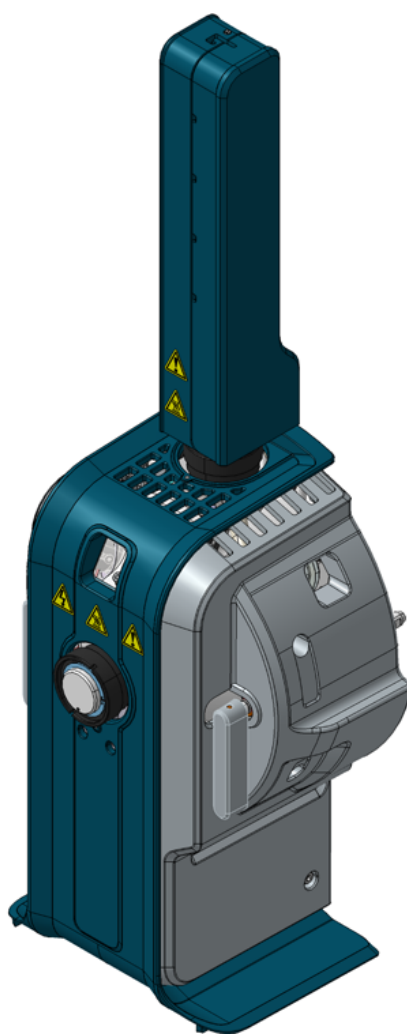


Operator Guide

OptiFlow Turbo V Ion Source



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Operational Precautions and Limitations

1

Note: Before operating the system, carefully read all of the sections of this guide.

This section contains general safety-related information. It also describes potential hazards and associated warnings for the system and the precautions that should be taken to minimize the hazards.

For information about the symbols and conventions used in the laboratory environment, on the system, and in this documentation, refer to the section: [Glossary of Symbols](#).

Operational Precautions and Hazards

For regulatory and safety information for the mass spectrometer, refer to the document: *System User Guide*.



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. Do not use the ion source without knowledge of and training in the correct use, containment, and evacuation of toxic or injurious materials used with the ion source.



WARNING! Hot Surface Hazard. Before maintenance procedures are started, wait a minimum of 60 minutes for the temperature of the OptiFlow Turbo V ion source to decrease sufficiently to prevent a burn hazard. Some surfaces of the ion source and vacuum interface become hot during operation.



WARNING! Fire and Toxic Chemical Hazard. Keep flammable liquids away from flame and sparks. Use flammable liquids only in vented chemical fume hoods or safety cabinets.



WARNING! Fire and Toxic Chemical Hazard. Before solvent leaks are corrected, make sure that the liquid flow to the ion source is stopped, that the ion spray voltage is off, that there are no open flames or other sources of fire nearby, and that the room is sufficiently ventilated. The fluid from a leak can be highly flammable. If the fluid is exposed to electrical discharges or a source of fire, then ignition can occur. If ventilation is not sufficient, then the fluid might cause poisoning.

Operational Precautions and Limitations



WARNING! Toxic Chemical Hazard. To prevent exposure of skin or eyes, wear personal protective equipment (PPE) that includes a laboratory coat, gloves, and protective eyewear.



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. If a chemical spill occurs, then refer to the safety data sheets (SDS) for the product for instructions to contain and remove the spill. Before cleaning procedures start, make sure that the system is in Standby status. Obey local regulations to discard the material that is used to clean the spill.



WARNING! Environmental Hazard. Do not discard system components in municipal waste. To discard components correctly, obey local regulations.



WARNING! Electrical Shock Hazard. To prevent contact with the high voltages that are used during operation, before adjustments are made to the sample tubing or other equipment near the ion source, put the system in Standby status.

Note: Use zero air when using the OptiFlow Turbo V ion source with micro flow rates less than 10 $\mu\text{L}/\text{min}$ or nano flow rates. Do not use UHP nitrogen for Ion source gas 1 or Ion source gas 2, because there is an increased risk of corona discharge, which can damage the emitter tip.

Chemical Precautions



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. Before cleaning or maintenance procedures are started, identify if decontamination is required. If radioactive materials, biological agents, or toxic chemicals have been used with the system, then the customer must decontaminate the system before cleaning or maintenance procedures are done.



WARNING! Puncture Hazard, Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. If the ion source window has cracks or is broken, then do not use the ion source. Contact a SCIEX field service employee (FSE). Toxic or injurious materials that go into the equipment will be in the source exhaust output. Exhaust from equipment should be vented from the room. Follow approved laboratory procedures to discard sharps.



WARNING! Environmental Hazard. Do not discard system components in municipal waste. To discard components correctly, obey local regulations.



WARNING! Biohazard or Toxic Chemical Hazard. To prevent leaks, connect the drain tubing to the mass spectrometer and the source exhaust drain bottle correctly.

- Before servicing and regular maintenance, identify the chemicals that have been used in the system. For the health and safety precautions that must be obeyed for a chemical, refer to the safety data sheet (SDS). For storage information, refer to the certificate of analysis. To find a SCIEX SDS or certificate of analysis, go to sciex.com/tech-regulatory.
- Always wear assigned personal protective equipment, which includes powder-free gloves, protective eyewear, and a laboratory coat.

Note: Nitrile or chloroprene gloves are recommended.

- Do work in a well-ventilated area or fume hood.
- When flammable materials, for example, isopropanol and methanol, are in use, do not go near ignition sources.
- Be careful with the use and disposal of chemicals. If the correct procedures for chemical use and disposal are not obeyed, then personal injury can occur.
- If solvent gets into the eyes or on the skin, then flush the solvent away immediately.
- During cleaning, do not let chemicals touch the skin. Wash hands after use.
- Make sure that all of the exhaust hoses are connected correctly and that all of the connections are functioning as designed.
- Collect all of the spent liquids and discard them as hazardous waste.
- Obey all of the local regulations for the storage, use, and disposal of biohazardous, toxic, and radioactive materials.
- (Recommended) Use a secondary containment tray below the roughing pump.

Laboratory Conditions

Safe Environmental Conditions

The system is designed to operate safely in these conditions:

- Indoors
- Altitude: Up to 2,000 m (6,562 ft) above sea level
- Ambient temperature: 10 °C (50 °F) to 35 °C (95 °F)
- Relative humidity: 20% to 80%, noncondensing
- Mains supply voltage fluctuations: $\pm 10\%$ of the nominal voltage
- Transient overvoltages: Up to the levels of Overvoltage Category II

Operational Precautions and Limitations

- Temporary overvoltages on the mains supply
- Pollution Degree 2

Performance Specifications

The system is designed to meet specifications under these conditions:

- Ambient temperature is between 15 °C to 30 °C (59 °F to 86 °F).
- Relative humidity is between 20% to 80%, noncondensing.

Equipment Use and Modification



WARNING! Electrical Shock Hazard. Do not remove the covers. If the covers are removed, then injury or incorrect system operation might occur. Removal of the covers is not required for routine maintenance, inspection, or adjustment. For repairs that require removal of the covers, contact a SCIEX field service employee (FSE).



WARNING! Personal Injury Hazard. Use only parts that are recommended by SCIEX. The use of parts that are not recommended by SCIEX or the use of parts for a purpose other than their intended purpose can put the user at risk of harm or have a negative effect on system performance.



WARNING! Crushing Hazard. When heavy objects are moved, wear protective footwear. If a heavy object falls during a move, then personal injury might occur.

Use the system indoors in a laboratory that complies with the environmental conditions recommended in the document: *Site Planning Guide*.

If the system is used in conditions or an environment that are not approved by the manufacturer, then the performance and protection that is supplied by the equipment might be decreased or lost.

Contact an FSE for information about servicing the system. Unauthorized modification or operation of the system might cause personal injury and equipment damage, and might void the warranty. If the system is operated outside the recommended environmental conditions or with unauthorized modifications, then the acquired data might be inaccurate.

Ion Source Overview

2

The OptiFlow Turbo V ion source can be used with these systems:

- SCIEX 5500 systems
- SCIEX 5500+ systems
- SCIEX 6500 systems
- SCIEX 6500+ systems
- TripleTOF 6600+ systems
- Echo[®] MS+ systems

For information on how to use the OptiFlow Turbo V ion source with the Echo[®] MS probe, refer to the document: *User Guide for the Echo[®] MS+ System*.

The ion source has two probe ports, a front probe port and a top probe port.

The ion source can be configured with the Micro probe, Nano probe, or Echo[®] MS probe. The following table lists the probes that are compatible with each supported mass spectrometer.

Table 2-1 Probe Compatibility

Probe	Mass Spectrometer				
	SCIEX 5500 systems	SCIEX 5500+ systems	SCIEX 6500 systems	SCIEX 6500+ systems	TripleTOF 6600+ systems
Micro 1–50 µL	✓	✓	✓	✓	✓
Micro 50–200 µL	✓	✓	✓	✓	✓
Nano < 1 µL	X	X	✓	✓	✓
Echo [®] MS	X	X	X	✓	X

Note: The ion source has two probe ports, a front port and a top port. Only one probe can be installed at a time. A probe port plug must be installed in the unused probe port.

The probes are configured for various flow rates and electrodes:

- Micro 1–50 µL probe: Flow rate of 1 µL/min to 50 µL/min. Compatible electrodes are:
 - Electrode 1–10 µL (1 µL/min to 10 µL/min)

Ion Source Overview

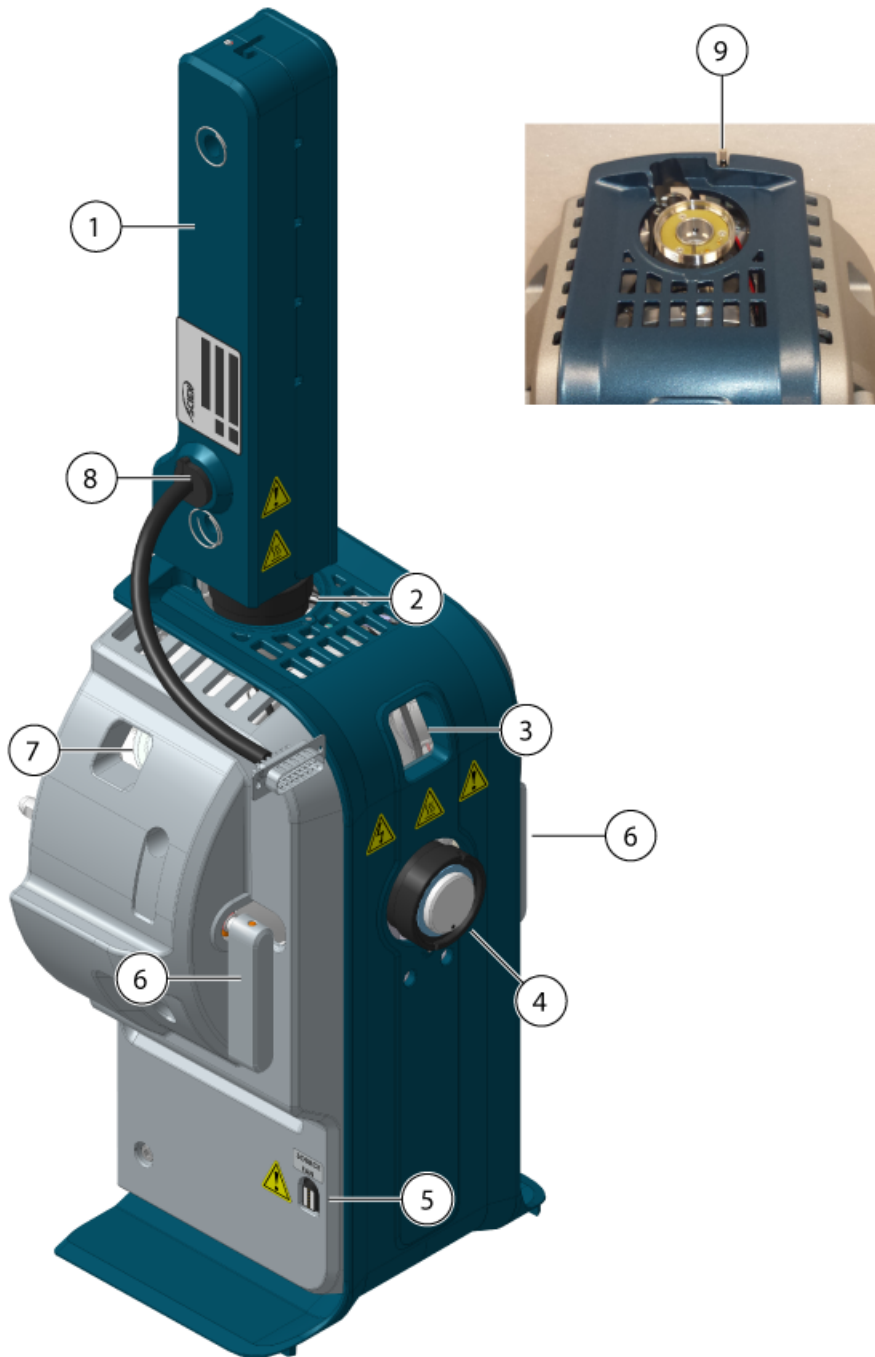
- Electrode 10–50 μL (10 $\mu\text{L}/\text{min}$ to 50 $\mu\text{L}/\text{min}$)
- Micro 50–200 μL probe: Flow rate of 50 $\mu\text{L}/\text{min}$ to 200 $\mu\text{L}/\text{min}$. Compatible electrodes are:
 - Electrode 50–200 μL (50 $\mu\text{L}/\text{min}$ to 200 $\mu\text{L}/\text{min}$)
- Nano < 1 μL probe: Flow rate of 100 nL/min to 1000 nL/min. Compatible electrodes are:
 - Nano electrode (100 nL/min to 1000 nL/min)

Ion Source Components

Micro Probe

Note: Only one probe can be installed at a time. For micro flow ESI operation, a probe port plug must be installed in the front probe port.

Figure 2-1 Ion Source Components (Micro Probe)



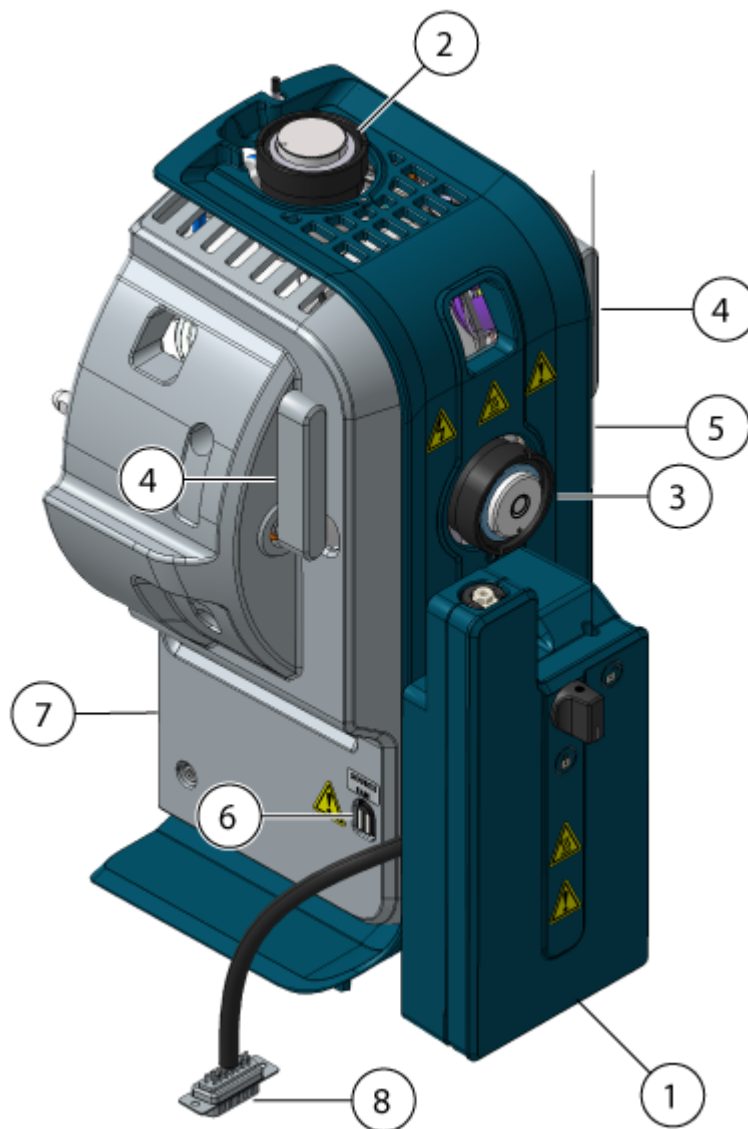
Ion Source Overview

Item	Description
1	Micro column heater. The Micro column heater can be configured with the NanoLC 415, NanoLC 425, M3 MicroLC, or M5 MicroLC system. The maximum column heater temperature is 90 °C (194 °F).
2	Top port. This probe port is used for micro operation.
3	Front window.
4	Front port. This probe port is used for nano flow operation. The probe port plug is shown in the figure.
5	Magnetic connector for ion source cooling fan power cable.
6	Source latch. The latches secure the ion source to the mass spectrometer.
7	Side window.
8	Power and communication connector. Used only if the ion source is configured for use with the NanoLC 415, NanoLC 425, M3 MicroLC, or M5 MicroLC system.
9	High-voltage enable switch. The switch allows the firmware to supply power to the ion source when activated. The switch is not visible in the main illustration.

Nano Probe

Note: Only one probe can be installed at a time. For nano flow operation, a probe port plug must be installed in the top port (Micro).

Figure 2-2 Ion Source Components (Nano Probe)



Item	Description
1	Nano column heater. The Nano column heater can only be configured with the NanoLC 415 and NanoLC 425 systems. The maximum column heater temperature is 90 °C (194 °F).
2	Top port (Micro probe). The probe port plug is shown in the figure.
3	Front port (Nano probe).
4	Source latch. The latches secure the ion source to the mass spectrometer.
5	Front cover.

Ion Source Overview

Item	Description
6	Magnetic connector for ion source cooling fan power cable.
7	Left cover.
8	Power and communication connector. Used only if the ion source is configured for use with the NanoLC 415 or NanoLC 425 system.

Gas and Electrical Connections

Gas and low- and high-voltage electrical connections are provided on the front plate of the vacuum interface and connect internally through the ion source housing. When the ion source is installed on the mass spectrometer, all of the electrical and gas connections are complete.

The ion source has an additional connection for the cooling fan between the magnetic connector on the ion source and the ion source connector on the mass spectrometer.

Ion Source Sense Circuit

An ion source sense circuit disables the high-voltage power supply for the mass spectrometer and the source exhaust system in these conditions:

- The ion source is not installed or is incorrectly installed.
- A probe or plug is not installed or is incorrectly installed.
- The mass spectrometer senses a gas fault.
- The ion source has overheated.
- The ion source cooling fan power cable between the magnetic connector on the ion source and the ion source connector on the mass spectrometer is not connected.

Source Exhaust System



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. To safely remove sample vapor exhaust from the laboratory environment, make sure that the source exhaust system is connected and in operation. Make sure that equipment emissions are released in the general building exhaust and not in the laboratory environment. For requirements for the source exhaust system, refer to the document: *Site Planning Guide*.



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. To prevent the release of hazardous vapors in the laboratory environment, make sure that the source exhaust system is connected to a dedicated laboratory fume hood or an external ventilation system.



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. If an LC system is used with the mass spectrometer, and if the source exhaust system does not operate correctly, then shut down the LC system until operation of the source exhaust system is correct.



WARNING! Fire Hazard. Do not put more than 2 mL/min of flammable solvent in the ion source. If the maximum flow rate is more than 2 mL/min, then the solvent can collect in the ion source. If the source exhaust system is not connected and in operation when the ion source and probe are correctly installed, then do not use the ion source.

Note: To decrease the risk that exhaust from the system will go into a room, make sure that all of the exhaust tubing is correctly connected.

An ion source makes sample and solvent vapors. These vapors are a potential hazard to the laboratory environment. The source exhaust system is designed to help the user safely remove and correctly release the sample and solvent vapors. When the ion source is installed, the mass spectrometer does not operate unless the source exhaust system operates.

An active exhaust system removes ion source exhaust through a drain port, but does not add chemical noise. The drain port connects through a drain chamber and a source exhaust pump to a drain bottle, and from there to a customer-supplied exhaust ventilation system. For information about the ventilation requirements for the source exhaust system, refer to the document: *Site Planning Guide*.

Note: To make sure that the exhaust tubing is serviceable and leaks have not occurred, examine the source exhaust system at regular intervals.

Ion Source Installation

3



WARNING! Electrical Shock Hazard. Do not use electrically conductive tubing or fittings, such as stainless steel or other metal or metallic compounds, with the ion source. A static shock or equipment malfunction might occur. Use only non-electrically conductive tubing and fittings, such as PEEK or PEEK-clad fused silica.



WARNING! Electrical Shock Hazard. When the sample is supplied through infusion, before fittings or tubing are examined for leaks, remove the infusion adapter to turn off the high-voltage power. If the high-voltage power is on and the user touches a liquid leak from the probe fittings or tubing, then a static shock might occur.



WARNING! Electrical Shock Hazard. Install the ion source on the mass spectrometer as the last step in this procedure. When the ion source is installed, the high-voltage power is on.

CAUTION: Potential System Damage. Do not lift or carry the ion source with one hand. The ion source is designed to be lifted or carried with the molded grips on each side of the ion source.

CAUTION: Potential System Damage. Do not install the ion source with a nano curtain plate in position. The probe will contact the nano flow curtain plate and damage the components.

When the ion source is installed, the software recognizes the ion source and shows the ion source identification.

Required Materials

- Ion source
- Red PEEK tubing (0.005-inch bore)
- Ion source cooling fan power cable
- For analysis by LC-MS:
 - Column
 - (Optional) Micro column heater
- For analysis by infusion:
 - Infusion adapter
 - PEEK tee or union
- PEEK-clad fused-silica tubing
- For micro flow ESI operation:
 - Micro column heater
 - Micro probe
 - Top and bottom fittings for the Micro probe
- For nano flow operation:
 - Nano column heater
 - Nano probe
 - Union and fitting for the Nano electrode
- Electrode

Install the Probes and Probe Port Plug

Use this procedure to install the probes.

Tip! The probe has a dot that must align with a related dot on the ion source.

1. To install a probe in the top port, do this:
 - a. Install the probe in the top port.
 - b. Tighten the knurled ring of the probe.
2. To install a probe or probe port plug in the front port, do this:

Ion Source Installation

- a. Install the probe or probe port plug in the front port.
- b. Tighten the knurled ring of the probe or probe port plug.

Install the Electrode in a Micro Probe



WARNING! Electrical Shock Hazard. Do not use electrically conductive tubing or fittings, such as stainless steel or other metal or metallic compounds, with the ion source. A static shock or equipment malfunction might occur. Use only non-electrically conductive tubing and fittings, such as PEEK or PEEK-clad fused silica.



WARNING! Electrical Shock Hazard. When the sample is supplied through infusion, before fittings or tubing are examined for leaks, remove the infusion adapter to turn off the high-voltage power. If the high-voltage power is on and the user touches a liquid leak from the probe fittings or tubing, then a static shock might occur.



WARNING! Puncture Hazard. Be careful with the handling of the electrode. The tip of the electrode is very sharp.

CAUTION: Potential System Damage. To decrease the risk of damage to the electrode tip during installation of the probe in the ion source, before the electrode is installed in the probe, install the probe in the ion source.

CAUTION: Potential System Damage. To prevent damage to the electrode, do not let the tip that extends from the electrode touch the ion source.

Prerequisite Procedures

- Install the probes. Refer to the section: [Install the Probes and Probe Port Plug](#).

Figure 3-1 Ion Source Probes



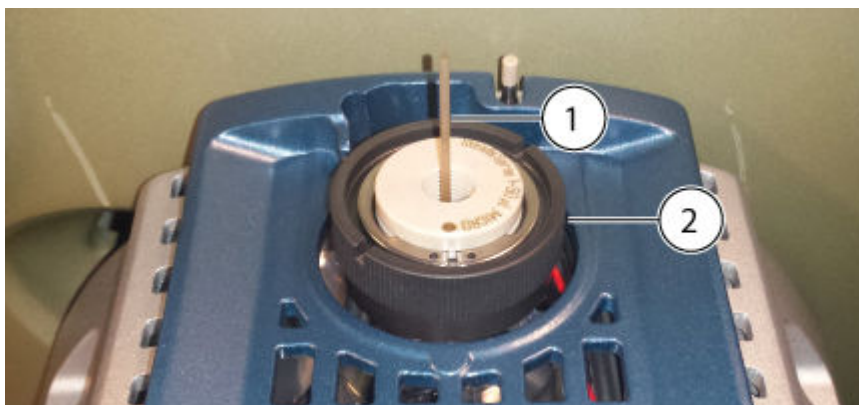
The Micro probe goes in the top port and the NanoSpray probe goes in the bottom port.

Item	Description	Comments
1	Micro probe	The probe is ready to have the electrode installed.
2	Front port plug	The probe port is capped with the plug.

1. Install the electrode in the probe with the fused-silica or steel end first.
2. Turn the electrode a small amount to install it fully in the probe, and then make sure that the tip of the electrode can be seen below the end of the probe.
The nominal protrusion for the electrode is 1.0 mm.

Ion Source Installation

Figure 3-2 Electrode in the Micro Probe



Item	Description
1	Electrode
2	Micro probe

3. Put the bottom fitting over the electrode, and then tighten the fitting until it is finger tight.

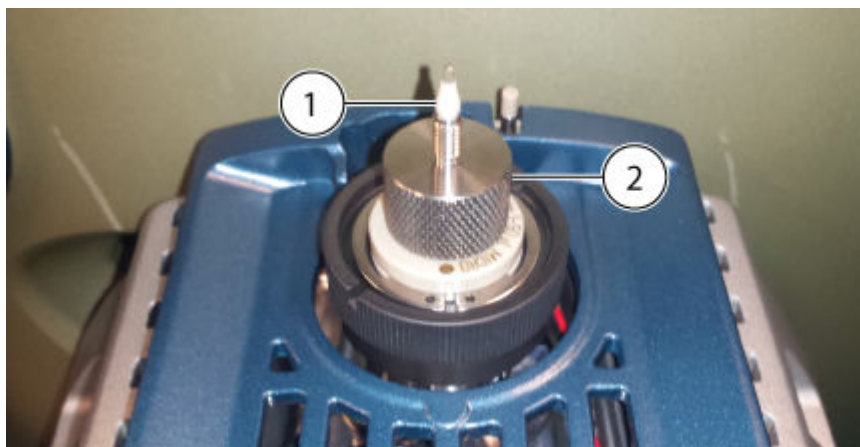
Figure 3-3 Bottom Fitting Installed



Item	Description
1	Bottom fitting

4. Put the PEEK ferrule on the top fitting, and then put the top fitting on top of the bottom fitting.
To let different column fitting depths be used, the top fitting is loose on top of the bottom fitting.

Figure 3-4 Top Fitting



Item	Description
1	PEEK ferrule
2	Top fitting

The electrode installation is completed. The sample tubing, which might include a column or an infusion adapter and PEEK tee, can be installed. To install the column, refer to the section: [Install the Micro Column and Heater](#). To install an infusion adapter and PEEK tee, refer to the section: [Install an Infusion Adapter and Connect an Infusion Line to a Micro Probe](#).

Install the Electrode in the Nano Probe



WARNING! Electrical Shock Hazard. Do not use electrically conductive tubing or fittings, such as stainless steel or other metal or metallic compounds, with the ion source. A static shock or equipment malfunction might occur. Use only non-electrically conductive tubing and fittings, such as PEEK or PEEK-clad fused silica.



WARNING! Puncture Hazard. Be careful with the handling of the electrode. The tip of the electrode is very sharp.

CAUTION: Potential System Damage. To decrease the risk of damage to the electrode tip during installation of the probe in the ion source, before the electrode is installed in the probe, install the probe in the ion source.

CAUTION: Potential System Damage. To prevent damage to the electrode, do not let the tip that extends from the electrode touch the ion source.

Ion Source Installation

Prerequisite Procedures

- Install the Nano probe. Refer to the section: [Install the Probes and Probe Port Plug](#).

1. Install the fitting in the union, and then turn the fitting clockwise until it is finger tight.

Figure 3-5 Nano Electrode



Item	Description
1	Union
2	Threaded fitting
3	Nano electrode

Note: The electrode is supplied with the fitting installed.

2. If a probe port plug is installed in the front probe port, then do this:
 - a. Loosen the knurled ring on the probe port plug, and then carefully pull the plug straight out of the ion source.
 - b. Install the Nano probe in the front probe port.

Tip! During installation of the probe in the ion source, align the dot on the probe with the related dot on the ion source housing.

- c. Tighten the knurled ring on the Nano probe.

Figure 3-6 Nano Probe



Item	Description
1	Nano probe
2	Dot on the probe Note: The dot on the probe shows the location of a pin on the ion source that fits in a hole in the back of the probe. When the dot on the probe is aligned with the dot on the ion source housing, the pin and the hole are aligned correctly.

3. Install the union and electrode in the Nano probe, and then turn the union clockwise to tighten it.

Figure 3-7 Union Installed in the Nano Probe



Item	Description
1	Nano probe
2	Union

Install the Micro Column and Heater



WARNING! Electrical Shock Hazard. Before this procedure is started, make sure that the ion source is fully disconnected from the mass spectrometer.



WARNING! Hot Surface Hazard. Before the column is removed or the PEEK-clad fused-silica tubing is replaced, let the column become cool. During operation, the column becomes hot.



WARNING! Electrical Shock Hazard. Do not use electrically conductive tubing or fittings, such as stainless steel or other metal or metallic compounds, with the ion source. A static shock or equipment malfunction might occur. Use only non-electrically conductive tubing and fittings, such as PEEK or PEEK-clad fused silica.



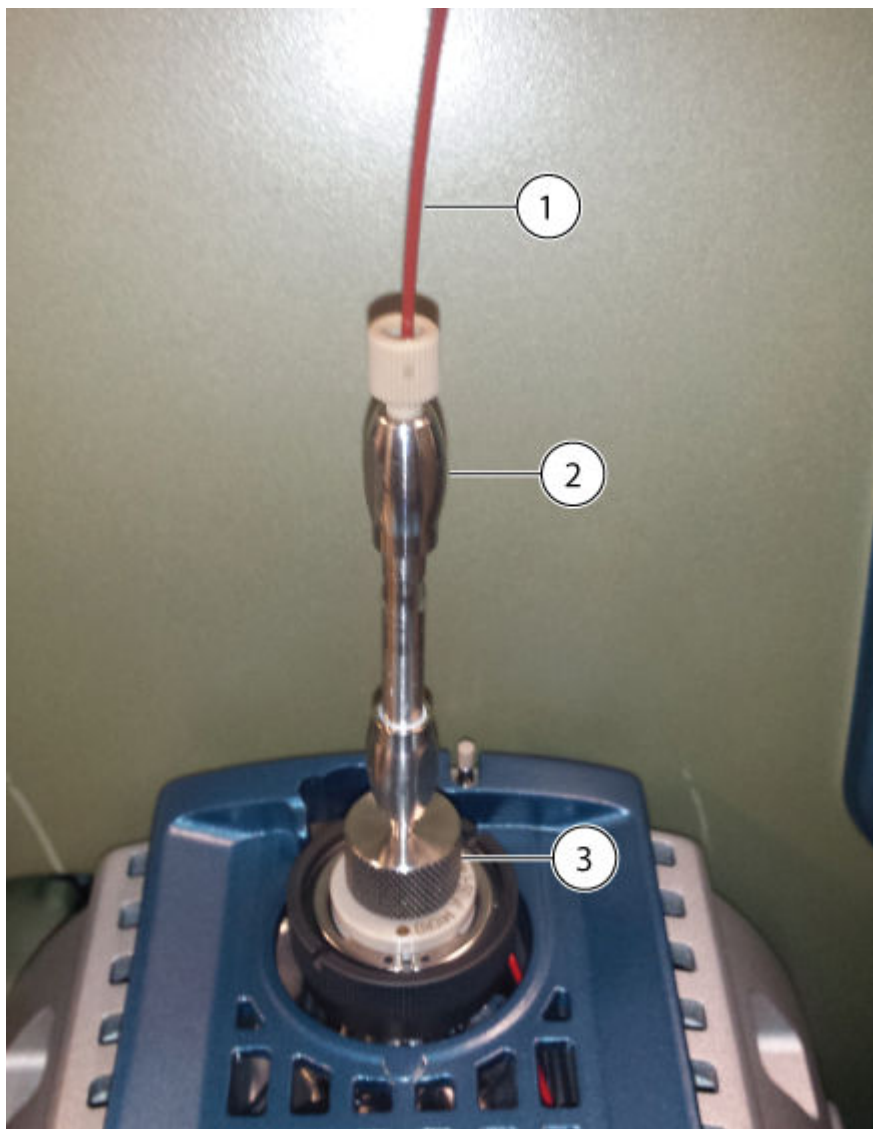
WARNING! Electrical Shock Hazard. When the sample is supplied through infusion, before fittings or tubing are examined for leaks, remove the infusion adapter to turn off the high-voltage power. If the high-voltage power is on and the user touches a liquid leak from the probe fittings or tubing, then a static shock might occur.

Prerequisite Procedures

- [Install the Electrode in a Micro Probe.](#)
- [Install the Ion Source on the Mass Spectrometer.](#)

1. Connect the sample tubing between the column and the LC system. If the ion source is configured for use with the NanoLC 415, NanoLC 425, M3 MicroLC, or M5 MicroLC system, then use the sample tubing supplied with the LC system. Refer to the LC system document: *Operator Guide*.
2. Attach the column to the top fitting on the probe.
 - a. To keep dead volume to a minimum, make sure that the electrode is fully installed in the column fitting.
 - b. Hold the column, and then turn the top fitting counterclockwise until the fitting is finger tight.

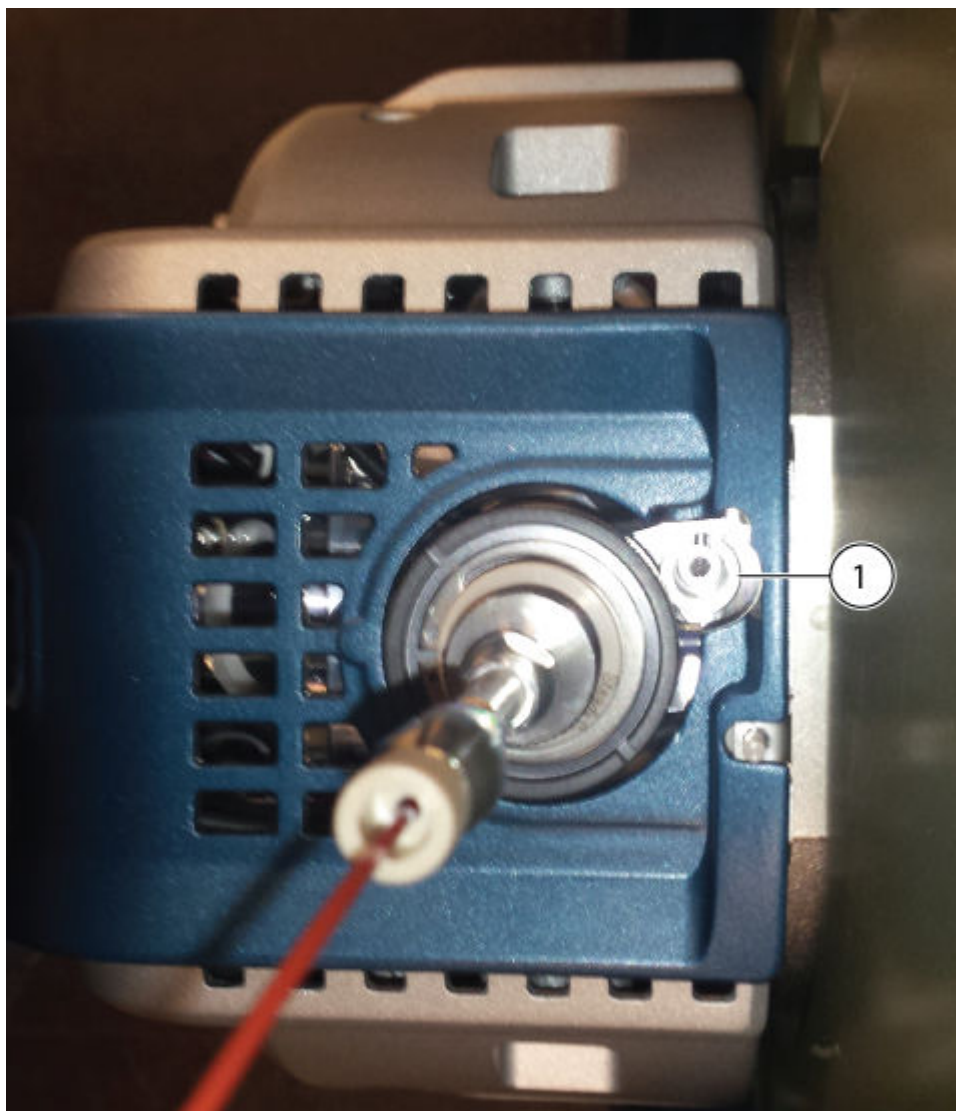
Figure 3-8 Column



Item	Description
1	Sample tubing
2	Column
3	Top fitting

3. Install the mounting post of the column heater in the socket on the ion source. Carefully push the column heater on the source.

Figure 3-9 Socket

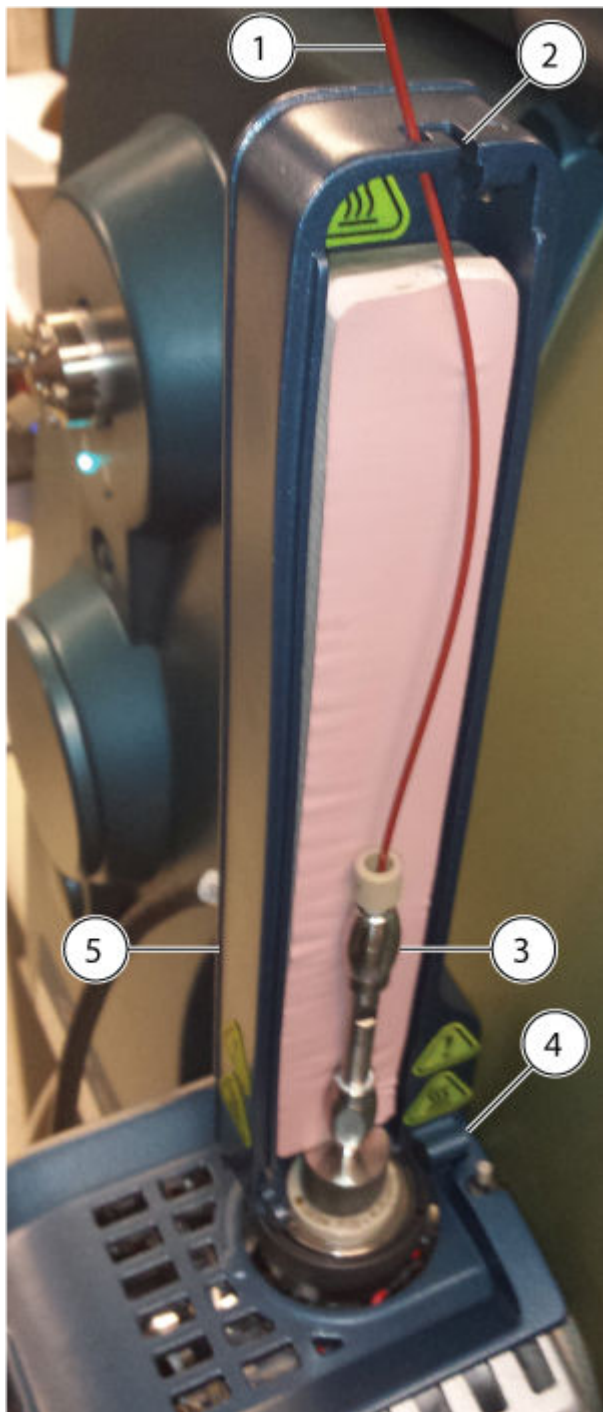


Item	Description
1	Socket for the mounting post for the column heater

4. Turn the left side of the column heater in the direction of the column.

Ion Source Installation

Figure 3-10 Column Heater, Left Side



Item	Description
1	Sample introduction tubing

Item	Description
2	Guide slot for the sample tubing
3	Column
4	Hinge
5	Left side of the column heater Note: The heater has two parts that must be assembled around the column.

Make sure that the mounting post is installed tightly in the socket on the ion source.

- Put the PEEK-clad fused-silica tubing through the entrance slot at the top of the column heater. Refer to the figure: [Figure 3-10](#).
- Install the right side of the column heater on the hinge at the base of the left side of the column heater, and then close both sides of the heater until they lock together.

Figure 3-11 Column Heater



Item	Description
1	Right side of the column heater
2	Left side of the column heater

Install the Nano Column Cartridge and Heater



WARNING! Electrical Shock Hazard. Before this procedure is started, make sure that the ion source is fully disconnected from the mass spectrometer.



WARNING! Hot Surface Hazard. Before the column is removed or the PEEK-clad fused-silica tubing is replaced, let the column become cool. During operation, the column becomes hot.



WARNING! Electrical Shock Hazard. Do not use electrically conductive tubing or fittings, such as stainless steel or other metal or metallic compounds, with the ion source. A static shock or equipment malfunction might occur. Use only non-electrically conductive tubing and fittings, such as PEEK or PEEK-clad fused silica.



WARNING! Electrical Shock Hazard. Do not connect the Nano column heater to a European-style two-pin electrical outlet. Fire or electric shock might occur.

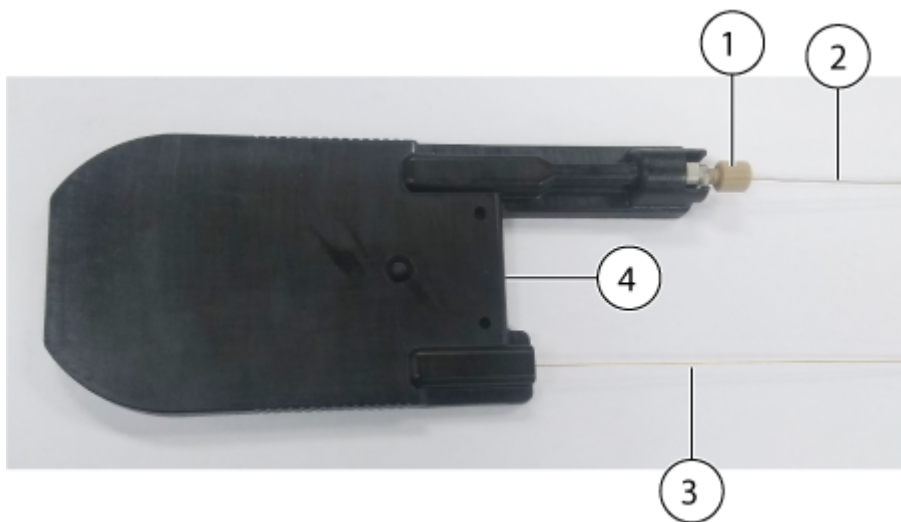


WARNING! Personal Injury Hazard. During handling of the Nano column heater, wear protective eyewear. A part of the fused-silica tubing extends from the top of the column heater and can cause injury.

Prerequisite Procedures	
•	Install the Electrode in the Nano Probe.
•	Install the Ion Source on the Mass Spectrometer.

1. If the ion source will be connected to an LC system, then attach a fitting to the pre-column transfer tube, and then turn the fitting clockwise in the Nano column cartridge until it is finger tight.

Figure 3-12 Nano Column Cartridge



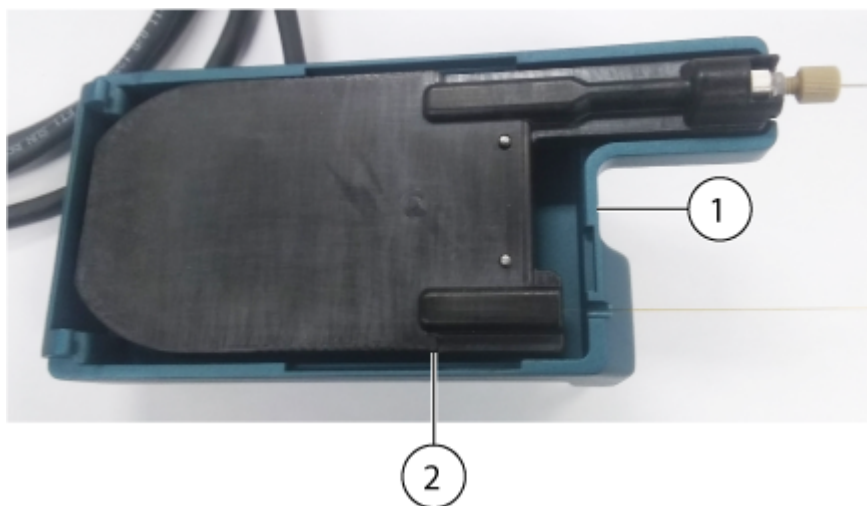
Item	Description
1	Fitting

Ion Source Installation

Item	Description
2	Pre-column transfer tube, connected to an LC system
3	Post-column transfer tube, connected to the Nano probe
4	Nano column cartridge

2. Install the column cartridge in the back of the Nano column heater.

Figure 3-13 Back of the Nano Column Heater



Item	Description
1	Back of the Nano column heater
2	Column cartridge

3. Install the base of the front of the column cartridge over the hinges of the back, and then fold the front down to close the column heater.

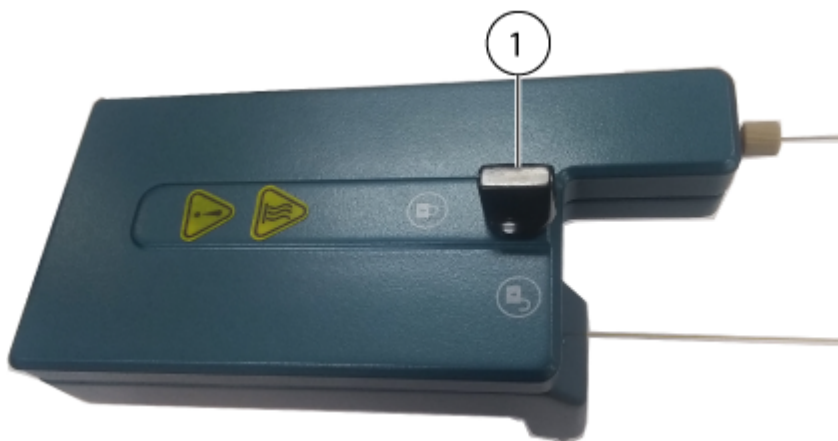
Figure 3-14 Front and Back of the Nano Column Heater



Item	Description
1	Front of the Nano column heater
2	Back of the Nano column heater
3	Locking dial in the unlocked position

4. Turn the locking dial clockwise to hold the column cartridge in the Nano column heater.

Figure 3-15 Nano Column Heater Closed



Ion Source Installation

Item	Description
1	Locking dial in the locked position

5. Find the connection points on the front of the ion source, and then install the Nano column heater on the ion source. Gently press the column heater on to the ion source. Do not use excessive force.

Note: The column heater has two pins that fit in the connection points.

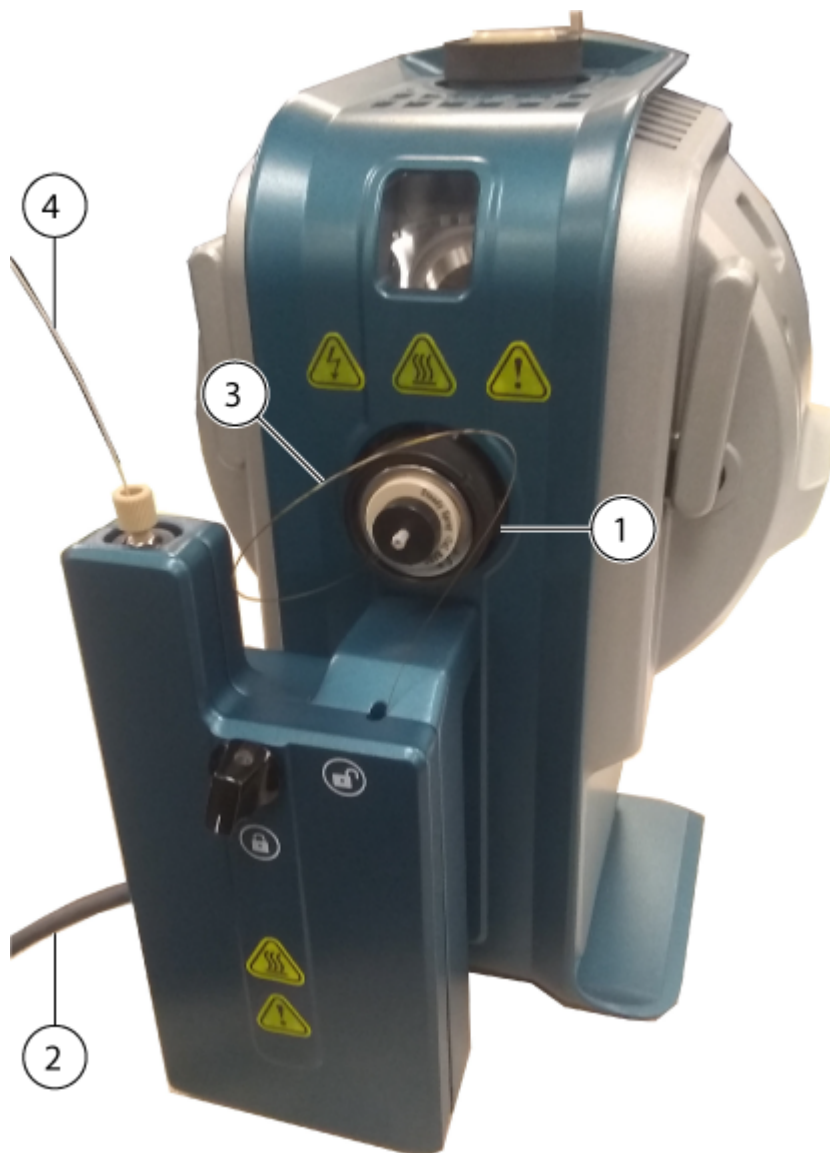
Figure 3-16 Nano Column Heater Connection on the Ion Source



Item	Description
1	Nano probe
2	Connection points for the Nano column heater

6. Attach a fitting to the post-column transfer tube, install the fitting in the union that is installed in the Nano probe, and then turn the fitting clockwise until it is finger tight.

Figure 3-17 Nano Column Heater Installed on the Ion Source



Item	Description
1	Nano probe
2	Power and communication cable to the LC system
3	Post-column transfer tube

Ion Source Installation

Item	Description
4	Pre-column transfer tube

7. Connect the pre-column transfer tube to the LC system.
8. Connect the power and communication cable to the LC system.

Install the Ion Source on the Mass Spectrometer

CAUTION: Potential System Damage. To prevent damage to the electrode, do not let the tip that extends from the electrode touch the ion source.

1. Make sure that the two source latches on either side of the ion source are pointing up in the 12 o'clock position.
2. Align the guide pins on the ion source with the sockets in the vacuum interface on the mass spectrometer.
3. Push the ion source gently against the vacuum interface, and then turn the ion source latches down to lock the ion source in position.
4. Connect the cable for the ion source cooling fan between the magnetic connector ion source and the ion source connector on the mass spectrometer.

Install an Infusion Adapter and Connect an Infusion Line to a Micro Probe



WARNING! Electrical Shock Hazard. Do not use electrically conductive tubing or fittings, such as stainless steel or other metal or metallic compounds, with the ion source. A static shock or equipment malfunction might occur. Use only non-electrically conductive tubing and fittings, such as PEEK or PEEK-clad fused silica.



WARNING! Electrical Shock Hazard. When the sample is supplied through infusion, before fittings or tubing are examined for leaks, remove the infusion adapter to turn off the high-voltage power. If the high-voltage power is on and the user touches a liquid leak from the probe fittings or tubing, then a static shock might occur.

Prerequisite Procedures

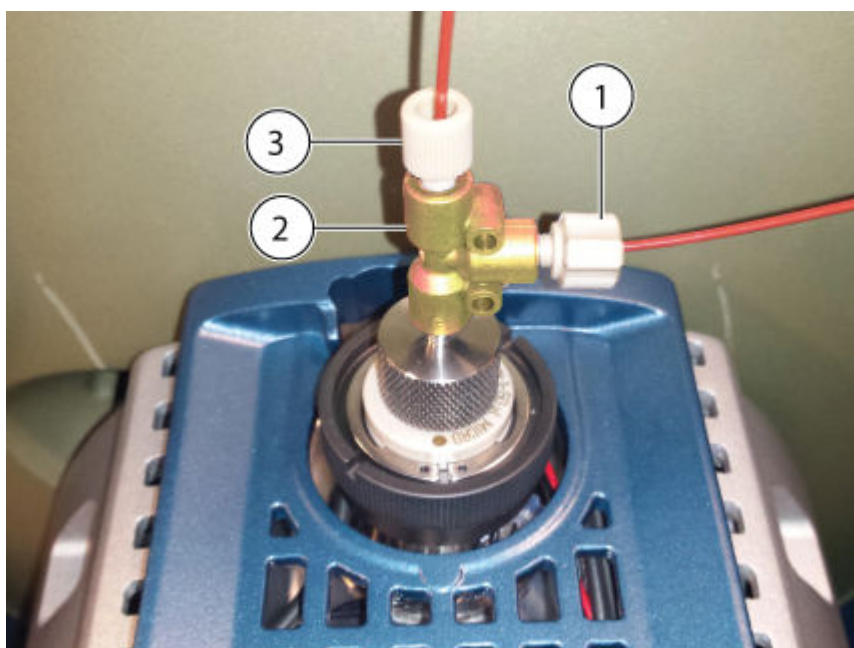
- Install the electrode in the probe. Refer to the section: [Install the Electrode in a Micro Probe](#).
- [Install the Ion Source on the Mass Spectrometer](#).

To optimize the ion source and mass spectrometer, samples can be supplied through a direct connection to the electrode. A PEEK union is used for direct infusion from a syringe pump, or a PEEK tee is used to mix the syringe pump flow with the LC mobile phases, as in Tee infusion. Tee infusion helps to optimize the ion source. To optimize system performance, the solvent composition can be adjusted through the LC system to be almost the same as the LC elution composition of the subject analyte.

Note: Use this procedure for Tee infusion. For direct infusion, replace the PEEK union with the PEEK tee.

1. Put the top fitting on top of the bottom fitting, put the top fitting in the PEEK tee, and then hold the PEEK tee and turn the top fitting clockwise until the fitting is finger tight.

Figure 3-18 PEEK Tee



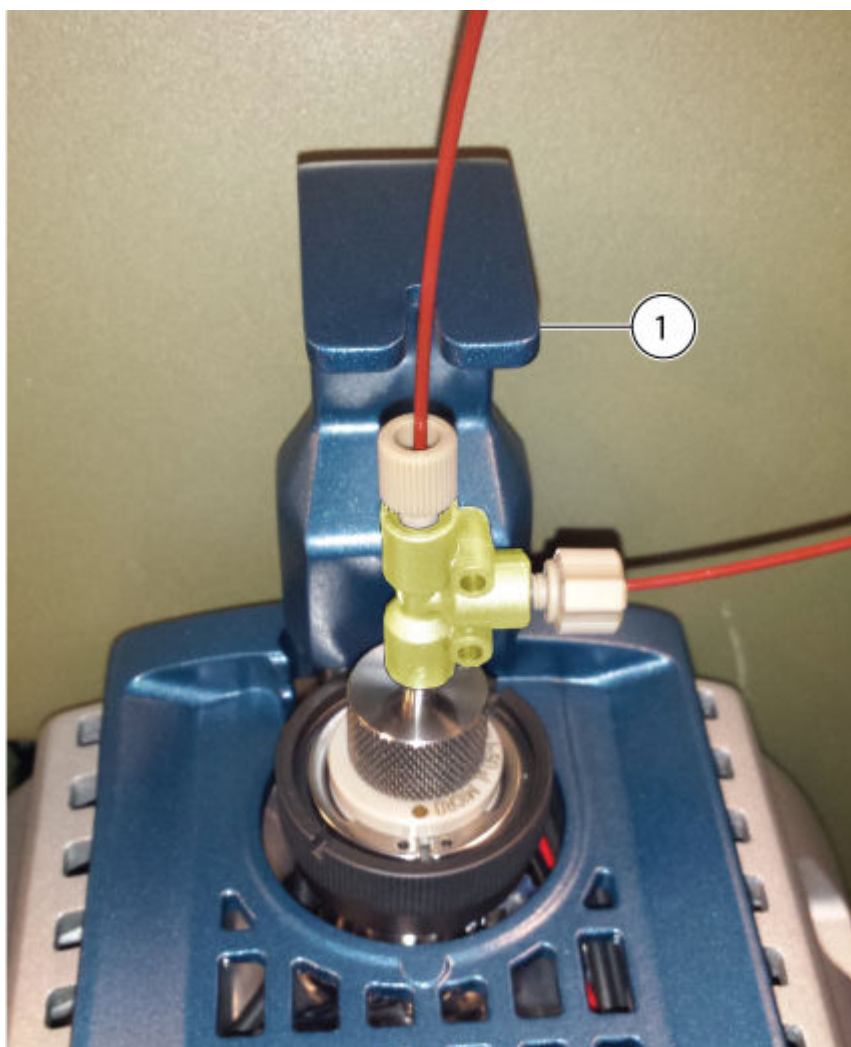
Item	Description
1	Infusion inlet
2	PEEK tee

Ion Source Installation

Item	Description
3	Mobile phase inlet from the LC system

2. Connect the mobile phase tubing from the LC system to one inlet of the tee.
3. Install the infusion tubing between the infusion inlet and the syringe pump.
4. To install the infusion adapter, install the adapter mounting post in the socket on the ion source. Refer to the figure: [Figure 3-9](#).

Figure 3-19 Infusion Adapter



Item	Description
1	Infusion adapter

Connect Infusion Tubing to the Nano Probe



WARNING! Electrical Shock Hazard. When the sample is supplied through infusion, before fittings or tubing are examined for leaks, remove the infusion adapter to turn off the high-voltage power. If the high-voltage power is on and the user touches a liquid leak from the probe fittings or tubing, then a static shock might occur.

Prerequisite Procedures

- Install the electrode in the Nano probe. Refer to the section: [Install the Electrode in the Nano Probe](#).

Use direct infusion from a syringe pump to introduce a sample. A direct connection to the electrode optimizes the source and mass spectrometer conditions.

1. Attach a fitting to the infusion tubing, install the fitting in the union, and then turn the fitting clockwise until it is finger tight.

Figure 3-20 Infusion Tubing



Item	Description
1	Nano probe
2	Fitting
3	Infusion tubing
4	Union

2. Install the fitting in the probe, and then turn the fitting clockwise until it is finger tight.

Sample Inlet Requirements

- To prevent blockage in the capillary tubing, use a filter to remove particles from the sample.
- Make sure that all of the connections are sufficiently tight to prevent leaks. Do not over-tighten the connections.

Examine for Leaks



WARNING! Toxic Chemical Hazard. To prevent exposure of skin or eyes, wear personal protective equipment (PPE) that includes a laboratory coat, gloves, and protective eyewear.

Regularly examine the ion source for leaks.

1. Make sure that the installed ion source is fully sealed to the mass spectrometer, with no signs of leaks.
2. Examine fittings and tubing for leaks.
3. Open the column heater to examine the column connections.

Optimize the Source and Gas Parameters

To get the best signal stability and sensitivity, optimize ion source gas 1 (nebulizer gas). Ion source gas 2 (heater gas) helps with the evaporation of solvent, which helps to increase the ionization of the sample.

For the ion source voltage, use the lowest possible value that keeps the signal.

Note: If the **Spray voltage (V)** is too high, then a corona discharge can occur. A corona discharge is seen as a blue glow at the tip of the probe. A corona discharge causes decreased sensitivity and stability of the signal.

1. To get the best signal or signal-to-noise ratio, adjust ion source gas 1 and ion source gas 2 in increments of 5.
2. Increase the flow rate of the gas for the Curtain Gas interface until the signal starts to decrease.

Note: Use the highest possible value that does not decrease sensitivity. Do not set the flow rate lower than the values in the table that follows. The optimum flow rate decreases background noise, prevents contamination of the aperture, and increases the signal-to-noise ratio.

Table 3-1 Value for the Curtain Gas Parameter

Mass Spectrometer	Initial Value
SCIEX 5500 systems	25
SCIEX 5500+ systems	25
SCIEX 6500 systems and SCIEX 6500+ systems	30

Ion Source Installation

3. To get the maximum signal-to-noise ratio, adjust the spray voltage in increments of 500 V.

Ion Source Service and Maintenance 4

These warnings are applicable to all of the maintenance procedures in this section.



WARNING! Hot Surface Hazard. Before maintenance procedures are started, wait a minimum of 60 minutes for the temperature of the OptiFlow Turbo V ion source to decrease sufficiently to prevent a burn hazard. Some surfaces of the ion source and vacuum interface become hot during operation.



WARNING! Fire and Toxic Chemical Hazard. Keep flammable liquids away from flame and sparks. Use flammable liquids only in vented chemical fume hoods or safety cabinets.



WARNING! Toxic Chemical Hazard. To prevent exposure of skin or eyes, wear personal protective equipment (PPE) that includes a laboratory coat, gloves, and protective eyewear.



WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. If a chemical spill occurs, then refer to the safety data sheets (SDS) for the product for instructions to contain and remove the spill. Before cleaning procedures start, make sure that the system is in Standby status. Obey local regulations to discard the material that is used to clean the spill.



WARNING! Electrical Shock Hazard. To prevent contact with the high voltages that are used during operation, before adjustments are made to the sample tubing or other equipment near the ion source, put the system in Standby status.

CAUTION: Potential System Damage. Do not lift or carry the ion source with one hand. The ion source is designed to be lifted or carried with the molded grips on each side of the ion source.

This section contains general maintenance procedures for the ion source.

These factors control how often cleaning or maintenance of the ion source is required:

- Compounds tested
 - Cleanliness of the samples
 - Sample preparation techniques
-

Ion Source Service and Maintenance

- How long a probe that is not in operation contains a sample
- Total time that the system is in operation

To keep performance at the optimum level, do this:

- Make sure that the installed ion source is fully sealed to the mass spectrometer, with no signs of gas leaks.
- Regularly examine the ion source and its fittings for leaks.
- Regularly clean the ion source components to keep the ion source in good condition for operation.

Recommended Maintenance Schedule

The table that follows supplies a recommended schedule for the cleaning and maintenance of the ion source.

Tip! To make sure that system performance is optimal, do maintenance tasks regularly.

For more maintenance procedures, refer to the document: *System User Guide*.

For part numbers and a list of consumable and spare parts, refer to the document: *Parts and Equipment Guide*.

To order consumable parts and to get support for basic service and maintenance requirements, contact a qualified maintenance person (QMP). For all other service and maintenance requirements, contact a SCIEX field service employee (FSE).

Table 4-1 Maintenance Tasks

Component	Frequency	Task	For more information...
Electrode	As required	Clean, examine, and replace	Refer to the sections: Install the Electrode in a Micro Probe or Install the Electrode in the Nano Probe .
Micro and Nano probes	As required	Replace	Refer to the section: Remove the Top Probe .

Table 4-1 Maintenance Tasks (continued)

Component	Frequency	Task	For more information...
Sample tubing	As required	Replace	Refer to the sections: <ul style="list-style-type: none"> • Install the Micro Column and Heater • Install an Infusion Adapter and Connect an Infusion Line to a Micro Probe • Connect Infusion Tubing to the Nano Probe
Ion source surfaces	As required	Clean	Refer to the section: Clean the Ion Source Surfaces .

OptiFlow Turbo V Ion Source Handling



WARNING! Personal Injury Hazard. During handling of the Nano column heater, wear protective eyewear. A part of the fused-silica tubing extends from the top of the column heater and can cause injury.

Surfaces of the ion source become hot during operation. The figures that follows show surfaces that are cooler (blue) and surfaces that stay hot for an extended period of time (red). Do not touch the surfaces shown in red while the ion source is used or removed.

Ion Source Service and Maintenance

Figure 4-1 Hot Surfaces: OptiFlow Turbo V Ion Source, Micro Flow ESI (Red=Hot, Blue=Handle with Care)

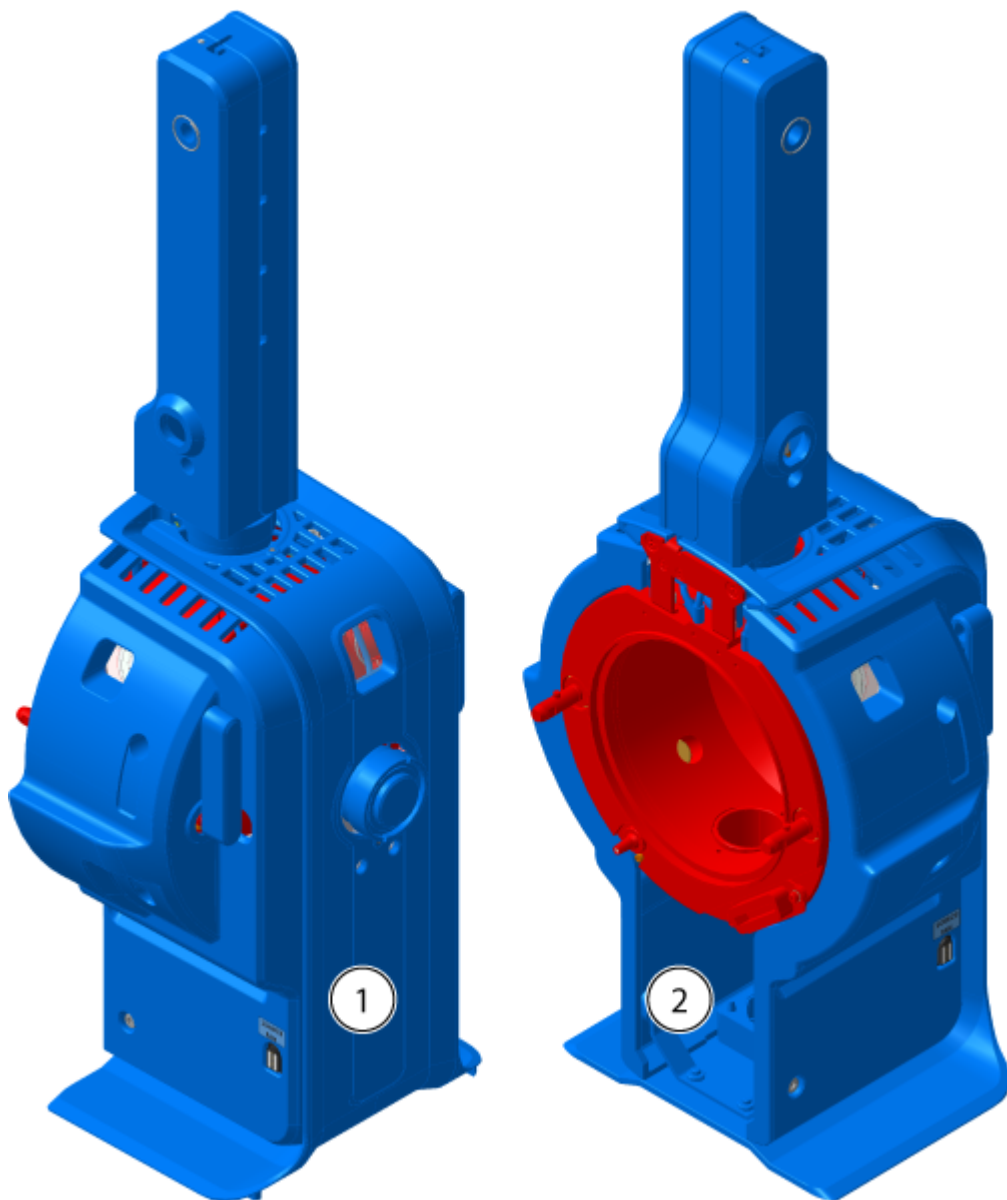
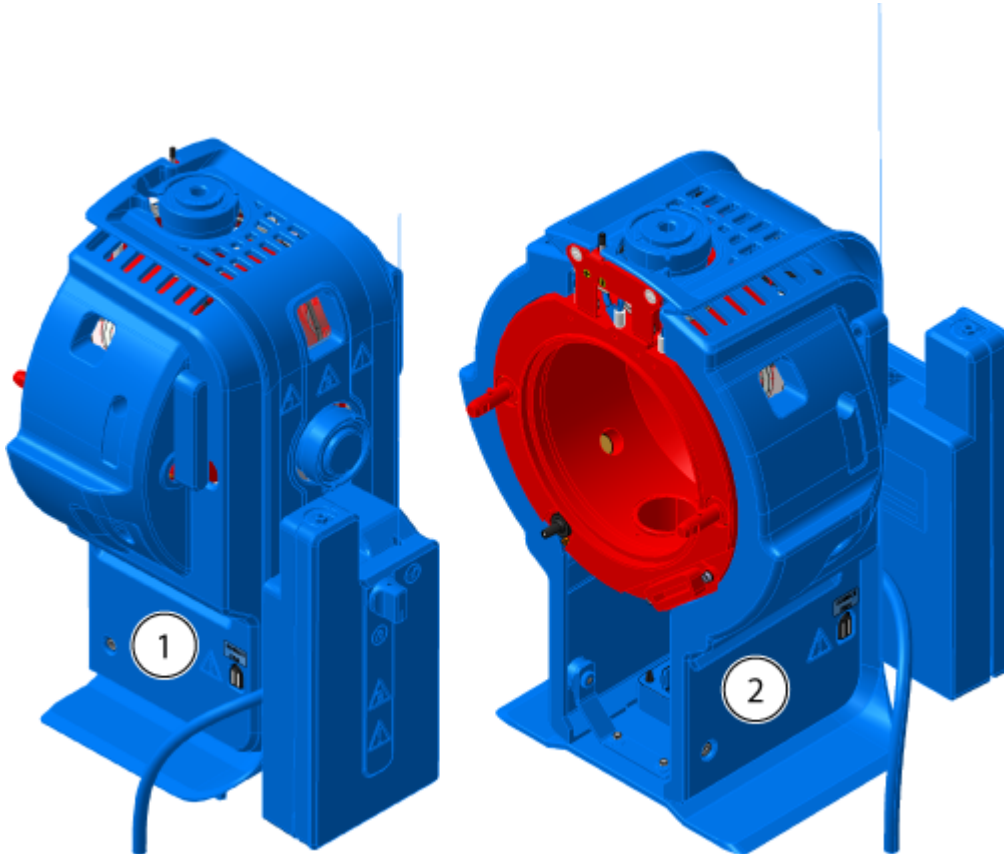


Figure 4-2 Hot Surfaces: OptiFlow Turbo V Ion Source, Nano Flow (Red=Hot, Blue=Handle with Care)



Item	Description
1	Front
2	Back

Remove the Ion Source



WARNING! Hot Surface Hazard. Before maintenance procedures are started, wait a minimum of 60 minutes for the temperature of the OptiFlow Turbo V ion source to decrease sufficiently to prevent a burn hazard. Some surfaces of the ion source and vacuum interface become hot during operation.

CAUTION: Potential System Damage. To prevent damage to the probe, do not let the tip that extends from the electrode touch a part of the ion source.

Ion Source Service and Maintenance

The ion source can be removed quickly and easily, without tools. We recommend that the ion source be removed from the mass spectrometer before maintenance procedures are done.

1. Stop the scans that are in progress.
2. Put the mass spectrometer in Standby status.
3. Wait a minimum of 60 minutes for the ion source to become cool.
4. If the ion source is configured for use with the NanoLC 415, NanoLC 425, M3 MicroLC, or M5 MicroLC System, then disconnect the power and communication cable from the column heater. Refer to the document: *Operator Guide* for the LC system.
5. Remove the column and column heater.
 - If the ion source has a Micro column installed, then remove the column heater and disconnect the column from the probe fitting. Refer to the section: [Install the Micro Column and Heater](#).
 - If the ion source has a Nano column heater installed, then remove the column heater and disconnect the post-column transfer tube. Refer to the section: [Install the Nano Column Cartridge and Heater](#).
6. Disconnect the infusion tubing.
 - If the ion source has an infusion adapter and PEEK tee connected to the Micro probe, then disconnect the infusion adapter and PEEK tee from the probe fitting. Refer to the section: [Install an Infusion Adapter and Connect an Infusion Line to a Micro Probe](#).
 - If the ion source has an infusion tubing connected to the Nano probe, then disconnect the infusion tubing from the probe. Refer to the section: [Connect Infusion Tubing to the Nano Probe](#).
7. Disconnect the power cable for the cooling fan for the ion source cooling from the magnetic connector on the ion source.
8. To release the ion source, do this:
 - a. Turn the source latches to the 12 o'clock position.
 - b. Carefully pull the ion source away from the vacuum interface.
 - c. Put the ion source on a clean, stable surface.

Clean the Ion Source Surfaces



WARNING! Hot Surface Hazard. Before maintenance procedures are started, wait a minimum of 60 minutes for the temperature of the OptiFlow Turbo V ion source to decrease sufficiently to prevent a burn hazard. Some surfaces of the ion source and vacuum interface become hot during operation.



WARNING! Electrical Shock Hazard. Before this procedure is started, remove the ion source from the mass spectrometer. Obey all electrical safe work practices.

Prerequisite Procedures

- [Remove the Ion Source.](#)
- [Remove the Top Probe.](#)

Required Materials

- Lint-free wipes
- LC-MS-grade water
- Powder-free gloves, nitrile, or chloroprene recommended

Clean the surfaces of the ion source when they become dirty or after a spill occurs.

- Use a lint-free wipe dampened with LC-MS-grade water to clean the surfaces of the ion source.

Remove the Top Probe



WARNING! Hot Surface Hazard. Before maintenance procedures are started, wait a minimum of 60 minutes for the temperature of the OptiFlow Turbo V ion source to decrease sufficiently to prevent a burn hazard. Some surfaces of the ion source and vacuum interface become hot during operation.



WARNING! Electrical Shock Hazard. Before this procedure is started, remove the ion source from the mass spectrometer. Obey all electrical safe work practices.

CAUTION: Potential System Damage. To prevent damage to the electrode, do not let the tip that extends from the electrode touch the ion source.

CAUTION: Potential System Damage. To prevent damage to the electrode tip, before the probe is removed from the ion source, remove the electrode from the probe.

Ion Source Service and Maintenance

Prerequisite Procedures

- Remove the column from the probe. Refer to the section: [Install the Micro Column and Heater](#) or [Install the Nano Column Cartridge and Heater](#).
- [Remove the Ion Source](#).

Required Materials

- Poly swab or lint-free wipes
- LC-MS-grade methanol
- Powder-free gloves, nitrile, or chloroprene recommended

If the probe is not correctly installed in the ion source, then the source exhaust system and high-voltage power for the mass spectrometer are turned off.

1. If a Micro probe is used, then remove the top fitting, with the integrated PEEK ferrule, and the bottom fitting from the probe. Refer to the section: [Install the Electrode in a Micro Probe](#).
2. Remove the electrode from the probe.
3. Put the electrode on a clean, stable surface.
4. Loosen the knurled ring on the probe, and then carefully pull the probe straight up out of the ion source.
5. Put the probe on a clean, stable surface.

Tip! While the probe is removed from the ion source, use a poly swab or lint-free wipe soaked in LC-MS-grade methanol to clean the surfaces.

Clean the Electrode

CAUTION: Potential System Damage. Do regular tests of the LC back pressure to make sure that the electrode is not blocked.

Required Materials

- LC-MS-grade methanol or LC-MS-grade isopropanol, at ambient temperature

These factors can cause blockage to occur more frequently:

- Sample type

- Mobile phase type
- Usage time
- Liquid that collects and dries in the electrode

We recommend that a new, clean electrode be used to do a test of the LC back pressure and set the baseline. Then, do regular tests and compare the results with the baseline. If the back pressure increases very much, then clean or replace the electrode.

1. Remove the probe and electrode from the ion source.
2. Connect the probe to the LC system.
3. Use the LC system to flush the probe with LC-MS-grade methanol or LC-MS-grade isopropanol at a minimum flow rate of 1 mL/min, until the back pressure is stable.

Storage and Handling



WARNING! Environmental Hazard. Do not discard system components in municipal waste. To discard components correctly, obey local regulations.

These are the environmental requirements to stow and move the ion source:

- Ambient temperature between $-30\text{ }^{\circ}\text{C}$ and $+60\text{ }^{\circ}\text{C}$ ($-22\text{ }^{\circ}\text{F}$ and $140\text{ }^{\circ}\text{F}$)
- Atmospheric pressure between 75 kPa and 101 kPa
- Relative humidity 99% or less, non-condensing

Source Parameters and Voltages

A

OptiFlow Turbo V Probe Parameters

Table A-1 Parameter Optimization

Parameters	Typical Value		Operational Range
LC flow rate	10 μ L/min	100 μ L/min	10 μ L/min to 100 μ L/min
Ion source gas 1 (nebulizer gas)	20 psi to 40 psi	40 psi	0 psi to 90 psi
Ion source gas 2 (heater gas)	0 psi	50 psi	0 psi to 90 psi
Gas for the Curtain Gas interface	30 psi	30 psi	20 psi to 50 psi
Declustering potential (DP) ¹	Positive: 70 V Negative -70 V	Positive: 70 V Negative -70 V	Positive: 0 V to 300 V Negative -300 V to 0 V

Solvent Composition

The standard concentration of ammonium formate or ammonium acetate is from 2 mmol/L to 10 mmol/L for positive ions and 2 mmol/L to 50 mmol/L for negative ions.

Frequently used solvents are:

- Acetonitrile
- Methanol
- Propanol
- Water

Frequently used modifiers are:

- Acetic acid
- Formic acid
- Ammonium formate

¹ DP values depend on the compound.

- Ammonium acetate

The following modifiers are not usually used because they complicate the spectrum with their ion mixtures and cluster combinations. They might also suppress the strength of the target compound ion signal.

- Triethyl amine (TEA)
- Sodium phosphate
- Trifluoroacetic acid (TFA)
- Sodium dodecyl sulfate

Declustering Potential

Declustering potential (DP) voltage should be set high enough to reduce the chemical noise, but low enough to avoid fragmentation. The fragmentation energy of a compound is a function of its structure and molecular weight. In general, lower molecular weight compounds require less energy—lower declustering potential—to induce fragmentation.




In general, the higher the declustering potential voltage the greater the energy imparted to the ions entering the analyzing region of the mass spectrometer. The energy helps to decluster the ions and to reduce the chemical noise in the spectrum, resulting in an increase in signal-to-noise, or sensitivity. Increasing the voltage beyond optimal conditions can induce fragmentation before the ions enter the mass filters, resulting in a decrease in sensitivity. In some instances, fragmentation is a valuable tool that provides additional structural information.

Labels on the Ion Source

B


In accordance with regulatory requirements, all warning labels shown on the ion source are documented in this guide. Warnings and labels on the ion source use international symbols.

Table B-1 Warning Labels

External Labels	Definition	Location
	ISO 7000-0434B (2004-1) CAUTION consult documentation	External
	CAUTION possibility of electric shock	External
	IEC 60417-5041 (2002-10) Caution hot surface	External

In addition to warning labels, the ion source contains labels for information purposes.









Table B-2 Information labels

External Labels	Definition	Location
	The label is placed beside the magnetic connector for the ion source cooling fan	External









Glossary of Symbols







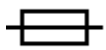



C

Note: Not all of the symbols in this table are applicable to every system.











Symbol	Description
	Australian Regulatory Compliance Mark. Indicates that the product complies with Australian Communications Media Authority (ACMA) EMC and Electrical Safety Requirements.
	Alternating current
A	Amperes (current)
	Asphyxiation Hazard
	Authorized representative in the European community
	Biohazard
	CE Marking of Conformity
	cCSAus mark. Indicates electrical safety certification for Canada and USA.
	Catalog number









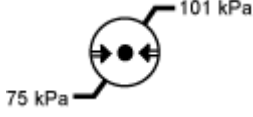
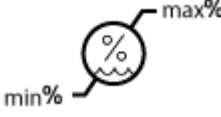
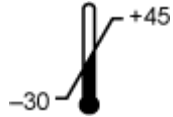
Glossary of Symbols

Symbol	Description
	Caution. Consult the instructions for information about a possible hazard. Note: In SCIEX documentation, this symbol identifies a personal injury hazard.
	China RoHS Caution Label. The electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows show the product is recyclable. The date code on the label or product indicates the date of manufacture.
	China RoHS logo. The device does not contain toxic and hazardous substances or elements above the maximum concentration values and the device is an environmentally-friendly product that can be recycled and reused.
	Consult instructions for use.
	Crushing Hazard
	cTUVus mark for TUV Rheinland of North America
	Data Matrix symbol that can be scanned by a barcode reader to obtain a unique device identifier (UDI)
	Environmental Hazard









Symbol	Description
	Ethernet connection
	Explosion Hazard
	Eye Injury Hazard
	Fire Hazard
	Flammable Chemical Hazard
	Fragile
	Fuse
Hz	Hertz
	International safety symbol Caution, risk of electric shock (ISO 3864), also known as High Voltage symbol If the main cover must be removed, then contact a SCIEX representative to prevent electric shock.
	Hot Surface Hazard
	In Vitro Diagnostic Device

Glossary of Symbols

Symbol	Description
	Ionizing Radiation Hazard
	Keep dry. Do not expose to rain. Relative humidity must not exceed 99%.
	Keep upright.
	Lacerate/Sever Hazard
	Laser Radiation Hazard
	Lifting Hazard
	Magnetic Hazard
	Manufacturer
	Moving Parts Hazard
	Pacemaker Hazard. No access to people with pacemakers.

Symbol	Description
	Pinching Hazard
	Pressurized Gas Hazard
	Protective Earth (ground)
	Puncture Hazard
	Reactive Chemical Hazard
	Serial number
	Toxic Chemical Hazard
	Transport and store the system within 66 kPa to 103 kPa.
	Transport and store the system within 75 kPa to 101 kPa.
	Transport and store the system within the specified minimum (min) and maximum (max) levels of relative humidity, noncondensing.
	Transport and store the system within $-30\text{ }^{\circ}\text{C}$ to $+45\text{ }^{\circ}\text{C}$.

Glossary of Symbols

Symbol	Description
	Transport and store the system within $-30\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$.
	USB 2.0 connection
	USB 3.0 connection
	USB 3.2 connection
	Ultraviolet Radiation Hazard
	United Kingdom Conformity Assessment Mark
UKRP	United Kingdom Responsible Person
VA	Volt Ampere (apparent power)
V	Volts (voltage)
	WEEE. Do not dispose of equipment as unsorted municipal waste. Environmental Hazard
W	Watts (power)
	<i>yyyy-mm-dd</i> Date of manufacture

Contact Us

Addresses



Made in Singapore

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Blk33, #04-06 Marsiling Industrial Estate Road 3
Woodlands Central Industrial Estate, Singapore 739256

SCIEX
Headquarters

AB Sciex LLC
250 Forest Street
Marlborough, MA 01752
USA

Customer Training

- Global: sciex.com/contact-us

Online Learning Center

- [SCIEX Now Learning Hub](#)

SCIEX Support

SCIEX and its representatives have a global staff of fully-trained service and technical specialists. They can supply answers to questions about the system or any technical issues that might occur. For more information, go to the SCIEX website at sciex.com or use one of the following links to contact us.

- sciex.com/contact-us
- sciex.com/request-support

Cybersecurity

For the latest guidance on cybersecurity for SCIEX products, visit sciex.com/productsecurity.

Documentation

This version of the document supersedes all of the previous versions of this document.

Contact Us

To find software product documentation, refer to the release notes or software installation guide that comes with the software.

To find hardware product documentation, refer to the documentation that comes with the system or component.

The latest versions of the documentation are available on the SCIEX website, at sciex.com/customer-documents.

Note: To request a free, printed version of this document, contact sciex.com/contact-us.
