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<td>EASY-Spray with the new controller PCB and extra cover plate</td>
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</tr>
<tr>
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<td></td>
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<td>Controller PCB (P/N ES233)</td>
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Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in the next section or sections by product name.

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.

Regulatory compliance results for the following Thermo Scientific products:
- EASY-Spray Ion Source (April 2012)
- EASY-Spray NG Ion Source (May 2013)

**EASY-Spray Ion Source (April 2012)**

**EMC Directive 2004/108/EC**

Intertek Semko AB has evaluated EMC compliance to standard EN61326-1:2006.

**Low Voltage Safety Compliance**


**EASY-Spray NG Ion Source (May 2013)**

**EMC Directive 2004/108/EC**

Intertek Semko AB has evaluated EMC compliance to standard EN61326-1:2006.

**Low Voltage Safety Compliance**

This device complies with Low Voltage Directive 2006/95/EC and harmonized standard EN 61010-1:2010.
FCC Compliance Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRERED OPERATION.

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.

Notice on the Proper Use of Thermo Scientific Instruments

In compliance with international regulations: This instrument must be used in the manner specified by Thermo Fisher Scientific to ensure protections provided by the instrument are not impaired. Deviations from specified instructions on the proper use of the instrument include changes to the system and part replacement. Accordingly, order replacement parts from Thermo Fisher Scientific or one of its authorized representatives.

Notice on the Susceptibility to Electromagnetic Transmissions

Your instrument is designed to work in a controlled electromagnetic environment. Do not use radio frequency transmitters, such as mobile phones, in close proximity to the instrument.

For manufacturing location, see the label on the instrument.
WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:

Thermo Fisher Scientific has contracted with one or more recycling or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. See www.thermoscientific.com/rohsweee for further information on Thermo Fisher Scientific’s compliance with these Directives and the recyclers in your country.

WEEE Konformität

Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96/EC erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet:

Conformité DEEE

Ce produit doit être conforme à la directive européenne (2002/96/EC) des Déchets d’Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant:

Preface

The *EASY-Spray Series Ion Source User Guide* describes the hardware components, and provides installation and configuration procedures for the Thermo Scientific™ EASY-Spray™ Series ion sources.

**Contents**

- Compatible Mass Spectrometers
- Product Requirements
- Contents of the EASY-Spray Series Ion Source Kits
- Safety and Special Notices
- Contacting Us

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Thank you in advance for your help.
Compatible Mass Spectrometers

Use the EASY-Spray Series ion source with the appropriate Thermo Scientific mass spectrometers (MSs) listed in Table 1 for nanoelectrospray (commonly referred to as nanoES or nanospray) analysis.

Table 1. Ion sources and compatible mass spectrometers

<table>
<thead>
<tr>
<th>Ion source model</th>
<th>Thermo Scientific mass spectrometer</th>
</tr>
</thead>
</table>
| EASY-Spray NG     | • Orbitrap Fusion™ (separate from the Orbitrap™ Series)  
                    • TSQ Endura™ and TSQ Quantiva™ |
| EASY-Spray       | • Exactive™ and Q Exactive™  
                    • Orbitrap Series  
                    • LTQ™ Series  
                    • TSQ Quantum Ultra™  
                    • LCQ™ Deca XP Max |

For information about your specific mass spectrometer, refer to the instrument manuals.

Product Requirements

Table 2 lists the environmental requirements for the EASY-Spray Series ion source. However, the requirements for the mass spectrometer supersede these requirements. Refer to the “Operating Environment” chapter in the preinstallation requirements guide for your Thermo Scientific mass spectrometer.

**CAUTION** The EASY-Spray Series source must connect to a certified Thermo Scientific mass spectrometer, which supplies high voltage capable of delivering a maximum of 8 kV and 100 μA.

If you connect the EASY-Spray Series source to another type of mass spectrometer, you might impair the protection provided by the equipment.

Table 2. EASY-Spray Series ion source environmental requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altitude</td>
<td>Up to 2000 m (6562 ft)</td>
</tr>
<tr>
<td>Humidity</td>
<td>Maximum relative humidity of 80% for temperatures up to 31 °C (88 °F), decreasing linearly to 50% relative humidity at 40 °C (104 °F)</td>
</tr>
<tr>
<td>Operating environment</td>
<td>Pollution degree 2 (indoor environment; normally only nonconductive pollution)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Ambient temperature: 15–27 °C (59–81 °F)</td>
</tr>
</tbody>
</table>
## Contents of the EASY-Spray Series Ion Source Kits

Table 3 lists the parts supplied in the EASY-Spray NG Ion Source Kit (P/N ES082) and the EASY-Spray Ion Source Kit (P/N ES081), which are identical except for the source housing. For a list of replaceable parts, see Chapter 8, “Replaceable Parts.”

### Table 3. Contents of the EASY-Spray Series ion source kits (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
<th>Quantity</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>EASY-Spray NG housing</td>
<td>1</td>
<td>—a</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>EASY-Spray housing</td>
<td>1</td>
<td>—b</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>EASY-Spray column, 15 cm × 3 μm ID</td>
<td>1</td>
<td>ES800</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>Controller power supply assembly:</td>
<td>1</td>
<td>ES231</td>
</tr>
<tr>
<td></td>
<td>• Power supply unit, 24 Vdc output (shown without the input plug)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Power adapter cable (not shown)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td>Dino-Lite™ digital video camera and power supply unit (not shown)</td>
<td>1</td>
<td>ES216</td>
</tr>
<tr>
<td><img src="image6.png" alt="Image" /></td>
<td>Monitor, power supply unit, and BNC adapter (not shown)</td>
<td>1</td>
<td>ES217</td>
</tr>
</tbody>
</table>
### Table 3. Contents of the EASY-Spray Series ion source kits (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
<th>Quantity</th>
<th>Part number</th>
</tr>
</thead>
</table>
| ![Tool](image1.png) | Tools:  
  - Emitter positioning tool  
  - 3 mm hex key | 1 set    | ES232       |
| ![Tool](image2.png) | 1.5 mm hex key                                                                 | 1        | —           |
| ![Tool](image3.png) | A/B mixing/venting tee, stainless steel, with three attached ferrules and nuts | 1 set    | SC901       |
| ![Tool](image4.png) | Tee holder (for the mixing/venting tee)                                       | 1        | ES234       |
| ![Tool](image5.png) | Sleeves, PEEK™, 1/16 in. OD                                                  | 3        | IDEX™, F-233 |
| ![Tool](image6.png) | Wash cap (for the EASY-Spray column)                                          | 1        | ES235       |

*a To order just the EASY-Spray NG source housing, you must order the EASY-Spray NG Ion Source Kit (P/N ES082).

*b To order just the EASY-Spray source housing, you must order the EASY-Spray Ion Source Kit (P/N ES081).
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.

Table 4 lists additional caution-specific symbols that appear in the *EASY-Spray Series Ion Source User Guide*.

**Table 4.** Caution-specific symbols and their meanings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Chemical hazard" /></td>
<td><strong>Chemical hazard:</strong> Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument.</td>
</tr>
<tr>
<td><img src="image" alt="Hot surface" /></td>
<td><strong>Hot surface:</strong> Before touching, allow any heated components to cool.</td>
</tr>
<tr>
<td><img src="image" alt="Risk of electric shock" /></td>
<td><strong>Risk of electric shock:</strong> This instrument uses voltages that can cause electric shock. Before servicing, shut down the instrument and disconnect it from line power.</td>
</tr>
<tr>
<td><img src="image" alt="Risk of eye injury" /></td>
<td><strong>Risk of eye injury:</strong> Eye injury could occur from splattered chemicals or airborne particles. Wear safety glasses when handling chemicals or servicing the instrument.</td>
</tr>
<tr>
<td><img src="image" alt="Trip obstacle" /></td>
<td><strong>Trip obstacle:</strong> Be aware of cords or other objects located on the floor.</td>
</tr>
</tbody>
</table>
Contacting Us

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

❖ 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 order consumable and spare parts

Go to www.proxeon.com/easyspray. For part numbers, see page 51.

❖ To contact Technical Support

Phone 800-532-4752
Fax 561-688-8736
E-mail (North and South America) us.techsupport.analyze@thermofisher.com
(North and South America) eu.techsupport.cmf@thermofisher.com
Web site www.proxeon.com
Address Thermo Fisher Scientific
Edisonvej 4
DK-5000 Odense C

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

❖ To find local contact information for sales or service

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

Use the list on the following pages.

Note The country code is enclosed in square brackets [ ]. The city code or area code
is enclosed in parenthesis ( ).

• For countries other than the U.S., when you dial from within the specified
country, dial the 0 of the city code.
• For countries other than Italy, when you dial from outside the country, do not
dial the 0 of the city code.
Europe—continued

Sweden, Norway, and Finland
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Fax .......................... [46] (0) 855 64 68 08

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Fax .......................... [41] (617) 16 77 20

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Phone ....................... [44] (0) 870 241 1034
Fax .......................... [44] (0) 144 223 3667

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Phone ....................... [61] 39757 4300
Fax .......................... [61] 9763 1169

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C-2F
3-9 Moriya-cho, Kanagawa-ku
Yokohama 221-0022
E-mail: analyze.jp@thermofisher.com
Phone ....................... [81] (45) 453 9100
Fax .......................... [81] (45) 453 9110

P.R. China
7th Floor, 7F Tower West, Younghe Plaza
No. 28, Andingmen East Street
Beijing 100007
E-mail: analyze.cn@thermofisher.com
Phone (free lines) ....800 810 5118
.......................... 400 650 5118
Fax .......................... [86] 108 837 0548
Introduction

The EASY-Spray Series ion source, shown in Figure 1, maintains excellent spray stability to ensure efficient evaporation and ionization of the liquid samples—the key to achieving the highest sensitivity at nano-flow rates.

Key benefits of the EASY-Spray Series are as follows:

- Simple, reliable, and robust design
- Effortless nano liquid chromatography (nanoLC)/MS integration
- Better separation with zero dead volume (ZDV) connections
- Increased productivity with the temperature-controlled EASY-Spray column™

Contents

- Advantages of Nanoelectrospray
- Functional Description
Advantages of Nanoelectrospray

The use of electrospray ionization (ESI) has evolved as a leading technique for generating intact, gas-phase ions from thermally labile, polar analytes in solution. In this technique, an emitter (a capillary tube or needle) induces ionization at a controlled distance from a counter electrode. Direct current (dc) voltage is applied, either to the needle or to the solvent, to produce a strong electrical field at the emitter tip. The electric field excites the ions in the solution as they leave the emitter tip. This interaction results in electrohydrodynamic disintegration of the fluid, generation of droplets, and formation of an aerosol jet.

Conventional ESI employs flow rates from 1 μL/min to 1 mL/min. Expediting desolvation and droplet shrinkage often requires a drying gas, thermal heating, or both, due to the high volume of liquid that exits the emitter. Nanospray ionization (NSI), also known as nanoelectrospray ionization (nanoESI or NSI), is a form of ESI that employs low rates of 10–1000 nL/min. NSI (or nanoESI) generally does not require a drying gas or thermal heating. Compared with ESI, NSI tolerates a wider range of liquid compositions including pure water.
As you lower the flow rate, a lower volume of mobile phase passes through the emitter, producing smaller aerosol droplets. This makes NSI more effective than conventional ESI at concentrating the analyte at the emitter tip, producing significant increases in sensitivity demonstrated by the signal response of the mass spectrometer.

Note: The mass spectrometer’s instrument control application uses the terms nanospray and NSI.

Functional Description

This section describes the following principal components of the EASY-Spray Series source and their functions:

- Source Housing
- Controller PCB
- Controller Power Supply

Source Housing

The EASY-Spray Series source housing (Figure 2 and Figure 3) arrives assembled and is easy to install on the appropriate mass spectrometer (see Table 1 on page xii). The source housing includes two locking levers, two observation windows, a position-adjustable column holder, and a controller printed circuit board (PCB). For installation instructions, see “Installing the Ion Source onto the Mass Spectrometer” on page 8.

Figure 2. EASY-Spray NG source housing (P/N ES082)
Using the top and front observation windows, you can view the tip of the emitter positioning tool while you move it into position. To enhance your view of the tool and then later of the emitter, connect the digital video camera and LCD monitor. For instructions, see Chapter 3, “Connecting the LCD Monitor and Video Camera.”

The column holder is mounted onto the front observation window and includes a position control knob. Use the control knob to align the $z$ axis (front-to-back) of the emitter positioning tool (Figure 14 on page 14) with the mass spectrometer’s ion transfer tube. To align the tool’s $x$-axis (side-to-side) and $y$-axis position (up-and-down), use the controls that are built into the EASY-Spray Series housing. For instructions, see “Adjusting the Emitter Tip Position” on page 14.
Controller PCB

The EASY-Spray Series source contains a controller PCB that powers and controls the heat generated for the connected EASY-Spray column. The controller PCB includes an input power socket, an output heater socket, a temperature control dial, and an actual temperature display. The bottom panel for the EASY-Spray NG source (Figure 4) is slightly different from that of the EASY-Spray source.

**Figure 4.** Controller PCB located on the bottom of the source (P/N ES082)

The controller power supply unit connects to the input power socket, which is located on the bottom, right side of the EASY-Spray Series source. The heater cable from the EASY-Spray column connects to the heater socket, which is located on the front and labeled “Heater.”

The temperature control dial has an OFF setting and temperature settings in 5 °C increments from 30 through 60 °C. As the column heats up, the actual temperature appears on the display.
Controller Power Supply

Figure 5 shows the controller power supply assembly that consists of a wall-mounted power supply unit with a detachable input plug and a power adapter cable. The other end of the power adapter cable connects to the input power socket located on the bottom of the EASY-Spray Series source (Figure 4 on page 5 and Figure 11 on page 12) to provide the 24 Vdc input for the controller PCB.

Figure 5. Controller power supply assembly (shown with a European input plug)

The total length of the output cord and power adapter cable is approximately 9 ft (274 cm). Make sure that an electrical wall outlet is within reach for the power supply unit and that you provide suitable clearance around it for cooling.
Installing the EASY-Spray Series Ion Source

Follow these procedures to install or remove the EASY-Spray Series ion source. The only tool required is the 3 mm hex key.

**Note** The complete EASY-Spray Series source installation, including the digital camera and LCD monitor, requires three electrical wall outlets. Ensure that your lab has the appropriate outlets near the nanoLC/MS system.

**Contents**
- Installing the Ion Source onto the Mass Spectrometer
- Connecting the Controller Power Supply
- Configuring the Venting Tee Holder
- Adjusting the Emitter Tip Position
- Removing the EASY-Spray Series Source
Installing the Ion Source onto the Mass Spectrometer

Before you install the EASY-Spray Series source, follow the procedure to prepare the mass spectrometer.

❖ To prepare the mass spectrometer

1. If installed, remove any other source from the mass spectrometer after it has cooled to room temperature.

   For instructions, refer to the mass spectrometer’s documentation.

   **CAUTION Hot surface.** Accidental contact with the part of the API probe or spray insert located inside the housing can severely burn you, as this area of the part can reach 350 °C (662 °F). In addition, although the exterior surface of the housing and the exposed part of the probe or spray insert fall below the limit of 70 °C (158 °F) for accessible metal surfaces, they too pose a burn hazard. Therefore, handle ALL heated parts with extreme caution.

   • Before removing the API probe, spray insert, or housing, allow the part to cool to room temperature (approximately 20 minutes) before you touch it.

   • If the mass spectrometer connects to an LC system, leave the solvent flow from the LC pump on while the probe or spray insert cools to room temperature.

2. If installed, remove the ion sweep cone (Figure 6) from the mass spectrometer by grasping the outer ridges of the ion sweep cone and pulling it off.

   The spray cone is directly behind the ion sweep cone (Figure 9 on page 10 or Figure 10 on page 11).
To install the source onto the mass spectrometer

1. Follow the procedure “To prepare the mass spectrometer” on page 8.

2. Depending on your source type, unlock the source’s locking levers as follows:
   - For the EASY-Spray NG source, rotate the locking levers until they are horizontal (Figure 7).

---

**Figure 6.** Examples of the mass spectrometer ion sweep cones

- Ion sweep cone for the Orbitrap Fusion mass spectrometer
- Ion sweep cone for the legacy mass spectrometers (shown is the offset orifice type for ESI, H-ESI, and APCI)

**Figure 7.** EASY-Spray NG locking lever positions (top view)

- Unlocked (horizontal) position
- Locked (vertical) position
2 Installing the EASY-Spray Series Ion Source
Installing the Ion Source onto the Mass Spectrometer

—or—

• For the EASY-Spray source, rotate the locking levers toward the front of the source (right lever in Figure 8).

**Figure 8.** EASY-Spray locking lever positions (top view)

3. Do one of the following:

• For the EASY-Spray NG source, align the three guide pins on the back of the source with the guide pin holes on the front of the mass spectrometer (Figure 9).

**Figure 9.** EASY-Spray NG source housing connection (ES082)
--or--

- For the EASY-Spray source, align the two guide pin holes on the back of the source with the guide pins on the front of the mass spectrometer (Figure 10).

**Note** Your legacy mass spectrometer might have a slightly different mount assembly, ion sweep cone, or both.

**Figure 10.** EASY-Spray source housing connection (ES081)

4. Carefully press the source onto the mass spectrometer.

5. Lock the source’s locking levers.

### Connecting the Controller Power Supply

**CAUTION** To avoid an electric shock, always use the detachable input plug that is appropriate for your country or territory and comes with the power supply unit.

**To connect the controller power supply unit**

1. Turn the temperature dial on the EASY-Spray Series source to the OFF position.

2. If not already connected, connect the detachable input plug and power adapter cable to the power supply unit (Figure 5 on page 6).

3. Plug the power supply unit into an electrical wall outlet.
4. Connect the power adapter cable to the input power socket located on the bottom, right side of the source (Figure 17 on page 16) as follows:

a. Align the red dot on the plug with the red dot on the socket, which is on the right side of the socket (Figure 11).

   **Figure 11.** Power connection for the controller PCB (bottom view)

   ![Red dot on the socket](image)
   ![Red dot on the plug](image)

b. Push the plug upward into the socket.

   **CAUTION** After completing the power supply connections, route the output cord so that it is not a trip hazard.

**Configuring the Venting Tee Holder**

**Tip** The EASY-Spray NG ion source (ES082) ships with the Tee holder attached to the column holder. If you have the EASY-Spray ion source (ES081), you can order the optional Tee holder to support the venting tee; see Chapter 8, “Replaceable Parts.”

Use this procedure to configure the (venting) Tee holder before inserting the emitter positioning tool or the EASY-Spray column.

Follow these procedures, as applicable:

- To install the optional Tee holder under the column holder
- To configure the Tee holder
To install the optional Tee holder under the column holder

1. Remove the screw located on the bottom of the column holder (Figure 12).

   **Figure 12.** Screw to remove before installing the Tee holder

2. Hold the Tee holder (Figure 13) under the column holder with one hand. With the other hand, insert and tighten the hex socket-head bolt through the bottom of the Tee holder and the column holder.

   The bolt is provided with the Tee holder.

   **Figure 13.** Tee holder in the shipping configuration

To configure the Tee holder

1. Bend the top part of the Tee holder down to the extended position (Figure 22 on page 28).

2. Move the sliding lock toward the column holder.

   **Note** If the ion source is not to be used for an extended period of time, unlock and position the Tee holder as shown in Figure 13.
Adjusting the Emitter Tip Position

Before installing the EASY-Spray column, use the emitter positioning tool (Figure 14) and 3 mm hex key to adjust the position of the column holder.

Figure 15 shows the emitter positioning tool touching the mass spectrometer’s ion transfer tube. The length of the tool’s tip ensures the 3 mm gap for the EASY-Spray column’s emitter.

Figure 14. Emitter positioning tool

Figure 15. Gap positions in front of the mass spectrometer’s ion transfer tube (side view)
To adjust the emitter tip position

**Tip** To enhance your view of the emitter positioning tool’s tip, install the video camera and monitor before you begin this procedure. For instructions, see Chapter 3, “Connecting the LCD Monitor and Video Camera.”

1. Retract the z-axis (front-to-back) position by turning the control knob located on the column holder counterclockwise (Figure 16).

2. Insert the emitter positioning tool into the top of the column holder, and then slowly slide it forward until it clicks into place.

3. Align the x-axis (side-to-side) position of the emitter positioning tool to the bore of the ion transfer tube by inserting the hex key into the left-side hex socket-head screw (Figure 16).

**Figure 16.** X- and z-axes position controls on the source (P/N ES081)
4. Align the $y$-axis (up-and-down) position of the emitter positioning tool to the bore of the ion transfer tube by inserting the hex key into the bottom hex socket-head screw (Figure 17).

**Figure 17.** $y$-axis position control (P/N ES082)

5. Adjust the $z$-axis (front-to-back) position of the emitter positioning tool’s tip by turning the control knob located on the front of the column holder (Figure 16 on page 15). Move the tool’s tip so that it gently touches the bore of the ion transfer tube.

**IMPORTANT** The fused-silica emitter is fragile. Make sure that the emitter positioning tool gently touches the ion transfer tube when you adjust its position or you will damage the actual emitter when fully inserted, requiring you to replace the EASY-Spray column.

6. After you adjust the tool tip’s position, slowly remove the emitter positioning tool.

The position of the column holder is now calibrated for use with any EASY-Spray column. You must repeat this procedure if you later change the $x$, $y$, or $z$-axis position.
Removing the EASY-Spray Series Source

Follow this procedure if you must remove the EASY-Spray Series ion source from the mass spectrometer.

❖ To remove the source from the mass spectrometer

1. In the applicable instrument control software, place the mass spectrometer in **Standby** mode.

   For instructions, refer to the mass spectrometer’s documentation.

2. Turn the source’s temperature dial to the **OFF** position.

   **CAUTION Hot surface.** The maximum safety limit for heated surfaces is 70 °C (158 °F). Although the surface temperature of the EASY-Spray Series ion source falls below this maximum, it can still severely burn you, reaching approximately 50 °C (122 °F) with the heater unit turned on. Allow the source to cool to room temperature (approximately 20 minutes) before you touch it.

3. Turn off the LC instrument.

4. Disconnect the LC plumbing from the EASY-Spray column, and then remove the EASY-Spray column.

   **Tip** Do not pull on the cable from the EASY-Spray column. Use the plug to disconnect the column from the heater socket.

5. If the Tee holder is installed, move the sliding lock away from the column holder, and then bend the unattached end upward (**Figure 13 on page 13**).

6. Remove the camera as follows:
   a. Unplug the camera power supply unit from the electrical wall outlet.
   b. Disconnect the camera’s yellow video connector from the back of the monitor and the black power connector from the camera power supply unit.
   c. Using the 1.5 mm hex key, loosen the hex socket-head screw securing the camera, and then remove the camera.

7. Unplug the controller power supply unit from the electrical wall outlet, and then disconnect the output cable from the source.

8. Unlock the source’s locking levers (**Figure 7 on page 9** and **Figure 8 on page 10**).

9. Grasp the source housing with both hands and slowly pull it away from the mass spectrometer.

After you remove the EASY-Spray Series ion source from the mass spectrometer, place it in its original shipping box. The EASY-Spray Series source does not require cleaning.
Connecting the LCD Monitor and Video Camera

Follow these procedures to connect the LCD monitor and digital video camera, and to adjust the video picture. The only tool required is the 1.5 mm hex key.

Contents

- Connecting the Monitor and Camera
- Adjusting the Video Picture

Connecting the Monitor and Camera

To enhance your view of the emitter tip, install the provided LCD monitor and digital video camera (see Table 3 on page xiii).

To connect the monitor and camera

1. Follow the procedure “To install the source onto the mass spectrometer” on page 9.
2. Plug the two power supply units into electrical wall outlets.
3. Install the camera as follows:
   a. Insert the camera into the opening above the top observation window with the focusing wheel facing toward you (Figure 18).
   b. Using the 1.5 mm hex key, tighten the hex socket-head screw on the left side of the top observation window (Figure 16 on page 15) until it touches the camera—do not overtighten the screw.
   c. Connect the camera’s black power connector to its power supply unit.
4. On the back of the monitor, make the following connections:
   - BNC adapter to one of the Video IN ports
   - Camera’s yellow video connector to the BNC adapter
   - Output cord from the other power supply unit to the DC 12V IN socket

**CAUTION** After completing the power supply connections, route the output cords so that they are not a trip hazard.

5. Place the monitor on top of the mass spectrometer near the source by using its support arm.

   Make sure that the monitor is not too close to the edge of the instrument.
Adjusting the Video Picture

Use this procedure to focus the picture from the video camera. For additional information, refer to the manuals for the monitor and camera.

To adjust the video picture

1. Follow the procedure “To connect the monitor and camera” on page 19.
2. Turn on the monitor by pressing its POWER button.
   The picture appears after a few seconds and is probably blurred. If there is no picture, press the monitor’s SOURCE button to change to the other video input channel.
3. If the picture is too dark, press the light button at the top of the camera (Figure 18 on page 20).
4. Adjust the picture by using the camera’s focusing wheel (Figure 18 on page 20).
Connecting the LC to the EASY-Spray Column

Follow these procedures to connect the plumbing from the Thermo Scientific LC instrument to the EASY-Spray column.

Tools and Supplies

Table 5 lists the required tools and supplies for configuring the LC plumbing and EASY-Spray column connections. Not all parts are required.

Note  The kit for the EASY-Spray Series ion source supplies the venting tee, fittings, and sleeves only. You are responsible for supplying the remaining parts and tools.

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>A/B mixing/venting tee, stainless steel, with three attached ferrules and nuts</td>
<td>SC901</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Sleeves, PEEK, 1/16 in. OD</td>
<td>IDEX, F-233</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>Wrench, open end, 1/4 in.</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 5. Tools and supplies (Sheet 1 of 2)
### Connecting the LC to the EASY-Spray Column

#### Tools and Supplies

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
</table>
| —     | Gloves, lint-free and powder-free | Fisher Scientific:  
  • 19-120-2947A (small)  
  • 19-120-2947B (medium)  
  • 19-120-2947C (large)  
  • 19-120-2947D (X-large)  
  Thermo Scientific:  
  • 23827-0008 (medium)  
  • 23827-0009 (large) |

#### Two-column setup

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
</table>
| ![Any nanoViper™-equipped precolumn](image) | Any nanoViper™-equipped precolumn  
This image shows the Acclaim™ PepMap100 Nano-Trap. (For the PepMap100 Nano-Trap) Fisher Scientific, 164705 |
| ![Viper™ union](image) | Viper™ union  
(for use with the EASY-nLC 1000) | Thermo Scientific Dionex™, 6040.2304 |
| ![ZDV adapter union (1/16 to 1/32 in.) and plug (not shown) (for use with the EASY-nLC II)](image) | ZDV adapter union (1/16 to 1/32 in.) and plug (not shown) (for use with the EASY-nLC II) | IDEX, P-881 |
| —     | UltiMate™ 3000 RSLCnano EASY-Spray Application Kit | Thermo Scientific Dionex, 6720.0395 |
Installing the EASY-Spray Column for the First Time

The EASY-Spray column (Figure 19) contains an integrated heatable column and a fused-silica emitter. For available columns, see Chapter 8, “Replaceable Parts.”

| IMPORTANT | The EASY-Spray column assembly includes an emitter protective cover. If you push back this cover by hand, you could damage the fused-silica emitter and make the EASY-Spray column unusable. |

Figure 19. EASY-Spray column

- To install the EASY-Spray column
  1. If the Tee holder is attached to the column holder, follow the procedure “To configure the Tee holder” on page 13.
  2. Follow the procedure “To adjust the emitter tip position” on page 15.
  3. Remove the protective cap on the end of the EASY-Spray column (Figure 19).
  4. With the cable on the bottom, slowly push the tip of the EASY-Spray column into the column holder opening until it clicks into place.
  As the EASY-Spray column moves forward into the source, the protective cover over the emitter retracts to expose the emitter tip.
  5. Connect the cable to the front output heater socket.

| Note | You can skip this step after the first time if you have not adjusted the column holder’s position. |

| Note | Do not pull on the cable from the EASY-Spray column. Use the plug to connect and disconnect the column. |
6. Follow the appropriate procedure in “Connecting the LC to the EASY-Spray Column” on page 27.

7. Using the temperature control dial, set the temperature for the EASY-Spray column.

Table 6 lists the display readings that can appear on the actual temperature display.

### Table 6. Readings for the actual temperature display

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>EASY-Spray column is not connected.</td>
</tr>
<tr>
<td>xx.</td>
<td>Actual temperature while heating up</td>
</tr>
<tr>
<td>xx</td>
<td>Actual temperature, stabilized</td>
</tr>
<tr>
<td>BL</td>
<td>Disconnect and reconnect power to the source.</td>
</tr>
</tbody>
</table>

*a If the display does not change, you must replace the controller PCB. See “Replacing the Controller PCB” on page 45.

## Using the nanoViper Fitting

For some of the LC instruments, the plumbing connects to the EASY-Spray column through several nanoViper fittings, such as the one shown in Figure 20. Although these fittings can withstand ultra-high-performance LC (UHPLC) backpressures up to ~1034 bar (~15 000 psi), they are fingertight fittings, which require only very small torques to seal. Therefore, you must follow the procedure below to avoid damage by overtightening.

### Figure 20. nanoViper fitting

ENERGY SEALING SURFACE

1. Insert the nanoViper fitting into the target port and slowly rotate the screw clockwise until you feel resistance.

2. Using the black knurled fitting tool, tighten the screw clockwise to an angle of 0–45 degrees (1/8-turn).

3. Start operating the system at the desired working pressure and check the backpressure.
4. If the backpressure is too low, check the system for leaks. For instructions, refer to the documentation for the LC instrument.

5. If the backpressure continues to be too low, return the system to atmospheric pressure.

**IMPORTANT** To extend the lifetime of the nanoViper fittings, open and close the connections at only atmospheric system pressures. Opening and closing connections at high system pressures can reduce the lifetime of the fittings.

6. Tighten the screw by as much as an additional 45 degrees. Do not turn the screw beyond an angle of 90 degrees from where you felt the initial resistance.

**IMPORTANT** To prevent damage to the sealing surface of the nanoViper fitting, do not overtighten the fitting.

---

**Connecting the LC to the EASY-Spray Column**

This section describes how to connect the one or two plumbing lines from a nanoLC instrument to the EASY-Spray column in either a one- or two-column configuration. Table 5 on page 23 lists the required parts.

**Note** The EASY-nLC Series instruments identify the two solvent lines as “Column Out” and “Waste In.”

**CAUTION** Wear protective gloves and eye wear when handling the solvent lines.

Follow the appropriate procedure:

- Connecting an EASY-nLC 1000 Instrument to the EASY-Spray Column
- Connecting an EASY-nLC II Instrument to the EASY-Spray Column, on page 31
- Connecting an RSLCnano System to the EASY-Spray Column, on page 33

**Connecting an EASY-nLC 1000 Instrument to the EASY-Spray Column**

Follow the appropriate procedure for a one- or two-column setup. The two-column setup includes a precolumn connected in the column-out flow path to the venting tee.

**Note** Remove the nuts and ferrules from the venting tee.

- To plumb a one-column setup from an EASY-nLC 1000 instrument
- To plumb a two-column setup from an EASY-nLC 1000 instrument, on page 29
To plumb a one-column setup from an EASY-nLC 1000 instrument

1. On the Column Out line, insert the nanoViper fitting into the venting tee’s side port as shown in Figure 21, tighten the fitting by hand until you feel resistance, and then tighten the fitting again by an additional 1/8- to 1/4-turn. Do not tighten the fitting by more than a 1/4-turn.

   Figure 21. Recommended plumbing locations on the venting tee (nanoViper example)

   ![Diagram of plumbing locations](image)

   **CAUTION** Because the fittings seal against each other inside the union, do not tighten them by more than 1/4-turn (90 degrees). Overtightening the fittings can irreparably damage their sealing surfaces.

   For additional information about nanoViper fittings, see “Using the nanoViper Fitting” on page 26.

2. On the Waste In line, insert the fitting into the venting tee’s bottom port, tighten the fitting by hand until you feel resistance, and then tighten the fitting by an additional 1/8- to 1/4-turn. Do not tighten the fitting by more than a 1/4-turn.

3. Insert the hex key into the bolt that secures the (venting) Tee holder to the column holder, loosen the hex socket-head bolt, and then slowly move the Tee holder forward (Figure 22).

   Figure 22. Tee holder secured to the bottom of the column holder

   ![Diagram of Tee holder](image)
4. Connect the venting tee to the EASY-Spray column to complete the one-column setup (Figure 23).

**Figure 23.** Example of a one-column setup with nanoViper fittings

5. Adjust the Tee holder’s position so that it supports the nanoViper fitting, and then use the hex key to tighten the hex socket-head bolt on the bottom of the column holder.

**To plumb a two-column setup from an EASY-nLC 1000 instrument**

1. Assemble and connect the Column Out line as follows:
   a. Insert the nanoViper fitting on the Column Out line into the Viper union, tighten the fitting by hand until you feel resistance, and then tighten the fitting again by an additional 1/8- to 1/4-turn (45–90 degrees). Do not tighten the fitting by more than a 1/4-turn.
   b. Connect the other end of the union to the appropriate end of the nanoViper precolumn.
   c. Insert the fitting on the other end of the precolumn into the venting tee’s side port (Figure 21 on page 28), and then tighten as noted in step 1a.

**Note** See the Caution on page 28.

2. On the Waste In line, insert the fitting into the venting tee’s bottom port, tighten the fitting by hand until you feel resistance, and then tighten the fitting again by an additional 1/8- to 1/4-turn. Do not tighten the fitting by more than a 1/4-turn.

3. Insert the hex key into the bolt that secures the (venting) Tee holder to the column holder, loosen the hex socket-head bolt, and then slowly move the Tee holder forward (Figure 22 on page 28).
4. Connect the venting tee to the EASY-Spray column to complete the two-column setup (Figure 24).

**Figure 24.** Example of a two-column setup with nanoViper fittings and a Viper union

5. Adjust the Tee holder’s position so that it supports the nanoViper fitting, and then use the hex key to tighten the hex socket-head bolt on the bottom of the column holder.

**Tip** When you install the two-column assembly, clear the One Column Setup check box in the Maintenance menu (choose Maintenance > Devices, select the instrument, and then select the Properties tab). For instructions, refer to “Setting Up the Properties for the HPLC Device” in Chapter 4 of the *EASY-nLC Series Getting Started Guide*.

When the One Column Setup check box is clear (not selected), valve W on the EASY-nLC 1000 moves to position 1–6 during the sample loading step. Excess solvent A exits the venting tee and passes through valve W to the waste beaker.
Connecting an EASY-nLC II Instrument to the EASY-Spray Column

Follow the appropriate procedure for a one- or two-column setup. The two-column setup includes a precolumn connected in the column-out flow path to the venting tee.

**Note** Remove the nuts and ferrules from the venting tee.

- To plumb a one-column setup from an EASY-nLC II instrument
- To plumb a two-column setup from an EASY-nLC II instrument

**To plumb a one-column setup from an EASY-nLC II instrument**

1. Attach the nuts and ferrules to the Column Out and Waste In lines as follows:
   a. Insert one of the lines into a sleeve, and then slowly push it forward until the line is parallel with the end of the sleeve.
   b. Slide the nut and then the ferrule onto the sleeved line until the sleeve extends past the ferrule (Figure 25).
   c. Repeat step 1a and step 1b with the second line.

   ![Figure 25. LC line with sleeve, ferrule, and nut](image)

2. On the Column Out line, insert the fittings into the venting tee’s side port (Figure 21 on page 28), tighten the nut by hand until you feel resistance, and then use the 1/4 in. wrench to tighten the nut until firmly secured—do not overtighten.

3. On the Waste In line, insert the fittings into the venting tee’s bottom port, tighten the nut by hand until you feel resistance, and then use the 1/4 in. wrench to tighten the nut until firmly secured—do not overtighten.

4. Insert the hex key into the bolt that secures the (venting) Tee holder to the column holder, loosen the hex socket-head bolt, and then slowly move the Tee holder forward (Figure 22 on page 28).

5. Connect the venting tee to the EASY-Spray column to complete the one-column setup.

6. Adjust the Tee holder’s position so that it supports the nanoViper fitting, and then use the hex key to tighten the hex socket-head bolt on the bottom of the column holder.

**Figure 23 on page 29** shows an example of a one-column setup for the EASY-nLC 1000 instrument, which uses nanoViper fittings.
To plumb a two-column setup from an EASY-nLC II instrument

1. Assemble and connect the Column Out line as follows:
   a. Remove the smaller fitting from the ZDV adapter union, insert the Column Out line into the fitting, and then slowly push the line forward until it extends past the fitting (Figure 26).

   Figure 26. Column Out line with smaller fitting from the ZDV adapter union

   b. With the plug inserted into the ZDV adapter union’s larger end, insert the Column Out line into the union’s smaller end, and then tighten the smaller fitting until you feel resistance.

   c. Remove the plug from the adapter union, and then connect the adapter union’s larger end to the appropriate end of the nanoViper precolumn.

   d. Insert the fitting at the other end of the precolumn into the venting tee’s side port (Figure 21 on page 28), and then tighten the fitting by an additional 1/8- to 1/4-turn (45–90 degrees). Do not tighten the fitting by more than a 1/4-turn.

   Note  Follow the recommended flow direction stated on the precolumn label.

   CAUTION  Because the fittings seal against each other inside the union, do not tighten them by more than 1/4-turn (90 degrees). Overtightening the fittings can irreparably damage their sealing surfaces.

   For additional information about nanoViper fittings, see “Using the nanoViper Fitting” on page 26.

2. Assemble and connect the Waste In line as follows:
   a. Attach a nut and ferrule to the Waste In line. See step 1a and step 1b in “To plumb a one-column setup from an EASY-nLC II instrument” on page 31.

   b. Insert the nut and ferrule fittings into the venting tee’s bottom port, tighten the nut by hand until you feel resistance, and then use the 1/4 in. wrench to tighten the nut until firmly secured—do not overtighten.

3. Insert the hex key into the bolt that secures the (venting) Tee holder to the column holder, loosen the hex socket-head bolt, and then slowly move the Tee holder forward (Figure 22 on page 28).
4. Connect the venting tee to the EASY-Spray column to complete the two-column setup (Figure 27).

**Figure 27.** Example of a two-column setup for the EASY-nLC II

5. Adjust the Tee holder’s position so that it supports the nanoViper fitting, and then use the hex key to tighten the hex socket-head bolt on the bottom of the column holder.

**Connecting an RSLCnano System to the EASY-Spray Column**

Follow the appropriate procedure for a one- or two-column setup for an RSLCnano system. The two-column setup includes a precolumn connected across the autosampler valve.

**Note** To connect the RSLCnano system to the EASY-Spray column, you must use the Thermo Scientific Dionex UltiMate 3000 RSLCnano EASY-Spray Application Kit (P/N 6720.0395).

- To plumb a one-column setup from an RSLCnano instrument
- To plumb a two-column setup from an RSLCnano instrument, on page 35
To plumb a one-column setup from an RSLCnano instrument

1. Insert the nanoViper fitting on the 20 μm ID nanoViper capillary into port 5 of the autosampler valve (Figure 28).

2. Insert the fitting on the other end of the capillary into the Viper union, tighten the fitting by hand until you feel resistance, and then tighten the fitting again by an additional 1/8- to 1/4-turn (45–90 degrees). Do not tighten the fitting by more than a 1/4-turn.

CAUTION Because the fittings seal against each other inside the union, do not tighten them by more than 1/4-turn (90 degrees). Overtightening the fittings can irreparably damage their sealing surfaces.

For additional information about nanoViper fittings, see “Using the nanoViper Fitting” on page 26.

3. Connect the union to the EASY-Spray column to complete the one-column setup (Figure 28).

Figure 28. Example of a one-column setup for an RSLCnano system (direct injection)
To plumb a two-column setup from an RSLCnano instrument

1. Connect the precolumn to ports 2 and 5 on one of the switching valves (Figure 29).

2. Insert the nanoViper fitting on the 20 μm ID nanoViper capillary into port 4 on the same switching valve.

3. Insert the fitting on the other end of the capillary into the Viper union, tighten the fitting by hand until you feel resistance, and then tighten the fitting again by an additional 1/8- to 1/4-turn (45–90 degrees). Do not tighten the fitting by more than a 1/4-turn.

Note See the Caution on page 34.

4. Connect the union to the EASY-Spray column to complete the two-column setup (Figure 29).

Figure 29. Example of a two-column setup for an RSLCnano system (preconcentration)
Configuring the Mass Spectrometer for NSI Mode

Follow the applicable procedures to configure the Thermo Scientific mass spectrometer for nanoelectrospray ionization (nanoESI or NSI) mode.

Contents
• Configuring the EASY-Spray NG Source’s NSI Parameters
• Configuring the EASY-Spray Source’s NSI Parameters
• Selecting the Source for the LCQ Deca XP Max Mass Spectrometer

Configuring the EASY-Spray NG Source’s NSI Parameters

After you complete the instrument configuration, use the Tune application to configure the NSI source parameters. For additional information, refer to the Tune Help.

❖ To set the NSI source parameters

1. On the Microsoft™ Windows™ taskbar, choose Start > All Programs > Thermo Instruments > Thermo model > model Tune, where model is your specific mass spectrometer, to open the Tune window.

2. Click Ion Source, and then click the Ion Source tab to view the Ion Source page (Figure 30).

The mass spectrometer automatically detects and enters the source type (NSI) in the Ion Source Type box.
Configuring the Mass Spectrometer for NSI Mode

Configuring the EASY-Spray Source’s NSI Parameters

Figure 30. Ion Source page in the Tune window for the Orbitrap Fusion (example)

3. In the Pos Ion Spray Voltage (V) box, enter 1900. Use 1900 V as the start value for the spray voltage. If the intensity of the full-scan spectrum is low, gradually increase the spray voltage to improve the spectrum. The recommended range for the spray voltage is 1400–2400 kV.

4. In the Sweep Gas (Arb) box, enter 0.

5. Click Apply.

Configuring the EASY-Spray Source’s NSI Parameters

After you complete the instrument configuration, use the Tune Plus application to configure the NSI source parameters. For additional information, refer to the Tune Plus Help.

❖ To set the NSI source parameters

1. Do one of the following to open the Tune Plus window (Figure 31):
   • On the Windows taskbar, choose Start > All Programs > Thermo Instruments > model > model Tune, where model is your specific mass spectrometer.
   • In the Thermo Xcalibur™ application, click the Roadmap View icon, the Instrument Setup icon, the model MS icon, and then Tune Plus.
5 Configuring the Mass Spectrometer for NSI Mode

Configuring the EASY-Spray Source’s NSI Parameters

—or—

- In the Xcalibur application, click the Roadmap View icon, the Instrument Setup icon, and the model MS icon. Then, from the main toolbar choose model > Start Tune Plus.

**Figure 31.** Tune Plus window for an NSI-configured Velos Pro (example)

2. Click the NSI Source icon (or choose Setup > NSI Source) to open the NSI Source dialog box (Figure 32).

**Figure 32.** NSI Source dialog box

3. In the Spray Voltage (kV) box, enter 1.90.

Use 1.90 kV as the start value for the spray voltage. If the intensity of the full-scan spectrum is low, gradually increase the spray voltage to improve the spectrum. The recommended range for the spray voltage is 1.40–2.40 kV.

4. Click OK.
Selecting the Source for the LCQ Deca XP Max Mass Spectrometer

Note: This section is for the LCQ Deca XP Max mass spectrometer, which uses the Xcalibur data system version 2.0.7 or earlier.

After you install the EASY-Spray source, use the Instrument Configuration window to configure the mass spectrometer for NSI mode.

❖ To configure the mass spectrometer for NSI mode

1. If open, close the Xcalibur data system and Tune Plus application.

2. On the Windows taskbar, choose Start > All Programs > Xcalibur > Instrument Configuration to open the Instrument Configuration window.

3. Select the devices to control from the Xcalibur data system if not already selected:
   a. In the Device Types list, select All.
   b. Under Available Devices, double-click the icons for the mass spectrometer and nanoelectrospray LC instrument to add them to the Configured Devices list.

4. Double-click the mass spectrometer icon to open the Model Configuration dialog box.

5. In the left pane, select Ion Source to display the ion source configuration page, and then select Nanospray in the Default Source list.

6. Click OK, and then click OK again to close the message box.

7. Configure the LC device if you have not done so.
   For instructions, refer to the LC instrument documentation.

8. In the Instrument Configuration window, click Done.

9. Restart the data system computer and the mass spectrometer.
Maintenance

This chapter provides maintenance guidelines, a list of required tools and supplies, and instructions for replacing the controller PCB in the EASY-Spray Series source.

Guidelines

For optimal results, follow these guidelines when performing the procedure in this chapter:

- Take precautions against electrostatic discharge (ESD), especially when the lab environment is at the lower end of the relative humidity specification (see page xii). For additional guidelines, refer to the “Operating Environment” chapter in the preinstallation requirements guide for your mass spectrometer.

- Proceed methodically.

- Always place the components on a clean, lint-free surface.

- Never overtighten a screw or use excessive force.
Preparing the Work Area

❖ To prepare the work area

Do the following:

• Make sure that the surrounding area is neat and clean.

• Prepare a clean work surface by covering the area with lint-free paper or a large sheet of clean aluminum foil.

• Have nearby the necessary tools, supplies, and replacement parts (when applicable).

Tools and Supplies

The EASY-Spray Series ion source requires very few tools to perform routine maintenance procedures. Table 7 lists the necessary tools and supplies for maintaining the ion source and column.

CAUTION Avoid exposure to potentially harmful materials

By law, producers and suppliers of chemical compounds are required to provide their customers with the most current health and safety information in the form of Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDSs). The MSDSs and SDSs must be freely available to lab personnel to examine at any time. These data sheets describe the chemicals and summarize information on the hazard and toxicity of specific chemical compounds. They also provide information on the proper handling of compounds, first aid for accidental exposure, and procedures to remedy spills or leaks.

Read the MSDS or SDS for each chemical you use. Store and handle all chemicals in accordance with standard safety procedures. Always wear protective gloves and safety glasses when you use solvents or corrosives. Also, contain waste streams, use proper ventilation, and dispose of all laboratory reagents according to the directions in the MSDS or SDS.
<table>
<thead>
<tr>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tools and equipment</strong></td>
<td></td>
</tr>
<tr>
<td>Controller PCB, with a 2.5 mm hex key and a cover plate for use on the EASY-Spray source</td>
<td>ES233</td>
</tr>
<tr>
<td>EASY-Spray column wash cap</td>
<td>ES235</td>
</tr>
<tr>
<td>Gloves, lint-free and powder-free</td>
<td>Fisher Scientific:</td>
</tr>
<tr>
<td></td>
<td>• 19-120-2947A (size small)</td>
</tr>
<tr>
<td></td>
<td>• 19-120-2947B (size medium)</td>
</tr>
<tr>
<td></td>
<td>• 19-120-2947C (size large)</td>
</tr>
<tr>
<td></td>
<td>• 19-120-2947D (size X-large)</td>
</tr>
<tr>
<td></td>
<td>Thermo Scientific:</td>
</tr>
<tr>
<td></td>
<td>• 23827-0008 (size medium)</td>
</tr>
<tr>
<td></td>
<td>• 23827-0009 (size large)</td>
</tr>
<tr>
<td>Graduated cylinder or beaker, glass, 20–60 mm diameter (for use with cleaning solvent)</td>
<td>–</td>
</tr>
<tr>
<td>Sonicator</td>
<td>–</td>
</tr>
<tr>
<td><strong>Chemicals</strong></td>
<td></td>
</tr>
<tr>
<td>Any organic solvent, for example:</td>
<td>Fisher Scientific (for examples):</td>
</tr>
<tr>
<td></td>
<td>• Acetonitrile, Optima™ LC/MS grade</td>
</tr>
<tr>
<td></td>
<td>• Methanol, Optima LC/MS grade</td>
</tr>
<tr>
<td></td>
<td>• A955-4 (amber glass, 4 L)</td>
</tr>
<tr>
<td></td>
<td>• A456-4 (amber glass, 4 L)</td>
</tr>
</tbody>
</table>
Cleaning the EASY-Spray Column Emitter Tip

If the video camera’s output shows dust particles on the EASY-Spray column’s emitter tip or if there are unresolved spray issues, follow the procedure in this section to clean the emitter.

CAUTION Wear protective gloves and eye wear when handling solvents.

❖ To clean the EASY-Spray column emitter

1. Carefully remove the EASY-Spray column from the source.

2. Carefully insert the column into the wash cap (Figure 33).

Figure 33. Wash cap installed over the column emitter tip

3. Over a wash container, hold the column and wash cap with one hand, and then slowly pull back on the wash cap to expose the emitter tip.

4. With the other hand, gently wash the emitter tip with a stream of organic solvent.

5. Reinstall the column in the source, and then use the video camera to inspect the emitter tip for any residual lint or particulates.

6. If the emitter tip is not fully clean, use the sonicator as follows:

   a. With the column inserted into the wash cap, place the emitter tip into the graduated cylinder or beaker.

   b. Fill the container with the organic solvent to cover the emitter tip.

   c. Place the container with the wash cap and column into the sonicator.

   d. Hold onto these components and run the sonicator for 1 minute.

This completes the cleaning procedure. If you have further issues with the emitter, you might need to replace the column.
Replacing the Controller PCB

If the controller PCB becomes damaged, the actual temperature display might remain off and the EASY-Spray column might not heat. Follow this procedure to install a new controller PCB.

To replace the controller PCB

1. Follow the procedure “To remove the source from the mass spectrometer” on page 17.

2. Using the 2.5 mm hex key, remove the four hex socket-head screws located on the bottom of the source. If you previously installed the controller PCB, P/N ES233, in the EASY-Spray source, remove the additional cover plate (Figure 34).

   ![Figure 34. EASY-Spray with the new controller PCB and extra cover plate (bottom view)](image)

   **Note** The cover plate is for use on the EASY-Spray source (ES081) only when installing the ES233 controller PCB.

3. Slowly pull out the enclosure for the controller PCB (Figure 35).

   ![Figure 35. Controller PCB (P/N ES233)](image)

   **IMPORTANT** If you remove the controller PCB too quickly or at an angle, you might damage the PCB components or the internal heater cable routed above the controller PCB.
4. Unpack the new controller PCB and make sure it is not damaged.

**CAUTION** To prevent damage to the electronic components on the PCB due to ESD, hold the new controller unit by the metal enclosure instead of the PCB.

5. Slowly push the new controller PCB enclosure into place, and route the heater cable so that it does not become damaged (pinched) (Figure 36).

**Figure 36.** Bottom of the EASY-Spray source without the controller PCB

6. (EASY-Spray only) Align the screw holes on the additional cover plate over the controller PCB’s back two screw holes (Figure 35 on page 45).

7. Using the 2.5 mm hex key, install the four hex socket-head screws into the bottom of the source.

You can now install the EASY-Spray Series source back onto the mass spectrometer. To dispose of the old controller PCB, see “WEEE Compliance” on page ix.
Troubleshooting

Table 8 lists some EASY-Spray Series ion source and column problems, their causes, and their possible solutions. You can resolve most problems by using a new EASY-Spray column.

If you need further troubleshooting assistance, contact your local Thermo Fisher Scientific field service engineer. See “Contacting Us” on page xvi.

Table 8. EASY-Spray Series source problems, causes, and possible solutions (Sheet 1 of 3)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera issues:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The light is not on.</td>
<td>The camera light is off.</td>
<td>Turn on the camera by pressing its top light button (Figure 18 on page 20).</td>
</tr>
<tr>
<td>—or—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The video output is too dark.</td>
<td>—or—</td>
<td></td>
</tr>
<tr>
<td>Column issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater issues:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The column is not heated.</td>
<td>The heater is off, or there might be a loose connection or a damaged PCB.</td>
<td>Try these solutions:</td>
</tr>
<tr>
<td>—or—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The actual temperature display is blank.</td>
<td>—or—</td>
<td></td>
</tr>
<tr>
<td>The EASY-Spray column is damaged.</td>
<td>—or—</td>
<td>Replace the EASY-Spray column.</td>
</tr>
</tbody>
</table>

Contents

- Camera issues
- Column issues
- Signal issues
### Signal issues

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
</table>
| The signal intensity is weak. | The parameters for the LC, MS, or both might need adjusting. | Try these solutions:  
• Verify that the EASY-Spray column is correctly positioned (that is, clicks on insertion).  
• Check the LC method and MS tune method parameters.  
• Run a known standard to check the sensitivity. |
| The mass spectrometer’s spray cone and ion transfer tube are dirty. | | Clean both the spray cone and ion transfer tube. For instructions, refer to the mass spectrometer’s documentation. |
| The spray is unstable. | There is a leak somewhere in the liquid path. | Check all of the LC connections. |
| –or– | Air bubbles in the emitter might cause the spray to “spit.” | Try degassing the mobile phase or purging the line, and then recheck the line for air bubbles. |
| There is no spray. | There is an emitter blockage from particles in the sample, other small particles from the flow lines or valves, and so on. | Try adjusting the spray voltage. If that does not resolve the blockage problem, either clean the emitter (see page 44) or insert a new EASY-Spray column. |
| The cleaning solvent is not LC/MS grade, which can negatively affect the spray stability. | | Use an LC/MS-grade solvent to clean the emitter tip. |
| The EASY-Spray column is out of alignment, which might occur if you bumped the source or moved the source from one MS to another MS. | | Follow the procedure “Adjusting the Emitter Tip Position” on page 14. |
The source high-voltage (HV) connection might be unstable.

Check the high voltage contact on the back of the source (Figure 9 on page 10 and Figure 10 on page 11) and the front of the mass spectrometer.

If the problem continues for the EASY-Spray NG source, do the following:

1. Open Tune and view the Ion Source page (see page 38).
2. Compare the setting for the spray voltage to the adjacent readback value.
   A green box ( ) indicates that the parameter is functioning properly.

If the problem continues for the EASY-Spray source, do the following:

1. Open Tune Plus, choose View > Display Status View, and then click the All tab.
2. Choose Setup > NSI Source to open the NSI Source dialog box.
3. Compare the setting in the NSI Source dialog box to the readback value for the NSI source's absolute spray voltage.
   A green check mark ( ) indicates that the parameter is functioning properly.

The source's HV connector has a loose connection.

If you have a digital multimeter that can measure 20 MΩ (mega ohms), do the following:

1. Test the meter's batteries, and then set the meter to the appropriate resistance setting or range.
2. Measure the resistance from the HV pin on the back of the source to the spring-loaded bolt located inside the housing (Figure 9 on page 10, or Figure 10 on page 11).
   A functional HV connection has a measured resistance of 18–22 MΩ.
Replaceable Parts

This chapter lists the consumable and replaceable parts for the EASY-Spray Series ion sources, and their corresponding part numbers. To order any of these parts, contact your local Thermo Fisher Scientific field service engineer or go to www.proxeon.com/easyspray.

Contents
- Spare Parts
- Consumables

Spare Parts

A/B mixing/venting tee ................................................................. SC901
EASY-Spray controller PCB (with a 2.5 mm hex key and cover plate) .......... ES233
EASY-Spray controller power supply with power adapter cable ................. ES231
EASY-Spray tools: emitter positioning tool and hex keys (1.5 mm and 3 mm) .. ES232
Monitor and power supply unit .................................................. ES217
Tee holder .................................................................................. ES234
Video camera and power supply unit .......................................... ES216
Wash cap (for the EASY-Spray column) ...................................... ES235

Consumables

Peptide Columns
EASY-Spray column, 15 cm × 75 μm ID, PepMap™ C18, 3 μm particles, 100 Å pore size .................................................. ES800
EASY-Spray column, 15 cm × 50 μm ID, PepMap RSLC C18, 2 μm particles, 100 Å pore size .................................................. ES801
EASY-Spray column, 25 cm × 75 μm ID, PepMap RSLC C18, 2 μm particles, 100 Å pore size .................................................. ES802
EASY-Spray column, 50 cm × 75 μm ID, PepMap RSLC C18, 2 μm particles, 100 Å pore size .................................................. ES803
8 Replaceable Parts
Consumables

**Intact Protein Columns**
EASY-Spray column, 25 cm × 200 μm ID, PepSwift™ Monolith .................. ES810
EASY-Spray column, 15 cm × 75 μm ID, Accucore™ C4, 2.6 μm particles,
150 Å pore size ............................................. ES811
EASY-Spray column, 15 cm × 75 μm ID, PepMap C18, 3 μm particles,
300 Å pore size ............................................. ES812
Glossary

API ion transfer tube  A tube assembly that assists in desolvating ions that are produced by the ESI, nanoESI (NSI), or APCI probe (or spray insert).

atmospheric pressure chemical ionization (APCI)  A soft ionization technique done in an ion source operating at atmospheric pressure. Electrons from a corona discharge initiate the process by ionizing the mobile phase vapor molecules. A reagent gas forms, which efficiently produces positive and negative ions of the analyte through a complex series of chemical reactions.

atmospheric pressure ionization (API)  Ionization performed at atmospheric pressure by using atmospheric pressure chemical ionization (APCI), electrospray ionization (ESI), or nanoelectrospray ionization (nanoESI or NSI).

dynamic nanoelectrospray  See nanoESI nanoLC gradient separation.

electrospray ionization (ESI)  A type of atmospheric pressure ionization that is currently the softest ionization technique available to transform ions in solution into ions in the gas phase.

H-ESI  Heated-electrospray ionization (H-ESI), a type of atmospheric pressure ionization, converts ions in solution into ions in the gas phase by using electrospray ionization (ESI) in combination with heated auxiliary gas.

ion source  A device that converts samples to gas-phase ions.

ion sweep cone  A removable cone-shaped metal cover that fits on top of the API ion transfer tube and acts as a physical barrier to protect the entrance of the tube.

nano liquid chromatography (nanoLC)  Liquid chromatography with typical flow rates of 10–1000 nL/min and 10–150 μm diameter columns.

nanoelectrospray ionization (nanoESI or NSI)  A type of electrospray ionization (ESI) that accommodates very low flow rates of sample and solvent on the order of 1–20 nL/min (for static nanoelectrospray) or 100–1000 nL/min (for dynamic nanoelectrospray, which is also called nanoESI nanoLC gradient separation).
**Glossary:** nanoESI nanoLC gradient separation

**nanoESI nanoLC gradient separation** Employs microscale capillary columns to separate the analytes in complex mixtures. The sample is loaded onto a column using an injection valve or a gas pressure vessel. The mixture components are then eluted by a solvent gradient and pumped through the emitter.

**nanoESI (NSI) source** The entire nanoelectrospray ion source.

**nanoESI (NSI) spray current** The flow of charged particles in the nanoESI (NSI) source. The voltage on the NSI spray needle supplies the potential required to ionize the particles.

**nanoESI (NSI) spray voltage** The high voltage that is applied to the spray needle in the nanoESI (NSI) source to produce the NSI spray current as liquid emerges from the nozzle. The NSI spray voltage is selected and set; the NSI spray current varies.

**nanospray ionization (NSI)** See nanoelectrospray ionization (nanoESI or NSI).

**S**

**source** See ion source.

**static nanoelectrospray** A device that performs continuous analysis of small analyte solution volumes over an extended period of time.
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