**Contents**

<table>
<thead>
<tr>
<th>Chapter 1</th>
<th>Instant Connect Thermospray SSL Injector Module</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Module Overview</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Injection Techniques</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Split Mode</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Splitless Mode</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Surged Splitless Mode</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Consumables</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Septum</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Liner</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Installing a Thermospray SSL Injector Module</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Configuration and Method Parameters Setup</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Through the GC Touch Screen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Configuring a Thermospray SSL Injector</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Using Thermospray SSL Injector Parameters</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Setting Gas Parameters</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Setting Parameters for the Split Mode</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Setting Parameters for the Splitless Mode</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Setting Parameters for the Surged Splitless</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Module Setup Through CDS</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Configuration Inlets Tab</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>S/SL Page</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Maintaining a Thermospray SSL Injector</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Replacing the Septum</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Cleaning or Replacing the Glass Liner</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Replacing a Broken Liner</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Replacing the Carrier and Split Lines Filters</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Replacing the Split Line Tubing</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Baking-out Contaminants from the Injector</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Replaceable Parts</td>
<td>38</td>
</tr>
</tbody>
</table>
Instant Connect Thermospray SSL Injector Module

This guide describes the Thermo Scientific Thermospray SSL injector module and provides instructions for programming the injector parameters, and for installing and maintaining the injector.

Contents
- Module Overview
- Injection Techniques
- Consumables
- Installing a Thermospray SSL Injector Module
- Configuration and Method Parameters Setup Through the GC Touch Screen
- Configuration and Method Parameters Setup Through CDS
- Maintaining a Thermospray SSL Injector
- Baking-out Contaminants from the Injector
- Replaceable Parts
Module Overview

The Instant Connect Thermospray SSL Injector Module is designed as a “double wide” module that fits into the space provided by two injector modules (front and back) on the upper deck of a Thermo Scientific TRACE 1300/1310 series GC. The “front” module includes the hot head SSL injector and the fittings for the connection to the analytical column, while the “back” module includes the split and purge vent valves, filters, and the digital pneumatics for the control of the carrier gas.

Figure 1. Thermospray SSL Injector Module

The module and injector components are shown in Figure 2, Figure 3, and Figure 4.

Figure 2. Thermospray SSL Injector Module Components: Top View
Figure 3. Thermospray SSL Injector Module Components: Bottom View

Figure 4. Thermospray SSL Injector Components
Injection Techniques

The degradation of thermolabile compounds, caused by the contact with hot surfaces, is minimized as in the thermospray technique the evaporation of the sample occurs from floating droplets. Sample is injected through **Hot Empty Needle** technique, that means needle is kept into the injector a few seconds, before pushing the syringe piston to eject the liquid sample. During this time needle becomes hot, and when the sample is ejected the evaporation starts as soon as sample pass through the hot needle. The Thermospray SSL injector is used for split, splitless, or surged splitless injections. You can use capillary and wide-bore columns. You can choose the operating mode from the injector parameter list.

**Split Mode**

Split injection mode is suitable for high-concentration sample analysis, headspace analysis, and isothermal analysis. Peak shapes in the chromatogram are generally very sharp due to the rapid sample transfer into the column. You inject the sample into a glass liner inside the heated vaporization chamber. In the chamber, the sample undergoes rapid evaporation. The relatively high gas flow through the injector carries the vaporized sample rapidly down toward the head of the column. Only a part of the sample transfers into the column. The rest discharges through the split line. The ratio of the split flow to the column flow (the **split ratio**) determines the amount of sample that enters the chromatographic column. The septum is continuously flushed throughout the analysis, which reduces contamination from the sample’s analytes.

**Splitless Mode**

Splitless injection mode is suitable for the analysis of compounds present in low concentrations. The splitless injection allows the entire sample to enter the column. The split line is closed during the sample injection and transfer to the column. Once the transfer is over, the split line reopens to flush the vaporization chamber of any remaining sample vapors. The time required to transfer the vaporized sample from the injector to the column is the **splitless time**. At the end of the splitless period, the split valve reopens and the split flow flushes the injector of any remaining sample vapors. The absolute split flow is not important. It need only be sufficient to purge the injector. A purge flow can continuously flush the septum throughout the analysis, which reduces contamination from the sample’s analytes.

**Surged Splitless Mode**

In this mode, a carrier gas pressure surge activates during the injection phase for a preset time. The pressure applied during the splitless time produces a surge of flow in the injector, and accelerates the transfer process of the sample substances from the injector to the column. This avoids the broadening of the sample band, and the risk of the injector overloading. A purge flow can continuously flush the septum throughout the analysis, which reduces contamination from sample's analytes.
Consumables

The consumables required for this injector are the septum and the glass liner.

Septum

You should always use good quality septa, such as the BTO septum supplied with the TRACE 1300/TRACE 1310 GC. Such septa resist deformation, have longer life expectancy, and have a low bleed level, even at high temperatures. Thermospray SSL injector is compatible with the Merlin Microseal™ High Pressure Valve instead of the standard septum.

Liner

The sample injection mode used determines the choice of liner to install into the injector body. An appropriate liner must ensure complete sample vaporization and contain the entire volume of the vaporized sample without reacting with it. Thermo Scientific Chromatography Data Systems include the Vapor Volume Calculator that rapidly calculates the expansion volume of several factors (solvent, injected liquid volume, temperature, and inlet pressure) to help you determine if a liner dimension is suitable for a method.

Split Liners

Select an appropriate liner from Table 1.

Table 1. Split Liners

<table>
<thead>
<tr>
<th>No</th>
<th>Liner</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glass Liner 5 mm ID; 8 mm OD; 105 mm length. User for split injections at high flow rates or for the most polar solvents.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Split Straight Liner 5 mm ID; 8 mm OD; 105 mm length.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Split Straight Liner 3 mm ID; 8 mm OD; 105 mm length.</td>
<td></td>
</tr>
</tbody>
</table>

Splitless Liners

Select an appropriate liner from Table 2.

Table 2. Splitless Liners

<table>
<thead>
<tr>
<th>No</th>
<th>Liner</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Splitless Straight Liner 3 mm ID; 8 mm OD; 105 mm length.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Splitless Straight Liner 5 mm ID; 8 mm OD; 105 mm length.</td>
<td></td>
</tr>
</tbody>
</table>
Installing a Thermospray SSL Injector Module

This section provides instructions for adding a “double wide” Thermospray SSL injector module. It must be placed into both the front and back injector modules housing on the upper deck of the TRACE 1300/TRACE 1310. For the purpose, before installing the Thermospray SSL injector module, the modules installed into the injector modules housing must be removed. See Figure 5.

**Figure 5.** Injector Modules Housing

---

**ATTENTION** Where a dummy module is installed, the gas connection is blocked by a plug.

---

**To install a Thermospray SSL injector module**

1. Put the GC in standby condition.
2. Cool the oven, injector, and detector to room temperature.

**Note** By pressing the **Maintenance** button, the GC cool down is automatically carried out.

3. Close the gas supplies.
4. Power off the GC.
   a. Push down the power switch (breaker), located at the back of the instrument, to the position O.
   b. Unplug the power cable from the AC Input connector into the back of the GC and from the wall outlet.

5. If external modules are present, unplug the power cable from the AC Input connector of each external module, and from the wall outlet.
6. Put the autosampler away if present.

7. Remove the all the dummy and/or injector modules installed in the injector modules housing. Before starting, remove the analytical column with its nut and ferrule from the bottom of the injector.
   a. Open the module flap cover.
   b. Using a T20 Torxhead screwdriver, unscrew the three captive fixing screws.
   c. Keeping the dummy or injector module flap cover open, lift up the module from its seat into the injector housing. Place the injector module on a clean surface.

8. Verify the presence of the gas block on gas connection. See Figure 6.

   **Figure 6.** Injector Gas Block Plug

   ![Gas Connection Without Gas Block Plug](image)
   ![Gas Block Plug on Injector Seat](image)

   a. The gas block plug on the back position must be removed from the gas connection by unscrewing its fixing screw using a T20 Torxhead screwdriver.
   b. The gas block plug on the front position must be placed on the gas connection by screwing its fixing screw using a T20 Torxhead screwdriver.

   **WARNING** Make sure the o-ring is placed into its seat on the gas connection of the back position. See Figure 6. Do not install the module if the o-ring is missing.

9. Open the front door of the GC.

10. Install the insulator cap on the front injector hole. See Figure 7.
The insulator cap is used for maintaining hot the bottom of the injector that protrudes into the oven.

11. Plug the Thermospray SSL injector module into the main frame. See Figure 8.

**Figure 7.** Insulating Plate

![Insulating Plate](image)

![Insulator Cap](image)

a. Hook the insulator cap on the ceiling of the oven and fix it by using the screw provided.

**Figure 8.** Thermospray SSL Injector Module Installation

![Thermospray SSL Injector Module Installation](image)

a. Open the module flap covers. Keeping the module flap covers open, tilt the module and carefully insert it into the position. After clearing the opening, lower the module. Be sure to insert the 25-pin male connector, on the bottom of the module, into the 25-pin female connector on the injector seat of the back injector housing.

b. Use a T20 Torxhead screwdriver to tighten the captive fixing screws without overtightening.
c. Close the module flap covers.

d. Keep the plug connected to the bottom of the injector.

12. Connect the carrier gas line to the back carrier gas inlet. Use a 7/16-in. wrench for tightening the fittings. See Figure 9.

**Figure 9.** Plumbing the Carrier Gas Line

13. Open the gas supplies.

14. Check the gas supply for leaks.

   a. Use a handheld electronic leak detector (Thermo Scientific GLD Pro leak detector or equivalent) to check each fitting for leaks.
   
   b. If you detect a leak, tighten the connection and retest it.
   
   c. Repeat this process until all connections are leak free.

15. If external modules are present, plug the power cable to the AC Input connector of each external module, and to the wall outlet.

16. Power on the GC.

   a. Plug the power cable to the AC Input connector into the back of the GC and to the wall outlet.
   
   b. Flip up the power switch (breaker) to the position I.

17. Pressurize the module with the carrier gas.

18. Check the module gas connections for leaks.

19. Remove the plug from the bottom.

20. Connect the analytical column end to the injector and verify the connection point.

**ATTENTION** To maintain the correct alignment the screws must be tightened in turn. Tighten each screw only a small amount before moving to the next screw. Repeat until all are secure.
a. Slide the graphite ferrule onto the capillary column with the bevelled end facing the injector. Be careful to avoid damaging the graphite ferrule when inserting the column.

b. Cut at least 1 cm from the column end.

c. Place the column on the column support.

d. Use typewriter correction fluid or a felt-tipped pen to mark the correct position of the ferrule from the end of the column depending on the injection technique. The correct positions are as follows:
   • 40 mm for split injection
   • 64 mm for splitless injection

e. Insert the column about 2 cm into the injector and slide the ferrule on the column up to the injector base, then slide the retaining nut onto the column through the side cut. The retaining nuts have a slotted design that makes them easy to add and remove.

f. Finger-tighten the column retaining nut until it starts to grip the column.

g. Adjust the column position so that the mark is even with the column retaining nut.

h. Use the 6 mm wrench to tighten the retaining nut using no more pressure than is necessary to obtain a good seal (1/4 to 1/2 turn).

i. Perform a column leak check and a column evaluation. For details refer to the section Installing the Column the First Time or to the section Replacing a Column in the TRACE 1300 and TRACE 1310 GC Hardware Manual.

21. Close the front door of the GC.

22. If present, move the autosampler towards the module to restore the original alignment.

23. Configure the Thermospray SSL injector module. See “Configuration and Method Parameters Setup Through the GC Touch Screen” on page 10, and “Configuration and Method Parameters Setup Through CDS” on page 17.

---

**Configuration and Method Parameters Setup Through the GC Touch Screen**

This section provides the instruction for configuring the injector and using its method parameters through the touch screen of the GC.

**IMPORTANT** The Thermospray SSL injector module is recognized by the GC as a SSL injector, then configure and program the parameters as a SSL injector.

- See “Configuring a Thermospray SSL Injector” on page 11
Configuring a Thermospray SSL Injector

Press the **Configuration** icon on the touch screen main menu to configure the Thermospray SSL injector.

Press the icon **Back Inlet SSL** and set the following parameters:

- **Purge Flow** — Enter a value in the range of 0.5-50 mL/min.
- **Gas Type** — Select the carrier gas in use for the column. The choices are He, H2, N2, Ar/CH4, Ar, none.
- Press the **Instrument Control** icon on the touch screen main menu for programming the parameters in the analytical method.

Using Thermospray SSL Injector Parameters

Press the **Instrument Control** icon on the touch screen main menu for programming the parameters in the analytical method.

This menu includes the operating parameters for the split/splitless module. Editable parameters vary with the operating mode: **split**, **splitless**, **surged splitless**, and the flow mode: **constant flow**, **constant pressure**, **programmed flow**, **programmed pressure**.

“Carrier Gas Parameters” on page 11
“Injection Mode” on page 13
“Inlet Parameters” on page 13
“Purge Parameters” on page 14
“Surge Parameters” on page 14
“Setting Gas Parameters” on page 14
“Setting Parameters for the Split Mode” on page 15
“Setting Parameters for the Splitless Mode” on page 16
“Setting Parameters for the Surged Splitless Mode” on page 16

The following sections list and describe the parameters controlling the Thermospray SSL injector. They are:

**Carrier Gas Parameters**

Set the carrier gas control parameters. Visualized parameters change according to the **Flow Mode** set.
Pressure — Defines the actual and setpoint pressure of the carrier gas. The range is On/Off; 5–1000 kPa (0.725-145 psi; 0.05-10 bar). This line is not editable when the Constant Flow or Programmed Flow mode is selected.

Column Flow — Defines the carrier gas flow rate through the column. The range is On/Off; 0.01–100 mL/min. Select On to display the actual and setpoint values. Select Off or 0 to turn off all inlet flows. This line is not editable when the Constant Pressure or Programmed Pressure mode is selected.

Flow Mode — Defines the carrier gas control mode to use. Each mode activates or deactivates the dedicated parameters.

- **Constant Flow** — The column flow is kept constant throughout the analysis. The pressure at the column head will change with the column temperature to maintain a consistent flow.

- **Constant Pressure** — The pressure at the column head is kept constant throughout the analysis. During a temperature program, the column flow decreases due to the increase of the carrier gas viscosity.

- **Programmed Flow** — The column flow rate can be programmed to change during the analytical run for up to three flow ramps.

  The parameters are:
  - **Initial Flow** — Defines the beginning flow rate.
  - **Initial Time** — Defines how long the Initial Flow is maintained.
  - **Ramp 1** — The ramp rate in mL/min² to reach the final flow rate. Select On to enable the ramp and display the setpoint value.
  - **Final Flow** — The final flow rate the carrier gas will reach at the end of the ramp rate.
  - **Final Time** — Defines how long the corresponding Final flow must be maintained.
  - **Ramp 2-3** — To program additional ramps, select On and enter the ramp rates in mL/min². The Final Flow and Final Time menu items for the ramp are displayed. The ranges and functions of these menu items are identical to the Final Flow and Final Time menu items for Ramp 1.

- **Programmed Pressure** — The inlet pressure can be programmed to change during the analytical run up to three pressure ramps.

  The parameters are:
  - **Initial Pressure** — Defines the initial pressure.
  - **Initial Time** — Defines how long the Initial Pressure is maintained.
  - **Ramp 1** — Defines the ramp pressure in kPa/min to reach the Final Pressure. Select On to enable the ramp and display the setpoint value.
- **Final Pressure** — Defines the final pressure the carrier gas will reach at the end of the ramp rate.

- **Final Time** — Defines how long the corresponding final pressure must be maintained.

- **Ramp 2-3** — To program additional ramps, select On and enter the ramp rates in kPa/min. The Final Pressure and Final Time menu items for the ramp are displayed. The ranges and functions of these menu items are identical to the Final Pressure and Final Time menu items for Ramp 1.

**Linear Velocity** — The calculated velocity of the carrier gas through the column, expressed in cm/s. It is not editable.

**Void Time** — The elution time of an un-retained peak, expressed in seconds. It is not editable.

**Gas Saver** — This function reduces carrier gas consumption. The range is On/Off; 5–500 mL/min. Select On to turn on the gas saver flow and display the setpoint values. Select Off to turn off the gas saver flow. The flow is retained in memory.

**Gas Saver Time** — Defines the time in the run when the gas saver function starts to operate. Usually it starts after the injection to conserve gas. Set a value from 0.00 to 999.99 min. This line does not appear if Gas saver flow is Off.

**Vacuum Comp.** — Use this parameter only when the TRACE 1300/TRACE 1310 is coupled with a mass detector to compensate for vacuum column outlet. The range is On/Off.

### Injection Mode

Choose which injection mode to use with the SSL injector. Each mode activates or deactivates the dedicated parameters.

- **Split** — The carrier flow is split in the injection port with the bulk going out the split vent. The split vent remains open all the time.

- **Splitless** — Closes the split vent during injection to drive the entire sample into the column. Splitless times of about 1 minute are typical.

- **Surged Splitless** — Same as Splitless but can also program a surge during an injection. Surge starts at Prep Run and continues until the surge duration time is finished. Surge is further defined in next group of controls.

### Inlet Parameters

The SSL injection parameters are described below:

- **Temperature** — Defines the setpoint for the injector’s temperature. Depending on the injection mode you select, set a temperature high enough to vaporize the sample and the solvent. Enter a value for the inlet temperature in the range of 0-400 °C.
Split Flow — Enter a value in the range of 5-1250 mL/min. The Split Ratio is adjusted automatically. In addition, this value is governed by the initial column flow rate entered on the associated carrier gas control. If the flow rate is changed, the Split Flow value is adjusted so that the Split Ratio is maintained. However, if the Split Flow value then falls outside its limits, a warning is generated.

Split Ratio — Enabled when the injection mode is set to Split. It is also associated to the Flow Mode set to either Constant Flow or Programmed Flow. Specify the ratio of split flow to column flow. Calculate the split ratio: Split Ratio = (split flow) / (column flow). Enter a value in the range of 1-12500. The Split Flow entry is adjusted automatically.

Splitless Time — Enabled when the injection mode is set to either Splitless or Surged Splitless. Specify the length of time the split valve remains closed after a splitless injection. Enter a value in the range of 0.00-999.99 min. The timer begins at the start of the run. The split vent reopens when the splitless time ends.

Purge Parameters

Purge parameters are available when the injection mode is set to either Splitless or Surged Splitless.

Constant Septum Purge — Controls the septum purge for the injector. The range is On; Off. Select On to activate the function to continuously flush the septum with a purge flow.

Note: The purge flow, in the range of 0.5-50 mL/min, must be set in the Configuration Page of the injector module.

Stop Purge For — Enabled if the Constant Septum Purge parameter is set to On. You can then enter a time from 0.00 to 999.99 min at which the septum purge ceases.

Surge Parameters

Surge parameters are enabled when the injection mode is set to Surged Splitless.

Surge Pressure — Defines the pressure applied during the splitless time to produce a surge of flow in the injector to speed the transfer of the sample. Enter a value in the range of 5-1000 kPa (0.725-145 psi; 0.05-10 bar).

Surge Duration — Defines the time that the surge pressure is maintained. Enter a value in the range of 0.00-999.99 min. Typically, set to coincide with the Splitless time.

Setting Gas Parameters

Before starting, check that the carrier gas type is correct for the analysis.

To set-up gas parameters

1. Program the carrier gas flow.
a. Select **Flow Mode**.

b. Choose the mode you want choosing among Constant flow, Constant Pressure, Programmed Flow or Programmed Pressure.

c. Enter the initial **Flow**, or **Pressure**.

   i. If you select the Constant Flow mode, enter the desired **Column Flow** value. The necessary pressure is calculated and adjusted to maintain the constant flow.

   ii. If you select Constant Pressure mode, enter the desired **Pressure** value.

d. Enter a **Programmed Flow/Programmed Pressure**.

   i. Select Progr Flow/Pressure, scroll to Initial Flow/Press and enter the desired value. Press Enter.

   ii. Scroll to Initial Time and enter a value. This parameter ends the initial part of the program.

e. Program the **Ramps**.

   i. Scroll to Ramp 1 and enter the value.

   ii. Scroll to Final Flow 1/Pressure 1 and enter the final value for the ramp.

   iii. Scroll to Final Time 1 and enter the final time for Ramp 1. This operation ends the first ramp setting.

   iv. If you do not want a second ramp, leave Ramp 2 set to Off. To enter a second ramp, scroll to Ramp 2 and enter the value.

   v. Scroll to Final Flow 2/Pressure 2 and enter the final value for the ramp.

   vi. Scroll to Final Time 2 and enter the final time for Ramp 2. This operation ends the second ramp setting.

   vii. If you do not want a third ramp, leave Ramp 3 set to Off. To enter a third ramp, scroll to Ramp 3 and enter the value.

   viii. Scroll to Final Flow 3/Pressure 3 and enter the final value for the ramp.

   ix. Scroll to Final Time 3 and enter the final time for Ramp 3. This operation ends the third ramp setting.

2. If the TRACE 1300/TRACE 1310 is working with a mass detector, set **Vacuum Compensation** to On to compensate for vacuum column outlet.

### Setting Parameters for the Split Mode

Before starting, verify that the correct liner is installed into the injector body and the system is free of leak.
To setup a Split injection

1. Program the carrier gas flow.
2. From the mode list, choose Split.
3. Set the injector Temperature.
4. If carrier Flow mode (Programmed or Constant) is selected, specify the Split Flow or Split Ratio.
   a. If you want a specific Split Flow, enter that value. Split Ratio will be calculated.
   b. If you want a specific Split Ratio, enter that value. Split Flow will be calculated.
5. If desired, turn on Gas Saver and set Gas Saver Time after the injection time.

Setting Parameters for the Splitless Mode

Before starting, verify that the correct liner is installed into the injector body and the system is free of leaks.

To setup a Splitless injection

1. Program the carrier gas flow.
2. From the mode list, choose Splitless.
3. Set the injector Temperature.
4. Enter the Splitless Time.
5. If desired turn on Constant Septum Purge and enter into Stop Purge For how many minutes elapse before restarting the purge.
6. If desired, turn on Gas Saver and set Gas Saver Time after the injection time.

Setting Parameters for the Surged Splitless Mode

Before starting, verify that the correct liner is installed into the injector body and the system is free of leaks.

To set up a Surged Splitless injection

1. Program the carrier gas flow.
2. From the Mode list, choose Surged Splitless.
3. Set the injector Temperature.
4. Enter the Splitless Time.
5. If desired turn on Constant Septum Purge and enter into Stop Purge For how many minutes elapse before restarting the purge.
6. Set the values for **Surge Pressure** and **Surge Duration**.

7. If desired, turn on **Gas Saver** and set **Gas Saver Time** after the injection time.

### Configuration and Method Parameters Setup Through CDS

This section contains instructions for configuring the injector and editing the method parameters through Xcalibur, Chrom-Card, ChromQuest, or Chromeleon Thermo Scientific Chromatography Data System (CDS).

**IMPORTANT** The Thermospray SSL injector module is recognized by the GC as a SSL injector, then configure and program the parameters as a SSL injector.

- See “Configuration Inlets Tab” on page 17
- See “S/SL Page” on page 18

### Configuration Inlets Tab

Use this tab to select the inlet installed on your GC and the carrier gas used. See Figure 10.

**Figure 10.** Configuration Window: Inlets Tab

This tab includes the fields **Inlets** and **Options**.

**Inlets**

This field includes the following options:

- **Inlet Type** — Choose the injector module installed on your GC.
Instant Connect Thermospray SSL Injector Module
Configuration and Method Parameters Setup Through CDS

- **Back** — Choose S/SL.

- **Carrier Gas** — Choose the type of carrier gas used to supply the front/back injector module.
  - **Back** — Choose one: Helium, Hydrogen, Nitrogen, Argon, or Argon/Methane.

### Options

Select **Hydrogen sensor** check box if a hydrogen sensor is installed into the GC.

### S/SL Page

This page is the method editor for the Thermospray SSL injector module. See Figure 11.

#### Figure 11. TRACE 1300 S/SL Page

This page includes the following fields:

- **S/SL Mode**
- **Inlet**
- **Surge**
- **Septum Purge**
- **Carrier Mode**
- **Carrier Flow**
- **Carrier Pressure**
- **Programmed Carrier Flow**
- **Programmed Carrier Pressure**
- **Carrier Options**
S/SL Mode

This parameter enables the fields in this pane. The options are described in Table 3.

### Table 3. S/SL Mode Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split</td>
<td>This option enables the Inlet field only. The carrier flow is split in the injection port with the bulk going out the split vent. Use this injection mode when analyzing high concentration or neat samples, or in instances where sensitivity is less important. The split vent remains open all the time. This method yields the sharpest peaks if the split gas is properly mixed.</td>
</tr>
<tr>
<td>Splitless</td>
<td>This option enables the Inlet and Purge fields. The split vent is closed during the injection to drive most of the sample into the column. The solvent effect is required to refocus the analytes, especially more volatile compounds. You can achieve the solvent effect by keeping the analytical column or guard column slightly below the solvent’s boiling point. Splitless times of about 1 minute are typical.</td>
</tr>
<tr>
<td>Splitless w/Surge</td>
<td>This option enables all fields. Same as Splitless but can also program a surge during an injection. Surge starts at Prep Run and continues until the surge duration time is finished. Surge is further defined in the next group of controls.</td>
</tr>
</tbody>
</table>

Inlet

The inlet parameters are set in this field which is common to all modes. Inlet parameters are described in Table 4.

### Table 4. S/SL Inlet Parameters (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Select the check box to enable the adjacent field. Enter a value for the inlet temperature in the range of 0-400 °C.</td>
</tr>
<tr>
<td>Split Flow</td>
<td>Select the check box to enable the adjacent field. Enter a value in the range of 5-1250 mL/min. The Split Ratio is adjusted automatically. In addition, this value is governed by the initial column flow rate entered on the associated Carrier mode.</td>
</tr>
</tbody>
</table>

- If the flow rate is changed, the Split Flow value is adjusted so that the split ratio is maintained. However, if the Split Flow value then falls outside its limits, a warning is generated and you then have to change the entry to a valid number.
Table 4. S/SL Inlet Parameters (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split Ratio</td>
<td>This field is enabled under the following conditions:</td>
</tr>
<tr>
<td></td>
<td>• Mode is set to Split.</td>
</tr>
<tr>
<td></td>
<td>• The Split Flow check box is selected.</td>
</tr>
<tr>
<td></td>
<td>• On the associated Carrier mode, the Flow Mode is set to either Constant Flow or Programmed Flow.</td>
</tr>
<tr>
<td></td>
<td>This is the ratio between the split flow and the column flow.</td>
</tr>
</tbody>
</table>
|                | \[
|                | \text{SplitRatio} = \frac{\text{SplitFlow}}{\text{ColumnFlow}}                                  |
|                | Enter a value in the range of 1-12500. The Split Flow entry is adjusted automatically.            |
| Splitless Time | This field is enabled when the S/SL Mode is set to either Splitless or Splitless w/Surge.         |
|                | Specify the length of time the split valve remains closed after a splitless injection. Enter a value in the range of 0.00-999.99 min. |
|                | The timer begins at the start of the run. During this time, most of the sample transfers from the injector to the column. The split vent reopens when the splitless time ends. This occurs in order to remove excess solvent vapor. |

Surge

This field is enabled when the S/SL Mode is set to Splitless or Splitless w/Surge. Make the surge settings in this field. Surge parameters are described in Table 5.

Table 5. S/SL Surge Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge Pressure</td>
<td>The pressure applied during the splitless time to produce a surge of flow in the injector to speed transfer of the sample. It may be used, depending upon the analysis, to sharpen peaks closer to the solvent’s boiling point where cold trapping is ineffective and solvent effect is the main refocusing mechanism. Enter a value in the range 5-1000 kPa (0.725-145 psi; 0.05-10 bar).</td>
</tr>
<tr>
<td>Surge Duration</td>
<td>This is the time that the surge pressure is maintained. Enter a value in the range of 0.00-999.99 min. Typically, set to coincide with the Splitless time.</td>
</tr>
</tbody>
</table>
Septum Purge

This field controls the septum purge for the injector. Septum purge is used to sweep the bottom of the septum reducing contamination from sample's analytes. This prevents carryover from run to run. Septum purge also prevents contamination of the injector from septum bleed. Make the purge settings in this field.

Septum purge parameters are described in Table 6.

Table 6. S/SL Purge parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purge Flow</td>
<td>This field indicates the flow at which the septum is continuously flushed.</td>
</tr>
<tr>
<td>Constant Septum Purge</td>
<td>Select the check box to continuously flush the septum with a purge flow.</td>
</tr>
<tr>
<td>Stop Purge Time</td>
<td>This field is enabled if the Constant Septum Purge check box is cleared. You can then enter a time at which the septum purge ceases. The range is 0.00-999.99 min.</td>
</tr>
</tbody>
</table>

Carrier Mode

In this field, you select the flow mode for the carrier gas.

The choice made here controls the parameters available in the Carrier Flow/ Carrier Pressure and Ramps field.

- **Constant Flow** — A single Flow field is available along with a check box to enable or disable it. The graph shows a horizontal line at the flow rate indicated. See Carrier Flow.

- **Constant Pressure** — A single Pressure field is available along with a check box to enable or disable it. The graph shows a horizontal line at the pressure indicated. See Carrier Pressure.

- **Programmed Pressure** — The Pressure program fields are displayed. The graph represents the ramps in the program. See Programmed Carrier Pressure.

- **Programmed Flow** — The Flow program fields are displayed. The graph represents the ramps in the program. See Programmed Carrier Flow.

Carrier Flow

Use this field to set up flow when the Constant flow carrier mode has been selected.

Select the Flow check box to enable the Flow field.
Enter a value in the range of 0.1-100 mL/min. If you clear the check box, the field is disabled and the graph becomes a horizontal line at a flow rate of zero.
Carrier Pressure

Use this field to set up pressure when the **Constant pressure** carrier mode has been selected. Select the **Pressure** check box to enable the Pressure field. Enter a value in the range of 5-1000 kPa (0.725-145 psi; 0.05-10 bar). If you clear the check box, the field is disabled and the graph becomes a horizontal line at zero pressure.

Programmed Carrier Flow

Use this field to set up a flow program when **Programmed Flow** carrier mode has been selected. See **Figure 12**.

**Figure 12.** Programmed Carrier Flow

In this mode you can program an initial constant flow rate field followed by up to three ramps.

Select the **Flow enable** check box to enable the flow. Enable the number of flow ramps required by clicking on the **+** button. Conversely, to reduce the number of rows on display, click on the **-** button as necessary. The initial row is displayed by default and cannot be hidden. If you wish to disable the ramps temporarily, clear the **Flow enable** check box. This disables the Flow column and the program is ignored as shown in the graph, which becomes a horizontal line at zero flow rate. The values entered are preserved and may be reactivated by selecting the check box once more.

The parameters in the timetable are as follows:

- **Rate** — Enter a value for the rate of flow rate change in the range of 0.001-100 mL/min². This field is not available for the initial field of the program.

- **Flow** — Enter a value for the constant flow rate field of the ramp in the range of 0.001-100 mL/min.

- **Hold Time** — Enter a value for which the flow rate will be held. The range is 0.00-999.99 min.
Programmed Carrier Pressure

Use this field to set up a pressure program when **Programmed Pressure** carrier mode has been selected. See **Figure 13**.

**Figure 13.** Programmed Carrier Pressure

![Programmed Carrier Pressure](image)

In this mode you can program an initial constant pressure rate field followed by up to three ramps.

Select the **Pressure enable** check box to enable the pressure. Enable the number of pressure ramps required by clicking on the **+** button. Conversely, to reduce the number of rows on display, click on the **-** button as necessary. The initial row is displayed by default and cannot be hidden. If you wish to disable the Pressure ramps temporarily, clear the **Pressure enable** check box. This disables the Pressure column, and the program is ignored as shown in the graph, which becomes a horizontal line at zero pressure. The values entered are preserved and may be reactivated by selecting the check box once more.

The parameters in the timetable are as follows.

- **Rate** — Enter a value for the rate of pressure change in the range of 0.01-1000 kPa/min (0.001-145 psi; 0.0001-10 bar). This field is not available for the initial field of the program.

- **Pressure** — Enter a value for the constant pressure field of the ramp in the range of 5-1000 kPa (0.725-145 psi; 0.05-10 bar).

- **Hold Time** — Enter a time for which the pressure will be held. The range is 0.00-999.99 min.

**Carrier Options**

This field includes the following parameters:

- **Vacuum Compensation** — Select the check box to enable the vacuum compensation feature. Use this only when the TRACE 1300 is connected to a mass spectrometer detector. When the check box is not selected, calculations are made for a normal GC detector, which is usually at atmospheric pressure.
• **Gas Saver** — Select the check box to enable the function in this field. Gas saver controls reduce carrier gas consumption, especially when a large split flow is used. It is set to come on at some point well after the injection to conserve gas. Gas Saver parameters are described in **Table 7**.

**Table 7.** Gas Saver Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Saver Flow</td>
<td>Enter a value for the gas saver flow rate in the range of 5-500 mL/min.</td>
</tr>
<tr>
<td>Gas Saver Time</td>
<td>This is time into the run when the gas saver feature starts up. Enter a value in the range of 0.00-999.99 min.</td>
</tr>
</tbody>
</table>

**Maintaining a Thermospray SSL Injector**

This section provides instructions for maintaining a Thermospray SSL injector module.

The module and injector components are shown in **Figure 14** and **Figure 15**.

**Figure 14.** Thermospray SSL Injector Module Components
The Thermospray SSL injector periodic maintenance includes:

- **Replacing the septum**

  Replace the septum at least after every 200 injections, or every time a problem related to septum damage, or wear occurs.

  See “Replacing the Septum” on page 27.

- **Cleaning or replacing the liner**

  Check the liner for contaminants, debris, breakage, and proper installation. The liner must be replaced depending on the number of injections performed, and the characteristics of the samples injected. Typical symptoms will indicate that the liner must be replaced. The most common is the appearance of tailing peaks in the chromatogram, particularly for polar compounds.

  See “Cleaning or Replacing the Glass Liner” on page 28.
When replacing or removing a glass liner, it might break inside the injector. In this case the broken parts of the liner must be removed from the injector, including the glass splinters that might fall into the lower part of the vaporization chamber.

See “Replacing a Broken Liner” on page 31.

- Replacing the active carbon filters on the carrier gas line and split line

The active carbon filters must be replaced depending on the volume of solvent injected in the time.

See “Replacing the Carrier and Split Lines Filters” on page 33.

- Replacing the split line tubing

Replace the split line tubing when strong contamination or block has been verified. The Assy split line 1/8-in. (PN 39000012) is required.

See “Replacing the Split Line Tubing” on page 35

- Baking-out the contaminants

See “Baking-out Contaminants from the Injector” on page 37

Before maintaining the injector, read the following warning:

**WARNING** The injector fittings could be hot. Carry out all the operation at low temperature to avoid burns. Therefore, before beginning the sequence, the injector must be cooled to room temperature.

When handling organic solvents, you must take precautions to avoid health hazards.

### Materials needed to maintain a Thermospray SSL injector

- Septum
- Tweezers
- Non metallic sharp tool
- Glass liner
- Liner seal (O-ring)
- Ultrasonic cleaner
- Mixture 1:1 methanol/acetone
- Graphite seal
- Carrier gas line and/or split gas line active carbon filters
- Liner cap removal tool
- T20 screwdriver
Replacing the Septum

To replace the septum

Figure 16. Thermospray SSL Injector: Septum Replacement

1. Put the GC in standby condition.
2. Cool the oven and injector to room temperature.
3. Turn the carrier gas off, and wait for the carrier pressure to go to zero.

**Note** By pressing the Maintenance button, the GC cool down is automatically carried out.

4. Put the autosampler away if present.
5. Open the module flap covers.
6. Replace the septum.
   a. Unscrew and remove the septum cap.
   b. Remove the septum holder with the septum, then the septum support.
   c. Remove the septum from the septum holder by using a non-metallic sharp tool.
   d. Avoid touching the septum with your fingers. Insert a new septum into the septum holder using tweezers.
   e. Clean the septum support from possible fragments left by the septum and reinsert it into the injector.
   f. Place the septum holder on the top of the septum support.
   g. Screw and tighten the septum cap to finger-tight.
CAUTION Do not overtighten the septum cap because you might damage the septum and affect instrument performance.

7. Close the module flap covers.
8. If present, move the autosampler towards the module to restore the original alignment.
9. Turn the carrier gas on.
10. Set the normal injector, detector, and GC working conditions.

Cleaning or Replacing the Glass Liner

❖ To clean or replace the glass liner

Figure 17. Thermospray SSL Injector: Glass Liner Replacement

1. Put the GC in standby condition.
2. Cool the oven and injector to room temperature.
3. Turn the carrier gas off, and wait for the carrier pressure to go to zero.

Note By pressing the Maintenance button, the GC cool down is automatically carried out.
4. Put the autosampler away if present.

5. Open the module flap covers.

6. Remove the top parts of the injector.
   a. Unscrew the septum cap of the injector.
   b. Remove the septum holder with septum, then the septum support.
   c. Remove the injector liner cap by using the liner cap removal tool provided.

7. Remove the liner.
   a. Using tweezers, remove the liner with the liner seal from the injector.

   **CAUTION** Be careful not to break the glass liner when removing it. Glass splinters might fall into the lower part of the vaporization chamber. If the glass liner breaks, see “Replacing a Broken Liner” on page 31.

8. Replace or clean the liner.
   - If you are going to use a new liner, go directly to step 10.
   - If you are going to clean the dirty liner, go to step 9.

9. Clean the liner.
   a. Put the liner into an ultrasonic cleaner filled with a methanol/acetone mixture (1:1).
   b. Sonicate the liner for about half an hour.
   c. Using tweezers, remove the liner from the bath and dry it with compressed clean air.

10. Install the liner.
    a. Holding the new (or cleaned) liner with tweezers place a new liner graphite seal over the liner making sure to leave a distance of about 10 mm between the seal and the liner end.

    ![10 mm](image)

    b. Make sure you insert the bevelled end of the liner towards the bottom of the injector. Insert the liner into the injector, and push it gently towards the bottom of the injector.
11. Reinstall the top parts of the injector.
   a. Tighten the liner cap using the liner cap wrench provided.
   b. Remove the septum from the septum holder using a non-metallic tool.
   c. Insert a new septum into the septum holder.
   d. Clean the septum support from possible fragments left by the septum and reinsert it into the injector.
   e. Place the septum holder on the top of the septum support.
   f. Screw and tighten the septum cap to finger-tight.

CAUTION  Be careful not to damage the graphite seal or allow graphite to entering the liner. Should this occur, clean the liner with an inert gas.

12. Close the module flap covers.

13. If present, move the autosampler towards the module to restore the original alignment.

14. Turn the carrier gas on.

15. Set the normal injector, detector, and GC working conditions.
Replacing a Broken Liner

To replace a broken liner

Figure 18. Thermospray SSL Injector: Broken Liner Replacement

1. Put the GC in standby condition.
2. Cool the oven and injector to room temperature.
3. Turn the carrier gas off, and wait for the carrier pressure to go to zero.
4. Put the autosampler away if present.
5. Open the module flap covers.
6. Remove the top parts of the injector.

Note By pressing the Maintenance button, the GC cool down is automatically carried out.
a. Unscrew the septum cap of the injector.

b. Remove the septum holder with septum, then the septum support.

c. Remove the injector liner cap by using the liner cap wrench provided.

7. Remove the broken liner.

a. Using tweezers, remove the upper part of broken liner with the liner seal from the injector.

8. Remove the bottom parts of the injector.

a. Inside the oven, unscrew the capillary column retaining nut, then remove the analytical column with its ferrule from the bottom of the injector.

b. From the bottom of the injector, unscrew the retaining nut and remove the terminal fitting with its silver seal. Glass splinters from the broken liner will fall from the injector.

c. With the aid of a pipe cleaner, remove the possible glass fragments from the vaporization chamber.

9. Reinstall the bottom parts of the injector.

a. Reinsert the silver seal and the terminal fitting.

b. Tighten the retaining nut.

c. Insert the analytical column with its ferrule into the bottom of the injector in its previous position.

d. Tighten the M4 retaining nut to hold the column in place.

10. Install the new liner.

a. Holding the new (or cleaned) liner with tweezers place a new liner graphite seal over the liner making sure to leave a distance of about 10 mm between the seal and the liner end.

b. Make sure you insert the bevelled end of the liner towards the bottom of the injector. Insert the liner into the injector, and push it gently towards the bottom of the injector.
11. Reinstall the top parts of the injector.
   a. Tighten the liner cap using the liner cap wrench provided.
   b. Remove the septum from the septum holder using a non-metallic tool.
   c. Insert a new septum into the septum holder.
   d. Clean the septum support from possible fragments left by the septum and reinsert it into the injector.
   e. Place the septum holder on the top of the septum support.
   f. Screw and tighten the septum cap to finger-tight.

12. Close the module flap covers.

13. If present, move the autosampler towards the module to restore the original alignment.

14. Turn the carrier gas on.

15. Set the normal injector, detector and GC working conditions.

### Replacing the Carrier and Split Lines Filters

**IMPORTANT** The dimensions of the filters are different. The filter on the split gas line is bigger than the filter on the carrier gas line. Do not invert their position when you replace them. It is not necessary to replace the filters together.

**To replace the active carbon filters on carrier gas line and split line**

1. Put the GC in standby condition.
2. Cool the oven and injector to room temperature.
3. Turn the carrier gas off, and wait for the carrier pressure to go to zero.

**Note** By pressing the Maintenance button, the GC cool down is automatically carried out.

4. Put the autosampler away if present.
5. Open the module flap covers.
Figure 19. Thermospray SSL Injector: Active Filters Replacement

6. Replace the filter.
   a. Remove the filter to replace from its seat by turning it counter-clockwise.
   b. Install the new filter, with o-rings, in its seat by turning it clockwise.

7. Close the module flap covers.

8. If present, move the autosampler towards the module to restore the original alignment.

9. Turn the carrier gas on.

10. Set the normal injector, detector, and GC working conditions.
Replacing the Split Line Tubing

Materials needed to maintain a Thermospray SSL injector

- 7/16-in. wrench
- Assy split line 1/8-in.

To replace the split line tubing

1. Put the GC in standby condition.
2. Cool the oven and injector to room temperature.
3. Turn the carrier gas off, and wait for the carrier pressure to go to zero.
4. Put the autosampler away if present.
5. Open the module flap covers.
6. Disconnect the split line tubing from the injector body and from the split line filter. See Figure 21.

Note: By pressing the Maintenance button, the GC cool down is automatically carried out.

Figure 20. Split Line Tubing
a. Using the 7/16-in. wrench, unscrew and disconnect the split line tubing from the injection body.

b. Using the 7/16-in. wrench, unscrew and disconnect the split line tubing from the split line filter.

7. Remove the split line tubing from the Thermospray SSL module.

8. Connect the new split line tubing. See Figure 22.

**Figure 22.** Replacing Split Line Tubing (2)

a. On the ends of the new split line tubing slide the 5/16-in. brass nuts and the brass front/back ferrules.

b. Fully insert the tubing into the fitting on the injector body and rotate the nut finger-tight.

c. Insert the tubing into the outlet of the split line filter and rotate the nut finger-tight.

d. Mark the nut at the 12 o’clock position. While holding the fitting body steady, tighten the nut three-quarters turn to the 9 o’clock position.

9. Close the module flap covers.

10. If present, move the autosampler towards the module to restore the original alignment.
11. Turn the carrier gas on.
12. Set the normal injector, detector, and GC working conditions.

**Baking-out Contaminants from the Injector**

Perform this operation to bake-out contaminants from Thermospray SSL injector.

- **To bake-out contaminants from the injector**
  1. Put the inlet into Split injection mode.
  2. Select Constant Flow mode and enter the normal operating Column flow value.
  3. Set Split flow to 200 mL/min.
  4. Purge the column with carrier flow for at least 10 minutes before heating the oven.
  5. If the column is connected to the detector, set the detector 25 °C above normal operating temperature. If the column is not attached to the detector, cap the detector fitting. In case of PDD detector, it is strongly recommended disconnecting the column from the detector.
  6. Set the injector temperature to 300 °C or 25 °C above the normal operating temperature to bake out contaminants from the injector, mostly through the split vent.
  7. Set the oven temperature 25 °C above the GC method final oven temperature to bake contaminants from the column. Do not exceed the column manufacturer's maximum temperature limit.
  8. Bake-out for 30 minutes or until the detector baseline is free of contamination peaks.
Replaceable Parts

The following SSL injector components can be replaced. See Figure 23 and Table 8.

**Figure 23.** Split Splitless Injector Components

- Septum Cap
- Septum Holder
- Septum
- Septum Support
- Liner Cap
- Liner
- Liner Graphite Seal
- Split Line Tube
- Carrier Gas Line Filter
- Split Gas Line Filter
- Silver Seal
- Terminal Fitting for Capillary Column
- Retaining Nut
- Graphite Ferrule for Capillary Column
- Fixing Nut for Capillary Column

**Table 8.** SSL Injector Components (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septum Cap</td>
<td>Each</td>
<td>35001050</td>
</tr>
<tr>
<td>Septum Holder</td>
<td>Each</td>
<td>23303015</td>
</tr>
<tr>
<td>Septum with Center Guide</td>
<td>Pkg of 50</td>
<td>31303233</td>
</tr>
<tr>
<td>Septum Support</td>
<td>Each</td>
<td>35005433</td>
</tr>
<tr>
<td>Liner Cap</td>
<td>Each</td>
<td>29004290</td>
</tr>
<tr>
<td>Liner Seal</td>
<td>Pkg of 10</td>
<td>29033406</td>
</tr>
</tbody>
</table>
## Table 8. SSL Injector Components (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liner Cap Removing Tool</td>
<td>Each</td>
<td>20507010</td>
</tr>
<tr>
<td>Liner Split 3 mm</td>
<td>Pkg of 5</td>
<td>45350031</td>
</tr>
<tr>
<td></td>
<td>Pkg of 25</td>
<td>45354031</td>
</tr>
<tr>
<td>Liner Split 5 mm</td>
<td>Pkg of 5</td>
<td>45350030</td>
</tr>
<tr>
<td></td>
<td>Pkg of 25</td>
<td>45354030</td>
</tr>
<tr>
<td>Liner Splitless 3 mm</td>
<td>Pkg of 5</td>
<td>45350032</td>
</tr>
<tr>
<td></td>
<td>Pkg of 25</td>
<td>45354032</td>
</tr>
<tr>
<td>Liner Splitless 5 mm</td>
<td>Pkg of 5</td>
<td>45350033</td>
</tr>
<tr>
<td></td>
<td>Pkg of 25</td>
<td>45354033</td>
</tr>
<tr>
<td>Liner for polar solvent</td>
<td>Pkg of 2</td>
<td>45300320</td>
</tr>
<tr>
<td>Carrier Line Filter</td>
<td>Each</td>
<td>28113196</td>
</tr>
<tr>
<td>Split Line Filter</td>
<td>Each</td>
<td>28113197</td>
</tr>
<tr>
<td>Silver Seal</td>
<td>Pkg of 10</td>
<td>29033629</td>
</tr>
<tr>
<td>Terminal Fitting for Capillary Column</td>
<td>Each</td>
<td>34705451</td>
</tr>
<tr>
<td>Nut for Terminal Fitting</td>
<td>Pkg of 2</td>
<td>35022125</td>
</tr>
<tr>
<td>Graphite Ferrule for 0.1 and 0.25 mm ID Column</td>
<td>Pkg of 2</td>
<td>29013488</td>
</tr>
<tr>
<td>Graphite Ferrule for 0.32 mm ID Column</td>
<td>Pkg of 2</td>
<td>29013487</td>
</tr>
<tr>
<td>Graphite Ferrule for 0.53 mm ID Column</td>
<td>Pkg of 2</td>
<td>29013486</td>
</tr>
<tr>
<td>Graphite Ferrule 0.8 mm ID</td>
<td>Pkg of 10</td>
<td>29043486</td>
</tr>
<tr>
<td>Fixing Nut for Column</td>
<td>Pkg of 5</td>
<td>35032423</td>
</tr>
<tr>
<td>Assy Split Line Tubing 1/8-in.</td>
<td>Each</td>
<td>39000012</td>
</tr>
<tr>
<td>Blanking Disk for Leak Test</td>
<td>Pkg of 10</td>
<td>29032655</td>
</tr>
<tr>
<td>O-ring Parafluor 2-006 for SSL manifold</td>
<td>Pkg of 3</td>
<td>29011310</td>
</tr>
</tbody>
</table>