

# APPLICATIONS

## Effectiveness of SecurityLINK™ Fingertight Fittings when used on Columns from Different Vendors

Genevieve Hodson and Jason Anspach  
Phenomenex, Inc., 411 Madrid Avenue., Torrance, CA 90501 USA



**Genevieve Hodson**  
**Technical Specialist**  
Genevieve loves to pick up a round of Skee-Ball, watching lightning storms in the distance, lazy summers in the Texas Hill Country and drinking a good cup of coffee with a book of equal good-ness.

### Background

When using a UHPLC column, a sub-2 particle, a superficially porous particle or a small ID column, the overall dead-volume of a system is an important variable to minimize. A bad connection will directly cause additional dead-volume which can contribute greatly to poor peak shape and lower overall efficiency of the system regardless of the column used.

### Introduction

The minimization of the dead or dwell volume in a UHPLC system is an important consideration. An incorrect, or poor, connection can be defined as any connection where the base of the tubing used does not sit flush against the inlet of the column, **Figure 2**, and which contributes to the overall dead-volume of the system. Although most chromatographers consider the connection of the column to be the largest potential location for an incorrect connection, poor connections can happen in many places throughout the system, including connections from the autosampler to the column heater. Additional dead-volume in a system can lead to more diffusion contributing to poor peak shape which in turn can cause failing results during method transfers or system suitability testing. This is especially true for both UHPLC and HPLC where chromatographic problems can be seen when columns with lower inner diameters or core-shell/sub-2 particles are used.

There are two main approaches to creating a zero dead-volume connection. The first involves swaging your stainless-steel tubing to the exact port depth of the column or connections inlet. This approach will not be investigated in this Technical Note. Instead the focus will be on the second approach, which involves the use of a reusable dead-volume connector (SecurityLINK) that does not require tools for installation.

The effectiveness of the SecurityLINK connector will be demonstrated in this technical note on three sub-2  $\mu\text{m}$  particle columns, each from a different column manufacturer.

### Experimental Conditions

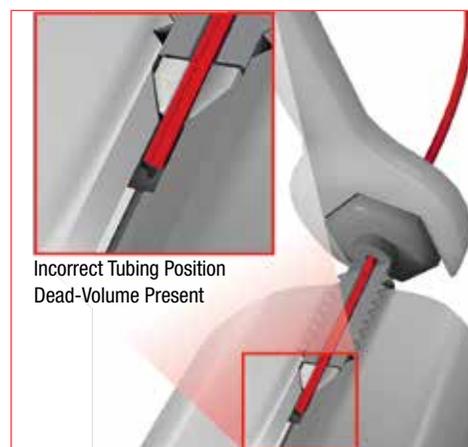
The three columns used in the experiment were a Luna<sup>®</sup> Omega 1.6  $\mu\text{m}$  C18 50 x 2.1 mm, a ZORBAX<sup>®</sup> Eclipse Plus 1.8  $\mu\text{m}$  C18 RRHD 50 x 2.1 mm (Agilent Technologies, Santa Clara, CA, USA) and an ACQUITY<sup>®</sup> UPLC<sup>®</sup> 1.7  $\mu\text{m}$  BEH C18 50 x 2.1 mm (Waters, Milford, MA, USA). Each column was connected onto the Agilent 1290 Infinity II system using SecurityLINK connections. A 100  $\mu\text{m}$  x 250 mm tubing was connected directly from the autosampler to the column. A 100  $\mu\text{m}$  x 150 mm tubing was used to connect the outlet of the column to the detector. Run times were optimized for each column to take into account the difference between phase selectivities.

Sample used was part no. AL0-3045 Prodigy Test Mix (Phenomenex, Torrance, CA, USA).

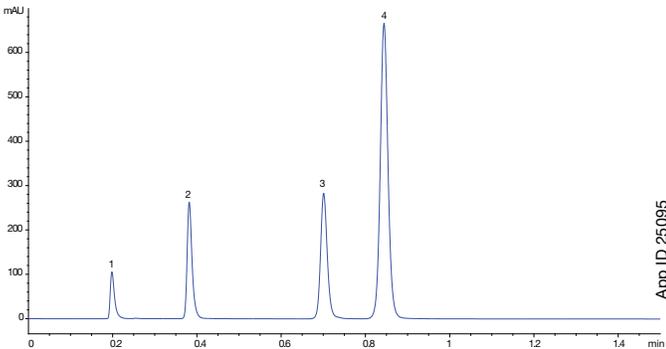
**Figure 1.**  
Ideal Flush Connection



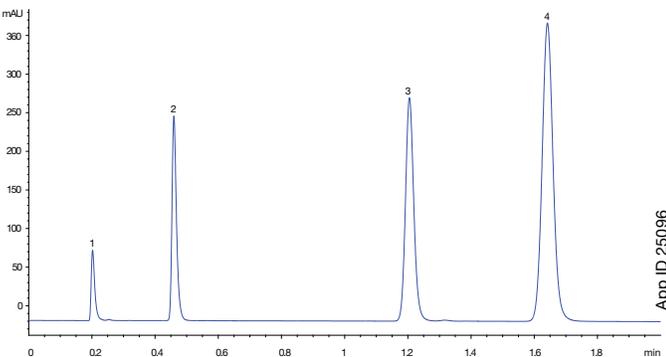
**Figure 2.**  
Incorrect/Poorly Made Connection



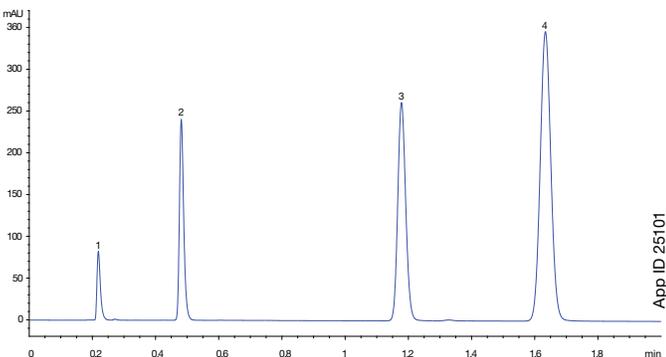
**Figure 3.**  
Phenomenex Luna® Omega 1.6 µm C18 50 x 2.1 mm



**Figure 4.**  
Agilent® ZORBAX® Eclipse Plus C18 RRHD 1.8 µm 50 x 2.1 mm



**Figure 5.**  
Waters® ACQUITY® UPLC® BEH C18 1.7 µm 50 x 2.1 mm



Comparative separations may not be representative of all applications.

### UHPLC Conditions

<b>Column:</b>	Luna Omega 1.6 µm C18 Agilent ZORBAX Eclipse Plus 1.8 µm C18 RRHD Waters ACQUITY UPLC 1.7µm BEH C18
<b>Dimensions:</b>	50 x 2.1 mm
<b>SecurityLINK Part No.:</b>	AJ1-1421, AJ1-1441
<b>Mobile Phase:</b>	Water/Acetonitrile (35:65)
<b>Flow Rate:</b>	0.5 mL/min
<b>Temperature:</b>	25°C
<b>Injection Volume:</b>	0.2 µL
<b>Sample:</b>	1. Uracil 2. Acetophenone 3. Toluene 4. Naphthalene

### Results & Discussion

Although each column manufacturer uses a different inlet depth for their endfittings, no tailing was observed for the tested columns. This is evidence of the minimized dead-volume provided by the use of SecurityLINK™ fittings for each column.

In contrast, a swaged fitting in combination with standard stainless-steel tubing will only allow a zero dead-volume connection to a single manufacturer's column, as once the ferrule is swaged then the depth of the tubing that will go into the column's endfitting becomes fixed and cannot be changed. This can potentially become an issue if a column from another manufacturer is used that has a very different inlet depth or the tubing measurement was made incorrectly causing the fitting to be swaged at the incorrect depth. The resulting dead-volume from this type of incorrect connection will cause poor peak shape and loss in efficiency of the column.

These potential negative results were not observed on any of the three columns used in the experiment due to the adaptability of the SecurityLINK fitting to change depth as needed and ensure a perfectly flush connection is made every time, independent of a column's endfitting inlet depth. This versatility allows the SecurityLINK connections to be used many times on different columns with no fear of poor connections.

### Conclusion

These results demonstrate the effectiveness of the SecurityLINK fittings to provide a zero dead-volume connection independent of the column manufacturer. With no tools needed, the fingertight SecurityLINK connector featured in this technical note ensured a dead-volume connection, which minimized the amount of potential diffusion in a system thus providing good peak shapes.

**SecurityLINK™ Ordering Information**



**PEEKsil™**

PEEKsil Double-Sided 10-32 Fittings with 1/16 in. OD tubing

Part No.	ID (µm)	Length (mm)
AJ1-2111	25	100
AJ1-2121	25	150
AJ1-2141	25	250
AJ1-2151	25	300
AJ1-2171	25	500
AJ1-2191	25	750
AJ1-21A1	25	1000
AJ1-2211	50	100
AJ1-2221	50	150
AJ1-2231	50	200
AJ1-2241	50	250
AJ1-2251	50	300
AJ1-2271	50	500
AJ1-2291	50	750
AJ1-22A1	50	1000
AJ1-2321	75	150
AJ1-2341	75	250
AJ1-2371	75	500
AJ1-23A1	75	1000
AJ1-2411	100	100
AJ1-2421	100	150
AJ1-2441	100	250
AJ1-2471	100	500
AJ1-24A1	100	1000

**Stainless Steel**

Stainless Steel Double-Sided 10-32 Fittings with 1/16 in. OD tubing



Part No.	ID (µm)	Length (mm)
AJ1-1421	100	150
AJ1-1441	100	250
AJ1-1461	100	350
AJ1-1471	100	500
AJ1-1481	100	600
AJ1-1521	125	150
AJ1-1541	125	250
AJ1-1561	125	350
AJ1-1571	125	500
AJ1-1581	125	600
AJ1-1621	254	150
AJ1-1641	254	250
AJ1-1661	254	350
AJ1-1671	254	500
AJ1-1681	254	600

**PEEKsil**

PEEKsil Single-Sided 10-32 Fitting with 1/16 in. OD tubing



Part No.	ID (µm)	Length (mm)
AJ1-2224	50	150
AJ1-2274	50	500
AJ1-2294	50	750
AJ1-22A4	50	1000

# APPLICATIONS

**Australia**

t: +61 (0)2-9428-6444  
 auinfo@phenomenex.com

**Austria**

t: +43 (0)1-319-1301  
 anfrage@phenomenex.com

**Belgium**

t: +32 (0)2 503 4015 (French)  
 t: +32 (0)2 511 8666 (Dutch)  
 beinfo@phenomenex.com

**Canada**

t: +1 (800) 543-3681  
 info@phenomenex.com

**China**

t: +86 400-606-8099  
 cninfo@phenomenex.com

**Denmark**

t: +45 4824 8048  
 nordicinfo@phenomenex.com

**Finland**

t: +358 (0)9 4789 0063  
 nordicinfo@phenomenex.com

**France**

t: +33 (0)1 30 09 21 10  
 franceinfo@phenomenex.com

**Germany**

t: +49 (0)6021-58830-0  
 anfrage@phenomenex.com

**India**

t: +91 (0)40-3012 2400  
 indiainfo@phenomenex.com

**Ireland**

t: +353 (0)1 247 5405  
 eireinfo@phenomenex.com

**Italy**

t: +39 051 6327511  
 italiainfo@phenomenex.com

**Luxembourg**

t: +31 (0)30-2418700  
 nlinfo@phenomenex.com

**Mexico**

t: 01-800-844-5226  
 tecnicomx@phenomenex.com

**The Netherlands**

t: +31 (0)30-2418700  
 nlinfo@phenomenex.com

**New Zealand**

t: +64 (0)9-4780951  
 nzinfo@phenomenex.com

**Norway**

t: +47 810 02 005  
 nordicinfo@phenomenex.com

**Portugal**

t: +351 221 450 488  
 ptinfo@phenomenex.com

**Singapore**

t: +65 800-852-3944  
 sginfo@phenomenex.com

**Spain**

t: +34 91-413-8613  
 espinfo@phenomenex.com

**Sweden**

t: +46 (0)8 611 6950  
 nordicinfo@phenomenex.com

**Switzerland**

t: +41 61 692 20 20  
 swissinfo@phenomenex.com

**United Kingdom**

t: +44 (0)1625-501367  
 ukinfo@phenomenex.com

**USA**

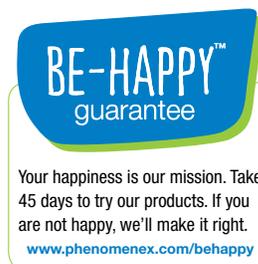
t: +1 (310) 212-0555  
 info@phenomenex.com

**All other countries  
 Corporate Office USA** 

t: +1 (310) 212-0555  
 info@phenomenex.com

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