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Datasheet

HPLC

Introduction

Fine Tubes manufacturer a range of specialist Stainless Steel tubes for the production of High Performance and Ultra High Performance Chromatography Columns. Our tubes are used in both analytical and preparative columns and are used across the range of analytical disciplines.

The process of control within Fine Tubes is critical in respect of consistently achieving the highest level of specification requirements. % CSAR (Cross Section Area Reduction) through pilgering and drawing is specific to each product dimension and specification requirements. This is the driver for tolerance control, OD and ID surface finish control, inclusion levels and final grain size. ID surface finish is further refined by passivation, polishing or electropolishing processes. OD surfaces are finished down to 0.1µm (0.25µ"), ID down to 0.2µm (0.5µ"). Finished temper of products can be controlled offering a range of work hardened conditions as specified by the customer.

Product definition commences at point of raw material engineering which is application specific.

Applications

Consistent and efficient service performance at high operating pressures and in exacting environments make Fine Tubes High Performance Liquid Chromatography tubes suitable for a full range of analytical applications.

- Size Exclusion Chromatography (SEC)
- Hydrophobic Interactive Chromatography (HIC)
- Ion Exchange Chromatography (IEC)
- Affinity Chromatography (AFC)
- Reverse Phase Chromatography (RPC)

Size Range

Size range for high pressure and HPLC application products is based upon manufacture of seamless cold drawn tubing typically in the range:

- Standard bores 2 mm to 4.6 mm (0.079 inch to 0.182 inch) ID
- Semi-preparative bores 9 mm to 20 mm (0.36 inch to 0.79 inch) ID

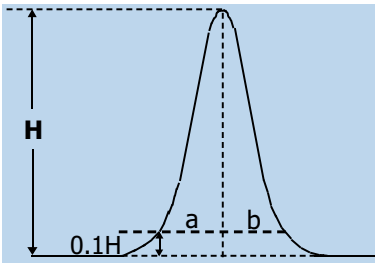
Profiles: round or sections.

Supply form: generally in straight lengths which are precision cut (ECM, laser, radial saw) to final length requirements.

Surface Finish

The condition of the inside surface of analytical columns is critical to the performance and peak symmetry achieved. Interaction or drag on the tube surface will slow down the mobile phase in this area and molecules away from the column surface will accelerate. This 'Wall Effect' can increase band broadening and decrease the efficiency of the column.

The manufacturing techniques we apply to the HPLC/UPLC column tubes are specifically designed to produce an internal surface that reduces variable migration rates at the packing/ column interface to the minimum. Further benefits are achieved in areas such as column efficiency, tailing and front peaks - avoiding band broadening, small ID sensitivity and increased column length performance.



As Column Asymmetry or Tailing Factor
As (10%) = b/a
As > 1 Tail
As < 1 Front

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Cleanliness

The relation between inclusion metallurgy and product application is clearly understood by Fine Tubes. Inclusion level assessment is also of utmost importance when manufacturing grades to the most demanding standards. Products provided by Fine Tubes far exceed the general assessment standards of ASTM E45 method A, JK and SEP1570 procedures.

Electropolishing

Electropolishing the inside surface of an HPLC or UPLC tube improves the performance of the column. The procedure develops the nature of the surface so that there is optimum performance at the surface interface and surface migration (wall effect) is kept to a minimum.

Other benefits are also experienced with removal of residual energy from the tubes surface and heightened passivation. This further reduces friction or drag of the mobile phase through the column at the interface of the columns internal surface.

Finishes of 0.1µm (0.25µ") are achieved with correspondence improvement in cleanability and corrosion resistance as well as optimum column efficiency.

Grade Chart

ALLOY UNS No.	Werk-stoffe	Chemical Analysis %							Density		Tem-per	Tensile Rm (min)		Yield Rp 0.2% (min)		Elong. % min	Hard-ness HV	Application
		C	Mn	Ni	Cr	Fe	Mo	N	g/cm³	lb/in³		ksi	MPa	ksi	MPa			
316L S31603	1.4404	0.035 max	2.0 max	10.0-13.0	16.0-18.0	bal	2.0-2.5		7.93	0.286	ANN	70	485	25	170	35	200 max	Standard AOD melt austenitic stainless steel grade.
	1.4435						2.5-3											316L with minimum molybdenum content of 2.5%.
316LN S31653	1.4406	0.035 max	2.0 max	10.0-14.0	16.0-18.0	bal	2.0-3.0	0.10-0.16	7.93	0.286	ANN	75	515	30	205	35	200 max	Good corrosion resistance and weldability. Higher proof strength than 316L.
316LVM S31673	1.4441	0.030 max	2.0 max	11.0-14.0	17.0-19.0	bal	2.0-3.0		7.93	0.286	ANN	70	485	25	170	35	200 max	Vacuum remelt or ESR to achieve highest microcleanliness levels and structural homogenity.

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