Selecting the Right Inlet Liner for Efficient Sample Transfer

GC inlets convert an injected liquid phase sample into gas for transfer onto the GC column. Selecting the wrong liner can lead to incomplete transfer, poor separation, and peak tailing—often incorrectly attributed to the GC system. As a result, you could waste valuable hours on troubleshooting.

What to consider when choosing a GC inlet liner

**Sample Matrix**

**Typical split injection**
- Low pressure: Split taper, wool, low pressure (LP), Ultra Inert (UI), 870 µm, 4 mm 5190-2295
- Glass-fritted liner: Single taper, universal UI fit, 4 mm 5190-5105

**Specialized applications**
- High concentration analytes
- Specialized
- Trace analytes
- Typical splitless injection
- Specialized applications

**Typical splitless injection**
- High concentration analytes
- Trace analytes

**General use**
- Glass-fritted liner: Single taper, universal UI fit, 4 mm 5190-5105
- Low pressure: Split taper, wool, LP, UI, 870 µm, 4 mm 5190-2295
- Straight: Split, UI, 990 µL, 1.8 mm 5190-2294

**Viscous sample**
- Low pressure: Split taper, wool, LP, UI, 870 µm, 4 mm 5190-2295
- Single taper, low pressure: Split taper, wool, LP, UI, 870 µm, 4 mm 5190-2295
- Split taper, wool, deactivated: UI, 870 µm, 4 mm 5183-4647
- Split, single taper: wool, deactivated: 870 µm, 4 mm 5183-4711

**Dirty matrix**
- Low pressure: Split cup, LP, UI, 870 µm, 4 mm 18740-80110
- Straight, deactivated: quartz, 2 mm 5181-8818
- Straight, deactivated: quartz, 4 mm 5185-9212
- Deactivated: Single baffle, glass wool, 150 µL, 2 mm 5183-3536
- Multi-baffle, UI, 675 µL, 4 mm 5183-3077
- Sintered glass, 1.5 mm 5190-1426

**Clean matrix**
- Direct inject, single taper, wool, bottom hole, UI, 675 µL, 4 mm ID 5190-7020
- Single taper, deactivated: 900 µL, 4 mm 5181-3315
- Single taper, deactivated, 900 µL, 4 mm 5190-2316
- Single taper, deactivated, 200 µL, 2 mm 5190-2316

**Specialized**
- Dual taper, UI, 800 µL, 4 mm 5190-3983
- Single taper, UI, 900 µL, 4 mm 5190-2392
- Direct connect, single taper, wool, bottom hole, UI, 675 µL, 4 mm ID 5190-7020
- Single taper, deactivated, 850 µL, 4 mm 5181-3315
- Single taper, deactivated, 850 µL, 4 mm 5181-3315
- Single taper, deactivated, 800 µL, 4 mm 5190-2392
- Single taper, deactivated, 800 µL, 4 mm 5190-2392

**Hot splitless, high matrices**
- Double taper, UI, 800 µL, 4 mm 5190-3983
- Direct connect, single taper, wool, bottom hole, UI, 675 µL, 4 mm ID 5190-7020
- Single taper, deactivated, 850 µL, 4 mm 5181-3315
- Single taper, deactivated, 850 µL, 4 mm 5181-3315
- Single taper, deactivated, 800 µL, 4 mm 5190-2392
- Single taper, deactivated, 800 µL, 4 mm 5190-2392

**Backflush issues**
- No backflush issues

**Splitless injection, high recovery**
- Direct connect, dual taper, UI with hole, 575 µL, 4 mm ID 5190-7011

**Active analyte**
- Uniformly coated, multimode inlet

**Fast transfer**
- Splitless, straight, wool found in some liners. For active analytes, an inert liner surface can help you avoid such interactions.

**Dirty matrix**
- Active analyte
- Uniformly coated, multimode inlet

**Clean matrix**
- Direct connect, single taper, wool, bottom hole, UI, 675 µL, 4 mm ID 5190-7020
- Single taper, deactivated, 900 µL, 4 mm 5181-3315
- Single taper, deactivated, 900 µL, 4 mm 5181-3315
- Single taper, deactivated, 850 µL, 4 mm 5181-3315
- Single taper, deactivated, 850 µL, 4 mm 5181-3315
- Single taper, deactivated, 800 µL, 4 mm 5190-2392
- Single taper, deactivated, 800 µL, 4 mm 5190-2392

**What to consider when choosing a GC inlet liner**

**Sample concentration**
- Use a split injection when compounds of interest are present at high concentration, or when you don’t need low limits of detection. In a split injection, only the desired amount of sample is transferred onto the GC column—avoiding column overload and prolonging column life.
- Choose a splitless injection when compounds of interest are present at low concentration levels. This technique involves closing the split vent at the start of the injection, directing all the flow passing through the split into the column. At the end of a set period (the purge time), the split vent is opened to flush out any remaining vaporized solvent.
- Direct injection is best when compounds of interest are at trace levels, and contact between the sample and inlet wool (or copper) could cause degradation or adsorption. With direct injection, the sample is injected into a hot inlet, vaporizing the entire sample into the GC column.
- Use a multimode injection (MMI) for small volumes of active analytes with lower boiling points. Samples are injected into a cold inlet that is programmed to increase in temperature. This temperature increase first vaporizes the solvent to vent, then vaporizes the compounds of interest, introducing them onto the column—avoiding column overload and prolonging column life.

**GC solvent vapor volume**

The volume of sample introduced into a heated liner increases greatly during vaporization. How much it expands is determined by the solvent, the inlet temperature, and the pressure inside the liner. See table.

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How to calculate GC solvent vapor volume

Vapor volumes for a 1 µL injection of various GC solvents at different inlet pressures and temperatures

<table>
<thead>
<tr>
<th>Solvent</th>
<th>Inlet Pressure (psi)</th>
<th>Inlet Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Pentane</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>DCM</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Methanol</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Water</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

To optimize your GC method parameters, use our vapor volume calculator and solvent vent calculator. Find them both at www.agilent.com/chem/gc-calculators