oertli®
SWITZERLAND

OS 4™
SERVICE MANUAL

VV016042
VC860100 / VC860200 / VC860300

EYE SURGERY. SWISS MADE.

CAUTION:
U.S. Federal Law restricts this device to sale by or on the order of a physician.

CE
0297

Document no: VV016042
Version: 10
Date of publication: 2021-03-23
Original service manual

© Oertli Instrumente AG. All rights reserved.
Oertli and the Oertli logo are registered trademarks of Oertli Instrumente AG.
OS 4, SPEEP, HFDS and ParaProg are trademarks of Oertli Instrumente AG.
This service manual shall not be used without authorization for competitive purposes without explicit consent of Oertli Instrumente AG.
Subject to modifications.

Contact and service:
Oertli Instrumente AG
Customer Service and Support
Hafnerwisenstrasse 4
CH – 9442 Berneck, Switzerland
Tel: +41 (0)71 747 42 00
Fax: +41 (0)71 747 42 90
E-mail: css@oertli-instruments.com
Website: www.oertli-instruments.com

Contents

1 About this document

The service manual is a supplement to VV016040 OS 4 instructions for use and describes safe and appropriate service and maintenance of the device.
The technical data of the unit can be found in the technical data chapter in the instructions for use.

1.1 Warnings and symbols in this manual

Warning sign/word	Danger level	Consequences of non-compliance
DANGER!	Imminent danger	Death, serious injury
WARNING!	Possible danger	Death, serious injury
CAUTION!	Possibly dangerous situation	Slight injury
NOTE!	Possibly dangerous situation	Material damage

Explanation of the structure of a warning message using the example of a warning:

WARNING!
Indication of the hazard
Indication of a potential impact
► Steps to take to avoid the hazard.

Symbol	Meaning
	Safety sign
	Electrostatic sensitive devices
	Information that facilitates easier handling of the device

1.2 Warnings and symbols on the unit

	Warning label LASER CLASS 4/3R PRODUCT
	Refer to VV016040 OS 4 instructions for use

2 Safety instructions

DANGER!
Electric shock
Risk of death or serious injury
► Unplug mains power cord before opening the unit!

DANGER!
Laser radiation of working beam
Eye or skin damage
► Avoid eye or skin exposure to direct, indirect or scattered radiation.
CLASS 4 LASER PRODUCT

WARNING!
Laser radiation of aiming beam
Eye or skin damage
► Avoid direct eye exposure.
CLASS 3R LASER PRODUCT

WARNING!
Repairs to the device may only be performed by service technicians authorized by Oertli and based on the last valid version of the service manual. Improper repairs can compromise the safety of staff and patients and will void any warranty.

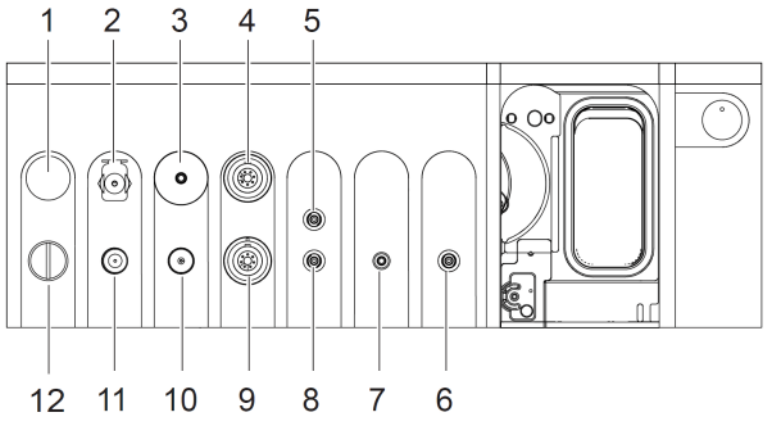
NOTE!
This unit contains **E**lectrostatic **S**ensitive **D**evices (ESD). When opening the unit, it is very important that both you and the unit are grounded at all times.

3 Abbreviations and terms

ccw/cw	Counter clock wise / clock wise
na	Not applicable
PLD	**P**ower **L**aser **D**iode → working beam of laser
TLD	**T**arged **L**aser **D**iode → aiming beam of laser
MED	**ME**asuring **D**iode of the laser module

4 Device overview / versions

4.1 General overview



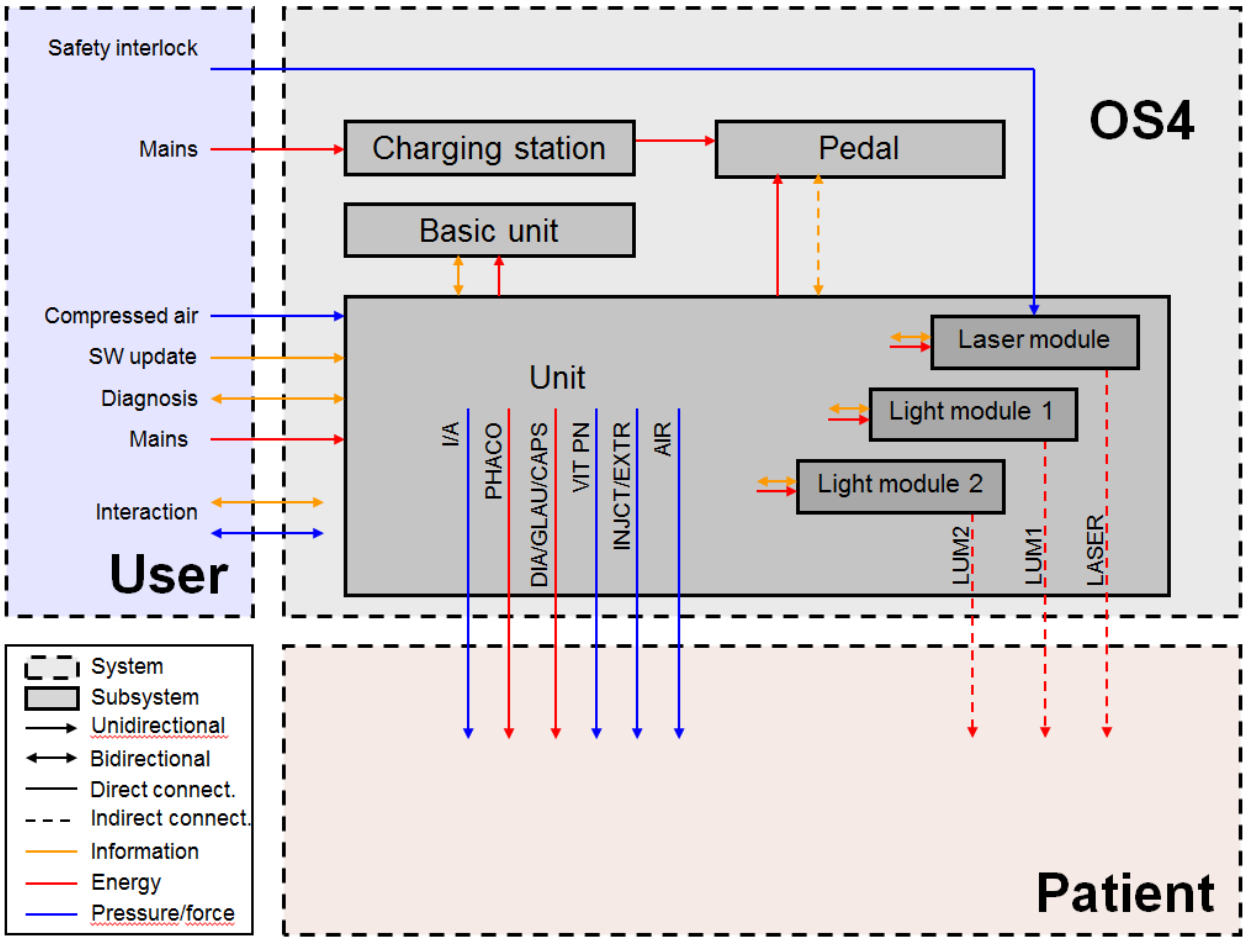
4.2 Anterior posterior segment version VC86020X

1	N. a.	7	Connector for AIR
2	Connector for Visco (EXTRACTION/IN-JECTION)	8	Connector for pneumatic cutter (green)
3	N. a.	9	Connector for high frequency applications (DIA, CAPS, HFDS GLAU)
4	Connector for PHACO handpiece	10	Connector for light LUM 2
5	Connector for pneumatic cutter (black)	11	Connector for light LUM 1
6	Connector for gas forced infusion (GFI)	12	N. a.

4.3 Anterior posterior segment version with endo laser function VC86030X

1	Button LASER STOP	7	Connector for AIR
2	Connector for Visco (EXTRACTION/IN-JECTION)	8	Connector for pneumatic cutter (green)
3	Connector for laser probe	9	Connector for high frequency applications (DIA, CAPS, HFDS GLAU)
4	Connector for PHACO handpiece	10	Connector for light LUM 2
5	Connector for pneumatic cutter (black)	11	Connector for light LUM 1
6	Connector for gas forced infusion (GFI)	12	Key switch for LASER

5 Block diagram OS4



6 Installation

6.1 General remarks

When placing the device, ensure clearance of at least 20 cm around the ventilation openings. Do not cover the device when in operation.

6.2 Power supply

WARNING!
Live components are exposed. Improper work on the device.
Risk of electric shock.
- ► Unplug power cable from mains socket before replacing fuses.
- ► Do not use any makeshift fuses.

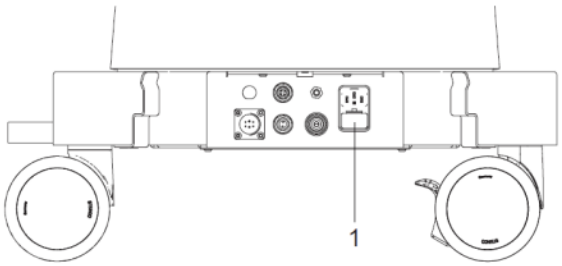
The device is supplied with two spare fuses. Always replace defective fuses with new fuses of the same type.
You will find the values printed next to the power source on the device.

The device is designed for two separate voltage ranges.

Type	Value	
Supply system	Voltage: Frequency: Output:	115 VAC 50 Hz/60 Hz 600 VA

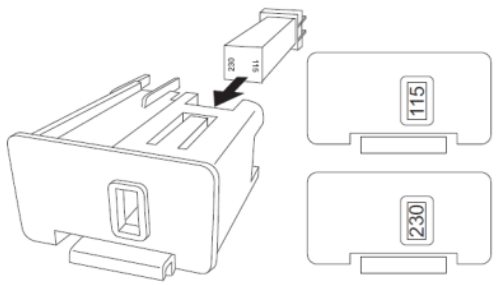
Type	Value	
Supply system	Voltage: Frequency: Output:	230 VAC 50 Hz/60 Hz 600 VA

Select the voltage at the fuse drawer before using the unit for the first time.



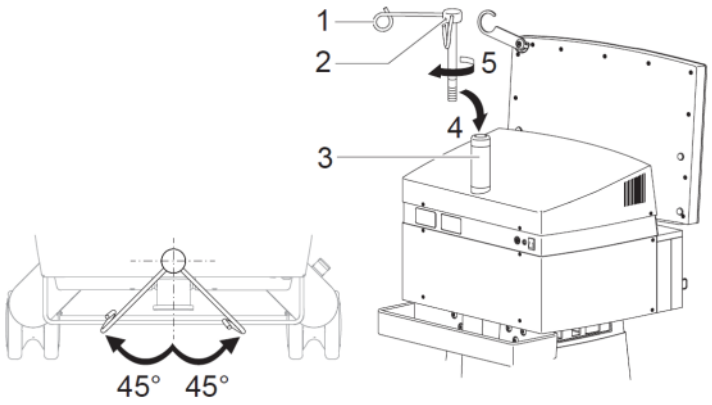
1. Hold down the tab of the fuse drawer.
2. Remove the fuse drawer.

The position of the voltage selector in the fuse drawer (to the left or to the right) determines the mains voltage (115 V or 230 V).



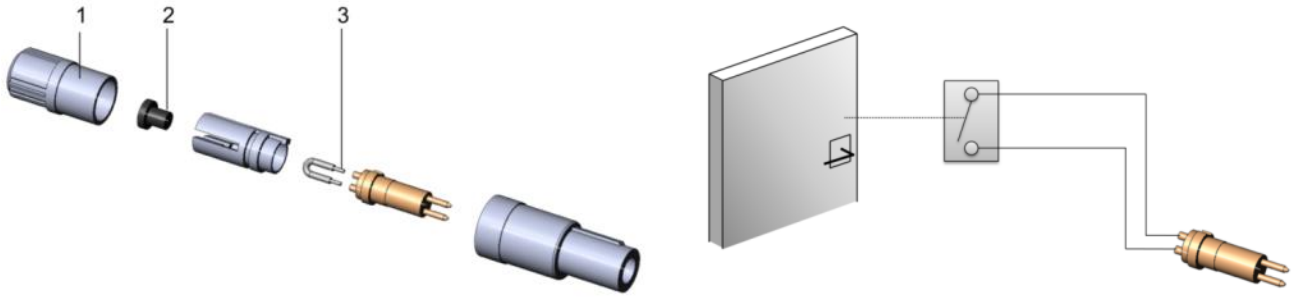
3. If necessary, replace the defective fuse.
4. Insert the voltage selector in such a way that the correct mains voltage is displayed in the viewing window.
   - 115 V: 115 V must be displayed in the viewing window of the voltage selector.
   - 230 V: 230 V must be displayed in the viewing window of the voltage selector.
5. Reinsert the fuse drawer.

6.3 Infusion pole



1. Insert (4) infusion pole (1) into the holder (3).
2. Firmly rotate the infusion pole in the direction of the arrow (5).
3. If the infusion hooks are not at a 45-degree angle to the device, proceed as follows:
   Use an Allen key to loosen the screw (2), position infusion pole at a 45-degree angle as illustrated above and secure screw once more.

6.4 Door remote switch (DRS) for endo laser module

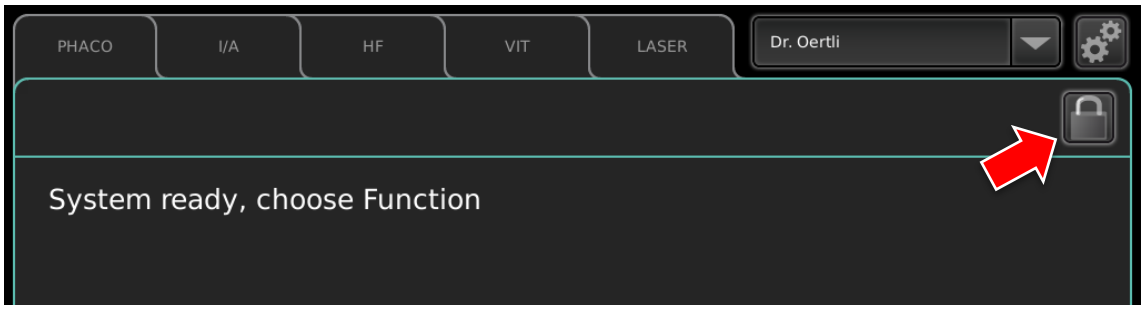


1. Unscrew the cap (1).
2. Remove the cover (2).
3. Remove the cable bridge (3). Use these pins to connect the door switch.

7 Service mode operation

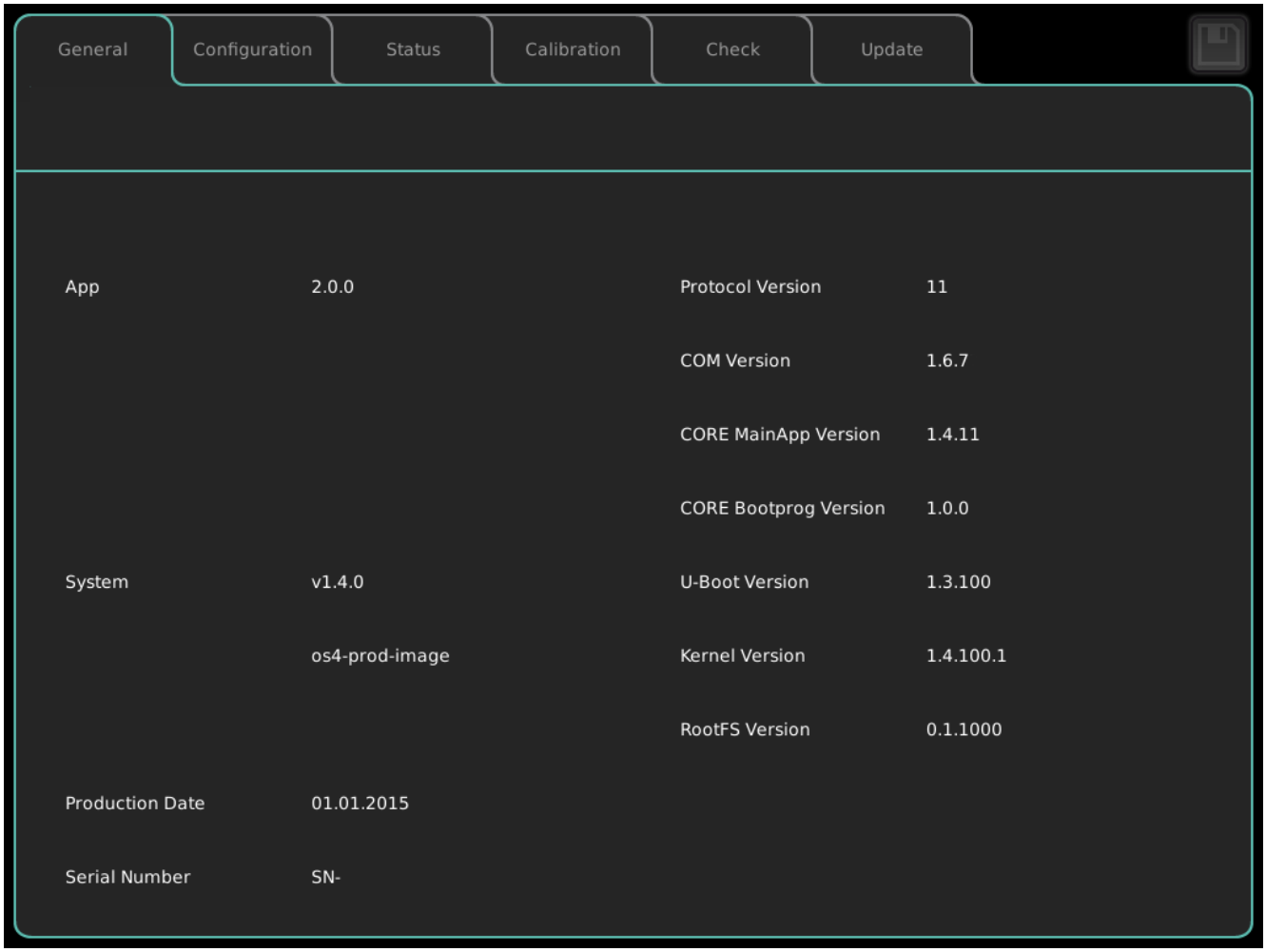
7.1 Login and main menu

Reset the device and enter service mode by pushing the „lock“ button. Enter the password 9442 and commit.

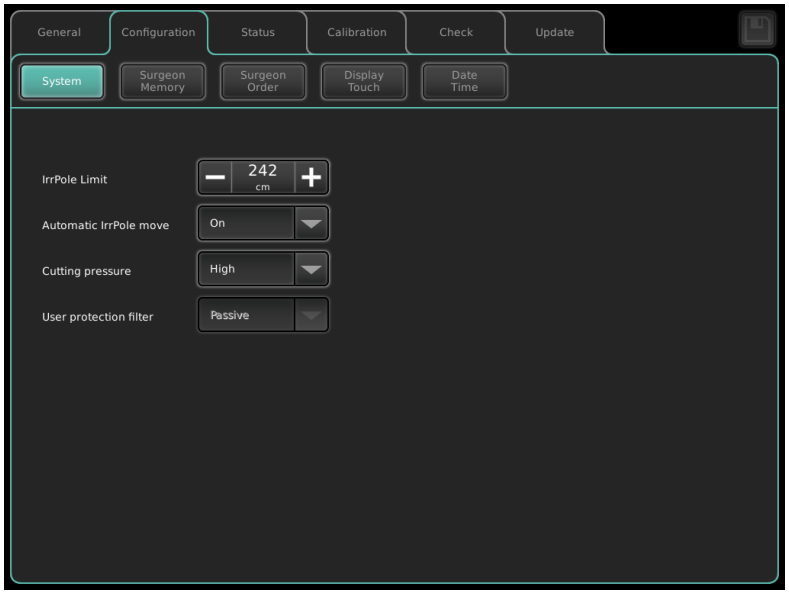


The following information is displayed on the service mode main screen:

- Serial number
- Software versions



7.2 Configuration of the unit



Configuration → system

IrrPole limit:
Maximum height of irrigation pole (measured from ground), valid for all surgeons.

Please be aware that due to a smooth control of the infusion, the irrigation pole can exceed the stored limit by approx. 5 cm when increasing the bottle height.

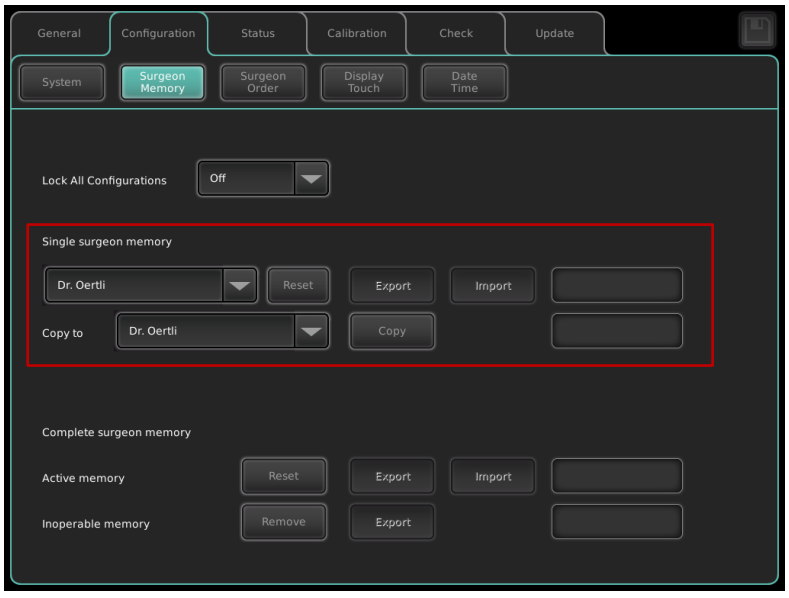
Automatic IrrPole move:
Indicates whether the irrigation pole is moved automatically when the following events occur:

- Cassette is inserted: infusion pole travels at the stored value of the programme selected. The infusion pole does not travel in the start level.
- Cassette is ejected: infusion pole travels downwards.

Cutting pressure:
Indicates whether low or high pressure is used for cutting in VIT functions. Valid for all surgeons.

User protection filter:
Indicates whether a passive or active user protection filter is used with the OS 4. This setting is valid for all surgeons.

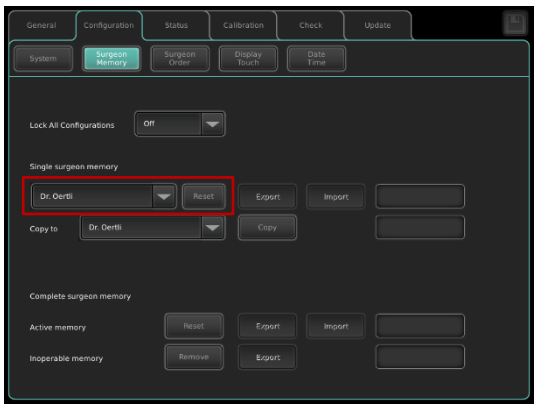
In case of the usage of an active user protection filter, make sure that the integrated laser is of software version 1.N or higher and an actual UPF cable (♦11.3.6) is implemented.



Configuration → Surgeon Memory

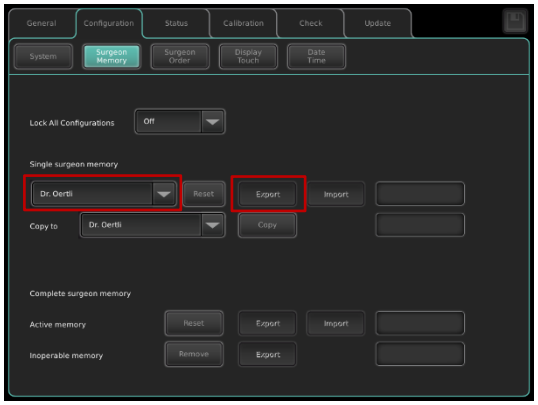
Lock all configurations:
Enable (Off) or block (On) the possibility of storing surgeons settings.

Single Surgeon Memory:
Under Single Surgeon Memory, the surgeon memory of a single surgeon is managed. The following actions can be triggered:



Reset a single surgeon memory:
To set settings of a single surgeon memory to default values, please proceed as follows:

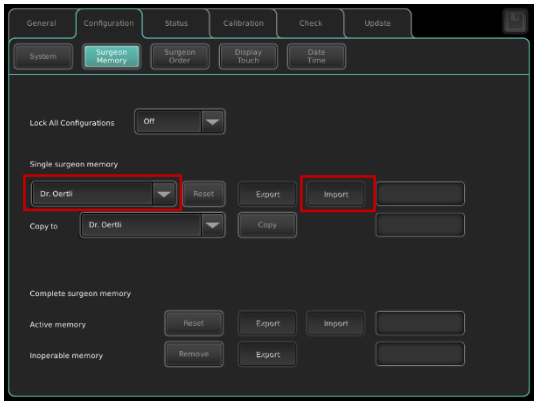
1. Select a surgeon memory to be reset to default values from the drop-down field under “single surgeon memory”.
2. Press the Reset button
3. The message “Confirm to reset surgeon xy: The selected target memory will set to default.” appears. Confirm with OK.
4. The message “Reset successful” appears.



Export a single surgeon memory to a USB stick:
To export a single surgeon memory to a USB stick, please proceed as follows:

1. Insert USB stick into the USB port of the device. The Export button is enabled.
2. Select a surgeon memory from the drop-down field to be exported
3. Press the Export button
4. The message “Export successful” appears

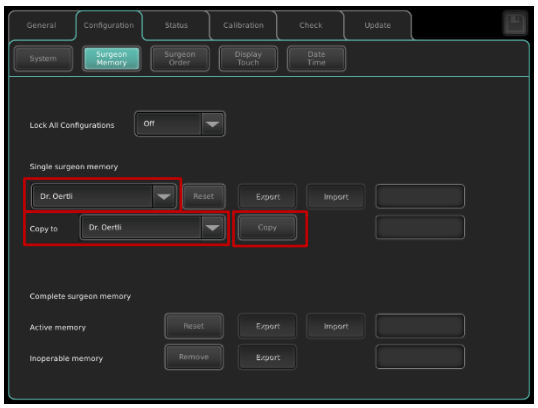
Only use an Oertli service USB flash drive in conjunction with the OS 4.



Import of single surgeon memory from a USB stick:
To import a single surgeon memory from a USB stick, please proceed as follows:

1. Insert USB stick into the USB port of the device. The Import button is enabled.
2. Select a surgeon memory from the drop-down field, where the surgeon memory from the USB stick shall be imported.
3. Press the Import button
4. Select a valid single surgeon memory file from the USB stick and press “Open”.
5. The message “Confirm to import surgeon memory: The selected target memory surgeon xy will be overwritten” appears. Confirm with OK.
6. The message “Import successful” appears.

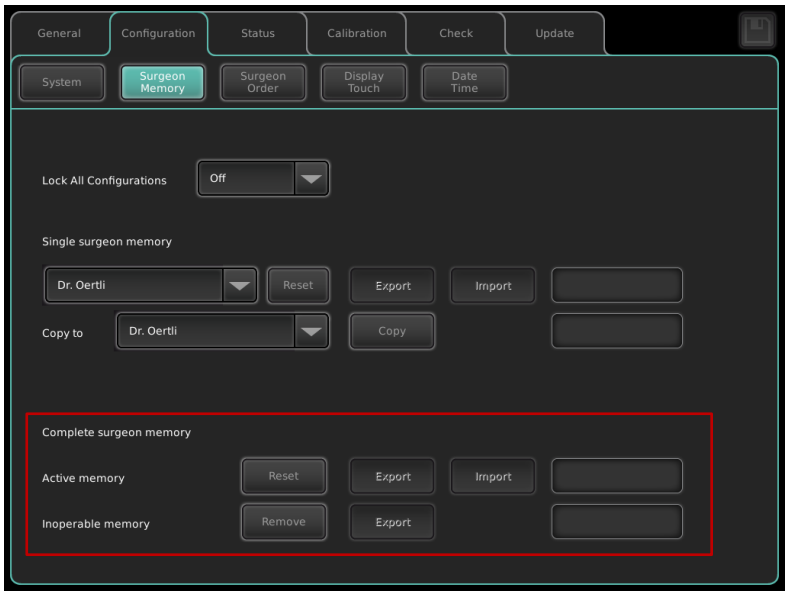
Only use an Oertli service USB flash drive in conjunction with the OS 4.



Copy a single surgeon memory:
To copy a single surgeon memory within a OS 4 platform, please proceed as follows:

1. Select a surgeon memory to be copied from the drop-down field under “single surgeon memory”.
2. Select a target surgeon memory from the “copy to”- drop-down field to determine where the surgeon memory is copied.
3. Press the Copy button
4. The message “Confirm to copy surgeon memory: The selected target memory surgeon xy will be overwritten”. Confirm with OK.
5. The message “Copy successful” appears.

The copied surgeon's memory is indicated by the suffix (1) (e. g. Dr. Oertli (1)).



<u>Complete Surgeon memory</u>

The OS 4 administers two different complete surgeon memories:

1. Active memory: surgeon memory currently in use
2. Inoperable memory: previous version of surgeon memory

Export of surgeon memory:
It is possible to export the active memory as well as the inoperable memory to an USB stick. To do this, please proceed as follows:

1. Insert USB stick into the USB port of the device.
2. Press the “Export” key.

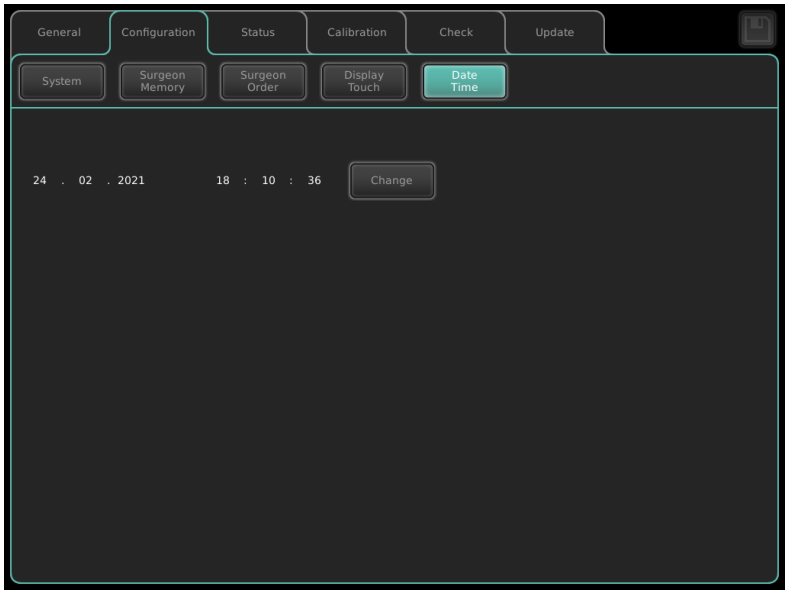
Import of surgeon memory:

1. Insert the USB stick that contains the surgeon memory to be imported into the USB port of the device.
2. Remove inoperable memory.
3. The message „Inoperable memory removed” will appear.
4. Press the „Import“ key.
5. The message „Import completed. Restart to apply.“ appears. The imported surgeon memory is located in the active memory. The previously used surgeon memory is now located in the inoperable memory.
6. Restart the device.

Reset of surgeon memory:
Set the entire surgeon memory to default.

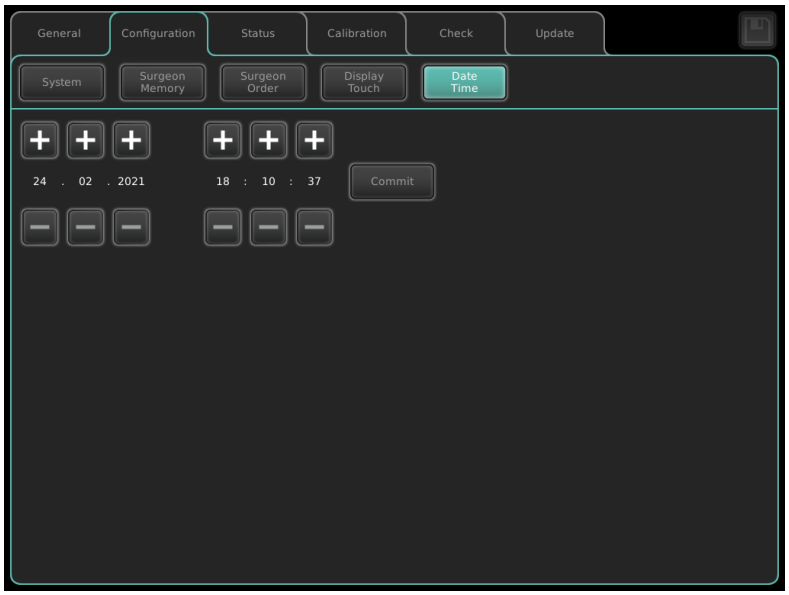
1. Remove inoperable memory.
2. Press the “Reset” key.
3. The message „Reset completed. Restart to apply“ will appear.
4. Restart the device.

Configuration → Surgeon Order
Press the “Up” or “Down” button to move a single surgeon forward or backward in the sequence of the surgeon memory. Press the Save button to save the new surgeon order.



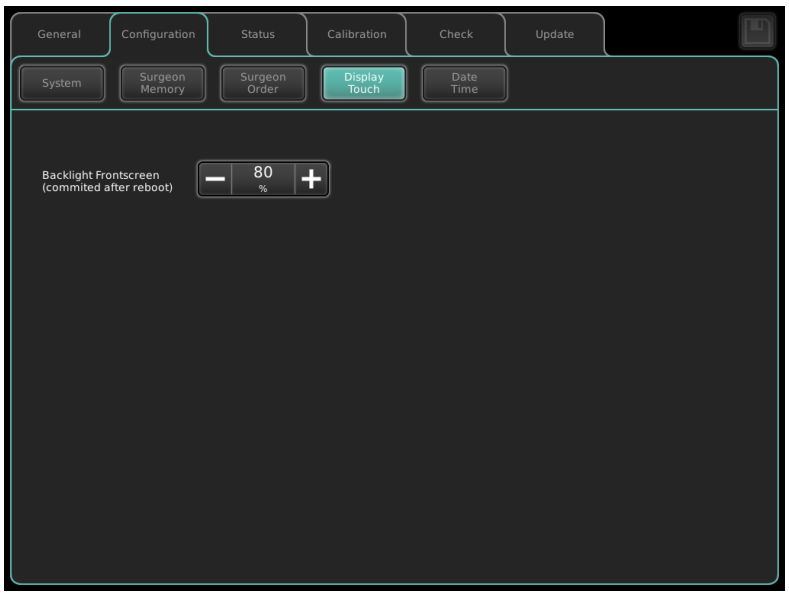
Configuration → Date / Time

Change:
To change date and/or time press the button <**Change**>.



[+] [-]:
Change date and time values by pressing the relevant buttons.

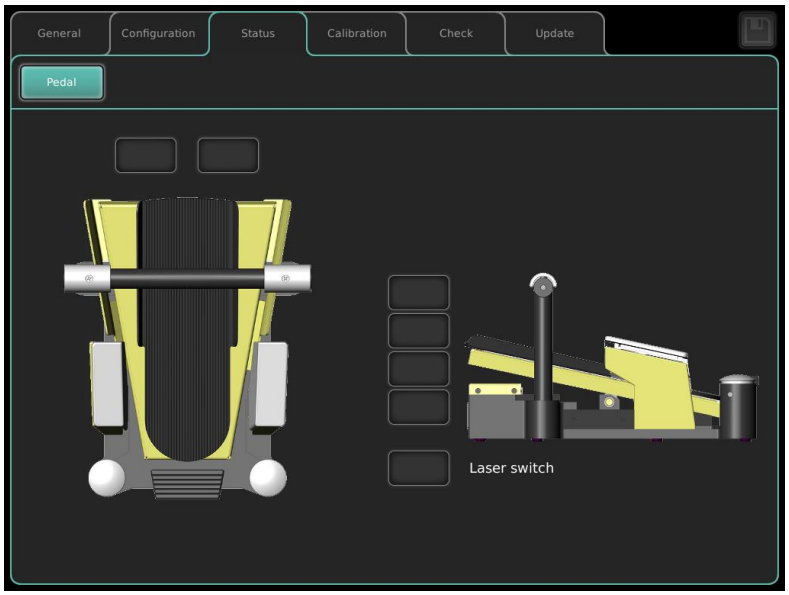
Commit:
Save new settings.



Configuration → display touch

Backlight front screen:
Change the brightness of the display with the +/- buttons.

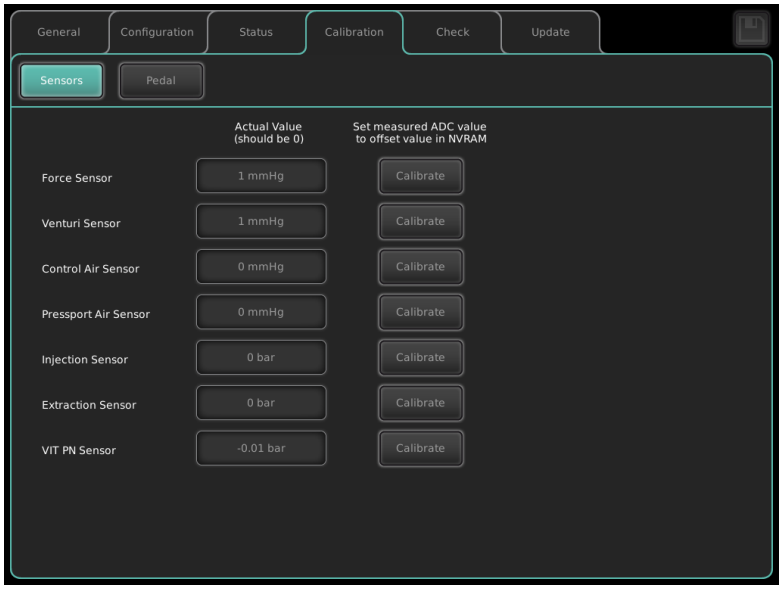
7.3 Pedal status



Status → pedal

The actual pedal status as well as the status of the laser switch is displayed.

7.4 Sensor calibration



Calibration → sensors

Store actual offset values of the sensors displayed by touching <**Calibrate**>.

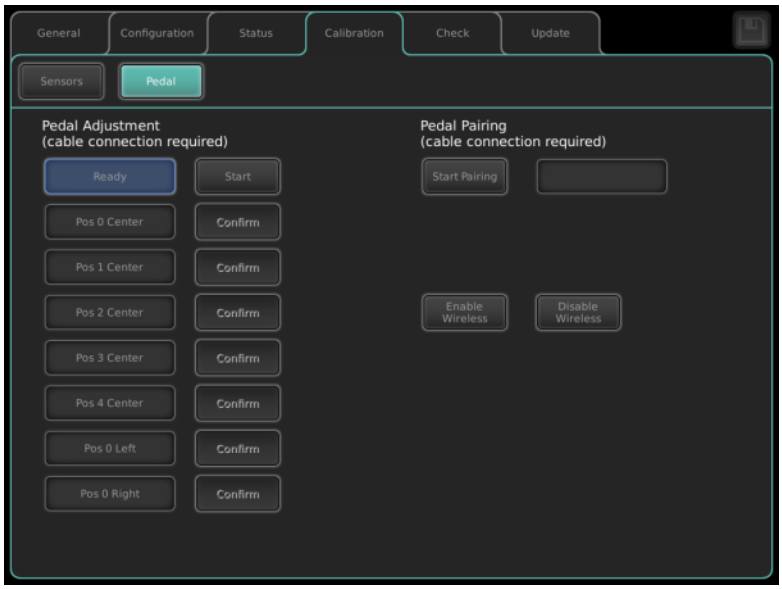
DANGER!

Incorrect calibration

Risk of eye damage to patient

► No instruments shall be connected to the device while calibrating sensors.

7.5 Pedal calibration



Calibration → pedal

Before adjusting and pairing the pedal make sure that it is connected with cable to the OS 4.

- Turn off the device, wait for 20 sec. at the minimum
- Connect pedal with cable to the OS 4
- Turn on the device
- Call up the service mode (see ♦ 7.1)

Pedal Adjustment:

The pedal adjustment has to be carried out before the pedal pairing is started.

Make sure that the foot pedal is placed on the ground.

- Push <**Start**> to begin with the calibration routine.
- Move to pedal position shown on the sequence and <**Confirm**>.

Pedal Pairing:

- In the menu <Calibration> select <Pedal>
- Push the button <Start Pairing>
- As soon as the pairing is finished, the message “Success” appears.

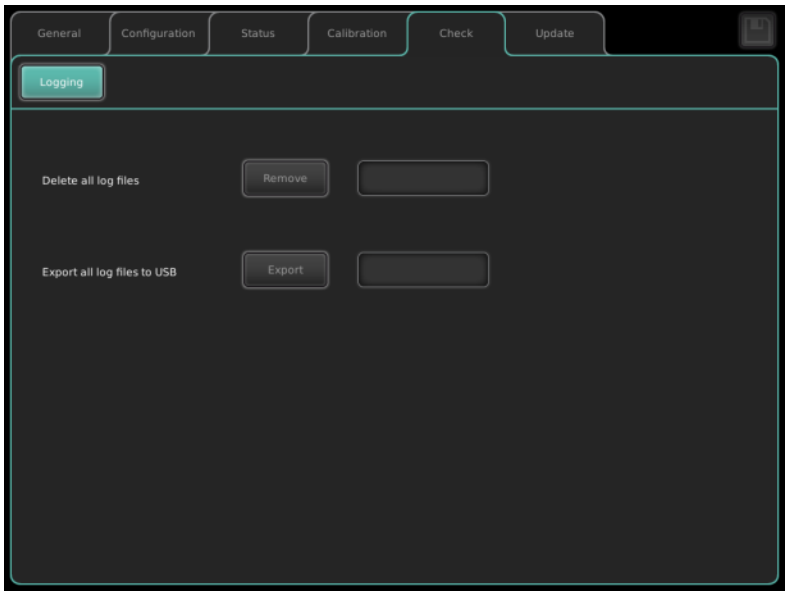
Establish radio communication:

- Connect pedal with cable to the OS 4
- Push the button <Enable Wireless>

Turn off radio communication:

- Connect pedal with cable to the OS 4
- Push the button <Disable Wireless>

7.6 Check - Logging



Export all log files to USB:

- Plug in USB flash drive
- Push the button <Export all log files to USB>
- Unplug USB flash drive

Only use an Oertli service USB flash drive in conjunction with the OS 4.

8 OS 4 service tools

8.1 Conversion of the surgeon memory

The following chapter describes the procedure in the case of an external conversion of a surgeon memory. The following equipment is required:

- Laptop with an USB interface.
- USB stick with a database exported from a device with SW version 1.3.0 or higher
- Software for converting the surgeon database (OS4_Database_Conversion.exe)

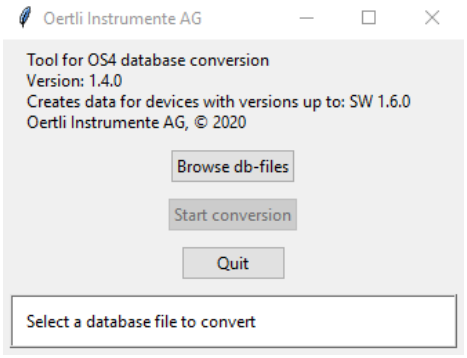
The software for converting the database does not have to be installed onto the laptop. Simply copying the software onto the laptop or executing it directly from a USB stick is enough.

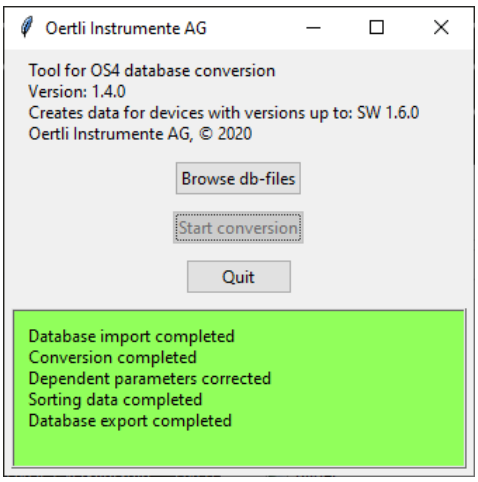
Convert the surgeon database before performing the software update. Otherwise, in the case of a faulty database (especially as regards pedal assignments), corrections cannot be made anymore!

The converted database must be located on a USB stick in the folder „dbexport“ so that it can be imported into the OS 4. This folder must be at the highest level within the data system of the USB stick. This is set as a default in the case of a database export from an OS 4 device onto a USB stick as well as after a database conversion.

The latest version of the software for converting the surgeon database (version 1.3.4 or higher; OS 4_Database_Conversion.exe) can be used for conversion of the surgeon database from software 1.3.0 to software 1.4.0 (♦8.1.3), software 1.4.0 to software 1.5.x (♦8.1.2) or software 1.5.x to software 2.0.x (♦8.1.1).

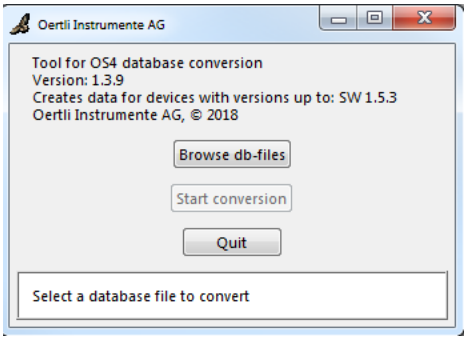
8.1.1 Procedure for converting a database from a device with SW version 1.5.x



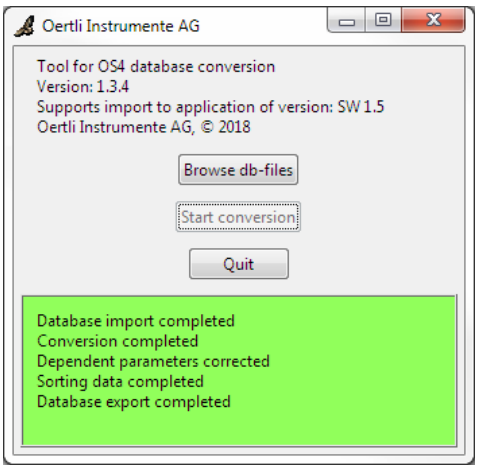


1. Export complete surgeon database from device with SW 1.5.x to USB according to ♦7.2.
2. Insert the USB stick containing the exported surgeon database into the USB port of your laptop.
3. Start the software for the conversion of the surgeon database. (OS 4_Database_Conversion.exe)
4. Click on the „Browse db-files“ button and select exported database.
5. After successful loading of the file (Status „File loaded“), start the conversion process by clicking on „Start conversion“.
6. Successful conversion is indicated by the display of the status message „Database export completed“ and is confirmed by a green background of the status field.
7. The converted database has been stored at the place of origin (normally on the USB stick). The original database has been stored as a backup copy with the ending of the corresponding scheme version.
8. The software of the device can now be updated to software package 2.0.x (♦12).
9. Following a successful software update, the converted database has to be loaded into the device according to ♦7.2.

8.1.2 Procedure for converting a database from a device with SW version 1.4.0



1. Export surgeon database from device with SW 1.4.0 to USB according to ♦7.2.
2. Insert the USB stick containing the exported surgeon database into the USB port of your laptop.
3. Start the software for the conversion of the surgeon database. (OS 4_Database_Conversion.exe)
4. Click on the „Browse db-files“ button and select exported database.
5. After successful loading of the file (Status „File loaded“), start the conversion process by clicking on „Start conversion“.
6. Successful conversion is indicated by the display of the status message „Database export completed“ and is confirmed by a green background of the status field.



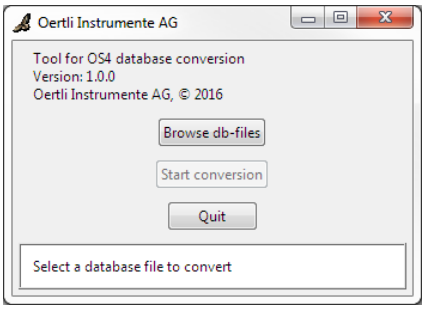
7. The converted database has been stored at the place of origin (normally on the USB stick). The original database has been stored as a backup copy with the ending of the corresponding scheme version.

8. The software of the device can now be updated to software package 1.5.x (♦12).

9. Following a successful software update, the converted database has to be loaded into the device according to ♦7.2.

8.1.3 Procedure for converting a database from a device with SW version 1.3.0

The conversion tool requires that following a software update to SW 1.3.0 all pedal assignments must be reselected for the surgeon memories that have been used. If a database is to be converted that has not previously undergone this process, a single option is offered to set back to default all pedal assignments of a surgeon, of which the pedal assignments have not been reselected.



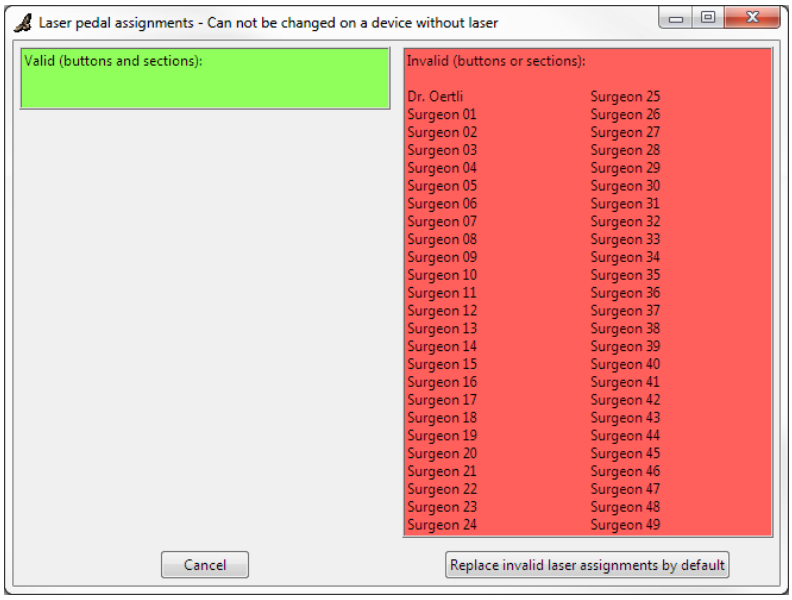
1. Export surgeon database from device with SW 1.3.0 to USB according to ♦7.2.

2. Insert the USB stick containing the exported surgeon database into the USB port of your laptop.

3. Start the software for the conversion of the surgeon database.
(OS 4_Database_Conversion.exe)

4. Click on the „Browse db-files“ button and select exported database.

5. After successful loading of the file (Status „File loaded“), start the conversion process by clicking on „Start conversion“.

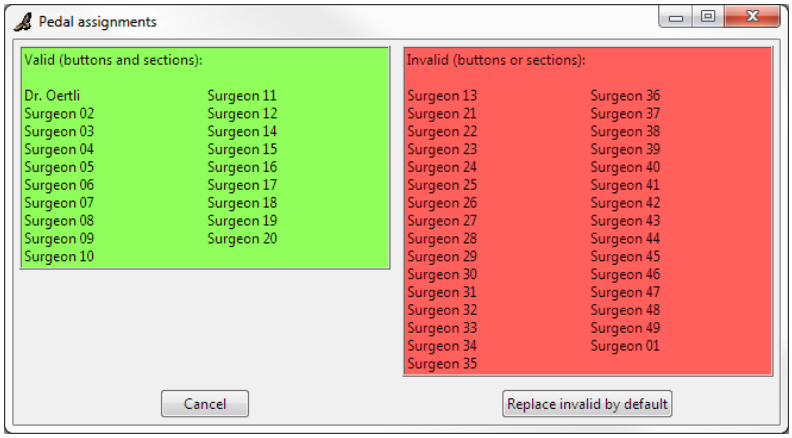


6. If <u>none</u> of the laser pedal assignments have been correctly set, a popup window will open up, in which laser pedal assignments are assessed.
   - Valid laser pedal assignments: For these surgeons, the laser pedal assignments (sections and buttons) have been correctly set.
   - Invalid laser pedal assignments: For these surgeons, the laser pedal assignments (sections or buttons) have <u>not</u> been correctly set.

   There are two possibilities of how to proceed:
   - Click on the button “Replace invalid laser assignments by default”: Only invalid laser pedal assignments will be replaced by the corresponding default settings.

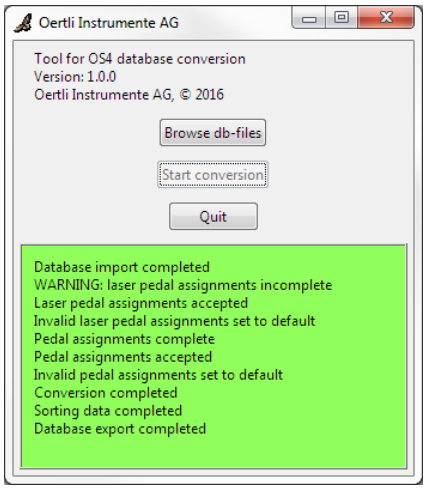
- Click on the „Cancel“ button, if the pedal assignments must not be overwritten. In this case, the conversion process will be aborted.

This window mainly opens up in the case of devices without a laser, as with these devices no default laser pedal assignments can be selected. In this case, confirm by pressing the button „Replace invalid laser assignments by default“.



7. A popup window opens up, in which all pedal assignments are assessed. If laser pedal assignments have already been set to default in the previous window, this will be taken into account here.
   - Valid pedal assignments: For these surgeons, the pedal assignments (sections and buttons) have been correctly set.
   - Invalid pedal assignments: For these surgeons, the pedal assignments (sections or buttons) have not been correctly set.

   There are two possibilities of how to proceed:
   - Click on the button „Replace invalid by default“: Invalid pedal assignments will be replaced by the corresponding default settings.
   - Click on the „Cancel“ button, if the pedal assignments must not be overwritten. In this case, the conversion process will be aborted.



8. Successful conversion is indicated by the display of the status message „Database export completed“ and is confirmed by a green background of the status field.

9. The converted database has been stored at the place of origin (normally on the USB stick). The original database has been stored as a backup copy with the ending of the corresponding scheme version.

10. The software of the device can now be updated to software package 1.4 (♦12).

11. Following a successful software update, the converted database can be loaded into the device.

8.1.4 Trouble shooting

Error message	Description	Solution
Invalid or no database file selected. Choose correct file.	No or incorrect file has been selected.	Select valid export file.
Database import failed	Database could not be imported.	
Wrong schema version	Database has incorrect scheme version.	• Use valid database file. • Use correct version of conversion tool.
ERROR: check for laser pedal assignments failed	Contradiction as regards laser pedal assignments.	Select valid export file (try export again from the device).
ERROR: setting laser pedal assignments failed	Error occurred when setting laser pedal assignments to default.	• Use valid database file. • Use correct version of conversion tool.
Laser pedal assignments cancelled	Appears after clicking on “Cancel” button. Conversion process is aborted.	Set pedal assignments for required surgeons correctly (in the ParaProg) and export database again.
ERROR: check for pedal assignments failed	Contradiction as regards pedal assignments.	Select valid export file (try export again from the device).
Pedal assignments cancelled	Appears after clicking on “Cancel” button. Conversion process is aborted.	Set pedal assignments for required surgeons correctly (in the ParaProg) and export database again.
ERROR: setting pedal assignments failed	Error occurred when setting pedal assignments to default.	• Use valid database file. • Use correct version of conversion tool.
ERROR: changes not completely defined	Error in the script as regards the definition of conversion data.	Use correct version of conversion tool.
ERROR: database not complete	The loaded database is not complete.	Use valid database (try export again from the device).
ERROR: Correction of dependent parameters failed	Error occurred when correcting the parameter dependencies due to obsolete parameter values	• Use valid database file. • Use correct version of conversion tool.
ERROR: sorting data failed	Error occurred when converting the database.	Use correct version of conversion tool.
ERROR: database export failed	Database could not be exported.	If error message occurs in combination with one of the messages mentioned below: Observe the solution indicated for the messages below. If not: • Use correct version of conversion tool. • Target directory must not be write-protected.
ERROR: xxxxxxxx_surgeon already exists	Error occurred when exporting, as target file already exists.	Delete or relocate the relevant file from the target directory.
ERROR: xxxxxxxx_surgeon.edb.1.3.1 already exists	Error occurred when exporting, as backup file already exists.	

8.2 Loading of calibration values of spare parts

In the case of some specific spare parts, the OS 4 requires calibration values tuned to the relevant spare parts following completed installation. After an exchange of components, these values have to be loaded onto the device by means of an USB interface cable and a software provided for this purpose.

The following equipment is required for loading adjustment values for spare parts:

- Laptop with two USB interfaces and an installed driver software (♦8.2.1)
- USB interface cable VX400313
- Spare part with USB stick (stored adjustment values)
- Software for loading adjustment values (OS 4_Spare_Parts.exe)
- OS 4 with the upper enclosure removed
- Pressure gauge with connection to the AIR port

8.2.1 Installation of the driver software

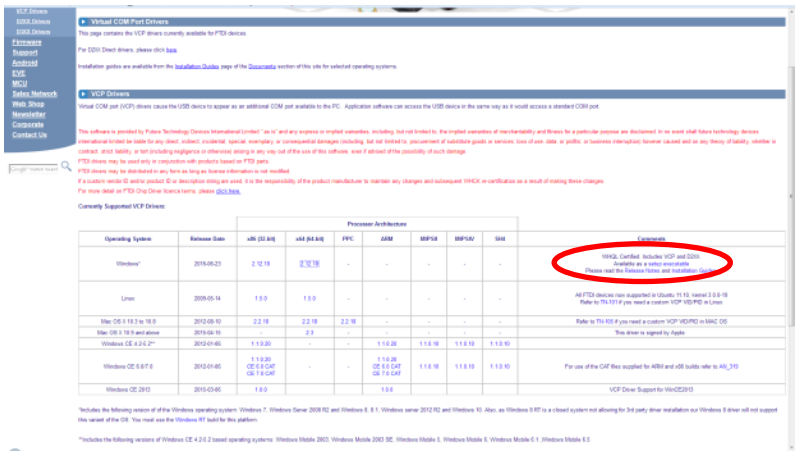
The following chapter describes the installation of the driver software required for the Oertli USB interface cable VX400313. The driver software is required for loading adjustment values onto the device. It has to be installed only once for each laptop. It is the pre-condition for using the Oertli USB interface cable VX400313.

Install driver software

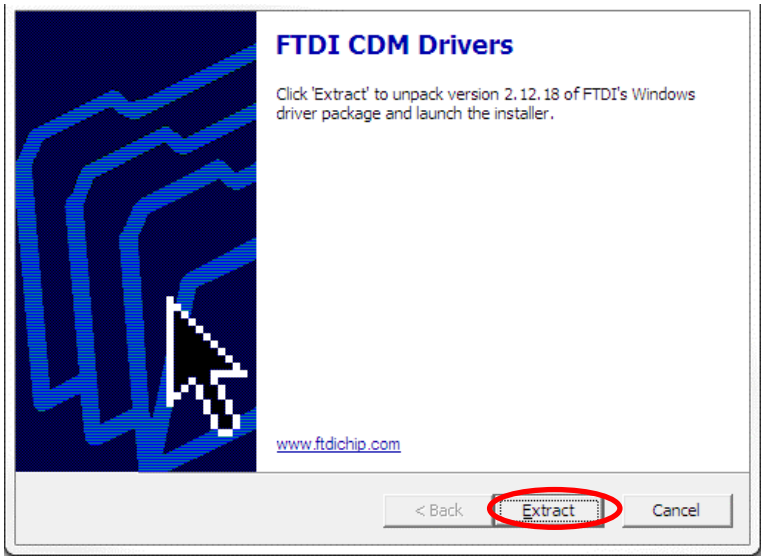
To perform the following steps, administrator permissions are required for the computer on which the drivers are to be installed!

The following steps must be performed on the laptop on which the USB interface cable VX400313 will subsequently be operated.

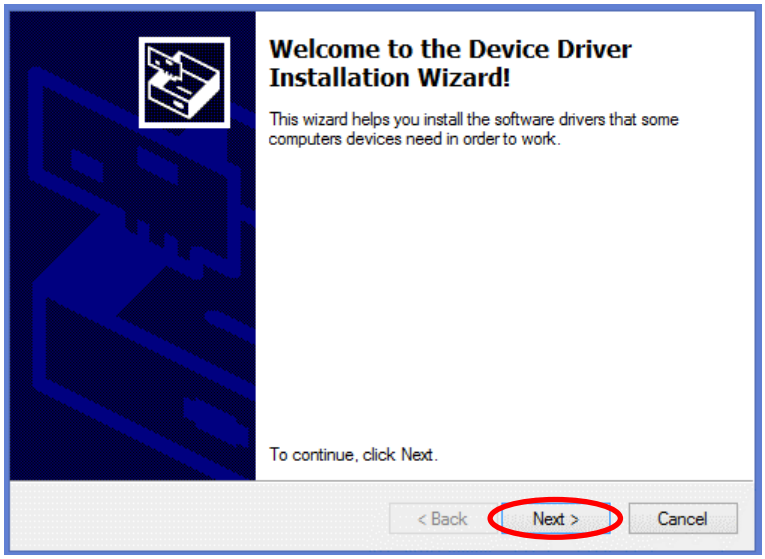
Download the latest driver for the installed operating system and process architecture from the website from FTDI.



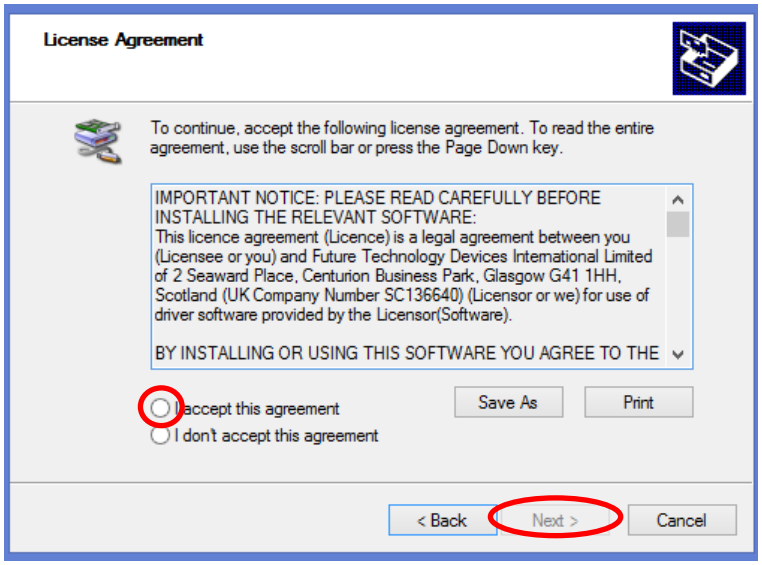
1. Call up website http://www.ftdichip.com/Drivers/VCP.htm
2. Click on the „setup executable“ option in the „Comments“ section.
3. Store the file locally on the laptop.
4. Unzip the file.
5. Start the setup by double-clicking on the unzipped .exe-file (CDM<Version>_Setup.exe). The following window will open up.



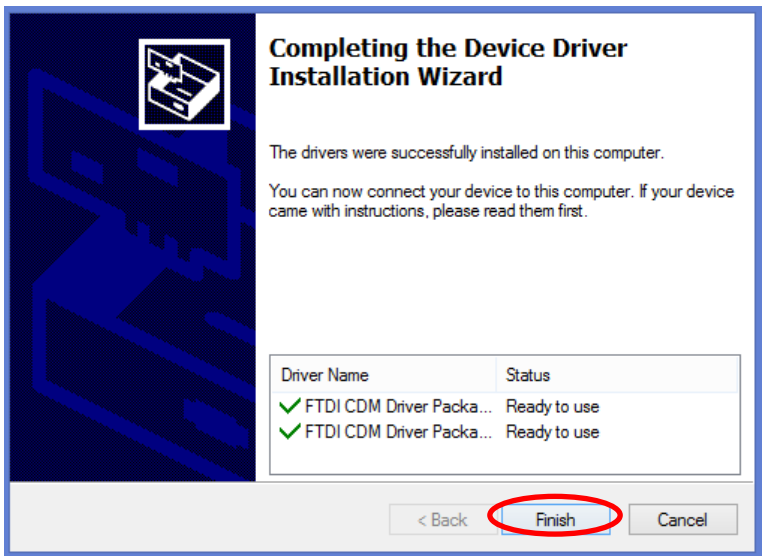
6. Click on the „Extract“ button. The device operator installation assistant will appear.



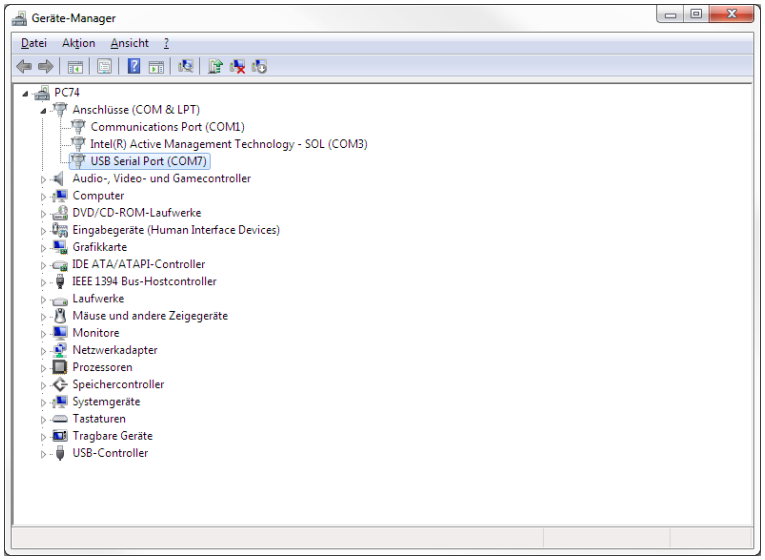
7. Click on the button „Next“.



8. Agree to the licence agreement in the following dialog box and click on „Next“.



9. A successful installation is confirmed by the following window. Click on “Finish” and restart the laptop.



Check interface

1. Connect the USB interface cable VX400313 with the laptop.
2. Start the device manager under system control / device manager.
3. Check if there is an entry „USB Serial Port (COMx)” in the „Connections (COM & LPT)“ menu.

8.2.2 Loading of adjustment values with the service tool

This chapter describes the procedure when loading adjustment values onto the OS 4 in the case of spare parts. The precondition is that the driver software for the Oertli USB interface cable VX400313 (♦8.2.1) has previously been installed on the laptop.

The software for loading the adjustment values does not have to be installed. Simply copying the software onto laptop or executing it directly from the USB stick is enough.

8.2.2.1 Procedure

The spare part must be installed in the device before adjustment values can be loaded.

1. Connect USB interface cable with the laptop.

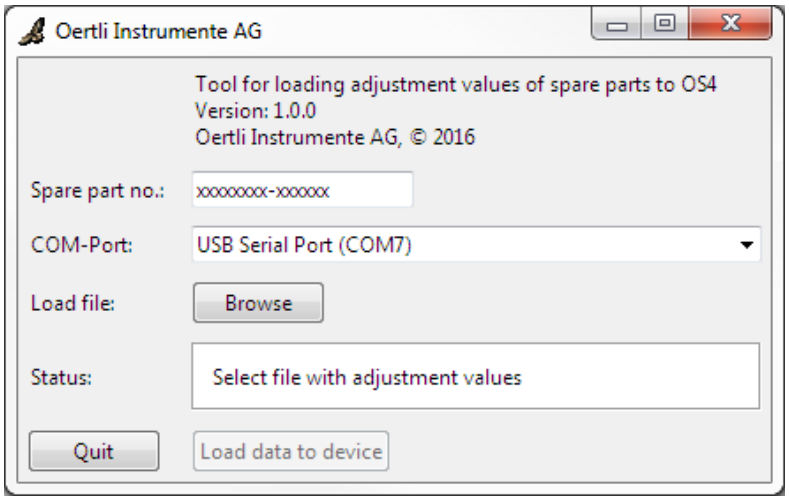
The driver software must have been installed previously (♦8.2.1).

2. Connect the USB interface cable with the plug JP2 DIAGNOSE on the CORE print.

3. Insert the USB stick with stored adjustment values into the USB port of the laptop.

4. Switch on the device.

5. Start the software for loading the adjustment values.

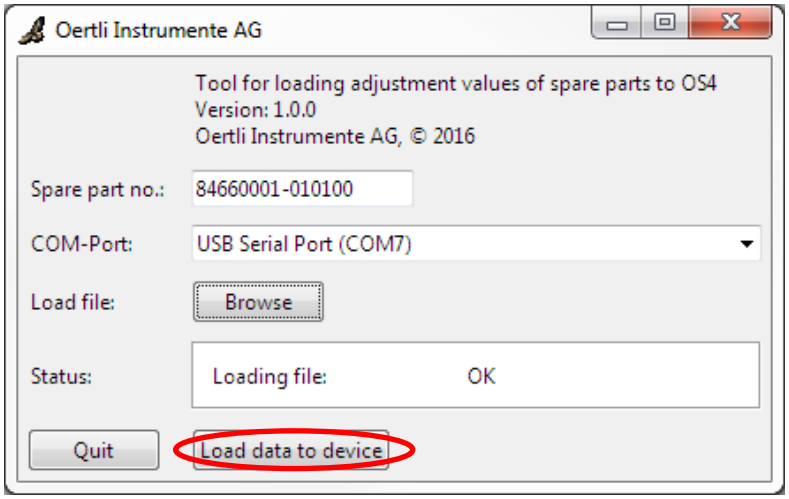


6. Enter the serial number of the spare part including the index in the field „Spare part no.“ This number must be read off the spare part.
Important: Enter the number including the hyphen.
Example: 84660001-010100

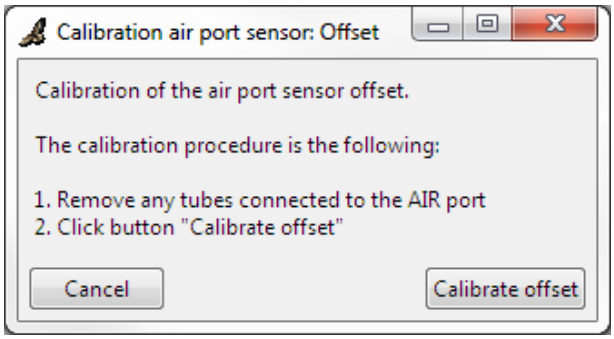
7. Select COM port of the USB interface cable. The correct COM port should have been selected as default already. Normally, the description of the COM port is „USB Serial Port“.

8. If the correct COM port is not indicated:
   - Check if the USB interface cable has been correctly connected (after plugging it into the laptop, it may take a few seconds before the cable is correctly recognised by the operating system).
   - Restart the software for loading the adjustment values.

9. Load the file with the stored adjustment values by clicking the „Browse“ button. Select the file „replacement.values“ on the USB stick.

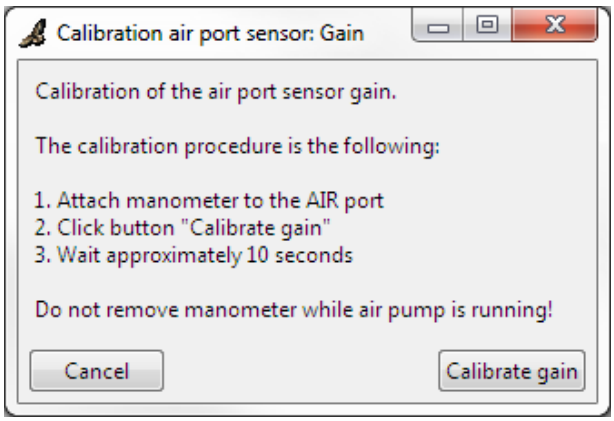


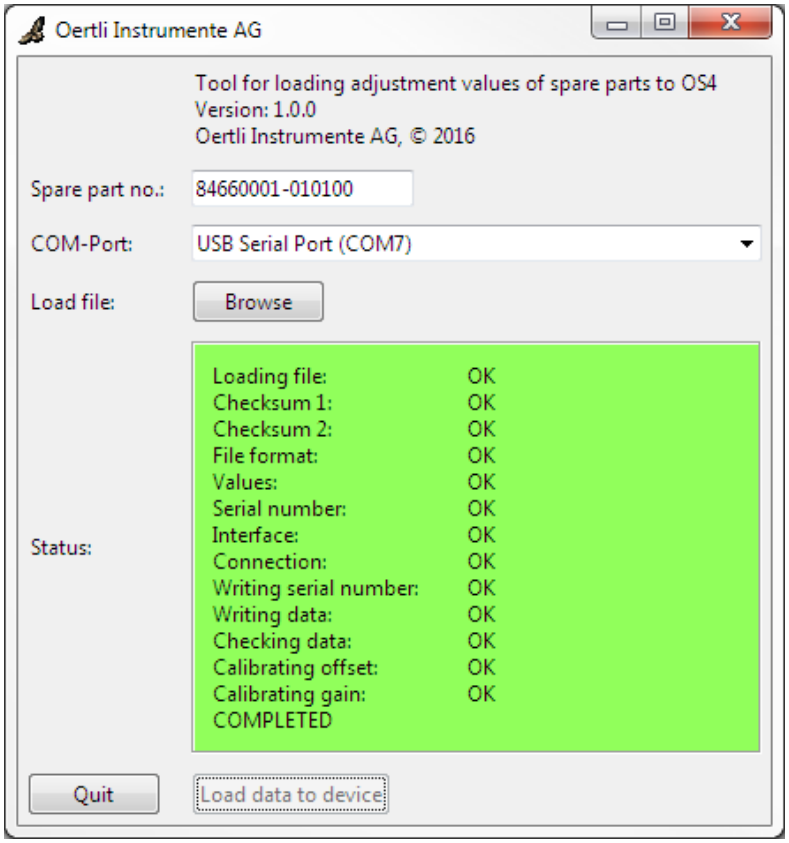
10. Load data onto the device by clicking the „Load data to device“ button.



11. If the spare part is a **fluidics unit** (VX210130): Perform actions according to the descriptions in the popup windows.

With all other spare parts, no popup window will appear.





12. A successful data transfer from the laptop onto the device is confirmed by the message „COMPLETED“ and a green background in the status field.

13. Switch off the device.

14. Remove the USB interface cable from the device and the laptop.

8.2.2.2 Trouble shooting

Error message	Description	Solution
Choose correct file	No or incorrect file has been selected.	Select valid file.
Loading file: FAILED	File could not be correctly loaded.	
Checksum 1: INVALID	Checksum 1 of the file is not OK (file has either been manipulated or file is corrupt).	
Checksum 2: INVALID	Checksum 2 of the file is not OK (file has either been manipulated or file is corrupt).	
File format: INVALID	File format of the file does not correspond with file format required by the tool.	Use the correct version of the tool.
Values: INVALID	For the values in the file, there is no counterpart in the script.	Error in the tool. Check tool version. If need be, request for tool again at Oertli Instrumente AG.
Serial number: INVALID	Serial number entered does not correspond with the number in the file.	Enter correct serial number (e.g. 84660001-010101 including the hyphen).

Could not open port	Serial interface could not be started.	Select correct COM port (normally “USB Serial Port“) If correct COM port does not occur in the list, close tool, check USB interface cable and restart tool.
Device not answering	There is no response from the device.	Connect the device correctly with the USB interface cable and switch the device on.
Writing serial number: FAILED	Error occurred when writing the serial number into the device.	Try to load data onto the device again. In the case of repeated failure, there may be a defect on the CORE print. Contact Support at Oertli Instrumente AG.
Writing data: FAILED	Error occurred when writing the adjustment data into the device.	
Checking data: FAILED	Faulty calibration data on the device.	
Calibrating offset: FAILED	Only concerns the fluidics spare part: Offset could not be calibrated. Either error in communication or calibration value outside tolerance range.	Connect required equipment as described in the tool and start tool again.
Calibrating gain: FAILED	Only concerns the fluidics spare part: Gain could not be calibrated. Either error in communication or calibration value outside tolerance range.	Connect required equipment as described in the tool and start tool again.
Spare part not defined	For this spare part, there is no counterpart in the tool.	Use correct version of the tool.

9 Endo laser system calibration

9.1 Laser safety

DANGER!

Direct or scattered laser radiation

Eye or skin damage

- ► All servicing, adjustments and settings must be carried out by service technicians authorized and trained by Oertli.
- ► Use periodically calibrated measurement devices only.

DANGER!

Direct or scattered laser radiation

Eye or skin damage

- ► Avoid eye or skin exposure to direct or scattered laser radiation.
- ► Do not turn the laser beam directly towards persons.
- ► If the laser path within the laser is no longer fully shrouded, suitable laser safety glasses must be worn by all persons in the room.
- ► In the case of damage to the laser safety glasses or a change in colouration, discontinue using them. Replace them immediately.

NOTE!

Improper repairs

Severe damage to laser module

- ► Never open the laser module by yourself. Always send the module back to the manufacturer.

9.2 General servicing procedure

Laser servicing consists of a two-level procedure.

First-level support:
Direct support at the unit shall only be carried out by service technicians authorized by Oertli. This comprises preventive maintenance and calibration. If the **difference** between the power settings and the power measured after calibration is **more than 20%**, second-level support will take place.

Second-level support:
All other maintenance steps take place in the manufacturer's support location. The second-level repair facility also provides service engineers with service information and advice.

9.3 Maintenance schedule

The laser system must be checked and/or calibrated once a year. The routine includes:

- Calibration of working beam
- Calibration of aiming beam
- Checking system according to Appendix D) Functional test

9.4 Inspection and cleaning of test fibre

The test fibre end face on both sides must be inspected prior to connection and if necessary cleaned. Otherwise the test fibre might get damaged and erroneous calibration may result.

DANGER!

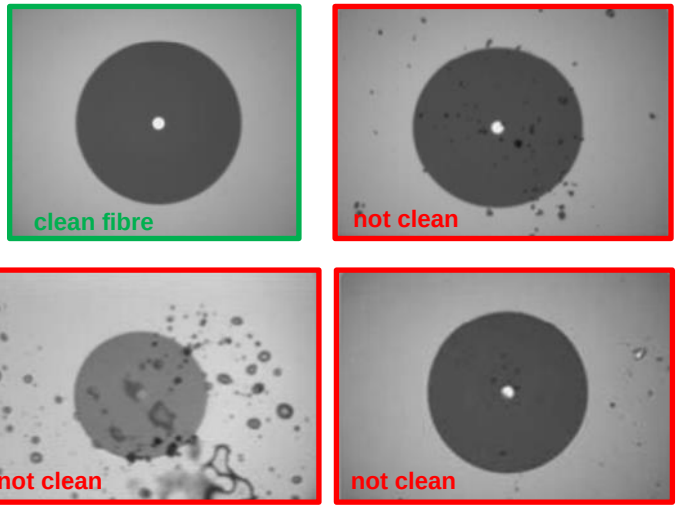
Direct or scattered laser radiation

Eye or skin damage

► Never inspect a fibre end face that is connected at the other end to a laser

STEP 1: Fibre inspection

1. Remove protective endcap on one side of the test fibre and put it on a clean surface.
2. Connect fibre to the inspection scope and adjust the focus ring so that you see a clear endface image.
3. The fibre connector must be clean and completely free of particles, otherwise continue with cleaning

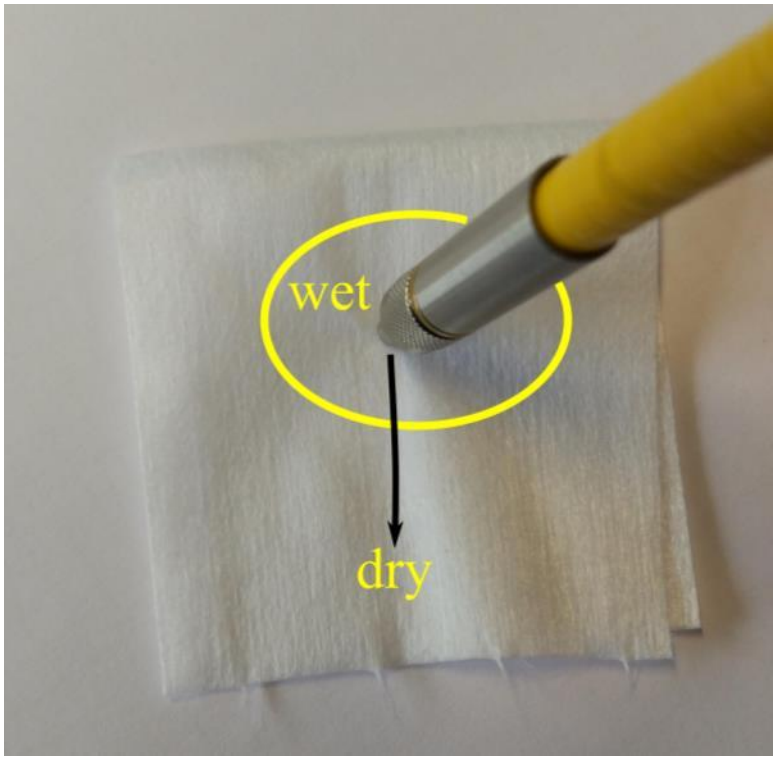


STEP 2: Dry cleaning
(only if connector end face is not clean)

4. Slide back protective cover and advance cloth to expose a new, clean surface.

5. Hold the fibre tip lightly against the cleaning cloth and wipe it using a figure 8 motion. Do not clean over the same surface more than once.

6. Inspect the fibre with the inspection scope. If not clean, repeat dry cleaning on a new cleaning cloth.



STEP 3: Wet/dry cleaning
(If the fibre endface is not clean after multiple dry cleaning procedures, try wet/dry cleaning)

7. Fold a lint-free wipe.

8. Moisten one section of the lint-free wipe with a drop of fibre connector cleaner. Be sure that a portion of the wipe remains dry.

9. Hold the fibre tip lightly against the moistened area of the lint-free wipe and move it to the dry section of the wipe.

10. Discard the lint-free wipe and inspect the fibre endface with the inspection scope.

    Repeat the process, if necessary. If the test fibre is not clean after multiply repletion of the wet/dry cleaning process, it must be replaced. It is recommended to keep a replacement fibre.

9.5 Laser servicing software

The servicing software as well as the access key to the software will be provided after the successful participation of a laser service training carried out by Oertli.

9.5.1 Introduction

The laser servicing software enables the service engineer to modify the control parameters of the laser and to read out the history of the device.

The laser servicing software runs on a PC connected to the laser main unit via a USB cable. Every control parameter can be read out and adjusted by using the servicing software. The only method possible for laser parameter adjustment is the servicing software. Moreover, history data can only be monitored by means of the servicing software.

DANGER!

Treatment of patient with servicing software. Direct or scattered laser radiation

Eye or skin damage

► Do not use the laser for clinical treatments (treatment of patients) while a PC or the servicing software is connected to the laser module. If the laser path is not fully shrouded, suitable laser safety glasses must be worn by all persons in the room.

9.5.2 Installation

Laser servicing software version 3.22 or higher is required.

Use a PC with minimum requirements of 100MHZ and a USB 2 port. The software runs on one of the following operating systems: Windows XP™, Vista™, Windows 7™ , Windows 8™, Windows 8.1™, Windows 10 ™.

The software contains the following files (version 3.22):

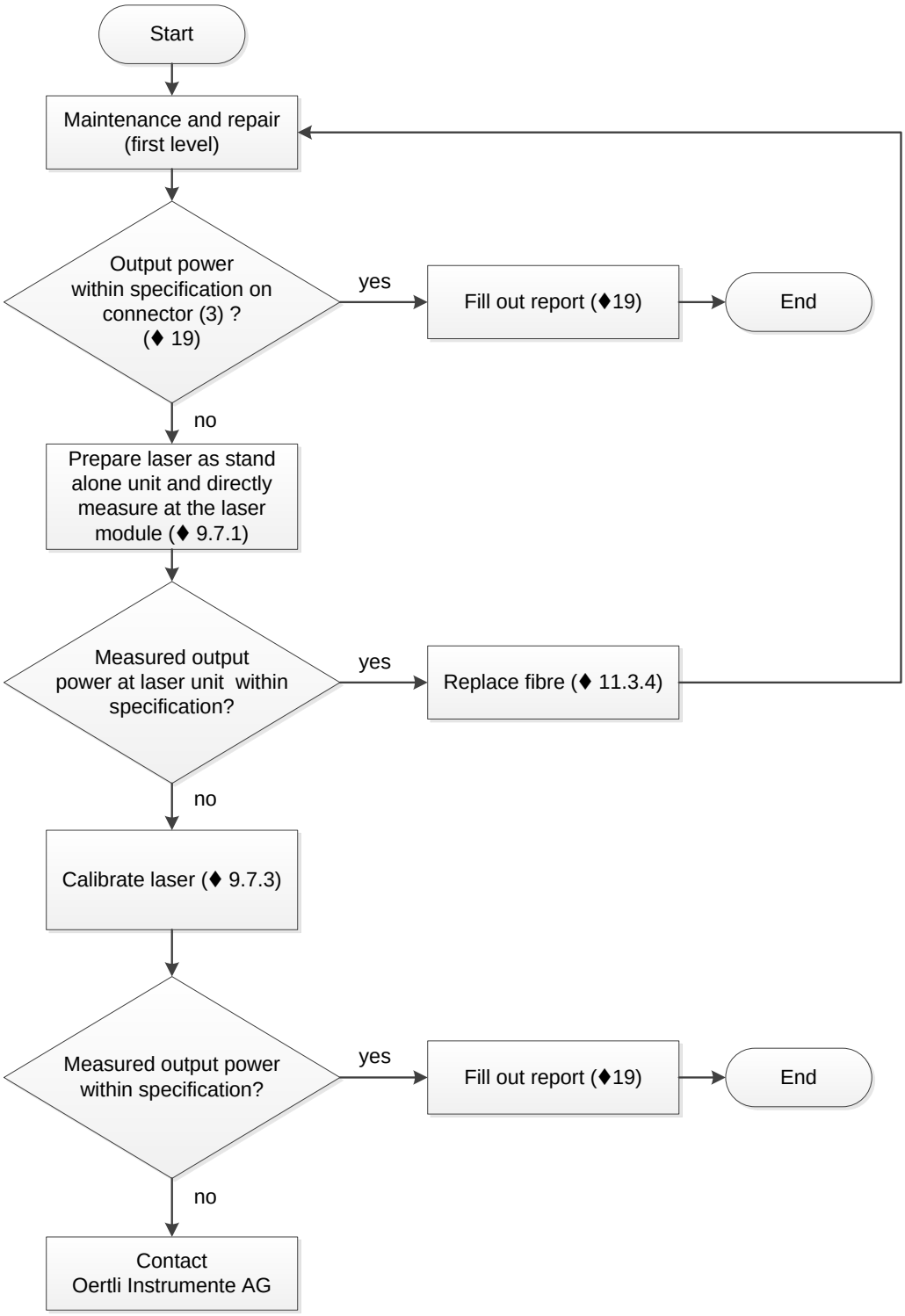
Installation procedure:

1. Disconnect the laser module if already connected.
2. Windows XP only: install dotNet Framework 4.
3. Create a folder on the hard disc of your PC.
4. Copy all files from the zip file into this folder. All files must be in the same folder.
5. Start the servicing software by double clicking *SERVICE_Vx.xx.EXE*

The servicing software automatically checks the software version compatibility between servicing software and software on the laser module during the communication initiation process. If incompatibility is detected, the servicing software cannot be activated.

On some computers, there will be no connection to the laser module due to insufficient power of the USB interface. In such a case, use a self-powered USB hub.

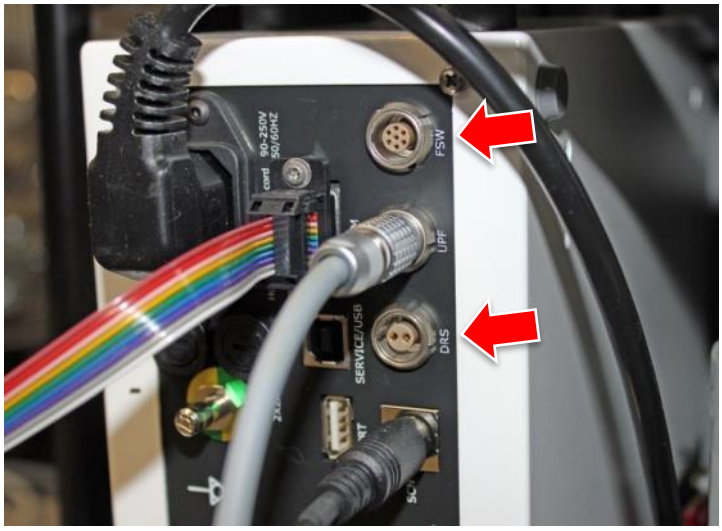
9.6 Overview of laser service and maintenance



9.7 Calibration procedure

9.7.1 Preparation for calibration

Check and clean the test fibre with recommended kit before using (♦ 9.4)



STEP 1:

1. Remove right side panel (side of cassette compartment) according to ♦11.1.5.
2. Disconnect cable from FSW.
3. Disconnect cable from DRS.

STEP 2:

4. Plug DRS dongle directly into DRS socket of the laser module.
5. Plug separate Meridian laser pedal directly into FSW socket of the laser module.
6. Connect laser module with service laptop via an USB connection.

   The laser will now be checked directly by the servicing software.

STEP 3:

7. Inspect and clean the test fibre on one side according to ♦9.4. Connect it to the power sensor.
8. Inspect and clean the test fibre on the other side according to ♦9.4. Connect the test fibre to the laser probe port on the OS 4 panel.

DANGER!

Direct or scattered laser radiation

Eye or skin damage

► Never inspect a fibre end face that is connected at the other end to a laser

STEP 4:

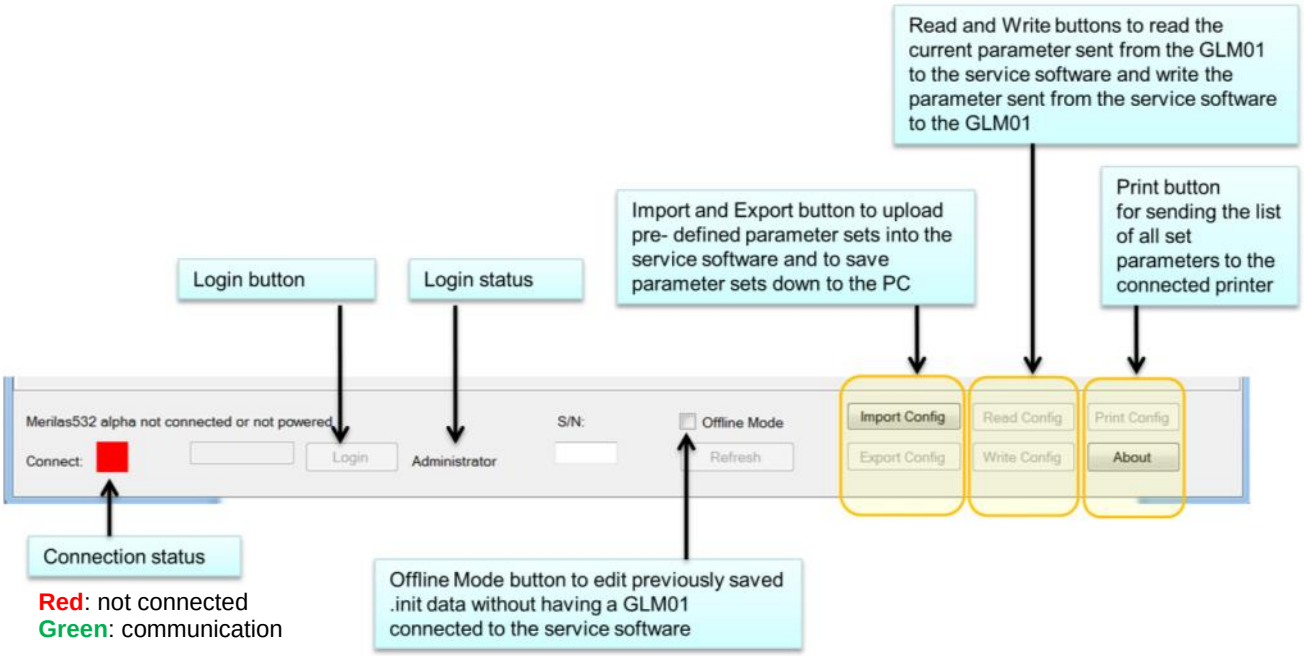
9. Plug in OS 4 mains cable.
10. Start meridian software.

9.7.1.1 Monitor

Explanation of the task bar is placed at the bottom of the window.

The bottom row displays connecting and login statuses. Moreover, the configuration of the laser module can be read, written, imported, exported and printed out.

To have the full functional range of the software, you must login as administrator.



<Read Config> reads the values from the module and displays them.

The configuration can be saved into a file by **<Export Config>** and restored by **<Import Config>**.

Recommended file name for Config

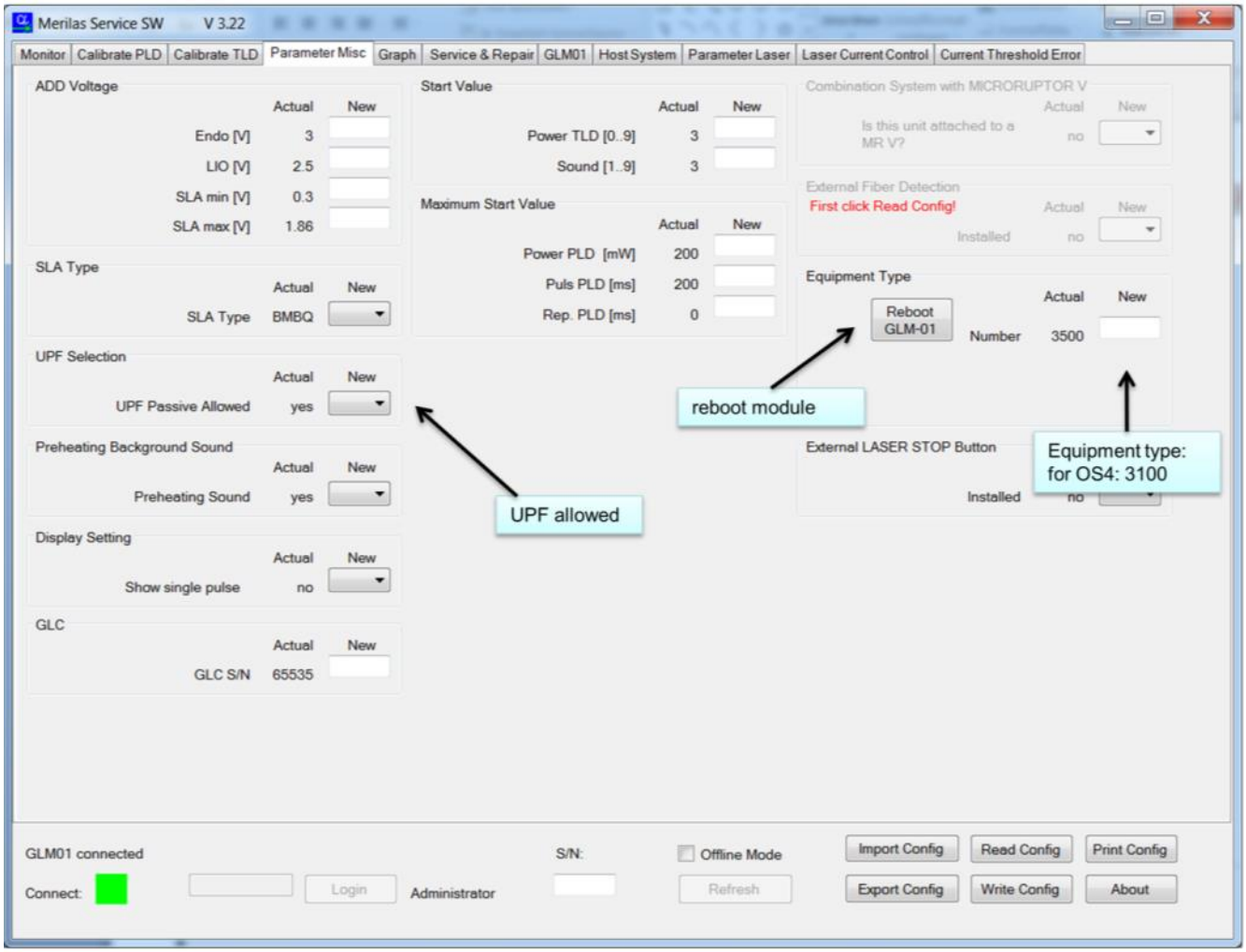
Export as SN……..._YYMMDD_Technician_Start.ini (Use serial number of OS 4 device_Date_Technicians initials_State of Backup.ini) Before calibration is started, make a BackUp called “Start”, and after completion of BackUp use “End” as state.

NOTE!

These files are important for future use, and also for trouble-shooting in case of any errors!

9.7.1.2 Parameter misc

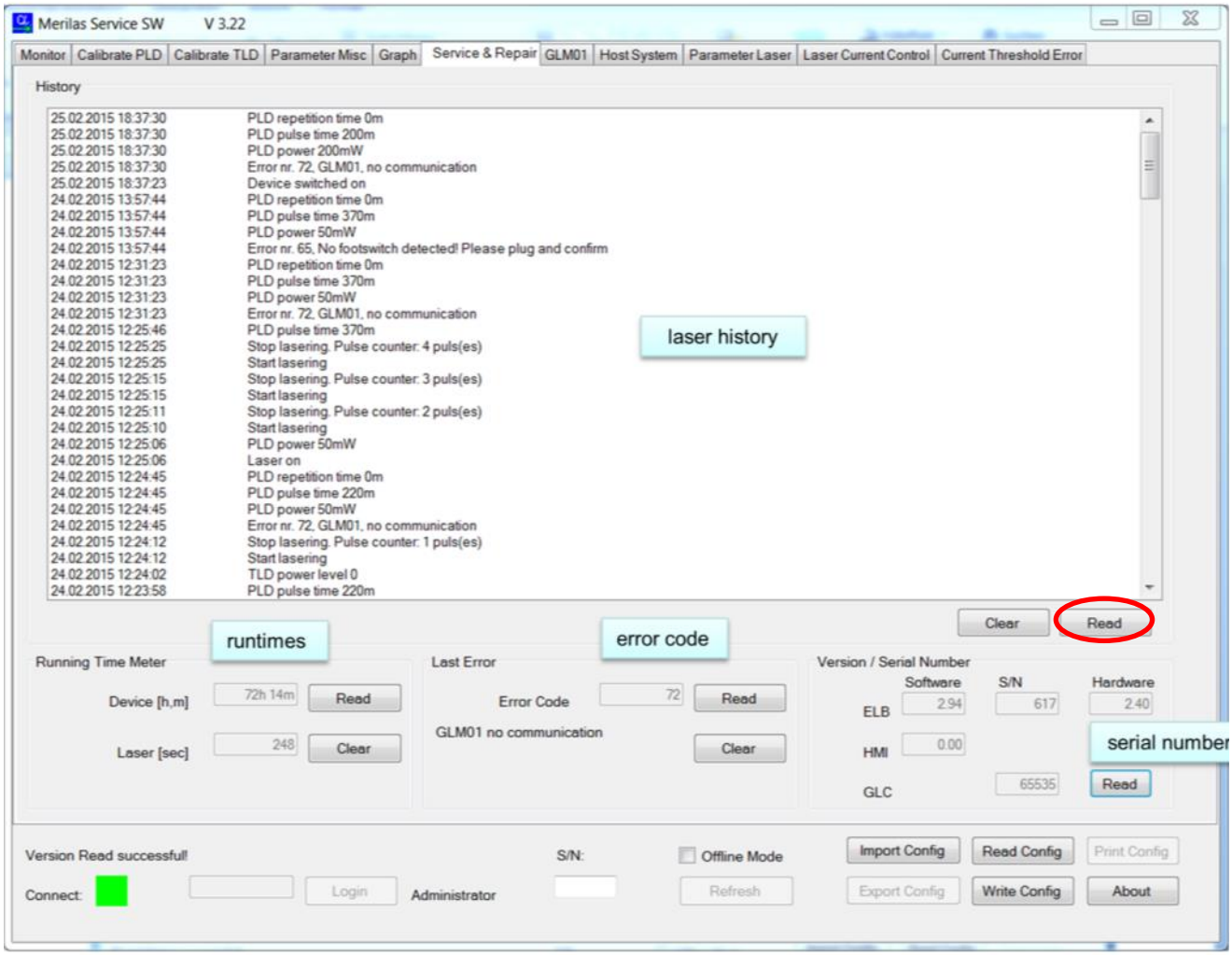
On this page, various parameters can be set. Any changes made must be saved by means of **<Write Config>**.



Equipment type:	Type that indicates how the software communicates with the laser module: ***3500***: module is used with service software (USB connector) ***3100***: default - module is controlled by OS 4 software
Power TLD:	Minimum power of the TLD, default is ***3***
Sound:	Minimum level of internal beeper, default is ***3***
UPF Passive Allowed:	Always set ***yes***

9.7.1.3 Safe History

This page contains information which is important for second-level support.

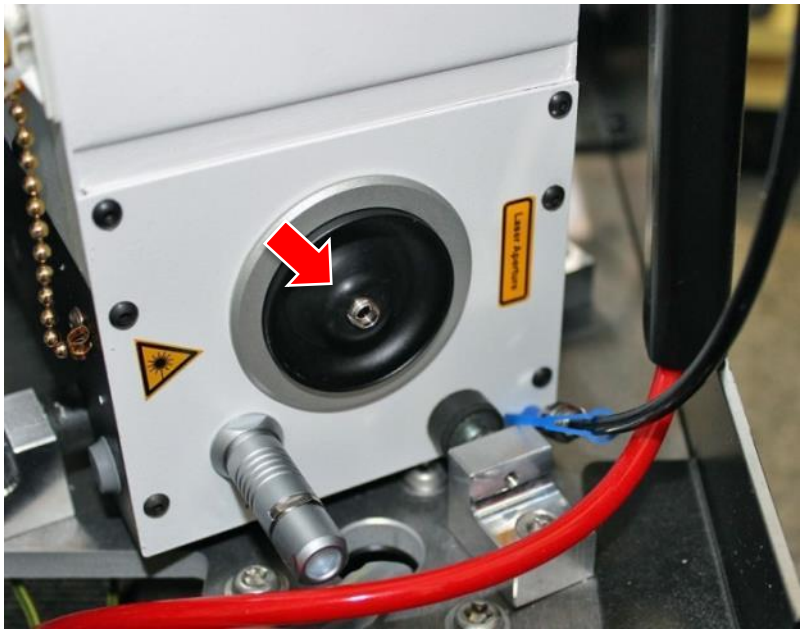


Procedure:

1. On this tab you can read the history, runtime, error code and version numbers.
2. To make a print screen and store the file, right click into the blank window, and click on “Select all”, then right click onto the marked text, and click on “Copy to Clipboard”. Open Word, or Word-Pad, and paste into document and safe (SN……._YYMMDD_Technician_History.doc) for future reference.

9.7.2 Fibre check

If the deviation is higher than expected, check power directly at the laser module:



STEP 1:

1. Disconnect fibre cable from laser module.
2. Protect end of fibre cable with the cap attached to the fibre itself.
3. Connect test fibre of measuring sensor head to laser module.
4. Set external fibre detection to “NO” (see ♦ 9.7.1.2).
5. Measure power and compare it with the intended value.
6. If the value is within the tolerance, exchange the fibre (see ♦ 11.3.4).
7. Calibrate as described in ♦ 9.7.

If the power at the module itself matches the values submitted at the software, then the power loss is caused by the fibre (narrow radii or kinked).

9.7.3 Short calibration guideline – power laser PLD (working beam)

This chapter guides you through a short calibration routine of the power laser diode. All further maintenance must be performed by one of the Oertli Instrumente AG certified service centres.

The power measured at the connector for the laser probe (3) must be within ± 20% of the value set on the screen. If the deviation is more than this, the laser must be recalibrated.

Use a power meter, measurement unit JOULE to perform measurement.
Select pulse duration of 1000 ms.

Perform measurement at the connector for the laser probe (3) at the front panel.

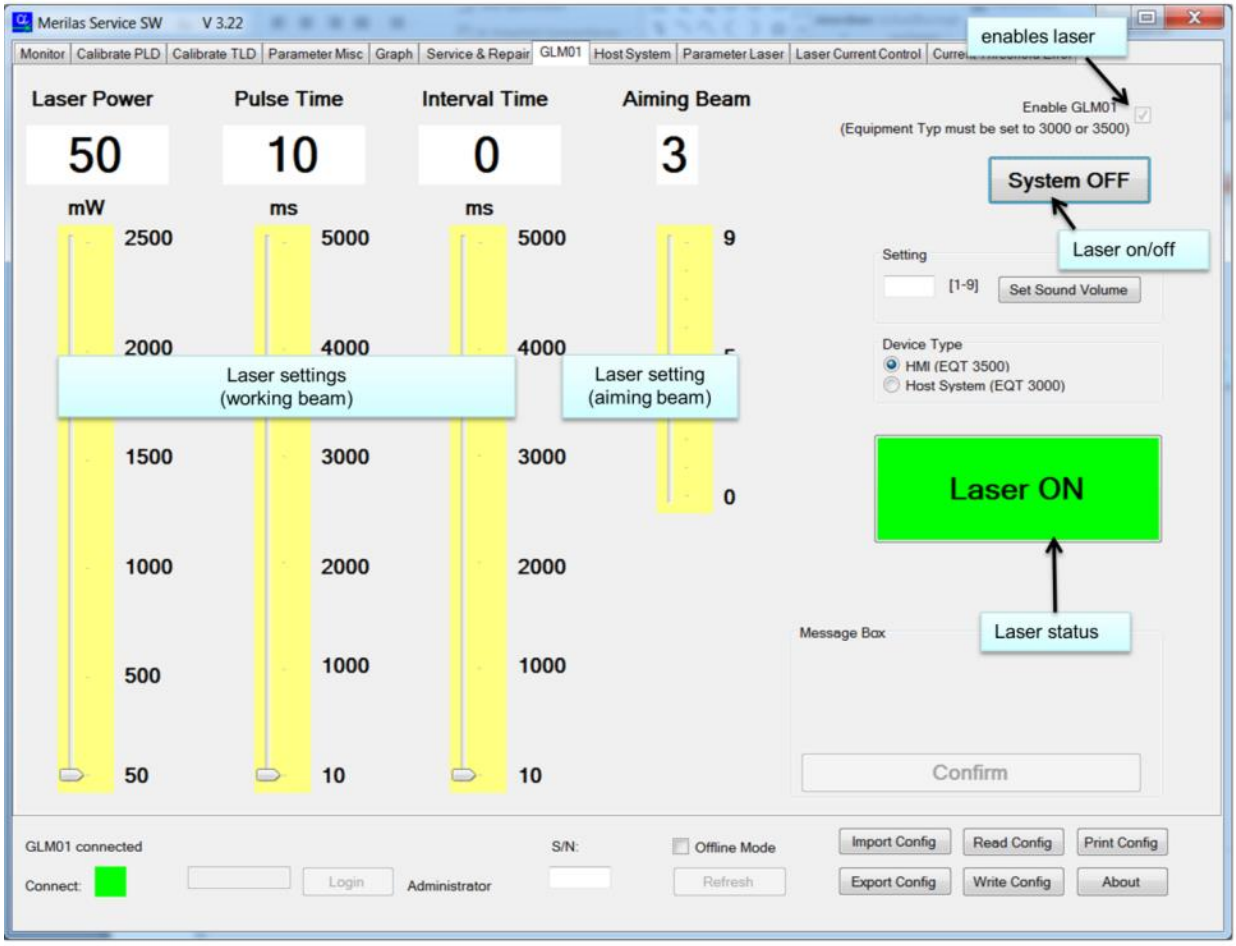
Procedure:

1. Connect login as administrator.
2. Click on **<Read config.>** (♦9.7.1.2)
3. Change equipment type to 3500. (♦ 9.7.1.2)
4. Click on **<Write config.>**
5. Reboot GML01
6. Check for error messages.(♦9.7.1.3)
7. **<enable>** GLM01 module. (♦ 9.7.3.1)
8. Click on **<System ON>.**
9. Click on **<Laser ON>.**
10. Module is heating up (time varies between 10 and 60 seconds).
11. Go to “calibrate PL” and click on “Endo”
12. Measure the power at 50 mJ / 100 mJ / 200 mJ / 400 mJ / 800 mJ / 1500 mJ at duration 1000 ms
13. Enter measured values minus 3 mW into white boxes (♦9.7.3.2) (for example: measure value *37 mW*, so enter *34 mW*).
14. 2500mJ must be measured at 500ms, and the result multiplied by 2 (♦ 9.7.3.2)
15. Click on **<Accept>.**
16. Click on **<Write Config>.** (♦ 9.7.3.2)
17. Click on **<Reboot> (**♦9.7.1.2)**.**
18. Fill in the “Functional Test” form.
19. Set the equipment type back to 3100.

If no separate laser pedal is available, measure all the values ranging between 50 and 2500 mJ in laser mode with the OS 4 in advance.

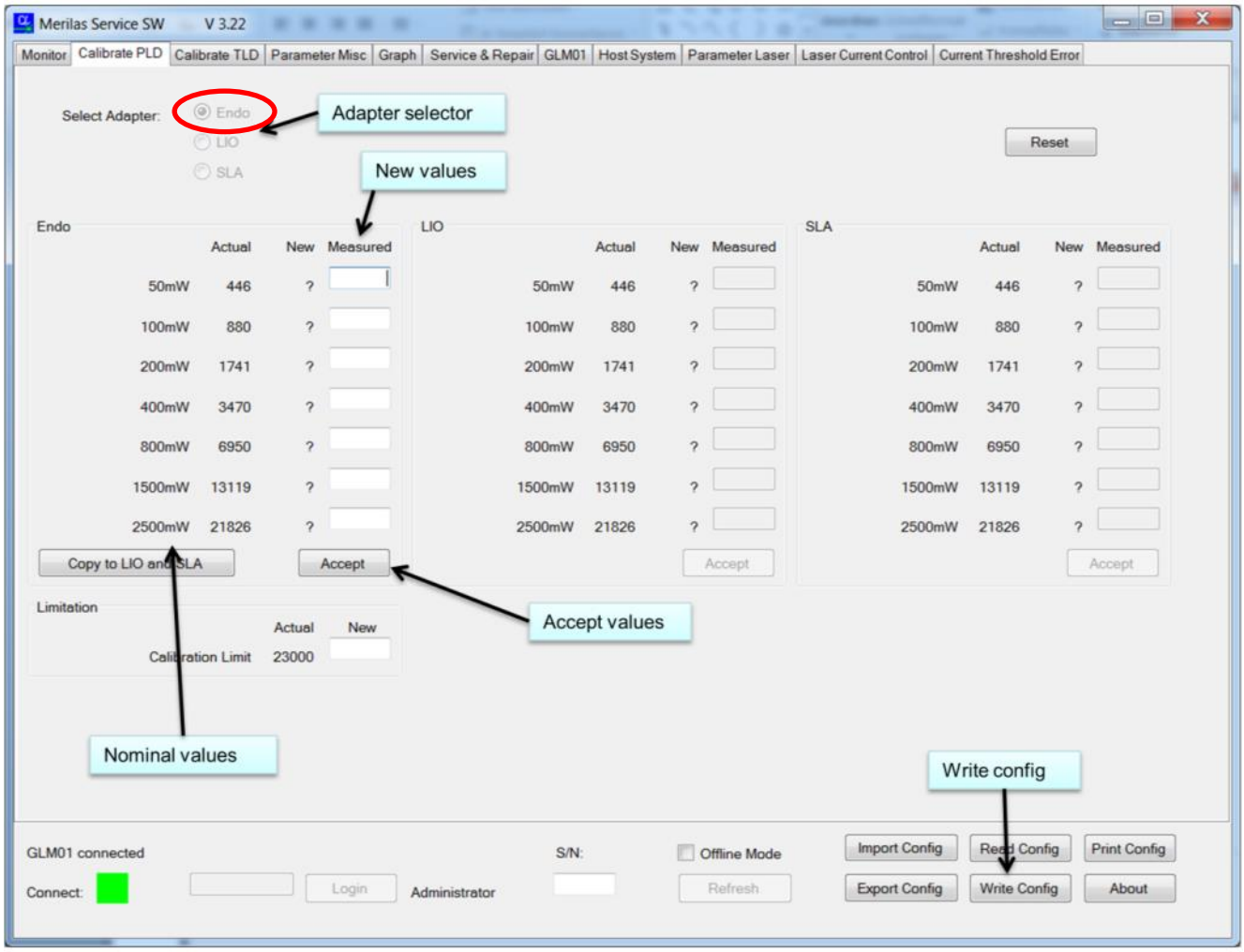
9.7.3.1 Front end for GLM01

The front end allows controlling the laser module without the OS 4 front panel. Power, pulse and interval settings can be made here.



9.7.3.2 Calibrate PLD (Power Laser Diode)

Calibration of the PLD is performed on this page. Current power values are shown and new ones are entered here.



For GLM01, adapter **<Endo>** is used. Make sure the correct adapter is selected before calibration.

9.7.4 Short calibration guideline – target laser TLD (aiming beam)

This chapter will guide you through a short calibration routine of the target laser diode.

Use a power meter, measurement unit WATT to perform measurement.

Perform measurement at the fibre connector at the front panel.

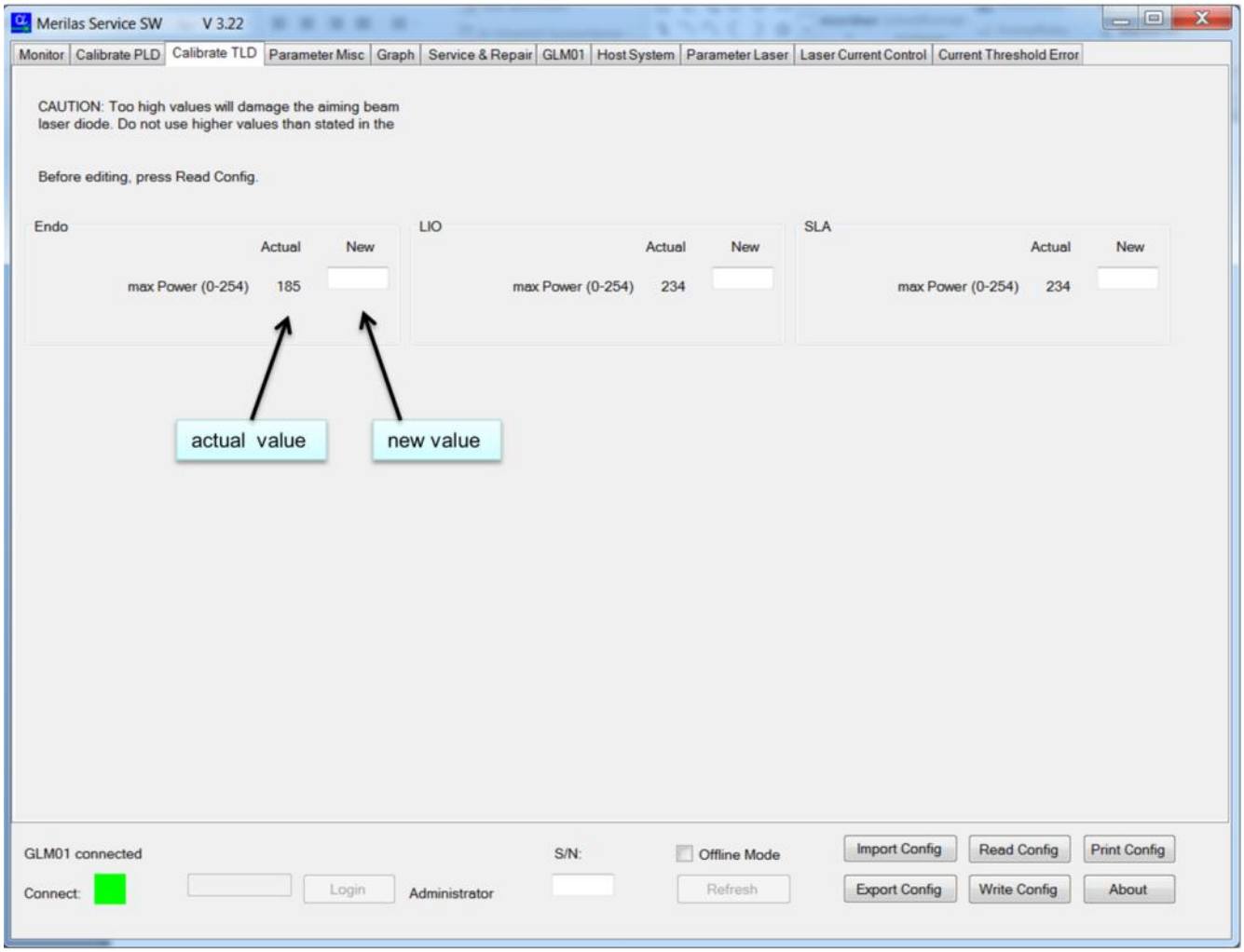
Procedure:

1. Start the laser in such a way that the aiming beam can be measured (♦ 9.7.3.1, procedure 1–6). The aiming beam is on as soon as “Laser ON” is activated.
2. Measure the aiming beam at level 9 (♦ 9.7.3.1).
3. Change new value until a value of minimal 700µW is shown on the measurement device.
4. Enter a higher or a lower value; corresponding to the measured one. If the value is out of tolerance (700µW ± 300µW), repeat 1-4.
   (♦ 9.7.4.1)
5. Click on **<Write config.>**
6. Change the value to 8 and back to 9 again (to ensure the setting change).

9.7.4.1 Calibrate TLD (Target Laser Diode)

Calibration of the TLD is performed on this page. The current power value is shown and the new one is entered here.

NOTE: The entered power value must be 40 or higher in order to achieve that the value of the aiming beam reaches the specified value and tolerance range.



For GLM01, adapter **<Endo>** is used. Make sure the correct adapter is selected during calibration.

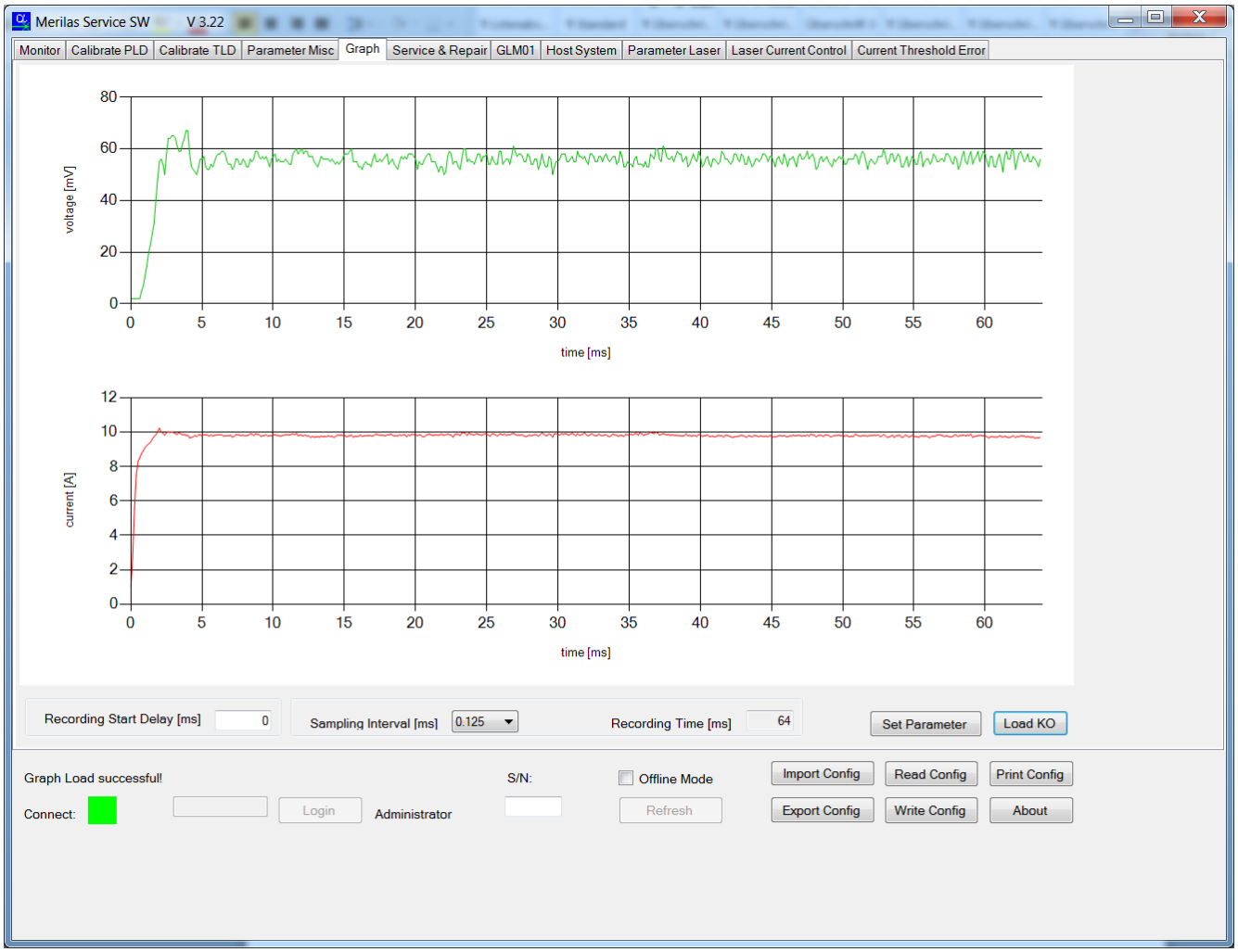
<Read Config> reads the values from the module and displays them.

After calibration, the configuration must be written on the module by **<Write Config>**.

The configuration can be saved into a file by **<Export Config>** and restored by **<Import Config>**.

9.7.4.2 How to read the graph

For diagnosis purposes, it can be helpful to check the voltage and current of the PLD. In this case, the transient response can be recorded.



Procedure:

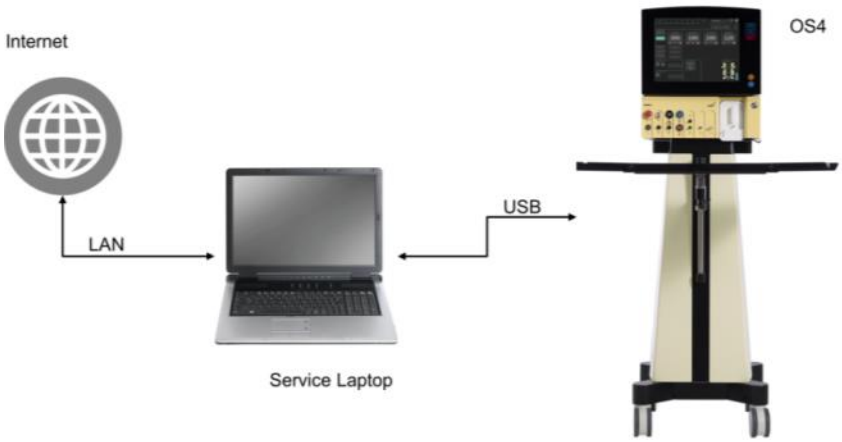
1. Define the recording start delay and the recording time. The default values normally work.
2. Click **<Set Parameter>**
3. Change to tab “GLM-01”, and enable GLM01
4. Click **<System On>**
5. Select relevant laser settings. See “Functional Test” documents for settings
6. Click **<Laser On>** Laser will start preheating
7. Fire the Laser via the service foot pedal
8. Change to the tab “Graph”
9. Click **<Load Ok>**
10. Safe each graph according to the “Functional Test” (♦ 19)

NOTE!

Maximum current should be reached within 3ms.

9.8 Remote servicing – second level support

For second-level support, the laser module must be connected to the internet. *TeamViewer Version 8.0* or higher must be installed on the servicing laptop.



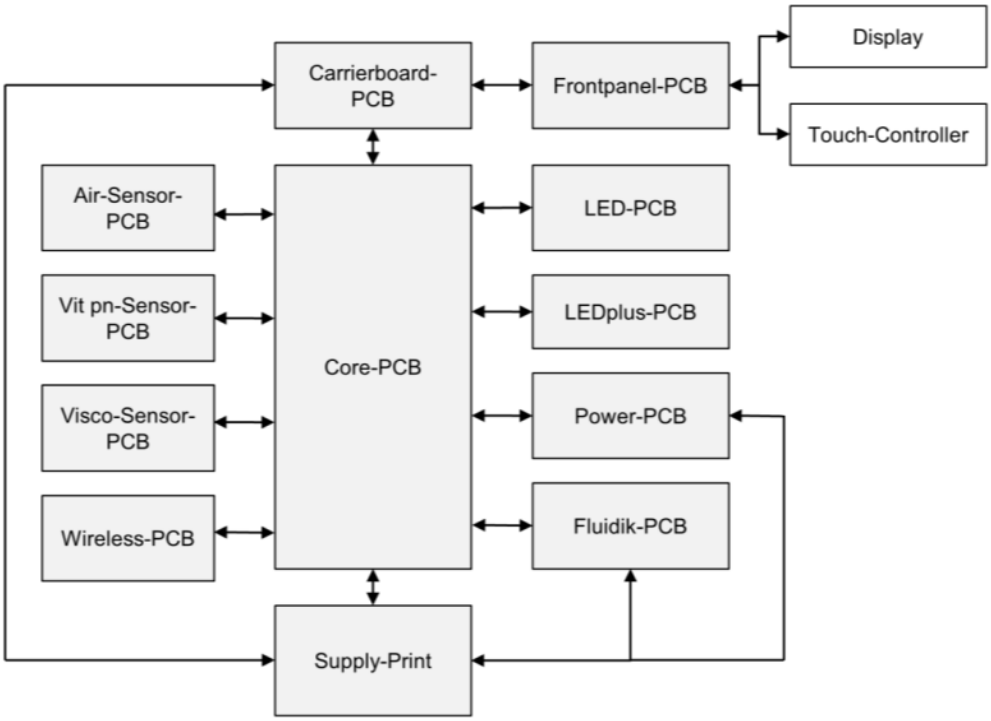
Procedure:

1. Prepare laser module according to ♦9.5.
2. Connect service laptop to internet.
3. Call service centre.
4. Start TeamViewer and commit access data to service centre.

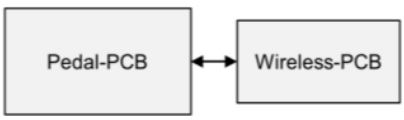
10 Device composition

10.1 PCB overview

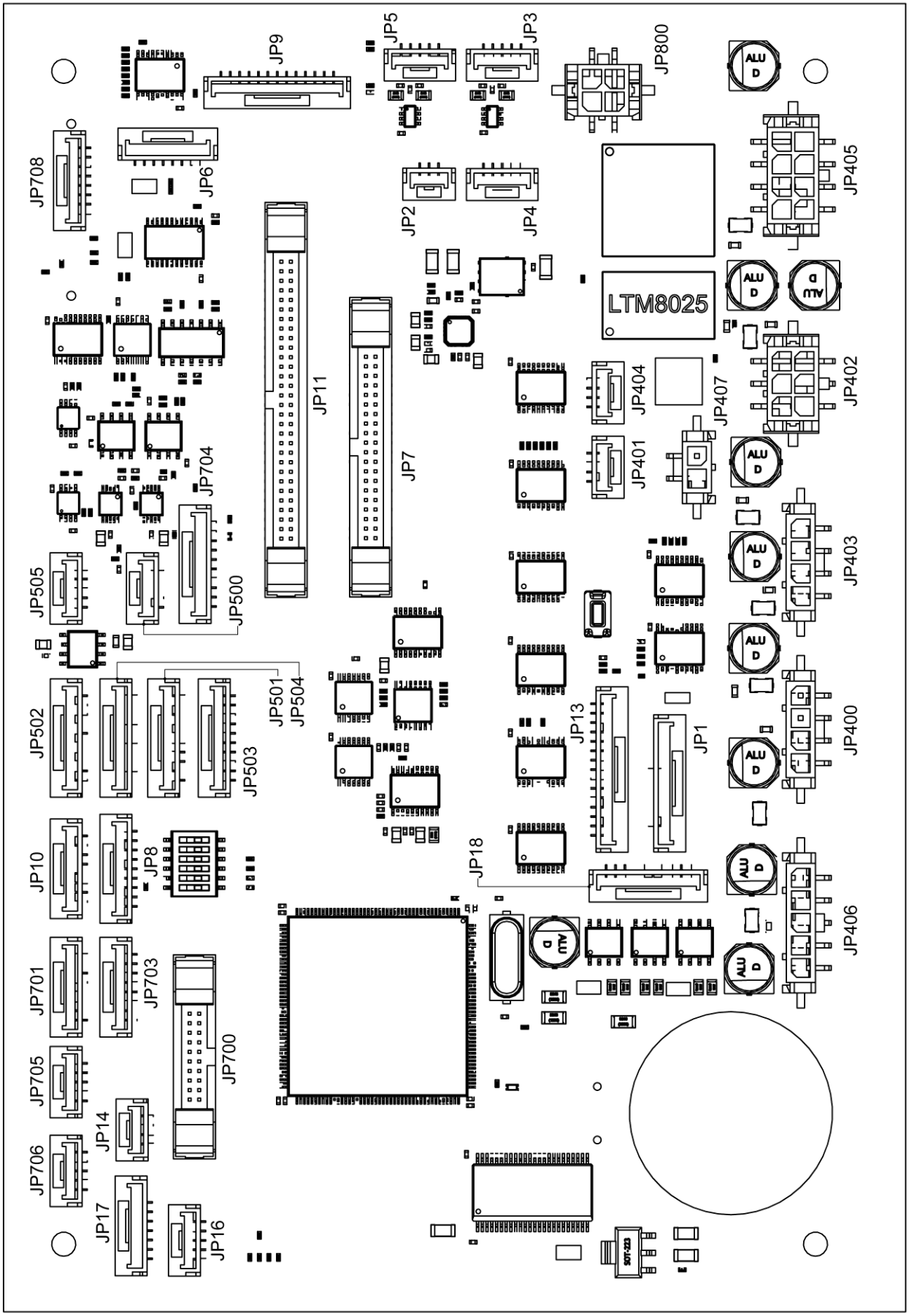
10.1.1 Unit



10.1.2 Pedal

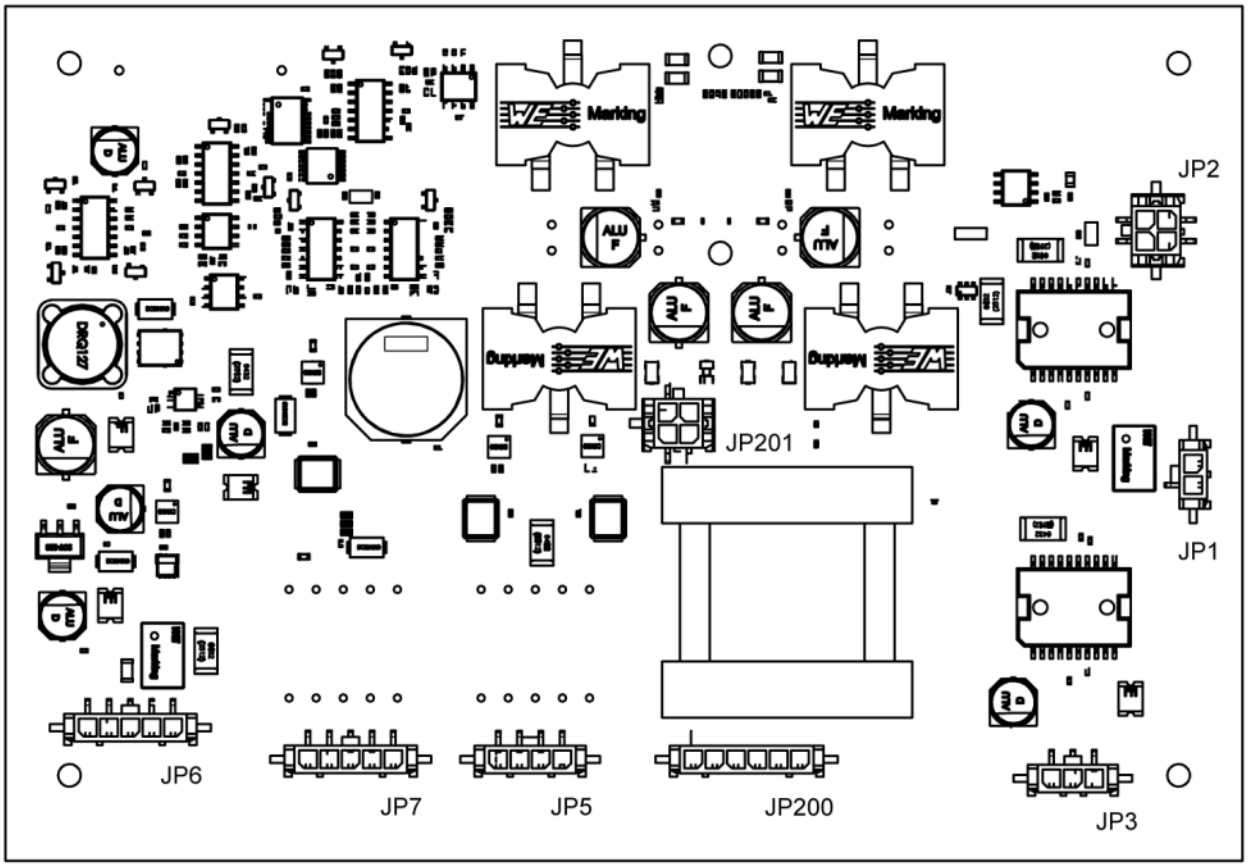


10.2 Core PCB


JP9
JP5
JP3
JP800
JP708
JP6
JP2
JP4
JP405
LTM8025
JP11
JP7
JP404
JP407
JP402
JP401
JP704
JP505
JP500
JP403
JP501
JP504
JP502
JP503
JP13
JP1
JP400
JP10
JP8
JP18
JP406
JP701
JP703
JP700
JP705
JP14
JP706
JP17
JP16

From	To	
JP001	Front panel (glass)	X1
JP002	-	-
JP003	Socket *CAN*	-
JP004	LEDplus PCB	X2
JP005	-	-
JP006	-	-
JP007	Suppl PCB	JP001
JP008	-	-
JP009	Carrier board PCB	JP204
JP010	Wireless PCB	JP001
JP011	Fluidic PCB	JP001
JP013	-	-
JP014	Laser key switch	-
JP016	Laser emergency switch	-
JP017	Laser detect signal	-
JP018	Front panel (glass)	X2
JP400	LEDplus PCB	X1
JP401	-	-
JP402	Valves vit pn	-
JP403	LED pcb	X1
JP404	-	-
JP405	Visco module	-
JP406	Air gfi front	-
JP407	Vit pn	-
JP500	-	-
JP501	Air sensor PCB	JP001
JP502	Vit pn sensor PCB	JP001
JP503	Visco sensor PCB	JP001
JP504	-	-
JP505	-	-
JP700	-	-
JP701	-	-
JP703	-	-
JP704	-	-
JP705	-	-
JP706	-	-
JP708	-	-
JP800	Supply PCB	JP207

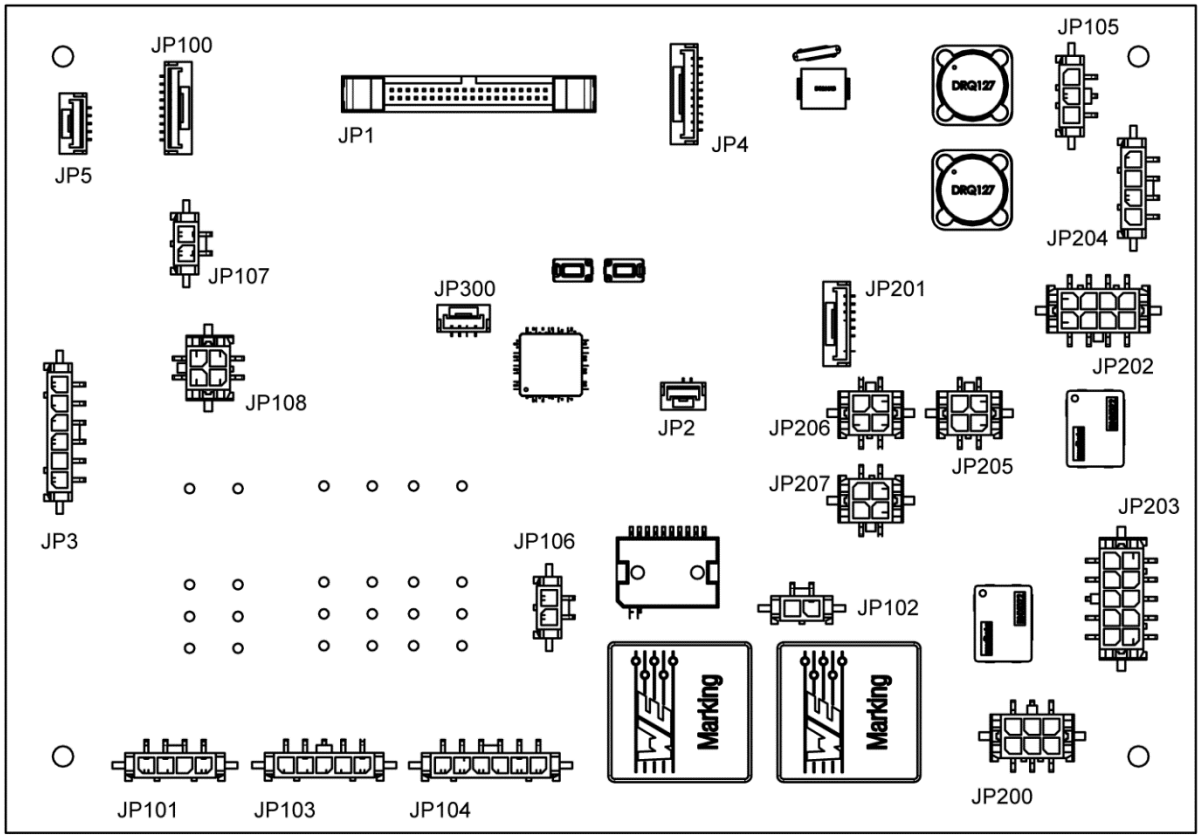
10.3 Power PCB



From	To	
JP001	-	-
JP002	Supply PCB	JP206
JP003	-	-
JP005	Socket *DIA*	-
JP006	-	-
JP007	-	-
JP200	Socket *PHACO*	-
JP201	-	-

10.4 Supply PCB

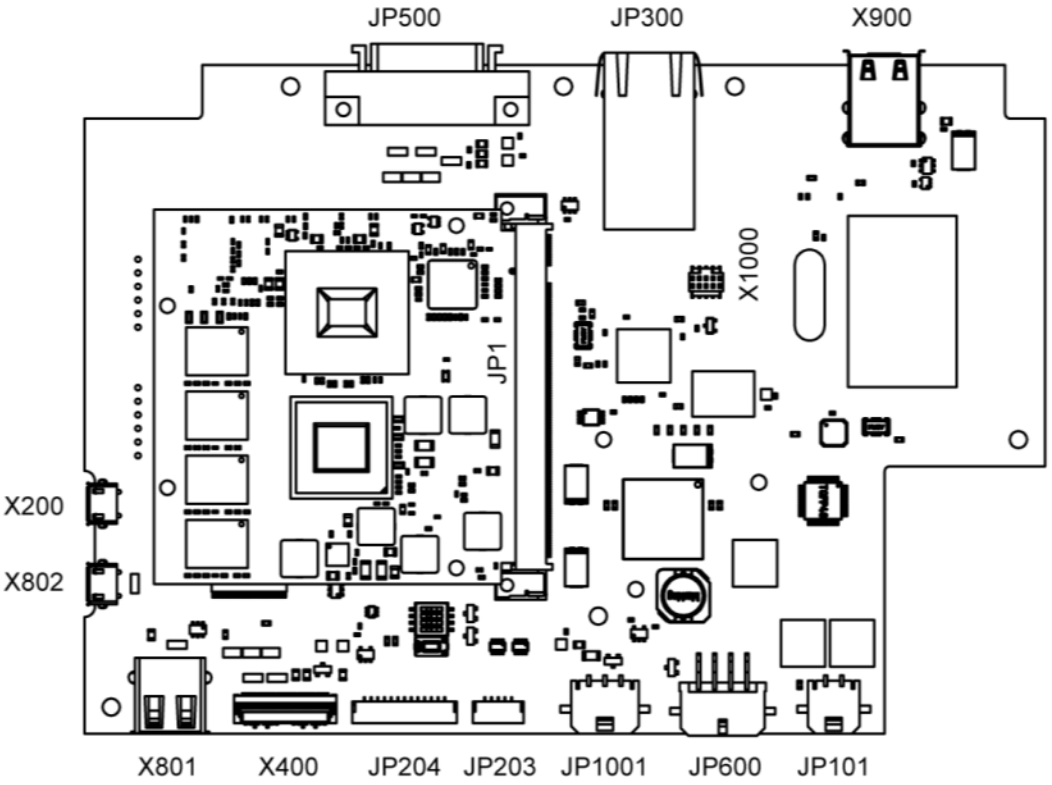
(VX541129)



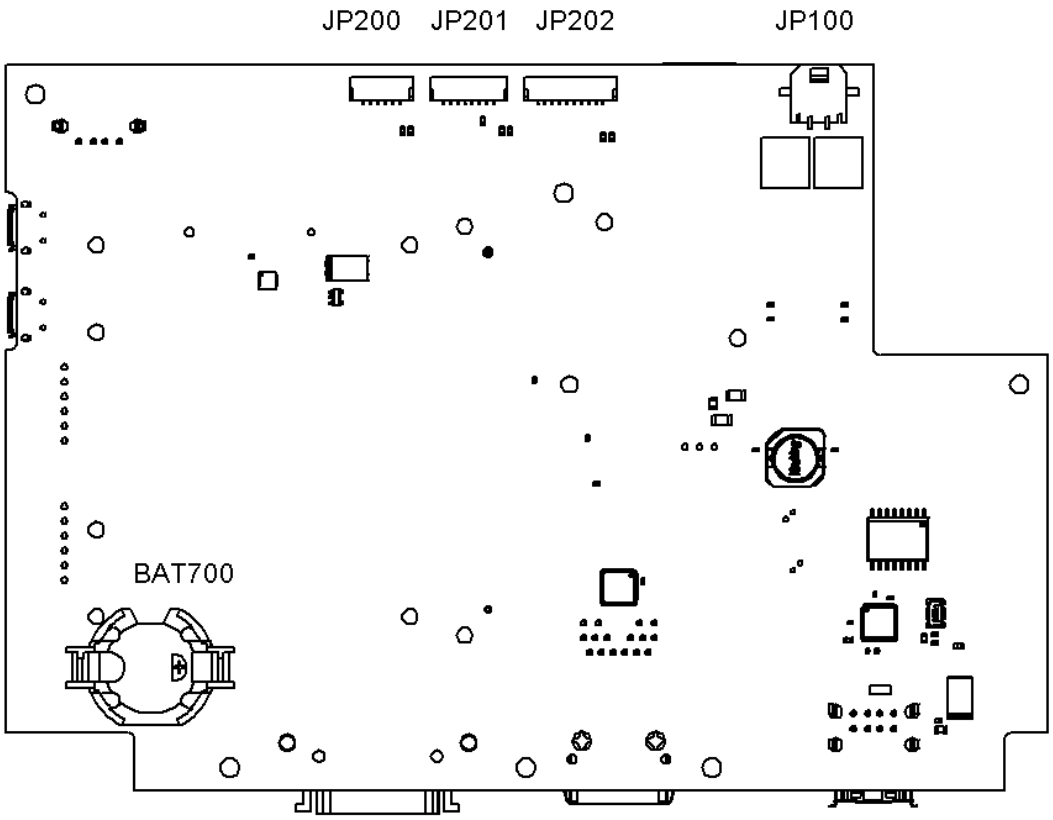
From	To	
JP001	Core PCB	JP007
JP002	IV pole potentiometer	-
JP003	Socket CAN pedal	-
JP004	-	-
JP005	-	-
JP100	Laser module	COM
JP101	Socket *DRS*	-
JP102	IV pole motor	-
JP103	Laser module	DRS
JP104	Laser module	FSW
JP105	Compressor	-
JP106	-	-
JP107	Fan	-
JP108	Valves	-
JP200	Power supply 24VDC	-
JP201	Switch *ON/OFF*	-
JP202	Carrier board PCB	JP600
JP203	Power supply 12VDC	-
JP204	-	-
JP205	Fluidic PCB	JP005
JP206	Power PCB	JP002
JP207	Core PCB	JP800
JP300	-	-

10.5 Carrier print

(VX541128)

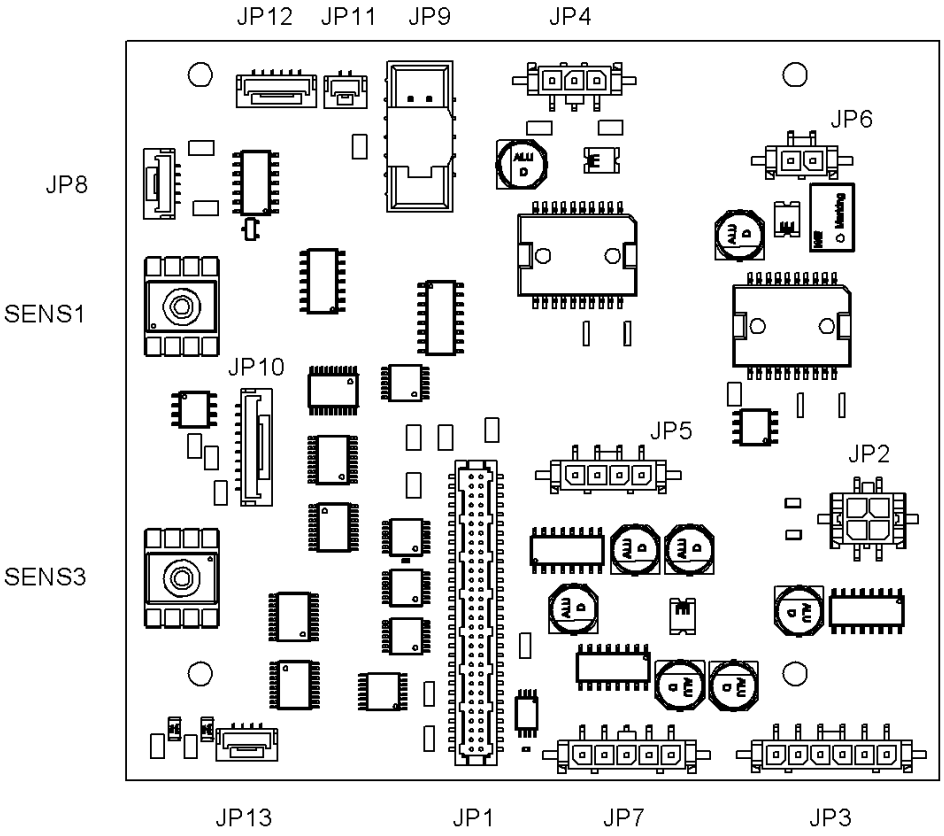


From	To	
JP001	CoM board	-
JP101	Speaker left	-
X200	-	
JP203	-	-
JP204	Core PCB	JP009
JP300	Ethernet	-
X400	Front panel PCB	X1
JP500	Remote control	-
JP600	Supply PCB	JP202
X801	-	-
X802	-	-
X900	USB (service)	-
X1000	-	-
JP1001	-	-



From	To	
JP100	Speaker right	-
JP200	-	-
JP201	-	-
JP202	-	-
BAT700	Support battery	-

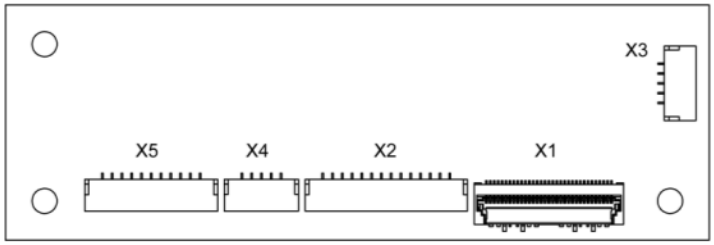
10.6 Fluidic PCB



From	To	
JP001	Core PCB	JP011
JP002	Supply PCB	JP205
JP003	Air module	-
JP004	Motor irrigation valve	-
JP005	Valves V7-V8	-
JP006	Pump motor	-
JP007	Venturi	-
JP008	Force sensor	-
JP009	Pump motor encoder	-
JP010	Fluidics level detector	-
JP011	Pump position sensor	-
JP012	Cassette recognition	-
JP013	Cassette release switch	-
SENS1	-	-
SENS2	-	-

10.7 Control panel PCB

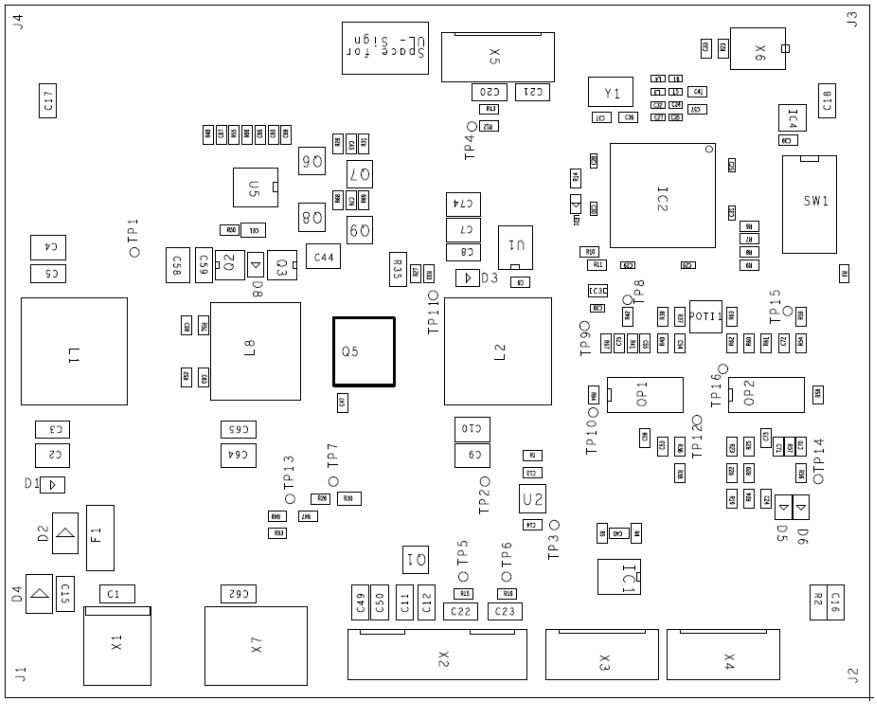
(Part of VX210159)



From	To	
X1	Carrier board PCB	X400
X2	Display	-
X3	Touch controller	-
X4	Display	-
X5	Display	-

10.8 (Power) LED module PCB

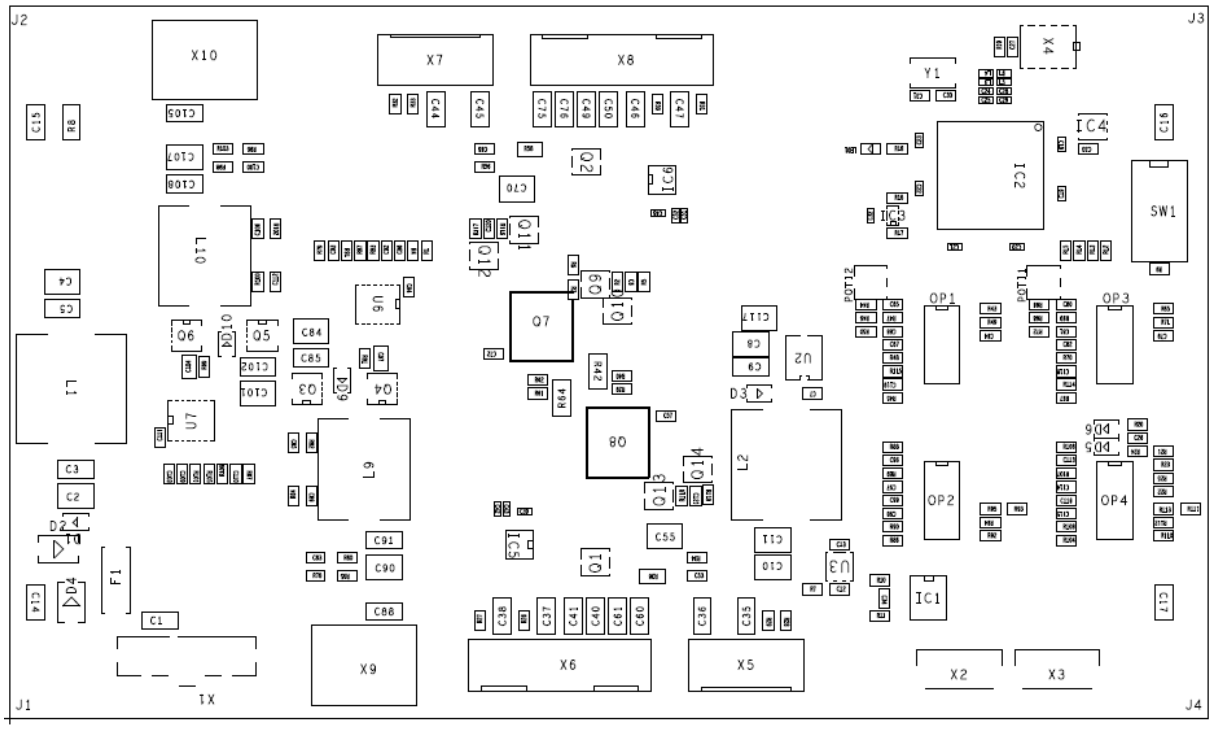
(Part of VX210149)



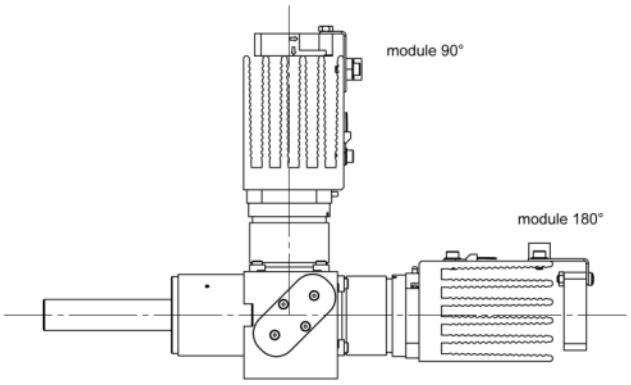
From	To	
X1	Core PCB	JP403
X2	Led module	-
X3	Led plus module PCB	X3
X4	-	-
X5	-	-
X7	Led module	-

10.9 (Power) LEDplus module PCB

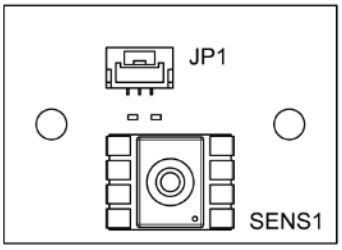
(Part of VX210148)



From	To	
X1	Core PCB	JP400
X2	Core PCB	JP004
X3	Led PCB	X3
X4	-	-
X5	-	-
X6	Led plus module 180°	-
X7	-	-
X8	Led plus module 90°	-
X9	Led plus module 180°	-
X10	Led plus module 90°	-



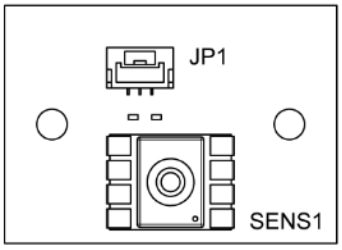
10.10 Air sensor PCB



From	To	
JP001	Core PCB	JP501
SENS1		

10.11 Visco sensor PCB

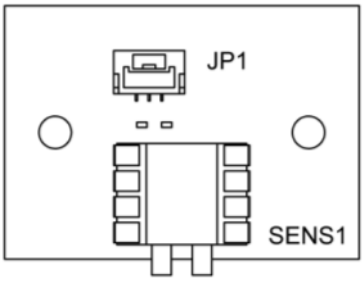
(Part of VX210132)



From	To	
JP001	Core PCB	JP503
SENS1		

10.12 Vit pn sensor PCB

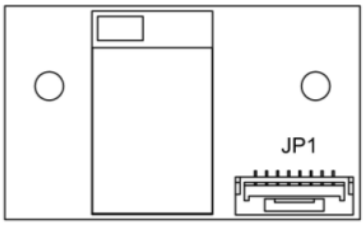
(Part of VX210157)



From	To	
JP001	Core PCB	JP502
SENS1		

10.13 Wireless module

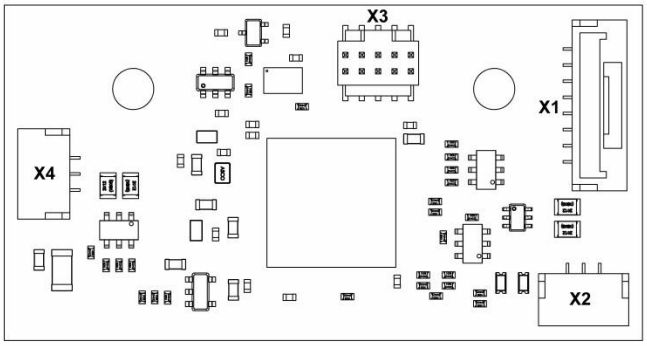
(VX541130)



From	To	
JP001	Core PCB	JP010

10.14 Fluidic sensor PCB

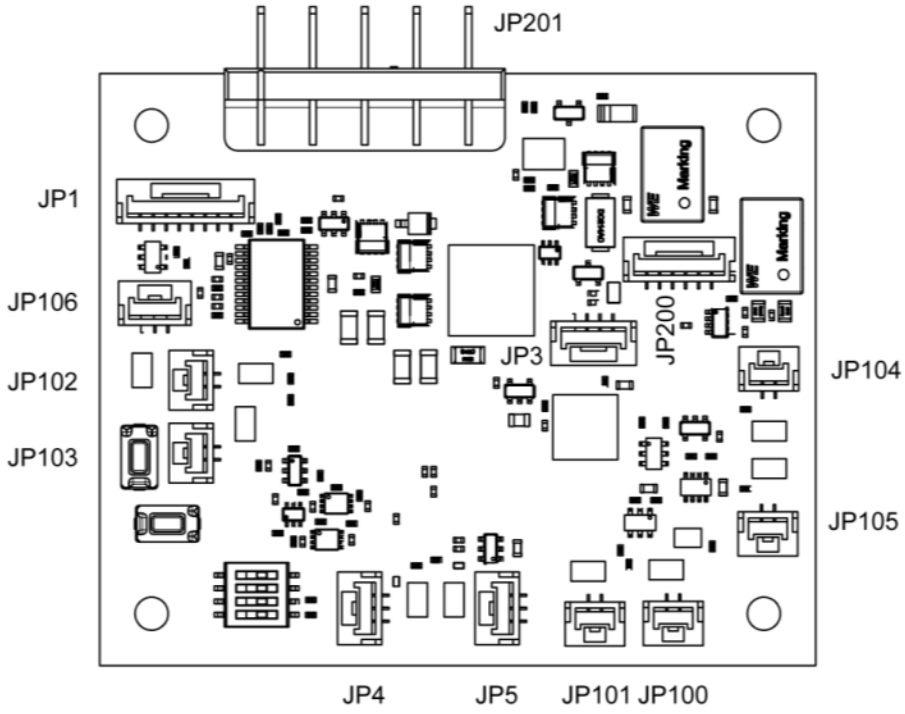
(Part of VX210130)



From	To	
X1	Fluidic PCB	JP010
X2	Level Sensor 1	-
X3	-	-
X4	Level sensor 2	-

10.15 Pedal PCB

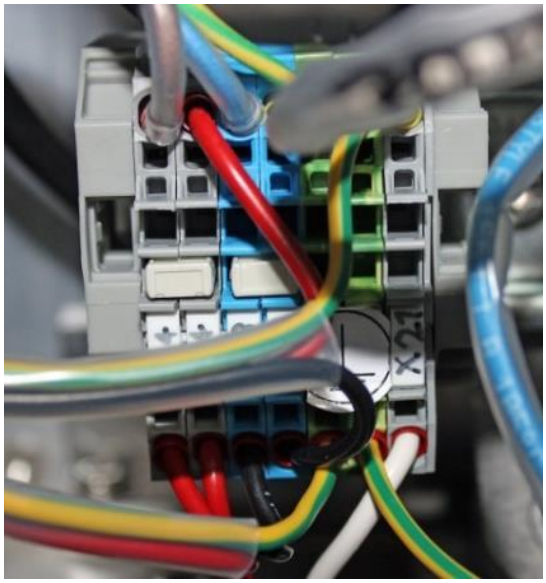
(VX541135)



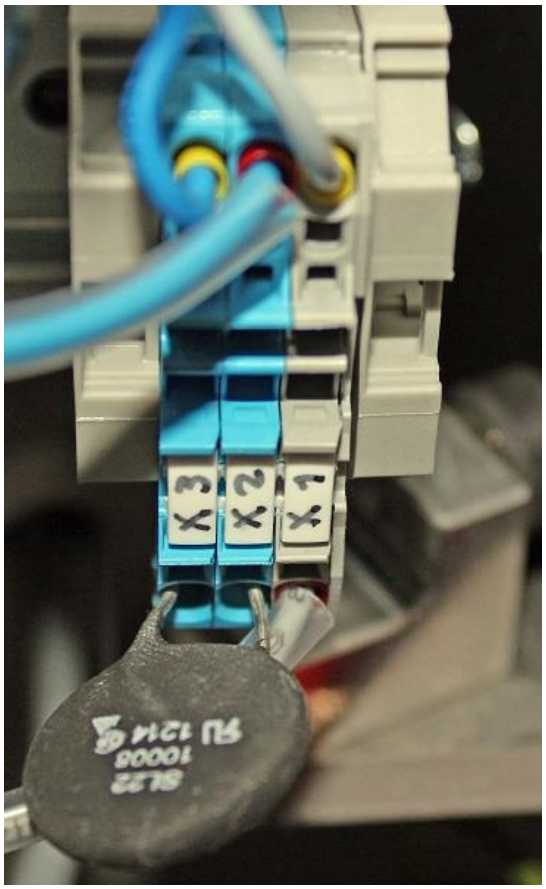
From	To	
JP001	Wireless module	-
JP003	-	-
JP004	Horizontal sensor	-
JP005	Vertical sensor	-
JP100	Heel switch left	-
JP101	Heel switch right	-
JP102	Side switch right	-
JP103	Top switch right	-
JP104	Top switch left	-
JP105	Side switch left	-
JP106	Laser switch	-
JP200	CAN / supply	-
JP201	Battery	-

10.16 Power supplies

10.16.1 Isolation transformer



Pos.	Bottom	Top
X24	Cable fuse holder RT	Laser module BN
X24	Power supply 12V RT	Power supply 24V RT
X23	Power supply 12V BK	Laser module BL
X23	Power supply 24V BK	Isolation transformer BK
GND	Power supply 12V GN/YE	Power supply 24V GN/YE
GND	Mains inlet GN/YE	Laser module GN/YE
X21	Cable fuse holder WH	Isolation transformer WH

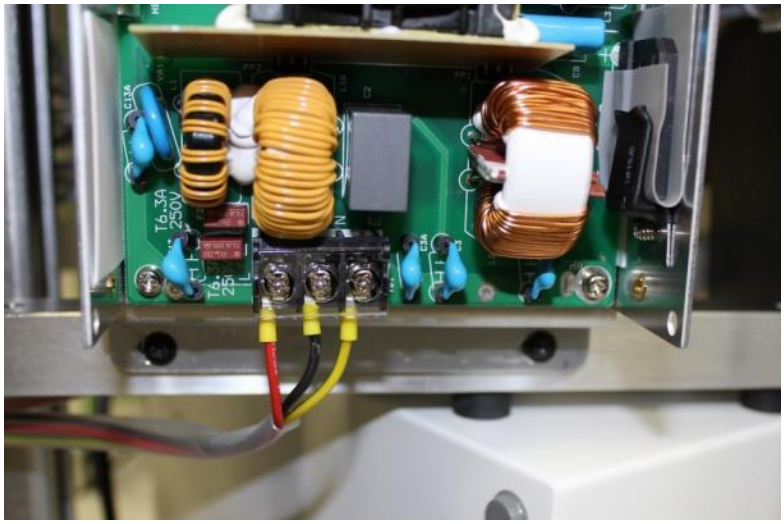


Pos.	Bottom	Top
X3	R2 (T)	Isolation transformer BL
X2	R2 (T)	Varistor BL
X1	Mains inlet GY	Isolation transformer GY

Colour abbreviations according to IEC 60757

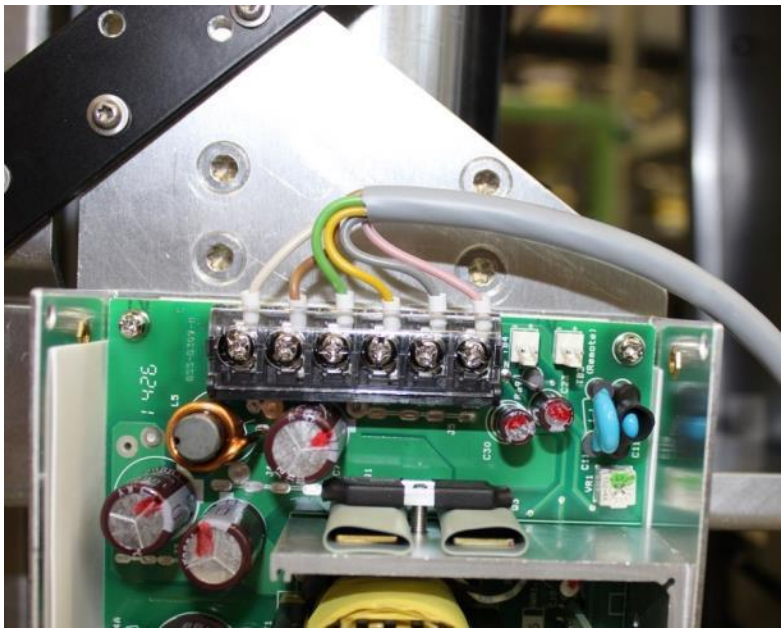
10.16.2 Power supply 24 VDC

(VX320019)



Pos.	Abbr.	Colour
L	RT	Red
N	BK	Black
E	GN/YE	Green/Yellow

Colour abbreviations according to IEC 60757.



Pos.	Abbr.	Colour
1	WH	White
2	BN	Brown
3	GN	Green
4	YE	Yellow
5	GY	Grey
6	PK	Pink

10.16.3 Power supply 12 VDC

(VX320024)

Do not fix any single wires to the power supply.

Attach the grounding wire with additional spring washer.

11 Installing and uninstalling of device components

The installation of components is done in the reverse order of their uninstallation. Each section specifically indicates any points which are important to observe.

11.1 General

11.1.1 Fuses

VX520013

Quantity	Description
10	Fuse 6.3AT 5x20mm

STEP 1:

1. **Fuse holder „square“:** Plug in tool (e.g. screw driver) downwards and replace fuses.
2. **Fuse holder „round“:** Turn fuse holder with tool counter in clock-wise direction.
3. Pull drawer out. It cannot be pulled out completely.

Following the installation of the spare fuses: Check in accordance with ♦6.2 if the correct voltage has been selected.
The laser module contains another fuse. To find this fuse, please check the laser module.
This should only blow if an internal error of the module occurs.

11.1.2 Hook for infusion pole

VX100869

Quantity	Description
1	Mount for infusion pole (incl. hooks)
1	M5x10 hex socket screw

STEP 1:

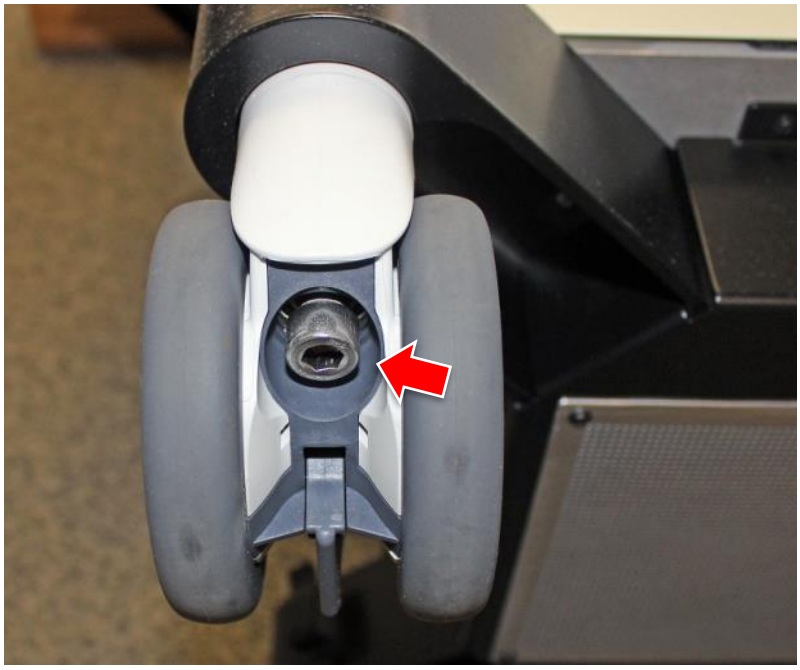
1. Unfasten screw of the mount for infusion pole.
2. Pull mount out of the infusion pole.

   Please consider during the assembling that both hooks must be at a 45-degree angle to the device (see ♦ 6.3).

11.1.3 Front castor wheel

VX120179

Quantity	Description
1	Front castor wheel



STEP 1:

1. Get access to the underside of the unit by tipping it so that the castor wheels come free.

   A second person should be consulted to do this.

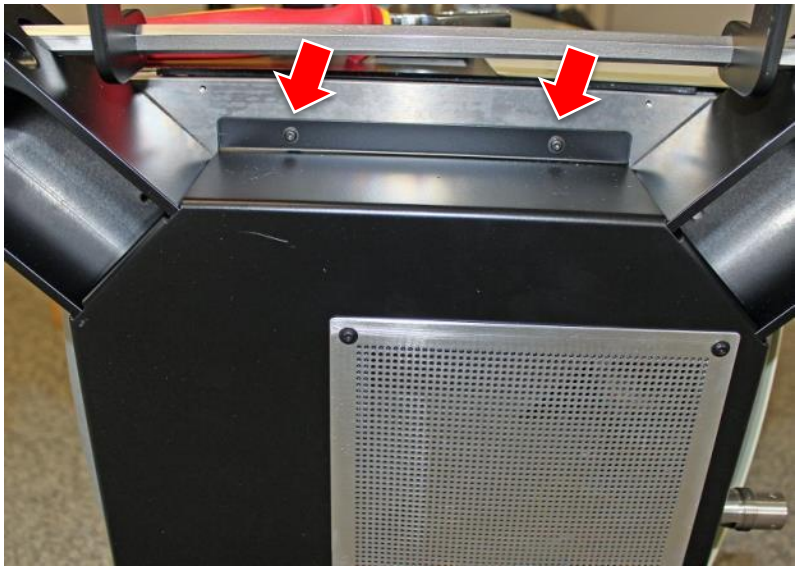
2. Loosen screw at the underside of the castor.

3. Pull castor out of carrier.

11.1.4 Back castor wheel

VX120178

Quantity	Description
1	Back castor wheel



STEP 1:

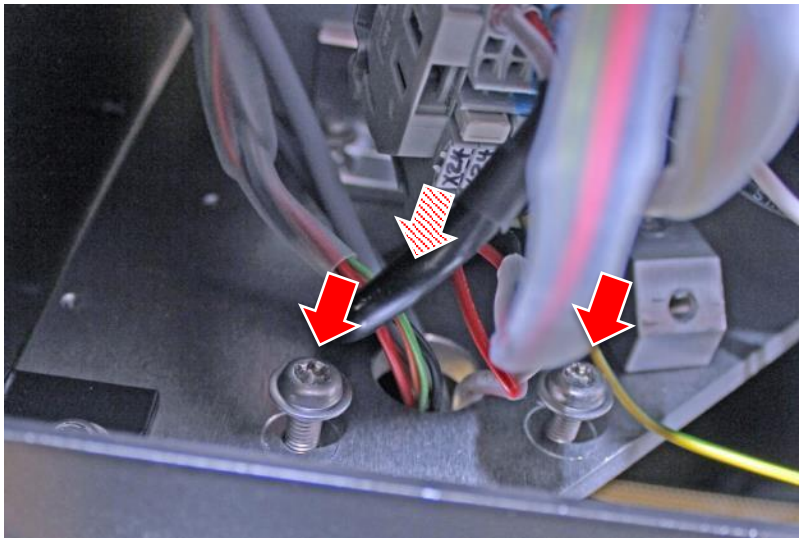
1. Get access to the underside of the unit by tipping it so that the castor wheels come free.

   A second person should be consulted to do this.

2. Remove cover by releasing 8 screws. The part stays connected with the unit by the cables.

STEP 2:

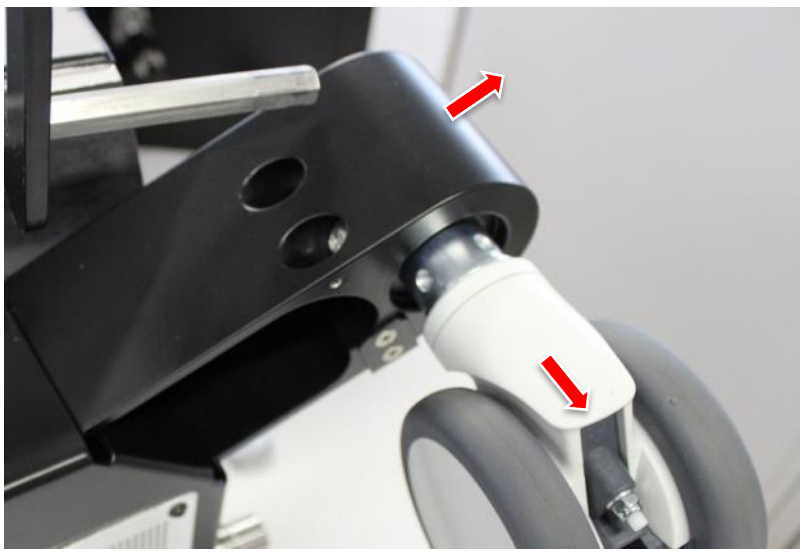
3. Remove the screw that holds the wheel in the carrier.



STEP 3:

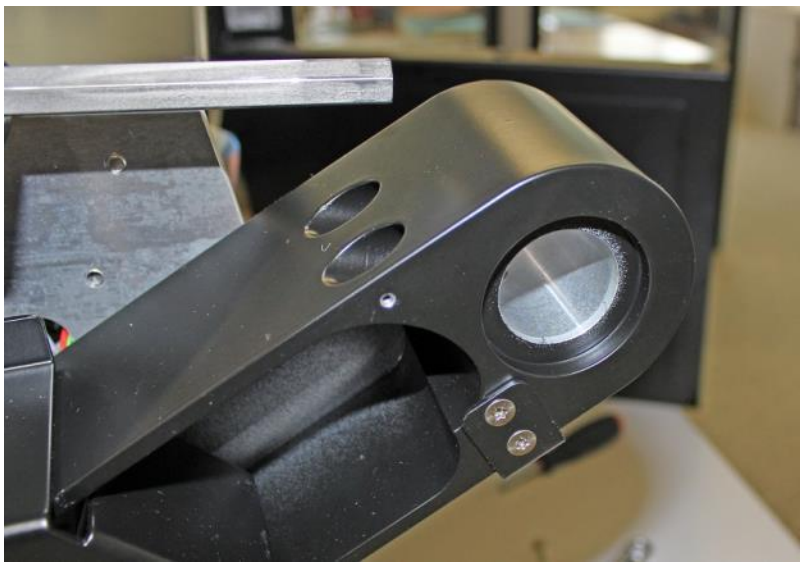
4. Remove the isolator transformer assembly according to procedure ♦11.1.9.

5. Remove wheel carrier by loosening 3 screws.



STEP 4:

6. Pull wheel carrier out so that the hexagonal bar comes free.



STEP 5:

7. The new wheel must be aligned so that the hexagonal bar can enter the wheel.

11.1.5 Housing

VX102156

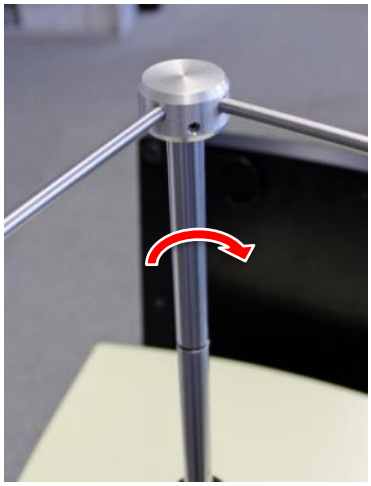
Quantity	Description
1	Side cover
8	M3x12 countersunk screw, TORX, black

VX102177

Quantity	Description
1	Lower enclosure
8	M3x12 countersunk screw, TORX, black

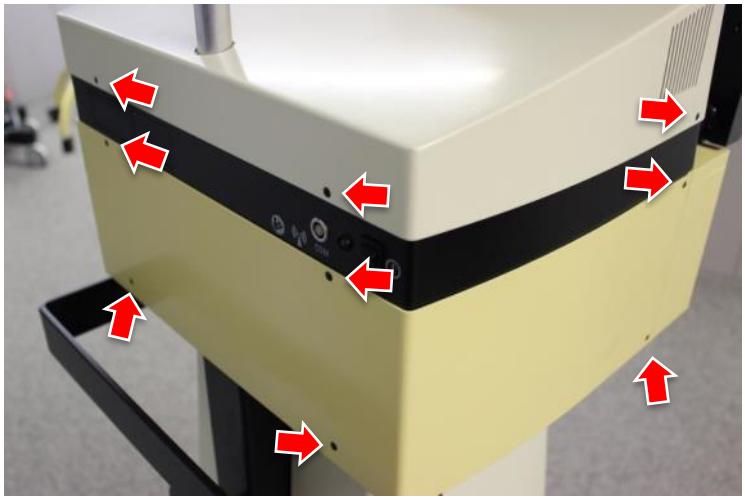
VX102179

Quantity	Description
1	Upper enclosure
4	M3x12 countersunk screw, TORX, black



STEP 1:

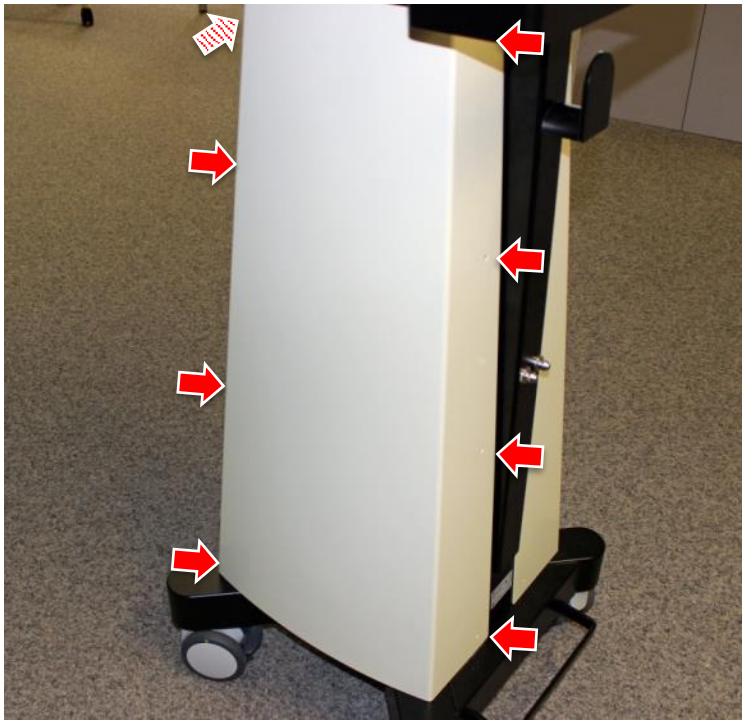
1. Remove upper part of IV pole by turning it counterclockwise.
2. Unscrew black cap.
3. Pull black tube, spacer and gasket over IV pole.



STEP 2:

4. Remove 4 screws from the upper enclosure.
5. Lift upper enclosure over IV pole.
6. Remove 8 screws from lower enclosure and pull sheet metal backwards.

There is only one position for correct mounting of the lower enclosure!



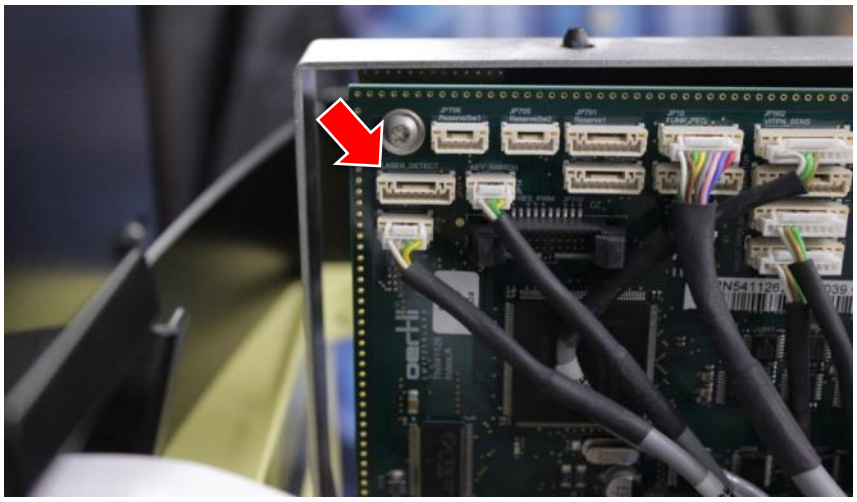
STEP 3:

7. Remove 8 screws on each side of the panels.
8. Pull panel away in a sideways direction.

11.1.6 Front enclosure

STEP 1:

1. Remove upper enclosure and lower enclosure according to section ♦11.1.5 steps 1 and 2.
2. Loosen front enclosure by removing 2 screws.



STEP 2:

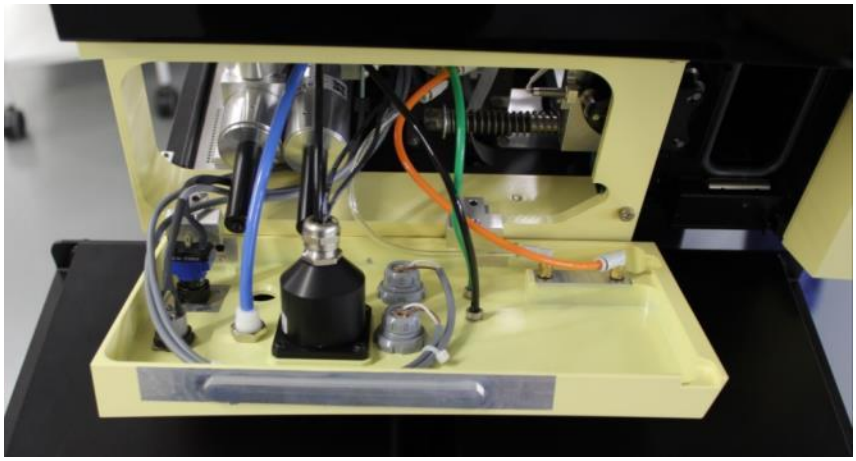
3. Remove the two air lines (green (on the left side viewed from the back) and the black) from the valves.
4. Unplug laser detect JP17 cable from CORE-Print.

STEP 3:

5. Pull lower part of the enclosure towards the front, until the light modules are no longer positioned in the openings.
6. Pull front enclosure downwards so that it comes free from the slot.

Please take great care of the key switch on the left to avoid breakage.

7. Make sure not to tear any cables and tubes that are still connected to the part!



STEP 4:

8. Pull part towards the front.

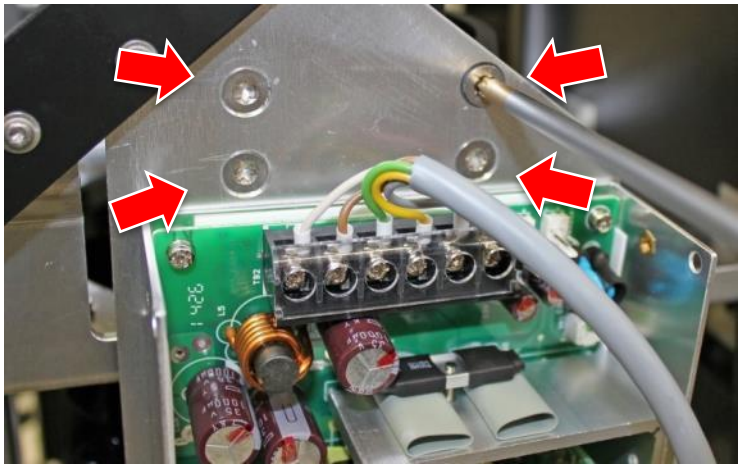
   Make sure not to tear any cables and tubes that are still connected to the unit!

   Support the front panel with the attached table, or by any other means, to avoid strain on the cables!

11.1.7 Power supply 24 VDC

VX320019

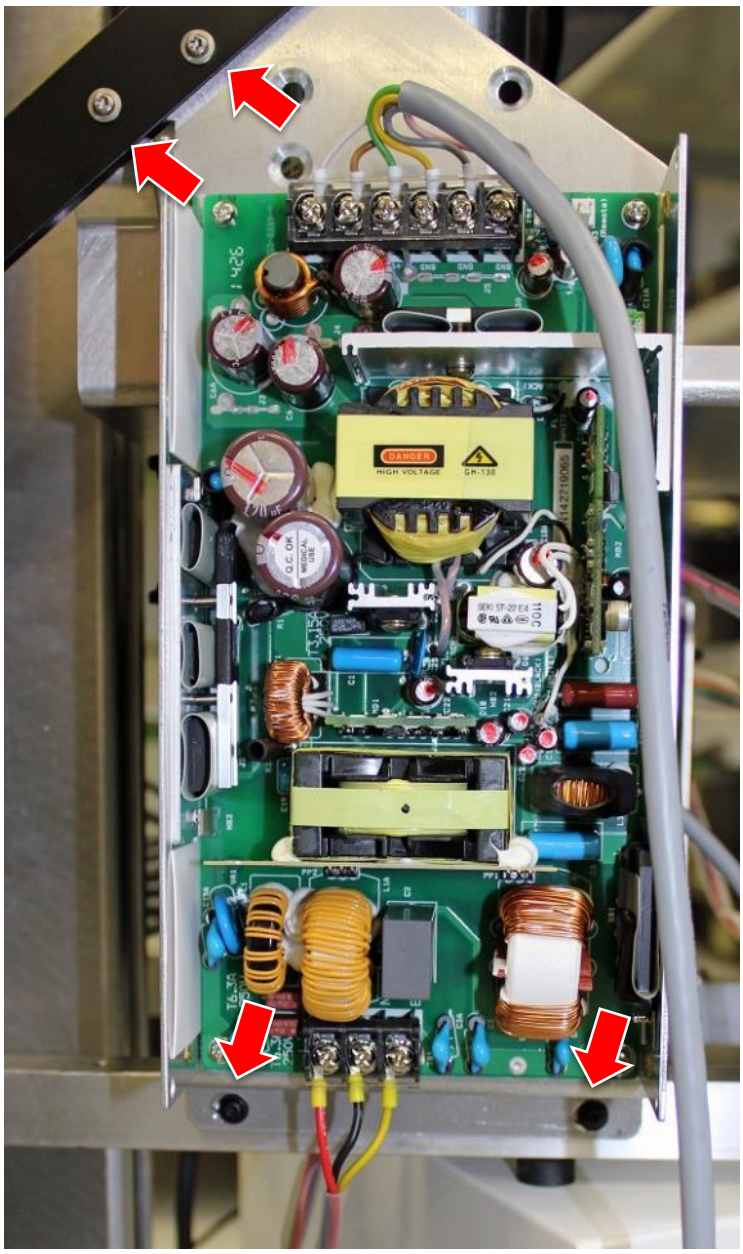
Quantity	Description
1	Power supply unit 24V



STEP 1:

1. Cables are fixed to the body with cable ties. Remove them all.
2. Remove black ring that fixes the compressor by loosening 4 screws.

The compressor cable is routed through a ring. Therefore, leave the ring in the unit.



STEP 2:

3. Disconnect all cables from the power supply.
4. Remove 4 screws from the supply carrier (sheet metal).
5. Turn supply carrier over.
6. Remove 4 screws from the backside of the carrier and take power supply away.

NOTE!

Use of incorrect screws

Risk of a short circuit

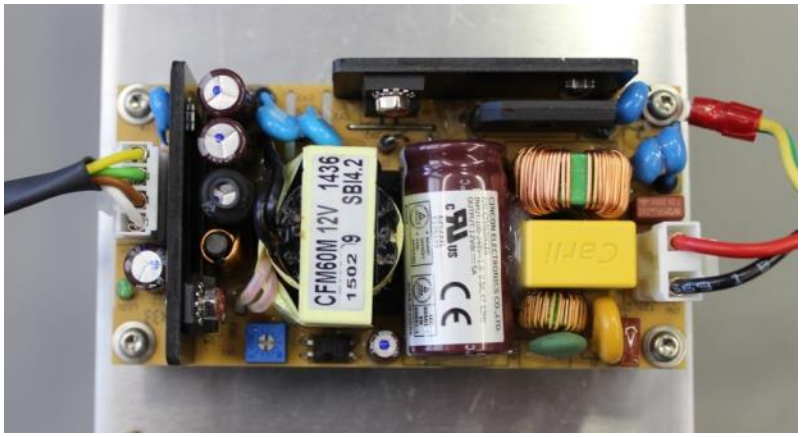
► Do not use any other screws than the original ones intended to fix the power supply.

For connection scheme of wires, see ♦ 10.16.2.

11.1.8 Power supply 12 VDC

VX320024

Quantity	Description
1	Power supply unit 12VDC

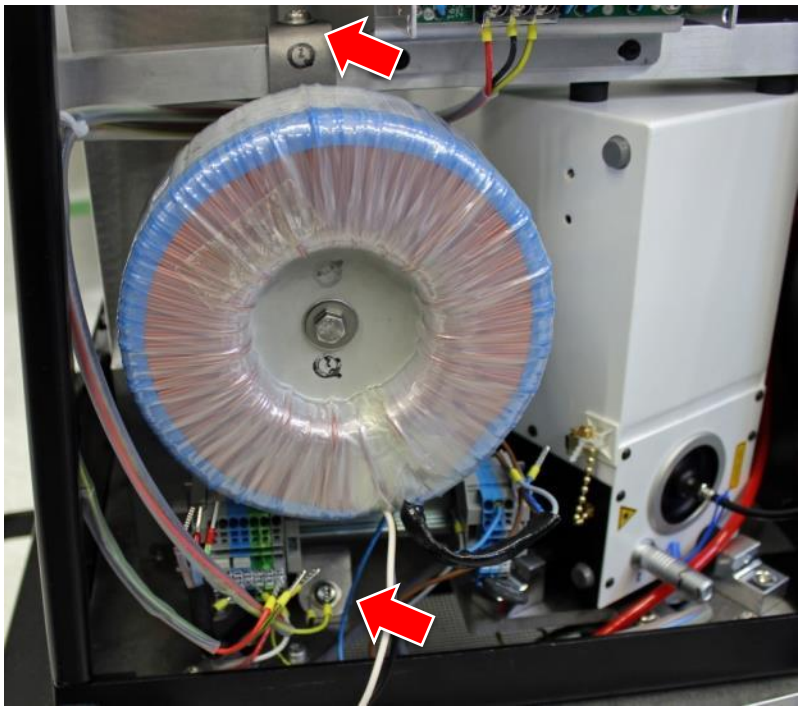


STEP 1:

1. Disconnect supply carrier as described in ♦ 11.1.7.
2. Disconnect cables and grounding wire.
3. Loosen 4 screws from the distance keeper and remove PCB.

   For connection scheme of wires, see ♦ 10.16.3

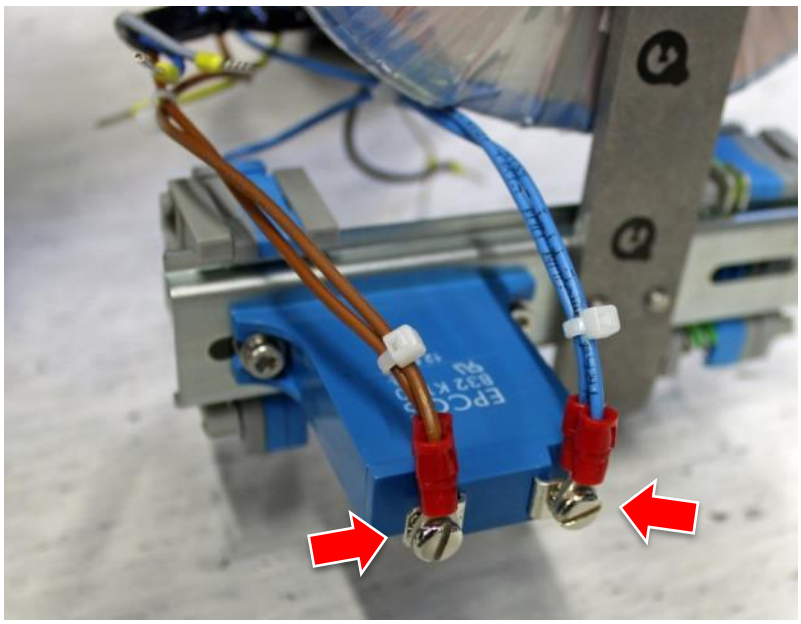
11.1.9 Varistor / isolation transformer assembly



STEP 1:

1. Disconnect all wires from the terminal block.
2. Remove 2 screws from the assembly carrier.
3. Lay assembly carefully aside. It remains attached to the device by the cables.

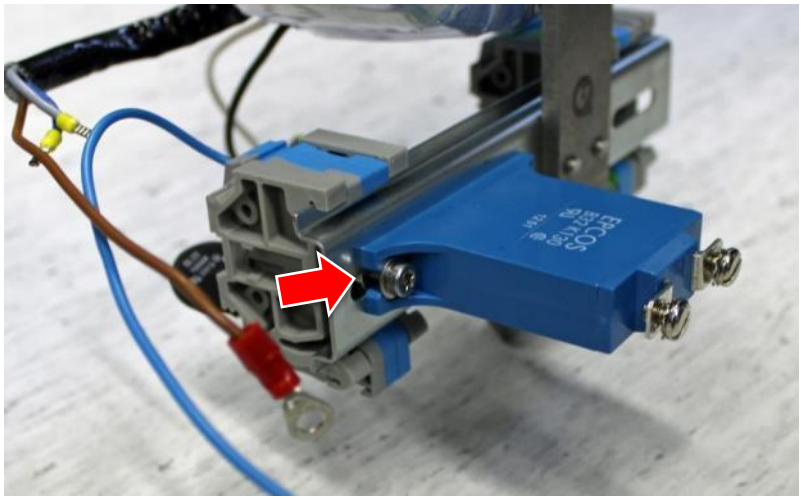
   For connection scheme of wires, see ♦ 10.16.1.



STEP 2:

4. Remove cable ties.

5. Disconnect wires from both terminals.



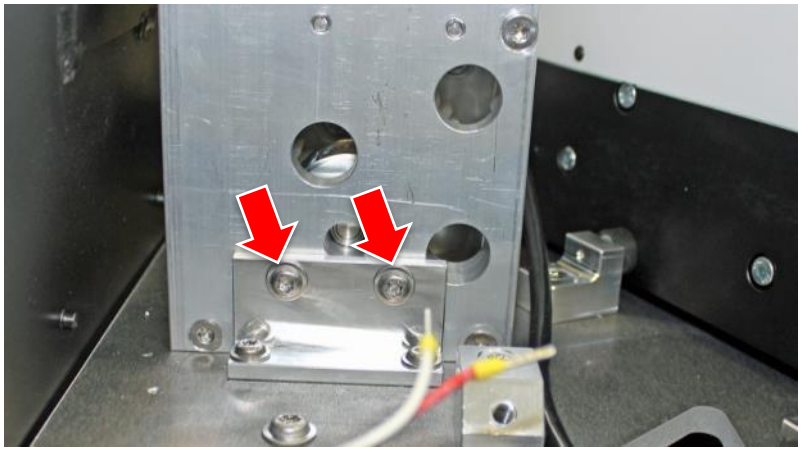
STEP 3:

6. Loosen the 2 screws that hold the varistor on the cap rail. Remove varistor in a sideways direction.

11.1.10 Drive for infusion pole

VX210126

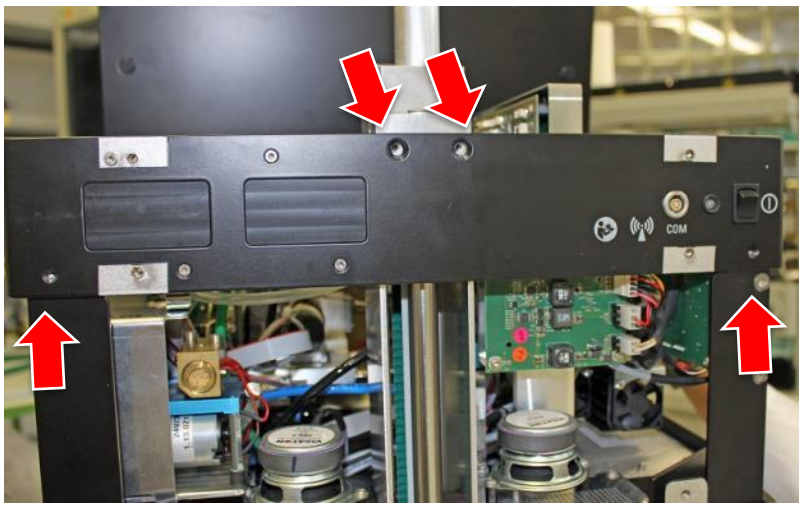
Quantity	Description
1	Drive for infusion pole



STEP 1:

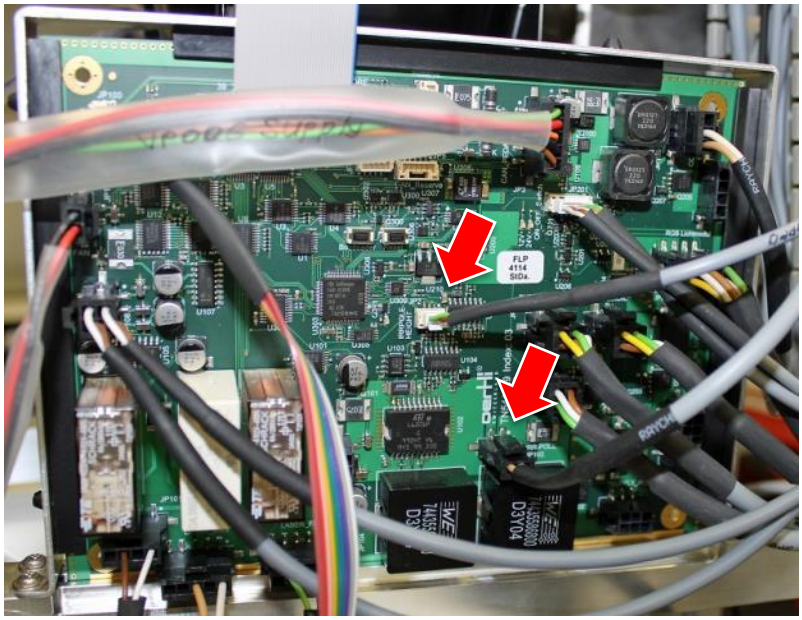
1. Remove the isolation transformer assembly as described in ♦11.1.9 so that access is granted to the screws of the lower mounting bracket.

2. Remove 2 screws from the lower mounting bracket.



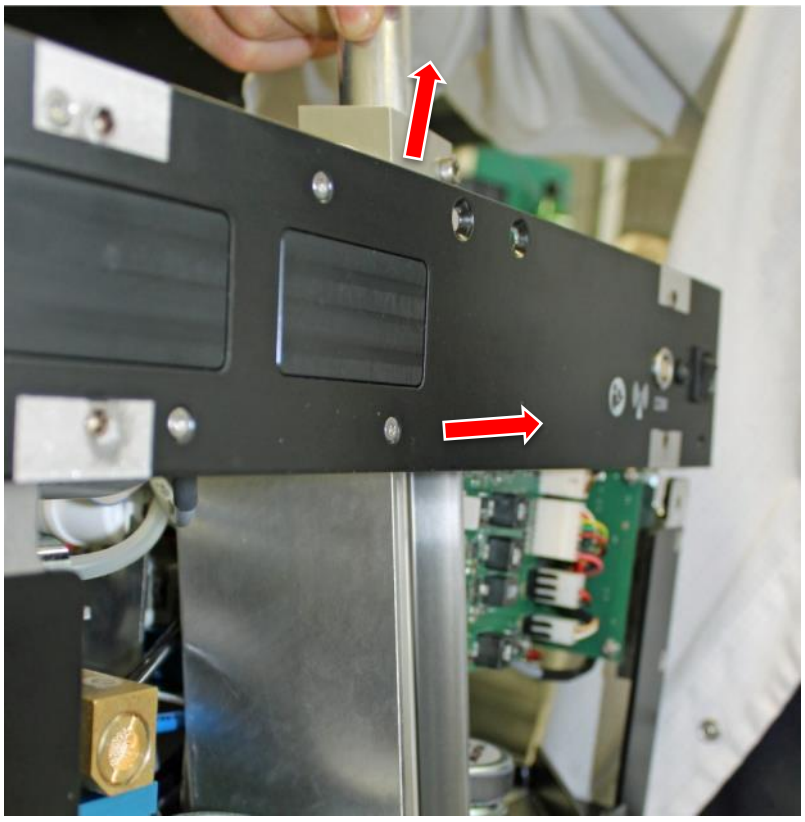
STEP 2:

3. Remove black pole cover.
4. Remove 2 screws from the upper mounting bracket.
5. Remove 2 screws at the back of the enclosure completely.
6. Loosen 2 screws at the side of the enclosure (no picture) so that the part can be swung upwards slightly.



STEP 3:

7. Disconnect 2 cables from the supply PCB.



STEP 4:

8. Push the complete assembly towards the enclosure.

NOTE!

Improper dismounting

Sheet metal is deformed permanently

► Push gently so that sheet metal is not deformed permanently.

9. Lift assembly upwards and then backwards.

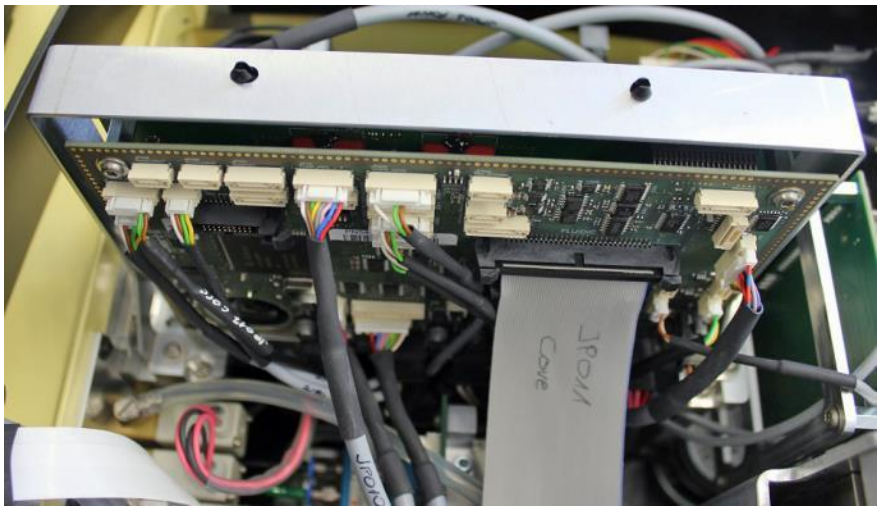
NOTE!

Improper dismounting

Cables are damaged

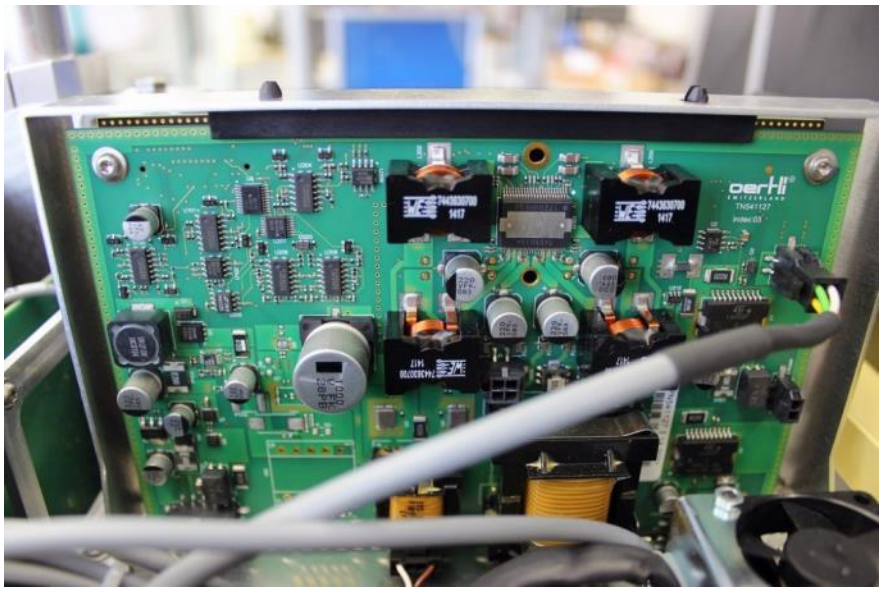
► Follow the instructions carefully.

11.1.11 System unit



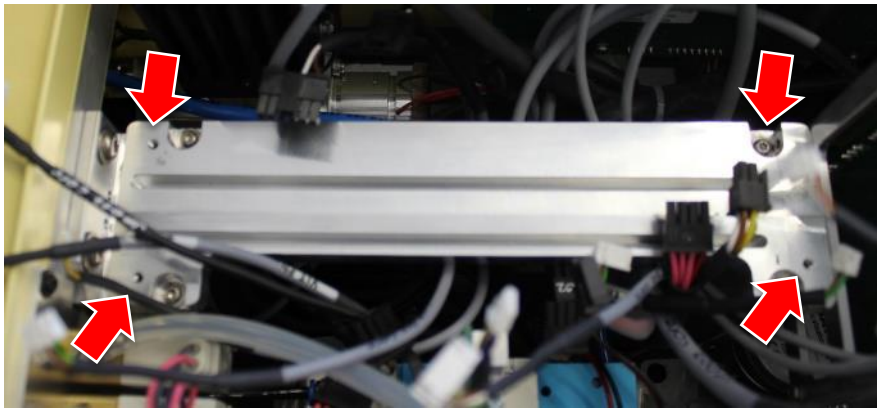
STEP 1:

1. Disconnect all cables from core PCB.



STEP 2:

2. Disconnect all cables from the power PCB.



STEP 3:

3. Unscrew 4 screws from the print frame (sheet metal) –
   2 screws on each side.

   The picture on the left shows the position of the screws.

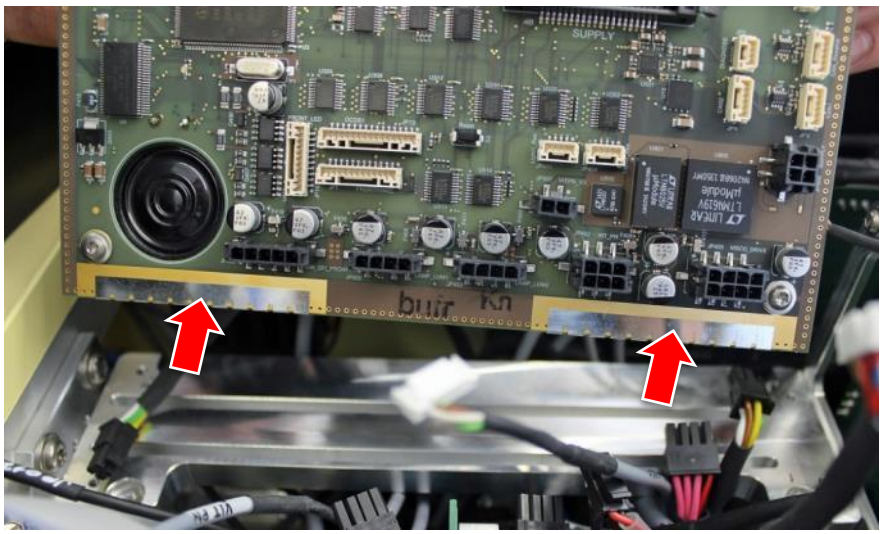
NOTE!

Screw falls into device

Risk of short circuit

► Do not lose any screws!

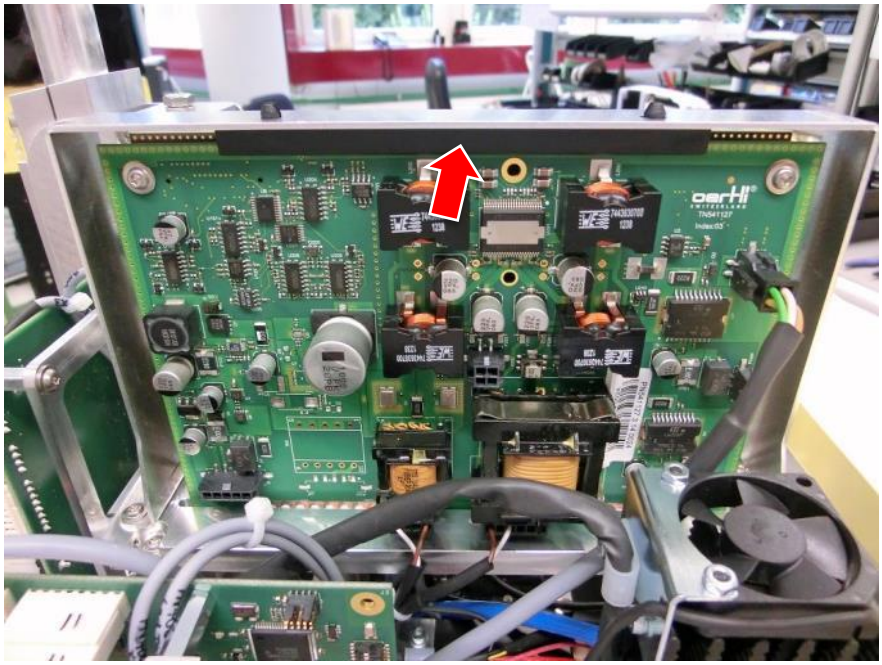
4. Pull sheet metal frame upwards.



STEP 4:

5. Carefully pull the PCB upwards.

   Contact springs should remain on the PCB.



STEP 5:

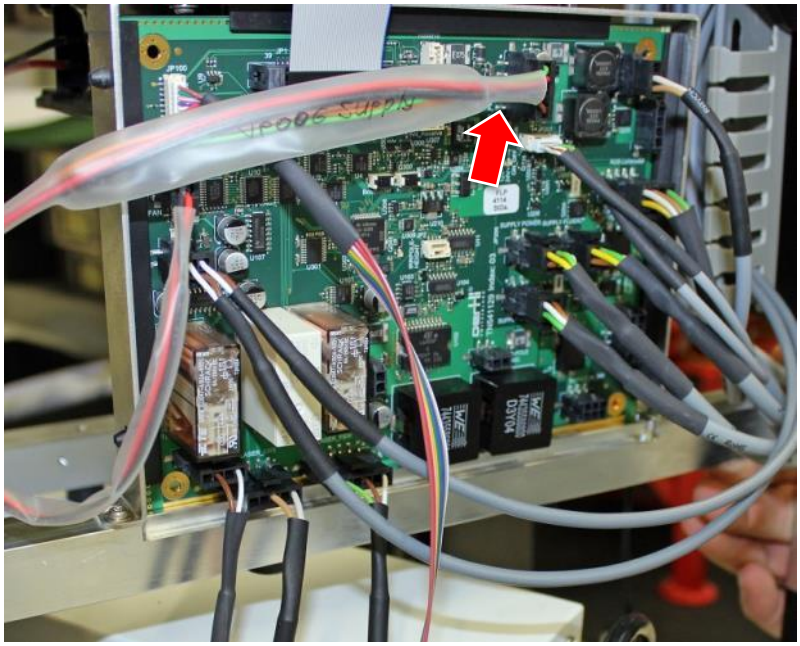
6. Insert the new PCB into the slots.

   Make sure the PCB has been properly inserted into the board guide.

11.1.12 Supply PCB

VX541129

Quantity	Description
1	Supply PCB



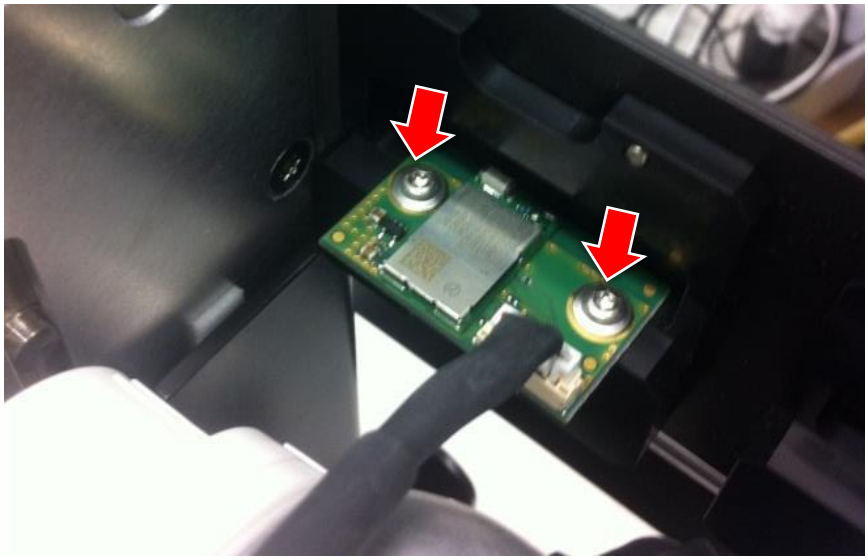
STEP 1:

1. Disconnect all cables from the PCB.
2. Remove 2 screws on each side of the PCB holder.
3. Pull PCB out of holder.

11.1.13 Wireless module

VX541130

Quantity	Description
1	Wireless module



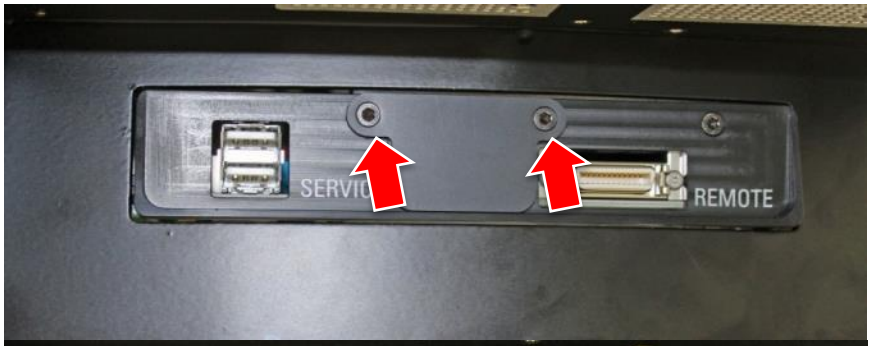
STEP 1:

1. Disconnect cable, loosen 2 screws and remove PCB.

11.1.14 Carrier print

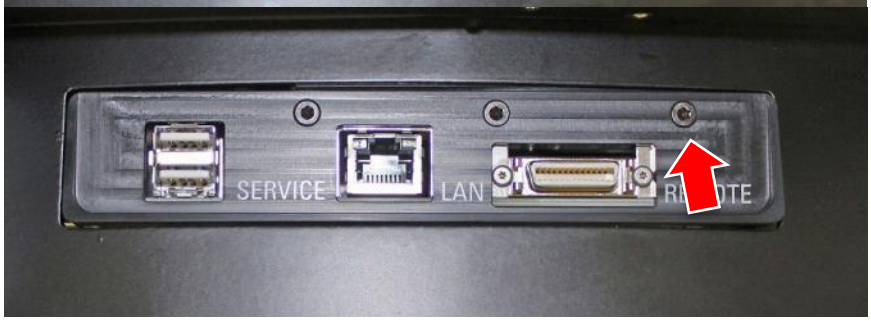
VX541128

Quantity	Description
1	Carrier print



STEP 1:

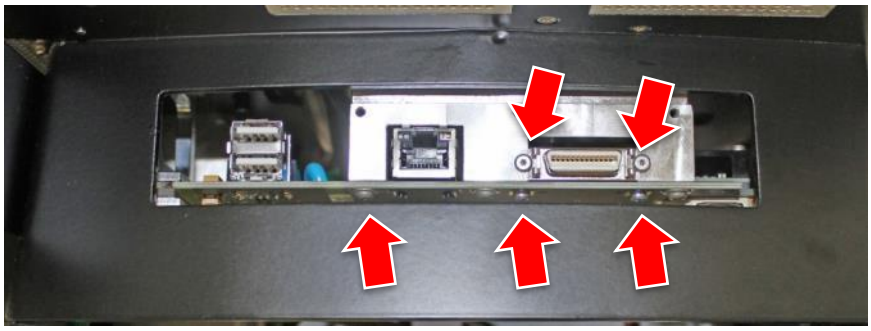
1. Loosen 2 screws from the Ethernet interface and remove cover.



STEP 2:

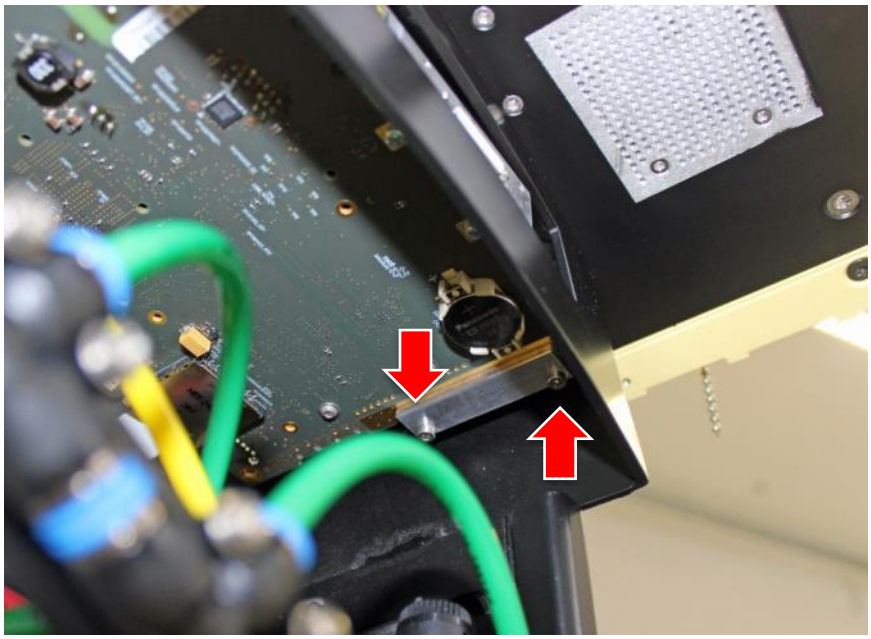
2. Loosen 1 screw from the plastic cover.

   Remove the plastic cover.



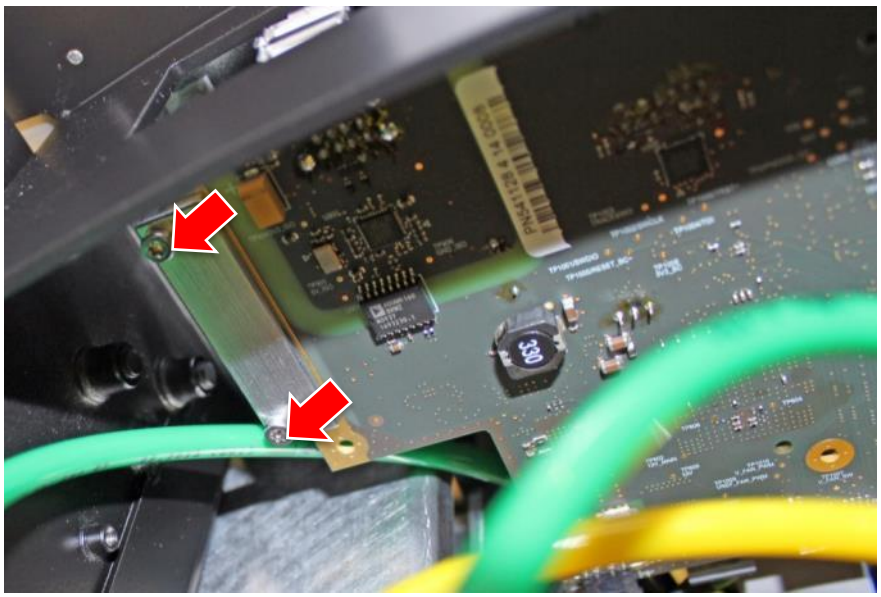
STEP 3:

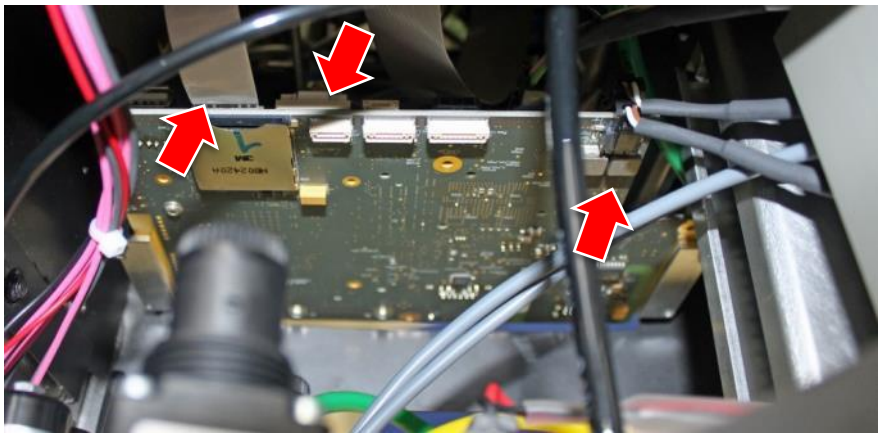
3. Loosen 2 screws in front and 3 screws below from the metal cover and remove the plastic cover.



STEP 4:

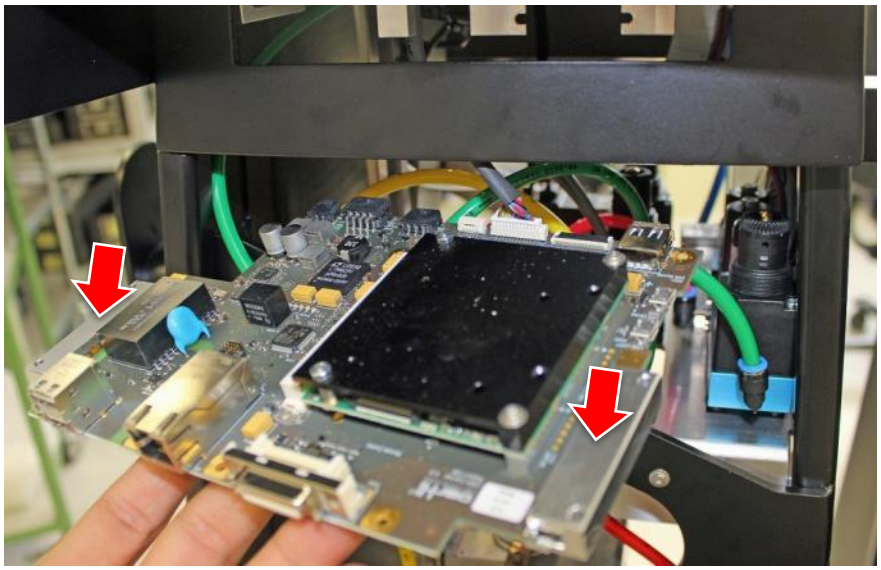
4. Remove 2 screws on each side of the PCB fastening – 4 screws in total.





STEP 5:

5. Disconnect all cables:
   - Flat ribbon cable for display.
   - Speaker (2x).
   - Connector cable to core PCB.
   - Power cable.

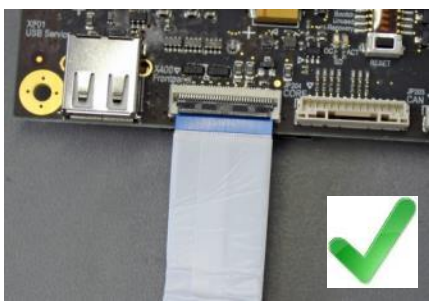


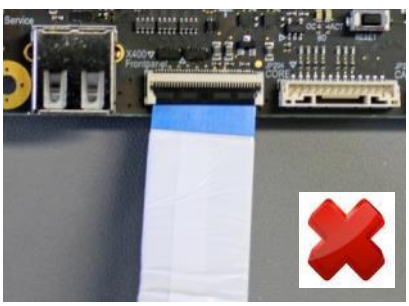
STEP 6:

6. Pull the carrier PCB out of the unit.

7. Dismantle the right and left metal clamps.

Do not throw away the metal clamps. They have to be used with the replacement part.





The flat ribbon cable must be connected with both connector and bare metal contact facing in the direction of the PCB.

11.1.15 Holder for Gas Forced Infusion (GFI)

VX102184

Quantity	Description
1	Holder for GFI

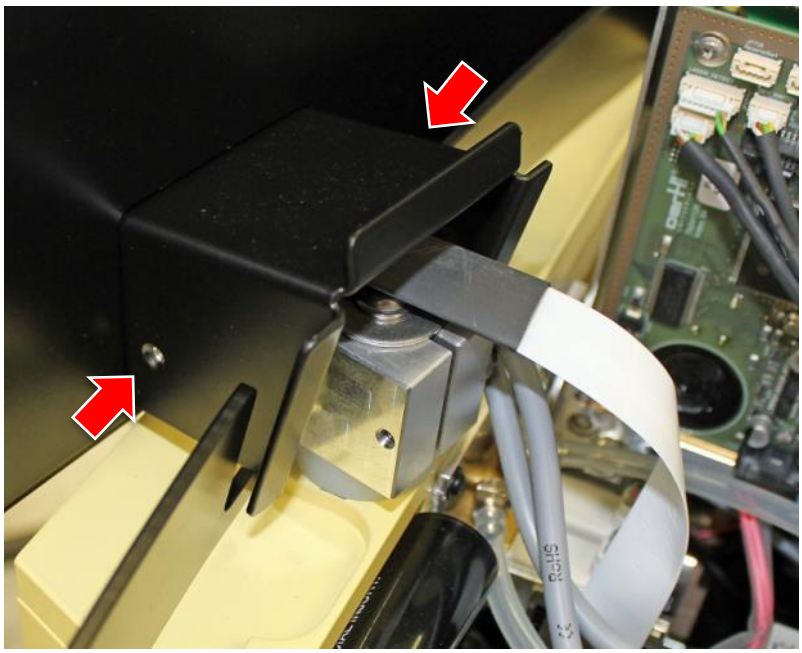
STEP 1:

1. Remove the screw.
2. Take off lever and plastic disc.

11.1.16 Control panel

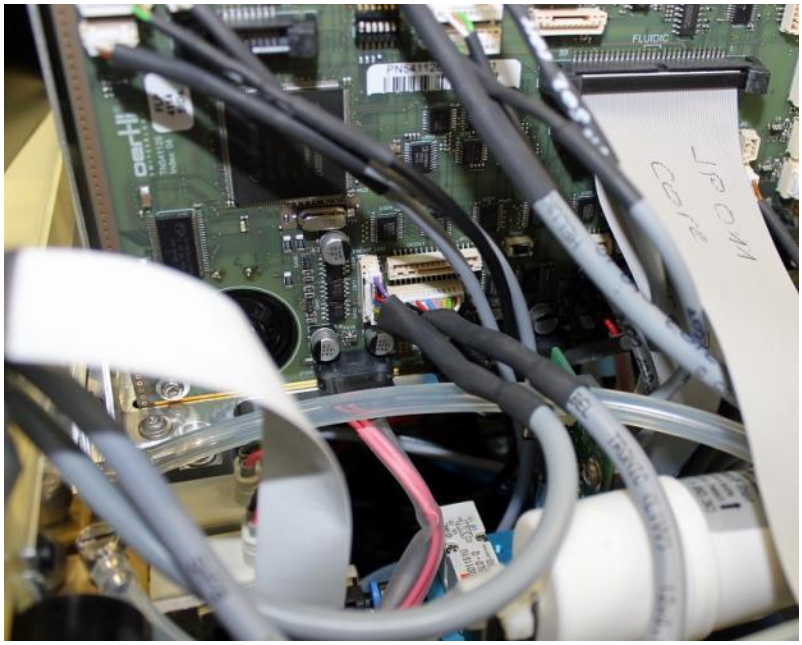
VX210159

Quantity	Description
1	Control panel
1	5x25 flat washers
1	M5x10 oval head screw, TORX



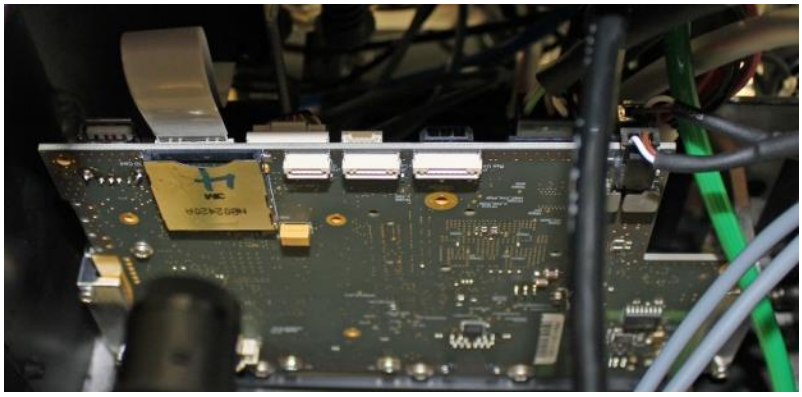
STEP 1:

1. Remove 2 screws from the joint cover.
2. Lift cover off.



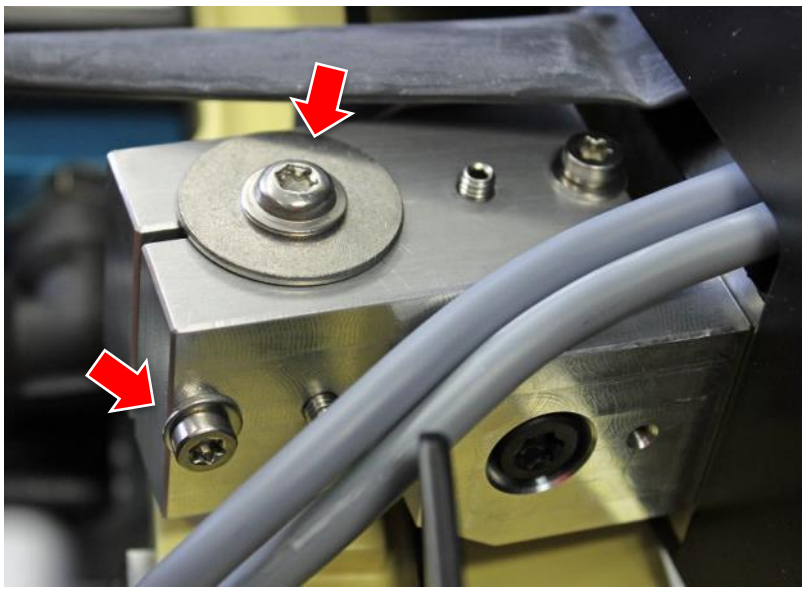
STEP 2:

3. Disconnect 2 cables from the core PCB.



STEP 3:

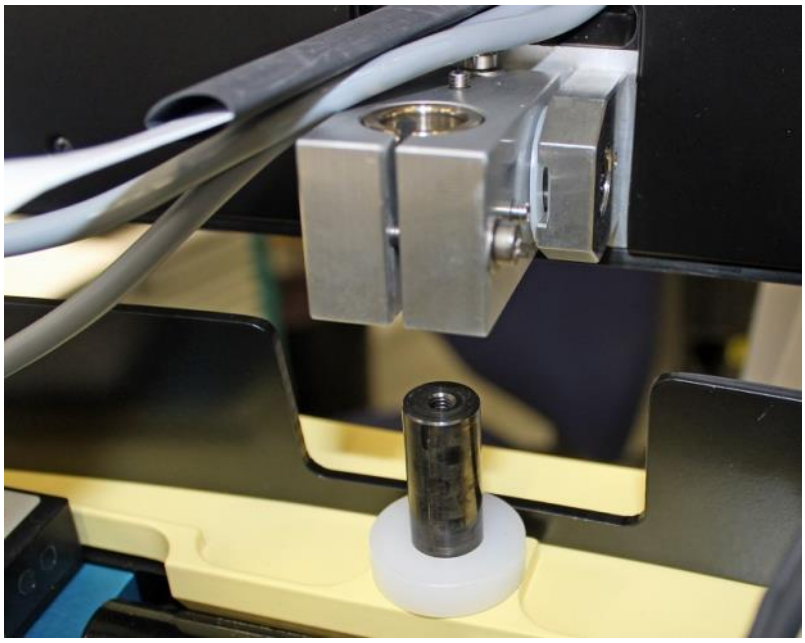
4. Disconnect the flat ribbon cable from the carrier PCB.
5. Open the holder of the flat ribbon cable and pull cable out towards front panel.



STEP 4:

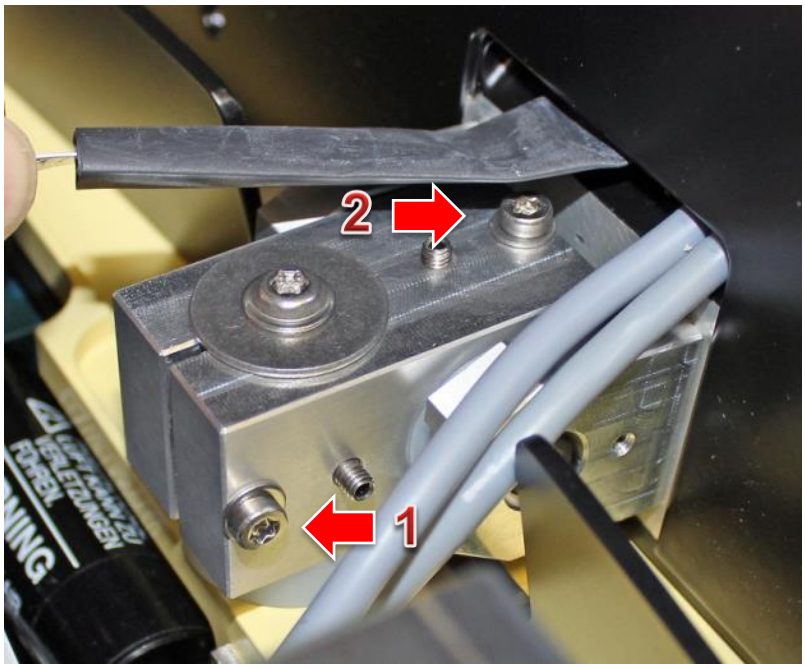
6. Loosen the screw on the side of the bracket.

7. Remove the screw and washer from the top of the bracket.



STEP 5:

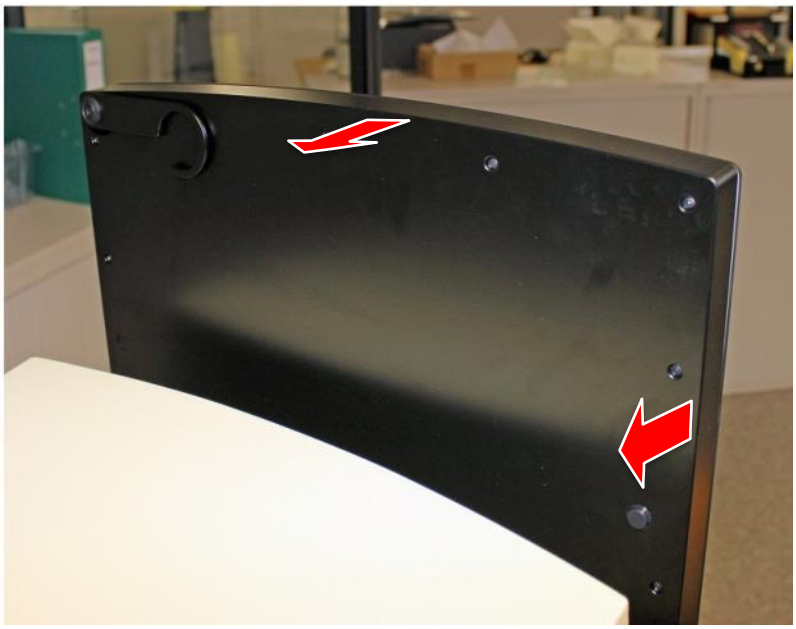
8. Lift the complete control unit from the pivot.



STEP 6:

9. **ASSEMBLING**
The horizontal pivot point is derived from screw 1, the vertical pivot point from screw 2.

Screw 1: horizontal pivot point
Screw 2: vertical pivot point



STEP 7:

10. Tighten these screws so that the forces at the points displayed on the left are:

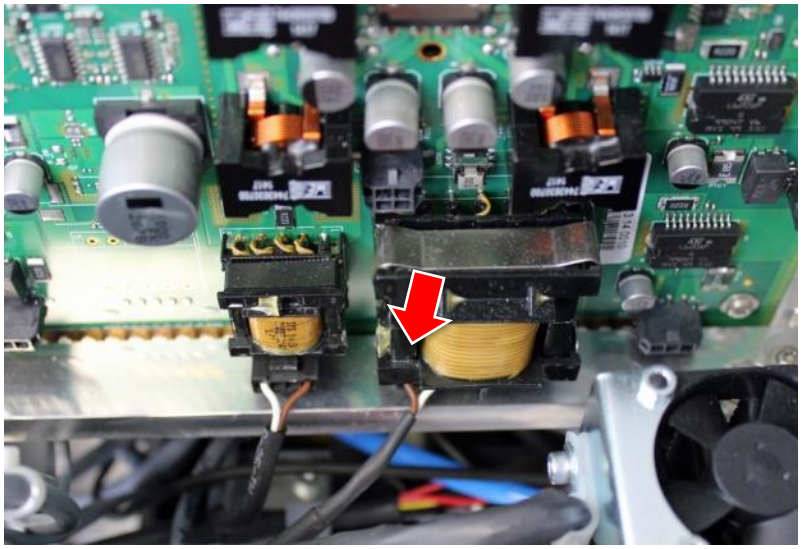
    Horizontal: 23 ± 3 N
    Vertical: 33 ± 3 N

    To measure the forces, use a spring scale.

11.1.17 Phaco connector

VX400236

Quantity	Description
1	Phaco connector with cable

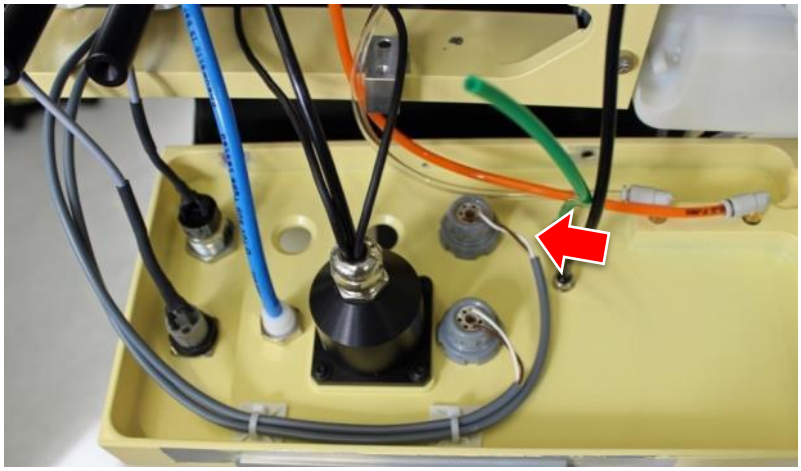


STEP 1:

1. Loosen the ***front enclosure*** according to ♦11.1.6.

2. Disconnect the cable from the power/PCB.

   The cable is attached to other cables. Do not damage these while cutting the cable ties.



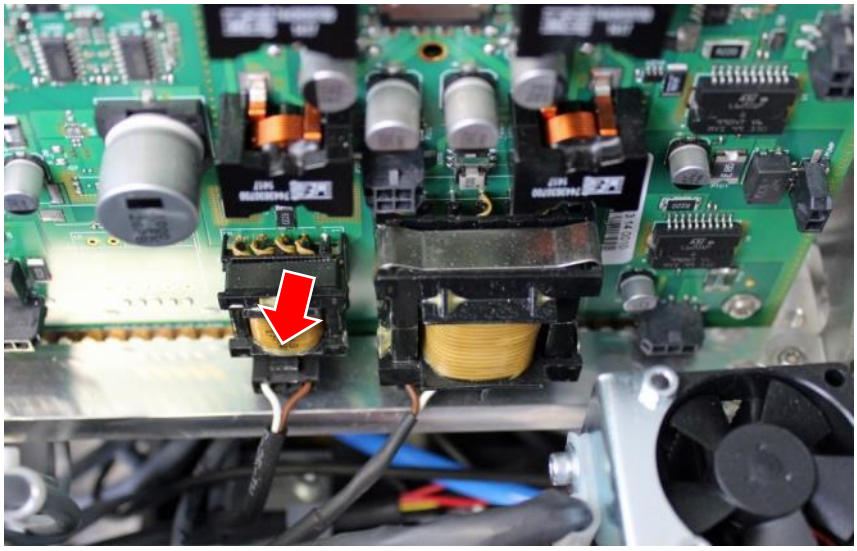
STEP 2:

3. Unscrew the nut at the phaco socket and remove the cable.

11.1.18 DIA connector

VX400235

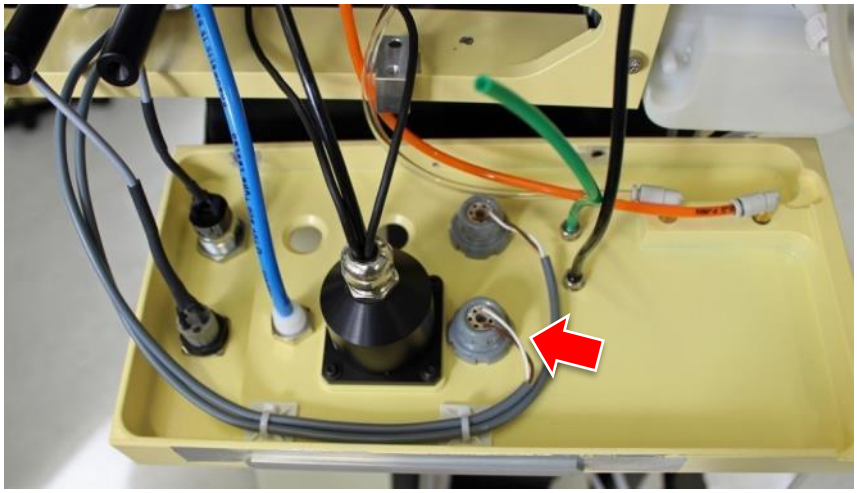
Quantity	Description
1	DIA connector with cable



STEP 1:

1. Dismantle the ***front enclosure*** according to ♦ 11.1.6.
2. Disconnect the cable from the power/PCB.

   The cable is attached to other cables. Do not damage these while cutting the cable ties.



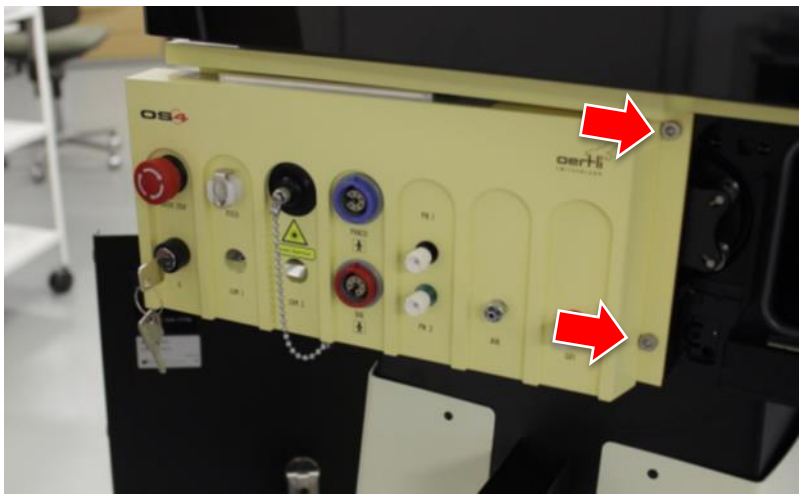
STEP 2:

3. Unscrew the nut at the phaco socket and remove the cable.

11.1.19 Fluidics unit

VX210130

Quantity	Description
1	Fluidics unit
2	M5x20 cheese head screw TORX
1	M5x10 countersunk screw, TORX
1	M3x12 countersunk screw, TORX black



STEP 1:

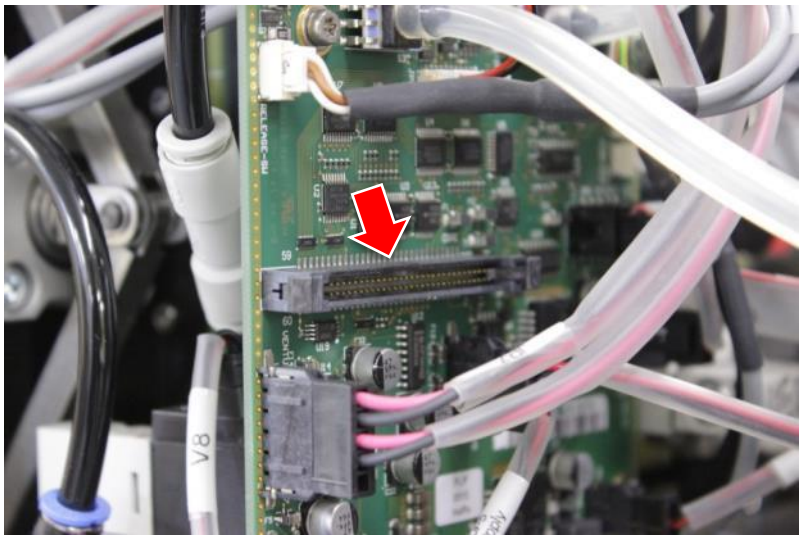
1. Remove lower and upper sheet metal enclosure according to section ♦11.1.5 steps 1 and 2.
2. Remove front enclosure according to section ♦11.1.6 step 1.
3. Carefully move front enclosure to the side so as to get access to the two fixation screws of the fluidics unit.

Please take great care of the key switch on the left to avoid breakage.

4. Loosen 2 fixation screws from the front.

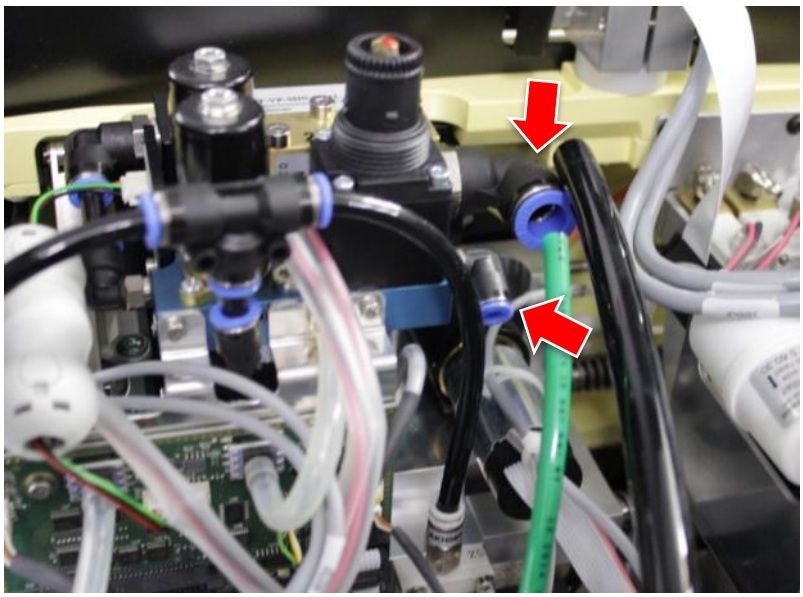
STEP 2:

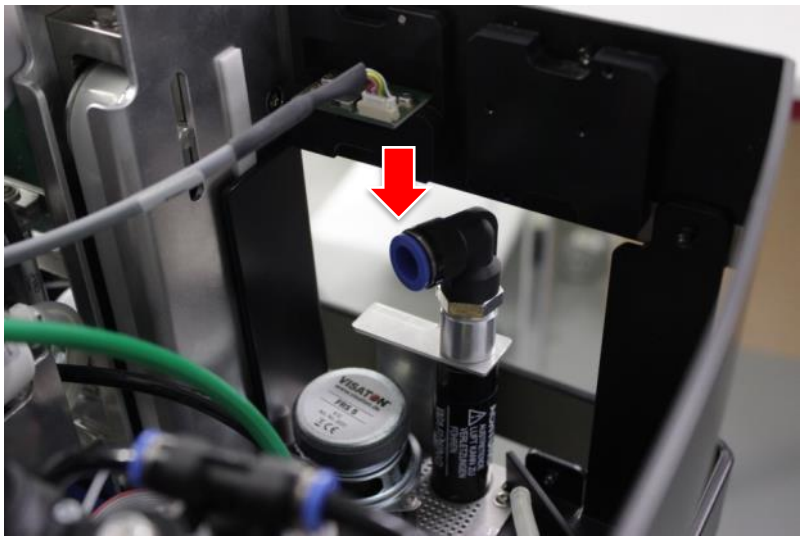
5. Dismount ***air module*** according to ♦11.1.21.



STEP 3:

6. Disconnect the flat ribbon cable from the fluidic PCB.

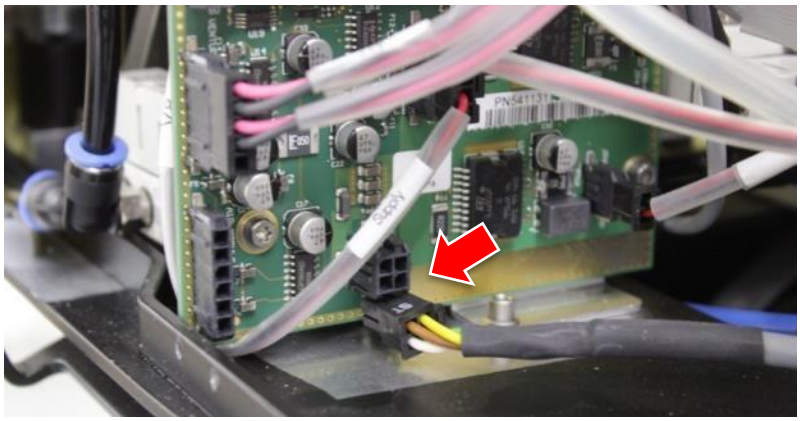




STEP 4:

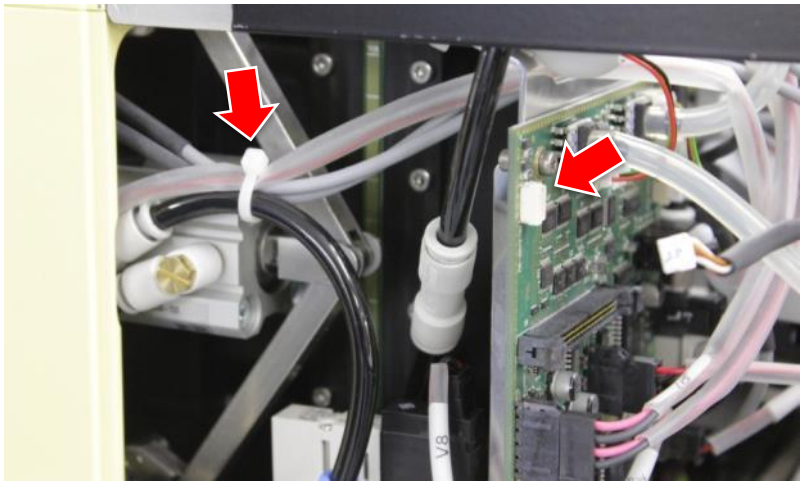
7. Disconnect the green tube from the venturi unit.

8. Disconnect the black tube both at the venturi unit and at the exhaust



STEP 5:

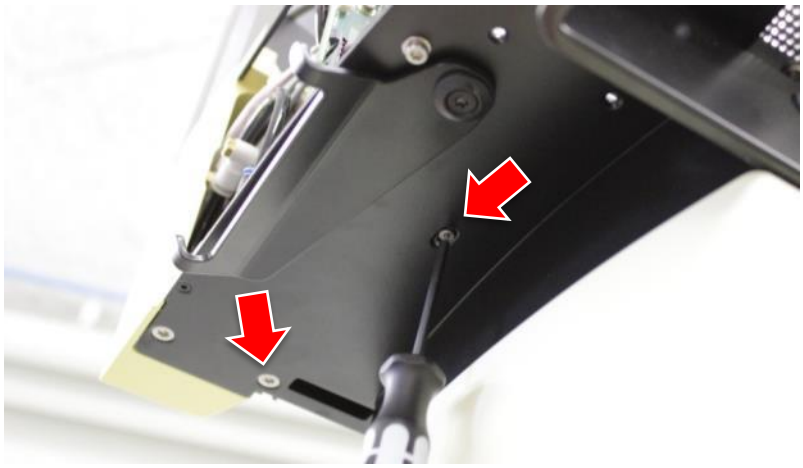
9. Disconnect the power supply cable from the fluidic PCB.



STEP 6:

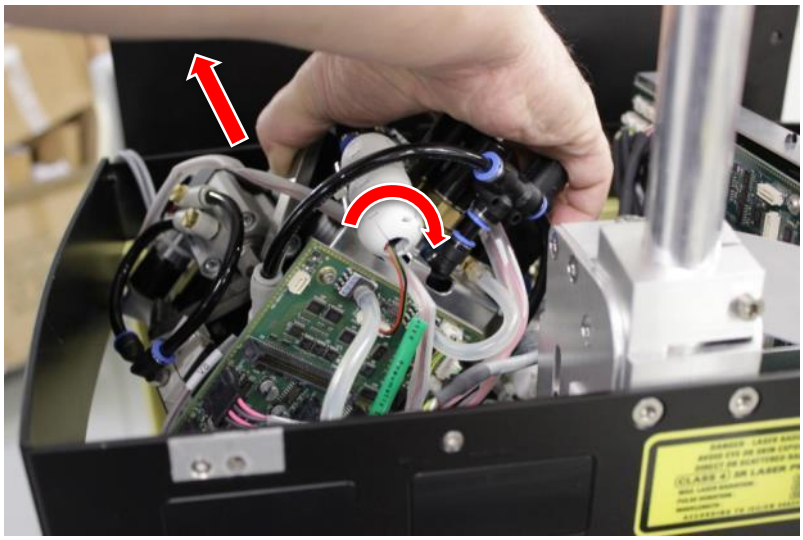
10. Disconnect the cable from the cassette release switch.

11. Remove the cable tie used for fixing the cable to the cassette eject button.



STEP 7:

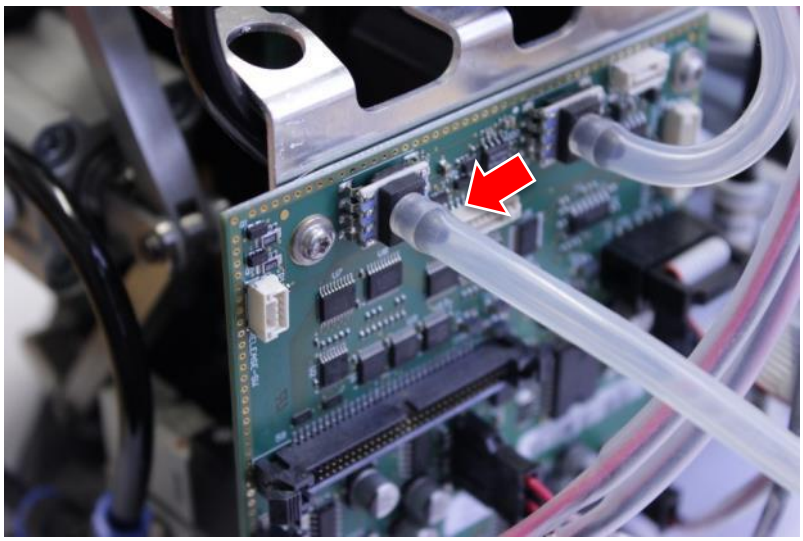
12. Remove the 2 screws from the underside.



STEP 8:

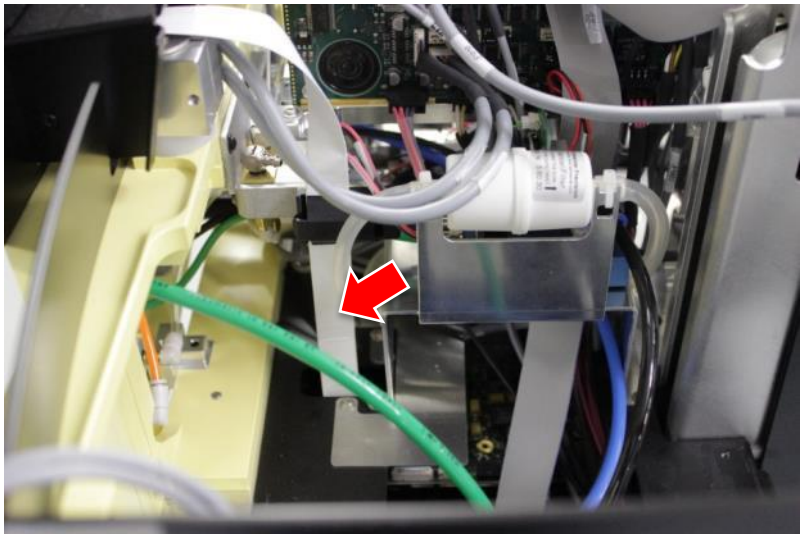
13. Remove complete module upwards by tilting it sideways.

Avoid tearing off or damaging any cables.



STEP 9:

14. Remove tube to the AIR module of the old unit and mount it to the sensor of the new device.

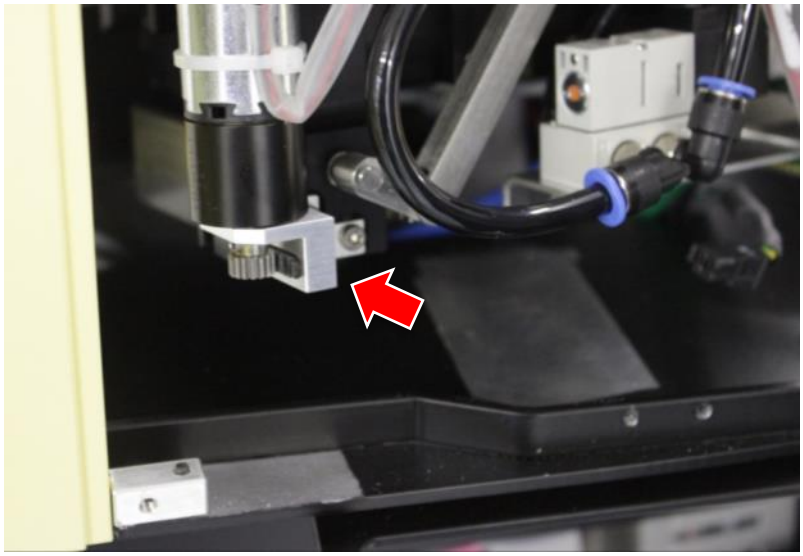


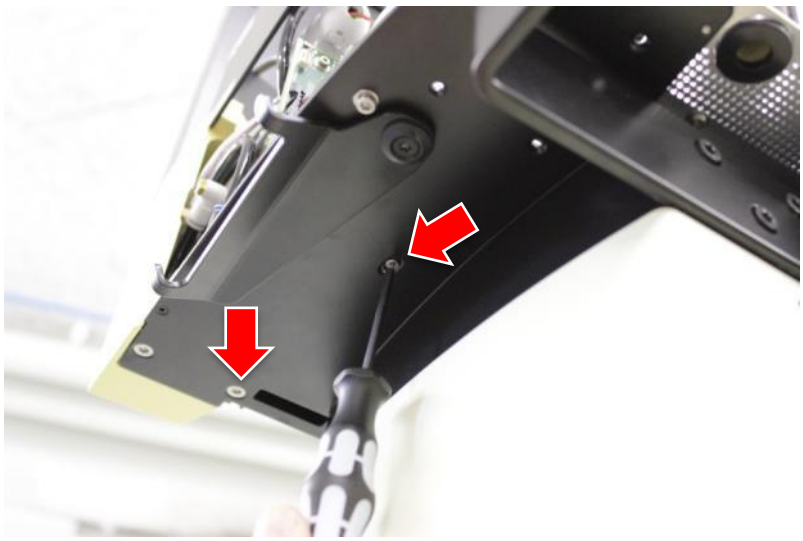
STEP 10:

15. Install new fluidics unit by paying particular attention to exposed components of the OS 4:

Avoid tearing off or damaging any cables.

1. Flat cable
2. Irrigation valve





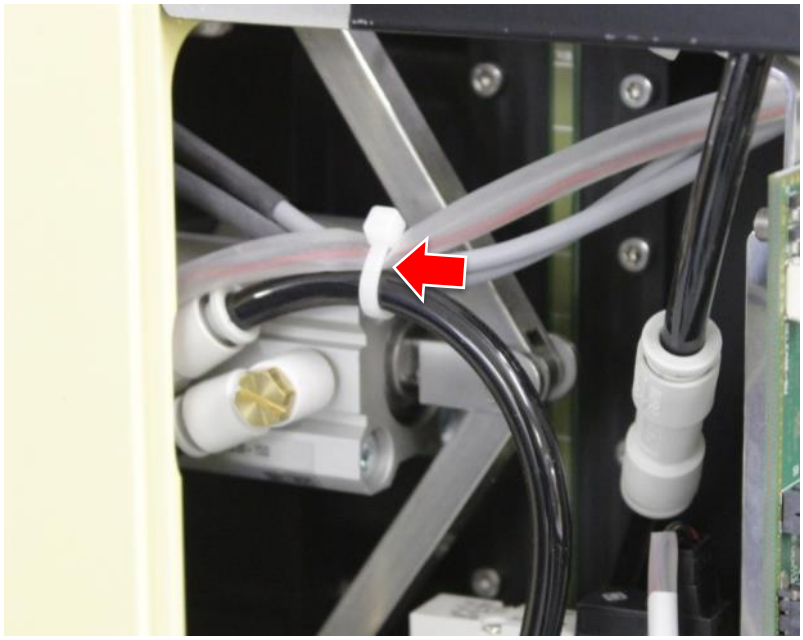
STEP 11:

16. Do not tighten the screw for fixing the fluidic print metal sheet, mount it loosely.

17. Do not tighten the second of the lower fixation screws of the fluidic unit, mount the screw loosely.

18. Mount 2 fixation screws to the front and tighten them.

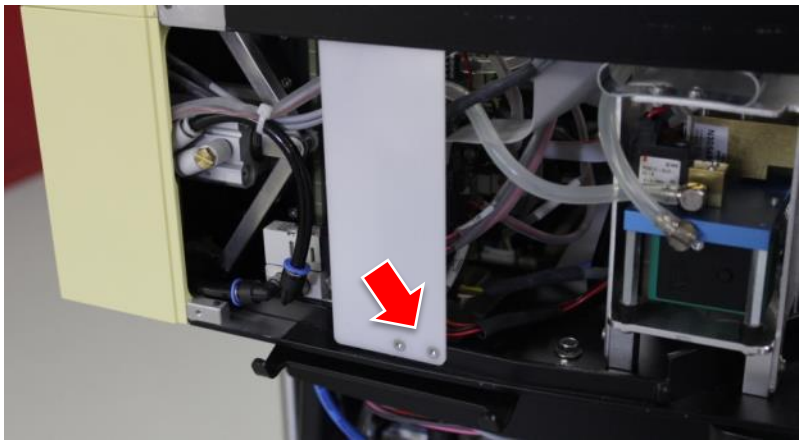
19. Tighten the remaining fixation screws.



STEP 12:

20. Mount all tubes and cables.

21. Secure the cable to the cassette eject button with cable tie.



STEP 13:

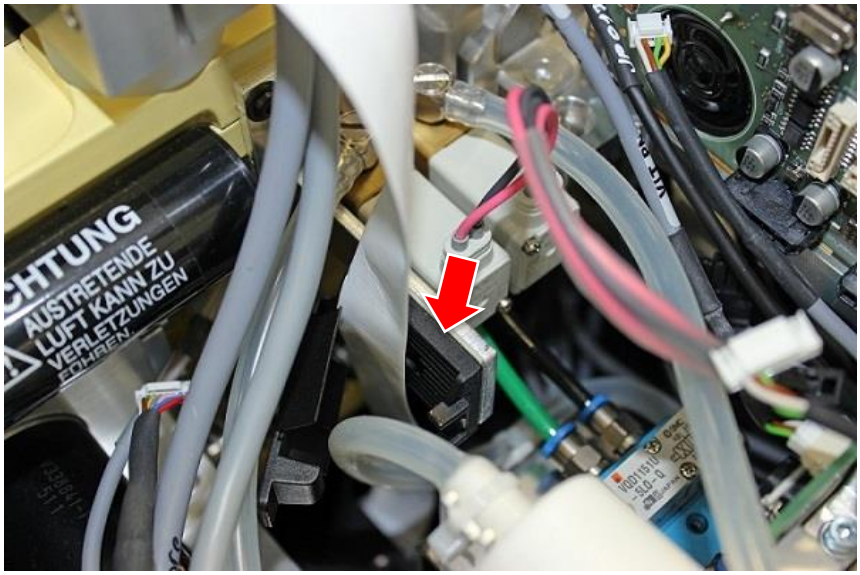
22. Install AIR module.

23. Mount protection plate.

STEP 14:

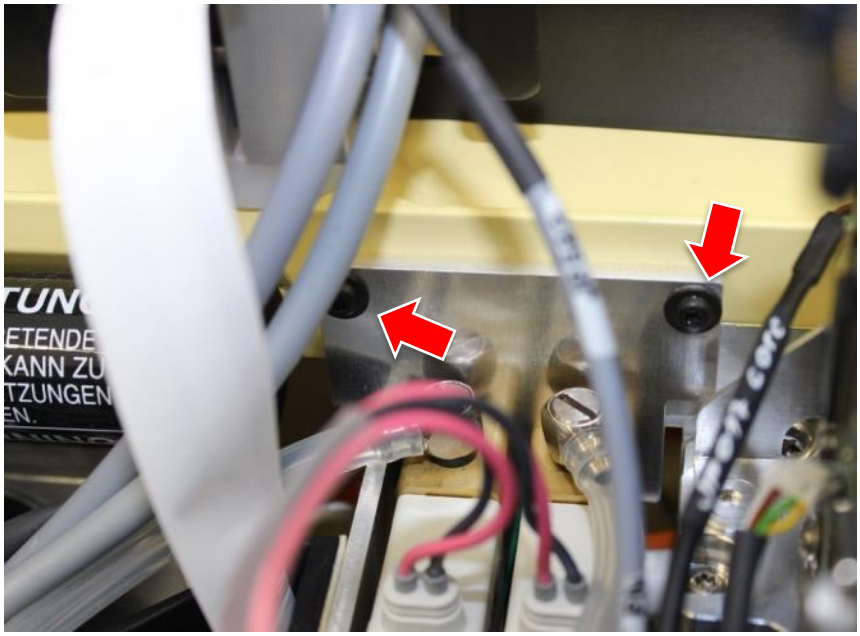
24. Load adjustment values onto the device according to ♦ 8.2.

11.1.20 GFI module



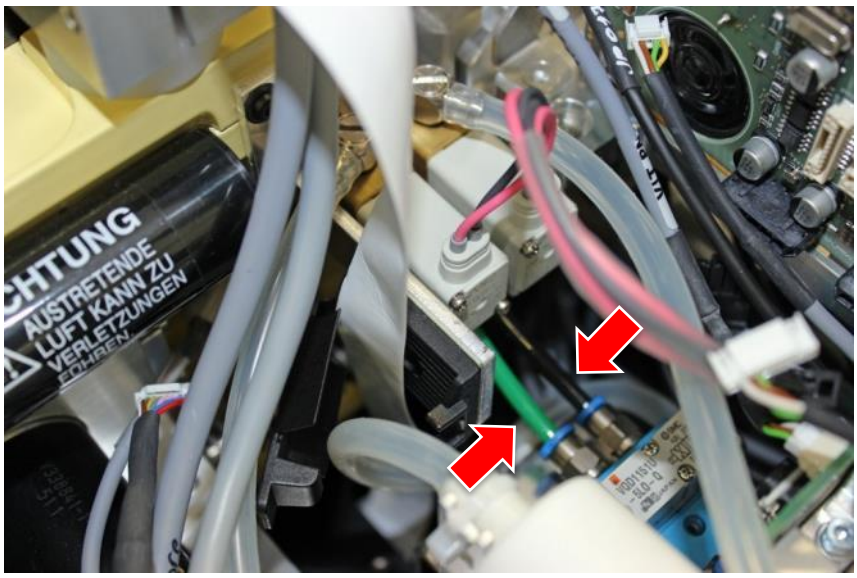
STEP 1:

1. Open clamp of flat ribbon cable.



STEP 2:

2. Remove both screws that hold the module on the front enclosure.

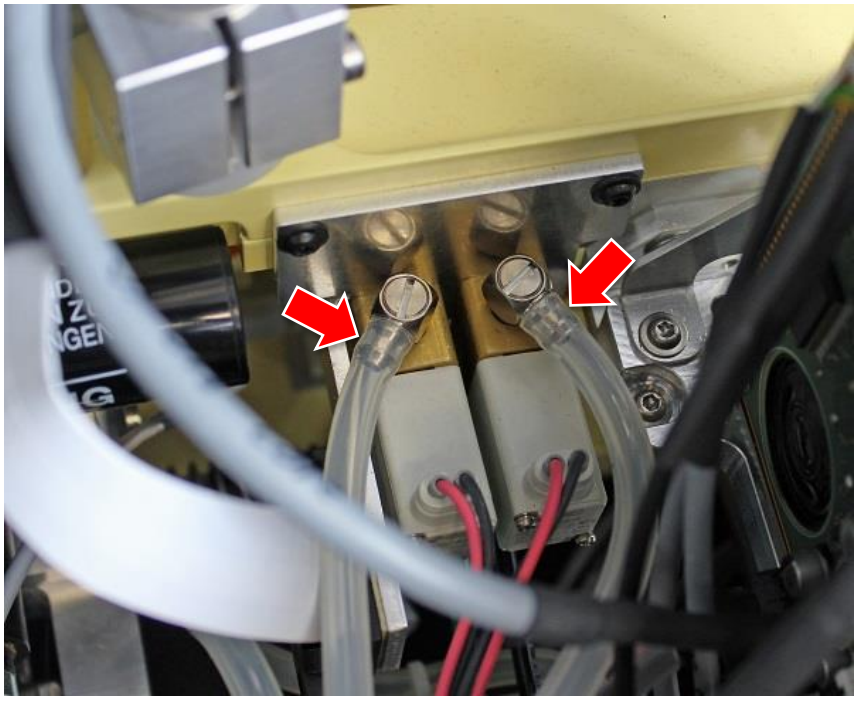


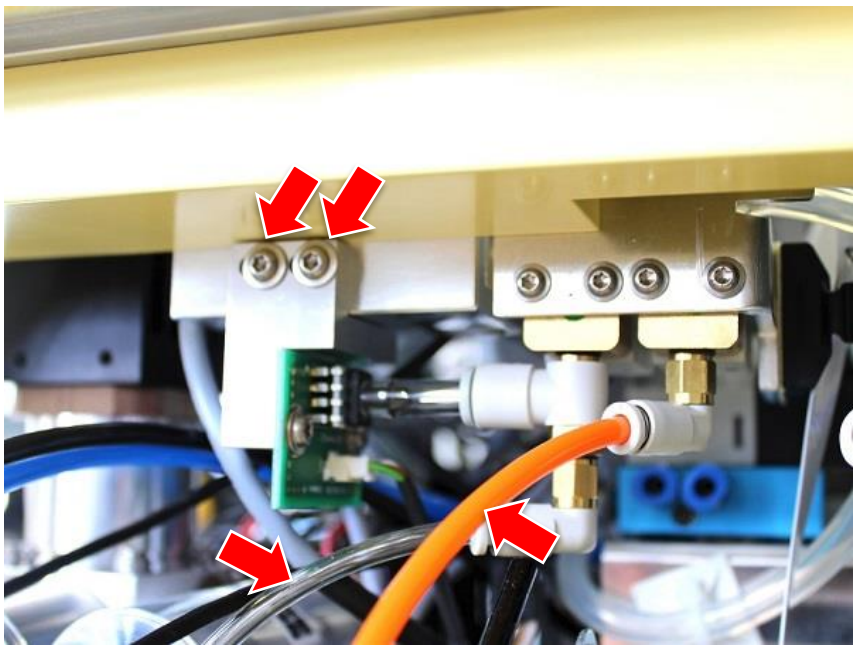
STEP 3:

3. Disconnect all tubes from the module:
   - 1x black
   - 1x green
   - 2x transparent

4. Disconnect the cable to the PCB

5. Loosen the ***front enclosure*** according to ♦11.1.6.



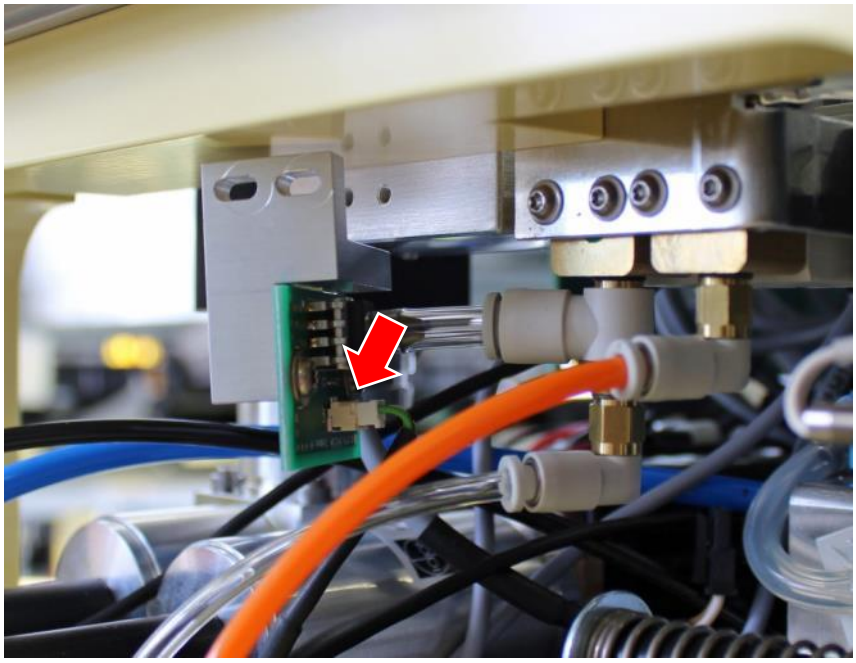


STEP 4:

5. Disconnect the tubes from the front connectors:
   - 1x orange
   - 1x transparent

6. Remove the 2 screws that hold the sensor unit in place.

When assembling the replacement part, do not tighten the screws at the beginning. Make sure the sensor is at the correct distance from the valve parts.

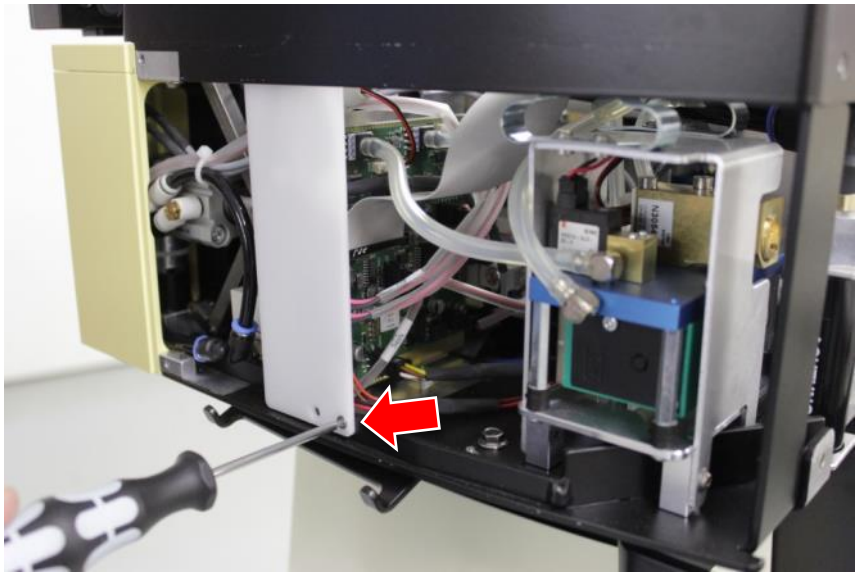


STEP 5:

8. Pull the complete module out of the unit.

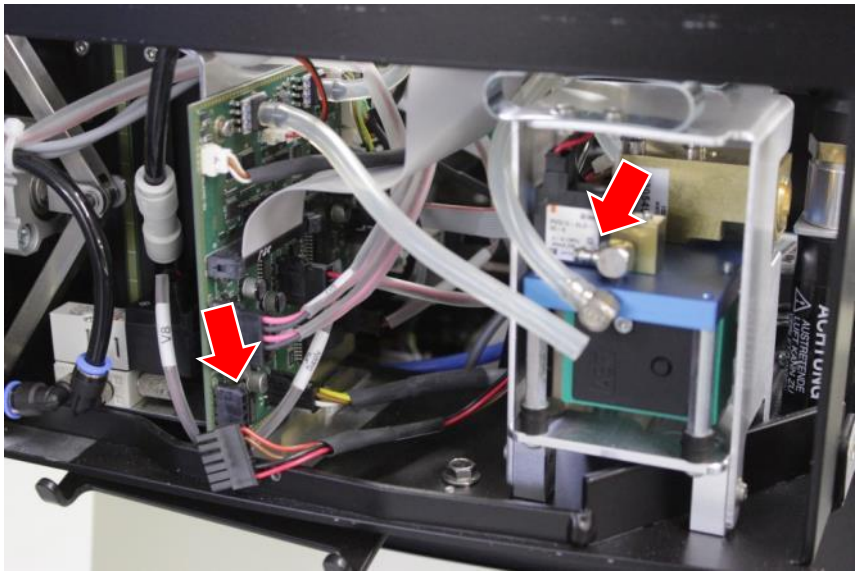
9. Disconnect the cable from the air sensor.

11.1.21 AIR module



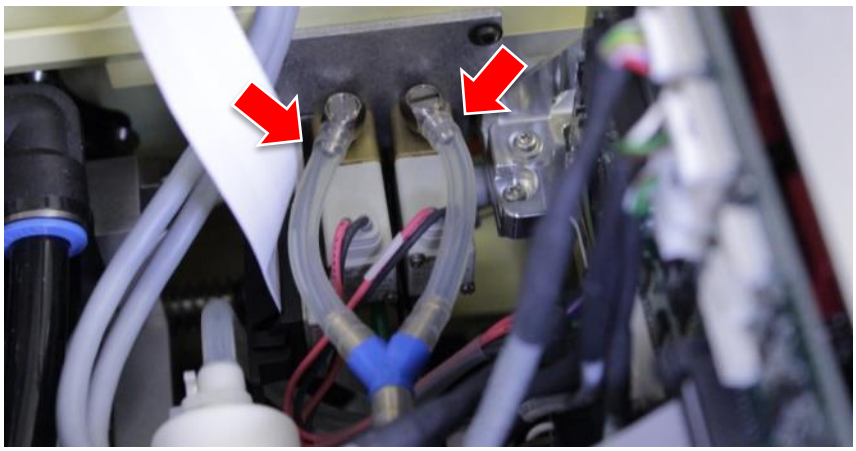
STEP 1:

1. Remove housing components according to section ♦11.1.5 steps 1 und 2.
2. Remove the protection plate



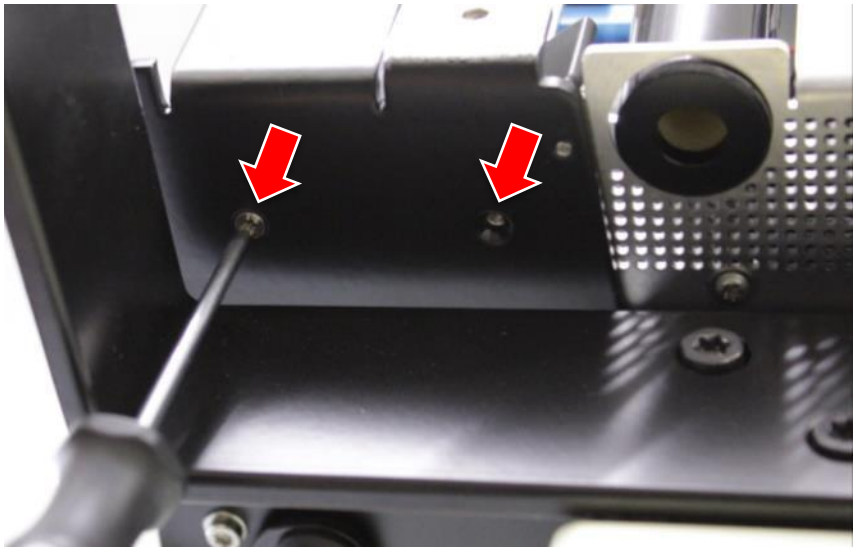
STEP 2:

3. Disconnect air module cable from the fluidic PCB.
4. Remove the tube from the air module.



STEP 3:

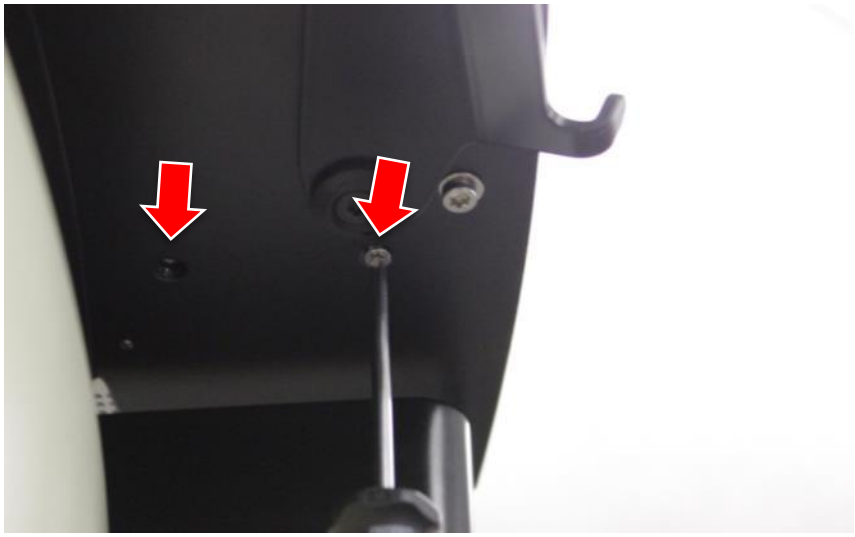
5. Remove the transparent tubes from the valves.



STEP 4:

6. Remove the 4 screws on the underside.

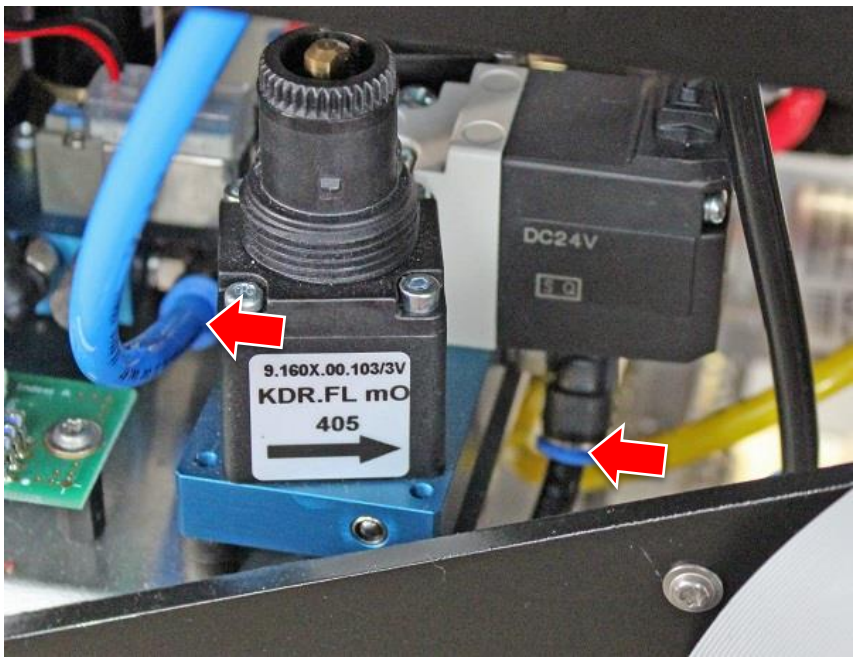
7. Pull the module out of the unit by holding it upwards.



11.1.22 Visco module

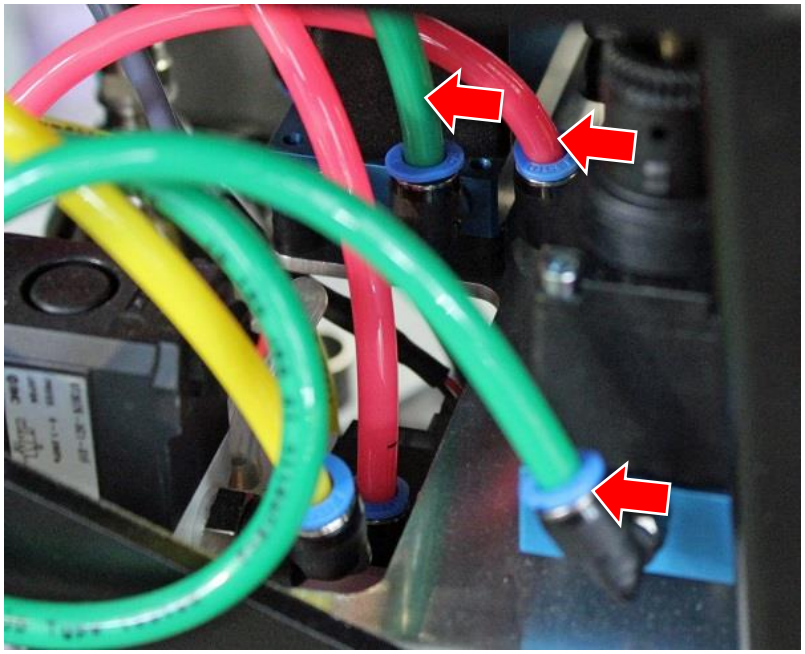
VX210132

Quantity	Description
1	Visco module
4	M3x6 oval head screw, TORX, ecosyn-fix



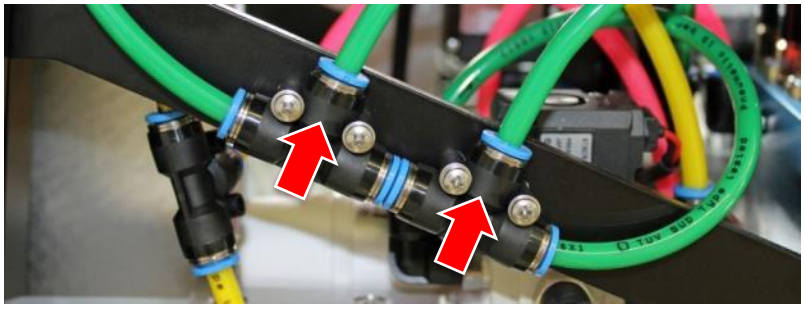
STEP 1:

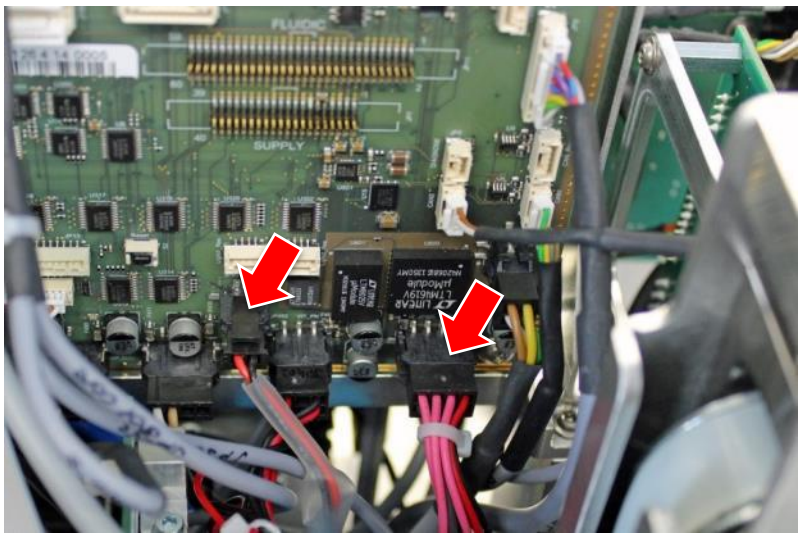
1. Disconnect all tubes from the module:
   - 2x green
   - 1x pink
   - 1x blue
   - 1x black



As an alternative, the green tubes can also be disconnected from the tee branches.

When assembling, pay attention to the difference in tube lengths.

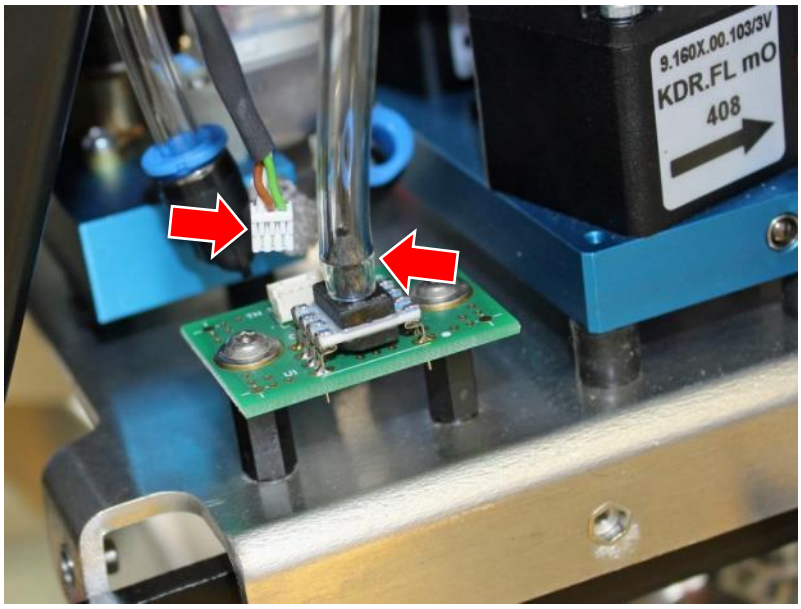




STEP 2:

2. Disconnect both cables from core PCB.

   For this purpose, the cover of the cable duct must be opened.

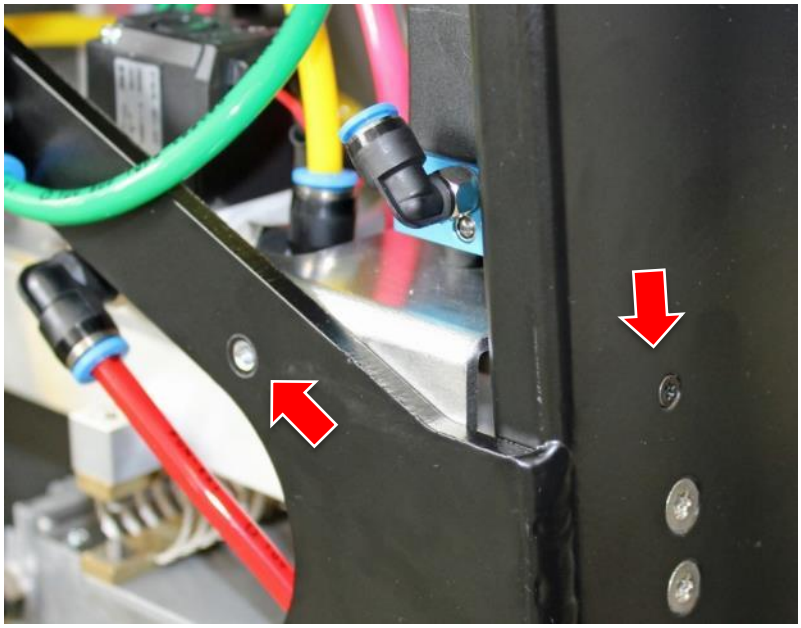


STEP 3:

3. Disconnect cable from the pressure sensor.

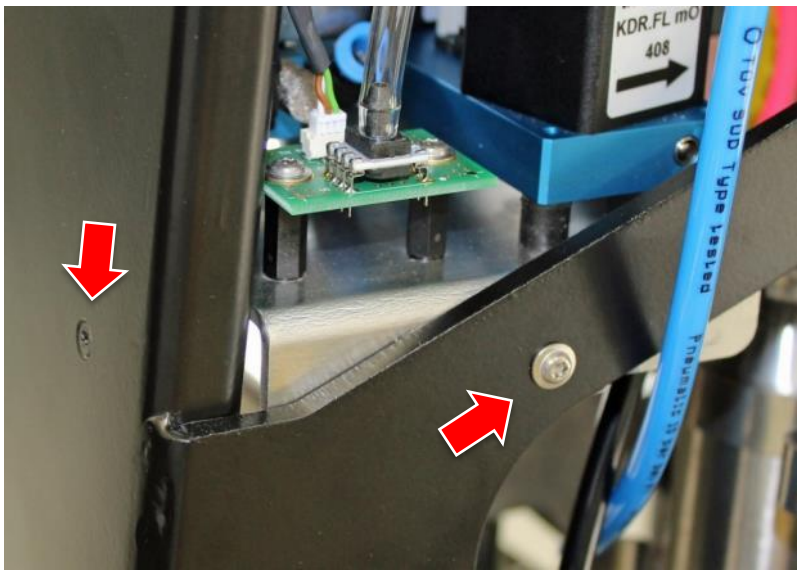
4. Disconnect air tube from the pressure sensor.

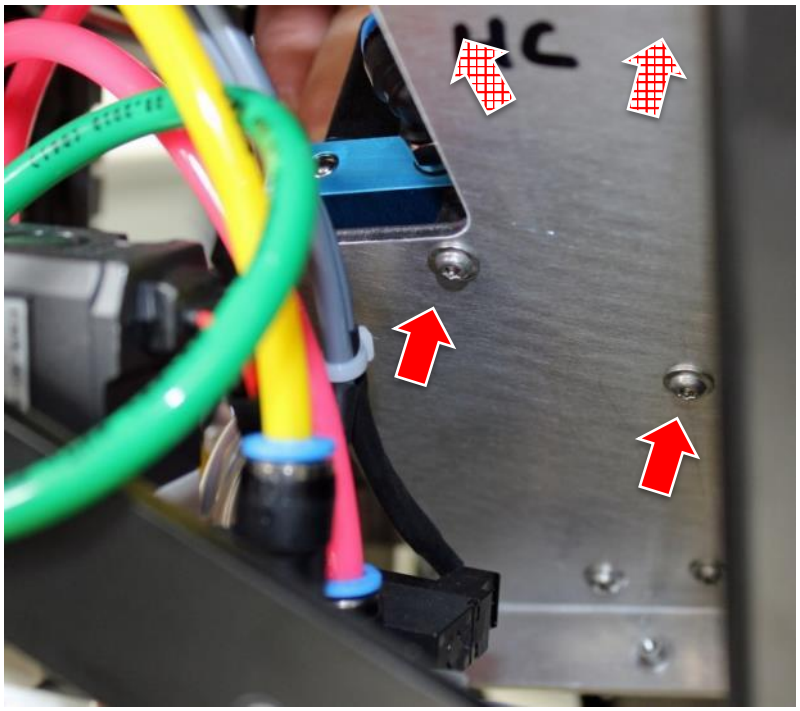
Do not break sensor hose inlet by applying too much force!



STEP 4:

5. Remove the 4 screws that hold the complete bracket in place – 2 screws on each side.





STEP 5:

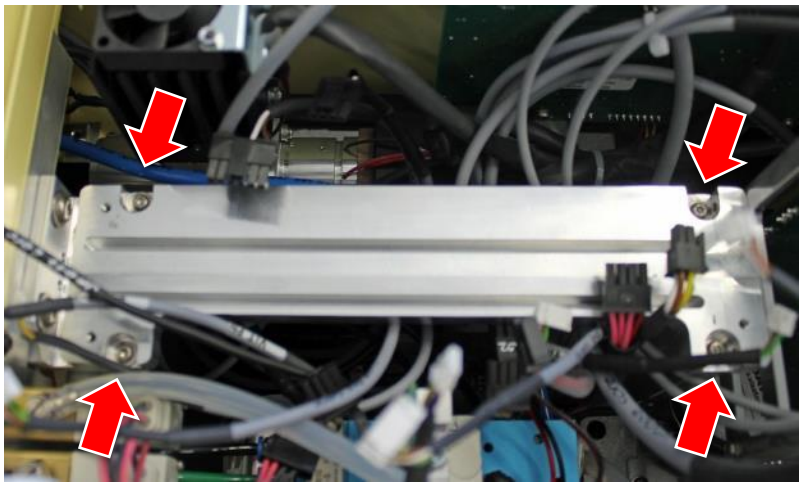
6. Move brackets upwards so that the screws on the side below can be reached.

7. Unscrew the 4 screws that hold the Visco module in place.

11.1.23 Vit-PN module

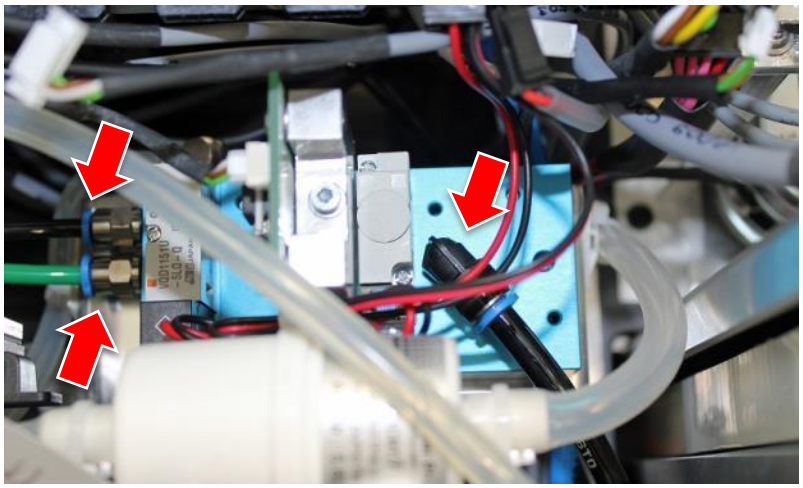
VX210157

Quantity	Description
1	Vit-PN module
4	M3x10 oval head screw, TORX, ecosyn-fix



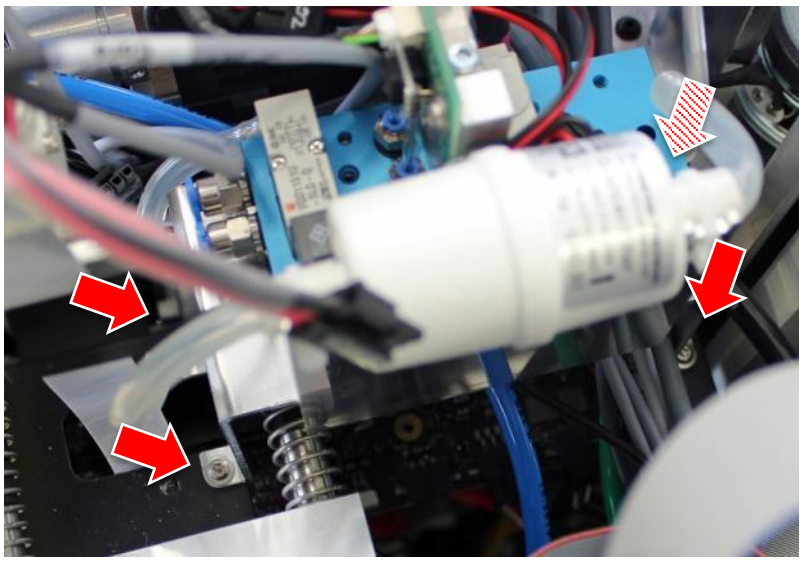
STEP 1:

1. Remove system PCB according to ♦ 11.1.11.
2. Remove board carrier by unfastening the 4 screws.



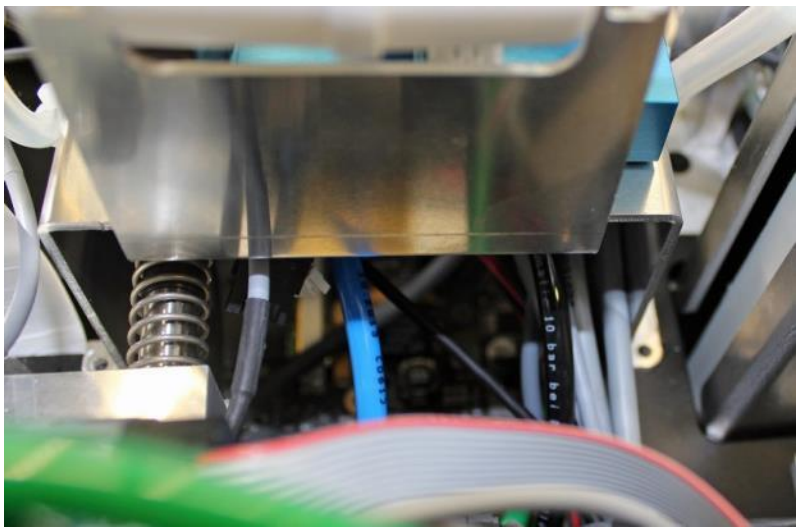
STEP 2:

3. Disconnect the 2 tubes from the air module.
4. Disconnect the green and black tubes from Vit-PN outputs.
5. Disconnect the black tube from the Visco module.



STEP 3:

6. Unfasten the 4 screws from carrier by using a tool with a long shaft.



STEP 4:

7. Lift module out of the unit by holding the module upwards.

NOTE!

Incorrectly placed tubes and wires

Improper function of VIT-PN

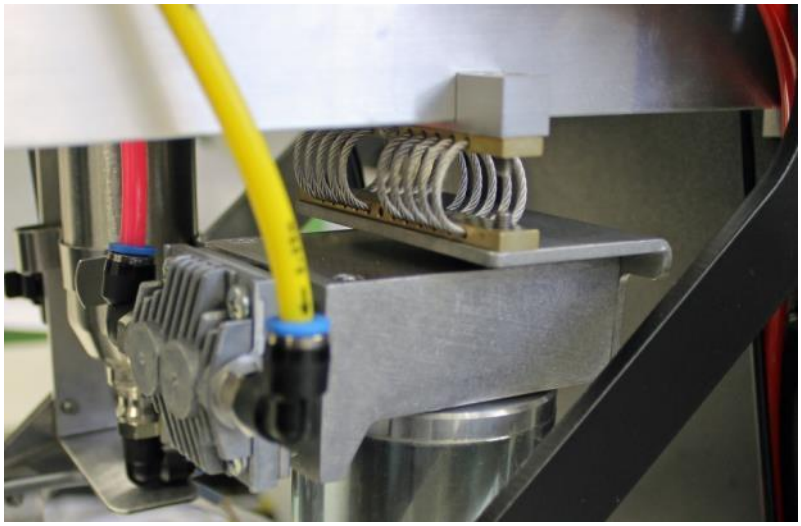
► When mounting the new module back into the unit, make sure that all tubes and wires are placed correctly under the sheet metal carrier.

8. To remove the pressure control valve, see the procedure described in ♦ 11.1.22.

11.1.24 Source pressure module

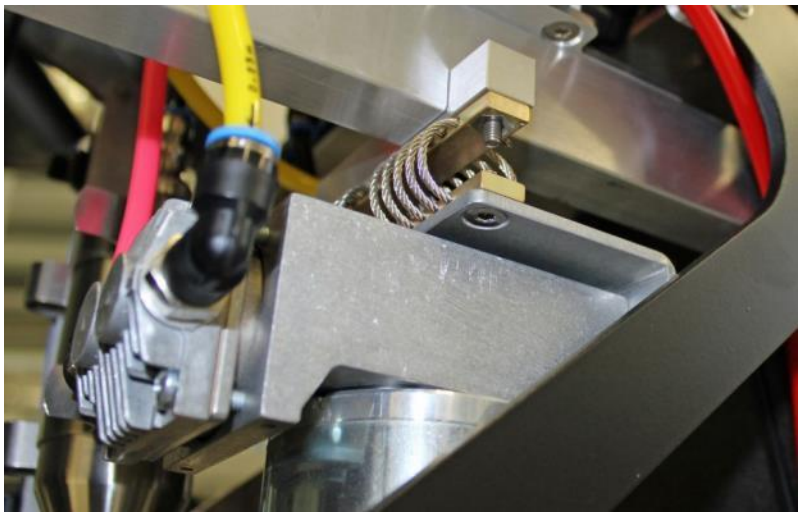
VX210152

Quantity	Description
1	Source pressure module



STEP 1:

1. Remove the black ring that holds the compressor in place. See step 2 of ♦11.1.7.
2. Disconnect 2 tubes from the compressor.
3. Disconnect all cables between the compressor and the supply PCB.



STEP 2:

4. Remove the 2 screws that connect the compressor with the spring suspension.
5. Take the compressor unit out of the unit in a sideways direction.

STEP 3:

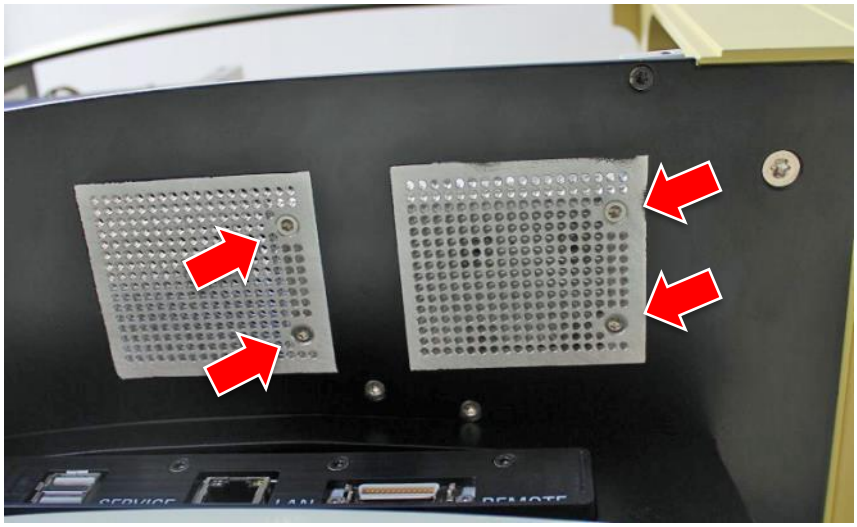
6. Remove the tube connectors from the old compressor module and fix them to the new module.

11.2 Components of posterior version

11.2.1 Power LEDplus module

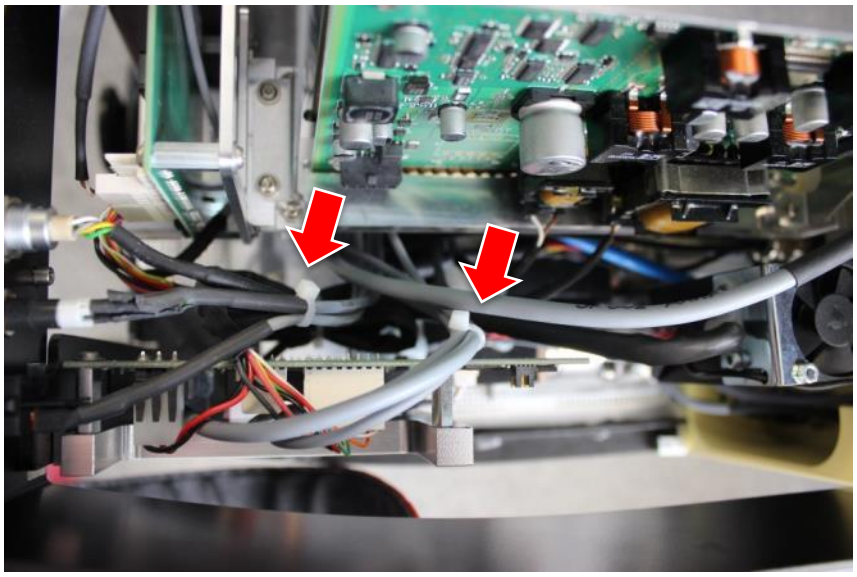
VX210148

Quantity	Description
1	Power LEDplus module



STEP 1:

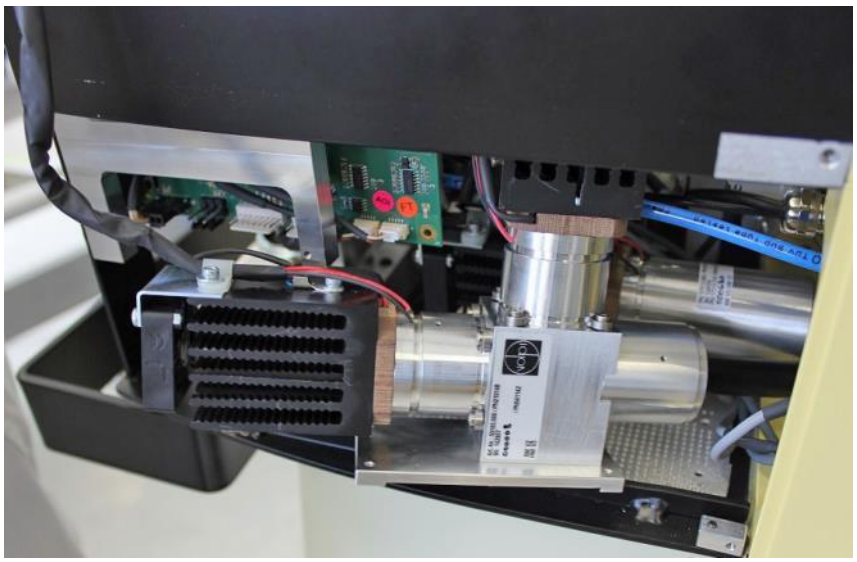
1. Remove 4 screws on the underside.



STEP 2:

2. Disconnect all cables from the PCB.

   Wires are tied together with wire cable ties – remove them carefully.



STEP 3:

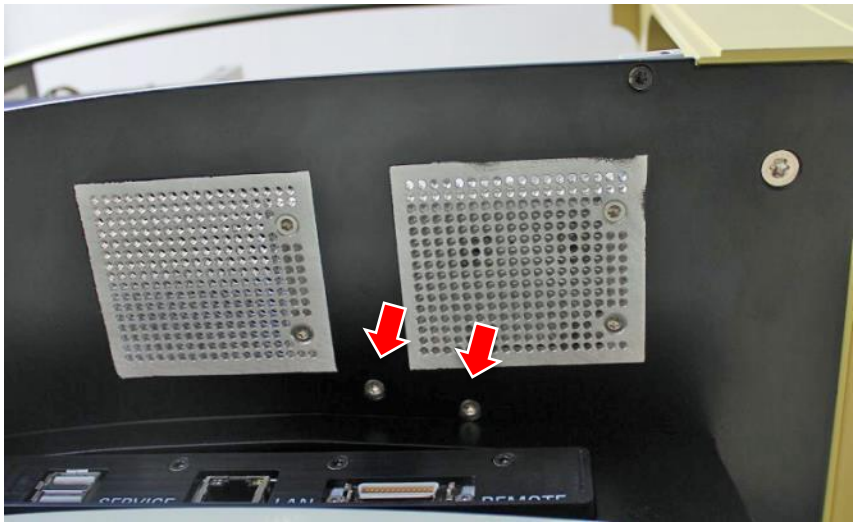
3. Pull module out of the unit in a sideways direction.

   Be careful not to damage any wires!

11.2.2 Power LED module

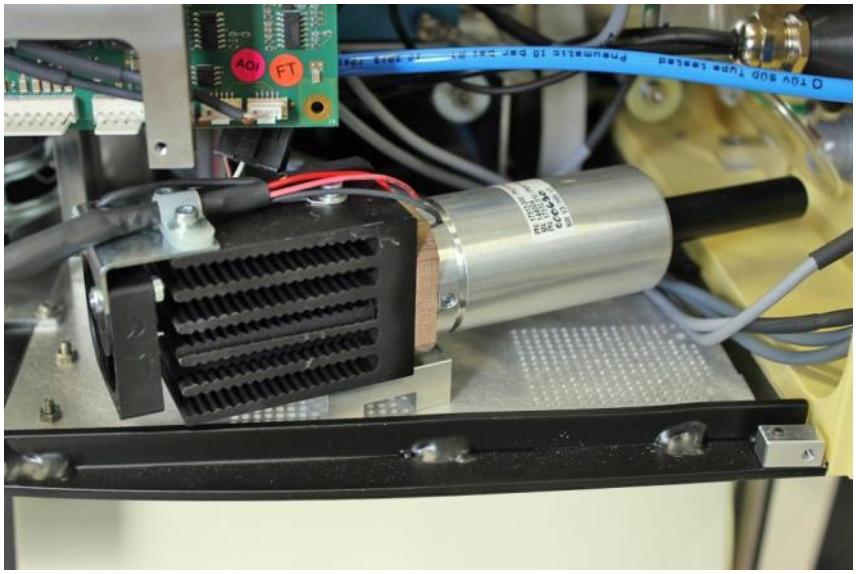
VX210149

Quantity	Description
1	Power LED module



STEP 1:

1. Remove the LEDplus light module according to ♦11.2.1.
2. Remove 2 screws from the underside of the module.



STEP 2:

3. Disconnect all cables from core PCB.

   Wires are tied together with wire cable ties – remove them carefully.
4. Pull module out of the unit in a sideways direction.

   Be careful not to damage any wires!
5. Remove holder from the light module and use it for the replacement part.

11.3 Components of laser version

11.3.1 Spare key for endo laser

VX240053

Quantity	Description
2	Laser safety key

New keys can be replaced without taking any specific action.

11.3.2 Laser – DRS dongle

VX400279

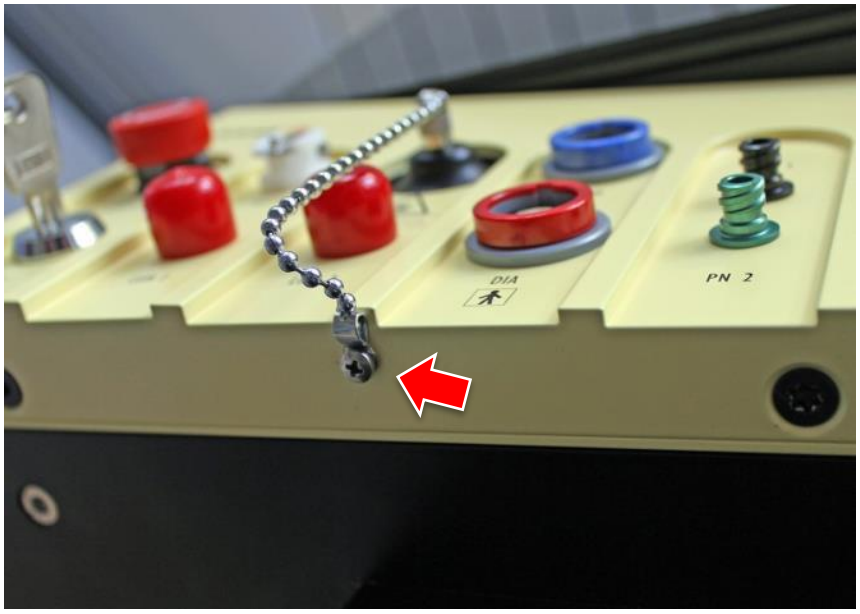
Quantity	Description
1	DRS dongle

The new plug connector can be replaced without taking any specific action.

11.3.3 Protection cap for laser

VX520405

Quantity	Description
1	Protection cap



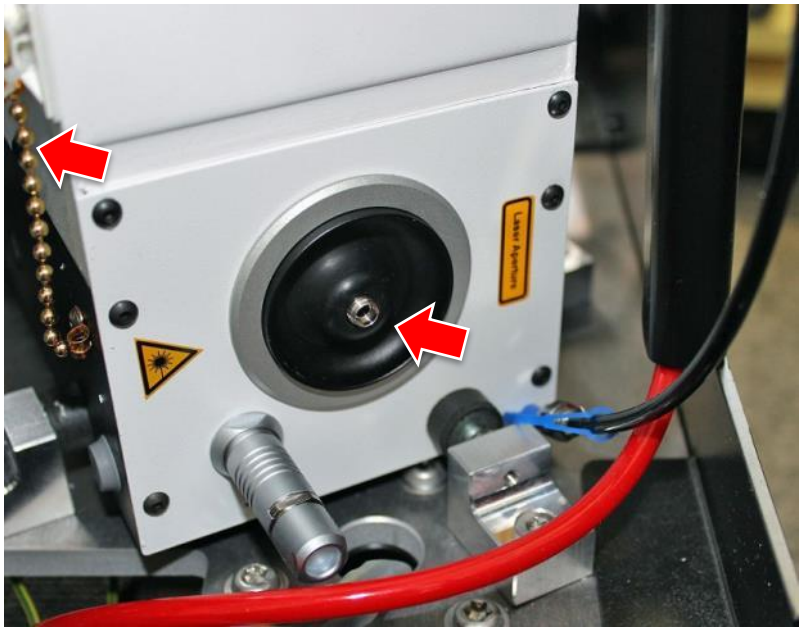
STEP 1:

1. Remove chain by unfastening the screw.

11.3.4 Fibre coupling unit for endo laser

VX400223

Quantity	Description
1	Fibre coupling unit with cable



STEP 1:

1. Remove the housing according to ♦11.1.5
2. Remove front enclosure according to ♦ 11.1.6.

STEP 2:

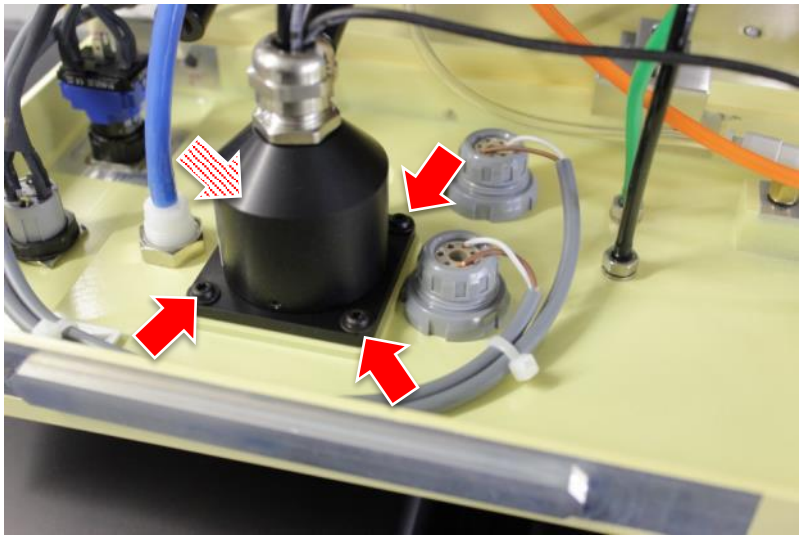
3. Disconnect cable labelled as SCN from the laser module, remove it from the trunking, and remember the path of it.
4. Unscrew light fibre at laser module.
5. Screw on protection cap on the laser module. The cap is chained to the laser module.

WARNING!

Dust and debris inside the power output of the laser module

Risk of fire inside the unit, reduction or damage of laser fibre

► Always keep connector clean from dust and debris. Use the protection cap at all times.



STEP 3:

6. Carefully pull light fibre and cable out of the unit. Make sure to remember the route. Best is to use a tracing line.
7. Remove 4 (TX4) screws from the fibre.

NOTE!

Laser power loss too high

Laser output cannot be calibrated

► Do not bend or kink new fibre when installing. A minimum radius of **75mm** must be adhered to.

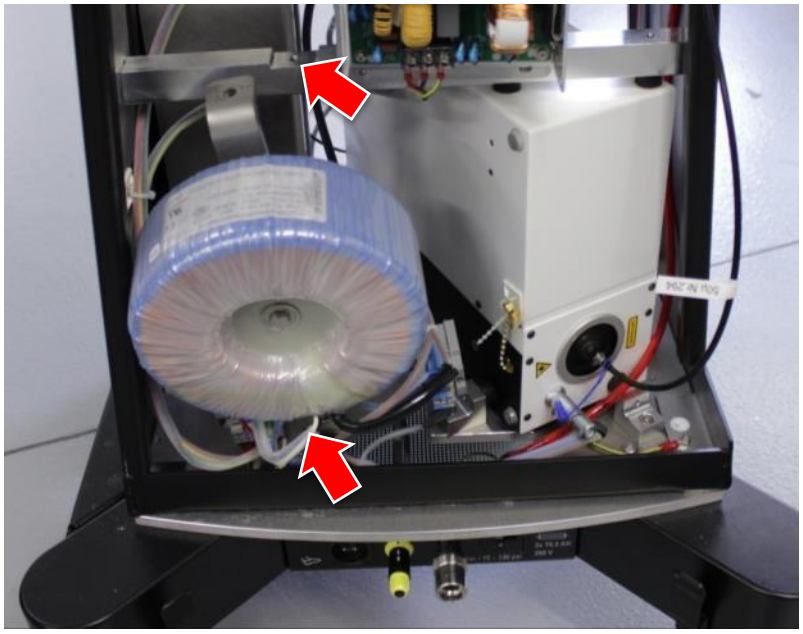
STEP 4: Installation

8. Install in reverse order.
9. Execute the calibration of the target and the power laser according to chapters ♦9.7.4 and ♦9.7.3. This will ensure the correct power output of the lasers.

11.3.5 Endo laser module

VX210162

Quantity	Description
1	Endo laser module

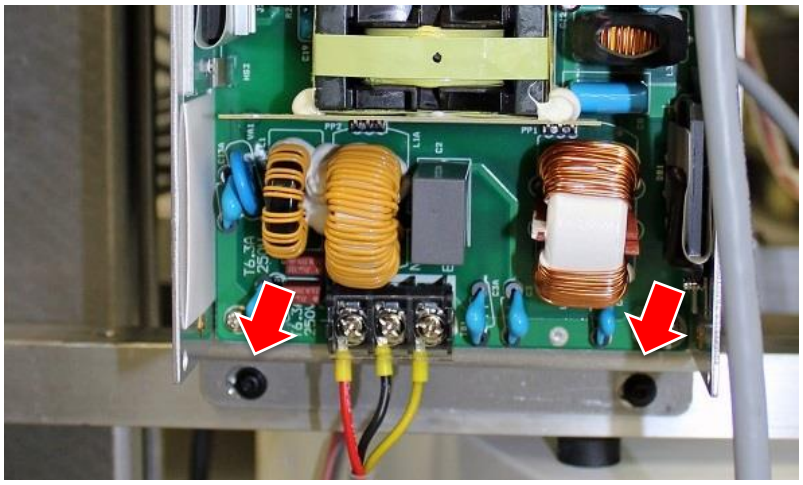


STEP 1:

1. Remove housing according to section ♦11.1.5 step 3.

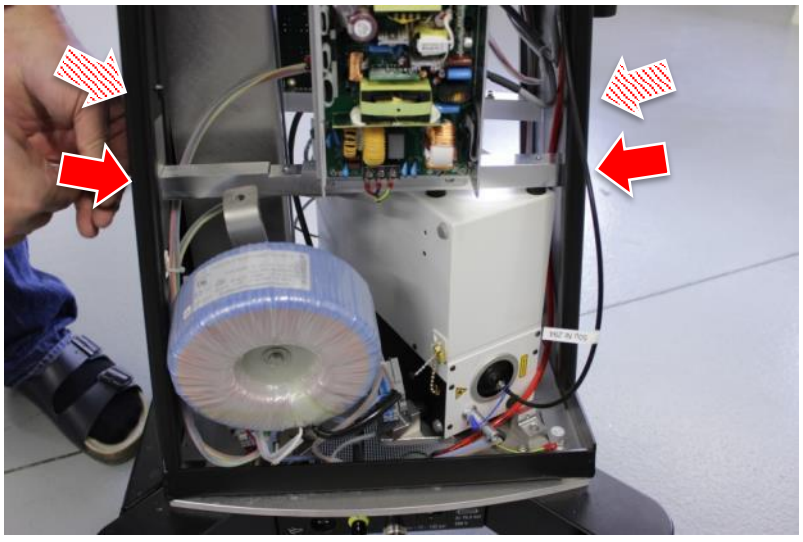
2. Remove isolation transformer assembly to get access to the laser module.

   Remove the top screw completely (TX30). The bottom screw needs only to be loosened. Swing the transformer to the left side.



STEP 2:

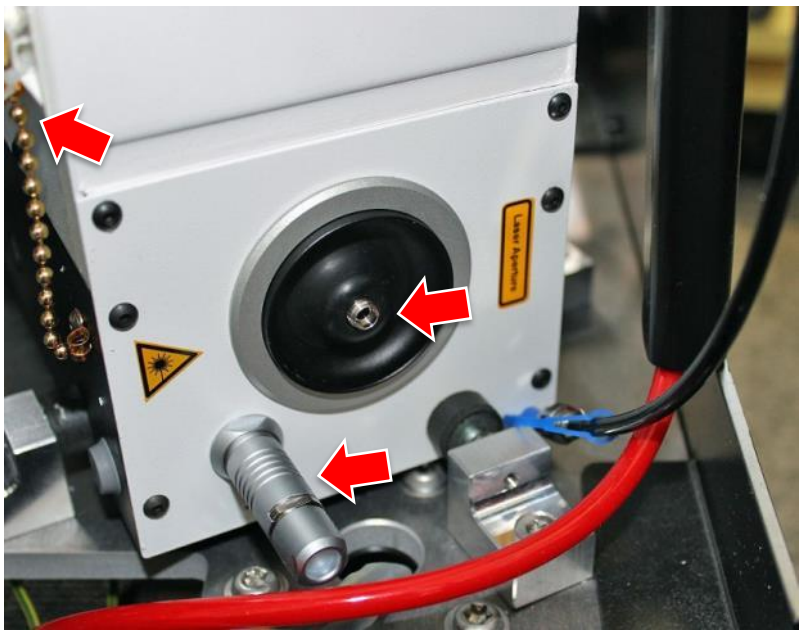
3. Remove 2 (TX10) screws from the power supply carrier.



STEP 3:

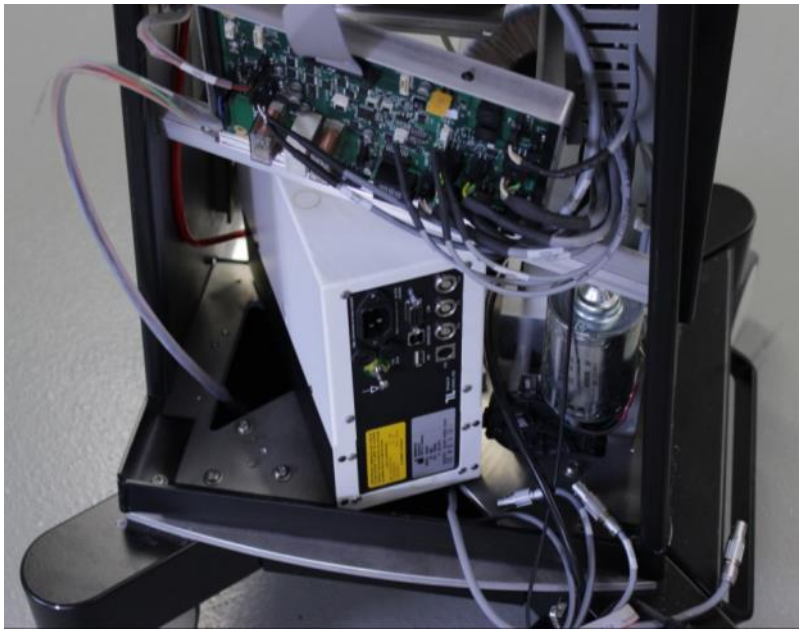
4. Remove 8 (TX25) screws from both supports where one of them holds the supply PCB in place.

5. Push the supports out of the frame.



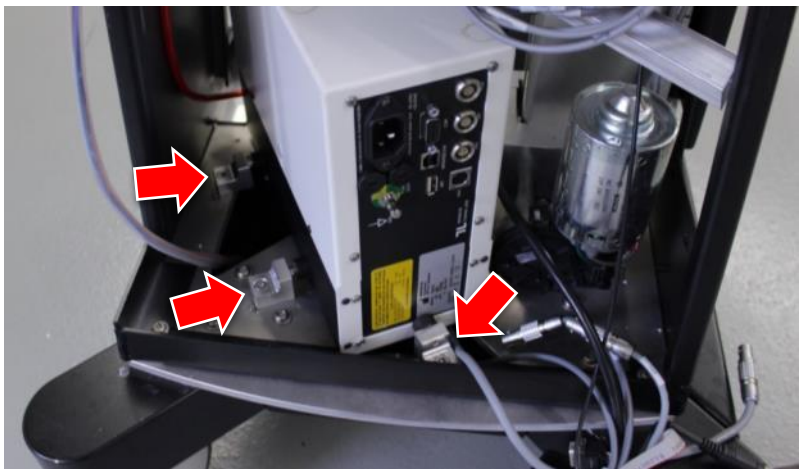
STEP 4:

6. Unscrew light fibre at laser module.
7. Screw on protection cap on the laser module. The cap is chained to the laser module.
8. Remove dongle beside fibre attachment.



STEP 5:

9. Plug out all cables that connect the laser module with the supply print at the supply print.
10. Plug out all cables at the laser module.



STEP 6:

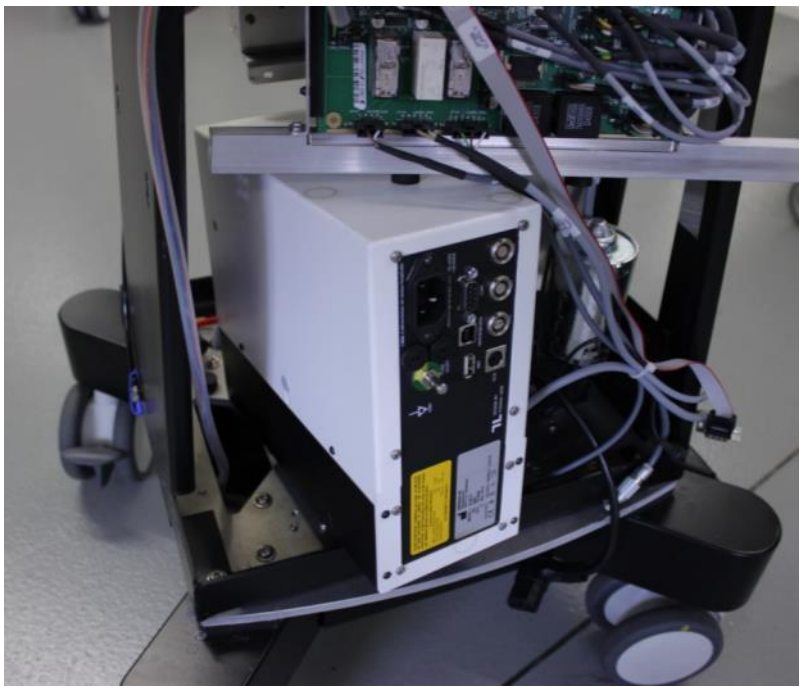
11. Loosen the screws (TX25) from the three marked spacers so that the module comes free and remember the corresponding positions.

NOTE!

Laser module is not fixed in the device

Laser module and device can be damaged

► The force that holds the laser module can be adjusted by the rubber buffer. Screw in or out for less or more force.



STEP 7:

12. Lift module out of the unit.

NOTE!

Improper packaging used

Misalignment of optical components

► Use proper packaging (e. g. laser packaging from the manufacturer) to dispatch the laser module.

STEP 8: Installation

13. Execute the calibration of the target and the power laser according to chapters ♦9.7.3 and ♦9.7.4. This will ensure the correct power output of the lasers.

11.3.6 Exchange of Connecting cable laser to UPF connector

VX400300

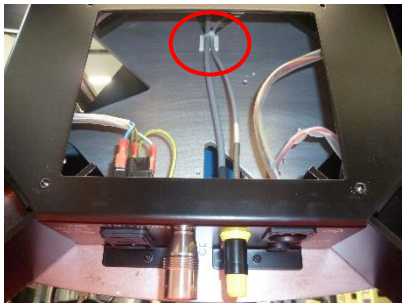
Quantity	Description
1	Connecting cable laser to UPF connector

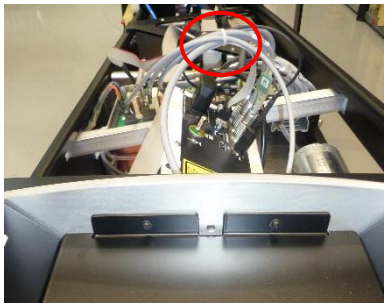
STEP 1:

1. Open the UPF socket with a Lemo key (DCH.91.161.PA), do not loosen completely, otherwise the toothed lock washer could be lost. Remove isolation transformer assembly to get access to the laser module.

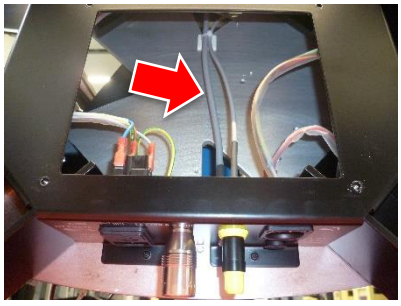
2. Place the OS4 carefully on its side (according to the position on the photo).

3. Remove the housing and the ventilation plate.





4. Remove the two cable ties according to the photos.



5. Disconnect and unthread the UPF cable from the laser and completely remove it.

6. Mount the replacement cable in reverse order.

   Remember to secure the UPF socket with the Lemo key at the end of the exchange.

STEP 2: Testing Connecting cable laser to UPF connector

1. Install the new OS 4 SW V.2.0.0 according to chapter ♦12 and press the RESET button.
2. Connect the OS 4 pedal via cable or Bluetooth with the OS 4
3. Select “active” for UPF according to chapter ♦7.2.
4. Disconnect the OS 4 from power supply by turning off the surgical platform and disconnecting the main cable.
5. Reconnect the main cable and turn on the OS 4.
6. Connect test fiber and measurement head (♦16) according to chapter ♦9 with the OS4.
7. Turn the key switch to on (I).
8. Plug in the DRS on the bottom of the surgical platform, see chapter ♦6.4.
9. Deactivate the laser stop button.
10. Connect the UPF with the OS 4 and keep the switch on the UPF housing pressed for the following steps.
11. Select program LASER and confirm by pressing “Ready”.
12. Set the Laser Power to 50mW and activate the laser with the foot pedal.
13. Release the switch on the UPF housing. When releasing the switch the warning “Laser: active user protection filter is plugged but not in place” appears.
14. Repeat step 10 to 12 one more time.

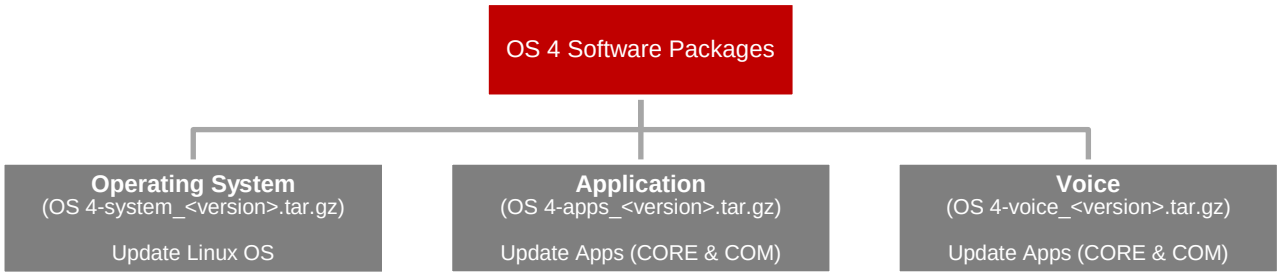
The Connecting cable laser to UPF connector is correctly installed if laser power can be activated and the filter of the fully automated UPF moves back and forth.

12 Software update

VX541969

Quantity	Description
1	USB stick with software update

The software of the OS 4 is delivered in form of the following packages, each containing a certain part of the software:



12.1 Update order

If several software packages are available at the same time, always follow the following update order (for upgrading and downgrading):

1. Operating system package:
   when the operating system package is updated, information on installed packages and their version is lost. Therefore, always update the operating system package first.
2. Application package
3. Voice package

When updating or downgrading, do not skip a released software versions, e.g. perform an update to 1.3.0 only from 1.2.0.

12.2 General updating procedure

The new software is delivered on USB stick.

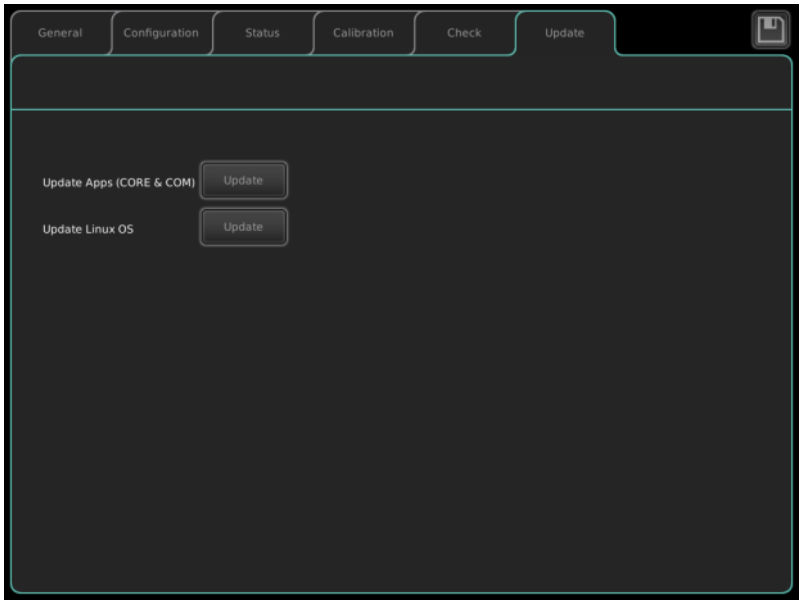
Only use an Oertli service USB flash drive in conjunction with the OS 4.

A started update of a package must not be aborted by pressing reset or switching the device off. Otherwise the device may be left in an undefined state rendering it unusable.

Exception:
The first automatically initiated system start-up ("System starting up ...") after an update of the operating system software may fail for some combinations of package versions. If "System starting up ..." is shown for more than 5 minutes, press the "RESET" button.

The update of the voice package and the operating system package takes its time (approx. 20 min). Make sure you have enough time before you start the update.

If the error message "The update process failed with error 1" appears, the update order has not been followed. Always upgrade or downgrade software packages according to the instructions in ♦12.1.



Procedure

1. Switch unit off.
2. Plug USB stick into the lower service port.
3. Switch unit on and enter service mode (see ♦7).
4. Select the relevant button <**Update**> of the software that needs to be updated.
5. Press button “Select File”.
6. In path “/media/sda1”, you will see your update package:
   - OS 4-apps_<version>.tar.gz for the application package
   - OS 4-system_<version>.tar.gz for the system package
   - OS 4-voice_<version>.tar.gz for the voice package
7. Select the correct file and press “open”.
8. Wait until the version is displayed.
9. Check if it is the right version and press “Perform Update”.
10. Wait until the status bar is going to the end and the button <Close> is enabled. Press the button <Close>
11. Wait until you see the start screen.

The software for the pedal cannot be updated in the field. If necessary, send the pedal back to the manufacturer.

12.3 Versions

This chapter contains information about the released software versions including, if necessary, a specific updating procedure.

12.3.1 Version 2.0.0

Files
OS 4-system_1.4.0.tar.gz
OS 4-apps_2.0.0.tar.gz
OS 4-voice_1.0.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v2.0.0
System: v1.4.0 OS 4-prod-image

Specific upgrading procedure from version 1.5.x
1. Make sure that version 1.5.x is installed on the device (♦12.3.2)
2. Export the surgeon memory to a USB stick as described in ♦7.2.
3. Convert the surgeon memory on the USB stick as described in ♦8.1.1
4. Update the operating system package according to ♦12.2.
5. Update the application package according to ♦12.2.
6. Import the converted surgeon memory from USB stick as described in ♦7.2.

12.3.2 Versions 1.5.x

12.3.2.1 Version 1.5.5

Files
OS 4-system_1.3.0.tar.gz
OS 4-apps_1.5.5.tar.gz
OS 4-voice_1.0.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v1.5.5
System: v1.3.0 OS 4-prod-image

Specific upgrading procedure from version 1.5.3 or higher
1. Make sure that version 1.5.3 or higher is installed on the device (♦12.3.4)
2. Update the application package according to ♦12.2.

Specific upgrading procedure from version 1.4.0
7. Make sure that version 1.4.0 is installed on the device (♦12.3.4)
8. Export the surgeon memory to a USB stick as described in ♦7.2.
9. Convert the surgeon memory on the USB stick as described in ♦8.1.2.
10. Update the operating system package according to ♦12.2.
11. Update the application package according to ♦12.2.
12. Upload the converted surgeon memory from USB stick as described in ♦7.2.

12.3.2.2 Version 1.5.4

Files
OS 4-system_1.3.0.tar.gz
OS 4-apps_1.5.4.tar.gz
OS 4-voice_1.0.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v1.5.4
System: v1.3.0 OS 4-prod-image

Specific upgrading procedure from version 1.5.3
1. Make sure that version 1.5.3 is installed on the device (♦12.3.4)
2. Update the application package according to ♦12.2.

Specific upgrading procedure from version 1.4.0
1. Make sure that version 1.4.0 is installed on the device (♦12.3.4)
2. Export the surgeon memory to a USB stick as described in ♦7.2.
3. Convert the surgeon memory on the USB stick as described in ♦8.1.2.
4. Update the operating system package according to ♦12.2.
5. Update the application package according to ♦12.2.
6. Upload the converted surgeon memory from USB stick as described in ♦7.2.

12.3.2.3 Version 1.5.3

Files
OS 4-system_1.3.0.tar.gz
OS 4-apps_1.5.3.tar.gz
OS 4-voice_1.0.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v1.5.3
System: v1.3.0 OS 4-prod-image

Specific upgrading procedure
1. Make sure that version 1.4.0 is installed on the device (♦12.3.4)
2. Export the surgeon memory to a USB stick as described in ♦7.2.
3. Convert the surgeon memory on the USB stick as described in ♦8.1.2.
4. Update the operating system package according to ♦12.2.
5. Update the application package according to ♦12.2.
6. Upload the converted surgeon memory from USB stick as described in ♦7.2.

12.3.3 Version 1.4.0

Files
OS 4-system_1.2.0.tar.gz
OS 4-apps_1.4.0.tar.gz
OS 4-voice_1.0.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v1.4.0
System: v1.2.0 OS 4-prod-image

Specific upgrading procedure
1. Make sure that version 1.3.0 is installed on the device (♦12.3.4)
2. Export the surgeon memory to a USB stick as described in ♦7.2.
3. Convert the surgeon memory on the USB stick as described in ♦8.1.
4. Update the operating system package according to ♦12.2.
5. Update the application package according to ♦12.2.
6. Update the voice package according to ♦12.2.
7. Upload the converted surgeon memory from USB stick as described in ♦7.2.

12.3.4 Version 1.3.0

Files
OS 4-system_1.1.0.tar.gz
OS 4-apps_1.3.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v1.3.0
System: v1.1.0 OS 4-prod-image

Specific upgrading procedure
1. Make sure that version 1.2.0 is installed on the device (♦12.3.5)
2. Update the operating system package according to ♦12.2.
3. Update the application package according to ♦12.2.

After updating the OS 4 application software from version 1.2.0 to 1.3.0 the pedal assignments remain unchanged and the new parameters influencing the pedal section assignments (e.g. Reflux Position) are not in effect. In this state, none of the ”Assignment” buttons for pedal section assignments are selected in ParaProg. To use the new pedal section assignments and the new parameters influencing the pedal section assignments for a certain surgeon and function, press one of the "Assignment" buttons and save the settings in ParaProg.

12.3.5 Version 1.2.0

Files
OS 4-system_1.0.0.tar.gz
OS 4-apps_1.2.0.tar.gz

Displayed in service mode (tab “General”) when installed:
App: v1.2.0
System: v1.0.0 OS 4-prod-image

Specific upgrading procedure
1. Make sure that version 1.1.0 is installed on the device (♦12.3.5)
2. Update the application package according to ♦12.2.

12.3.6 Version 1.1.0

Files
OS 4-system_1.0.0.tar.gz or OS 4-system.tar.gz
OS 4-apps_1.1.0.tar.gz or OS 4-apps.tar.gz

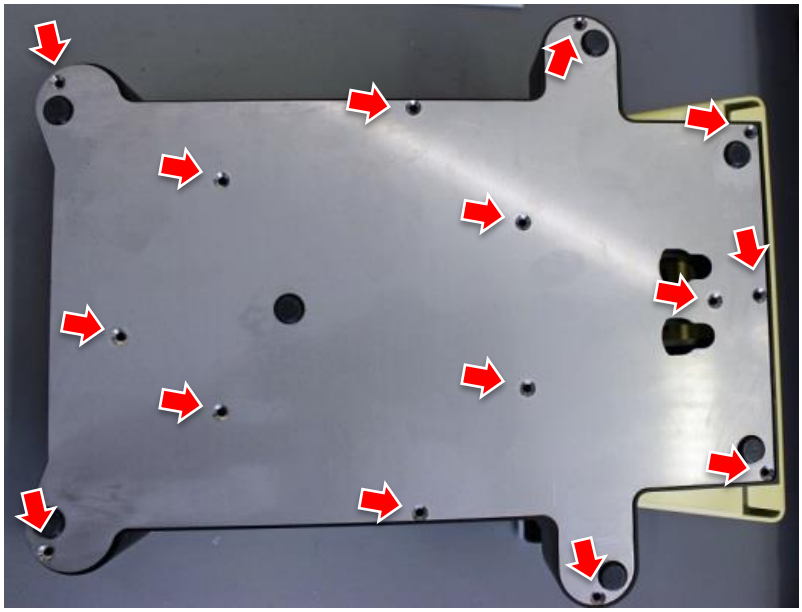
Displayed in service mode (tab “General”) when installed:
App: v1.1.0
System: v1.0.0 OS 4-prod-image

Specific upgrading procedure
1. Update the application package according to ♦12.2.

13 Installing and uninstalling of pedal components

13.1 Pedal housing

13.1.1 Pedal housing up to serial no. 80670098



STEP 1:

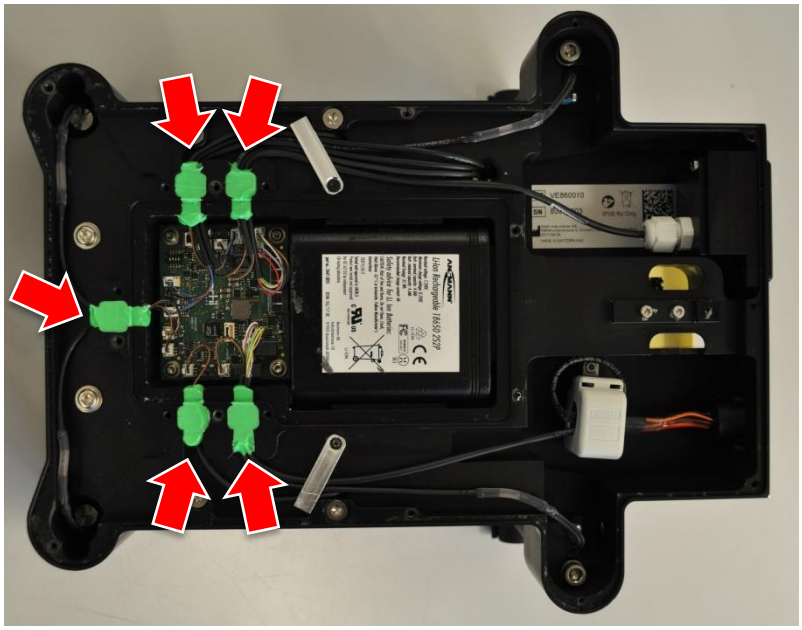
1. Remove all screws from the base plate.
2. Lift the base plate up.
3. If necessary, remove the gasket from electronic compartment.

NOTE!

Improper sealing of pedal

Pedal does not correspond to IPX-class anymore

► After repair, do seal the pedal with the sealing set (VX102479)



STEP 2:

4. If necessary, pull the wires out of the slot.
5. If necessary, release cable routing.

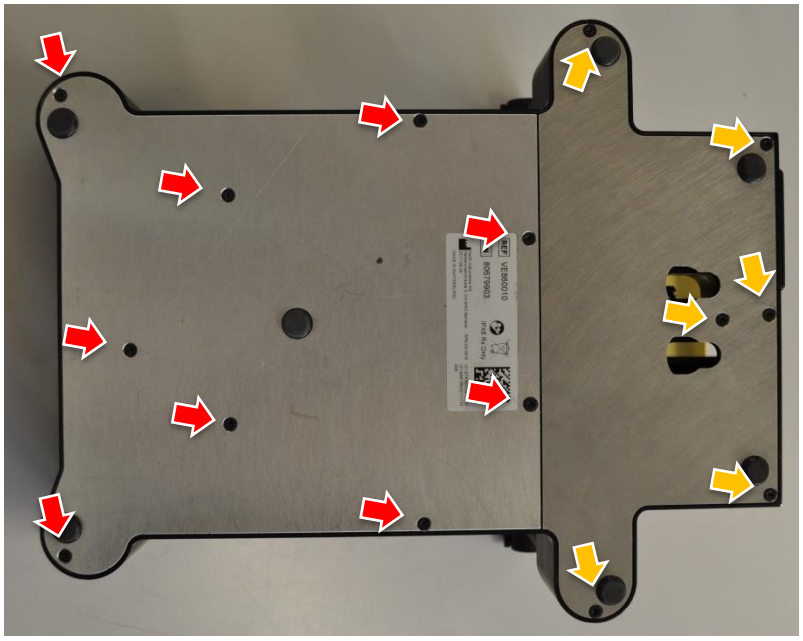
NOTE!

Improper sealing of pedal

Pedal does not correspond to IPX-class anymore

► After repair, do seal the pedal with the sealing set (VX102479)

13.1.2 Pedal housing from serial no. 80670099



STEP 1:

1. Dependent on the service case: Remove all in the picture red and/or orange marked screws from the base plate.
2. Lift the base plate up.
3. If necessary, remove the gasket from electronic compartment.

NOTE!

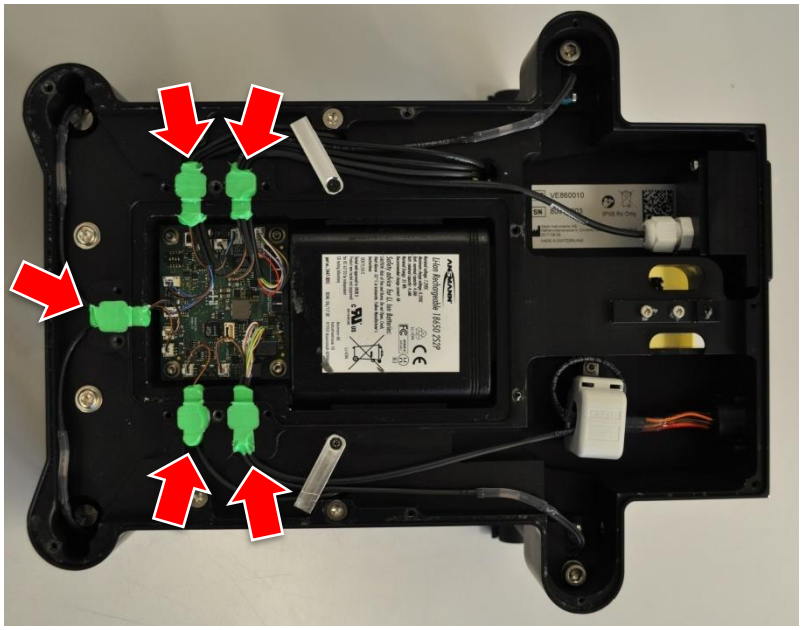
Improper sealing of pedal

Pedal does not correspond to IPX-class anymore

► After repair, do seal the pedal with the sealing set (VX102479)

Remove screws (red arrows)

Remove screws (orange arrows)



STEP 2:

4. If necessary, pull the wires out of the slot.
5. If necessary, release cable routing.

NOTE!

Improper sealing of pedal

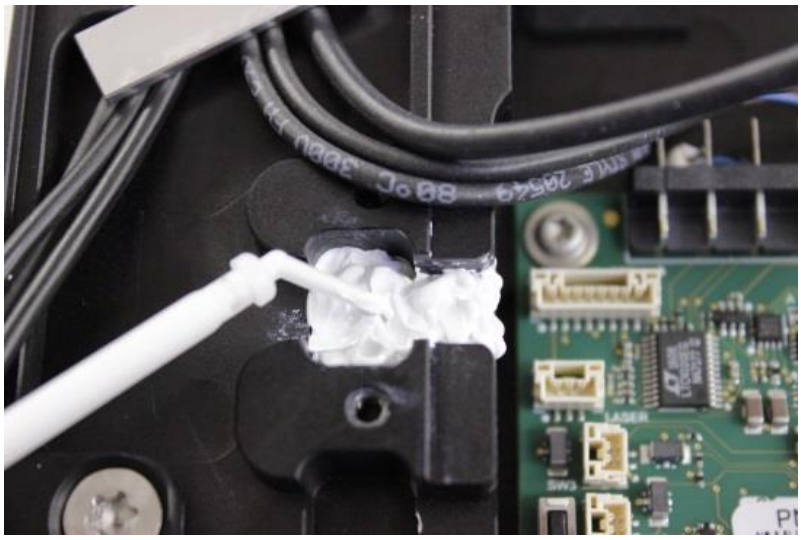
Pedal does not correspond to IPX-class anymore

► After repair, do seal the pedal with the sealing set (VX102479)

13.2 Sealing set

VX102479

Quantity	Description
1	Sealing mat
1	TEMPO SIL2 white

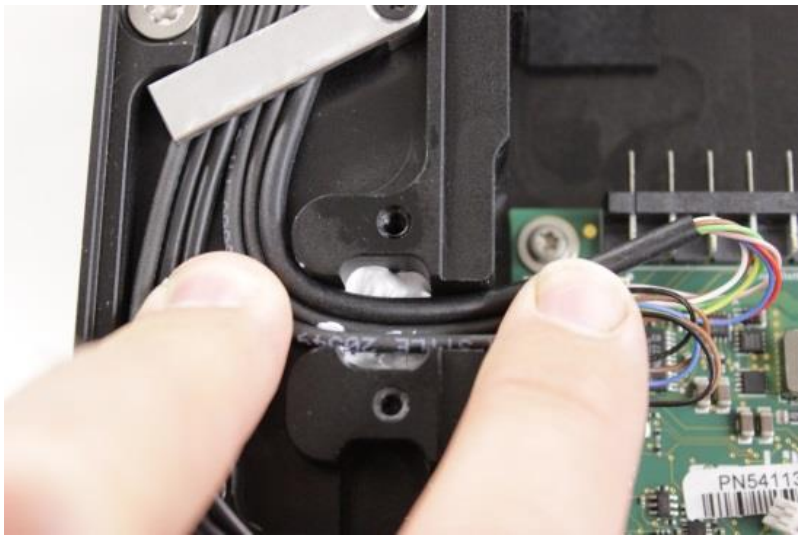


STEP 1:

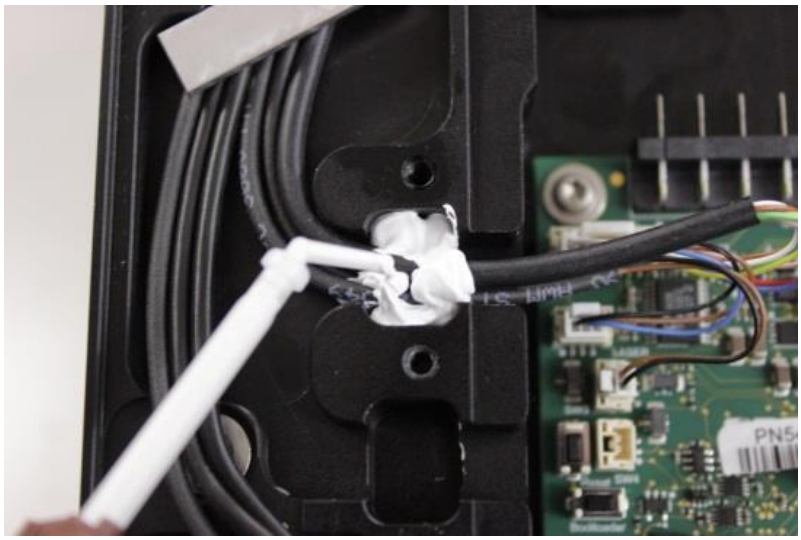
1. Open pedal housing according to the procedure described in ♦13.1.

2. Seal pedal with TEMPO SIL 2 in three steps:

2a Pre-fill pouch



2b Press the cable into sealing compound and refill pouch up to the rim.



2c Fill pouch above the rim.

STEP 2:

3. Place adhesive tape on uncoated area and wait until TEMPO SIL 2 has cured (approx. 2 minutes).

STEP 3:

4. Remove adhesive and use a sharp razor blade to remove excess.

5. Plug in all cables to the pedal print.

6. Place sealing.

NOTE!

Improper sealing of pedal

Pedal does not correspond to IPX-class anymore

► After repair, do seal the pedal with the sealing set (VX102479)

7. Mount base plate according to procedure described in in ♦13.1.

13.3 Rechargeable battery

VX400015

Quantity	Description
1	Rechargeable battery

STEP 1:

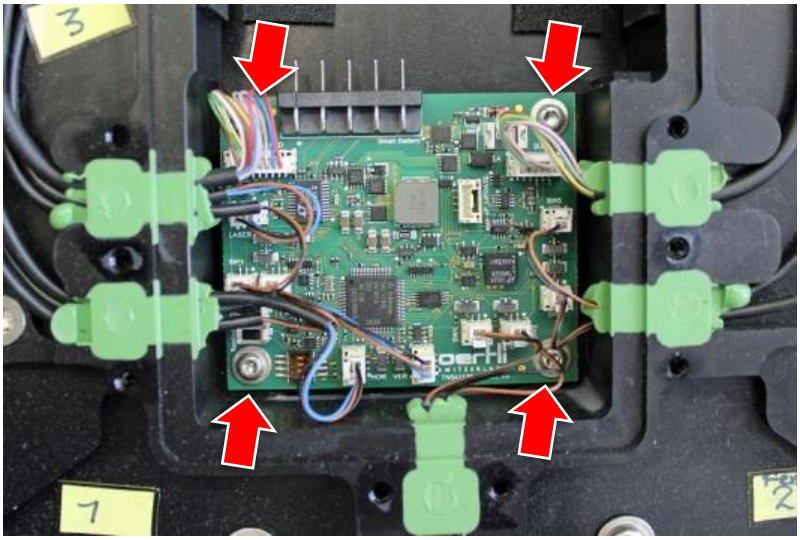
1. Open pedal housing according to the procedure described in ♦13.1.

2. Lift battery pack out of the contact terminal.

13.4 Pedal PCB

VX541135

Quantity	Description
1	Pedal PCB



STEP 1:

1. Open pedal housing according to the procedure described in ♦13.1.
2. Remove battery pack according to ♦13.3.
3. Take a photo of the connected cables.
4. Disconnect all cables.
5. Release PCB by removing 4 screws.

When mounting the new print take care that you plug in the cables according to the photo.

After this procedure, the pedal must be paired with the unit.

CAUTION!

Incorrect pedal signals transferred to device

Faulty operation of device

► After this procedure, the pedal needs recalibrating according to ♦7.5.

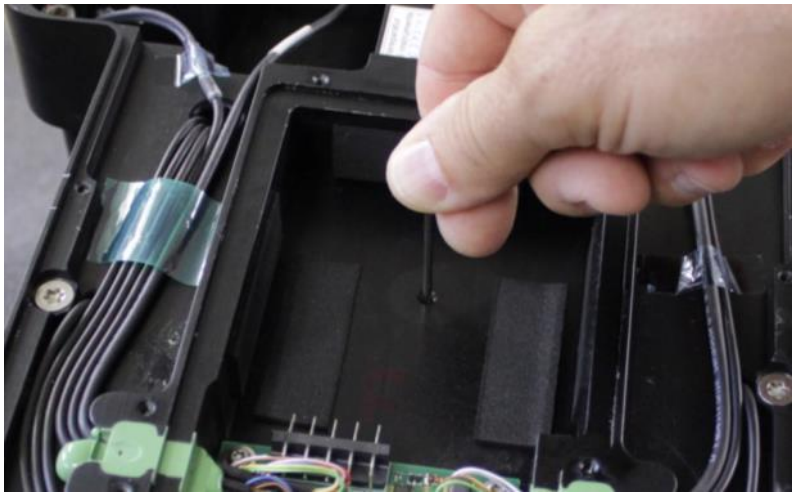
13.5 Connecting Rod

VX102741 Connecting Rod Standard

Quantity	Description
1	Connecting Rod Standard
1	Seal
3	M3x8 cheese head screw, TORX

VX102571 Connecting Rod with long aspiration path

Quantity	Description
1	Connecting Rod Aspiration
1	Seal
3	M3x8 cheese head screw, TORX

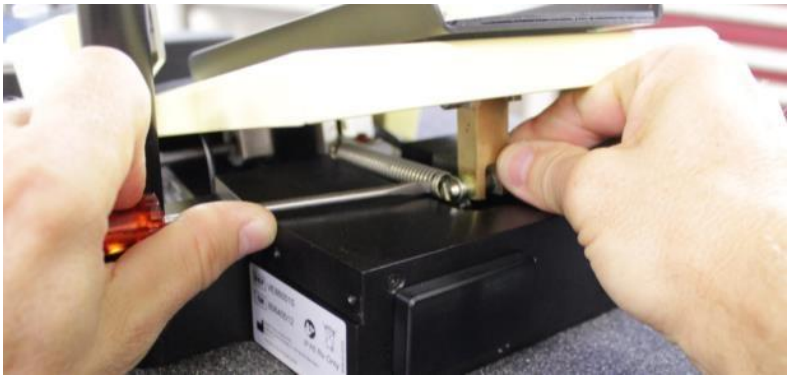


STEP 1:

1. Remove protection sheet according to ♦ 13.8.
2. Open pedal housing according to the procedure described in ♦13.1.
3. Remove seal
4. Remove battery pack according to ♦13.3.
5. Loosen the grub screw by turning it three times.

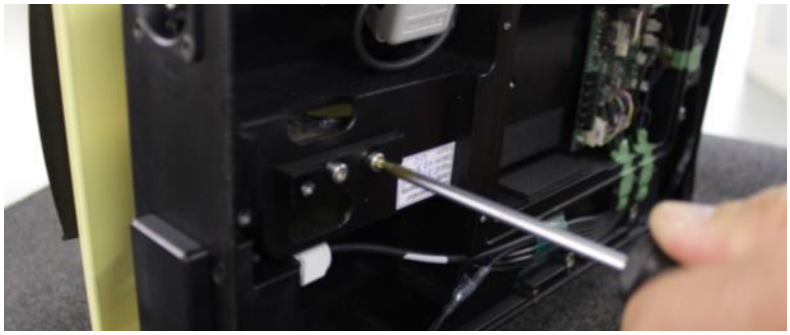
STEP 2:

6. Push out the wave vertical deflection component from the base body, keep the tool in the mounting.



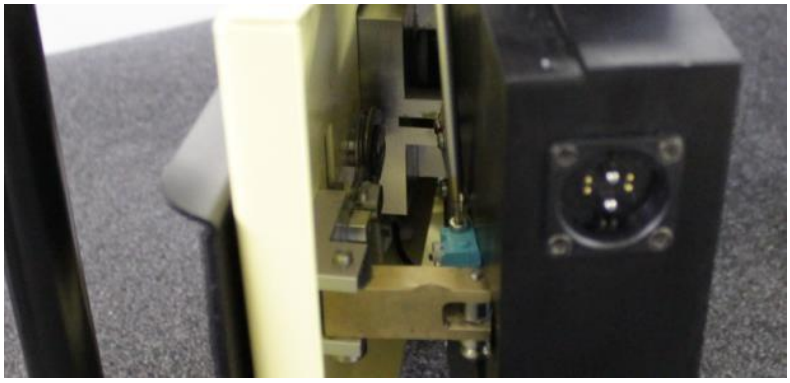
STEP 3:

7. Release spring.
8. Place rocker in such a way that access is given to connecting rod.



STEP 4:

9. Loosen two cheese head screws for the fixation of the connecting rod, remove one of them.

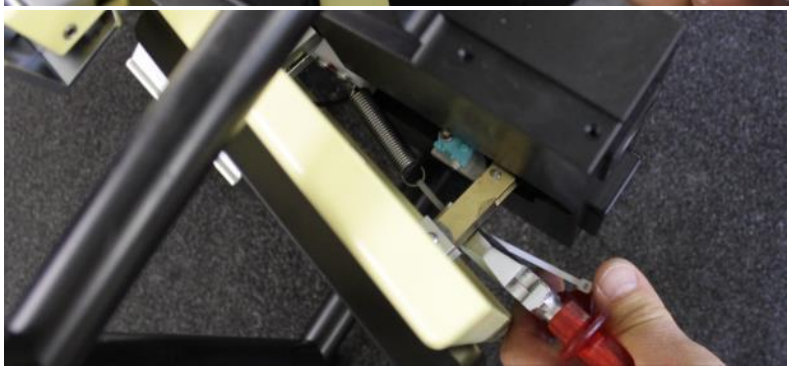


STEP 5:

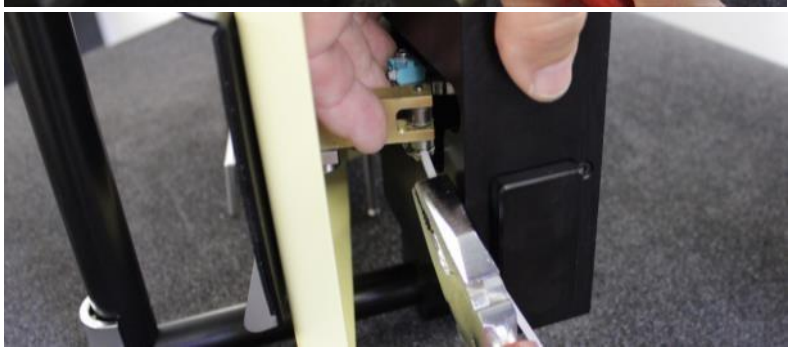
10. Remove cheese head screw at switch.

11. Remove second cheese head screw for fixation of the connecting rod and remove connecting rod.

a)



b)



c)

STEP 6:

12. Mount new connecting rod in the reverse order of the uninstallation.

Secure three cheese head screws with screw locking. Hook in spring with auxiliary means (i. e. cable tie).

NOTE!

Improper sealing of pedal

Pedal does not correspond to IPX-class anymore

► After repair, do seal the pedal with the sealing set (VX102479)

CAUTION!

Incorrect pedal signals transferred to device

Faulty operation of device

► After this procedure, the pedal needs recalibrating according to ♦7.5.

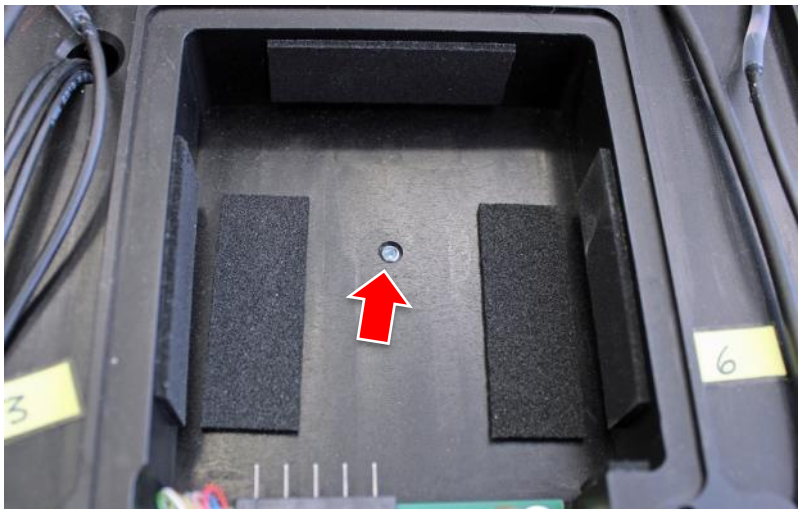
13.6 Sensors

13.6.1 Horizontal pedal sensor

VX310078 Pedal sensor horizontal

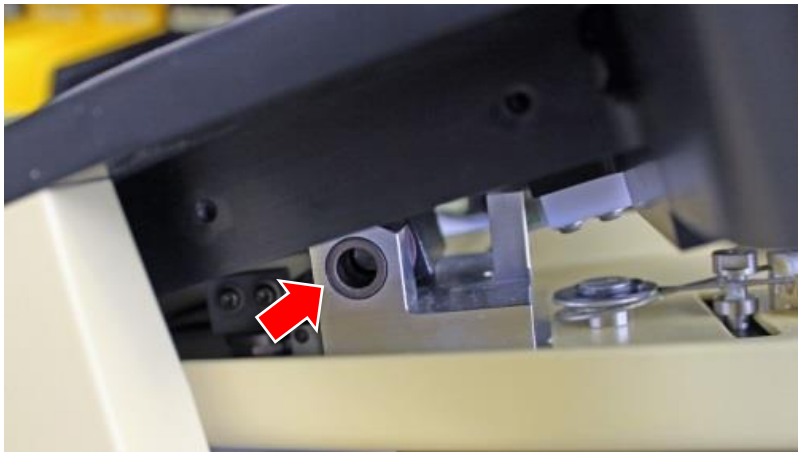
Quantity	Description
1	Pedal sensor horizontal
2	M3x12 oval head screw, TORX, ecosyn-fix
2	Cable tie

After the exchange of a pedal sensor, the pedal has to be sealed. For this purpose, additionally order **VX102479 sealing set** (see chapter 13.2)!



STEP 1:

1. Open pedal housing according to the procedure described in ♦13.1.
2. Remove battery pack according to ♦13.3.
3. Disconnect cable from PCB.
4. Undo the grub screw.

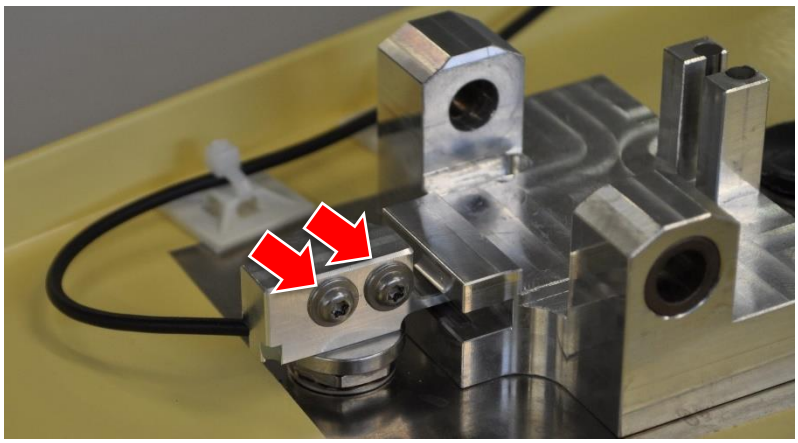


STEP 2:

5. Push out the wave vertical deflection component from the base body.
6. Release spring.
7. Place rocker in such a way that access is given to both sensors.

Do not lose the washers when pushing out the wave vertical deflection and reassemble them after repair.

Lubricate the wave vertical deflection before reassembling the pedal.



STEP 3:

8. Unscrew sensor (2 screws).

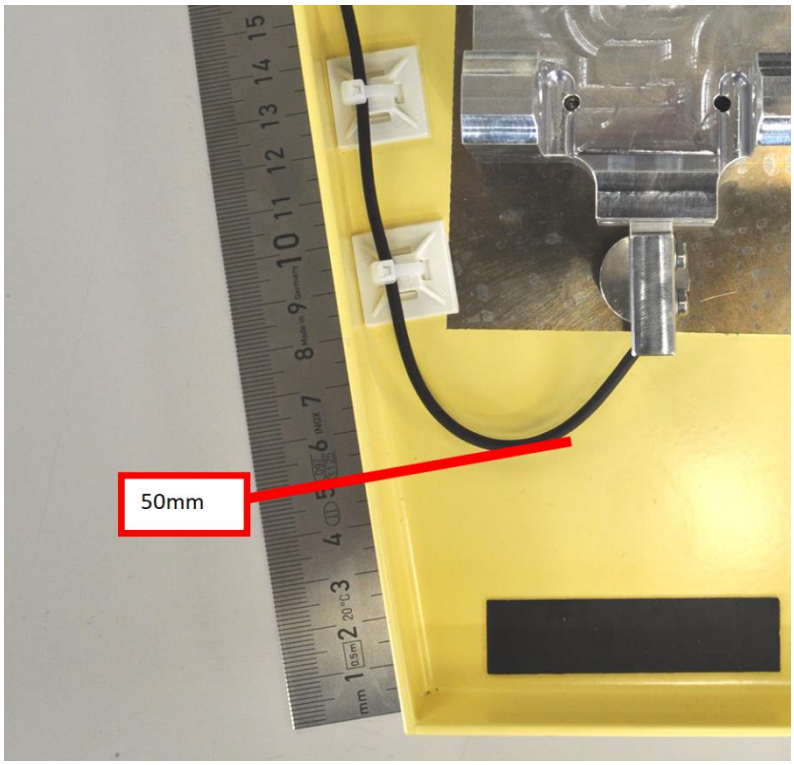
9. Release cable and mount the new sensor in the reverse order of disassembling.

CAUTION!

Incorrect pedal signals transferred to device

Faulty operation of device

► After this procedure, the pedal needs recalibrating according to ♦7.5.



When mounting the new sensor, keep attention to the following steps:

► Mount the sensor up to the stop.

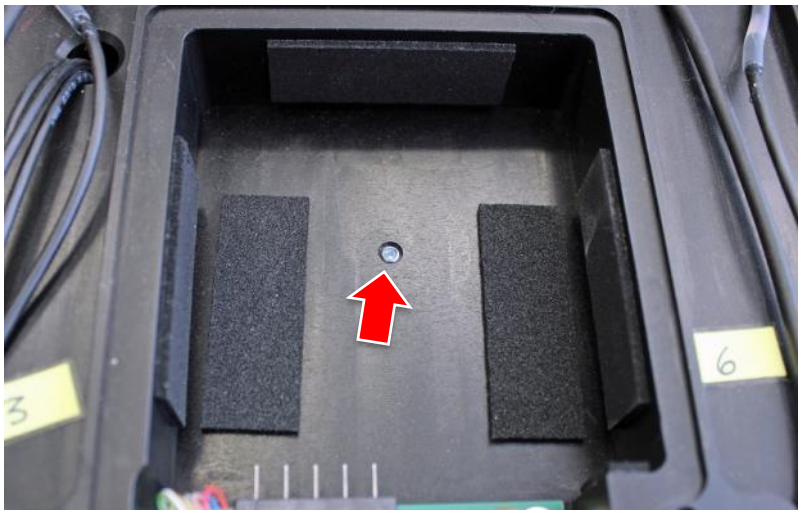
After mounting the new sensor, fix the cable with the help of cable ties at the cable tie holders. Ensure that the loop of the cable enables sufficient moving space for the sensor (see picture).

13.6.2 Vertical pedal sensor

VX310082 Pedal sensor vertical

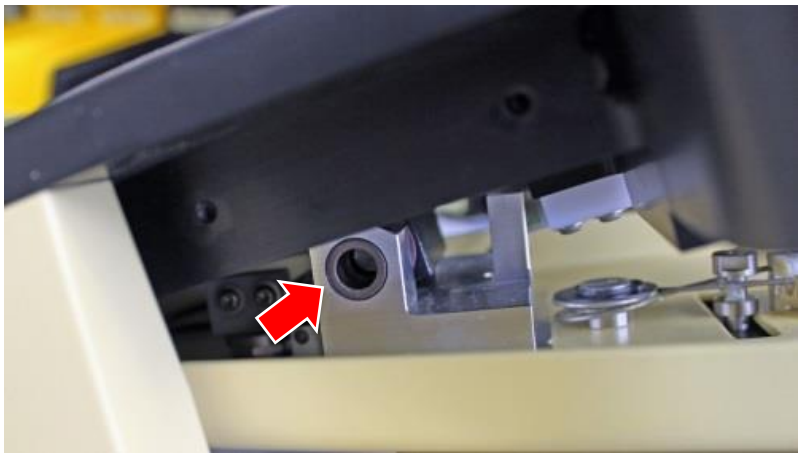
Quantity	Description
1	Pedal sensor vertical
2	M3x12 oval head screw, TORX, ecosyn-fix
1	Cable tie

After the exchange of a pedal sensor, the pedal has to be sealed. For this purpose, additionally order **VX102479 Sealing set** (see chapter 13.2)!



STEP 1:

1. Open pedal housing according to the procedure described in ♦13.1.
2. Remove battery pack according to ♦13.3.
3. Disconnect cable from PCB.
4. Undo the grub screw.

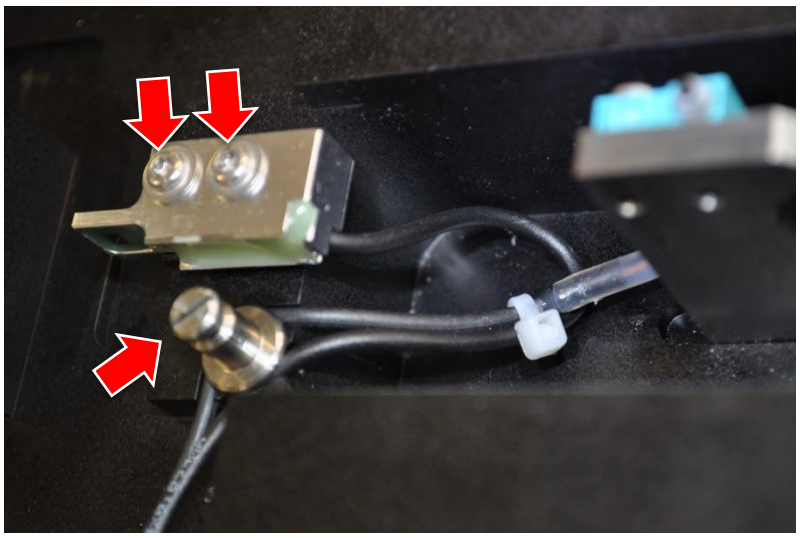


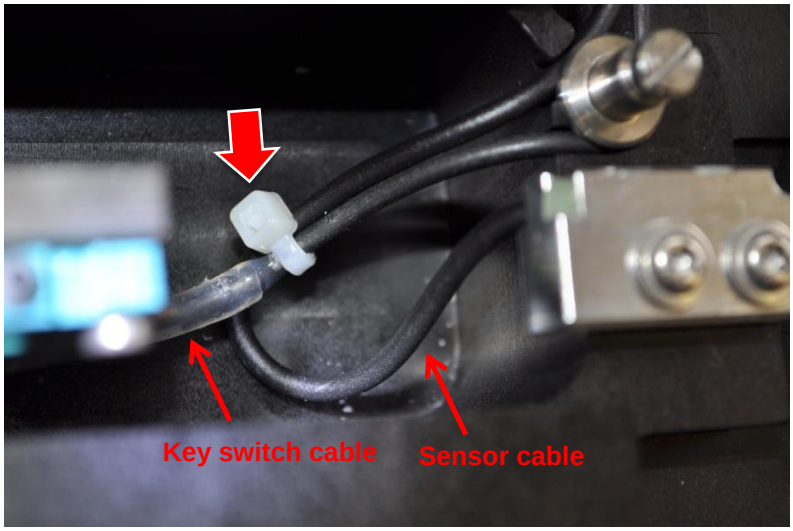
STEP 2:

5. Push out the wave vertical deflection component from the base body.
6. Release spring.
7. Place rocker in such a way that access is given to both sensors.

Do not lose the washers when pushing out the wave vertical deflection and reassemble them after repair.

Lubricate the wave vertical deflection before reassembling the pedal.





STEP 3:

8. Unscrew sensor (2 screws).

9. Unscrew bolt, release cable and mount the new sensor in the reverse order of disassembling.

CAUTION!

Incorrect pedal signals transferred to device

Faulty operation of device

► After this procedure, the pedal needs recalibrating according to ♦7.5.

When mounting the new sensor, keep attention to the following steps:

► Mount the sensor up to the stop.

► Route the sensor cable underneath the key switch cable. Tie the two cables with the cable tie on the rising side of the sensor cable loop together and make sure, that the cables are pushed down and away from the spring (see picture).

13.7 Rubber mat

VX102492

Quantity	Description
1	Rubber mat

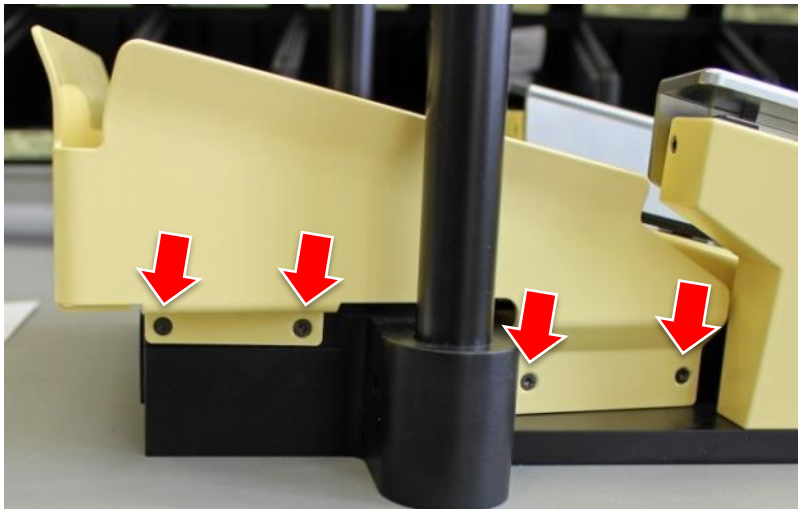
STEP 1:

1. Remove the old or defective rubber mat.
2. Thoroughly clean the rocker attachment with medical benzene.
3. Remove the film from the new rubber mat.
4. Apply the new rubber mat to the rocker attachment.

13.8 Protection sheet

VX102472

Quantity	Description
1	Protection sheet left
1	Protection sheet right
1	Front protection sheet
8	M3x6 countersunk bolt Torx



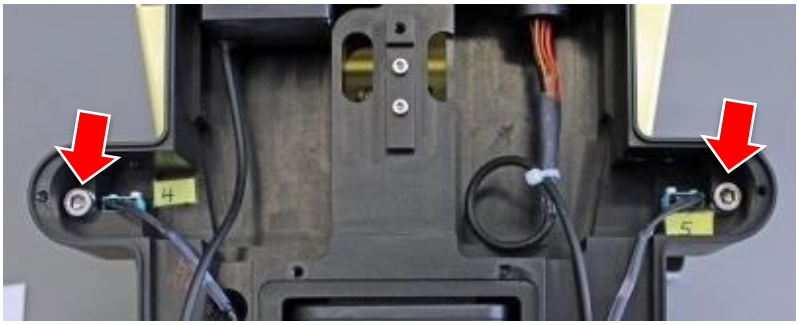
STEP 1:

1. Loosen the screws from the protection sheets.
2. Remove protection sheet (3 parts) towards the pedal's back side.

13.9 Pedal handle

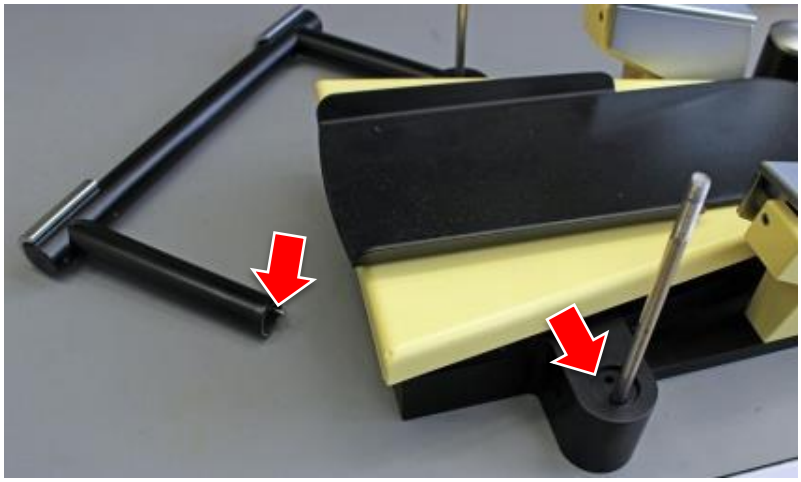
VX310079

Quantity	Description
1	Pedal handle



STEP 1:

1. Open pedal housing according to the procedure described in ♦13.1.
2. Completely loosen the 2 screws that hold the pedal handle.



STEP 2:

3. Lift handle off the screws.

When assembling the new handle, make sure that the plungers fit straight in the bores before you tighten the screws.

13.10 Side switches left or right

VX310080 (left)

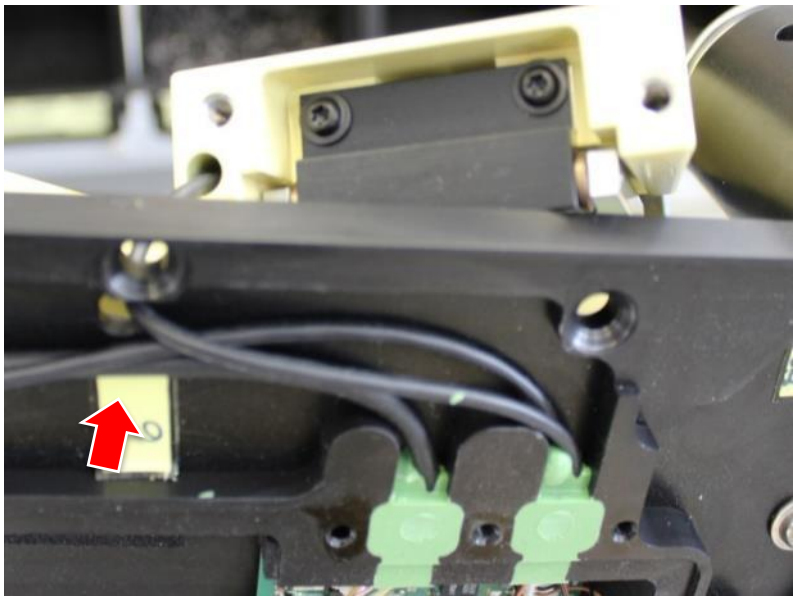
Quantity	Description
1	Side switch left
2	M5x16 countersunk bolt Torx
1	TEMPO SIL2 white
1	Seal

VX310081 (right)

Quantity	Description
1	Side switch right
2	M5x16 countersunk bolt Torx
1	TEMPO SIL2 white
1	Seal

STEP 1:

1. Open pedal housing according to the procedure described in ♦13.1.
2. Disconnect cable from PCB.
3. Remove the screws that fix the side switch assembly.



STEP 2:

4. Gently pull the cable through hole.

13.11 Wireless module

VX400285

Quantity	Description
1	Wireless module with cable

STEP 1:

1. Open pedal housing according to the procedure described in ♦13.1.
2. Unfasten the 2 screws that hold the wireless module in place.
3. Disconnect cable from the PCB and remove the module.

Following this procedure, the pedal must be paired with the unit according to ♦7.5.

13.12 Cable for pedal

VX102522

Quantity	Description
1	Cable for pedal

The new cable can be replaced without taking any specific action.

14 Messages, warnings and error messages / fault correction

14.1 Information and warnings

Message	Solution
HF test successful	-
Surgeon name must be unique	Change surgeon name.
Surgeon name is too long	Choose a surgeon name with fewer letters.
No pedal	Connect a pedal or switch pedal on.
Check phaco handpiece	Use another handpiece.
Phaco handpiece defective	Plug in another phaco handpiece or a handpiece.
Repeat phaco test	Repeat phaco test.
Check phaco tip	- Check whether tip is broken. - Tighten tip correctly.
Check air pressure	- Check whether air pressure is on. - Plug in air hose.
Visco pressure deviation	Check Visco setup.
Temperature to high	Wait for a short time while machine can cool down.
No cassette	Insert a cassette.
Laser key switch off	Turn the key switch for the laser on.
Laser emergency switch off	Release emergency switch.
Laser: no fibre detection - fully connect fibre.	Insert fibre into laser port.
Laser door interlock not closed	Insert DRS dongle.
Remind: Laser user protection	Check whether laser protection filter in microscope is in place and all persons in the room wear their laser protection glasses.
Laser power too low	- Set laser power value.
No serial number on print	Call service.
Serial number invalid	Call service.
Pedal not laser conform	Connect an OS 4 pedal.
Cassette full	Empty cassette into a drainage bag or change cassette.
HF tip defective	- Change HF tip or HF handpiece.
Laser in saturation	- Decrease laser power and/or pulse duration. - Increase interval between two pulses.
Laser: output power too low	- Check fibre and recalibrate laser. - Call for laser second level support.
Laser beeper malfunction	Call for laser second level support.
Laser microphone malfunction	Call for laser second level support.
Laser over temperature	- Wait until system has cooled down. - Reduce laser power or increase pulse interval.
Laser: no auto key detected	- Auto key at the laser module (connector at front of laser module) is missing. Call service.
Laser: foot switch malfunction	Call for laser second level support.
Laser: no foot switch detected	- Connect OS 4 foot pedal and confirm. - Switch pedal on and confirm.
Laser: Active user protection filter detected although it is not configured. Active user protection filter is used.	If active user protection filter is installed permanently, change the configuration for the user protection filter in the service mode to “active”.
Laser: active user protection filter is plugged but not in place.	Install the active UPF in the microscope according to the manufacturer's instructions.
Laser: no active user protection filter detected – connect active user protection filter	Connect active user protection filter. If you wish to permanently use a passive user protection filter, install a passive user protection filter and change the configuration for the user protection filter in the service mode to “passive”.

Laser module deactivated due to error 38	Laser has been deactivated due to error 38. All other functions on the OS 4 remain active. To use the laser again, disconnect the OS 4 from power and restart it.
Laser: GLM01-IF no communication	Call service.
Faulty connection of giving set at cassette - immediately remove cassette!	- Immediately remove cassette from device - Close infusion line of giving set - Empty cassette - Connect giving set correctly to infusion port - Dry cassette outside if wet - Insert cassette to device

14.2 Error Messages

Error number	Meaning	Solution
ERROR 1	Supply error +12V, +24V, +5V, -5V, +3.3V not within tolerance	Replace system unit.
ERROR 2	Adjust DIA	Replace the system unit and notify the manufacturer.
ERROR 3	Pedal not calibrated or incorrectly calibrated Adjust pedal	The pedal has to be readjusted as described in the Section “Service mode operation / Pedal calibration”.
ERROR 4	Remote graphic display	- Check the cable to the remote control panel. - Replace the remote control panel.
ERROR 5	Display error (RESET key is blinking)	- Check the cable from the carrier board PCB to the control unit. - Replace the control panel.
ERROR 7	CORE software	Restart device, send Log-Files to manufacturer
ERROR 8	COM error (RESET key is blinking)	- Restart device, send Log-Files to manufacturer - Check the cable from the carrier board PCB to the core PCB - Replace the carrier board PCB
ERROR 10	Peristaltic pump failure	Check the encoder cable and the motor cable to the peristaltic pump motor.
ERROR 11	HF output stage	Replace the system unit and notify the manufacturer.
ERROR 12	Irrigation pole motor	- Check if irrigation pole is blocked or overloaded - Check the cables of the drive for infusion pole - Replace the drive for infusion pole
ERROR 15	Force sensor	- Adjust force sensor - Ascertain whether the force sensor is plugged in or whether there is a severed cable - Replace fluidic unit.
ERROR 16	Adjust Venturi sensor	Adjust Venturi sensor or replace fluidic PCB.
ERROR 17	Adjust force sensor	Adjust force sensor or replace fluidic unit.
ERROR 18	Check Venturi pump system	- Adjust Venturi and force sensor - Replace fluidic unit
ERROR 20	Extraction deviation	- Replace compressor unit - Replace visco module
ERROR 21	Adjust Visco sensor	Adjust injection and extraction sensor.
ERROR 22	Adjust air sensor	Adjust AIR sensor and pressport AIR sensor.
ERROR 23	VIT PN differential sensor	Replace VIT-PN module
ERROR 24	LUM1 module	- Wait for a short time while light module can cool down. - Replace LEDplus module, light LEDplus cannot be operated.
ERROR 25	LUM2 module	- Wait for a short time while light module can cool down. - Replace LED module, Light LED cannot be operated.
ERROR 26	Venturi System	- Adjust Venturi Sensor - Replace Venturi unit
ERROR 31	Liquid level sensor	Notify the manufacturer
ERROR 32	Irr valve	- Replace irrigation valve - Replace fluidic unit
ERROR 33	Air/gfi port	- Adjust Control AIR sensor and pressport AIR sensor. - Replace AIR/GFI module
ERROR 38	Laser module	- Switch off device, disconnect it from the mains supply, connect it to the mains supply, switch device on - Notify manufacturer
ERROR 39	Wireless module	- Restart device - Replace wireless PCB

ERROR 41	CORE print	Replace system unit
ERROR 44	COM module	Replace carrier PCB
ERROR 45	Watchdog	- Restart device, send log file to manufacturer. - Replace system unit
ERROR 46	COM has no connection to CORE	- Restart device - Check cable between carrier PCB and CORE PCB
ERROR 47	Interface index between COM and CORE is not identical.	Perform software update
ERROR 48	Database error	Restart device. All surgeon data have been deleted.
ERROR 49	Laser: no active user protection filter detected	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. To use the laser again, connect an active UPF, disconnect the OS 4 from the power supply and restart it. - If you want to permanently use a passive user protection filter, install a passive user protection filter and change the configuration for the user protection filter in the service mode to “passive”.
ERROR 50	Laser: Active user protection filter detected. To use the active user protection filter, contact the service for updating the laser module. To use a passive user protection filter, remove the active user protection filter, disconnect the device from the power supply and restart it.	- To use the active user protection filter, update the laser module with a software higher than 1.N. - To use a passive user protection filter, remove the active user protection filter from the OS 4 and the microscope, install the passive user protection filter in the microscope, disconnect the OS 4 from the power supply and restart it.
ERROR 201	Laser: PLD: current control malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 202	Laser: PLD: light control malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 203	Laser: PLD: current measurement malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 204	Laser: PLD: current measurement malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 205	Laser: PLD: voltage measurement malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 206	Laser: Measuring diode or PLD malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 207	Laser: PLD: malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 208	Laser: PLD: supply malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 209	Laser: PLD: supply malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 210	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support

ERROR 211	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 212	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 213	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 214	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 215	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 216	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 217	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 218	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 219	Laser: cooling system malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 230	Laser: processor malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 232	Laser: processor malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 234	Laser: power supply malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 235	Laser: power supply malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 239	Laser: internal clock malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 240	Laser: memory malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 264	Laser: fibre detection malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 266	Laser: foot switch malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support

ERROR 268	Laser: user protection filter malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 269	Laser: beam switch malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 273	Laser: I2C IO expander malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support
ERROR 274	Laser: processor malfunction	- Press «OK, disable LASER» to disable the laser function. All other functions of the OS 4 remain available. - Call for laser second level support

15 Authorized service points

Oertli Instrumente AG
Hafnerwisenstrasse 4
Customer service and support
CH – 9442 Berneck, Switzerland
Tel.: +41 (0)71 747 42 00
E-mail: css@oertli-instruments.com
Website: www.oertli-instruments.com

Contact your local distribution partner or Oertli Instrumente AG for information on service points in your country authorized by Oertli.

15.1 Sending defective device, instrument or part to Oertli

1. Clean and sterilise instruments before returning them to the service point.
2. Fill out the QMF 17.09E and QMF 17.15E
3. Send device, instrument or part in appropriate packaging to the service point.

16 Appendix A) Recommended service tools for laser

	**Laser protection glasses** filter effect OD6+, blocked wave length 532 nm *Available at:* *Oertli Instrumente AG,* *Article No.: F.18.P1E01.1001MED*
	**Service kit laser** Service kit laser: foot pedal with door remote switch *Available at:* *Oertli Instrumente AG,* *Article No.: 322100*
	**Fibre inspection scope** for inspection of the SMA connector *Recommended:* *Thorlabs, www.thorlabs.com* *FS201 Fibre Inspection Scope*
	**Fibre end face cleaning products:** - Universal fibre connector cleaner, handheld box with spool of lint-free cleaning cloth - Lint-free wipes - Optical grade fibre connector cleaning fluid *Recommended:* *Thorlabs, www.thorlabs.com* - *FCC-7020 Universal Fibre Cleaner* - *LFW90 Lint-Free Wipes* - *FCS Precision Fibre Cleaning Fluid*

Test fibre

Fibre: 200µm, NA 0.22
Connector: SMA (both ends)
Safety version with protective tube and bend limitation.

Available at:
Oertli Instrumente AG,
Article No.: MHP200L02

Power meter

Recommended:
Ophir Optronics Solutions Ltd, www.ophiropt.com
OPHIR NOVA II
Article No. 7Z01550

Measurement head

Recommended:
Ophir Optronics Solutions Ltd, www.ophiropt.com
Ophir 3A-P-SH-V1
Article No. 7Z02622

SMA fibre adapter for 3A-P-SH-V1

Recommended:
Ophir Optronics Solutions Ltd, www.ophiropt.com
Article No. 1G01236

CAUTION!
The laser power meter must be calibrated periodically!

17 Appendix B) Spare parts

17.1 Spare parts for the unit

Article No.	Description	Packing Unit
VX520013	Replacement fuses 6.3AT, high breaking capacity, box of 10	10
VX320019	Power supply unit 24VDC, spare part for OS 4	1
VX320024	Power supply unit 12VDC, spare part for OS 4	1
VX210162	Endolaser module, spare part for OS 4	1
VX400223	Fiber coupling unit for endolaser, spare part for OS 4	1
VX120179	Castor wheel, spare part for OS 4 (front) and Faros from SN 8669xxxx / 8769xxxx	1
VX120178	Back castor wheel, spare part for OS 4	1
VX210126	Drive for infusion pole, spare part for OS 4	1
VX541129	Supply print, spare part for OS 4	1
VX541130	Wireless module, spare part for OS 4	1
VX541128	Carrier print, spare part for OS 4	1
VX210149	Power LED light module, spare part for OS 4	1
VX210148	Power LEDplus light module, spare part for OS 4	1
VX210159	Control panel, spare part for OS 4	1
VX102184	Holder for GFI, spare part for OS 4	1
VX240053	Spare key for endolaser, spare part for OS 4, box of 2	2
VX400279	DRS dongle, spare part for OS 4	1
VX400236	Phaco connector, spare part for OS 4	1
VX400235	Dia connector, spare part for OS 4	1
VX520405	Cap for endolaser incl. chain, spare part for OS 4	1
VX100869	Hook for infusion pole, spare part for OS 4	1
VX210130	Fluidics unit complete, spare part for OS 4	1
VX400313	Diagnostic cable, service tool for OS 4	1
VX210132	Visco module, spare part for OS 4	1
VX210157	VIT-PN module, spare part for OS 4	1
VX210152	Source pressure module, spare part for OS 4	1
VX950046	Set of spare screws, spare part for pedal OS 4	Set
VX950047	Set of incidentals, spare part for OS 4	Set
VX541969	Software update OS 4	1
VX102156	Side cover, spare part for OS 4	1
VX102179	Cover sheet, spare part for OS 4	1
VX102177	Back cover, spare part for OS 4	1
VX400300	Connecting cable laser to UPF connector, spare part for OS 4	

17.2 Spare parts for pedal

Article No.	Description	Packing Unit
VX102522	Cable for pedal, spare part for OS 4	1
VX541135	Pedal print, spare part for OS 4	1
VX310078	Pedal sensor horizontal, spare part for OS 4	1
VX310082	Pedal sensor vertical, spare part for OS 4	1
VX400015	Rechargeable battery for pedal, spare part of OS 4 (not charged)	1
VX310079	Pedal grip, spare part for OS 4	1
VX102492	Rubber mat for pedal, spare part for OS 4	1
VX102479	Sealing set for pedal print, spare part for OS 4	1
VX310080	Side switch left for pedal, spare part for OS 4	1
VX310081	Side switch right for pedal, spare part for OS 4	1
VX102806	Heel switch for pedal, spare part for OS 4	1
VX102472	Protection sheet for pedal, spare part for OS 4	1
VX400285	Wireless module for pedal, spare part for OS 4	1
VX102741	Crank plate for pedal, standard, spare part for OS 4	1
VX102571	Crank plate for pedal with long aspiration path, spare part for OS 4	1

17.3 Set of replacement screws

VX950046

Quantity	Description	Picture
50	M3x12 countersunk bolt Torx	
10	UNC 6-32x1/4"	
50	M3x6 eco-fix Torx	
20	M3x25 countersunk bolt Torx	
10	M5x10 grub screw	
10	M3x8 eco-fix Torx	
30	M3x6 countersunk Torx	

17.4 Set of small replacement parts

VX950047

Quantity	Description
30	Rubber buffer Ø12.7 x 3.5 mm black
15	Damper M4x10, Ø15 x 8 mm
10	Cable strap holder
1	O-seal Ø28 x Ø2 mm
4	Washer for pedal rocker

18 Appendix C) Safety check

Please see form on next page.

Safety Check

OS 4

Customer	
Address:	

Contact person:	

OS 4 device		
Article No.:		
Serial No.:		
Software version:	App:	System:

Test device			
Brand / Model:		Serial No.:	

Perform safety check

		not OK	OK
1. Check protective earth connections.	according to IEC 60601-1	❑	❑
2. Check leakage currents.	according to IEC 60601-1	❑	❑

Work completed:	❑ yes	❑ no	Installation accepted:	❑ yes
Needs follow up:	❑ yes	❑ no	Service accepted:	❑ yes

Field engineer:		**Customer:**	
Name:		Name:	
Date:		Date:	
Signature:		Signature:	
Comments:			

Oertli Instrumente AG CH-9442 Berneck Switzerland Phone +41 (0)71747 42 00
Fax +41 (0)71 747 42 90 www.oertli-instruments.com info@oertli-instruments.com

19 Appendix D) Functional test

Please see form on next page.

Functional Test

OS 4

Customer

Address:	

Contact person:	

Data of OS 4 device

Article no.:		
Serial no. OS 4 device:		
Software version OS 4 device:	App:	System:
Serial no. OS 4 pedal		
Software version OS 4 pedal:	SW:	HW:
Serial no. endo laser: (if applicable)		
Serial no. laser fibre:		

Functional test

1. User data and log files

		OK
1.1	Save user data on a USB flash drive according to the OS 4 service manual (VV016042), chapter 7.2. Notice: _____	☐
1.2	Save log files on a USB flash drive according to the OS 4 service manual (VV016042), chapter 7.6 Notice: _____	☐

2. Software

		OK
2.1	Latest software version installed? Notice: _____	☐

3. Settings in service mode

Pedal (Status / Pedal) OK

3.1 Heel, side and top switch, each left/right, is correctly displayed. ☐
Notice: _____

3.2 Neutral position: no deflection is displayed (all fields are black) ☐
Notice: _____

3.3 Vertical Pos. 1, Pos. 2, Pos. 3 and Pos. 4: sectors from 0 to 100 % are correctly displayed and correspond to the mechanical transition. ☐
Notice: _____

3.4 Horizontal left and right: Sectors from 0 to 100 % are correctly displayed. ☐
Notice: _____

3.5 Check cable connection. ☐
Notice: _____

3.6 Check wireless connection. ☐
Notice: _____

Sensors (Calibration / Sensors)

Without cassette! OK

3.7. Force sensor 0 ±10 Current value: _____ mmHg New value: _____ mmHg ☐
Notice: _____

3.8 Venturi sensor 0 ±10 Current value: _____ mmHg New value: _____ mmHg ☐
Notice: _____

3.9 Control air sensor 0 ±10 Current value: _____ mmHg New value: _____ mmHg ☐
Notice: _____

3.10 Pressport air sensor 0 ±10 Current value: _____ mmHg New value: _____ mmHg ☐
Notice: _____

3.11 Injection sensor 0 ±0.05 Current value: _____ bar New value: _____ bar ☐
Notice: _____

3.12 Extraction sensor 0 ±0.05 Current value: _____ bar New value: _____ bar ☐
Notice: _____

3.13 VIT PN sensor 0 ±0.05 Current value: _____ bar New value: _____ bar ☐
Notice: _____

Only calibrate in case of a deviation from tolerance!

Touch screen OK

3.14 Check the accuracy of the touchpad. ☐

Notice: _____

4. Visual and mechanical inspection

OK

4.1 Cassette compartment: check sealing, spring deflection and pump reels ☐

Notice: _____

4.2 Check infusion hooks, GFI hooks and holder for drainage bag for a tight fit. ☐

Notice: _____

4.3 Check castor wheels for smooth running. ☐

Notice: _____

4.4 Pedal mechanical i. O. (Rubber buffer, switch, rubber mat, etc.) ☐

Notice: _____

4.5 Check mains cables and power socket with fuses for mechanical damages. ☐

Notice: _____

4.6 Check compressed air connection for stability and impermeability. ☐

Notice: _____

4.7 Measure input pressure (in the building) | Range of compressed air 5-9 bar | Measured value: _____ bar ☐

Notice: _____

For all subsequent tests, the device must be connected to the compressed air net.

5. Irrigation pole

OK

5.1 Vary IOP height by means of pedal and screen. ☐

Notice: _____

5.2 Entire path runs without any scratching noises (clean sealing ring). ☐

Notice: _____

6. Venturi pump system

Insert cassette, connect I/A tubes, connect infusion tube to filled infusion bottle or immerse in liquid.			OK
6.1	Select I/A function, Venturi pump system. Press PREOP key. Notice: _____	PREOP 0-100 %, duration approx. 1 min.	☐
6.2	Generate occlusion with I/A values from surgeons‘ memory. Notice: _____	Reaches set values	☐
6.3	Generate occlusion with 100 % Venturi effect and 500 mmHg vacuum. Notice: _____	Reaches maximum values in approx. 3 s	☐
6.4	Hold occlusion and get pedal to neutral position. Notice: _____	Pressure is decreased	☐

7. Peristaltic and Speep® pump system

Insert cassette, connect I/A tubes, connect infusion tube to filled infusion bottle or immerse in liquid.			OK
7.1	Select I/A function, peristaltic pump system. Notice: _____		☐
7.2	Generate occlusion with I/A values from surgeons‘ memory. Notice: _____	Reaches set values	☐
7.3	Generate occlusion with a maximum of 60 ml / min flow and 500 mmHg vacuum. Notice: _____	Reaches maximum values in approx.< 2.5 s	☐
7.4	Hold occlusion and get pedal to neutral position. Notice: _____	Peristaltic pump is lowering pressure	☐
7.5	Aspirate until cassette filling level of approx. 50 % is displayed. Release pedal. Notice: _____	Displayed filling level _____ %	☐
7.6	Remove cassette. Notice: _____	Pump wheel is turning in such a way that two rolls are visible above each other	☐
7.7	Check the liquid level inside the cassette. Notice: _____	The cassette is less than half full	☐
7.8	Insert cassette again. Notice: _____	Filling level analog 7.5	☐

Open I/A tubes and hold them into an empty vessel.

			OK
7.9	Activate reflux.	Aspiration flows back	☐
	Notice: _____		
7.10	Activate reflux and generate occlusion.	Pump stops (audibly)	☐
	Notice: _____		
7.11	Press „Continuous Irrigation“ key and “BSS extraction” key.	Irrigation is retained (liquid is flowing from irrigation tube)	☐
	Notice: _____		
7.12	Activate „BSS extraction“ key.	Irrigation stops	☐
	Notice: _____		

8. Phaco

Assemble phaco handpiece with phaco tip and test chamber and install tubing system!

			OK
8.1	Select phaco, press „TEST“ key.	Phaco test is performed	☐
	Notice: _____		
8.2	After completion of the phaco test, the notice „Test OK“ appears.		☐
	Notice: _____		
8.3	Activate maximum phaco power output.	Reaches 100 %, hisses	☐
	Notice: _____		
8.4	Activate pulse, burst and CMP.	Function OK, hisses	☐
	Notice: _____		
8.5	Generate occlusion with surgeons‘ values and undo occlusion.	Test chamber remains stable	☐
	Notice: _____		

9. HF: Dia, Caps, HFDS Glau

No HF instrument is connected!

			OK
9.1	Select HF / Dia and press „TEST“ key.	HF test is performed	☐
	Notice: _____		
9.2	After completion of the HF test, the notice „TEST OK“ appears.		☐
	Notice: _____		

Connect HF instrument and immerse any HF tip in liquid!

9.3	Activate Dia	Function OK, sound correct	☐
	Notice: _____		

OK

9.4 Activate Caps — Function OK, sound correct ☐
Notice: _____

9.5 Activate HFDS Glau — Function OK, sound correct ☐
Notice: _____

10. VIT

Connect cutter! OK

10.1 Select VIT and press the „TEST“ key — VIT test is performed ☐
Notice: _____

10.2 After completion of the VIT test, the notice „Test OK“ appears. ☐
Notice: _____

Activate cutter via the pedal! OK

10.3 Loosen green tube at the cutter / device connection. — Air escapes from the connection. After approx. 2s it stops. ☐
Notice: _____

10.4 Activate VIT with maximum cutting rate. — Function OK ☐
Notice: _____

10.5 Check light 1: Brightness and color regulation. — Function OK ☐
Notice: _____

10.6 Check light 2: Brightness regulation. — Function OK ☐
Notice: _____

11. Measurements conducted with pressure gauge (without any liquid)

11.1 Check the following pressure values:

Function	Setting value	Tolerance	Measured value
Peristaltic and Speep® pump system (set maximum flow)	Reflux +150 mmHg (Activate reflux several times)	± 30 mmHg	_____ mmHg
	- 150 mmHg	± 20 mmHg	_____ mmHg
	- 300 mmHg	± 20 mmHg	_____ mmHg
	- 450 mmHg	± 20 mmHg	_____ mmHg
	- 650 mmHg	± 25 mmHg	_____ mmHg
Venturi pump system (set maximum Venturi effect)*	Reflux + 100 mmHg	± 20 %	_____ mmHg
	- 150 mmHg	± 20 %	_____ mmHg
	- 300 mmHg	± 20 %	_____ mmHg
	- 450 mmHg	± 20 %	_____ mmHg

	- 600 mmHg	± 20 %	_____ mmHg
Air	30 mmHg	± 5 mmHg	_____ mmHg
	60 mmHg	± 6 mmHg	_____ mmHg
	90 mmHg	± 9 mmHg	_____ mmHg
	120 mmHg	± 12 mmHg	_____ mmHg
GFI	30 mmHg	± 3 mmHg	_____ mmHg
	60 mmHg	± 6 mmHg	_____ mmHg
	90 mmHg	± 9 mmHg	_____ mmHg
	120 mmHg	± 12 mmHg	_____ mmHg
Injection	0.5 bar	± 0.2 bar	_____ bar
	2.5 bar	± 0.2 bar	_____ bar
	5.0 bar	± 0.2 bar	_____ bar
Extraction	- 0.1 bar	± 0.02 bar	_____ bar
	- 0.5 bar	± 0.1 bar	_____ bar
	- 0.8 bar	± 0.1 bar	_____ bar

* The values for the Venturi pump depend on the atmospheric pressure. Calculated maximum target vacuum values, depending on altitude above sea level, can be taken from the following table:

Place	Altitude above sea level in meters	Vacuum in mmHg
Berneck (Switzerland)	427 m	600
Mexico-City (Mexico)	2'250 m	476[1]

[1] calculated values

12. Laser

☐ **Test not applicable (non-laser device)**

Observe Laser protective measures.

Measuring equip-ment	Reference power meter	Type: _____	Serial no.: _____
	Reference power head	Type: _____	Serial no.: _____

Laser safety test OK

Set key switch to „0“, LASER STOP key on, DRS plugged out, no fibre connected!

12.1 Select. “Laser” function. Message “Laser key switch off” is displayed ☐

Notice: _____

12.2 Turn key switch to “I”. Message “Laser key switch off” disappears, message “Laser emergency switch activated” is displayed ☐

Notice: _____

12.3	Undo LASER STOP key (OFF). Notice: _____	Message “Laser emergency switch activated” disappears, message “Laser: no fibre detection” is displayed	☐
12.4	Connect light conductor with laser measurement device to laser probe connection and confirm message on screen Notice: _____	Message “Laser door interlock not closed” is displayed	☐
			OK
12.5	Plug in DRS (Door Remote Switch) at the device and confirm message on screen. Notice: _____	Message “Laser door interlock not closed” disappears and laser changes to stand-by mode	☐
12.6	Activate „Ready“ key. Notice: _____	Message “Reminder: Laser user protection” appears	☐
12.7	Confirm message. Notice: _____	Laser changes to “Ready” mode	☐
12.8	Get pedal to position 2. Notice: _____	Aiming beam is activated	☐
12.9	Get pedal to position 3 (100%). Notice: _____	Working beam is activated, sound is correct	☐

Laser power testing

Connect test fibre!

12.10 Measure and check the following values at the OS 4 device exit:

Type	Laser power	Laser duration	Expected energy	Tolerance	Measured value
Aiming Beam	Set value to 9 (= 0.7 mW)	n/a	n/a	± 0.3 mW	_____ mW
Working Beam	50mW	1000 ms	50 mJ	± 10 mJ	_____ mJ
	100 mW	1000 ms	100 mJ	± 20 mJ	_____ mJ
	200 mW	1000 ms	200 mJ	± 40 mJ	_____ mJ
	400 mW	1000 ms	400 mJ	± 80 mJ	_____ mJ
	800 mW	1000 ms	800 mJ	± 160 mJ	_____ mJ
	1500 mW	1000 ms	1500 mJ	± 300 mJ	_____ mJ
	2500 mW	500 ms	1250 mJ * 2	± 500 mJ	_____ mJ

Notice: _____

If values are not within tolerance range, calibrate values according to the service manual, chapter 8, measure values at OS 4 device exit again and check in subsequent chart!

Laser power calibration (see service manual chapter 8) OK

12.11 Set up a specific file according to the following file designation: (SN……..._YYMMDD_Technician_History.doc) on a test PC. Connect laser to the test PC, go to page “Safe History”, read configuration, read, copy / paste all text lines into these files. ☐

Notice: _____

OK

12.12 Save initial parameters (read configuration, export configuration) file name (SN……..._YYMMDD_Technician_Start.ini) ☐

Notice: _____

Laser power testing after calibration

Type	Laser power	Laser duration	Expected energy	Tolerance	Measured value
Aiming Beam	Set value to 9 (= 0.7 mW)	n/a	n/a	± 0.3 mW	_____ mW
Working Beam	50mW	1000 ms	50 mJ	± 10 mJ	_____ mJ
	100 mW	1000 ms	100 mJ	± 20 mJ	_____ mJ
	200 mW	1000 ms	200 mJ	± 40 mJ	_____ mJ
	400 mW	1000 ms	400 mJ	± 80 mJ	_____ mJ
	800 mW	1000 ms	800 mJ	± 160 mJ	_____ mJ
	1500 mW	1000 ms	1500 mJ	± 300 mJ	_____ mJ
	2500 mW	500 ms	1250 mJ * 2	± 500 mJ	_____ mJ

Filing / conclusions OK

12.13 Save final parameters (read config., export config.) SN……..._YYMMDD_Technician_Start.ini ☐

Notice: _____

12.14 Copy/paste print screen of two graphs at 1500 mW / 1000 ms and add to existing file SN……..._YYMMDD_Technician_History.doc ☐
- With sampling interval 0.125 / 64 ms
- With sampling interval 2.0 / 1024 ms
- With sampling interval 10 / 5000 ms

Notice: _____

13. Safety Check

OK

13.1 Check protective earth connections according to IEC 60601-1. ☐

Notice: _____

13.2 Check leakage currents according to IEC 60601-1. ☐

Notice: _____

Functional Test

OS 4

Used replacement parts

Description	Article no.	Serial no. / version	Quantity	Remark

Work completed:	❑ yes	❑ no	Service accepted:	❑ yes
Adjustments completed:	❑ yes	❑ no		
Needs follow up:	❑ yes	❑ no		
Needs estimate of costs:	❑ yes	❑ no	Send to:	

Field engineer:		**Customer:**	
Name:		Name:	
Date:		Date:	
Signature:		Signature:	

Comments / recommendations:

Oertli Instrumente AG CH-9442 Berneck Switzerland Phone +41 (0)71747 42 00
Fax +41 (0)71 747 42 90 www.oertli-instruments.com info@oertli-instruments.com

20 Appendix E) Laser installation protocol

Please see form on next page.

Laser installation protocol

OS 4

Customer

Address:	

Company laser safety officer:	

Data of OS 4 device

Article no.:		
Serial no. OS 4 device:		
Software version OS 4 device:	App:	System:
Serial no. OS 4 pedal		
Software version OS 4 pedal:	SW:	HW:
Serial no. endo laser:		
Serial no. fiber coupling unit:		

Functional test

Observe Laser protective measures.

Measuring equipment	Reference power meter	Type: _____	Serial no. _____
	Reference power head	Type: _____	Serial no. _____

1.	**Laser safety test**		OK
Set key switch to „0“, LASER STOP key on, DRS plugged out, no fibre connected!			
1.1	Select “Laser” function.	Message “Laser key switch off” is displayed	☐
	Notice: _____		
1.2	Set key switch to “I”.	Message “Laser key switch off” disappears, message “Laser emergency switch activated” is displayed	☐
	Notice: _____		
1.3	Undo LASER STOP key (OFF).	Message “Laser emergency switch activated” disappears, message “Laser: no fibre detection” is displayed	☐
	Notice: _____		

			OK
1.4	Connect light conductor with laser measurement device to laser probe connection and confirm message on screen. Notice: _____	Message “Laser door interlock not closed” is displayed	☐
1.5	Plug in DRS (Door Remote Switch) at the device and confirm message on screen. Notice: _____	Message “Laser door interlock not closed” disappears and laser changes to stand-by mode	☐
1.6	Activate „Ready“ key. Notice: _____	Message “Reminder: Laser user protection” appears	☐
1.7	Confirm message. Notice: _____	Laser changes to “Ready” mode	☐
1.8	Get pedal to position 2. Notice: _____	Aiming beam is activated	☐
1.9	Get pedal to position 3 (100%). Notice: _____	Working beam is activated, sound correct	☐

2. Laser power calibration

Connect test fibre!

2.1 Measure and check the following values at the OS 4 device exit:

Type	Laser power	Laser duration	Expected energy	Tolerance	Measured value
Aiming Beam	Set value to 9 (= 0.7 mW)	n/a	n/a	± 0.3 mW	_____ mW
Working Beam	50mW	1000 ms	50 mJ	± 10 mJ	_____ mJ
	100 mW	1000 ms	100 mJ	± 20 mJ	_____ mJ
	200 mW	1000 ms	200 mJ	± 40 mJ	_____ mJ
	400 mW	1000 ms	400 mJ	± 80 mJ	_____ mJ
	800 mW	1000 ms	800 mJ	± 160 mJ	_____ mJ
	1500 mW	1000 ms	1500 mJ	± 300 mJ	_____ mJ
	2500 mW	500 ms	1250 mJ * 2	± 500 mJ	_____ mJ

Notice: _____

Laser installation protocol

OS 4

3.	Training confirmation		OK
3.1	System function	see user manual chapter 18.5	☐
3.2	Maintenance	see user manual chapter 22.3	☐
3.3	Safety	see user manual chapter 2.4	☐
3.4	Operating	see user manual chapter 18.4	☐
3.5	Precautions	see user manual chapter 2.4	☐
3.6	Accessories and consumables	see user manual chapter 24.1	☐

Teacher:		**Company:**	
Attendee:		Function:	
Attendee:		Function:	
Attendee:		Function:	
Attendee:		Function:	
Attendee:		Function:	
Attendee:		Function:	
Attendee:		Function:	
Attendee:		Function:	

Work completed:	❑ yes	❑ no	Installation accepted:	❑ yes
Needs follow up:	❑ yes	❑ no		

Field engineer:		**Customer:**	
Name:		Name:	
Date:		Date:	
Signature:		Signature:	
Comments / recommendations:			

Oertli Instrumente AG CH-9442 Berneck Switzerland Phone +41 (0)71747 42 00
Fax +41 (0)71 747 42 90 www.oertli-instruments.com info@oertli-instruments.com

Oertli Instrumente AG
Hafnerwisenstrasse 4
9442 Berneck
Switzerland

T +41 71 747 42 00
F +41 71 747 42 90

www.oertli-instruments.com

VV016042 2021-03-23 / Rev. 10