



Integra-Guard™

capillary columns

from **RESTEK**

 **HROMalytic** +61(0)3 9762 2034
ECHnology Pty Ltd
Website NEW : www.chromalytic.com.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

Australian Distributors
Importers & Manufacturers
www.chromtech.net.au

Integra-Guard™ Columns

*Eliminate connectors, extra conditioning time, leaks, active sites.
Prolong column lifetime without affecting separations or
analysis times.*

Get the protection without the connection!

Why Use a Guard Column?

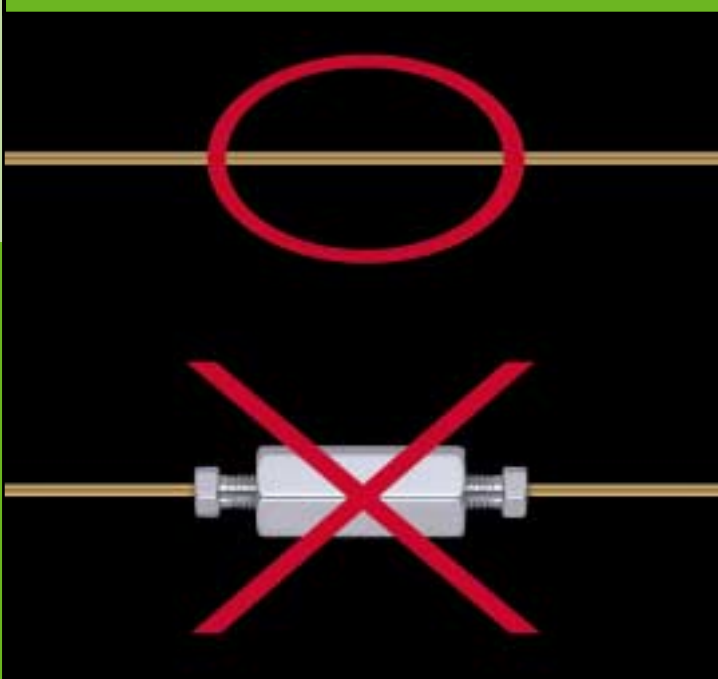
Many samples contain non-volatile residue, such as high molecular weight compounds, inorganic salts, or particles that can contaminate your analytical column. These residues can cause adsorption of active compounds, loss of resolution, and poor peak symmetry. In an attempt to restore column performance that has been affected by non-volatile contaminants, some analysts will clip off short sections from the inlet end of the column. Although this procedure often works, eventually it will leave the column too short to achieve the required separation. To minimize the amount of residue reaching the analytical column, many analysts connect a guard column to the inlet of the analytical column. A guard column can trap much of the non-volatile residue and prolong the useable life of the analytical column.

Eliminate the Frustrations Associated with Connectors

Conversely, many analysts don't use guard columns because they are frustrated with making the connection between the guard column and the analytical column. Connectors often leak, create active sites, or cause peak tailing due to dead volume. Restek's innovative Integra-Guard™ columns eliminate the connector, thereby eliminating all of the problems associated with making the connection. An Integra-Guard™ column is made from a continuous length of tubing that comprises both the guard column and the analytical column (Figure 1). No leaks! No loss in resolution! No more frustration!!!

Figure 1:

Restek's Integra-Guard™ columns offer the protection of a guard column without the frustration of a connector.



For helpful information about analyzing samples that contain nonvolatile residue, request our *Guide When Injecting Dirty Samples* (lit. cat.# 59881).

www.restekcorp.com

Integra-Guard™ Columns are Economical

In addition to prolonging the life of your analytical columns, Integra-Guard™ columns eliminate the need for costly column connectors and save the time and labor that would be spent in making the connection. Therefore, Integra-Guard™ columns actually cost less than conventional guard columns.

What Phases are Available with Integra-Guard™ Columns?

Table I lists the wide variety of stationary phases that can be manufactured with an Integra-Guard™ column. The guard column portion of Integra-Guard™ columns is available in 5- and 10-meter lengths, for columns with 0.18, 0.25, 0.28, 0.32, or 0.53mm ID.

Table I

Phases Available with Integra-Guard™ Columns

Rtx®-1	Rtx®-1301	Rtx®-35MS
Rtx®-1MS	Rtx®-624	Rtx®-BAC1
Rtx®-5	Rtx®-1701	Rtx®-BAC2
Rtx®-5MS	Rtx®-Volatiles	Stabilwax®
Rtx®-5SiIMS	Rtx®-20	Rtx®-G27
XTI-5	Rtx®-35	Rtx®-G43

Typical Applications for Integra-Guard™ Columns

Semivolatile Pollutants

Analyzing semivolatile pollutants in hazardous or industrial waste often is difficult because of the high levels of non-volatile contamination in these samples. This contamination eventually will affect the inertness of the column, causing poor response or peak tailing of active components. Many analysts will attempt to restore the inertness of the column by clipping off the contaminated section from the front of the column. While this procedure can restore column performance, eventually the column must be discarded because it will be too short to achieve adequate separation of the semivolatile compounds.

An Integra-Guard™ column extends column lifetime because the contamination collects on the guard column, not on the analytical column. Because no analyte separation takes place on the guard column, sections of guard column can be removed without loss of resolution. Similarly, because the guard column does not retain the components, the Integra-Guard™ column will not significantly increase analysis time.

Integra-Guard™

Figure 2:

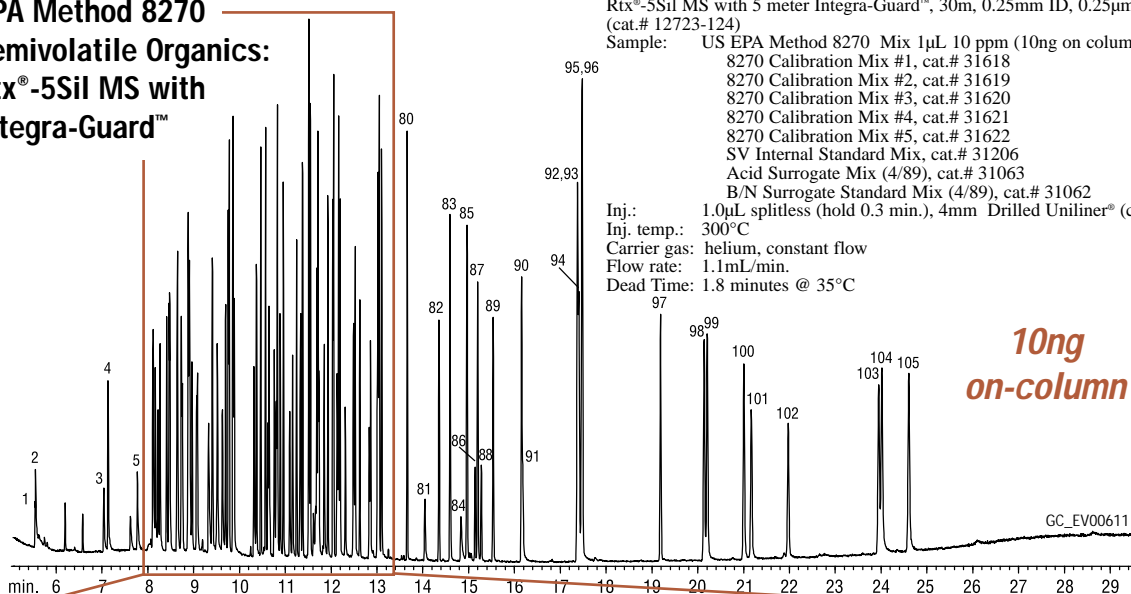
Prolong column lifetime for semivolatile pollutant analysis without affecting separation or significantly increasing analysis time—compare these results with the performance you get now.

EPA Method 8270**Semivolatile Organics:
Rtx®-5Sil MS with
Integra-Guard™**

Rtx®-5Sil MS with 5 meter Integra-Guard™, 30m, 0.25mm ID, 0.25µm (cat.# 12723-124)

Sample: US EPA Method 8270 Mix 1µL 10 ppm (10ng on column)
8270 Calibration Mix #1, cat.# 31618
8270 Calibration Mix #2, cat.# 31619
8270 Calibration Mix #3, cat.# 31620
8270 Calibration Mix #4, cat.# 31621
8270 Calibration Mix #5, cat.# 31622
SV Internal Standard Mix, cat.# 31206
Acid Surrogate Mix (4/89), cat.# 31063
B/N Surrogate Standard Mix (4/89), cat.# 31062

Inj.: 1.0µL splitless (hold 0.3 min.), 4mm Drilled Uniliner® (cat.# 21055)
Inj. temp.: 300°C
Carrier gas: helium, constant flow
Flow rate: 1.1mL/min.
Dead Time: 1.8 minutes @ 35°C



Oven temp.: 35°C (hold 4 min.) to 245°C @ 25°C/min.(no hold) to 330°C @ 6°C/min. (hold 3 min.)

Det: Agilent 5973 GC/MS

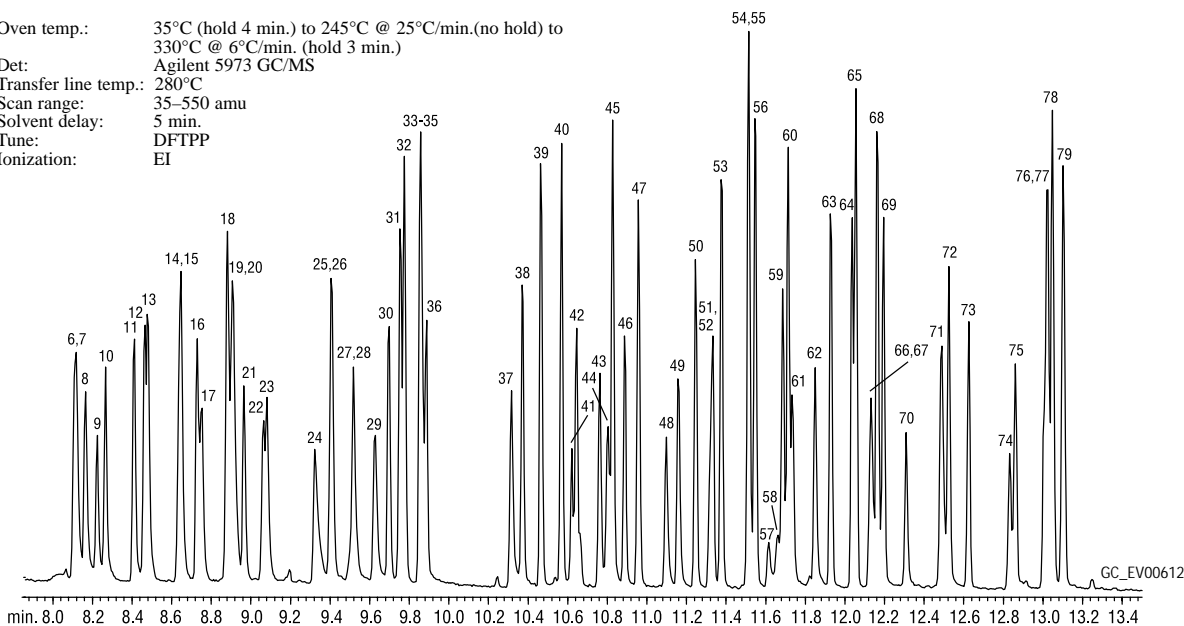
Transfer line temp.: 280°C

Scan range: 35–550 amu

Solvent delay: 5 min.

Tune: DFTPP

Ionization: EI



- | | | | |
|---|--------------------------------|----------------------------------|--------------------------------------|
| 1. N-nitrosodimethylamine | 28. bis(2-chloroethoxy)methane | 55. acenaphthene-d10 | 82. isodrin |
| 2. pyridine | 29. 2,4-dichlorophenol | 56. acenaphthene | 83. fluoranthene |
| 3. methyl methanesulfonate | 30. 1,2,4-trichlorobenzene | 57. 2,4-dinitrophenol | 84. benzidine |
| 4. 2-fluorophenol | 31. naphthalene-d8 | 58. 4-nitrophenol | 85. pyrene |
| 5. ethyl methanesulfonate | 32. naphthalene | 59. pentachlorobenzene | 86. aromite |
| 6. phenol-d6 | 33. 2,6-dichlorophenol | 60. dibenzofuran | 87. <i>p</i> -terphenyl-d14 |
| 7. phenol | 34. 4-chloroaniline | 61. 2,4-dinitrotoluene | 88. aromite isomer |
| 8. aniline | 35. hexachloropropene | 62. 2,3,4,6-tetrachlorophenol | 89. chlorbenzilate |
| 9. bis(2-chloroethyl)ether | 36. hexachlorobutadiene | 63. diethyl phthalate | 90. butyl benzyl phthalate |
| 10. 2-chlorophenol-d4 | 37. 4-chloro-3-methylphenol | 64. 4-chlorophenyl phenyl ether | 91. kepone |
| 11. 1,3-dichlorobenzene | 38. isosafrole | 65. fluorene | 92. benzo(a)anthracene |
| 12. 1,4-dichlorobenzene-d4 | 39. 2-methylnaphthalene | 66. 4-nitroaniline | 93. 3,3'-dichlorobenzidine |
| 13. 1,4-dichlorobenzene | 40. 1-methylnaphthalene | 67. 4,6-dinitro-2-methylphenol | 94. chrysene-d12 |
| 14. benzyl alcohol | 41. hexachlorocyclopentadiene | 68. diphenylamine | 95. chrysene |
| 15. 1,2-dichlorobenzene | 42. 1,2,4,5-tetrachlorobenzene | 69. azobenzene | 96. bis(2-ethylhexyl)phthalate |
| 16. 2-methylphenol | 43. 2,4,6-trichlorophenol | 70. 2,4,6-tribromophenol | 97. di- <i>n</i> -octyl phthalate |
| 17. bis(2-chloroisopropyl)ether | 44. 2,4,5-trichlorophenol | 71. phenacetin | 98. benzo(b)fluoranthene |
| 18. 4-methylphenol/3-methylphenol | 45. 2-fluorobiphenyl | 72. 4-bromophenyl phenyl ether | 99. benzo(k)fluoranthene |
| 19. acetophenone | 46. safrole | 73. hexachlorobenzene | 100. benzo(a)pyrene |
| 20. N-nitroso-di- <i>n</i> -propylamine | 47. 2-chloronaphthalene | 74. pentachlorophenol | 101. perylene-d12 |
| 21. hexachloroethane | 48. 2-nitroaniline | 75. pentachloronitrobenzene | 102. 3-methylcholanthrene |
| 22. nitrobenzene-d5 | 49. 1,4-naphthoquinone | 76. dinoseb | 103. indeno(1,2,3- <i>cd</i>)pyrene |
| 23. nitrobenzene | 50. dimethylphthalate | 77. phenanthrene-d10 | 104. dibenzo(a,h)anthracene |
| 24. isophorone | 51. 1,3-dinitrobenzene | 78. phenanthrene | 105. benzo(ghi)perylene |
| 25. 2-nitrophenol | 52. 2,6-dinitrotoluene | 79. anthracene | |
| 26. 2,4-dimethylphenol | 53. acenaphthylene | 80. di- <i>n</i> -butylphthalate | |
| 27. benzoic acid | 54. 3-nitroaniline | 81. 4-nitroquinoline-1-oxide | |

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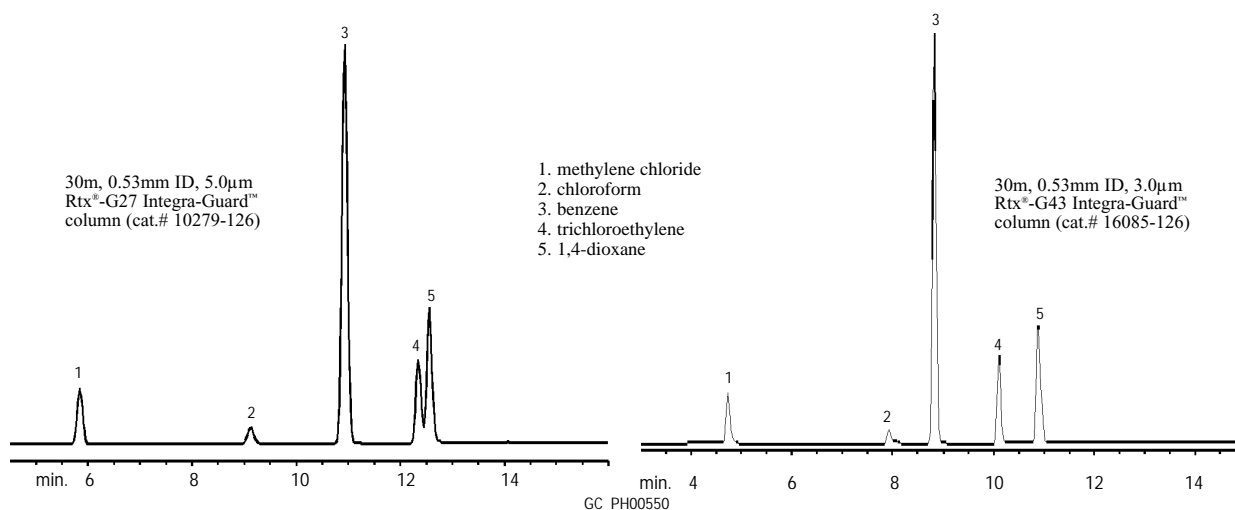
Residual Solvents in Pharmaceutical Products

The US Pharmacopoeia (USP) recommends methods for analyzing residual solvents—also known as organic volatile impurities (OVI)—in pharmaceutical products. The non-headspace methods, USP 24 <467> Methods I and V, suggest the use of a 5-meter phenylmethyl guard column connected to either the G27 or G43 phase. Restek offers both of these recommended phases with Integra-Guard™ columns (Figure 3).

Figure 3:

Restek's Rtx®-G27 and Rtx®-G43 columns with 5-meter Integra-Guard™ columns meet the requirements of USP 467 methods.

Specially-designed Rtx®-G27 and Rtx®-G43 columns resolve residual solvents in USP 467.



1.0µL direct injection of USP 467 Mix #1 (cat.# 36001).

Oven temp.: 35°C (hold 5 min.) to 175°C @
8°C/min. to 260°C @ 35°C/min.
Inj. / det. temp.: 200°C / 240°C,
Carrier gas: helium
Linear velocity: 34cm/sec. set @ 35°C
FID sensitivity: 1 x 10⁻¹¹ AFS

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Product Listing



Ordering Information | Innovative Integra-Guard™ Columns

Add the appropriate suffix number to the catalog number for the analytical column.

ID	Length	Suffix #
0.25mm	5m	-124
	10m	-127
0.28mm	5m	-243
	10m	-244
0.32mm	5m	-125
	10m	-128
0.53mm	5m	-126
	10m	-129

Ordering Integra-Guard™ columns is simple. Just add the appropriate suffix number from the table to the catalog number for the analytical column. For example, a 30 meter, 0.25mm ID, 0.25µm Rtx®-5Sil MS column with a 5 meter, 0.25mm ID Integra-Guard™ column is cat.# 12723-124. The price of the column will be adjusted.

Ordering Information | Rtx®-5Sil MS (Fused Silica) with 5-meter Integra-Guard™ (Equivalent selectivity of Crossbond® 5% diphenyl/95% dimethyl polysiloxane) Stable to 360°C

ID	df (µm)	temp. limits	30-Meter with 5-Meter, 0.25mm ID Integra-Guard™ Column
0.25mm	0.25	-60 to 330/350°C	12723-124

Ordering Information | Rtx®-G27 (Fused Silica) with 5-meter Integra-Guard™ (Crossbond® 5% diphenyl/95% dimethyl polysiloxane) Stable to 360°C

ID	df (µm)	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard™ Column
0.53mm	5.00	-60 to 270/290°C	10279-126

Ordering Information | Rtx®-G43 (Fused Silica) with 5-meter Integra-Guard™ (Crossbond® 6% cyanopropylphenyl/94% dimethyl polysiloxane) Stable to 280°C

ID	df (µm)	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard™ Column
0.53mm	3.00	-20 to 240°C	16085-126

U.S.: 110 Benner Circle • Bellefonte, PA 16823 • 814-353-1300 • 800-356-1688 • fax: 814-353-1309 • www.restekcorp.com

Germany: phone: 49 06172 2797 0 • fax: 49 06172 2797 77 • e-mail: RESTEK-GMBH@t-online.de

France: phone: 01 60 78 32 10 • fax: 01 60 78 70 90 • e-mail: restekfr@club-internet.fr

Thames Restek U.K. LTD: phone: 01753 624111 • fax: 01753 624666 • e-mail: Sales@Thamesrestek.co.uk

Restek Ireland: phone: 44 28 9081 4576 • fax: 44 28 9081 4576 • e-mail: restekeurope@aol.com

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