

Installing an Exactive Series Instrument

Sep 2013



Installation Schedule

- Assure that lab is ready
 - Power (1 Phase = 0 to 230 or 2 Phases boosted to 230 between phases) for Instrument and pump (requires separate supply)
 - Type C tripping characteristic fuses (*changed requirement Sep 2013*)
 - Gas (Nitrogen >99% purity, 8 bar pressure)
 - Q Exactive Preinstallation package
 - Bench
- “30 Days Before You Arrive”
 - With the order the customer gets the Q Exactive Preinstallation package (Part Number 1306250)
 - Includes:
 - Exactive Series preinstallation guide (PN).
 - Receptacle (Quantity 2) 16A/3POL (2105500).
 - MRFA (1305050).
 - Exactive Sigma Chemicals Kit (1306260).
 - The other Calmix ingredients and Buspirone



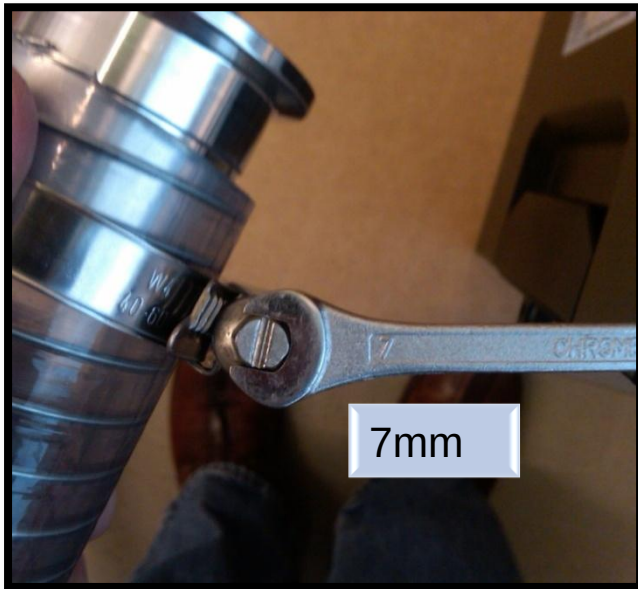
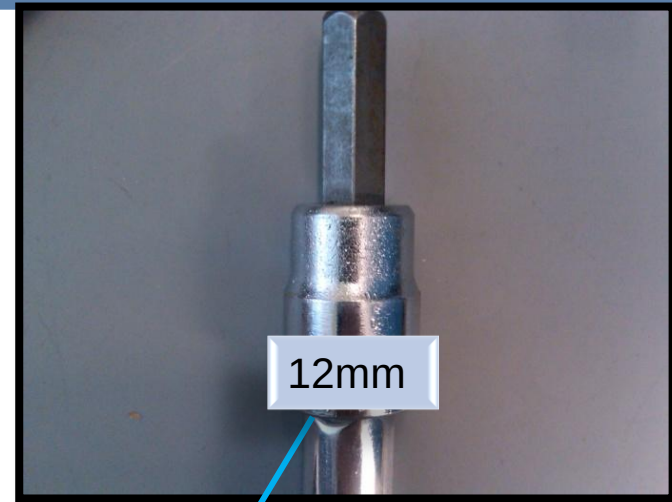
Safety rules!

- Wear protective clothing (e.g. steel-capped shoes for lifting)!
- Apply proper lifting techniques when lifting the instrument or heavy parts.

Tools for installation

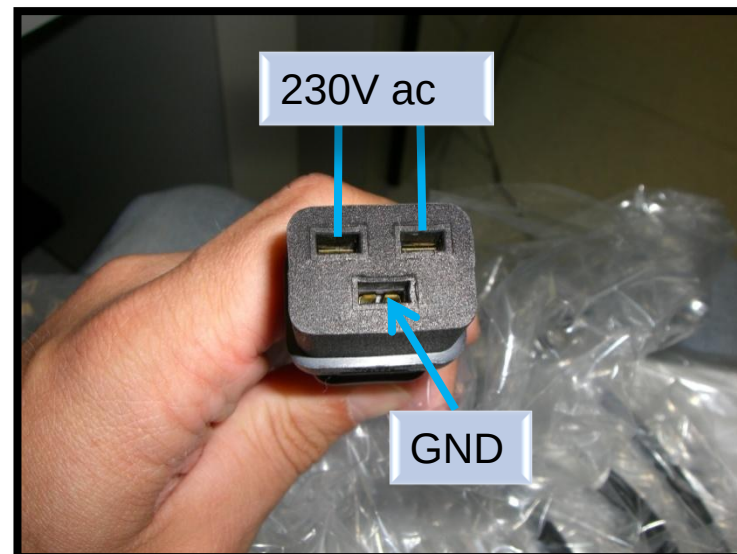
■ Tools for Installation

- 6 in. adjustable wrench
- 2.5, 3, 4, 5, 6, 8, 12 mm Hex keys
- 5 -17 mm open-end wrench set
- Digital Voltmeter (Fluke model 189)



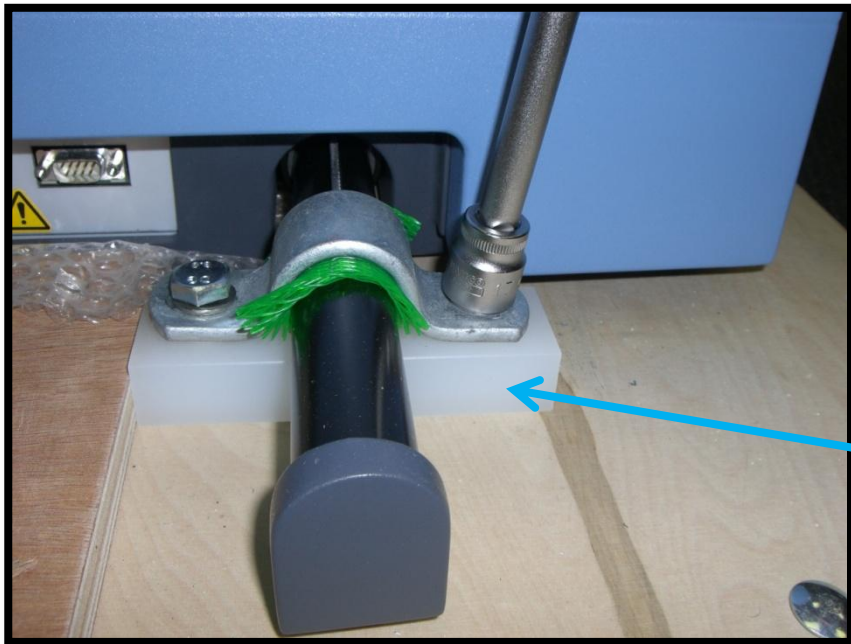
Day 1

- Meet the customer
- Check the site preparation according to the Exactive Series Preinstallation Requirements Guide and cancel the installation if requirements are not met!
- Check the two main power plugs
 - Measure between phase and neutral or phase to phase
 - Voltage between neutral and GND < 1V
- Two receptacles are supplied in the preinstallation kit. One for the instrument and one for the forepump. These should be installed by an electrical engineer responsible for the lab.



Day 1

- Unpack the shipping boxes
 - 17mm nut to loose transport fixtures



Remove the plastic block

Day 1 - Contents of the Instrument container.



Day 1 - Contents of the Instrument container.



Day 1 - Contents of the Instrument container.



Day 1 – Accessories Kit



Day 1 – Accessories Kit



Day 1 – Accessories Kit



Day 1 - Check instrument handles



Warning!

- Check each handle before lifting the instrument!
- Push and pull on each handle to check that they cannot slide in or out of the instrument.



Day 1 - Bring in position

- **4 Persons are required for lifting the instrument**
- **1 additional person is recommended to draw the pallet away to prevent from tripping over it.**
- **The instrument is top heavy.**
 - **Do not tilt the instrument when lifting it.**
 - **Support the top of the instrument.**
(Front handles each 55 kg, back handles each 30 kg)

The weight of the Q Exactive is 182 kg (401 lbs)

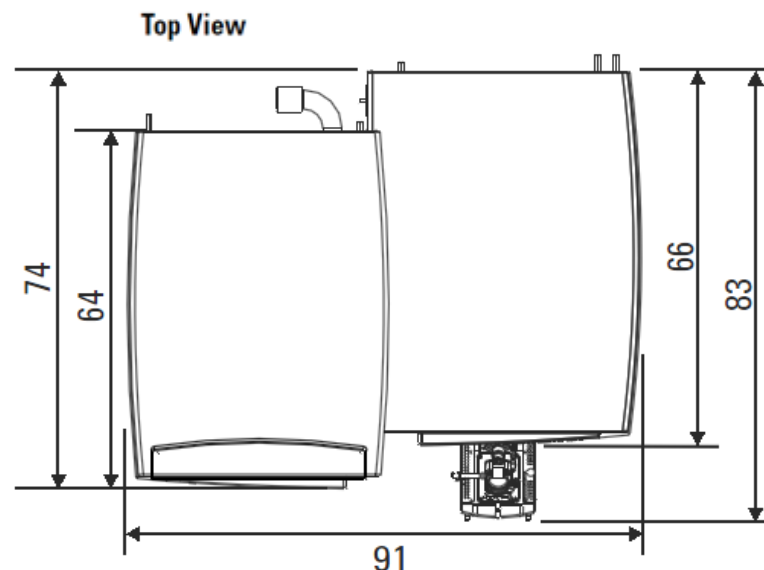
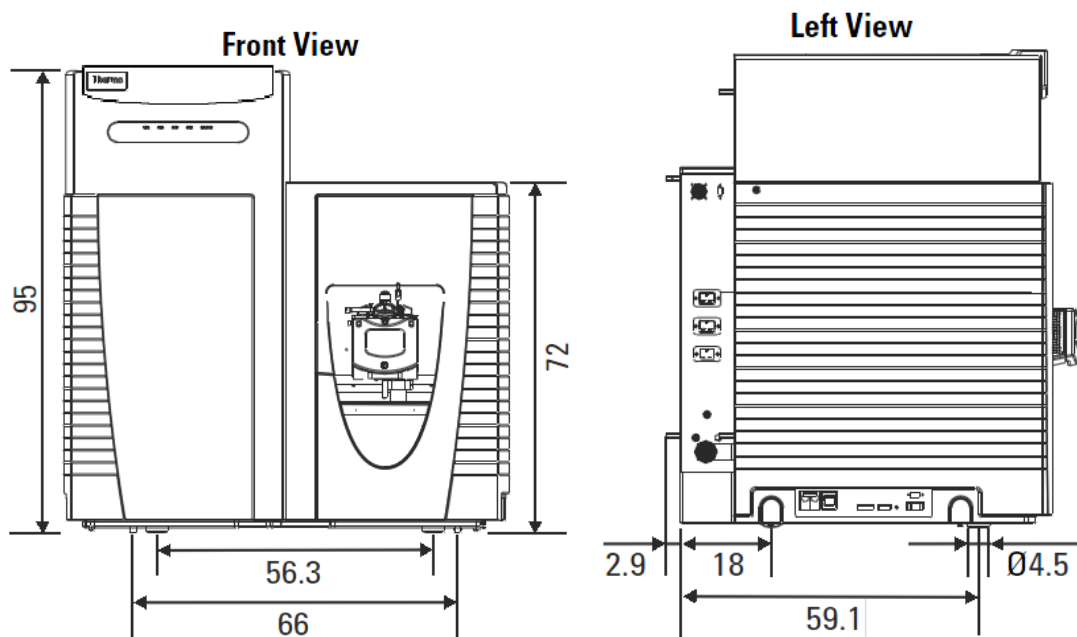
Allow at least 15 cm (6 in.) of clear space behind the system for proper air circulation and for clearance of the gas lines and electrical connections.



- The rear pair of the four support points for the instrument are wheels. Thus, only two persons are necessary for moving the instrument into its final position on a bench, holding the two front handles.

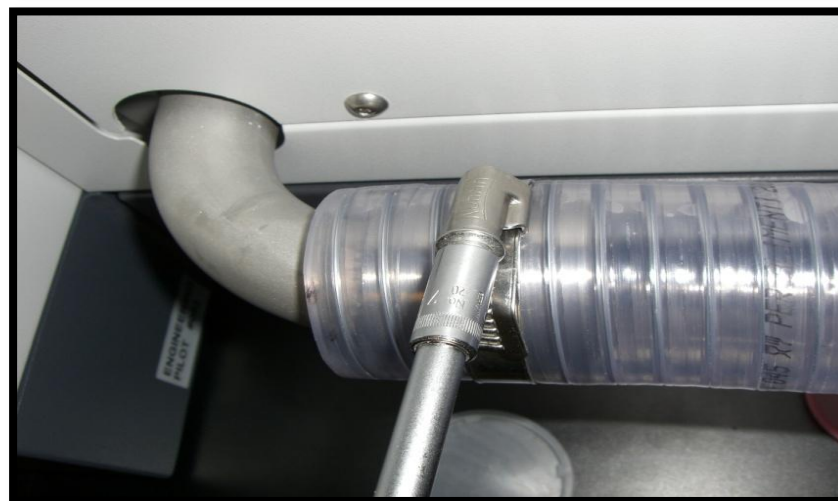
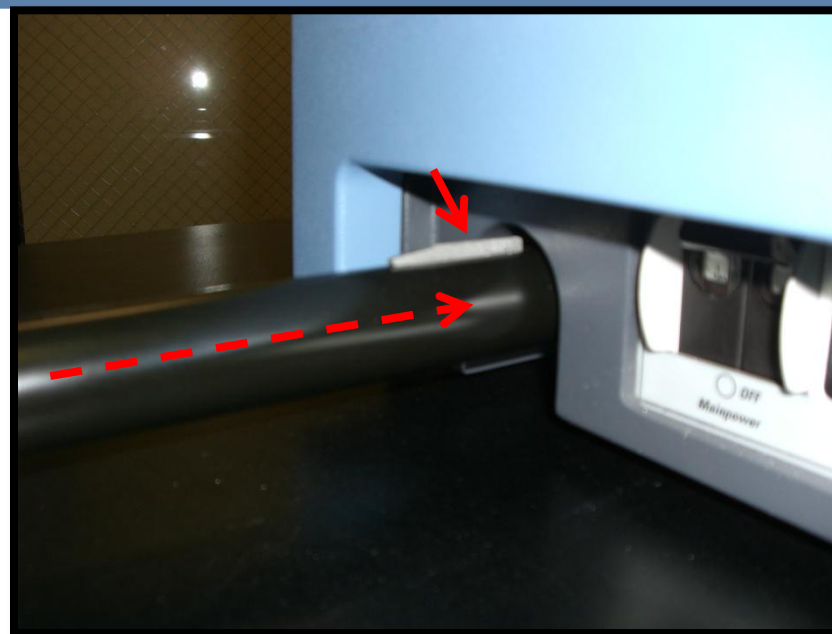
Day 1 - Bring in position

- Lift up the system with four people and place the rear onto the bench
- Move the instrument on the wheels to the back, holding the two front handles



Day 1 - Handles

- Push the lock on the handle down to slide them into the instrument
- Connect the helix hose to the Q Exactive with the hose clamp (7mm nut needed)



Day 1 - Prepare Forepump

- Place the fore pump on the metal tray
- 2 Persons are required for lifting the pump



!!! Warning !!!
Pump weighs 55 kg



Forepump Oil for Q Exactive – LVO200 (1L) Part Number **1249170**

Day 1 - Prepare Forepump

- Assure that the pump is filled with oil, otherwise fill up with LVO200 (Hex key 12mm)
- Connect the fore vacuum line with the KF40 vacuum O-ring and clamp.

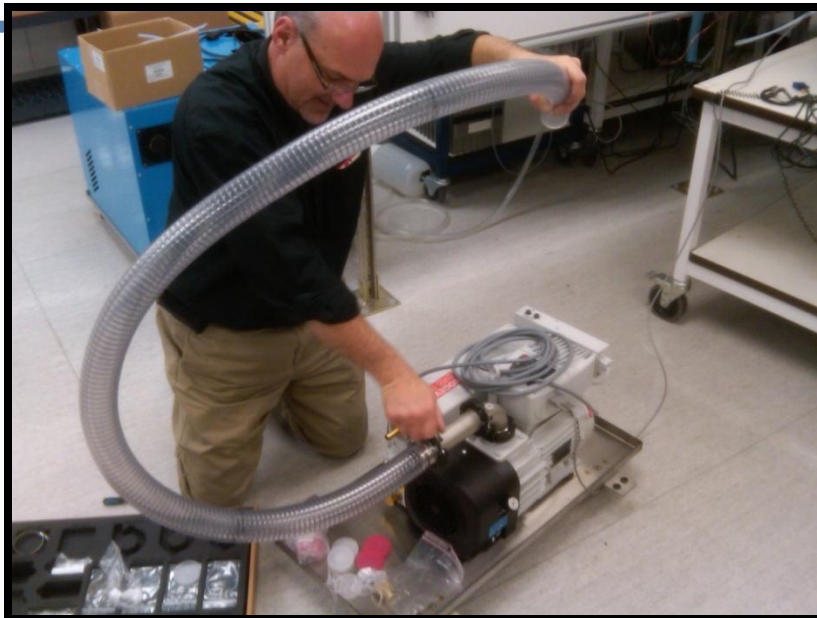


Forepump Oil for Q Exactive – LVO200 (1L) Part Number **1249170**

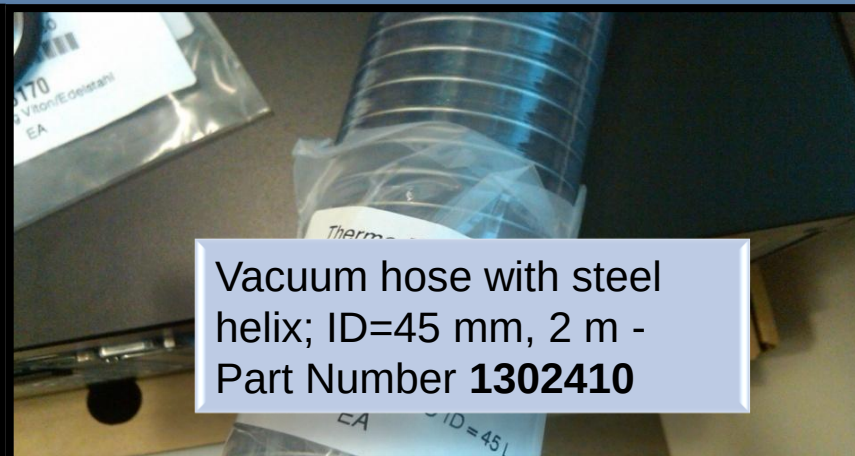
Day 1 - Prepare Forepump



Day 1 - Prepare Forepump



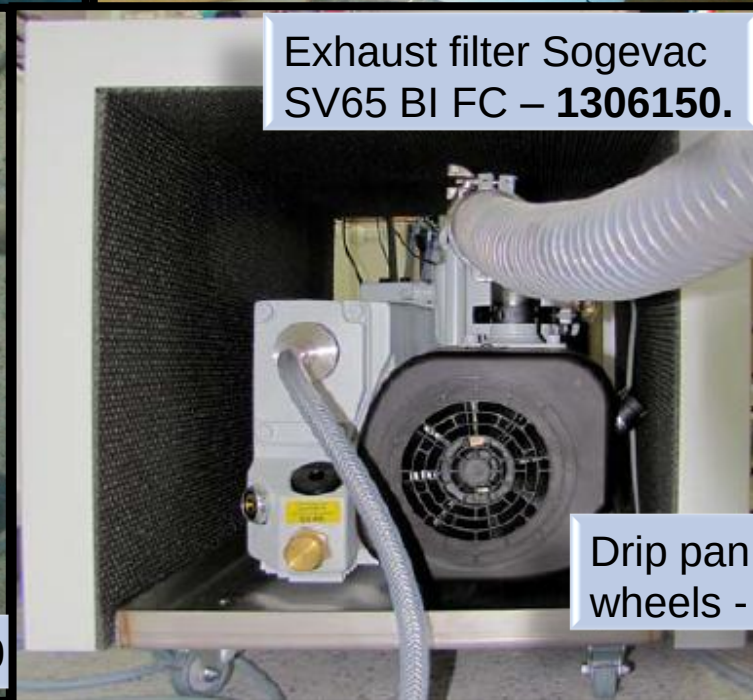
Day 1 - Prepare Forepump



Vacuum hose with steel helix; ID=45 mm, 2 m - Part Number **1302410**



Q Exactive Forepump - Part Number **1302380**

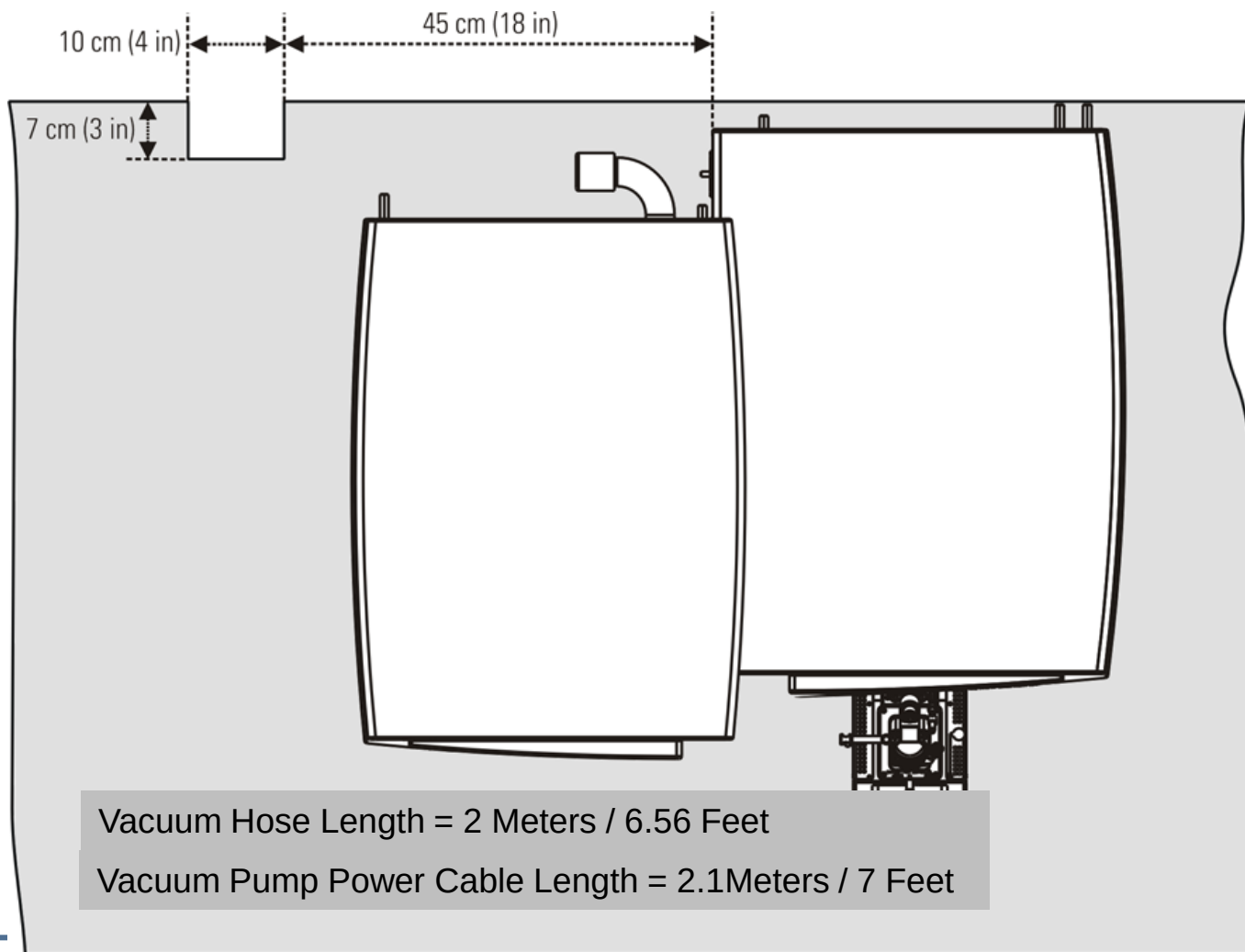


Exhaust filter Sogevac SV65 BI FC – **1306150**.

Drip pan, with wheels - **1296680**

Oops! Don't forget to drill a hole.

Depending on the height of the table and table width

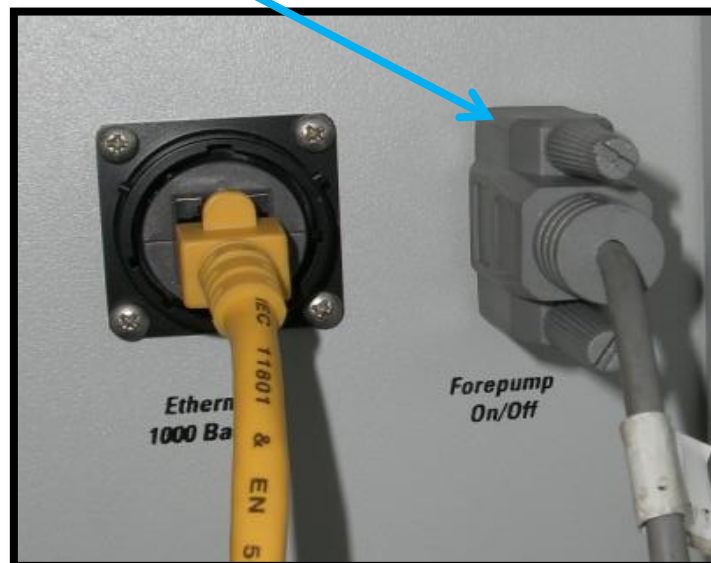
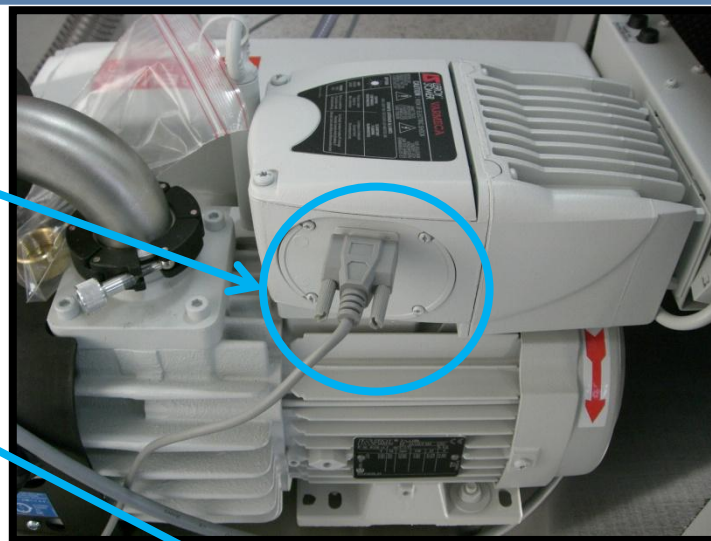


Day 1 - Prepare Forepump

Connect the RS232 cable to the pump.

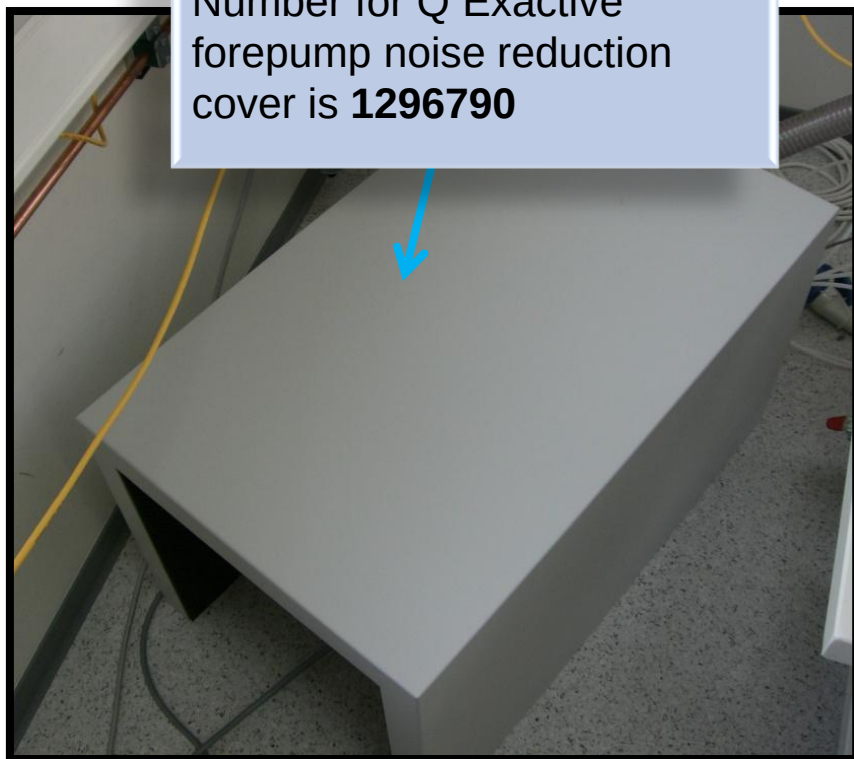
Connect the RS232 to the instrument.

Connect the Forepump power cable to the wall outlet.

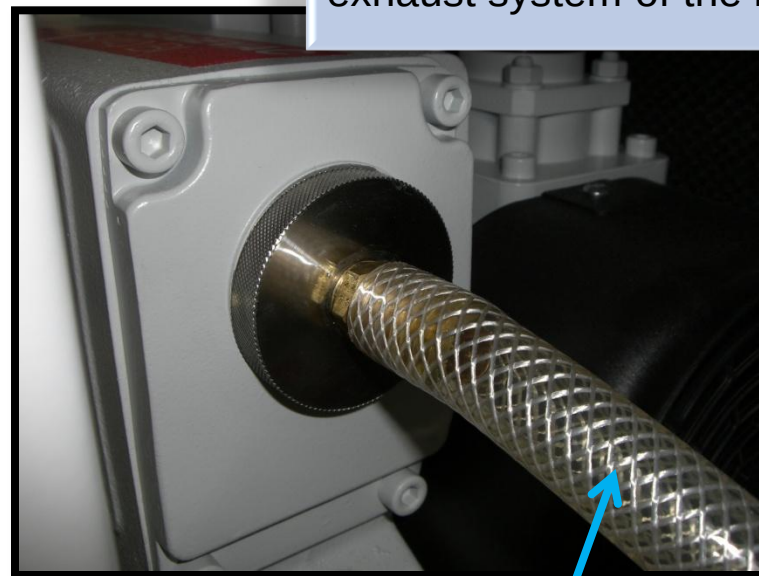


Day 1 - Prepare the Forepump

The forepump noise reduction cover is not designed to support body weight. Part Number for Q Exactive forepump noise reduction cover is **1296790**



Exhaust outlet of the forepump is to be fitted to exhaust system of the lab



Exhaust Hose Part Number **0690720**.
13 × 3.5, PVC

Day 1 - Connect gases

Connect the Nitrogen for the HCD/CLT and the ESI gas. (6mm tubing)

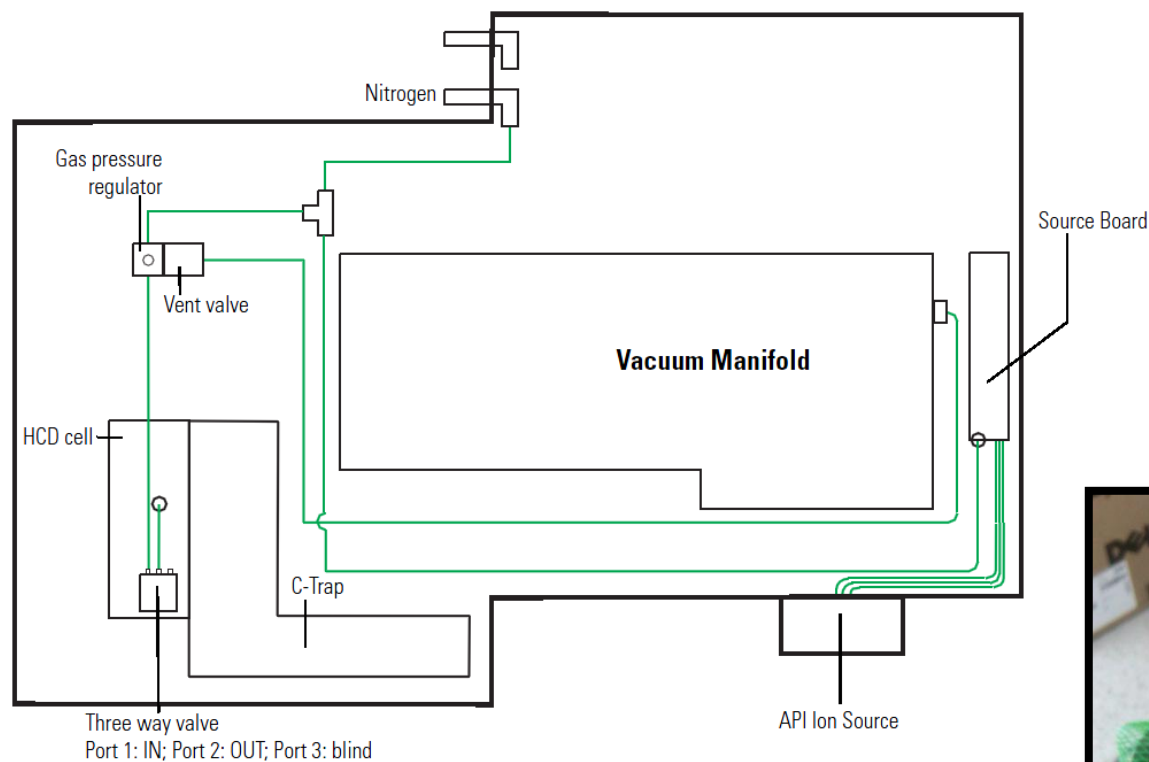
The gas pressure has to be set to 8 bar (116 psi). Otherwise the instrument will have problems with the ion transmission to the Orbitrap.



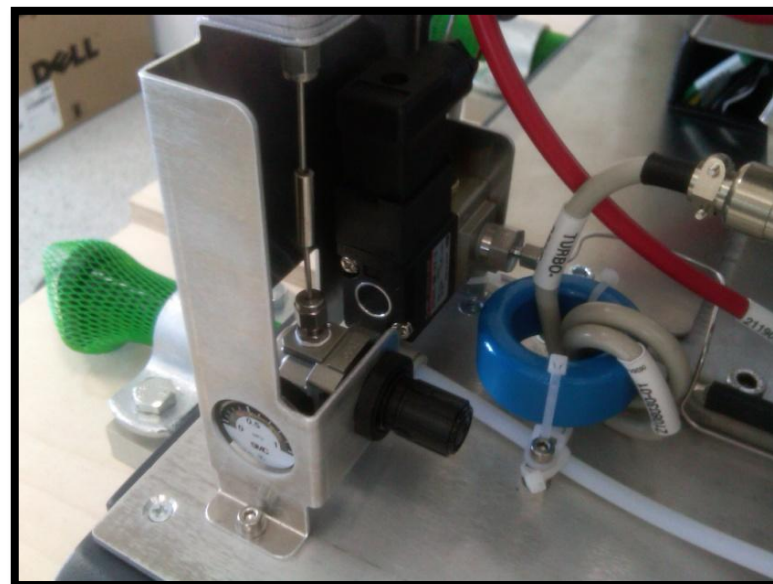
Nitrogen purity specification is 99% or better.



Internal gas plumbing



The Nitrogen is now plumbed similarly to an LTQ Orbitrap Velos where the Nitrogen connects only to the HCD cell. The CLT receives it's nitrogen by being in the vicinity of the HCD cell.



Swagelok Connectors

<http://www.swagelok.com/>

Swagelok Catalog

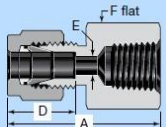
<http://www.swagelok.com/downloads/webcatalogs/en/MS-01-140.pdf?301Red=Y>

It is the customer's responsibility to provide the connector between their gas regulator and our 6mm O.D. Teflon tubing. Sometimes something like this is what is provided!

The aim of this slide is to help you on helping the customer in determining what connectors are needed from Swagelok. It is advisable to have a stock of connectors in your toolbox also.



Female Connectors



NPT

NPT – National Pipe Thread Taper

Tube OD	NPT Size in.	Basic Ordering Number	Dimensions			
			A	D	E	F
Dimensions, mm						
3	1/8	-3M0-7-2	28.7	12.9	2.4	14
	1/4	-3M0-7-4	33.5			19
4	1/8	-4M0-7-2	29.7	13.7	2.4	14
	1/4	-4M0-7-4	31.3			19
6	1/8	-6M0-7-2	31.3	15.3	4.8	14
	1/4	-6M0-7-4	35.8			19
	3/8	-6M0-7-6	37.6			22
	1/2	-6M0-7-8	42.5			27



Swagelok part
Number **B-6M0-7-2**

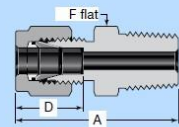
How to Order

Select a basic ordering number. Example -100-6

Add a material designator. Example: SS-100-6

Material	Designator	Material	Designator
316 SS	SS	Alloy C-276	HC
Aluminum	A	Brass	B
Alloy 20	C20	Carbon steel	S
Alloy 400	M	Nylon	NY
Alloy 600	INC	PTFE	T
Alloy 625	625	Titanium (grade 4)	TI
Alloy 825	825		

Male Connectors



NPT

Tube OD	NPT Size in.	Basic Ordering Number	Dimensions			
			A	D	E ^①	F
Dimensions, mm						
2	1/8	-2M0-1-2	30.5	12.9	1.7	12
3	1/8	-3M0-1-2	30.5	12.9	2.4	12
	1/4	-3M0-1-4	35.6			14
4	1/8	-4M0-1-2	31.2	13.7	2.4	12
	1/4	-4M0-1-4	36.3			14
6	1/8	-6M0-1-2	32.8	15.3	4.8	14
	1/4	-6M0-1-4	37.9			14
	3/8	-6M0-1-6	38.4			18
	1/2	-6M0-1-8	44.7			22

Swagelok part
Number **B-6M0-1-2**



Swagelok Connectors

If you must, you may be able to order and use the following Thermo part numbers as a temporary solution / work around. Note the Exactive Nitrogen Tubing outer diameter is 6mm and the fittings listed below that may be of use are 1/4 inch (6.35mm) so you will have to tighten the connector some more than usual.

Please do not use 1/4 inch Teflon tubing. You may damage the push fit connector and the tubing will likely be difficult to remove.



Thermo part numbers for **LTQ** connectors

Exactive does not use Helium

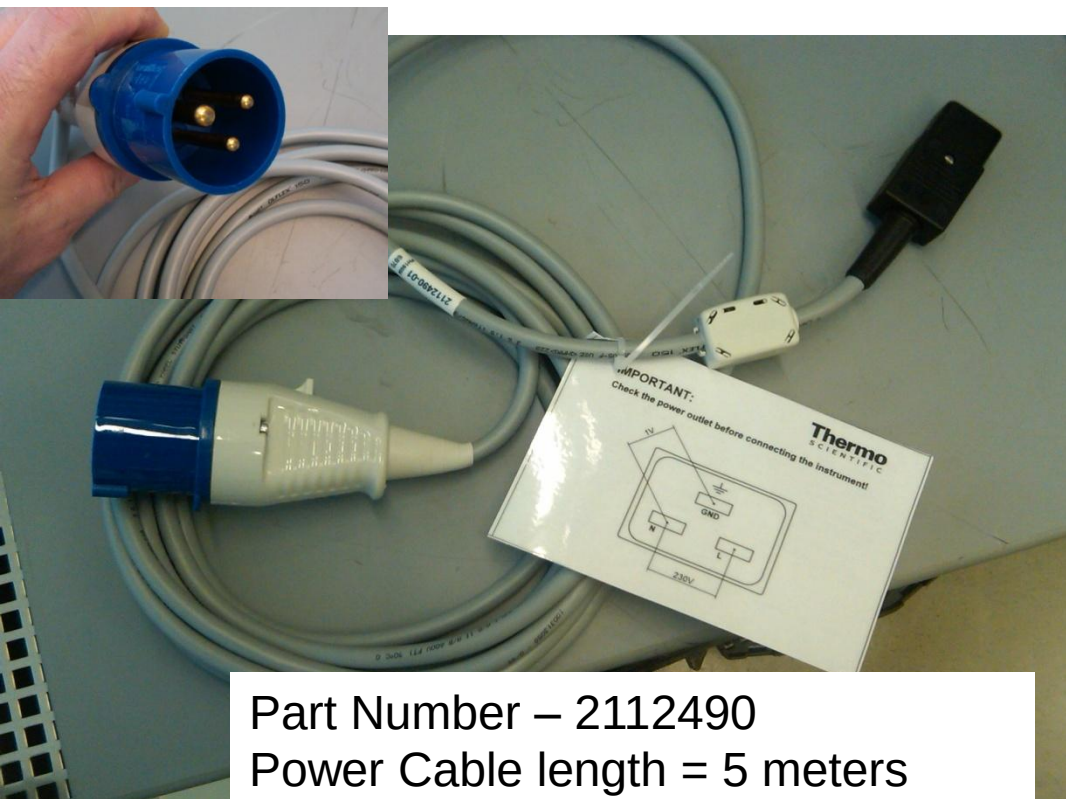
97055-62037S

KIT,INSTALL,TANK FTGS,1/8 & 1/4,He & N2

Part Number	Part Description	Quantity	Unit of Measure
00101-01709	FTG SWG-CONN 1/4FPT X 1/8	1	EA
00101-01712	FTG SWG CONN 1/4MPTX1/8 B	1	EA
00101-01-00005	FTG,SWG,CONN, 1/4 X 1/4 MALE, NPT	1	EA
00101-01-00006	FTG,SWG,CONN,1/4 X 1/4 FE-M, NPT	1	EA

Day 1 - Start main power

- Connect the main power cable
- Start the vacuum system by turning on the circuit breaker.
The service switch stays OFF



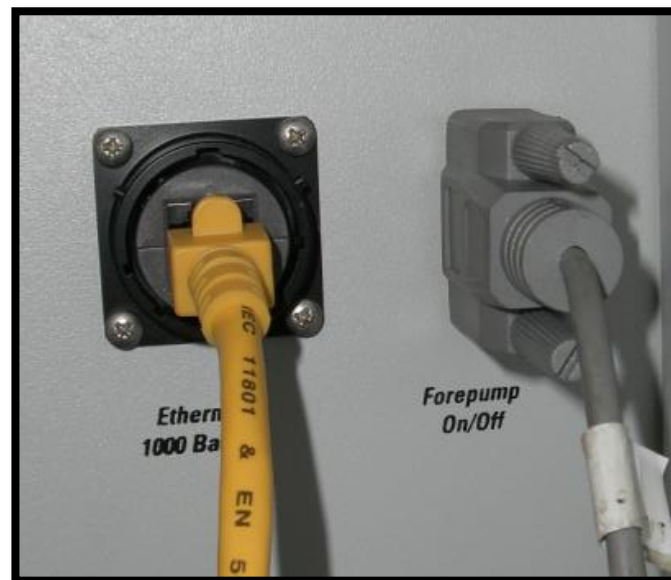
Part Number – 2112490
Power Cable length = 5 meters



Day 1 - Install PC

Unpack and install the Dell data system.
Connect the PC to the switch

Connect the switch to the Ethernet port
located at the rear of the instrument.



Thermo Fisher Scientific
Mouse Pad - **1150720**

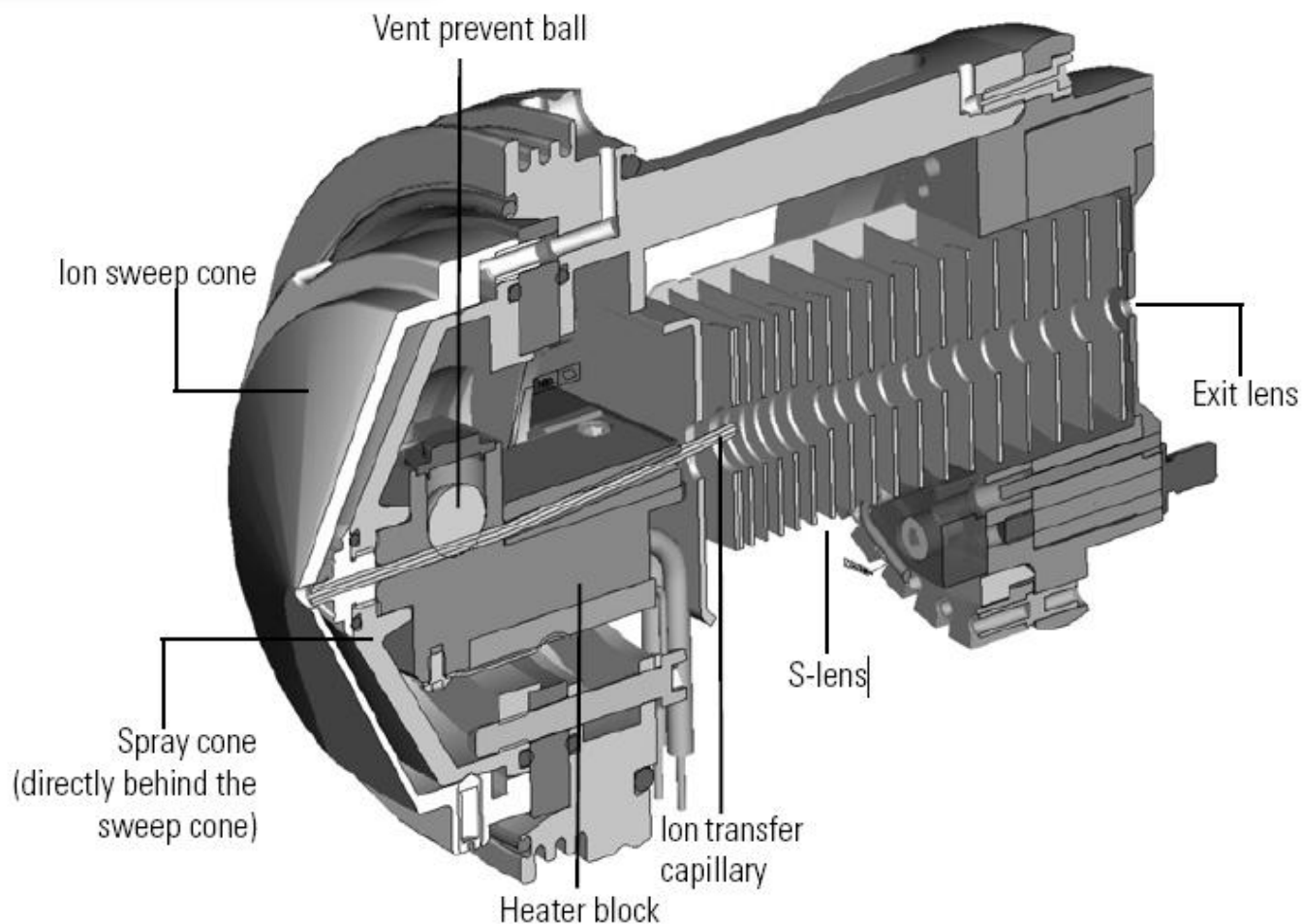
Day 1 – Wait before turning on Electronics

While you waiting for the instrument to pump down, you can set up the ESI or HESI Source and probe, Syringe Pump, Divert Valve, Install the Metal Needle, connect the Infusion line, Solvent Waste Line, prepare the Cal Mix and Buspirone sample or consume some dark brown caffeine solution.

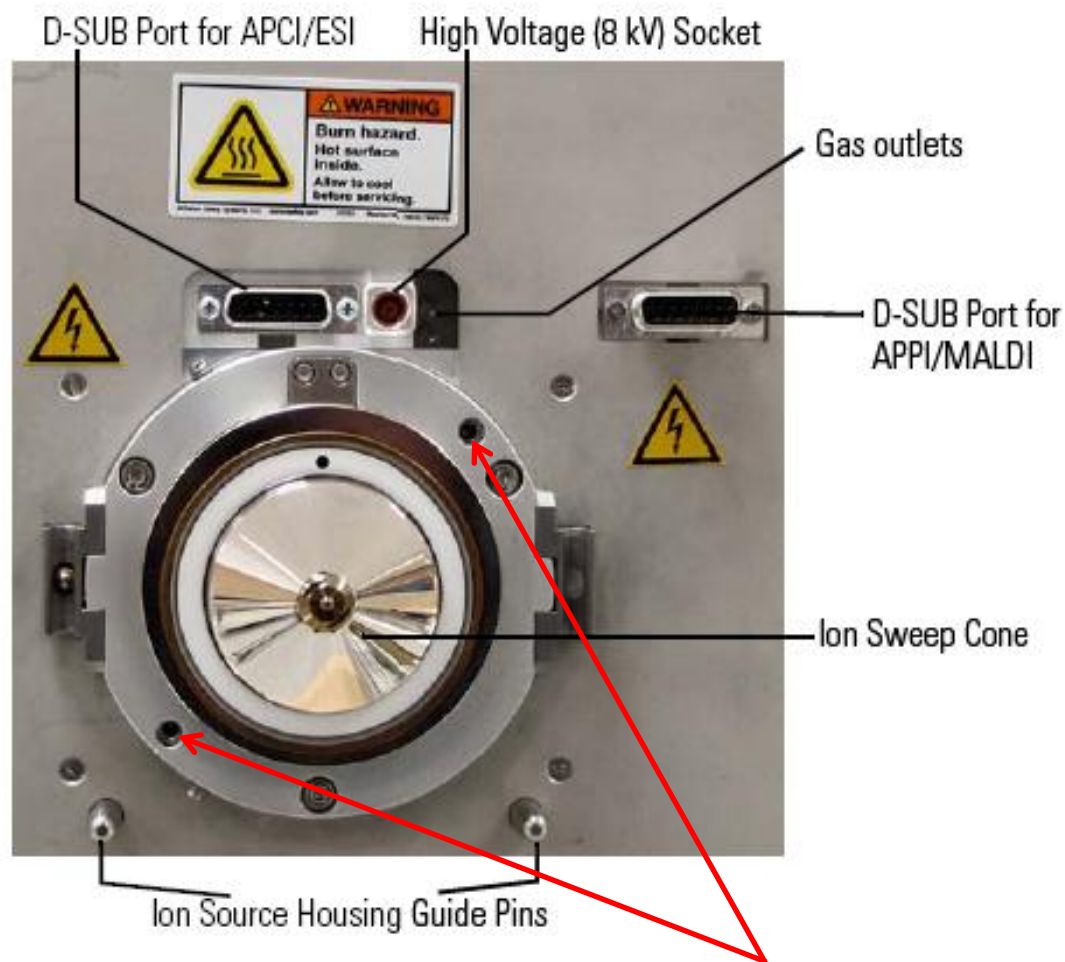


SRIG

SRIG (Stacked Ring Ion Guide).

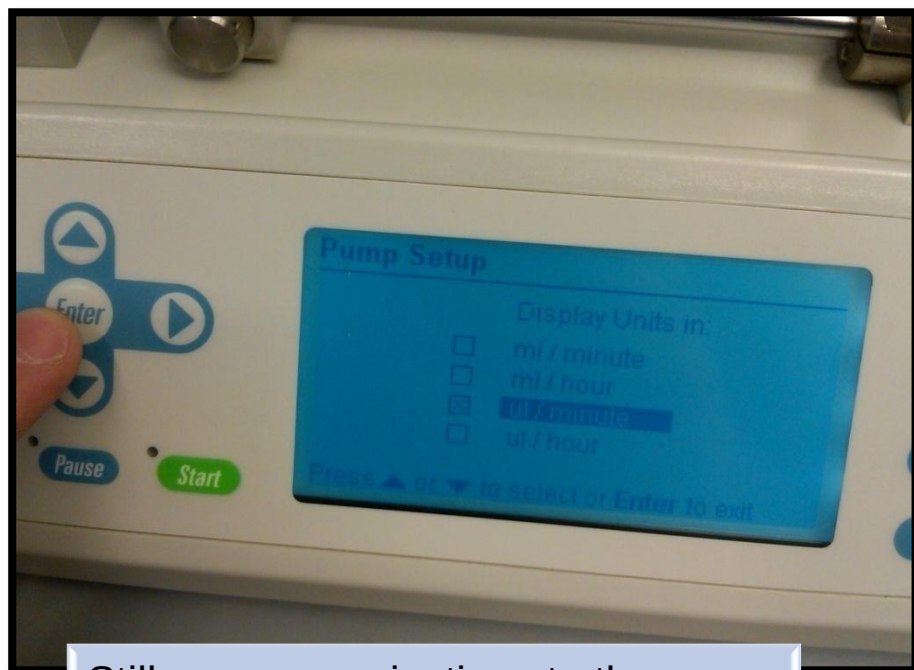
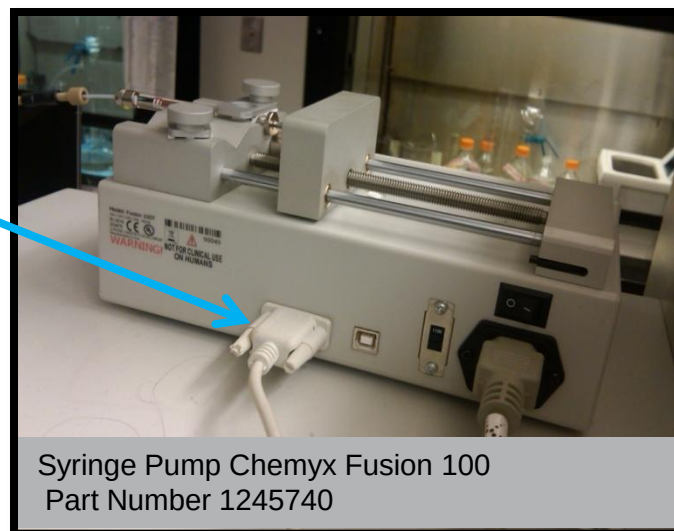
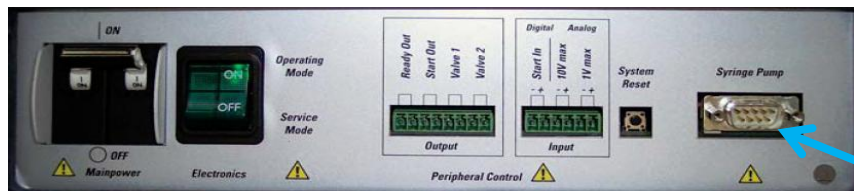


Srig Source



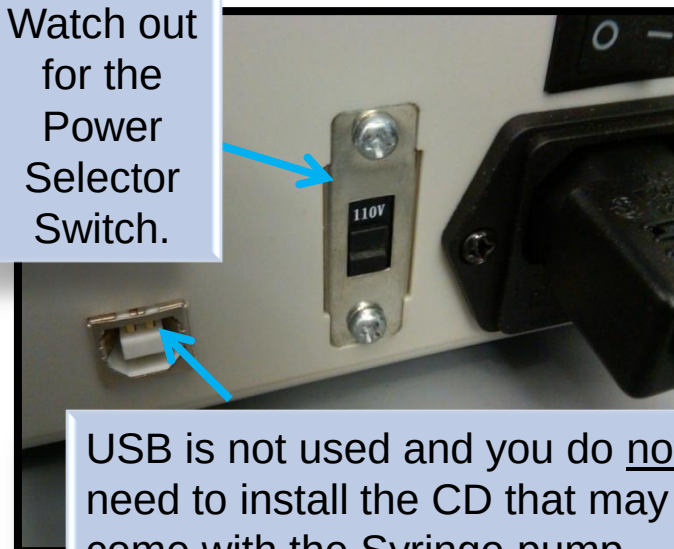
Screws to push out the outer cage

Syringe Pump



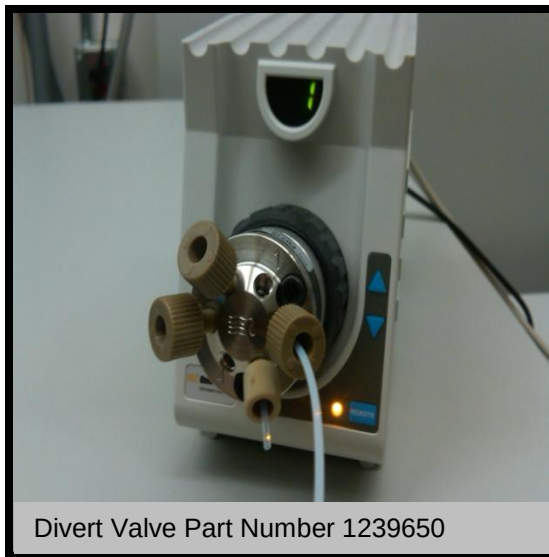
Still no communications to the Syringe Pump? Refer to Service Note Exactive - 014

Watch out for the Power Selector Switch.

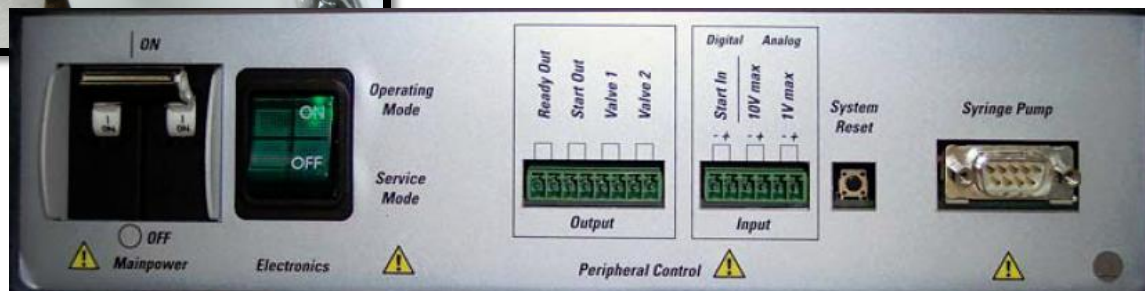
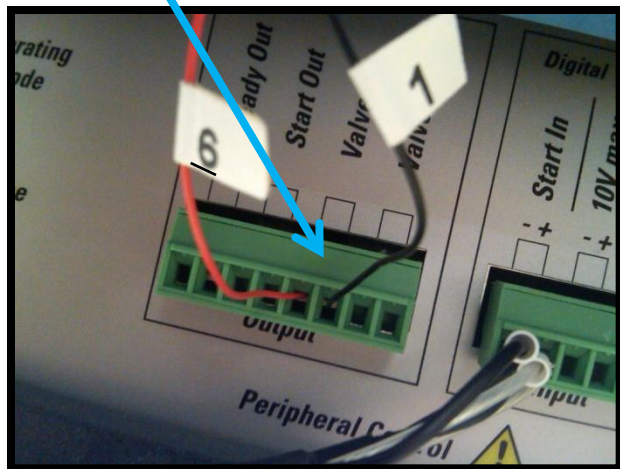
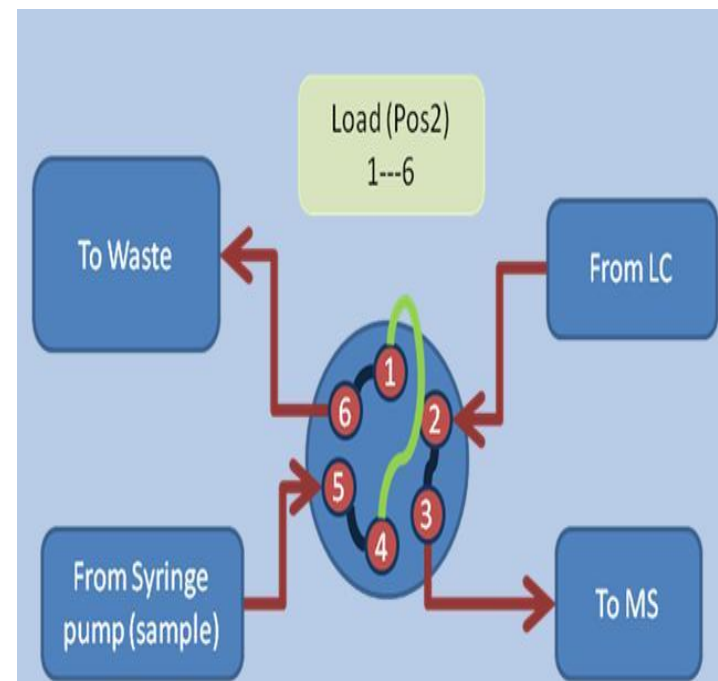


USB is not used and you do not need to install the CD that may come with the Syringe pump.

Divert valve



Divert Valve Part Number 1239650



Holder Assembly

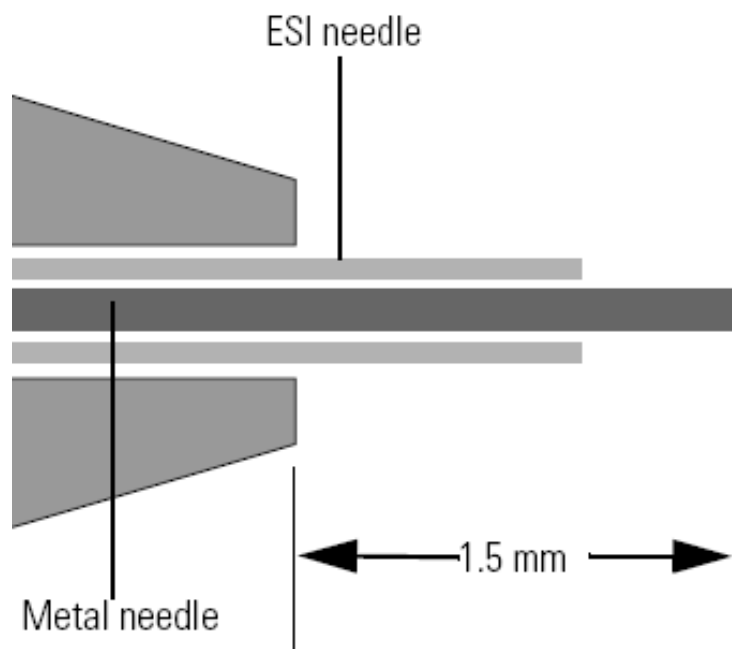


Holder assembly (Syringe
Pump/Valves)**1302140**

Installing the HESI II

High flow metal needle is installed and usually adjusted

If adjustment or replacement is required, follow the steps on the next slides

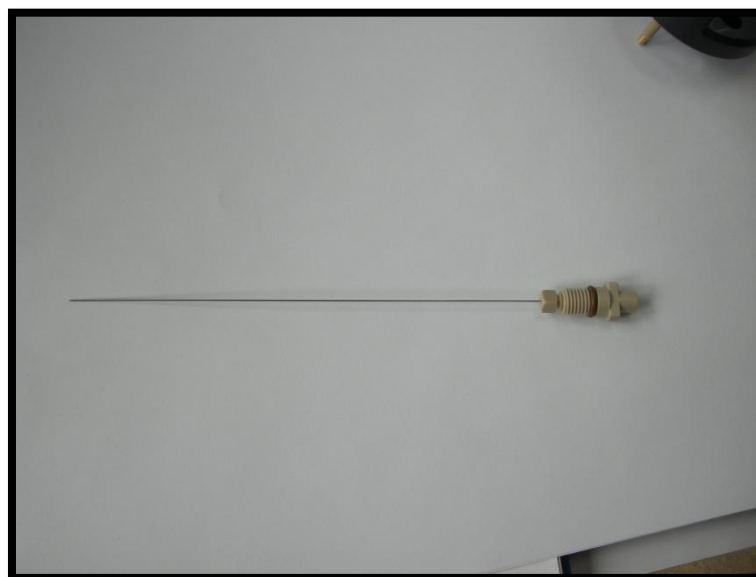


Installing the HESI II

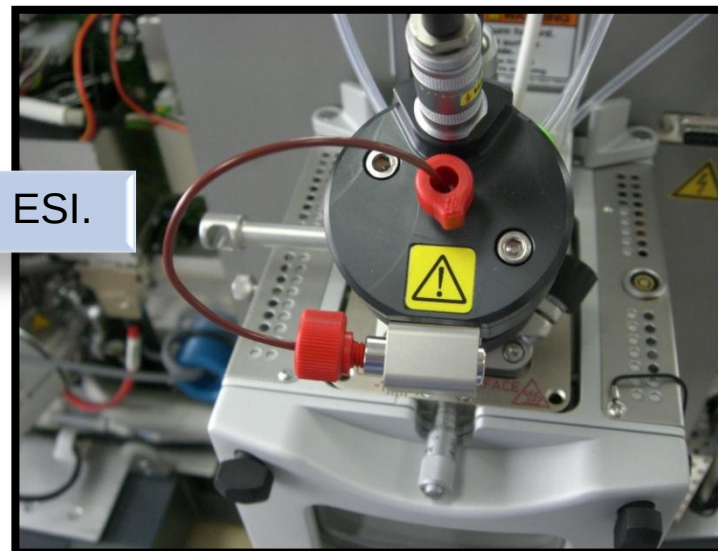
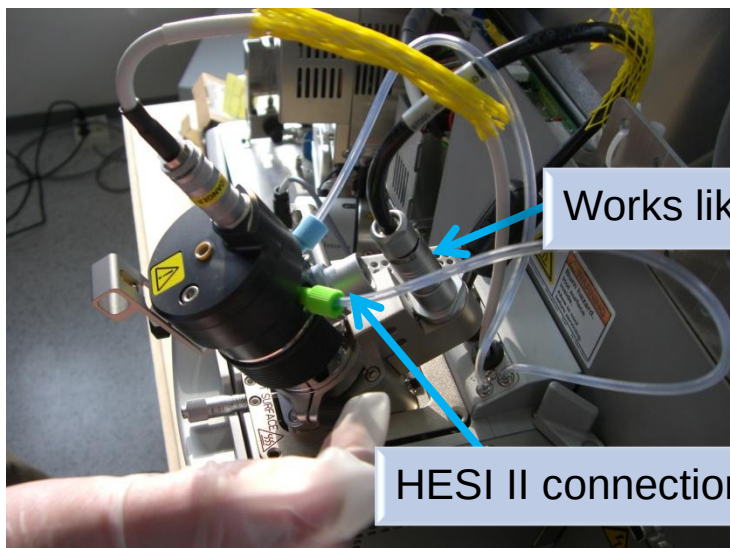
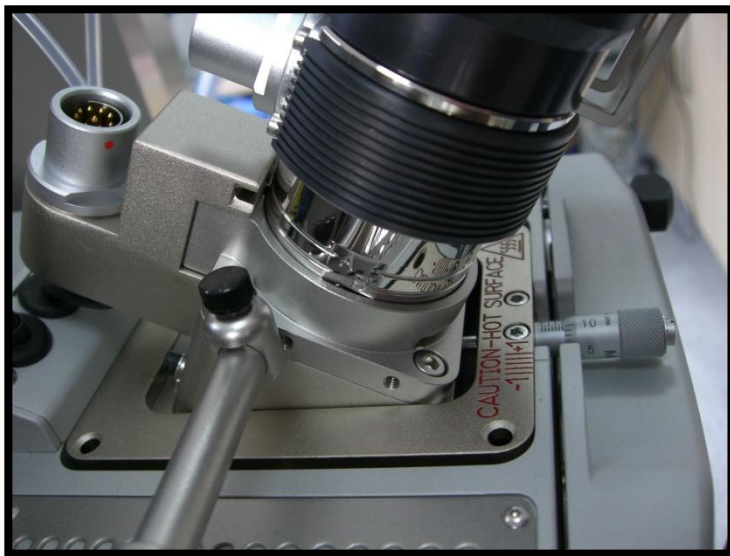
HESI - Heated Electrospray Ionization.



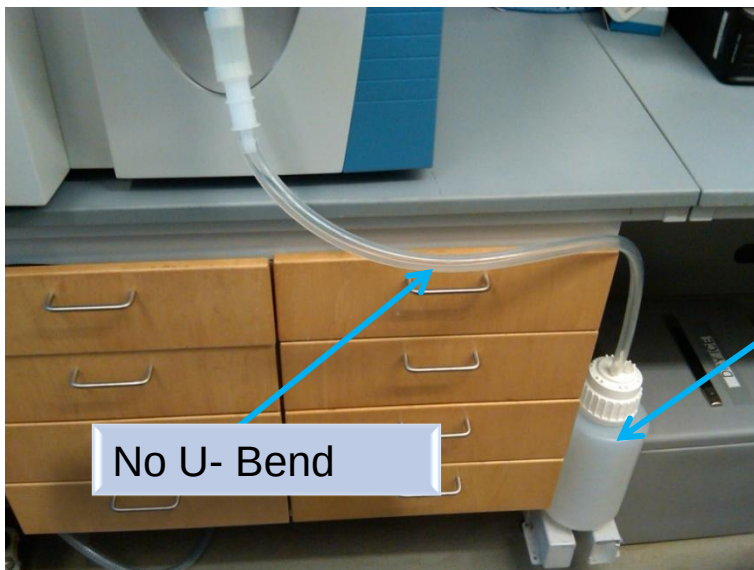
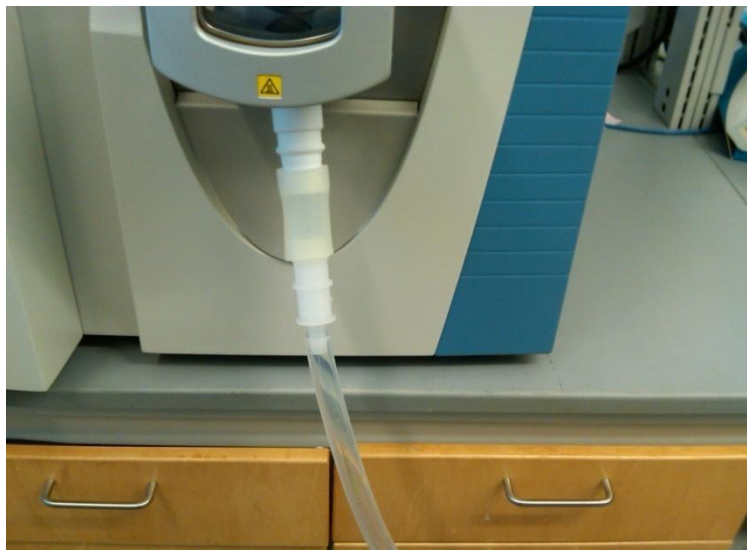
Installing the HESI II



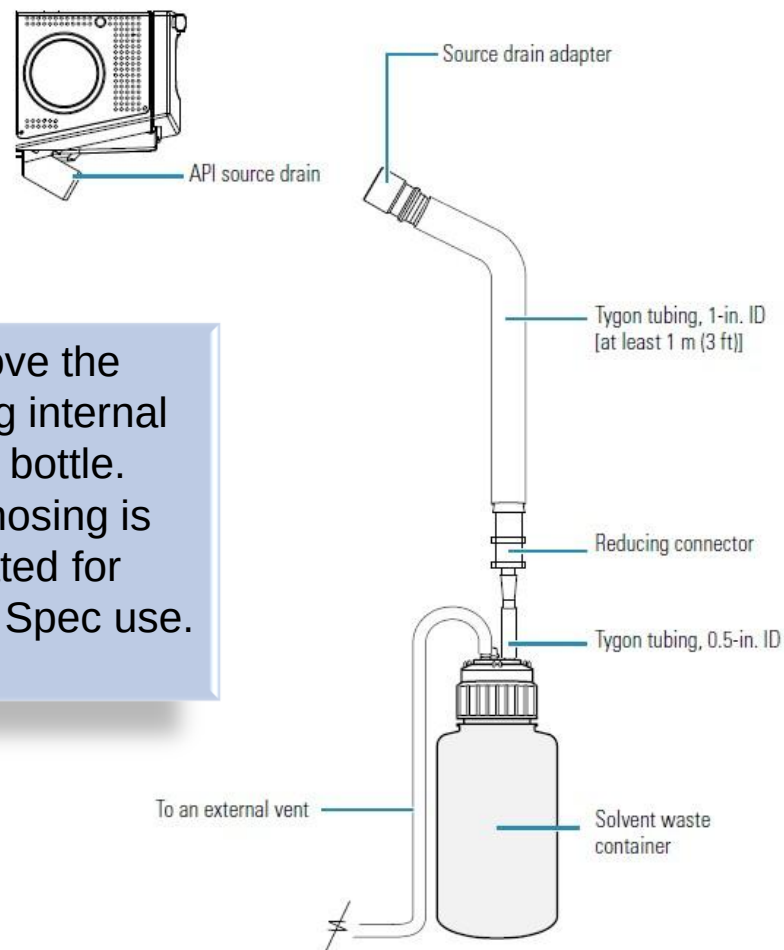
Installing the HESI II



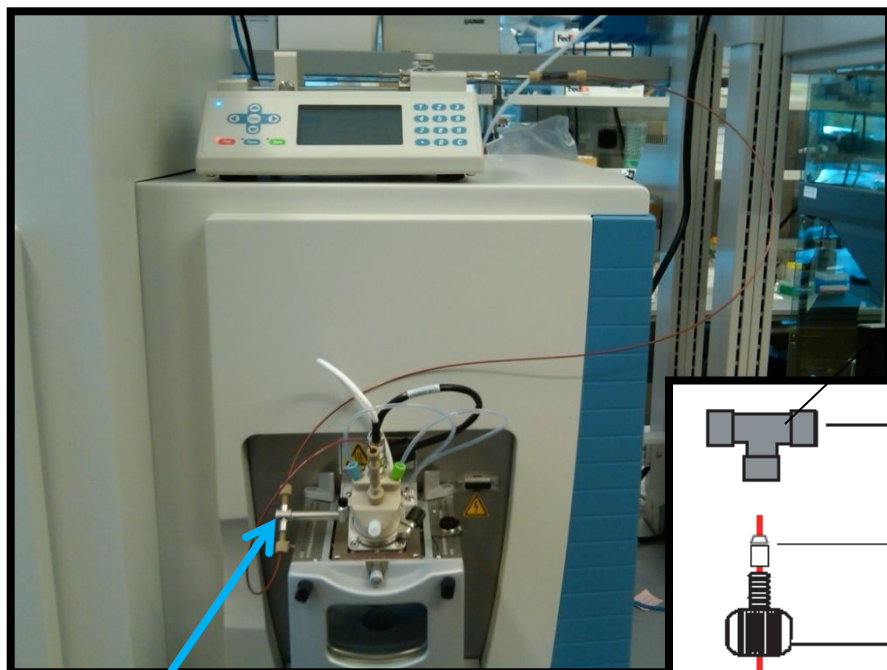
Waste Line



Remove the hosing internal to the bottle. This hosing is not rated for Mass Spec use.



Infusion Line

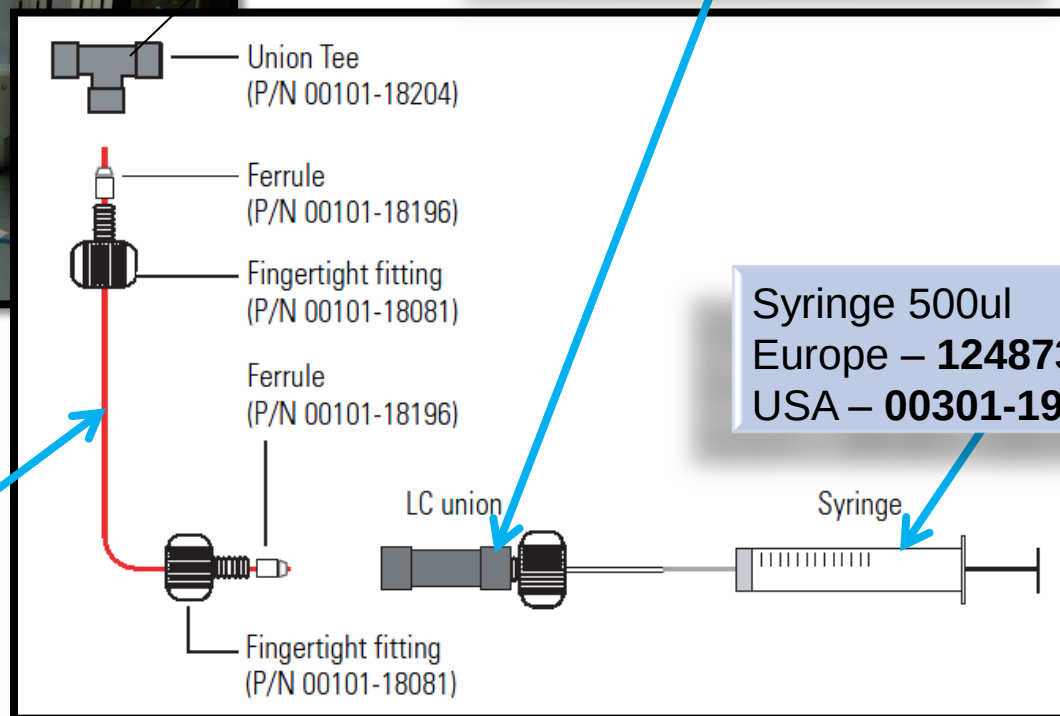


Grounding Union part number **97055-20230**

PEEK Tubing part number **00301-22912.**

Union tee does not come with the installation kit

HPLC Union 0.010 orifice, PEEK **00101-18202**



Syringe 500ul
Europe – **1248730**
USA – **00301-19016**

Day 1 - Turn on electronics

After about half an hour turn on the electronics and establish communications.

Thermo Exactive, version 0.1 at 172.16.0.200 is connected

Note:
Any changes here affect the data acquisition or the functionality of your instrument. **Never change anything except during installation of the instrument.** A later change will rarely solve problems users have to face.

Path to instrument files: C:\Xcalibur\system\Exactive\instrument

Path to log files: C:\Xcalibur\system\Exactive\log

Base port: 6018

Network address: 00-1C-C0-8F-28-67

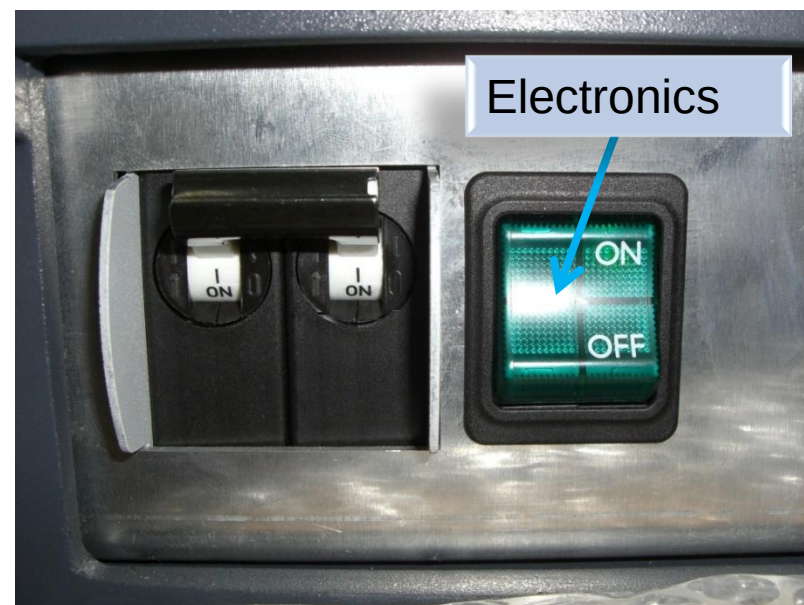
IP address: 172.16.0.200

Public Name: Exactive slot #49

IP address range: 172.16.0.200-172.16.0.209

Instrument Thermo Exactive is connected to the service.

Apply Reset changes Help



Communications should be automatic.

Electrometer check

Instrument	Electronics - Digital Boards - FT Adapter - no
+ Current Scan	
Control	
+ Settings	
+ Mass Calibration Data	
Procedures	;0.0;
+ Default Mass List	Calmix
+ User Mass List	Calmix
+ AutoTune	1;;AutoTune
+ Calibrate	1;;Calibrate
+ Bakeout	1;;Bakeout
Evaluate	1;;Evaluate
+ Positive Ion Evaluation	1;;Positive Ion Evaluation
+ Negative Ion Evaluation	0;;Negative Ion Evaluation
+ Extra Evaluation	0;;Extra Evaluation
+ Factory Test	# 12 / 12 ok --- 0 f
Diagnostics (Service/Support)	0;;Diagnostics (Service/Support)
+ Device Calibration	0;;Device Calibration
Transfer MP DC scan	0;;Transfer MP DC scan
2nd harmonic test	0;;2nd harmonic test
Ion transfer time evaluation	0;;Ion transfer time evaluation
Flatapole Evaluation	0;;Flatapole Evaluation
Check for ions with electrometer	0;;Check for ions with electrometer
Readback and Voltage check	0;;Readback and Voltage check
Basic Performance Check	0;;Basic Performance Check

The syringe pump is not controlled by the procedure.

Enable it manually or infuse some calmix by hand.

The signal should reach around 20-100e6 if everything is fine.

Reset the instrument when finished

Day 1 - Start bake out

- Set the time for bake out to 16h.
- Start Bake out.
- System and Vacuum LED's start blinking.

Vacuum / Bakeout

Fore vacuum (mbar)	2.18E+00	●
High vacuum (mbar)	3.30E-05	●
UHV (mbar)		

Bakeout time (h)

Enter standby after Bakeout ☒

Pre-bake
Vacuum

Vacuum / Bakeout

Fore vacuum (mbar)	1.89E+00	●
High vacuum (mbar)	9.45E-06	●
UHV (mbar)	1.50E-10	●

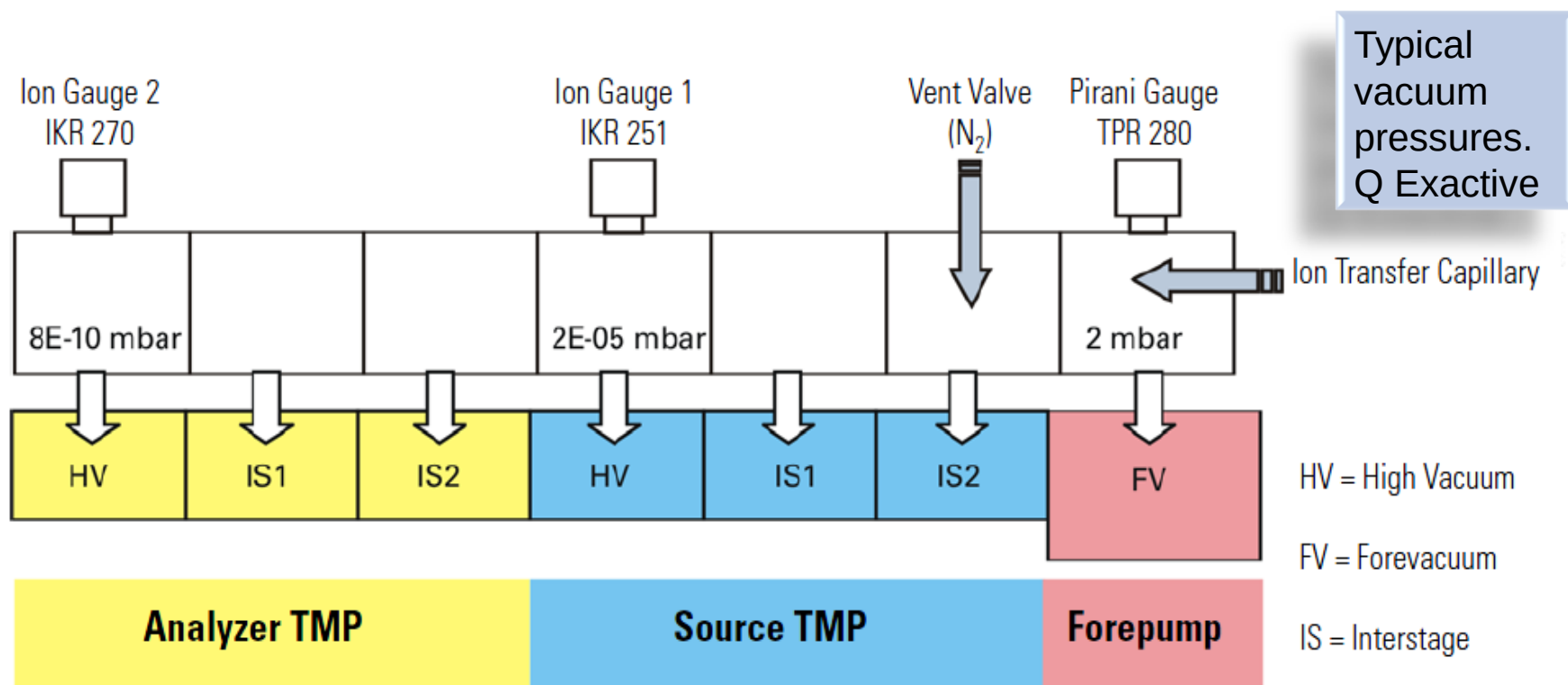
Bakeout time (h)

Post-bake
Vacuum

Turns off after 30
minutes

Bake out stop's if

- The preset duration has expired
- Pressure raises above a preset value.



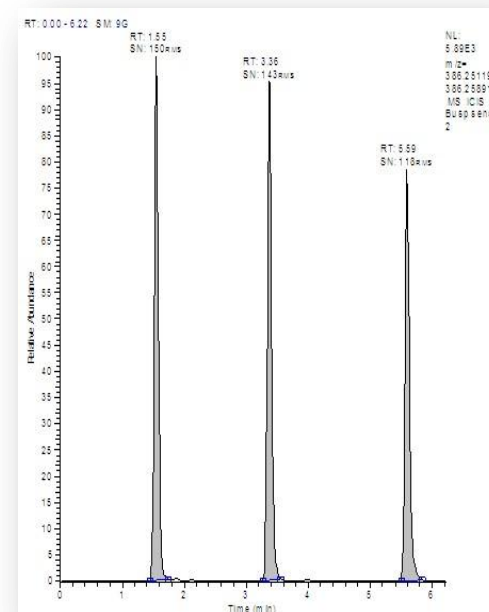
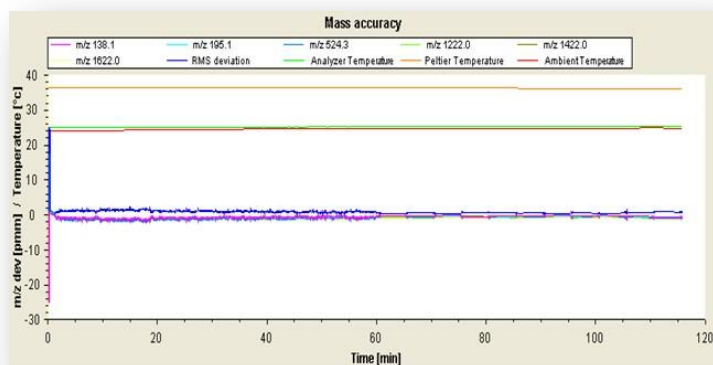
Using the electrometer tool without the procedure

- **For this, the instrument operating state needs to be “On”**
- Instrument -> system -> user role “service”
- Instrument -> control-> settings -> ion injections -> Multi RF set from 4 to 100
- Instrument -> control-> settings -> define scan -> electrometer -> electrometer mode set to “beam”
- View now the ion current in
- Instrument -> electronics-> ion optics board II -> define scan -> electrometer control -> electrometer reading
- When you have an ion beam the reading should be as follow:
- Pos mode and NO spray voltage +/- 2 pA
- Pos mode and spray voltage > 30 pA
- Neg mode spray voltage (with pos calmix) > -3pA

Day 2 – Start the Acceptance Tests

ThermoFisher
SCIENTIFIC

Q Exactive INSTALLATION ACCEPTANCE Revision 0



ThermoFisher
SCIENTIFIC

Thermo Fisher
Hanna-Kunat
28199 Bremen
Phone 0421-5
Fax 0421-5

4. Quadrupole Isolation

The Isolation width of the Quadrupole is depending on the mass range. The following table shows the ranges with the smallest isolation width possible. Lowering the isolation width is accomplished by increasing the signal.

Mass range	Isolation width	Signal
$50 < m/z \leq 400$	> 0.4 amu	Low
$400 < m/z \leq 700$	> 0.7 amu	Medium
$700 < m/z \leq 1000$	> 1.0 amu	High
$1000 < m/z \leq 2000$	> 2.0 amu	Very High