



Orbitrap Exploris 480: Orbitrap and Turbo Pump Exchange Instructions

Revision 00 – June 2019



ThermoFisher
S C I E N T I F I C

Orbitrap Exchange

Preparations

- Power off and vent the instrument
- Remove the outer top cover
- Open the chamber lid
- Use gloves for handling the ion optics

Tools needed

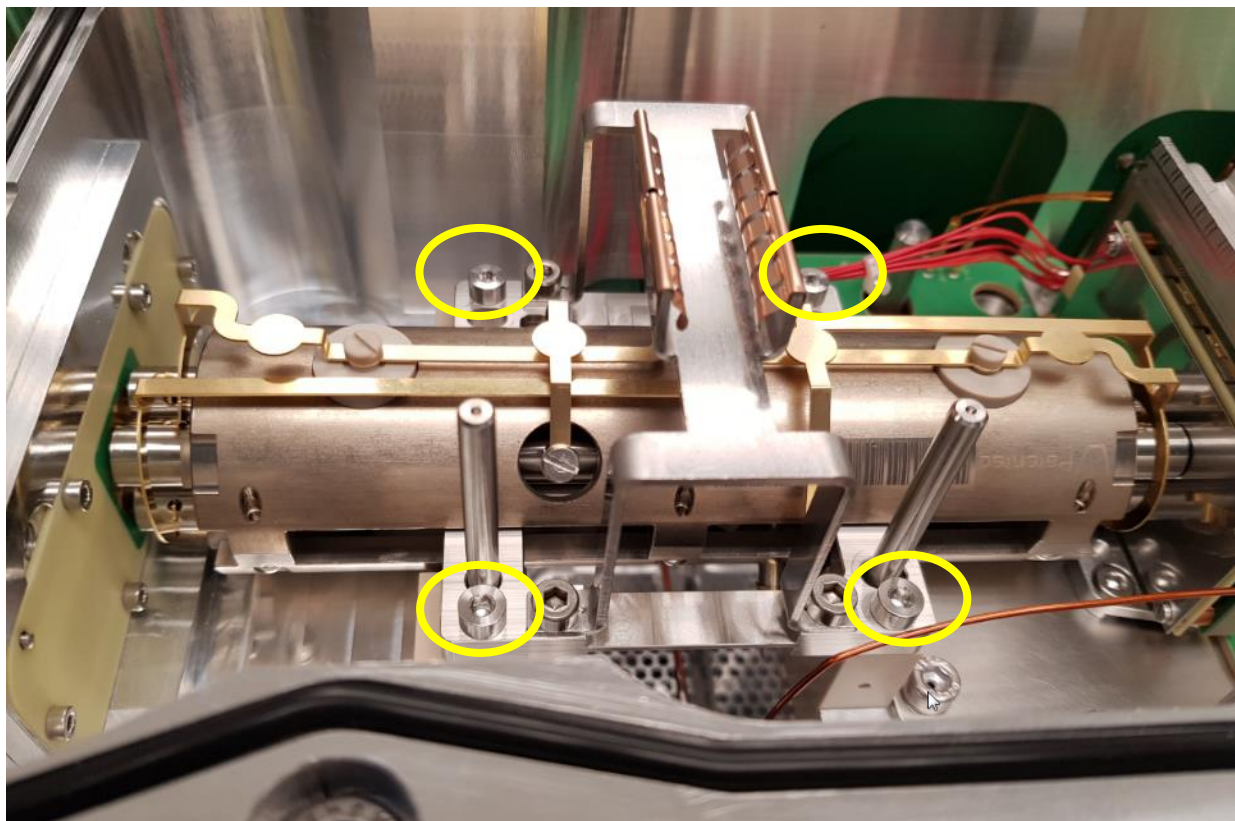
- Gloves
- Aluminium foil to prepare a place to keep the ion optics clean
- Torque wrench (5 Nm for orbitrap replacement, 10 Nm for turbo pump exchange)
- Allen key extension to reach orbitrap cell bolts (5 mm)
- Metric allen key set, standard FSE tools



To reach orbitrap bolts: flat head, no ball

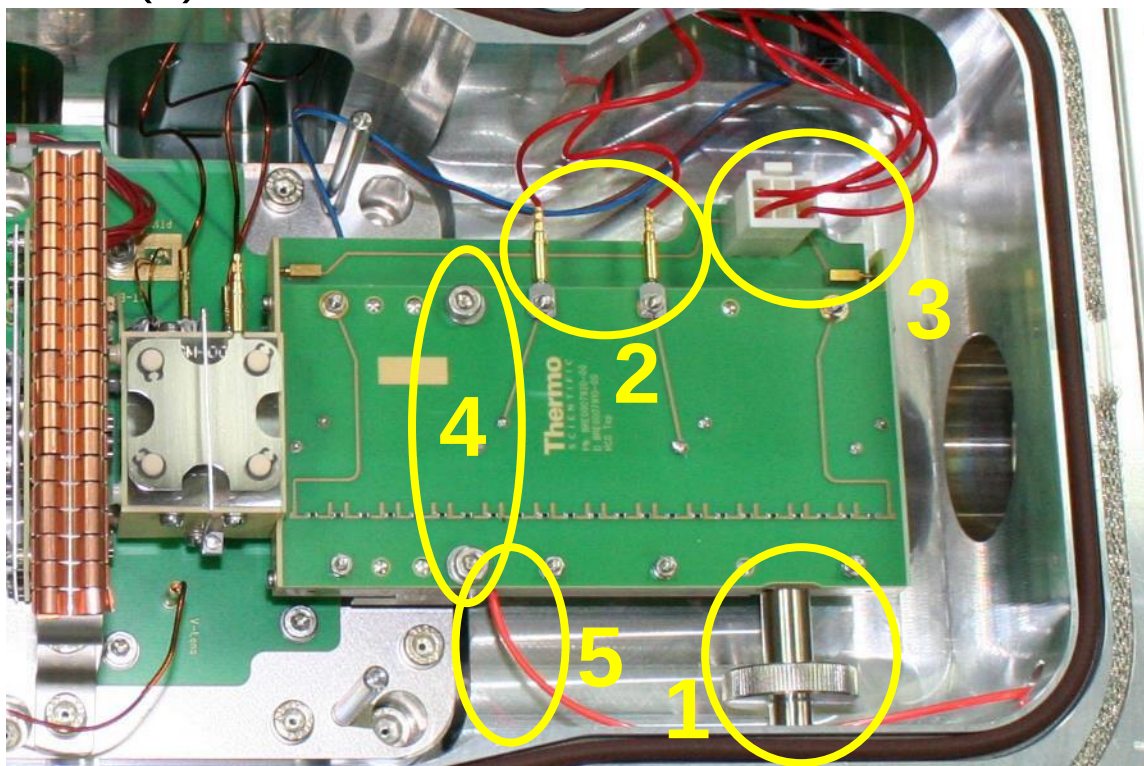
Step 1 – Quadrupole Removal

- Loosen the 4 screws holding the quadrupole.
- Remove the holding brackets.
- Lift the quadrupole straight up to remove it, store it in a clean environment.



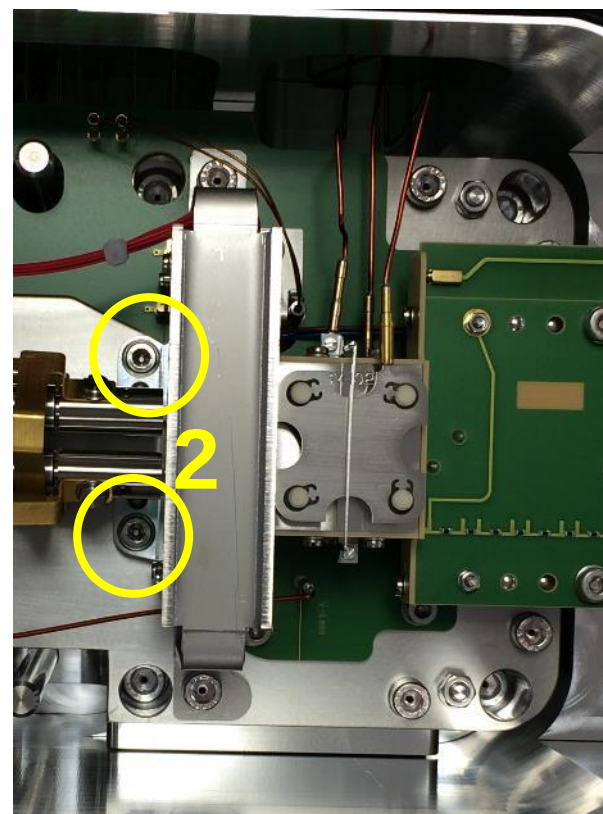
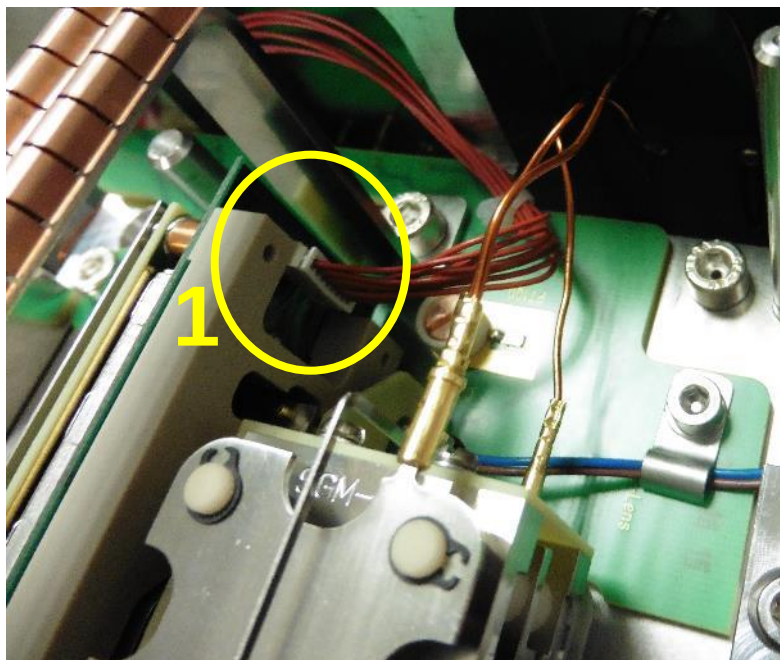
Step 2 – IRM removal

- Retract the tube to the vacuum gauge by turning it counterclockwise (1)
- Disconnect the two RF wires (2)
- Unplug the DC connector (3)
- Loosen the two holding screws (4)
- Pull out the gas line (5)
- Remove the IRM by lifting it upwards by lifting it upwards



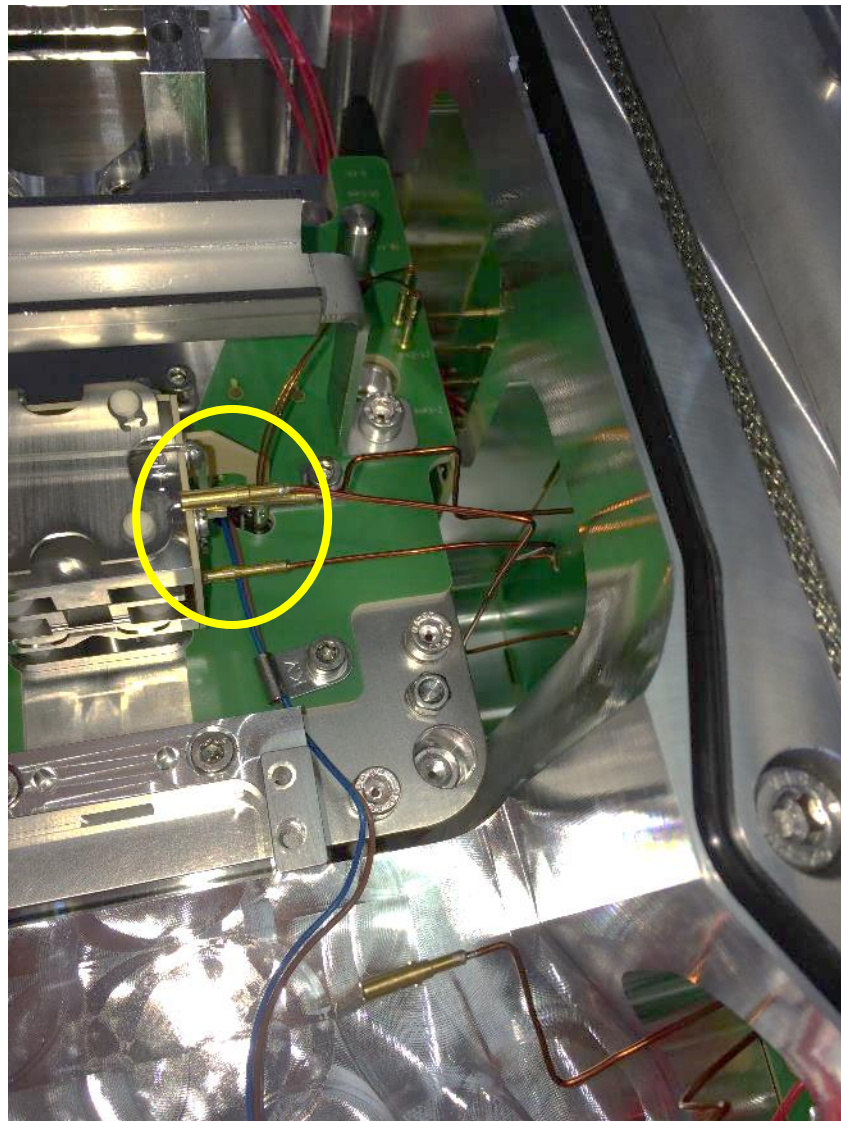
Step 3 – Independent charge detector (ICD) removal

- Loosen the two screws and remove them (2), move the ICD to the left to facilitate cable removal (1)
- Disconnect the cable (1) [Latest version uses different connector, but both types are available on the ICD assembly – Picture on Slide 22]
- Remove the assembly
- Store the ICD in clean environment



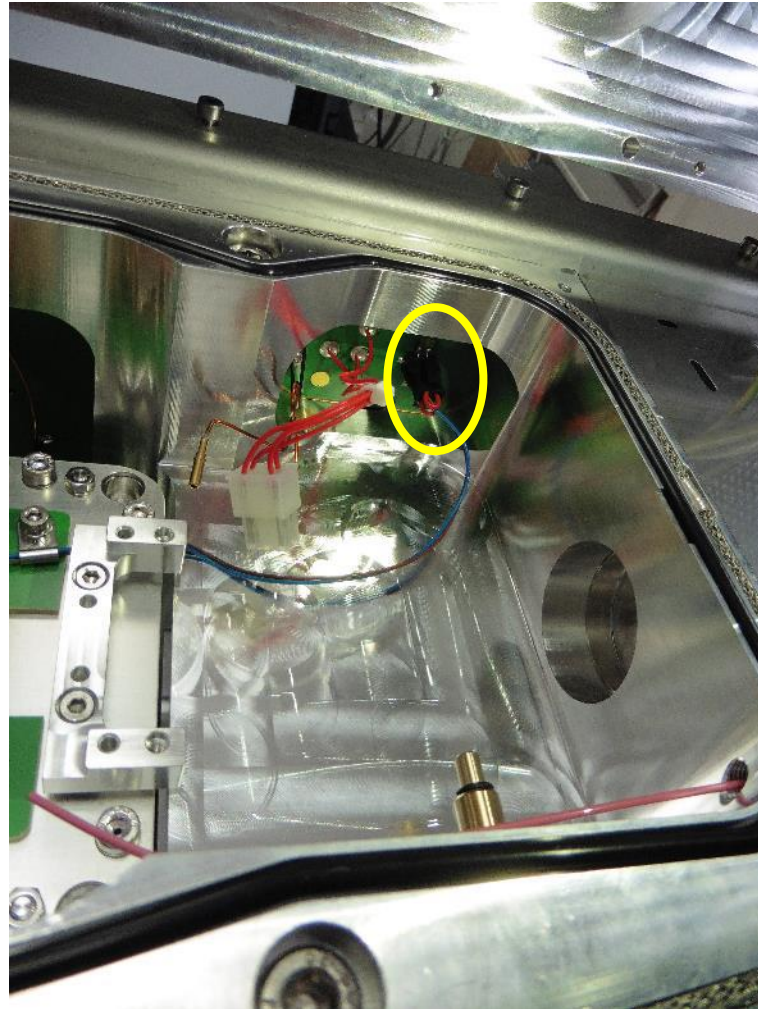
Step 4 – C-Trap/Orbitrap removal

- After quad, ICD and IRM removal
- Take a note of the location of the three gold plated connectors at the back, disconnect these connections
 - Bottom left on feedthrough PCB -> lower connector on C-Trap
 - Bottom right -> upper pin
 - top center -> center pin
- At the front, disconnect the V-lens Connector
- Bend away connectors carefully before removing the orbitrap assembly



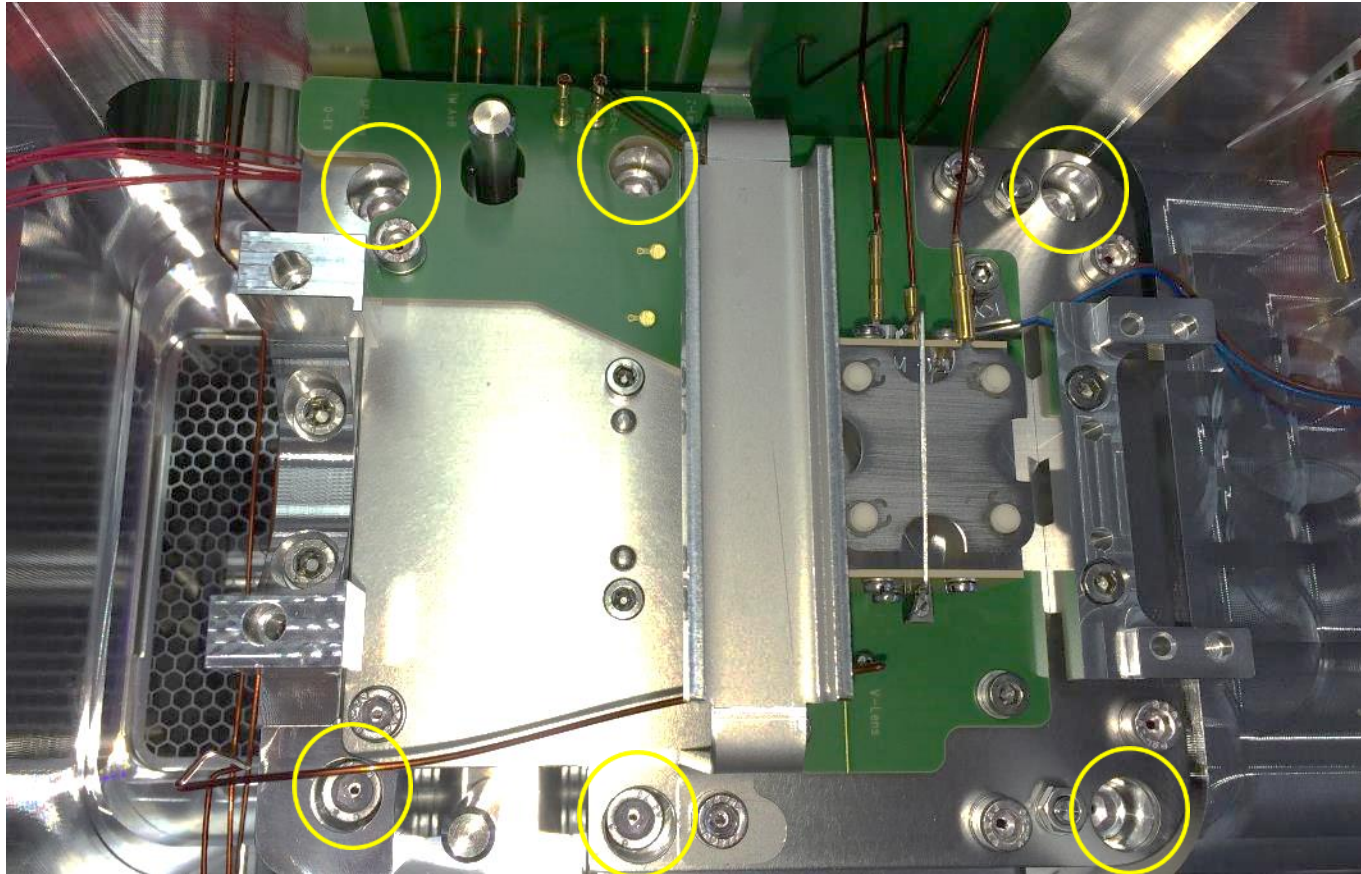
C-Trap/Orbitrap removal (cont.)

- Disconnect heater cable

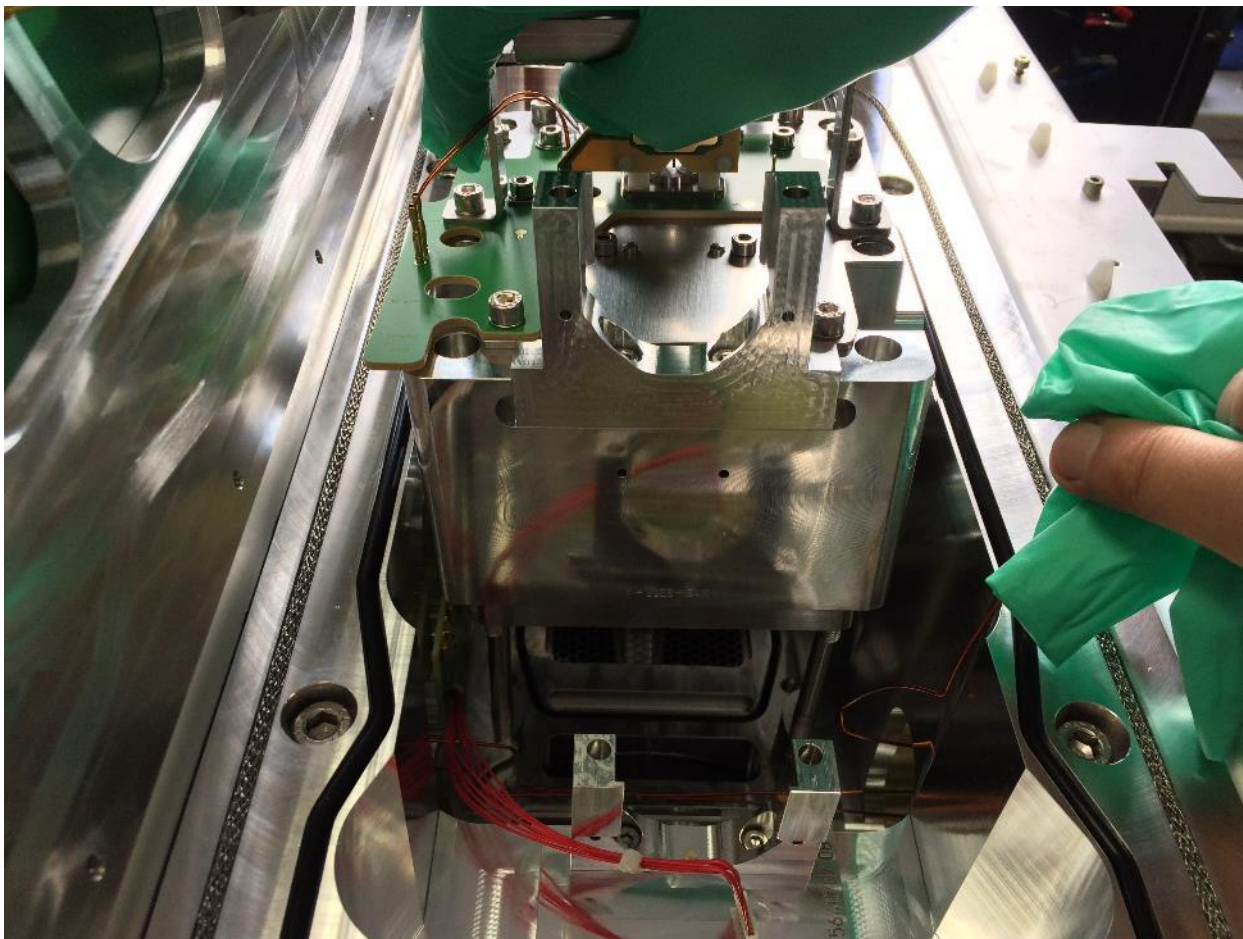


C-Trap/Orbitrap removal (cont.)

- Loosen and remove all 6 screws (do not use ballhead allenkeys for this task due to the risk of damaging bolts)
- Grip the assembly by the handle and pull straight up carefully
- Store the assembly in a clean environment



C-Trap/Orbitrap removal (cont.)



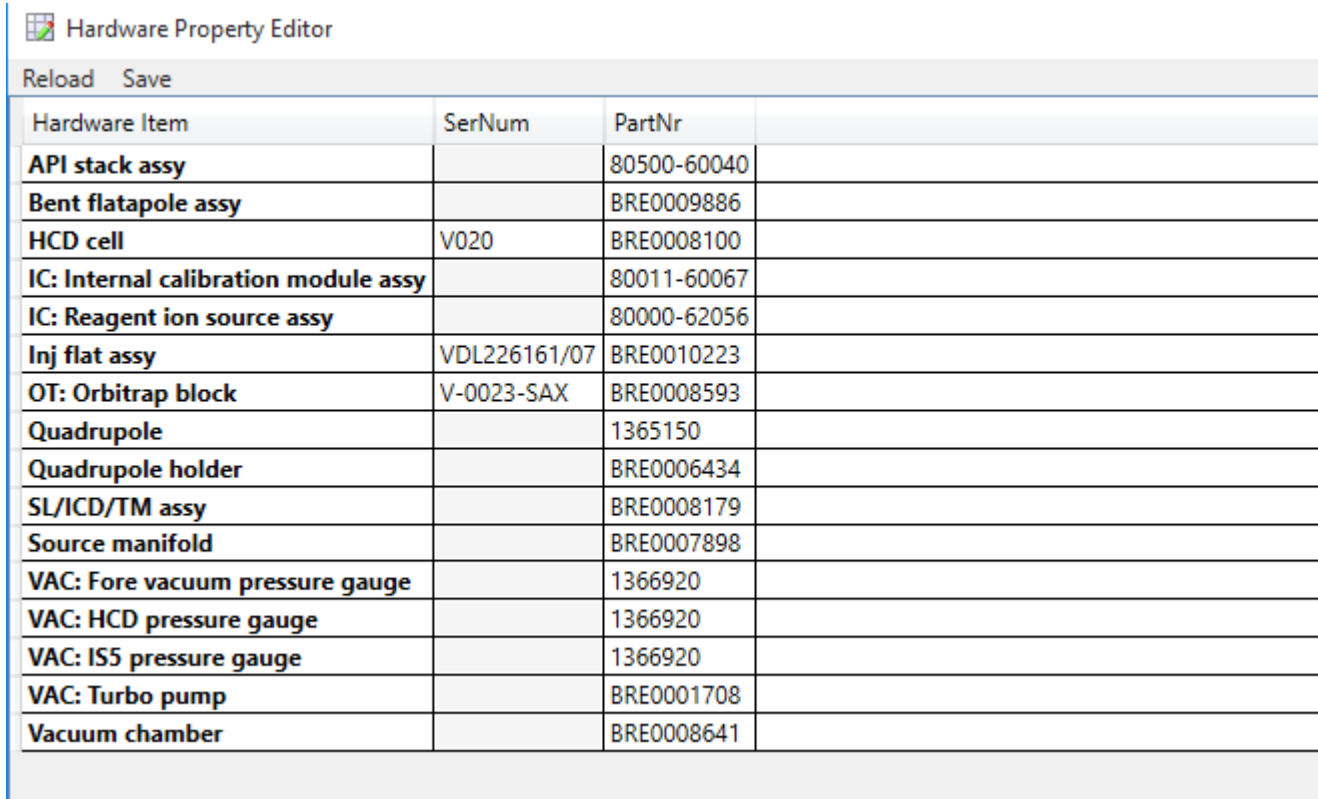
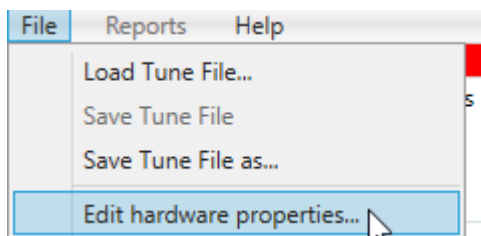


Orbitrap Re-installation

Important: Serial number tracking

While the instrument is still vented

Take a note of Serial numbers of all newly installed parts to enter them into the Hardware Property Editor in SDT.



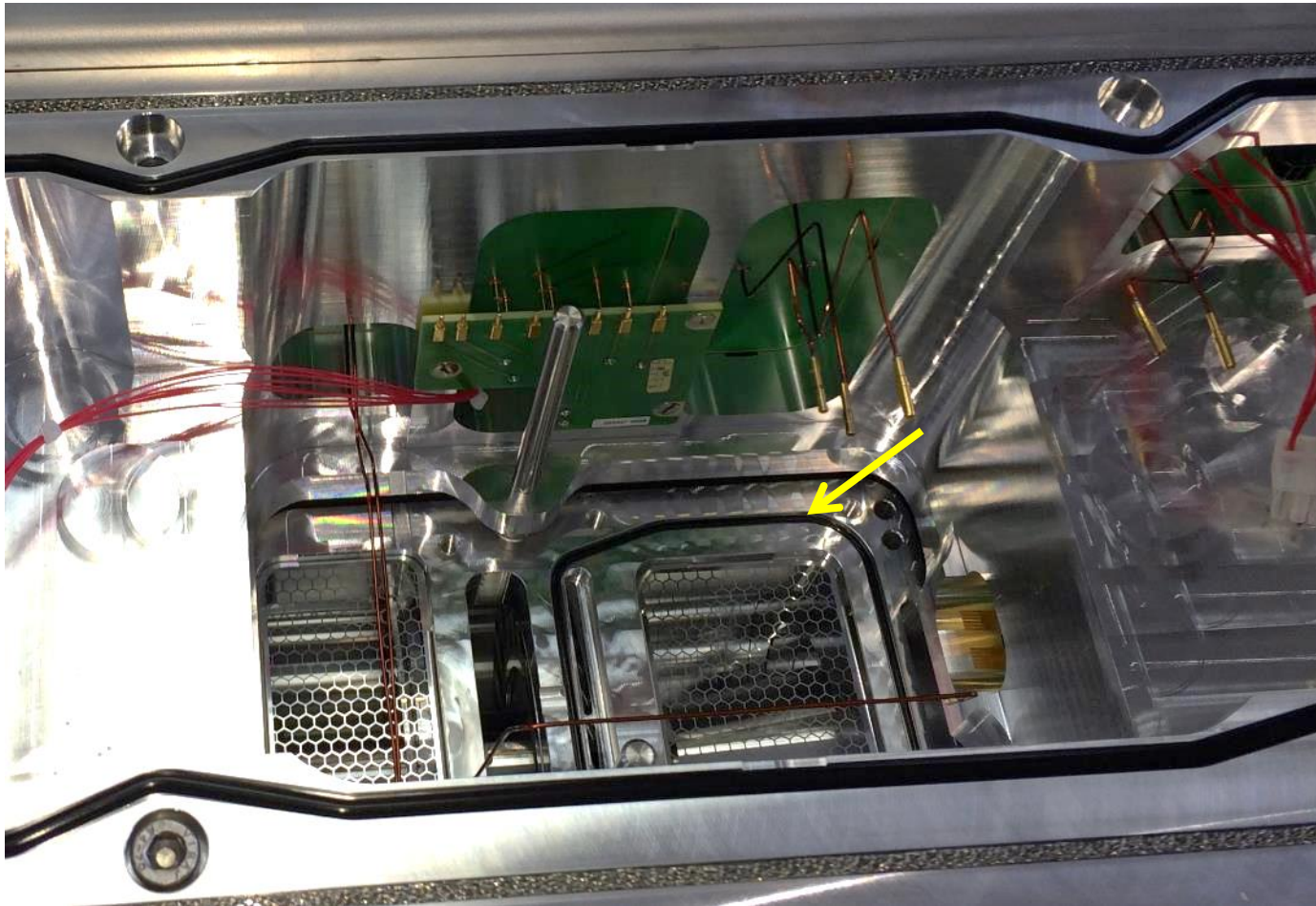
Hardware Property Editor

Reload Save

Hardware Item	SerNum	PartNr
API stack assy		80500-60040
Bent flatapole assy		BRE0009886
HCD cell	V020	BRE0008100
IC: Internal calibration module assy		80011-60067
IC: Reagent ion source assy		80000-62056
Inj flat assy	VDL226161/07	BRE0010223
OT: Orbitrap block	V-0023-SAX	BRE0008593
Quadrupole		1365150
Quadrupole holder		BRE0006434
SL/ICD/TM assy		BRE0008179
Source manifold		BRE0007898
VAC: Fore vacuum pressure gauge		1366920
VAC: HCD pressure gauge		1366920
VAC: IS5 pressure gauge		1366920
VAC: Turbo pump		BRE0001708
Vacuum chamber		BRE0008641

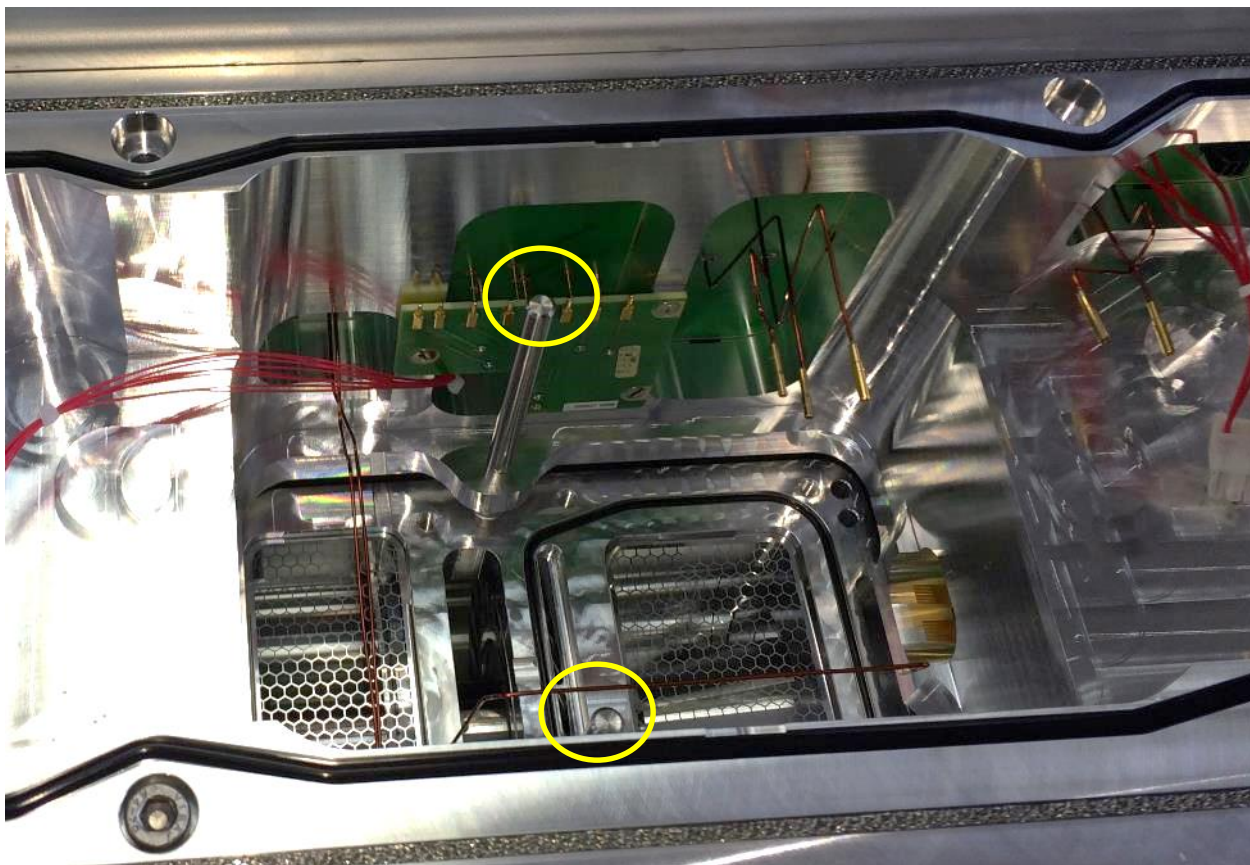
Installation of new assembly

- Inspect O-ring below Orbitrap assembly for any debris and proper seat
- Replace if necessary



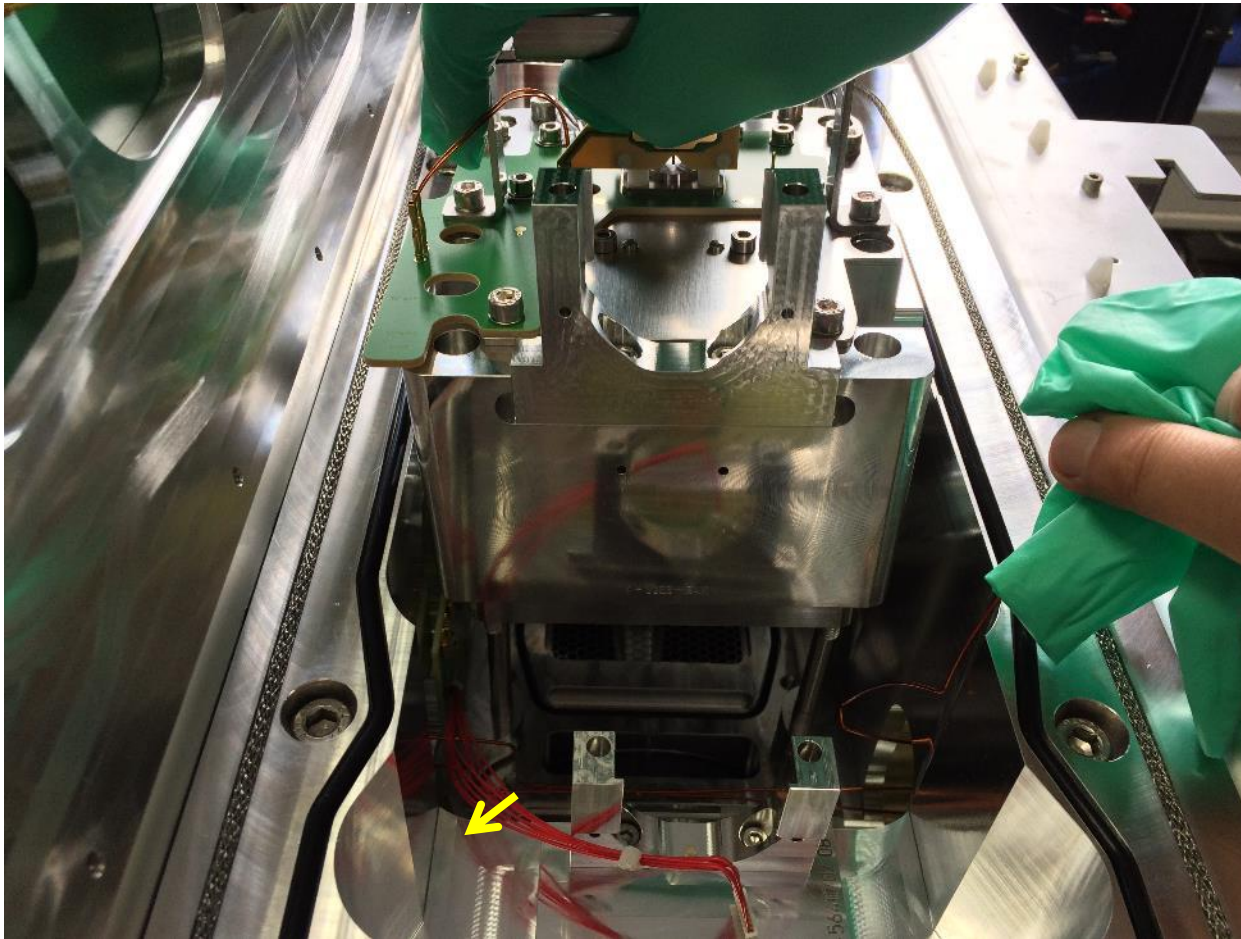
Installation of new assembly

- Use the guiding pins to assure proper alignment of the orbitrap
- Lower the orbitrap into place carefully and ensure proper seating before putting in the bolts
- Install all bolts loosely before



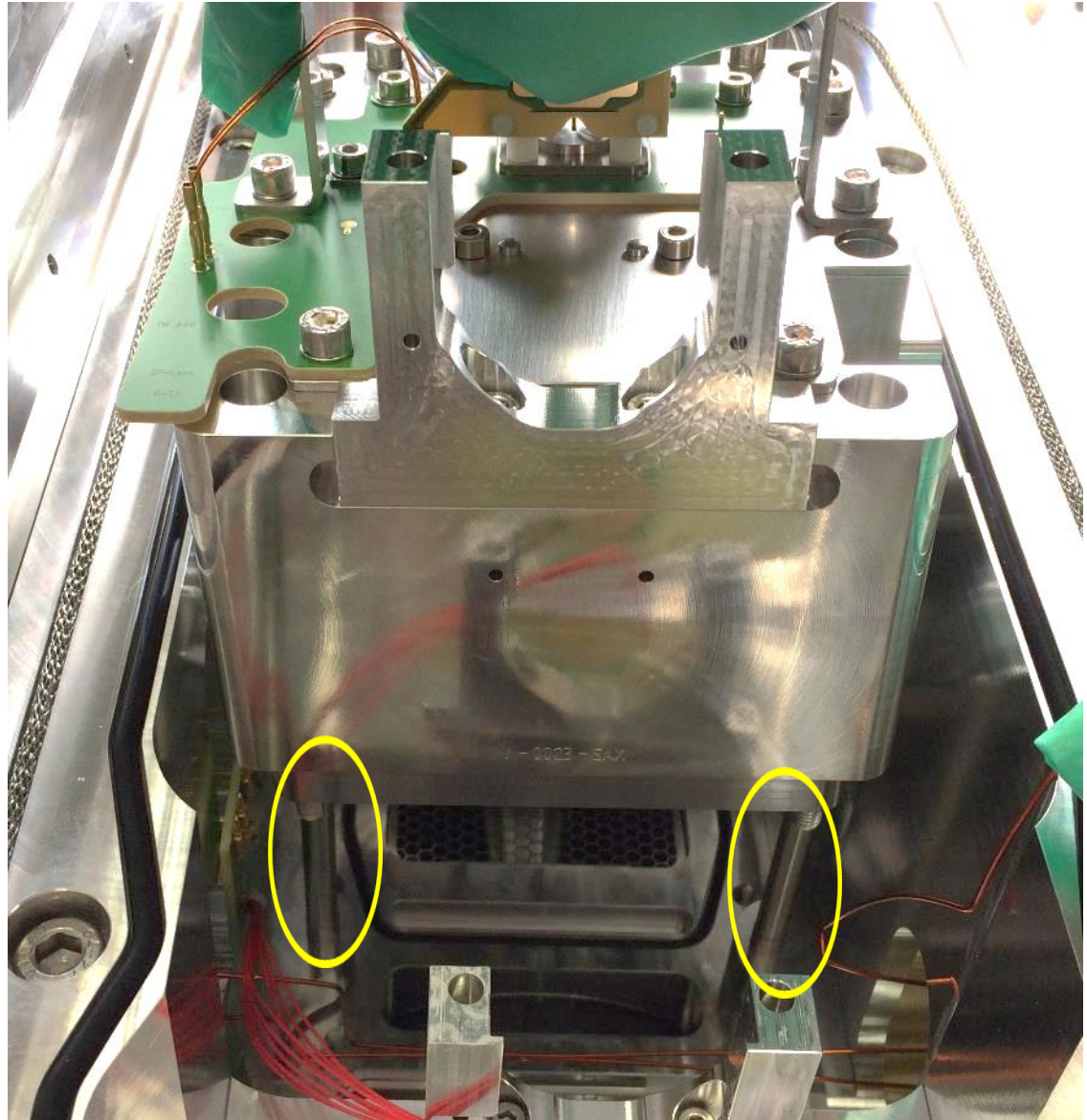
Installation of new assembly (cont.)

- Arrange ICD cable so it does not get caught under the assembly



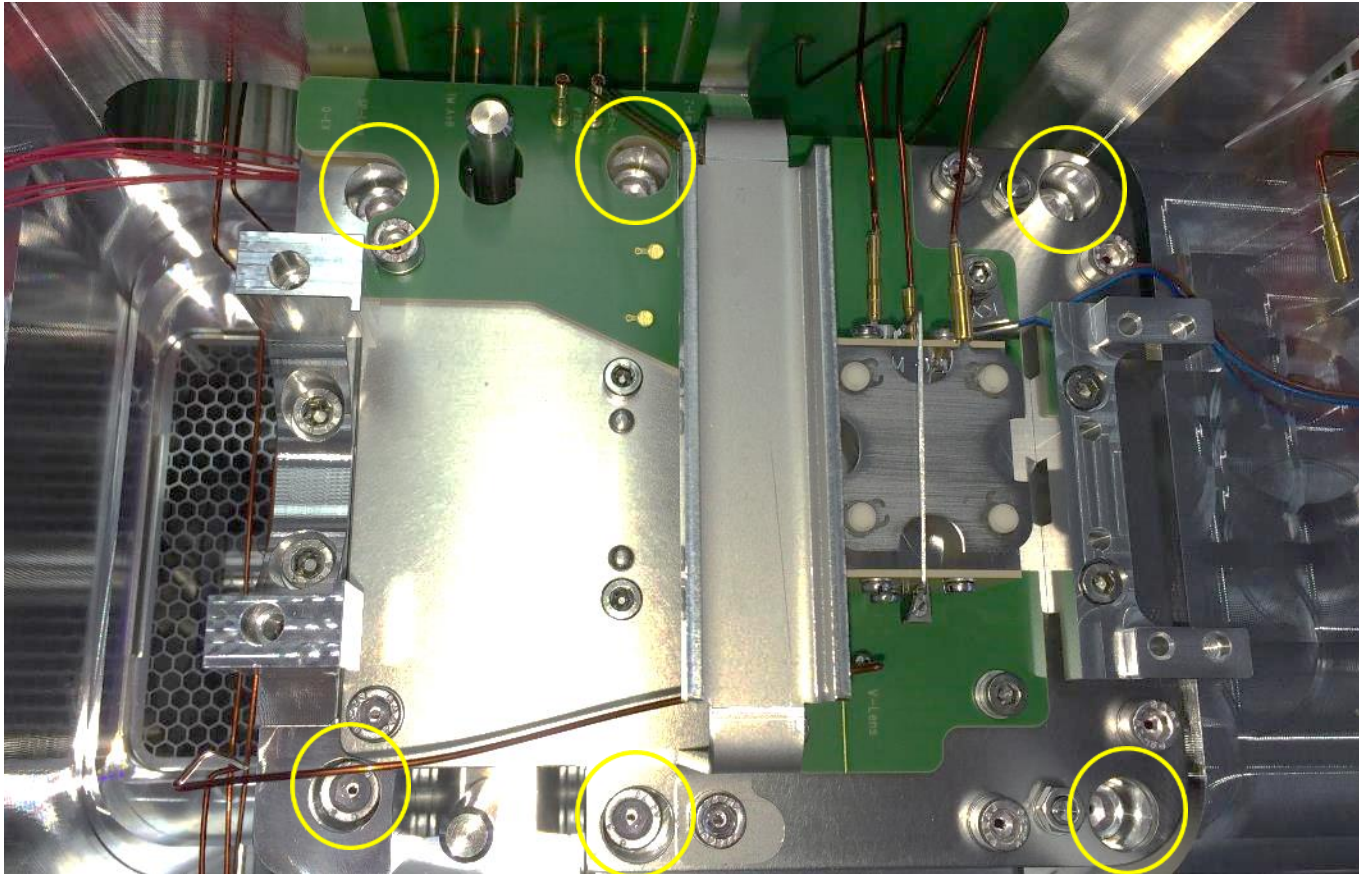
Installation of new assembly (cont.)

- Slide the assembly unto the guiding bolts



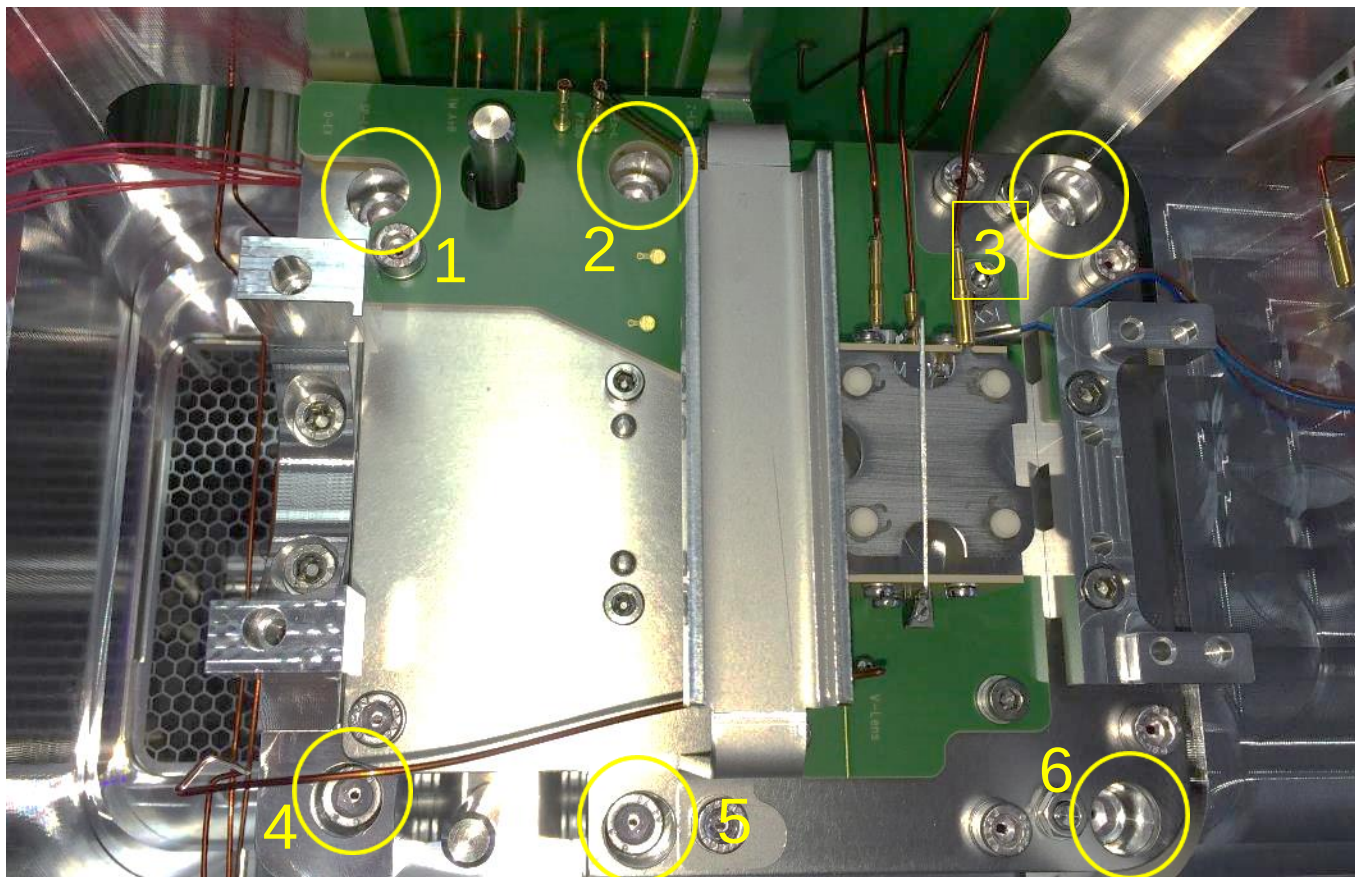
Installation of new assembly (cont.)

- Install the 6 screws
- **IMPORTANT:** Use a torque wrench to **tighten them with 5 Nm**



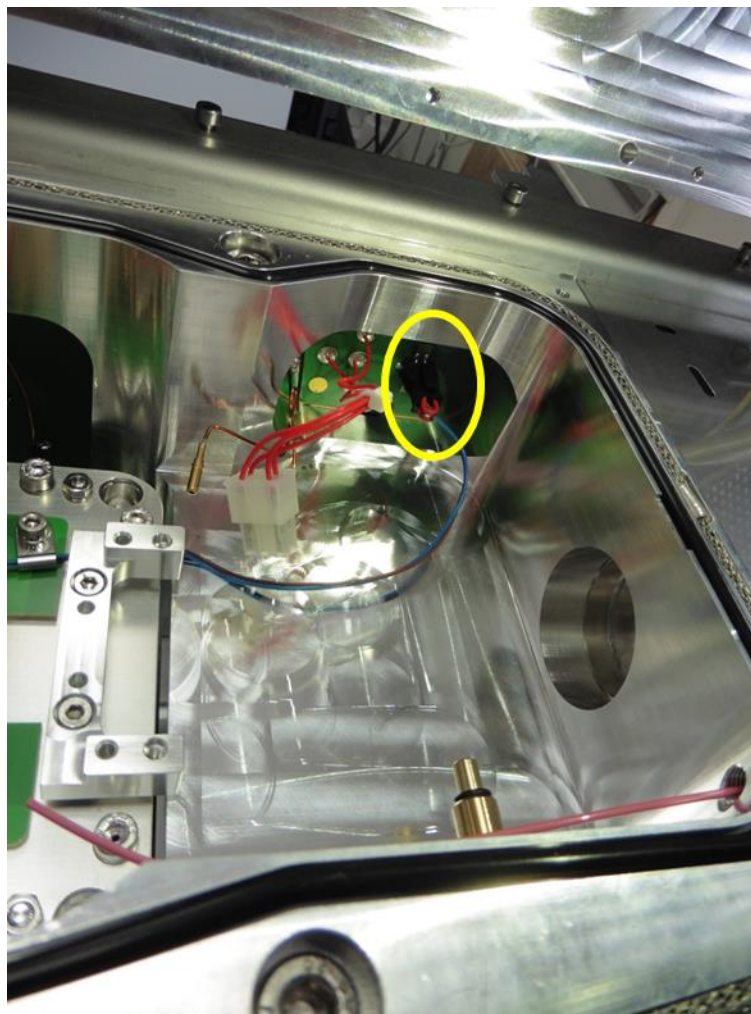
Installation of new assembly (cont.)

- Place the 6 screws and only finger tighten, then use a torque wrench to **tighten them stepwise to 5 Nm in the order 1, 6, 3, 4, 2, 5 and repeat until the torque setting is reached**



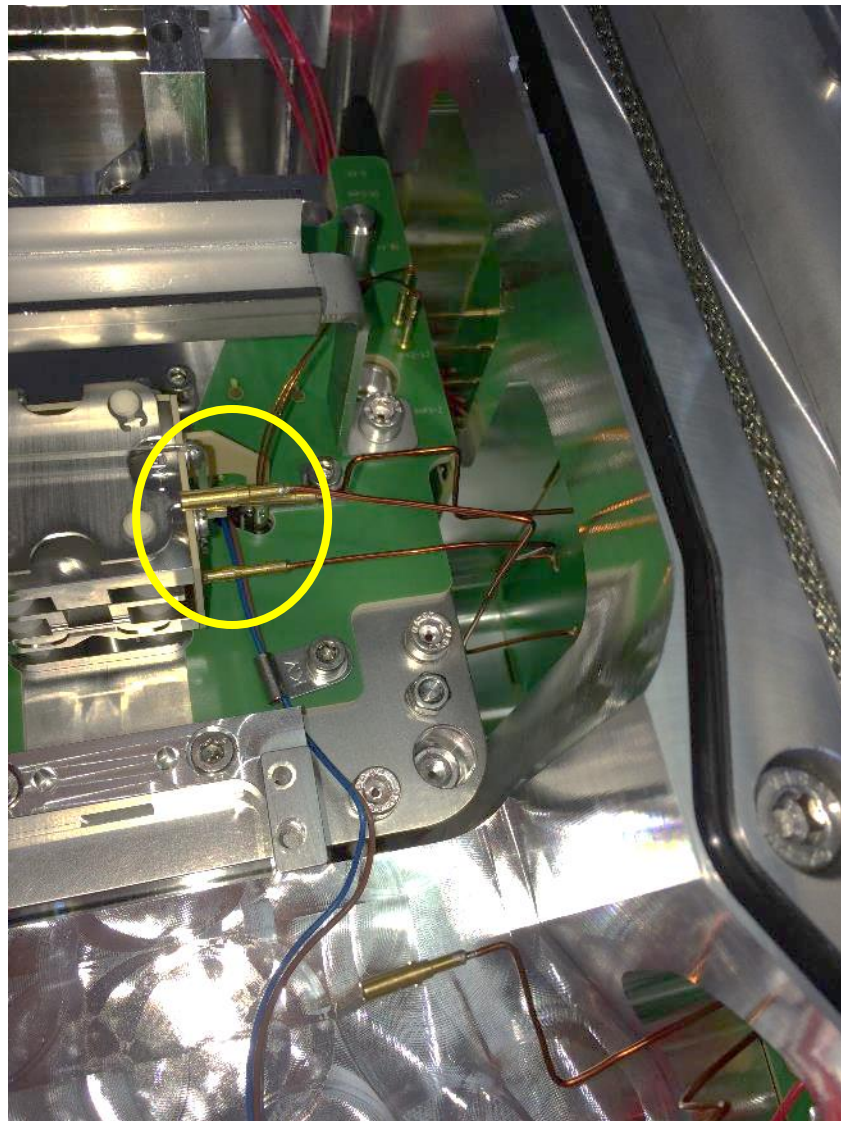
C-Trap/Orbitrap connections

- Connect heater cable



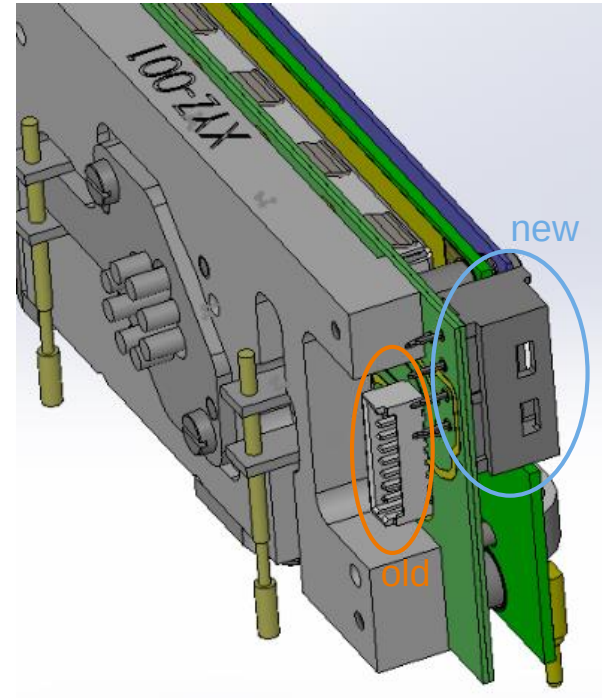
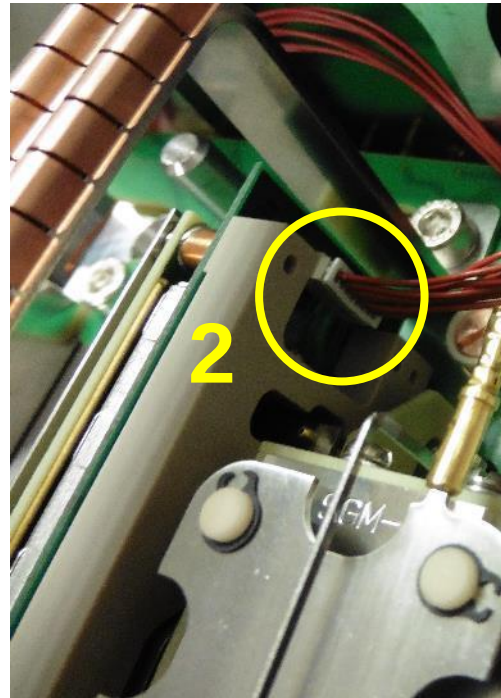
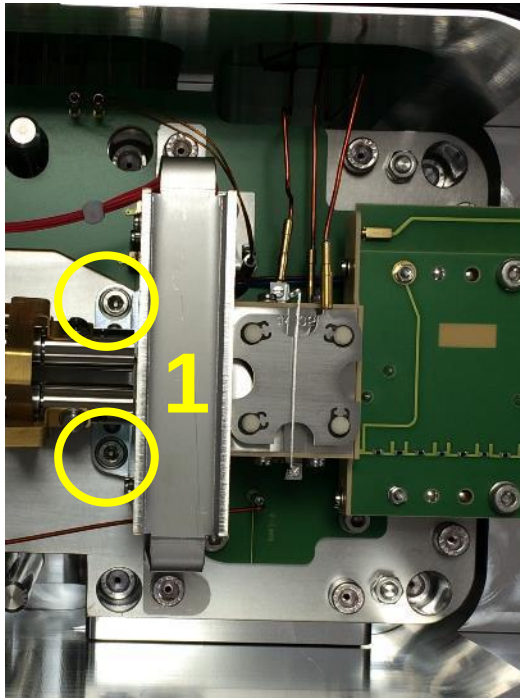
C-Trap/Orbitrap connections (cont.)

- Connect C-Trap wire
- Bottom left on feedthrough PCB -> Lower connector on C-Trap
- Bottom right -> Upper pin
- Top center -> Center pin



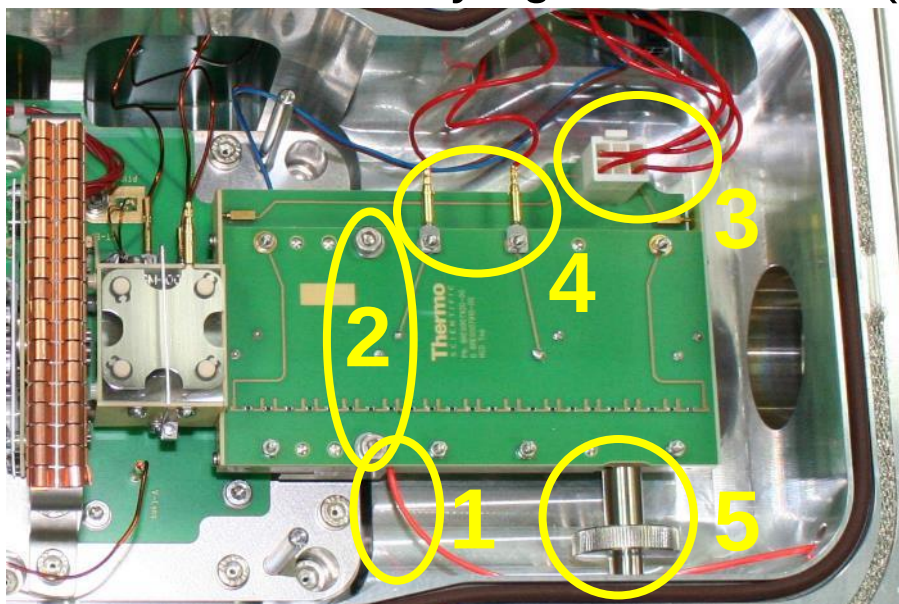
ICD installation

- Install the ICD assembly
- Connect the supply cable to the ICD (2)
- Install and tighten the two screws (1)
- Latest version uses different connector, but both types are available on the ICD assembly.



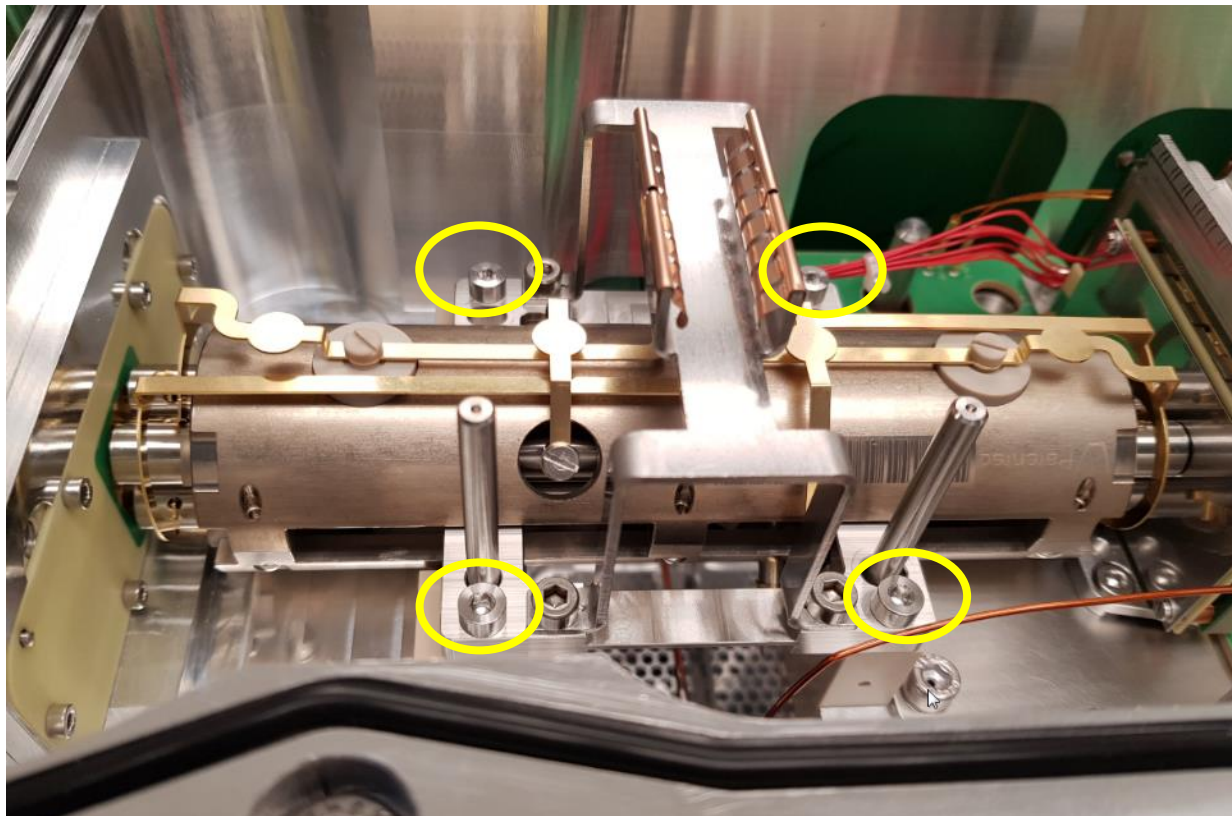
IRM installation

- Install the IRM
- Insert the gas line, pushing it all the way in (1)
- Install and tighten the two holding screws (2)
- Plug in the DC connector (3)
- Connect the two RF wires (4)
- Extend the vacuum gauge tube until it is firmly against the IRM (5)



Quadrupole Installation

- Place the quadrupole onto the holders
- Only one Orientation is possible
- Tighten the 4 screws holding the quadrupole.



Final steps

- Double-check all connections
- Close the chamber lid
- Enter the serial numbers of the newly installed parts into the software
- Start up the instrument

Hardware Property Editor

Reload Save

Hardware Item	SerNum	PartNr	
API stack assy		80500-60040	
Bent flatapole assy		BRE0009886	
HCD cell	V020	BRE0008100	
IC: Internal calibration module assy		80011-60067	
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VAC: HCD pressure gauge		1366920	
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VAC: Turbo pump		BRE0001708	
Vacuum chamber		BRE0008641	



Turbo Pump Exchange

Preparation

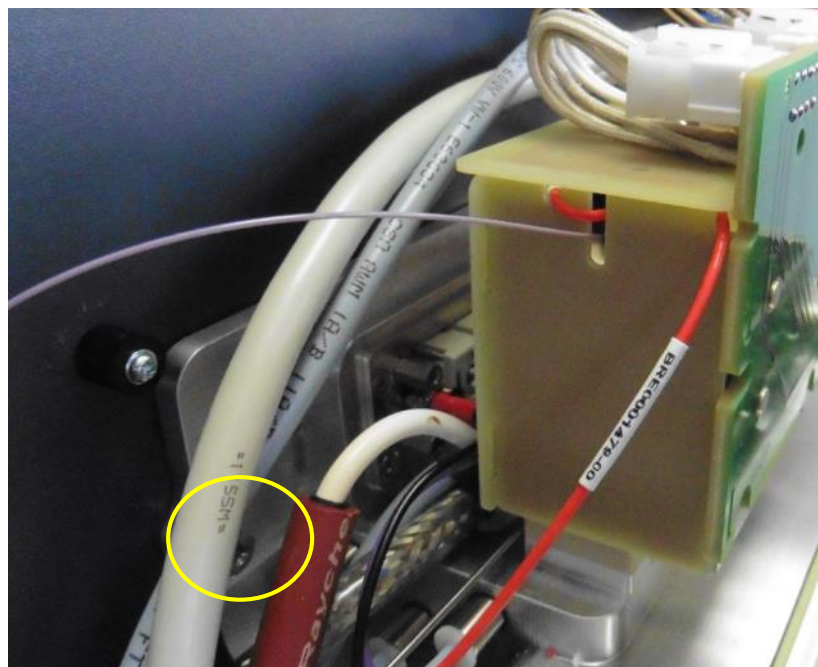
- Turn electronics and main switch off
- Remove the instrument covers
- Remove the EMC side panel (next to main switch)
- Remove the EMC cover, which is connected to the front panel



only loosen screw here,
do not remove it

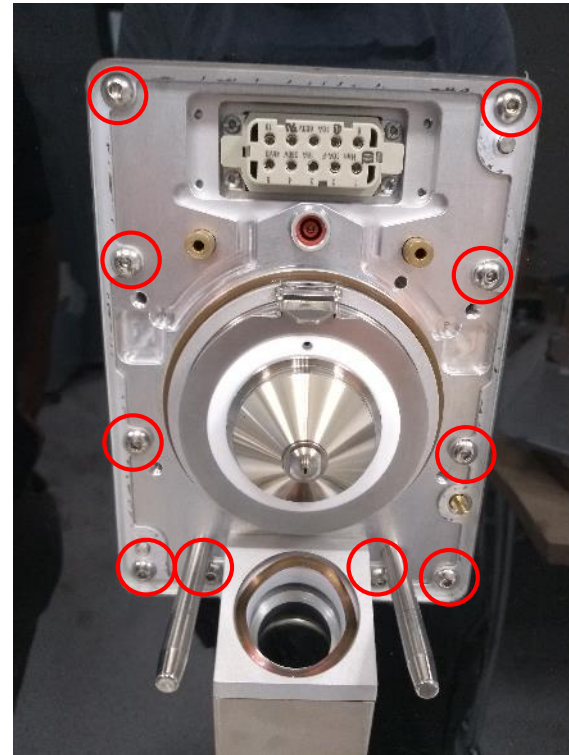
Preparation

- Remove the front panel by removing two screws from the inside (one shown, one at other side, 8 mm spanner/wrench required), this design will change
- Careful: Screws easily fall in fans



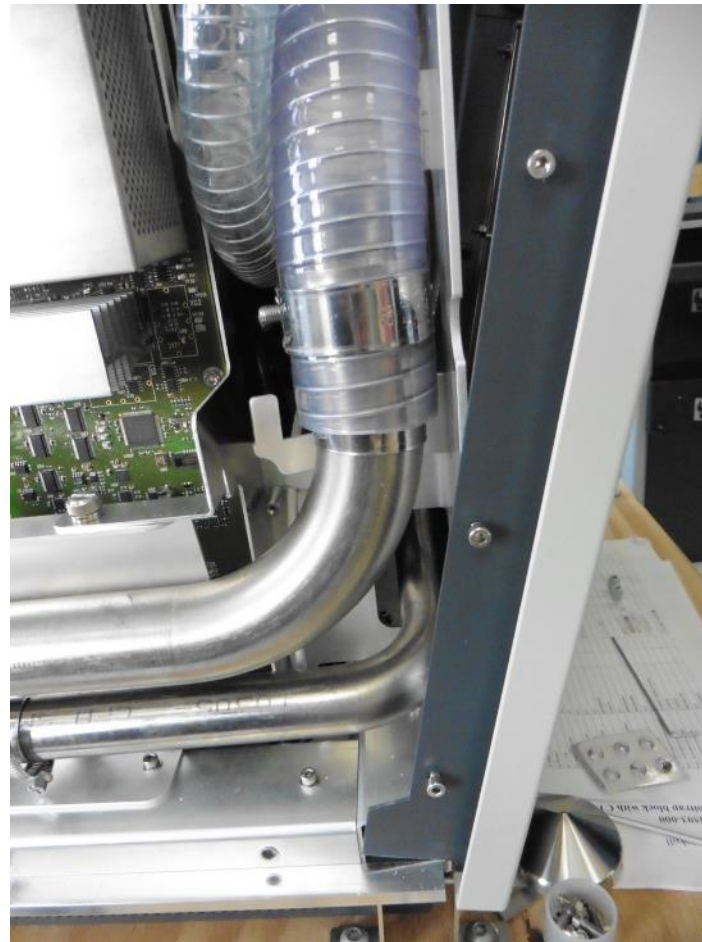
Preparation

- Remove the drain insert
- Remove the screws on the source shield plate.
- Remove the plate
- Remove the screws under the plate.



Preparation

- Take of the front panel



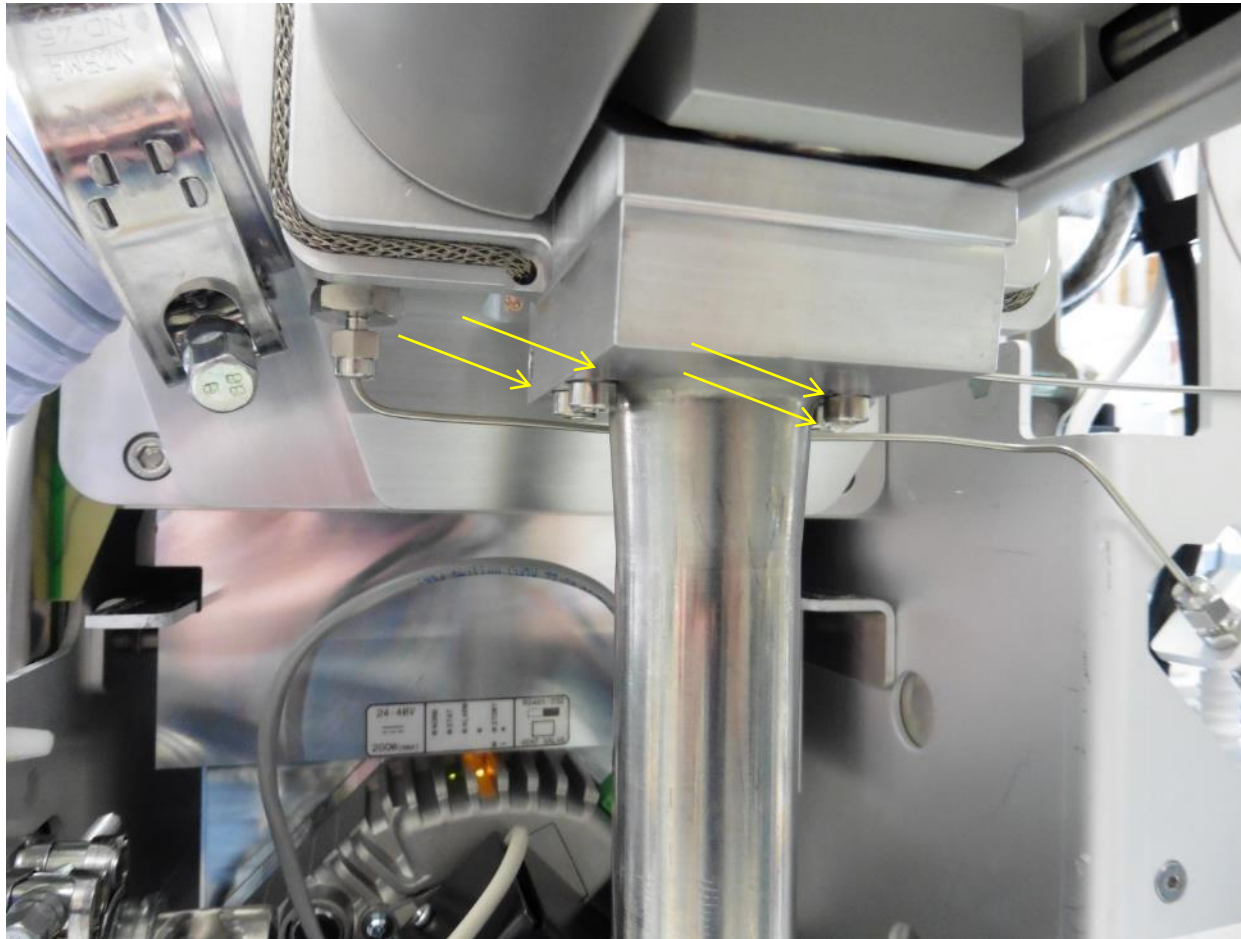
Preparation

- Loosen the clamp at the source waste line (7 mm wrench)



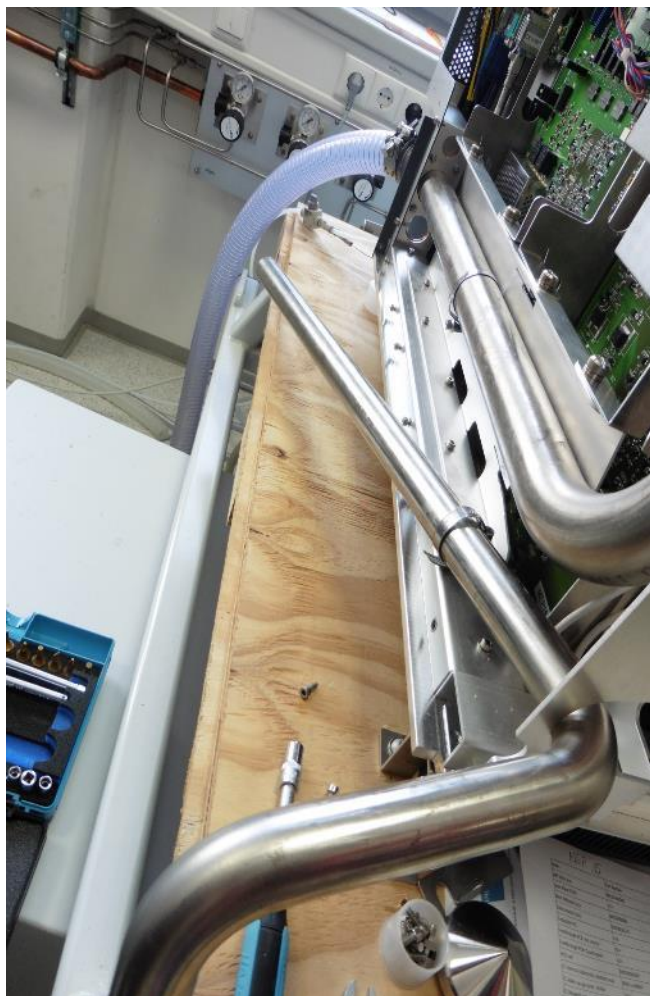
Preparation

- Loosen the four screws which connect the waste line to the source (3 mm allen key) and move the waste line out of the way.



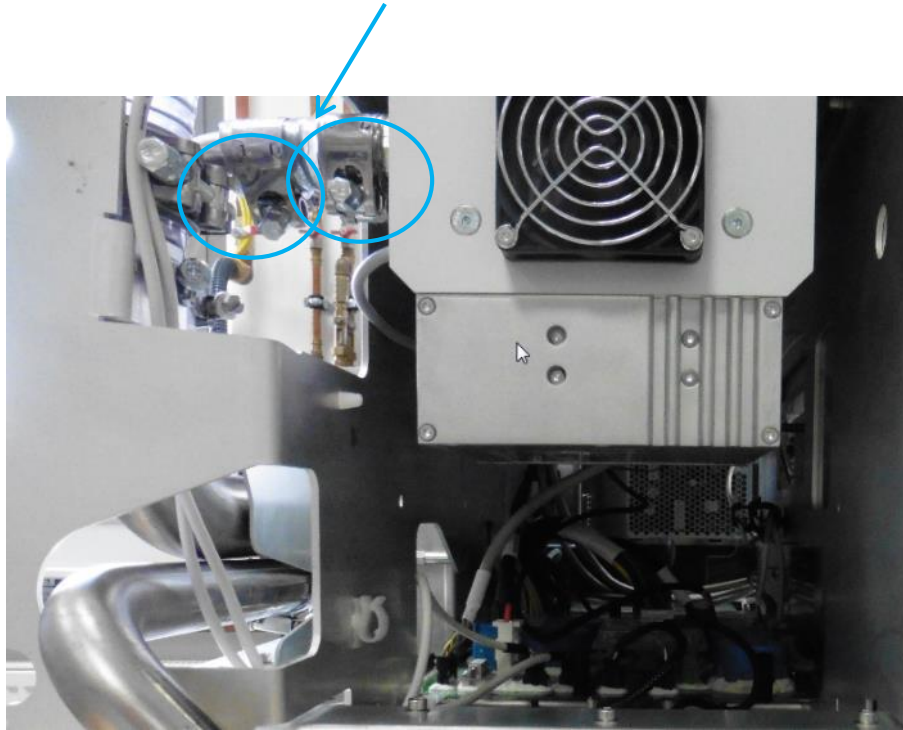
Preparation

- Remove the waste line completely



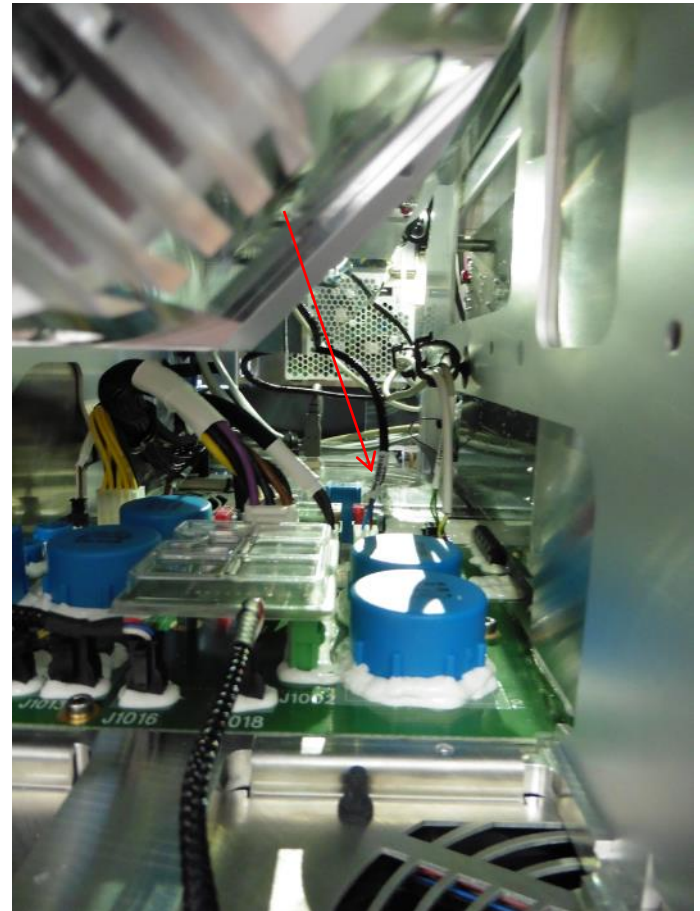
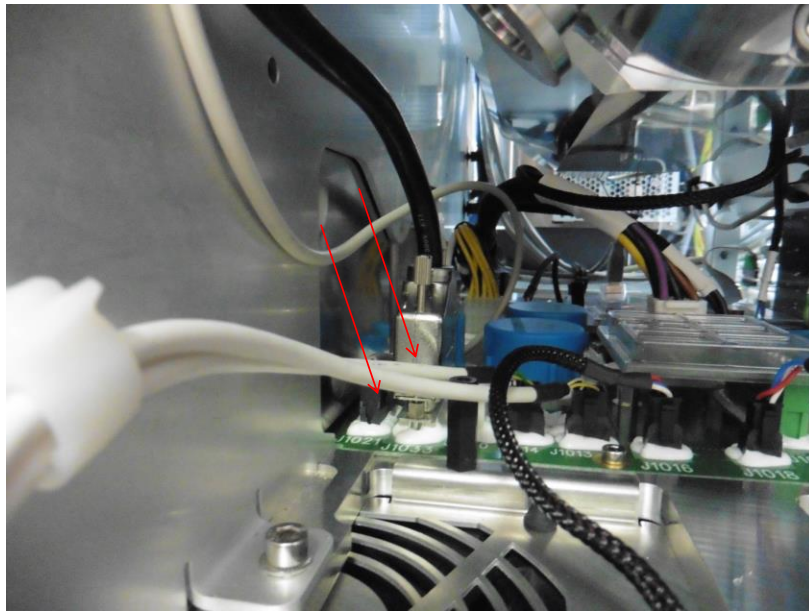
Preparation

- Open the two clamps and remove the Forepump connection from the tube and the metal tubing



Preparation

1. Unplug the cables at the back first (heaters and UHV gauge)
2. Connect the two cables in the front.

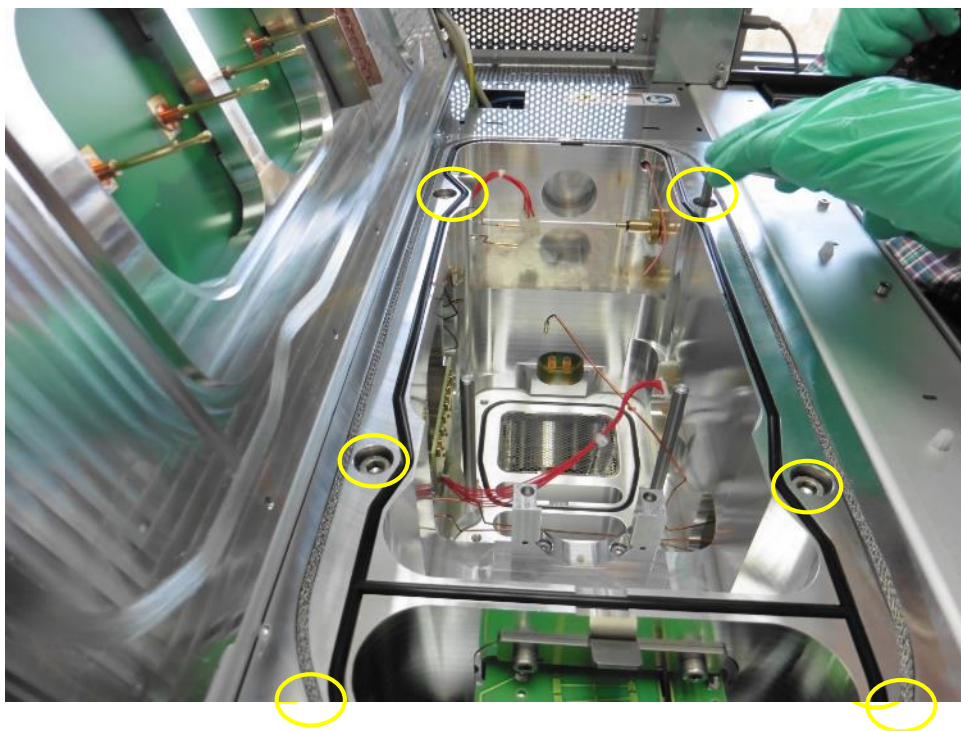


How to access turbo pump screws

- To unscrew pump, open the top cover of the analyzer (just lift it up) and remove the following ion optics:
 - Quadrupole
 - IRM (remove completely)
 - ICD/transfer multipole
 - Orbitrap/C-trap assembly

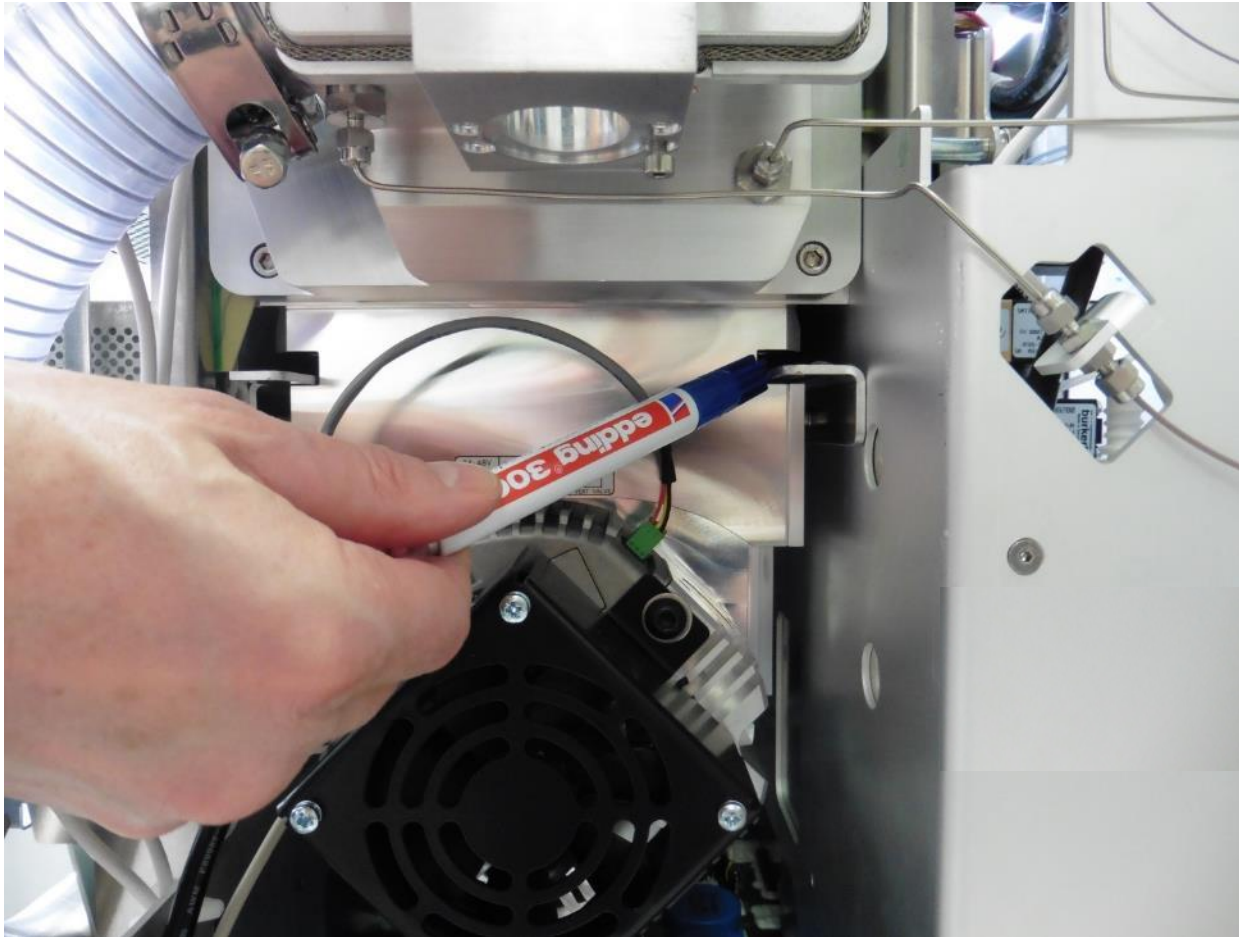
Removal of the old turbo pump

- Remove Ion optics (Quadrupole, Electrometer, IRM, Orbitrap/ C-Trap Assembly)
- Remove the six screws, which hold the pump in place & pull out turbo pump
- Please note: **Pump weight is 20kg!**



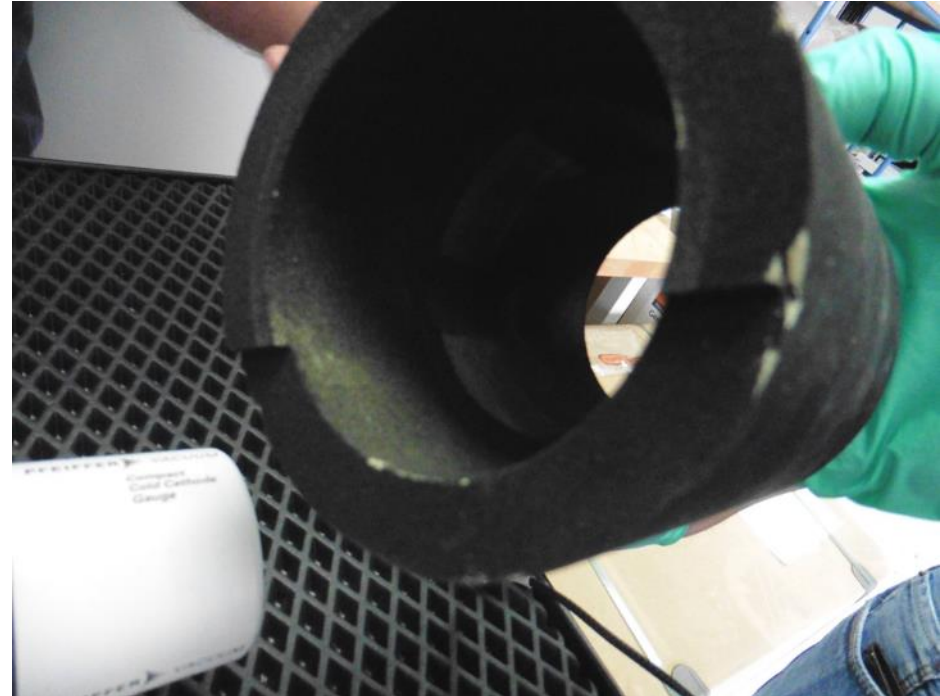
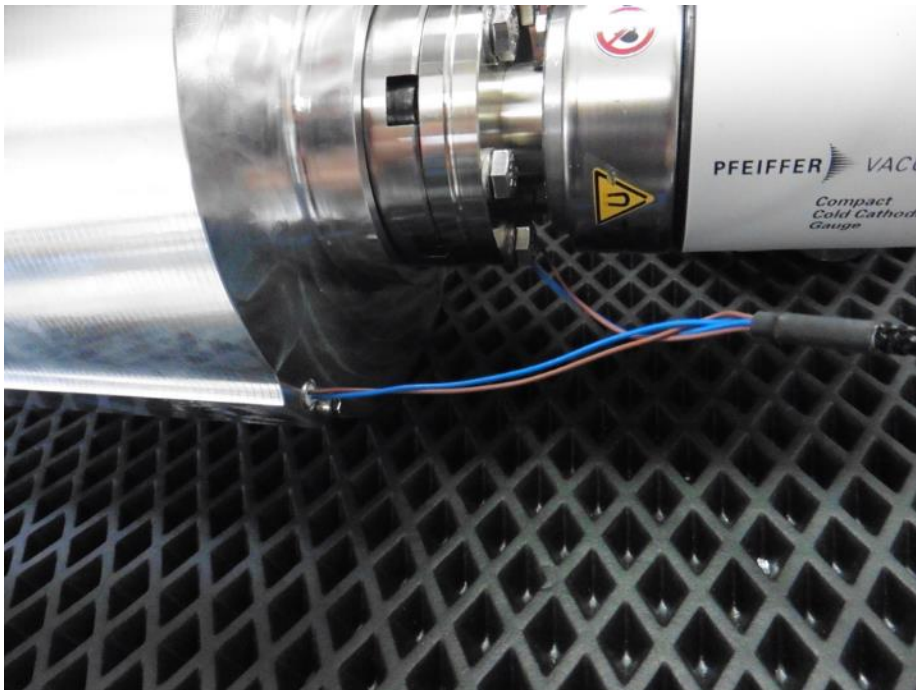
Preparation

- Pump will slowly fall on rails (like in Exactive series) when screws @ in analyzer are unscrewed



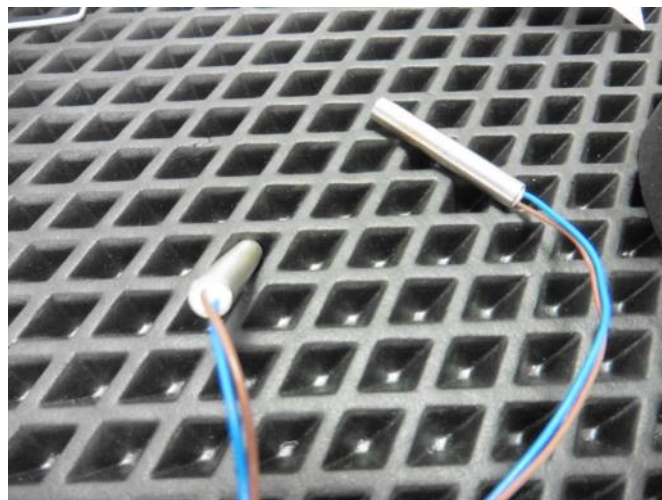
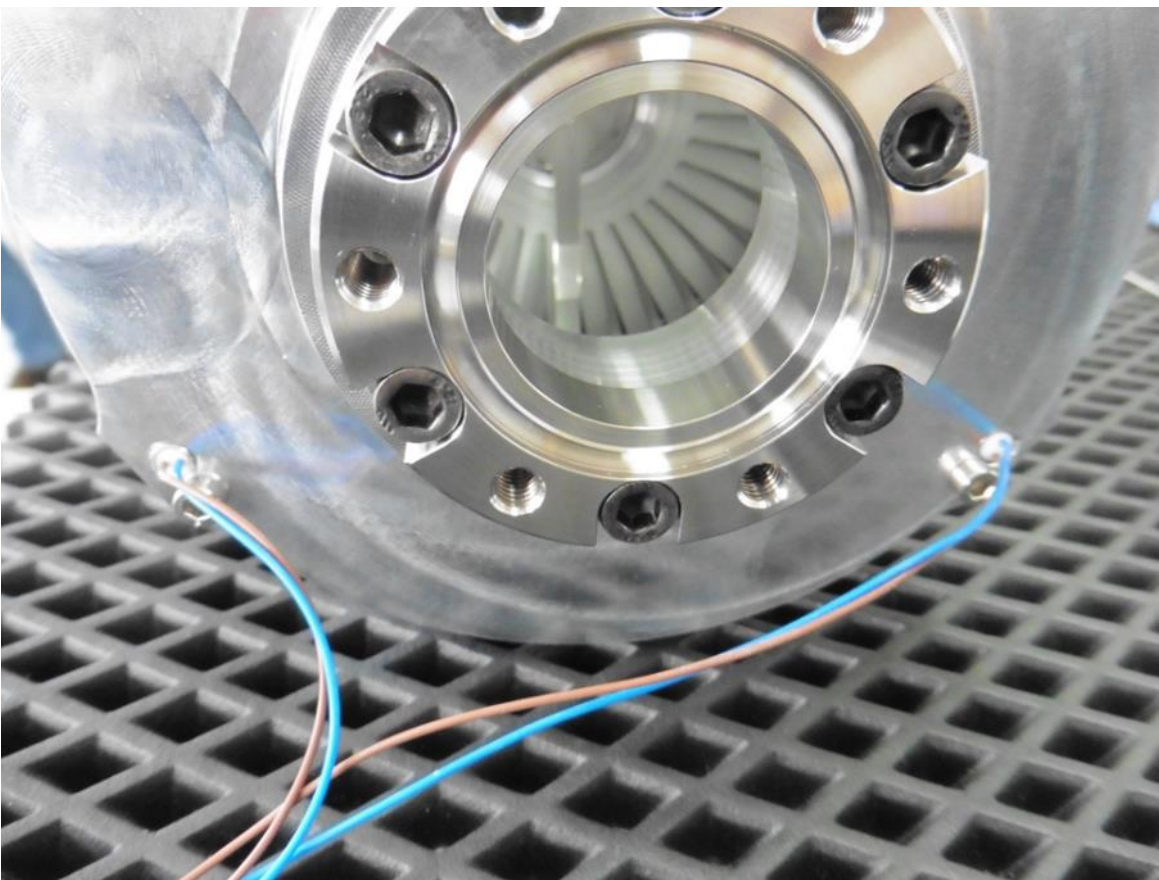
Ion gauge

- Transfer the black foam insulation part from the old pump to the new pump.



Removal of the turbo pump

- Remove the two heater cables from the pump (unscrew and pull out; 3 mm)



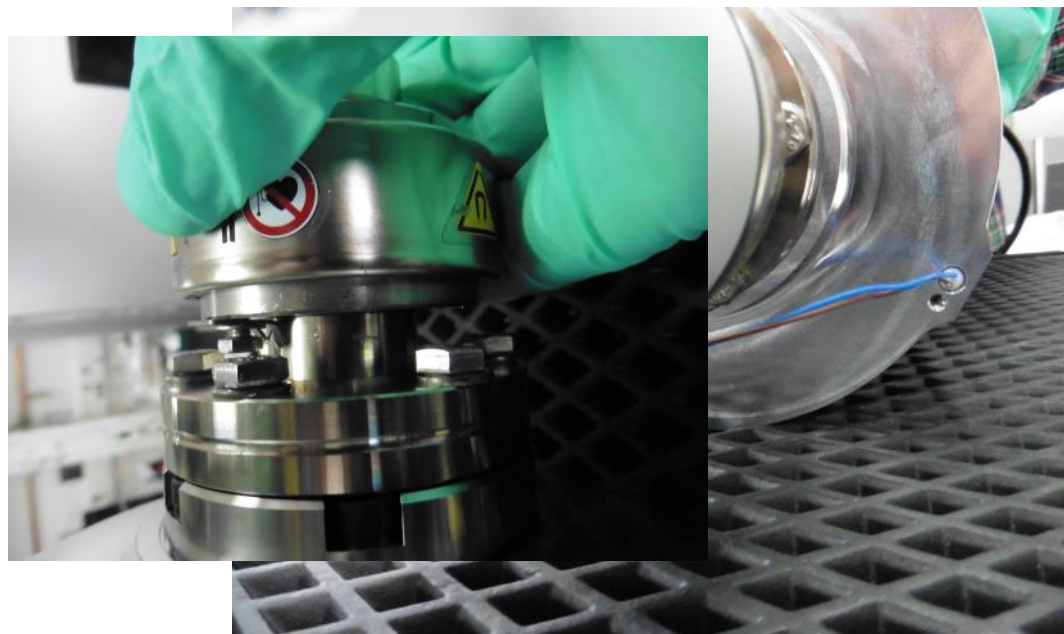
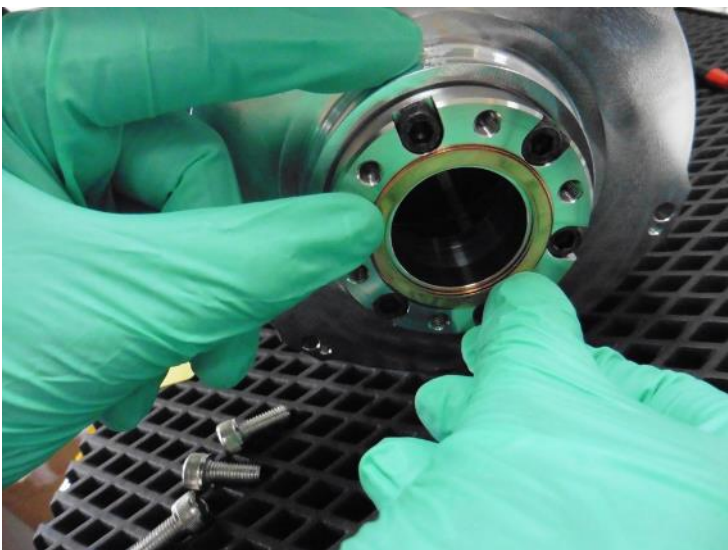
Preparation of the new Turbopump

- Remove the protective covers from the new pump
- Put the O-rings in

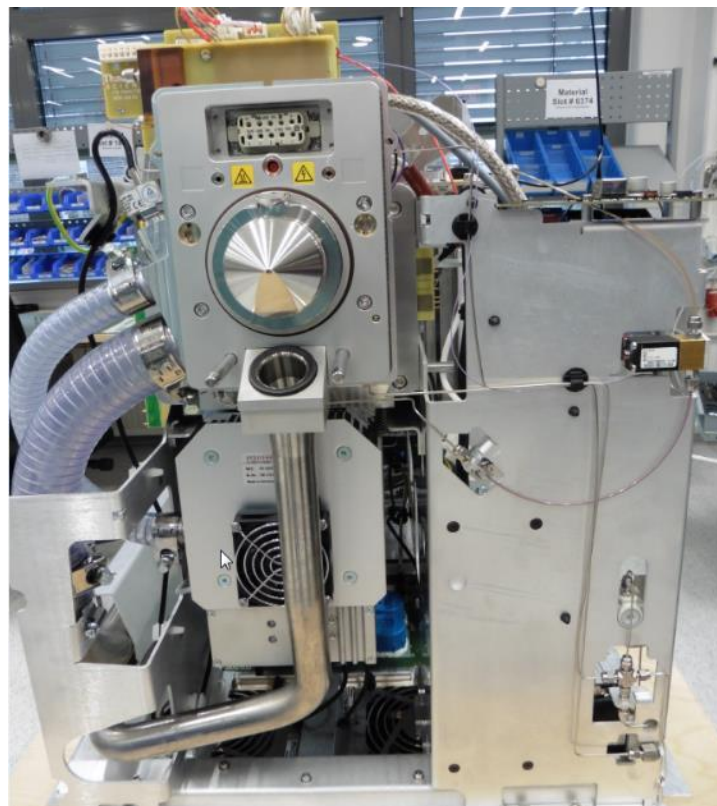
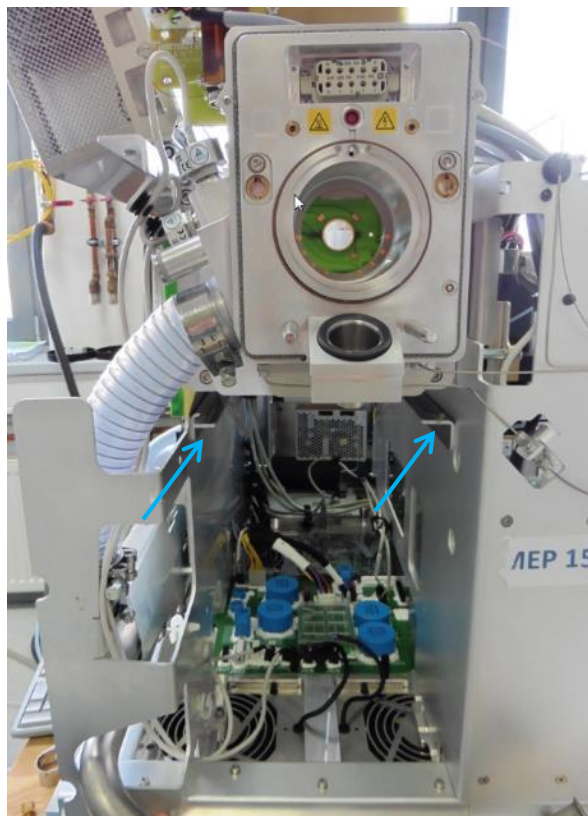


Just in case: Changing the Ion Gauge

- Use a new copper gasket, flat side towards the analyzer
- Make sure there is no space between the edge on the tube and the front of the magnet
- Attach the heater cables using the screws provided

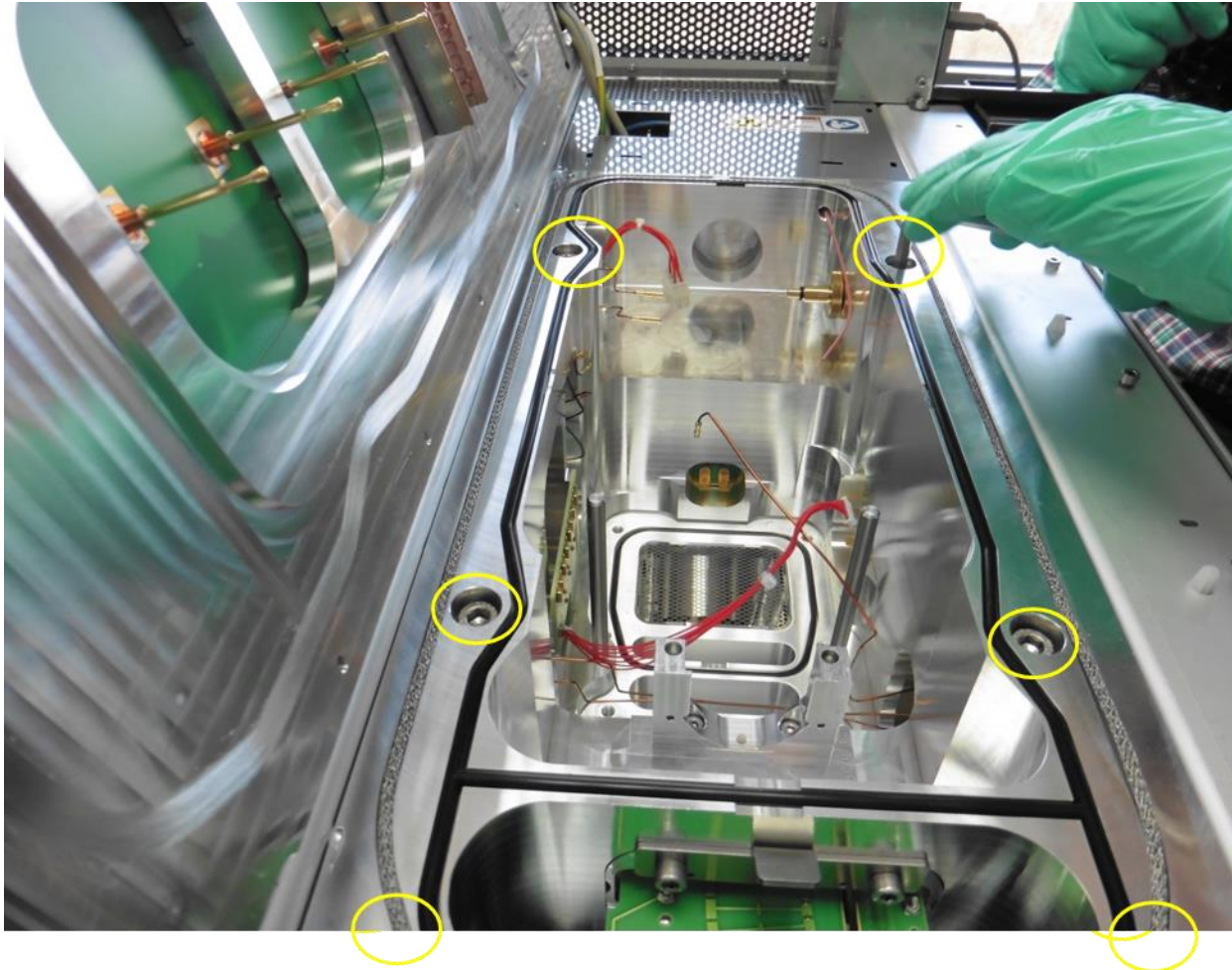


- Slide the pump on the rails into the correct position



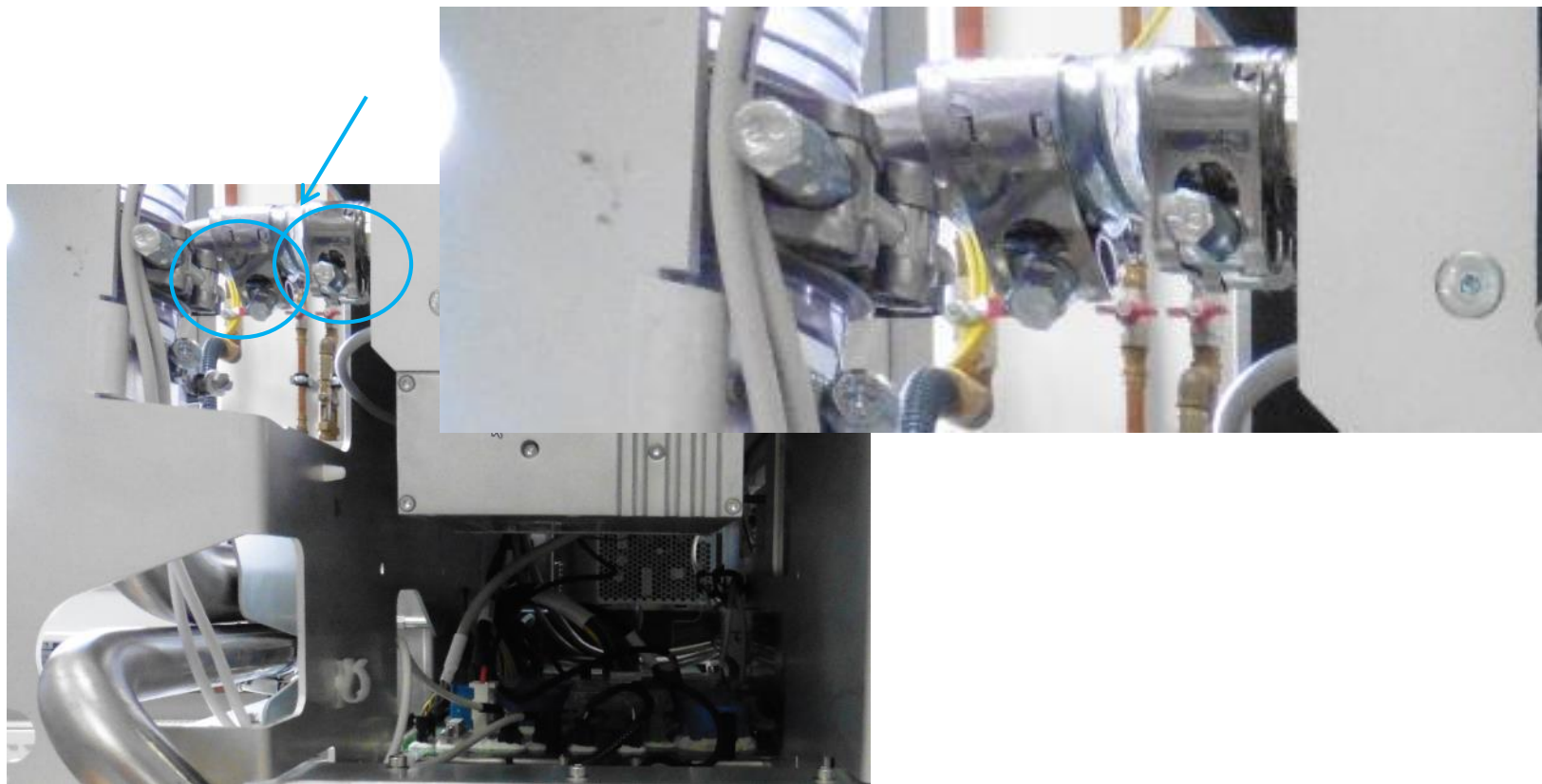
Install the new turbo pump

- Push the new pump into the correct position and tighten the six screws, which hold it in place. Use a torque wrench to reach 10 Nm.



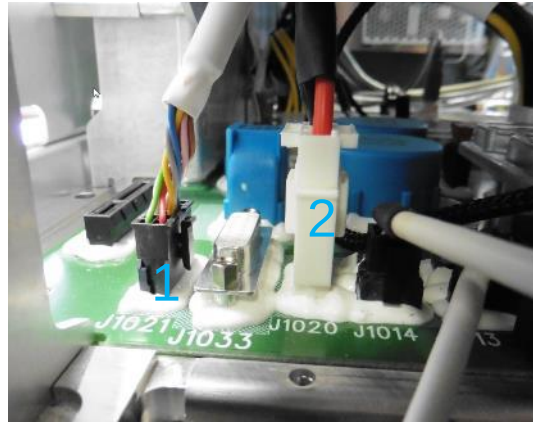
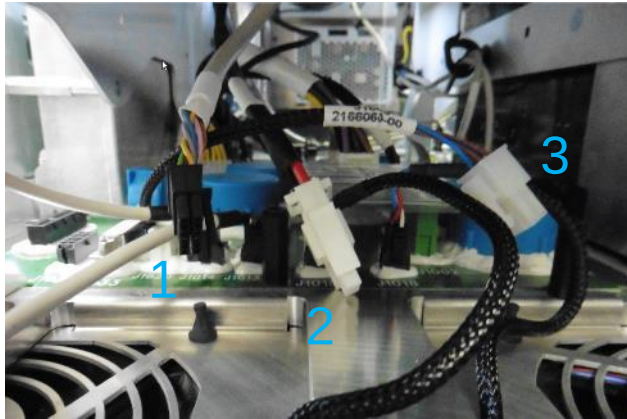
Installing the new Turbopump

- Re-install the tubing and connections to the turbo pump



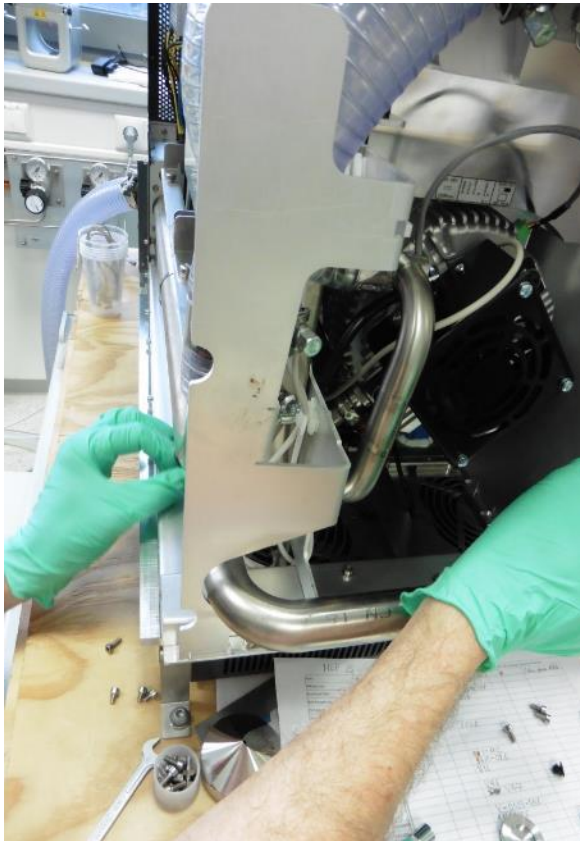
Installing the new Turbopump

- Reconnect the three cables under the pump. Two in the front, on in the back



Installing of the new Turbopump

- Re-install the source waste line and tighten the clamp



Final steps

- Re-install the ion optics (and connections)
 - Orbitrap block
 - Electrometer unit
 - Quadrupole
 - IRM
- Double-check all connections (inside and outside)
- Reinstall all Covers
- Start up the instrument