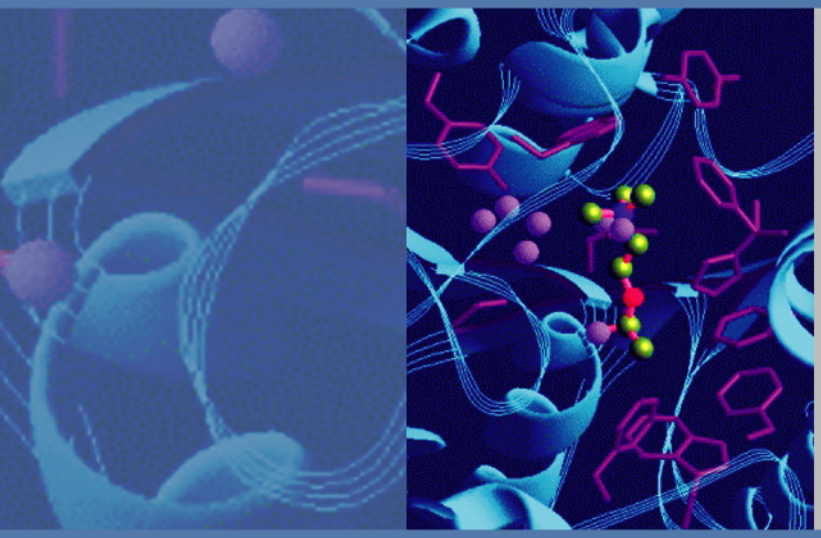

# Nanospray Flex Ion Source

Version 1.0

## Getting Connected Guide

60053-97126 Revision A November 2010

DOCUMENTATION SURVEY

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

Release history: Revision A, November 2010

Software version: EASY-nLC 2.5 and later; Xcalibur 1.3 and later

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Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

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**CAUTION** Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device.

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For manufacturing location, see the label on the instrument.

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# Contents

# Preface

This guide provides information on the Thermo™ Nanospray Flex™ ion source, including setup, installation, and operation.

The Nanospray Flex ion source works in conjunction with these Thermo Scientific mass spectrometers:

- LTQ™ Series: LTQ, Orbitrap™, FT™, Velos™
- Exactive™
- TSQ™ Series: Quantum™, Quantum Access™, Quantum Discovery MAX™, Quantum Ultra™, Vantage™
- LCQ™ Deca XP MAX

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## Related Documentation

In addition to this guide, Thermo Fisher Scientific provides the following documents for the Nanospray Flex ion source available as PDF files:

- Thermo Xcalibur™ manual suite
- *Ion Max Source and Ion Max-S API Source Hardware Manual*

The software also provides Help.

## Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

Safety and special notices include the following:

**CAUTION** Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

**IMPORTANT** Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

**Note** Highlights information of general interest.

**Tip** Highlights helpful information that can make a task easier.

**CAUTION**

- Emitter tips are extremely sharp. Never touch the tips as this may cause injury.
- Always depressurize the LC-system with transfer line before removing emitters from the source head. Failure to do so may result in the emitter being ejected at high speed.

**CAUTION**

- Although the ion source is shielded, in certain cases there might be access to the emitter which is on high voltage (HV). Always turn off the HV before touching the source head.
- Never connect a power supply able to deliver more than 8kV and 100 µA to this Nanospray source.
- Do not leave the source unattended while the spray voltage is on.

**CAUTION** The interface region, especially the cone of the mass spectrometer can be hot. Do not touch this area.

# Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need.

❖ **To contact Technical Support**

| | |
|---|---|
| Phone | 800-532-4752 |
| Fax | 561-688-8736 |
| E-mail | us.techsupport.analyze@thermofisher.com |
| Knowledge base | www.thermokb.com |

Find software updates and utilities to download at mssupport.thermo.com.

❖ **To contact Customer Service for ordering information**

| | |
|---|---|
| Phone | 800-532-4752 |
| Fax | 561-688-8731 |
| E-mail | us.customer-support.analyze@thermofisher.com |
| Web site | www.thermo.com/ms |

❖ **To get local contact information for sales or service**

Go to www.thermoscientific.com/wps/portal/ts/contactus.

❖ **To copy manuals from the Internet**

Go to mssupport.thermo.com, agree to the Terms and Conditions, and then click **Customer Manuals** in the left margin of the window.

❖ **To suggest changes to documentation or to Help**

- Fill out a reader survey online at www.surveymonkey.com/s/PQM6P62.
- Send an e-mail message to the Technical Publications Editor at techpubs-lcms@thermofisher.com.

# Disclaimer

- This equipment, including spray capillaries, is designed specifically for creating ions in a mass spectrometer. (No other use is recommended.)
- This equipment is for laboratory use only and is not a medical device.
- This equipment must not be connected to any power supply delivering more than 8 kV and 100 µA.
- Do not allow unauthorized or untrained operators to use this equipment.

- Any misuse will be the sole responsibility of the user/owner. Thermo Fisher Scientific assumes no implied or inferred liability for direct or consequential damages or injuries from this instrumentation if it is operated or used in any way other than that for which it is designed.
- Any legal disagreements must be settled before a Danish court of law.
- Only use this equipment if you agree with the conditions above.

# Declaration of Conformity

### European Safety Standards

### Declaration of Conformity

| | |
|---|---|
| Standard(s) to which conformity is declared: | IEC 61010-1/ EN61010-1:2001, Second edition - "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use." |
| Manufacturer's Name: | Proxeon Biosystems A/S |
| Manufacturer's Address | Edisonsvej 4, DK-5000 Odense, Denmark |
| Type of Equipment: | Laboratory Instrumentation |
| Model Name: | Nanospray Flex ion source |
| Model Numbers: | ES071 |
| Serial Number: | ES-001000 and later |
| Year of Manufacture: | 2010– |

I, the undersigned hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Ole Vorm, Site Manager October 11, 2010

# Introduction

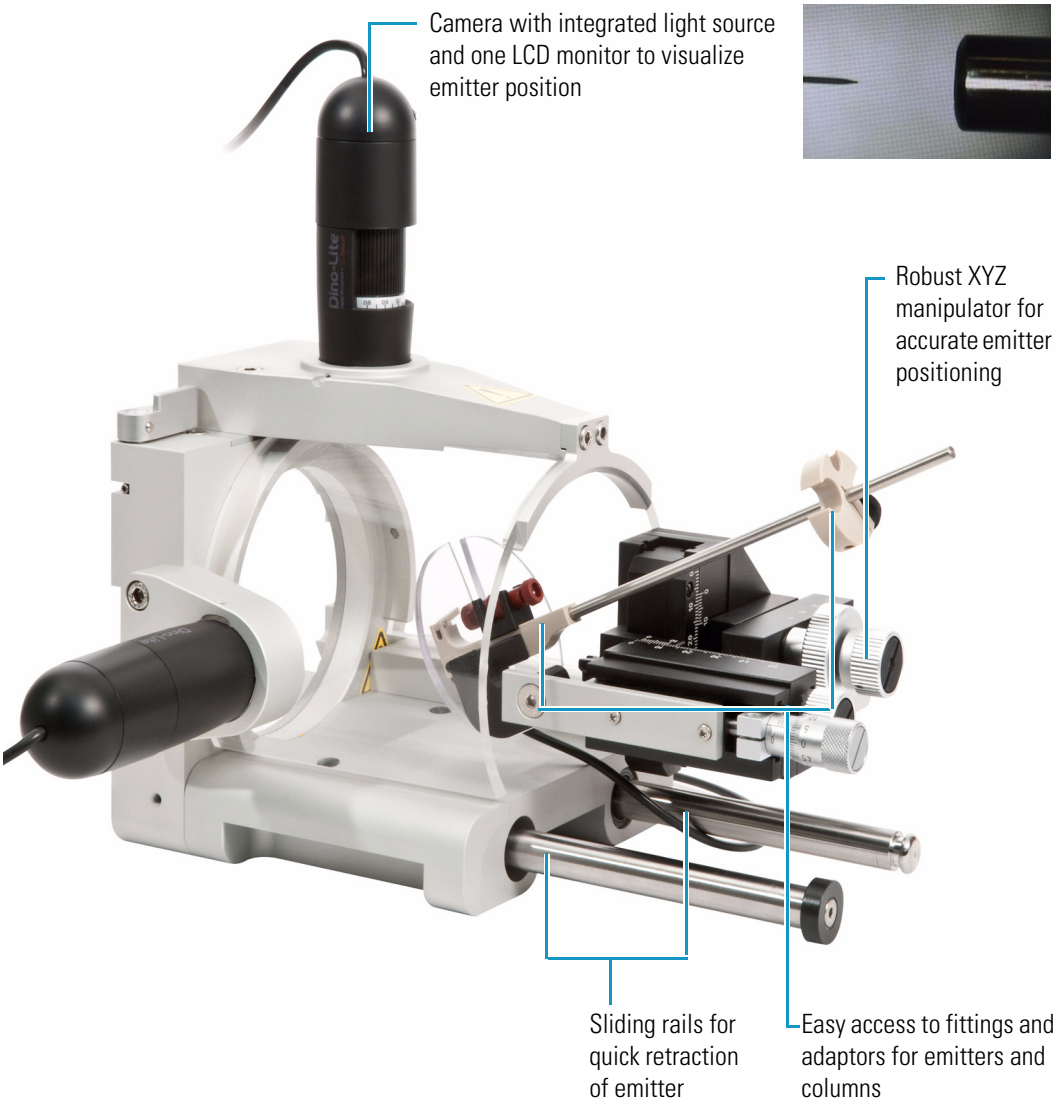
Nanospray Flex ion sources minimize the liquid flow rate (nL/min) and maintain excellent spray stability to ensure evaporation and ionization of liquid samples —the key to achieving the highest sensitivity.

Key benefits of the Nanospray Flex ion source include

- User-friendly design
- Single setup for all online nanoflow applications
- Ability to interface with online nanoscale LC separation techniques

**Contents**

**Figure 1.** Nanospray Flex ion source




# Content of Nanospray Flex Ion Source Kit

The Nanospray Flex Ion Source Kit (P/N ES071) includes the following:

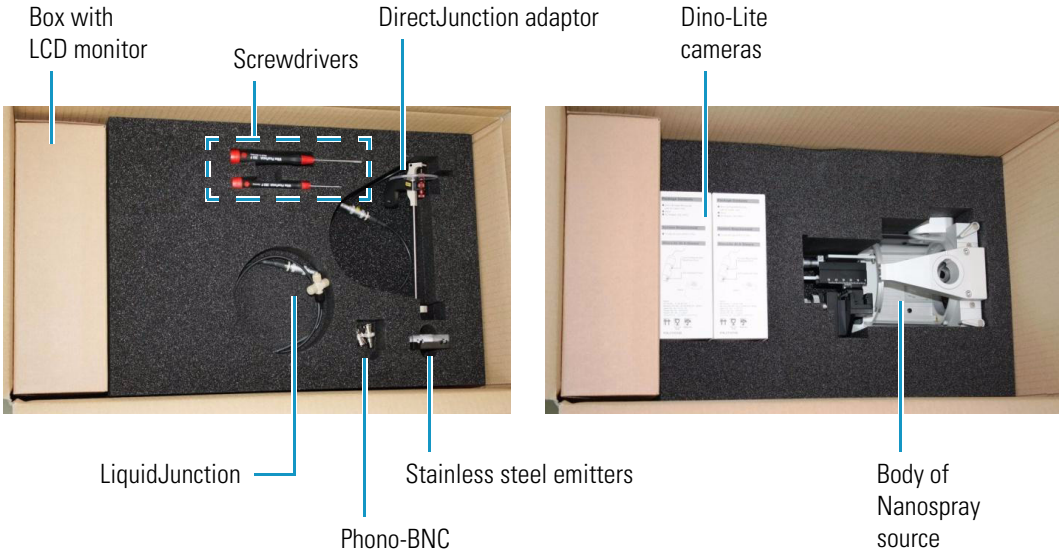
- Flexible ion source housing with precision XYZ manipulator and fittings
- DirectJunction™ adaptor ready for use with a variety of different column/emitter configurations for online analysis
- LiquidJunction MicroCross for one column setup with long packed emitters
- Dual camera setup including one LCD monitor
- Nanobore stainless steel emitters fitting the DirectJunction adaptor

- All necessary cables and connectors for the ion source
- *Nanospray Flex Ion Source Getting Connected Guide*

# Unpacking the Ion Source and Preinstallation

The Nanospray source kit is packed in a single box. To fully protect the components during transport, the source mechanics, DirectJunction adaptor, and cameras are not assembled (see Figure 2).

**Figure 2.** Nanospray ion source components

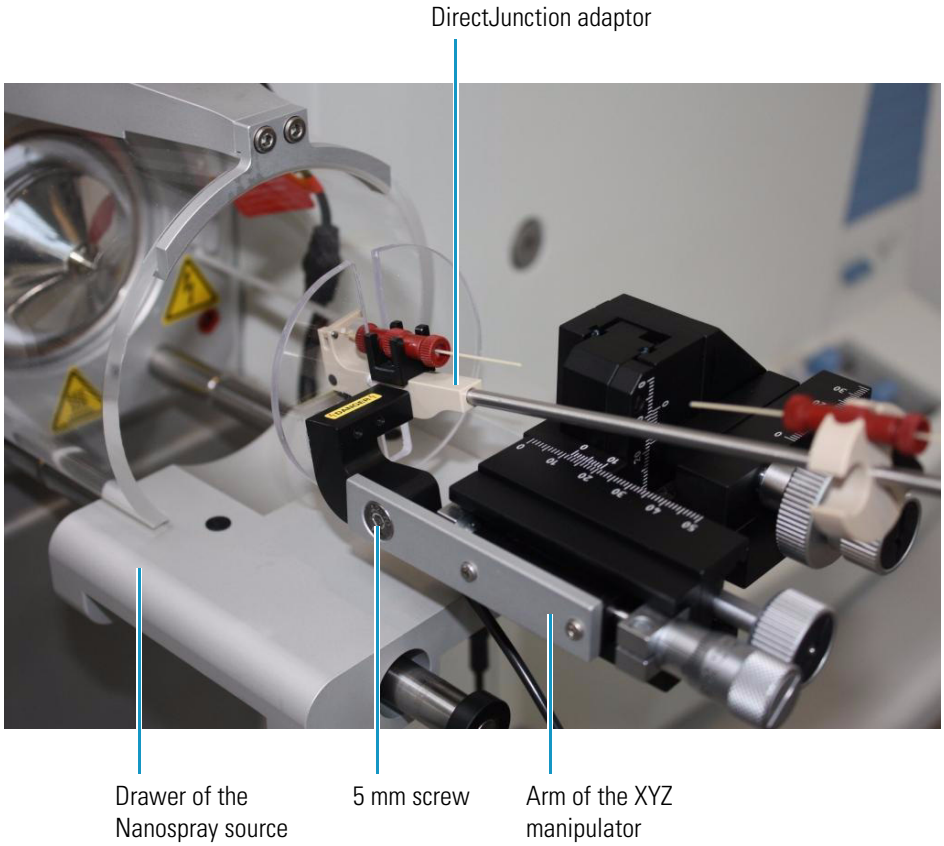



### ❖ To unpack the ion source

1. After removing the foam from the top of the box, access the accessories for the Nanospray source.
2. Carefully lift up the next foam bar including the accessories to access the body of the Nanospray source.
3. Carefully take out the body of the Nanospray source and place it on a table to complete the assembly of the Nanospray source.

4. Pull back the drawer of the Nanospray source to access the arm on the XYZ manipulator (see Figure 3). The DirectJunction adaptor has to be mounted to this arm using the 5 mm. screw in the holder of the DirectJunction.

**Figure 3.** Assembly of the DirectJunction to the XYZ manipulator arm

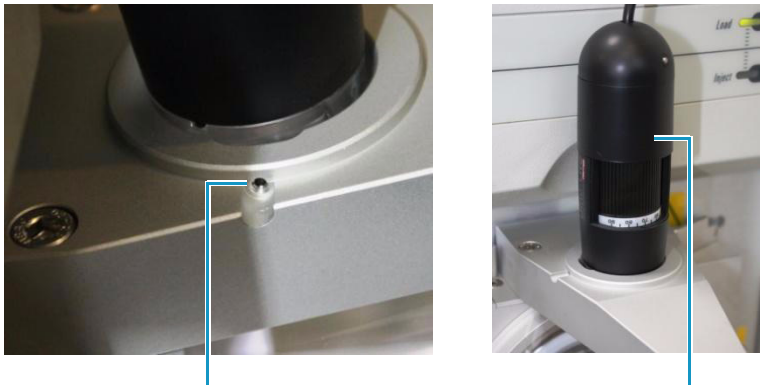



5. Use the supplied screwdriver to mount the DirectJunction adaptor on the XYZ manipulator arm. Before tightening the 5 mm screw, position the DirectJunction with the back of the DirectJunction elevated about 20° above horizontal. Tighten the screw firmly.

   The two white boxes in the box contain Dino-Lite™ cameras, which are located in the opening on the top and left side of the source body.

6. Loosen the small screw which is used to secure the cameras in place with the supplied screwdriver (see Figure 4).

**Figure 4.**



Small screw to fix camera in place

Dino-Lite camera placed on top of the source body

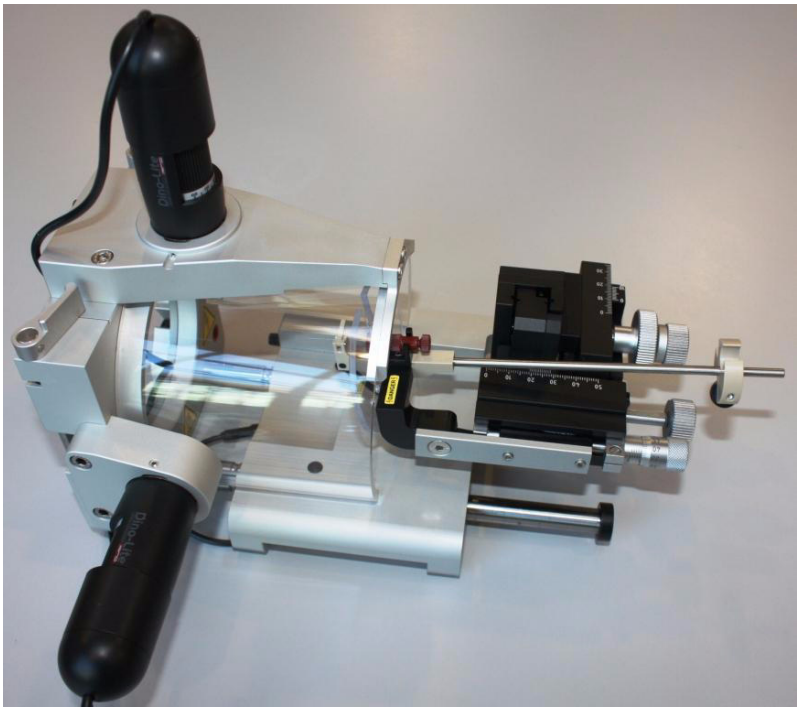
7. Remove the cameras and install the first one in the top of the source body. Note that the camera can only be placed one way, ensuring optimal alignment. Slowly tighten the screw until it touches the camera housing. Tighten by another half turn.
8. Repeat the procedure for the second camera, which is located on the left side of the source body.

You are now ready to install the Nanospray source.

# Installing the Ion Source on the Mass Spectrometer

After assembling the body and accessories, you are ready to mount the completed source on the mass spectrometer.

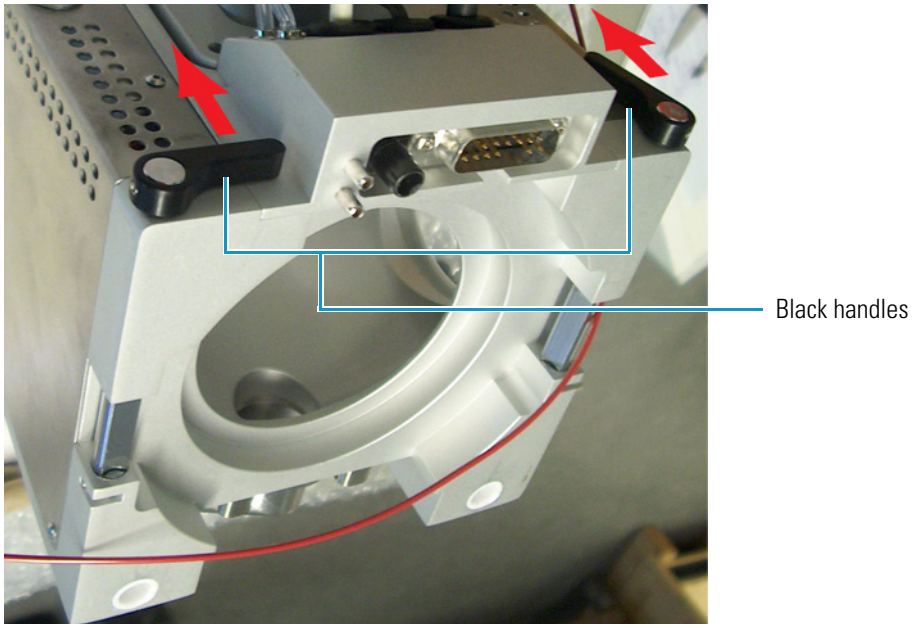
**Figure 5.** Thermo Nanospray Flex ion source with DirectJunction



### ❖ To install the ion source on the mass spectrometer

1. Before removing the previous ion source, disconnect any columns and flow lines from the HPLC system.
2. Refer to the mass spectrometer user manual for guidance on how to remove the existing ion source.
3. Remove the existing ion source as follows:
   a. Turn the two black handles on top of the source in the direction indicated in Figure 6. The handles might give some resistance.
   b. Carefully pull out the source.

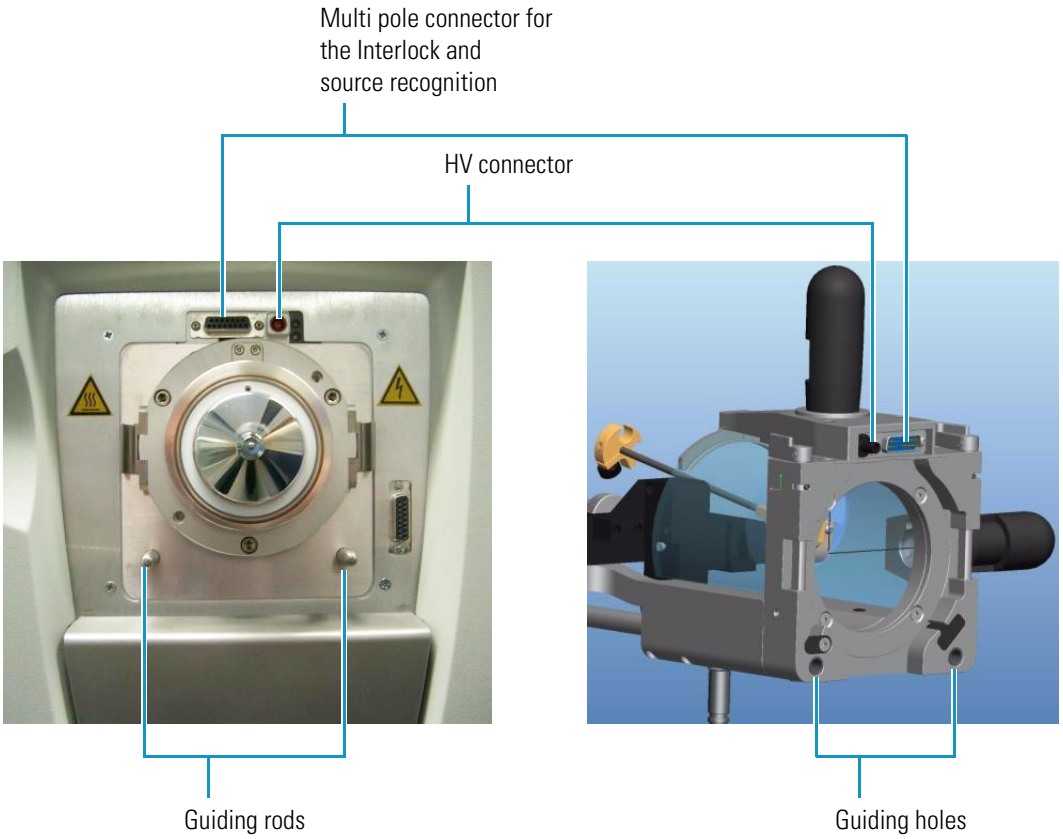
**Figure 6.** Turning the black handles on top of the ion source




4. Take the Nanospray source and align the guiding rods of the source with the guiding holes of the mass spectrometer (see Figure 7).
5. Push the source gently towards the mass spectrometer. The top part with the connectors might give some resistance. If so, push a little harder in the top area of the source.
6. Close the two handles by turning them so that they point toward each other (you might feel some resistance).

The mass spectrometer is now in Standby mode and the source is mounted.

**Figure 7.** Guiding holes on the Nanospray source for mounting on the guiding rods of the mass spectrometer



# Electrical Connections

For correct operation, use these procedures to connect the cameras and monitor electrically and to adjust the focus for sharp pictures.

**Contents**



**CAUTION** When you push the XYZ manipulator onto the mounting frame of the source, the HV for the spray emitter switches on. For your protection, always retract the drawer of the source before working with the source head.

You must use the supplied HV cables and connectors in the Nanospray Flex ion source.

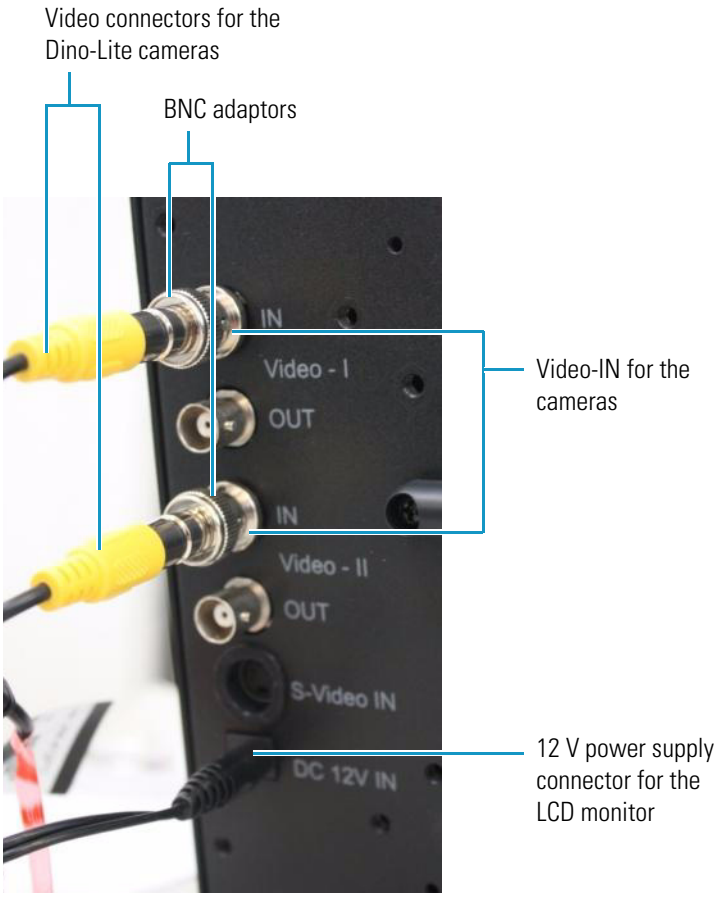
## Connecting the Monitor and Cameras

After installing the Thermo Nanospray Flex ion source, you must set up the LCD monitor and Dino-Lite cameras.

❖ **To connect and adjust the LCD monitor and Dino-Lite cameras**

1. In the ion source kit, remove the monitor from the brown box and place it on top of the mass spectrometer by using the support arm on the back of the monitor (see Figure 8.)

**Figure 8.** Back of LCD monitor

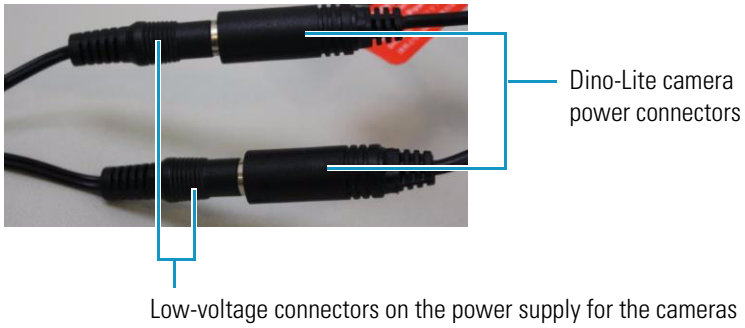



2. Connect the 12 V power supply connector to the monitor.
3. Locate the two BNC adaptors in the ion source kit and, using a quarter-turn, insert them into the two Video-IN ports on the back of the monitor (Figure 8).
4. Connect the two yellow video connectors from the Dino-Lite cameras onto the two BNC adaptors.
5. Choose and insert the appropriate connector to the power supply:
   a. Locate the power supply for the cameras in the camera box.

      The power supply comes equipped with an EU standard net connector. The kit box contains one U.K. and one U.S. connector.

   b. Connect the low-voltage connectors of the two power supplies to the two Dino-Lite camera power connectors (see Figure 9).

**Figure 9.** Connection of the low-voltage connectors to the camera power connectors




6. Connect the power adaptors for the two Dino-Lite cameras and the power adaptor for the monitor to your net power sockets.

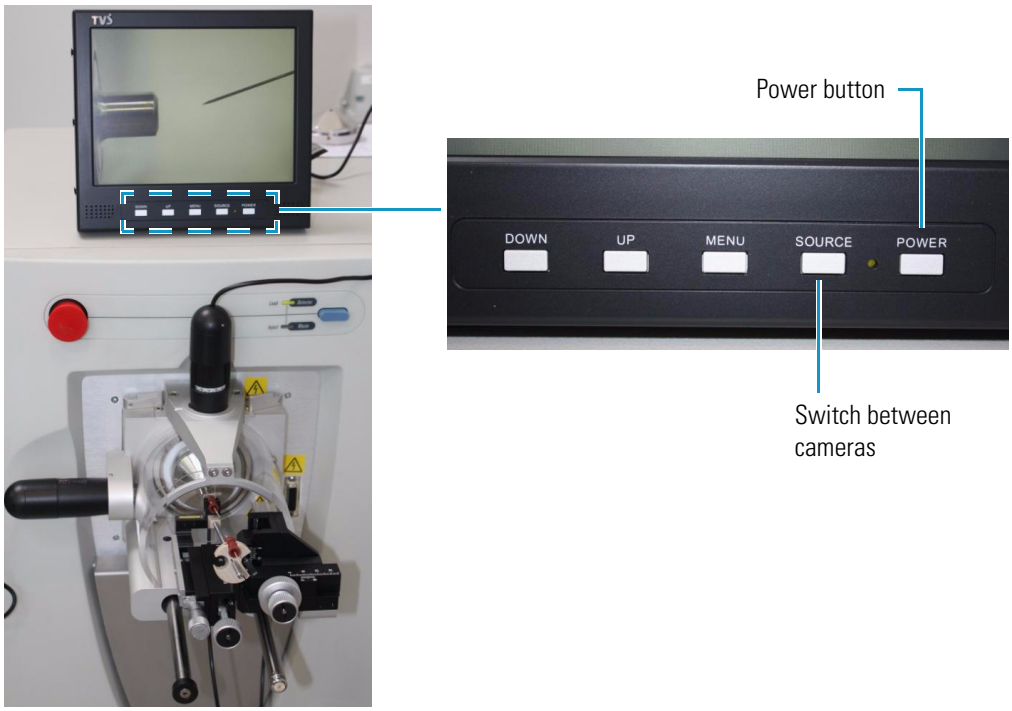
The cameras and the monitor are now ready for use.

# Adjusting the Monitor and Cameras

❖ **To adjust the LCD monitor and Dino-Lite cameras**

1. Turn on the LCD monitor by pressing the POWER button on the front of the monitor (see Figure 10).

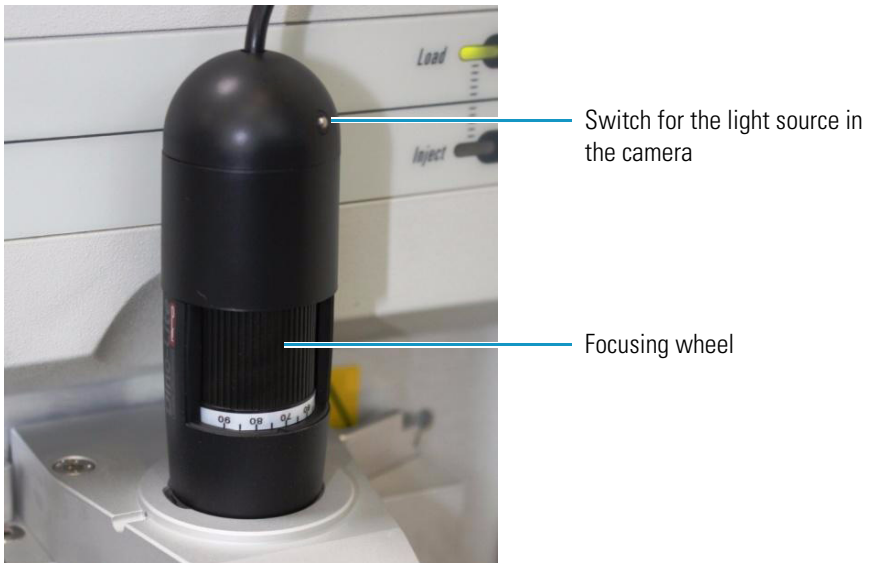
**Figure 10.** LCD Monitor setup and control panel



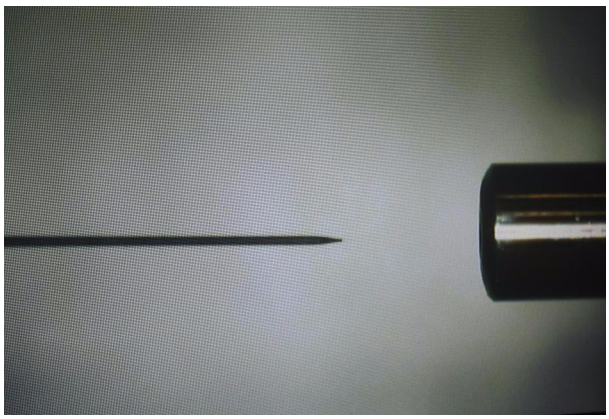

After a few seconds the picture from one of the two cameras appears. The picture is likely to be very blurred.

2. Adjust the focus with the focusing wheel (Figure 4).

**Figure 11.** Camera light source switch and focusing wheel




The adjustments produce a sharp image on the monitor:



3. Switch to the second camera by pressing the SOURCE button (see Figure 10 on page 11), and adjust the focus with the focusing wheel as above.

4. If the picture on the LCD monitor is too dark, use the camera's internal light to make adjustments.

   a. To turn on the light, gently press the small button on the back of either camera (Figure 4).

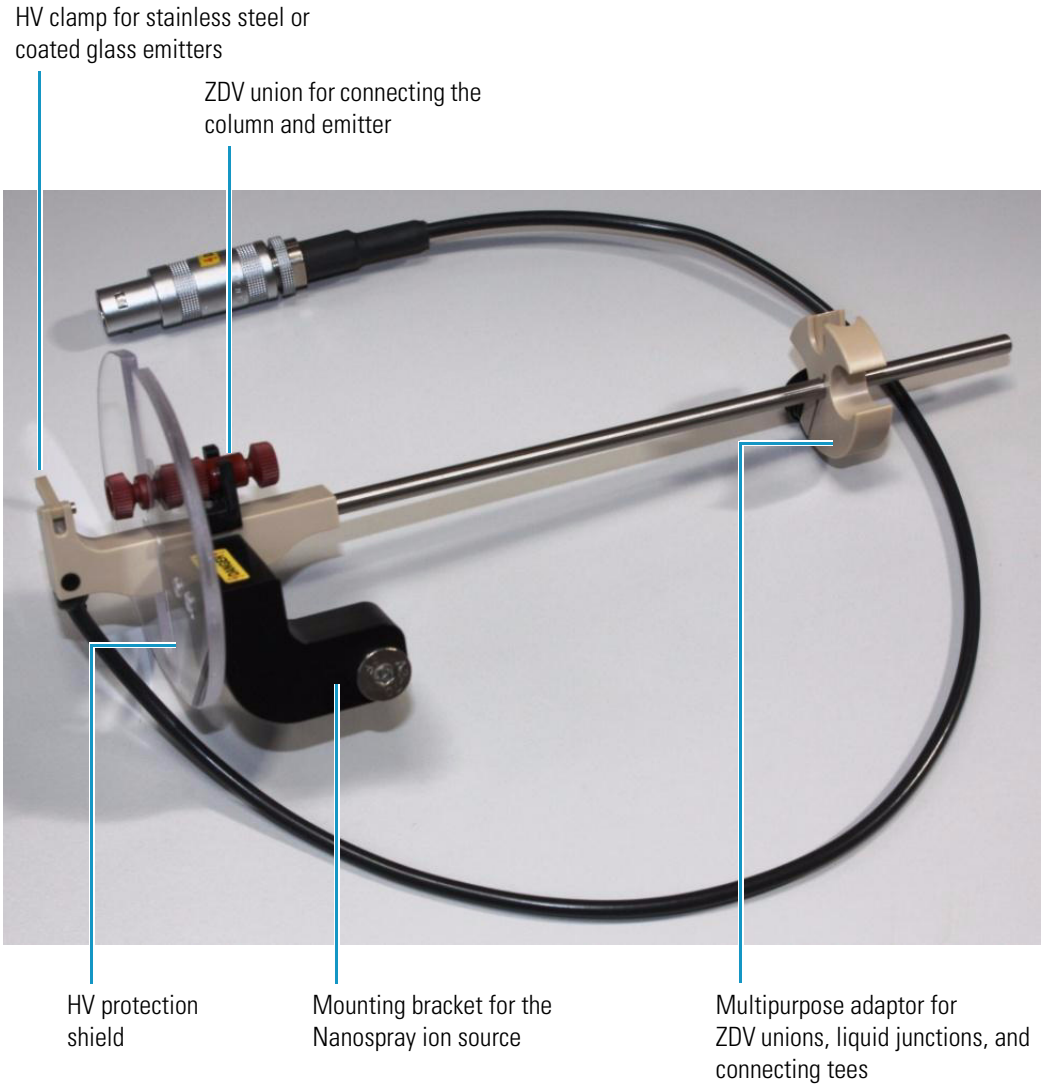
   b. Adjust the picture to achieve the sharpest image by using either camera light or both lights together.

# DirectJunction Adaptor

DirectJunction is a configurable adaptor for the Thermo Nanospray Flex ion source (see Figure 12). It enables the flexible interchange between most online column and emitter configurations, and uses stainless steel or glass emitters and a one-column or two-column setup, with or without a liquid junction.

**Contents**

**Figure 12.** DirectJunction adaptor




# Choosing a One-Column or Two-Column Configuration

The DirectJunction adaptor supports both a one- and two-column configuration.

A one-column configuration has the following advantages:

- It has fewer connections, which minimize any potential peak broadening that results from dead volumes.
- It enables MS analysis of compounds that elute during sample loading (as they might not bind to the column material) because the fluid path leads directly to the MS.

A two-column setup (typically a short pre/trap-column with a large inner diameter and a longer analytical column with a narrower inner diameter) has these advantages:

- A pre/trap-column provides an increased loading capacity and an increased loading flow rate when compared to loading directly onto the analytical column.
- It directs the loading solvent to waste so that sample "contaminants" do not enter the MS, reducing the need to clean the MS inlet.
- A pre/trap-column acts as a guard column by protecting the analytical column from particulate matter.

# Choosing Stainless Steel or Glass Emitters

Stainless steel emitters are more robust than glass emitters, and help to maintain a stable and consistent spray for longer periods of time.

The DirectJunction adaptor enables high voltage (HV) to be applied directly to the stainless steel emitter through the small HV clamp at the front of the adaptor. By applying voltage across the entire emitter, you can maintain a constant optimal electrical contact with the liquid. The result is superior spray stability.

A cross section of scientists consider glass emitters to be more bio-inert than stainless steel emitters. This state means reducing the risk of non-specific adsorption of biomolecules and leads to slightly improved sensitivity.  However, the degree of this adsorption depends on the chemical characteristics of the sample.

You can pull glass emitters to produce very small ID emitter openings. However, the very small opening at the tip often results in stability problems associated with blockage of the tip, and means that glass emitters rarely last as long as their steel counterparts.

Glass emitters usually have HV applied through a liquid junction. This means that only a small percentage of the bulk liquid flow is exposed to the electrode carrying the HV.

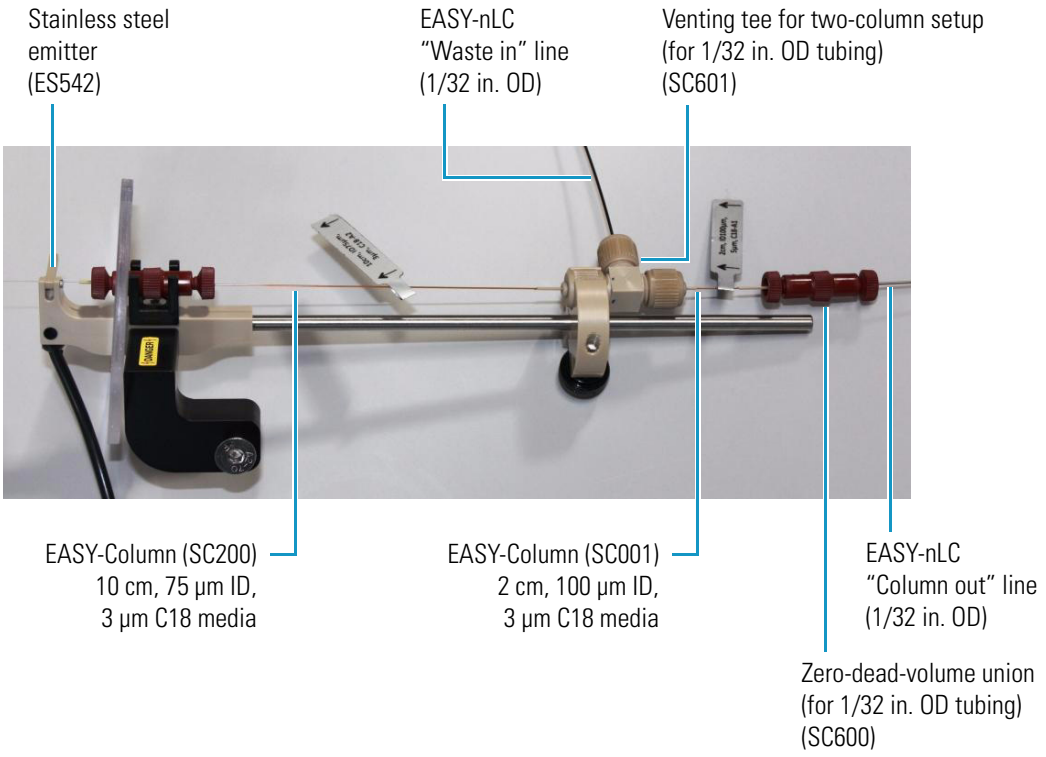
**Tip** When using glass emitters, do the following:

- Place the liquid junction at the high-pressure side of the column. Electrochemical processes occurring  at the electrode can otherwise create gas that leads to spray instability.
- Use glass emitters with small ID emitter tips (<20 µm) to create back pressure in the emitter and avoid outgassing and consequent spray instability.

# Standard Configuration

Figure 13 shows the recommended configuration for the EASY-nLC™ nano-flow liquid chromatography system and EASY-Columns™ with a stainless steel emitter installed on the DirectJunction prior to mounting onto the Nanospray Flex ion source.

**Figure 13.** Configuration for the EASY-nLC and EASY-Columns on DirectJunction using a stainless steel emitter




## Assembling the Columns for Standard Configuration

❖ **To assemble the pre-column and analytical column**

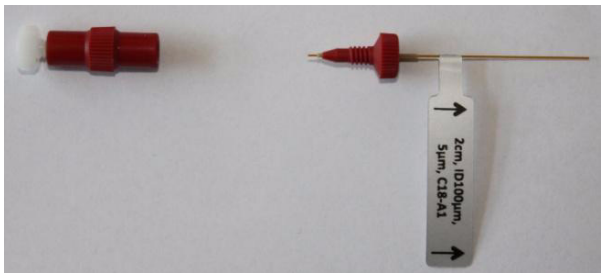
1. Remove both red nuts from the ZDV union (SC600).
2. Screw the white blind plug into the union.

   **Figure 14.** ZDV union with white blind plug (SC600)

   
3. Insert the pre-column (SC001) through a 2 cm (0.79 in.) 1/32 in. OD sleeve (F-385) with arrows on the label pointing away from the sleeve.

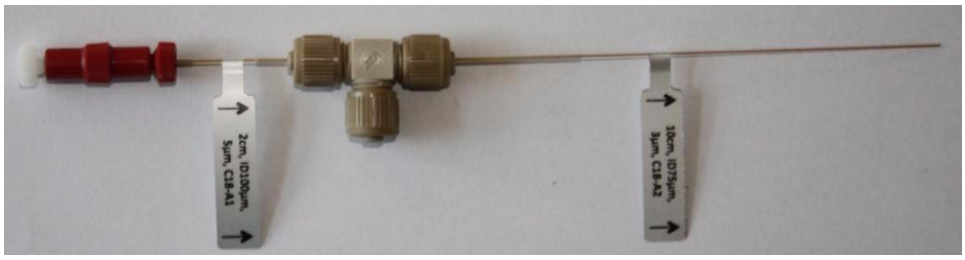
4. Insert the sleeved pre-column through a red nut.
5. Screw in the red nut while ensuring that the pre-column and sleeve are firmly pushed against the white blind plug.
6. Insert the other end of the pre-column through a 1/32 in. OD sleeve (F-385), ferrule, and nut from the venting tee (SC601).

**Figure 15.** ZDV union (SC600) and pre-column (SC001) assembly




7. Tighten the nut while ensuring that the pre-column and sleeve are firmly pushed against the center of the venting tee.
8. Install the analytical column on the other side of the venting tee using a 1/32 in. OD sleeve (F385). Check the label for the flow, and firmly push the sleeve and column against the center of the venting tee.

**Figure 16.** ZDV union (SC600), pre-column (SC001), venting tee (SC601), and analytical column (SC200) assembly




## Connecting the Columns to a Stainless Steel Emitter

❖ **To connect the columns to a stainless steel emitter**

1. Remove both red nuts from a **second** ZDV union (SC600).
2. Insert the white blind plug into the union.
3. Insert the outlet end of the analytical column through a 1/32 in. OD sleeve (F385) and a red nut.
4. Screw the outlet end into the union, ensuring that the column and sleeve are firmly pushed against the white blind plug. Then, remove the white blind plug.
5. Insert the sleeved emitter (ES542) through a red nut.

6. Screw the sleeved emitter into the other end of the union, ensuring that the emitter and sleeve are firmly pressed against the column outlet and sleeve.

**Figure 17.** Stainless steel emitter with 1/32 inch sleeve (ES542)

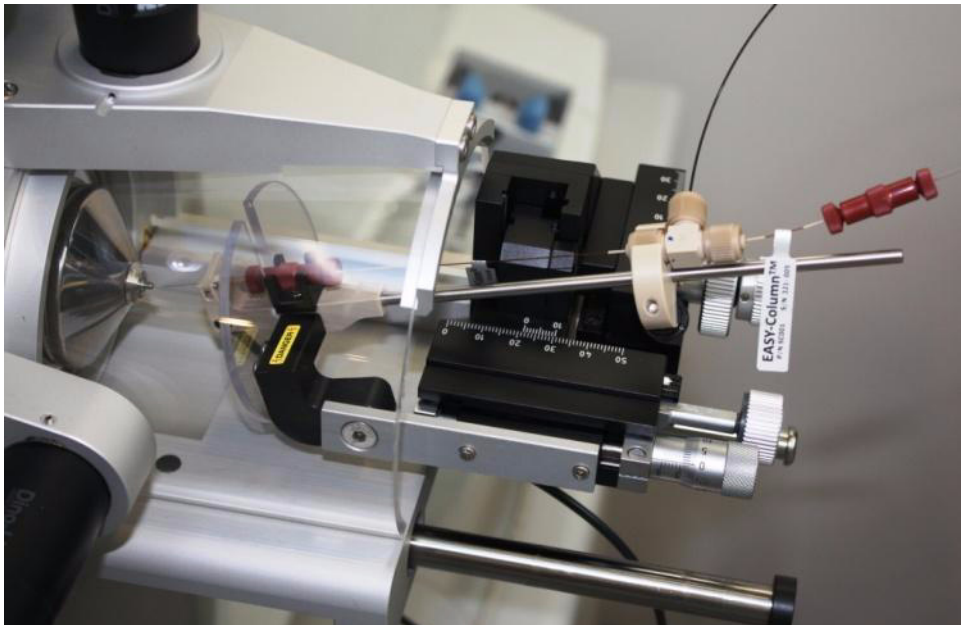
**Figure 18.** ZDV union assembly between analytical column and stainless steel emitter

## Mounting the Column and Emitter Setup onto the DirectJunction Adaptor

❖ **To mount the column and emitter setup onto the DirectJunction adaptor**

1. Mount the DirectJunction adaptor onto the Nanospray ion source.
2. Connect the red HV cable to the banana plug on the DirectJunction adaptor.
3. Open the front HV clamp on the DirectJunction adaptor.
4. Mount the ZDV union connecting the emitter and analytical column in the black holder onto the DirectJunction adaptor, and close the clamp over the emitter.
5. Adjust the position of the multipurpose adaptor on the steel rod, and mount the venting tee in the adaptor.

**Figure 19.** DirectJunction adaptor with two-column setup and steel emitter mounted on a Nanospray Flex ion source

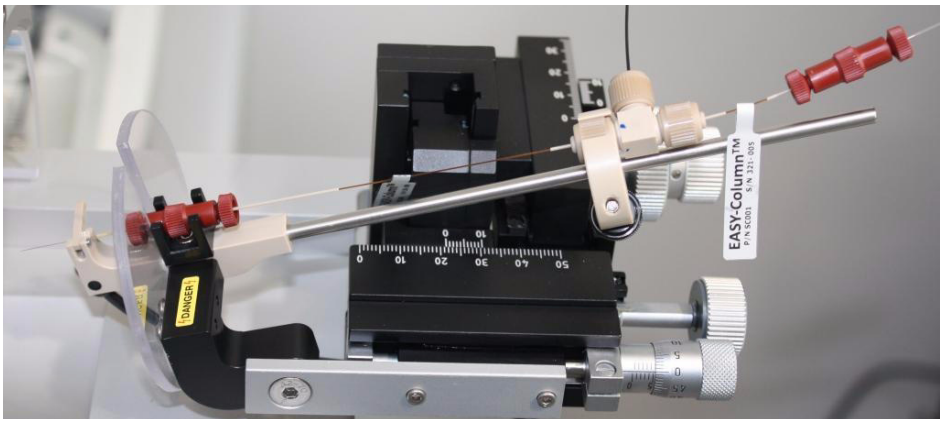


## Connecting the LC System to the Column Setup

❖ **To connect the LC system to the column setup**

1. Connect the “Column out” line from the EASY-nLC system to the pre-column through the ZDV union, ensuring the line is firmly pushed against the pre-column and sleeve.
2. Connect the “Waste in” line from the EASY-nLC system to the third port on the venting tee.

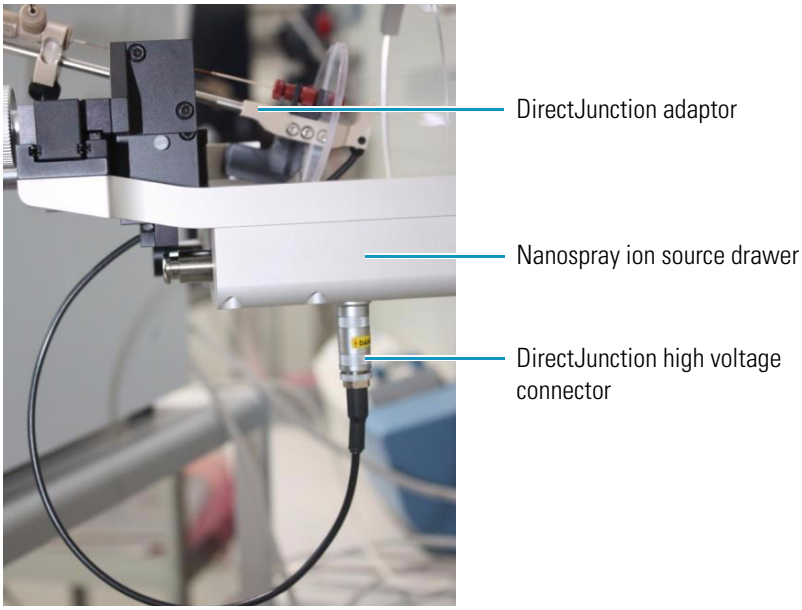
**Figure 20.** DirectJunction adaptor (as in Figure 19) but with “Column out” and “Waste in” flow lines connected from the EASY-nLC system




## Connecting the DirectJunction to HV

Make sure that the high voltage connector of the DirectJunction adaptor is inserted into the Lemo™ HV socket on the underside of the Nanospray ion source drawer.

**Figure 21.**



# Alternative Configurations for DirectJunction

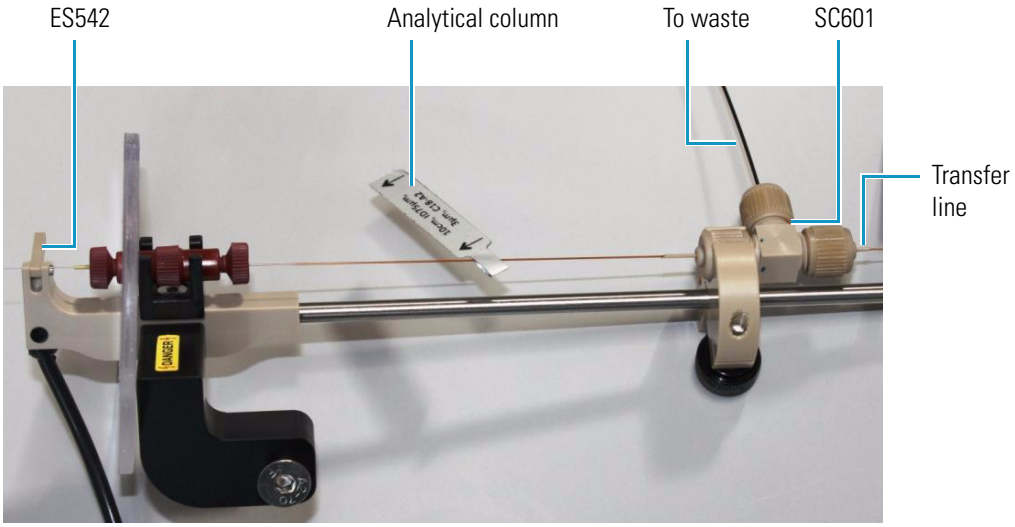
Depending on the specific experimental requirements on columns, emitters, and connections, the following configurations might work well in different situations.

**Contents**



## Stainless Steel Emitter and One-Column Setup

**Figure 22.** Stainless steel emitter with one column

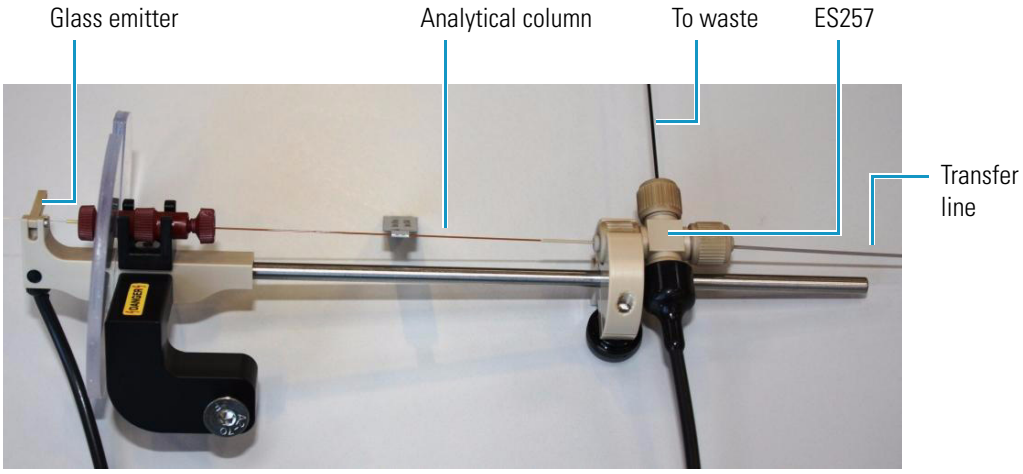



**Note** EASY-nLC software version 2.5 and later require use of the "Waste in" line connected to the vent (SC601) upstream of the analytical column in one-column configurations.

For earlier software versions or with other LC systems, you can replace the venting tee with a ZDV union (SC600).

# Glass Emitter with Liquid Junction and One-Column Setup

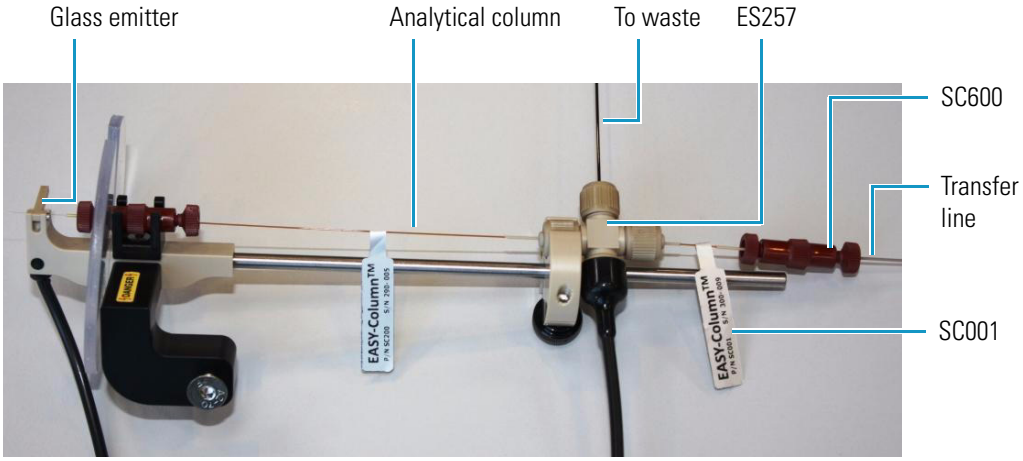
**Figure 23.** Glass emitter with a liquid junction and one column




**Note** EASY-nLC software version 2.5 and later require use of the "Waste in" line connected to the vent (ES257) upstream of the analytical column in one-column configurations. For earlier software versions or with other LC systems, you can replace the Liquid Junction Cross (ES257) with a Liquid Junction Tee (ES258). Use small ID emitter tips (<20 µm) to prevent out gassing in the tip and subsequent spray instability.

# Glass Emitter with Liquid Junction and Two-Column Setup

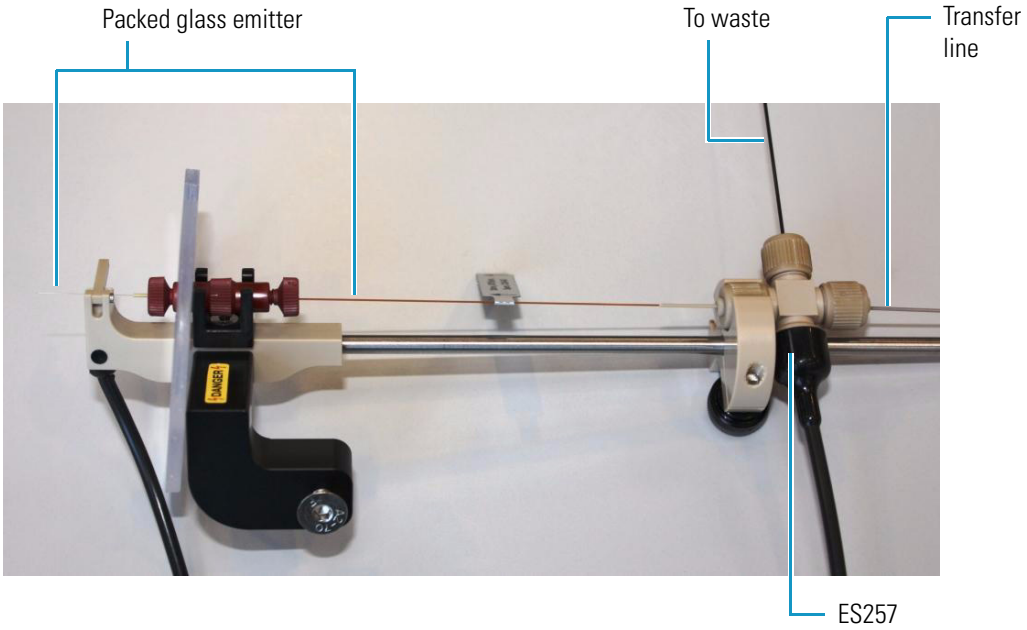
**Figure 24.** Glass emitter with a liquid junction and two columns



**Note** Use small ID emitter tips (<20 µm) to prevent out gassing in the tip and subsequent spray instability.

# Packed Glass Emitter with Liquid Junction in One-Column Setup

**Figure 25.** Packed glass emitter with a liquid junction and one column

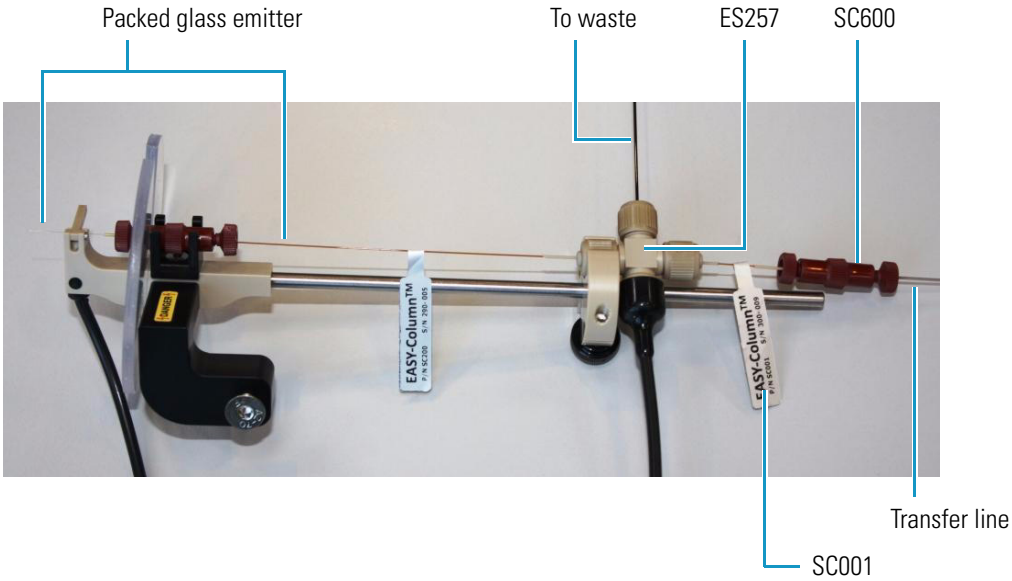



**Note** The packed glass emitter contains the stationary phase and has dual roles: as the analytical column and the emitter. The packed glass emitter is inserted through the ZDV union, which only serves as positional support.

**Note** EASY-nLC software version 2.5 and later require use of the "Waste in" line connected to the vent (ES257) upstream of the analytical column in one-column configurations. In earlier software versions or with other LC systems, you can replace the Liquid Junction Cross (ES257) with a Liquid Junction Tee (ES258).

# Packed Glass Emitter with Liquid Junction in Two-Column Setup

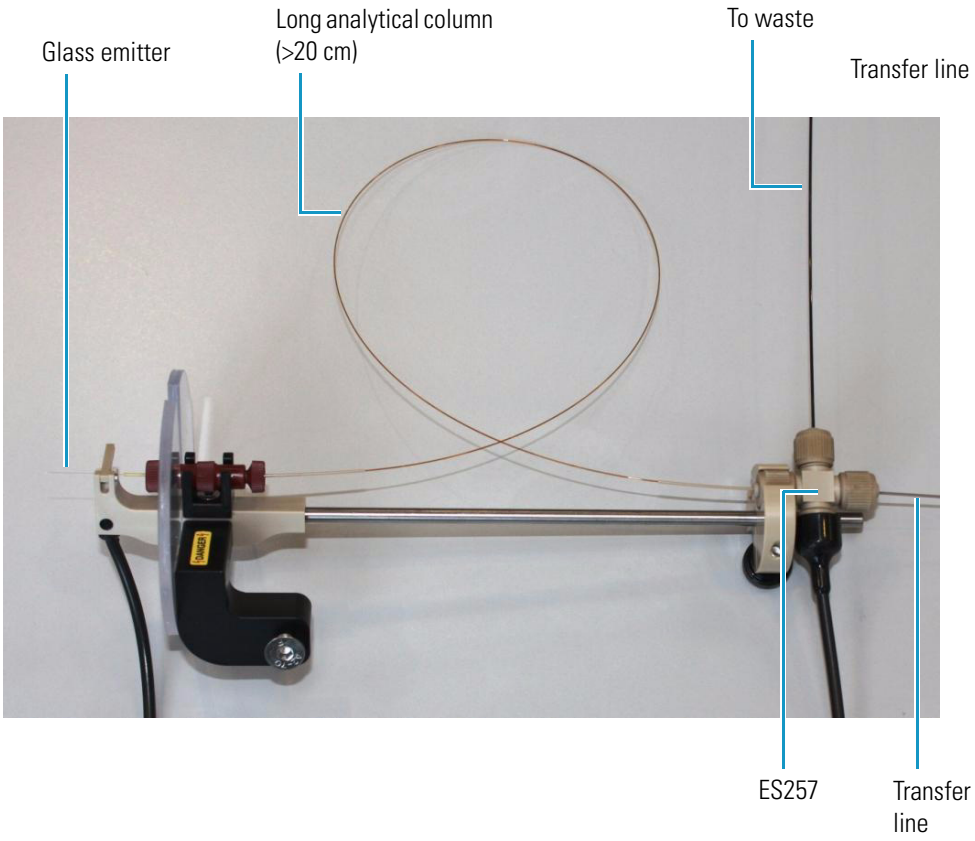
**Figure 26.** Packed glass emitter with a liquid junction and two columns




**Note** The packed glass emitter contains the stationary phase and has dual roles: as the analytical column and the emitter. The packed glass emitter is inserted through the ZDV union, which only serves as positional support.

# Setup with a Long Analytical Column

**Figure 27.** Long analytical column




**Note** You can easily fit long columns to the DirectJunction adaptor by coiling them between the ZDV union and the vent (ES257). Figure 27 shows a glass emitter and a liquid junction, but combinations with a steel emitter, a two-column configuration, or both of these are also possible.

**Note** EASY-nLC software version 2.5 and later require use of the "Waste in" line connected to the vent (ES257) upstream of the analytical column in one-column configurations. In earlier software versions or with other LC systems, you can replace the Liquid Junction Cross (ES257) with a Liquid Junction Tee (ES258). Use small ID emitter tips (<20 µm) to prevent out gassing in the tip and subsequent spray instability.

# Nano Flex Ion Source Configuration

When analyzing with nanospray sources, you only need to change a few mass spectrometer settings in the Xcalibur data sytem. The MS software will automatically recognize the ion source type.

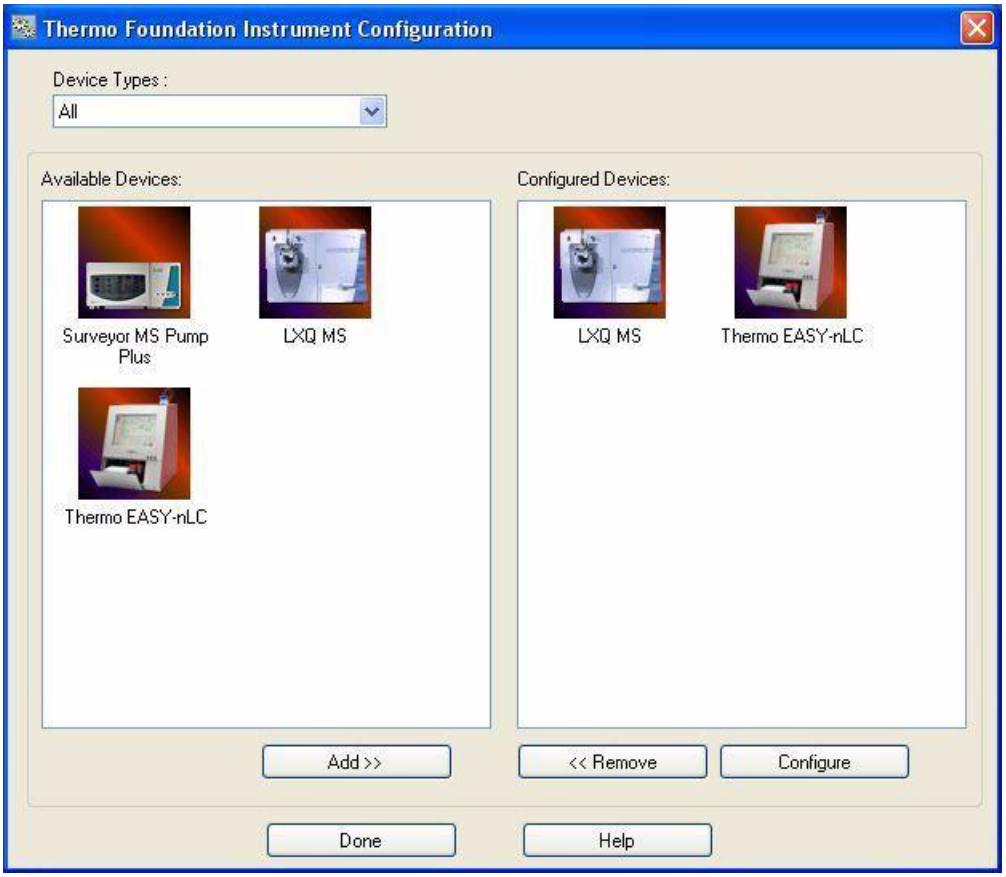
### ❖ To specify configuration options for the ion source

1. Open the Instrument Configuration window from the computer desktop as follows:

   - For Xcalibur 2.0.7 or earlier versions, choose **Start > All Programs > Xcalibur > Instrument Configuration**. Or, double-click the **Instrument Configuration** icon.
   - For Xcalibur 2.1.0 or later versions, choose **Start > All Programs > Thermo Foundation 1.0 > Instrument Configuration**.

   The [Thermo Foundation] Instrument Configuration window appears with a list of the installed available devices (see Figure 28).

**Figure 28.** Thermo Foundation Instrument Configuration window




2. Double-click the icon that represents your MS system (for example, LXQ MS).

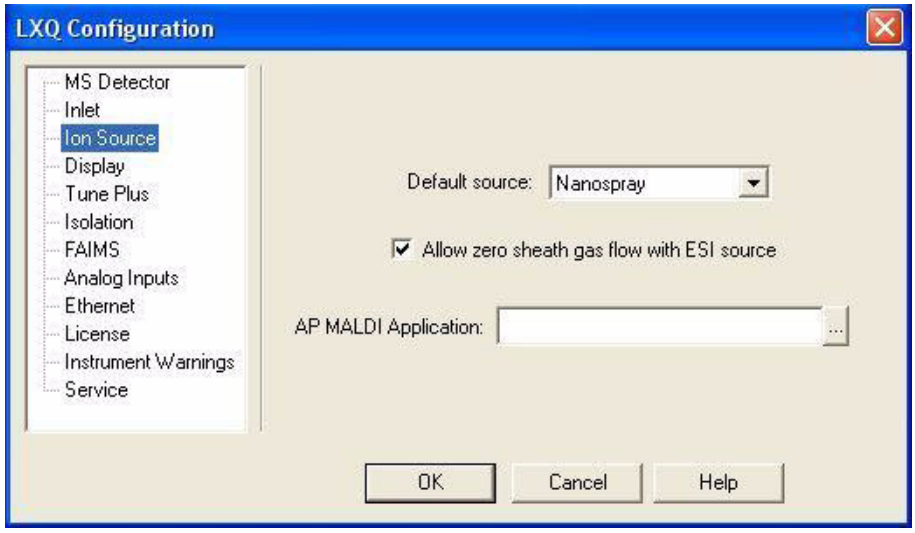
   A copy of the icon appears in the Configured Devices pane.

3. Complete the configuration of the mass spectrometer as follows:

   a. In the Configured Devices pane, double-click the **LXQ MS** icon (or the icon for your system).

      The LXQ Configuration dialog box appears (see Figure 29).

**Figure 29.** LXQ Configuration dialog box




b. Select **Ion Source** in the left pane if it is not already selected.

c. Ensure that the default source is **Nanospray** (the instrument recognizes the source automatically).

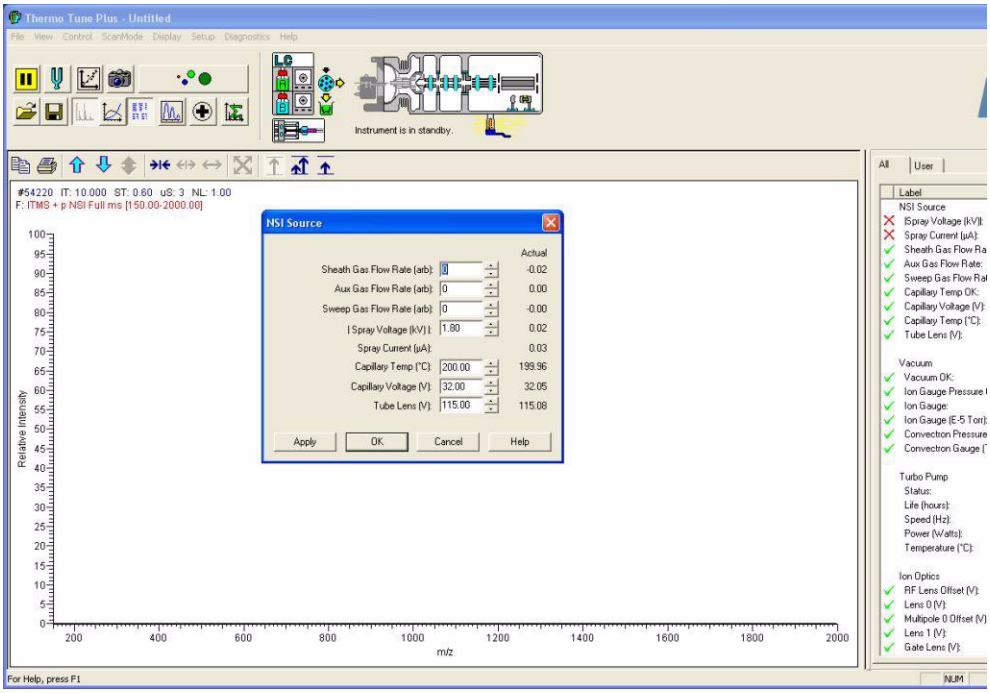
   If the source is not correct, follow the instructions in the Xcalibur manual.

d. Click **OK** to close the window.

4. From your desktop, double-click the **LXQ Tune** icon (or the correct system name of your MS).

   The Thermo Tune Plus window opens where you can analyze and choose specific settings (see Figure 30).

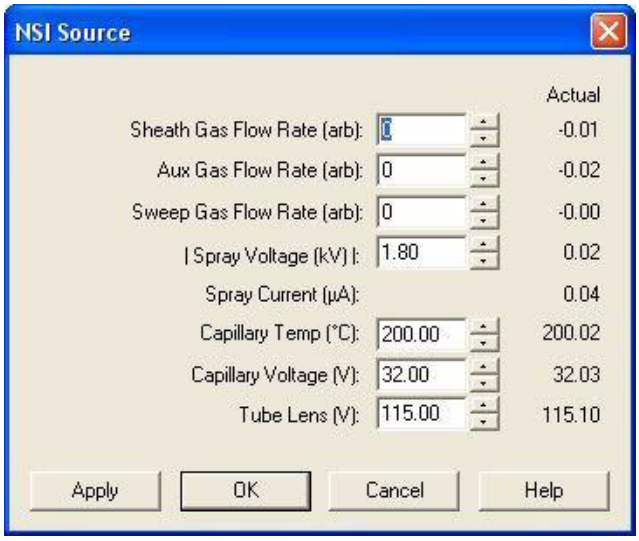
**Figure 30.** Thermo Tune Plus window




5. From the main menu, choose **Setup > NSI Source**.

   The NSI source dialog box opens.

**Figure 31.** NSI Source dialog box



6. Set the ion spray voltage for nanospray analysis. Pay attention to these nanospray-specific settings:

   - For online analysis:

     I Spray Voltage (kV): 1.40 to 2.40
     (Start with **1.80** kV.)

   - For offline analysis:

     I Spray Voltage (kV): 0.70 to 1.20
     (Start with **0.90** kV.)

7. Click **OK**.

**Note** Before you begin nanospray analysis, check that the drawer of the Nanospray Flex ion source is pushed completely toward the frame; otherwise, a message that the source is open appears and the MS will not scan.

The Nanospray Flex ion source is now be ready for analysis.

# Operation

Both for intial setup and regular maintenance, use these procedures to monitor the position of the emitter tip and the spray voltage/current for optimal performance.

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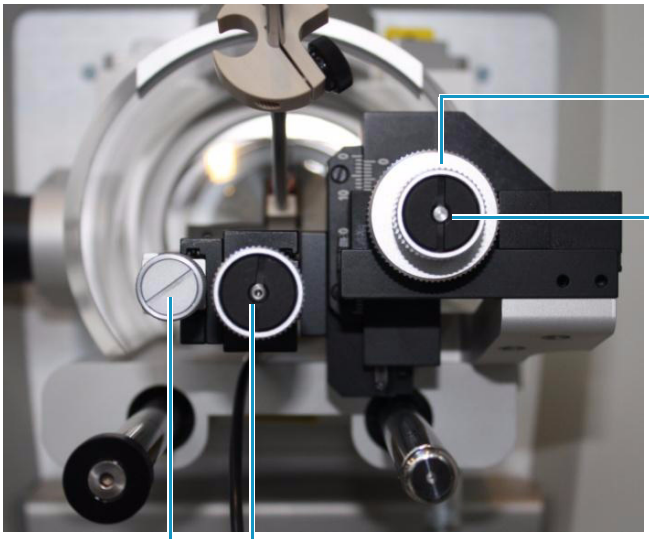
## Positioning the Emitter Tip

The correct position of the emitter tip is an important parameter in nano ES analysis.

❖ **To optimize the position of the emitter tip**

1. Position the spray capillary tip almost on-axis with the orifice by using the four knobs on the XYZ manipulator (see Figure 32).
2. As you make adjustments, observe the magnified inlet/orifice on the monitor.

**Figure 32.** Adjustment knobs on the XYZ manipulator



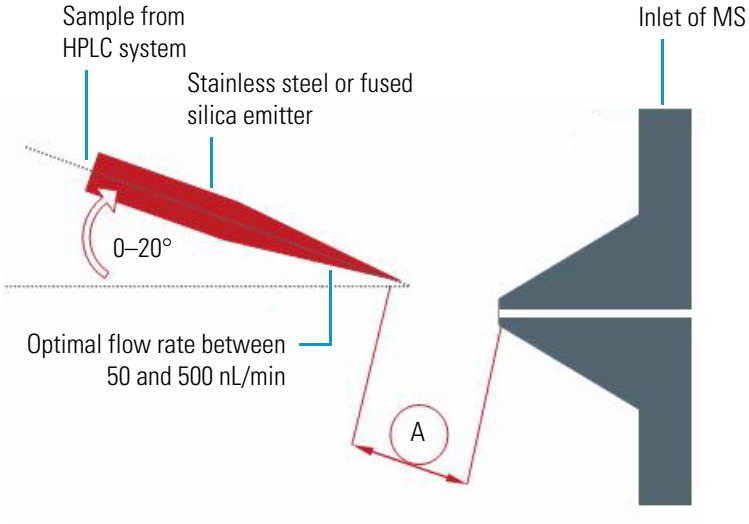

**CAUTION** Emitter tips are extremely sharp. Never touch the tips as this may cause injury.

**CAUTION**

- Although the ion source is shielded, there is easy access to the source head.
- Always turn off the high voltage before touching the source head. Do not leave the source unattended while the spray voltage is on.
- Always mount the high voltage insulator correctly before turning on the high voltage.
- The interface region of the mass spectrometer can be hot. Do not touch this area.

Figure 33 illustrates some important settings whose values can vary depending on the mass spectrometer in use. Also, the optimal distance between the emitter tip and orifice depends on the flow rate, as does the optimal potential on the emitter.

**Figure 33.** Schematic setup of the ion source and the mass spectrometer interface




Values for stainless steel or fused silica emitters:
A = 3 to 5 mm and the potential on the emitter, 1400 to 2400 V

# Maintaining Stable Spray

For best results, use stainless steel emitters for nano electrospray experiments. These emitters ensure straightforward initiation of the spray and help to maintain spray stability over extended periods (up to 1000 hours).

Unstable spray is detrimental to most analyses. Table 1 lists the most common reasons for unstable spray and ways to correct it.

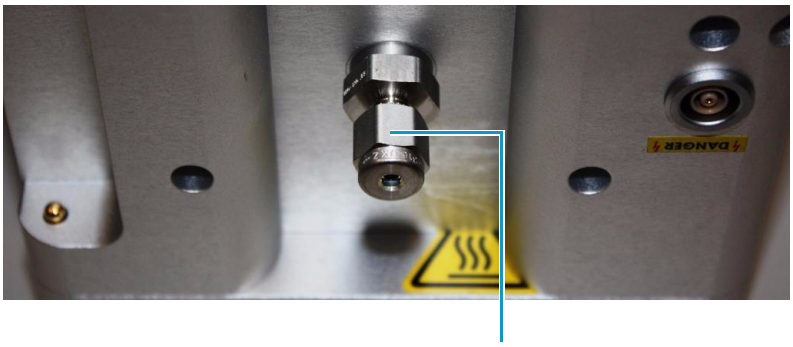
**Table 1.** Correcting unstable electrospray

| Cause | Possible correction |
|---|---|
| The HV contact is interrupted. | Check/clean the gold contact in the HV clamp where the emitter is held in the DirectJunction adaptor. Check the red cable and connectors. Check if the mass spectrometer is supplying the correct high voltage. |
| Air bubbles in the emitter (if glass) might cause the emitter to “spit.” | Check if the solvents are degassed properly. |
| The emitter is blocked because of particulates in the sample, other small particles from the flow lines/valves, and so on. | (Stainless steel emitter only) If sonicating the emitter does not remove the blockage, replace the emitter. |
| There is a leak at some point in the liquid path. | Check if the correct flow is being delivered. |

# Using the Optional Gas Connection

The drawer of the Nanospray Flex ion source is equipped with a gas connector, a Swagelok™ fitting for tubing with 1/8" (OD).

**Figure 34.**




Swagelok 1/8” gas connector, option for drying- or curtain gas.

In research analyses, use this optional gas connection for drying gas when you want to work in a controlled environment around the spray area.

# Accessories and Spare Parts

This appendix provides ordering information for the Nano ES Spray Kit for offline analysis, and spare parts and accessories for the Thermo Nanospray Flex ion source.

For detailed descriptions and ordering information on the full range of spare parts and accessories for the Nanospray Flex ion source, visit www.proxeon.com.

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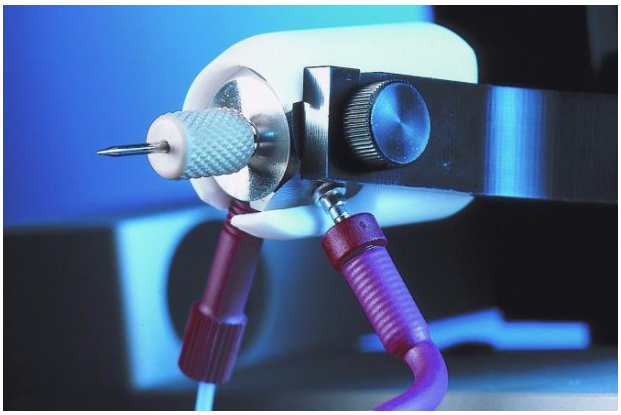
## Nano ES Spray Kit for Offline Analysis

Through offline analysis, you can extract the maximum amount of information from very limited amounts of sample. You can also average data extensively to improve the S/N-ratio and conditions optimized for MS/MS experiments. Using the Nano ES Spray Kit (see Figure 35), you can do the following:

- Work at low flow rates of 10–40 nL/min.
- Utilize nearly 100 percent of sample.
- Work effectively with sample volumes down to 300 nL.
- Avoid cross contamination by using disposable emitters.
- Spray from purely aqueous as well as purely organic solvents.

The Nano ES Spray Kit includes all necessary items for offline analysis. The kit is not included with the Nanospray Flex ion source but can be ordered separately.

**Figure 35.** ES259 offline Nano ES Spray Kit



# Accessories List

This section lists the part numbers for the followingNanospray Flex ion source accessories:

DirectJunction . . . . . ES256
LiquidJunction with Cross 1/32 in. . . . . ES257
LiquidJunction with Tee 1/32 in. . . . . ES258
Off-line source head kit . . . . . ES259
One Dino-Lite video camera . . . . . ES216
One LCD Monitor 8 in. . . . . ES217

# Limited Warranty

- Thermo Fisher Scientific limits the warranty on repair of supplied Nano ES equipment and replacement, provided that instrument operation has been in accordance with the instructions outlined in the instruction manual.
- Abuse or misuse of the Nano ES equipment, or unauthorized repairs void this warranty.
- Limited warranty work is performed only at the factory, and the user bears the cost of shipment to and from the factory.
- The limited warranty is as stated above and no implied or inferred liability for direct or consequential damage is intended.

# Additional Support

For further assistance, go to www.proxeon.com and click **Support and Service** in the left margin of the window.

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