bond Head Type



fig. 12 - 273 Software Configuration > Change Bond Head Type

The change is confirmed by pressing the "OK" button.

- **Bond Head 1/2:** Selects bond head from the list

The bond head types can likewise be allocated in the control software. When changing the bond head it is however recommend to make the changeover in the Setup Tool before the control software is started for the first time. This prevents a faulty activation of the bond head during the first initialization.

N O T E !

If the machine remains for an extended period with an incorrectly set bond head type in the control software, there is a risk of electronic components overheating and incurring damage.

Install Software Update

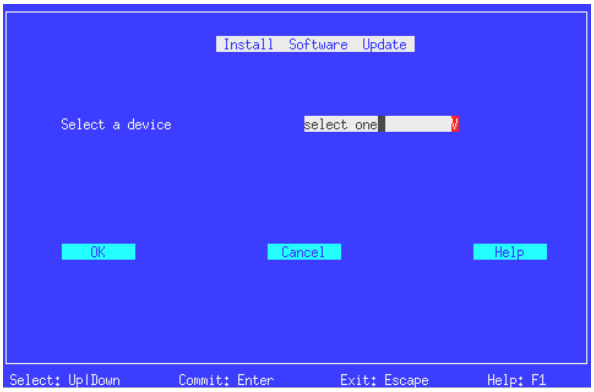


fig. 12 - 274 Software Configuration > Install Software Update

Select a device: The logged-in user can select a device with the parameter.
The software installation is then carried out by pressing the "OK" button.

System Backup

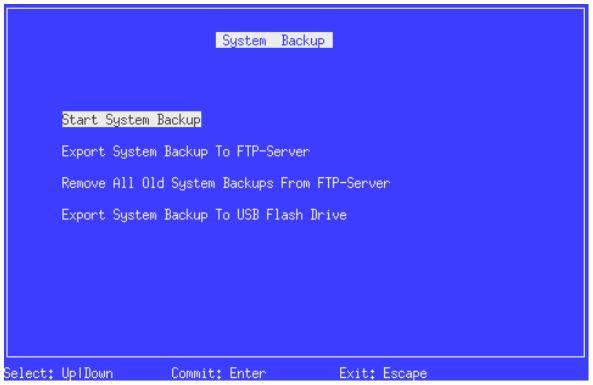


fig. 12 - 275 Software Configuration > System Backup

Select the parameter "Start System Backup" and then the backup selection is displayed:

1 Rescue CD-ROM only (no backups)
2 Rescue + backup into /spare/mkcdrec/isofsdir (to burn on CDROM)
3 Rescue + backup into /spare/mkcdrec/isodir (ISO file system only)
4 Enter another path (spare disk or NFS)
5 Enter (remote) tape device
6 Rescue + backup on USB Key, enter USB device
7 Quit

- Method 2: Select this method if an external DVD burner is connected via USB and the backup is to be burned directly onto a blank.
- Method 3: Select this method if first an ISO image is created any you intend to export this later via the network (FTP) or a USB memory stick (see "Export System Backup to FTP Server") and (see "Export System Backup to USB Flash Drive").

N O T E

All other backup methods offered are only advisable in special situations. Use these only after prior consultation with F&K Delvotec.

Export to FTP/USB: The backup image last exported with "Start System Backup" is exported (backup method "3"). Therefore "Start..." must be called up first before the Export functions are called up.

Export System Backup to FTP Server
With this function an ISO image created beforehand with "Start System Backup" method 3 is made available on the bonder's internal FTP server so that it can be downloaded via the local network.

Remove All Old System Backups From FTP Server:
Old ISO images of the Backup function that are no longer needed are deleted to free up memory space.

Export System Backup to USB Flash Drive
Connect a USB flash memory stick (at least 2 GB free memory) to copy the ISO image created beforehand with the function "Start System Backup" method 3.

Export Logfiles To USB

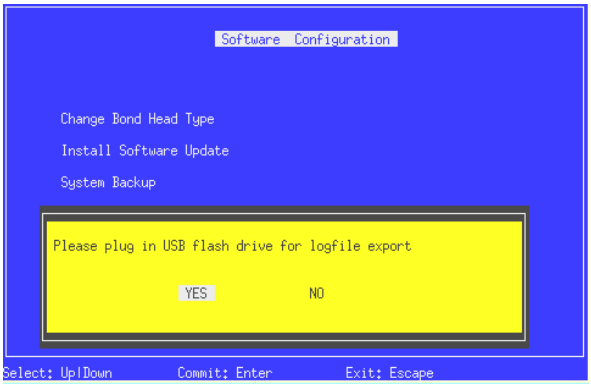


fig. 12 - 276 Software Configuration > Export Logfiles To USB

After actuating the "Export logfiles to USB" button insert a USB stick and select "YES"; the logfiles will then be automatically exported. With this function the internal logfiles of the machine software are combined in a file, which can be transmitted to F&K Delvotec, Service Department, for further analysis of problem situations.

Hardware Configuration



fig. 12 - 277 Sublevel - Hardware Configuration

This submenu offers the user the option of changing the basic hardware configuration and the driver configuration for the machine-specific additional hardware .

- **Graphic Card Settings:** The basic system settings are made here (see "Graphic Card Settings" on page -187).
- **User Panel Settings:** Defines whether the USB user panel is used (see "User Panel Settings" on page -188).

Graphic Card Settings

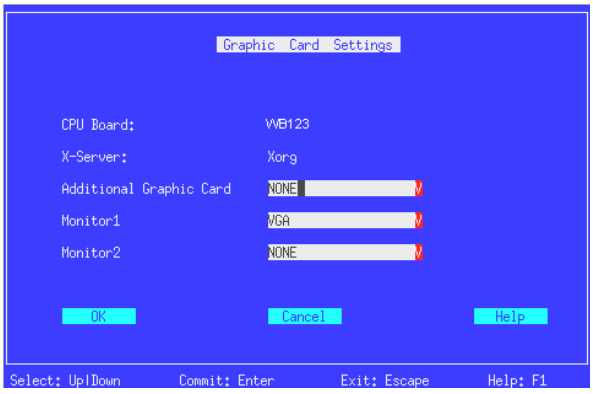


fig. 12 - 278 Hardware Configuration > Graphic Card Settings

This page contains information on the CPU and the X-server type. It is used to define the type of the second graphics card monitor 1 / 2.

MONITOR SELECTION

- Monitor 1:
  - VGA
  - DVI
- Monitor 2:
  - VGA
  - DVI
  - NONE

The change is confirmed by pressing the "OK" button.

N O T E

In the case of dual-head configurations (two monitors) with "Boogie" CPU, "Boogie" must likewise be set as the additional graphic card, because the second monitor connection is also located on the CPU module.

User Panel Settings

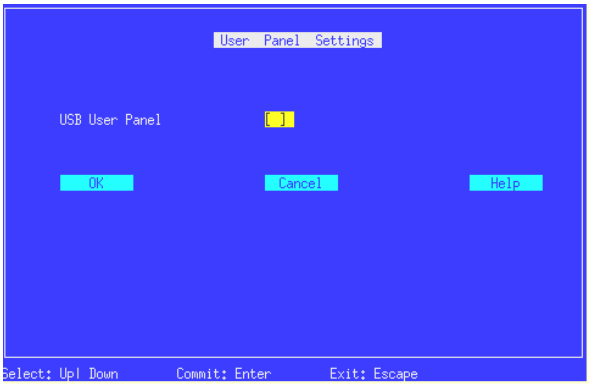


fig. 12 - 279 Hardware Configuration > User Panel Settings

Activates/deactivates the USB keyboard via the "Enter" key.

The change is confirmed by pressing the "OK" button.

NOTE

The PS/2 connection is active when "USB User Panel" is deactivated. With this setting the keyboard does work at the USB port, but the LEDs in the upper keypad do not indicate a state.

Networking

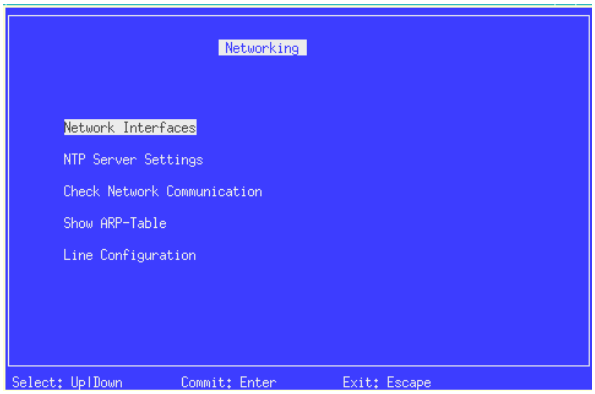


fig. 12 - 280 Sublevel - Networking

The settings for the network are defined in the sublevel.

- **Network Interfaces:** The basic settings such as computer name, IP address and network mask are set here (see "Network Interfaces" on page -189).
- **NTP Server Settings:** Time synchronization with a server available in the network (see "NTP Server Settings" on page -192).
- **Check Network Communication:** Option of entering an IP address and testing the network communication between bonder and entered IP address (an external computer). The individual functions and setting options are shown in greater detail in the following (see "Check Network Communication" on page -193).
- **Show ARP-Table:** Shows the information of the ARP (Address Resolution Protocol).
- **Line Configuration:** Settings for special configurations if several machines from F&K Delvotec are connected in one network. These arrangements are customer-specific and documented separately in each case.

Network Interfaces

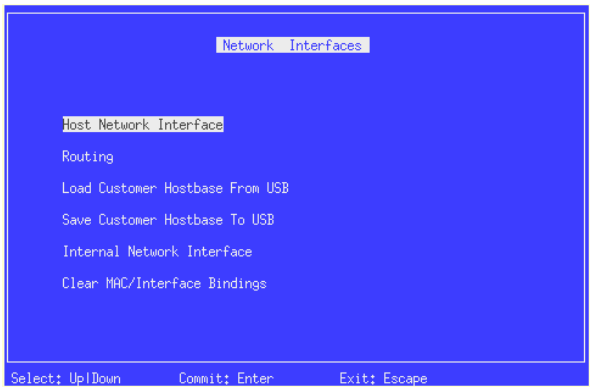


fig. 12 - 281 Networking > Network Interfaces

- **Host Network Interfaces:** The basic settings such as computer name, IP address and network mask are set and the information displayed here (see "Host Network Interface" on page -189).
- **Routing:** Option of specifying two network routes or selecting a standard gateway (see "Routing" on page -190)
- **Load Customer Hostbase From USB:** Loads the file "hosts.customer" via USB
- **Save Customer Hostbase To USB:** Exports the file "hosts.customer" via USB
- **Internal Network Interface:** The internal basic settings such as IP address and network mask are set and the information displayed here (see "Internal Network Interface" on page -191)

N O T E

host.customer: A small table by means of which a local resolution of network names can be specified. This is generally not necessary, because the bonder's internal network is fully operational even without a name resolution. In complex, networked line configurations it may be necessary however to provide network users with corresponding names. The format of this file corresponds to the classic "Host File". Example:
„# custom entries of additional hosts
,# notation: ipaddress Hostname
e.g: 172.16.6.31 MAINFRAME"

Host Network Interface

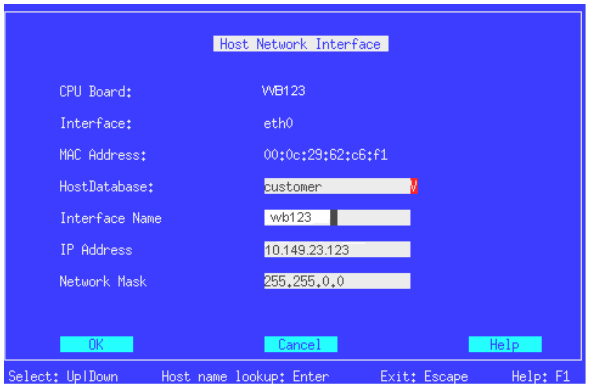


fig. 12 - 282 Networking > Network Interfaces > Host Network Interface

The machine can be connected to your in-house or line network via the "Host Network Interface". To do so, enter the IP address and network mask which have been assigned to the bonder by your IT administration.

N O T E !

Do not under any circumstances connect the bonder to your in-house or line network before these settings have been made with the value assigned by your IT administration. Otherwise this could result in serious malfunctions in the network.

The bonder has an internal network (see below). The address range specified by the IP address and network mask must not under any circumstances overlap with the internal network interface. If necessary, consult your responsible network administrator.

N O T E

The addressing of the internal network components can only be changed by F&K Delvotec, Service Department. When the bonder is delivered, IP addresses of the form 192.168.xx.xx can therefore NOT be used for the "Host Network Interface".

- **Interface Name:** The host name assigned to the interface.

NOTE

The host name is used for identification purposes in the network and corresponds to the specified IP address. This name is not relevant to the internal function of the machine.

- **IP Address:** IP address of the machine

The further lines show the network information associated with this machine.

After Interface, IP Address and Network Mask have been entered, they must be confirmed with the "Enter" key. Correct IP address and mask are automatically found provided it is possible to list the name via the local "hostbase".

Actuate the "OK" button to save the settings. These settings will take effect only after the machined has been restarted (rebooted).

A green dialog appears if all the information has been successfully saved; if not, a red dialog appears with an error message.

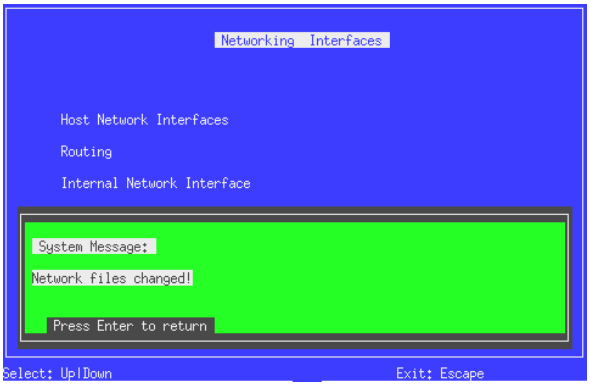


fig. 12 - 283 Networking > Network Interfaces - Confirmation for correct entry

ROUTING

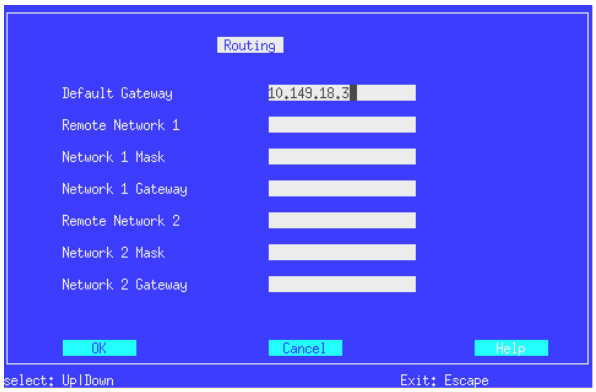


fig. 12 - 284 Networking > Network Interfaces > Routing

In standard situations it is sufficient to enter a default route. Routes 1+2 are only necessary in special situations. The data to be entered can be obtained from your network administrator.

- **Default Gateway:** IP address of the default gateway (e.g. 123.123.123.123).
- **Remote Network 1:** Network address of an external network (e.g. 111.111.111.0).
- **Network 1 Mask:** Network mask of the external network (e.g. 255.255.255.0).
- **Network 1 Gateway:** Router with which the external network can be reached (e.g. 123.123.234.17).
- **Remote Network 2:** Network address of a further external network (e.g. 222.222.222.0).
- **Network 2 Mask:** Network mask of the external network (e.g. 255.255.255.0).
- **Network 2 Gateway:** Router with which the external network can be reached (e.g. 223.223.234.18).

NOTE!

The bonder does not need a connection to the Internet and has no software whatsoever which could use such a connection. For network security reasons no routes should be set to the Internet here.

Enter here only those routes which are required to operate the machine, e.g. for accessing a ?workstation outside the production area.

When these options are entered, the IPs are checked for incorrect input. If one of the conditions is not satisfied, a red error message (System Message) is displayed on screen showing the user the incorrect IP. This only has to be changed once and then saved with the "OK" button to achieve an error correction.

If all the changes are correct, a green message (System Message) appears showing the user that the data have been successfully saved.

INTERNAL NETWORK INTERFACE

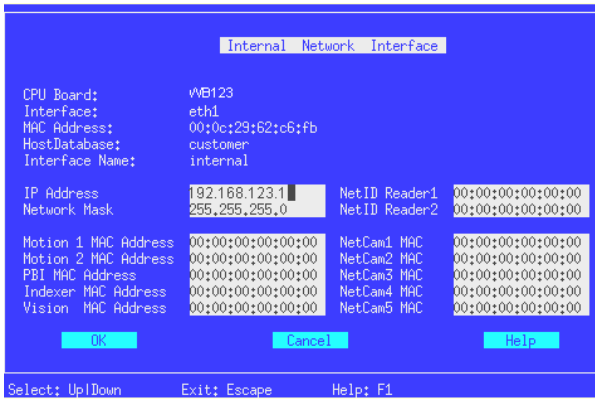


fig. 12 - 285 Networking > Network Interfaces > Internal Network Interface

- **IP Address:** Internal IP address for this machine.
- **Motion1/Motion2/PBI/Indexer/Vision MAC Address:** Defines the MAC address for required and optional components.
- **NetIDReader1/ NetIDReader2:** Barcode reader of the MAC address for internal connections.
- **NetCam1/... NetCam5:** Defines an additional MAC address for internal connections.

N O T E !

Incorrect settings in this dialog may cause parts of the control system to stop functioning.

The settings for the IP Address/Network Mask are specified by F&K Delvotec and CANNOT be changed in the field. Such a change would also require internal components to be reprogrammed, which can only be carried out by F&K Delvotec, Service Department. If necessary, contact F&K Delvotec.

N O T E

At present it is not possible to assign the MotionControllers (Motion1/Motion2) via their MAC addresses. Changes in these fields therefore have no effect.

After a change to the address assignment via MAC addresses it can take up to 60 minutes

for this to be accepted by the connected devices. It is better after changing the MAC addresses to switch off the machine once completely and switch it back on to force the change to be accepted.

NTP Server Settings



fig. 12 - 286 Networking > NTP Server Settings

With "NTP Server Settings" access to a time server is configured in the local network in order to synchronize permanently the time kept internally by the machine. The internal clock then no longer has to be set manually (this function is then no longer accessible in "System Time").

The specified NTP server must support the NTP protocols according to RFC-1305 without authentication.

There are two selection options in the drop-down box:

- If no NTP server is selected, the machine is not time-synchronized.
- If an NTP server is specified with the associated IP address, the machine is synchronized (see fig. 12 - 286 "Networking > NTP Server Settings" on page -192). The entered IP is checked again for correctness. If an incorrect IP is entered, a red fault message appears; otherwise a green confirmation message (System Message) appears. The changes must always be confirmed with "OK".

Check Network Communication



fig. 12 - 287 Networking > Check Network Communication

By entering the IP address of the partner it is possible to check the network connection between the bonder and the external computer.

- **Save MAC To:** Saves the MAC address to a destination address given in the list, i.e. the address is saved to the "Motion1/Motion2/ Indexer/NetIDReader/NetCam MAC address" on the "Internal Network Interface" side.

N O T E

The acceptance of the setting in the "Internal Network" must be confirmed again with "OK".

Printer Configuration

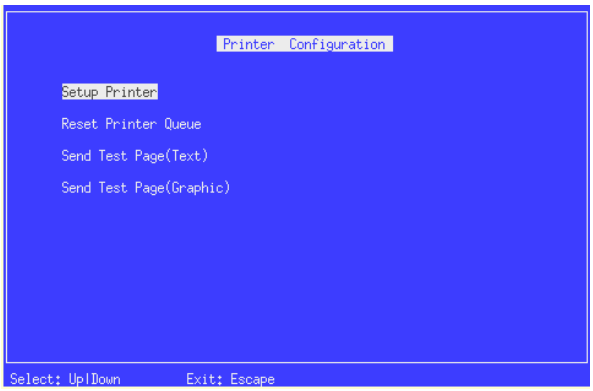


fig. 12 - 288 Sublevel - Printer Configuration

- **Setup Printer:** Setting for configuration of the available printer (e.g. printer format, printer IP) (see "Setup Printer" on page -193).
- **Reset Printer Queue:** Deletes all the print jobs from the "spool queue". Print jobs are permanently saved in the bonder. Use this function to delete all the "old" print jobs.
- **Send Test Page (Text):** To check the function of the print jobs, there is the option of printing a test page in "Text" mode.
- **Send Test Page (Graphic):** To check the function of the print jobs, there is the option of printing a test page in "Graphic" mode.

Setup Printer



fig. 12 - 289 Printer Configuration > Setup Printer

As shown in the illustration, there is the option here of defining a printer for the user. The default setting is "no printer". Only the installation of a network printer is currently supported. This is sufficient in practice, because the printers are usually located outside the clean room and not in the vicinity of the bonding machine.

Printer

- no printer
- net printer

The following settings are provided for configuration of the network printer: Format, IP address, Raw queue and Text queue.

Format

- Postscript
- PCL

IP

The IP address is checked for its signature. A red error message appears if a text should be entered. Only IPs can be entered here.

Raw queue / Ascii queue

No check is carried out for the parameters "Raw queue" and "Ascii queue".

IMPORTANT

Refer to the printer manual for the settings for "Raw queue" & "Ascii queue".

Change Password for User

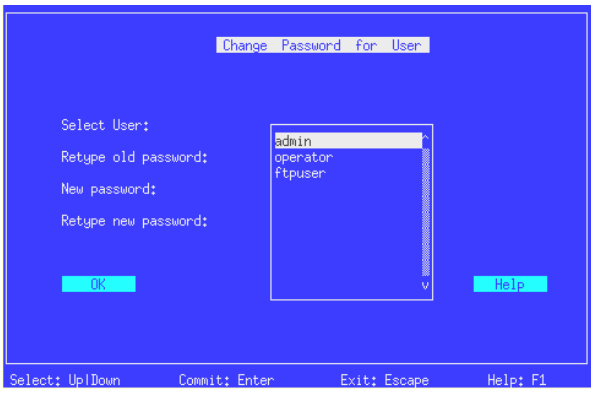


fig. 12 - 290 Sublevel - Change Password for User

The user enters the Setup Tool main level via user login (see fig. 12 - 269 "Login" on page -183). There is the option here of changing the password for the logged-in user under the screen point "Change Password for User".

Select User

The logged-in user is shown using the first parameter.
Two user levels are possible:

- admin
- operator
- ftpuser

Retype old password

Enter the old password to check the user.

New password / Retype new password

Enter and confirm the new password. The changed password is confirmed by pressing the "OK" button.

IMPORTANT

If a new password is not entered in the last two input fields, the newly set password for the respective user is deactivated.

LIST OF ILLUSTRATIONS

fig. 12 - 1 Sequence of operations in touchdown bonding (only when a gold bond head is used) 12-3
fig. 12 - 2 Sequence of operations in touchdown bonding (when a thin wire/heavy wire bond head is used) . . . 12-3
fig. 12 - 3 Bonding procedure, thin wire bond head - moving to the first bonding position . . . 12-3
fig. 12 - 4 Bonding procedure, thin wire bond head - performing the source bond . . . 12-4
fig. 12 - 5 Bonding procedure, thin wire bond head - moving to loop height . . . 12-4
fig. 12 - 6 Bonding procedure, thin wire bond head - moving to the second bond position . . . 12-4
fig. 12 - 7 Bonding procedure, thin wire bond head - performing the destination bond . . . 12-4
fig. 12 - 8 Bonding procedure, thin wire bond head - tearing off the wire . . . 12-5
fig. 12 - 9 user interface . . . 12-6
fig. 12 - 10 Context-sensitive help . . . 12-7
fig. 12 - 11 Learn chip (mode 1) . . . 12-8
fig. 12 - 12 learn chip . . . 12-8
fig. 12 - 13 Learn Wire (mode 2) . . . 12-8
fig. 12 - 14 learn wire . . . 12-8
fig. 12 - 15 Corr Offset (Mode 3) . . . 12-8
fig. 12 - 16 Wire numbers . . . 12-8
fig. 12 - 17 Wire fade-in . . . 12-8
fig. 12 - 18 Cross hairs . . . 12-8
fig. 12 - 19 help . . . 12-9
fig. 12 - 20 Help > File - Exit . . . 12-9
fig. 12 - 21 Help > Manual Set-up . . . 12-9
fig. 12 - 22 Print dialog . . . 12-9
fig. 12 - 23 wizard . . . 12-10
fig. 12 - 24 Wizard > Micron <=> Mil . . . 12-10
fig. 12 - 25 Wizard > Calculator . . . 12-10
fig. 12 - 26 User interface > Temperature . . . 12-11
fig. 12 - 27 temperature . . . 12-11
fig. 12 - 28 User interface > Door OK . . . 12-12
fig. 12 - 29 User interface > Door OK (Setting) . . . 12-12
fig. 12 - 30 Show Program > Example of a graphic illustration . . . 12-12
fig. 12 - 31 Show Program > Information bar . . . 12-12
fig. 12 - 32 Show Program > Function bar . . . 12-13
fig. 12 - 33 Show Program > Selection bar . . . 12-13
fig. 12 - 34 Show Program > Left mouse button . . . 12-13
fig. 12 - 35 Show Program > Middle mouse button . . . 12-14
fig. 12 - 36 Show Program > Menu right mouse button . . . 12-14
fig. 12 - 37 Show Program > Bond program display . . . 12-14
fig. 12 - 38 Show Program > Wire list selection . . . 12-15
fig. 12 - 39 Show Program > Change Wire Position . . . 12-15
fig. 12 - 40 Show Program > Change Bond Parameter . . . 12-16
fig. 12 - 41 Show Program > Loop Height Correction . . . 12-16
fig. 12 - 42 Show Program > Wire Group . . . 12-17
fig. 12 - 43 Show Program > Module list selection . . . 12-17
fig. 12 - 44 Show Program > Copy Modules . . . 12-17
fig. 12 - 45 Show Program > Copy Modules (Original>Copy) . . . 12-17
fig. 12 - 46 Show Program > Module Matrix . . . 12-18
fig. 12 - 47 Show Program > Copy Modules (Original>Copy) . . . 12-18
fig. 12 - 48 File menu . . . 12-18
fig. 12 - 49 File > Load: Confirmation prompt . . . 12-19
fig. 12 - 50 File > Load: Program library . . . 12-19
fig. 12 - 51 File > Load: Program library (layout preview) . . . 12-20
fig. 12 - 52 File > Load: Program library with saved note . . . 12-20
fig. 12 - 53 File > Save as...: Program library . . . 12-21
fig. 12 - 54 File > Save as...: Are you sure? query . . . 12-21
fig. 12 - 55 File > File Commander . . . 12-21
fig. 12 - 56 File > New: Confirmation prompt . . . 12-22
fig. 12 - 57 File > New: Program library . . . 12-22
fig. 12 - 58 File > File Annotation . . . 12-23
fig. 12 - 59 File > Save Display . . . 12-23
fig. 12 - 60 File > BPC Screen . . . 12-23
fig. 12 - 61 File > SW Update . . . 12-24
fig. 12 - 62 File > FTP Export.... . . . 12-24
fig. 12 - 63 File > FTP Import... . . . 12-25

fig. 12 - 64 File > Export to USB Flash Drive . . . 12-25
fig. 12 - 65 File > Import from USB Flash Drive . . . 12-26
fig. 12 - 66 File > Move Screenshots to USB Flash Drive . . . 12-26
fig. 12 - 67 File > Move PRU info to USB Flash Drive . . . 12-26
fig. 12 - 68 File > Exit: Security question 1 . . . 12-27
fig. 12 - 69 File > Exit: Security question 2 . . . 12-27
fig. 12 - 70 Mode menu . . . 12-27
fig. 12 - 71 Mode > Learn Chip (Mode 1) . . . 12-29
fig. 12 - 72 Mode > Learn Chip (Mode 1) . . . 12-29
fig. 12 - 73 Save Single Task . . . 12-30
fig. 12 - 74 Save Display . . . 12-30
fig. 12 - 75 save image . . . 12-30
fig. 12 - 76 Mode > Learn Chip (Mode 1) > PRU Parameters . . . 12-31
fig. 12 - 77 Mode > Learn Chip (Mode 1) > Bond Parameters . . . 12-34
fig. 12 - 78 Mode > Bond Force Progression . . . 12-35
fig. 12 - 79 Mode > Learn Chip (Mode 1) > Bond Parameters > Impedance Parameters . . . 12-36
fig. 12 - 80 Mode > Learn Chip (Mode 1) > Adjust (Default) . . . 12-37
fig. 12 - 81 Mode > Learn Chip (Mode 1) > Loop Parameters . . . 12-37
fig. 12 - 82 types of loop . . . 12-43
fig. 12 - 83 Mode > Learn Chip (Mode 1) > Tear Parameters . . . 12-44
fig. 12 - 84 Learn Wire (Mode 2) - Module, Chip and Wire Selection . . . 12-45
fig. 12 - 85 Mode > Learn Wire (Mode 2) . . . 12-45
fig. 12 - 86 Mode > Learn Wire (Mode 2) > Bond Parameters . . . 12-47
fig. 12 - 87 Mode > Learn Wire (Mode 2) > Loop Parameters . . . 12-49
fig. 12 - 88 Mode > Learn Wire (Mode 2) > Tear Parameters . . . 12-52
fig. 12 - 89 Mode > Learn Wire (Mode 2) > Stitch-Bonds . . . 12-53
fig. 12 - 90 Mode > Learn Wire (Mode 2) > Adjust Parameters . . . 12-54
fig. 12 - 91 Mode > Learn Wire (Mode 2) > Repeat Wire . . . 12-55
fig. 12 - 92 Mode > Corr Offset (Mode 3) . . . 12-56
fig. 12 - 93 Mode > Corr Offset (Mode 3) > Diagram . . . 12-57
fig. 12 - 94 Mode > Search Bond Height (Mode 4) . . . 12-58
fig. 12 - 95 Mode > Search Bond Height (Mode 4) > Diagram . . . 12-58
fig. 12 - 96 Mode > Repeat Module (Mode 5) . . . 12-59
fig. 12 - 97 Mode > Repeat Module (Mode 5) . . . 12-59
fig. 12 - 98 Mode > Insert Wire (Mode 6) . . . 12-60
fig. 12 - 99 Mode > Delete Wire (Mode 7) . . . 12-61
fig. 12 - 100 Mode > Delete Wire (Mode 7) > Confirmation prompt . . . 12-61
fig. 12 - 101 Mode > Delete Chip (Mode 8) . . . 12-61
fig. 12 - 102 Mode > Delete Chip (Mode 8) > Confirmation prompt . . . 12-61
fig. 12 - 103 Mode > Delete module (Mode 9) . . . 12-62
fig. 12 - 104 Mode > Delete Module (Mode 9) > Confirmation prompt . . . 12-62
fig. 12 - 105 Mode > Display Bond (Mode 10) . . . 12-62
fig. 12 - 106 Mode > Single Bond (Mode 11) . . . 12-63
fig. 12 - 107 Mode > Single Wire (Mode 11) > Light . . . 12-64
fig. 12 - 108 Mode > Single Wire (Mode 11) > Bond Parameters . . . 12-65
fig. 12 - 109 Mode > Single Wire (Mode 11) > Loop Parameters . . . 12-65
fig. 12 - 110 Mode > Single Wire (Mode 11) > Tear Parameters . . . 12-66
fig. 12 - 111 Mode > Feed Tail (Mode 12) . . . 12-66
fig. 12 - 112 Mode > Move Program (Mode 13) . . . 12-67
fig. 12 - 113 Mode > Re-Adjust (Mode 14) . . . 12-68
fig. 12 - 114 Mode > Test US Generator (Mode15) . . . 12-68
fig. 12 - 115 Mode > Feed In (Mode 16) . . . 12-70
fig. 12 - 116 Mode > Module Matrix (Mode 17) . . . 12-71
fig. 12 - 117 Mode > Module Matrix (Mode 17) > Diagram . . . 12-72
fig. 12 - 118 Mode > Reset Adjust (Mode 19) . . . 12-72
fig. 12 - 119 Mode > Reset Adjust (Mode 19) > Diagram . . . 12-72
fig. 12 - 120 Mode > Normalize Program (Mode20) . . . 12-73
fig. 12 - 121 Mode > Module Matrix (Mode 21) . . . 12-73
fig. 12 - 122 Mode > Insert Chip (Mode 22) . . . 12-76
fig. 12 - 123 Mode > Force Calib. Set-up (Mode 42) . . . 12-76
fig. 12 - 124 Mode > Edit Force Map (Mode 43) . . . 12-77
fig. 12 - 125 Mode > Force Calibration (Mode 44) . . . 12-77
fig. 12 - 126 Mode > Force Verification (Mode 45) . . . 12-77
fig. 12 - 127 Mode > Edit Bond Program (Mode 50) . . . 12-78
fig. 12 - 128 Mode > Edit Bond Program > confirmation request (Mode 50) . . . 12-78
fig. 12 - 129 Mode > Edit Modules (Mode 51) . . . 12-78
fig. 12 - 130 Mode > Edit module > Get Chips (Mode 51) . . . 12-78

fig. 12 - 131 Mode > Edit module > Get Chips > confirmation request (Mode 51 12-79
fig. 12 - 132 Mode > Clear Program (Mode 52). 12-79
fig. 12 - 133 Mode > Tool Cleaning (Mode 122) 12-79
fig. 12 - 134 Page Menu 12-82
fig. 12 - 135 BHC Parameters (page 1) 12-83
fig. 12 - 136 BHC Parameters (Page 1) > Checking Flags 12-86
fig. 12 - 137 BHC Parameters (Page 1) > Dig. USG Setting... 12-88
fig. 12 - 138 BHC Parameters (Page 1) > Init/Limit Setting 12-88
fig. 12 - 139 BHC Parameters (Page 1) > Ultrasonic Profiles 12-90
fig. 12 - 140 BHC Parameters (Page 1) > Bond Force Setting 12-91
fig. 12 - 141 Program Status (Page 2). 12-92
fig. 12 - 142 Program Status (Page 2) > Reset Statistics > confirmation request 12-93
fig. 12 - 143 Motor Data (page 3) 12-93
fig. 12 - 144 Machine Setup (Page 4) 12-94
fig. 12 - 145 Work Height 1 to 3 12-94
fig. 12 - 146 Delays and Indexer Data (page 5) 12-97
fig. 12 - 147 Process data Set-up (Page 6) 12-98
fig. 12 - 148 Process data Set-up (Page 6) > Log creation schedule 12-99
fig. 12 - 149 Process data PartID (Page 7) 12-99
fig. 12 - 150 PRU Parameters (Page 8) > PRU General). 12-100
fig. 12 - 151 PRU Parameters (Page 8) > PRU General > Pr8 Video Options 12-101
fig. 12 - 152 PRU Parameters (Page 8) > PRU Scale 12-101
fig. 12 - 153 PRU Parameters (Page 8) > PRU Specials 12-102
fig. 12 - 154 BHC Outputs (page 9) 12-103
fig. 12 - 155 Trackball (page 10) 12-103
fig. 12 - 156 US-Generator (Page 81) 12-104
fig. 12 - 157 US-Generator (Page 81) > Select Program Page No. 12-105
fig. 12 - 158 US-Generator (Page 81) > Select Program Page No. > Filter function. 12-106
fig. 12 - 159 US-Generator (Page 81) > Select Program Page No. > Functions 12-106
fig. 12 - 160 US-Generator (Page 81) > Calibration Voltage Control 12-107
fig. 12 - 161 US-Generator (Page 81) > Calibration Power Control 12-108
fig. 12 - 162 US-Generator (Page 81) > Calibration Current Control 12-108
fig. 12 - 163 US-Generator (Page 81) > Import CSV File 12-108
fig. 12 - 164 US-Generator (Page 81) > Curve Display 12-109
fig. 12 - 165 US-Generator (Page 81) > Export Analyze Data 12-109
fig. 12 - 166 Production Mode (Page 86) 12-110
fig. 12 - 167 CAN (page 88) > CAN A master) 12-110
fig. 12 - 168 CAN (page 88) > CAN B Indexer 12-110
fig. 12 - 169 CAN (page 88) > CAN A Slave 12-112
fig. 12 - 170 CAN (page 88) > Info > System State 12-112
fig. 12 - 171 CAN (page 88) > Info > Node Info 12-112
fig. 12 - 172 CAN (page 88) > Info > Failures 12-113
fig. 12 - 173 CAN (page 88) > Info > State 12-113
fig. 12 - 174 CAN (page 88) > Info > Config 12-113
fig. 12 - 175 CAN (page 88) > Info > Test 12-113
fig. 12 - 176 CAN (page 88) > Info > Graph 12-114
fig. 12 - 177 Calibration (Page 89 > Mechanical) 12-114
fig. 12 - 178 Calibration (Page 89 > Touchdown) 12-116
fig. 12 - 179 Calibration (Page 89 > Compensation) 12-117
fig. 12 - 180 Calibration (Page 89 > Bondforce). 12-118
fig. 12 - 181 BPC - Display Options (page 100) 12-120
fig. 12 - 182 BPC - Display Options > Deformation diagram. 12-120
fig. 12 - 183 Light Tower Setup (Page 117) 12-122
fig. 12 - 184 signal light 12-122
fig. 12 - 185 Wire Spool (Page 144) 12-122
fig. 12 - 186 Wire Spool (Page 144) > Expert Page 12-124
fig. 12 - 187 Operator Check List (Page 150) 12-125
fig. 12 - 188 Edit Operator Check List (Page 151) 12-126
fig. 12 - 189 Default - Parameter (Page 300) 12-127
fig. 12 - 190 Default - Parameter (Page 300) 12-127
fig. 12 - 191 Default - Parameter (Page 300) > Bond Parameters 12-128
fig. 12 - 192 Default - Parameter (Page 300) > Loop Parameters 12-128
fig. 12 - 193 Default - Parameter (Page 300) > Tear Parameters 12-128
fig. 12 - 194 Default - Parameter (Page 300) > Load from Single Wire 12-128
fig. 12 - 195 Default - Parameter (Page 300) > Save to Single Wire 12-129
fig. 12 - 196 Default - Parameter (Page 300) > Load from Data Base 12-129
fig. 12 - 197 Default - Parameter (Page 300) > Save to Data Base 12-129

fig. 12 - 198 Default - Parameter (Page 300) > Load from F&K Data Base . . . 12-129
fig. 12 - 199 Default - Parameter (Page 300) > Save to F&K Data Base. . . . 12-130
fig. 12 - 200 Service Menu . . . 12-131
fig. 12 - 201 General Information (Service 1) . . . 12-132
fig. 12 - 202 Bonder Base (Service 2) . . . 12-132
fig. 12 - 203 Bonder Base - master side (Service 2) . . . 12-132
fig. 12 - 204 Bonder Base - slave side (Service 2) . . . 12-132
fig. 12 - 205 Set Printer Format (Service 3). . . . 12-134
fig. 12 - 206 Set Printer Format (Service 3) > Print dialog button . . . 12-134
fig. 12 - 207 Tracings (Service 4) . . . 12-135
fig. 12 - 208 Get Versions (Service 5) > Page #1 . . . 12-135
fig. 12 - 209 Get Versions (Service 5) > Page #2 . . . 12-136
fig. 12 - 210 BHC Service (Service 10) . . . 12-137
fig. 12 - 211 BHC Service (Service 10) > Move dialog . . . 12-138
fig. 12 - 212 F&K PWM Board (Service 10) . . . 12-140
fig. 12 - 213 X-Amp (Service 10) . . . 12-141
fig. 12 - 214 Indel Service Application (Service 11) . . . 12-142
fig. 12 - 215 PRU Service (Service 20) . . . 12-143
fig. 12 - 216 CAN Download (Service 88) . . . 12-143
fig. 12 - 217 Can Download (Service 88) > Do Download . . . 12-144
fig. 12 - 218 User Administration (Service 90) . . . 12-144
fig. 12 - 219 User Administration (Service 90) > Access Rights . . . 12-145
fig. 12 - 220 Change User Level (Service 91) . . . 12-145
fig. 12 - 221 USB Backup (Service 98) . . . 12-145
fig. 12 - 222 USB Restore (Service 99) . . . 12-146
fig. 12 - 223 USB Restore (Service 99) . . . 12-146
fig. 12 - 224 Process Window (Chip) (Service 100) . . . 12-146
fig. 12 - 225 System Monitor (Service 256) . . . 12-147
fig. 12 - 226 Rebond Wire Parameters . . . 12-148
fig. 12 - 227 Rebond Wire Parameters > Bond Parameters . . . 12-149
fig. 12 - 228 Rebond Wire Parameters > Loop Parameters . . . 12-149
fig. 12 - 229 Rebond Wire Parameters > Tear Parameters . . . 12-150
fig. 12 - 230 Control procedure for bonding with bond process control. . . . 12-150
fig. 12 - 231 Control process of the bonding sequence without bonding process control . . . 12-151
fig. 12 - 232 impedance monitoring . . . 12-151
fig. 12 - 233 File > BPC Screen . . . 12-152
fig. 12 - 234 BPC Screen > Process Data . . . 12-153
fig. 12 - 235 BPC Screen > File . . . 12-153
fig. 12 - 236 BPC Screen > File > Open . . . 12-153
fig. 12 - 237 BPC Screen > File > Export . . . 12-154
fig. 12 - 238 BPC Screen > File > Delete Export File . . . 12-154
fig. 12 - 239 BPC Screen > File > Copy Export File to USB . . . 12-154
fig. 12 - 240 BPC Screen > File > Set Limits. . . . 12-154
fig. 12 - 241 BPC Screen > File > Clear Online Data. . . . 12-155
fig. 12 - 242 BPC Screen > Selection. . . . 12-155
fig. 12 - 243 BPC Screen > Navigation . . . 12-156
fig. 12 - 244 BPC Screen > 1st Bond . . . 12-156
fig. 12 - 245 BPC Screen > Classification/Info . . . 12-156
fig. 12 - 246 BPC Screen > Classification/Info > Selection function. . . . 12-156
fig. 12 - 247 BPC Screen > Distribution . . . 12-157
fig. 12 - 248 Setting up BPC . . . 12-157
fig. 12 - 249 PRU > diagram layout . . . 12-158
fig. 12 - 250 PRU > Calibrating the optics . . . 12-159
fig. 12 - 251 PRU > Image detail > Explanation for the following graphics . . . 12-159
fig. 12 - 252 PRU > Image detail > Zoom . . . 12-159
fig. 12 - 253 PRU > Image detail > Contrast . . . 12-159
fig. 12 - 254 PRU > Image detail > Unequivocal structure . . . 12-160
fig. 12 - 255 PRU > Image detail > Lighting . . . 12-160
fig. 12 - 256 PRU > Image detail > Shadow effects . . . 12-160
fig. 12 - 257 PRU > lighting > incident light (coaxial) . . . 12-161
fig. 12 - 258 PRU > lighting >spot light (lateral)) . . . 12-161
fig. 12 - 259 PRU > lighting > diffused lighting ?(indirect) . . . 12-161
fig. 12 - 260 Multi Stitch wires . . . 12-175
fig. 12 - 261 Repeat of multi stitch wires . . . 12-176
fig. 12 - 262 Nominal chip placement. . . . 12-177
fig. 12 - 263 Actual chip placement . . . 12-177
fig. 12 - 264 Advanced Adjust Parameter Mode . . . 12-177

fig. 12 - 265 Control procedure for bonding with slope angle . . . 12-179
fig. 12 - 266 Example display - Screen layout. . . . 12-181
fig. 12 - 267 Setup Tool sequence during the booting process. . . . 12-182
fig. 12 - 268 Main level . . . 12-183
fig. 12 - 269 Login . . . 12-183
fig. 12 - 270 Main level of Setup Tool. . . . 12-184
fig. 12 - 271 Sublevel - System Time . . . 12-184
fig. 12 - 272 Sublevel - Software Configuration . . . 12-185
fig. 12 - 273 Software Configuration > Change Bond Head Type. . . . 12-185
fig. 12 - 274 Software Configuration > Install Software Update . . . 12-186
fig. 12 - 275 Software Configuration > System Backup . . . 12-186
fig. 12 - 276 Software Configuration > Export Logfiles To USB . . . 12-187
fig. 12 - 277 Sublevel - Hardware Configuration. . . . 12-187
fig. 12 - 278 Hardware Configuration > Graphic Card Settings. . . . 12-187
fig. 12 - 279 Hardware Configuration > User Panel Settings . . . 12-188
fig. 12 - 280 Sublevel - Networking . . . 12-188
fig. 12 - 281 Networking > Network Interfaces . . . 12-189
fig. 12 - 282 Networking > Network Interfaces > Host Network Interface . . . 12-189
fig. 12 - 283 Networking > Network Interfaces - Confirmation for correct entry . . . 12-190
fig. 12 - 284 Networking > Network Interfaces > Routing . . . 12-190
fig. 12 - 285 Networking > Network Interfaces > Internal Network Interface . . . 12-191
fig. 12 - 286 Networking > NTP Server Settings . . . 12-192
fig. 12 - 287 Networking > Check Network Communication. . . . 12-193
fig. 12 - 288 Sublevel - Printer Configuration . . . 12-193
fig. 12 - 289 Printer Configuration > Setup Printer . . . 12-193
fig. 12 - 290 Sublevel - Change Password for User . . . 12-194

F&K Delvotec Bondtechnik GmbH
Daimlerstrasse 5-7
D-85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

FK DELVOTEC



Bonder series M17

TROUBLESHOOTING AND SERVICE
SINGLE, LARGE, XL

F&K DELVOTEC Bondtechnik GmbH
Daimlerstraße 5-7
85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

13 TROUBLESHOOTING AND SERVICE
. . . . . SINGLE, LARGE, XL 13-1

13.1 Structure of error messages 13-1
13.2 Bond Program Sequencer 13-2
13.3 pattern recognition unit 13-3
13.4 heat 13-4
13.5 CAN 13-5
13.6 Bond Head Controller 13-6
13.7 bonder base 13-12
13.8 Troubleshooting, general 13-12
13.9 Form for fault description. 13-13

1
2
3
4
5
6
7
8
9
10
11
12
13
A

13 TROUBLESHOOTING AND SERVICE SINGLE, LARGE, XL

13.1 Structure of error messages

The error messages with error codes are shown in a superimposed window on the bonder monitor. The error code is accompanied by a plain-text message detailing the error.

Example

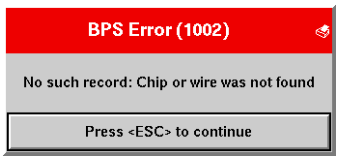


fig. 13 - 1 Example of an error message

N O T E !

Faults must be rectified by trained, qualified personnel working in compliance with all safety precautions.

N O T E

Contact F&K Delvotec service if an error message not included in the list below is displayed. Please keep the error code of the displayed error message at the ready or send the Error Description form to F&K Delvotec *(see 13.9 "Form for fault description" on page 13-13)*

13.2 Bond Program Sequencer

Error code	Error message	Meaning	Cause	Remedy
BPS (1002)	No such record: Chip or wire was not found	No entry exists: System was unable to find chip or wire	No chip or wire has been taught in	Teach in the chip and wire
BPS (1003)	File/program error	Error in file or program	Program is unable to read or write	Check program name; check storage capacity of hard disc
BPS (1004)	Module doesn't exist	Module does not exist	The module number you selected is incorrect or the module was skipped	Select correct module number
BPS (1005)	Chip doesn't exist	The chip does not exist	The chip number you selected is incorrect	Select correct chip number
BPS (1006)	Wire doesn't exist	Wire does not exist	The wire number you selected is incorrect	Select correct wire number
BPS (1007)	wrong state to perform command	In its present state, the system is unable to execute this command	You attempted to perform teach-in commands while the Production operating mode was active	Press the "Stop" and "ESC" keys to exit the Production mode and enter the teach-in mode
BPS (5004)	Invalid Bondhead Controller configuration record	The configuration entry for the bond head controller is invalid	System error	Contact F&K Delvotec Service
BPS (1010)	Bond program header doesn't exist	The bond program header does not exist	System error	Contact F&K Delvotec Service
BPS (-1011)	Invalid coordinate	A coordinate is invalid	Parameter settings incorrect	Check the limits of the positioning system
BPS (1012)	Inconsistency found in data base	The database contains inconsistent data	Bond program incorrect	Regenerate the bond program
BPS (1014)	No such record: Module, chip, or wire not found	No entry exists: The module, chip or wire does not exist	You attempted to call up an invalid module, chip or wire number	Check the module, chip and wire numbers (page 2)
BPS (1016)	Could not locate chip	The system was unable to find the chip	Focus setting incorrect, position incorrect, component missing, search area (PRU parameter) too small	Check the settings; if necessary, teach in the position again
BPS (1017)	Error bonding wire	Error in the bonding process	The wire was not bonded	Repeat the bonding process
BPS (1021)	There is an unadjusted chip	Unadjusted chip found	System error	Contact F&K Delvotec Service
BPS (1028)	Wedge count beyond maximum	The wedge counter has overshot the maximum count	A bond tool may execute only a maximum number of bonds in order to ensure a high bond quality	Change the bonding tool and / or reset the counter to zero

13.3 pattern recognition unit

The following are error messages that are not clearly visible and seldom critical:

Error code	Error message	Meaning	Cause	Remedy
PRU / PR8	Mailbox is full or VP communication failed/ no access PR8 timeout	Image processing processor or the image processing program not available	PRU system error or hardware error	Contact F&K Delvotec Service. If necessary, restart the machine
PRU/PRC	No GigE camera accessible!	No Ethernet camera "visible"	Network problem (CPU has local/global connections: cameras must be local, connected to NW switch and allocated by MAC address ...)	Contact F&K Delvotec Service
PRU/PRC	GigE camera with subnet problem!	Camera was identified, but has an incorrect NW address	A required camera is basically "visible", but incorrectly configured in network technology terms	Contact F&K Delvotec Service
PRU/PRC	No Cognex license dongle!	The Cognex USB dongle is not "accessible"	Dongle is not provided, incorrectly connected or faulty. Cognex functions are therefore not "activated"	Contact F&K Delvotec Service
PRU / PR8	general			Contact F&K Delvotec Service

IMPORTANT

However, in most cases only integrated reactions to fault messages appear. These important identifiers can be taken from the information line above the video image or in the PRU console window in the bottom right corner.

Typical for this class of problems are for example searching without valid trained model (in the production run this leads, for example, to the "Manual-Adjust" dialog): "Task xy: Model not trained" as message.

Frequent in the "LearnChip" dialog: insufficient structures for the training of a model: the feedback in this case would be "Task xy: not found" (explanation: Training automatically includes a search to generate information on search qualities/uniqueness). In addition to this the fade-in of the model edges determined into the video image is also interesting.

13.4 heat

Error code	Error message	Meaning	Cause	Remedy
HEAT (1000)	Heater not available	Heating controller is not available	Heating controller not available or fuse is defective	Check the unit and the fuse
HEAT (3000)	Loading of heater data failed	Error loading the heating controller configuration	Invalid configuration file	Save the bond program under another name
HEAT (3002)	Saving of heater data failed	Error saving the heating controller configuration	System error	Restart of the application
HEAT (50020)	Timeout while waiting for answer from CAN server	Time exceeded while waiting for the answer from the CAN server	System error	Restart of the application
HEAT (50050)	Error communicating with pneumatic / heater unit	No communication with the pneumatic / heating controller unit	Pneumatic / heating controller unit is in error state	Reset the pneumatic / heating controller unit and wait for several seconds
HEAT (50051)	Timeout while waiting for answer from pneumatic / heater unit	Time exceeded while waiting for the answer from the pneumatic / heating controller unit	Pneumatic / heating controller unit is not yet initialized	Wait for several seconds or reset the pneumatic / heating controller unit
HEAT (52710)	Timeout while waiting for answer from heater	Time exceeded while waiting for the answer from a heating controller	Heating controller is not yet initialized	Wait for several seconds or reset the pneumatic / heating controller unit

13.5 CAN

Error code	Error message	Meaning	Cause	Remedy
CAN (1105)	CAN: Node is not init	The node just tripped is not yet initialized	The reset or initialization process is not yet completed	Wait for several seconds
CAN (1153)	BPC: Error communicating with bond process unit - check unit and cable	No communication with the BPC (bonding process control)	Unit or CAN connection	Reset the unit or check the CAN connections
CAN (1154)	USG: Error communicating with ultrasonic generator - check unit and cable	No communication with the USG (ultrasonic generator)	Unit or CAN connection	Reset the unit or check the CAN connections
CAN (1158)	ZPMAIN: Error communicating with light unit - check unit and cable	No communication with the ZPMAIN unit (light unit)	Unit or CAN connection	Reset the unit or check the CAN connections
CAN (1159)	SPOOL: Error communicating with wire spool - check unit and cable	No communication with the SPOOL unit (wire spool)	Unit or CAN connection	Reset the unit or check the CAN connections
CAN (1191)	CAN: Error communicating with NODE_EXT	No communication with an external node that is controlled by the indexer	Unit or CAN connection	Reset the unit or check the CAN connections
CAN (1210)	CAN: Node is busy	The node just tripped is still busy with an ongoing action	Unintentional time behaviour upon task assignment of the node	Repeat last process
CAN (1219)	CAN: Timeout while waiting for answer from node	No communication with the node just tripped	Unit is in error state	Reset the unit and wait for several seconds
CAN (11001)	CAN: Fault when save configuration in EEPROM	Error while saving the EEPROM configuration	Node has problems accessing the EEPROM	Try again
CAN (29001)	SPOOL: Wire spool can not change to running mode	Wire spool cannot be put into controlled mode	Wire cannot be fed into the sensor area because of mechanical problems	Check the position of the wire and mechanical drive or air setting (thin wire spool)
CAN (29801)	SPOOL: Action not allowed here, wire spool is in running mode	Action is not allowed in this case. Wire spool is in controlled mode	For calibration the wire spool must be in service mode	Put the wire spool into service mode
CAN (29803)	SPOOL: Position of the wire is unknown, move wire close to detect sensor	The position of the wire is unknown. Move the wire in the sensor area	The position of the wire is unknown and a search run is not allowed	Move the wire into the sensor area. Position the parameter "Error Definition" on search
CAN (29805)	SPOOL: Action not allowed here, wire spool is not in running mode	Action is not allowed in this case. Wire spool is not in controlled mode	For inward spooling of the wire the wire spool must be in controlled mode	Put the wire spool into controlled mode

13.6 Bond Head Controller

Error code	Error message	Meaning	Cause	Remedy
BHC (-110)	Some differences between Machine-Type and Bond-Program	The bond program is intended for another bond head	The wrong bond program has been selected	Load suitable bond program for the currently mounted bond head
BHC (-120)	Motion controller is in error state	The motor control unit is still in error state	The motor control unit has not yet been initialized	Select page 11 to initialise the motor controller and press "Home"
BHC (-303)	Motion Controller did not acknowledge move to home	The motor control unit has not confirmed approach of the initialization position	The motor control unit has reported an error while approaching the initialization position	Select page 11 to initialise the motor controller and press "Home"
BHC (-400)	Error moving to target position	Error moving to target position	The motor control unit has reported an error while approaching the target position	Select page 11 to initialise the motor controller and press "Home"
BHC (-403)	Can not send move cmd to Motion Controller	The run command could not be sent to the motor control unit	The motor control unit was not ready	Select page 11 to initialise the motor controller and press "Home"
BHC (-500)	Can not set BHC configured data	An error has occurred in setting hardware parameters	software error	Check the settings on Page 1
BHC (-510)	Can not save BHC configured data to hard disk	An error has occurred in reading the hardware parameters	software error	Contact F&K Delvotec Service
BHC (-610)	Can not load BHC configured data from hard disk	An error has occurred in reading the hardware parameters	software error	Contact F&K Delvotec Service
BHC (-1002)	Index clamp not closed	The indexer clamp is not closed	The index clamp is not closed.	Close the indexer clamp
BHC (-1003)	Index vacuum not activated	The indexer vacuum is not applied	The indexer vacuum is not applied	Activate indexer vacuum
BHC (-1010)	Can't compute position of P-Axis for source bond	Unable to compute the position of the P axis for the source bond	The BHC is unable to compute the bracket for the source bond	Check whether the positions for source bond and destination bond are identical and whether the bracket is greater than the limit setting
BHC (-1011)	Position of P-Axis for source Bond is out of range (pls. check and correct the Neg. Limit in Page #1 Init/ Limit Setting)	Calculated position of the P axis for the source bond is outside the negative limit	Limit is dimensioned too low in negative direction	Adapt initial position and limit on page 1
BHC (-1012)	Position of P-Axis for source Bond is out of range (pls. check and correct the Pos. Limit in Page #1 Init/ Limit Setting)	Calculated position of the P axis for the source bond is outside the positive limit	Limit is dimensioned too low in positive direction	Adapt initial position and limit on page 1

Error code	Error message	Meaning	Cause	Remedy
BHC (-1020)	Z-Motor LimitStop for Workheight 1.Bond	Limit stop for Z-axis motor: Work height of source bond	The Z-axis has reached the limit stop in moving to the work height of the source bond	The values entered must satisfy the following condition: Init < workheight < bond height
BHC (-1021)	Workheight is greater than TD-Ramp	The workheight is greater than the touchdown ramp	The workheight setting is too high.	The values entered must satisfy the following condition: Init <= workheight <= (bond height ramp height)
BHC (-1040)	X-Motor LimitStop for source Bond	Limit stop for X-axis motor: Source bond	The X-axis has reached the limit stop in moving to the position of the source bond	Check parameters
BHC (-1041)	Y-Motor LimitStop for source bond	Limit stop for Y-axis motor: Source bond	The Y-axis has reached the limit stop in moving to the position of the source bond	Check parameters
BHC (-1042)	Z-Motor LimitStop for source bond	Limit stop for Z-axis motor: Source bond	The Z-axis has reached the limit stop in moving to the source bond	Check parameters
BHC (-1043)	P-Motor LimitStop for Source Bond	Limit stop for P-axis motor: Source bond	The P-axis (rotational axis) has reached the limit stop in moving to the position of the source bond	Check parameters
BHC (-1044)	Z-Motor LimitStop for Source Bond TD-Ramp	Limit stop for Z-axis motor: Source bond touchdown ramp	The Z-axis has reached the limit stop in moving to the touchdown ramp of the source bond	Check parameters
BHC (-1045)	Z-Motor LimitStop for Source Bond TD-Overdrive	Limit stop for Z-axis motor: Source bond touchdown overdrive	The Z-axis has reached the limit stop in moving to the touchdown overdrive of the source bond	Check parameters
BHC (-1046)	Z-Motor LimitStop for Source Bond TD-Steps	Limit stop for Z-axis motor: Source bond touchdown steps	Moving with touchdown steps, the Z-axis has reached the limit stop in moving to the touchdown of the source bond	Check parameters
BHC (-1050)	X-Motor LimitStop for Reverse factor	Limit stop for X-axis motor: Reverse factor	The X-axis has reached the limit stop in a reverse loop	Check parameters
BHC (-1051)	Y-Motor LimitStop for Reversefactor	Limit stop for Y-axis motor: Reverse factor	The Y-axis has reached the limit stop in a reverse loop	Check parameters

Error code	Error message	Meaning	Cause	Remedy
BHC (-1052)	Z-Motor LimitStop for Reversefactor	Limit stop for Z-axis motor: Reverse factor	The Z-axis has reached the limit stop in a reverse loop	Check parameters
BHC (-1053)	Z-Motor LimitStop for Presign	Limit stop for Z-axis motor: Presign	The Z-axis has reached the limit stop in presign movement	Check parameters
BHC (-1054)	Z-Motor LimitStop for Loopheight	Limit stop for Z-axis motor: Loop height	The X-axis has reached the limit stop in moving to loop height	Check parameters
BHC (-1055)	X-Motor LimitStop for LoopZDelay1	Limit stop for X-axis motor: LoopZDelay1	The X-axis has reached the limit stop in moving to the Loop Delay value of the source bond	Check parameters
BHC (-1056)	Y-Motor LimitStop for LoopZDelay1	Limit stop for Y-axis motor: LoopZDelay1	The Y-axis has reached the limit stop in moving to the Loop Delay value of the source bond	Check parameters
BHC (-1057)	X-Motor LimitStop for LoopZDelay2	Limit stop for X-axis motor: LoopZDelay2	The X-axis has reached the limit stop in moving to the Loop Delay value of the destination bond	Check parameters
BHC (-1058)	Y-Motor LimitStop for LoopZDelay2	Limit stop for Y-axis motor: LoopZDelay2	The Y-axis has reached the limit stop in moving to the Loop Delay value of the destination bond	Check parameters
BHC (-1059)	Wrong abs. Loop-Length	Error while checking the absolute loop distance	The combination of several loop parameters provides a defective loop distance	Check parameters
BHC (-1060)	X-Motor LimitStop for Reverse factor	Limit stop for X-axis motor: Reverse position	The X-axis has reached the limit stop in moving to the reverse position	Check parameters
BHC (-1061)	Y-Motor LimitStop for Reversefactor	Limit stop for Y-axis motor: Reverse position	The Y-axis has reached the limit stop in moving to the reverse position	Check parameters
BHC (-1070)	X-Motor LimitStop for destination Bond	Limit stop for X-axis motor: Destination bond	The X-axis has reached the limit stop in moving to the position of the destination bond	Check parameters
BHC (-1071)	Y-Motor LimitStop for destination Bond	Limit stop for Y-axis motor: Destination bond	The Y-axis has reached the limit stop in moving to the position of the destination bond	Check parameters

Error code	Error message	Meaning	Cause	Remedy
BHC (-1072)	Z-Motor LimitStop for destination Bond	Limit stop for Z-axis motor: Destination bond bond height	The Z-axis has reached the limit stop in moving to the destination bond	Check parameters
BHC (-1073)	P-Motor LimitStop for destination Bond	Limit stop for P-axis motor: Destination bond	The P-axis (rotational axis) has reached the limit stop in moving to the position of the destination bond	Check parameters
BHC (-1074)	Z-Motor LimitStop for 2.Bond TD-Ramp	Limit stop for Z-axis motor: Destination bond touchdown ramp	The Z-axis has reached the limit stop in moving to the touchdown ramp of the destination bond	Check parameters
BHC (-1075)	Z-Motor LimitStop for destination Bond TD-Over drive	Limit stop for Z-axis motor: Destination bond touchdown overdrive	The Z-axis has reached the limit stop in moving to the touchdown overdrive of the destination bond	Check parameters
BHC (-1076)	Z-Motor LimitStop for destination Bond TD-Steps	Limit stop for Z-axis motor: Destination bond touchdown steps	Moving with touchdown steps, the Z-axis has reached the limit stop in moving to the touchdown of the destination bond	Check parameters
BHC (-1090)	Z-Motor LimitStop for Tailheight	Limit stop for Z-axis motor: Tailheight	The Z-axis has reached the limit stop in moving to the tailheight	Check parameters
BHC (-1091)	Z-Motor LimitStop for Cutheight	Z motor limit stop for cut height	The z-axis has reached the limit stop in approaching the cut height	Check parameters
BHC (-1092)	Z-Motor LimitStop for Tearheight	Limit stop for Z-axis motor: Tear-off height	The Z-axis has reached the limit stop in moving to the tear-off height	Check parameters
BHC (-1093)	TailLength1 greater than TailLength2	Taillength 1 is greater than taillength 2	The value selected for taillength 1 is larger than that for taillength 2	Check parameters
BHC (-1094)	Can't compute TailLength1 X-Y	Unable to compute taillength1 X-Y	Source and destination position are identical	Check parameters
BHC (-1095)	Can't compute TailLength2 X-Y	Unable to compute taillength 2 X-Y	Source and destination position are identical	Check parameters
BHC (-1096)	X-Motor LimitStop for TailLength1	Limit stop for X-axis motor: Taillength1	The X-axis has reached the limit stop in moving to taillength 1	Check parameters

Error code	Error message	Meaning	Cause	Remedy
BHC (-1097)	Y-Motor LimitStop for TailLength1	Limit stop for Y-axis motor: Taillength1	The X-axis has reached the limit stop in moving to taillength 1	Check parameters
BHC (-1098)	X-Motor LimitStop for TailLength2	Limit stop for X-axis motor: Taillength2	The X-axis has reached the limit stop in moving to taillength 1	Check parameters
BHC (-1099)	Y-Motor LimitStop for TailLength2	Limit stop for Y-axis motor: Taillength2	The Y-axis has reached the limit stop in moving to taillength 2	Check parameters
BHC (-1501)	Deformation too high	Deformation is excessive	Deformation has reached maximum permissible limit	Check and, if necessary, adjust bond and BPC parameters and the touchdown threshold settings
BHC (-1502)	Minimum deformation not reached	Deformation has not attained minimum acceptable limit	Maximum deformation has been exceeded	Check and, if necessary, adjust bond and BPC parameters and the touchdown threshold settings
BHC (-9000)	BPC timeout	The BPC has timed out	Problem with communication with the BPC	Contact F&K Delvotec Service
BHC (-10001)	Bondhead door not closed	Hood door is not closed	Hood door is not closed	Close door
BHC (-16006)	System error, Motion system is not in IPOL-Mode.	Motor control unit can no longer move all axes together	At least one motor axis is in error state	Select page 11 to de-initialize the motor control unit, select Service 10 (BHC Service) and perform disconnect and connect once on the motor control unit
BHC (-16300)	Timeout during wait for response from Motion controller	Motor control unit not answering within the prespecified time	Motor control unit in error state	Select page 11 to initialise the motor controller and press "Home"
BHC (-16523)	HW-Touchdown was detected. (probably crash)	Bond head has collided with an obstruction in Z	Bond head moved to wrong position, chip holder or parts obstructing travel	Check limits and bond positions, remove obstructions
BHC (-16531)	No TD Trigger was found; 1st. Bond chip too Low	Z-axis movement was not stopped by a touchdown in bonding the source bond	Chip at the source bond has been touched too , because too low	Check whether device is in place. As applicable, increase travel / measure bond height/ check bondhead cable
BHC (-16532)	No TD Trigger was found; 2nd. Bond chip too Low	Z-axis movement was not stopped by a touchdown in bonding the destination bond	Chip at the destination bond has not been touched, because too low	As under source bond

Error code	Error message	Meaning	Cause	Remedy
BHC (-16533)	TD Trigger was found too early, 1st. Bond chip too High	Z-axis movement was stopped prematurely by a touch-down in bonding the source bond	Chip at the source bond has been touched too early, because too high	Check whether device is correctly located. As applicable, in mode 15 check the touchdown offset / measure bond height and correct offset / check bond-head cable
BHC (-16534)	TD Trigger was found too early, 2nd. Bond chip too High	Z-axis movement was stopped prematurely by a touch-down in bonding the destination bond	Chip at the destination bond has been touched too early, because too high	As under source bond
BHC (-59100)	SPOOL: Wire spool can not change to running mode	Wire-spool error	No wire detected	Check the wire spool sensor, air pressure and wire. Check the wire on page 144

13.7 bonder base

Error message	Meaning	Cause	Remedy
No bonder serial number at master/slave	No entry of the machine serial number in the file bonderbase.ini	File bonderbase.ini faulty or no entry	Enter serial number
Unknown Machine Type at master/slave	No entry of machine type in the file bonderbase.ini	File bonderbase.ini faulty	Contact F&K Service
CAN BUS ERROR can not read serial number at master/slave	Disrupted communication on the CAN bus	CAN cable not connected or other fault	Check CAN
CAN ZPMAIN - device not found can not read serial number at master/slave	ZPMAIN UNIT cannot be found	Faulty CAN configuration file	Contact F&K Service
CAN ZPMAIN - not in run mode can not read serial number at master/slave	ZPMAIN UNIT not in run mode	CAN interruption to ZPMAIN UNIT - ZPMAIN UNIT faulty - No voltage supply	Check CAN Check ZPMAIN
Wrong head serial number at master/slave	Bond head serial number does not match	Bond head changed	Select or configure corresponding bond head

13.8 Troubleshooting, general

Fault	Cause	Remedy
Switch on: power supply unit cannot be switched on	■ Machine?s Emergency Stop button pressed ■ External Emergency Stop not pressed (plug on the rear side of the power supply unit not plugged in ■ Switch on module not connected ■ Main fuse not in order	■ Release the Emergency Stop ■ Insert plug with bypass ■ Connect the switch on module ■ Find the cause for triggering of the main fuse and switch on the main fuse on the front panel
Battery: Neither of the two LED?s on the battery light up	Battery temperature too high; battery no longer being charged until the temperature is lower than the preset threshold value.	Wait until the temperature has dropped; after switching on the bonder the battery is charged at maximum current for approx. 2 minutes. This can lead to a marked temperature increase, if the bonder is frequently switched on and off. If the frequent switching-on and off is necessary, it is recommended that the battery is pulled out for the time being.

13.9 Form for fault description

Were you unable to rectify the fault with the assistance of the tables above?

If so, please complete this form and fax it to our Service department:
Fax: +49-89-6 29 95-275

IMPORTANT

Copy this page before you fill in the blanks, so that you will have a blank form in case you need one in future.

Bonder type	**serial number**
Software version	**bond material**
Special equipment	
Your name	**Company**
Phone	**Fax**
E-mail	
Description of the fault	
How often did the error occur?	
What has already been undertaken to rectify the error?	

LIST OF ILLUSTRATIONS

fig. 13 - 1 Example of an error message 13-1

F&K Delvotec Bondtechnik GmbH
Daimlerstrasse 5-7
D-85521 Ottobrunn
Germany

Copyright © 2018 F&K Delvotec Bondtechnik GmbH
Right reserved to make technical changes

A APPENDIX

A.1 Function keys

The table on the right shows an overview of the function keys that are available. You have the possibility of cutting out this table and laying it on the keyboard.

IMPORTANT

Please copy this page before cutting it out or print it out again from the digital version so that it does not get lost from the overall documentation.

FN	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
	help	step	bond	adjust	store trace	mode	page	stop	trackball Z	trackball XY	wire clamp	wire feed
Shift+FN	file	digit video	wire ctrl off	auto adjust	auto index	slow go on	duplicate	index	skip module	skip chip	trackball P	
Ctrl+FN	service	head	rebond	display trace	pru	flame off	screen		index reset	index clear	index clamp	index vacuum
Alt+FN	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed	not allowed

fig. A - 676 function keys

A.2 Information on RoHS and WEEE

The recast RoHS2 Directive requires the use of six hazardous substances in electronic and electrical equipment to be restricted to defined maximum concentration values.

The six substances in question are as follows:

- Lead (Pb)
- Hexavalent chromium (Cr +6)
- Mercury (Hg)
- Polybrominated biphenyl (PBB)
- Cadmium (Cd)
- Polybrominated diphenyl ether (PBDE)

If you have further questions on this subject, please do not hesitate to contact:

info@de.fkdelvotec.com

A.2.1 End-of-life device return to manufacturer

At the end of the device lifetime, there is an option to initiate proper disposal and recycling of the device through F&K Delvotec.

If an individual solution arranging for disposal and recycling directly by you or your certified waste-disposal specialist is agreed with F&K Delvotec or a local sales partner, it is important to ensure that the device is recycled correctly in accordance with the relevant specifics. Under these circumstances, you are requested to notify Fall F&K Delvotec or your sales partner, as applicable, that disposal has taken place. You are also requested to provide a record of the recycling extraction quotas if you do not yourself forward this recycling data to the competent authorities.

Please also dispose of any parts and accumulators or primary batteries that are contained in accordance with the relevant legal regulations, if they are not returned to F&K Delvotec.

IMPORTANT

When disposal is necessary, please contact F&K Delvotec (http://www.fkdelvotec.com) ?directly to obtain information on the current mode of return.

A.3 Your opinion

As a manufacturer of high-end bonders, F&K Delvotec wants you to have your machine up and running as quickly as possible. We hope that this User Guide is useful and to your satisfaction in every way.

We are always glad to receive your suggestions and proposals relating to the machine, the user interface and the documentation, and we always do our utmost to evaluate and implement everything that helps improve our service to you. Consequently, we have drawn up a list with a few questions to help you express your opinions and your suggestions.

Please complete this page and fax it to our Documentation department:

Fax: +49-89-6 29 95-100

IMPORTANT

Copy this page before you fill in the blanks, so that you will have a blank form for your future suggestions.

Your name	**Company**
Phone	**Fax**
E-mail	
Was the information you needed easy to find?	**How do you grade the user prompting in the machine and the structure of the documentation?**
Which sections could be more detailed?	**Do you have any suggestions for improvement?**
Do you have any open questions? If so, what are they?	**What features did you like?**

Headquarter
F&K Delvotec Bondtechnik GmbH
Daimlerstr. 5-7
85521 Ottobrunn
Germany
Phone: +49(89)62995-0
Fax: +49(89)62995-100
info@de.fkdelvotec.com

F&K Delvotec Inc.
27182 Burbank Avenue
Foothill Ranch, CA 92610

USA
Phone: +1(949)595-2200
Fax: +1(949)595-2207
info@de.fkdelvotecusa.com

F&K Delvotec Bondtechnik GmbH & Co. KG
3 International Business
Park #04-05
Nordic European Centre
Singapore 609927
Phone: +65(6890)6020
Fax: +65(6890)6021
info@de.fkdelvotec.com

Navigation symbols

SEFxxxx <-> cable overview, cable no. <-> cable

<-> cable overview, plug put in position <-> cable, connection

<-> cross-referenced plugs

<-> page <-> page

<-> circuit diagram <-> component location

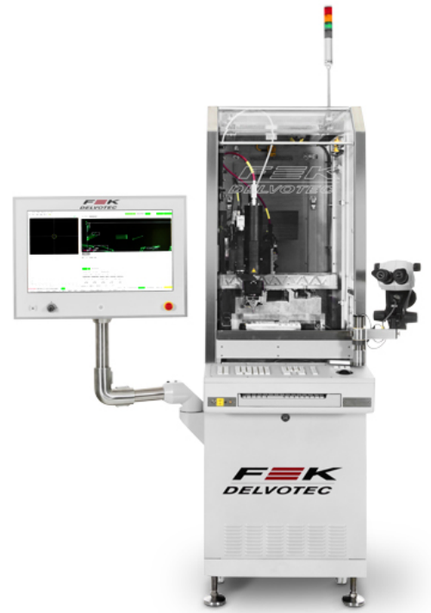
<-> pin contact <-> socket contact

cross-reference

Wire Bonder G6.0

Single

Signal tracing and cable manufacturing



Changed on the 25.04.2018 from (abr.): bagaricr

Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	F&K DELVOTEC	WB G6	Cover Sheet	= Title	
		User	bagaricr					+ Single	
		Check	17.11.2017					Drawing No. 60-S-6xxxxx V1.1	Page 1
		Norm		First	Created for	Created by			10 Page

0	1	2	3	4	5	6	7	8	9

Machine Base:
Connection Diagram of
all cables below baseplate.

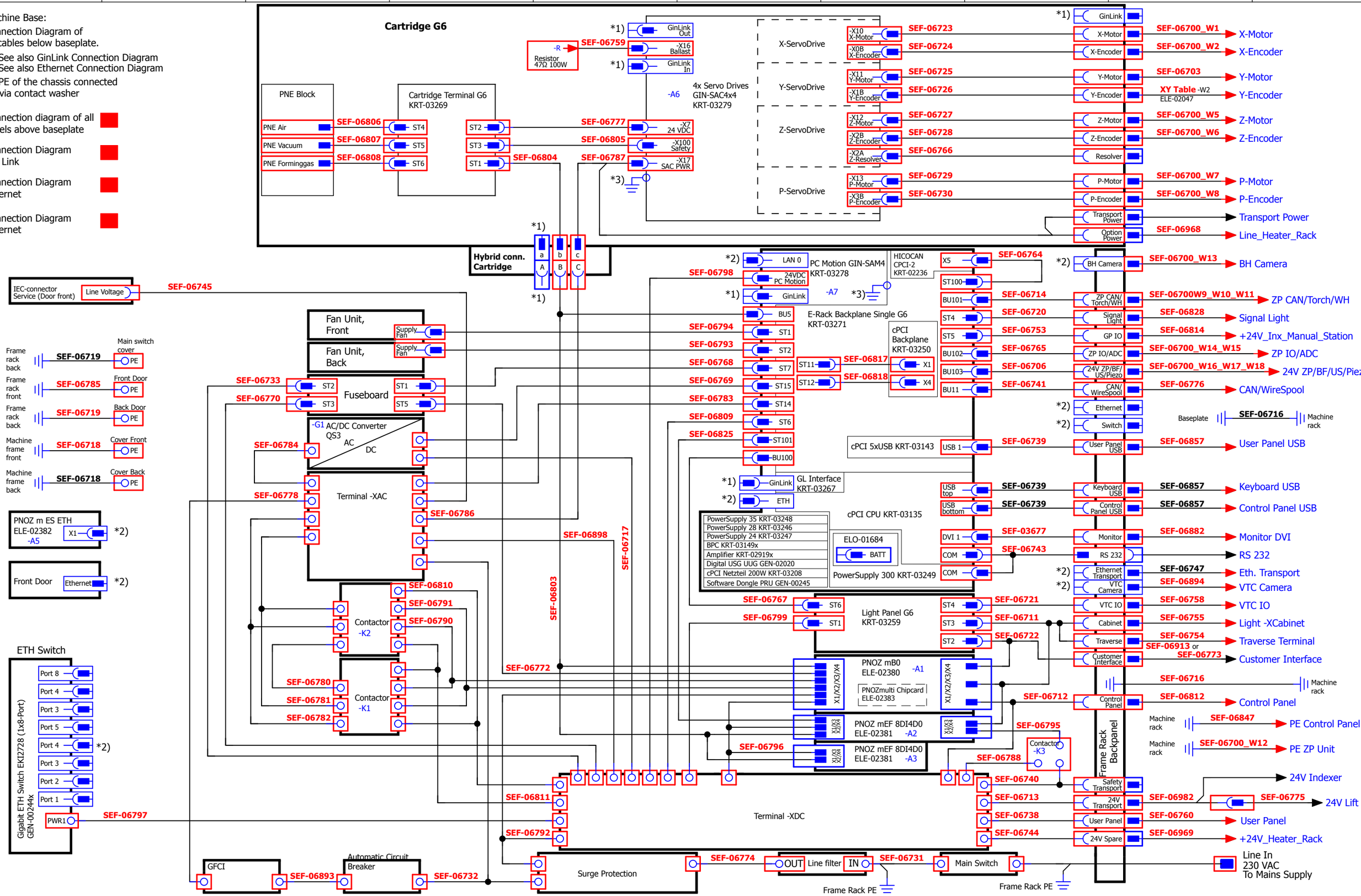
*1) See also GinLink Connection Diagram
*2) See also Ethernet Connection Diagram
*3) PE of the chassis connected
via contact washer

Connection diagram of all cabels above baseplate

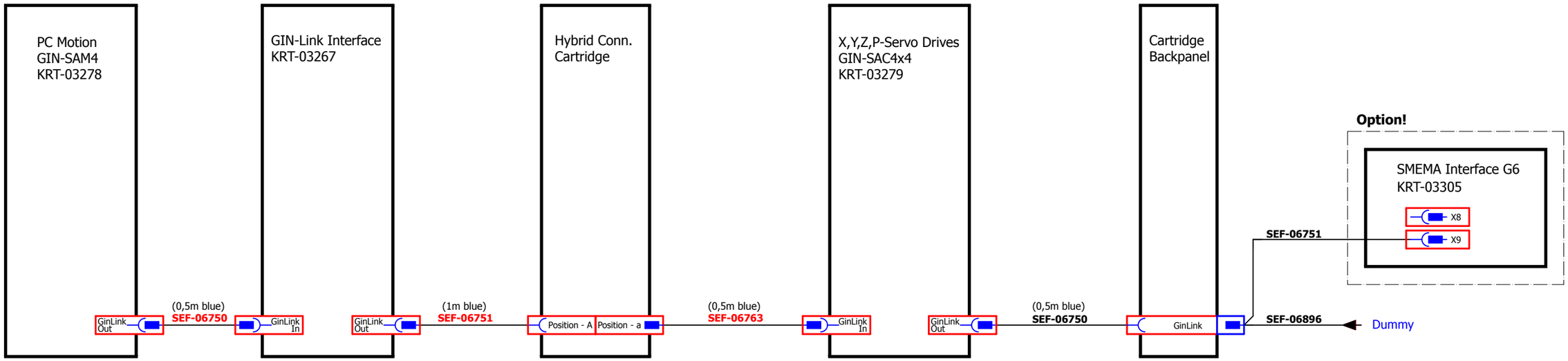
Connection Diagram Gin Link

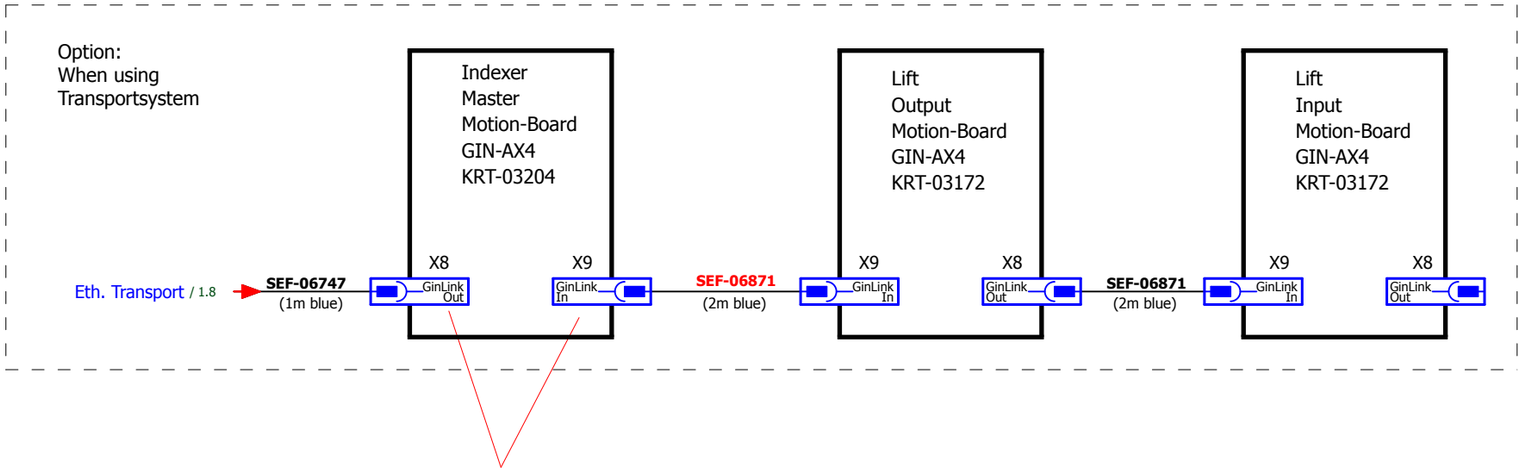
Connection Diagram Ethernet

Connection Diagram Ethernet



Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved		WB G6	Cable overview below baseplate	= 60-S-6xxxxx V1.1	
		User	bagaricr					+ Overview	
		Check	25.04.2018					Drawing No. 60-S-6xxxxx V1.1	Page 2
		Norm		First	Created for	Created by			10 Page

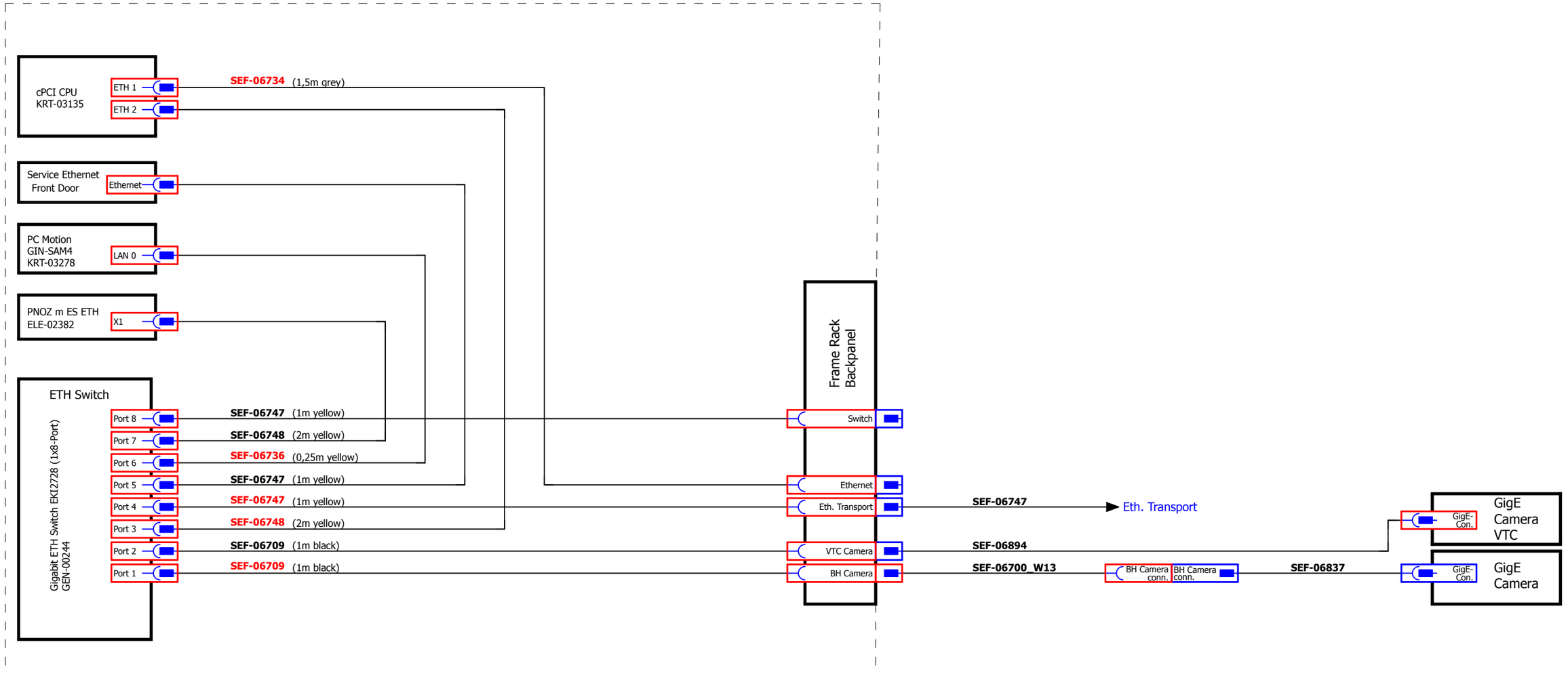




Connection Diagram of
all cables below baseplate

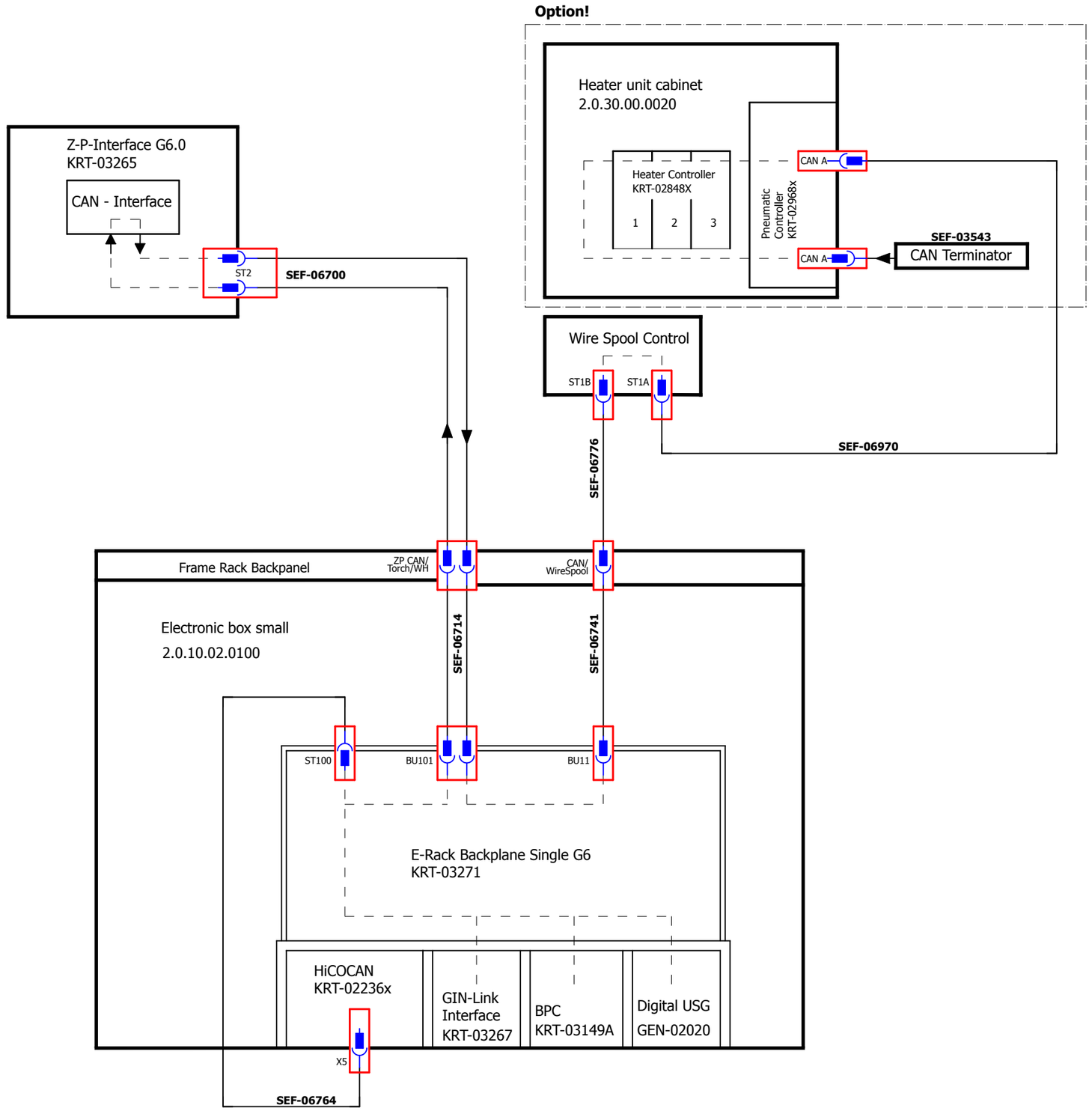
Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	Cable Overview Gin Link	= 60-S-6xxxxx V1.1	
		User	bagaricr					+ Overview	
		Check	25.04.2018					Drawing No. 60-S-6xxxxx V1.1	Page 3 / 10 Page
		Norm		First	Created for	Created by			

Frame Rack



Connection Diagram of
all cables below baseplate

Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	Cable overview Ethernet	=60-S-6xxxxx V1.1
		User	bagaricr					+Overview
		Check	25.04.2018					Drawing No. 60-S-6xxxxx V1.1
		Norm		First	Created for	Created by		Page 4 / 10 Page



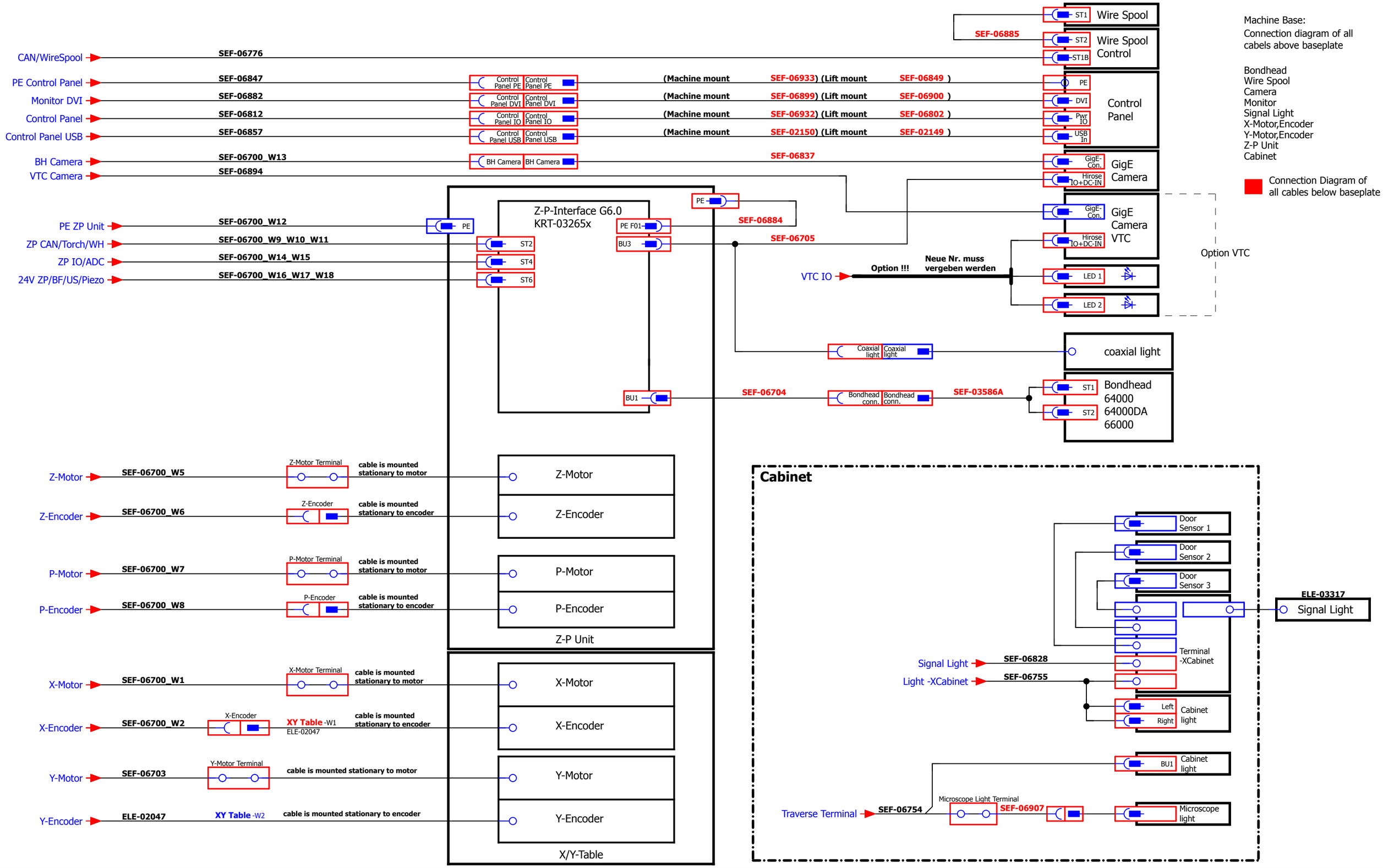
Machine Base:

Connection diagram of
all CAN cables

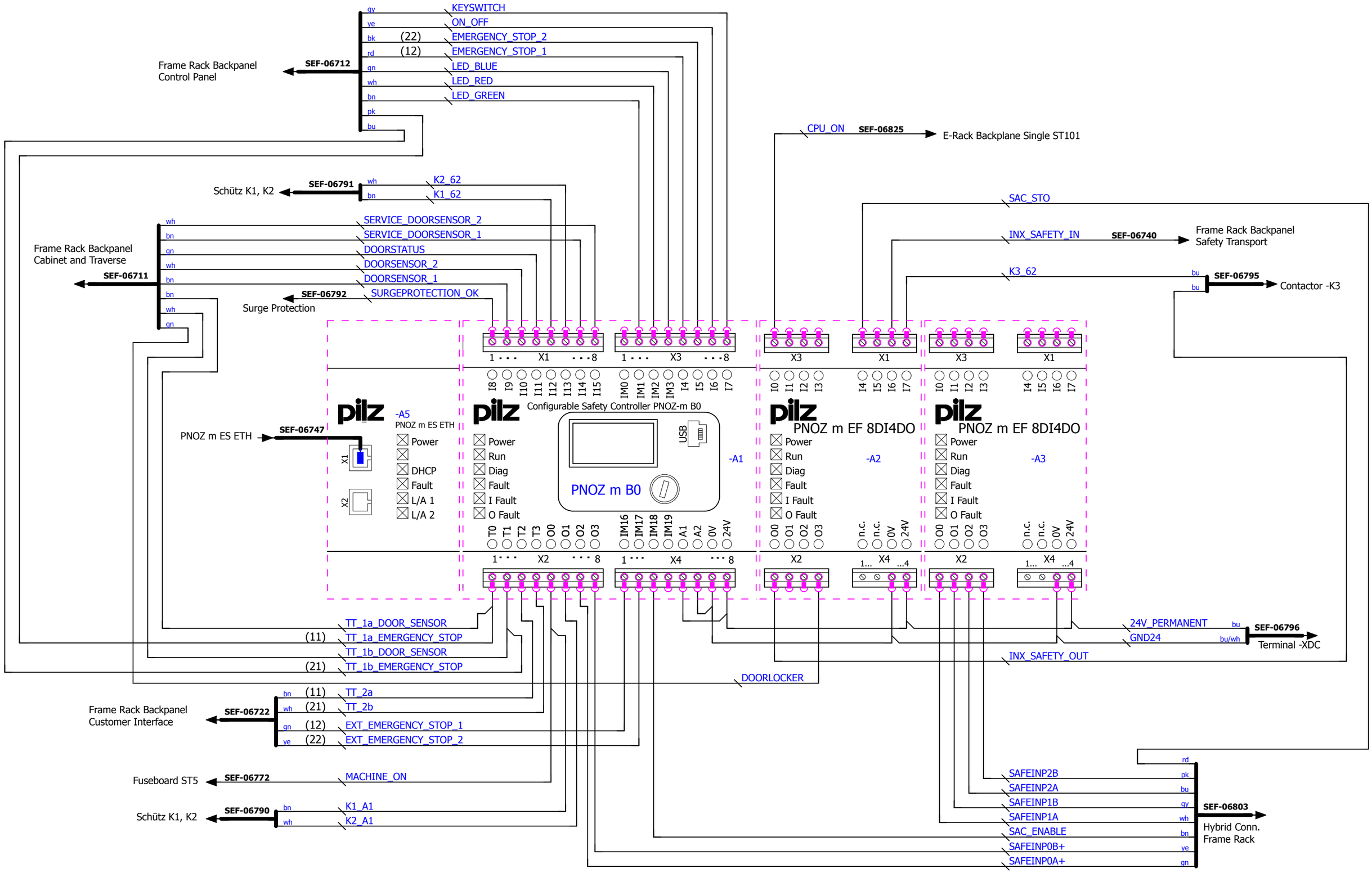
CAN = Internal System Bus

Connection Diagram of
all cables below baseplate

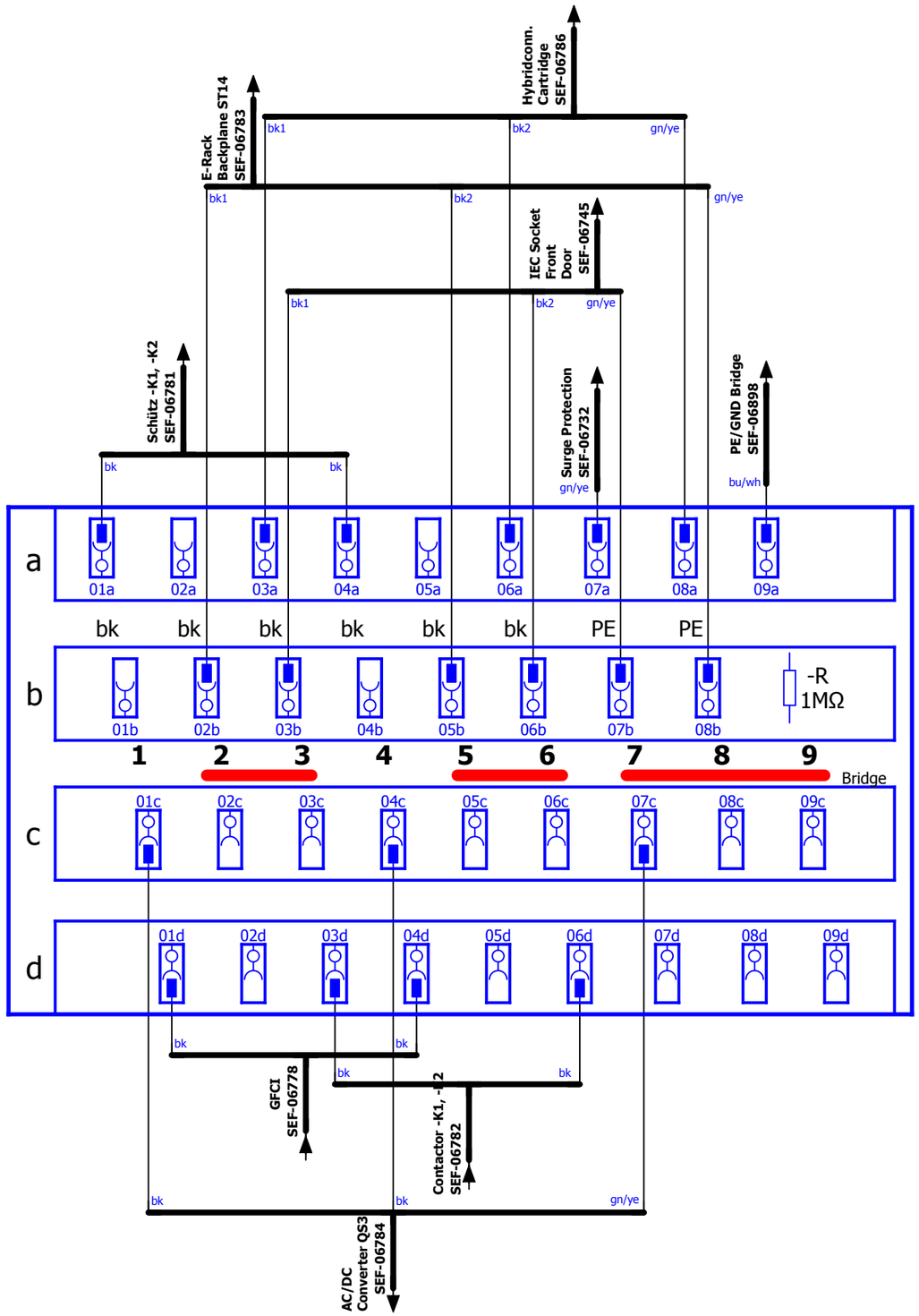
Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FK DELVOTEC	WB G6	Cable overview CAN	= 60-S-6xxxxx V1.1
		User	bagaricr					+ Overview
		Check	15.03.2018					Drawing No. 60-S-6xxxxx V1.1
		Norm		First	Created for	Created by		Page 5 / 10 Page



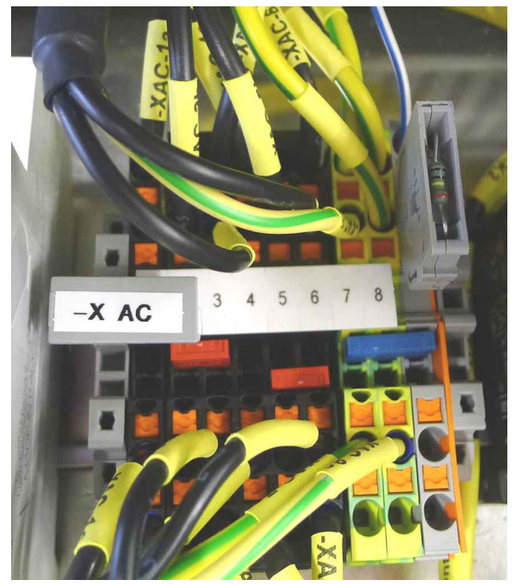
Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	Cable overview upper baseplate	= 60-S-6xxxxx V1.1	
		User	bagaricr					+ Overview	
		Check	25.04.2018					Drawing No. 60-S-6xxxxx V1.1	Page 6 / 10 Page
		Norm		First	Created for	Created by			



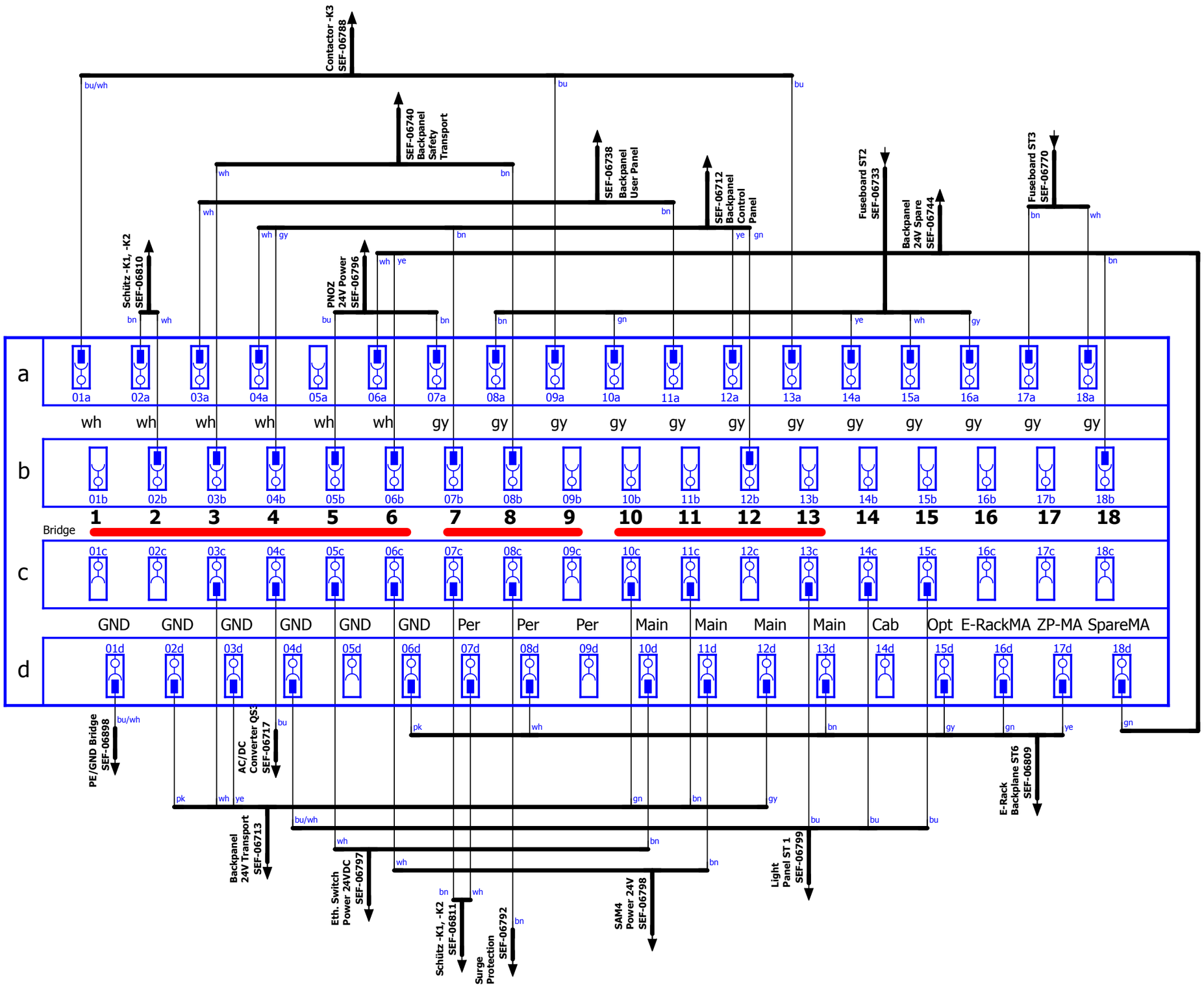
Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	PNOZ	=60-S-6xxxxx V1.1	
		User	bagaricr					+PNOZ	
		Check	15.03.2018					Drawing No. 60-S-6xxxxx V1.1	Page 7 / 10 Page
		Norm		First	Created for	Created by			



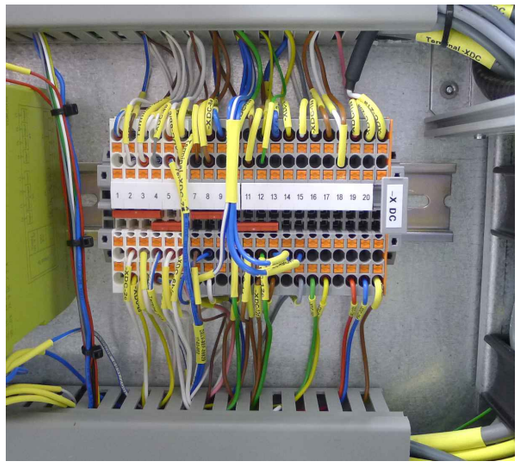
Terminal -XAC



Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	Terminal -XAC	=60-S-6xxxxx V1.1
		User	bagaricr					+Terminals
		Check	15.03.2018					Drawing No. 60-S-6xxxxx V1.1
		Norm		First	Created for	Created by		Page 8 / 10 Page



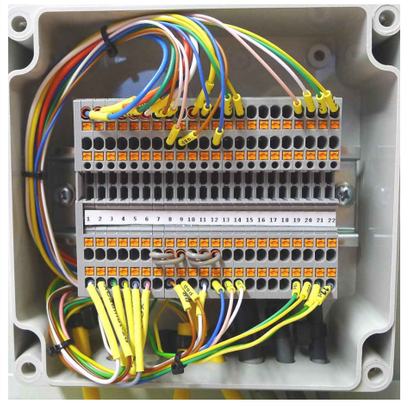
Terminal -XDC



Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	Terminal -XDC	=60-S-6xxxxx V1.1
		User	bagaricr					+Terminals
		Check	15.03.2018					Drawing No. 60-S-6xxxxx V1.1
		Norm		First	Created for	Created by		Page 9 / 10 Page

0	1	2	3	4	5	6	7	8	9

Terminal -XCabinet



Door Sensor 1
Signal Light ELE-03317
Door Sensor 5
Bridge
Frame Rack Backpanel "Signal Light" SEF-06828
Frame Rack Backpanel "Cabinet" SEF-06755
Door Sensor 2

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
a																						
	gy	gy	gy	gy	gy	gy	gy	gy	gy	wh	wh	wh	gy	gy	gy	gy	gy	gy	gy	gy	gy	gy
b																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
c																						
	Signal Light buzz	Signal Light rd	Signal Light ye	Signal Light gn	Signal Light bu	Signal Light wh	24V	24V	24V	GND	GND	GND	Sensor	Sensor	Sensor	Sensor	Sensor	Sensor	Sensor	Sensor	Sensor	Sensor
d																						

Name/Date/Change	Name/Date/Change	Date		Copyright DIN 34 reserved	FEK DELVOTEC	WB G6	Terminal -XCabinet	= 60-S-6xxxxx V1.1	
		User	bagaricr					+ Terminals	
		Check	15.03.2018					Drawing No. 60-S-6xxxxx V1.1	Page 10
		Norm		First	Created for	Created by			10 Page