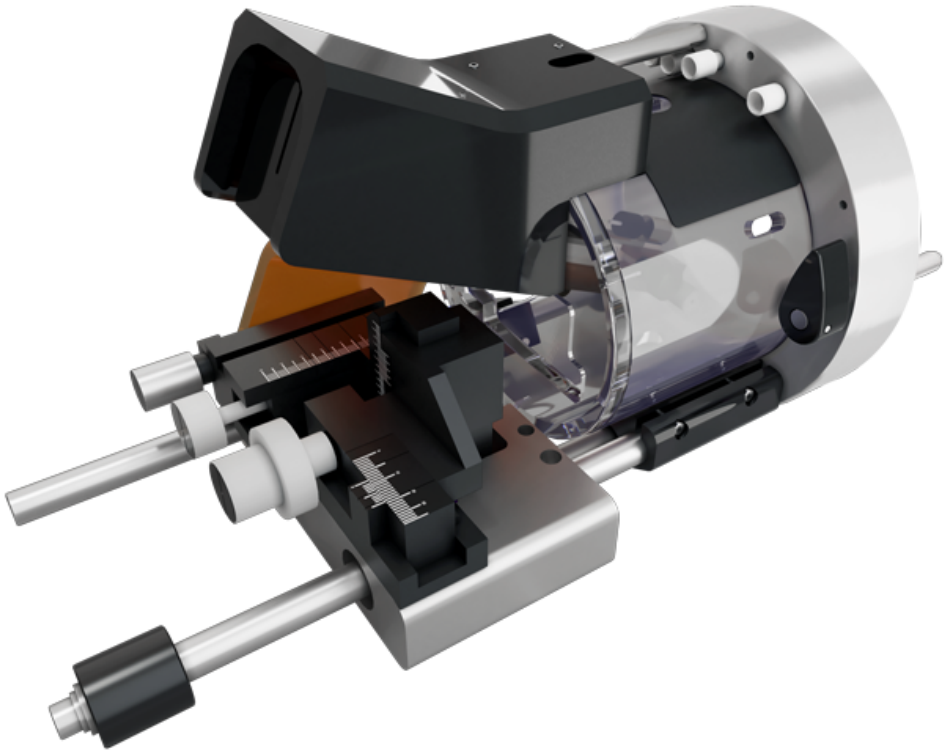
SCIEX

The Power of Precision

NanoSpray Ion Source

Operator Guide



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Operational Precautions and Limitations
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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 proper use, containment, and evacuation of toxic or injurious materials used with the ion source.

WARNING! Hot Surface Hazard. Let the NanoSpray ion source cool for at least 60 minutes before starting any maintenance procedures. Some surfaces of the ion source and vacuum interface become hot during operation.

WARNING! Toxic Chemical Hazard. Wear personal protective equipment, including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. In the event of a chemical spill, review product Safety Data Sheets for specific instructions. Use appropriate personal protective equipment and absorbent wipes to contain the spill and dispose of it following local regulations.

WARNING! Environmental Hazard. Do not dispose of system components in municipal waste. Follow local regulations when disposing of components.

WARNING! Electrical Shock Hazard. Avoid contact with the high voltages applied to the ion source during operation. Put the system in Standby state before adjusting the sample tubing or other equipment near the ion source.

Chemical Precautions

WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. Determine whether decontamination is required before cleaning or maintenance. 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.

WARNING! Environmental Hazard. Do not dispose of system components in municipal waste. Follow local regulations when disposing of components.

- Determine which chemicals have been used in the system prior to service and regular maintenance. For the health and safety precautions that must be followed for a chemical, refer to the document: *Safety Data Sheet*. For storage information, refer to the document: *Certificate of Analysis*. To find a SCIEX *Safety Data Sheet* or *Certificate of Analysis*, go to sciex.com/tech-regulatory.
- Always wear assigned personal protective equipment, including powder-free gloves, safety glasses, and a laboratory coat.

  Note: Nitrile or neoprene gloves are recommended.

- Work in a well-ventilated area or fume hood.
- Avoid ignition sources when working with flammable materials, such as isopropanol, methanol, and other flammable solvents.
- Take care in the use and disposal of any chemicals. There is a potential risk of personal injury if proper procedures for handling and disposal of chemicals are not followed.
- Avoid skin contact with chemicals during cleaning, and wash hands after use.
- Collect all spent liquids and dispose of them as hazardous waste.
- Comply with all of the local regulations for the storage, handling, and disposal of biohazardous, toxic, and radioactive materials.

System Safe Fluids

The following fluids can safely be used with the system.

CAUTION: Potential System Damage. Do not use any other fluid until confirmation is received from SCIEX that it does not present a hazard. This is not an exhaustive list.

- **Organic Solvents**
  - Acetonitrile; up to 100%
  - Methanol; up to 100%
  - Isopropanol; up to 100%
  - DDI water water; up to 100%
  - Tetrahydrofuran; up to 100%
  - Toluene and other aromatic solvents; up to 100%
  - Hexanes; up to 100%
- **Buffers**
  - Ammonium acetate; less than 100 mM
  - Ammonium formate; less than 100 mM
  - Phosphate; less than 1%
- **Acids and Bases**
  - Formic acid; less than 1%
  - Acetic acid; less than 1%
  - Trifluoroacetic acid (TFA); less than 1%
  - Heptafluorobutyric acid (HFBA); less than 1%
  - Ammonia/ammonium hydroxide; less than 1%
  - Phosphoric acid; less than 1%
  - Trimethylamine; less than 1%
  - Triethylamine; less than 1%

Laboratory Conditions

Safe Environmental Conditions

The system is designed to operate safely under these conditions:

- Indoors
- Altitude: Up to 2,000 m (6,560 ft) above sea level
- Mains supply voltage fluctuations: ± 10% of the nominal voltage
- Transient overvoltages: Up to the levels of Overvoltage Category II
- Temporary overvoltages on the mains supply
- Pollution Degree 2

Performance Specifications

The system is designed to meet specifications under these conditions:

- An ambient temperature of 15 °C to 30 °C (59 °F to 86 °F)
- Relative humidity from 20% to 80%, non-condensing

Equipment Use and Modification

WARNING! Electrical Shock Hazard. Do not remove the covers. Removing the covers might cause injury or malfunctioning of the system. The covers need not be removed for routine maintenance, inspection, or adjustment. Contact a SCIEX Field Service Employee (FSE) for repairs that require the covers to be removed.

WARNING! Personal Injury Hazard. Use SCIEX-recommended parts only. Use of parts not recommended by SCIEX or use of parts for any purpose other than their intended purpose can put the user at risk of harm or negatively impact system performance.

Ion Source Overview 2

Electrospray ionization (ESI) is a soft ionization technique for mass spectrometry. Nano-flow ESI is particularly useful when small amounts of valuable sample are available, or when high sensitivity is required.

The NanoSpray ion source is ideally suited for the analysis of polar, thermally labile compounds by mass spectrometry. It is an atmospheric pressure ionization (API) source that provides high ionization efficiency for the transfer of analytes into gas phase ions.

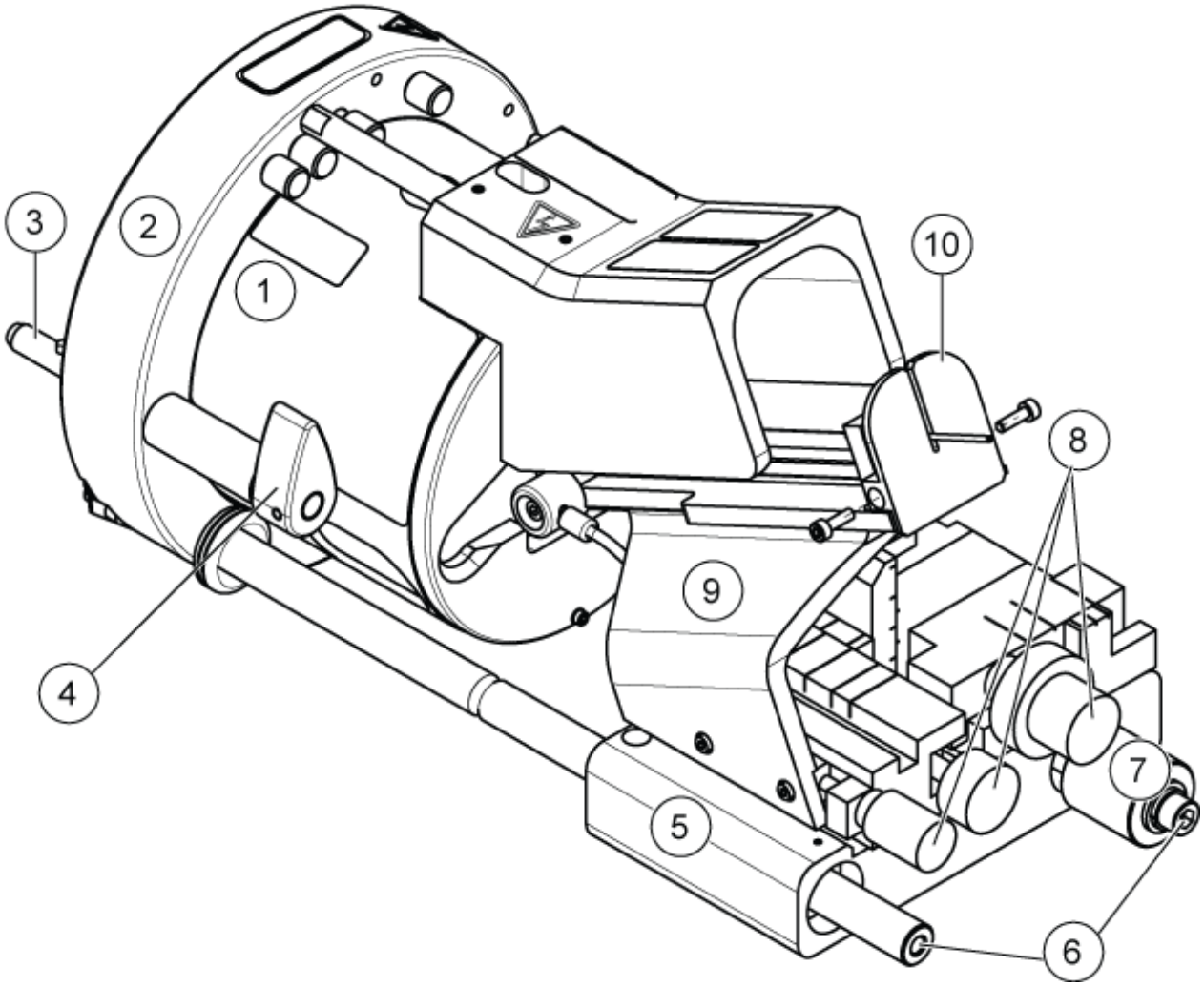
The ion source is intended for continuous sample throughput. It is used in combination with a capillary electrophoresis (CE) separation system with a cartridge containing a capillary that connects directly to the ion source. The ion source has an X-Y-Z positioning unit that can be used to position the capillary tip relative to the curtain plate.

For information on how to optimize the ion source as well as information on supported mass spectrometers, refer to the documentation that comes with the CESI 8000 Plus system.

Refer to the section: Principles of Operation.

Ion Source Components 3

Figure 3-1 Ion Source Components



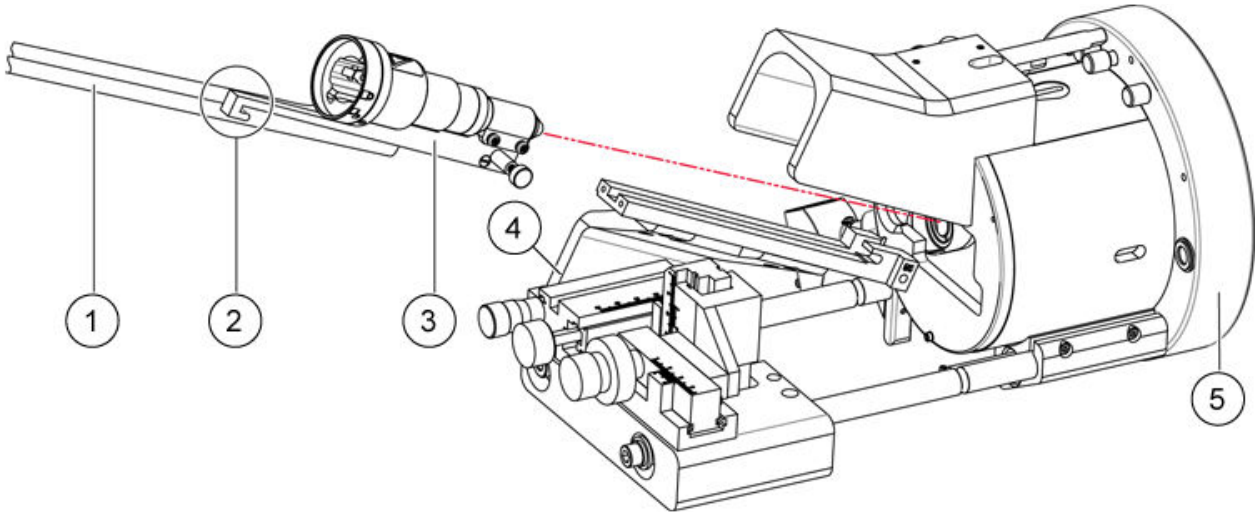
Item	Description
1	Cover
2	Ion source interface
3	Release pin

Item	Description
4	Release latch
5	X-Y-Z positioning unit
6	Positioning rails
7	Sleeve
8	X-Y-Z adjustment knobs (micrometers)
9	Bracket
10	Protective end cap

Ion Source Bracket

The bracket holds the CESI adapter. The following figure shows the bracket for the NanoSpray III ion source. A CESI adapter is required to hold the ESI spray assembly. For more information on how to install the CESI adapter, refer to documentation that comes with the CESI 8000 Plus system.

Figure 3-2 Ion Source and CESI Adapter



Item	Description
1	High voltage output cable
2	Hook
3	Adapter

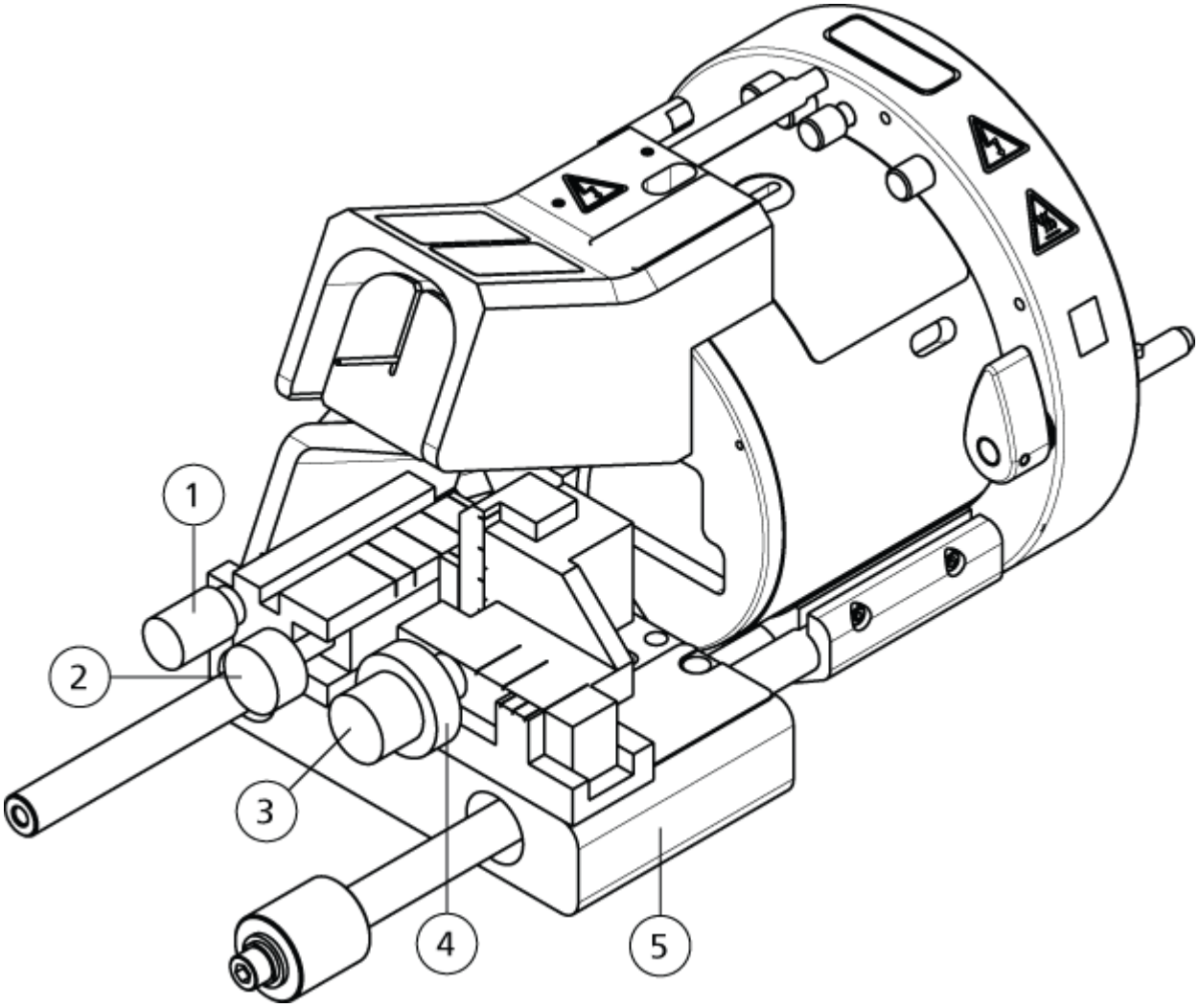
Item	Description
4	Bracket
5	NanoSpray III ion source

X-Y-Z Positioning Unit

After the X-Y-Z positioning unit, shown in the following figure, is in place against the ion source interface, the position of the capillary tip can be adjusted with the X-Y-Z axis adjustment knobs.

Note: The movement of the X-Y-Z positioning unit is limited by the cover. The unit cannot be moved to positions at the limits of the micrometer range.

Figure 3-3 Controls on the X-Y-Z Positioning Unit



Item	Description
1	Fine Z-axis adjustment knob (movement toward the curtain plate)
2	Coarse Z-axis adjustment knob (movement toward the curtain plate)
3	Y-axis adjustment knob (vertical movement)
4	X-axis adjustment knob (horizontal movement)
5	X-Y-Z positioning unit

Positioning Rails

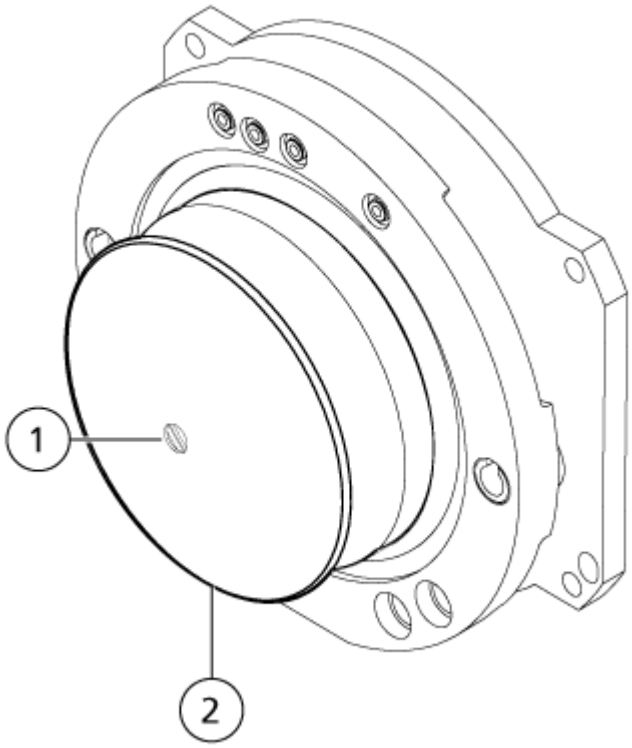
The ion source has two rails that support the X-Y-Z positioning unit. Move the X-Y-Z positioning unit along these rails into and out of the operating position. Moving the X-Y-Z positioning unit away from the ion source interface disconnects the high-voltage supply from the ion source head and allows the ion source head to be removed. The high-voltage power supply to the ion source head is disconnected until the X-Y-Z positioning unit is pushed completely into its operating position.

Interface Components for the NanoSpray Ion Source

The ion source housing connects to the interface components for the NanoSpray ion source. Refer to the figure: Figure 3-4. The interface components consist of the orifice plate and the curtain plate.

Note: The interface components for the NanoSpray ion source for the different mass spectrometers might be physically interchangeable, but they have different aperture sizes. Be sure to install the correct interface for the mass spectrometer. The interface for the NanoSpray ion source is not applicable to the TripleTOF 6600+ system.

Figure 3-4 Interface Components for the NanoSpray Ion Source



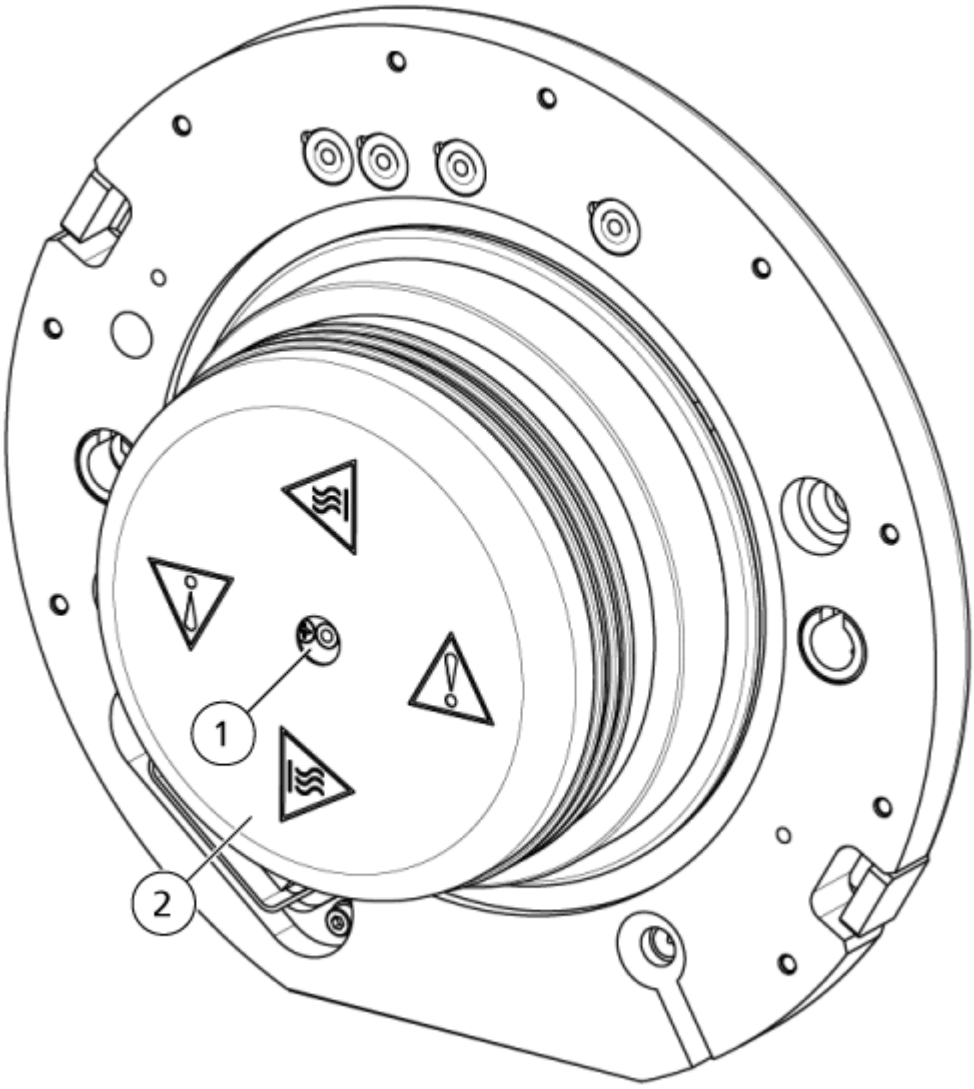
Item	Description
1	Curtain plate aperture
2	Curtain plate

OptiFlow Interface Components

The ion source housing connects to the OptiFlow interface components. Refer to the figure: Figure 3-5. The OptiFlow interface components consist of the nano cell heater assembly and nano cell curtain plate.

Note: The OptiFlow interface components are applicable only to a TripleTOF 6600 system upgraded with the OptiFlow interface or the TripleTOF 6600+ system.

Figure 3-5 OptiFlow Interface Components



Item	Description
1	Nano cell heater assembly
2	Nano cell curtain plate

Requirements

Gases

CAUTION: Potential System Damage. Do not supply nitrogen gas for Gas 1.

CAUTION: Potential System Damage. Do not supply house air for Gas 1.

Tip! Typical zero air specifications are: hydrocarbon content of less than 0.1 ppm and particle size of less than 0.01 microns.

Solvents

For best results, use high purity solvents for nano-flow experiments. Low quality solvents might result in high background, contaminant peaks, or blocked parts in the CE systems. Refer to the section: System Safe Fluids.

Ion Source Maintenance 4

The following warnings apply to all of the maintenance procedures in this section.

WARNING! Hot Surface Hazard. Let the NanoSpray ion source cool for at least 60 minutes before starting any maintenance procedures. 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 and use them only in vented chemical fume hoods or safety cabinets.

WARNING! Toxic Chemical Hazard. Wear personal protective equipment, including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. In the event of a chemical spill, review product Safety Data Sheets for specific instructions. Use appropriate personal protective equipment and absorbent wipes to contain the spill and dispose of it following local regulations.

WARNING! Electrical Shock Hazard. Avoid contact with the high voltages applied to the ion source during operation. Put the system in Standby state before adjusting the sample tubing or other equipment near the ion source.

CAUTION: Potential System Damage. Do not lift or carry the ion source with one hand.

This section contains general maintenance procedures for the ion source. To determine how often to clean or perform maintenance on the ion source, consider the following:

- Compounds tested
- Cleanliness of the samples and sample preparation techniques
- Amount of time an idle probe contains a sample
- Overall system run time

These factors can cause changes in ion source performance, indicating that maintenance is required.

Make sure that the installed ion source is fully sealed to the mass spectrometer with no evidence of gas leaks. Regularly inspect the ion source and its fittings for leaks. Clean the ion source components regularly to keep the ion source in good working condition.

CAUTION: Potential System Damage. Use only the recommended cleaning methods and materials to avoid damaging the equipment.

Required Materials
• 1/4 inch open-ended wrench • Flat-bladed screwdriver • Methanol • Deionized water • Safety glasses • Breathing mask and filter • Powder-free gloves, nitrile or neoprene recommended • Lab coat

Remove the Ion Source

Tip! Before removing the source, note how the cables are routed, so that they can be routed the same way when the ion source is installed.

WARNING! Hot Surface Hazard. Let the NanoSpray ion source cool for at least 60 minutes before starting any maintenance procedures. Some surfaces of the ion source and vacuum interface become hot during operation.

The ion source can be removed quickly and easily, without tools. Always remove the ion source from the mass spectrometer before performing any maintenance on the ion source.

1. Stop any ongoing scans.
2. Shut down the sample stream.
3. Pull the X-Y-Z positioning unit as far back from the ion source interface as possible, until it is stopped by the sleeve, to make sure that the supply of high-voltage power to the ion source head is disabled.
4. Deactivate the hardware profile.

5. Close the Analyst/Analyst TF software.
6. Let the ion source cool for 60 minutes.
7. Disconnect the sample tubing from the ion source.
8. Turn the two source latches upward to release the ion source.
9. Pull the ion source gently away from the vacuum interface.
10. Put the ion source on a clean, secure surface.

Install the Ion Source

1. Align the ion source with the mass spectrometer. Make sure that the ion source latches are in their unlocked positions,that is, the 12 o'clock position, and that they are aligned with the sockets on the mass spectrometer.
2. Push the ion source towards the vacuum interface and then turn the ion source latches towards the 6:00 o'clock position until they stop. Do not force the latches after they become tight. Make sure that no gap is visible between the ion source housing and the ion source interface.

Change Ion Sources

WARNING! Hot Surface Hazard. Let the NanoSpray ion source cool for at least 60 minutes before starting any maintenance procedures. Some surfaces of the ion source and vacuum interface become hot during operation.

The procedure for changing from a NanoSpray ion source to a Turbo V, IonDrive Turbo V, or DuoSpray ion source varies depending on whether the OptiFlow interface components are installed on the mass spectrometer.

- If they are installed, then the nano cell heater assembly and curtain plate must be removed, and the standard curtain plate installed. Refer to the section: Change to a Different Ion Source (Interface Components for the OptiFlow Turbo V Ion Source).

  Note: Because the orifice plate does not need to be changed, the system need not be shut down and vented.

- If they are not installed, then the NanoSpray interface components must be removed, and the standard interface components installed. Refer to the section: Change to a Different Ion Source (Interface Components for the NanoSpray Ion Source).

The procedure for changing from a different ion source to the NanoSpray ion source also varies depending on whether the OptiFlow components are installed.

- If they are installed, then the standard curtain plate must be removed and the nano cell heater assembly and curtain plate must be installed. Refer to the section: Change to the NanoSpray Ion Source (Interface Components for the OptiFlow Turbo V Ion Source).

  Note: Because the orifice plate does not need to be changed, the system need not be shut down and vented.

- If they are not installed, then the standard interface components must be removed, and the NanoSpray interface components installed. Refer to the section: Change to the NanoSpray Ion Source (Interface Components for the NanoSpray Ion Source).

Change to a Different Ion Source (Interface Components for the OptiFlow Turbo V Ion Source)

Follow these steps to change from a NanoSpray ion source to a Turbo V, IonDrive Turbo V, or DuoSpray ion source when the interface components for the OptiFlow Turbo V ion source are used.

1. Remove the NanoSpray ion source. Refer to the section: Remove the Ion Source.
2. Remove the interface components for the OptiFlow Turbo V ion source. Refer to the section: Install the Interface Components for the OptiFlow Turbo V Ion Source.
3. Clean the standard curtain plate. Refer to the documentation that comes with the mass spectrometer.

   Tip! To easily clean the components before installing them on the mass spectrometer, remove the nano cell curtain plate and nano cell heater assembly separately and then store them in the nano cell holder.

4. Install the standard curtain plate.
5. Install the ion source. Refer to the applicable ion source document: *Operator Guide*.

Change to the NanoSpray Ion Source (Interface Components for the OptiFlow Turbo V Ion Source)

1. Remove the installed ion source. Refer to the applicable ion source document: *Operator Guide*.
2. Clean the nano cell heater assembly. Refer to the section: Clean the Nano Cell Heater Assembly.

3. Install the interface components for the OptiFlow Turbo V ion source. Refer to the section: Install the Interface Components for the OptiFlow Turbo V Ion Source.
4. Install the ion source. Refer to the section: Install the Ion Source.

Change to a Different Ion Source (Interface Components for the NanoSpray Ion Source)

Follow these steps to change from a NanoSpray ion source to a Turbo V, IonDrive Turbo V, or DuoSpray ion source when the interface components for the NanoSpray ion source are installed.

1. Remove the NanoSpray ion source. Refer to the section: Remove the Ion Source.

   Tip! Remove the components (the curtain plate and orifice plate) separately, and then store them disassembled, so that they can be cleaned more easily before installing them on the mass spectrometer.

2. Remove the interface components for the NanoSpray ion source. Refer to the section: Remove the Interface Components.
3. Clean the standard interface components. Refer to the mass spectrometer documentation.
4. Install the standard interface components. Refer to the section: Install the Interface Components.
5. Install the ion source. Refer to the ion source document: *Operator Guide*.

Change to the NanoSpray Ion Source (Interface Components for the NanoSpray Ion Source)

1. Remove the installed ion source. Refer to the ion source document: *Operator Guide*.
2. Install the interface components for the NanoSpray ion source by following these steps:
   a. Remove the standard interface components. Refer to the section: Remove the Interface Components.
   b. Clean the curtain plate and orifice plate for the NanoSpray ion source. Refer to the documentation that comes with the mass spectrometer.

      Note: The curtain plate is easier to remove from the interface when it is installed on the mass spectrometer.

   c. Install the interface components for the NanoSpray ion source. Refer to the section: Install the Interface Components.
3. Install the NanoSpray ion source. Refer to the section: Install the Ion Source.

Change the Interface Components

Before using an ion source, make sure that the correct interface is installed. The NanoSpray ion source requires either the NanoSpray interface components or the OptiFlow interface components.

Install the Interface Components for the OptiFlow Turbo V Ion Source

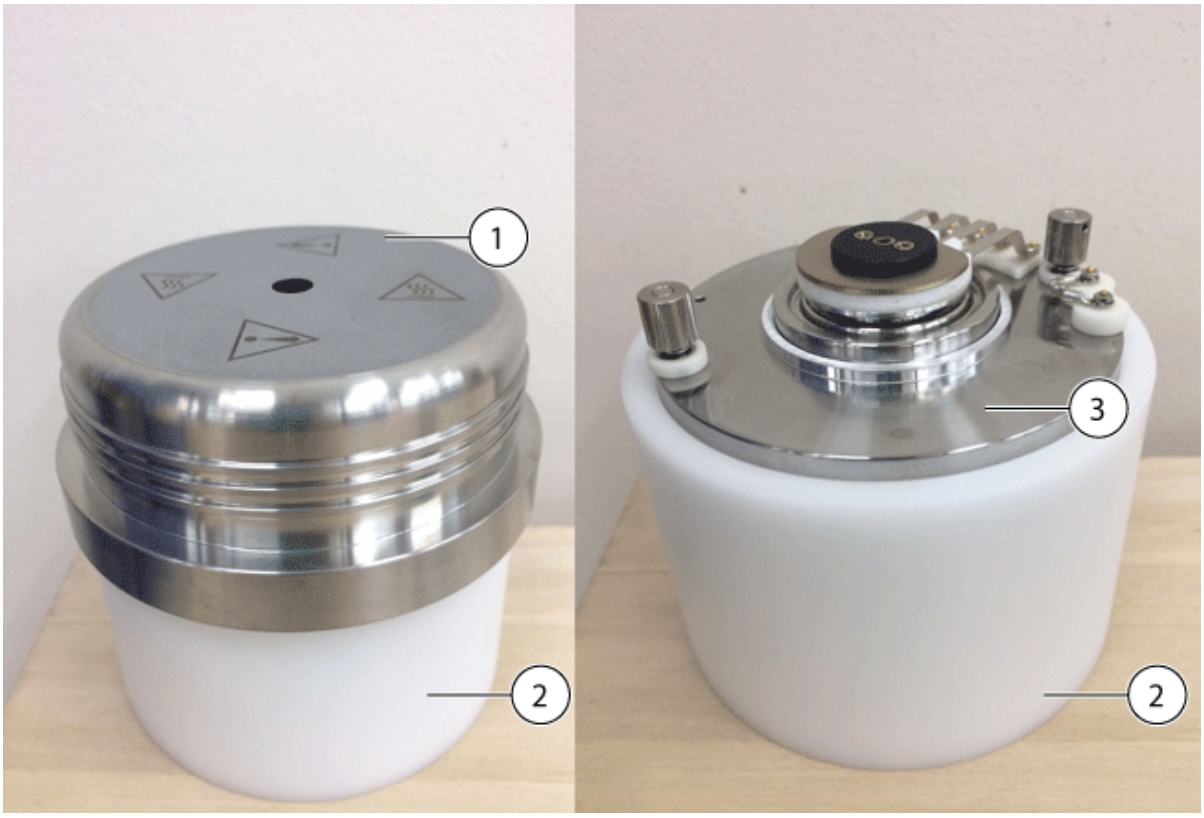
The NanoSpray ion source is the only ion source that fits on the interface components for the OptiFlow Turbo V ion source. Other ion sources will not fit on the mass spectrometer if the interface components for the OptiFlow Turbo V ion source are installed.

Note: The following procedure is applicable only for TripleTOF 6600 mass spectrometers, TripleTOF 6600 mass spectrometers upgraded with the interface components for the OptiFlow Turbo V ion source, and TripleTOF 6600+ mass spectrometers with the prefix EY.

CAUTION: Potential System Damage. Wear gloves and be careful when handling the interface components. The electrical connecting pins are delicate.

1. Remove the nano cell heater assembly and the nano cell holder from the foam packaging.
2. Remove the standard curtain plate on the mass spectrometer.
3. Remove the nano cell curtain plate from the foam packing.
4. Remove the nano cell heater assembly from the nano cell holder.

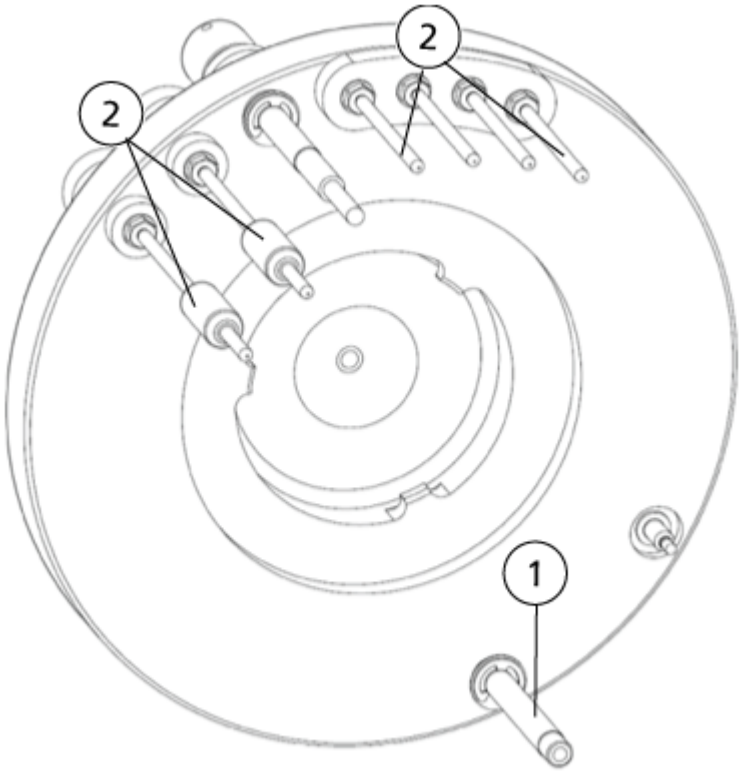
Figure 4-1 Interface Components for the OptiFlow Turbo V Ion Source



Item	Description
1	Nano cell curtain plate
2	Nano cell holder
3	Nano cell heater assembly

5. Find the six contact pins on the nano cell heater assembly and the corresponding sockets of the orifice plate on the mass spectrometer.
   These pins and sockets act as keys to prevent the orifice plate from being installed in the wrong orientation.
6. Place the nano cell heater assembly so that the six contact pins align with the sockets, when the two retaining pins are inserted into the tightening sockets, and then press the assembly firmly into position. Refer to the figure: Figure 4-2.

Figure 4-2 Contacts and Retaining Pins on the Nano Cell Heater Assembly



Item	Description
1	Retaining pins
2	Contact pins

7. Tighten the two retaining pins to secure the nano cell heater assembly.
8. Install the nano cell curtain plate.

Remove the Interface Components

Use this procedure to remove the standard or interface components for the NanoSpray ion source (curtain plate and orifice plate) from the mass spectrometer.

Note: The assembly is system-specific. Use the correct interface components for the mass spectrometer.

CAUTION: Potential System Damage. Wear gloves and be careful when handling the interface components. The electrical connecting pins and ceramic base are delicate.

1. Complete or stop any ongoing scans.

CAUTION: Potential System Damage. Turn off the sample flow before shutting down the system.

2. Turn off the sample flow to the mass spectrometer.
3. Deactivate the hardware profile in the Analyst/Analyst TF software, if it is active.
4. Shut down the system. Refer to the documentation that comes with the mass spectrometer.

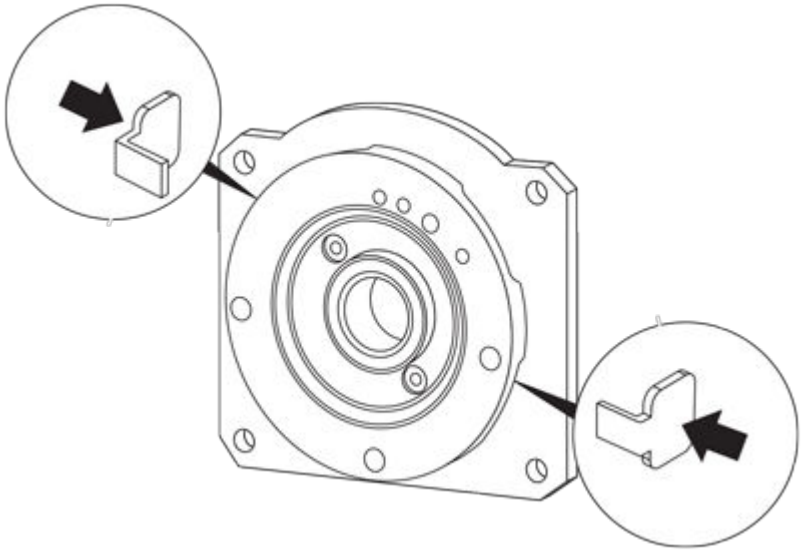
WARNING! Hot Surface Hazard. Let the NanoSpray ion source cool for at least 60 minutes before starting any maintenance procedures. Some surfaces of the ion source and vacuum interface become hot during operation.

5. After the mass spectrometer reaches atmospheric pressure, remove the installed ion source from the mass spectrometer and then put the ion source carefully to one side.

CAUTION: Potential System Damage. If the interface does not release, then do not attempt to pry it from the bulkhead. Continue to vent the mass spectrometer until the interface releases easily.

6. While holding the curtain plate with one hand, use the other hand to release the interface latches.

Figure 4-3 Interface Latch Release Buttons



7. Remove the interface components and then put them on a clean, stable surface.

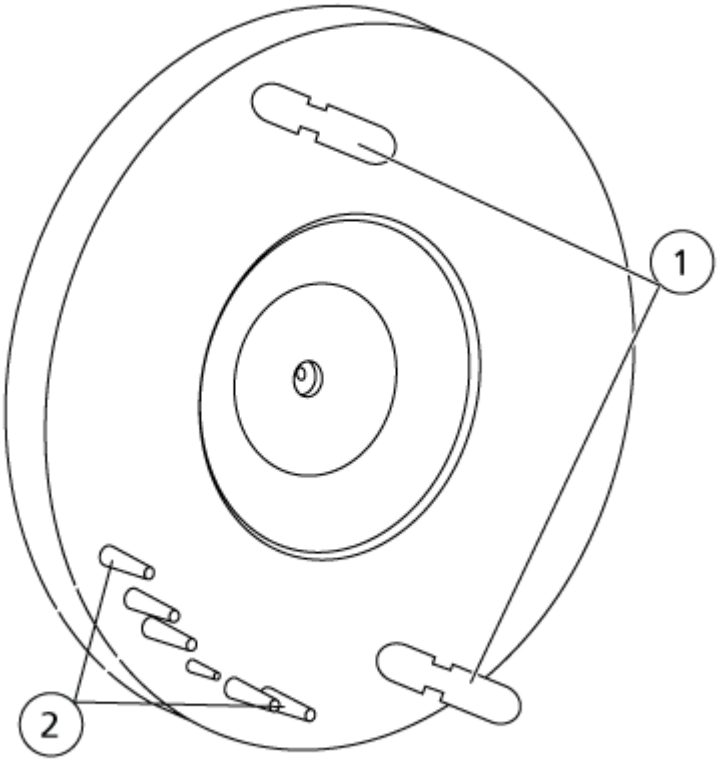
Tip! Use the shaped foam insert from the package to store the standard interface components.

Install the Interface Components

Use this procedure to install the standard or interface components for the NanoSpray ion source on the mass spectrometer.

1. Find the six contact pins on the interface components and the corresponding sockets on the mass spectrometer.
   These pins and sockets act as keys to prevent the interface components from being installed in the wrong orientation.
2. Orient the interface components so that the six contact pins align with the sockets when the two retaining pins are inserted in their clamps. Refer to the figure: Figure 4-4.

Figure 4-4 Interface Contacts and Retaining Pins



Item	Description
1	Retaining pins
2	Contact pins

3. Holding the interface components with both hands, insert the retaining pins in the clamps, and then push the assembly firmly into place. If the interface components are properly aligned then a click is heard as the retaining pins are pushed into position.

Bake the Interface

The following procedure is applicable for both the interface components for the NanoSpray and the OptiFlow Turbo V ion sources.

Note: Sample need not be infused for this procedure.

Note: Make sure that the curtain plate, orifice plate, and nano cell heater assembly are clean and dry before baking the interface.

1. Move the X-Y-Z positioning unit along the positioning rails, away from the interface.
2. Start the Analyst/Analyst TF software.
3. On the Navigation bar, click **Configure**.
4. Click **Tools** > **Settings** > **Queue Options.**
5. In the **Max. Tune Idle Time** field, type `720`.
6. On the Navigation bar, under **Tune and Calibrate**, double-click **Manual Tuning**.

   Note: The tip rail must not be in position when performing this step as the tip might become damaged. This procedure can be performed using any scan type.
7. In the Tune Method Editor, open the Source/Gas tab.
8. In the upper left corner of the screen, make sure that the **Ion Source ID** is **NanoSpray**.
9. Set the interface heater temperature by typing a value in the **Interface Heater Temperature** field, and then pressing enter:
   - For the interface for the OptiFlow Turbo V ion source, type `300`.
   - For the interface for the NanoSpray ion source, type `225`.
10. Wait 5 minutes for the interface heater to reach the correct temperature.
    To determine whether the temperature has been reached, monitor the mass spectrometer detailed status by double-clicking the mass spectrometer icon on the status bar. When the correct temperature is reached, the **Interface Heater Status** is **Ready**.
11. Let the interface bake at least 12 hours to eliminate any chemical contaminants.

Clean the Ion Source

WARNING! Electrical Shock Hazard. Remove the ion source from the mass spectrometer before starting this procedure. Follow all electrical safe work practices.

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

Prerequisite Procedures
• Remove the Ion Source

1. Remove the ion source from the mass spectrometer.
2. Wipe the surfaces of the ion source with a soft, damp, cloth.

Clean the Nano Cell Heater Assembly

Required Materials

Note: U.S. customers can call 877-740-2129 for ordering information and inquiries. International customers can visit sciex.com/contact-us.

- Powder-free gloves, nitrile or neoprene recommended
- Safety glasses
- Laboratory coat
- Fresh LC-MS-grade water. Old water can contain contaminants that can further contaminate the mass spectrometer.
- LC-MS-grade methanol, isopropanol (2-propanol), or acetonitrile
- Cleaning solution. Use one of:
  - 100% methanol
  - 100% isopropanol
  - 1:1 acetonitrile:water solution, freshly prepared
  - 1:1 acetonitrile:water with 0.1% acetic acid solution, freshly prepared
- Clean 1 L or 500 mL glass beaker to prepare cleaning solutions
- 1 L beaker to catch used solvent
- Organic waste container
- Lint-free wipes. Refer to the section: Tools and Supplies Available from the Manufacturer.
- (Optional) Polyester (poly) swabs

Tools and Supplies Available from the Manufacturer

Table 4-1

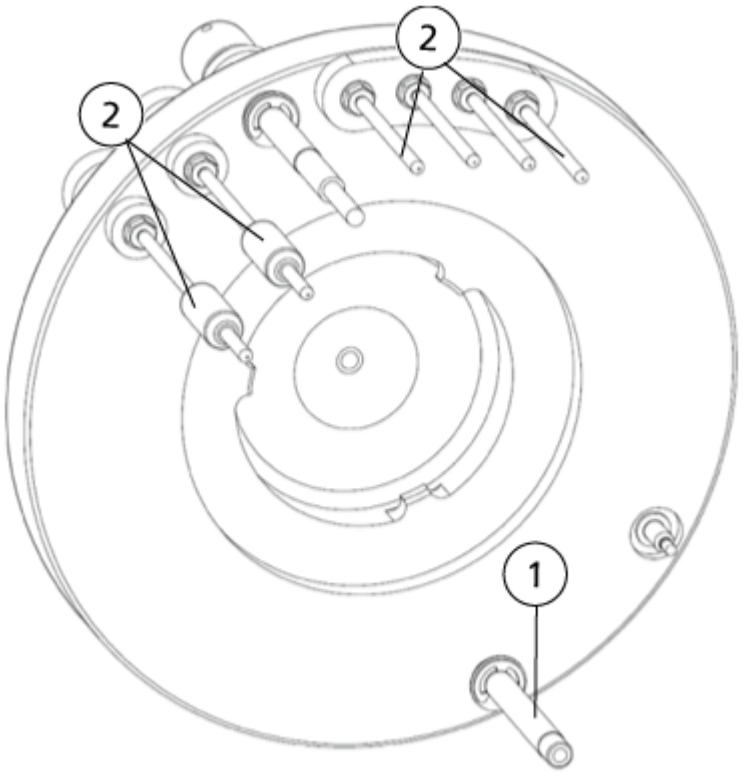
Description	Part Number
Small poly swab, thermally bonded. Also available in the Cleaning kit.	1017396
Lint-free wipe (11 cm x 21 cm, 4.3 inches x 8.3 inches). Also available in the Cleaning kit.	018027

Clean the Assembly

CAUTION: Potential System Damage. Do not insert a wire or metal brush in the aperture on the nano cell heater to avoid damaging the aperture.

1. Remove the nano cell curtain plate.
2. Loosen the two retaining pins that secure the nano cell heater assembly. Refer to the figure: Figure 4-5.

Figure 4-5 Contacts and Retaining Pins on the Nano Cell Heater Assembly



Item	Description
1	Retaining pins
2	Contact pins

3. Remove the nano cell heater assembly.

Note: After the nano cell heater assembly and nano cell curtain plate are removed, make sure that they are stored in the nano cell holder provided.

4. Clean the aperture in the nano cell heater assembly with a syringe using the cleaning solution. For information about the cleaning solution, refer to the section: Required Materials.
5. Put the nano cell heater assembly on a 100 mL beaker. Refer to the figure: Figure 4-6.

Figure 4-6 Nano Cell Heater Assembly on the Beaker and Syringe

6. Fill the 5 mL syringe with 5 mL cleaning solution.
7. Inject the cleaning solution through the aperture of the nano cell heater assembly.
8. Repeat step 6 and step 7 three times.
9. Wipe the nano cell heater assembly with a lint-free wipe dampened with water.
10. Wipe the nano cell heater assembly with a lint-free wipe dampened with the cleaning solution.

Note: If more rigorous cleaning is required, then use the brush supplied in the cleaning kit.

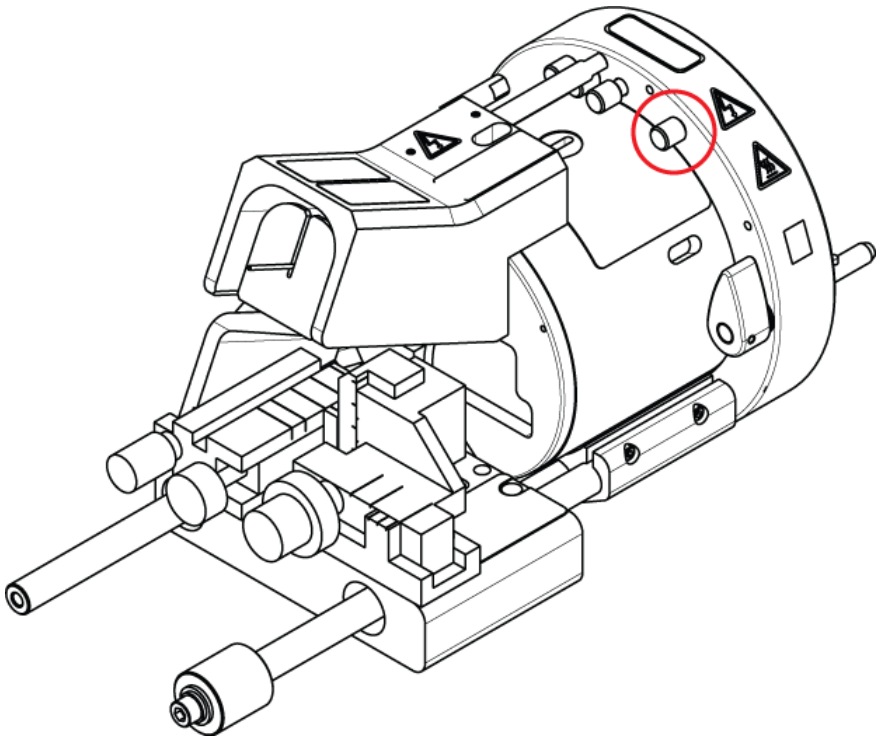
11. Wait until the nano cell heater assembly is dry.
12. Inspect the nano cell heater assembly for solvent stains or lint, removing any residue with a clean, slightly damp, lint-free wipe.

Troubleshooting 5

Mass Spectrometer Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
Gas 2 Over Pressure error occurs and the electronics turn off	The Gas 2 inlet port on the ion source is blocked and Ion Source Gas 2 (GS2) is set to a value other than 0 in the acquisition method.	1. Loosen the plug in the port so that the inlet is not sealed. (Do not remove the plug.) Refer to the figure: Figure 5-1. 2. Set GS2 to 0 in the acquisition method.

Figure 5-1 Gas 2 Port



NanoSpray III Ion Source Troubleshooting Tips

Tip! To troubleshoot issues with the ion source, remove the ion source from the mass spectrometer, and then run sample through it.

Symptom	Possible Cause	Corrective Action
No spray	1. Liquid is not arriving at the sprayer head. 2. The tip is blocked or damaged. 3. The sample line contains a blockage.	• Refer to the documentation that comes with the CESI 8000 Plus system.
No spray (continued)	1. The value in the **IonSpray Voltage (IS)** or **IonSpray Voltage Floating (ISVF)** field (IS or ISVF) is too low. 2. The flow rate for the gas for the Curtain Gas interface (CUR) is too high. The spray bends away from the curtain plate aperture.	1. Adjust IS or ISVF in increments of 100 volts. 2. Use the CESI 8000 Plus system to adjust the **CUR** value to 5 psi. For QTRAP systems, adjust the pressure for the gas for the Curtain Gas interface in the software. Contact a CESI 8000 Plus system FSE to discuss how to modify the standard setup.
Unstable spray	• The Interface Heater Temperature (IHT) parameter is incorrect.	• Adjust parameter in increments of 100 V. • In general, use a temperature of 50 °C to 100 °C.
Arcing (can melt the capillary tip and damage the temperature controller board)	1. The tip is too close to the curtain plate. 2. IS or ISVF voltage is too high.	1. Use the X-Y-Z adjustment knobs to adjust the tip position. 2. Reduce IS or ISVF voltages.

Acquisition Troubleshooting Tips

Symptom	Possible Cause	Corrective Action
No signal	• No spray is being generated.	• Refer to the troubleshooting section in the documentation that comes with the CESI 8000 Plus system. • Use the X-Y-Z adjustment knobs to adjust the capillary tip position.
Low peak intensity	1. The source parameter values are incorrect. 2. The mass spectrometer is not optimized. 3. The sample has degraded or has a low concentration.	1. Use the **Instrument Optimization** wizard to optimize the mass spectrometer. 2. Inspect the sample concentration. Use the CESI PepCal Mix to determine whether the sample is causing an issue.
Poor MS resolution	1. The mass spectrometer is not optimized.	1. Optimize the mass spectrometer.
Low signal-to-noise ratio	1. The heater temperature is too high.	1. Reduce the IHT parameter.
High background	1. The diluent is contaminated. 2. There is residue on the interface. The capillary tip is too close to the curtain plate aperture, resulting in frequent contamination.	1. Use freshly prepared diluent. 2. Clean the curtain plate and orifice plate. Contact the Qualified Mainitenance Person (QMP) If necessary, bake the interface. Refer to the section: Bake the Interface. If the issue is not resolved, then clean Q0 or the QJet ion guide, following the procedures in the hardware documentation for the mass spectrometer.

Symptom	Possible Cause	Corrective Action
Temperature not reached	1. The interface heater is faulty.	1. Open the Mass Spectrometer Detailed Status dialog. • For the NanoSpray interface, the **Source Temperature** field does not contain the set temperature value and it is shown as n/a and the **Interface Heater Status** should be Ready. • For the OptiFlow interface, the **Source Temperature** field contains the set temperature and the **Interface Heater Temperature** must show the temperature. Contact an FSE. For more information, visit the SCIEX website at sciex.com.

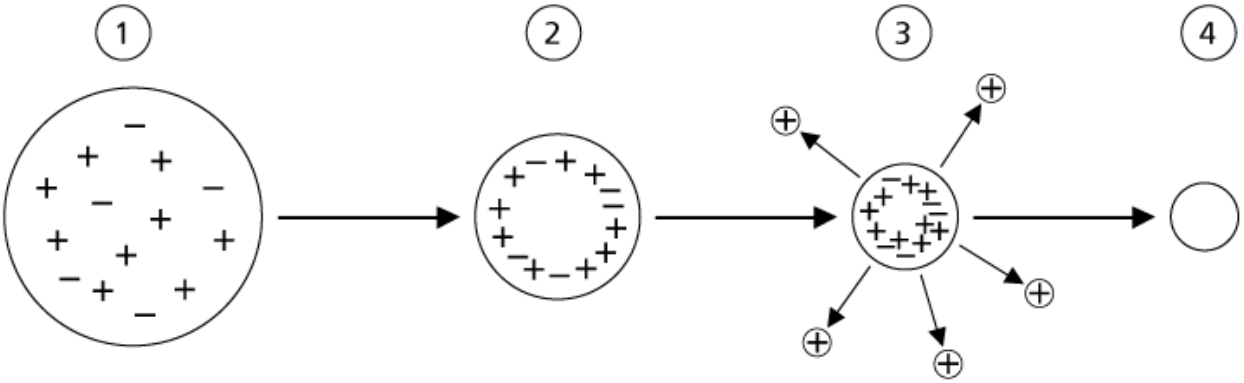
Symptom	Possible Cause	Corrective Action
Temperature too high or unstable	1. The interface heater is faulty.	1. Open the Mass Spectrometer Detailed Status dialog. • For the interface for the NanoSpray ion source, the **Source Temperature** field does not contain the set temperature value and it is shown as n/a and the **Interface Heater Status** should be Ready. • For the OptiFlow interface, the **Source Temperature** field should contain the set temperature and the **Interface Heater Temperature** should show the temperature. Contact an FSE. For more information, visit the SCIEX website at sciex.com.

Principles of Operation A

Nano-flow ionization is a soft ionization technique that is particularly useful for analyzing biological samples such as proteins and peptides. It uses very small volumes of sample and takes full advantage of the benefits of capillary chromatography. It also preserves the sample integrity and reduces fragmentation.

The flow of the gas for the Curtain Gas interface improves the laminar flow of ions toward the orifice plate aperture, creating smaller droplets that ionize more efficiently and produce a higher yield of useful ions. The interface removes larger particles from the ion current before they enter the aperture.

Figure A-1 Ion Evaporation



Item	Description
1	Droplet contains ions of both polarities with one polarity being predominant.
2	As the solvent evaporates, the electrical field increases and the ions move to the surface.
3	At some critical field value, ions are emitted from the droplets.
4	Nonvolatile residue remains as a dry particle.

Each charged droplet contains solvent, positive ions, and negative ions, but with one polarity predominant. The surface of each droplet contains an excess of charges. As the droplets evaporate, the radius of the droplet shrinks, and the electrical field at the surface increases.

If the droplet contains excess ions, and enough solvent evaporates from its surface, a critical point is reached at which ions are ejected into the gas phase by a very low energy process that

does not induce fragmentation. After the solvent evaporates, it leaves a dry particle consisting of the non-volatile components from the sample.

Analyzing samples with the interface for the NanoSpray ion source accelerates this process by using two separate stages of desolvation. Charged droplets first pass through a counter-current gas flow that provides the primary desolvation and discriminates against neutrals and very large charged particles. The finely dispersed charged droplets then enter a heated laminar flow chamber where they undergo a rapid evaporation with minimal thermal decomposition. This gentle evaporation preserves the sample's molecular identity.

The laminar gas flow and the electric field between the heated chamber and the orifice plate aperture transports the ions into the vacuum system of the mass spectrometer. The heated interface removes the larger residual charged particles.

Tips for Working with the Ion Source B

Factors Affecting Optimization

The following factors affect NanoSpray III ion source performance:

- Tip position
- Voltage for the NanoSpray ion source
- Flow rate of the gas for the Curtain Gas interface
- Heater temperature

NanoSpray III Head Position

CAUTION: Potential System Damage. Do not allow the emitter tip to contact the curtain plate. Use the fine Z-axis adjustment knob to adjust the sprayer position, to avoid damage to the emitter tip.

The head optimizes off-axis with the curtain plate aperture. For analyses in positive ion mode at typical CE-flow rates the distance of the tip from the orifice is between 2 mm to 3 mm away from the curtain plate. This distance varies depending on the background electrolyte composition.

Note: Always monitor the signal and background levels while adjusting the sprayer position.

Flow Rate for the Gas for the Curtain Gas Interface

For the CESI 8000 Plus system, the flow rate for the Curtain Gas interface is 5 psi.

Heater Temperature

For the CESI 8000 Plus system, in general, the recommended temperature is 50 °C.

The interface takes approximately 10 minutes to reach its working temperature after the system reaches a vacuum ready state.

The following describes the heater temperature set-point relationship between the interface for the NanoSpray ion source and the interface for the OptiFlow Turbo V ion source.

For a < 100 °C, b = 0.8a + 10

For a > 100 °C, b = 1.4a - 50

Where a = heater temperature for the interface for the NanoSpray ion source

Where b = heater temperature for the OptiFlow Turbo V ion source

Glossary of Symbols

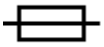
C

Note: Not all of the symbols in the following table are applicable to every instrument.

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

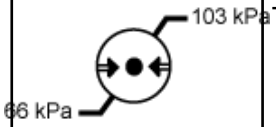
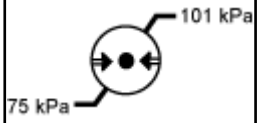
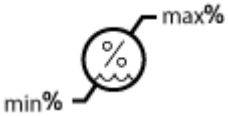
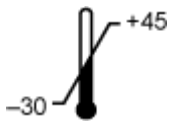
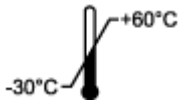
Glossary of Symbols

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 indicate 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 it 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
	Ethernet connection

Symbol	Description
	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
	Ionizing Radiation Hazard

Glossary of Symbols

Symbol	Description
	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.
	Pinching Hazard

Symbol	Description
	Pressurized Gas Hazard
	Protective Earth (ground)
	Puncture Hazard
	Reactive Chemical Hazard
SN	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 °C to +45 °C.
	Transport and store the system within –30 °C to +60 °C.

Glossary of Symbols

Symbol	Description
	USB 2.0 connection
	USB 3.0 connection
	Ultraviolet Radiation Hazard
	United Kingdom Conformity Assessment Mark
VA	Volt Ampere (power)
V	Volts (voltage)
	WEEE. Do not dispose of equipment as unsorted municipal waste. Environmental Hazard
W	Watts
	*yyyy-mm-dd* Date of manufacture

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