ML 3031

Mobile Micrograph Laboratory on 4 wheels

Operation Manual

English

Version 1.0.0

Quality Management
Environmental Management
ISO 9001
ISO 14001
www.dekra-seal.com

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Contents

Impress

Please study this handbook carefully before initial use of the equipment. Keep this handbook at the working place, where you can easily find it and hand it over with the equipment to other persons.

1 Safety Regulations for Electrical Machines in Industrial Use

Danger

Electrical machines are equipment for use in industrial plants. During operation of the machine dangers may arise through rotating parts and/or high voltage.

In case of improper use of the machine during commissioning, operation and maintenance **severe injuries to persons and damage of property** may arise. The machine may only be used under the provisions stated in the instruction manual, additionally the local working conditions should be considered.

Warning

- Transportation, installation, commissioning, electrical connection, operation and maintenance may only be carried out by authorized and qualified specialist staff.
- Knowledge of the regulations for the prevention of industrial accidents and first aid measures is a prerequisite for safe and trouble-free operation of this system.
- This instruction manual contains the most important notes for operation of the system in accordance with safety requirements.
- This instruction manual and especially the safety notes contained, herein must be observed by all the persons working with the system.

Non-observance is a safety risk!

Our “general sales and supply conditions” always apply, as these are available to the user under www.cable-tec.net at any time. Any claims for warranty or liability in case of personal injury or property damage are excluded, if they can be traced back to one or several of the following causes.

- The equipment was not used according to the intended purpose.
- Improper installation, commissioning, operation, and maintenance of the equipment.
- Operation of the equipment with defective safety devices or with improperly mounted or non-functional safety and protection devices.
- Non-observance of the information in the operating instructions concerning installation, commissioning, operation and maintenance of the equipment.
- Unauthorized modifications of the equipment.
- Repair work performed improperly (no original spare parts) by unauthorized personnel.
- Events caused by the effect of foreign bodies and force majeure.

Hotline

In case of breakdown of the machine or in case of danger please call our service hotline :
Tel. +49 (0) 8554 94 23 9-0, Fax + 49 (0) 8554 94 23 9-20, eMail info@cable-tec.net

2 Function of the equipment

The Microlab ML 3031 is used for a reliable processing of microsections and their illustration, verification, assessment and storage via special PC software. Due to the mobile design the Mobile Lab ML3031 can be used anywhere in the production area.
The quality check of the “teach-in” crimps by micro section is important for the release of crimping tools and terminals. The recording of the micro sections can be used as proof of quality in case of any complaint. The documented values based on micro sections represent the proof of the quality and adherence of specifications. The crimped terminal will be fixed in a universal and easy-to-use crimp terminal holder. Directed by a guide rail the sample will be brought to a cutting station and afterwards to a grinding station. By a powerful and easy to learn PC software the image can be analysed, measured and filed. Calibrated gauge pins are included for the calibration of the measuring optics. These gauge pins have to be re–calibrated within adequate periods by a calibration laboratory.

3 Intended use

The mass production of wiring harnesses, especially in the automotive industry, must meet and be verified according to the highest quality standards. Failures can lead to substantial claims for damages and loss of money. Specified inspections and tests after any interruption in the production process are mandatory to comply with the rules of the manufacturer. Due to the high measuring accuracy and resolution the measurement readings are recorded with a high grade of accuracy. Microlab ML 3031 is designed to process fast and accurately crimp cross section analysis in a most accurate and efficient way. The requirements for temperature and humidity have to be carefully observed. Ignoring these rules can cause accidents or damages. Other use as described in this manual is not allowed and can lead to the loss of warranty claims and liability exclusion of the supplier. Any unauthorized modification of the gauge carried out by user will invalidate the manufacturer’s liability to any resulting damage or injury to personnel.

4 Technical data

Type	ML 3031
Power connection of charger	100 - 240 VA / 47 – 63Hz
Smallest magnification (15” monitor)	32 times
Biggest magnification (15” monitor)	120 times
Smallest crimp height for full picture	1.8 mm
Largest crimp height for full screen	7.0 mm
Measurement resolution per pixel	2.7 – 2.1 – 1.4 – 1.0 – 0.8 – 0.7µm
Optical zoom grades	0.75 – 1.0 – 1.5 – 2.0 – 2.5 – 3.0
Camera resolution	2592 x 1944 Pixel
Camera Interface	USB 3.0 port
Object illumination	Long-life LED light source for true to color pictures
Fine polishing	Electrochemical polishing
Crimp section	0.1 mm² - 6 mm²
Dimensions with closed cover (W x D x H)	520 mm x 800 mm x 1340 mm
Weight (without laptop)	62 kg

5 Scope of delivery

Standard delivery includse:

- ML 3031 on a trolley with four wheels and protective housing
- Power cable
- Zoom optics with digital colour camera
- USB cable for camera
- Dust cover for zoom optics
- Mouse and mouse pad
- Fine polishing pen with fixture 4.6 mm and connection cable, black 500 mm
- 250ml fine polishing liquid Electrolyte C250
- Plastic container with closure head, 90ml
- 6 pc. spare polishing tips 4.6 mm
- Cleaning sponge
- Sample holder Screwfix
- Calibration base with measuring scale incl. calibration certificate
- USB flash drive with analysis software X-Scan
- USB protection dongle for X-Scan
- 34 pc. of cutting discs in a container
- 20 pc. of grinding paper grit 600 (P1200)
- 1 pc roll paper towel (Kleenex)
- 1 pc cable cutter
- 1 pc cleaning brush
- 1 pc Allen wrench, 2.5mm
- 1 pc hook wrench
- 1 pc blocking pin
- Safety data sheet for C250

6 Packing

The device is fitted in special transport packaging.
According to the packaging law, we are obliged to take back empty packaging free of charge. We comply with this obligation as a matter of course. Returned packaging will be reused or recycled as far as possible.
Please contact us regarding the specific procedure for taking back old electrical equipment, batteries and packaging. Alternatively, you can reuse this packaging or send it for recycling via your recycling collection point.

7 Transportation

The transportation of the unit must be free of vibration and shock. The normal packaging is not seaworthy and cannot be used for water carriage. The packing does not protect against wet conditions. Tumbling of the unit during transportation is not allowed. Handle with care! Throwing or falling down of the packed unit can cause damages or total demolition.

8 Storing

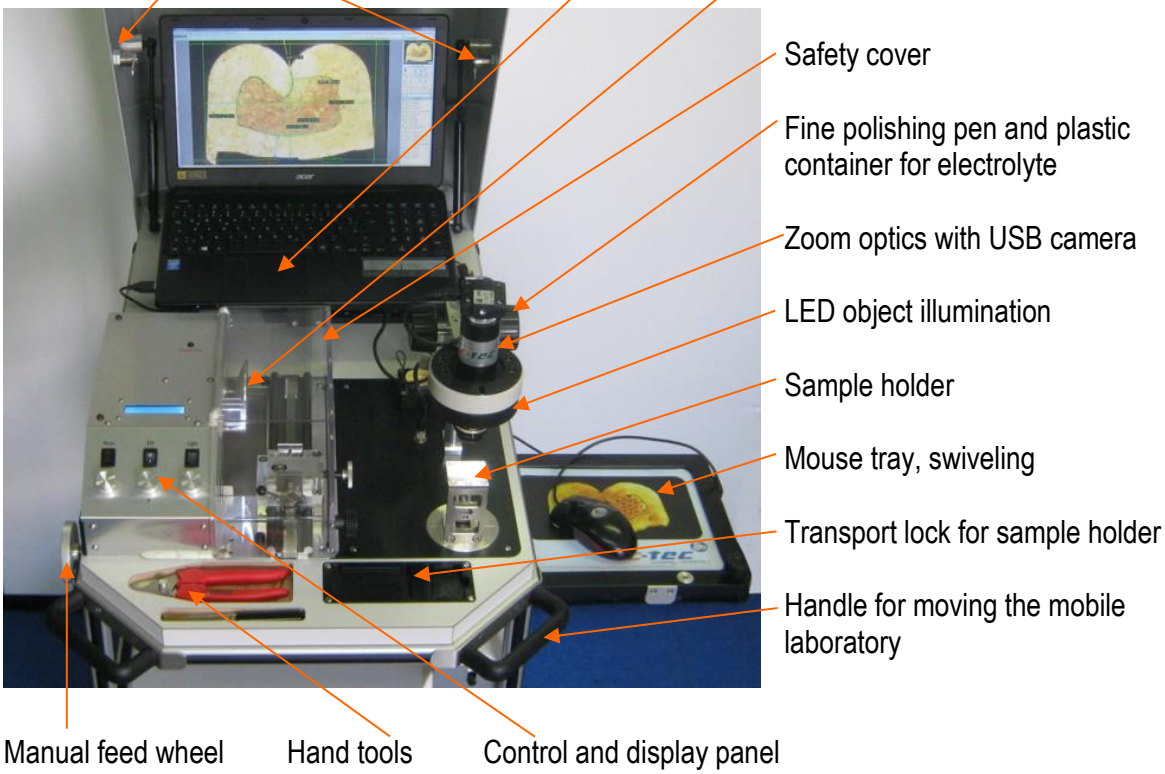
The micro lab has to be stored in a dry and well-tempered room. The optimum store temperature is at 20°C. Too high humidity can cause corrosion on important precision parts.

9 Set up of the Microlab

The ML 3031 has to be set up in a dry, dust free and well-tempered room. It must be protected from improper environment conditions like high or low temperature, direct sun light, vibrations and other mechanical influences, electromagnetic or magnetic fields, humidity or dust.
Driving on sloping ramps and uneven floor coverings with the mobile laboratory should be avoided. For stable parking of the device, the two front wheels are equipped with parking brakes.
If any defects, improper functions, damages or problems occur, which cannot be solved by the instructions in this manual, please contact C-tec for support.
DANGER TO LIFE: The unit shall be operated only by grounded power connection or power socket. Before open up the lab, switch off the unit from power supply! Do not open the unit during operation.

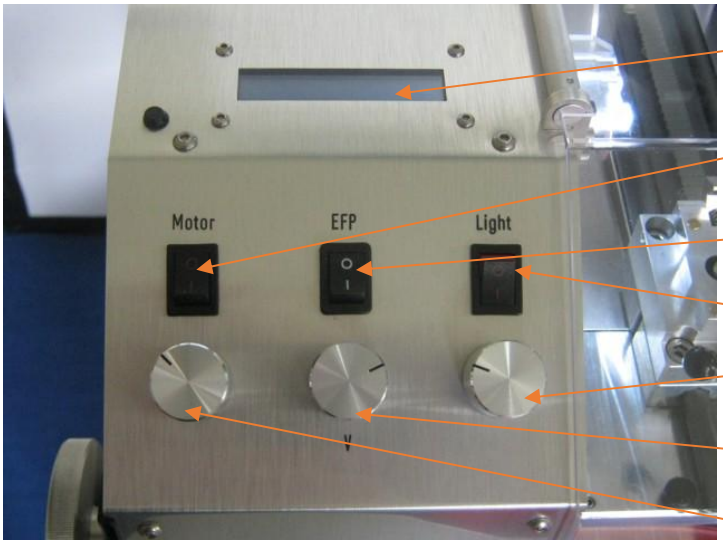
10 Starting up of the Mobile Lab

10.1 Parts and tools



*Please note: the laptop is not included in standard delivery

Control and display unit



Display for electronic fine polishing (EFP)

Motor switch

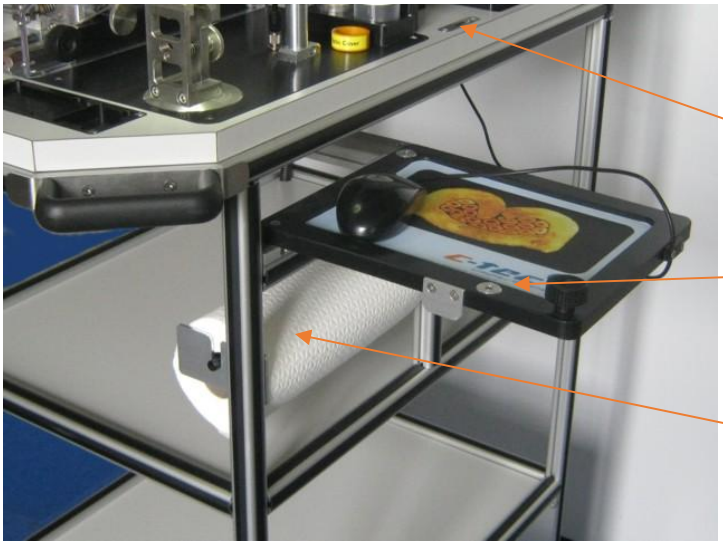
Switch for EFP

Switch for illumination

Regulator for illumination brightness

Regulator for polishing power

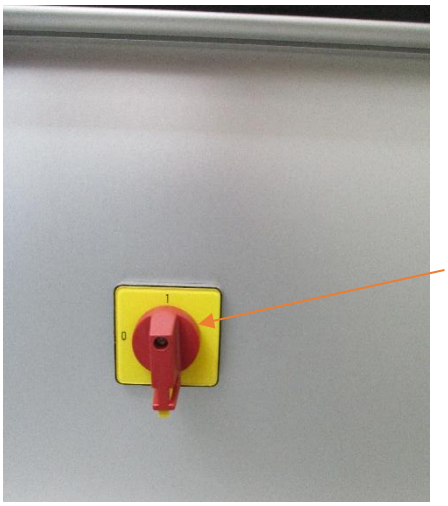
Regulator for motor speed



Lock of safety cover

Swiveling mouse tray with optical mouse

Dispenser for cleaning paper



Main switch


Power
100 - 240 VAC
50 - 60 Hz
Power connection
Fixed rolls, non steerable

10.2 Preparatory activities

10.2.1 Set up the ML 3031

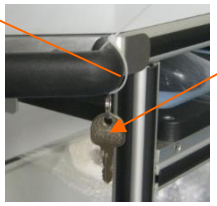
Open the transport on two adjacent front sides and remove the top cover.

Remove the scantlings

Now the ML 3031 can be taken out.

Unlock the hinged cover on both sides.

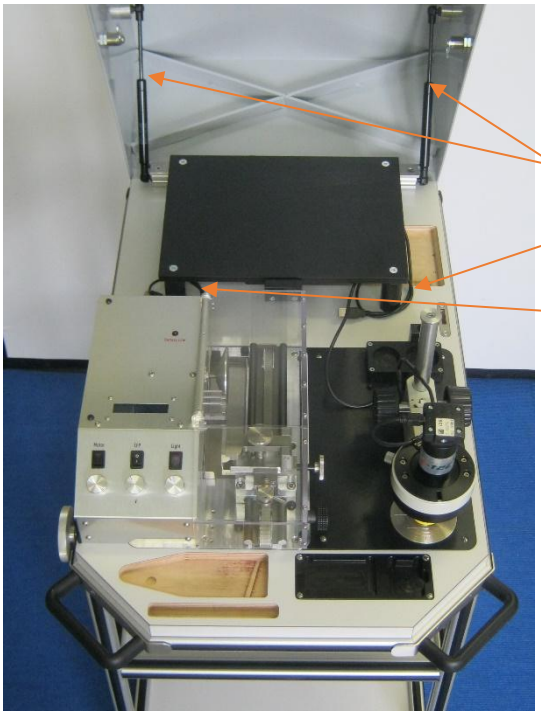
Left side of the lab.



Both locks can be unlocked with the same key.

Take out the complete accessories.

10.2.2 Place accessories



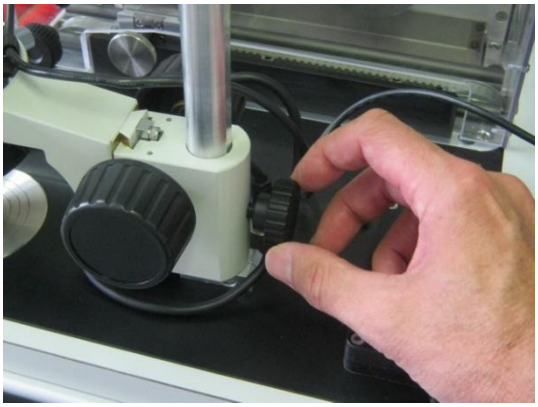
Lift the cover. It will stay open by the built-in pneumatic springs.

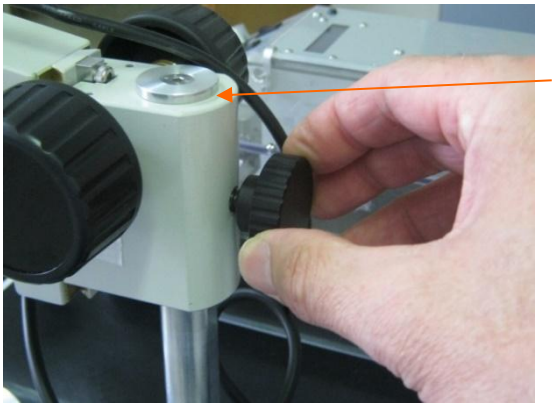
USB connection cable for digital camera

USB connection cable for mouse

Set the cable cutter and the cleaning brush in place.

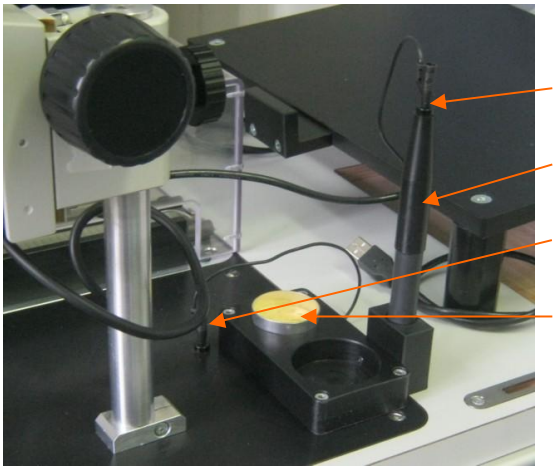
Loosen the safety screw of the optic support and shift the holder up to the top limit. Fix the screw again.





No gap!

Set up the electronic fine polishing system (EFP)



Connector at the polishing pen

Place polishing pen and connect it with the cable.

Connector at the device

Moisten the cleaning sponge with water.

Fill up working container with polishing liquid / electrolyte

Working container

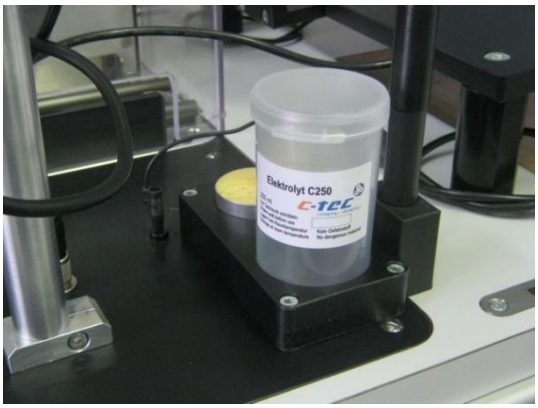
Fill up the working container with C250 liquid by 1/3 (approx. 25 ml) out of the storage container.

Important: C250 is a non-hazardous liquid!

Refill by 1/3.

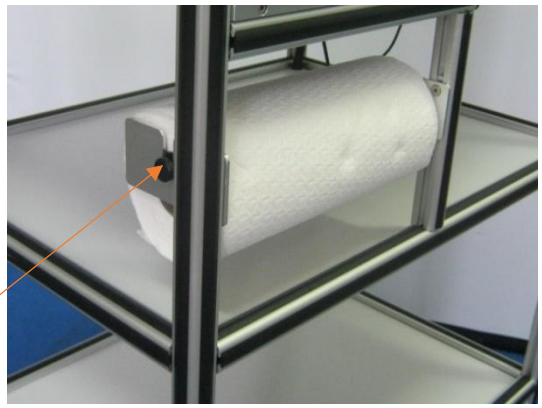
Note: Close the storage container firmly after use and store them in a dark and safe place.

Storage container



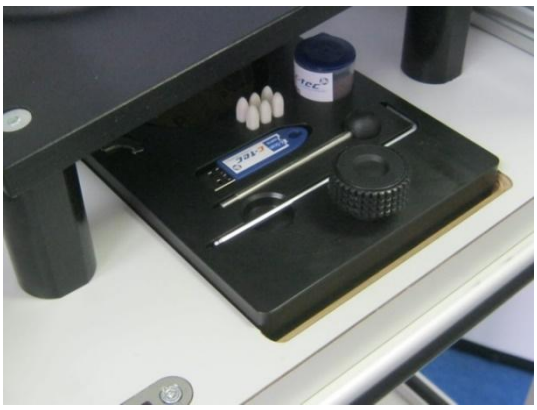
Set the working container with the electrolyte in place.

Place the paper roll



Push the rod from one side till it locks in the groove.

Tools and spare parts set



Insert the panel with the tool and spare parts set from the right side into the cavity.

Power supply

Connect the power supply unit of the laboratory to the factory power supply.
The factory power supply must be properly earthed (protective conductor). The device can be supplied with voltages from 100V AC to 240V AC.

10.2.3 Set up of the laptop

Important: Standard delivery does not contain the laptop. It can be ordered separately at C-tec or provided from customer.
Please note the current minimum requirements for the laptop for the operation of the X-Scan software.

Place the laptop on the board. We recommend to fix the laptop on the board (screwing, sticking…) to avoid damage if moving the mobile lab.

How to differentiate USB 2.0 from USB 3.0:

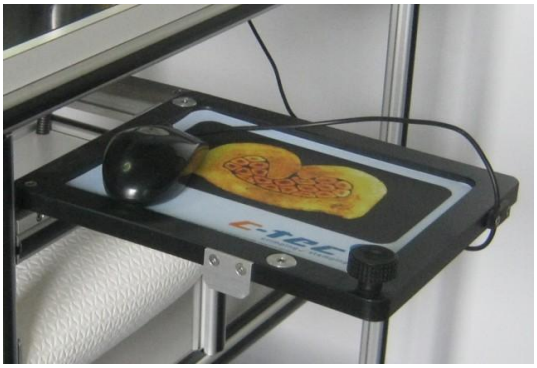
Black = USB 2.0 interface 

Blau = USB 3.0 interface 

Important: The digital camera which comes with the zoom optic may only be connected to an USB 3.0 interface.

First connect the cable of the mouse which is provided as standard accessory to an USB port (USB 2.0 as well as USB 3.0 are possible). The connection cable is on the left side under the laptop board.

Swivel mouse tray



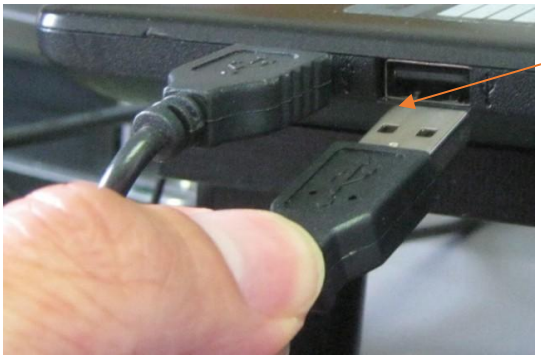
10.2.4 Installation of the analysis software X-Scan

See manual X-Scan, chapter 2

10.2.5 Installation of the USB digital camera driver software on the laptop

See manual X-Scan, chapter 3

Close all open programmes including X-Scan on the laptop. Now connect the USB 3.0 cable from the USB digital camera to an open USB port on your laptop.



Connect the USB 3,0 cable coming from the USB digital camera to your laptop.
Note: Choose always the same USB port for the camera to avoid reconfiguration of the PC.

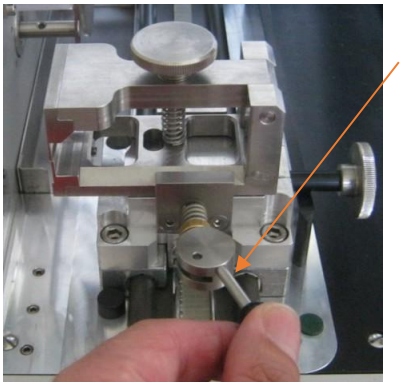
Finally connect the USB dongle to another USB port of your laptop (USB 2.0 or USB 3.0)
An installation of dongle software is not necessary.

The preparation works are finished now.

10.2.6 First start of X-Scan
See manual X-Scan, chapter 4

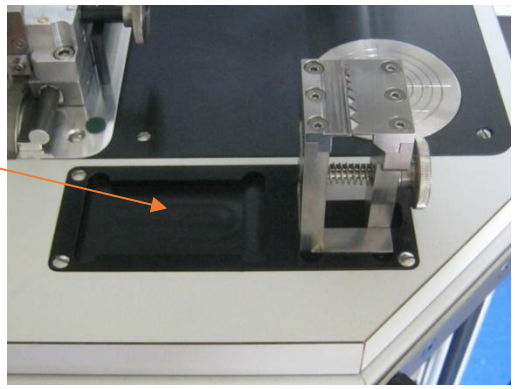
10.2.7 Calibration of analysis software X-Scan
See manual X-Scan, chapter 6

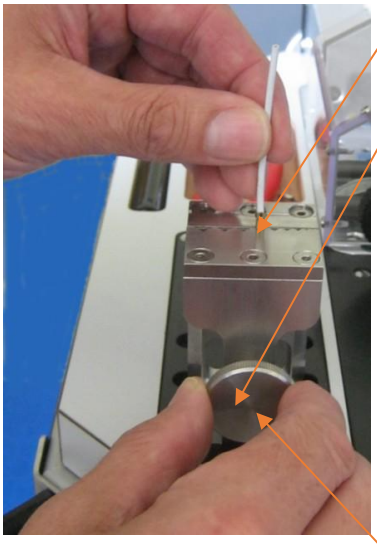
10.3 Perform a microsection
10.3.1 Correct setting of the terminal in the terminal holder



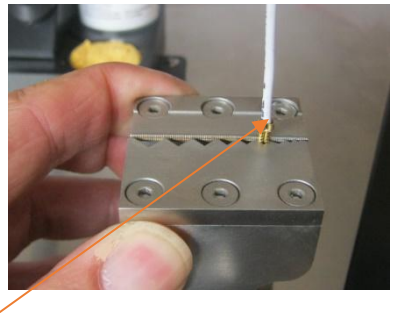
First, put the fixation lever to the left side.

Then remove the sample holder and place it in the transport lock.

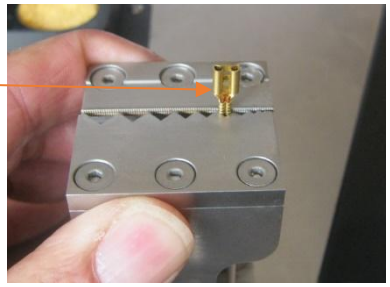


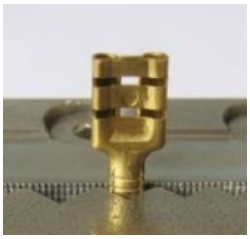


Put the crimp into the best fitting prism. The best prism is, when the top clamping plate has in closed position a distance of approximate 0.5 mm to the bottom clamping plate. When you have found the right position, push the top side with your thumb to the bottom.



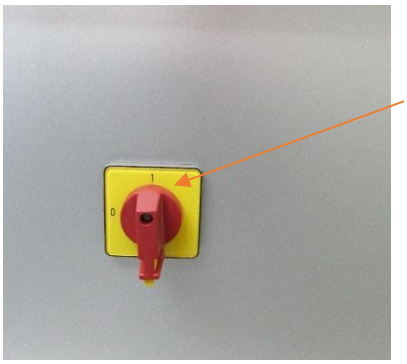
Cable side can be out or terminal side can be out.





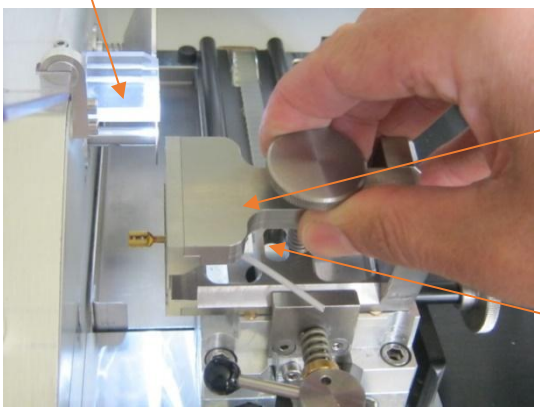
Now close the knurled head screw tightly. The crimped terminal should be fixed in a right angle. If this is not the case, loose the head screw a little and redo the setting of the terminal in the sample holder.

10.3.2 Cutting and grinding of the crimp sample



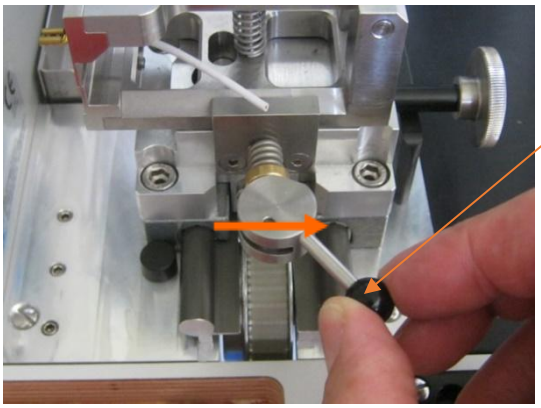
Turn the main switch to position 1.

The illumination will switch on immediately after turning the main switch.

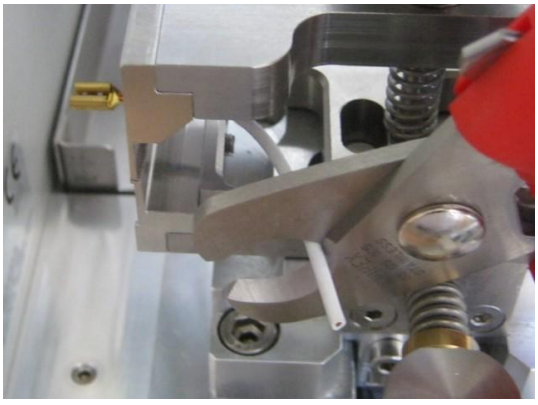


Insert the sample holder with the sample in the carrier base on the cutting and grinding unit. To make the insertion easier, insert the sample holder first with the front jaw and then lower it down backwards.

Important: Make sure that the position bolt on the carrier will meet the oblong hole in the sample holder.

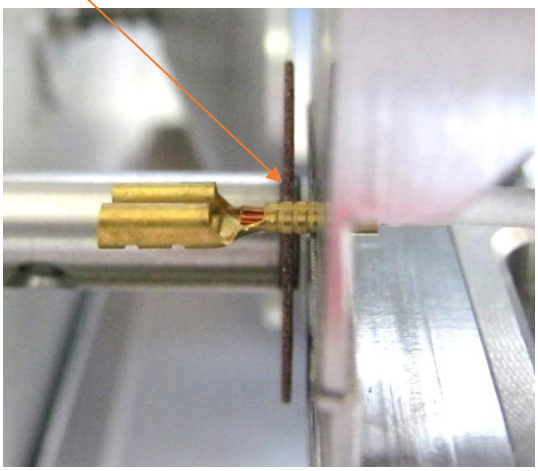


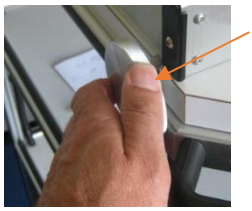
Fix the sample holder by turning the lever to the right side.



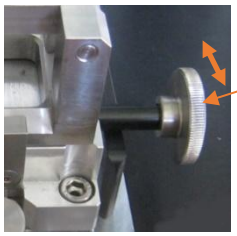
Cut too long cable ends with a cable cutter.

Move the sample holder near to the cutting blade by turning on the manual feed wheel.



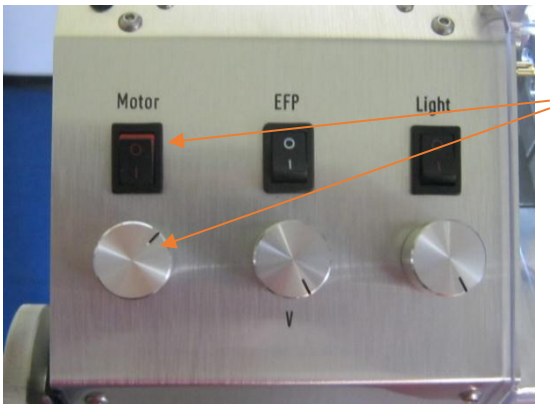


Turn the manual feed wheel till the crimp is shortly before the cutting blade.



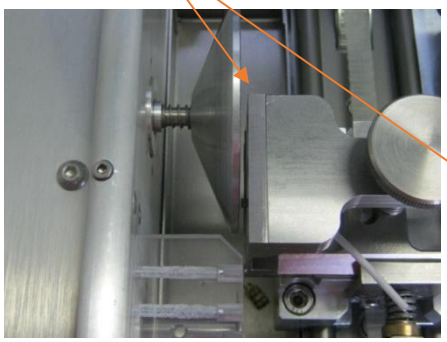
The cutting position can be changed by turning the fine adjustment knob.
Counterclockwise = away from blade
Clockwise = towards blade

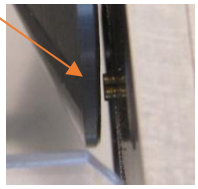
Now close the safety cover.

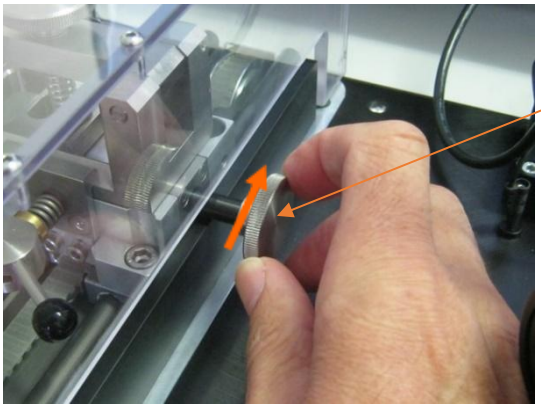


Switch on the main motor and set the motor speed as shown in the picture.

Cut the terminal by turning the manual feed wheel carefully and turn further on to approach the grinding disc.

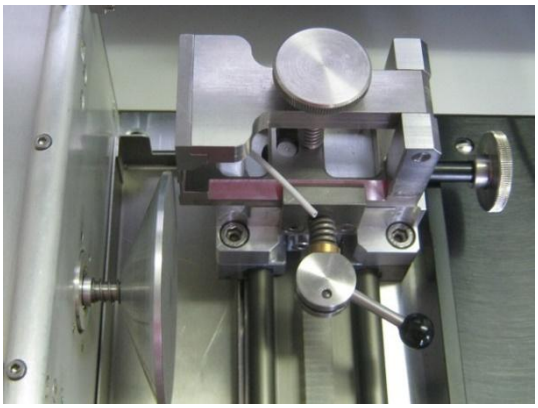






Turn the fine adjustment wheel clockwise until you can hear a clear grinding noise.

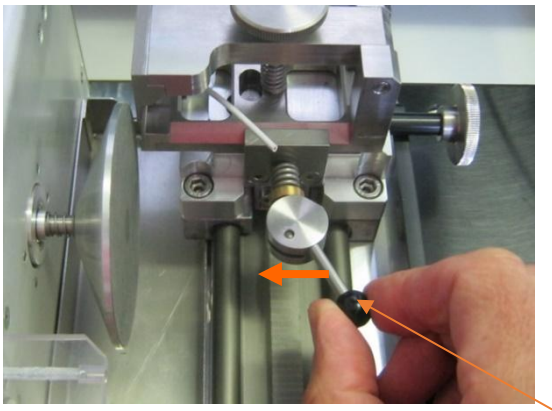
Note: The grinding disc is spring loaded. There is no danger of damage if the readjustment is too tight.

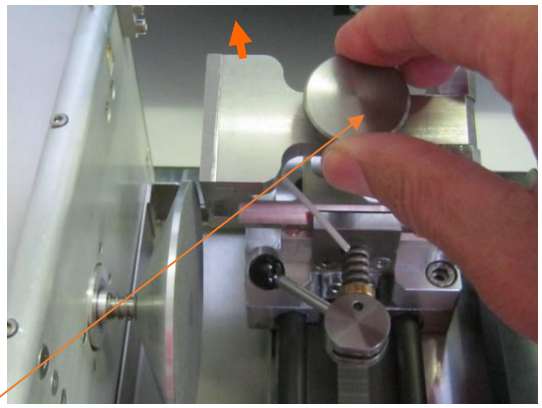


Move the cut terminal surface along the grinding disc by turning the manual feed wheel and turn on until the movement has reached the grinding disc.

Usually it is sufficient to pass it one time.

The main motor can be switched off now.

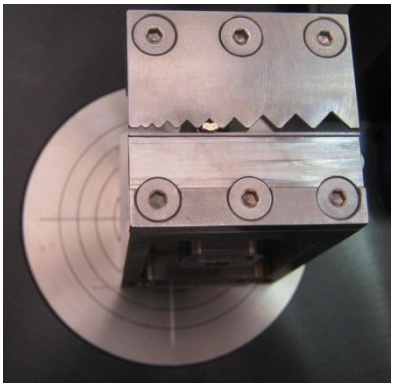


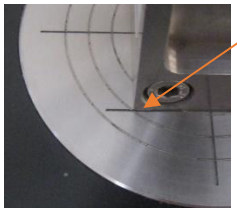


Open the safety cover and unlock the terminal sample by turning the lever to its left position.
Unload the sample holder.

10.3.3 Fine polishing of the grinded surface

Place the sample holder with the grinded X-section under the optics.





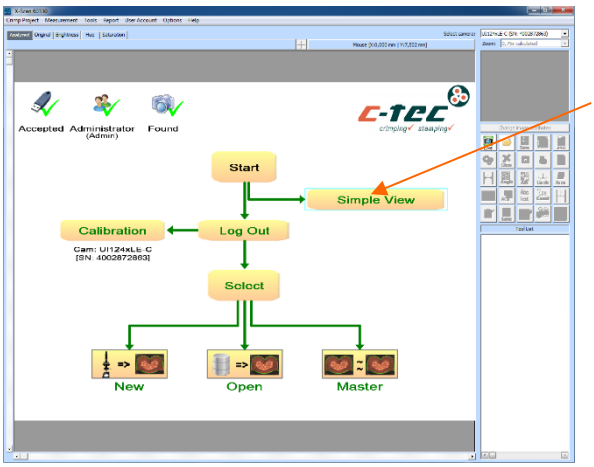
The lower end of the terminal holder should meet the highlighted line.

Remove the dust cover from the optics.

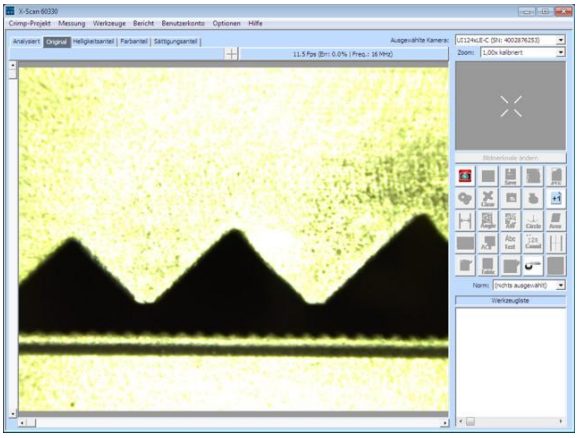
Start with the smallest zoom ratio.

Start X-Scan

Start the software X-Scan on your laptop.

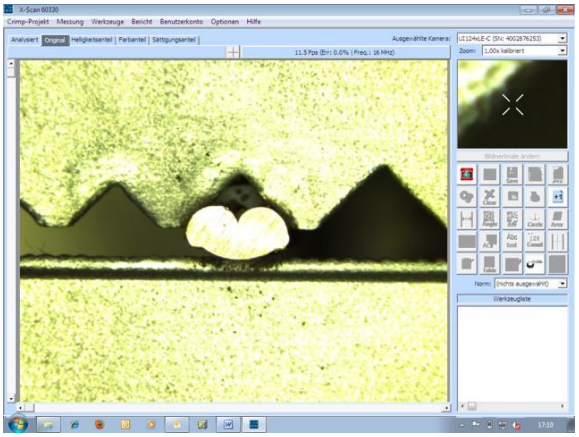


Click on the button “Simple View”.

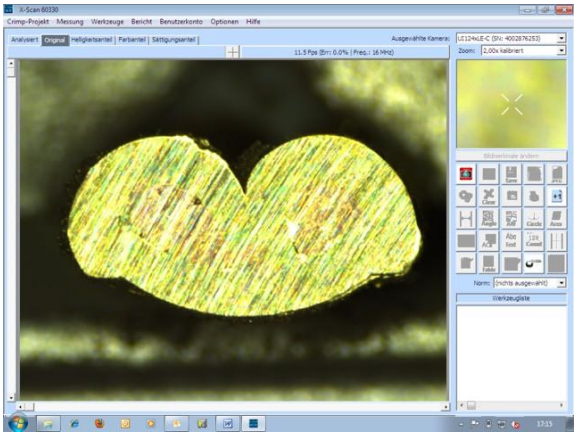


Move the sample holder left and right until you can see the X-section on the monitor.

Move the sample holder along the line.



Place the terminal in the middle of the monitor.



Now adjust the zoom step by step until you get a clear and screen filling picture.

Adjust the focus with the knurled screw until the picture gets sharp.

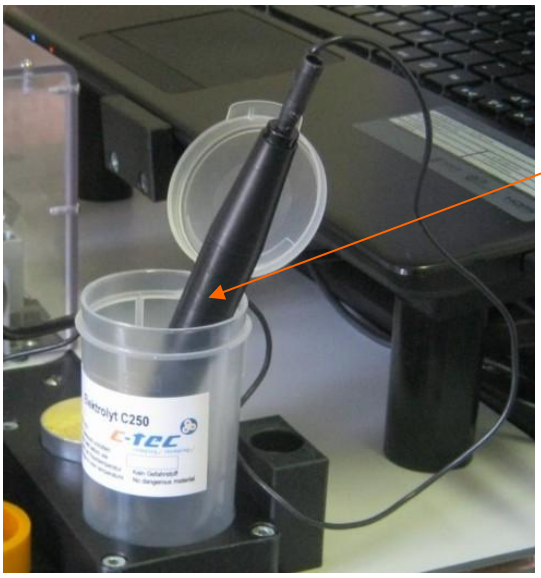
Finally adjust the brightness of lighting.

Finish the grinded crimp surface with the electronic fine polishing unit

Display which shows the polishing power

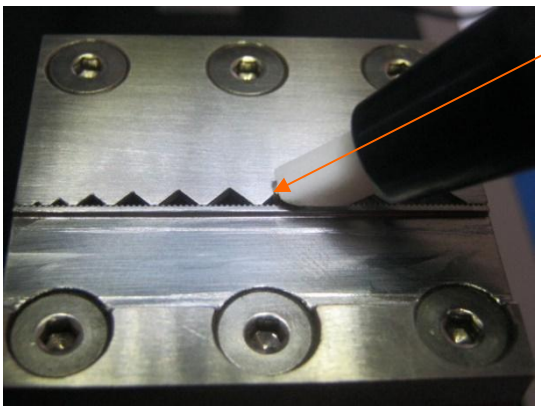
Switch the EFP on and set it to a voltage of 12.5V.

Start with a polishing power of 100%. If you process terminals smaller than 0.5 mm² you should reduce this power.



At first put the polishing pen for about 20 seconds into the working container with polishing liquid C250.

By touching the edge of the bottle with the tip of the polishing pen, the redundant liquid can be removed.

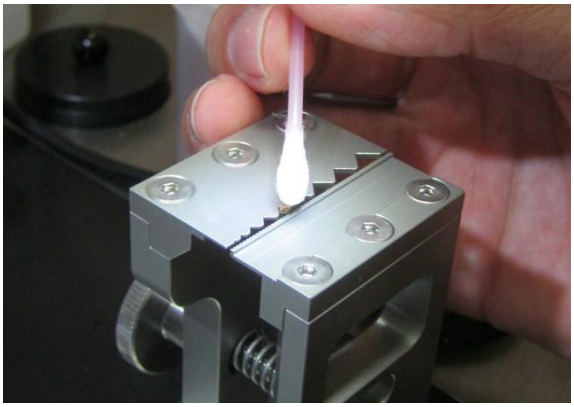


Now touch the grinded surface with the tip of the polishing pen and stay there for about 10 – 20 seconds.
Note: Crimped terminals can vary a lot. Therefore, different polishing time is required!

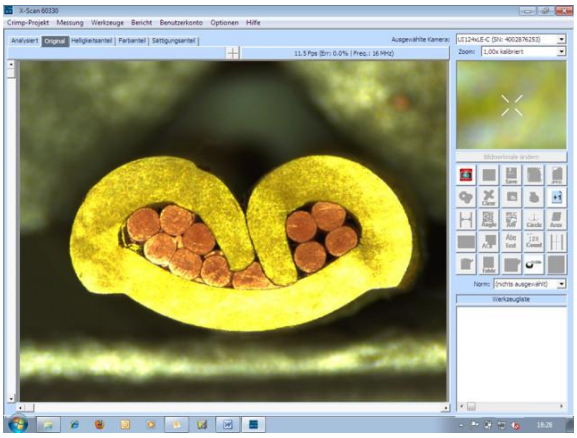
Bars will show the polishing power.
(Min.: 2 bars)

Clean the polishing tip with a cleaning paper after every fine cleaning work.
It will elongate the lifetime of the tip.

After the polishing process, the surface of the cross section has to be cleaned with a cleaning paper.

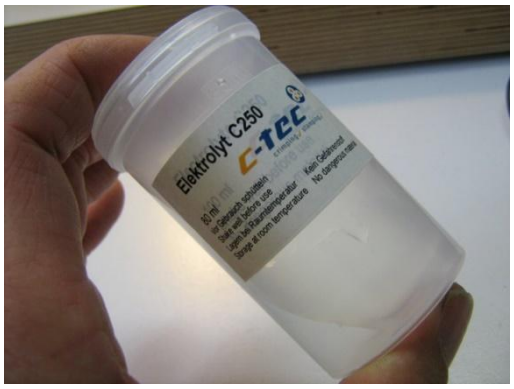


Sometimes it can be better to use a Q-tip with cleaning alcohol to clean the fine polished cross section. The result can be better than using a dry paper.



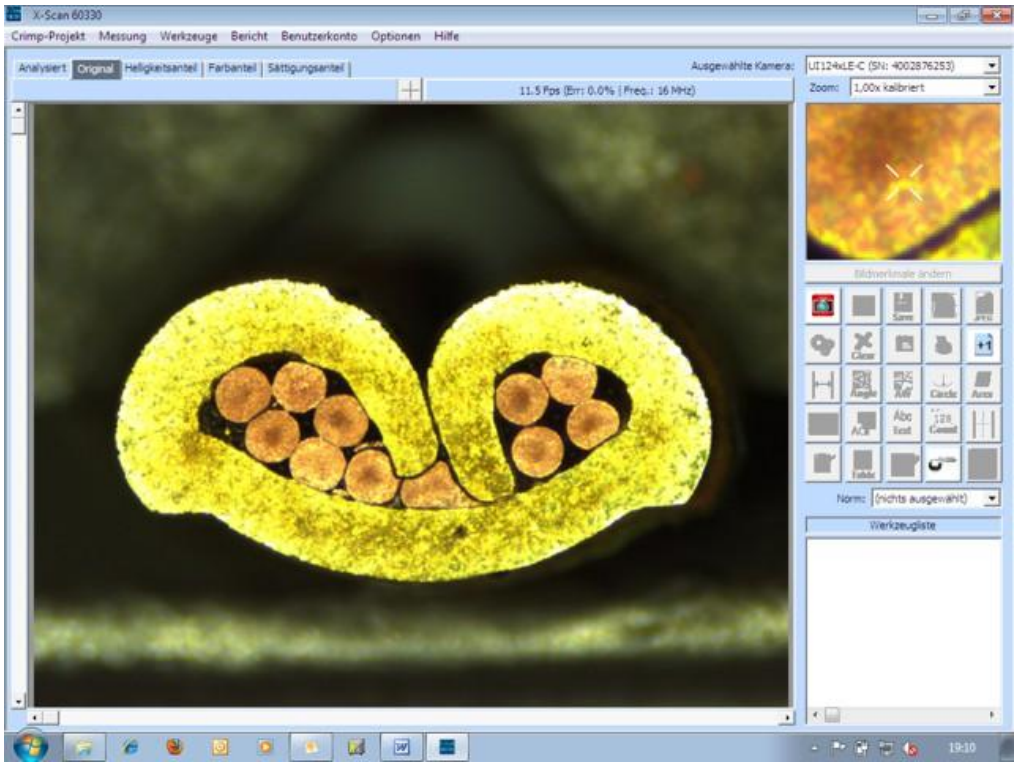
Possible result by using polishing liquid C250.

If you are not satisfied with the quality of the fine polishing procedure, you can repeat it several times.



The working container with polishing liquid C250 must be shaken time by time (every hour or before using the liquid).

10.4 Analysis of a crimp cross section



See manual X-Scan: Chapter 7 - Simple measurement
Chapter 8 - Automatic measurement

11 Handling, Maintenance and Servicing

To keep the Microlab 3031 in a proper condition the following provisions have to be observed:

- Set up of the unit in a dry and well-tempered room.
- If the unit is not in operation, the optics shall be protected with the dust cover.
- Close the working container with polishing liquid C250 after every use.
- Change the fine polishing pen tips when they become black or if the result is not good any more.
- Change the cutting disc if it becomes smaller than 15 mm in diameter.
- Change the grinding paper if it shows damages.
- Don't use any strong cleaning chemicals.
- Don't remove the safety covers.
- Switch off main motor directly after cutting and grinding.
- Empty and clean the cutting and grinding waste container every day.
- Clean the working surface every day.

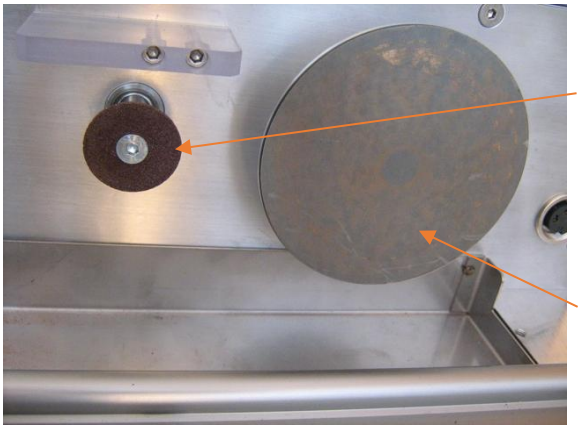
12 Periodical inspections

The ML 3031 is a high-quality and precise measuring instrument used for quality control. It is therefore subject to regular recurring calibration. An initial calibration is performed before the instrument is delivered. In case of normal use of the device, re-calibration should be performed at intervals of 3 months. To ensure valid results, the accuracy should be checked daily. The calibration scale is subject to the measuring equipment management and shall be calibrated regularly by a certified calibration laboratory.

13 Decommissioning

Don't dispose the unit with residual waste!
This unit is subject to the European Community Directive for used electrical and electronic devices and may not be disposed in regular household garbage.
After period of use the device can be returned to C-tec for duly recycling.

14 Wear parts



(1) Cutting disc ø 24mm, inner diameter ø 5mm

(2) Grinding paper grit 600 (P1200) ø 73mm

(3) Storage bottle Elektrolyte C250, 250ml

(5) Roll of paper towel

(4) Cleaning sponge

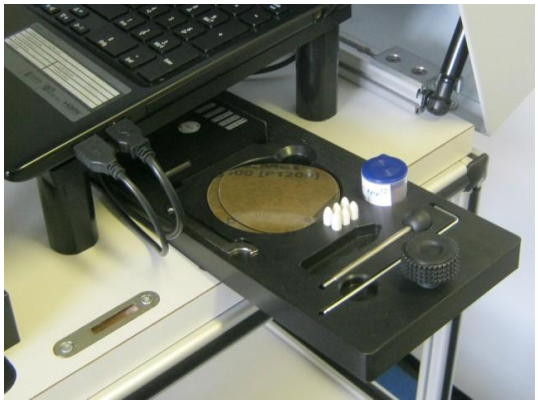
(6) Tip for fine polishing pen 4.6 white

Pos.	Part Nr.	Description
(1)	101070	Cutting disc 24/5 (container with 24 pcs)
(2)	100832	Grinding paper 600 / Ø73
(3)	101184	Electrolyte C250 (250 ml)
(4)	101077	Cleaning sponge
(5)	101446	Roll of paper towel
(6)	101385	Polishing tip 4.6mm white

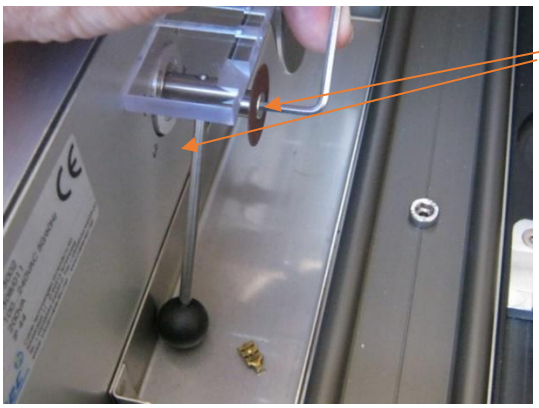
15 How to change wear parts

15.1 Change of cutting disc

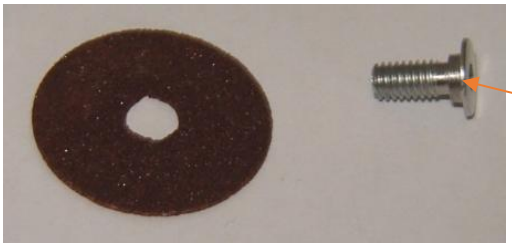
Attention: Switch off the main switch and disconnect the power plug.



Tools and spare parts can be found in the panel beneath the laptop.
It can be taken out by moving it to the right side.



Hold the shaft with the blocking pin and open the blade fixing screw with the 2.5 mm Allen wrench (open counter-clockwise).



Replace the worn cutting disc with a new one.

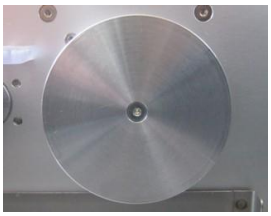
Important: The cutting disc must fit on the collar of the screw.

15.2 Change of grinding paper

Attention: Switch off the main switch and disconnect the power plug.

Remove the old grinding paper.

Remove all the glue remains with cleaning alcohol and a paper towel from the grinding disc.



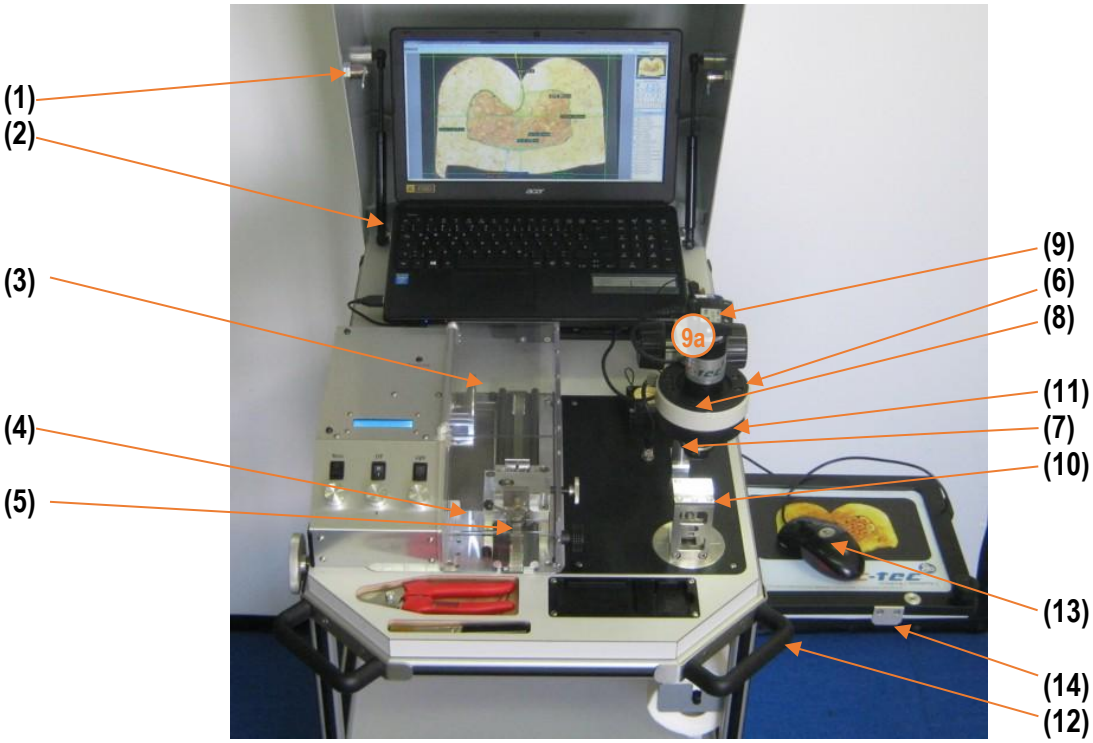
Grinding disc must be clean.

Stick down the new grinding paper on the grinding disc and press it down on the complete surface.
Mainly the outer edge of the grinding paper has to be stuck very properly.

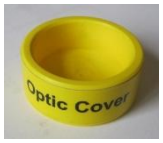
15.3 Refill working container with polishing liquid

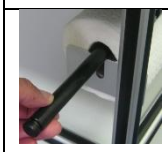
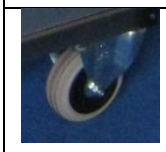
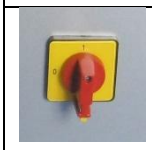
See chapter 10.2.2.

16 Spare parts



No.	Art. no	Description
(1)		Lock complete with keys
(2)		Pneumatic spring
(3)	101807	Safety cover
(4)		Dust tray
(5)	101349	Clamping base for sample holder Screwfix
(6)	100672	Microscope holder with coaxial coarse drive for focus adjustment
(7)	100657	LED ring light LR-45/90
(8)	100593	Zoom optics 0.75 – 3x
(9)	102326	Digital colour camera USB 3.0 with CMOS sensor, 2592x1444 pixel
(10)	101275	Sample holder Screwfix
(11)	101140	Clamping ring for zoom objective VZM 0.75-3x
(12)		Handle with mounting plate
(13)		Optical mouse
(14)		Mouse tray complete

No.	Art. no	Description
	304392	ACT-Motor
	101145	Gear wheel with collar, number of teeth 12
	101148	Gear wheel, 44 teeth (2 pcs are needed per device)
	101811	HTD Gear belt 9 x225 mm
	304437	HTD Gear belt 9x177mm
	102412	Gear wheel Z36
	102413	Gear wheel Z15 for cutting shaft
	101147	Gear wheel T5 (32 teeth) for manual feed wheel
	101808	Belt T5 for manual feed wheel
		Dust cover for optics
	101216	Fine polishing pen (without fixture for polishing tip)
	101527	Fixture for polishing tip 4.6 mm square

	101511	Cable for polishing pen black, 500 mm
	101251	Plastic container for polishing liquid
		Power cable EU
		Rod for paper roll
		Steering wheel with holding brake
		Fixed wheel
		Main switch
	101155	Cleaning brush
	101153	Cable cutter

Tool and spare parts set

No.	Art. no	Description
(1)	102360	Calibration base with measuring scale incl. calibration certificate
(2)		Hook Wrench
(3)	101488	USB protection dongle for X-Scan (only as a replacement in case of loss or damage)
(4)	101246	Blocking pin 2.9
(5)	101243	Allen wrench 2.5 mm
(6)		Panel with slots for tools

Please consider your environmental responsibility before printing this document.

Version history:

Date	Version	Responsible	Amendment
05.05.2026	1.0.0	Marlene Egginger	Original state of English version

Notes: