Overview
Removing part of the inlet end of a GC column to maintain its performance is common, but this can reduce the column’s performance and life span. Even using a fused silica guard column and column unions can adversely affect the separation. We demonstrate the lifetime and performance advantages of an integrated guard and analytical column design over the use of a separate guard column.

Introduction
Gas chromatography columns can accumulate involatile contaminants, which can affect their chromatographic performance. A typical approach to column maintenance is to replace the stationary phase. However, this removal can result in a loss of stationary phase, which will have an adverse effect on the separation. Instead, a guard column consisting of a length of fused silica, can be used in front of the analytical column in order to protect the column from contamination. The guard is typically connected to the analytical column with a union. The disadvantage of using such unions is that these can introduce unwanted activity and dead volume into the system, which can adversely affect the peak shape of the analyses.

Thermo Scientific TraceGC GC Column with SafeGuard combine an analytical column and a deactivated fused silica guard column. We have compared the chromatographic results of cutting standard columns and columns fitted with integrated guards. We have also compared the performance of columns with integrated guards and those connected to a separate fused silica guard with a column union.

Methods
1) The Effect of Cutting a GC Column: Analysis of Polycyclic Aromatic Hydrocarbons (PAHs)

Instrumentation
Thermo Scientific Trace GC Ultra with Thermo Scientific ISQ Mass Spectrometer

Columns:
1) Thermo Scientific Trace TR-5, 30m x 0.25mm x 0.25µm
2) Thermo Scientific Trace TG-5MS, 30m x 0.25mm x 0.25µm with SafeGuard (10µm)

Septum: BTQ 1.7mm
Injection syringe: 10µL Fixed needle syringe for a TriPlus Autosampler
Injection: Split/Splitless
Injection Volume: 1µL
Pre and Post Injection Dwell Time: 5 seconds

Carrier gas: Helium
Flow rate: 1.0mL/min, constant flow
Injection temperature: 251°C
Oven temperature: 100°C (1 min), 10°C/min, 250°C (4 min)

Injection: Split/Splitless
Injection Volume: 1µL
Pre and Post Injection Dwell Time: 5 seconds

Scan Parameters: 29-400 amu
Scan time: 0.25 seconds

**TABLE 1 – Peak table of toothpaste compounds used to compare columns with separate guards and those with integrated guards.**

<table>
<thead>
<tr>
<th>Compound</th>
<th>(a) s/n 25 rms</th>
<th>(b) s/n 47 rms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3</td>
<td>4 5</td>
</tr>
<tr>
<td>2</td>
<td>6 7</td>
<td>8 9</td>
</tr>
<tr>
<td>3</td>
<td>10 11</td>
<td>12 13</td>
</tr>
<tr>
<td>4</td>
<td>14 15</td>
<td>16 17</td>
</tr>
</tbody>
</table>

**FIGURE 1 – Cutting 13m off of a standard column**
(a) Before cut (b) After cut

**FIGURE 2 – Cutting 13m off of a column fitted with an integrated guard column**
(a) Before cut (b) After cut

**FIGURE 3 – Comparison of chromatography from a Wax column fitted with a separate guard column, connected with a fused silica column union and a similar column fitted with an integrated guard column**

**Conclusion**
TraceGC GC columns with SafeGuard feature an integrated guard column and a separate guard column. By providing the capability to trim the inlet end of the column, without removing the stationary phase and therefore reducing any changes to a separation. The removal of any need to use a column union can also improve peak shape by reducing dead volume, and increase the sensitivity for some compounds by reducing the presence of active silica surface.

©2011 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific Inc. For details regarding any mentioned products or services, please consult your local sales representatives for details.