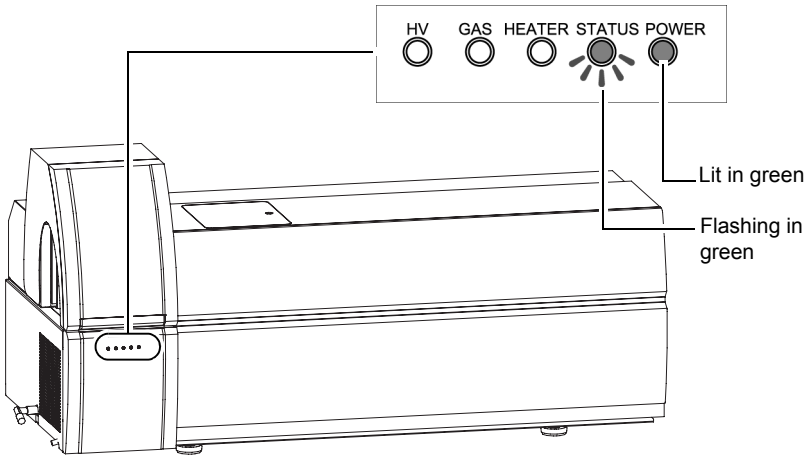
# 6 Troubleshooting

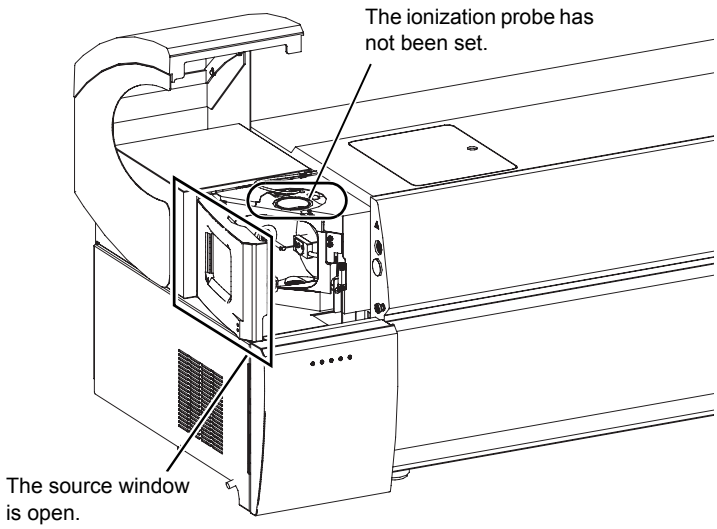
## 6.1 Fault Diagnosis and Corrective Actions

This chapter describes the causes of problems and the corrective action to take when they occur. For more details on the action to take, refer to the reference pages cited in the tables below.

If the problem is not resolved after taking the corrective action described here, or if the fault is considered to be one not described here, contact your Shimadzu representative.

### ■ General

| Problem | Cause / Corrective Action |
|---|---|
| The LEDs do not light when the power is turned ON. | Check if the power cable is correctly connected and if single-phase 230 V power is being supplied to the distribution panel. (See "8.1.2 Connecting the Instrument" P.189.)<br>Status immediately after turning the power ON<br>  |
| The instrument does not connect. | Check the connection of the USB cable. (See "2.2 Names of Parts" P.14.) |
| | After checking that the power to the instrument (MS, LC) is ON, restart the PC. Check the environment settings in LabSolutions. |

<table>
<tr><th>Problem</th><th>Cause / Corrective Action</th></tr>
<tr><td rowspan="2">The detector and heater cannot be turned ON. If they are set to ON they immediately turn back OFF again.</td><td>The vacuum system is not operating normally.<br>If the vacuum system is not in the "ready" status the MS detector and heater cannot be turned ON.</td></tr>
<tr><td>An interlock has been actuated.<br>Interlock functions operate as a measure to prevent danger when people are working.<br>If either of the conditions indicated in the figure below applies, the MS detector (high voltage) and heater are turned OFF.<br> 
</td></tr>
<tr><td>The instrument stops and the "STATUS" LED lights in red.</td><td>When an abnormality of the vacuum system has been detected, the instrument is automatically stopped by a protective function.<br>The probable causes are as follows.<br><br>• A large vacuum leak<br>• An abnormality of the vacuum pump (rotary pump, triple inlet turbo molecular pump)<br>• An abnormality of the leak valve<br><br>If this happens, temporarily exit LabSolutions and turn OFF the power to the PC and MS.<br>Checking for vacuum leaks and, after effecting repairs (see "7.12 Vacuum Leak Check" P.176), turn the power to the MS back ON, then turn the power to the PC ON and start up LabSolutions.</td></tr>
</table>

| Problem | Cause / Corrective Action |
|---|---|
| The "STATUS" LED is flashing in green. | When the triple inlet turbo molecular pump is still in preparation, or the degree of vacuum has not reached the target value, the LED flashes in green.<br>The LED flashes in green when in standby mode.<br>**NOTE**<br>When starting and stopping the instrument, except when it is started other than by an automatic start (i.e., manually), the ion gauge has to be set to ON.<br>**NOTE**<br>When the instrument has been stopped for a long time it takes some time to evacuate it and the "Ready" status may not be reached within the prescribed time. In this case the "STATUS" LED on the front of the instrument will continue to flash in green, but this does not indicate an abnormality. When the pressure has dropped the "Ready" status will be attained and the "STATUS" LED will light in green.<br><br>If the ion gauge cannot be turned ON, or if the ion gauge is turned on but the "STATUS" LED continues to flash in green for longer than three hours, there could be a vacuum leak.<br>Take appropriate action by referring to "7.12 Vacuum Leak Check" P.176. |
| The "STATUS" LED is flashing in green and the LabSolutions screen indicates standby status. | The DL is not mounted. Mount the DL. |
| | The DL connector is disconnected. See "7.9 Replacing the DL" P.163 and check that the DL connector is connected properly. |
| | There is a broken wire. See "7.9 Replacing the DL" P.163 and replace the DL. |
| | Check the Pirani gauge value on the instrument status. If the value is more than 300 Pa, perform the procedure described in "7.12 Vacuum Leak Check" P.176. |
| The buzzer is sounding. | Check the cause of the error, which will be displayed on the LabSolutions screen. |
| The buzzer sounds in the pattern "pip pipee pip pipee" (sounding twice per second). | A liquid leakage has been detected at the leak tray inside the instrument's front door.<br>When a liquid leakage error occurs, analysis is stopped. Eliminate the cause of the liquid leakage. |
| The buzzer sounds in the pattern "pip pip pip pip" (sounding four times per second). | This indicates overheating of the DL, APCI heater and heated block. The heater is turned OFF automatically. This indicates that, as the result of some abnormality, the temperature of any part of the DL, heated block or APCI heater, has risen to the upper limit value for heat resistance. When the upper limit temperature is reached the heaters are automatically turned OFF; once the temperature has fallen below the upper limit value the buzzer stops sounding. Once the temperature has dropped below 50 °C, check that the DL and APCI connectors are attached properly. |
| | Overheating and liquid leakage are detected at the same time. |
| The message "Ion gauge error" is displayed. | The filament of the ion gauge vacuum meter has broken.<br>Contact your Shimadzu representative if the message appears even after turning the ion gauge ON again. |
| The message "Pirani gauge error" is displayed. | The filament of the Pirani gauge vacuum meter has broken.<br>Contact your Shimadzu representative if the message appears even after checking the connection of the Pirani gauge again. |
| The source window cannot be closed. | The O-ring of the source window is lifted.<br>Correctly fit the O-ring into the groove. |

## ■ Data Acquisition

| Problem | Cause / Corrective Action | See |
|---|---|---|
| The ion intensity is unstable or low. | ESI probe | |
| | The capillary ASSY is blocked. | "7.2.1 Replacing the Tubing" P.122 |
| | The tip of the capillary ASSY is projecting too far beyond the ESI probe, or is too recessed. | "7.2.1 Replacing the Tubing" P.122 |
| | The ESI probe is substantially out of place. | "3.5.1 Mounting the ESI Probe" P.55 |
| | The probe current (interface current) is too high. (It can become unstable as the result of discharge.) | Lower the interface voltage. |
| | The high-voltage cable is not connected. | "3.5.1 Mounting the ESI Probe" P.55 |
| | The high voltage is not being supplied properly (broken wire). | Check the analysis method parameters and the tuning file. |
| | APCI probe | |
| | The APCI pipe ASSY is blocked. | "7.3.1 Replacing the APCI Pipe" P.129 |
| | The corona needle is substantially displaced from the center. | "3.6.1 Mounting the Corona Needle for APCI" P.60 |
| | The corona needle is soiled. | "7.3.3 Cleaning and Replacement of the APCI Corona Needle" P.136 |
| | The probe current (interface current) is too high. (It can become unstable as the result of discharge.) | Lower the interface voltage. |
| | The probe has not been heated properly. | "3.6.2 Mounting the APCI Probe" P.63 |
| | The heater cable and/or high-voltage cable are not connected. | |
| | Broken wire in the high-voltage cable, heater cable or sensor. | |

| Problem | Cause / Corrective Action | See |
|---|---|---|
| The ion intensity is unstable or low. | DL | |
| | The DL is blocked (the PG value is 50 Pa or lower). | "7.9 Replacing the DL" P.163 |
| | The DL is soiled. | "7.9 Replacing the DL" P.163 |
| | The probe has not been heated properly. | Check the analysis method parameters and the tuning file. If the situation does not improve, see "7.9 Replacing the DL" P.163. |
| | The wiring has not been done properly. (Parts are shorted.) | "7.9 Replacing the DL" P.163 |
| | Detector | |
| | The detector voltage is too low. | |
| | The detector has deteriorated. | |
| | The attenuation is set low. | Adjust the attenuation. "Attenuation settings" P.113 |
| | Heated block | |
| | The heated block is soiled. | "7.7 Cleaning the Spray Unit" P.159 |
| | Lens system | |
| | The skimmer is soiled. | "7.5 Maintenance of the Lens System" P.142 |
| | The multipole is soiled. | "7.5 Maintenance of the Lens System" P.142 |
| | The entrance lens is soiled. | "7.5 Maintenance of the Lens System" P.142 |
| | The skimmer or the entrance lens is blocked. | "7.5 Maintenance of the Lens System" P.142 |
| The base level (background level) is too high. | Soiling of the DL | "7.9 Replacing the DL" P.163 |
| | Soiling of the heated block | "7.7 Cleaning the Spray Unit" P.159 |
| | Soiling of the spray unit | "7.7 Cleaning the Spray Unit" P.159 |
| | Soiling of the LC | Clean the mobile phase. |
| | Soiling of the ESI and/or APCI probe | Clean the mobile phase. |
| | Soiling due to the standard sample for auto tuning | "7.7 Cleaning the Spray Unit" P.159 |
| | Soiling of the mobile phase | Replace the mobile phase. |
| | Influence of background noise originating from the mobile phase | |
| | Soiling of the tubing | Clean the flow line, or replace the tubing. |

| Problem | Cause / Corrective Action | See |
|---|---|---|
| The peaks are too wide. | There is dead volume in the tubing section (section that connects to the ionization probe). | Repair the connection. |
| | There is dead volume in the connecting section downstream of the injector. | Repair the connection. |
| | The tubing bore is too large (make the internal diameter downstream of the injector 0.13 mm). | Replace the tubing. |
| | The cut face of the tubing is inclined. | Replace the tubing. |
| | Soiling of the injector | Rinse the injector. |
| | The ESI probe is out of position. | "3.5.1 Mounting the ESI Probe" P.55 |
| The baseline undulates. | Air is contained in the tubing. | Purge the LC pump. |
| | Air is contained in the mobile phase. | Degas the mobile phase. |
| | The temperature of the DL, heated block or APCI heater is fluctuating. | |
| The pump pressure is too high. | Blockage of the ESI capillary. Blockage of the APCI or SUS pipe | "7.2.1 Replacing the Tubing" P.122 |
| | | "7.3.1 Replacing the APCI Pipe" P.129 |
| | Blockage of the tubing | "7.2.1 Replacing the Tubing" P.122 "7.3.1 Replacing the APCI Pipe" P.129 |
| | Blockage at the LC side | Check the LC side and clear the blockage. |

| Problem | Cause / Corrective Action | See |
|---|---|---|
| Auto tuning has failed. | The wrong standard sample was used. | "8.3.1 Method for Preparing the Standard Sample" P.213 |
| | The standard sample is old (the spectrum has changed). | "8.3.1 Method for Preparing the Standard Sample" P.213 |
| | There is a leak in the tubing of the standard sample introduction unit. | "8.1.5 Installing the Standard Sample" P.198 |
| | The resistance tube is clogged. | "7.6.2 Replacing the Resistance Tube" P.156 |
| | There is not a sufficient volume of standard sample in the standard sample bottle. | "7.6.1 Replacing the Standard Sample" P.154 |
| | The ESI probe is out of position. | Adjust the ESI probe position to gain a stronger target m/z intensity. In particular, check that negative ions are m/z 1007. |
| | An interference peak exists around the target m/z. | After washing the ESI probe tubing with water or methanol, check that there is no interference peak around the target m/z in the manual tuning window. "8.2.1 Checking Ions in the [MS Tuning] Window" P.201 |
| | The target m/z intensity decreases when using substances such as TFA. | "Interpreting tuning results" P.90 in "3.8.2 Starting Auto Tuning" |
| The peaks are split. | The ion intensity has exceeded 20 million. (The signal strength is too high, causing saturation.) | The sample concentration is too high. Dilute the sample before use. |
| | There is dead volume in the tubing. | Repair the tubing connection. |
| | There is a problem with the column. | Replace the column. |
| The peak top is flat. | The ion intensity has exceeded 20 million. (The signal strength is too high, causing saturation.) | Adjust the attenuation. "Attenuation settings" P.113 |

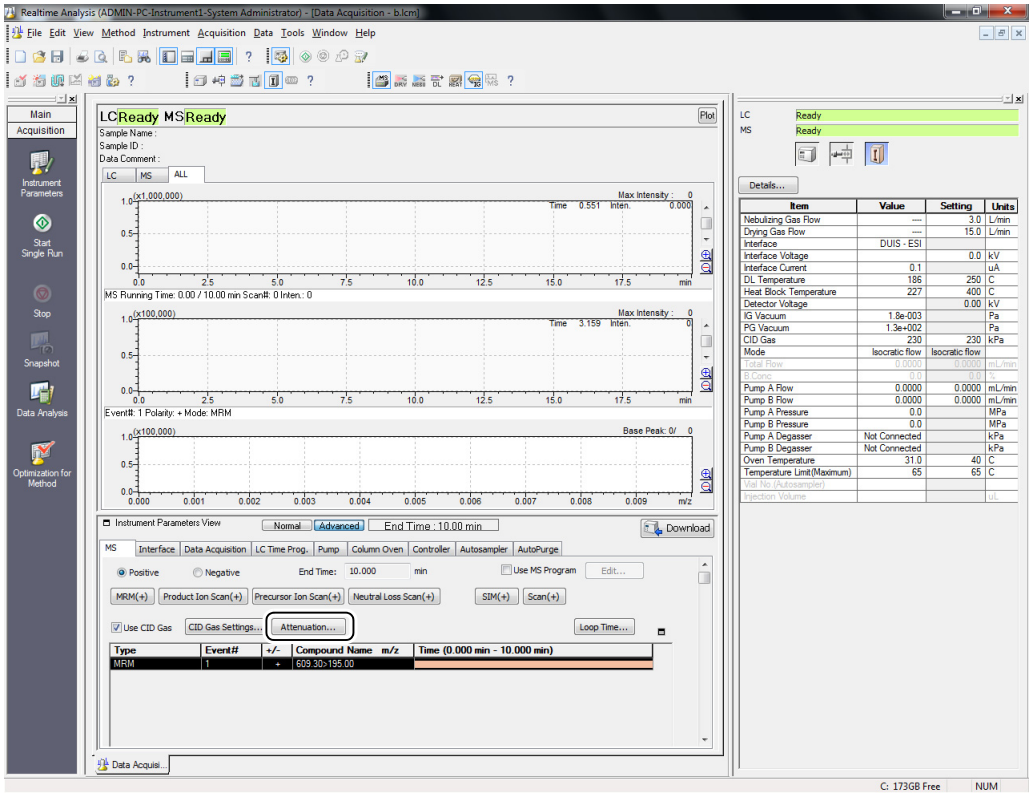
| Problem / Cause | Corrective Action / See |
|---|---|
| Software | |
| The tuning file is not appropriate. An old tuning file is being used. | "3.8.2 Starting Auto Tuning" P.82 |
| The method file is not appropriate. | Refer to the LabSolutions Getting Started Guide or Operators Guide. |
| The batch file is not appropriate. | |
| The lens setting conditions are wrong. | "3.8.2 Starting Auto Tuning" P.82 |
| Tubing | |
| There is a liquid leakage.<br>(The pump pressure is too low.) | Mount the ionization probe.<br>Identify and retighten any locations at which liquid is leaking. |
| There is a gas leak. | "8.1.3 About the Gas Used" P.193 |
| | "3.5.1 Mounting the ESI Probe" P.55<br>"3.6.2 Mounting the APCI Probe" P.63 |
| The pumping is unstable. | Purge the LC pump and check the check valve (see the LC pump instruction manual). |
| The gas is not flowing. | "8.1.3 About the Gas Used" P.193 |
| The mobile phase is not flowing. | |

## ■ Attenuation settings

If signal saturation occurs due to excessive ion intensity, attenuation adjustment may solve the problem. If the problem persists, dilute the sample.

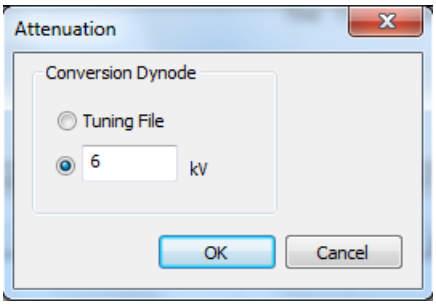
### 1 Click [Attenuation].

The [Attenuation] window is displayed.




### 2 Adjust the conversion dynode voltage.

Set a voltage that will reduce the signal intensity to below 20 million. The default value is 6 kV.



# 6.2 Operation Flow for Automatically Starting the Vacuum System

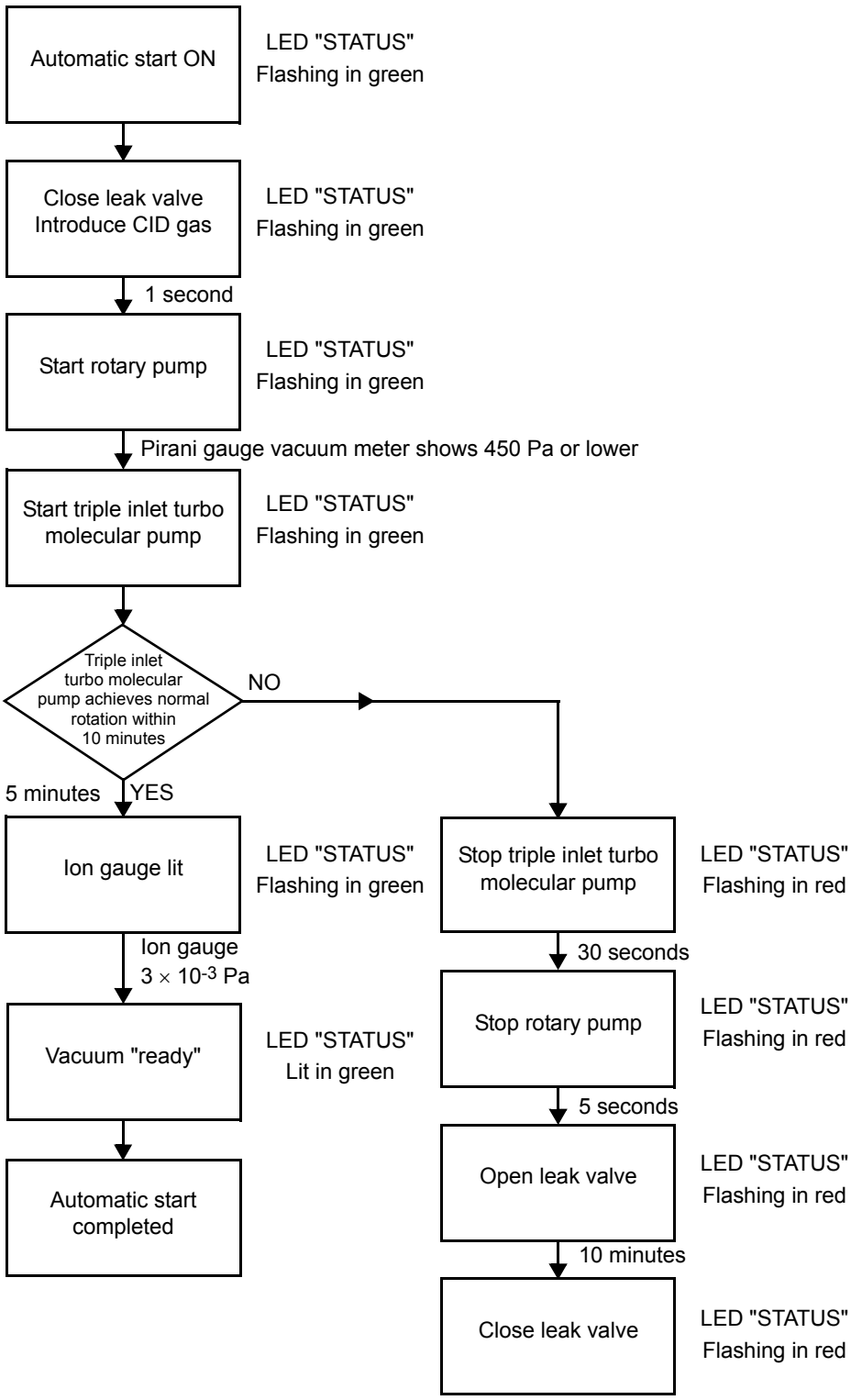



Fig. 6-1

**NOTE**

When the instrument has been stopped for a long time it takes some time to evacuate it and the "Ready" status may not be reached within the prescribed time. In this case the "STATUS" LED on the front of the instrument will continue to flash in green, but this does not indicate an abnormality. When the pressure has dropped the "Ready" status will be attained and the "STATUS" LED will light in green.

# 6.3 Operation Flow for Automatically Stopping the Vacuum System

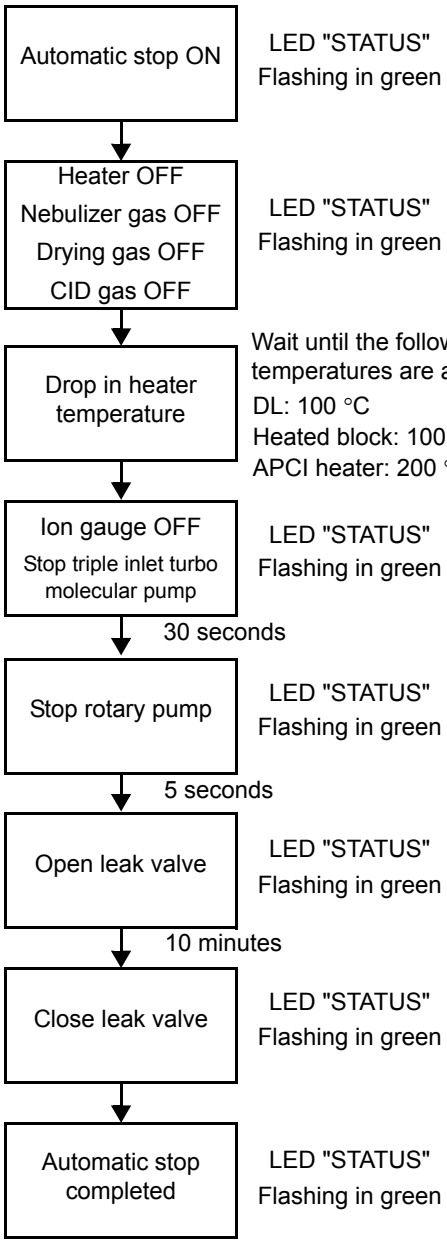



Fig. 6-2

**NOTE**

To turn the vacuum system off manually, turn each of the heaters OFF and, when the temperature has fallen to 100 °C or lower, stop the vacuum pump.

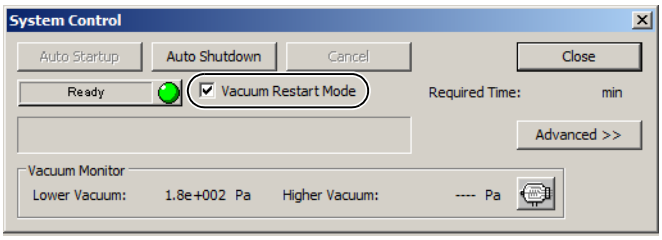
# 6.4 Power Outages

If the 230 V AC power supply to the LCMS-8030/LCMS-8040 has been cut off and LabSolutions is set to the automatic restart mode (i.e. if [Vacuum Restart Mode] is checked among the recovery modes in the [System Control] window), the vacuum system will automatically start when the power is restored.

**NOTE**

To set the automatic recovery mode, select [System Control] from the assistant bar in the LabSolutions analysis window and check the [Vacuum Restart Mode] box in the [System Control] window.

If automatic restart is not set, start the instrument by referring to "3.1 Starting the Instrument" P.41.



# 7 Maintenance

## 7.1 Periodic Inspections and Servicing

In order to use this product safely, carry out periodic inspections.

Conduct everyday maintenance and management of performance as appropriate.

For details on maintenance inspection contracts, consult your Shimadzu representative.

**⚠ WARNING**

**Instructions**

Before starting maintenance or servicing work, turn the power to the product OFF.

Otherwise there will be a risk of fire, electric shock and instrument failure.

**⚠ CAUTION**

**Prohibitions**

Never remove the main body cover.

This may cause injury or damage the instrument.

If repair work that necessitates removal of the main body cover is required, consult your Shimadzu representative.

**Instructions**

- When replacing parts, use the parts specified by Shimadzu.
  Using parts other than those specified could lead to breakage of parts, injuries or instrument failure.
- When carrying out periodic inspections, observe the cautions on each operation.
- Wear clean gloves when carrying out maintenance work on the ion source unit, the lens system or the interface.
- Be sure to wipe off any soiling on the tools used for maintenance work on the ion source unit, lens system or interface using gauze impregnated with acetone.
  Using soiled tools or gloves will cause background noise.
- Place removed parts on clean fabric such as gauze.
  If you place parts on soiled fabric they will become soiled.

## 7.1.1 List of Periodic Inspections and Servicing

**⚠ CAUTION**

Instructions

The replacement and inspection frequencies indicated in this list are merely for guidance. They are not guaranteed intervals.
There is some latitude in the appropriate frequency depending on the conditions of use.

### ■ Replacement

| Inspection/Service Operation or Part | Part No. | Replacement/Inspection Frequency | | | | Remarks |
|---|---|---|---|---|---|---|
| | | Every 6 Months | Every Year | Every 2 Years | Every 3 Years | |
| ESI probe | | | | | | ☞ P.122 |
| Capillary tube body | S225-14915 | | ○ | | | |
| Capillary ASSY | S225-14948-91 | | ○ | | | |
| PEEK tube | S228-32999-01 | | ○ | | | |
| Elbow, KQ2L23-M5 | S035-60724-21 | | | | ○* | |
| O-ring, 4D-S8 | S036-19004-05 | | | | ○* | Capillary holder |
| APCI probe | | | | | | ☞ P.128 |
| Heater unit ASSY | S225-15619-41 | | ○ | | | |
| Corona needle (for both APCI and DUIS) | S225-15877-92 | | | | ○ | |
| APCI pipe ASSY | S225-15845-91 | | ○ | | | |
| Half union, KQ2H01-M5 | S035-60725-01 | | | | ○ | |
| DUIS | | | | | | ☞ P.140 |
| Corona needle (for both APCI and DUIS) | S225-15877-92 | | | | ○ | |
| Interface | | | | | | ☞ P.162, P.163, P.166 |
| DL ASSY | S225-15718-91 | ○ | | | | |
| Orifice | S225-15479 | | | | ○* | |
| Sampling cone | S225-15487 | | | | ○* | |
| M6PEEK washer for heater flange | S023-65106-01 | | | ○ | | |
| O-ring, 4D-S100 | S036-19004-53 | | | | ○* | Heater flange |
| O-ring, 4D G145 | S036-12527 | | | | ○* | Front door |
| Lens system | | | | | | ☞ P.177 |
| Multipole 1 | - | | | | | |
| Multipole 2 | - | | | | | |
| O-ring, AS568A-253 | S036-15552-53 | | | | ○* | Door unit |

| Inspection/Service Operation or Part | Part No. | Replacement/Inspection Frequency | | | | Remarks |
|---|---|---|---|---|---|---|
| | | Every 6 Months | Every Year | Every 2 Years | Every 3 Years | |
| Vacuum system | | | | | | P.246, P.247 |
| IG GAUGE | S225-09490-01 | | | | ○* | |
| Gasket 14 | S261-00207-02 | | | | ○* | IG unit |
| Pirani gauge filament | S225-20310-91 | | | | ○* | |
| RP oil #46 (4L) | S017-30163-02 | | ○ | | | Changed 3 times per year<br>1.5 L used in each oil change |
| SI unit ASSY | | | | | | P.154 |
| PEEK frit | S228-48607-91 | | | | ○* | |
| Resistance tube, alone | S225-15873-91 | | | ○ | | |
| Spacer, FKM | S225-15697-01 | | ○ | | | |
| Detector | | | | | | P.31 |
| EM, MS644 | S225-14168-01 | | | ○** | | |
| $N_2$ gas related | | | | | | P.178 |
| FEP tube for nebulizer gas, 1/16 | S225-14255-41 | | | ○ | | Cut off 1 cm from the end of the tube once every 2 years. |
| Sample | | | | | | P.213 |
| Sample for auto tuning (200 mL) | S225-14122-01 | | ○ | | | |

**NOTE**

The asterisks in the "Replacement/Inspection Frequency" column indicate that the replacement parts are included in the PM 3-year maintenance part kit (P/N S225-15869-42). Work indicated with ** must be performed by field engineers.

## ■ Overhaul

| Inspection/Service Operation or Part | Part No. | Replacement/Inspection Frequency | | | | Remarks |
|---|---|---|---|---|---|---|
| | | Every 6 Months | Every Year | Every 2 Years | Every 3 Years | |
| Vacuum system | | | | | | P.245 |
| RP E2M28 230V | - | | | ○ | | *** |
| Triple inlet turbo molecular pump body and SPLIT FLOW310 set | - | | | | ○ | |

**CAUTION**

**Instructions**

Perform overhauls.

If a rotary pump for which "***" is indicated under "Overhaul" is not overhauled, it may cause an accident or performance may decrease, resulting in damage to the instrument.

## ■ Cleaning

| Inspection/Service Operation or Part | Part No. | Replacement/Inspection Frequency | | | | Remarks |
|---|---|---|---|---|---|---|
| | | Every 6 Months | Every Year | Every 2 Years | Every 3 Years | |
| APCI probe | | | | | | P.136 |
| Corona needle (for both APCI and DUIS) | - | ○ | | | | |
| Interface | | | | | | P.159 |
| Spray unit | - | ○ | | | | |
| Sampling cone | - | ○ | | | | Cleaning |
| Orifice | - | | | ○ | | Cleaning |
| Lens system | | | | | | P.142 |
| Qarray | - | ○ | | | | Cleaning |
| Skimmer | - | ○ | | | | Cleaning |
| Multipole 1 | - | ○ | | | | Cleaning |
| Multipole 2 | - | ○ | | | | Cleaning |
| Collision cell | | | | | | P.30 |
| CID cell ASSY | - | | ○** | | | Cleaning |

**NOTE**

Work indicated with ** in the Replacement/Inspection Frequency column must be performed by field engineers.

The cleaning frequency of the interface, lens system, or collision cell may differ depending on the operating conditions at your site.

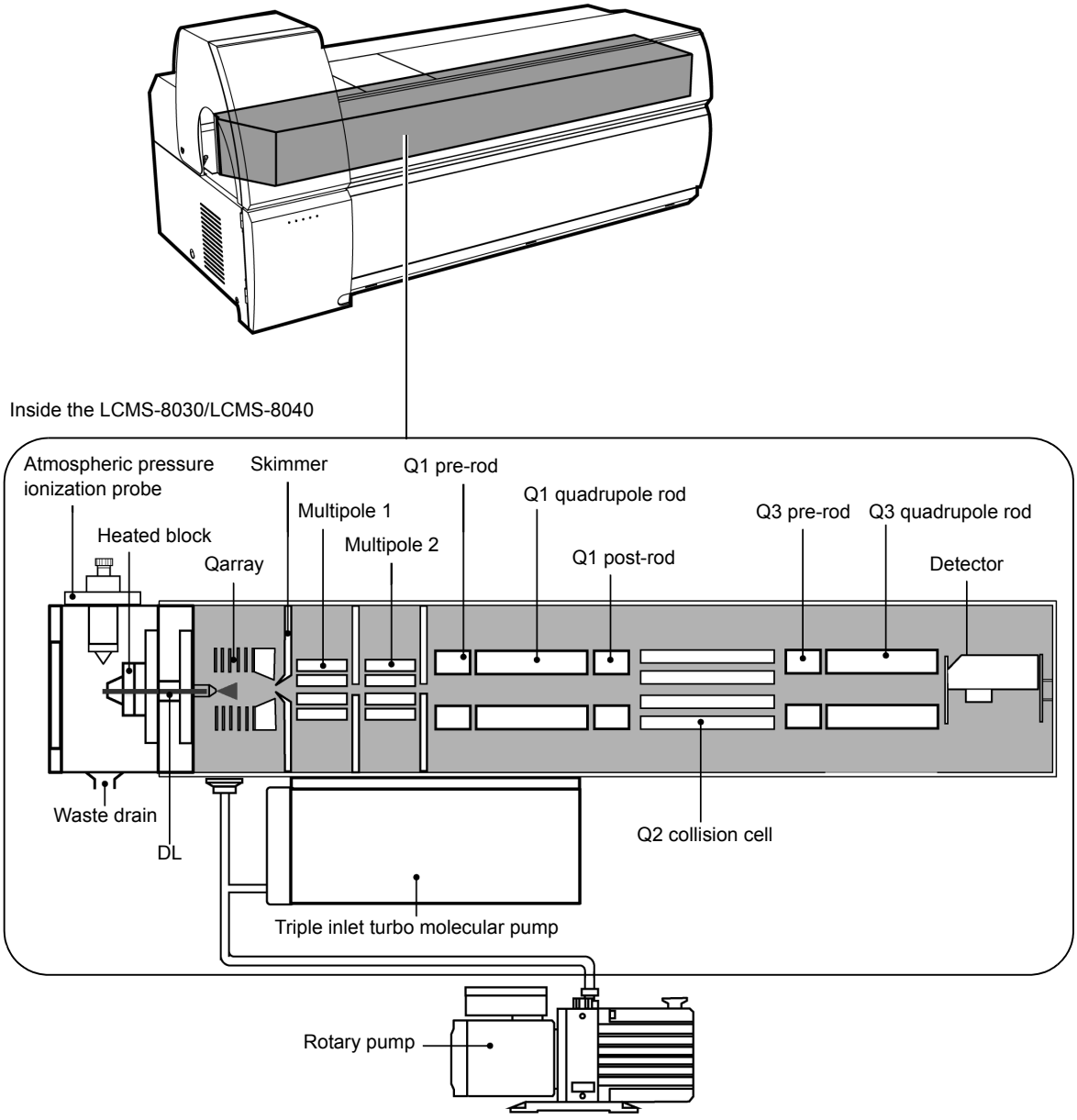

Inside the LCMS-8030/LCMS-8040
Atmospheric pressure ionization probe
Skimmer
Q1 pre-rod
Multipole 1
Q1 quadrupole rod
Q3 pre-rod
Q3 quadrupole rod
Heated block
Multipole 2
Qarray
Q1 post-rod
Detector
Waste drain
DL
Q2 collision cell
Triple inlet turbo molecular pump
Rotary pump

Fig. 7-1

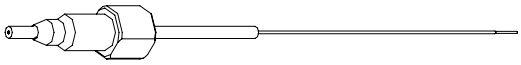
# 7.2 Maintenance of the ESI Probe

## 7.2.1 Replacing the Tubing

A high voltage (up to 5 kV) is applied to the sample solution sprayed from the tip of the capillary ASSY in order to ionize the sample. Since a very fine-gauge tube is used in the capillary ASSY, if any very small pieces of dirt get into the mobile phase or the sample, they can cause a blockage which will lead to a rise in the pump pressure.

If this happens, replace the tubing of the capillary ASSY.

### Parts used

| Part Name | Part No. |
|---|---|
| Capillary ASSY | S225-14948-91 |
|  | |
| O-ring | S036-19004-05 |

**NOTE**

When carrying out maintenance work on the ESI probe, rest it on the stand.

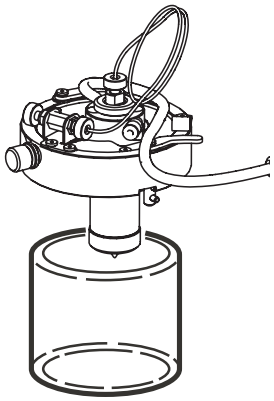


Fig. 7-2

1 Remove the ESI probe from the instrument.

Reference

"3.5.2 Removing the ESI Probe" P.58

2 Remove the ESI coupling.

1 Loosen the male nut ❶ by hand and remove it.
2 Loosen the ESI coupling ❷.

*3* Remove the knurled screw ❸.

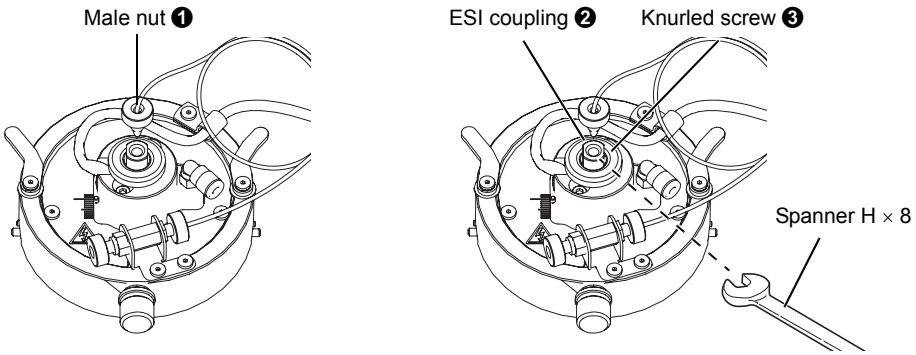



Fig. 7-3

*4* Remove the ESI coupling ❹.

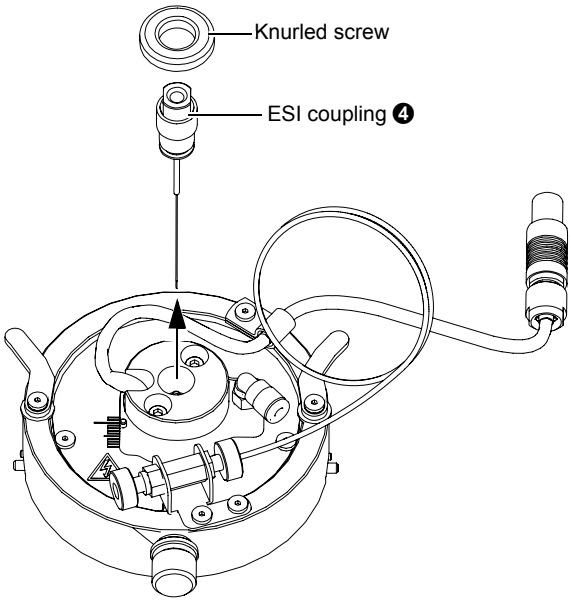
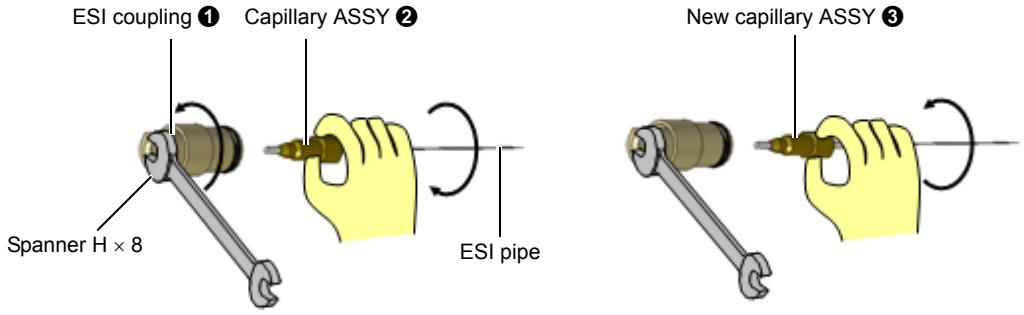



Fig. 7-4

## 3 Replace the capillary ASSY.

1. Remove the capillary ASSY ❷ from the ESI coupling ❶.
2. Mount the new capillary ASSY ❸ on the ESI coupling ❶.

   Tighten it firmly by hand.




**NOTE**

Make sure that the tip of the ESI pipe is not either projecting too far or too recessed.

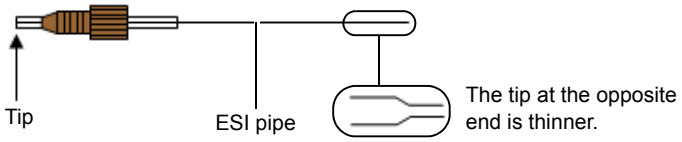



Fig. 7-5

## 4 Mount the ESI coupling in the ESI probe.

1. Insert the ESI coupling ❶ into the ESI probe.

   **Hint**

   If the O-ring of the ESI coupling is damaged, replace it.

   **Reference**

   "10.3.1 ESI Probe: S225-14949-41" P.232

2. Tighten the ESI coupling ❶ by hand and then turn it with a spanner, and adjust the projection of the tip.

   Adjust so that the tip of the capillary ASSY projects about 0.5 to 1 mm.

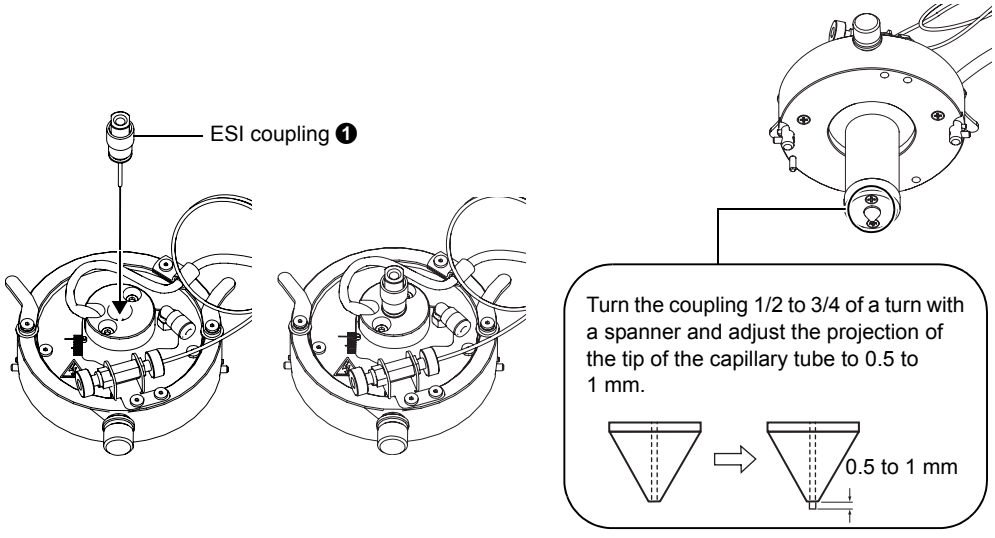



Fig. 7-6

## 5 Secure the ESI coupling in place.

1. Turn the knurled screw ❶ by hand and fix the position of the capillary ASSY.
2. Turn the male nut ❷ by hand to secure it.
   When securing the male nut ❷, press against the PEEK tube ❸ while tightening it.

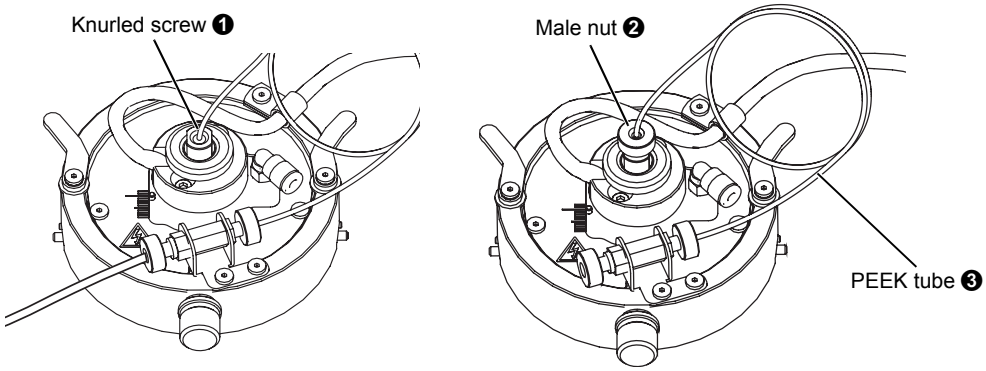



Fig. 7-7

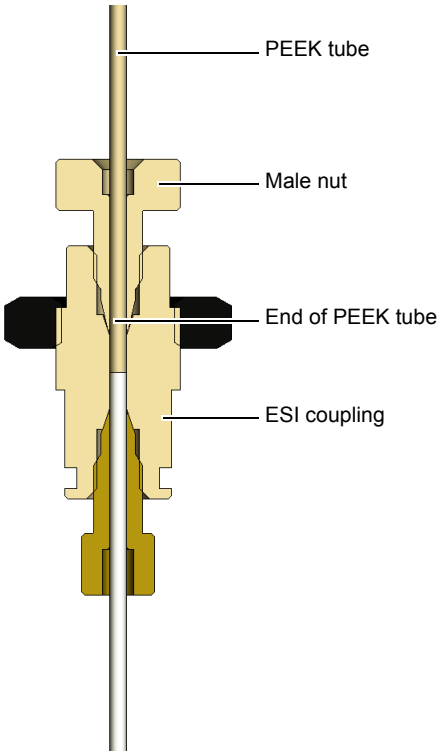



Fig. 7-8

## 7.2.2 Replacing the PEEK Tube

As a result of contamination in the mobile phase or sample, the tube may become blocked, causing the pump pressure to rise.

### Parts used

| Part Name | Part No. |
|---|---|
| PEEK tube<br>ϕ1.6 × ϕ0.13, red, 3 m | - |

1 Remove the ESI probe from the instrument.

Reference

"3.5.2 Removing the ESI Probe" P.58

2 Replace the PEEK tube.

1 Remove the male nuts ❶ at both ends and remove the PEEK tube ❷.

2 Replace the PEEK tube with the new one.

The standard tube length is 420 mm.

3 Attach the tube to the ESI probe and tighten the male nut at each end by hand.

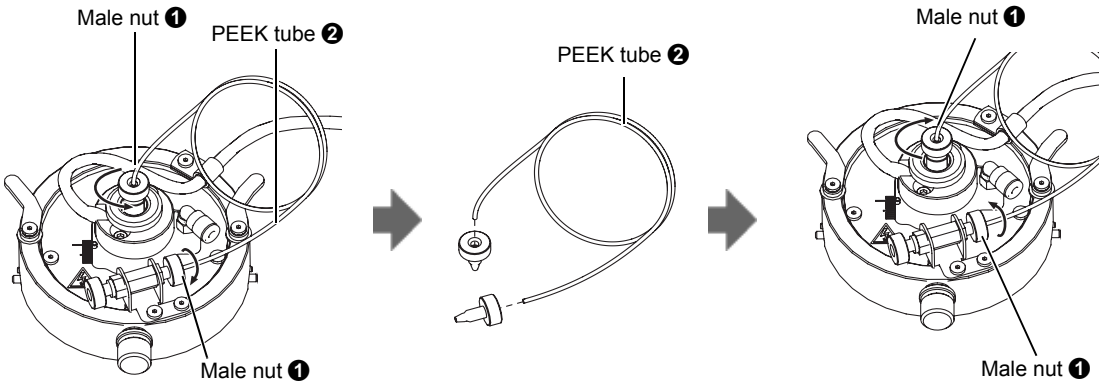



Fig. 7-9

**NOTE**

- If you are going to cut the PEEK tube before using it, use a tube cutter.
- When securing the male nuts, press against the PEEK tube while tightening them.

**Hint**

- The tube cutter (S228-32930-01) is not provided as an accessory. It is an option.
- Make sure that the cut face of the PEEK tube is always square. Cutting the tube on an incline will create dead volume which will lead to broadening of peaks.

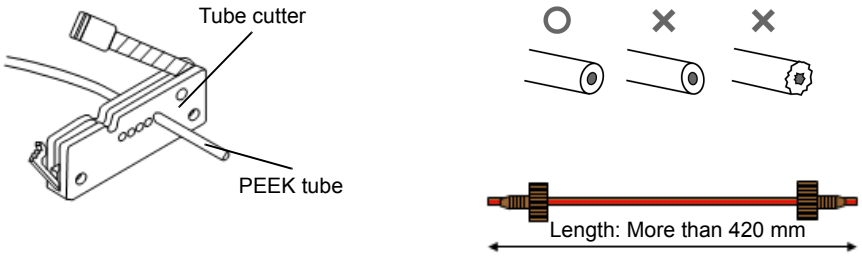



Fig. 7-10

## 7.2.3 Replacing the Tube Joint

If the tube joint for nebulizer gas develops a gas leak, replace it.

### Parts used

| Part Name | Part No. |
|---|---|
| Tube joint (Elbow, KQ2L23-M5) | S035-60724-21 |

1 Remove the ESI probe from the instrument.

Reference

"3.5.2 Removing the ESI Probe" P.58

2 Replace the tube joint.

1 Loosen the tube joint with a spanner and remove it.

2 Secure the new tube joint with the spanner.

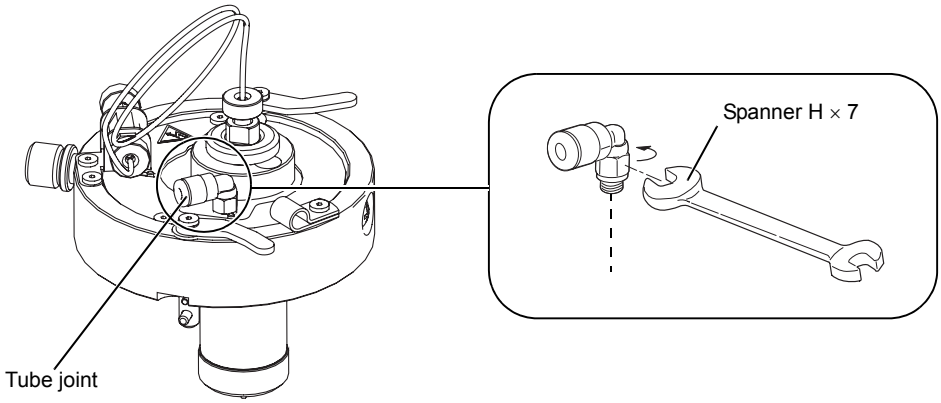



Fig. 7-11

NOTE

Note that overtightening will damage the thread, so care is required.

Finger-tighten the tube joint and then turn it another quarter of a turn with the spanner.

# 7.3 Maintenance of the APCI Probe

**WARNING**

Instructions

The inside of the APCI probe reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

Do NOT touch the metal faces at either end or the ceramic cylinder. You could sustain burns.

**CAUTION**

Instructions

When performing APCI analysis in which a halogenated mobile phase additive is used, note the following:

In the APCI method, the analyte is heated to high temperatures. If the mobile phase contains a halogenated compound such as chloroform, a corrosive gas will be produced. Even a small percentage concentration of halogens in the mobile phase can cause corrosion.

Use SUS tubes to connect the high performance liquid chromatograph to the instrument. PEEK resin tubes do not have sufficient strength and should they rupture, solvent may blow out.

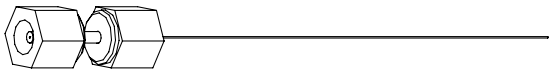
Black particles may build up on the APCI probe or inside the probe holder.

Because of exposure to corrosive gases, you may need to replace the following parts at a shorter interval than specified.

| Part Name | Part No. |
|---|---|
| APCI pipe ASSY | S225-15845-91 |
| Nebulizer joint ASSY | S225-15788-91 |
| Heater unit ASSY | S225-15619-41 |
| Adapter | S225-04993 |
| Ferrule (LCMS-2020) | S225-03748-03 |
| Nut | S225-15739 |
| Heater flange | S225-15486-91 |
| Needle unit | S225-15921-92 |
| DL | S225-15718-91 |

## 7.3.1 Replacing the APCI Pipe

### Parts used

| Part Name | Part No. |
|---|---|
| APCI pipe ASSY | S225-15845-91 |
|  | |

**NOTE**
When carrying out maintenance work on the APCI probe, rest it on the stand.

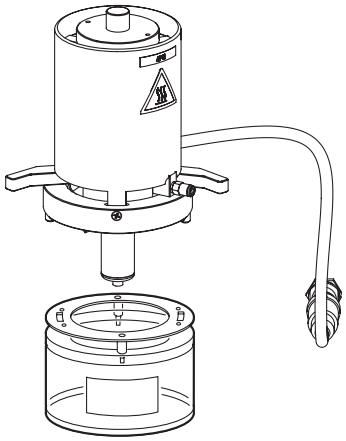


Fig. 7-12

### ■ Removing the APCI pipe

1 Remove the APCI probe from the instrument.

Reference
"3.6.3 Removing the APCI Probe" P.66

2 Remove the APCI cover.

1 Remove the screws ❶ at three locations.
2 Loosen the locking screw ❷.

3 Remove the APCI cover ❸.

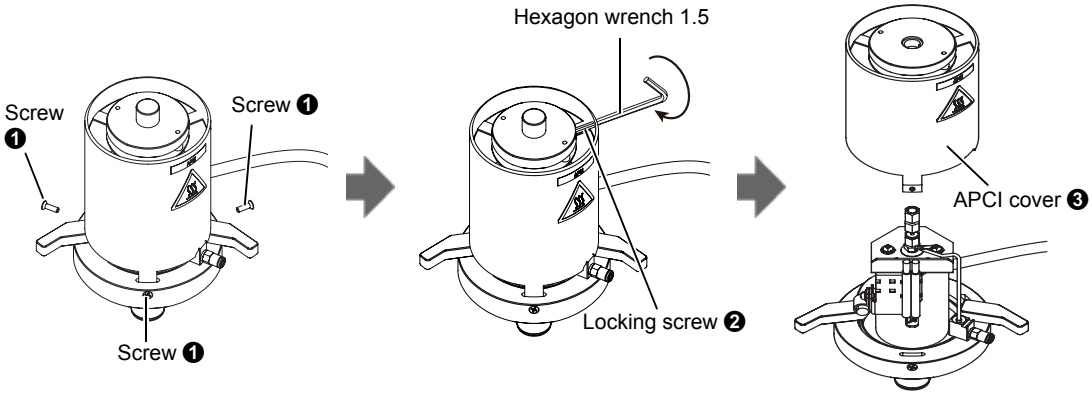



Fig. 7-13

## 3 Remove the APCI pipe ASSY.

1 Hold the nut ❶ at the heater side steady and turn the APCI adapter nut ❷.
2 Remove the APCI pipe ASSY ❸.

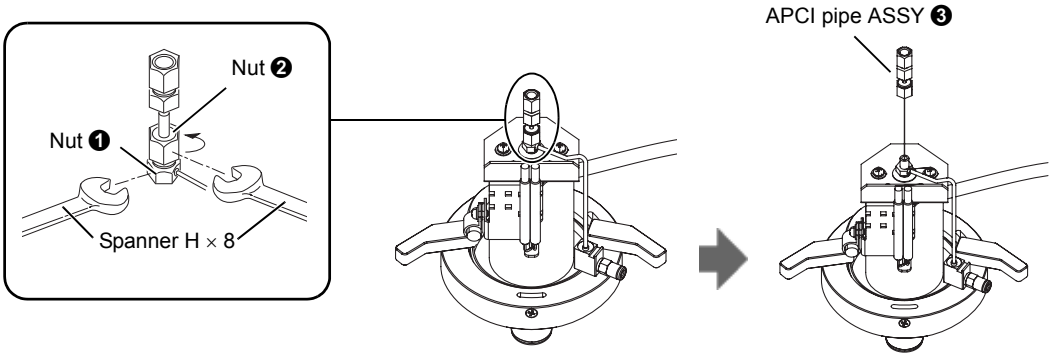



Fig. 7-14

## 4 Remove the APCI adapter from the APCI pipe ASSY.

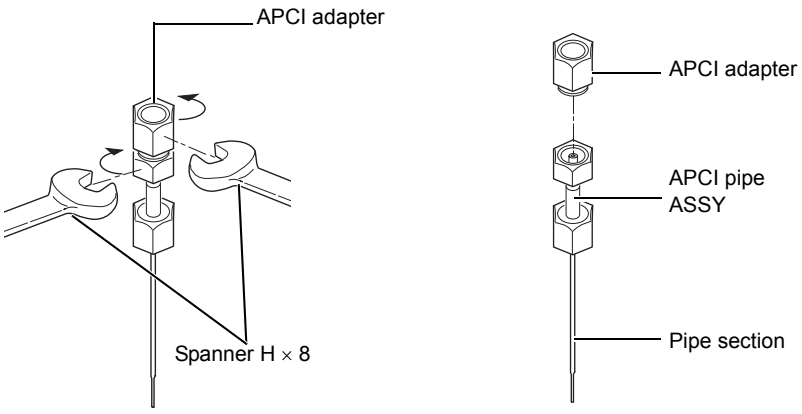



Fig. 7-15

**NOTE**
Handle the pipe section of the APCI pipe ASSY with care since it is easily bent.

## ■ Mounting the APCI pipe

1 Mount the APCI pipe.

1 Mount the APCI adapter ❷ on the new APCI pipe ❶.
2 Insert the APCI pipe into the APCI probe.
Insert the tip of the APCI pipe while keeping the pipe vertical.

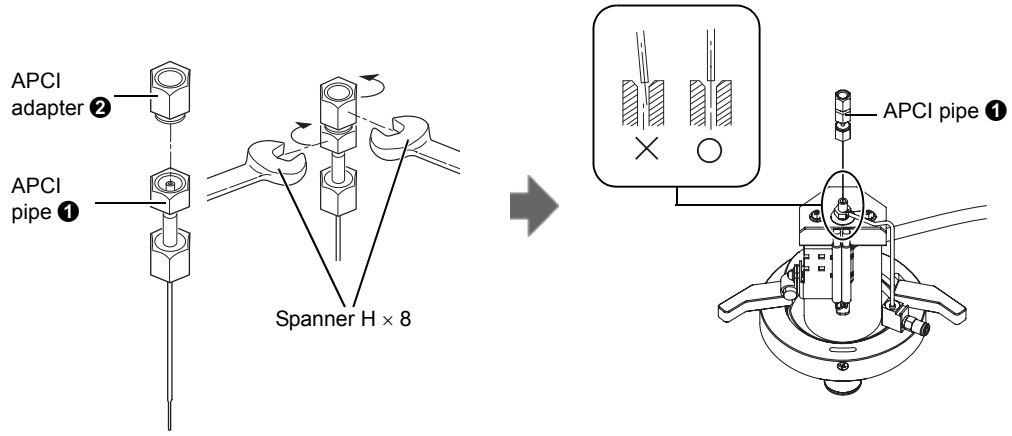



Fig. 7-16

**NOTE**
Finger-tighten the APCI adapter and then turn it another quarter of a turn with the spanner.

2 Mount the APCI cover.

1 Tighten the APCI pipe nut ❶.
2 Pass the APCI adapter through the hole in the APCI cover ❷.
3 Orient the notch ❸ correctly.
4 Insert the three projections ❹ into the three slots ❺.

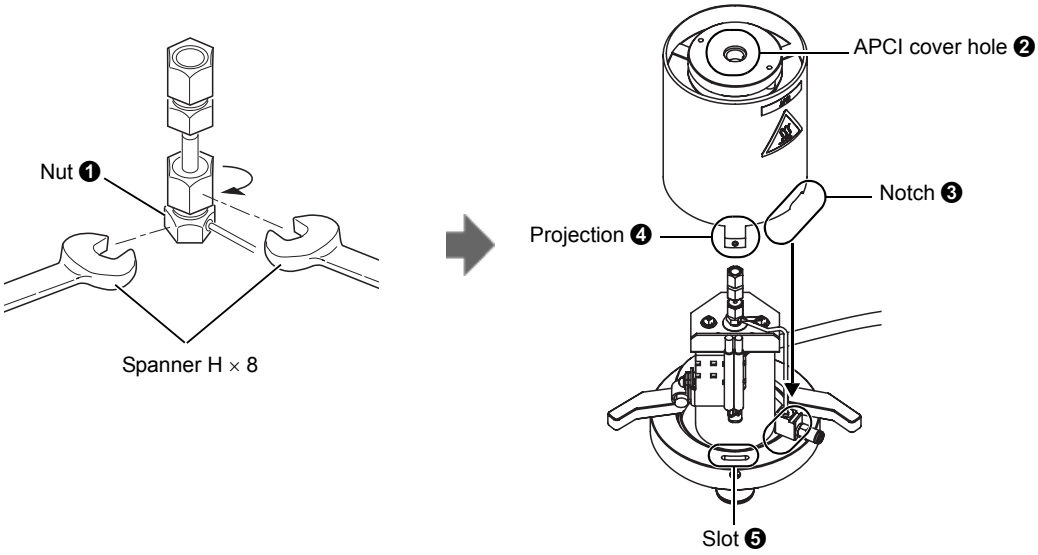



Fig. 7-17

5 Secure the APCI cover with the screws ❻ at three locations.
6 Tighten the locking screw ❼.

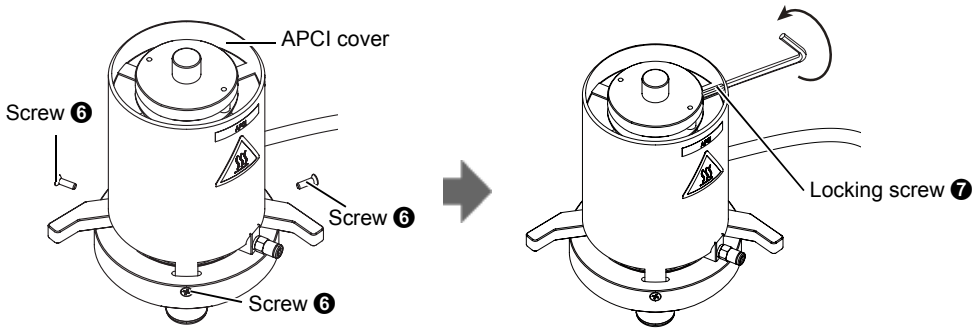
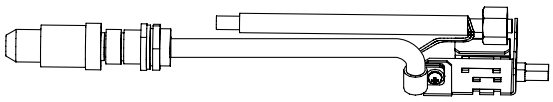



Fig. 7-18

## 7.3.2 Replacing the Heater Unit

### Parts used

| Part Name | Part No. |
|---|---|
| Heater unit ASSY | S225-15619-41 |
|  | |

### ■ Removing the APCI heater

1 Remove the APCI probe from the instrument.

Reference
"3.6.3 Removing the APCI Probe" P.66

2 Remove the APCI heater from the APCI probe.

1 Remove the screws ❶ at three locations.
2 Loosen the locking screw ❷.
Use a hexagon wrench 1.5.

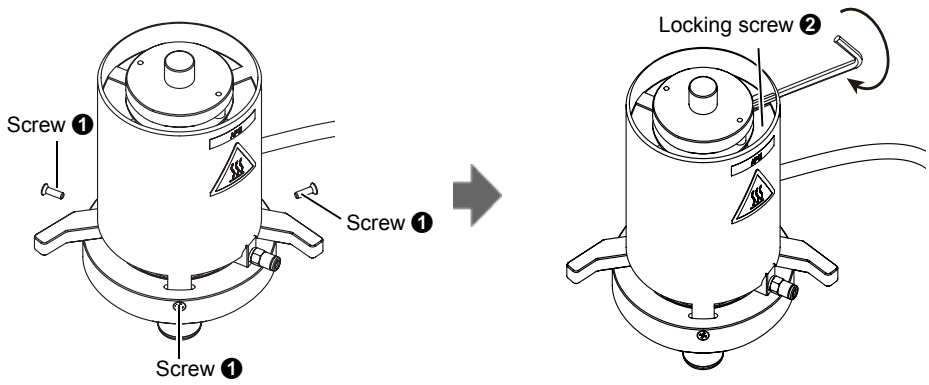



Fig. 7-19

3 Remove the APCI cover ❸.
4 Remove the screws ❹ at three locations.
5 Draw out the heater unit ❺.

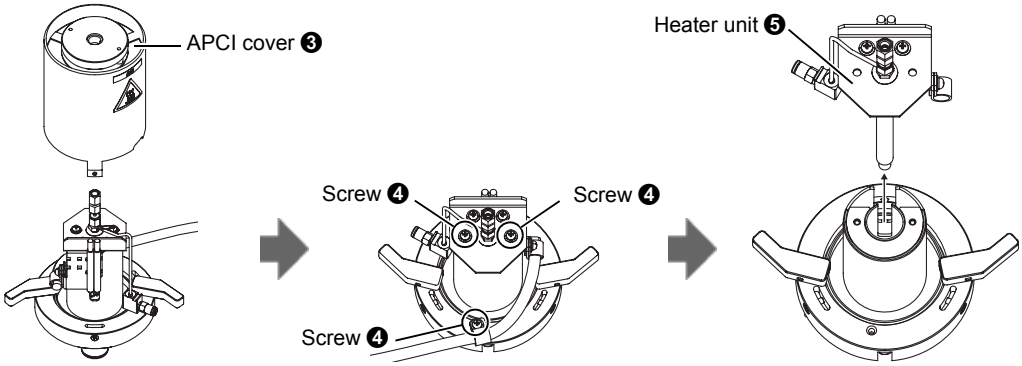



Fig. 7-20

## 3 Remove the nebulizer unit.

1 Remove the screws ❶ at two locations.
2 Remove the nut.
Hold the nut at the nebulizer side steady and loosen the nut at the heater side ❷.

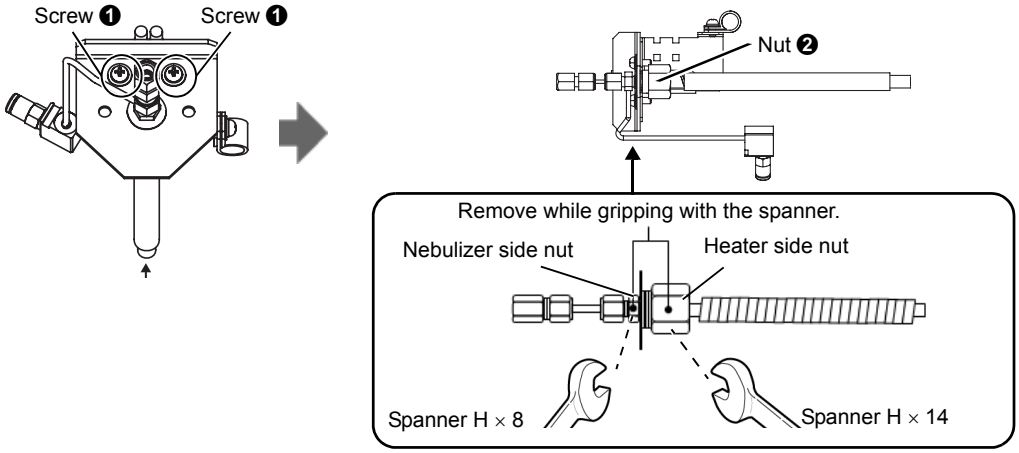



Fig. 7-21

3 Remove the nebulizer unit.

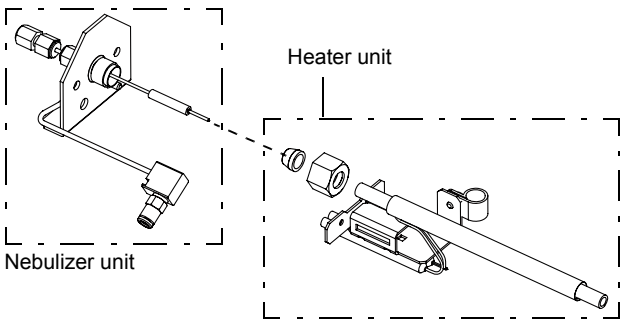



Fig. 7-22

## ■ Mounting the APCI heater

### 1 Mount the heater in the nebulizer unit.

1 Mount the ferrule ❶, nut ❷ and heater ❸.
2 Tighten the two screws ❹.
Tighten these screws in order to achieve alignment with the position of the ferrule.

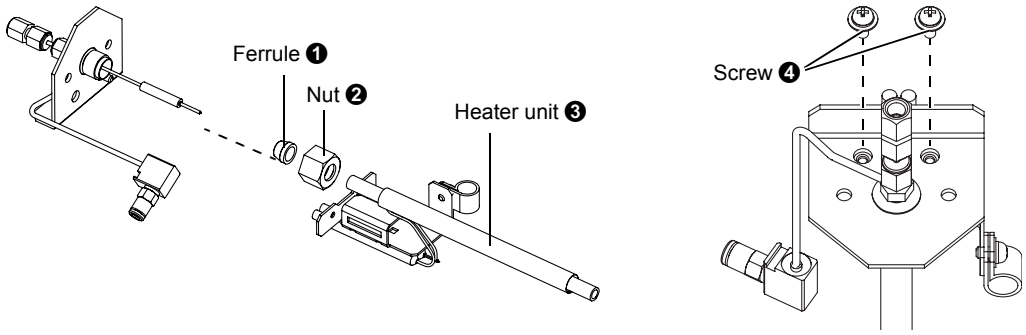



Fig. 7-23

**NOTE**
Take care to mount the ferrule in the correct orientation.

### 2 Secure the nut.

Hold the nut at the nebulizer side steady while tightening the nut at the heater side.

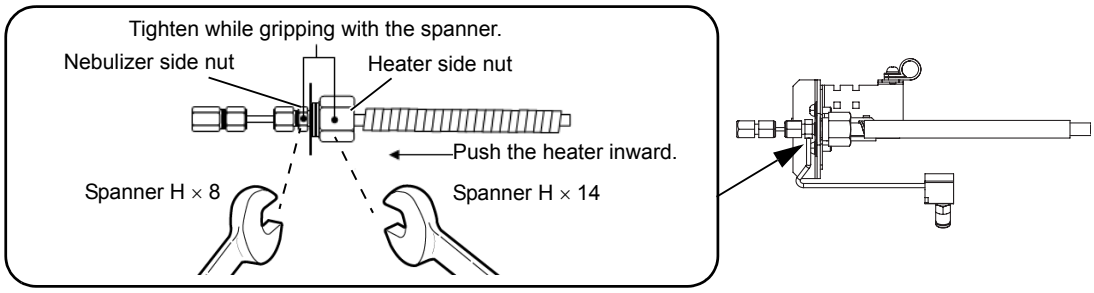



Fig. 7-24

**NOTE**
Push the heater toward the nut when tightening the nut at the heater side.

## 3 Insert the heater unit.

1. Align the cable section of the heater unit with the recess ❶ in the probe pedestal.
2. Align the tip of the heater unit with the hole in the probe pedestal.

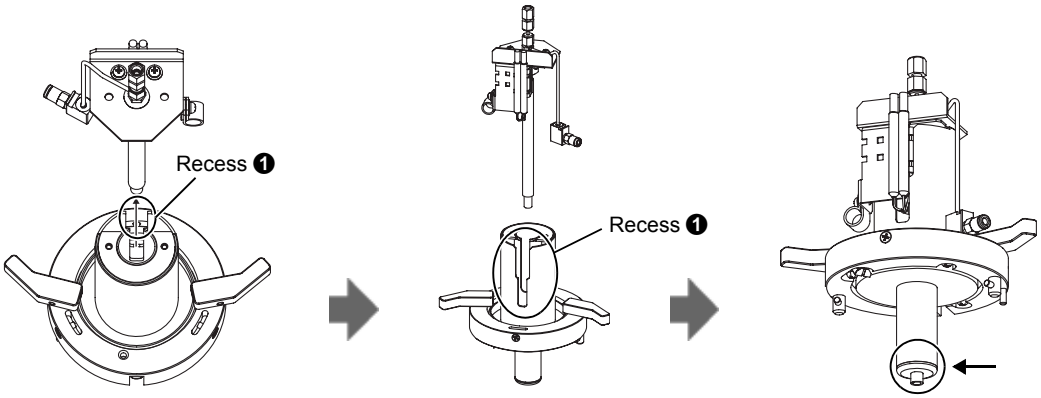



Fig. 7-25

## 4 Mount the APCI cover.

1. Tighten the screws ❶ at three locations.
2. Pass the adapter through the hole in the APCI cover ❷.
3. Orient the notch ❸ correctly.
4. Insert the three projections ❹ into the three slots.

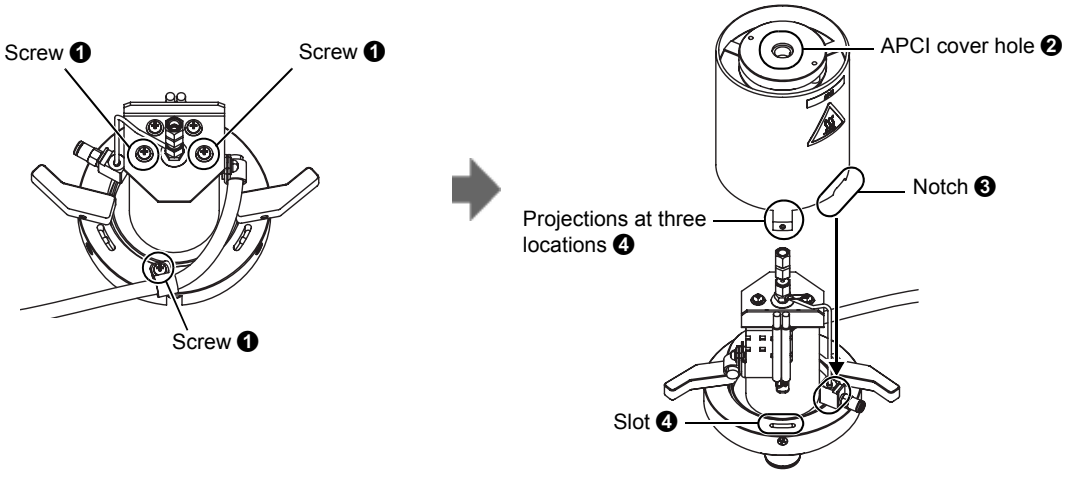



Fig. 7-26

5. Tighten the screws ❺ at three locations and the locking screw ❻.

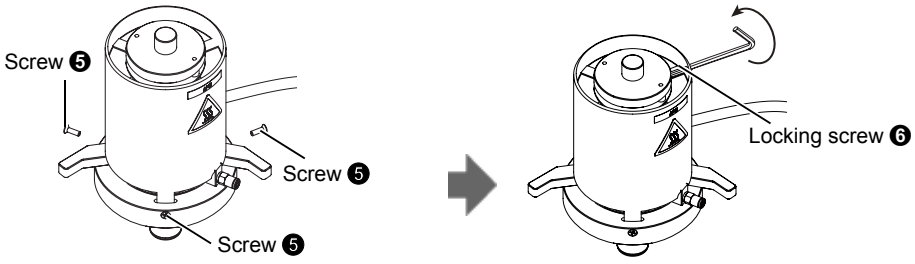



Fig. 7-27

## 7.3.3 Cleaning and Replacement of the APCI Corona Needle

**WARNING**

Instructions

Before starting maintenance work, turn the high-voltage switch OFF in the LabSolutions program and disconnect the high-voltage cable.

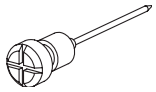
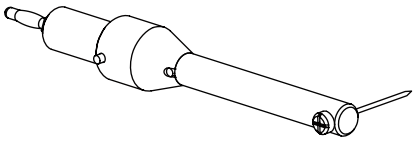
If the high-voltage cable is not disconnected there will be a danger of electric shock.

**CAUTION**

Instructions

Take care because the tip of the APCI needle is sharp.

### Parts used

| Part Name | Part No. |
|---|---|
| APCI needle | S225-15877-92 |
|  | |
| Needle unit ASSY | S225-14290-41 |
|  | |

1 Remove the needle unit from the instrument.

Reference

"3.6.4 Removing the Corona Needle for APCI" P.69

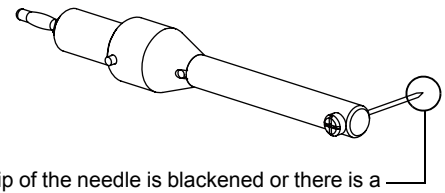



Fig. 7-28

## 2 Polish the APCI needle.

1 Remove the APCI needle ❶ with a screwdriver.

2 Polish the tip ❷ of the APCI needle.

Polish the tip of the APCI needle using about 4-micron lapping film. When polishing, take care not to curve the tip.

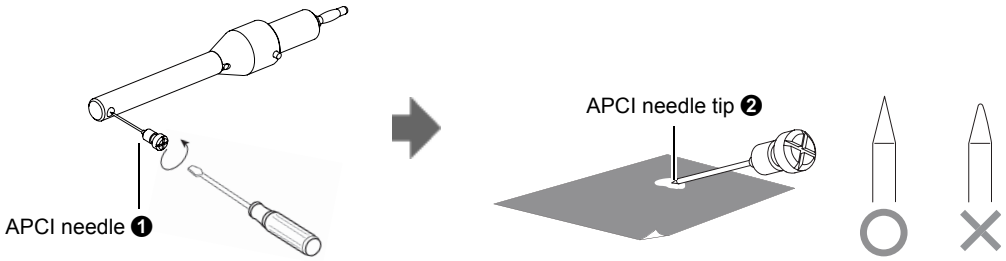



Fig. 7-29

## 3 Immerse the APCI needle in methanol and clean it by ultrasonic cleaning.

Fig. 7-30

## 4 Mount the APCI needle on the support arm.

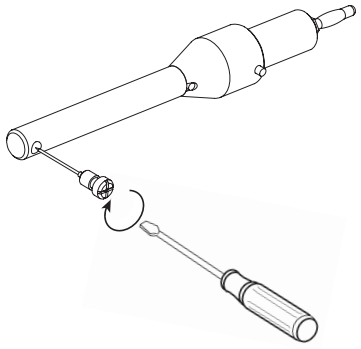


Fig. 7-31

5 Mount the needle unit on the instrument.

Reference
"3.6.1 Mounting the Corona Needle for APCI" P.60

NOTE
Before mounting the needle unit, check that the tip of the APCI needle is not bent by using the needle alignment tool.

Check that the needle is contained within the range of the slit and repair the needle if it is bent.

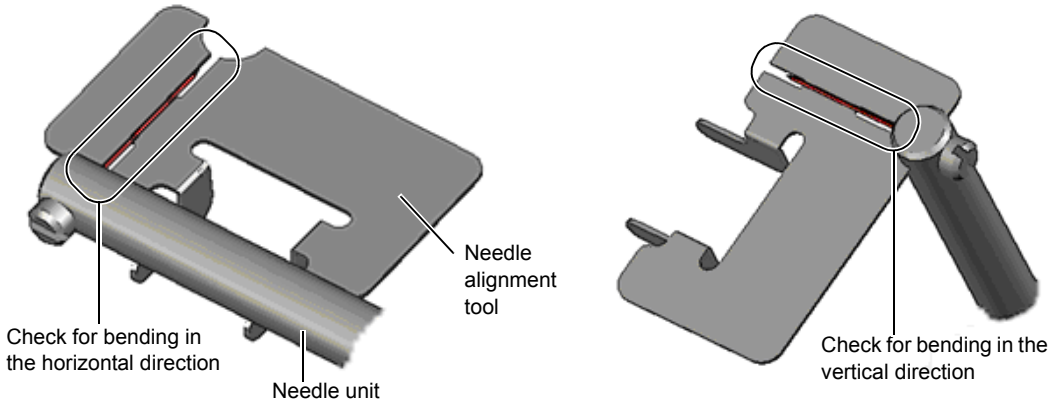



Fig. 7-32

## 7.3.4 Replacing the Gas Joint

If the tube joint for the nebulizer gas develops a gas leak it must be replaced.

### Parts used

| Part Name | Part No. |
|---|---|
| Gas joint (Half union, KQ2H01-M5) | S035-60725-01 |

1 Remove the APCI probe from the instrument.

Reference
"3.6.3 Removing the APCI Probe" P.66

2 Loosen the tube joint with a spanner and remove it.

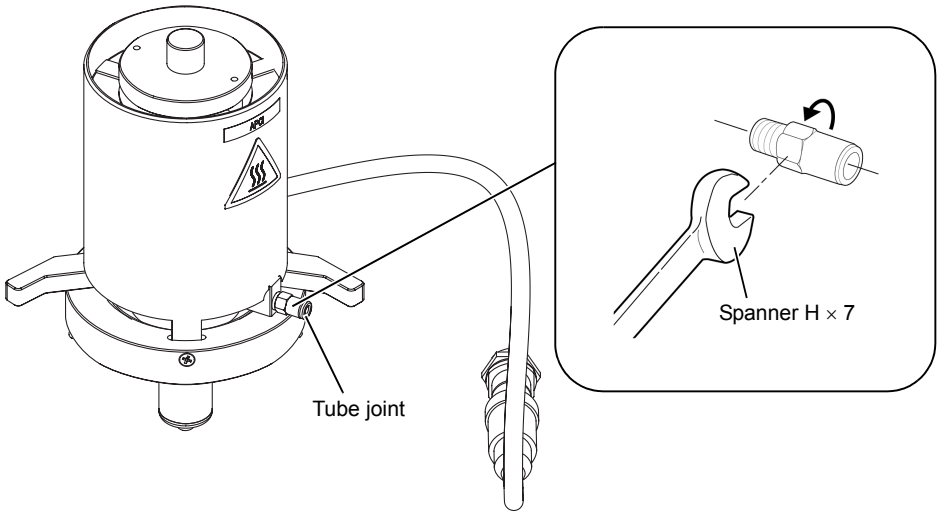



Fig. 7-33

3 Secure the new tube joint with the spanner.

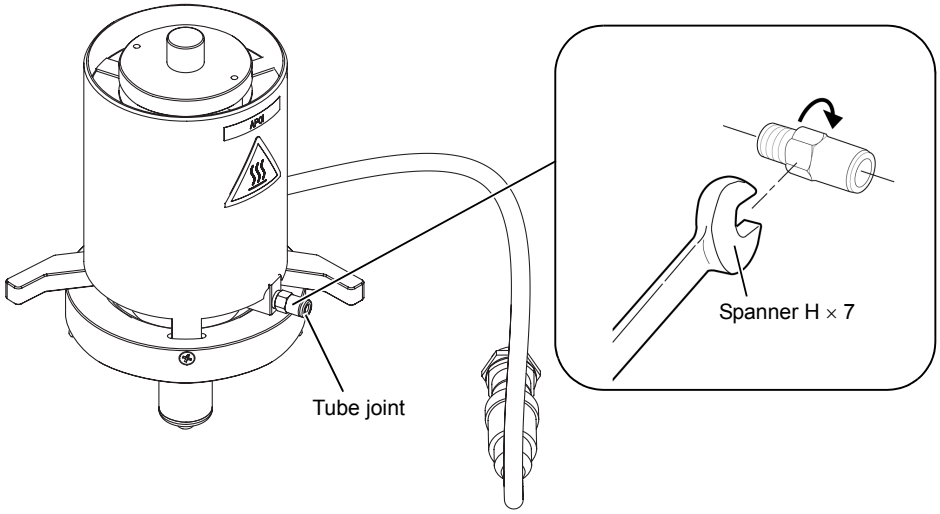



Fig. 7-34

**NOTE**

Finger-tighten the tube joint and then turn it another quarter of a turn with the spanner. Note that overtightening will damage the thread, so care is required.

# 7.4 Maintenance of DUIS

For maintenance procedures relating to the ESI probe, see "3.7 Preparation for DUIS Analysis" P.72.

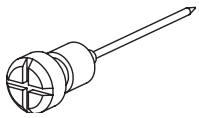
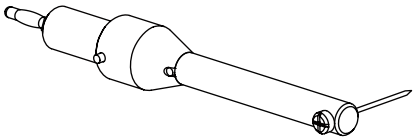
**CAUTION**

Take care because the tip of the DUIS needle is sharp.

Instructions

## 7.4.1 Cleaning or Replacing the Needle for DUIS

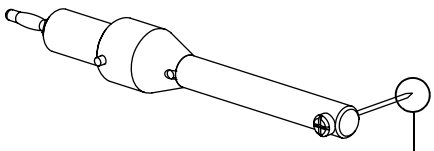
### Parts used

| Part Name | Part No. |
|---|---|
| DUIS needle | S225-15877-92 |
|  | |
| Needle unit ASSY | S225-14290-41 |
|  | |

1 Remove the needle unit from the instrument.

Reference

"3.7.3 Removing the ESI Probe" P.76



If the tip of the needle is blackened or there is a foreign body present, clean the needle.

Fig. 7-35

## 2 Polish the DUIS needle.

1 Loosen the DUIS needle ❶ with a screwdriver and remove it.

2 Polish the tip ❷ of the DUIS needle.

Polish the tip of the needle using about 4-micron lapping film. When polishing, take care not to curve the tip.

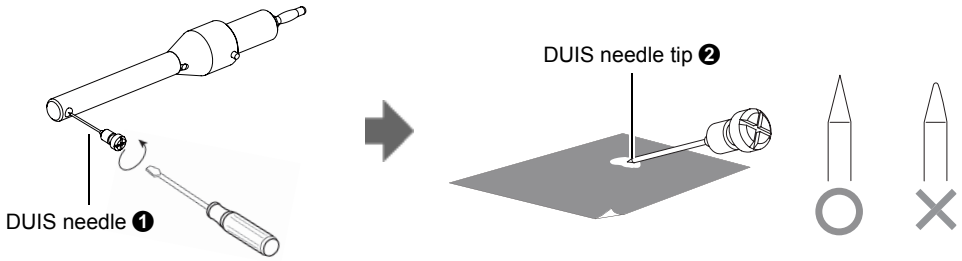



Fig. 7-36

## 3 Immerse the DUIS needle in methanol and clean it by ultrasonic cleaning.

Fig. 7-37

## 4 Mount the DUIS needle on the support arm.

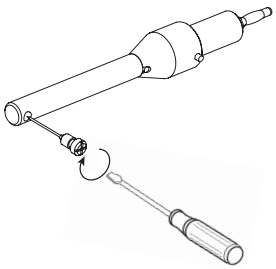


Fig. 7-38

**NOTE**

Check the mounting angle of the DUIS needle with the tool and, if the angle is incorrect, correct it.

**Reference**

"7.3.3 Cleaning and Replacement of the APCI Corona Needle" P.136

## 5 Mount the needle unit to the instrument.

**Reference**

"3.7.1 Mounting the Corona Needle for DUIS" P.72

# 7.5 Maintenance of the Lens System

**WARNING**

Instructions

Stop the vacuum system and turn the instrument power switch OFF before starting maintenance work.

If you do not turn the power switch OFF there will be a danger of electric shock.

**CAUTION**

Instructions

Wear clean gloves when carrying out maintenance work on the lens system.

Since the lens system focuses the ions generated by the ionization unit, it becomes soiled over long periods of use and the detection sensitivity diminishes. For this reason you must clean the following lens system components: Qarray, skimmer, multipoles, and entrance lens. Also, clean the lens system components when a considerable decrease in sensitivity is observed.

## 7.5.1 Removing the Multipoles and Entrance Lens

1 Stop evacuation and turn the power switch OFF.

Reference
"3.2 Stopping the Instrument" P.48

2 Open the multipole maintenance cover.

1 Press the indentation with your finger.
2 Lift the entire cover upward to remove it.

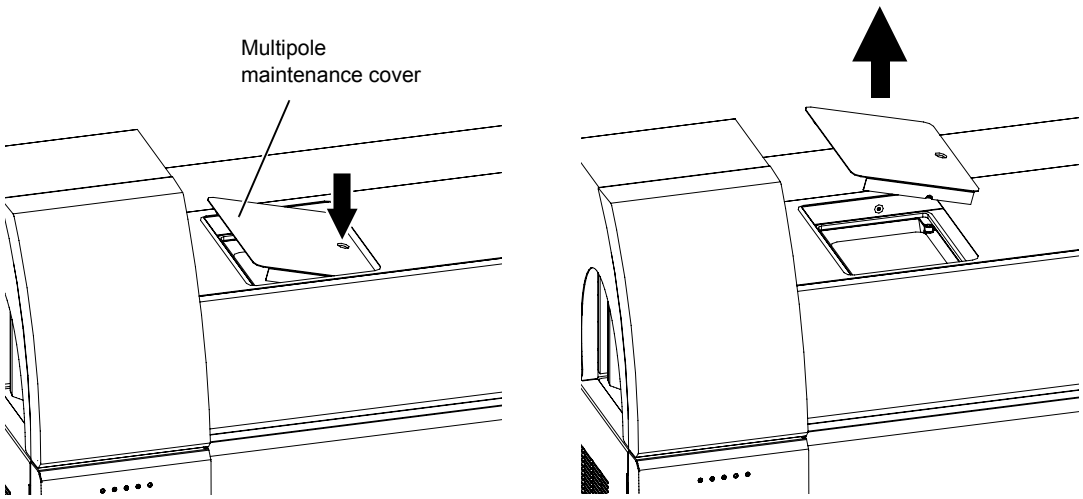



Fig. 7-39

## 3 Open the lens system door.

Loosen the knurled screw to open the door. The vacuum housing must be opened to atmosphere before opening the door.

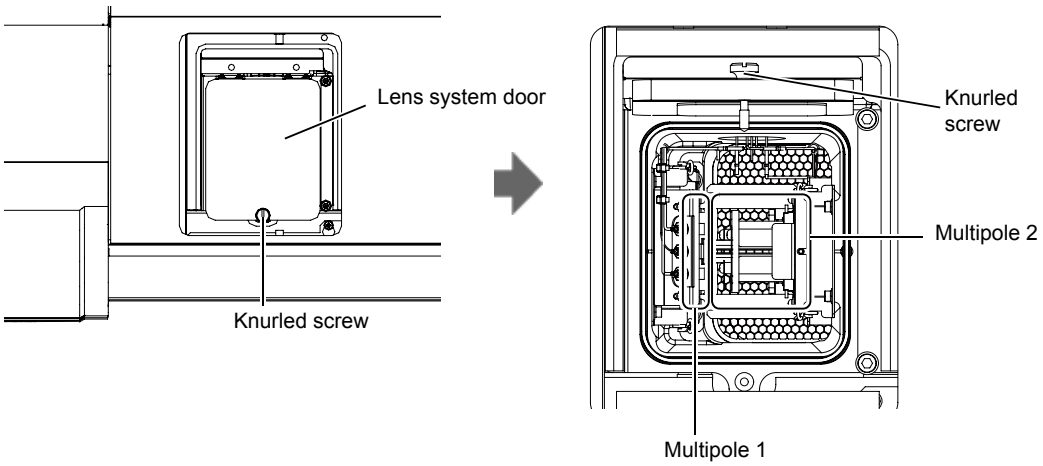



Fig. 7-40 (The figure shows the LCMS-8040.)

## 4 Remove multipole 2 and the entrance lens.

1. Remove the hooks at two locations from the hook plate.
2. Slide the flange section of multipole 2 and lift it upward.

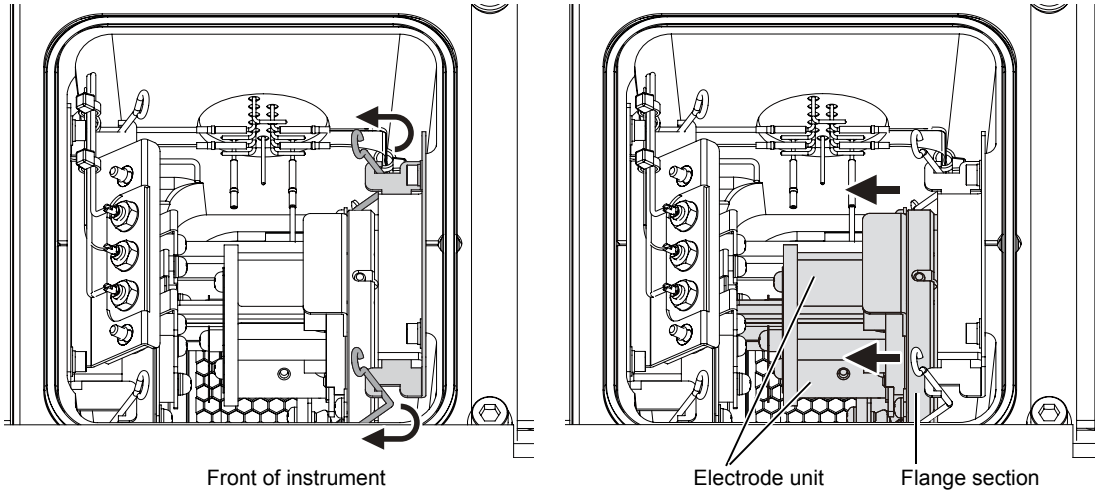



Fig. 7-41 (The figure shows the LCMS-8040.)

**Hint**

Once you have removed the flange section, lift the multipole upward while keeping it horizontal.

**NOTE**

- Hold the flange section during removal so that you do not touch the electrode unit.
- Do not place any parts on top of the instrument.

5 Remove multipole 1 and the entrance lens.

1 Remove the hooks at two locations from the hook plate.
2 Slide the flange section of multipole 1 and lift it upward.

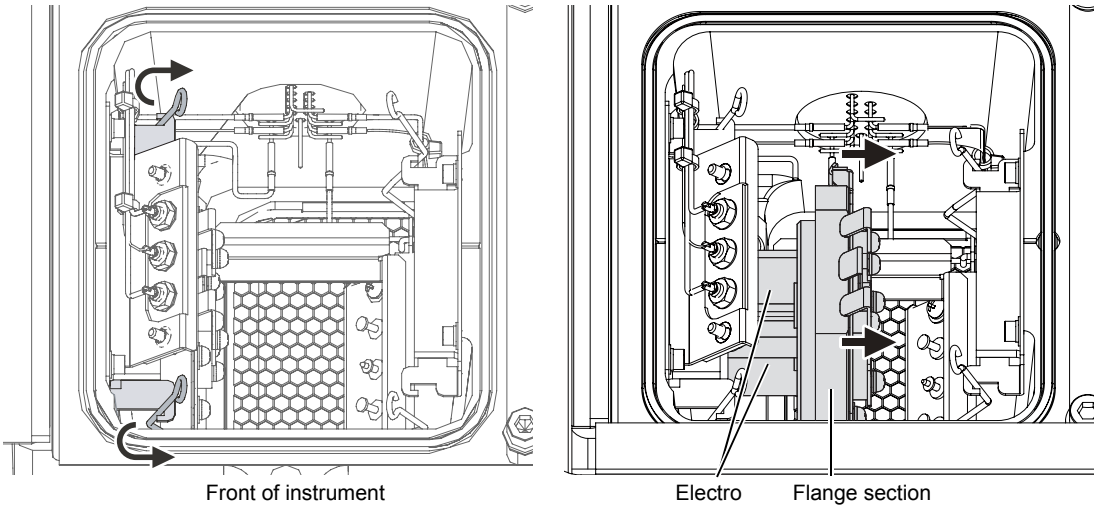



Fig. 7-42 (The figure shows the LCMS-8040.)

## 7.5.2 Cleaning the Multipoles and Entrance Lens

**CAUTION**

Prohibitions

Do NOT disassemble either multipole body.
Disassembling them could cause injuries and instrument failure.

1 Clean the multipoles.

1 Immerse the multipoles in methanol and clean them by ultrasonic cleaning.
2 Remove the multipoles from the methanol and leave them to air until dry.

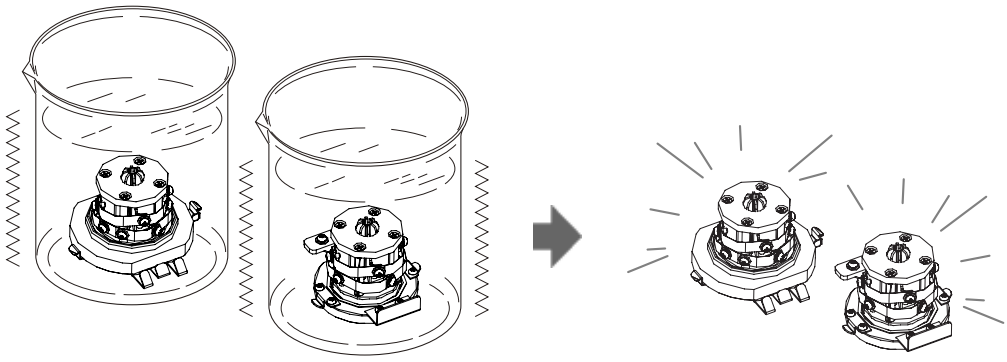


Fig. 7-43

**NOTE**

Do not use paper towels but allow the multipoles to dry naturally.

## 7.5.3 Removing the Qarray and Skimmer

1 Open the probe cover.

2 Open the source window and remove it.

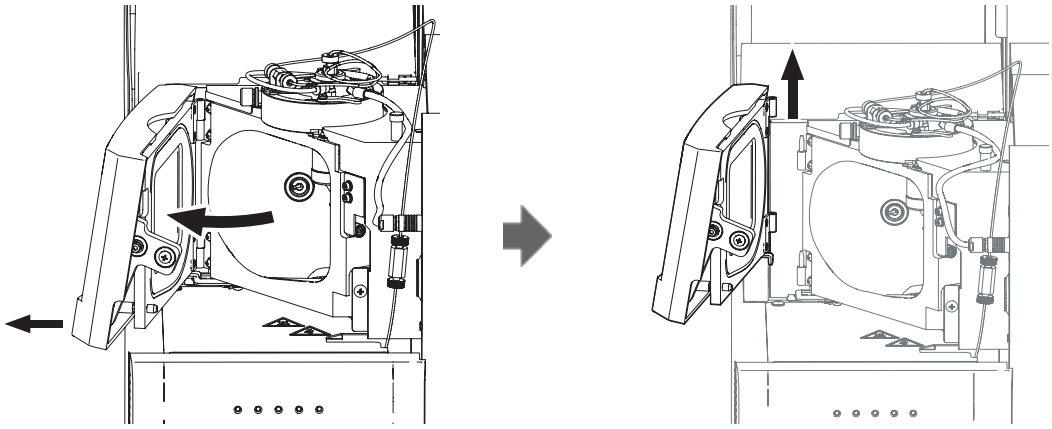


Fig. 7-44

3 Remove the ESI and APCI probes from the instrument.

Reference

"3.5.2 Removing the ESI Probe" P.58

"3.6.3 Removing the APCI Probe" P.66

4 Open the front door.

5 Pull the lever up and open the probe holder.

NOTE

The vacuum housing must be opened to atmosphere before opening the door.

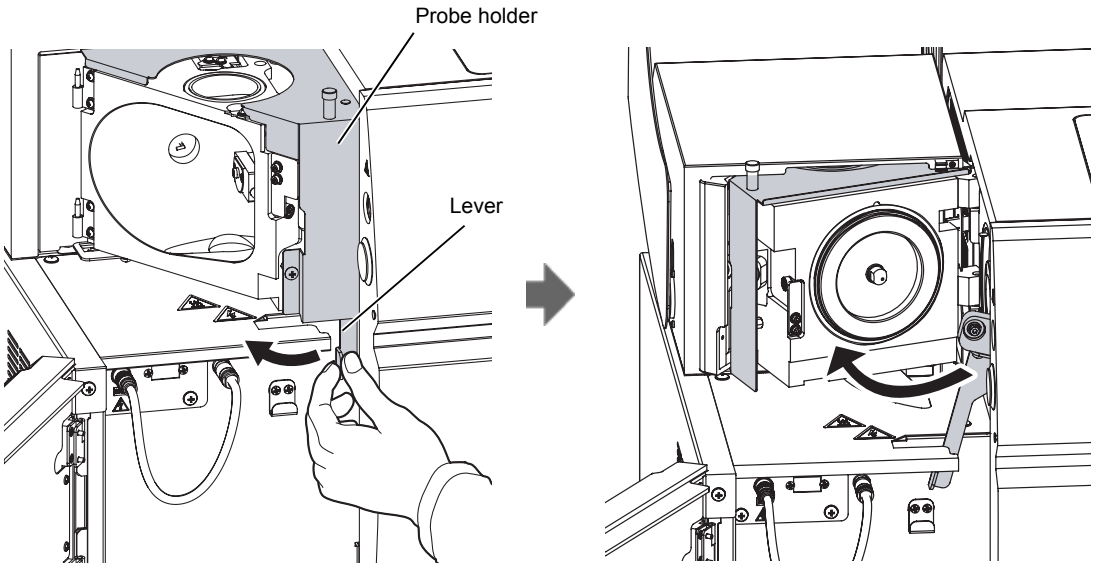



Fig. 7-45

6 Remove the flange.

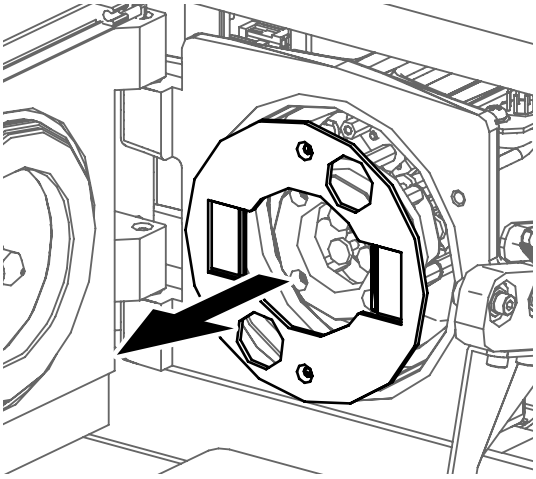


Fig. 7-46

7 Draw out the Qarray and skimmer.

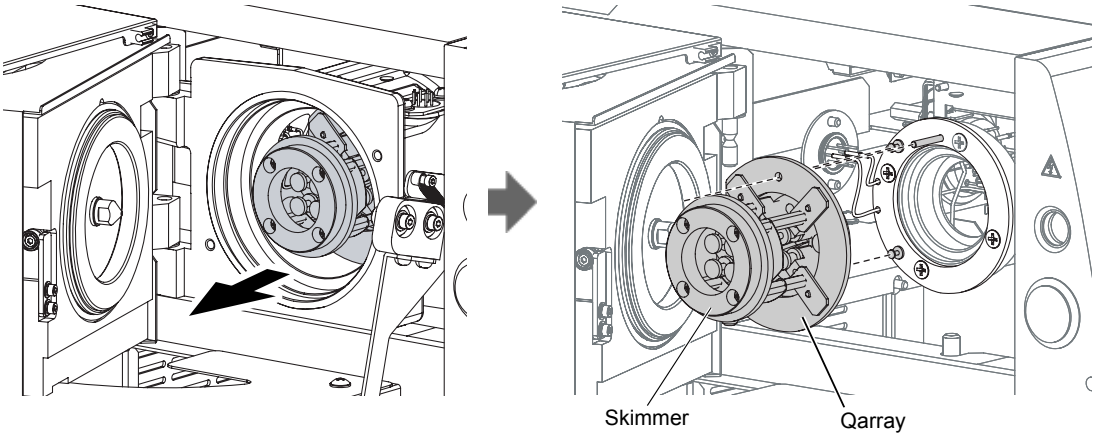



Fig. 7-47

## 7.5.4 Cleaning the Qarray and Skimmer

**CAUTION**

Prohibitions

Do NOT disassemble the Qarray body.
Disassembling it could cause injuries and instrument failure.

**NOTE**
Rest the Qarray on the probe stand and then remove the skimmer.

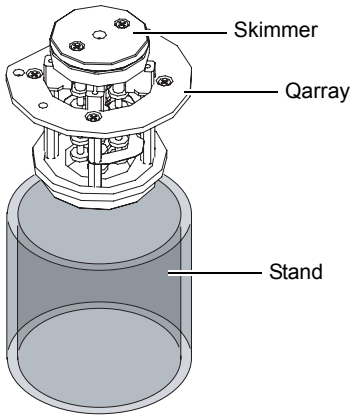



Fig. 7-48

1 Clean the Qarray and skimmer.

1 Remove the two screws ❶ and remove the skimmer ❷.
2 Immerse the skimmer and Qarray in methanol and subject them to ultrasonic cleaning.

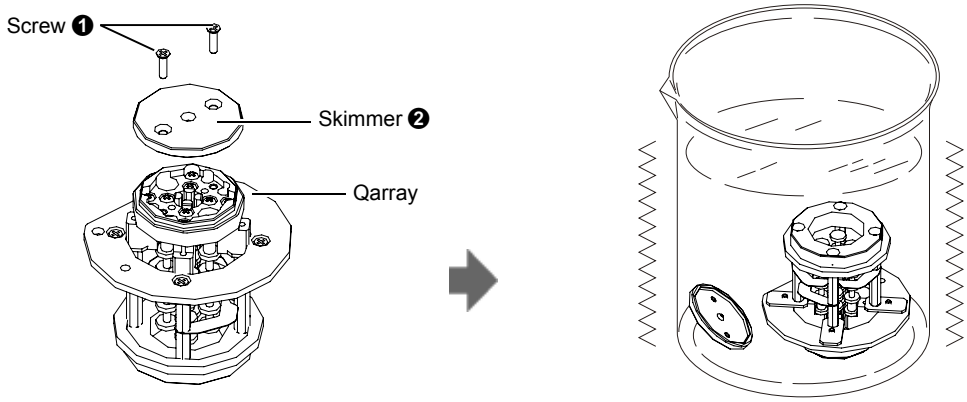



Fig. 7-49

## 2 Return the parts to their original positions.

### 1 Dry the parts after cleaning.

**NOTE**

If the central part of the inner face of the skimmer is soiled, wipe it clean, e.g. with a cloth. If there is any contamination adhering to the central hole, remove it.

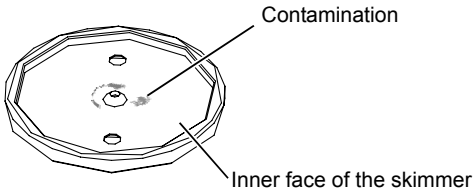



Fig. 7-50

### 2 Mount the skimmer ❶ and secure it with the two screws ❷.

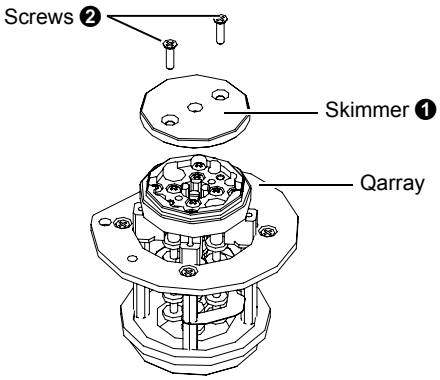



Fig. 7-51

## 7.5.5 Mounting the Qarray and Skimmer

1 Mount the Qarray and skimmer by fitting them on the guide pins.

Insert the Qarray all the way in until it slightly pushes back towards you on the springs.

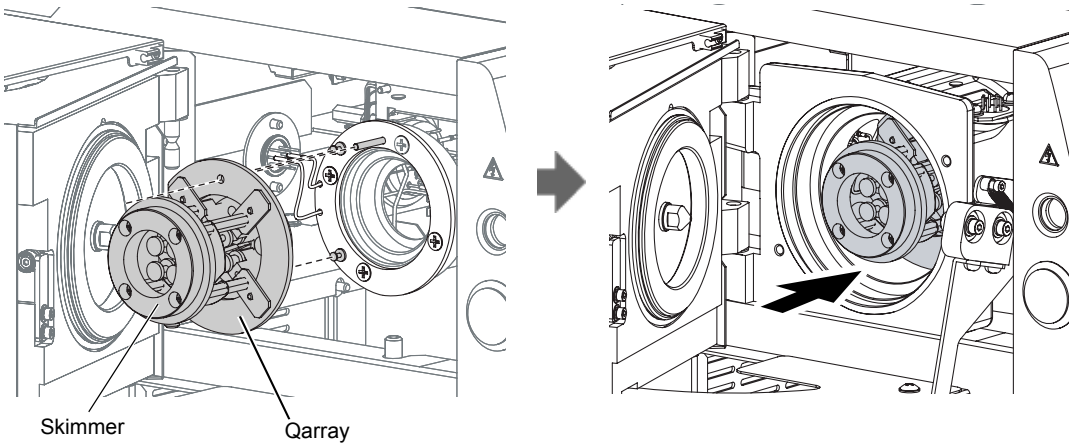



Fig. 7-52

2 Attach the flange.

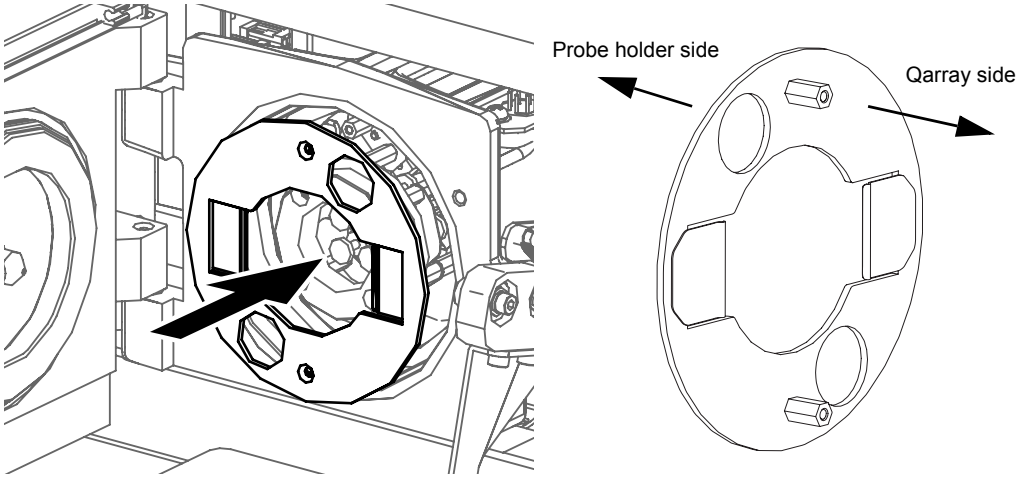



Fig. 7-53

3 Return the probe holder to its original position and close the lever.

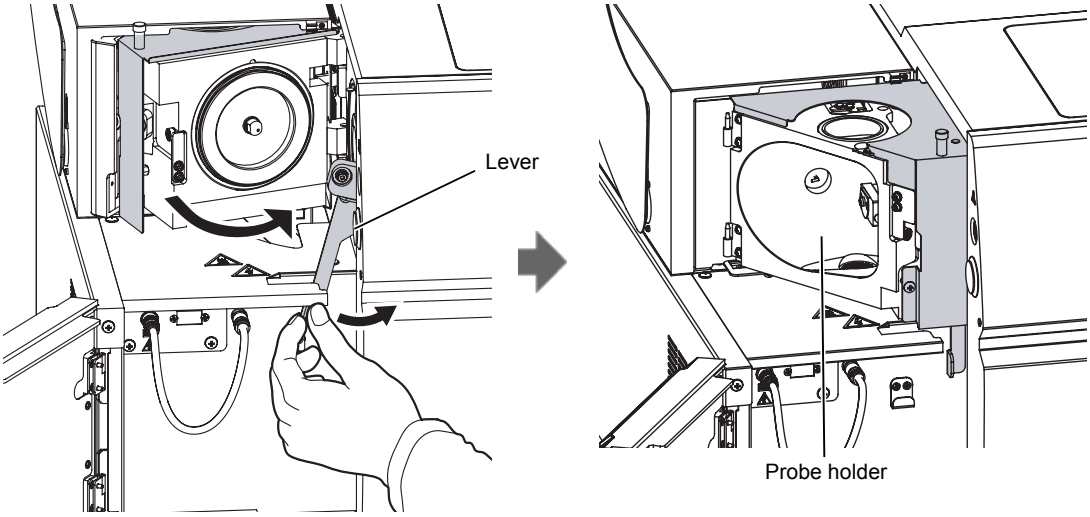



Fig. 7-54

4 Mount the ESI and APCI probes.

Reference

"3.7.2 Mounting the ESI Probe" P.75
"3.6.2 Mounting the APCI Probe" P.63

5 Mount the source window.

## 7.5.6 Mounting the Multipoles and Entrance Lens

*1* Mount the multipoles and the entrance lens.

*1* Hold and slide the flange section and insert multipole 1.
*2* Attach the hooks at two locations onto the hook plate.

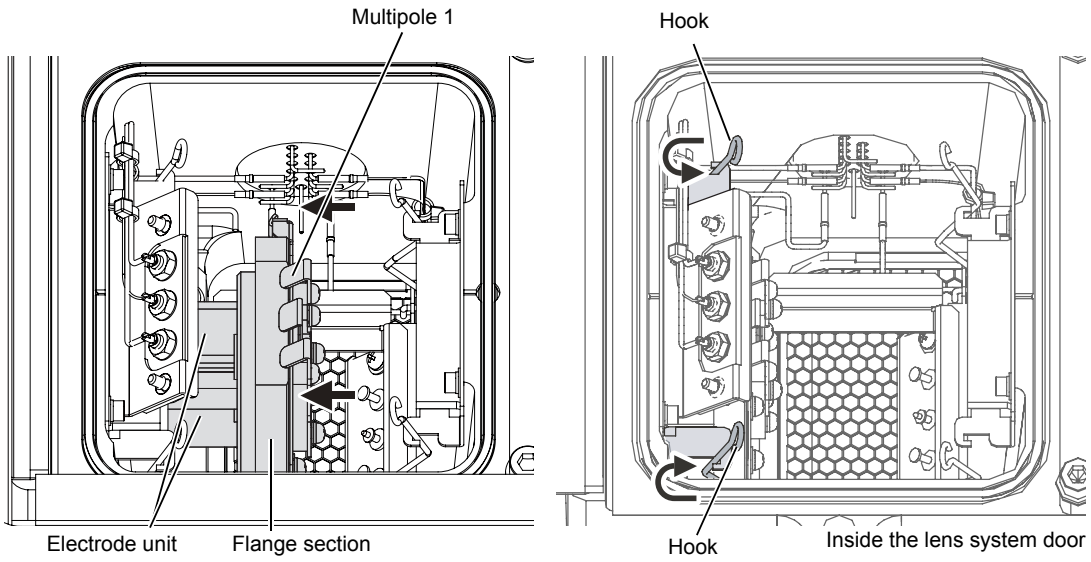



Fig. 7-55 (The figure shows the LCMS-8040.)

*2* Mount multipole 2 and the entrance lens.

*1* Hold the flange section and insert multipole 2.
*2* Attach the hooks at two locations onto the hook plate.

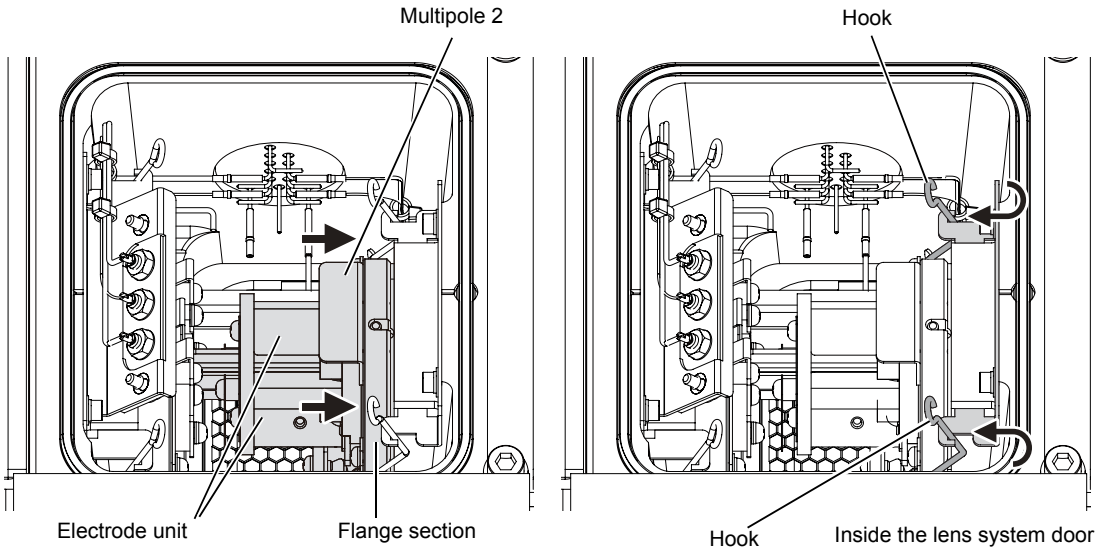



Fig. 7-56 (The figure shows the LCMS-8040.)

3 Close the lens system door.

Close the lens system door and secure it with the knurled screw.

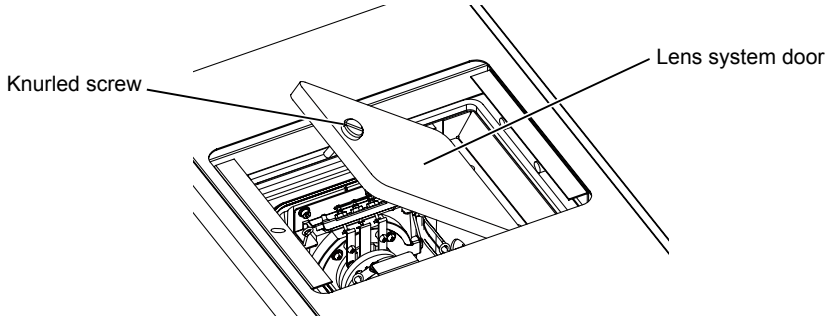



Fig. 7-57

## 7.5.7 Replacing the O-Ring

1 Stop evacuation and turn the power switch OFF.

Reference

"3.2 Stopping the Instrument" P.48

2 Open the multipole maintenance cover.

1 Press the indentation with your finger.
2 Lift the entire cover upward to remove it.

3 Loosen the knurled screw and open the lens system door.

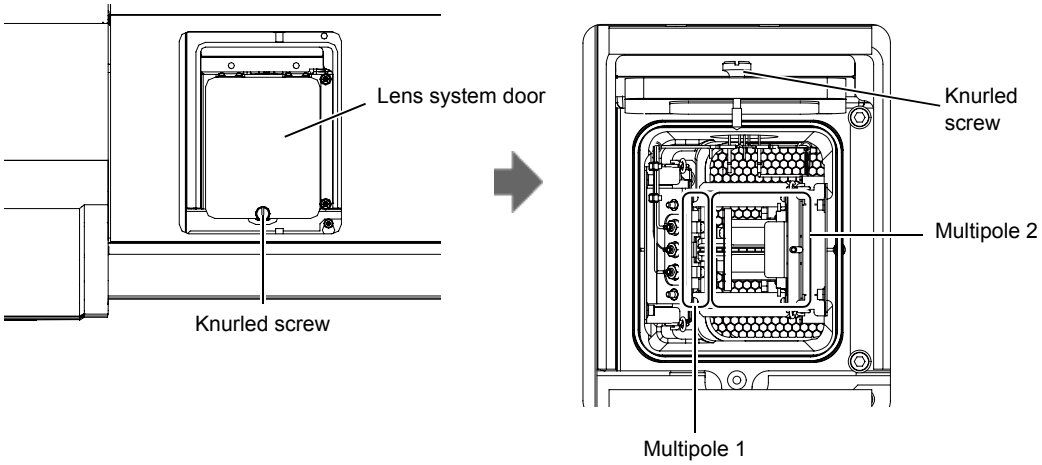



Fig. 7-58 (The figure shows the LCMS-8040.)

4 Remove the O-ring and, if there is any damage, replace it.

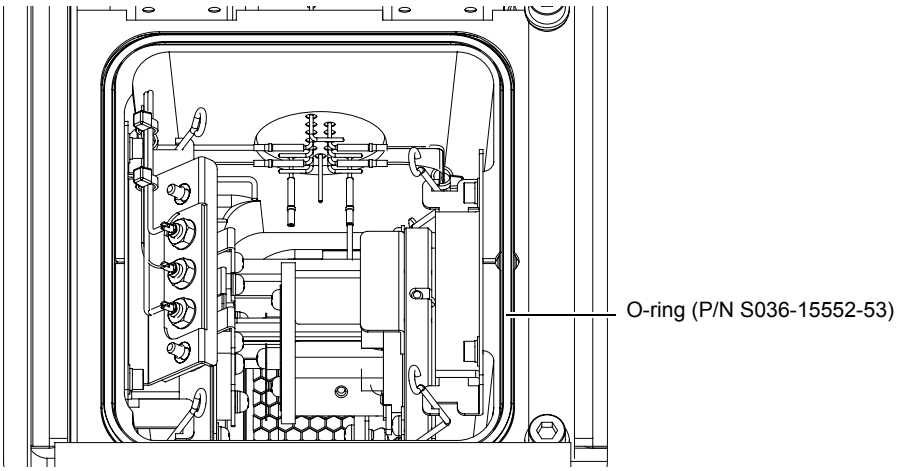



Fig. 7-59 (The figure shows the LCMS-8040.)

**NOTE**

When inserting the O-ring into the groove, make sure that there is no dirt adhering to it.

# 7.6 Maintenance of the Standard Sample Introduction Unit

## 7.6.1 Replacing the Standard Sample

1 Stop pumping the standard sample.

Reference

"8.2.1 Checking Ions in the [MS Tuning] Window" P.201

2 Open the front door.

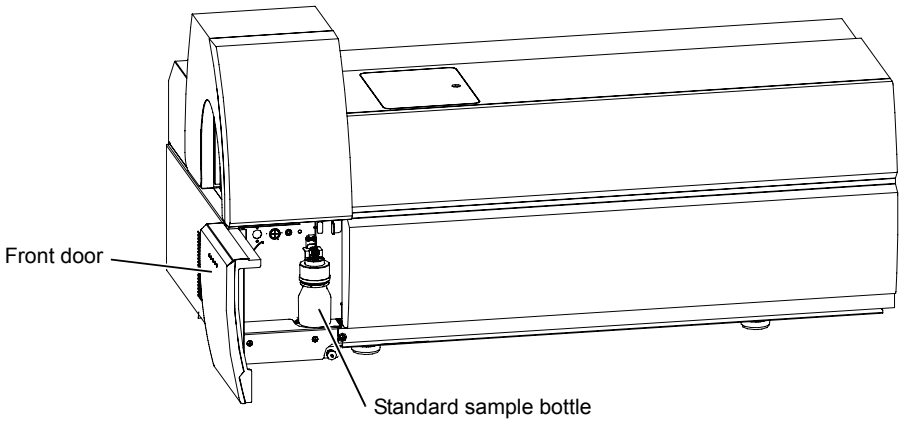



Fig. 7-60

3 Remove the standard sample bottle.

1 Disconnect the resistance tube.
2 Lift the standard sample bottle up to remove it from the bracket.
3 Turn the bottle ❷ while holding the bottle cap ❶.

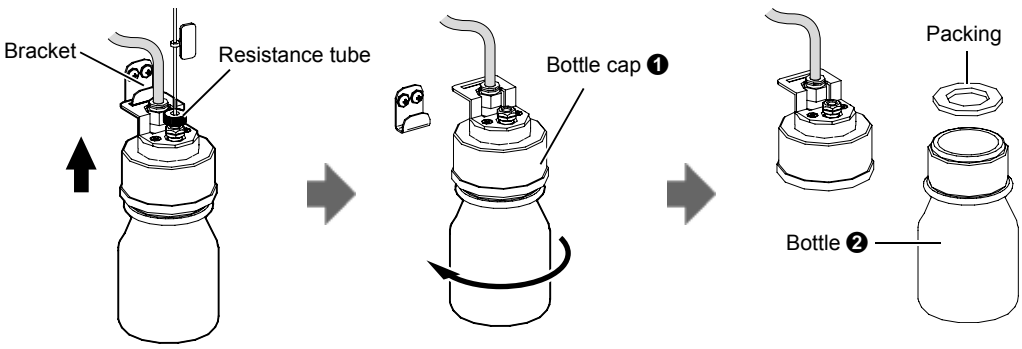



Fig. 7-61

NOTE

When removing the standard sample bottle, take care not to injure yourself on the edge of the bracket.

Hint

Some packing may become stuck in the bottle cap.

4 Pour standard sample into the bottle.

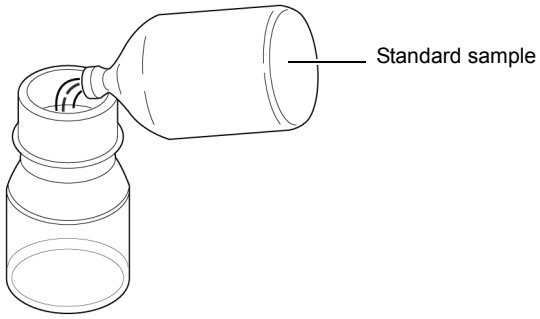



Fig. 7-62

**NOTE**

If there is only a little standard sample left in the bottle, throw it away and wash the bottle before pouring in new standard sample. Fill the bottle with at least 40 to 80 mL of standard sample (the highest reading on the bottle's scale corresponds to 80 mL).

**Reference**

"8.3 Standard Sample" P.213

5 Return the standard sample bottle to its original position.

1 Attach the bottle cap ❶ to the bottle ❷.
2 Fit the standard sample bottle onto the bracket.
3 Attach the resistance tube ❸.

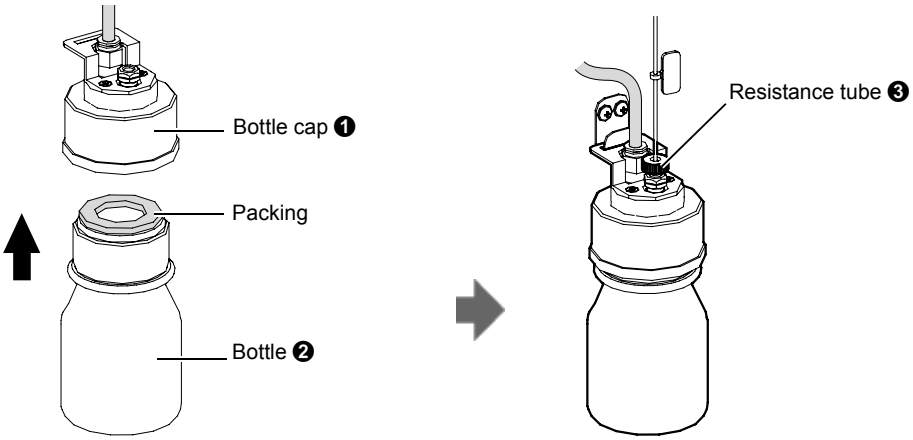



Fig. 7-63

**NOTE**

- Always ensure there is packing between the bottle and the bottle cap.
- When mounting the standard sample bottle, take care not to injure yourself on the edge of the bracket.

6 Close the front door.

## 7.6.2 Replacing the Resistance Tube

1 Stop pumping the standard sample.

Reference

"8.2.1 Checking Ions in the [MS Tuning] Window" P.201

2 Open the front door.

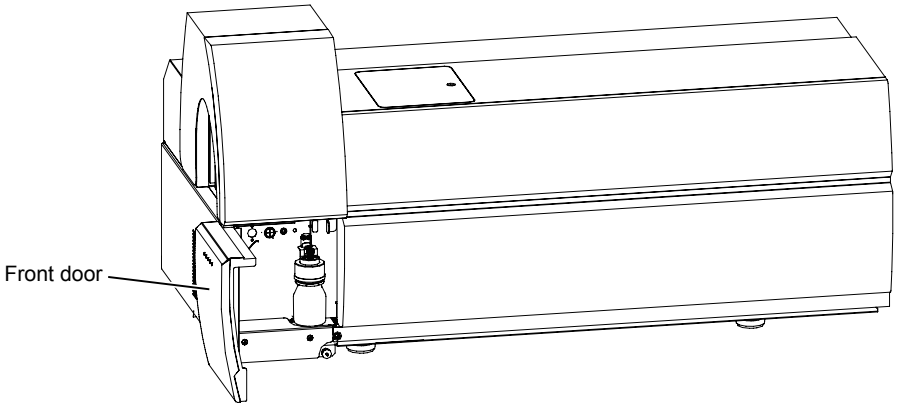



Fig. 7-64

3 Replace the resistance tube.

1 Disconnect the resistance tube ❶.
2 Remove the male nuts ❷ from the resistance tube ❶.
3 Fit the male nuts ❷ to the new resistance tube ❸.

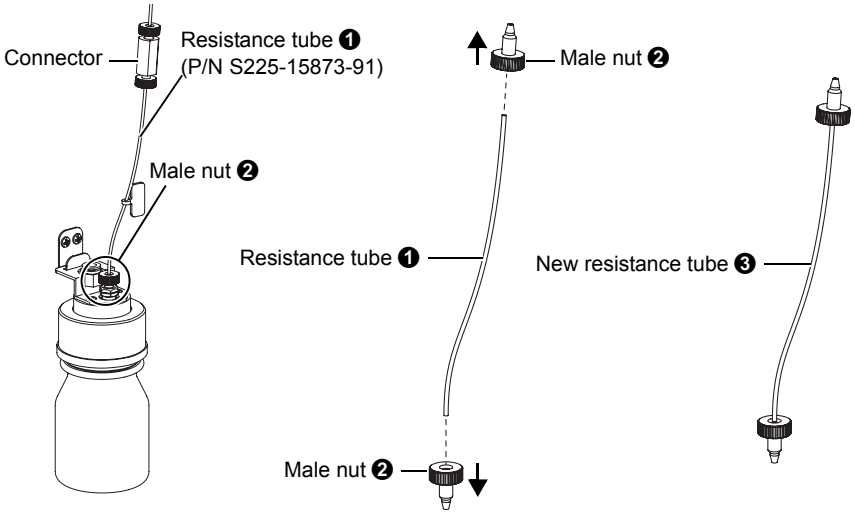



Fig. 7-65

4 Fit the resistance tube between the standard sample bottle and the connector.

NOTE

Take care not to bend the resistance tube too much.

Maintain a moderate bending radius of at least 40 mm while handling the tube.

5 Close the front door.

## 7.6.3 Replacing the Filter

1 Remove the standard sample bottle from the instrument.

Reference
"7.6.1 Replacing the Standard Sample" P.154

2 Remove the gas tubing for delivering the standard sample from the standard sample bottle.

The tube can be removed by pressing the release bush of the gas one-touch joint.

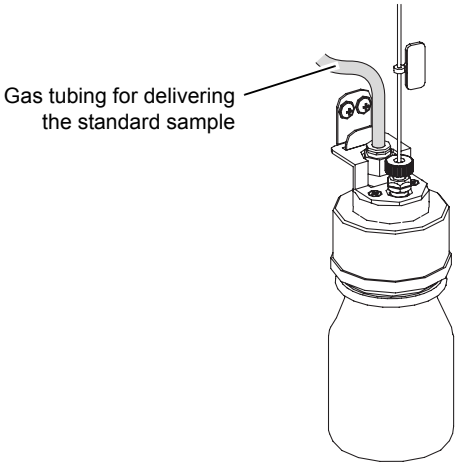



Fig. 7-66

3 Remove the two screws and disassemble the parts.

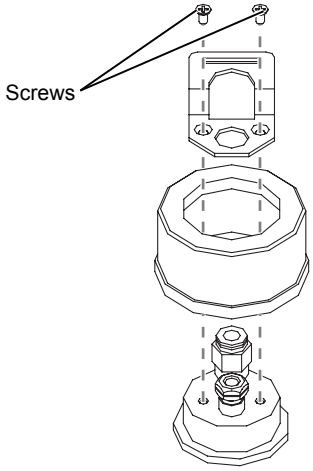



Fig. 7-67

4 Secure the base with a spanner.

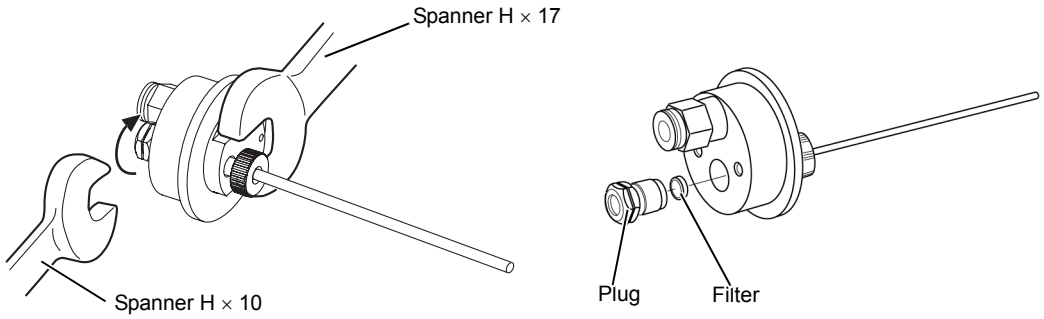



Fig. 7-68

5 Replace the filter with a new one and tighten the plug.

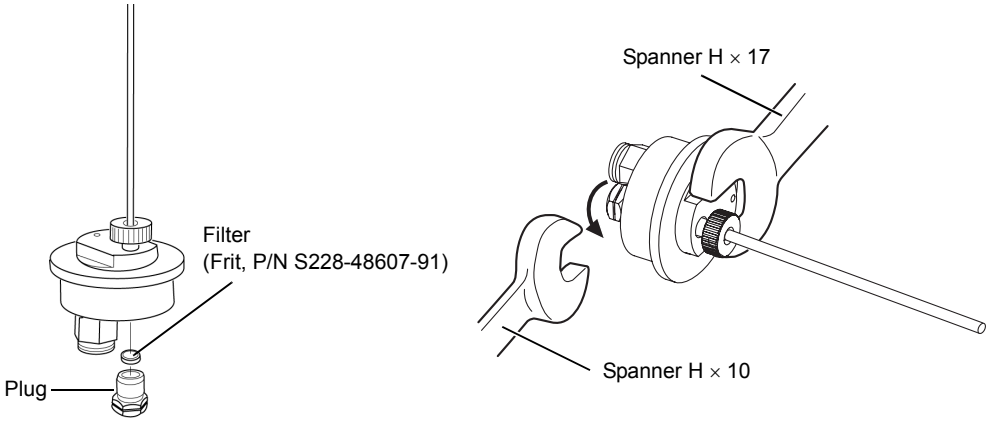



Fig. 7-69

**NOTE**

To tighten the plug, first hand-tighten it and then turn it another 60 to 90 degrees.

6 Tighten the two screws to assemble the parts.

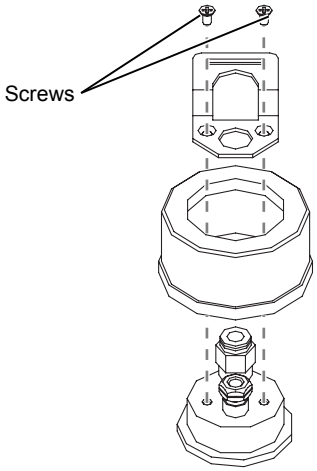



Fig. 7-70

# 7.7 Cleaning the Spray Unit

**WARNING**

Instructions

- Before starting maintenance work, turn the heater OFF from the LabSolutions program and make sure that the temperature of the heated block has fallen to 50 °C or lower.
  The spray unit reaches high temperatures and could cause burns.
- Before starting maintenance work, turn the high-voltage switch OFF in the LabSolutions program and disconnect the high-voltage cable.
  If the high-voltage cable is not disconnected there will be a danger of electric shock.

If soiling cannot be removed, replace the part.

### Parts used

| Part Name | Part No. |
|---|---|
| Sampling cone | S225-15487 |
| Flat countersunk head screw M3 × 5 | S225-14287-41 |
| Drain mesh | - |

1 Remove the ionization probe.

1 Open the probe cover.
2 Open the source window.
3 Remove the ionization probe.
With APCI or DUIS, remove the corona needle.

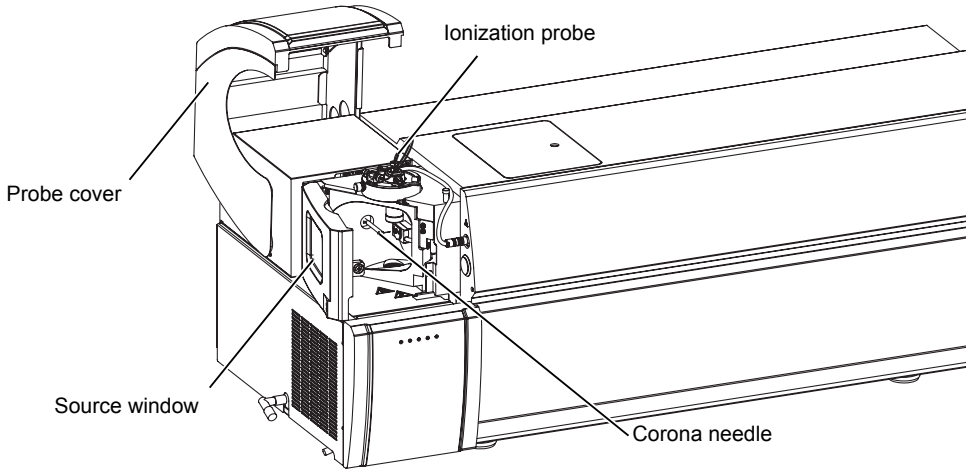



Fig. 7-71

Reference
"3.5.2 Removing the ESI Probe" P.58
"3.6.3 Removing the APCI Probe" P.66
"3.6.4 Removing the Corona Needle for APCI" P.69

## ■ Routine inspection

### 1 Wipe off soiling.

Moisten gauze with a solvent that can remove soiling (such as water/methanol) and wipe the soiling off with the gauze.
Clean the locations indicated below.

- Sampling cone
- Heated block
- Heater flange
- Inside face of the source window
- Inside walls of the spray unit

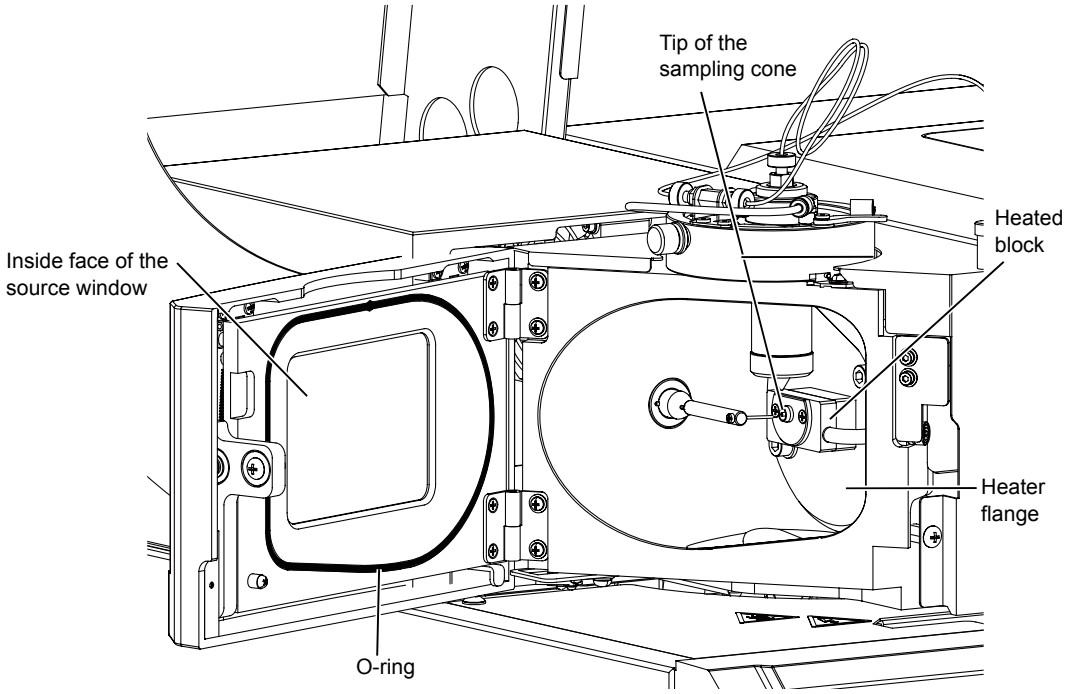



Fig. 7-72

**NOTE**

Do not clean the tip of the DL since this can cause blockage of the tubing. If the tip of the DL is badly soiled, replace the DL.

**Reference**

"7.9.1 Removing the DL from the Instrument" P.163

## ■ If the soiling is severe:

1 Clean the parts.

1 Remove the two flat countersunk head screws ❶ and remove the sampling cone ❷.

**NOTE**
Remove the flat countersunk head screws only after the temperature drops to around room temperature in order to prevent damage to the screws.

2 Remove the drain mesh ❸.

Lift it up with tweezers.

3 Wipe the rear of the sampling cone.

Moisten gauze with a solvent that can remove soiling (such as water/methanol) and wipe the soiling off with the gauze.
If the heated block is soiled, scrub it with a nylon brush and then wipe it clean with gauze moistened with a solvent that can remove the soiling (such as water/methanol).

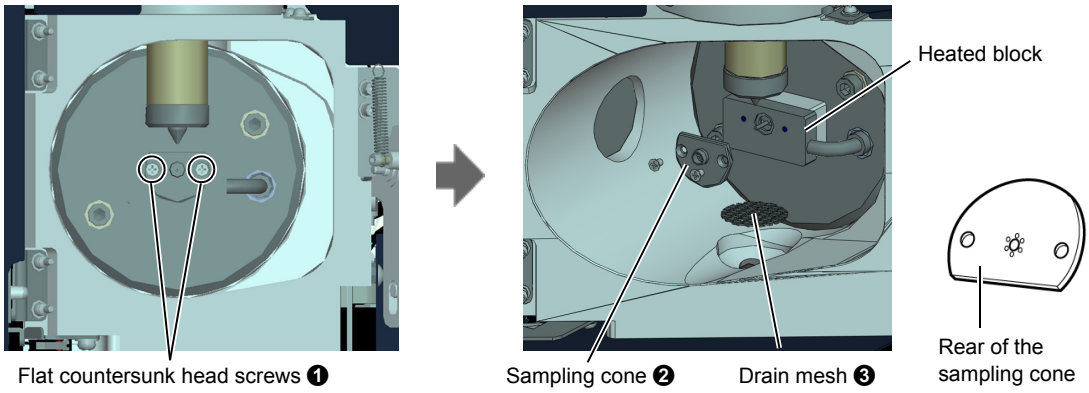



Fig. 7-73

4 Subject the sampling cone, flat countersunk head screws and drain mesh to ultrasonic cleaning in a methanol solution.

**Hint**
If the soiling is particularly bad, polish the parts with about 4-micron lapping film.

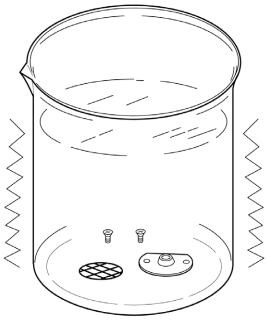


Fig. 7-74

2 After drying the parts, mount them in the instrument.

**NOTE**
When mounting the parts, check if there is any foreign body in the hole of the sampling cone, and if there is any cleaning fluid left on the parts. If there is a foreign body it may cause blockage of the DL.

# 7.8 Replacing the O-Ring of the Source Window

If the O-ring of the source window has become damaged or has deteriorated, it could lead to solvent leakage.

In such cases it must be replaced.

### Parts used

| Part Name | Part No. |
|---|---|
| O-ring, 4D G145 | S036-12527 |

*1* Remove the O-ring.

*1* Open the probe cover ❶.
*2* Open the source window ❷.
*3* Remove the O-ring ❸.

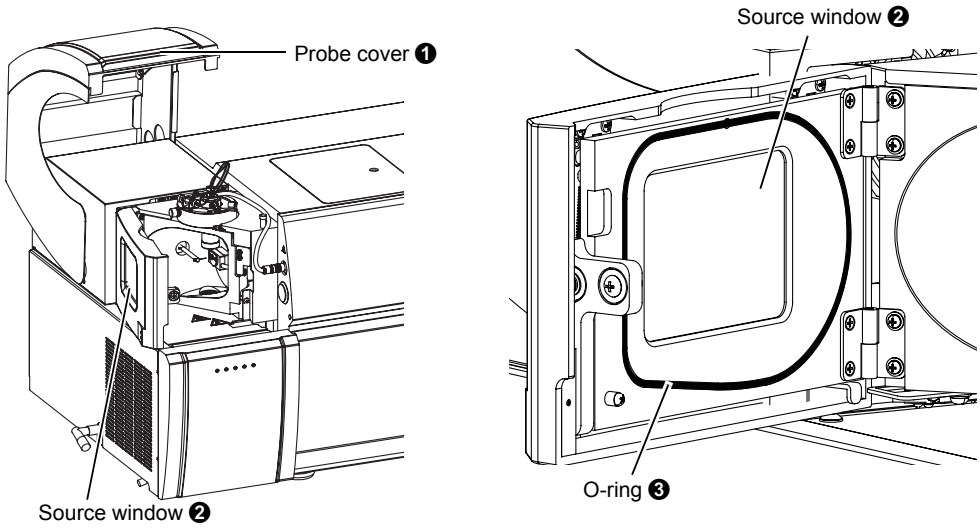



Fig. 7-75

**NOTE**
If the O-ring is difficult to remove, remove the source window and then remove the O-ring. The source window can be removed by lifting it upward.

*2* Fit the new O-ring.

**NOTE**
When fitting the O-ring, be careful not to damage it or let any dirt adhere to it.

# 7.9 Replacing the DL

**WARNING**

Instructions

- Before starting maintenance work, turn the heater OFF from the LabSolutions program and make sure that the temperature of the heated block has fallen to 50 °C or lower.
  The spray unit reaches high temperatures and could cause burns.
- Before starting maintenance work, turn the high-voltage switch OFF in the LabSolutions program and disconnect the high-voltage cable.
  If the high-voltage cable is not disconnected there will be a danger of electric shock.

### Parts used

| Part Name | Part No. |
|---|---|
| DL ASSY | S225-15718-91 |

## 7.9.1 Removing the DL from the Instrument

1 Open the probe cover ❶.

2 Unlock and open the source window ❷.
Grip the lower right of the source window and pull towards you.

3 Remove the ionization probe ❸.
If using APCI or DUIS, remove the corona needle too.

4 Loosen the two screws ❹ with the hexagon wrench provided as an accessory.

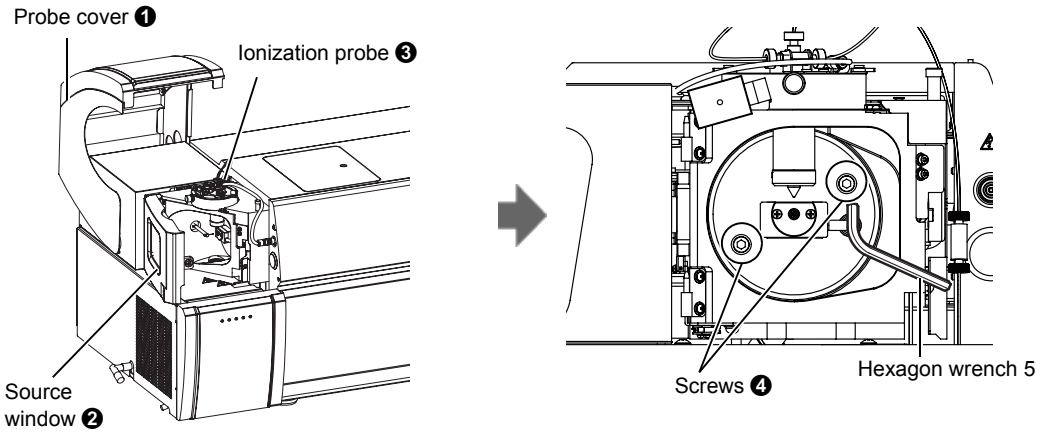



Fig. 7-76

5 Insert the drawing tool ❺ provided as an accessory under the heated block and remove the heater flange ❻.

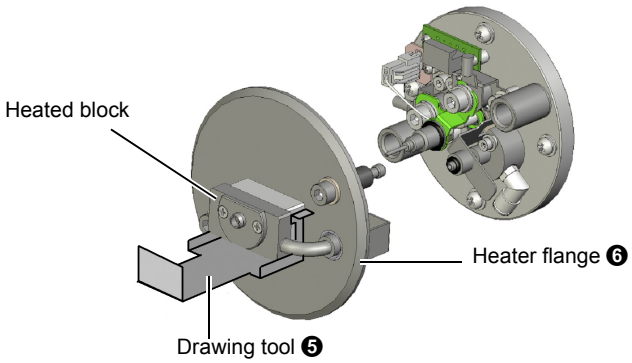



Fig. 7-77

6 Disconnect the connector ❼.

Press in the catches on the connector as you remove it.

7 Loosen the two DL locking screws ❽ with the hexagon wrench provided as an accessory.

Turn the hexagon wrench about three turns.

8 Turn the notched section ❾ to the direction in which the DL is to be removed, then draw it out.

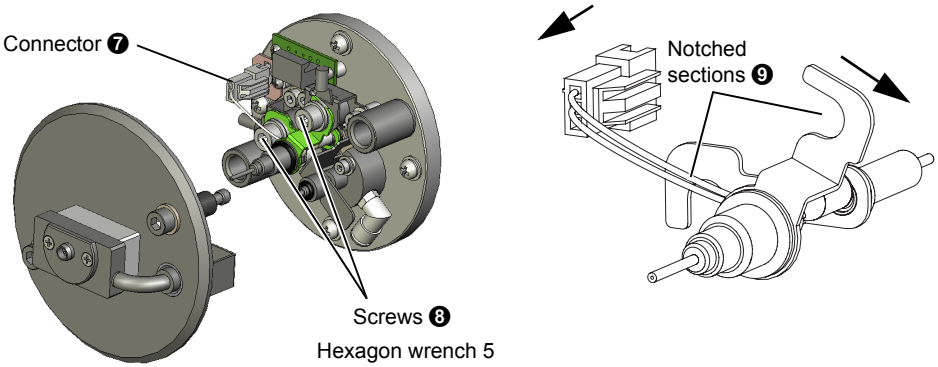



Fig. 7-78

**Hint**

The triple inlet turbo molecular pump changes to standby mode when the DL is removed.
The pump returns to normal mode about 3 minutes after mounting the DL (connector ❼).

## 7.9.2 Mounting the DL in the Instrument

1 Turn the notched section in the direction in which it engages to secure the DL to the heater flange ❹, then connect the connector ❶.

2 Tighten the two DL locking screws ❷ with the hexagon wrench provided as an accessory.
Tighten the locking screws sufficiently.

3 Insert the heater flange ❹ into the IF flange and tighten the two screws ❺.
Use the drawing jig to insert the heater flange.

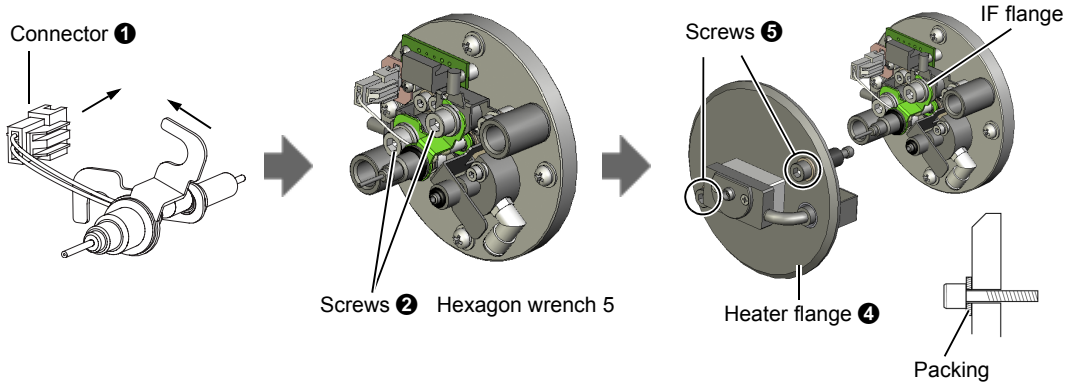



Fig. 7-79

**NOTE**
When mounting the heater flange, take care about the positioning of the top and bottom of the flange.

4 Mount the ionization probe ❶.

5 Close the source window ❷.

6 Close the probe cover ❸.

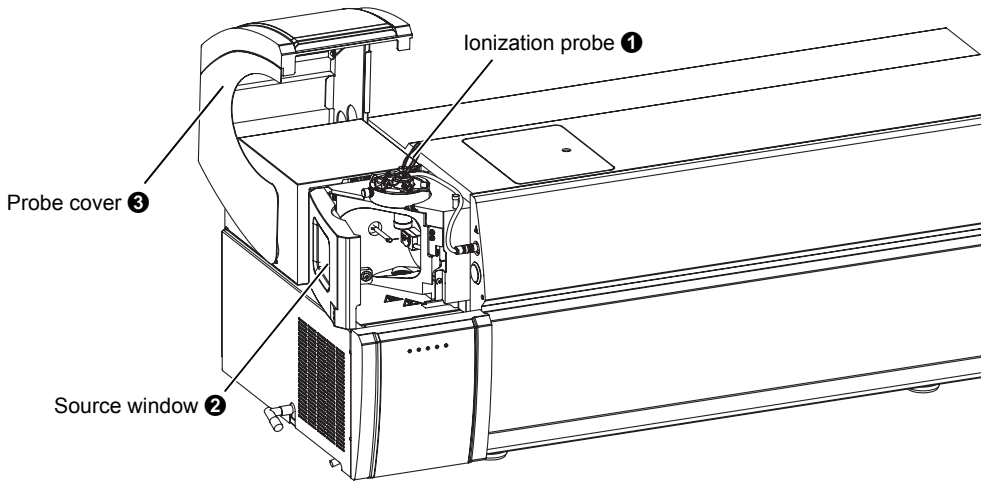



Fig. 7-80

# 7.10 Cleaning and Replacing the Orifice

**WARNING**

Instructions

- Stop the vacuum system and turn the instrument power switch OFF before starting maintenance work.
  If you do not turn the power switch OFF there will be a danger of electric shock.
- Before starting maintenance work, turn the heater OFF from the LabSolutions program and make sure that the temperature of the heated block has fallen to 50 °C or lower.
  The spray unit reaches high temperatures and could cause burns.
- Before starting maintenance work, turn the high-voltage switch OFF in the LabSolutions program and disconnect the high-voltage cable.
  If the high-voltage cable is not disconnected there will be a danger of electric shock.

### Parts used

| Part Name | Part No. |
|---|---|
| Orifice | S225-15479 |

## 7.10.1 Removing the Orifice from the Instrument

1 Stop the vacuum.

Reference
"3.2.1 Stopping the Vacuum System" P.48

2 Remove the DL.

Reference
"7.9.1 Removing the DL from the Instrument" P.163

3 Remove the orifice ASSY.

1 Loosen the single screw ❶.
2 Turn the notched section ❷ in the direction indicated by the arrow and remove the orifice ASSY.

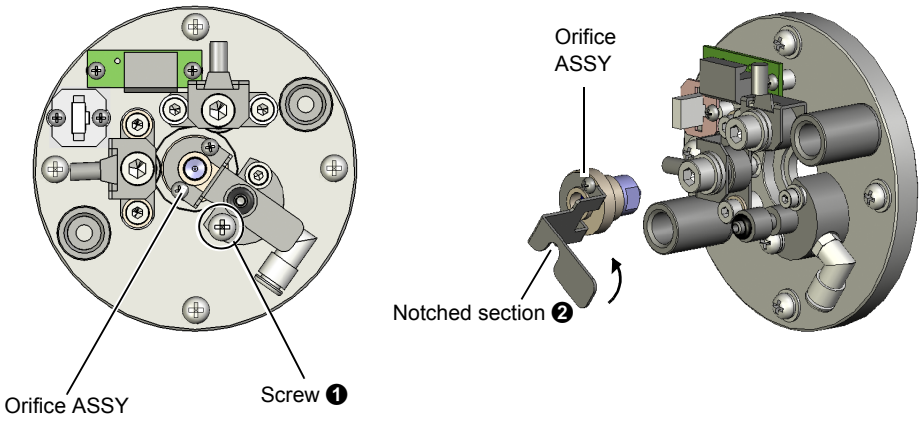



Fig. 7-81

4 Turn the orifice with a spanner and remove it.

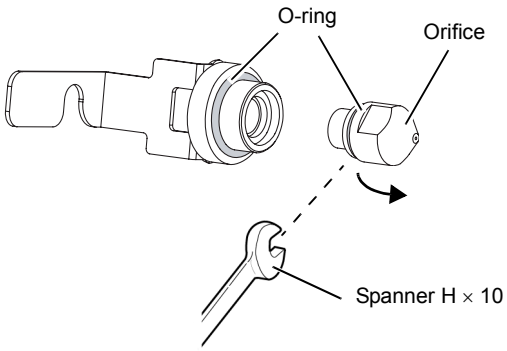



Fig. 7-82

## 7.10.2 Cleaning and Assembling the Orifice

1 Use approximately 4-micron lapping film to clean and polish the tip of the orifice until you can see its metal surface.

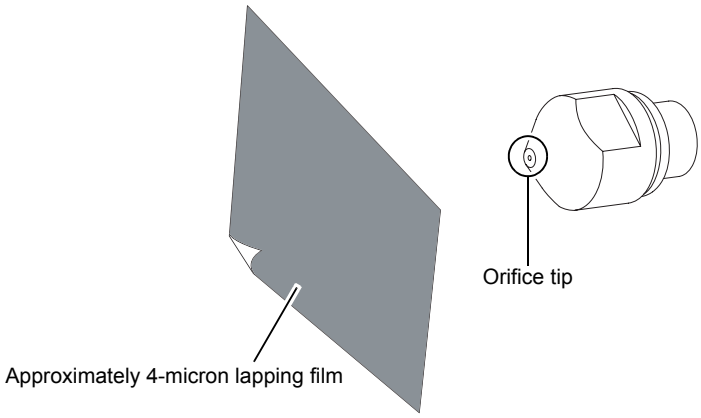



Fig. 7-83

2 Wipe off any soiling on the orifice tip using solvent.

Moisten gauze with a solvent that can remove soiling (such as water/methanol) and wipe any soiling off with the gauze.

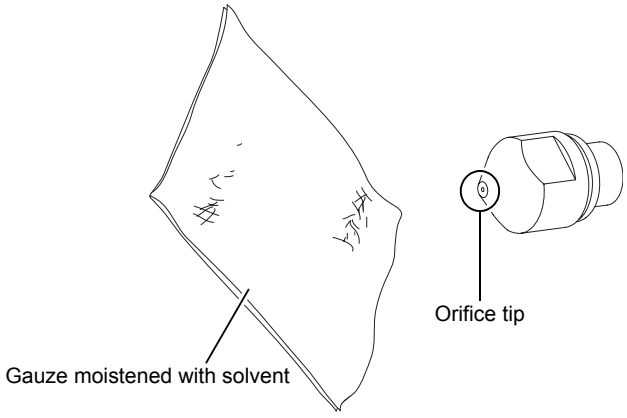



Fig. 7-84

3 Dry the orifice parts.

4 Check that there are no foreign bodies in or around the orifice.

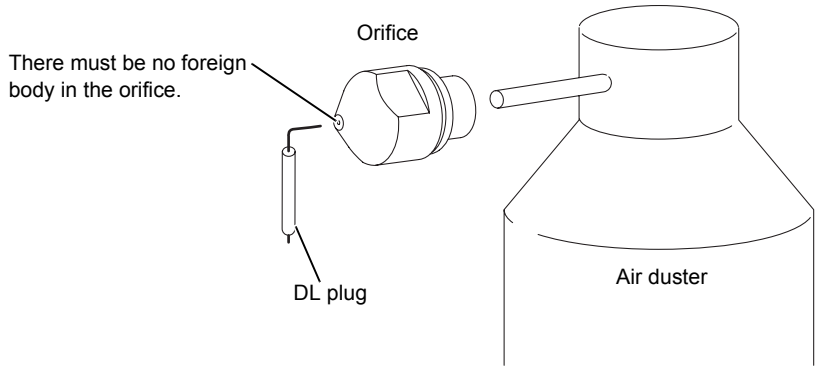



Fig. 7-85

**NOTE**

If there is a foreign body in the orifice, use the provided "DL plug" and the air duster to remove it.

5 Turn the orifice with a spanner to tighten it.

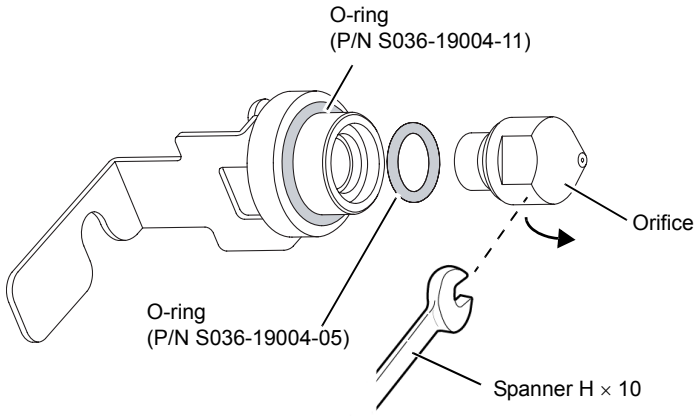



Fig. 7-86

**NOTE**

Refit the O-ring if it has come loose from the orifice. Replace the O-ring if it is damaged in any way.

## 7.10.3 Mounting the Orifice in the Instrument

1 Mount the orifice ASSY.

1 Turn the notched section ❶ in the direction indicated by the arrow to mount the orifice ASSY.

2 Tighten the single screw ❷.

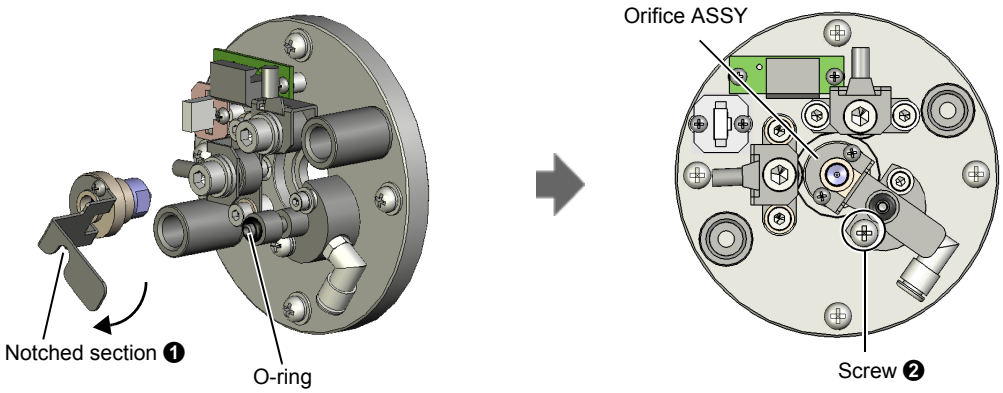



Fig. 7-87

**NOTE**

If the O-ring (P/N: S036-19004-11) is damaged, replace it.

2 Mount the DL.

**Reference**

"7.9 Replacing the DL" P.163

3 Start the vacuum.

**Reference**

"3.1.2 Starting the Vacuum System" P.42

# 7.11 Maintenance of the Rotary Pump

**WARNING**

Instructions

Stop the vacuum system and turn the instrument power switch OFF before starting maintenance work.

If you do not turn the power switch OFF there will be a danger of electric shock.

## ■ Rotary pump oil change

The rotary pump (type E2M28) that is used as the auxiliary pump for this product's vacuum system requires an oil change every four months. Failure to change the oil will cause trouble including vacuum deficiency, oil leaks and increased noise; it is therefore essential to perform oil changes.

Use an oil whose characteristics are matched to the model of the pump and which is authorized by Shimadzu.

### Parts used

| Part Name | Part No. |
|---|---|
| Rotary pump oil<br>Ultragrade19 (4 L container) | S017-30163-02 |

**WARNING**

Instructions

Change the oil in response to change in its color and in its volume.

It may be necessary to change the oil more frequently than at four-month intervals, depending on the conditions of use and frequency of use of the instrument.

## 7.11.1 Changing the Oil

**NOTE**

Immediately after stopping the instrument the rotary pump oil will be at a high temperature (approximately 30 °C above room temperature), so you must wait 10 minutes before changing the oil.

1 Stop the instrument.

Reference
"3.2 Stopping the Instrument" P.48

2 Wait about 10 minutes after stopping it.

3 Inject the new oil.

1 Turn the motor switch of the rotary pump OFF.

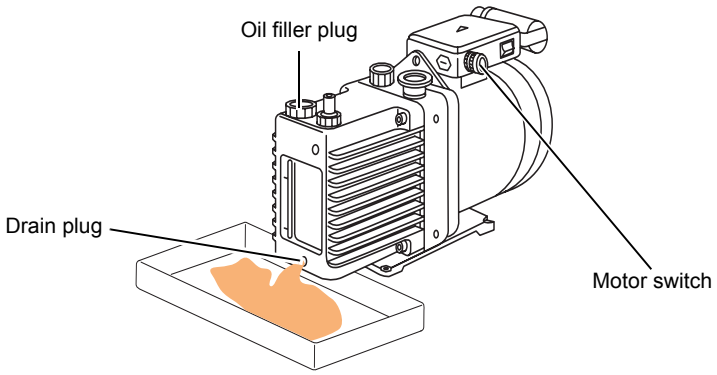



Fig. 7-88

2 Remove the drain plug.

Drain the oil while receiving it in a tray or plastic bag with a capacity of about 2 L.
Note that oil may spray out when the drain plug is removed, so care is required.

3 When oil has stopped coming out of the drain port, close the drain plug.

4 Remove the oil filler plug.

5 Pour in new oil up to the bottom of the MAX indication of the oil gauge (approximately 1.5 L).

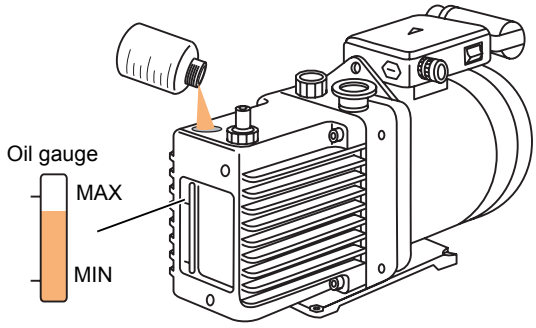
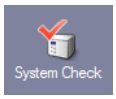



Fig. 7-89

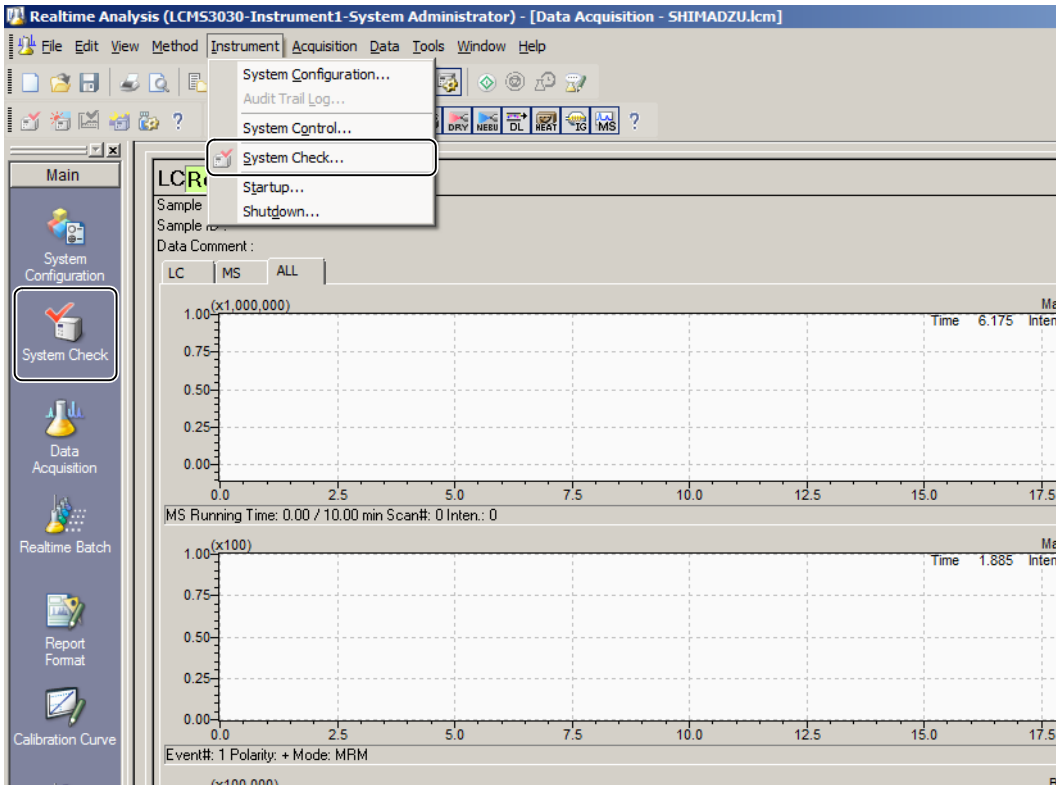
4 Close the oil filler plug.

5 Turn the motor switch of the rotary pump ON.

6 Reset the rotary pump oil change frequency.

1 Click the 

(System Check) icon.



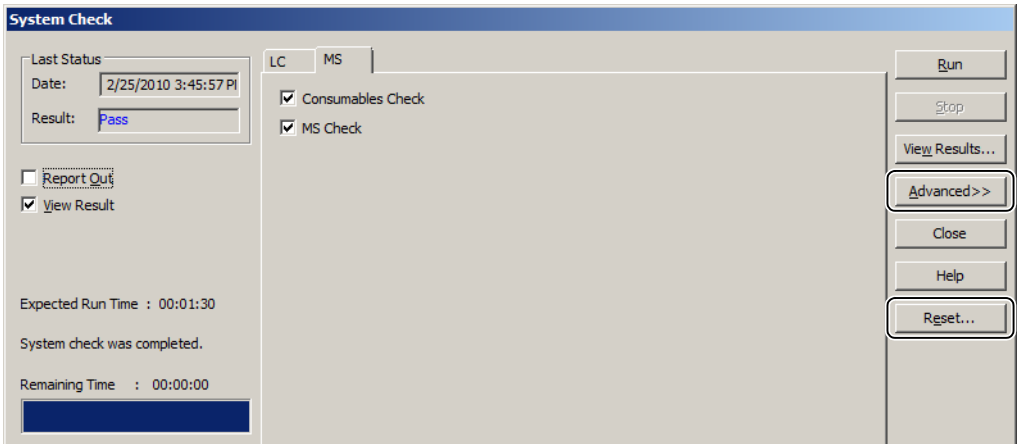

**Hint**

Alternatively, select [Instrument] - [System Check...].

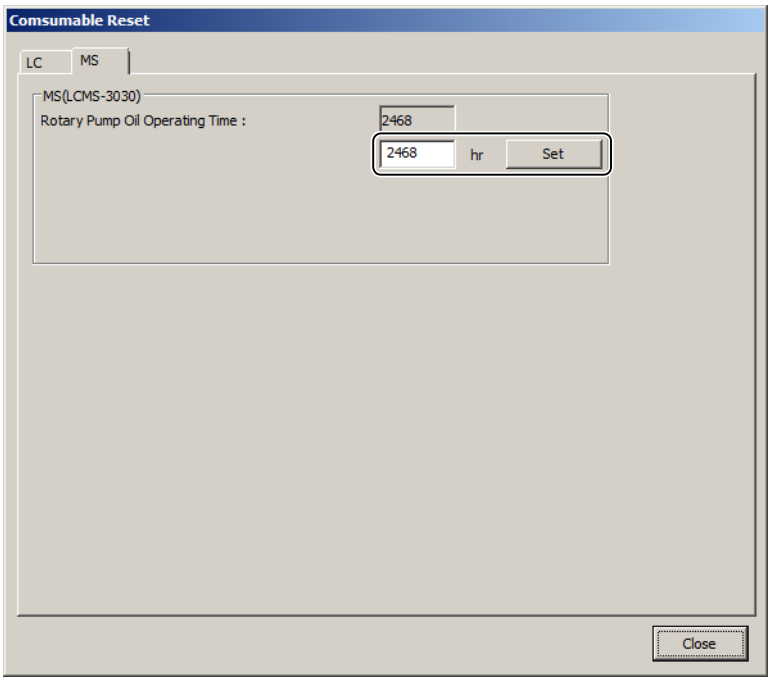
The [System Check] window is displayed.

2 Click [Reset...].

If [Reset...] is not displayed, click [Advanced >>].




3 Enter the rotary pump oil use time (set to 0 after an oil change) and click [Set].




4 Click [Close].

## 7.11.2 Gas Ballast Valve

**CAUTION**

Instructions

Under normal conditions of use, open the gas ballast valve once a week for around 15 to 30 minutes to remove the contaminants in the oil.

If the water content ratio of the mobile phase is high or the flow volume is large, open the gas ballast valve once every 1 to 3 days.

When you open the valve, a large quantity of oil mist will emerge from the exhaust port. Make sure that the exhaust gas is always released into a duct system.

Since a large quantity of mobile phase and water is taken into the rotary pump in the instrument, using it over a long period of time without opening the gas ballast valve will cause deterioration in exhaust performance and instrument failure.

1 Exit LabSolutions.

Reference

"3.2.2 Exiting LabSolutions" P.48

2 Open the gas ballast valve and wait 15 to 30 minutes.

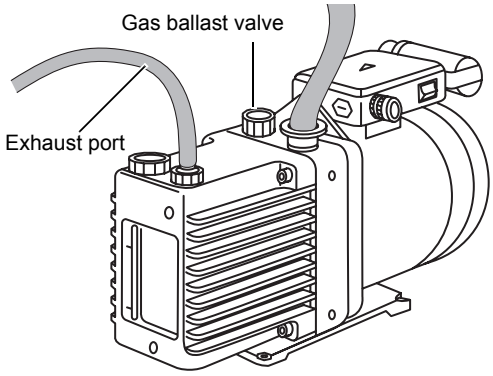



Fig. 7-90

3 Close the gas ballast valve.

NOTE

Apart from the oil changes described above, the rotary pump is also subject to some checks in periodic inspections.

For details on these checks, refer to 5 "Maintenance" in the separately attached E2M28 instruction manual (A373-10-880).

# 7.12 Vacuum Leak Check

Running the instrument while there is a vacuum leak will lead to problems such as reduced sensitivity, increased noise, and breakage of the ion gauge (vacuum gauge) filament.

For this reason, always carry out a vacuum leak check on restarting the instrument after it has been stopped.

A whole range of vacuum leaks can affect the MS, from large leaks that stop the rotary pump from functioning normally to small leaks that are no hindrance to the normal operation of the triple inlet turbo molecular pump. These vacuum leaks develop from very small problems.

There are always O-rings fitted on parts with connections, such as the probe holder, between the lens system door and its housing, as well as the adjacent parts of the orifice. By making close contact with both sides at connections, these O-rings maintain the vacuum inside the housing by preventing vacuum leaks. If dirt adheres to an O-ring, or if you forget to fit an O-ring, a vacuum leak will occur.

When you stop the instrument and carry out maintenance work with the vacuum applied (cleaning of the lens system, replacement of the DL, replacement of the orifice), observe the following points in order to prevent vacuum leaks.

### Cautions for preventing vacuum leaks

**⚠ CAUTION**

| | |
|---|---|
| Prohibitions | • Do NOT damage the seal faces.<br>• Do NOT forget to fit O-rings. |
| Instructions | • Fit O-rings correctly.<br>• Remove any dirt that adheres to O-rings.<br>• Remove dirt on the faces with which the O-ring makes close contact (seal faces). |

In the following circumstances, the rotary pump and triple inlet turbo molecular pump are not operating normally.

- The exhaust noise of the rotary pump continues for several minutes.
- The triple inlet turbo molecular pump started, but after the elapse of around 10 minutes the power to the vacuum system went OFF automatically.

In these cases it is probable that there is a vacuum leak or that the vacuum pump is abnormal. After the vacuum housing has leaked to atmospheric pressure, check the probe holder, lens system door, DL and orifice in accordance with "Cautions for preventing vacuum leaks" described previously.

If it is thought that a vacuum leak has occurred for reasons other than those described above, contact your Shimadzu representative.

**NOTE**
If the pressure is high, focus your attention on the locations subjected to maintenance.

## Parts where there is a possibility of vacuum leakage

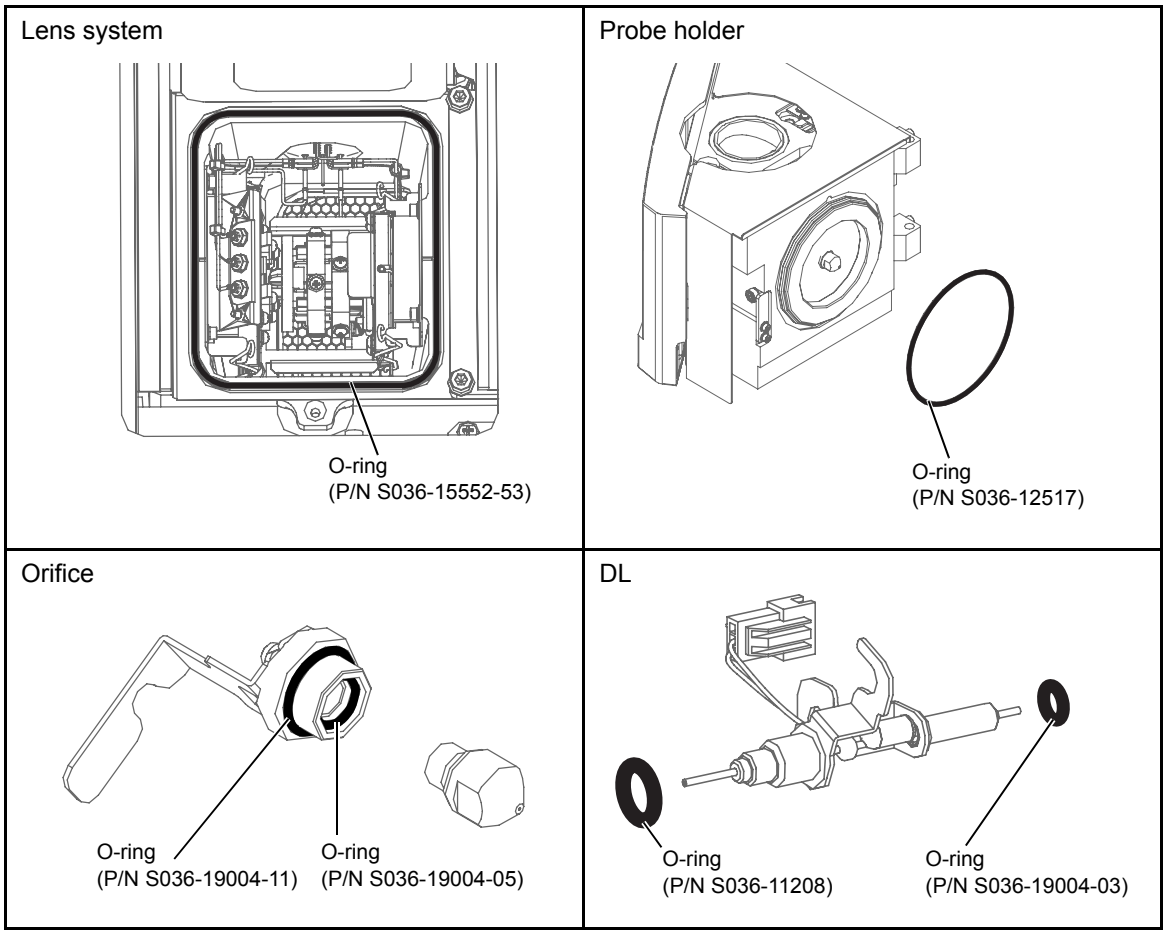



Fig. 7-91

# 7.13 Repairing the Nebulizer Gas Tube

1 Open the probe cover.

2 Press the release bush and remove the nebulizer gas tube.
Stop the gas supply from LabSolutions before starting work.

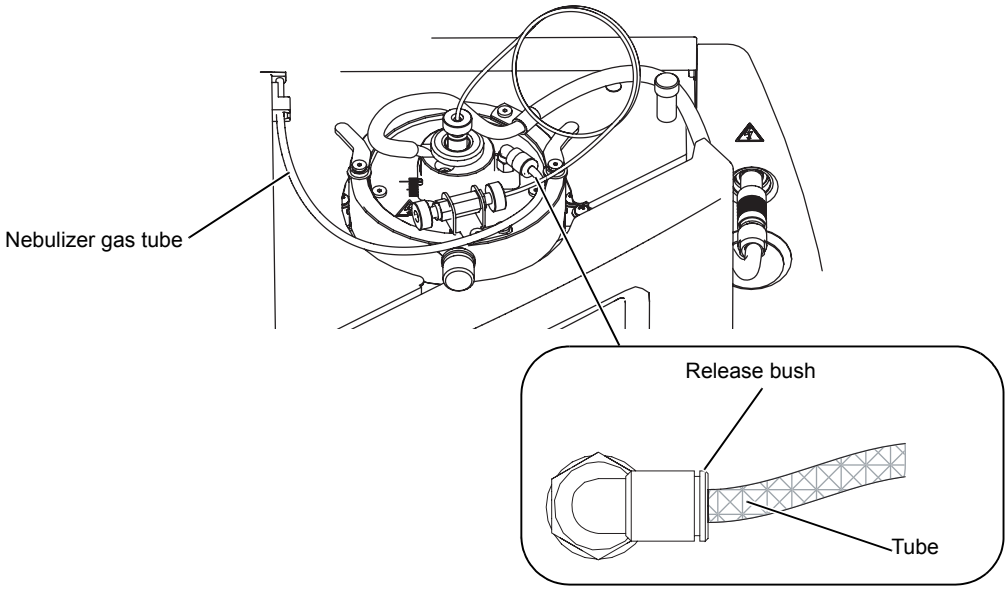



Fig. 7-92

3 Cut perpendicularly across the tube about 1 cm from the end with a cutter knife.
Alternatively, cut it with the tube cutter (option P/N S228-32930-01).

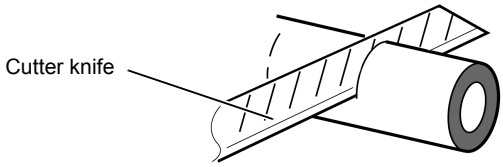



Fig. 7-93

4 Fit the nebulizer gas tube by inserting it as far as it will go.

# 7.14 Replacing the Waste Tubes

Waste tubes are fitted at the locations indicated below.

If these tubes are particularly soiled, or are damaged, replace them.

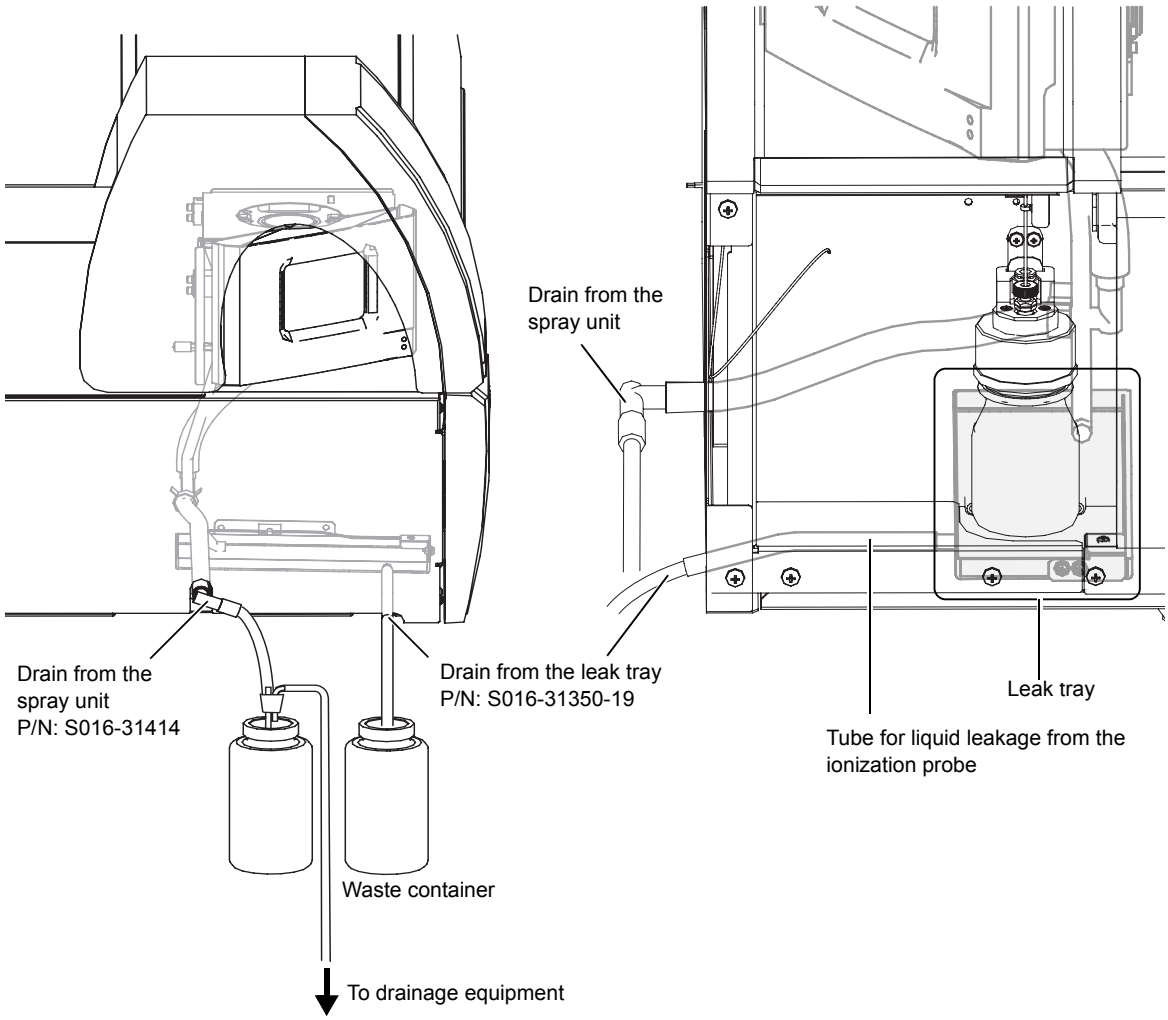



Fig. 7-94

**NOTE**

Replace the waste tubes once every three years.

# 7.15 Cleaning the Leak Tray

The leak tray is fitted with a leak sensor to detect liquid leakage. If a liquid leakage occurs, wipe up all the liquid in the leak tray by following the procedure below.

1 Open the front door.

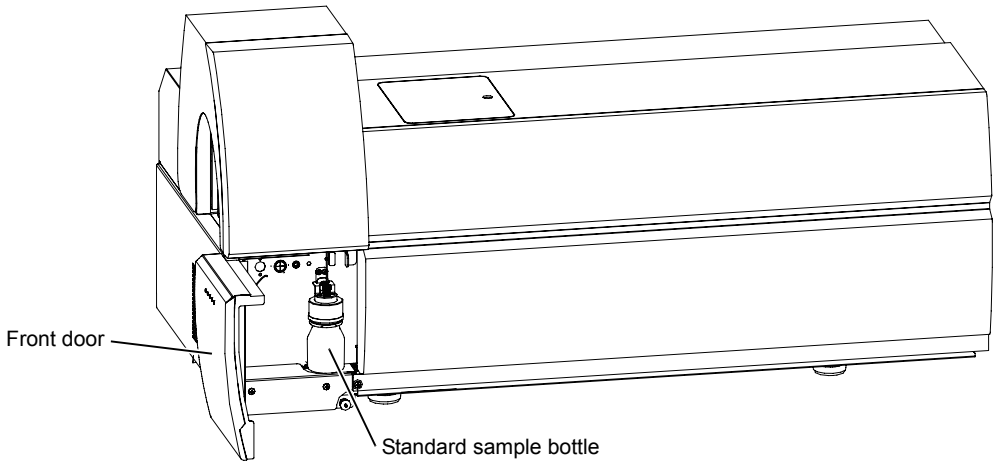



Fig. 7-95

2 Completely wipe up all leakage around the leak sensor.

If there is any soiling, wipe it off with water.

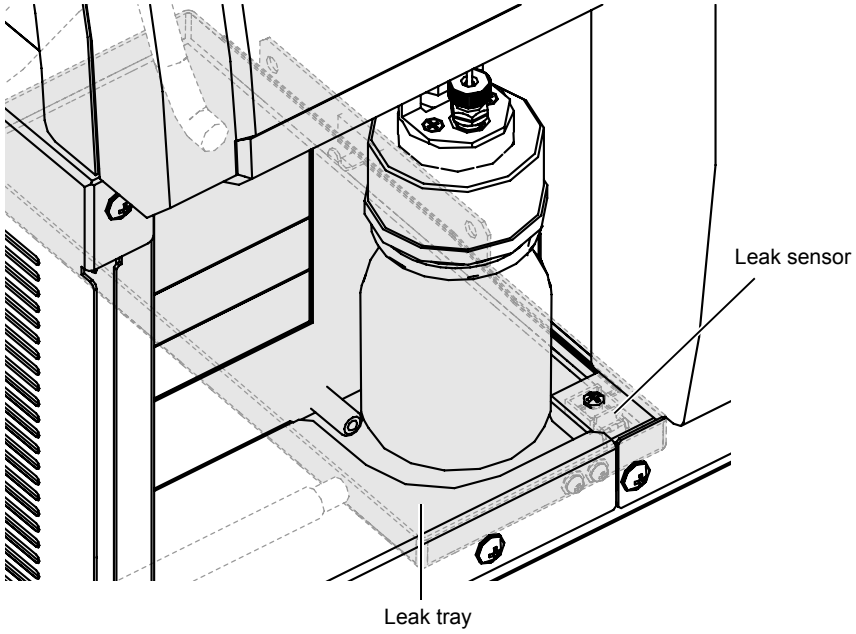



Fig. 7-96

# 7.16 Cleaning the Exterior

If the body cover is soiled, wipe it with a soft dry cloth or tissue paper.

If the soiling is particularly bad, clean it off as follows.

1 Wipe the cover with a cloth that has been dipped in a diluted neutral detergent and wrung out well.

2 Dip a cloth in water, wring it out well and wipe the body so that no detergent remains, then wipe off the moisture with a dry cloth.

**NOTE**

Do not leave the body moist with water or wipe it over using any kind of alcohol or thinner.

Doing so could cause rust formation or discoloration.

## 7.16.1 Cleaning the Fans

1 Remove the dust from the two fan filters on the instrument with, for example, a vacuum cleaner.

Clean the fan filters about every six months.

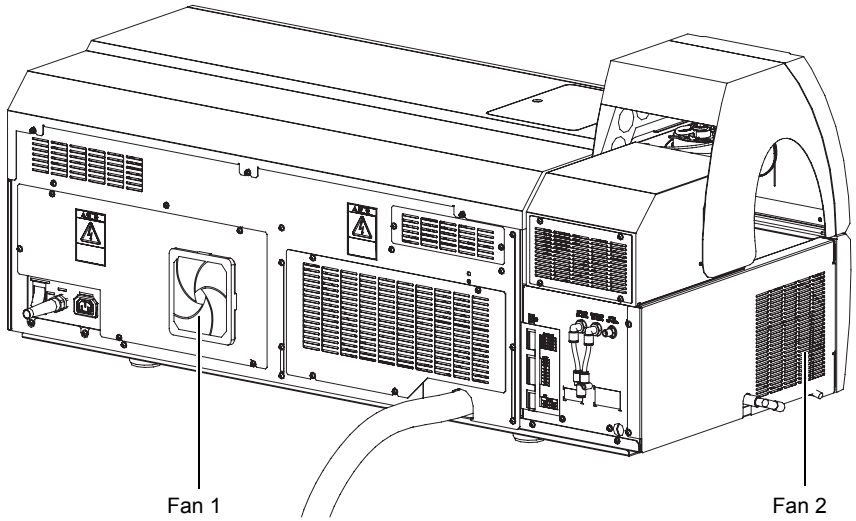



Fig. 7-97

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# 8 Technical Information

## 8.1 Installation

### 8.1.1 Conditions for the Installation Site

The instrument will be installed and adjusted by your Shimadzu representative.

In order to keep the instrument operating stably and to obtain highly reliable analysis results, observe the conditions given below.

#### ■ Power supply

**⚠ WARNING**

Prohibitions

- Do NOT share the power supply for this instrument with other devices.
- The electric capacity of the instrument must not exceed the stipulated capacity of the earth leakage breaker.
- Do NOT rest anything heavy on the power cable.
  Do NOT run the power cable close to any heat-generating equipment.
  Such treatment could damage the cable, leading to fire, electric shock or instrument failure.
  If the cable becomes damaged, contact your Shimadzu representative immediately.

Instructions

- Connect the instrument to a compatible power supply.
  This product has a power supply voltage of 230 V AC and a power consumption of 3.45 kVA.
  Connect to a compatible power supply. A supply that is not compatible will cause fire or electric shocks.
  If the power supply voltage is unstable or the power supply capacity is insufficient, the intended performance of the instrument cannot be guaranteed. You must check the power supply capacity of the system as a whole and prepare an appropriate supply.
- The power supply that you connect to must be equipped with an earth leakage breaker.
- The instrument must be grounded (earthed).
  If you do not ground it, there will be a risk of instrument failure and electric shock in the event of current leaks. It is also essential to ground the instrument in order to stabilize it.

## (1) Required power supply

| | |
|---|---|
| LCMS-8030/LCMS-8040 | Single phase 230 V AC, 15 A (50/60 Hz) |
| Power supply voltage range to guarantee intended performance: | 218.5 to 241.5 V |
| Power supply voltage range to guarantee operation: | 207 to 253 V |
| Frequency stability: | ± 0.5 Hz max. |
| (200 V max.) | With APCI 10 A (200 V, 50/60 Hz)<br>Without APCI 9 A (200 V, 50/60 Hz) |
| (200 V steady) | 4 to 6 A (200 V, 50/60 Hz) |
| (230 V max.) | With APCI 10 A (230 V, 50/60 Hz)<br>Without APCI 9 A (230 V, 50/60 Hz) |
| (230 V steady) | 4 to 5 A (230 V, 50/60 Hz) |
| LC | Refer to the specifications or the instruction manual provided with your LC. |

(The electric capacity varies depending on the configuration of the LC system.)

Prepare the power supply for the LC in accordance with the specifications of the LC unit you are using or the instruction manual.

For details on the power supply specifications of peripheral devices such as the computer and printer, check the specifications or instruction manuals of the units you are using. Approximate values are indicated below.

| | |
|---|---|
| Power for PC system | Supply correct voltage to the PC or printer, etc. referring to the instruction manuals accompanying the PC or printer, etc. |

**⚠ CAUTION**

Instructions

Use a PC, printer, etc. that conform to your local laws and regulations.

## (2) Grounding

100 Ω max.

In order to prevent electric shocks, be sure to ground the instrument (connect it to earth).

### (3) Installation conditions

OVERVOLTAGE CATEGORIE: CATEGORIE II (IEC)

POLLUTION DEGREE: 2 (IEC)

## ■ Installation environment

**⚠ WARNING**

**Prohibitions**

Do NOT use naked flames.

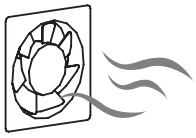
The use of naked flames is prohibited at the site where the high performance liquid chromatograph mass spectrometer is installed. You should also avoid installing other equipment that produces a naked flame in the same room. To ensure readiness in the event of an accident, install a fire extinguisher.

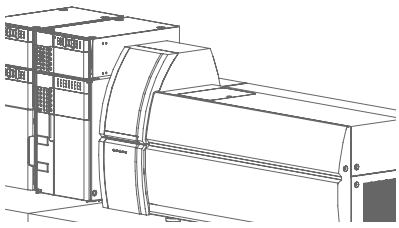
**Instructions**

- Be sure to provide ventilation in the room.

  Some of the solvents that are used with a high performance liquid chromatograph mass spectrometer are inflammable or toxic. Also note that this instrument contains a large quantity of nitrogen gas. Its use in a room that is inadequately ventilated could cause oxygen deficiency.

  Install the instrument in a room that has a ventilation mechanism such as the type of draft chamber in general use (approx. 20 $m^3$/min), and feed the exhaust tube into the draft chamber.

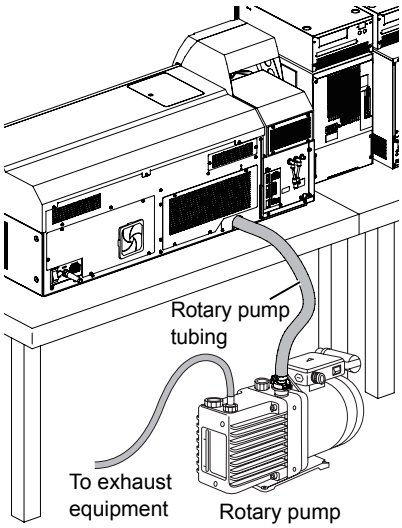




- Use a duct system for exhaust.

  Be sure to release the exhaust gas from the rotary pump, the solvent vapor that builds up in the waste container, and nitrogen gas into a duct system such as a draft chamber. Be sure to provide separate exhaust channels for the exhaust from the rotary pump and the nitrogen for ionization.

  Failure to do so will lead to contamination of the mass spectrometer.




- Install a wash basin.

  If a solvent gets into someone's eyes or someone touches a toxic solvent, it has to be rinsed away immediately. Install a wash basin as close to this product as possible.

**CAUTION**

**Prohibitions**

- Do NOT install this product in a location where there is corrosive gas, contaminants or a lot of dust.

  Avoid installing the instrument at a location where there is corrosive gas or a lot of dust in order to maintain its performance.

- Do NOT install the instrument close to any device that generates a strong magnetic field.

  To ensure that the instrument can be operated normally, do not install it at a location where there is a strong magnetic field.

  In addition, if there is a lot of noise in the power line add a noise filter.

**Instructions**

Observe the installation conditions.

- A room with a temperature within the range 18 to 28 °C and where the change in room temperature throughout the day is small
- A location where the instrument is not directly exposed to the airflow from a heater/ air conditioner
- A location not exposed to direct sunlight
- A location where there is little vibration
- A location where the humidity remains within the range 40 to 70 %

### (1) Temperature, humidity

Temperature 18 °C to 28 °C

Humidity 40 % to 70 % (to be no dew condensation)

Note, however, that temperature changes over a short time can cause instability in the instrument. In order to ensure that stable analysis is performed, make sure that changes in temperature over a short period of time do not exceed 3 °C.

### (2) Installation space

The table on which the instrument is installed must be robust, steady and flat, and must be able to comfortably bear the weight of the instrument. The body of the instrument weighs approximately 130 kg (excluding the rotary pump). You must also take into account the weight of the LC system used, and the weight of the computer system.

For an example installation see "9.5 Example Installation" P.222. Note that, for maintenance purposes, a space of at least 30 cm is required at the right side of the LCMS-8030/LCMS-8040 main body. A space of at least 5 cm is also required at the left side of the instrument. Install the instrument so that it is separated by at least 5 cm from the LC unit.

### (3) Ventilation

Some of the solvents used with this instrument are inflammable or toxic. The instrument also uses a large quantity of nitrogen gas, so its use in a room with inadequate ventilation could cause oxygen deficiency. Install equipment that provides adequate ventilation in the room.

### (4) Exhaust gas from the rotary pump, solvent vapor

Be sure to release the exhaust gas from the rotary pump and the solvent vapor that builds up in the waste container into a duct system such as a draft chamber.

Be sure to provide separate exhaust lines for the exhaust from the rotary pump and the nitrogen for ionization. Failure to do so will lead to contamination of the mass spectrometer.

### (5) Other considerations

Install the instrument in a location free from contaminants, dust, vibration, electromagnetic noise, corrosive gas, interfering magnetic fields, and other hindrances.

In order to maintain the instrument's performance, also give adequate consideration to the following points.

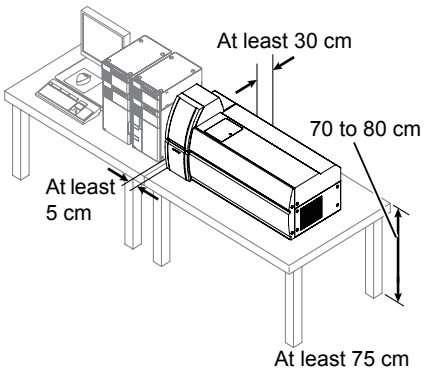
1. Changes in room temperature during use must be small.
2. The airflow from heaters, air conditioners, etc. must not directly strike the instrument.
3. The instrument must not be exposed to direct sunlight.

## ■ Installation space

**⚠ CAUTION**

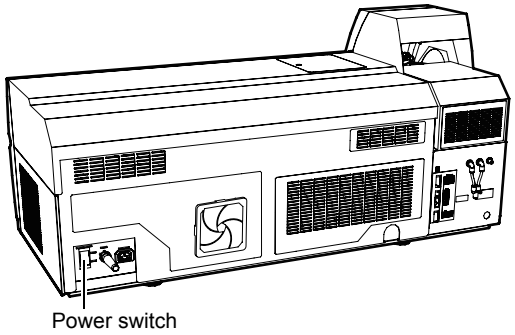
Instructions

- Install the instrument on a desk or table that meets the following conditions.
  - Flat and stable / Able to comfortably bear the weight of this product (approx. 130 kg) and the entire computer system / Having a depth of at least 75 cm
    Failing to meet these conditions can cause accidents in which the table collapses or units fall off.
  - Allowing the instrument to be placed a sufficient distance from walls
    Make the distance between the rear face of the instrument and the wall at least 30 cm and the distance between the left and right faces and other units at least 5 cm. If these conditions are not met it will not be possible for the fans to provide adequate air cooling and there will be a risk that the instrument will overheat and its performance will drop.
  - Providing sufficient space for maintenance
    For maintenance purposes a space of at least 30 cm is required to the right of the body of the instrument. Place units that are easy to move, like the computer and printer, on the right side of the instrument body, and place walls and units that are difficult to move at a distance of at least 30 cm from the instrument body.




  - Having an appropriate height
    Use a table with a height of about 70 to 80 cm. Using a table with a height outside this range will impair the operating convenience of the instrument, so care is required.

- Install the instrument so that the power switch can be operated easily.
  If the power switch is difficult to operate, it will not be possible to switch the power off immediately in an emergency.



## ⚠ CAUTION

Instructions

- Install the rotary pump on a stable floor.
  Install the body of the instrument and the rotary pump at a distance that allows them to be connected with the tubing.
  If the tubing is extended the intended performance of the machine cannot be guaranteed.

An example configuration of a typical system and its installation space are shown in Fig. 8-1.

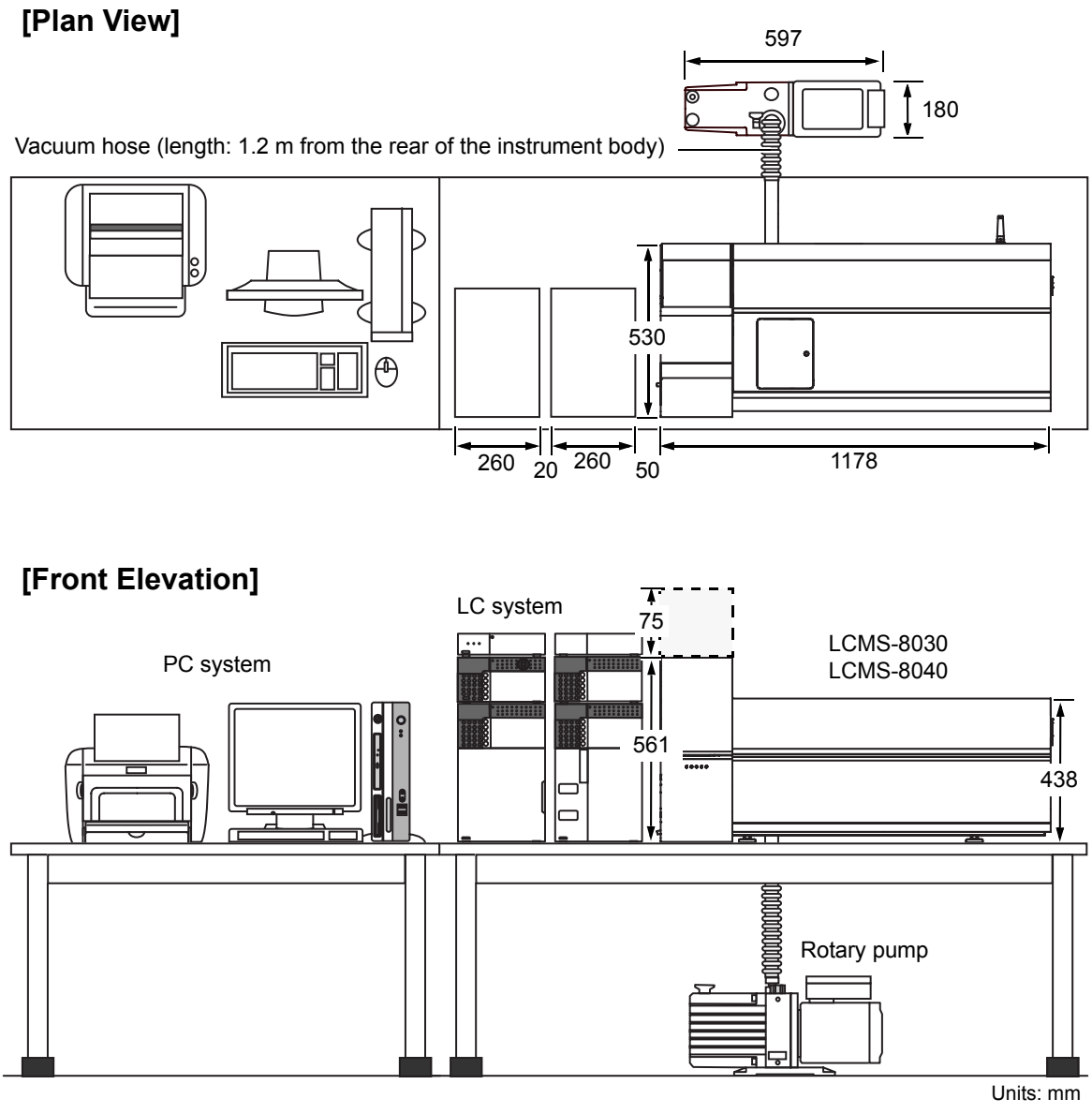



Fig. 8-1

## 8.1.2 Connecting the Instrument

### ■ Connecting the rotary pump

1 Connect the vacuum hose of the rotary pump.

2 Connect the rotary pump mist exhaust hose.
Connect the other end of the hose to the exhaust system.

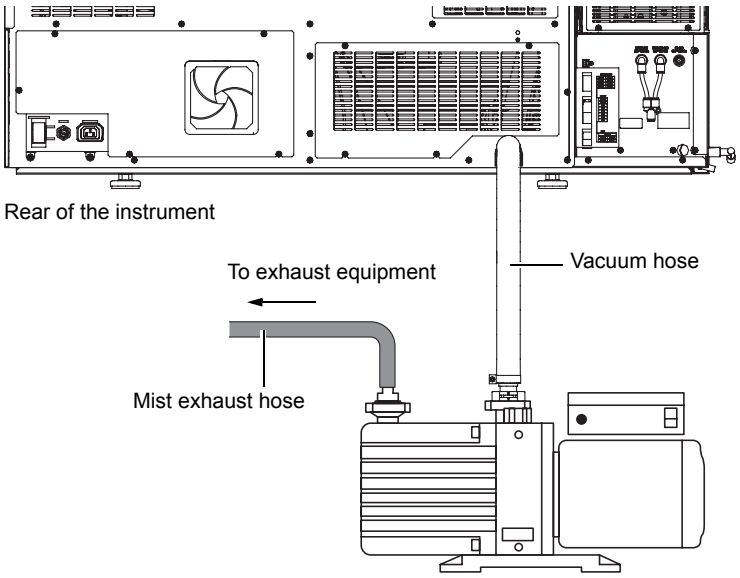



Fig. 8-2

3 Connect the rotary pump's power cable to the instrument.

4 Turn the rotary pump's power switch ON.

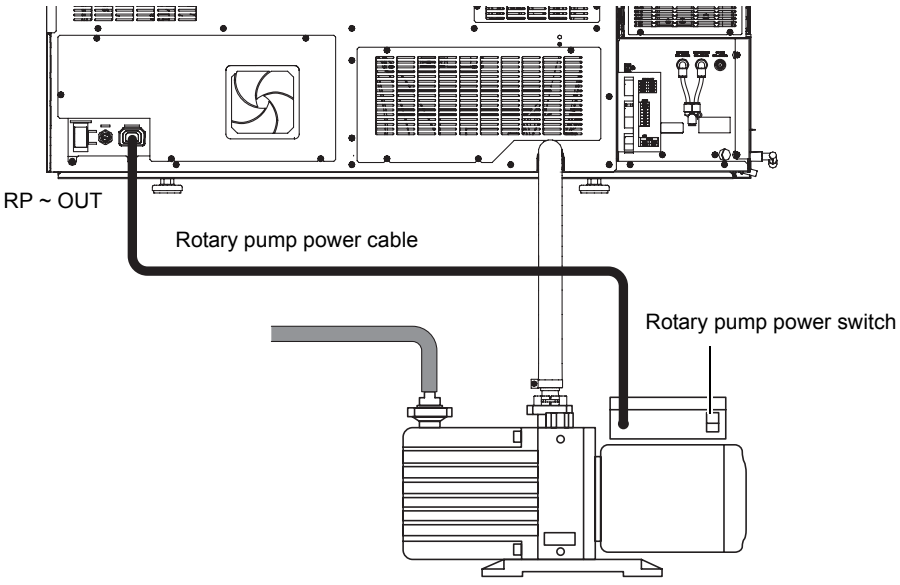



Fig. 8-3

## ■ Fitting the oil mist filter and oil return tube

The oil mist filter is a part that traps the exhaust mist from the rotary pump.

The oil return tube serves to return the oil that accumulates in the oil mist filter.

In cases where the quantity of mobile phase introduced for mass spectrometer is 0.5 mL/min or greater, a large quantity of water is introduced into the rotary pump and for this reason the gas ballast valve has to be opened and closed frequently in order to remove this water. In cases like this you are recommended to use the oil return kit.

The rotary pump oil return kit is included in the optional parts and should be purchased if required.

| Part Name | Part No. |
|---|---|
| Rotary pump oil return kit | S225-05990-92 |

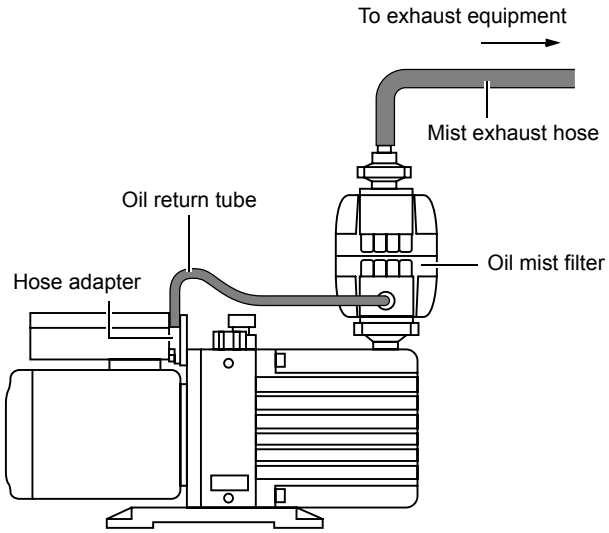
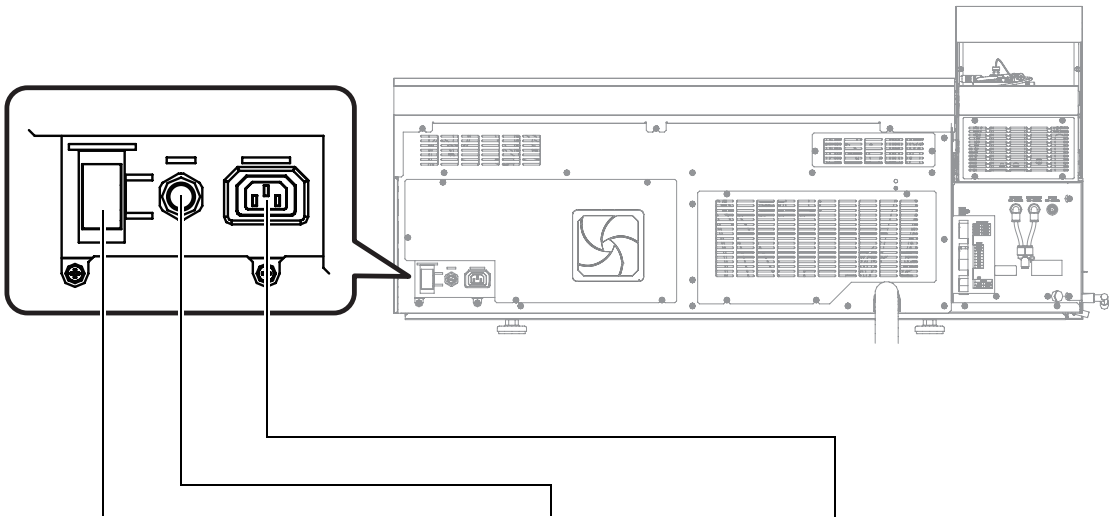



Fig. 8-4

## ■ Connecting the power supply cable

1 Connect the instrument's power cable to a power supply that is fitted with an earth leakage breaker.

2 Turn the instrument's power switch ON.



Power switch
Circuit protector, 15 A (S)
If the current exceeds 15 A, the power is shut off automatically.
I: Power is supplied (ON).
O: Power is not supplied (OFF).
~: Indicates AC voltage.

Power cable
230 V AC, 50/60 Hz

230 V AC, 50/60 Hz
Connector that supplies power to the rotary pump
It cannot be used other than for the rotary pump.

Fig. 8-5

## ■ Connection to the PC

The LCMS-8030/LCMS-8040 and computer are connected with a USB cable.

1 Connect the USB socket on the rear face of the LCMS-8030/LCMS-8040 and a USB socket on the computer.

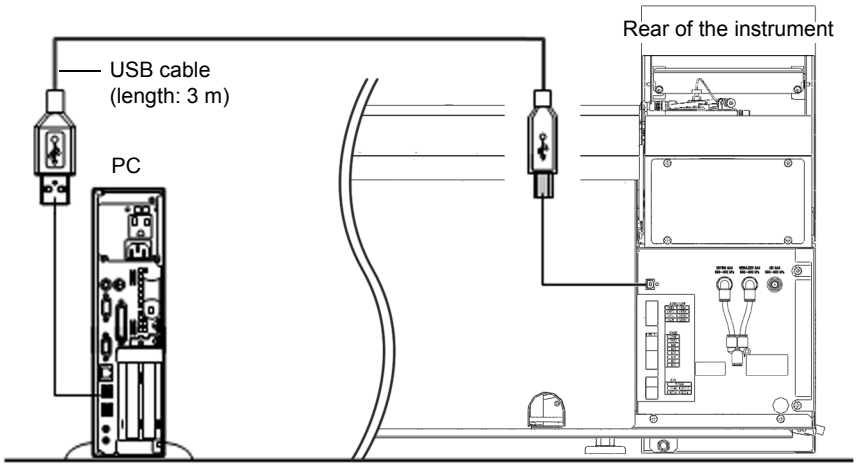



Fig. 8-6

## ■ Connecting to the LC

When connecting to the CBM-20A or CBM-20Alite system controller:

*1* Connect the start cable between the EVENT IN1 terminal on the rear face of the LCMS-8030/LCMS-8040 and the OUT1 or OUT2 terminal on the rear face of the CBM-20A/20Alite.

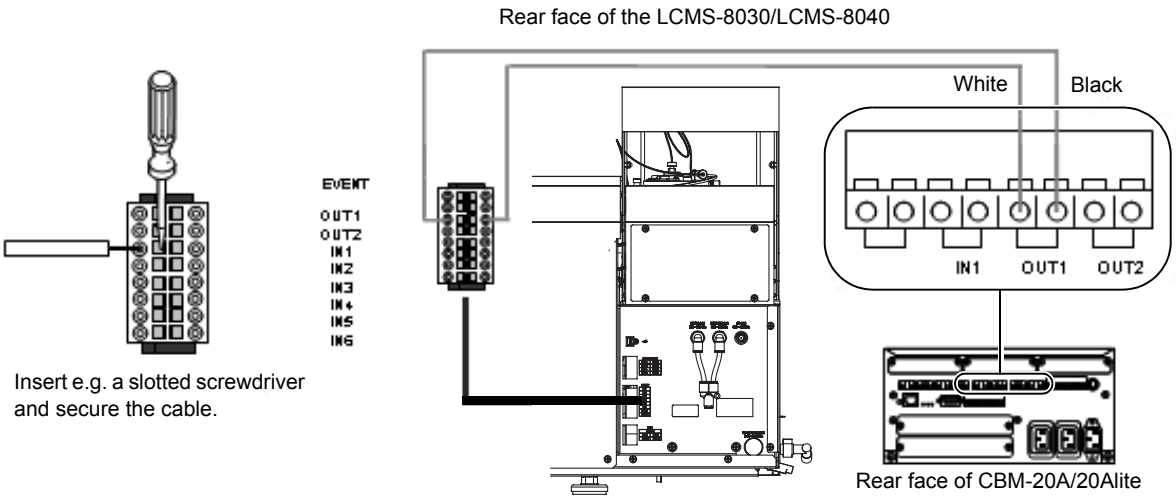



Fig. 8-7

## 8.1.3 About the Gas Used

This instrument uses a large volume of nitrogen gas. This poses a risk of anoxia symptoms (oxygen deficiency). Read this section carefully and give adequate consideration to the use of nitrogen gas.

### ■ Preventing anoxia symptoms (oxygen deficiency)

In accordance with the regulations for preventing anoxia symptoms, provide ventilation to maintain the concentration of oxygen at least 18 % at the installation site. (The normal concentration of oxygen in the air is about 21 %).

Install the instrument in a room that has a ventilation mechanism such as the type of draft chamber in general use (approx. 20 $m^3$/min), and feed the exhaust tube into the draft chamber.

When using nitrogen gas, appoint a person in charge of operations where there is a danger of anoxia symptoms (a person who has completed a skills course for a first class superintendent of work involving a danger of anoxia symptoms) and give the workers special training relating to anoxia hazards.

To cover all eventualities, you are also recommended to use a separate oxygen analyzer. Details of the recommended portable oxygen analyzer are given below.

Recommended product: Type XO-2000 oxygen analyzer

- New Cosmos Electric Co., Ltd.

  2-5-4 Mitsuyanaka, Yodogawa-ku, Osaka 532-0036, Japan

  Tel: +81-6-6308-3111

  FAX: +81-6-6308-8129

  URL: http://www.new-cosmos.co.jp/en/index.html

### ■ Specifications of the nitrogen gas

In order to maintain the performance of the instrument, use gas with the specifications indicated below.

Nitrogen Supply pressure: 690 to 800 kPa

Purity: 97 % or greater

The maximum flow rate during use is 25 L/min.

You are recommended to use a nitrogen gas generator.

### ■ Specifications of argon gas

Argon gas is used for the CID gas. Use gas with the specifications indicated below.

Argon Supply pressure: 500 kPa or greater

Purity: 99.99 % or greater

## ⚠ WARNING

Instructions

- Cautions on the use of high-pressure gas cylinders
  If you use a high-pressure gas cylinder as the gas supply source, follow the guidance of the cylinder dealership and others and handle the cylinders in a way that will avoid accidents.
  - High-pressure gas cylinders should be sited outdoors at a location where there is a good passage of air and no exposure to direct sunlight, and the gas should be fed indoors through tubing. In the case of liquefied gases in particular, these arrangements are obligatory under law.
  - Take care to ensure that high-pressure gas cylinders never reach high temperatures of over 40 °C. Also ensure that there will be no naked flames within 2 m of the cylinders.
  - Pay adequate attention to ventilation, and, as a start-of-work inspection, check for gas leakage using, for example, the soapy water test.
  - Secure high-pressure gas cylinders, e.g. with rope, so that they cannot be made to fall over/fall off.
  - Make sure that you use a pressure reducing valve of the oil prohibition type. In addition, do not use a valve that has oil adhering to the inside faces of the pipes that gas comes into contact with.
  - When the use of gas has finished, turn off the main cock on the high-pressure gas cylinder immediately.
  - Inspect the pressure gauge to check that it functions correctly at least once every three months.
  - Note that permission is required under the law to store more than 300 $m^3$ (standard status) of high-pressure gases like these.

- Handle high-pressure gas cylinders correctly in compliance with regulations, the general high pressure gas preservation regulations and laws applicable in your country.

## ■ Supplying nebulizer gas and drying gas

1 Connect the nitrogen gas tubing to the rear of the instrument.

In the standard specifications, a ϕ6 mm tube joint is fitted. If, for example, you are connecting inch size tubing, prepare a convertor joint.
Use nitrogen gas with a purity of at least 97 %.

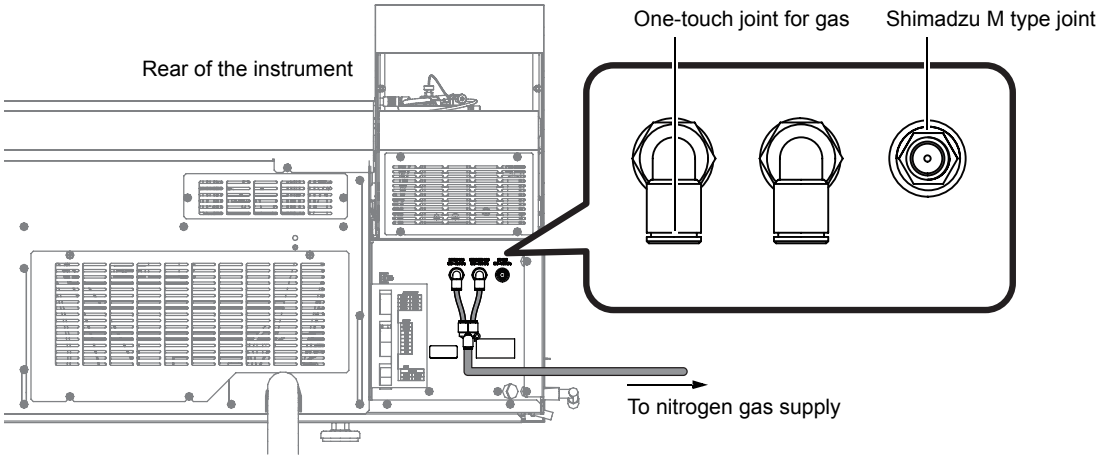



Fig. 8-8

**NOTE**

Connection to and disconnection from the one-touch joint

- To connect, insert the tube as far as it will go into the joint.
- To disconnect, press in the release bush.

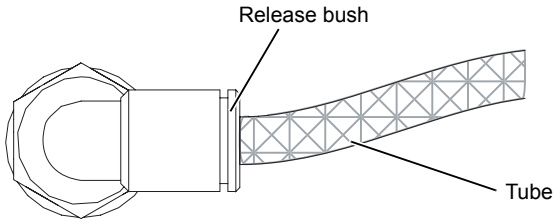



Fig. 8-9

2 Open the main cock for the supply of nebulizer gas and drying gas.

Check that the supply pressure is 690 to 800 kPa.

## ■ Supplying CID gas

1 Connect the argon gas tubing to the rear of the instrument.

A Shimadzu M-shaped joint (see Fig. 8-8) is attached to the rear of the instrument.
The following gas conductor has been prepared for connecting the argon gas cylinder to the LCMS-8030/LCMS-8040.

| Part Name | Part No. |
|---|---|
| Gas conductor (length: 2.5 m) | S201-48067 |

2 Open the argon gas main cock in order to supply CID gas.

Check that the supply pressure is 500 kPa.

## About tubing joints

The parts described below are options. Purchase them if necessary.

### ■ Conversion from inch sizes

| Part Name | Part No. |
|---|---|
| Tube joint 6.4 | S225-15849-91 |

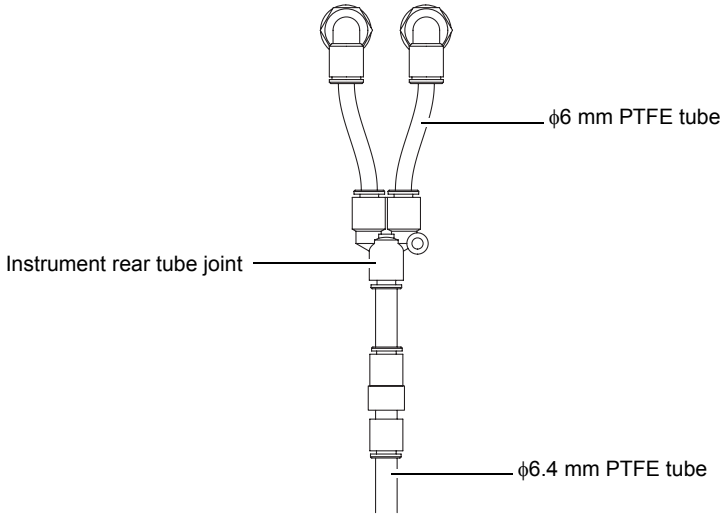



Fig. 8-10

### ■ Carrier gas tubing: Conversion from a Shimadzu M type joint

| Part Name | Part No. |
|---|---|
| Gas pipe adapter kit | S225-10766-91 |

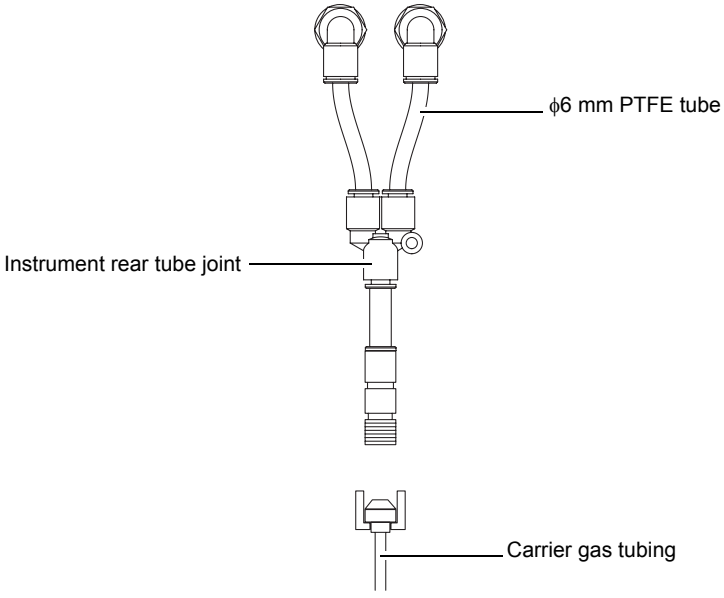



Fig. 8-11

## 8.1.4 Tubing for the LC Flow Line

### ■ Piping example

A typical example of the tubing used with the LCMS-8030/LCMS-8040 is shown below.

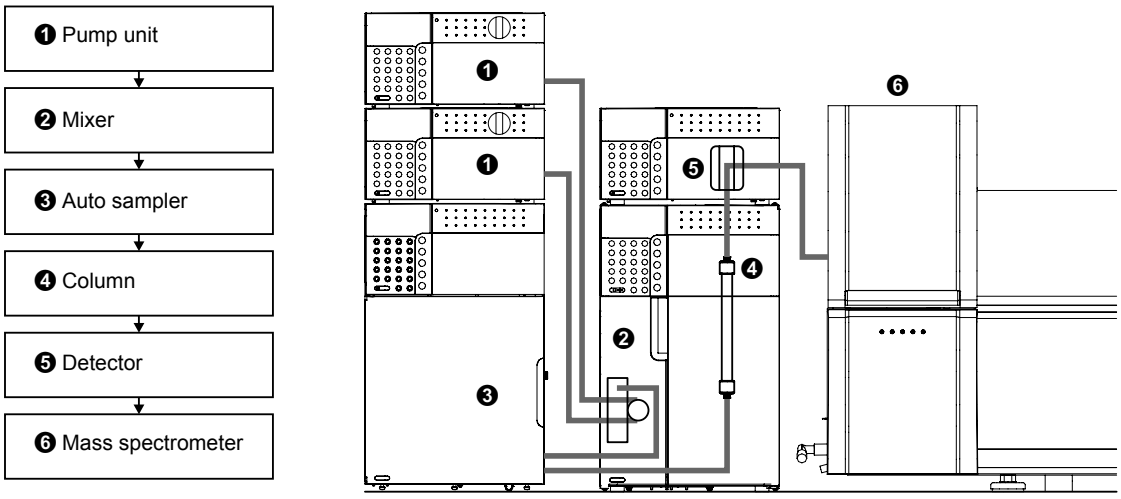



Fig. 8-12

### ■ For ESI (DUIS)

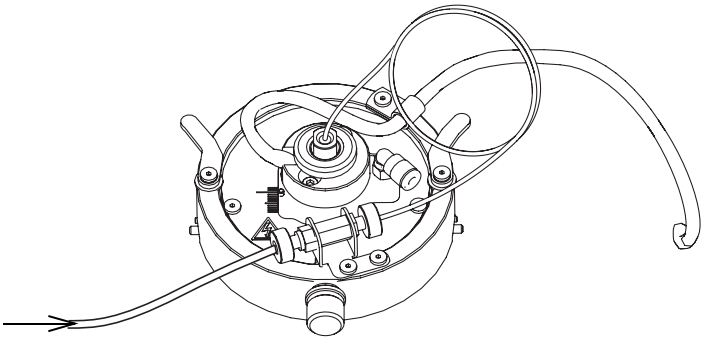


Fig. 8-13

### ■ For APCI

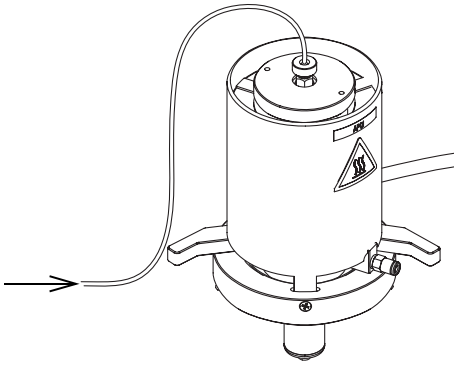


Fig. 8-14

## 8.1.5 Installing the Standard Sample

The standard sample is used for optimization of the supply pressure to the lens system and quadrupole rods inside the instrument in auto tuning, for sensitivity adjustment, for resolution adjustment, and for mass calibration.

**CAUTION**

Instructions

Turn the standard sample OFF from LabSolutions before removing tubing or the bottle cap.

1 Pour 40 to 80 mL of standard sample into the standard sample bottle.

Reference

"7.6.1 Replacing the Standard Sample" P.154

2 Open the front door and set the standard sample bottle in the instrument.

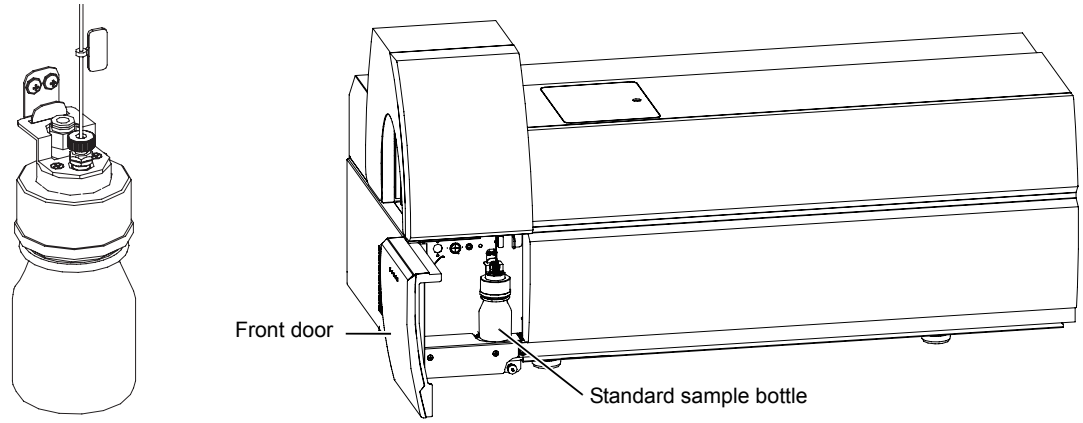



Fig. 8-15

**NOTE**

A glass capillary tube is inserted into the resistance tube.

If bent abruptly, it could break.

Maintain a moderate bending radius of at least 40 mm while handling the tube.

3 Connect the gas tubing for delivering the standard sample.

*4* Connect the resistance tube and the tubing to the ionization probe.

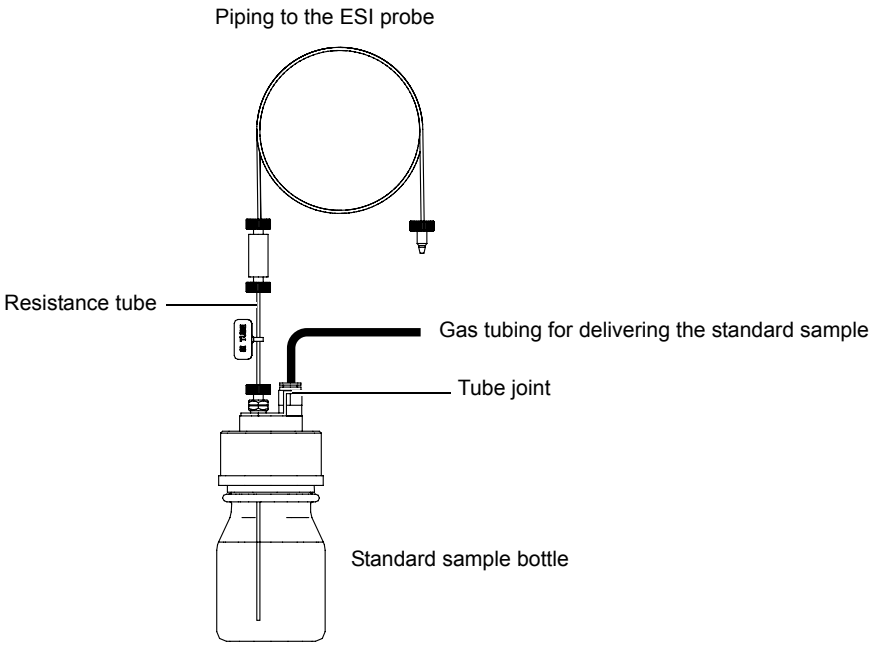



Fig. 8-16

**NOTE**

Connection to and disconnection from the one-touch joint

- To connect, insert the tube as far as it will go into the joint.
- To disconnect, press in the release bush.

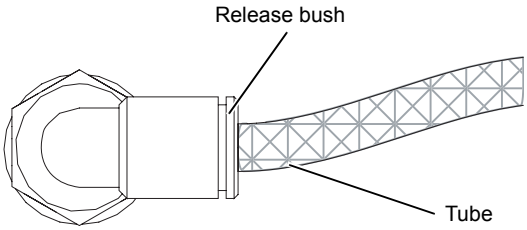



Fig. 8-17

**Reference**

For a figure showing how to run the tube to the instrument body, see Fig. 3-53.

## 8.1.6 Installing the Waste Container

**WARNING**

Instructions

For details on handling the waste container, be sure to read "Static Electricity Precautions" P.xiii.

**CAUTION**

Instructions

- Install the waste container at a position lower than the surface on which the LCMS-8030/LCMS-8040 is installed.
  The waste liquid is expelled through the mechanism of a head drop. This will cause the waste liquid to overflow into the interior of the instrument.
- Make sure that the waste tube is not submerged below the surface of the liquid.
  This will cause the waste liquid to overflow into the interior of the instrument.

1 Prepare a waste container of an appropriate capacity (diameter of mouth: 29 to 31 mm) and place this container at a position lower than the instrument (e.g. on the floor).

Connect the drain in the manner shown Fig. 8-18.

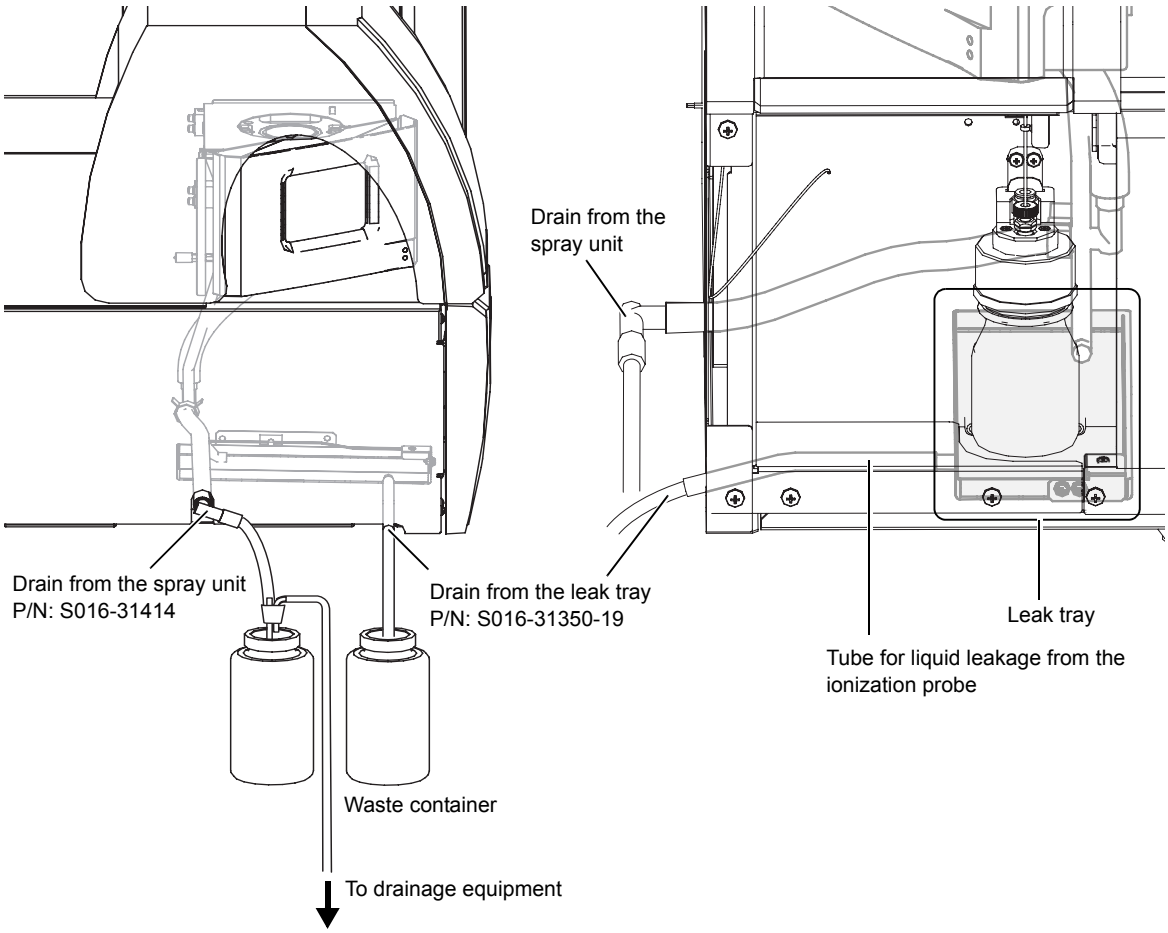



Fig. 8-18

# 8.2 Manual Tuning

In manual tuning, the instrument can be adjusted manually while monitoring peaks. If peaks cannot be checked while using manual tuning, execute auto tuning instead.

**NOTE**

- Ion monitoring using the standard sample can be accomplished in ESI analysis.
- In the APCI mode the flow volume is low and ions cannot be monitored stably.

**CAUTION**

Instructions

Create a new tuning file when replacing the detector and never use a previous tuning file.

## 8.2.1 Checking Ions in the [MS Tuning] Window

1 Connect the standard sample.

Reference

"8.1.5 Installing the Standard Sample" P.198

2 Start up LabSolutions.

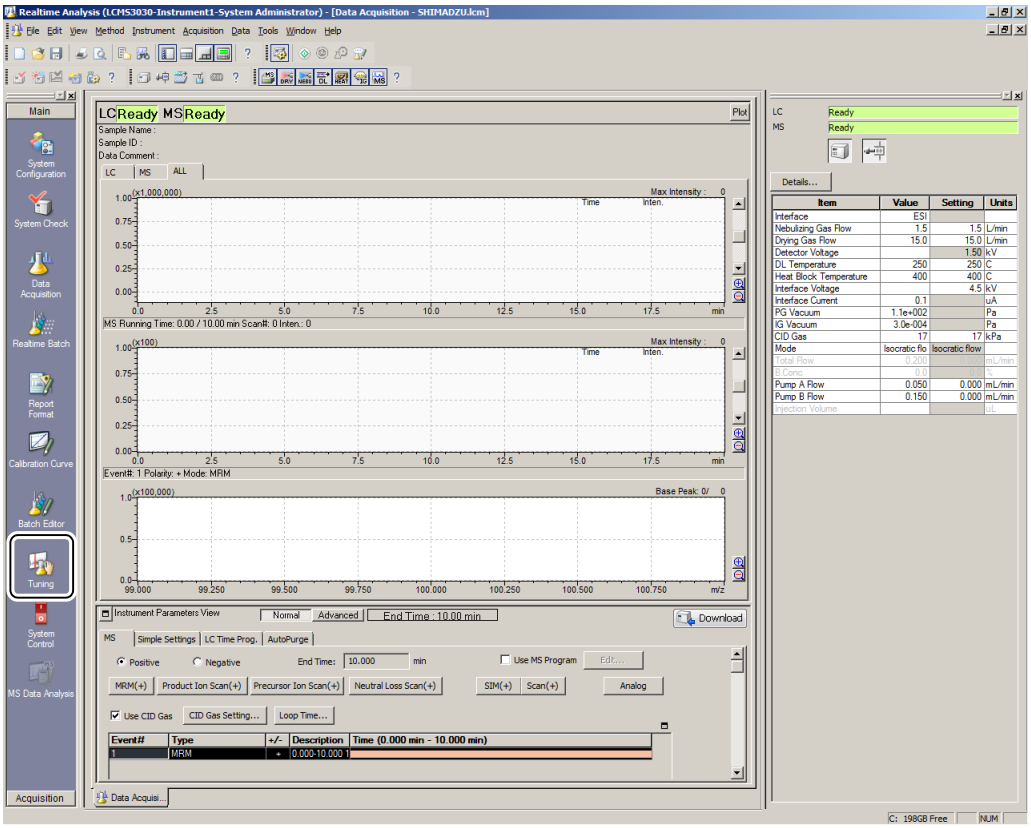
Reference

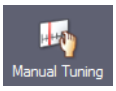
"3.1.2 Starting the Vacuum System" P.42

3 Click the 

(Tuning) icon.

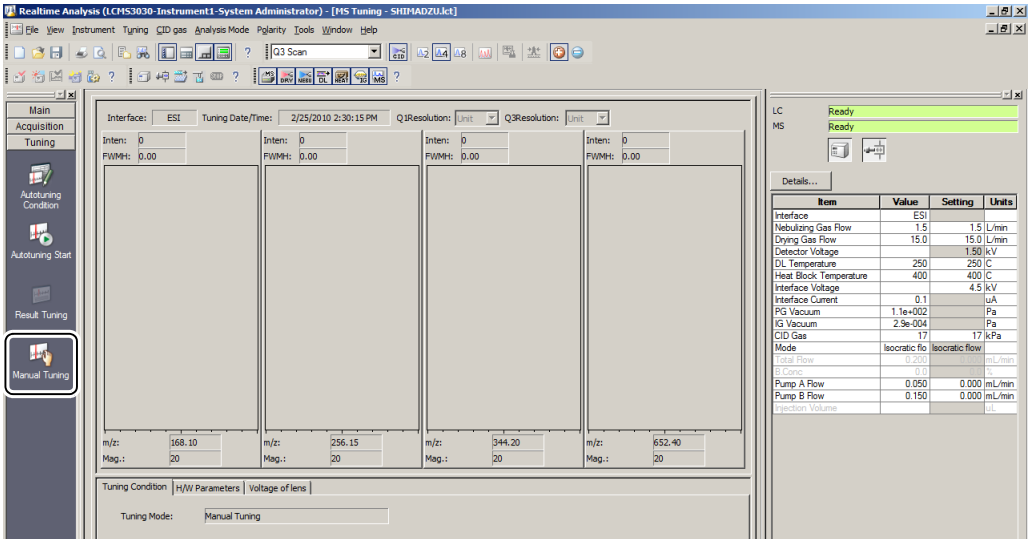
The [Tuning] window is displayed.



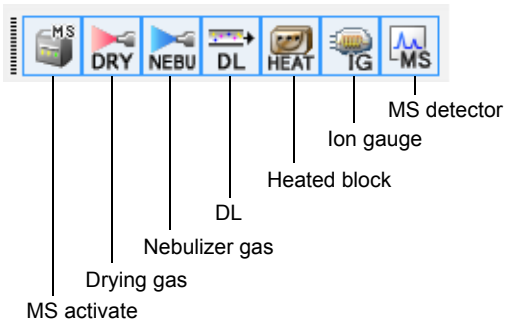

4 Click the 

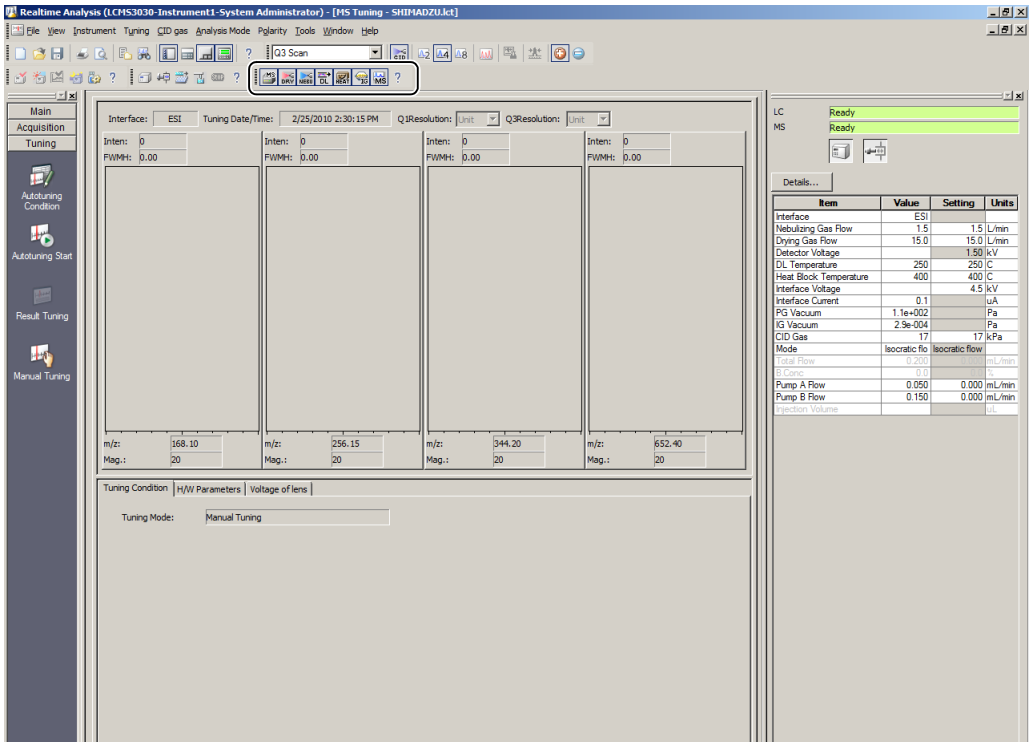
(Manual Tuning) icon.

The [MS Tuning] window is displayed.



5 Turn ON the nebulizer gas, the heaters (DL, heated block) and the [MS detector] button.




6 Turn ON the  (standard sample) button.

The sample will not flow out for approximately one minute while the sample tubing becomes filled with the sample.

## 7 Check the peaks in the [MS Tuning] window.

In manual tuning, screen settings are configured so that the following ions can be monitored in each analysis mode.

- Ions configured in positive mode

| Analysis Mode | Peak Monitor Settings m/z |
|---|---|
| Q1 and Q3 scan | 168.10, 256.15, 344.20, 652.40, 1004.60, 1224.75, 1603.15, 1893.40 |
| Precursor ion scan | 168.10 > 89.00, 300.20 > 89.00, 344.20 > 177.10, 388.25 > 177.10 |
| Product ion scan | 168.10 > 45.05, 168.10 > 89.00, 388.25 > 133.10, 388.25 > 177.10 |
| Neutral loss scan | 256.15, 300.20, 344.20, 388.25, neutral loss 211.15 |

- Ions configured in negative mode

| Analysis Mode | Peak Monitor Settings m/z |
|---|---|
| Q1 and Q3 scan | 503.15, 1007.30 |
| Precursor ion scan | 503.15 > 89.00, 1007.30 > 503.15 |
| Product ion scan | 503.15 > 89.00, 503.15 > 179.05 |
| Neutral loss scan | 503.15 neutral loss 414.15, 503.15 neutral loss 324.10 |

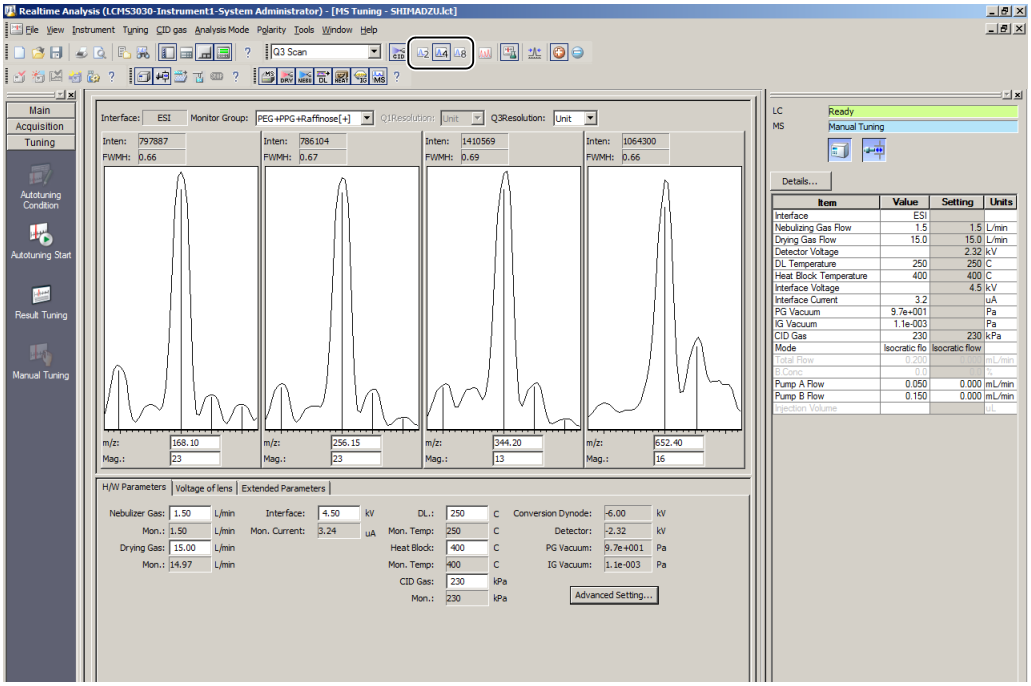
Reference
"8.3.3 Mass of the Standard Sample" P.215

## ■ Switching the number of windows displayed

Switch to 8 windows.

Switch to 4 windows.

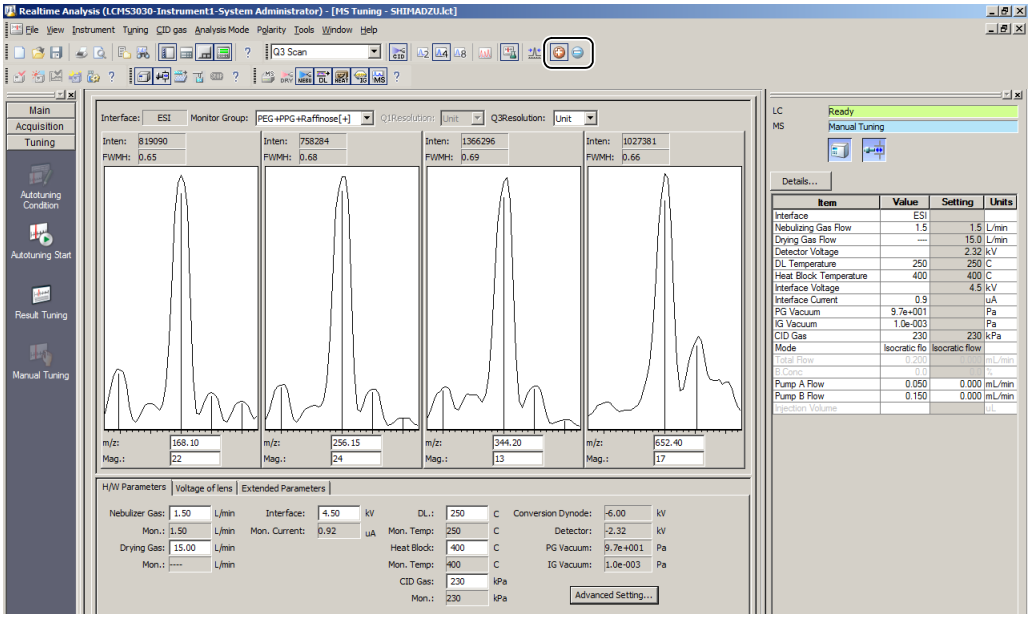
Switch to 2 windows.



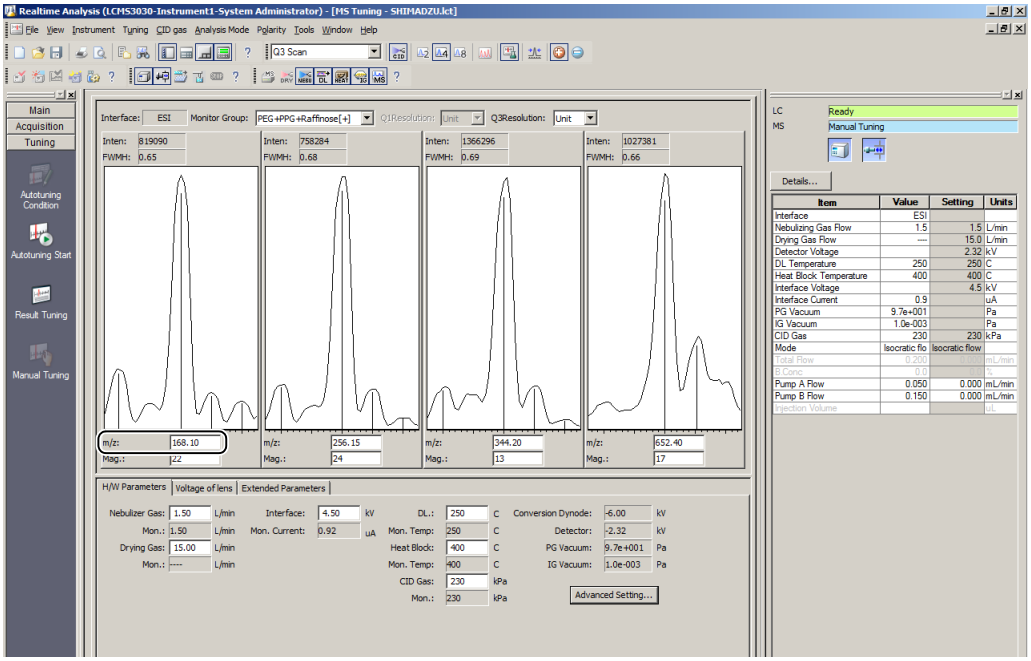
## ■ Switching between the positive ion and negative ion monitor

Monitor negative ions.

Monitor positive ions.

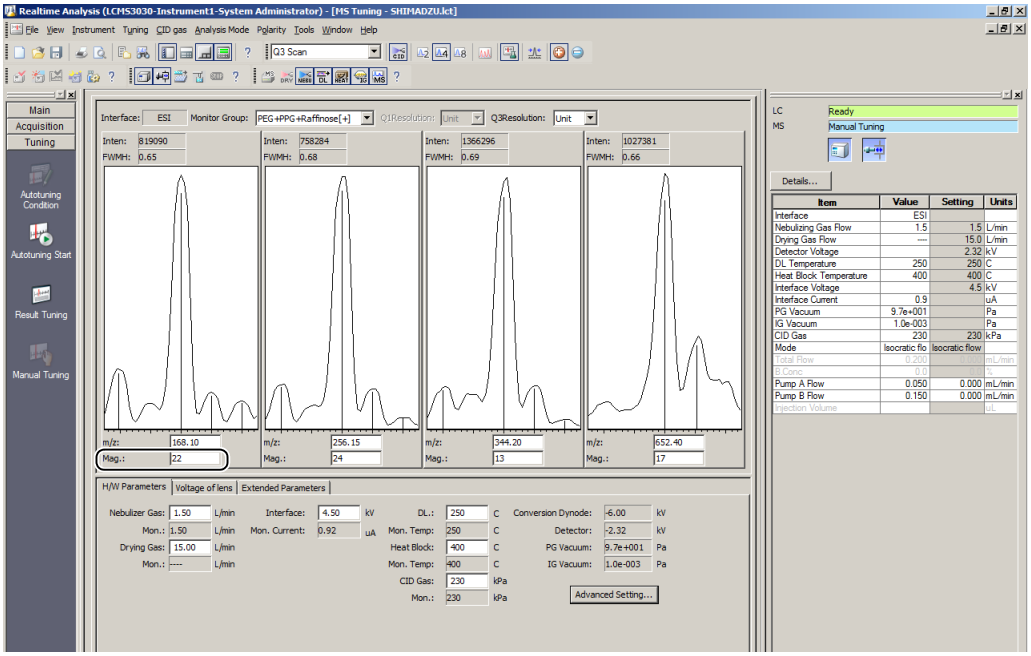


## ■ Entering the m/z value to be monitored



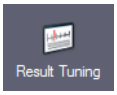

## ■ To change the monitoring magnification

Enter a value at [Mag.].

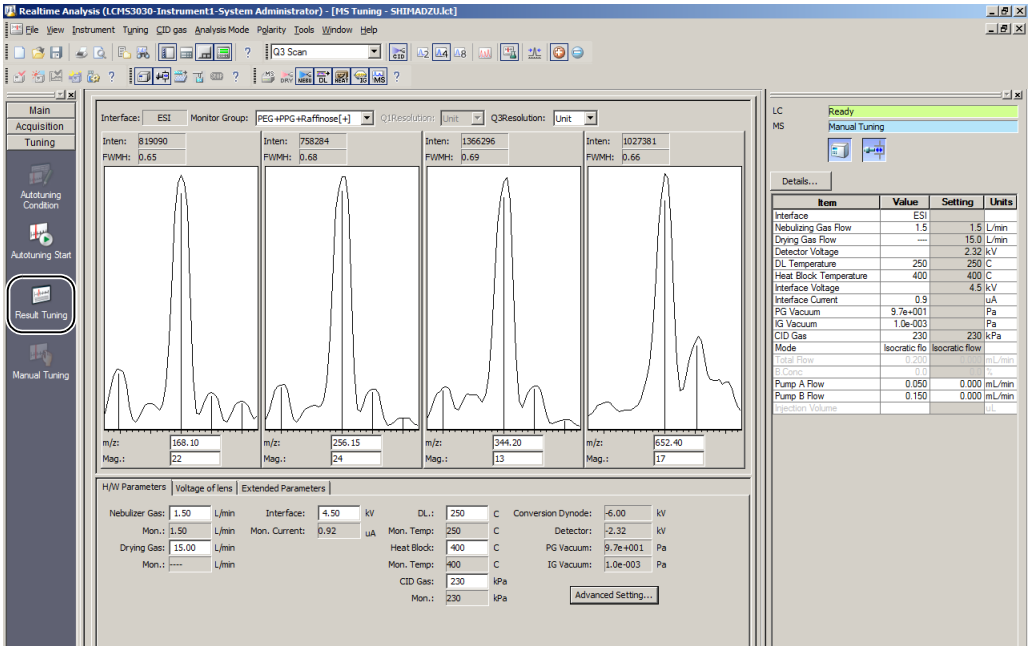


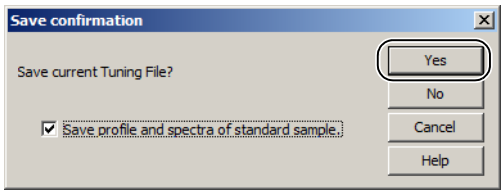

Move the mouse cursor into the ion observation panel and double click to display the data standardized at the maximum intensity.

## 8.2.2 Exiting the [MS Tuning] Window

1 Click the 

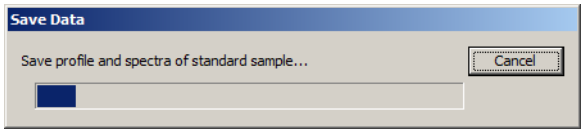
(Result Tuning) icon to exit manual tuning.




The save confirmation message is displayed. Click [Yes] to save the result of manual tuning.

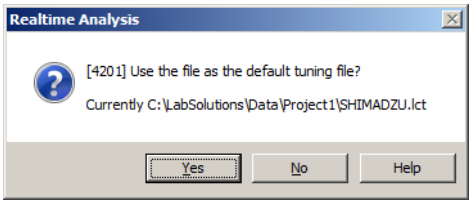
2 Select whether you want to save the peak profile and spectrum of the standard sample observed in manual tuning or not. If [Yes] is selected, the following message will be displayed.




3 Select whether the saved tuning file is to be set as the default tuning file or not.

Reference

"3.8.2 Starting Auto Tuning" P.82



## 8.2.3 Explanations of Parameters

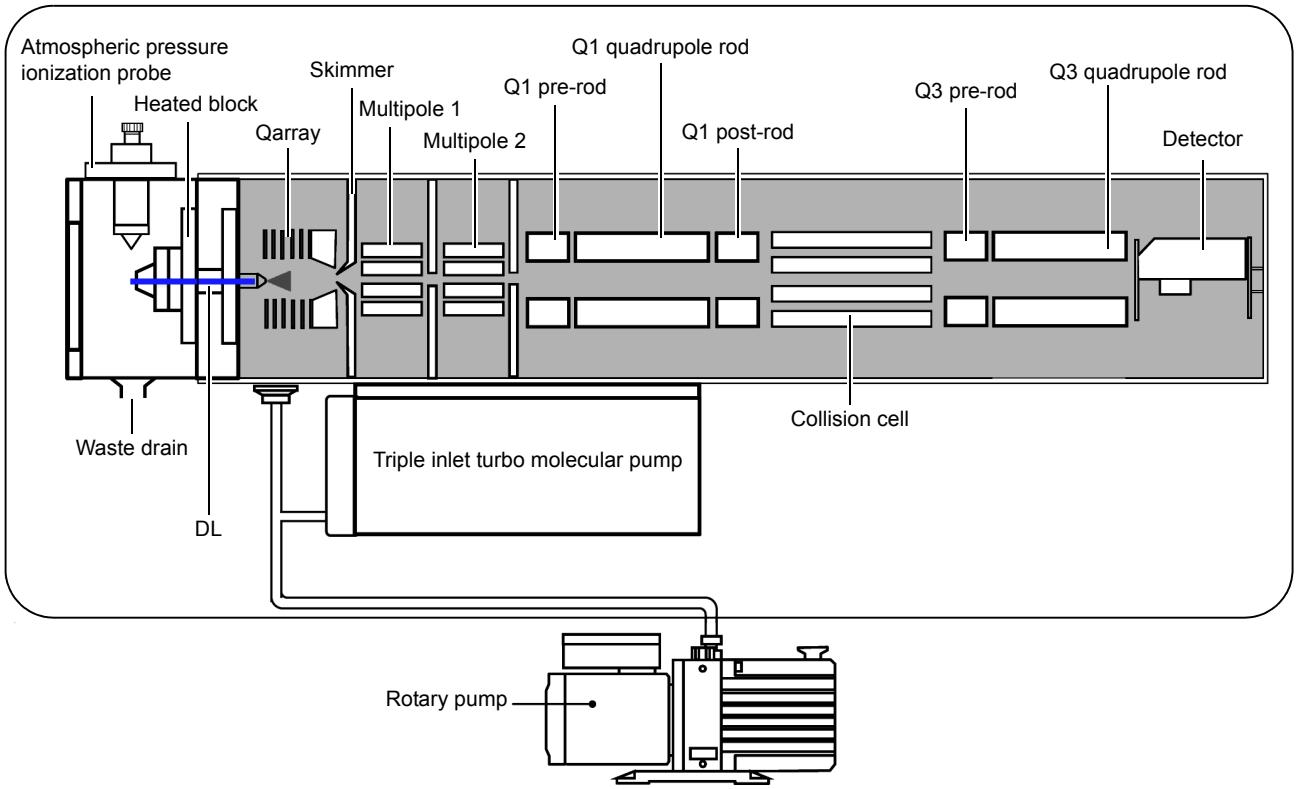



Fig. 8-19

## ■ Gas

| Parameter Name | Default Value | Maximum | Minimum | Remarks |
|---|---|---|---|---|
| Nebulizer gas | 3.0 L/min (ESI)<br>2.0 L/min (DUIS)<br>3.0 L/min (APCI) | 3.0 L/min<br>(ESI, DUIS)<br>4.4 L/min (APCI) | 0.5 L/min<br>(ESI, DUIS)<br>0.5 L/min (APCI) | |
| Drying gas | 15 L/min<br>(ESI, DUIS)<br>5 L/min (APCI) | 20 L/min | 3 L/min | Execute with auto tuning OFF |
| CID gas | 230 | 230 | 17 | 0 when turned OFF in the [System Control] window |

## ■ High voltage

| Parameter Name | Default Value | Maximum | Minimum | Remarks |
|---|---|---|---|---|
| Interface HV | ESI<br>(+) 4.5 kV<br>(-) -3.5 kV<br>APCI<br>(+) 4.5 kV<br>(-) -3.5 kV | (+) 5.0 kV<br>(-) -5.0 kV | (+) 0.0 kV<br>(-) 0.0 kV | |
| DUIS corona HV | (+) 4.5 kV<br>(-) -3.5 kV | (+) 5.0 kV<br>(-) 5.0 kV | (+) 0.0 kV<br>(-) 0.0 kV | |

## ■ Heater

| Parameter Name | Default Value | Maximum | Minimum | Remarks |
|---|---|---|---|---|
| DL heater | 250 °C | 300 °C | 50 °C | |
| Heated block | 200 °C (APCI)<br>400 °C (ESI, DUIS) | 300 °C (APCI)<br>500 °C (ESI, DUIS) | 50 °C | |
| APCI heater | 350 °C | 500 °C | 50 °C | |

## ■ Lens voltage

| Parameter Name | Default Value | Maximum | Minimum | Remarks |
|---|---|---|---|---|
| DL | 0 V | (+) 100 V<br>(-) -100 V | 0 V | |
| Qarray DC | 0 V | 100 V | -100 V | |
| Qarray RF | 1) Depends on m/z | 130 V | 10 V | |
| Skimmer | 0 V | 0 V | 0 V | Fixed |
| Multipole 1 DC | 0 V | 0 V | 0 V | |
| Multipole 2 DC | (+) -1 V<br>(-) +1 V | 10 V | -10 V | |
| Multipole RF | 2) Depends on m/z | 300 V | 10 V | Same for multipole 1 and 2 |
| Entrance lens 1 | (+) -1 V<br>(-) +1 V | 10 V | -10 V | |
| Entrance lens 2 | (+) -2 V<br>(-) +2 V | 50 V | -50 V | |

1) Qarray RF

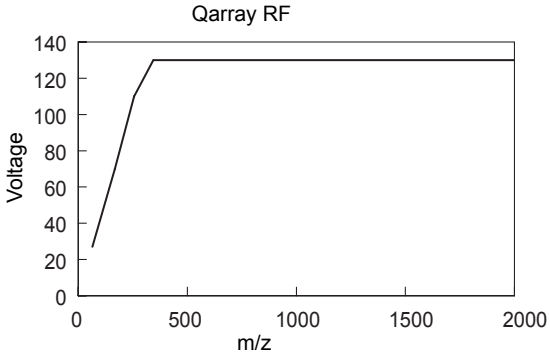



Fig. 8-20

2) Multipole RF

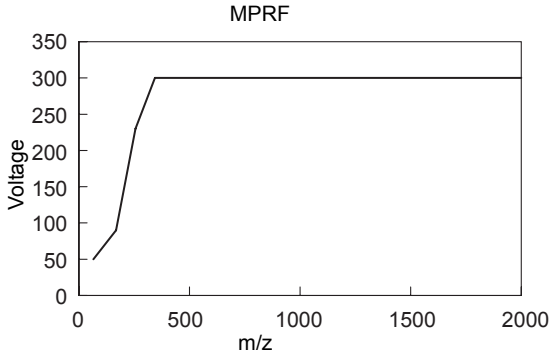



Fig. 8-21

## ■ Analysis unit

| Parameter Name | Default Value | Maximum | Minimum | Remarks |
|---|---|---|---|---|
| Q1 pre-rod DC | 1) Depends on m/z | 50 V | - 50 V | |
| Q1 main rod DC | (+) - 5 V<br>(-) + 5 V | 50 V | - 50 V | |
| Q1 post-rod DC | (+) - 5 V<br>(-) + 5 V | 50 V | - 50 V | |
| Collision cell RF (CCRF) | 2) Depends on m/z | 300 V | 0 V | Optimized for each analysis mode |
| Collision energy | (+) - 15 V<br>(-) 30 V | 180 V | - 180 V | |
| Q3 pre-rod DC | 3) Depends on m/z | 50 V | - 50 V | Difference with CE |
| Q3 main rod DC | 4) Depends on m/z | 50 V | - 50 V | Difference with CE |

1) Q1 pre-rod DC with positive ions

With negative ions, the positive and negative voltages are interchanged.

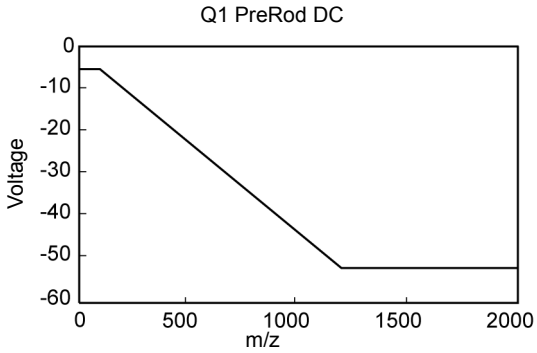



Fig. 8-22

2) Collision cell RF

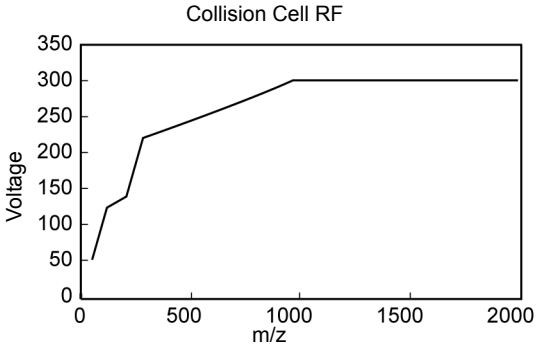



Fig. 8-23

3) Q3 pre-rod DC with positive ions

With negative ions, the positive and negative voltages are interchanged.

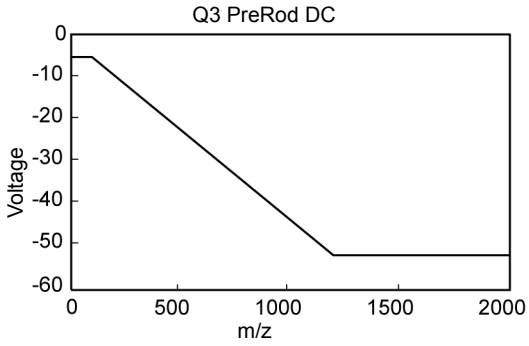



Fig. 8-24

4) Q3 main rod DC with positive ions

With negative ions, the positive and negative voltages are interchanged.

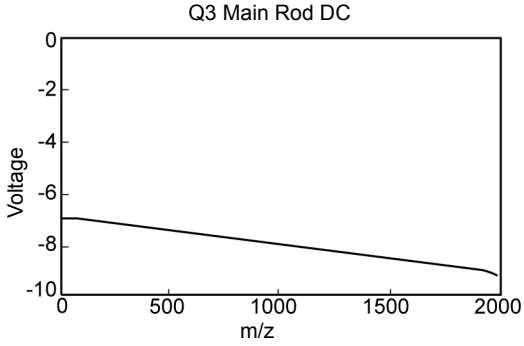



Fig. 8-25

## ■ Detector

| Parameter Name | Default Value | Maximum | Minimum | Remarks |
|---|---|---|---|---|
| Conversion dynode | (+) -6 kV<br>(-) 6 kV | (+) -10.0 kV<br>(-) 10.0 kV | 0 V | |
| Detector | -1.75 kV | -3.5 kV | 0 V | |

# 8.3 Standard Sample

For carrying out sensitivity adjustment and atomic mass number adjustment of the instrument, the LCMS-8030/LCMS-8040 uses a mixture of polyethylene glycol (PEG) 200, 600, 1000, 2000 polypropylene glycol (PPG) and raffinose solution as the standard sample.

Sample for instrument calibration P/N S225-14122-01 (200 mL)

Using this standard sample, auto tuning automatically performs sensitivity optimization and mass calibration.

## 8.3.1 Method for Preparing the Standard Sample

The method for preparing the standard sample is as follows.

The result is the same as P/N S225-14122-01 (200 mL).

1 Make up the dilution solvent.

Dilution solvent (when making approx. 1 L)

| | |
|---|---|
| Pure water | 800 mL |
| Methanol | 200 mL |
| Ammonium acetate | 14.5 mg |

2 Make up the stock solution.

Dissolve the sample compounds indicated below in 100 mL of the dilution solvent described in 1 above.

| | |
|---|---|
| PEG200 | 0.75 µL |
| PEG600 | 1.0 µL |
| PEG1000 | 150 µL |
| PPG2000 | 100 µL |

This is the stock solution.

(It is 100 times the concentration of the standard sample. However, it does not contain raffinose.)

PEG1000 is a solid at room temperature. To weigh it, warm it to around 60 °C to liquefy it, weigh it quickly in a disposable micro pipette and then dissolve it in the solvent.

3 Make up the standard sample for auto tuning.

1 Dilute the stock solution created in step 2 to 1/100th concentration using the dilution solution created in step 1.

2 Dissolve raffinose in this solution to achieve a concentration of 15 mg/L.

This completes the procedure.

The resulting concentrations are as indicated below.

| | |
|---|---|
| PEG 200 | : 0.075 µL/L |
| PEG 600 | : 0.1 µL/L |
| PEG 1000 | : 15.0 µL/L |
| PPG 2000 | : 10.0 µL/L |
| Raffinose | : 15 mg/L |

**NOTE**

The PEG and PPG used for the standard sample easily stick to the equipment and are difficult to remove even by washing, so the pipette, containers, etc. used for weighing these compounds should not be used for the preparation of the mobile phase or reagents.

This will cause contamination of reagents and background noise during analysis.

## 8.3.2 Reagents

| | | |
|---|---|---|
| PEG200 | 500 g | Wako Pure Chemical Industries P/N 167-09045 |
| PEG600 | 500 g | Wako Pure Chemical Industries P/N 168-09075 |
| PEG1000 | 500 g | Wako Pure Chemical Industries P/N 165-09085 |
| PPG2000 | 500 g | Wako Pure Chemical Industries P/N 164-05895 |
| Raffinose | 5 g | Wako Pure Chemical Industries P/N 182-00011 |

| | | |
|---|---|---|
| Solvent | | |
| Methanol for LC use | 1 L | P/N 017-40019-06 |
| Distilled water for LC use | 1 L | P/N 017-40513-01 |
| Ammonium acetate, special grade | 500 g | Wako Pure Chemical Industries P/N 019-02835 |

## 8.3.3 Mass of the Standard Sample

### For the positive ionization mode

PEG (Polyethylene Glycol): $HOCH_2$ ($CH_2OCH_2$) $nCH_2OH$

Auto tuning is performed by using the PEG + $NH_4$ molecules with added ammonium ions.

| n=1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| 124.0974 | 168.1236 | 212.1498 | 256.176 | 300.2022 | 344.2284 | 388.2547 | 432.2809 | 476.3071 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 520.3333 | 564.3595 | 608.3857 | 652.4119 | 696.4382 | 740.4644 | 784.4906 | 828.5168 | 872.543 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 916.5692 | 960.5954 | 1004.622 | 1048.648 | 1092.674 | 1136.7 | 1180.727 | 1224.753 | 1268.779 |

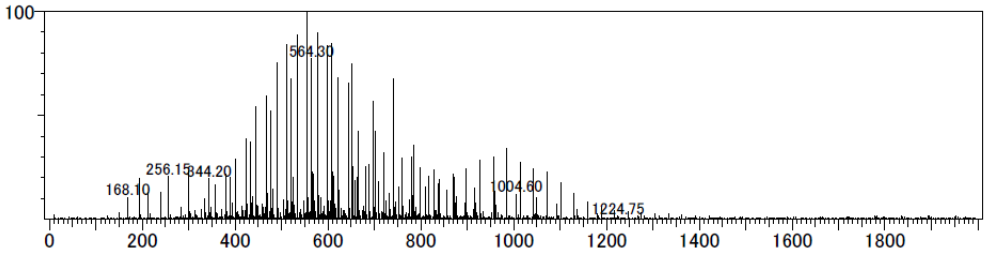



Fig. 8-26

### For the negative ionization mode

Raffinose: $C_{18}H_{32}O_{16}$

Auto tuning performs mass calibration using Raffinose 503.16 (M-H) deprotonated molecules and 1007.33 (2M-H) dimer ions.

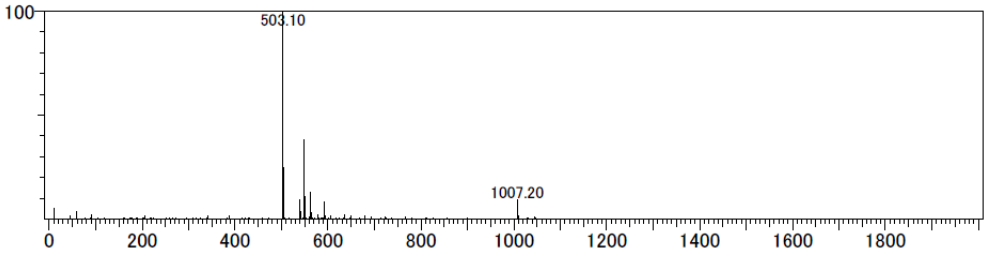
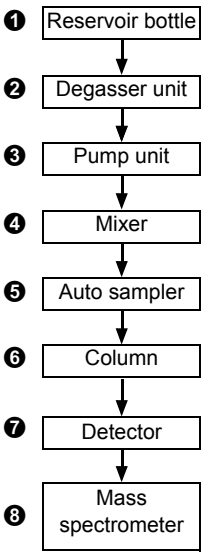



Fig. 8-27

# 8.4 Example Configuration of a High-Pressure Gradient System (Auto Injector)

## ■ Prominence system

**Flow of solvent** **Function of each unit**



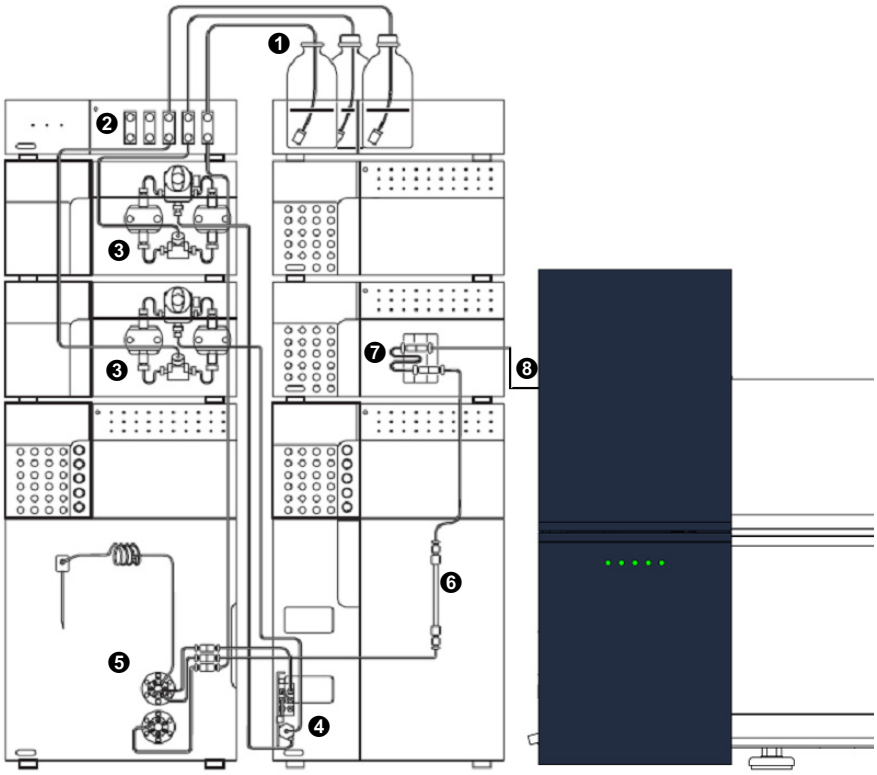




Fig. 8-28

# 9 Specifications

## 9.1 Performance

| Item | Specifications |
|---|---|
| Mass range | m/z 10 to 2000 |
| Resolution | R = 2 M (however, 50 % valley, 1000 u/sec.) |
| Sensitivity (MRM) | ESI<br>Positive ions<br>Reserpine 1 pg, m/z 609.3 > 195<br>S/N > 200 (RMS) @LCMS-8030<br>S/N > 1000 (RMS) @LCMS-8040 |
| Maximum scan speed | 15000 u/sec |
| Positive/negative switching time | 15 msec |
| MRM settings | Minimum Dwell Time: 1 msec<br>Minimum Pause Time: 1 msec |

# 9.2 Hardware

| Item | Specifications |
|---|---|
| Interface section | ESI probe / APCI probe (option) / DUIS (option) and ion sampling unit<br>Drying gas Max. flow rate 20 L/min |
| ESI probe | Sample flow rate (max.) 2 mL/min<br>Probe voltage ± 5 kV max.<br>Nebulizer gas Flow rate 3.0 L/min max. |
| APCI probe (option) | Sample flow rate (max.) 2 mL/min<br>Corona needle voltage ± 5 kV max.<br>Probe temperature 500 °C max.<br>Nebulizer gas Flow rate 4.4 L/min max. |
| DUIS (option) | Sample flow rate (max.) 1 mL/min<br>Probe voltage ± 5 kV max.<br>Corona needle voltage ± 5 kV max. |
| DL | Temperature 300 °C max.<br>Voltage ± 100 V |
| Heated block | Temperature 500 °C max. (ESI, DUIS)<br>300 °C max. (APCI) |
| Analysis/detection section | |
| Analysis rods | Hyperbolic quadrupole rods made of molybdenum, with pre-rods |
| Collision cell | Multipole type ultra high speed collision cell |
| Detector | Secondary electron multiplier with conversion dynode |
| Vacuum system | Triple inlet turbo molecular pump, 1 unit (triple inlet) Vacuum speed 40 L/s + 260 L/s + 210 L/s<br>Rotary pump, 1 unit Vacuum speed 28 $m^3/h$ |

# 9.3 Software

## 9.3.1 Analysis

| Item | Specifications |
|---|---|
| Analysis conditions | Batch register the measurement conditions for the LC, the measurement conditions for the MS, and the conditions for data processing in the Method, and register the report output format in the template file. |
| MS analysis | Q3 scan (max. 512 events), Q3 SIM (max. 512 events × 32 channels)<br>Q1 scan (max. 512 events), Q1 SIM (max. 512 event × 32 channels) |
| MS/MS analysis | MRM (max. 512 events × 32 channels)<br>Product ion scan (max. 512 events)<br>Precursor ion scan (max. 512 events)<br>Neutral loss scan (max. 512 events) |
| Automatic analysis | Automatic analysis can be performed through the combination of the auto injector (option) and the schedule function. |

## 9.3.2 Data Processing

| Item | Specifications |
|---|---|
| Data processing | Drawing of LC chromatograms, MS chromatograms and MS spectra<br>Elimination of background noise in LC chromatograms<br>Background subtraction and equalization for MS spectra<br>Area calculations for LC chromatograms and MS chromatograms<br>Calculation of column performance from LC chromatograms |
| Quantitative calculations | For both LC data and MS data<br>Number of identified peaks: Max. 3000<br>Identification method: Absolute retention time method / relative retention time method, time band method /time window method, reference ions can be used (maximum of 5).<br>Quantitative calculations: Correction percentage method (possible to add a scale factor), internal standard method, absolute calibration curve method (external standard), standard addition method<br>Calibration curve: Straight line (method of least square, averaging method), broken line, secondary curve, tertiary curve, maximum of 64 calibration points (averaging up to 10 times is possible for each calibration point), weighting |
| Library search | Database: Private library<br>Search modes: Similarity search, index search<br>Number of libraries as simultaneous search targets: Max. 5 |
| Library editing | Editing of the private library |
| Report output | LC chromatograms, MS chromatograms, MS spectra, profiles, LC peak tables, MS peak tables, MS status log, LC column performance reports, library search results, summary reports |
| Batch processing | Data processing by the scheduler, and continuous automatic processing of report output are possible. |

### 9.3.3 Instrument Control

| Item | Specifications |
|---|---|
| Instrument Control | Starting and stopping the MS unit<br>Automatic and manual adjustment of the MS unit<br>LC unit and MS unit diagnosis functions |

### 9.3.4 User Management

| Item | Specifications |
|---|---|
| User Management | A maximum of 37 levels of privileges can be assigned to each user. |

# 9.4 Installation Conditions

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Required power supply</td><td>Single phase 230 V AC (50 Hz/60 Hz), 15 A, for LCMS-8030/LCMS-8040<br>Power for LC<br>Refer to the specifications or the instruction manual provided with your LC.<br>(The current capacity varies according to the configuration of the LC unit.)<br>*) For details on the power supply specifications of the computer, printer and peripheral equipment, check either the specifications or the instruction manuals of the devices you are using. The specifications given below are a rough guide.<br>Power for PC<br>Supply correct voltage to the PC or printer, etc. referring to the instruction manuals accompanying the PC or printer, etc.<br><br>⚠ CAUTION<br>Use a PC, printer, etc. that conform to your local laws and regulations.<br>Instructions<br><br>*) As far as voltage fluctuation is concerned, the instrument is designed to operate adequately well provided the range of voltage fluctuation is within ± 10 % including the amplitude of the fast noise superimposed in the AC line, but the voltage fluctuation range required in order to guarantee the performance specifications is ± 5 % including noise.<br>Grounding: 100 Ω max.</td></tr>
<tr><td>Installation environment</td><td>Temperature 18 °C to 28 °C<br>Humidity 40 % to 70 % (to be no dew condensation)<br>Other Apart from this, the instrument should be installed in an environment with few disturbances such as dust, vibration, electromagnetic wave noise, corrosive gases, interfering magnetic fields and so on.</td></tr>
<tr><td>Exhaust gas</td><td>In order to process the exhaust gas of the rotary pump safely, an exhaust system such as a draft chamber is required.</td></tr>
<tr><td>Required gas</td><td>Nitrogen gas<br>Supply pressure: 690 to 800 kPa<br>Purity: 97 % or greater<br>Max. flow rate during use: 25 L/min<br>Argon gas<br>Supply pressure: 500 to 800 kPa<br>Purity: 99.99 % or greater<br>Max. flow rate during use: Approx. 10 mL/min</td></tr>
</table>

# 9.5 Example Installation

| | Dimensions | | | Weight, kg |
|---|---|---|---|---|
| | W | D | H | |
| LCMS-8030<br>LCMS-8040 | 1178 | 530 | 561 | 130 |
| Rotary pump | 597 | 180 | 276 | 44 |

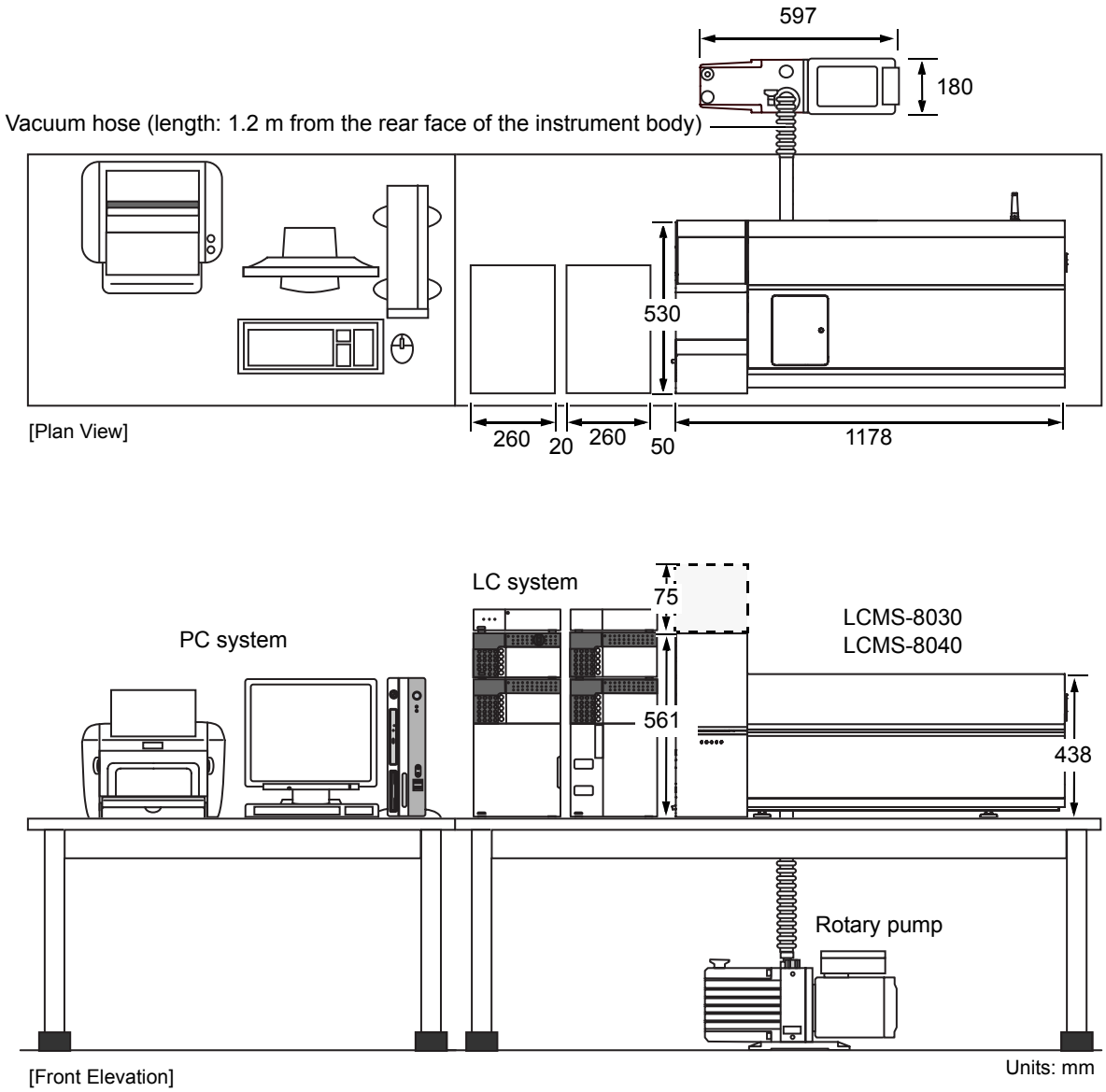



Fig. 9-1

# 10 Maintenance Parts

## 10.1 Consumables

| Part Name | Part No. | Remarks |
|---|---|---|
| ESI probe ASSY | | |
| CAPILLARY ASSY | S225-14948-91 | Set of tubes for ESI |
| PEEK TUBE 5999 | S228-32999-01 | |
| ELBOW, KQ2L23-M5-ROHS | S035-60724-21 | |
| APCI probe ASSY | | |
| APCI PIPE ASSY | S225-15845-91 | SUS capillary tube |
| HEATER ASSY | S225-15619-41 | APCI heater unit (with ferrule) |
| FERRULE | S225-03748-03 | |
| HALF UNION, KQ2H01-M5-ROHS | S035-60725-01 | |
| Corona needle ASSY | | |
| NEEDLE ASSY | S225-15877-92 | Needle (for both APCI and DUIS) |
| Interface ASSY | | |
| DL PIPE ASSY | S225-15718-91 | DL unit set |
| ORIFICE | S225-15479 | |
| SAMPLING CONE | S225-15487 | |
| WASHER PEEK | S023-65106-01 | Seal for fixed part of heater flange |
| SI unit ASSY | | |
| TUBE, SI | S225-15848-91 | Resistance tube, joints, tubing for LC |
| SPACER, FKM | S225-15697-01 | Glass bottle packing |
| PEEK FRIT | S228-48607-91 | Made of PEEK |
| Standard sample bottle | S038-00512-01 | |
| Bottle cap | S225-15868-91 | Standard sample bottle cap |
| Standard sample | S225-14122-01 | |
| Detection unit | | |
| EM, MS644 | S225-14168-01 | Secondary electron multiplier |
| Vacuum system | | |
| RP Oil Ultragrade19 (4L) | S017-30163-02 | About 1.5 L used at each oil change |
| IG GAUGE | S225-09490-01 | Vacuum gauge |
| FILAMENT FOR PB1, ROHS | S225-20310-91 | Vacuum gauge (Pirani gauge) |

# 10.2 Spare Parts

| Part Name | Part No. | Remarks |
|---|---|---|
| Waste tube | | |
| SILICON RUBBER TUBE, 7X10NL | S016-31350-19 | Piping from the leak tray |
| PVC TUBE, R3603 1/2X3/4X1/8 | S016-31414 | Drain tube from the spray unit, for use outside the instrument |
| TUBE, SE-200 1/2-3/4 | S016-37619-02 | Drain tube from the spray unit, for use inside the instrument |
| Vacuum system | | |
| TMP, split flow 310 | S225-14179-01 | Triple inlet turbo molecular pump body + power supply |
| ROTARY PUMP, E2M28 | S225-09309-02 | For 230 V |
| CABLE ROTARY PUMP | S225-17224-41 | Power supply cable for the rotary pump |
| LEAK VALVE ASSY | S225-03540-94 | |
| HOSE TG-32 | S018-31555-06 | Use a 1.5 m RP intake hose (purchase unit: m) |
| HOSE, CHEMIFLEX 15MM | S016-31697-02 | Use a 0.5 m TMP exhaust hose (purchase unit: m) |
| SLEEVE, PTFE 15X22 CL | S018-31511 | Use a 5 m RP exhaust hose (purchase unit: m) |
| HOSE BAND, GEAR S 50 | S037-61064 | For spring hose #32 |
| HOSE BAND, WIRE 24 | S037-61023 | For spring hose #15 |
| HOSE BAND, WIRE SY-22 | S037-61002 | For vinyl hose 15 × 1.5 |
| CENTER RING, KF10 | S035-06004-21 | |
| CENTER RING, KF25 | S035-06004-24 | |
| CLAMP, KF16 | S035-06004-01 | |
| CLAMP, KF25C | S035-06004-02 | |
| FLANGE PIPE, TQ-VAC | S225-12211-91 | For RP intake |
| ELBOW, KF25-#15 | S225-03535-91 | For TMP back (TMP side) |
| FLANGE | S202-55374 | For RP intake side (RP side) |
| O-RING, 4D G30 | S036-12502 | For RP intake |
| Housing ASSY | | |
| O-RING, 4D P15 | S036-11216 | |
| O-RING, 4D P40 | S036-11243 | |
| O-RING, 4D-S56 | S036-19004-41 | |
| O-RING, AS568A-253 4D | S036-15552-53 | |
| O-RING, AS568A-272 4D | S036-15552-72 | |
| O-RING, AS568A-278 4D | S036-15552-78 | |
| O-RING, AS568A-341 4D | S036-15553-41 | |
| O-RING, 4D P18 | S036-11218 | |
| O-RING, 4D P5 | S036-11203 | |
| PACKING 4TX14X22 | S261-00207-02 | For the ion gauge |

| Part Name | Part No. | Remarks |
|---|---|---|
| Interface section | | |
| IF FLANGE | S225-15477-41 | Interface flange body |
| INSULATOR FLANGE | S225-15481 | |
| PLATE, ORIFICE | S225-15710 | |
| SOCKET ASSY | S225-15717-41 | |
| BOLT, SST HEXSOCKET M6X16 | S022-27104 | |
| O-RING, 4D P4 | S036-11202 | |
| O-RING, 4D S8 | S036-19004-05 | |
| O-RING, 4D S14 | S036-19004-11 | |
| O-RING, 4D-S70 | S036-19004-46 | |
| HEATER FLANGE ASSY | S225-15486-41 | Heater flange body |
| BLOCK, HEATER | S225-15488 | |
| INSULATOR BLOCK | S225-15489 | |
| HEATER ASSY | S225-15716-41 | |
| INSULATOR, FLANGE | S225-15491 | |
| BUSH, HEATER | S225-15498 | |
| O-RING, 4D S100 | S036-19004-53 | |
| O-RING, 4D S18 | S036-19004-14 | |
| O-RING, 4D S14 | S036-19004-11 | |
| O-RING, 4D S10 | S036-19004-07 | |
| Ion source unit | | |
| DOOR ASSY | S225-12100-41 | |
| WINDOW | S225-12106 | Window glass |
| DOOR COVER | S225-12101 | Plastic cover |
| O-RING, 4D G145 | S036-19004-53 | |
| O-RING, 4D P14 | S036-11215 | |
| O-RING, 4D G50 | S036-12506 | |
| O-RING, 4D G100 | S036-12517 | |
| O-RING, 4D P26 | S036-11228 | |
| ESI probe | | |
| ESI PROBE ASSY | S225-14949-41 | ESI probe, complete |
| CAPILLARY | S225-14915 | |
| NOZZLE | S225-14902 | |
| SUS COUPLING | S228-16447-03 | |
| COUPLING | S225-14903 | |
| MALE NUT, PEEK | S228-18565-84 | 5 included |
| HIGH VOLTAGE CABLE | S225-14947-41 | |
| O-RING, 4D P7 | S036-11205 | |
| O-RING 4D P9 | S036-11207 | |

| Part Name | Part No. | Remarks |
|---|---|---|
| ESI probe | | |
| O-RING, 4D-S8 | S036-19004-05 | |
| ELBOW, KQ2L23-M5-ROHS | S035-60724-21 | |
| APCI probe | | |
| APCI PROBE ASSY | S225-14271-41 | APCI probe, complete (excluding corona needle) |
| JOINT ASSY | S225-15788-91 | |
| NUT | S225-15739 | |
| HIGH VOLTAGE CABLE | S225-15888-41 | Common to APCI and DUIS |
| ADAPTER | S225-04993 | |
| NEEDLE UNIT ASSY | S225-14290-41 | Common to APCI and DUIS |
| HALF UNION, KQ2H01-M5-ROHS | S035-60725-01 | Gas joint |
| DUIS | | |
| NEEDLE UNIT ASSY | S225-14290-41 | Common to APCI and DUIS |
| HIGH VOLTAGE CABLE | S225-15888-41 | Common to APCI and DUIS |
| Analysis unit | | |
| ROD ASSY | S225-03550-91 | Quadrupole rod (with pre-rod) |
| PRE-ROD ASSY | S225-03560-91 | Common to Q1 and Q2 |
| PRE-ROD ASSY | S225-03560-92 | Common to Q1 and Q2 |
| SPRING ASSY | S225-12257-91 | Common to Q1 and Q2 |
| PRE-ROD | S225-03552-01 | Q1 post-rod |
| INSULATOR | S225-03553 | For post-rod (pre-rod) coupling |
| NUT | S225-03554 | For post-rod (pre-rod) coupling |
| PIN, POST ROD | S225-12258-42 | Post-rod short |
| Q1 CABLE ASSY | S225-12270-91 | Q1 cable |
| Q3 CABLE ASSY | S225-12270-92 | Q3 cable |
| BAND | S225-03566-03 | Quadrupole rod tension plate |
| CID cell | | |
| COLLISION CELL ASSY | S225-12070-41 | CID cell (for the LCMS-8030) |
| | S225-12070-42 | CID cell (for the LCMS-8040) |
| BAND CID CELL | S225-12015 | CID cell tension plate |
| COLLISION CELL CABLE ASSY | S225-14150-91 | |
| O-RING, 4D-S4 | S036-19004-01 | |
| COLLISION CELL Lens1 | S225-12217-41 | |
| COLLISION CELL Lens2 | S225-12218-41 | |
| COLLISION CELL Lens3 | S225-12219-41 | |
| COLLISION CELL Lens out | S225-12220-41 | |
| COLLISION CELL Plate | S225-14092 | |

| Part Name | Part No. | Remarks |
|---|---|---|
| Detection unit | | |
| Detector ASSY | S225-14168 | Detector, complete |
| EM, MS644 | S225-14168-01 | Secondary electron multiplier only |
| EM HV CABLE ASSY | S225-12292-91 | Cable for detector voltage supply |
| EM SIG CABLE ASSY | S225-12293-91 | Signal cable |
| Lens system | | |
| Qarray ASSY | S225-12030-91 | Qarray + skimmer |
| SKIMMER | S225-12034-01 | |
| OP1 ASSY | S225-12040-91 | Qarray side multipole ASSY (for the LCMS-8030) |
| QP1 ASSY | S225-13646-41 | Qarray side multipole ASSY (for the LCMS-8040) |
| OP2 ASSY | S225-12050-91 | Q1 side multipole ASSY (for the LCMS-8030) |
| QP2 ASSY | S225-13648-41 | Q1 side multipole ASSY (for the LCMS-8040) |
| OP1 Lens | S225-12045-01 | Entrance lens of the QA side multipole ASSY (for the LCMS-8030) |
| QP1 Lens | S225-13630-01 | Entrance lens of the QA side multipole ASSY (for the LCMS-8040) |
| OP2/QP2 Lens | S225-12052-01 | Entrance lens of the Q1 side multipole ASSY (for the LCMS-8030/8040) |
| SI unit | | |
| MANIFOLD, SI | S225-15695-91 | Manifold |
| HALF UNION, GWJS6-M5 | S035-65415-06 | Gas joint |
| HOUSING, LINEFILTER | S228-46358 | |
| PEEK TUBE 1.6X0.25 | S228-32999-03 | Use 95 mm (purchase unit: m) |
| MALE NUT, PEEK | S228-18565-84 | 5 included |
| BRACKET, SI | S225-15560 | Mounting plate |
| Gas control system | | |
| GAS Controller ASSY | S225-12008-41 | Gas control unit set |
| FEP TUBE 1/16, NEB | S225-14255-41 | For nebulizer gas |
| FEP TUBE 4 mm, DRY | S225-14255-42 | For drying gas |
| FEP TUBE 1/16, DRY | S225-14255-43 | For drying gas |
| POLYURETHANE TUBE, U2-4-6X4BK | S016-46021 | |
| VALVE ASSY (NEB) | S225-51226-01 | |
| VALVE ASSY (DRY) | S225-14292-41 | |
| VALVE ASSY SAGINOMIYA | S221-48813-91 | |
| FEP TUBE 6mm, GAS | S225-15846-93 | |
| TUBE JOINT, M | S225-10766-91 | For conversion from M type (option) |
| TUBE JOIN, 6.4 | S225-15849-91 | For conversion from 6.4 mm (option) |
| FILTER, 2300B-SS-1/8-2U | - | |
| REGULATOR, AR10-M5BG | S040-72549-51 | For CID gas pressure reduction |
| PCB ASSY, TQ-FLOW | S225-17010-42 | PCB (for maintenance, adjusted) |

| Part Name | Part No. | Remarks |
|---|---|---|
| CID gas vacuum introduction unit | | |
| CID VALVE ASSY | S225-12103-41 | |
| CID GAS INLET ASSY | S225-12131-41 | CID gas introduction unit, complete |
| CID GAS CAPILLARY | S225-12131-42 | Capillary and connection parts only |
| Fan | | |
| FAN-ASSY | S225-14263-41 | Main power supply, TMP cooling fan |
| PROBE FAN ASSY | S225-14190-41 | Fan for inside the probe cover |
| FAN60MM ASSY | S225-09853-41 | Fan for CID-RF power supply |
| RF FAN ASSY | S225-12151-41 | For the main RF power supply |
| FILTER | S042-60935-14 | Filter media only |
| Cover | | |
| TOP COVER | - | Top panel |
| FRONT COVER | - | Cover for entire surface |
| SIDE PANEL R | - | Right side panel |
| SIDE PANEL L | - | Left side panel |
| PROBE COVER ASSY | - | Probe cover, complete |
| TQ PROBE COVER FRONT | S225-12233 | Plastic cover for the probe cover front section only |
| GAS SPRING | S034-33018-05 | Gas spring for the probe cover section |
| OP COVER | - | Multipole maintenance section cover |
| SI_DOOR | S225-12236 | SI cover (for the LCMS-8030) |
| | S225-12236-01 | SI cover (for the LCMS-8040) |

## ■ Electrical parts

| Part Name | Part No. | Remarks |
|---|---|---|
| Main power supply | | |
| PCB ASSY, TQ-HPSCONT | S225-16940-40 | |
| PCB ASSY, TQ-DCDCPS | S225-16950-40 | |
| POWER SUPPLY, ZWS240PAF-24/J H | S074-80435-38 | |
| POWER SUPPLY, ZWS150AF-24/J HFP | S074-80429-75 | |
| POWER SUPPLY, ZWS100AF-24/J | S074-80429-55 | |
| POWER SUPPLY, ZWS30-5/J HFP | S074-80383-22 | |
| HEATER TRANS ASSY | S225-13518-41 | Heater transformer |
| FILTER, MAS-1215-33 | S075-00073-13 | Noise filter |
| PROTECTOR, BAM2151310 | S065-90768-12 | Power switch |
| CABLE, MAIN POWER | S225-17112-41 | |
| Control system | | |
| PCB ASSY, TQ-CPU | S225-16900-41 | CPU |
| PCB ASSY, TQ-LENSDC | S225-16930-41 | LENS |
| PCB ASSY, TQ-ANALOG | S225-16920-41 | ANALOG |
| CDL transformer | | |
| LCMS CDLTRANS2 | S225-13515 | For the CDL heater |
| High-voltage power supply | | |
| TQ-HV SIG ASSY | S225-17099-41 | High-voltage power supply unit for detector |
| HV IF SUB ASSY | S225-13347-41 | High-voltage power supply unit for interface |
| CABLE, PR HV P OUTPUT | S225-13602-42 | HV cable for IF |
| HV DUAL SUB ASSY | S225-13348-41 | High-voltage power supply unit for DUIS |
| CABLE, NED HV N OUTPUT | S225-13603-42 | HV cable for DUIS |
| CABLE, NED HV INPUT | S225-13599-41 | Flat cable for DUIS |
| RF power supply | | |
| TQ-MAIN-RF | S225-12281-42 | Main RF power supply shared by Q1 and Q3 |
| TQ-QP-OP PS ASSY | S225-12161-41 | Qarray, multipole RF power supply |
| TQ-CID PS ASSY | S225-12162-41 | CID cell RF power supply |
| PCB ASSY, TQ-CNOR | S225-17060-41 | Relay PCB for Qarray, multipole RF power supply (for the LCMS-8030) |
| PCB ASSY, TQ-CNOR2 | S225-17060-42 | Relay PCB for Qarray, multipole RF power supply (for the LCMS-8040) |
| PCB ASSY, TQ-CNCR | S225-17070-41 | Relay PCB for collision cell RF power supply (for the LCMS-8030) |
| PCB ASSY, TQ-CNCR2 | S225-17070-42 | Relay PCB for collision cell RF power supply (for the LCMS-8040) |

| Part Name | Part No. | Remarks |
|---|---|---|
| Detector | | |
| BOARD, PRE AMP | S225-16960-41 | |
| LED | | |
| PCB ASSY, LCMS-LED | S225-13480-41 | PCB ASSY, LCMS-LED |
| Start signal | | |
| CABLE, LCMS EVENT | S225-17126-41 | MS-LC event cable |
| Analog output | | |
| CABLE, TQ-ANALOG | S225-17128-41 | MS-FCV signal cable |
| USB cable | | |
| CABLE, PC-MS ASSY | S225-17125-41 | USB cable |
| Cable for FCV | | |
| CABLE, TQ-FCV | S225-17127-41 | MS-FRC analog cable |

# 10.3 Unit Configurations

| Part Name | Part No. | Remarks |
|---|---|---|
| ESI PROBE ASSY | S225-14949-41 | |
| APCI PROBE | S225-14271-41 | |
| NEEDLE UNIT ASSY | S225-14290-41 | Common to APCI and DUIS |
| IF FLANGE ASSY | - | |
| HEATER FLANGE ASSY | S225-15486-41 | |
| IF FLANGE | S225-15477-41 | |
| DL PIPE ASSY | S225-15718-91 | |
| ORIFICE PART | - | |
| SPRAY UNIT | - | |
| LENS UNIT | - | |
| DETECTOR UNIT | - | |
| Qarray ASSY | S225-12030-91 | |
| OP1 ASSY | S225-12040-91 | (for the LCMS-8030) |
| QP1 ASSY | S225-13646-41 | (for the LCMS-8040) |
| OP2 ASSY | S225-12050-91 | (for the LCMS-8030) |
| QP2 ASSY | S225-13648-41 | (for the LCMS-8040) |
| VACUUM UNIT | - | |
| ION GAGE | - | |
| PIRANI GAGE | - | |
| DRAIN TUBE | - | |
| STANDARD SAMPLE SOURCE | - | |
| NEBULIZER GAS | - | |
| ACCESORY | - | |
| STARTUP KIT | S225-13915-42 | |
| OIL RETURN KIT | S225-05990-92 | |

## 10.3.1 ESI Probe: S225-14949-41

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | CAPILLARY ASSY | S225-14948-91 | Capillary ASSY consumables |
| 1-1 | CAPILLARY | S225-14915 | Capillary tube body |
| 2 | NOZZLE | S225-14902 | |
| 3 | COUPLING, 1.6 | S228-16447-03 | SUS |
| 4 | COUPLING | S225-14903 | PEEK (for securing capillary tube) |
| 5 | HIGH VOLTAGE CABLE | S225-14947-41 | |
| 6 | ELBOW, KQ2L23-M5-ROHS | S035-60724-21 | |
| 7 | PEEK TUBE 5999 | S228-32999-01 | Use 420 mm (purchase unit: m) |
| 8 | MALE NUT, PEEK | S228-18565-84 | 5 included |
| 9 | O-RING, 4D P7 | S036-11205 | |
| 10 | O-RING, 4D S8 | S036-19004-05 | |
| 11 | SCREW, SST FLAT HEAD M3X16 | S020-12109 | For securing the nozzle |
| 12 | SET SCREW, SST M3X3 CUP POINT | - | For securing the high-voltage cable |
| 13 | NUT, KNURL | S225-14914 | For securing the capillary tube |
| 14 | NUT, RID-6A | S228-16034 | For securing the SUS, coupling |

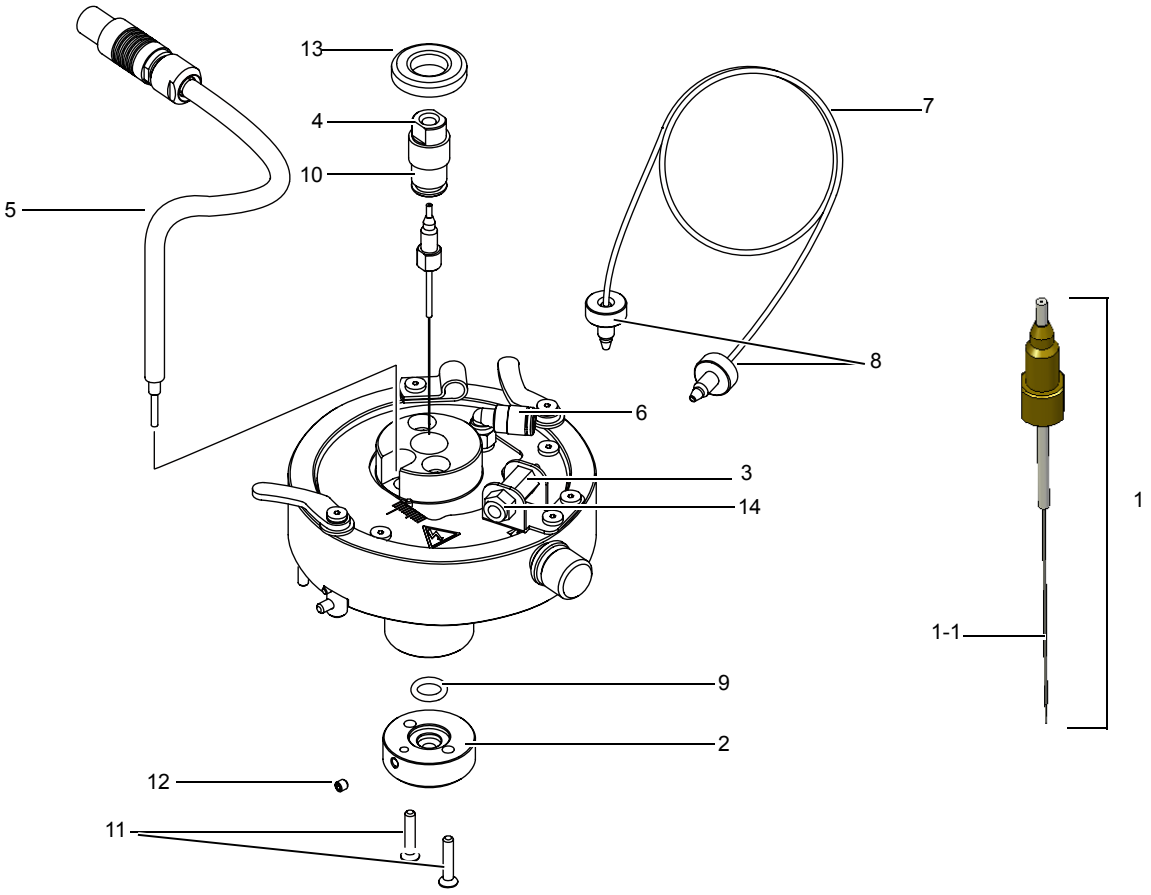



Fig. 10-1

## 10.3.2 APCI Probe: S225-14271-41

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | APCI PIPE ASSY | S225-15845-91 | |
| 2 | JOINT ASSY | S225-15788-91 | |
| 3 | HEATER ASSY | S225-15619-41 | |
| 4 | ADAPTER | S225-04993 | |
| 5 | FERRULE | S225-03748-03 | |
| 6 | NUT | S225-15739 | |
| 7 | SCREW, SST SEMS P3 M3X8 | - | Four |
| 8 | SET SCREW M3X5 | - | One |
| 9 | SCREW, SST FLAT HEAD M3X10 | - | Three |

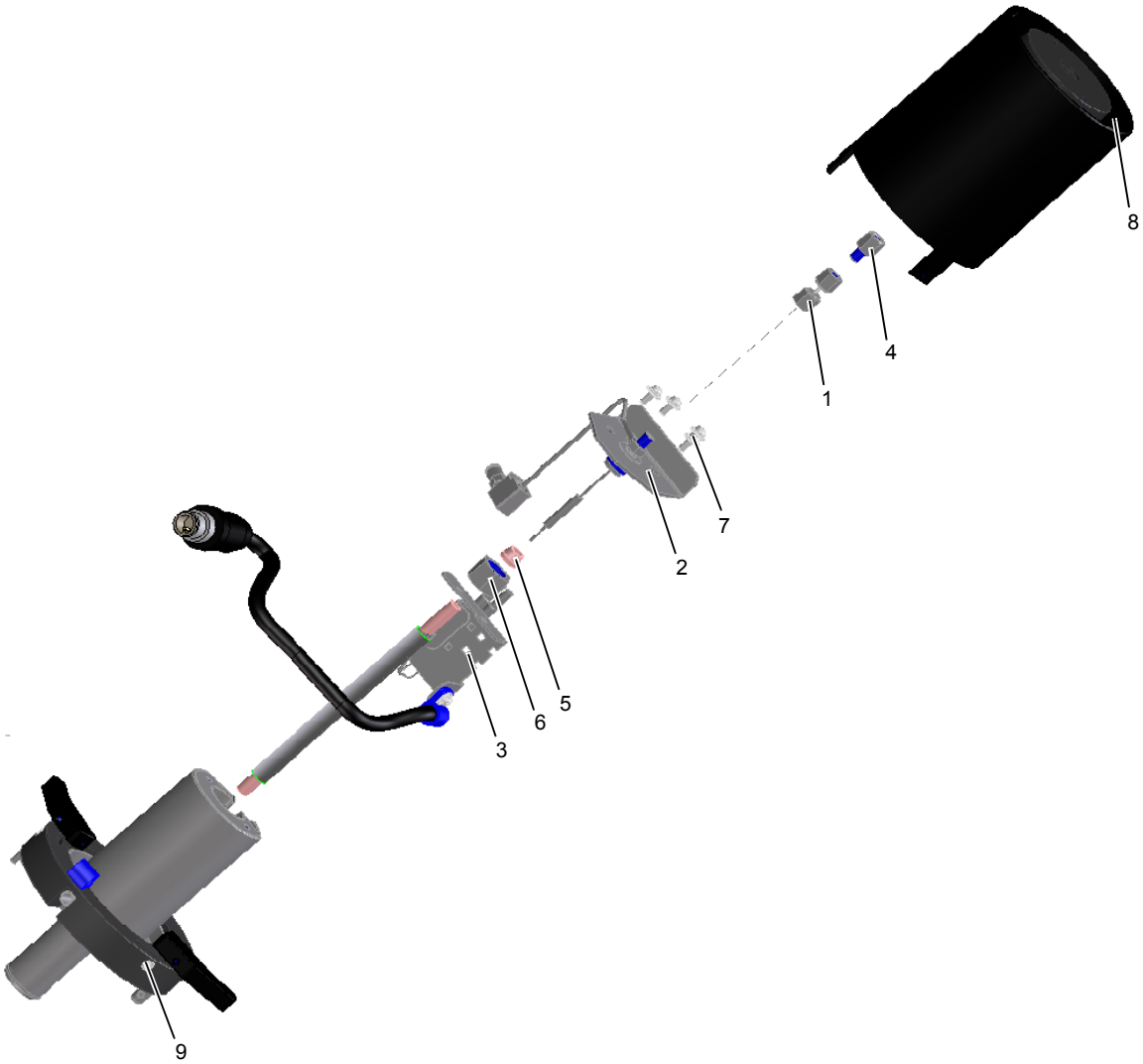



Fig. 10-2

## 10.3.3 Corona Needle ASSY

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | NEEDLE UNIT ASSY | S225-14290-41 | Including needle and support arm |
| 2 | NEEDLE ASSY D | S225-15877-92 | Needle only |
| 3 | HIGH VOLTAGE CABLE | S225-15888-41 | Used in common with APCI |
| 4 | APCI/DUIS SOCKET ASSY | S225-14232-41 | Including high-voltage cable |

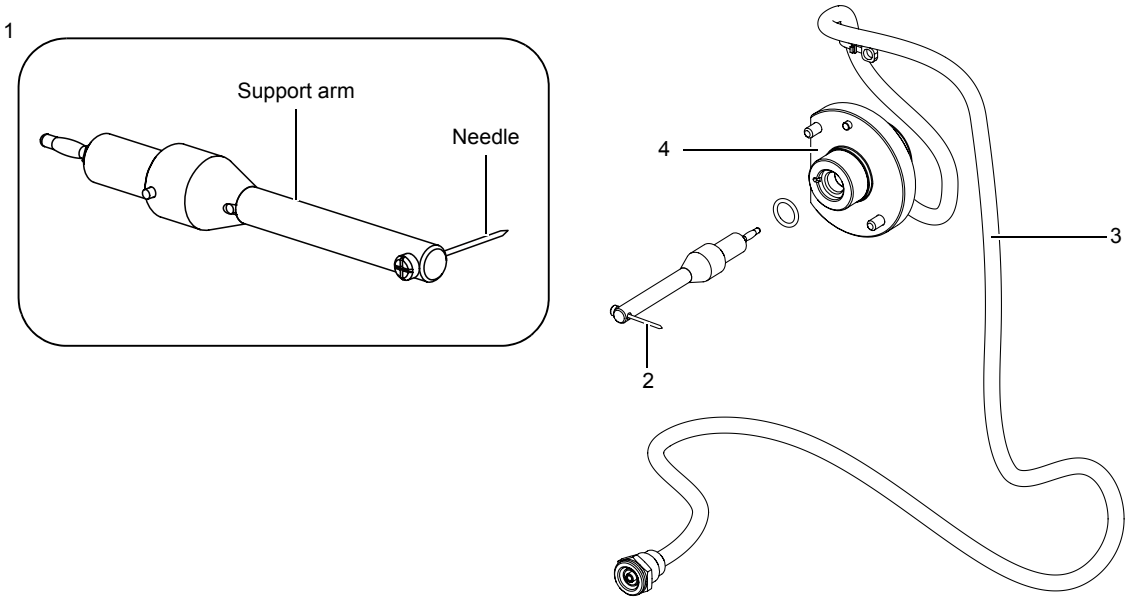



Fig. 10-3

## 10.3.4 IF Flange ASSY

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | HEATER FLANGE ASSY | S225-15486-41 | |
| 2 | IF FLANGE | S225-15477-41 | |

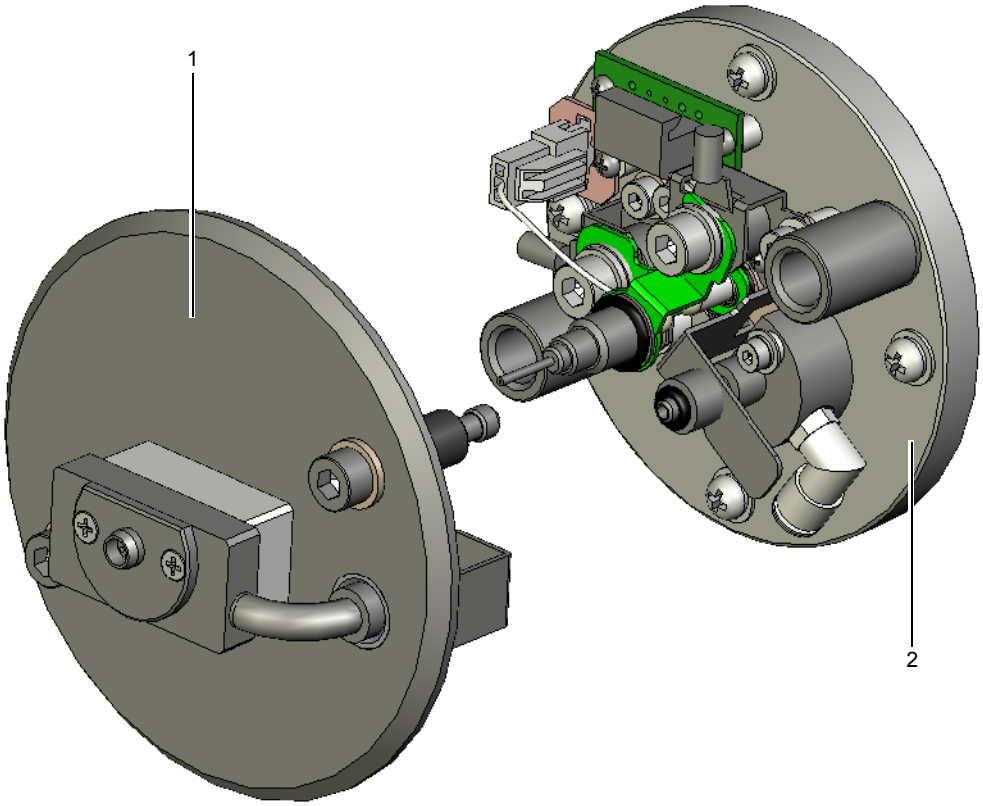



Fig. 10-4

## 10.3.4.1 Heater Flange ASSY

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | SAMPLING CONE | S225-15487 | |
| 2 | BLOCK, HEATER | S225-15488 | |
| 3 | INSULATOR BLOCK | S225-15489 | |
| 4 | HEATER ASSY | S225-15716-41 | |
| 5 | INSULATOR, FLANGE | S225-15491 | |
| 6 | BUSH, HEATER | S225-15498 | |
| 7 | O-RING, 4D S100 | S036-19004-53 | |
| 8 | O-RING, 4D-S18 | S036-19004-14 | |
| 9 | O-RING, 4D S14 | S036-19004-11 | |
| 10 | O-RING, 4D-S10 | S036-19004-07 | |
| 11 | SCREW, SST FLAT HEAD M3X5 | S225-14287-41 | Two |
| 12 | BOLT M6X35 | S225-15493-91 | Two |
| 13 | BUSH FASTENER | S225-15494 | Two |
| 14 | WASHER | S023-65106-01 | Two |

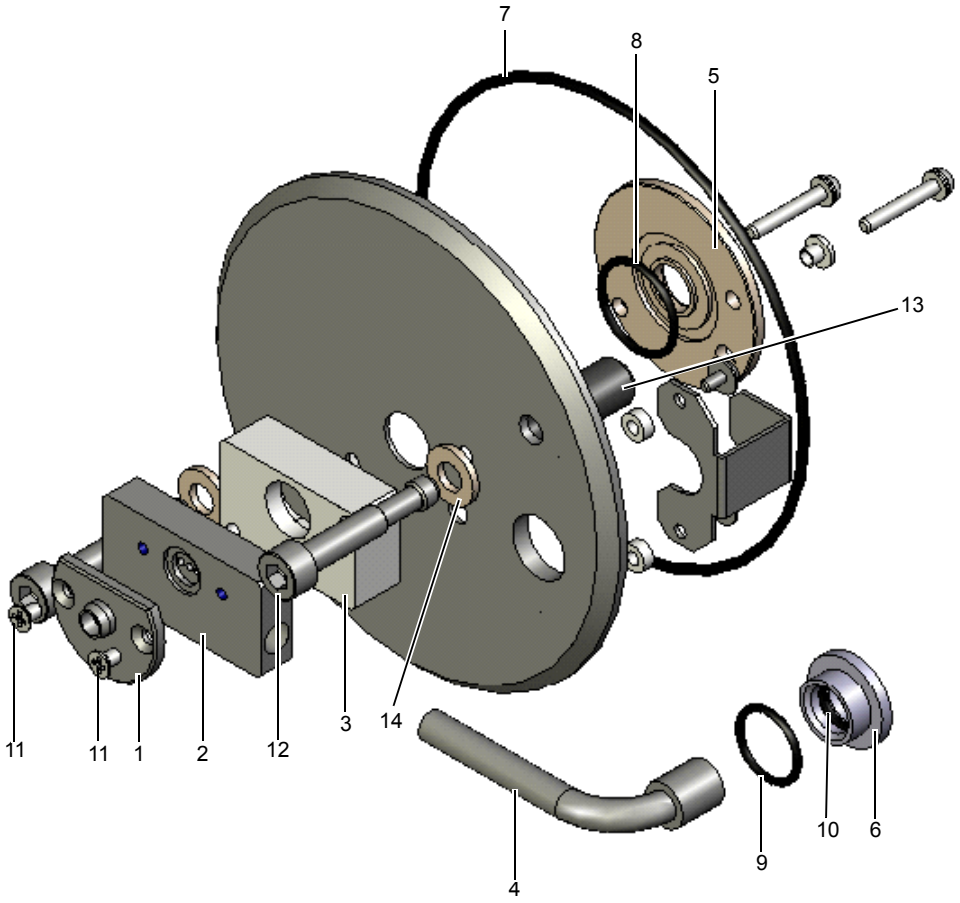



Fig. 10-5

## 10.3.4.2 IF Flange

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | DL PIPE ASSY | S225-15718-91 | With O-rings (2 locations) |
| 2 | ORIFICE PART | - | |
| 3 | O-RING, 4D P4 | S036-11202 | |

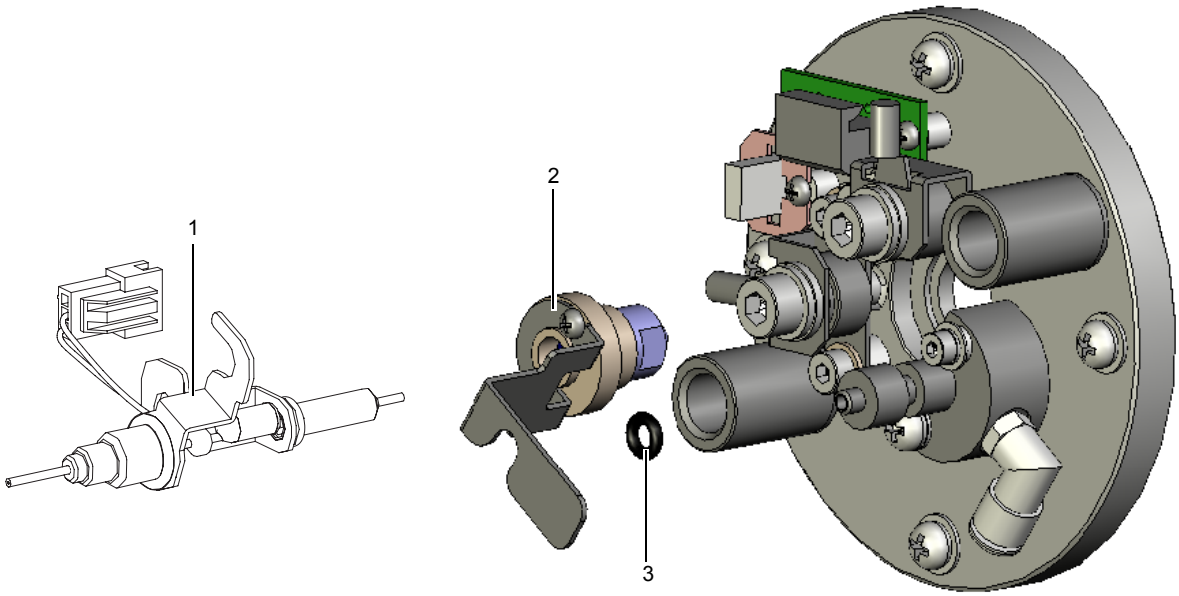



Fig. 10-6

### ■ DL (Desolvation Line)

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | O-RING, 4D P10 | S036-11208 | |
| 2 | O-RING, 4D-S6 | S036-19004-03 | |

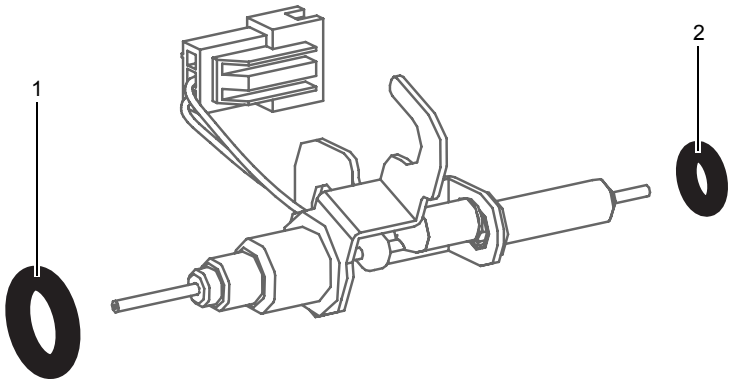



Fig. 10-7

## ■ Orifice unit

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | ORIFICE | S225-15479 | |
| 2 | O-RING, 4D S8 | S036-19004-05 | |
| 3 | O-RING, 4D S14 | S036-19004-11 | |
| 4 | INSULATOR FLANGE | S225-15481 | |
| 5 | PLATE, ORIFICE | S225-15710 | |
| 6 | SCREW, SST PAN HEAD M2.5X3 | - | Two |

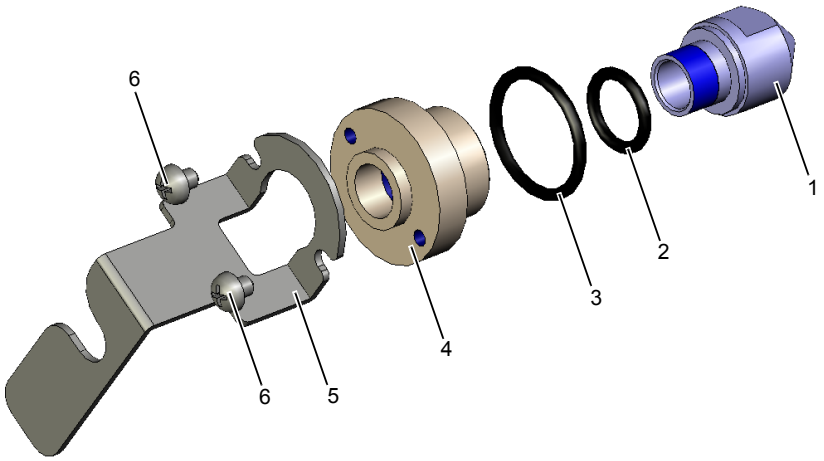



Fig. 10-8

## 10.3.5 Spray Unit

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | O-RING, 4D G145 | S036-12527 | |
| 2 | DOOR ASSY | S225-12100-41 | |
| 3 | MESH | - | |
| 4 | DL PLUG | - | DL cover |

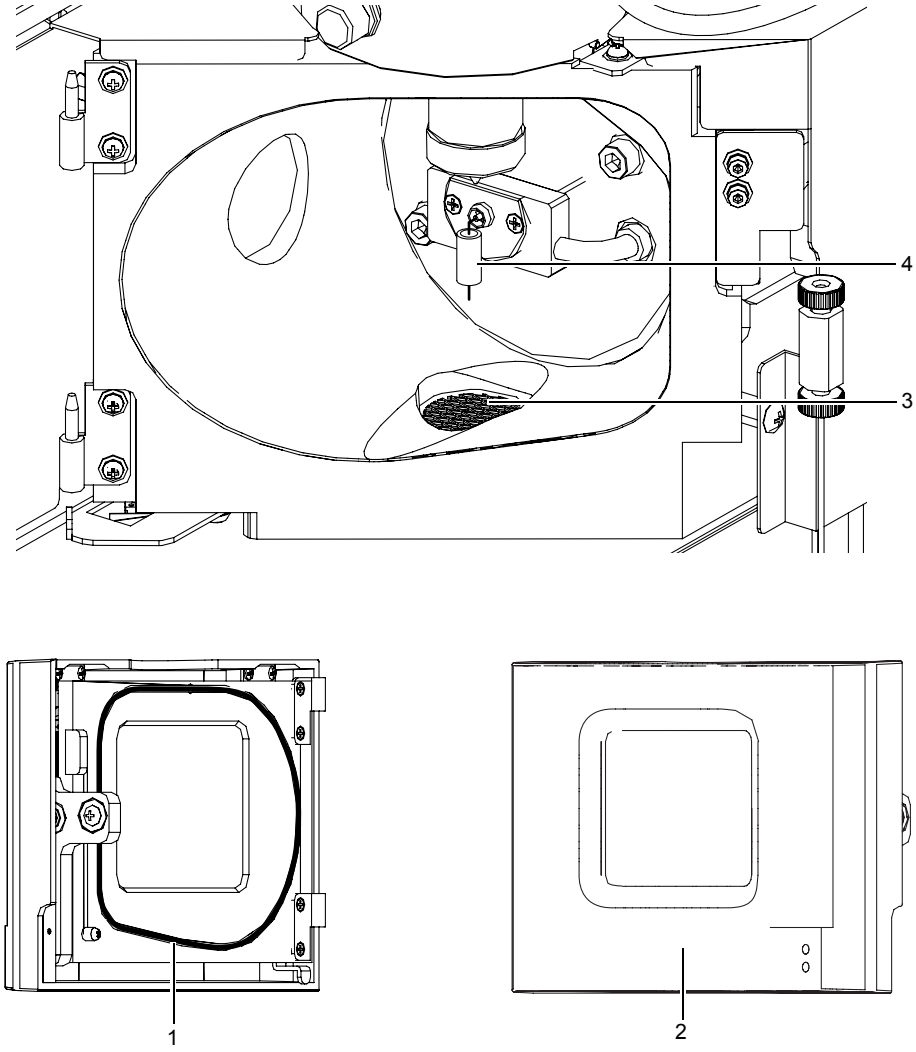
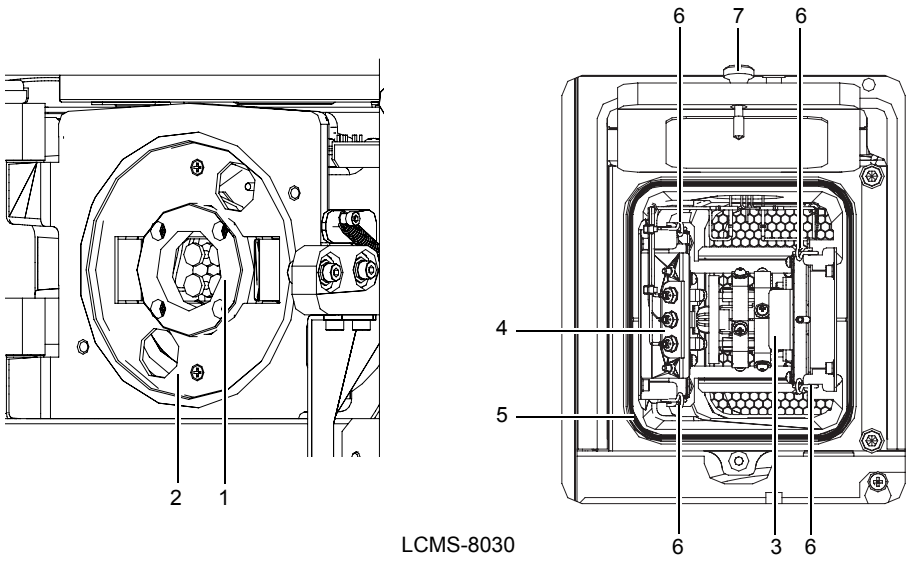



Fig. 10-9

## 10.3.6 Lens System

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | Qarray ASSY | S225-12030-91 | Qarray + skimmer, complete |
| 2 | SPACER | S225-12215-91 | |
| 3 | OP1 ASSY | S225-12040-91 | Multipole 1 + entrance lens, complete (for the LCMS-8030) |
| | QP1 ASSY | S225-13646-41 | Multipole 1 + entrance lens, complete (for the LCMS-8040) |
| 4 | OP2 ASSY | S225-12050-91 | Multipole 2 + entrance lens, complete (for the LCMS-8030) |
| | QP2 ASSY | S225-13648-41 | Multipole 2 + entrance lens, complete (for the LCMS-8040) |
| 5 | O-RING, AS568A-253 4D | S036-15552-53 | |
| 6 | HOOK | S225-12029 | |
| 7 | KNOB, KNURL A-1176-17 | S037-02829-12 | |



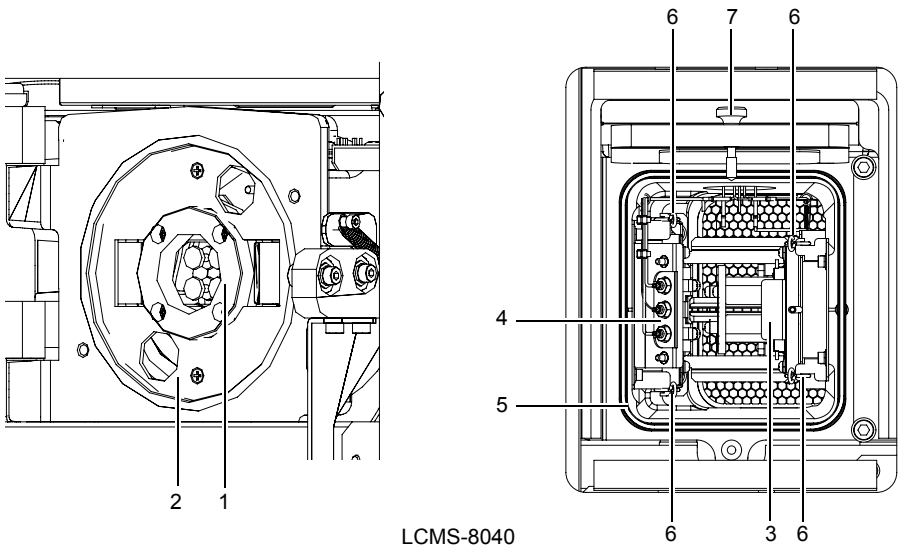




Fig. 10-10

## 10.3.6.1 Qarray ASSY: S225-12030-91

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | SKIMMER | S225-12034-01 | |
| 2 | SCREW, SST FLAT HEAD M3X12 | S020-12107 | Two |

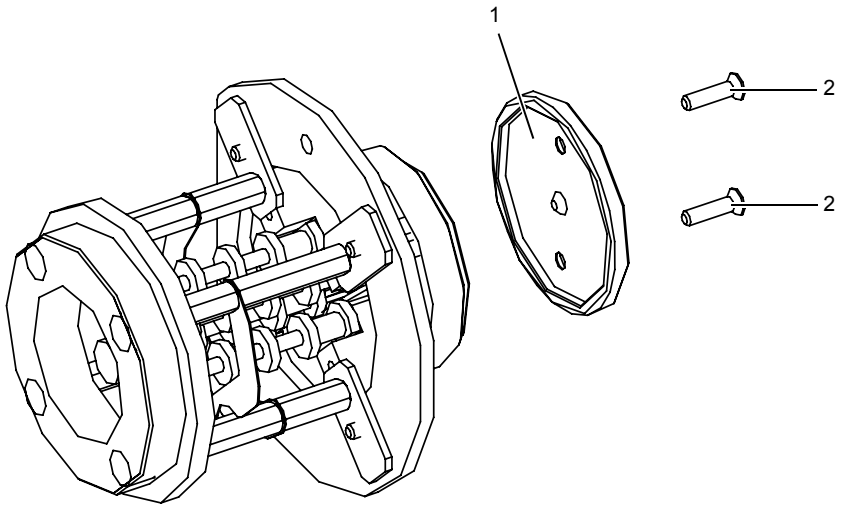



Fig. 10-11

## 10.3.6.2 OP1 ASSY/QP1 ASSY

### ■ OP1 ASSY: S225-12040-91 (for the LCMS-8030)

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | OP1 LENS | S225-12045-01 | |
| 2 | SCREW, SST SEMS P4 M3X6 | S020-46634 | |

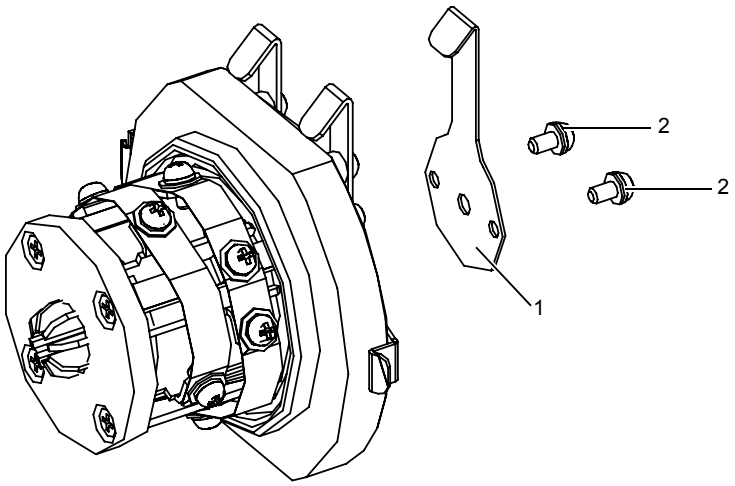



Fig. 10-12

### ■ QP1 ASSY: S225-13646-41 (for the LCMS-8040)

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | QP1 LENS | S225-13630-01 | |
| 2 | SCREW, SST SEMS P4 M3X6 | S020-46634 | |

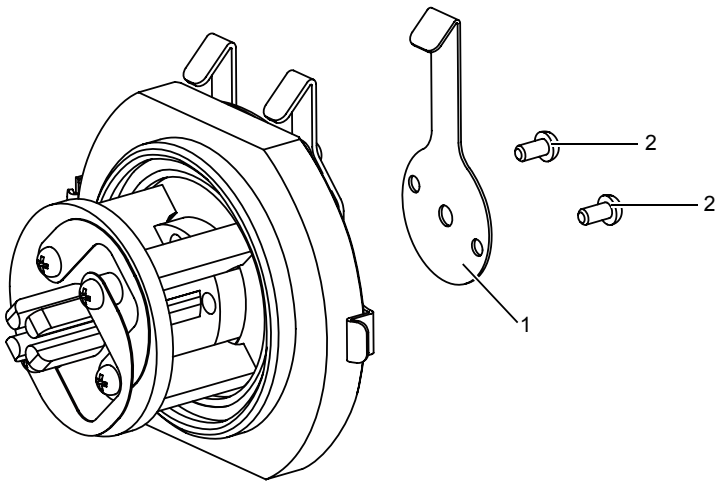



Fig. 10-13

## 10.3.6.3 OP2 ASSY/QP2 ASSY

### ■ OP2 ASSY: S225-12050-91 (for the LCMS-8030)

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | OP2/QP2 LENS | S225-12052-01 | |
| 2 | SCREW, SST FLAT HEAD M3X16 | S020-12109 | |

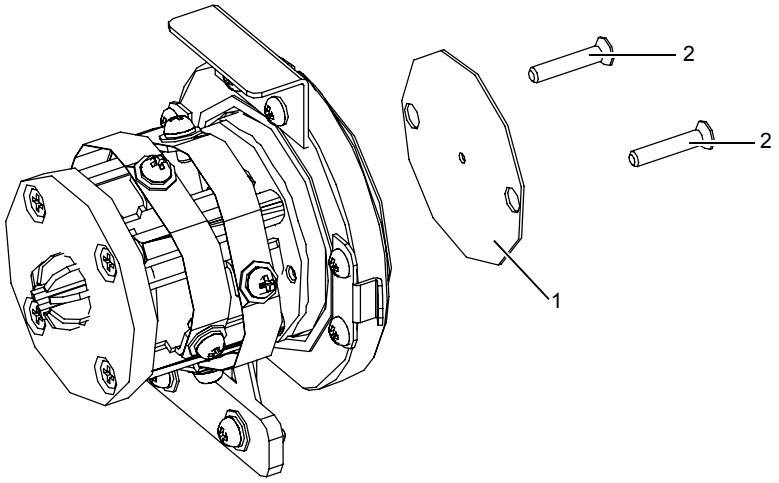



Fig. 10-14

### ■ QP2 ASSY: S225-13648-41 (for the LCMS-8040)

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | OP2/QP2 LENS | S225-12052-01 | |
| 2 | SCREW, SST FLAT HEAD M3X16 | S020-12109 | |

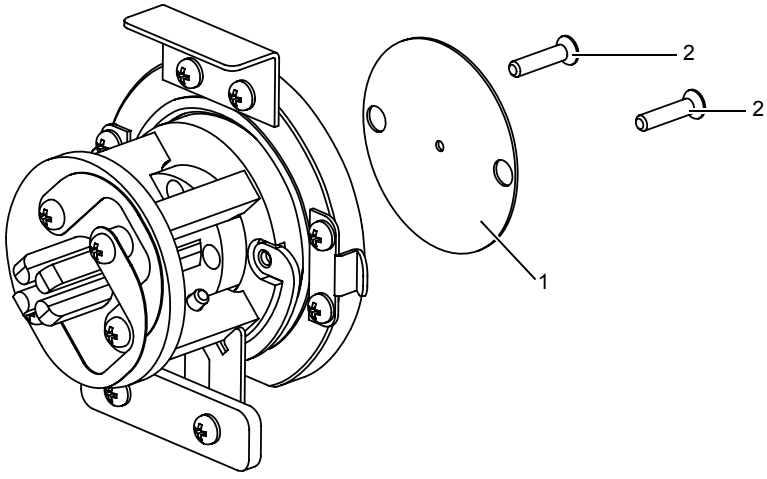



Fig. 10-15

## 10.3.7 Detection Unit

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | DETECTOR | S225-14168 | Detector, complete |
| 2 | ELECTRON MULTIPLIER | S225-14168-01 | |
| 3 | Cable 1 | S225-12292-91 | For high voltage |
| 4 | Cable 2 | S225-12293-91 | For signals |
| 5 | SCREW, SST PAN HEAD M3X6 | - | One |
| 6 | BOLT, SST HEXSOCH SEMS P3 M3X8 | - | Two |
| 7 | SCREW, SST SEMS P4 M3X10 | - | One |

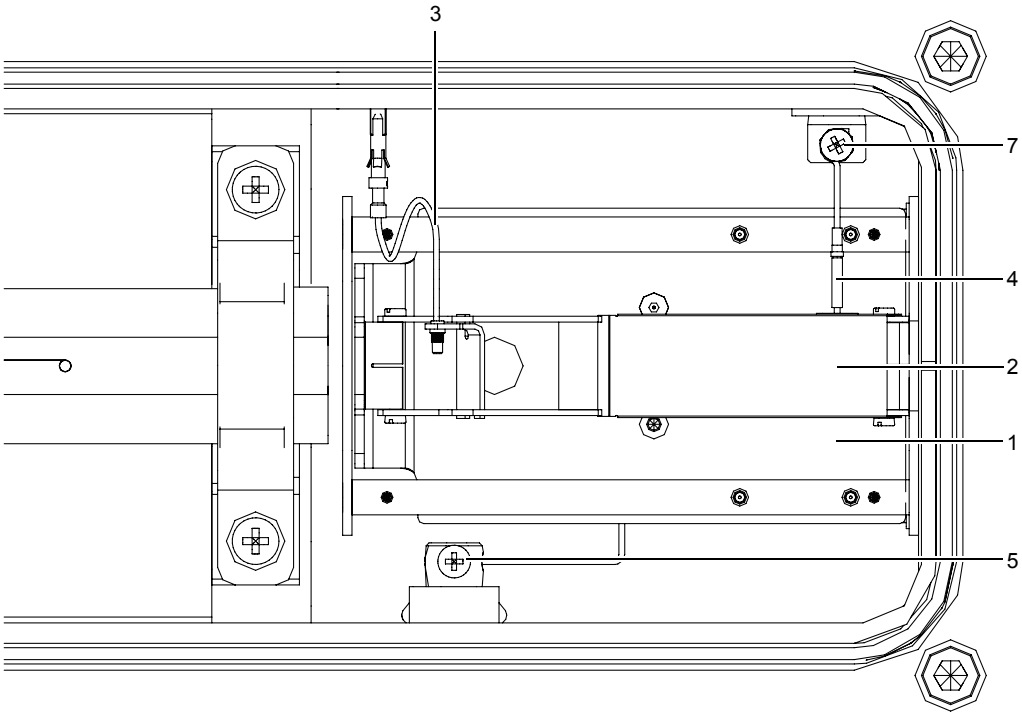



Fig. 10-16

## 10.3.8 Vacuum System

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | RP OIL Ultragrade19 (4 L) | S017-30163-02 | About 1.5 L used at each oil change |
| 2 | IG GAUGE | S225-09490-01 | Ion gauge vacuum gauge |
| 3 | FILAMENT FOR PB1, ROHS | S225-20310-91 | Pirani gauge vacuum gauge |
| 4 | TMP, split flow 310 | S225-14179-01 | Triple inlet turbo molecular pump body + power supply |
| 5 | ROTARY PUMP, E2M28 | S225-09309-02 | For 230 V |
| 6 | CABLE, RP ASSY | S225-17224-41 | Power supply cable for the rotary pump |
| 7 | LEAK VALVE ASSY | S225-03540-94 | |
| 8 | HOSE TG-32 | S018-31555-06 | Use a 1.5 m RP intake hose (purchase unit: m) |
| 9 | HOSE, CHEMIFLEX 15MM | S016-31697-02 | Use a 0.5 m TMP exhaust hose (purchase unit: m) |
| 10 | SLEEVE, PTFE 15X22 CL | S018-31511 | RP exhaust hose (purchase unit: m) |
| 11 | HOSE BAND, GEAR S 50 | S037-61064 | For spring hose #32 |
| 12 | HOSE BAND, WIRE 24 | S037-61023 | For spring hose #15 |
| 13 | HOSE BAND, WIRE SY-22 | S037-61002 | For vinyl hose 15 × 1.5 |
| 14 | CENTER RING, KF10 | S035-06004-21 | |
| 15 | CENTER RING, KF25 | S035-06004-24 | |
| 16 | CLAMP, KF16 | S035-06004-01 | |
| 17 | CLAMP, KF25C | S035-06004-02 | |
| 18 | FLANGE PIPE, TQ-VAC | S225-12211-91 | |
| 19 | ELBOW, KF25-#15 | S225-03535-91 | |
| 20 | FLANGE | S202-55374 | For RP intake |
| 21 | O-RING, 4D P14 | S036-11215 | Drain seal |
| 22 | O-RING, 4D G50 | S036-12506 | Seal for the ionization probe |
| 23 | O-RING, 4D G100 | S036-12517 | Seal for the probe holder |
| 24 | O-RING, 4D P26 | S036-11228 | Seal for DUIS |
| 25 | O-RING, 4D P15 | S036-11216 | Pirani, hermetic seal |
| 26 | O-RING, 4D P40 | S036-11243 | For IG, feed-through |
| 27 | O-RING, AS568A-253 4D | S036-15552-53 | OP cover |
| 28 | O-RING, AS568A-272 4D | S036-15552-72 | Q3 cover |
| 29 | O-RING, AS568A-278 4D | S036-15552-78 | Q1 cover |
| 30 | O-RING, AS568A-341 4D | S036-15553-41 | Front and back housing |
| 31 | O-RING, 4D P18 | S036-11218 | For feed-through |
| 32 | O-RING, 4D P5 | S036-11203 | Feed-through conversion |

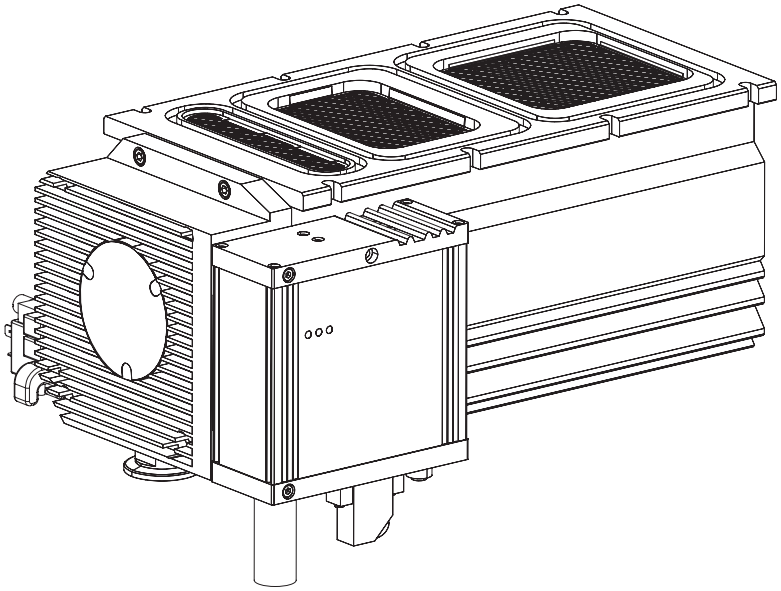


Fig. 10-17

## 10.3.8.1 Ion Gauge Vacuum Gauge

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | IG GAUGE | S225-09490-01 | |
| 2 | SACK NUT | S261-00210 | |
| 4 | GASKET PRESS | S261-00209 | |
| 3 | PACKING 4TX14X22 | S261-00207-02 | 2 pc |
| 5 | FLANGE | S225-10150-01 | |
| 6 | SCREW, SST SEMS P3 M4X12 | - | Three |
| 7 | O-RING, 4D P40 | S036-11243 | For IG |
| 8 | BAFFLE | S225-15534 | |

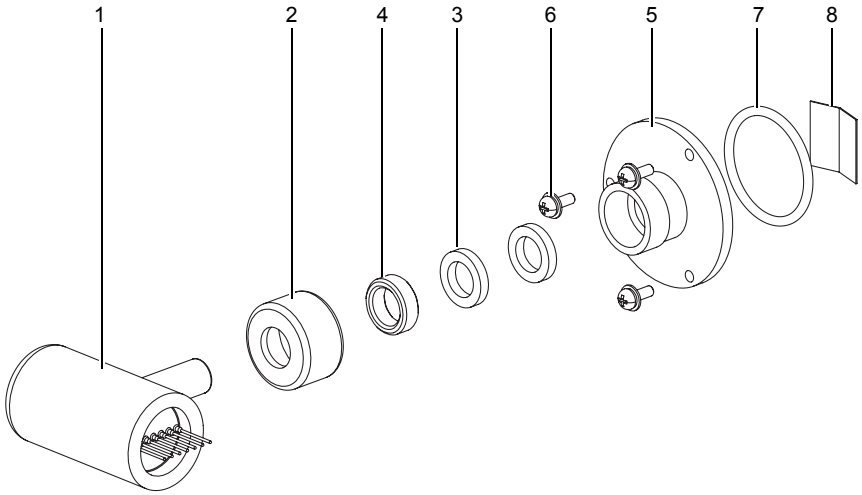



Fig. 10-18

## 10.3.8.2 Pirani Gauge Vacuum Gauge

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | FILAMENT FOR PB1, ROHS | S225-20310-91 | |
| 2 | O-RING, 4D P15 | S036-11216 | For the Pirani gauge |
| 3 | SCREW, SST SEMS P3 M4X8 | - | |

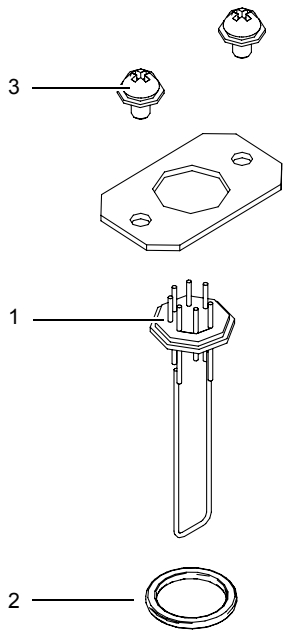



Fig. 10-19

## 10.3.9 Waste Tube

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | SILICON RUBBER TUBE, 7X10NL | S016-31350-19 | 1 m drain tube from the leak tray |
| 2 | PVC TUBE, R3603 1/2X3/4X1/8 | S016-31414 | 1 m drain tube from the spray unit, for use outside the instrument |
| 3 | TUBE, SE-200 1/2-3/4 | S016-37619-02 | 320 mm drain tube from the spray unit, for use inside the instrument |
| 4 | SLEEVE, PTFE 12X3 | S018-31510 | 5 m |
| 5 | RUBBER CAP | S225-06482-92 | |

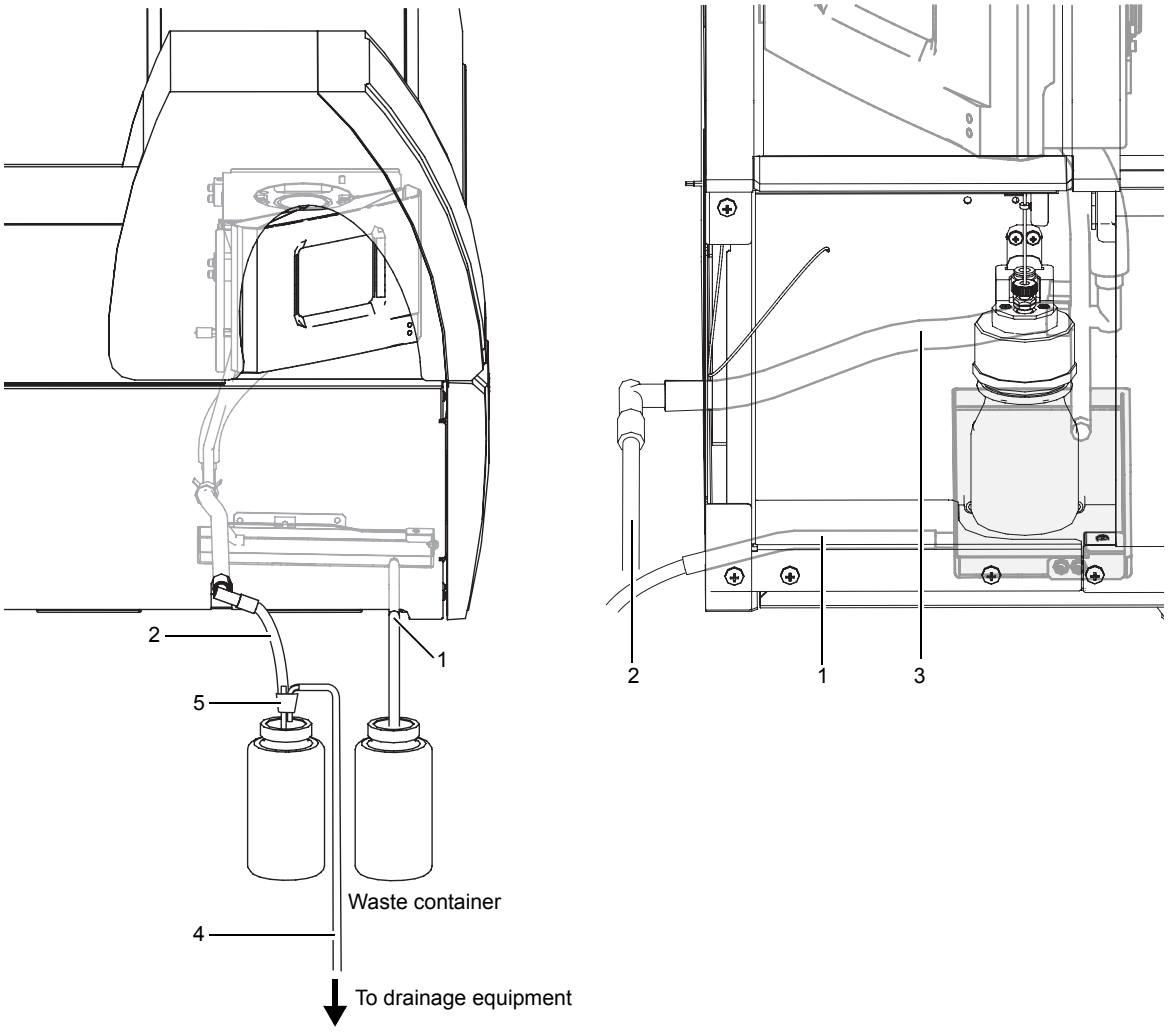



Fig. 10-20

## 10.3.10 Standard Sample Introduction Unit

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | FRIT PEEK | S228-48607-91 | One |
| 2 | CAPILLARY ASSY | S225-15848-91 | |
| 3 | Standard sample bottle | S038-00512-01 | |
| 4 | SPACER, FKM | S225-15697-01 | |
| 5 | Bottle cap | S225-15868-91 | |
| 6 | Standard Sample | S225-14122-01 | Standard sample solution 200 mL |
| 7 | BRACKET, SI | S225-15560 | |
| 8 | SCREW, SST FLAT HEAD M3X6 | - | |
| 9 | HALF UNION, GWJS6-M5 | S035-65415-06 | |
| 10 | HOUSING, LINEFILTER | S228-46358 | |
| 11 | MALE NUT, PEEK | S228-18565-84 | 5 included |
| 12 | PEEK TUBE 1.6X0.25 | S228-32999-03 | 3 m (cut to 95 mm for use) |
| 13 | PEEK TUBE 1.6X0.25 | S228-32999-03 | 3 m (cut to 400 mm for use) |
| 14 | TUBE, 0624304 | S225-15873-91 | Resistance tube |
| 15 | MAIL CONNECTER, PEEK | S228-25014 | |

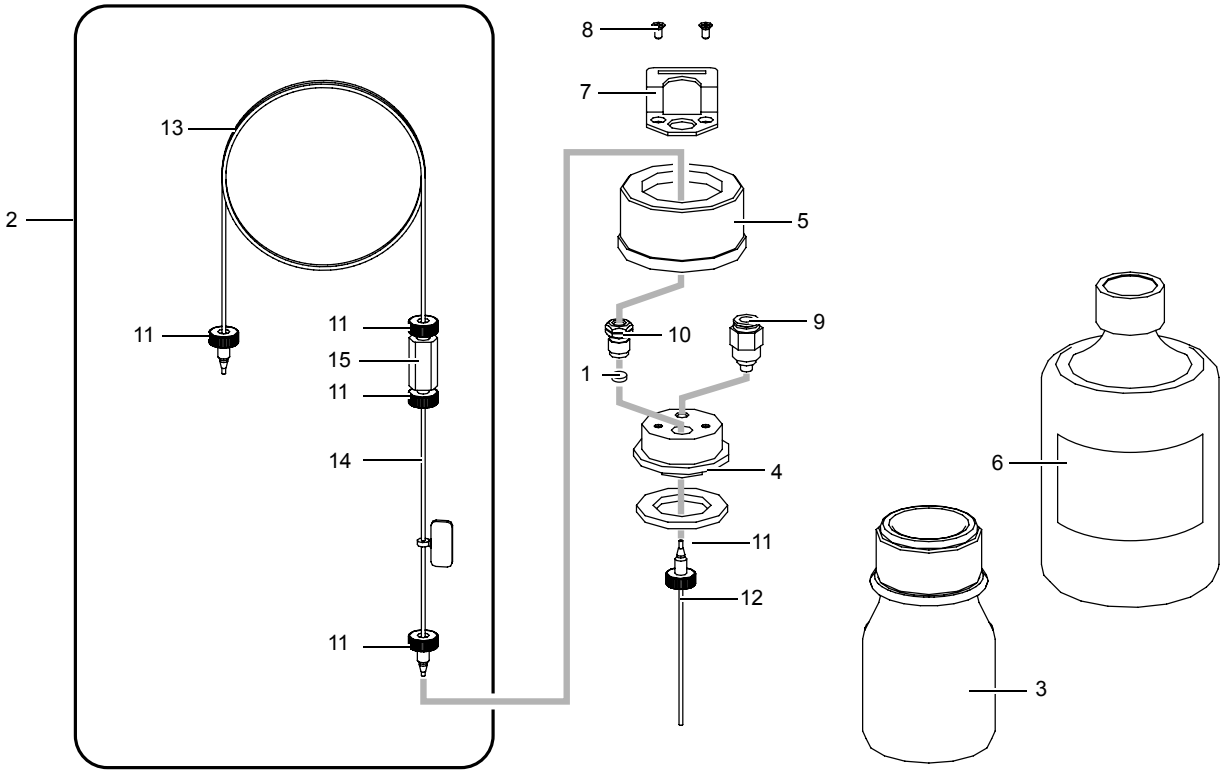



Fig. 10-21

## 10.3.11 Gas Controller

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | Filter, 2300B-SS-1/8-2U | - | |
| 2 | VALVE ASSY (NEB) | S040-51226-01 | |
| 3 | VALVE ASSY (DRY) | S225-14292-41 | |
| 4 | SUS316L 1.6X1.0X40 | S228-49000-40 | |
| 5 | Valve, SI | S225-15688-91 | |
| 6 | VALVE, RELIEF RAB2V-150 | S040-27013-01 | |
| 7 | REGULATOR, AR10-M5BG | S040-72549-51 | |
| 8 | VALVE ASSY SAGINOMIYA | S221-48813-91 | |
| 9 | FILTER,PTFE 20 MICRON | S221-18154 | |
| 10 | QUARTZ TUBE, TSP040375 | S016-70402-01 | |
| 11 | VALVE, RELIEF | S225-15688-42 | |
| 12 | LATERAL, UNION KQ2U06-00 | S035-60693-29 | |
| 13 | FEP TUBE 6 mm, GAS | S225-15846-93 | |
| 14 | FEP TUBE 1/16, NEB | S225-14255-41 | |
| 15 | FEP TUBE 4 mm, DRY | S225-14255-42 | |
| 16 | FEP TUBE 1/16, DRY | S225-14255-43 | |
| 17 | POLYURETHANE TUBE, U2-4-6X4BK | S016-46021 | |
| 18 | TEE, RUN KQ2Y04-M5-ROHS | S035-60690-05 | |
| 19 | TEE, RUN KQ2Y06-M5-ROHS | S035-60690-08 | |
| 20 | TUBE, M5-MF 80MM | S221-41410-93 | |
| 21 | 3-WAY JOINT ASSY | S221-25211-91 | |
| 22 | TUBE, M5-MF 260MM | S221-41410-94 | |
| 23 | TUBE, M5-MF 200MM | S221-41410-92 | |

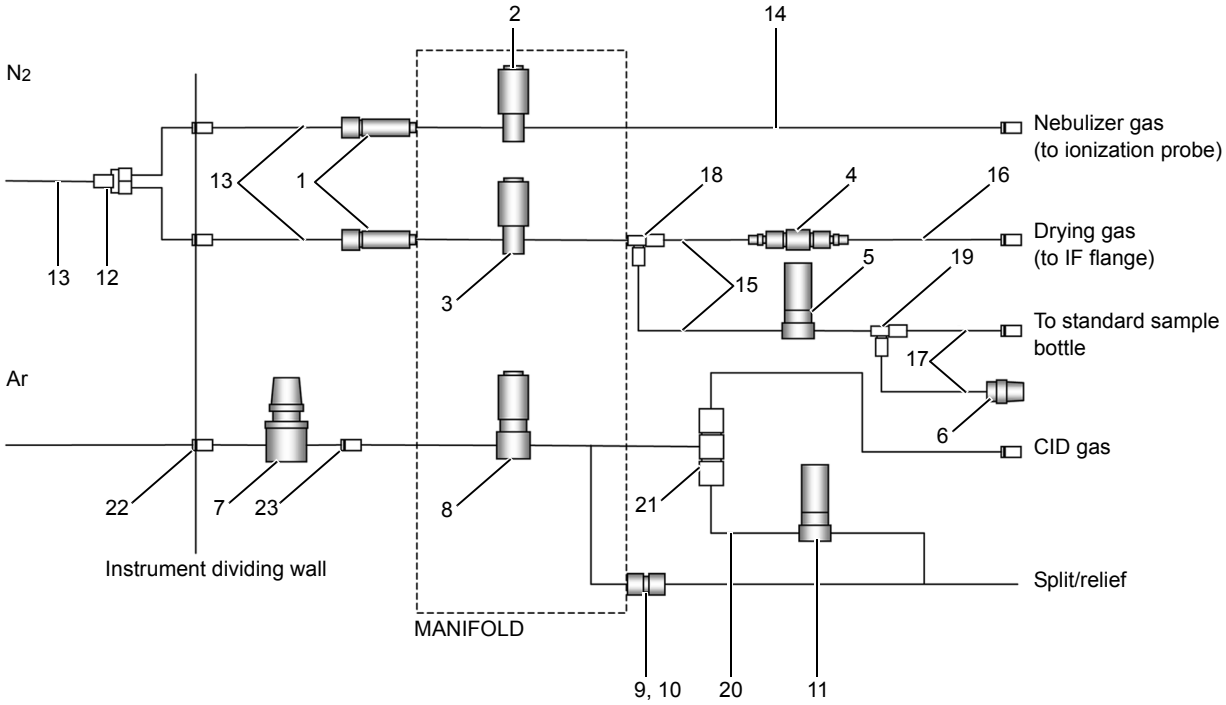

N2
Ar
2
14
13
1
18
4
16
13
12
3
15
5
19
Nebulizer gas
(to ionization probe)
Drying gas
(to IF flange)
To standard sample
bottle
17
6
CID gas
22
7
23
8
21
Instrument dividing wall
MANIFOLD
Split/relief
9, 10
20
11

Fig. 10-22

## 10.3.12 Accessory Parts

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | SPANNER, HEX 1.5 ROHS | - | |
| 2 | SPANNER, HEX 3 ROHS | - | |
| 3 | SPANNER, HEX 5 ROHS | - | |
| 4 | SPANNER, HEX 6 ROHS | - | |
| 5 | SPANNER, HX7-8-R | - | |
| 6 | SPANNER, HX10-12-R | - | |
| 7 | SPANNER, DOUBLE OPEN END17X19-R | - | |
| 8 | SCREWDRIVER, TORQUE #2 100MM | - | |
| 9 | CABLE, LCMS EVENT | S225-17126-41 | |
| 10 | CONNECTER, 6 P | - | |
| 11 | CONNECTER, 8 P | - | |
| 12 | PEEK CAPILLARY 5999B | - | |
| 13 | DL PLUG | - | |
| 14 | JIG PULL | - | |
| 15 | MALE NUT, PEEK | S228-18565-84 | |
| 16 | SPACER, FKM | S225-15697-01 | |
| 17 | MAGNIFIER, 1962 | - | |
| 18 | CLAMP, DKN-5GSP | - | |
| 19 | GUARD | - | |
| 20 | ABRASIVE CLOTH | - | |
| 21 | COUPLING, 1.6C 316L | - | |

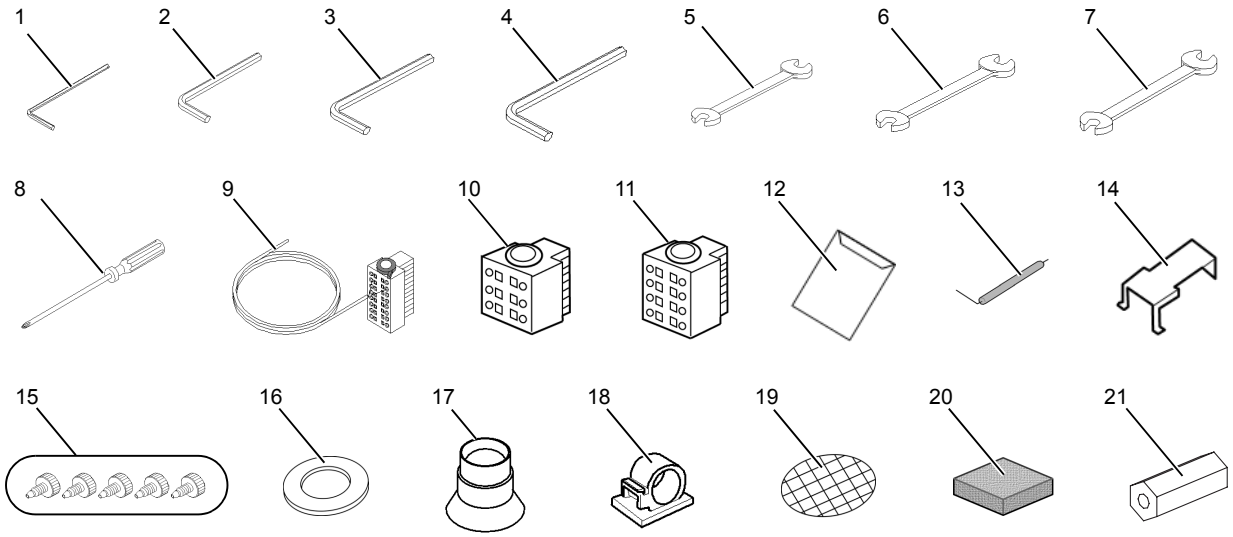



Fig. 10-23

## 10.3.13 Startup Kit (Option)

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | FERRULE 1.6F | S228-33513-91 | PEEK ferrule (total of 3) |
| 2 | DL PIPE ASSY | S225-15718-91 | |
| 3 | PUMP OIL, H11025013 | S017-30163-02 | Rotary pump oil, 4 L |
| 4 | MALE NUT, PEEK | S228-18565-84 | Male nut, 1.6 MN (total of 5) |
| 5 | FERRULE, 1.6F-T | S228-16007-84 | PTFE ferrule (total of 5) |
| 6 | PEEK CAPILLARY 5999B | - | ID0.13 mm PEEK tube, 3 m |
| 7 | ETFE TUBE 1.6X0.5 | S228-18495-04 | |
| 8 | FITTING | S228-32651-41 | Nut, ferrule (5 each) |
| 9 | CAPILLARY ASSY | S225-14948-91 | |
| 10 | SI BOTTLE LINE FILTER | S228-48607-91 | |
| 11 | 0.1 SUS PIPE | S228-49120-00 | ID0.1 mm SUS pipe, 2 m |
| 12 | PEEK TUBE CUTTER | S228-32930-01 | |
| 13 | FILTER | S042-60935-14 | |
| 14 | GROVE, LATEX | S086-72599-01 | |
| 15 | RESISTANCE TUBE, GLP CLEAN | S228-32722-94 | |

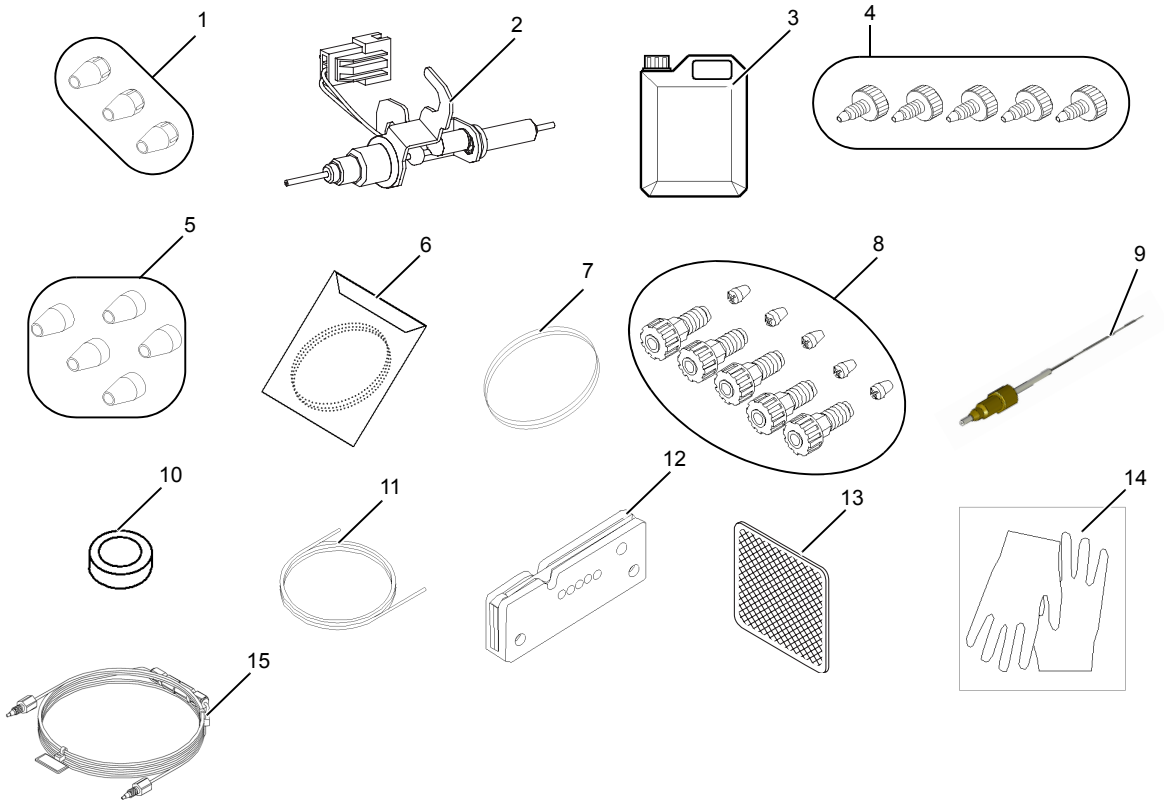



Fig. 10-24

## 10.3.14 RP Oil Return Kit (Option): S225-05990-92

| No. | Part Name | Part No. | Remarks |
|---|---|---|---|
| 1 | OIL RETURN KIT, E2M28 | - | |
| 2 | OIL MIST FILTER, EMF20 | S042-00124-33 | |
| 3 | FLANGE, KF25-#15 STRATE | - | |
| 4 | CENTER RING, KF25ANCR | S035-06004-13 | |
| 5 | CLAMP, KF25C | S035-06004-02 | |
| 6 | SPANNER, HEX 8 ROHS | - | |

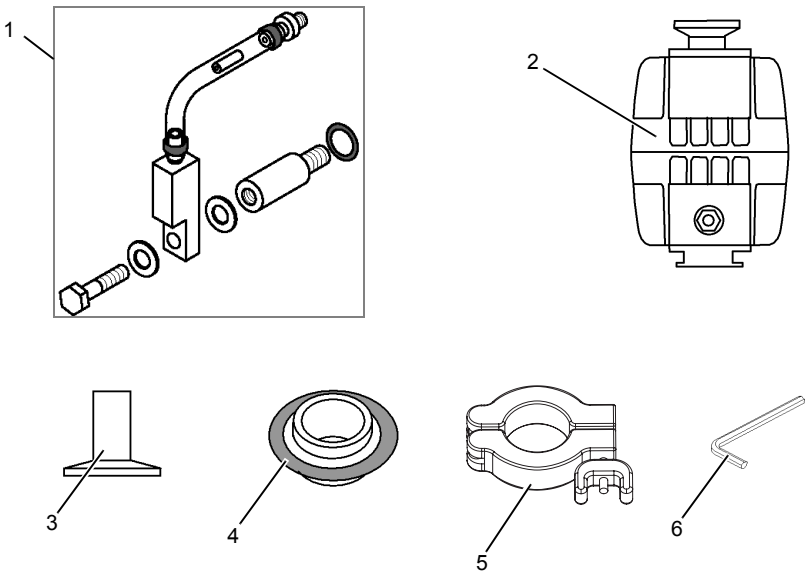



Fig. 10-25

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