EZ No-Vent® GC/MS Connector
for Shimadzu QP 2010 and QP 2010 Plus Mass Spectrometers
Cat.# 22431

Product Description
The EZ No-Vent® connector allows for column changes without having to vent the mass spectrometer (MS). It accomplishes this by creating a restriction at the MS interface that limits flow into the MS during column removal or installation. This restriction will affect the column flow rate, inlet pressure, and analyte retention times, but these effects can easily be accounted for with a few simple modifications to the method (see Establishing the Conditions Required to Maintain Expected Retention Times section). Prior to attempting installation, carefully review the exploded view in Figure 1 and special instructions.

Special Instructions:
1. Do not exceed 350°C transfer line temperature.
2. Use only brass capillary nuts.
3. Transfer line ferrules and capillary ferrules are not interchangeable. Verify the correct part and orientation prior to installation or leaks may occur.

Installation Instructions:
1. Prepare the instrument by performing a proper vent cycle according to the instrument operation manual.
2. Once the instrument is cooled and vented, remove the capillary column from the mass spectrometer (the column can remain installed in the inlet).
3. Cut an approximately 18cm section off of the 1m transfer line included in the EZ No-Vent® kit using a scoring wafer, or similar device, to ensure a clean, square cut (Figure 2).
4. Place the two-piece aluminum transfer line ferrule on the transfer line (Figures 1 and 3).
   
   Note: transfer line ferrules and capillary ferrules have different designs and are not interchangeable. If switched, the ferrules will not seal properly, potentially causing leaks.
5. Make clean, square cuts on both ends of the 18cm length of transfer line, leaving a final transfer line length of 14.7cm. Correct final length is important to ensure the proper positioning of the column inside the mass spectrometer.
6. Install the transfer line into the mass spectrometer leaving 2-3cm extending into the GC oven. This will ensure that the transfer line is properly seated inside the EZ No-Vent® connector, eliminating dead volume (Figures 1 and 4).
   
   Note: the transfer line ferrule must be installed in the correct direction or it will not seal.
7. Gently thread the EZ No-Vent® connector onto the mass spectrometer transfer line fitting, pushing the extended length of transfer line into the mass spectrometer. This will ensure that the transfer line is properly seated inside the EZ No-Vent® connector.

8. Tighten the EZ No-Vent® connector finger-tight, then tighten an additional 3/4 turn (Figure 5).

9. Place the capillary nut included in the EZ No-Vent® kit and the capillary ferrule (cat.# 21015 or 21016, depending on column inner diameter) onto the end of the capillary column (Figure 6), making sure that the conical end of the capillary ferrule faces toward the mass spectrometer.

   Note: The capillary ferrule must be installed in the correct direction or it will not seal.

10. Make a clean, square cut at the end of the capillary column using a scoring wafer or similar device, and extend the end of the capillary column approximately 2cm beyond the end of the capillary ferrule. This will ensure that the capillary column is properly seated inside the EZ No-Vent® connector.

11. Gently thread the capillary nut onto the EZ No-Vent® connector.

12. Tighten the capillary nut until finger-tight, then tighten an additional 1/2 turn. Use a second wrench to hold the EZ No-Vent® connector in place while tightening the capillary nut (Figure 7).

13. Start a flow of carrier gas. Leak check the vacuum side of the system using the Restek Electronic Leak Detector (cat.# 22839).

14. Pump the instrument down according to the instrument operation manual.

15. Leak check the fitting under vacuum conditions (e.g. using argon). Note that polyimide ferrules may shrink after an initial oven thermal cycling and may need to be retightened. To retighten, brace the EZ No-Vent® connector with a second wrench and tighten only 1/8 turn at a time, as over tightening may cause leaks.

   Note: Do not overtighten the connector, as this may cause leaks.
Establishing the Conditions Required to Maintain Expected Retention Times

The installation of the EZ No-Vent® connector creates a restriction at the end of the column that will change the flow characteristics inside the chromatographic system. Method conditions used prior to installation will have to be modified to account for the added restriction. The user must determine correct adjusted column length or pressure input empirically. Figure 8 illustrates the steps used to account for the effect of the restriction when constant linear velocity mode is used. If constant pressure mode is used, simply increase the inlet head pressure, observe the changes in dead-time, and adjust the pressure until the desired dead-time is achieved.

Figure 7 Installing the capillary nut onto the EZ No-Vent® connector.

Figure 8 Users must empirically determine the correct adjustments to the original method conditions to account for the EZ No-Vent® connector.

1. Dead-time measurement before installation
   - Dead time = 1.075 min

2. Dead-time measurement after installation (red) with no adjustments to the method
   - Original measurement
   - Dead time = 1.633 min

3. Notice a rise in baseline from slight leak.
   - After installation
   - Before installation
   - 3.0
   - Tightened the EZ No Vent another 1/8-turn

   - Baseline dropped
   - After 1/8 turn
   - Target RT
   - 3.0

Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Suggested solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS will not pump down</td>
<td>Leak in the system</td>
<td>Check EZ No-Vent fitting—retighten; check column connection—retighten.</td>
</tr>
<tr>
<td>Extended retention times</td>
<td>Compensation for EZ No-Vent not being programmed</td>
<td>Check linear velocity with unretained peak and follow retention time parameters chart.</td>
</tr>
<tr>
<td>Poor peak shapes</td>
<td>Column/transfer line not properly installed</td>
<td>Re-install column or reconnect EZ No-Vent fitting to MS transfer line.</td>
</tr>
<tr>
<td>High background</td>
<td>Leak in the system</td>
<td>Check EZ No-Vent fitting—retighten; check column connection—retighten.</td>
</tr>
<tr>
<td>Ferrules stick in EZ No-Vent fitting</td>
<td>Ferrules over-tightened</td>
<td>Tighten only 1/4-turn at a time to obtain a leak-tight seal.</td>
</tr>
<tr>
<td>Ferrules do not seal/</td>
<td>Incorrect ferrule ID for tubing OD</td>
<td>Use correct ferrule.</td>
</tr>
<tr>
<td>require excessive torque</td>
<td>Incorrect ferrule alignment/placement</td>
<td>See Instructions for correct ferrule placement.</td>
</tr>
<tr>
<td></td>
<td>Incorrect nut used for ferrule</td>
<td>Must have correct inner chamfer for ferrule, do not use nuts other than those provided with EZ No-Vent kit.</td>
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</table>

Changing Columns

The EZ No-Vent® connector is designed to allow column changes without the need to pump down the mass spectrometer. To change columns:

1. Cool the MS transfer line temperature.
2. Remove the capillary nut and ferrule from the EZ No-Vent® connector.
   Use a wrench to hold the EZ No-Vent® connector in place when removing the capillary nut and ferrule to avoid loosening the connector.
3. Install the plug included with the EZ No-Vent® kit onto the column end of the EZ No-Vent® connector and finger tighten (Figure 9). Using a second wrench to brace the EZ No-Vent® connector, further tighten the plug 1/4 turn and leak check.
4. Install the capillary nut and a new capillary ferrule on the new column following the procedures described in the installation instructions (Steps 9-10).
5. Remove the plug from the EZ No-Vent® connector, using a second wrench to brace the EZ No-Vent® connector to make sure it does not loosen (Figure 7).
6. Install the column following the procedures described in the installation instructions (Steps 11-12).

Retention Time (Dead Time) for Methane

\[
\text{Average linear velocity (cm/sec.)} = \frac{\text{Retention Time (Dead Time) for Methane}}{\text{Column length (cm)} + \text{Dead volume time (sec.)}}
\]

<table>
<thead>
<tr>
<th>Column Length</th>
<th>10m</th>
<th>15m</th>
<th>20m</th>
<th>30m</th>
<th>45m</th>
<th>60m</th>
<th>75m</th>
<th>105m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen @ 40cm/sec.</td>
<td>0.42 min.</td>
<td>0.63 min.</td>
<td>0.83 min.</td>
<td>1.25 min.</td>
<td>1.88 min.</td>
<td>2.50 min.</td>
<td>3.13 min.</td>
<td>4.38 min.</td>
</tr>
<tr>
<td>Helium @ 20cm/sec.</td>
<td>0.83 min.</td>
<td>1.25 min.</td>
<td>1.67 min.</td>
<td>2.50 min.</td>
<td>3.75 min.</td>
<td>5.00 min.</td>
<td>6.25 min.</td>
<td>8.75 min.</td>
</tr>
</tbody>
</table>

Product Listing

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty.</th>
<th>Cat.#</th>
</tr>
</thead>
<tbody>
<tr>
<td>EZ No-Vent Connector Kit for Shimadzu QP 2010 &amp; QP 2010 Plus (Kit includes: EZ No-Vent Connector, two 0.4mm ID polyimide ferrules for capillary column, two 0.4mm ID aluminum ferrules for transfer line, 100μm deactivated transfer line (3 ft.), column plug, capillary nut.)</td>
<td>kit</td>
<td>22431</td>
</tr>
<tr>
<td>Replacement ferrules for connecting capillary column to EZ No-Vent Connector: 0.4mm ID (Polyimide)</td>
<td>2-pk.</td>
<td>21015</td>
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<tr>
<td>Replacement ferrules for connecting capillary column to EZ No-Vent Connector: 0.5mm ID (Polyimide)</td>
<td>2-pk.</td>
<td>21016</td>
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<tr>
<td>Replacement ferrules for connecting transfer line to EZ No-Vent Connector: 0.4mm ID</td>
<td>2-pk.</td>
<td>22432</td>
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<tr>
<td>Replacement 100μm deactivated transfer line</td>
<td>3 ft.</td>
<td>21018</td>
</tr>
<tr>
<td>Replacement EZ No-Vent Capillary Nut</td>
<td>20-pk.</td>
<td>23100</td>
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<tr>
<td>Replacement EZ No-Vent Plug</td>
<td>5-pk.</td>
<td>23112</td>
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<tr>
<td>Open-End Wrenches (1/4’’ x 5/16’’)</td>
<td>2-pk.</td>
<td>20110</td>
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Call Technical Service at 800-356-1688 or 814-353-1300, ext. 4 (or your Restek representative) if you have any questions about this product or any other Restek product.