☐ *Internal Diameter (ID)*

When selecting an internal diameter, sample concentration and instrumentation must be considered. If the concentration of the sample exceeds the column's capacity, loss of resolution, poor reproducibility, and peak distortion will result. Table III shows typical column characteristics. Note the limited capacity of narrow bore columns (0.18mm ID <50ng) versus the high capacity of 0.53mm ID columns (2000ng). Also, 0.53mm ID columns are recommended in high flow situations, such as with a purge and trap unit. Conversely, narrow bore columns can be installed directly into a MSD because of the limited flow at optimum linear velocity.

❑ *Table 111*

Typical Column Characteristics

Column ID	**0.l8mm**	**0.25mm**	**0.32mm**	**0.53mm**
Helium (flow: 20cm/sec.)	0.3cc/min.	0.7cc/min.	1.2cc/min.	2.6cc/min.
Hydrogen (flow: 40cm/sec.)	0.6cc/min.	1.4cc/min.	2.4cc/min.	2.6cc/min.
Sample Capacity	<50ng	50-100ng	400-500ng	l000-2000ng
Trenzahl Values	**40**	**30**	**25**	**15**
Theoretical Plates/Meter	**5300**	**3300**	**2700**	**1600**
Effective Plates/Meter	**3900**	**2500**	**2100**	**1200**

❑ *Film Thickness*

Film thickness has a direct effect on the retention and elution temperature for each sample compound. Thicker films retain compounds longer by maximizing the amount of time the compounds spend in the stationary phase. Thinner films retain compounds less by minimizing the amount of time the compounds spend in the stationary phase. Therefore, very volatile compounds should be analyzed on thick filmed columns to increase the time the compounds spend in the column and allow them to separate. High molecular weight compounds such as triglycerides must be analyzed on a thin film column. This minimizes the amount of time the analytes stay in the column and provide low bleed at elevated temperatures which are required when analyzing high molecular weight compounds.

Kristi
Assistant Supervisor,
Fused Silica Manufacturing

Film thickness directly effects phase ratio (beta) which is an important consideration when changing internal diameter. When internal diameter increases, film thickness (df) must increase in order to provide the similar resolution and retention. Table IV shows beta values for common dimensions of columns. Similar values indicate similar elution for different IDS.

- Taleb IV

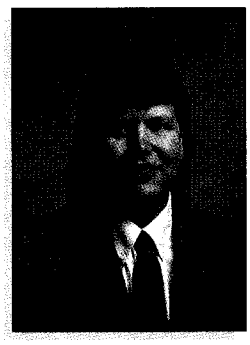
Common beta Values

Column ID	**0.10um**	**0.25um**	**0.50um**	**1.00um**	**1.50um**	**3.00um**	**5.00um**
0.18mm	**450**	**180**	**90**	**45**	**30**	**15**	**9**
0.25mm	**625**	**250**	**125**	**63**	**42**	**21**	**13**
0.32mm	**so0**	**320**		**80**	**53**	**27**	**16**
0.53mm	**1325**	**530**	**265**	**128**	**88**	**43**	**27**

The following chromatograms show a sample containing low boiling compounds analyzed on a 0.25, 1.0, and 5.0µm column with all other variables held constant. Notice that the 0.25µm column does not resolve butanol from benzene (peaks 1 & 2). The 1.0µm column provides about 80% resolution of this pair. Note that the retention times of the compounds eluting on the 0.25µm column more than double on the 1.0µm column. Now, compare the 5.0µm to the 0.25 and 1.0µm columns. The resolution between butanol and benzene (peaks 1 & 2) is not any better than the 1.0µmcolumn, and the retention times have increased six times over the 0.25µm. For this particular sample, the 1.0µm column is best. The resolution is better than the 0.25µm column and the 5.0µm column does not offer any additional improvements. If our true interest was in resolving the compounds prior to butanol (peak 1), then the 5.0µm column would be the preferred film thickness.

Would you like to know more about **WHICH COLUMN** to use for your analyses?

Have one of Restek's chromatography seminars presented in-house. Call your local distributor for information.



Rick Crago
Product Marketing Manager, Fused Silica

Film Thickness Effects

A sample containing low boiling components shows the differences in resolution between 0.25, 1.0, and 5.0µm columns. The 1.0µm offers better resolution than the 0.25µm and the 5.0µm does not offer any further improvements for compounds eluting after C6.