



ThermoFisher
SCIENTIFIC

Orbitrap Exploris 480 Familiarization

Revision 00 – July 2019

Proprietary & Confidential

The world leader in serving science

Objective

- Training document for FSE, not to be shared with customer
- Guide: what needs to be shown the customer during familiarization
- **direct to customer facing documentation:**
 - Quick user guides
 - Operating manuals
 - Knowledgebase
 - Extended Maintenance manual

☐	☐	Customer has contact information for each of the following areas									
☐	☐	Knowledge-base/Website		☐	☐	Tech Support		☐	☐	Customer Service	
☐	☐	Training		☐	☐	Spare Parts		☐	☐	Field Service	
F. Customer Familiarization											
Review Hardware modules that were installed (from section A above)											
Yes	No	TASK		Yes	No	TASK		Yes	No	TASK	
☐	☐	System Start Up		☐	☐	Daily Maintenance		☐	☐		
☐	☐	System Shut down		☐	☐	Monthly Maintenance		☐	☐		
☐	☐	Sample Flow		☐	☐	Sample Injection		☐	☐		
Review Software/System Operation (based on section C above)											
Yes	No	TASK		Yes	No	TASK		Yes	No	TASK	
☐	☐	Software Start Up		☐	☐	Saving Method		☐	☐	Saving Data	
☐	☐	Sample Set Up		☐	☐	Data Reporting		☐	☐	Software Shut Down	
☐	☐	How to run Samples		☐	☐	Data Collection		☐	☐		

Find most up to date documentation on thermofisher.com and ULS knowledgebase

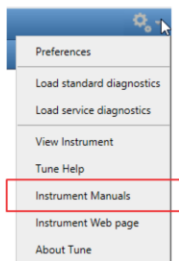
Outline

- [Where to find information](#)
- [Overview of the instrument](#)
- [System start-up](#)
 - [Safety](#)
 - [System pump-down and bake out procedure](#)
 - [Instrument configuration and integration in system](#)
- [System shut-down](#)
- [Software](#)
- [Maintenance](#)
- [Consumables](#)

Do not share with customer, ppt to be used as general guide to FSE on what to show during familiarization.

Where to find information

- In tune:
 - Orbitrap Exploris manuals
 - Source manuals



1.0 > System > Programs > dependencies > Manuals

Name	Date modified
EASY-ETD-IC_User	5/27/2019 1:57 PM
EASY-Spray_Series_User	5/27/2019 1:57 PM
Ion_Max_NG_EASY_Max_NG_User	5/27/2019 1:57 PM
NanosprayFlexSeries_User	5/27/2019 1:57 PM
Orbitrap_Exploris_480_Operating	5/27/2019 1:57 PM
Orbitrap_Exploris_480_Preinstallation	5/27/2019 1:57 PM

- Hardcopy: Pump manuals

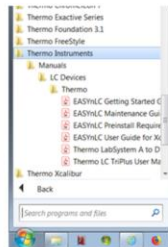
Manuals can be found installed or on help sections.
direct customer also to ULS knowledgebase, thermofisher.com, for most up to date documents, tips&tricks, etc

Where to find information

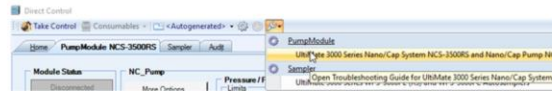
• EASY-nLC

Name	Date modified	Type	Size
EASynLC_Maintenance	8/25/2015 5:05 PM	Adobe Acrobat D...	47,664 KB
EASynLC_Preinstall	8/25/2015 5:05 PM	Adobe Acrobat D...	1,908 KB
EASynLC_Start	8/25/2015 5:05 PM	Adobe Acrobat D...	12,606 KB
EASynLC_Xcalibur_User	8/25/2015 5:05 PM	Adobe Acrobat D...	1,367 KB

Or via windows start



• UltiMate RSLC nano



Manuals can be found installed or on help sections.
direct customer also to ULS Knowledgebase, thermofisher.com, for most up to date documents, tips&tricks, etc
Engineers are advised to consult the internal sharepoints for latest information
LC: TMC OneDrive for latest familiarization instructions

Where to find information

Contacting Us

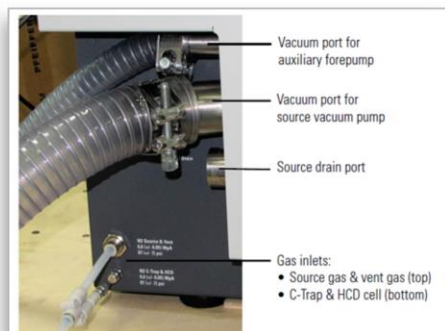
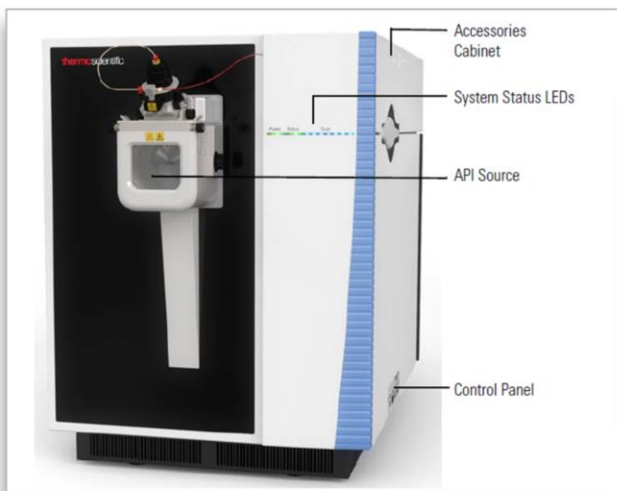
There are several ways to contact Thermo Fisher Scientific. You can use your smartphone to scan a QR Code, which opens your email application or browser.

Contact	Link / Resource	QR Code
Brochures and Ordering Information	www.thermofisher.com/ordering	
Product Information	www.thermofisher.com/usa/products	
Service Contact	www.thermofisher.com	
Technical Documentation SharePoint	• To get user manuals for your product 1. With the serial number (S/N) of your instrument, request access on our customer SharePoint as a customer at www.thermofisher.com/technicaldocumentation 2. For the first login, you have to create an account. Follow the instructions given on screen. Accept the invitation within six days and log in with your created Microsoft® password. 3. Download content sections of user manuals and other customer-oriented documents for your product. Translations into other languages may be available there as well.	
Customer Feedback	• To suggest changes to this manual You are encouraged to report errors or omissions in the text or index. Send an email message to the Technical Editor at documentation.feedback@thermofisher.com.	

- [ULS Knowledgebase](#)
- [Planet Orbitrap](#)
- www.thermofisher.com
- [Software Download and Licensing Portal](#)
- [Bremen Technical Documentation](#)

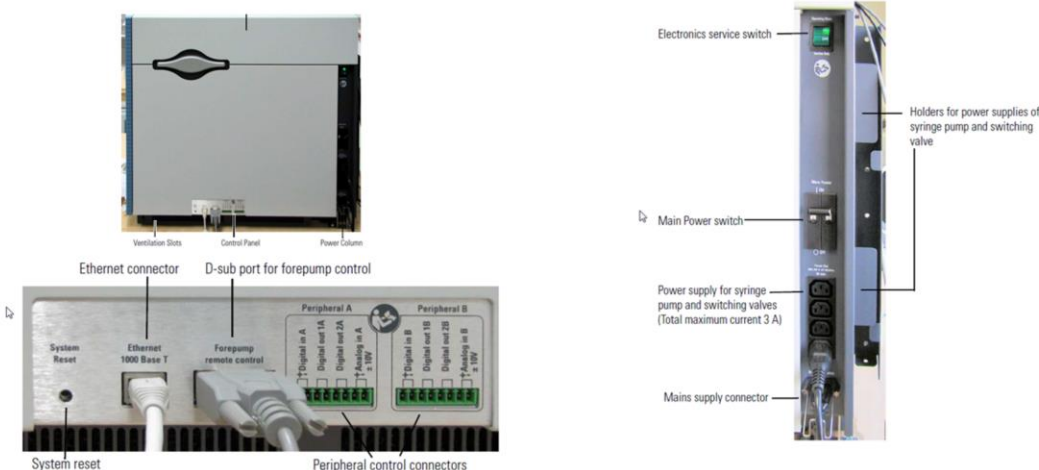
Manuals can be found installed or on help sections.
direct customer also to the respective sites for most up to date documents,
tips&tricks, etc

Orbitrap Exploris 480: layout



The Orbitrap Exploris 480 mass spectrometer is a stand-alone Orbitrap™ instrument with an atmospheric pressure ionization (API) source for liquid chromatography (LC) mass spectrometry (MS) high-throughput applications. The instrument is designed to be placed on a bench in the laboratory. The forevacuum ports, the source drain port, and the gas inlets are at the left side of the instrument.

Orbitrap Exploris 480: layout



8 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

The *reset button* is located on the control panel. When you press the reset button, the instrument software is reloaded from the data system.

Use the Ethernet port to connect the mass spectrometer to the data system computer.

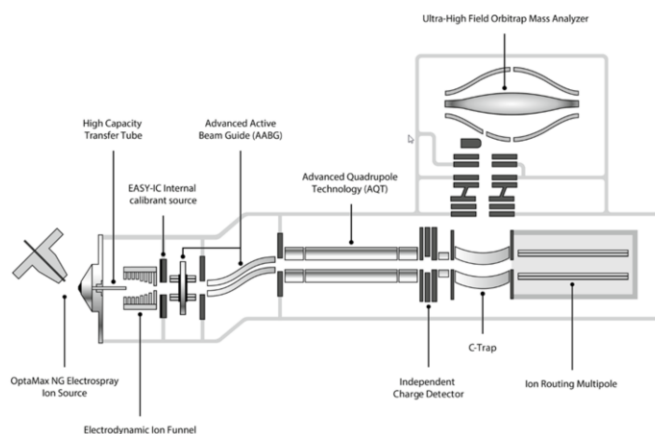
Use the D-sub port to connect the remote control cable that is used for switching the forepump with a contact closure (relay output) signal. The Orbitrap Exploris 480 MS has identical connectors (Peripheral A, Peripheral B) to communicate with two peripherals (LCs, for example) by digital and analog signals.

The main power circuit breaker switch (labeled Main Power) is located in the middle of the power column. In the OFF (O) position, the circuit breaker removes all power to the mass spectrometer, including the turbomolecular pump. It switches off the forepump by the remote control cable. In the ON (I) position, power is supplied to the mass spectrometer. In the standard operational mode, the circuit breaker is kept in the ON (I) position.

Use the four power outlets below the main power circuit breaker to supply electric power for low power devices of the LC/MS system (for example, a syringe pump or switching valves). These outlets are rated at 208–240 V AC, 50/60 Hz, 3 A total maximum. They are controlled by the main power circuit breaker switch and not by the electronics service switch.

Use separate wall outlets to supply electrical power for the forepump, the data system, and the devices of the LC/MS system if applicable.

Orbitrap Exploris 480



[Animation](#)

9 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

The Orbitrap Exploris 480 mass spectrometer consists of six main components.

- Ion source
- Injection filter with mass resolving capabilities
- Quadrupole mass filter for precursor ion selection
- C-Trap for short pulse injection
- Ion Routing multipole
- Orbitrap analyzer for Fourier transform mass analysis

Operating Modes:

Samples can be introduced into the Thermo Scientific OptaMax NG™ API source at the front side by a variety of methods that include direct infusion (with a syringe pump) or a U-HPLC system (for example, Thermo Scientific UltiMate 3000).

The injection filter transmits ions from the source to the quadrupole. The injection filter also performs coarse pre-filtering of ions according to their mass-to-charge ratios.

The bent flatapole always acts as an ion transmission device. It guides the ions

through an arc from the injection filter to the quadrupole and removes the neutral gas jet and solvent droplets that pass through the ion funnel and the injection filter. The neutral particles cannot follow the bent path of the flatapole.

The quadrupole rod assembly operates as an ion transmission device with the possibility to filter the transmitted ions according to their mass-to-charge ratios. By applying RF voltages and DC voltages to the rods, the filter characteristic are configured.

The independent charge detector (ICD) is positioned between the quadrupole and the C-Trap. It is used to increase the fidelity of the Automatic Gain Control (AGC) in certain operation modes. The assembly includes a split lens, which is used to start and stop the injection of ions into the C-Trap. A precise determination of the ion beam intensity and a fast switching of the ion beam are needed for the Automatic Gain Control (AGC) of the Orbitrap mass analyzer. The assembly also includes a short transport RF multipole, which is the interface between the ICD and the C-Trap.

The ions are transferred into the C-Trap through four stages of differential pumping. The ions are passed through the C-Trap into the ion-routing multipole. For Full scan operation, the ion routing multipole is used to cool and trap the ions. A potential gradient is used to effectively transport the ions back towards the C-Trap.

For HCD (Higher Energy Collisional Dissociation), ions pass through the C-Trap into the ion-routing multipole. The offset voltage between the C-Trap and the IRM accelerates the precursor ions into the gas-filled multipole. In combination with the quadrupole mass filter, this allows MS/MS experiments or all-ion fragmentation (AIF) in case of a broad range of selected mass-to-charge ratios. After the ions have been fragmented in the ion-routing multipole, the ion-routing multipole voltages are ramped up and the ions are transferred back into the C-Trap.

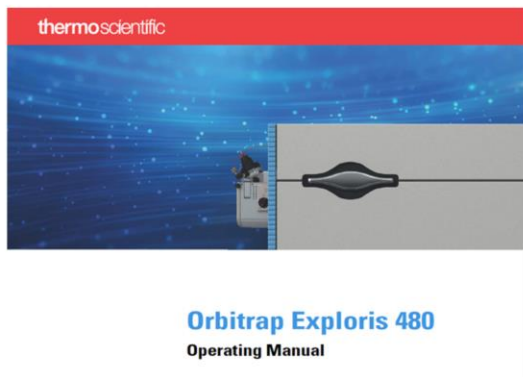
From the C-Trap, the ions are then injected through three further stages of differential pumping by a lens system (Z-lens) into the Orbitrap analyzer where mass spectra are acquired by image current detection. The vacuum inside the Orbitrap analyzer is maintained below $1\text{E-}9$ mbar.

System startup

- [Safety](#)
- [System pump-down and bake out procedure](#)
- [Instrument configuration and integration in system](#)
 - [Optamax Ion Source](#)
 - [Peripherals](#)

- Depending on Configuration:

- [IC option](#)
- [EASY-nLC](#)
- [UltiMate 3000](#)
- [EASY Spray Ion Source](#)
- [Nano Spray Flex Ion Source](#)
- [FAIMS](#)



Contents

- Safety Symbols and Signal Words in this Manual on page 4-2
- Safety Symbols on the Instrument on page 4-3
- Intended Use on page 4-5
- Electric Safety Precautions on page 4-8
- In Case of an Emergency on page 4-9
- Residual Hazards on page 4-10
- Personal Protective Equipment on page 4-12



In the instrument computer show the customer where to find the instrument operating manual. Show the customer the Safety Chapter. This chapter contains information that is important for your own safety or the safety of others, and that prevents damage to the instrument. Read and Instruct the customer to read this chapter carefully before you install or operate the instrument and its accessories, or come into contact with it.

Pump down and Baking

Starting Up the System after a Shutdown

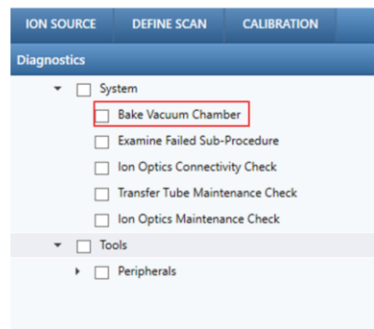


To start up the Orbitrap Exploris 480 mass spectrometer after it has been shut down (and vented), you must do the following:

1. Start up the instrument
2. Set up conditions for operation

- The instrument will start an automatic bake-out when the turbomolecular pump is at nominal speed
 - typically 10–15 minutes after power up of the instrument.
- Please note that the data acquisition PC needs to be up and running and connected to the instrument

Also possible to trigger bake-out manually from the diagnostics in Tune



Refer to operating manual on all conditions that need to be met for start up and operation
(including gas, power, software, data system, etc)

Configuring the Ion Source

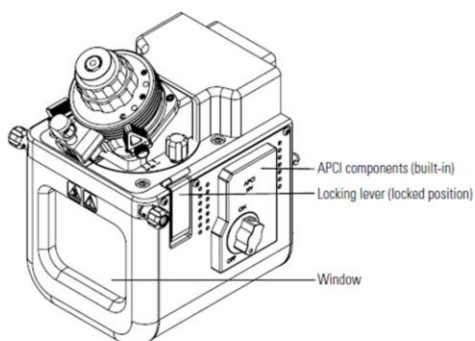
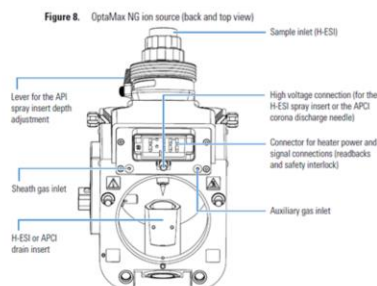


Figure 3-4. OptaMax NG API source (H-ESI mode)



The atmospheric pressure ionization (API) source forms gas-phase sample ions from sample molecules that are contained in solution. The API source also serves as the interface between the LC and the mass spectrometer. The Orbitrap Exploris 480 mass spectrometer is shipped with the Thermo Scientific OptaMax NG™ API source and a combined HESI/APCI probe. You can configure the API source to operate in any of several API modes, including electrospray ionization (ESI), atmospheric pressure chemical ionization (APCI), and atmospheric pressure photoionization (APPI). A separate nanospray ionization (NSI) probe is necessary to operate in NSI mode. The API source housing enables you to quickly switch between ionization modes without the need for specialized tools. A safety relay switches off the high voltage supply (8 kV) when you remove the source from the mass spectrometer. A window at the front side of the ion source housing permits viewing the probe position during ESI operation and the addition of accessories.

(Demonstrate Connecting the API Probe to the Mass Spectrometer)

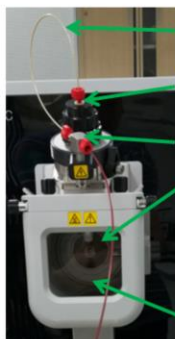
Three valid configurations of the Optamax Source

High flow application



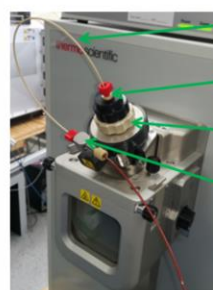
- Red short PEEK tubing
- High flow needle insert
- Grounding union
- Spray cone (suitable version)
- Drain Insert

Low flow application



- Beige long PEEK tubing
- Low flow needle insert „L“
- Grounding union
- Spray cone (optional)
- No Drain Insert

Calibration only



- Beige long PEEK tubing
- Low flow needle insert „L“
- ESI calibration probe (beige nut)
- Grounding union
- No Spray cone
- No Drain Insert

The Orbitrap Exploris 480 mass spectrometer is shipped with the Thermo Scientific OptaMax NG™ API source housing and a combined HESI/APCI probe. See “API Probe Maintenance” for instructions about installing and removing this API probe. For information about changing to other API probes, refer to the manuals that came with the API source and the API probe.

Needle assemblies and probe types



Low-flow needle (two piece)
(OPTON-30139)

High flow needle (single piece)



„L“



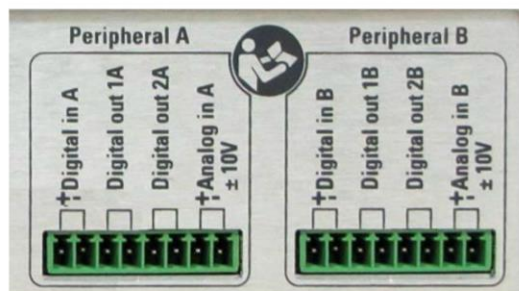
ESI calibration probe
(always low-flow)

HESI probe

- default with high-flow needle
- can be changed to low-flow needle, with OPTON-30139

User I/O Connections

- Peripheral A, Peripheral B
- identical connectors
- communicate with two peripherals (LCs, for example) by digital and analog signals.



16 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

±Digital in + (positive, pin 1) and – (negative, pin 2)
Based on the configuration, the mass spectrometer starts the data acquisition when it receives a digital contact closure signal from an external device.

Digital out 1
Digital out 2
(interchangeable)

The mass spectrometer transmits the ready status through contact closure to an external receiving device.

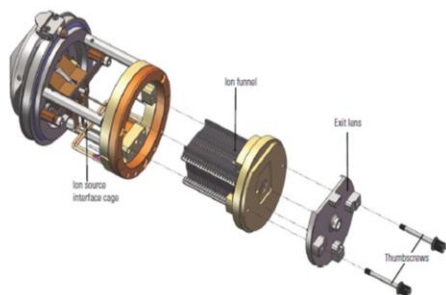
The mass spectrometer transmits a programmable contact closure output signal to the inputs of an external receiving device (a fraction collector, for example).

Analog In
±10 V
+ (positive, pin 7) and – (negative, pin 8)

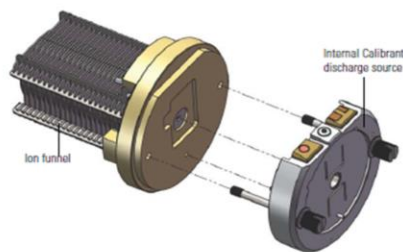
The mass spectrometer can record an analog signal between -10 V and $+10\text{ V}$ from an external device with the mass spectrometer data.

Orbitrap Exploris 480 Option: Internal Calibration

- Without IC option



- With IC option



17 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

A Orbitrap Exploris 480 MS with the Internal Calibration configuration (MS/IC system) incorporates a second ion source—the Internal Calibrant discharge source. The Internal Calibrant discharge source is installed in the IC source heater interface, which is located in the API source interface just after the ion funnel.

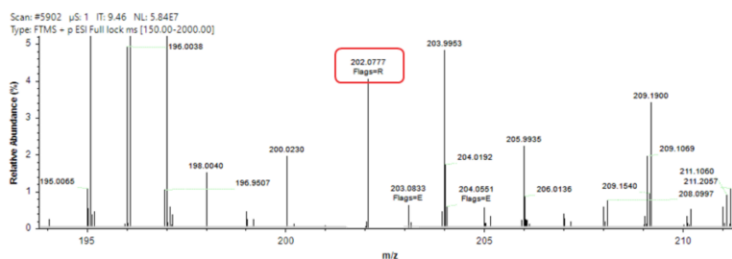
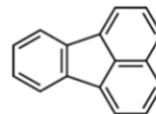
It replaces the exit lens of the standard Orbitrap Exploris 480 MS.

The Internal Calibrant discharge source delivers a regulated number of calibrant ions into the much larger population of analyte ions. The location of the Internal Calibrant discharge source allows the quadrupole mass filter to isolate the internal calibrant (reference) ions. The internal calibrant ions are used as a lock mass (m/z) that significantly improves the mass-to-charge ratio (m/z) assignment accuracy to less than 1 ppm (up to m/z 1500) in every Fourier transform (FT) mass spectrum.

The instrument software uses the precisely known mass-to-charge ratio of the calibration mass peak to provide real-time fine adjustment of the instrument's mass-to-charge ratio calibration, enabling a correction for otherwise uncompensated errors that occur due to temperature changes and scan-to-scan variations in the total charge of the population of ions analyzed.

Orbitrap Exploris 480 Option: Internal Calibration

- Additional mass calibration with one mass ($m/z = 202$, Fluoranthene)
- Fluoranthene is already filled in and will last for 1 year



18 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

The Internal Calibrant discharge source has its own dedicated continuous introduction system that delivers a highly stable flow of fluoranthene. The calibrant distribution assembly receives an initial charge of fluoranthene upon installation. You can expect this charge to last at least one year under continuous usage. Only a Thermo Fisher Scientific field service engineer can replace the calibrant once it is consumed.

A glow discharge electrode stably produces a very intense current of fluoranthene radical anions and a moderate current of fluoranthene radical cations. When you switch on the IC option, it uses the radical anions (negative polarity) and cations (positive polarity) of fluoranthene as the internal calibration lock mass.

Thermo Scientific Dionex UltiMate 3000 Series

Nano/Cap System NCS-3500RS
Nano/Cap Pump NCP-3200RS

Operating Instructions
(Original Operating Instructions)



UltiMate 3000 Series
NCS-3500RS and NCP-3200RS

3.4 Connecting the Module

Thermo Scientific SII for Xcalibur Quick Start Guide

You can use Thermo Scientific® Standard Instrument Integration (SII) for Xcalibur™ software to acquire data and control a wide range of instruments via the Thermo Scientific® Xcalibur™ data system. SII for Xcalibur is based on the Thermo Scientific® Dionex® Chromatography Data System and uses certain key Chromatography features. This guide provides an overview of operation when SII for Xcalibur is installed.

Note For access to Chromatography features other than those required by SII for Xcalibur, you must purchase the appropriate licenses. Contact your local Thermo Scientific sales representative for details.

Contents

- Overview
- Starting the Software
- Equalizing the System
- Direct Control of the System
- Automated Control of the System
- Viewing Chromatographic Data
- Troubleshooting

If applicable, refer to the manuals and demonstrate how to connect and configure the LC and MS and establish communication.



Thermo

EASY-nLC Series

User Guide for LC Devices

2 Setting Up the Foundation Instrument Configuration
Adding the System Devices to the Instrument Configuration

Thermo

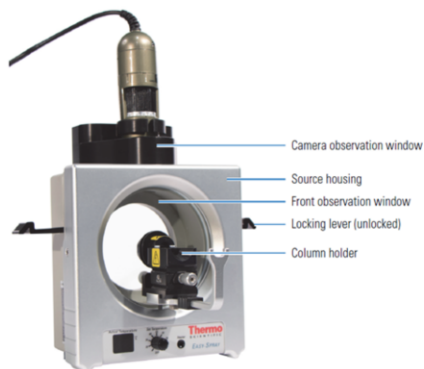
EASY-nLC Series

Getting Started Guide

4 Configuring the EASY-nLC System
Setting Up Communication with the Mass Spectrometer

If applicable, refer to the manuals and demonstrate how to connect and configure the LC and MS and establish communication.

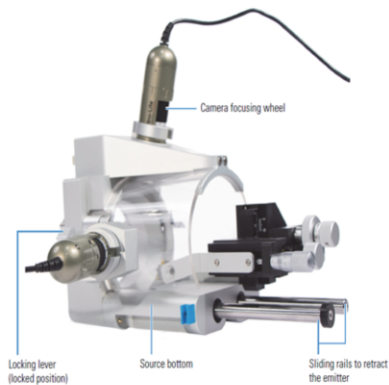
EASY-Spray NG Source



EASY-Spray Series Ion Source User Guide

If applicable, demonstrate how to attach and remove the source, and how to operate

Nanospray Flex NG Source



Nanospray Flex Series Ion Source User Guide

If applicable, demonstrate how to attach and remove the source, and how to operate

FAIMS



[FAIMS User Guide](#)

FAIMS Pro System

User Guide

High-Field Asymmetric Waveform Ion Mobility Spectrometry System

If applicable, demonstrate how to attach and remove the FAIMS interface, and how to operate

System shut down

- Shutdown: For service or maintenance
 - If not acquiring over short periods of time place instrument in standby
- Wait until data acquisition, if any, is complete.
- Turn off the flow of sample solution from the LC (or other sample introduction device).
- In the Tune window, click the System Off button.
 - All high voltages are shut off, as are the sheath and sweep gas.
- Put the main power circuit breaker switch of the mass spectrometer in the Off position.
 - When the rotational speed of the TMP is reduced sufficiently, power to the vent valve solenoid is shut off. The vent valve opens and the manifold is vented with nitrogen.
 - Keeping on the nitrogen flow prevents humidity from contaminating the vacuum system of the mass spectrometer. You may however switch off the nitrogen if your supply is limited.
- Dust can be sucked in through the ion inlet system. To reduce this risk to a minimum, keep an ion source housing installed on the mass spectrometer also during off and standby times.

Explain shutdown section in manual

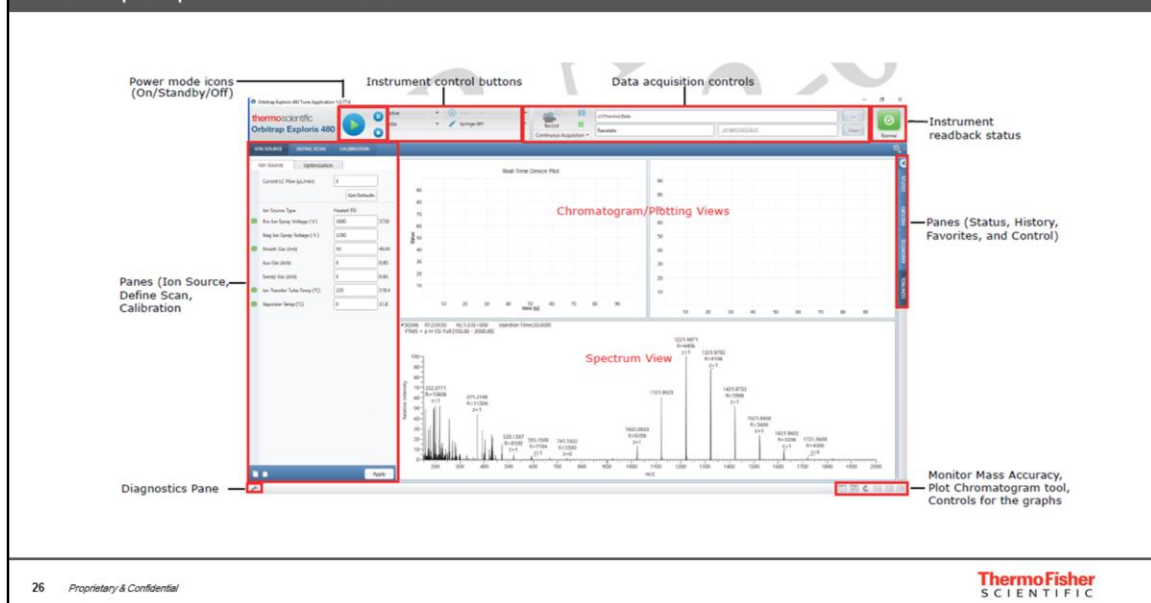
The Orbitrap Exploris 480 system must not be shut down completely if you are not going to use it for a short period of time, such as overnight or over a weekend. See “Setting the System in Standby Condition” on page 6-6. This section describes how to shut down the system for a maintenance or service procedure.

Basic functions in Orbitrap Exploris tune

- [Orbitrap Exploris tune overview](#)
 - [Calibrations](#)
 - [Evaluations](#)
 - [Diagnostics](#)
- [Basic Method set up in Xcalibur](#)
- [Setting up a sequence in Xcalibur](#)

Refer customer to Quick start guide, explain basic functions and demonstrate how to perform some basic functions

Orbitrap Exploris tune overview



26 Proprietary & Confidential

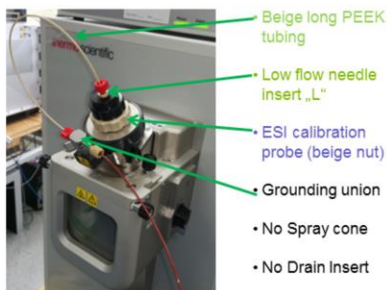
ThermoFisher
SCIENTIFIC

Use Orbitrap Exploris 480 Tune to operate the Orbitrap Exploris 480 MS with the data system computer. It has the following components:

- Three power mode icons to set the MS's power mode (on, standby, and off).
- The system readback icon to indicate the various readback states.
- Three panes on the left to define parameters for scanning, ion source, and calibration.
- Up to three graphs to show real-time information about the current measurement.

Setting up for calibration

• Calibration set up



suggested position: down halfway between M and L; forward 1.2; sideways visually in the middle
Place a clean 500 μ L syringe with 450 μ L of calibration solution in the syringe pump.
Remove any air bubbles.

Positive ion mode	
Pos Ion Spray Voltage (V)	2500 to 3500
Ion Spray Current Readback*	0.4-0.5 μ A
Sheath Gas (Arb)	0
Aux Gas (Arb)	7
Sweep Gas (Arb)	0
Ion Transfer Tube Temp ($^{\circ}$ C)	320
Funnel RF (%)	50
Negative ion mode	
Neg Ion Spray Voltage (V)	2000 to 3500
Ion Spray Current Readback*	0.2-0.3 μ A

Initial starting point for stable spray, adjust if required, ensure spray is stable before calibration

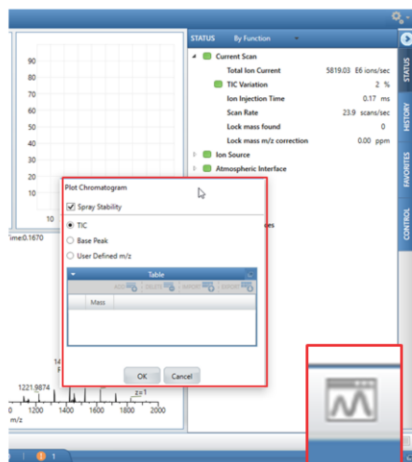
Ion Source and Define Scan panes

ION SOURCE		DEFINE SCAN	CALIBRATION
Ion Source Optimization			
Current LC Flow (μL/min)		0	
		Get Defaults	
Ion Source Type		ESI	
☒ Pos Ion Spray Voltage (V)	3000	2964	
☒ Neg Ion Spray Voltage (V)	2200		
Sheath Gas (Arb)	0	0.00	
☒ Aux Gas (Arb)	7	7.01	
Sweep Gas (Arb)	0	0.00	
☒ Ion Transfer Tube Temp (°C)	320	320.3	

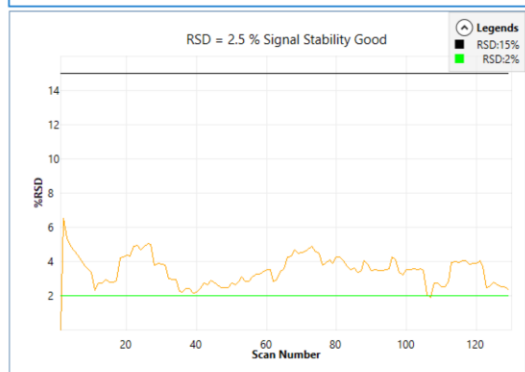
ION SOURCE	DEFINE SCAN	CALIBRATION
Scan Type		
Full Scan		
Orbitrap Resolution		
15000		
Scan Range (m/z)		
150 - 2000		
RF Lens (%)		
50		
AGC Target		
Standard		
Maximum Injection Time		
Custom		
Time (ms)		
50		
Microscans		
1		
Source Fragmentation		
☐		

The above are the recommended initial settings for calibration, you can use them to demonstrate how to define ion source settings and scan parameters in tune.

Checking for stable spray

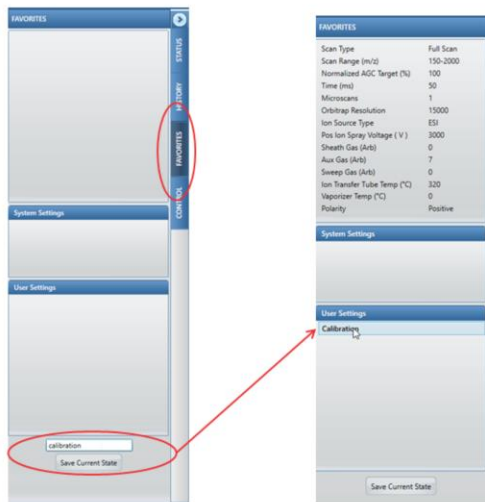


Note: set resolution at 15k

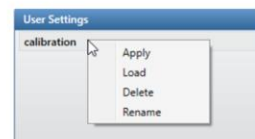


Show the customer how to check the spray stability, this should be done with 15 k resolution

Saving Favorites

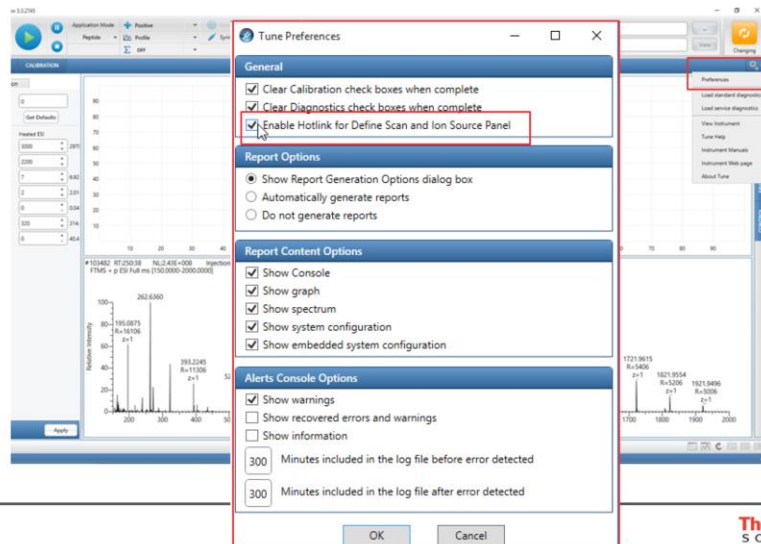


- Ion Source settings are a global instrument method parameter
- Favorites allow for saving, deleting, loading, applying ion source and scan settings



No “tune file” but can save favorites. Save the calibration recommended settings and show how to apply.

Enable hotlink

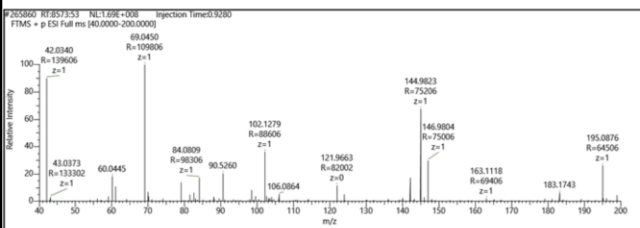
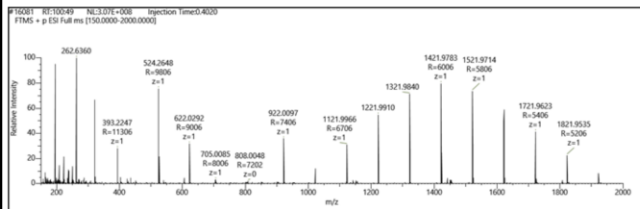


31 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

How to enable hotlink

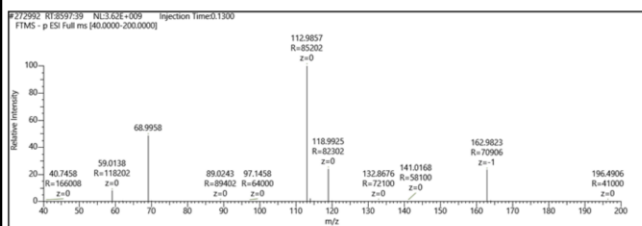
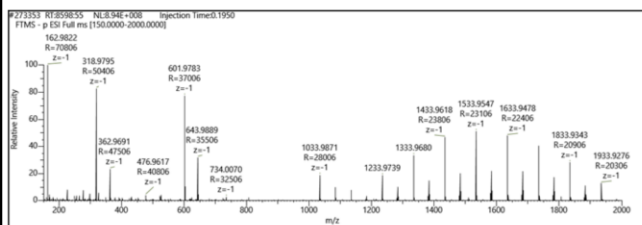
Flexmix – pos Ion Mode



Components:	Accurate Mass (m/z)	Ion Type
Imidazole	69.04472	[M+H] ⁺
Triethylamine	102.12773	[M+H] ⁺
Tetramethylpiperidine	142.15903	[M+H] ⁺
Caffeine	195.08765	[M+H] ⁺
MRFA 2+	262.63612	[M+2H] ²⁺
Hexamethoxyphosphazene	322.04812	[M+H] ⁺
MRFA	524.26496	[M+H] ⁺
Hexakis(2,2-difluoroethoxy)phosphazene	622.02896	[M+H] ⁺
Hexakis(2,2,3,3-tetrafluoropropoxy)phosphazene	922.00980	[M+H] ⁺
Ultramark	1022.00341	[M+H] ⁺
	1121.99702	[M+H] ⁺
	1221.99064	[M+H] ⁺
	1321.98425	[M+H] ⁺
	1421.97786	[M+H] ⁺
	1521.97147	[M+H] ⁺
	1621.96509	[M+H] ⁺
	1721.95870	[M+H] ⁺
Hexakis(1h,1h,7h-perfluoroheptoxy)phosphazene	1821.95231	[M+H] ⁺
	1921.94593	[M+H] ⁺
	2121.93315	[M+H] ⁺
	2721.89483	[M+H] ⁺
Hexakis(1h,1h,9h-perfluorononyloxy)phosphazene	2721.89445	[M+H] ⁺

Typical spectra and composition

Flexmix – neg Ion Mode



Components:	Accurate Mass (m/z)	Ion Type
LC-MS grade acetic acid	59.01385	[M-H] ⁻
Trifluoroacetic acid (TFA)	112.98559	[M-H] ⁻
Pentafluoropropionic acid	162.98239	[M-H] ⁻
Perfluoroheptanoic acid	362.96962	[M-H] ⁻
2,4,6-Tris(heptafluoropropyl)-1,3,5-triazine	601.97898	[M+OH] ⁻
Hexakis(2,2,3,3-tetrafluoropropoxy)phosphazene	1033.98811	[M+TFA] ⁻
Ultramark	1133.98172	[M+TFA] ⁻
	1233.97533	[M+TFA] ⁻
	1333.96895	[M+TFA] ⁻
	1433.96256	[M+TFA] ⁻
	1533.95617	[M+TFA] ⁻
	1633.94979	[M+TFA] ⁻
	1733.94340	[M+TFA] ⁻
	1833.93701	[M+TFA] ⁻
	1933.93062	[M+TFA] ⁻
Hexakis(1h,1h,7h-perfluoroheptoxy)phosphazene	2233.91146	[M+TFA] ⁻
Hexakis(1h,1h,9h-perfluorononyloxy)phosphazene	2833.87314	[M+TFA] ⁻

Typical spectra and composition

Mass Calibration

ION SOURCE DEFINE SCAN **CALIBRATION**

Calibration Options

☐ Skip Spray Stability Evaluation

☐ Check Only

☐ Set System to Standby on Completion

☒ Mass Calibration

☐ Positive ion mode

☐ Negative ion mode

▼ ☐ System Calibration

☐ Positive ion mode

☐ Negative ion mode

- MS should be calibrated to ensure the mass accuracy of the results.
- Before you start the calibration check that you have a **stable spray**
- If the system has been in Off mode before, put the instrument into On mode or Standby mode for at least 90 minutes before you start a mass calibration procedure.
- Evaluate daily/weekly if it fails, calibrate. Good idea to calibrate before every sequence of important experiments.
- Calibrate unused polarity modes (e.g. neg) at least every 3 months.

System Calibration

ION SOURCE	DEFINE SCAN	CALIBRATION
Calibration Options		
☐ Skip Spray Stability Evaluation		
☐ Check Only		
☐ Set System to Standby on Completion		
☐ Mass Calibration ☐ Positive ion mode ☐ Negative ion mode		
☐ System Calibration ☐ Positive ion mode ☐ Negative ion mode		

- **Always** run the positive ion polarity calibration procedure before the negative ion polarity calibration procedure
- Before you start the calibration check that you have a **stable** spray
- Calibrate monthly

	Recommended	Last Calibrated
☐ Mass Calibration ☐ Positive ion mode ☐ Negative ion mode	Jun 08, 2019	Jun 07, 2019
☒ System Calibration ☐ Positive ion mode ☐ Negative ion mode	Jun 07, 2019	Jun 07, 2019

Smart calibration: eg if system was vented performs more calibrations

Evaluations

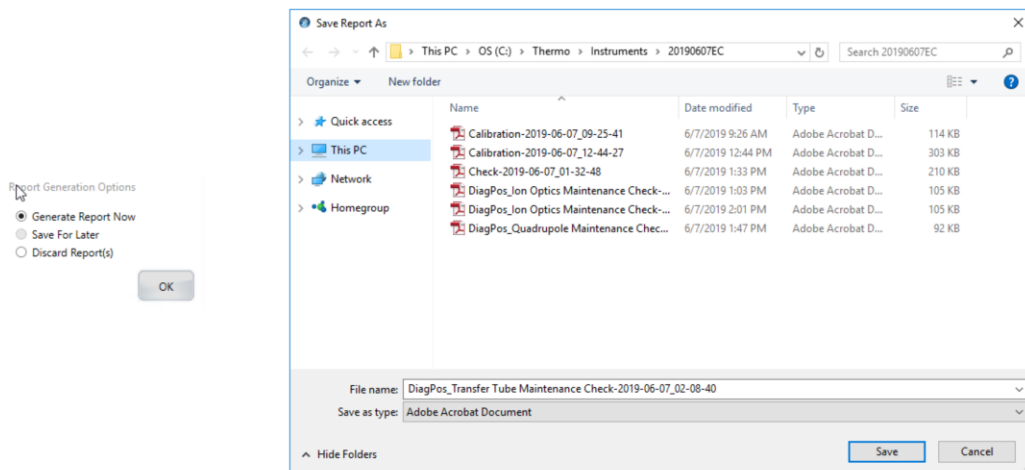
- Calibration/evaluation

The screenshot shows the 'CALIBRATION' tab selected in a software interface. Under the 'Calibration Options' section, there are three checkboxes: 'Skip Spray Stability Evaluation', 'Check Only', and 'Set System to Standby on Completion'. The 'Check Only' checkbox is highlighted with a red box. Below this, there are two expandable sections: 'Mass Calibration' and 'System Calibration', each with sub-options for 'Positive ion mode' and 'Negative ion mode'. These sections are also highlighted with a red box.

- Each Tune Calibration is accompanied by a Check procedure
- „Check Only“ toggle enables Evaluation only, skips Calibration

Each calibration is accompanied by a check procedure. If you want to perform only an evaluation, select the Check Only check box. Includes HCD evaluation

Saving a report



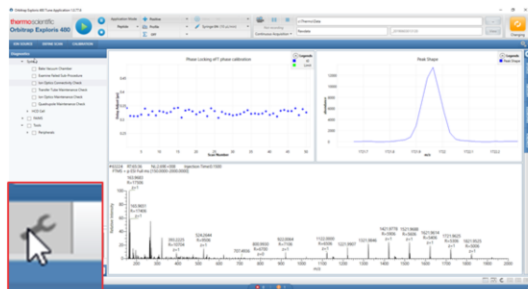
The calibration and evaluation results can be saved in a report

Evaluation Results

Name	Result	Value	Minimum	Maximum	Comment
Check Signal Stability	Passed	-	-	-	good signal stability 5.5 N
System Calibration - Positive Ion mode	Passed	-	-	-	
eFF Phase Check	true	-	-	-	
PhaIDH Hi-Speed THT Phase Check	true	-	-	-	Delta tbt=0.02 +/- 0.01
Spectral Mass Accuracy Check	true	-	-	-	External Calibration Error rms = 1.0 ppm (Acceptance limit = 3.0 ppm). Internal Calibration Error rms = 0.1 ppm (Acceptance limit = 1.0 ppm).
Low n/z Spectral Mass Accuracy Check	true	-	-	-	External Calibration Error rms = 0.8 ppm (Acceptance limit = 3.0 ppm). Internal Calibration Error rms = 0.2 ppm (Acceptance limit = 1.0 ppm).
Mass Accuracy Transient Length Dependency Check	true	-	-	-	Maximum mass accuracy deviation is 0.5 ppm.
Mass Accuracy Space Charge Dependency Check	true	-	-	-	Maximum mass accuracy deviation is 0.3 ppm.
IOD ProSA Scaling Check	true	-	-	-	-
Injection Filter Isolation Check	true	-	-	-	-
Quadrupole Isolation Check	true	-	-	-	Quadrupole isolation check passed in both rod orientations.
Quadrupole Transon./Rod Config. Check	true	-	-	-	Passed: Transmission of n/z [69, 109, 124, 162] meet specifications for both rod configurations. Both rods meet transmission equivalence specifications for rod switching.
HCD Fragmentation and Trapping Efficiency Check	true	-	-	-	All measurements within specifications.

Note that Evaluation Includes HCD evaluation

Diagnostics

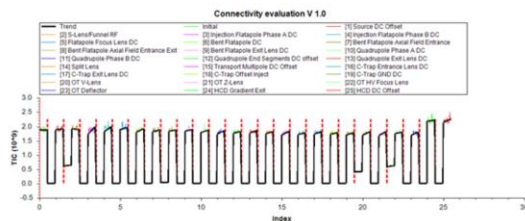


ION SOURCE	DEFINE SCAN	CALIBRATION
Diagnostics		
- System ☐ Bake Vacuum Chamber ☐ Examine Failed Sub-Procedure ☐ Ion Optics Connectivity Check ☐ Transfer Tube Maintenance Check ☐ Ion Optics Maintenance Check ☐ Quadrupole Maintenance Check - HCD Cell ☐ FAIMS ☐ Tools		

Show the customer where to find the diagnostics

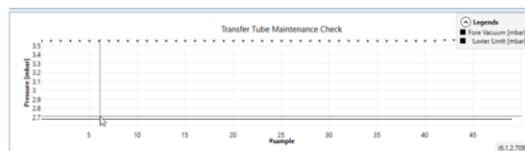
Diagnostics: Ion optics connectivity check

- Evaluates connectivity of ion optical elements
- Switches each element to operating state and to deflecting state
- In some cases signal will not be fully lost
- Good result show a change in each step
- Requires stable ion signal.



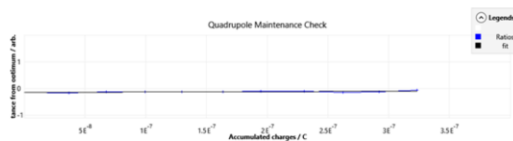
Diagnostics: Transfer tube maintenance check

- Checks if the transfer tube needs cleaning by measuring the fore vacuum.
- If the fore vacuum is below a (temperature dependent) threshold, the transfer tube might be blocked and cleaning is recommended.



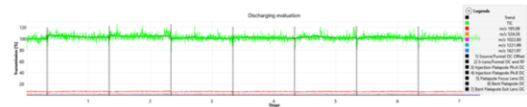
Diagnostics: Quadrupole Maintenance Check

- This check tries to charge up potential contamination inside the quadrupole.
- It uses ions of both polarities, so:
 - a stable and bright spray is required on both polarities.
 - Recommended to set the source gases and temperatures to the same levels in positive and negative ion mode.
- On a clean quadrupole, no charge can be deposited, so the plot will show a straight line. With increasing contamination of the quadrupole, the plot will start showing a slope. This is expected and to a certain level tolerated by the instrument.
- Once the fail threshold is reached the quadrupole should be cleaned.
- The cycle time between two cleanings depends strongly on the sample type and the sample amount injected. .

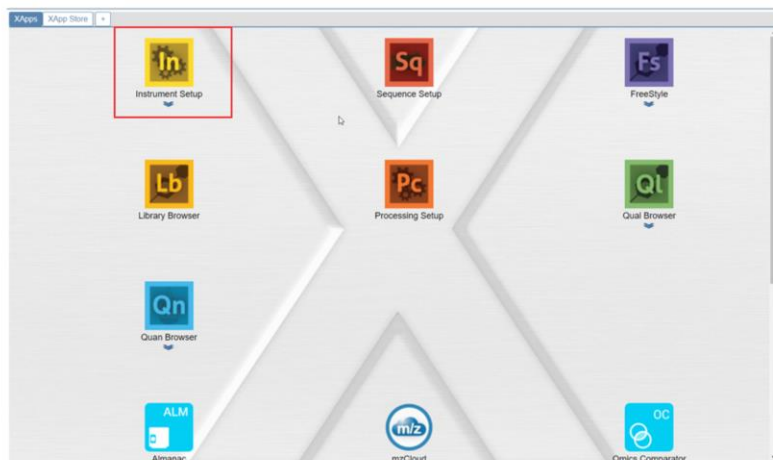


Diagnostics: Ion optics maintenance check

- From Source to Bent flatapole Exit lens:
- actively discharges ion optical element (neg. ions) and subsequently evaluates transmission trend.
- It is recommended:
 - a stable and bright spray on both polarities.
 - Recommended to set the source gases and temperatures to the same levels in positive and negative ion mode.
 - Recommended to set negative ion mode voltage to low values (range 2.2 kV)

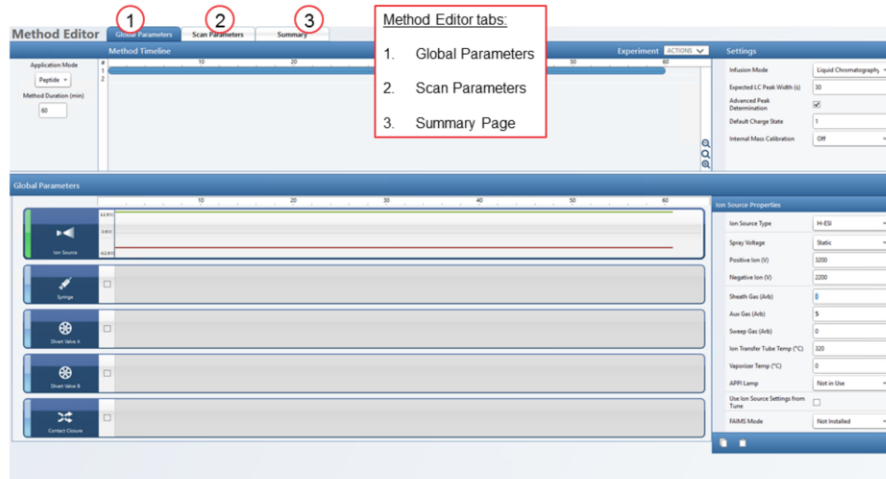


Creating a method



In Xcalibur

Method Editor: Overview



Method Editor: Global Parameters

Method Editor | Global Parameters | Scan Parameters | Summary

Method Timeline: 0 10 20 30 40 50 60

Application Mode: **Proteomics**

Method Duration (min): **60**

Global Parameters

1. Ion Source Properties
2. Syringe Properties
3. Divert Valve A Properties
4. Divert Valve B Properties
5. Contact Closure Properties

Ion Source Properties

- Ion Source Type: **HESI**
- Spray Voltage: **Static**
- Positive Ion (V): **2000**
- Negative Ion (V): **2000**
- Sheath Gas (J/L): **8**
- Aux Gas (J/L): **5**
- Sweep Gas (J/L): **0**
- Ion Transfer Tube Temp (°C): **320**
- Vaporizer Temp (°C): **0**
- APPI Lamp: **Not in Use**
- Use Ion Source Settings from Tune: **Not Installed**

Ion source

Global Parameters

Ion Source

Ion Source Properties

Ion Source Type: HESI

Spray Voltage: Static

Positive Ion (V): 3200

Negative Ion (V): 2200

Sheath Gas: Range: 0-5500: 0

Aux Gas (Arb): 5

Sweep Gas (Arb): 0

Ion Transfer Tube Temp (°C): 320

Vaporizer Temp (°C): 0

APPI Lamp: Not in Use

Use Ion Source Settings from Tune: ☐

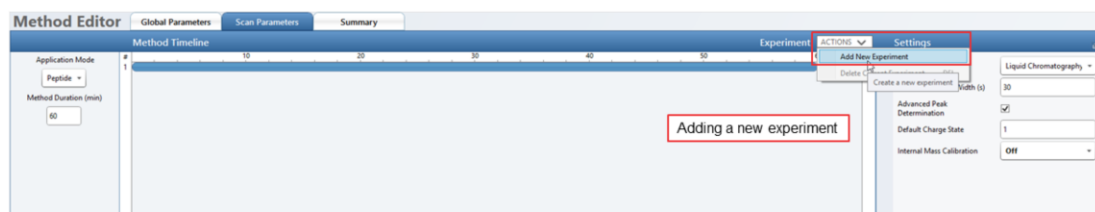
FAIMS Mode: Not Installed

Ion Source:
copy and paste available

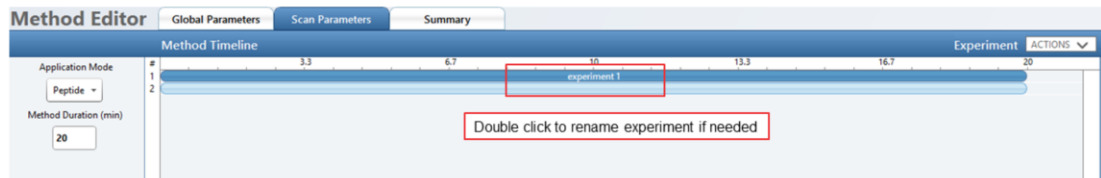
Scan Parameters



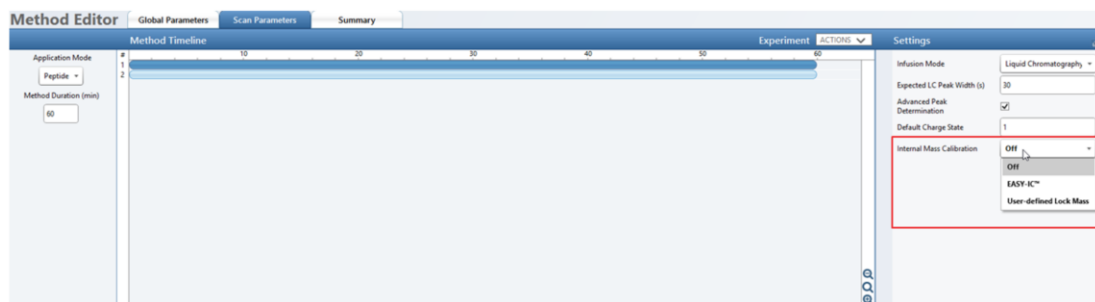
Scan Parameters



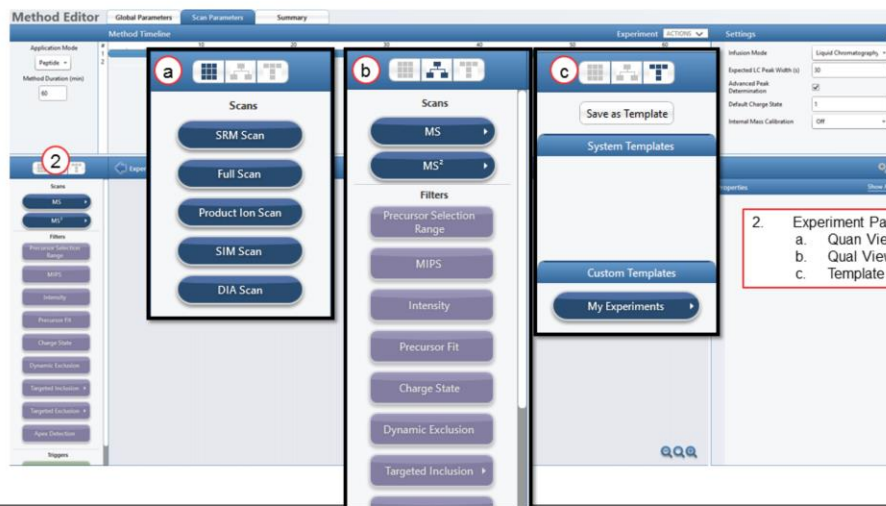
Scan Parameters



Internal mass calibration



Experiment Pane View Types



Example: Create a Full Scan data-dependent MS² method in Qual View

The screenshot displays the 'Method Editor' window with the 'Scan Parameters' tab selected. The 'Method Timeline' at the top shows a duration of 20 minutes. A text box with the following instructions is overlaid on the timeline:

1. Go to MS Scans, click on Full scan
2. Drag and drop the Full Scan to the experiment pane.

Below the timeline, the 'Experiment # 1' pane is visible. On the left, a 'Scans' list contains 'MS' and 'MS²'. A red circle with the number '1' highlights the 'MS' button. In the center, a 'Full Scan' button is highlighted with a red circle and the number '2'. A red arrow points from the 'Full Scan' button to a 'Place Scan Here' button on the right. The 'Filters' section on the left includes 'Precursor Selection', 'Range', 'MIPS', and 'Intensity'.

Example: Create a Full Scan data-dependent MS² method in Qual View

The screenshot displays the 'Method Editor' window with the 'Scan Parameters' tab selected. The 'Method Timeline' at the top shows a single MS scan at 10 minutes. A red box highlights the following instructions:

- 3. Go to MS² Scans, click on MS²
- 4. Drag and drop the MS² Scan to the experiment

Below the timeline, the 'Scans' section on the left lists 'MS' and 'MS²'. A red circle with the number '3' is around the 'MS²' button. A red box highlights the 'MS²' button in the 'Scans' list, with a red circle and the number '4' around it. A red arrow points from this button to a 'Full Scan' button in the 'Experiment # 1' section, which is labeled 'Drop Scan Here'.

Scan properties

Method Editor

Global Parameters | Scan Parameters | Summary

Method Timeline

Experiment # 1

Time Range (min): 0-30

Full Scan

Full Scan Properties

Orbitrap Resolution: 60000

Scan Range (m/z): 100-1000

RF Lens (%): 50

AGC Target: Standard

Maximum Injection Time Mode: Auto

Microscans: 1

Data Type: Profile

Polarity: Positive

Source Fragmentation: ☐

Use EASY-IC™: On

Scan Description:

A new Full Scan data-dependent MS² method is created
Scan parameters can be changed on properties pane

Filters

Go to Scan Filters and add an Intensity Filter to the experiment pane.

Intensity Properties:
- Intensity Threshold : The minimum signal intensity required to trigger a data dependent scan.

The screenshot displays the 'Method Editor' interface. On the left, the 'Filters' section is expanded, and the 'Intensity' filter is selected. In the main workspace, a flowchart is visible with an 'Intensity' filter box. A red arrow points from the 'Intensity' filter in the sidebar to the 'Intensity' filter in the workspace. The 'Intensity Properties' panel on the right shows 'Filter Type' set to 'Intensity Threshold' and 'Intensity Threshold' set to '5.0e3'.

Just a filter example

Holistic Test



Use the holistic test settings (see planet orbitrap document or Bremen sharepoint) to demonstrate how to set up a method

Summary pane

Method Editor | Global Parameters | Scan Parameters | **Summary**

Document View | **Tree View**

Method Summary

Method Settings

Application Mode: **Peptide**
Method Duration (min): **131**

Global Parameters

Ion Source

Ion Source Type: **ESI**
Spray Voltage: **Static**
Positive Ion (V): **2500**
Negative Ion (V): **400**
Sample Ion (V): **0**
Ion Transfer Tube Temp (°C): **270**
Use Ion Source Settings from Tune: **False**
APMS Mode: **Not Installed**

MS Global Settings

Infusion Mode: **Liquid Chromatography**
Expected LC Peak Width (s): **15**
Advanced Peak Determination: **True**
Default Charge State: **2**
Internal Mass Calibration: **Use default Lock Mass**
Current Lock Mass: **Current**

Positive Ion

Positive Ion

MS/MS

Scan Time (min): **0**
End Time (min): **131**

Master Scan

Full Scan

Orbitrap Resolution: **120000**
Scan Range (m/z): **375-1500**
RF Lens (V): **40**
AGC Target: **Custom**
Normalized AGC Target (%): **300**
Maximum Injection Time Mode: **Custom**
Maximum Injection Time (min): **40**
Microscan: **1**
Data Type: **Profile**
Priority: **Profile**
Source Fragmentation: **Disabled**
Scan Description:

Filters

MPFS

Monoisotopic peak determination: **Peptide**
Rule: restrictions when too few precursors are found
True

Intensity

Filter Type: **Intensity Threshold**
Intensity Threshold: **1.0e3**

Charge State

Include charge (state): **2-5**
Include underrepresented charge states: **False**

Dynamic Exclusion

Dynamic Exclusion Mode: **Custom**
Exclude after n scans: **1**
Exclusion Duration (s): **30**
Mass Tolerance: **ppm**
Low: **10**
High: **10**
Exclude isotopes: **True**

Performance

Perform dependent scan on single charge state per precursor only: **False**

Data Dependent

Data Dependent Mode: **Scan Per Outcome**

Scan Event Type 1:

MS/MS

Scan Priority: **1**
Multiple ions: **False**
Isolation Window (m/z): **2**
Isolation Offset: **0M**
Collision Energy Mode: **Fixed**
Collision Energy Type: **Normalized**
HCD Collision Energy (V): **30**
Collision Resolution: **30000**
Turbo/IFT: **Off**
Scan Range Mode: **Unlabeled First Mass**
First Mass (m/z): **120**
AGC Target: **Custom**
Normalized AGC Target (%): **100**
Maximum Injection Time Mode: **Custom**
Maximum Injection Time (min): **60**
Microscan: **1**
Data Type: **Profile**
Scan Description:

Scan Event Type 2:

Targeted Mass

Mass List

Mass List Type: **MS/MS**
Time Mode: **Unscheduled**
Include Intensity Threshold: **False**

Component

Component	MS/MS
LTLEILA	498.8018
MDLQVPR	571.2825
ELASDPPVPR	685.0705
GSNDSQNAK	613.3187
SLAARPPPR	465.7683
PLATYSEK	498.2867
DPVPPR	497.2864
SDNAK	462.7365
TASDPSNAK	685.8324
SAAGAPFELR	586.8033
ELQGVNTH	558.2339
SLPVDSVSSGGSGR	801.4113
SEANPLEVYVK	745.3824
LSGARLQFELA	767.4212

Scan Description:
Number of Dependent Scans: **1**

Mass Tolerance: **ppm**
Low: **10**
High: **10**
Set Collision Energy per Compound: **False**
Perform dependent scan on most intense ion if no targets are found: **False**

Scan

MS/MS

Scan Priority: **2**
Multiple ions: **False**
Isolation Window (m/z): **2**
Orbitrap Resolution: **120000**
AGC Target: **Custom**
Normalized AGC Target (%): **50**
Maximum Injection Time Mode: **Custom**
Maximum Injection Time (min): **40**
Microscan: **1**
Data Type: **Profile**

4 of 11

Summary pane has tree view and document view

Note on Mass ranges

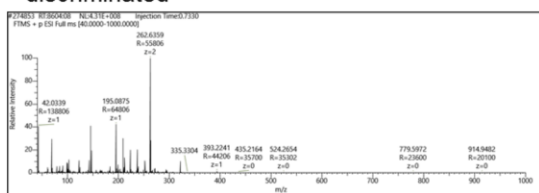
Mass Range for Full Scans	<i>m/z</i> 40–6000 (8000 with BioPharma option)
	Recommended settings:
	- If first mass is $\geq m/z$ 150, set last mass $\leq 15 \times$ first mass. - If first mass is $50 \leq m/z < 150$, set last mass $\leq 10 \times$ first mass. - If first mass is $40 < m/z < 50$, set last mass $\leq 5 \times$ first mass.

if factor 5-10-15 rule is violated the fields to enter the scan range are highlighted in yellow

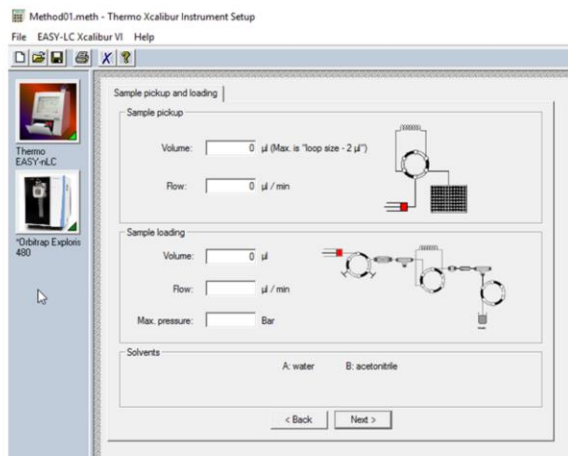
Full Scan Properties		Show Favorites
Orbitrap Resolution	60000	★
Scan Range (m/z)	40-1000	★
RF Lens (%)	50	★

⚠ It is recommended that Last Mass should be 5x of First Mass or less when First Mass is between 40-50 m/z

The instrument conducts the experiment, However, the larger masses (above the recommended scan range) will be discriminated

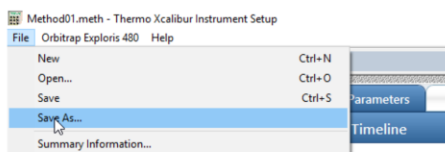


Setup LC method

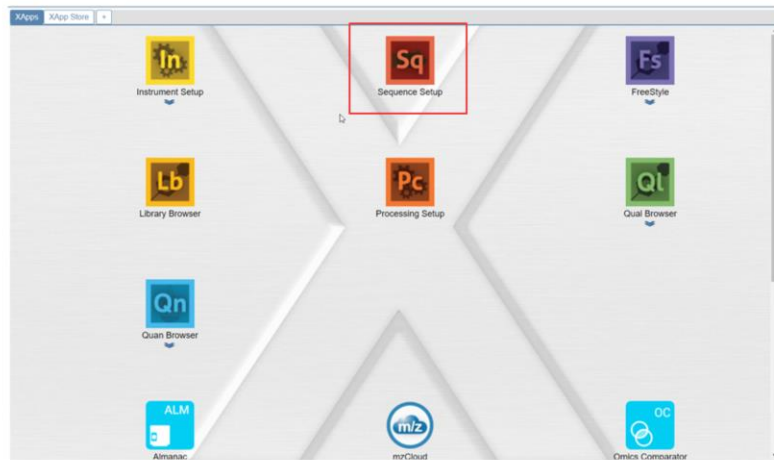


If customer also acquired LC demonstrate how to set up also the LC method (ideally use holistic test method as template)

Save the method

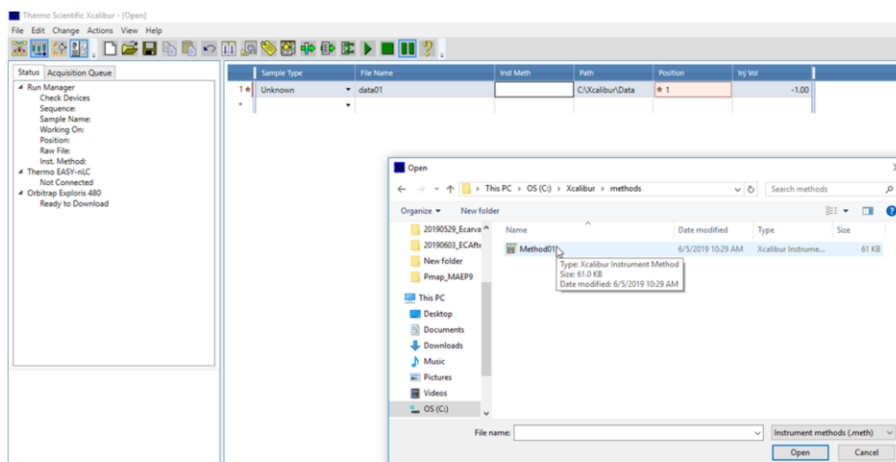


Setting up a sequence

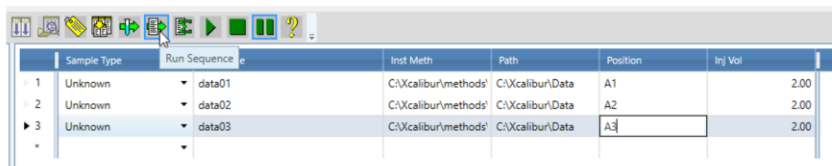


In Xcalibur

Setting up a sequence



Running a sequence



	Sample Type	Run Sequence	Inst Meth	Path	Position	Inj Vol
1	Unknown	data01	C:\Xcalibur\methods\	C:\Xcalibur\Data	A1	2.00
2	Unknown	data02	C:\Xcalibur\methods\	C:\Xcalibur\Data	A2	2.00
3	Unknown	data03	C:\Xcalibur\methods\	C:\Xcalibur\Data	A3	2.00
*						

Maintenance

- Overview
- [Orbitrap Exploris User Maintenance](#)
 - [Flush Sample lines and API probe](#)
 - [Check pump oil](#)
 - [Purge pump oil](#)
 - [Air filters](#)
 - [Sweep cone and ITT](#)
 - [API Source interface maintenance](#)
 - [Bent Flatapole and Quad maintenance](#)
- Depending on Configuration:
 - [EASY-nLC](#)
 - [UltiMate](#)
 - [FAIMS](#)
 - [PNs of recommended consumables](#)

General

- Orbitrap Exploris 480 empowers the user to perform their own performance maintenance as required
- Service Plans
 - Preferred Service plan
 - Corrective maintenance
 - Parts, labor, and travel
 - Annual PM
 - does not provide a Performance Maintenance service.
 - Elective Performance Maintenance Package
 - Customer may elect to purchase a Performance Maintenance Package if desired and IES will perform the service.
- Standard Factory one-year warranty:
 - Performance Maintenance **Training** (~2 months after install)
 - Preventative Maintenance (~11 months after install)

The Orbitrap Exploris 480 features a unique design for increased robustness and more customer routine maintenance. The Orbitrap Exploris 480 unique optics configuration empowers the user to perform their own performance maintenance as required.

Since the user is now able to directly maintain performance without service assistance, Warranty and Service plans will no longer include these user enabled performance maintenance.

The Preferred Service Plan takes the place of the *Essential Plan* and the *Extended Warranty*. The Proactive and Limited Plans are available and do not include performance maintenance.

Customers who choose to do Performance maintenance themselves should contact the FSR to book a training about 2 months after install. Here the FSE trains the customer on how to perform maintenance on the quadrupole and the bent flatapole.

FSR should book the standard warranty jobs as training and PM to differentiate from an unplanned warranty visit.

User Maintenance

Table 9-1. User maintenance procedures

MS Component	Procedure	Frequency	Procedure Location
Instrument	System bake-out	After the system was vented (even partially by a short power outage).	page 8-12
	Check warning labels on instrument	Annually	page 8-6
	Leak check gas lines	Annually	page 8-6
	Check condition of tubings and hoses	Annually	page 8-7
Cooling fans	Check fan filters	Every four weeks.	page 8-14
	Clean fan filters	If necessary.	
Ion optics	Clean flangeplate focus lens	If necessary.	page 8-29
	Clean injection filter	If necessary.	page 8-28
API source	Tip For instructions about performing maintenance on the quadrupole and the bent flangeplate, refer to the <i>Orbitrap Explorer Extended Maintenance Manual</i> .		
	Flush (clean) sample transfer line, metal needle, and API probe	Daily	page 6-14
	Clean the sweep cone and the spray cone	Daily	page 6-15
	Remove and clean ion transfer tube	Daily, or if ion transfer tube bore is contaminated (chemical noise) or obstructed (pressure decrease).	page 6-20
	Replace ion transfer tube	If ion transfer tube bore is corroded.	page 6-20
	Clean exit lens* and ion funnel	Check bi-weekly. Clean as needed. ^b	page 8-30
	Replace needle insert	If metal needle is blocked.	
	Replace metal needle	If metal needle is broken or obstructed.	See manufacturer's documentation.
Calibration ESI probe	Replace low-flow needle assembly	If metal needle is blocked.	

MS Component	Procedure	Frequency	Procedure Location
Forepumps	Purge (decontaminate) oil	Daily ^c	page 6-17, see also manufacturer's documentation
	Check oil level	Daily	page 8-10, see also manufacturer's documentation
	Check oil condition	Depends on process.	
	Add oil (requires venting)	If oil level is close to minimum.	
	Check filter insert of external oil mist filter	Daily	
	Check gas ballast valve	Monthly	
	Change oil	Every 8000 h (-one year) of operation.	
	Replace exhaust filter	If oil mist appears at exhaust or annually.	
	Check anti-suckback valve	Annually	
	Clean fan cover	Annually	

* The exit lens is not installed in instruments with the Internal Calibration (IC) option.

^b The frequency of cleaning the components of the mass spectrometer depends on the types and amounts of samples and solvents that are introduced into the instrument.

^c Depends on the types and amounts of samples and solvents that are introduced into the instrument. For low flow applications, purging the forepump is rarely necessary.



Diagnostics to help assess the need for maintenance

The frequency of cleaning the components of the API source depends on the types and amounts of samples and solvents that are introduced into the instrument. In general, for a given sample and ionization technique, the closer a mass spectrometer component is to the source of the ions, the more rapidly it becomes dirty. The sample transfer line, the sample tube, and the API probe should be cleaned at the end of each operating day to remove any residual salts from buffered mobile phases or other contamination that might have accumulated during normal operation.

The ion transfer tube and the ion sweep cone of the API source must be removed and cleaned periodically. Remove and clean the ITT if ion transfer tube bore is contaminated (chemical noise) or obstructed (pressure decrease).

The exit lens and the ion funnel become dirty at a slower rate than the API probe, the ion sweep cone, and the ion transfer tube.

Diagnostic tools available to help assess the need for maintenance of ion optics (see slide 39)

A good time to purge the oil is at the end of the working day after you flush the API probe, the ion sweep cone, and the API probe with a 50:50 methanol:water solution from the LC. Depends on the types and amounts of samples and solvents that are introduced into the instrument. For low flow applications, purging the forepump is rarely necessary.

Flushing the Sample Transfer Line, the Metal Needle, and the API Probe

Flush the sample transfer line, the metal needle, and the API probe at the end of a working day or a series of measurements (or more often if you suspect they are contaminated) by flowing a 50:50 methanol:distilled water solution from the LC through the API source.

Tip You do not need to flush the inlet components daily. However, if a mass spectrum shows unwanted contamination peaks, flush the inlet components.

◆ **To flush the sample transfer line, the metal needle, and the API probe**

1. Wait until the data acquisition, if any, is complete.
2. Open the Tune application by choosing **Start > All Apps > Thermo Instruments > model x.x > model Tune**.
3. From the Tune software window, click the **System On** button to toggle it from Standby to On. The voltages and gas flows to the API source are switched on.
4. Set up the HESI probe as follows:
 - a. In the Tune software window, display the HESI Source window.
 - b. In the HESI Source window, enter **30** in the Sheath Gas Flow Rate text box.
 - c. In the HESI Source window, enter **5** in the Aux Gas Flow Rate text box.
 - d. In the HESI Source window, enter **0** in the Sweep Gas Flow Rate text box.



CAUTION

- e. In the HESI Source window, enter **0** in the Spray Voltage text box.
- f. Click **Apply**.
5. Set up and start a flow of 50:50 methanol:water solution from the LC to the API source:
 - Set the Flow Rate to a value that is typical for your experiments.
 - Set the solvent proportions to 50% methanol and water.

Hazardous Substance. Methanol is highly flammable and noxious. Keep away from heat, sparks, and flame. Avoid accidental exposure. Use with adequate ventilation. When possible, dilute it with 50% water. Refer to your supplier's Material Safety Data Sheet (MSDS) for proper handling of methanol.

6. Let the solution flow through the sample transfer line, the metal needle, and the API probe for 15 minutes. After 15 minutes, switch off the flow of liquid from the LC to the API source. Keep the API source (including the APCI vaporizer, the sheath gas, and the auxiliary gas) on for additional 5 minutes. Stop the LC pump.
7. After 5 minutes, place the system in Standby condition as described on [page 6-6](#).

After Operating the System

The sample transfer line, the sample tube, and the API probe should be cleaned at the end of each operating day to remove any residual salts from buffered mobile phases or other contamination that might have accumulated during normal operation.

Check oil on the forepumps

Refer to Operating and pump manual for further instructions



Demonstrate how to check and refill oil, referring to service and pump manuals

Purging the Oil in the Forepumps

Purge (decontaminate) the oil in the forepumps on a regular basis to remove water.

♦ To purge the oil in a forepump

1. Turn off the flow of liquid from the LC (or other sample introduction device) to the API source.
2. From the Tune software window, click the **System Standby** button to put the mass spectrometer in Standby.
3. Open the gas ballast valve on the forepump. Refer to the manual that came with the pump for the location and handling of the gas ballast valve.
4. Let the pump run for 30 minutes with the gas ballast valve open.
5. After 30 minutes, close the gas ballast valve.

NOTICE

Forgetting to close the gas ballast valve increases the risk of either running dry the oil pump or, upon venting, getting oil into the vacuum system!

* Depends on the types and amounts of samples and solvents that are introduced into the instrument. For low flow applications, purging the forepump is rarely necessary.



Demonstrate how to purge the oil, referring to service and pump manuals
A good time to purge the oil is at the end of the working day. Depends on the types and amounts of samples and solvents that are introduced into the instrument. For low flow applications, purging the forepump is rarely necessary.

Maintenance of Fan Filters

- Check every four weeks and clean them if they are dirty.
- Beginning at the front side of the instrument, insert a finger into the recess in the bracket and pull at the fan filter bracket to open it.
- Pull each fan filter out of the filter bracket and check it for dust.
- If the fan filters are covered with dust:
 - wash the fan filters in a solution of soap and water.
 - Rinse with tap water.
 - Squeeze the water and let them air dry.
- Reinstall



Each of the ventilation slots at the front side, the left side, and the right side of the mass spectrometer is equipped with a fan filter. Each fan filter bracket is plugged into the instrument frame. Beginning at the front side of the instrument, insert a finger into the recess in the bracket and pull at the fan filter bracket to open it. Check the fan filters every four weeks and clean them if they are dirty. Replacements for the fan filters are available.

Removal of sweep cone and ion transfer tube

Refer to Operating manual for further instructions



Maintenance of the Ion Transfer Tube and the Sweep Cone

Maintenance

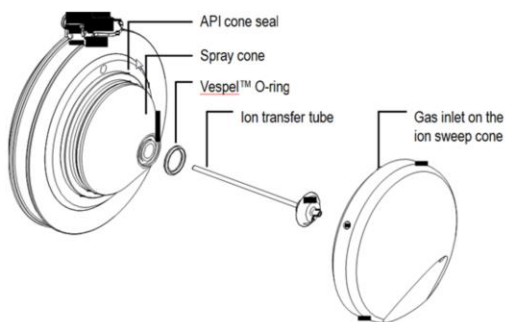
Maintenance of the API Source

Make sure that you do not accidentally lift the release lever that is located at the top of the API source interface, which will vent the MS.

To avoid contaminating the ion transfer tube, do not touch its exposed entrance.

NOTICE

To prevent mechanical damage to the transfer tube, make sure that the tube temperature is well below 200 °C. Let the spray cone cool down for at least 60 minutes to allow safe handling by laboratory personnel. See the safety information on [page 8-20](#).



T2 Proprietary & Confidential

ThermoFisher
SCIENTIFIC

Demonstrate how to remove and clean the sweep cone and ITT Refer to the manual for instructions

The ion transfer tube and the ion sweep cone of the API source must be removed and cleaned periodically. Remove and clean the ITT if ion transfer tube bore is contaminated (chemical noise) or obstructed (pressure decrease).

Turn off the flow of liquid from the LC (or other sample introduction device) to the API source.

Switch the system to Off mode. Wait for at least 60 minutes to let hot components cool down.

Remove the API source housing from the front of the mass spectrometer.

Remove the ion sweep cone by grasping its outer ridges and pulling the cone straight off the API cone seal.

Remove the ion transfer tube by turning it counterclockwise with the custom removal tool until you can pull it straight out of the ion source interface.

When you remove the ion transfer tube (after it has cooled to room temperature), the vent prevent ball drops into place to stop air from entering the vacuum manifold.

Therefore, you can remove the ion transfer tube for cleaning or replacement without venting the system.

Preparation steps

Refer to Operating manual for further instructions

- Wait until data acquisition, if any, is complete.
- Turn off the flow of sample solution from the LC (or other sample introduction device).
- In the Tune software window, put the instrument in Off condition.
- Shut down and vent the system by setting the Main Power switch to the OFF position.
- After 5 minutes, disconnect the power cable to prevent the system from being turned on in the opened state.
- Prepare a clean surface on the bench or ideally in a fume hood, e.g. place some clean aluminum foil on the bench.
- Wait 10 min for the instrument to vent before beginning any maintenance.
- For opening the main chamber: Disconnect and remove all items that are in the accessories cabinet (for example, the syringe pump). Make sure that nothing is plugged into the USB ports at the right side of the compartment.



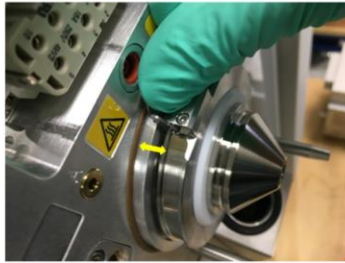
To maintain ion source interface assembly components other than the sweep cone and the ion transfer tube, the instrument needs to be shut down and vented.

API Source Interface Removal

Refer to Operating manual for further instructions



- After fully **venting** the system remove the **cooled** inlet stack by pushing the release latch up.



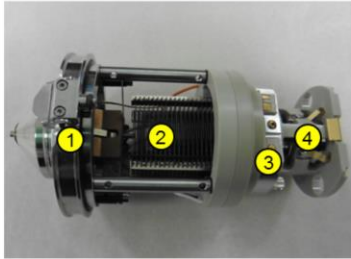
- Pull the inlet stack straight out and store it in a clean area.
- Block the opening to the analyzer chamber to prevent dust contamination



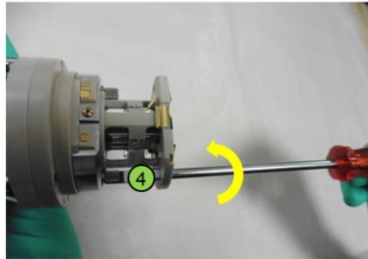
Demonstrate how to remove and clean the inlet stack
Refer to the manual for instructions

Disassembly Inject filter and focus lens

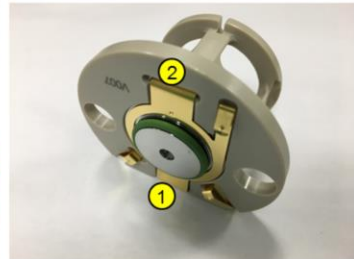
Refer to Operating manual for further instructions



- Inlet stack components:
 1. Source cage
 2. Ion funnel
 3. Internal calibration unit
 4. Injection filter



- Insert a flat head screwdriver through the holes in the injection filter PEEK holder to loosen the screws.



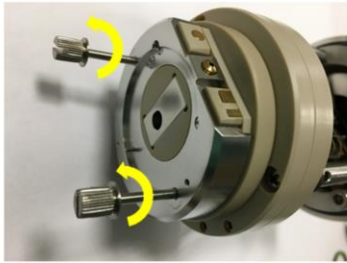
- Pull up tab 1 of the metal retainer for the focus lens until it is freed from the PEEK holder. Unhook tab 2 and remove the lens.

④ Flat head screwdriver

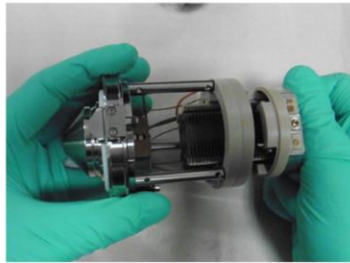
Demonstrate how to remove and clean the inlet stack
Refer to the manual for instructions

Disassembly of the Ion Funnel

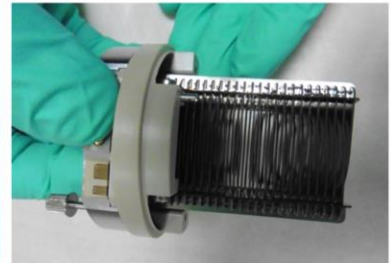
Refer to Operating manual for further instructions



- By hand, continue to unscrew the long screws until the second set of windings is free.



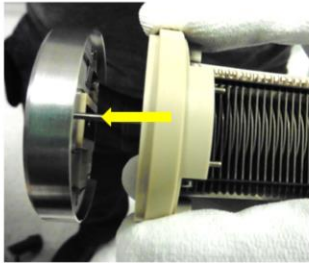
- Pull the entire Ion Funnel and IC unit assembly straight out of the source cage.



Demonstrate how to remove and clean the inlet stack
Refer to the manual for instructions

Disassembly Exit Lens/IC Unit

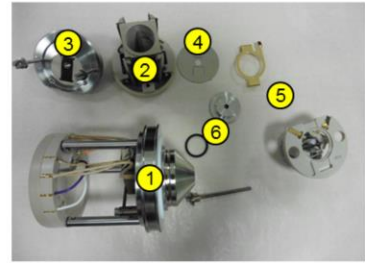
Refer to Operating manual for further instructions



- Separate the IC unit from the Ion funnel being sure not to bend the long metal pin extending through the PEEK holder of the S-lens.



- Wipe clean with wet lint-free wipes soaked in Isopropanol:Water and purge with N₂.



- For cleaning instructions see Operating manual.
 1. Source Cage
 2. Ion Funnel
 3. Internal Calibration Unit
 4. Exit Lens
 5. Injection Filter
 6. Flatapole Focus Lens

Demonstrate how to remove and clean the inlet stack
Refer to the manual for instructions

Removal of the top cover

Refer to *Extended Maintenance Manual* for further instructions



- With the accessory compartment open, loosen the 3 mm hex screws in the accessories cabinet that connect the top cover to the instrument frame
- Remove all equipment located in the accessory compartment. Make sure nothing is plugged into the USB ports



- Grab the front of the top cover of the instrument with both hands and push it a small distance toward the rear side of the instrument.



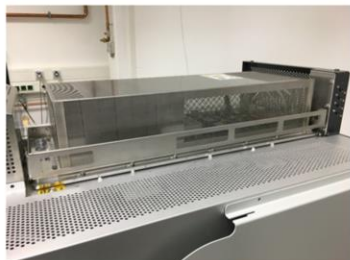
- Grab the Orbitrap-shaped handles of the cover with both hands and lift it off. Store the cover in a safe place.

The Orbitrap Exploris 480 unique optics configuration empowers the user to perform their own performance maintenance as required.

Demonstrate how easy it is to remove top cover to access quadrupole and bent flatapole.

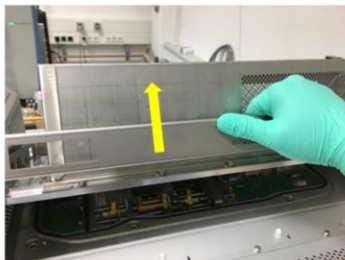
Opening the main chamber

Refer to *Extended Maintenance Manual* for further instructions

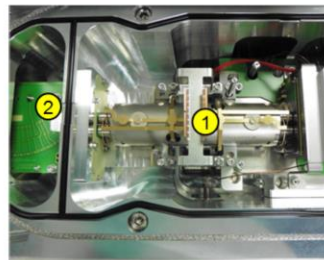


- **Important:**
Wait until instrument is fully **vented**

- Make sure that the chamber is open only when you do work on the components inside



- Use the handle to open the lid of the quadrupole chamber.



- Customer-accessible parts:
1. Quadrupole
2. Bent Flatapole

The Orbitrap Exploris 480 unique optics configuration empowers the user to perform their own performance maintenance as required.

Demonstrate how easy it is to access quadrupole and bent flatapole, and indicate to the customer where the parts are located. Customers who choose to do Performance maintenance themselves can contact the FSR to perform a hands on training 2 months after install. Here the FSE can demonstrate how to perform maintenance for the quadrupole and the bent flatapole. The extended maintenance manual can be given to the customer during the hands on training and contains detailed step by step instructions on how to do maintenance on these parts.

EASY-nLC maintenance



Thermo

EASY-nLC 1200

Troubleshooting and Maintenance Guide

Touch-screen application version 4.1

02053-97214 Revision B 2016

thermo
scientific

1

If an LC is also installed, refer the customer to the respective manuals for maintenance and best practices. EASY-nLC manuals can be found in LC Devices. Latest revisions can be found on www.thermofisher.com, ULS knowledgebase,

UltiMate 3000 maintenance

Thermo Scientific Dionex UltiMate 3000 Series

Nano/Cap System NCS-3500RS
Nano/Cap Pump NCP-3200RS

Operating Instructions
(Original Operating Instructions)



UltiMate 3000 Series:
NCS-3500RS and NCP-3200RS

5.8 Recommendations for Optimally Running Systems (Best Practice)

If an LC is also installed, refer the customer to the respective manuals for maintenance and best practices. RSLC nano manual can be found in Direct control. Latest revisions can be found on www.thermofisher.com, ULS knowledgebase,

FAIMS maintenance



FAIMS User Guide

FAIMS Pro System

User Guide

High-Field Asymmetric Waveform Ion Mobility Spectrometry System

Maintaining the FAIMS Pro System

Contents

- Maintenance Schedule
- Guidelines
- Tools and Supplies
- Shutting Down the LC/MS/FAIMS Pro System
- Flushing the Inlet Components
- Removing Components
- Cleaning Components
- Fixing a Gas Leak Between the MS and the Electrodes
- Reassemble Components

For a list of replaceable parts, see Chapter 9, "Replaceable Parts."

Refer to the FAIMS manual for maintenance,

PN of recommended consumables: LC-MS

Product Name	Unit Size	Product Number
Pierce™ HeLa Protein Digest Standard	1x 20 µg dry pellet	88328
PRTC: Pierce™ Peptide Retention Time Calibration Mixture	0.5 µM, 50 µl frozen aliquot	88320
99.9% Water, 0.1% FA Optima LCMS grade	500 mL	LS118-500
80% ACN, 0.1% FA Optima LCMS grade	500 mL	LS122-500
99.9% ACN, 0.1% FA Optima LCMS grade	500 mL	LS120-500
EASY-Spray Column	15 cm x 75 µm ID, PepMap C18 3 µm particles, 100 Å pore size	ES800A

www.thermofisher.com or www.fishersci.com.
For holistic test

PN of recommended consumables: maintenance

Product Name	Unit Size	Product Number
Pierce™ FlexMix™ Calibration Solution	10 mL	A39239
Performance Maintenance Starter Kit - Exploris		BRE0021873
Maintenance Consumables Kit		BRE0021372
DUO 11 Oil P3	0.5L	BRE0015107
SOGEVAC oil LVO700	2L	BRE0019927
Ion transfer tube, high capacity	1	80500-20045

Further information on replaceable parts in operating manual

Replaceable Parts