

# Chromatography Columns



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## System Selection

### Main Considerations

1. The size of the columns is determined by the degree of resolution and the capacity required.
  - Long columns are used for fractionation with high resolution.
  - Large diameter columns are used to obtain the large sample capacity demanded by preparative methods.
  - Smaller columns are used in ion exchange and affinity chromatography where the capacity and resolution are largely controlled by the separation and elution media and not the column geometry.
2. The materials used for the construction of the column and accessories are determined by the solvents and pressures to be used.
  - Less expensive polymers (e.g., nitrile rubber and polypropylene) can be used with most aqueous buffer systems.
  - More expensive polymers (e.g., Teflon<sup>®</sup>) are required when dealing with many organic solvents.

### Chromatography Columns

Spectra/Chrom<sup>®</sup> columns are versatile state of the art columns intended for high quality classical chromatographic separations using gravity flow to moderate pressure. They are available in a wide range of diameters from 6 to 150 mm (1/4" to 6") and standard lengths from 10 to 200 cm (4" to 6'). These lengths may be joined together using column extenders to create virtually any length column with a continuous inner bore.

Two different column series are available, one intended for aqueous buffers and a second for organic solvents. Both feature borosilicate glass bodies. The aqueous series uses polypropylene endplates. The organic series uses virgin Teflon endplates and fittings to provide complete resistance to organic solvents. Columns of both series may be autoclaved\*.

All of the columns, as well as their optional adjustable plungers, are constructed with non-clogging bed supports. These bed supports are made of a thin membrane with 10 µm openings suspended over a more coarse (50 µm) woven grid. The construction of the membrane minimizes its potential to clog, especially when compared with a porous packing support. The coarse grid both supports the 10 µm membrane

\* Endplates must be loosened prior to autoclaving.

and minimizes the loss of resolution which occurs in other columns when a band passes from the packing in the bore of the column to the smaller bore of the tubing connected to the column.

The upper end plates of the columns have a multipurpose vent port in addition to the tubing connection. This additional port can be used to bleed air from the column, to introduce sample on the top of the column packing, or, with an optional fitting, to introduce a second fluid stream into the column.

Both the top and bottom endplates accept multifit tubing connectors. A set of these tubing connectors is included with each column. The included connectors may be unscrewed and replaced with any of a variety of tubing connectors, special purpose connectors, or valves.

### Features:

- Wide range of standard sizes
- Non-clogging high-resolution bed supports
- Excellent solvent compatibility
- Temperature control option
- Ascending or descending flow
- Full line of accessories available

### Options and Accessories:

- Adjustable Plungers
- Sample baskets for even laying of sample
- Water jackets for temperature control
- Packing reservoirs for convenient slurry packing



## Selecting System Components

Spectra/Chrom columns and accessories are intended to meet the requirements of virtually any low-pressure chromatographic application including ion exchange, gel filtration, affinity, adsorption, and partition separations. These columns are compatible with aqueous or organic solvent systems, single or multiple eluants, descending or ascending flows, and in-line or layered sample application.

In considering these options, it becomes apparent that what is needed is a system of components selected for a specific application. The following is an explanation of the many factors that should be considered when setting up a column system.

### Nature of the Eluant

The necessary elution process is determined for the separation and the eluant is broadly classified as either aqueous or organic. Mixed eluants are generally classified as organic if the organic components exceed about 3-5% concentration. Very strong acids or bases or situations which require extreme freedom from organics may also necessitate the use of organic style columns.

Columns for organic solvents are constructed of chemically inert materials like Teflon, Kel-F<sup>®</sup>, and glass. These are available in the full variety of sizes. Many of the optional accessories listed are also suitable for organic solvents as they are constructed of the same inert materials.

For most applications, the columns for aqueous solvents, which use polypropylene endplates, are acceptable. These can be used with most aqueous solutions, including most acids, alkalis, and salts.

Gradients, when required, are generally formed in one of 2 simple ways. For step gradients a valve may be used to select the appropriate eluant or the pump inlet tubing may be simply taken from one container and placed in another. For continuous gradients a 2 chamber gradient former is usually used.

### Operating Temperature and Pressure

In some instances the operating temperature can have a significant impact on a separation. Water jackets are available for both the aqueous and organic columns to allow the column temperature to be controlled.

The pressure of the eluant can be of extreme importance in a separation, especially with longer columns. The columns manufactured by Spectrum are intended for low-pressure



applications (less than 50 psi). Soft packing materials can compress at higher pressures potentially reducing the flow rate as the pressure increases.

### Means of Inducing Flow

Depending upon the pressure requirements, the eluant flow may be generated with a gravity flow reservoir or a low pressure pump.

For many applications, a simple elevated reservoir is sufficient as a means of inducing flow. When using gravity flow, it is usually desirable to have an on/off valve at the column outlet. Using this outlet valve to control the flow ensures that the column will remain wet and not dry out. It is also sometimes convenient to have an additional on/off valve at the reservoir outlet.

A peristaltic pump may be used to obtain higher flow rates and pressures and is also generally used in ascending flow applications. The use of a pump also makes control of the flow rate more convenient. An on/off valve at the column outlet is a convenience even when using a pump, although an alternative would be to leave the pump on at a low flow rate to keep the column wet. When using organic solvents, care must be taken in choosing the pump tubing since most tubing formulations are readily attacked by organic solvents.



### Direction of Flow

Even though descending flow is used in most liquid chromatography, a sharper separation is often obtained using ascending flow. This is because the flow does not lead to increased bed compression.

To use ascending flow, bed supports must be located at both the top and bottom of the column. Generally an adjustable plunger is used on one or both ends of the column to both provide a bed support and to facilitate adjusting the bed height. An alternative to using a plunger would be to use a lower endplate on each end of the column.

### Procedure for Packing the Column

Different packing materials and flow directions require different packing techniques. In general the column should be packed under a greater pressure than it will be used and columns for ascending flow should be packed in the descending direction and the flow reversed for use.

For soft low-pressure gels that are packed from a slurry using gravity feed, a packing reservoir attached to the top of the column will allow an

entire column to be poured at once. This eliminates any discontinuities that may occur during a segmented pour.

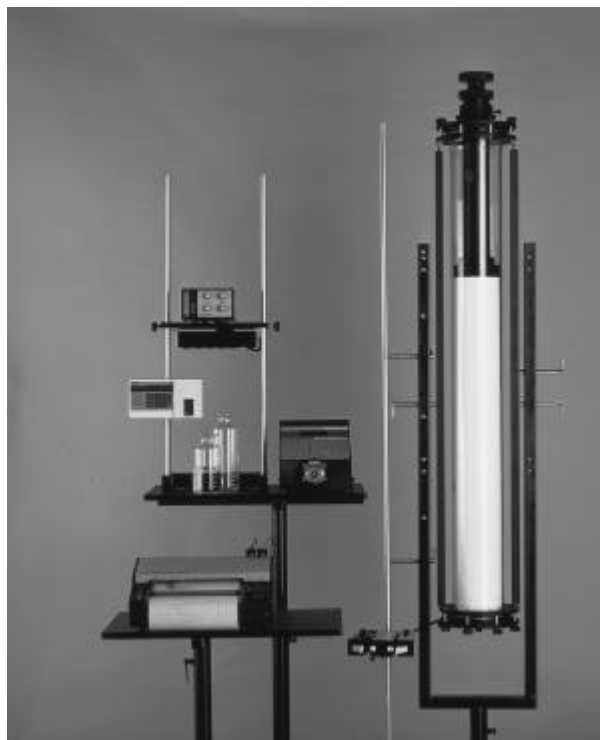
When using a pump to pack a column from a slurry, a column extender and a second column can allow you to pack an entire column in one pour under pressure.

### Sample Application

Because each sample is different, the best method of sample application may be different for different samples.

For descending column flows the sample can be directly applied to the top of the gel bed. If the sample is more dense than the eluant it can be layered on top of the gel bed under the eluant. Less dense samples can frequently be mixed with a more dense material (e.g., glycerol) and then layered on top of the gel bed. If necessary, the eluant can be drained to just above the gel bed to facilitate the layering. A sample application basket can make this task less disturbing to the gel bed.

In-line application of the sample permits the introduction of the sample without interrupting the flow. Although this technique requires additional accessories, it is useful with both ascending and descending flow systems. It can also save time and result in a more effective sample application.





## Soft Gel Columns

Spectrum's line of soft gel columns are designed specifically for use with many of the softer gels frequently encountered in analytical size-exclusion chromatography. Each of these columns comes with 2 adjustable plungers to allow for maximal control of the bed height. They are available in both aqueous and organic versions and include tubing fittings making them suitable for immediate use. (The aqueous columns include fittings for 3/16" OD tubing while the organic columns use 1/8" OD tubing.)

The plungers in these columns are constructed with capillary passages extending down their shafts to eliminate dead space. Knobs at the end of the plungers are used to expand a Viton® O-ring against the glass to make a leak-proof seal. Each plunger has a non-clogging 10 µm bed support.

Because these columns are for softer media they are rated to only 15 psi.

### Ordering Information

Aqueous Part No.	Column Size (cm)	Organic Part No.	Glass Only Part No.
108007	0.6 x 20	108053	106620
108009	0.6 x 40	108055	106640
108011	0.6 x 60	108057	106660
108013	0.6 x 80	108059	106680
108015	0.6 x 100	108061	106610
108017	0.9 x 20	108063	106920
108019	0.9 x 40	108065	106940
108021	0.9 x 60	108067	106960
108023	0.9 x 80	108069	106980
108025	0.9 x 100	108071	106910
108027	1.5 x 20	108073	106152
108029	1.5 x 40	108075	106154
108031	1.5 x 60	108077	106156
108033	1.5 x 80	108079	106158
108035	1.5 x 100	108081	106151
108037	2.5 x 30	108083	106253
108039	2.5 x 60	108085	106256
108041	2.5 x 90	108087	106259
108043	2.5 x 100	108089	106251
108045	5.0 x 60	108091	106506
108047	5.0 x 120	108093	106512

### Plunger Lengths for Soft Gel Columns

Column ID	Plunger Length	Total Adjustment
0.6 cm	10 cm	20 cm
0.9 cm	10 cm	20 cm
1.5 cm	10 cm	20 cm
2.5 cm	16 cm	32 cm
5.0 cm	32 cm	64 cm

## Disposable Minicolumns

Spectrum's disposable minicolumns are manufactured of ultrapure polystyrene and polypropylene. They have wide brimmed reservoirs to make packing quick and easy. The bed support is available in 3 different porosities to accommodate a variety of media. Although these columns are inexpensive enough to be disposable, each column can be repeatedly reused by placing the tip guard back onto the column.

These columns are ideal for sample preparation, desalting, concentration and other methods requiring simplicity and speed and involving limited sample sizes.

The overall column length is 12.3cm and the total volume is 7.5 ml. The upper column reservoir has a capacity of about 4.5 ml.

The column can accommodate up to 3 ml of media. The bed area is 8 x 10 x 60 mm (ID x OD x length). The gel bed support is manufactured from polyethylene.

These columns can be placed inside 16 x 150 mm (ID x length) test tubes which can then act as receptacles for the effluent. Multiple columns can also be easily arranged in a test tube rack.

The polypropylene columns are fully autoclavable.

### Ordering Information

Part No.	Material	Pore size	Qty
104700	Polystyrene	90 µm	20/pk
104701	Polystyrene	45 µm	20/pk
104702	Polystyrene	15 µm	20/pk
104703	Polypropylene	90 µm	20/pk
104704	Polypropylene	45 µm	20/pk
104705	Polypropylene	15 µm	20/pk



## Aqueous Columns with Polypropylene Endplates



Aqueous Column  
0.6 to 5.0 cm ID

Part No.	ID (cm)	Length (cm)	Max Pressure (psi)	Volume (ml)	— Column Mount —			Tubing OD
					Stand	Clamp	Insert	
123903	0.6	10	50	2.8	A or AA	C	E	3/16
123900	0.6	15	50	4.2	A or AA	C	E	3/16
123905	0.6	20	50	5.6	A or AA	C	E	3/16
123910	0.6	30	50	8.4	A or AA	C	E	3/16
123915	0.6	40	50	11	A	C	E	3/16
123920	0.6	50	50	14	A	C	E	3/16
123925	0.6	60	50	17	A	C	E	3/16
123930	0.6	70	50	20	A	C	E	3/16
123935	0.6	80	50	22	A	C	E	3/16
123940	0.6	90	50	25	A	C	E	3/16
123945	0.6	100	50	28	T & U	C	E	3/16
123950	0.9	10	50	6.4	A or AA	C	F	3/16
124000	0.9	15	50	9.6	A or AA	C	F	3/16
124001	0.9	20	50	13	A or AA	C	F	3/16
124002	0.9	30	50	19	A or AA	C	F	3/16
124003	0.9	40	50	26	A	C	F	3/16
124004	0.9	50	50	32	A	C	F	3/16
124005	0.9	60	50	38	A	C	F	3/16
123960	0.9	70	50	45	A	C	F	3/16
123961	0.9	80	50	51	A	C	F	3/16
123962	0.9	90	50	58	A	C	F	3/16
124006	0.9	100	50	64	T & U	C	F	3/16
123952	1.5	10	45	18	A or AA	C	G	3/16
123954	1.5	15	45	26	A or AA	C	G	3/16
124008	1.5	20	45	35	A or AA	C	G	3/16
124010	1.5	30	45	53	A or AA	C	G	3/16
124012	1.5	40	45	71	A	C	G	3/16
124013	1.5	50	45	88	A	C	G	3/16
124014	1.5	60	45	106	A	C	G	3/16
124016	1.5	70	45	124	A	C	G	3/16
124017	1.5	80	45	142	A	C	G	3/16
124018	1.5	90	45	159	A	C	G	3/16
124020	1.5	100	45	177	T & U	C	G	3/16
123956	2.5	10	40	49	A or AA	C		3/16
123955	2.5	15	40	74	A or AA	C		3/16
124021	2.5	20	40	98	A or AA	C		3/16
124022	2.5	30	40	147	A or AA	C		3/16
124024	2.5	40	40	196	A	C		3/16
124026	2.5	45	40	221	A	C		3/16
124027	2.5	50	40	245	A	C		3/16
124028	2.5	60	40	295	A	C		3/16
124030	2.5	70	40	340	A	C		3/16
124031	2.5	80	40	390	A	C		3/16
124032	2.5	90	40	440	A	C		3/16
124034	2.5	100	40	490	T & U	C		3/16
123958	2.5	120	40	590	T & U	C		3/16
123972	5.0	10	25	196	A	D		3/16
123974	5.0	20	25	390	A	D		3/16
124036	5.0	30	25	590	A	D		3/16
124038	5.0	60	25	1180	A	D		3/16
124040	5.0	90	25	1760	A	D		3/16
124042	5.0	100	25	1960	T & U	D		1/4
124043	5.0	120	25	2350	T & U	D		1/4
124044	5.0	150	25	2940	B & S	D		1/4

### Recommended tubing for Aqueous Columns

Size (OD)	3/16"	1/4"	3/16"	1/4"
Material	Vinyl		Polyethylene	
Package Length	30 meters (100 ft)			
Part No.	123744	123758	123754	123768

Part No.	ID (cm)	Length (cm)	Max Press. (psi)	Volume (ml)	Stand	Clamp for Stand A	Rod for stand B	Tubing OD
124046	7.5	30	15	1330	A or B	C & GG	H	1/4
124047	7.5	60	15	2650	B		K	1/4
124048	7.5	90	15	4000	B		N	1/4
124049*	7.5	100	15	4400	B		O	1/4
124050*	7.5	120	15	5300	B		P	1/4
124051*	7.5	150	15	6600	B		Q	1/4
124052	10	30	10	2360	A or B	C & GG	H	1/4
124053	10	40	10	3100	A or B	C & GG	I	1/4
123963	10	50	10	3900	A or B	C & GG	J	1/4
124054	10	60	10	4700	B		K	1/4
124055	10	70	10	5500	B		L	1/4
123964	10	80	10	6300	B		M	1/4
123965	10	90	10	7100	B		N	1/4
123966*	10	100	10	7800	B		O	1/4
124056*	10	120	10	9400	B		P	1/4
123967*	10	150	10	11800	B		Q	1/4
124058	15	30	10	5300	A or B	C & GG	H	1/4
124059	15	45	10	8000	A or B	C & GG	I	1/4
124060*	15	60	10	10600	B		K	1/4
124061*	15	75	10	13300	B		L	1/4
123970*	15	90	10	15900	B		N	1/4
124062*	15	120	10	21200	B		P	1/4
124064*	15	150	10	26600	B		Q	1/4
124066*	15	200	10	35000	B		R	1/4

\* A refundable crate deposit may be required on purchases of these and other large columns.

Legend	Part No.	Description
AA	123321	Bench Top Chromatography Ministand
A	123320	Bench Top Chromatography Work Station
B	123300	Floor Model Chromatography Work Station
C	123334	2.5 cm Column Support Ring (2 each required)
D	123340	5.0 cm Column Support Ring (2 each required)
E	123353	0.6 cm Column Mounting Insert Kit
F	123354	0.9 cm Column Mounting Insert Kit
G	123355	1.5 cm Column Mounting Insert Kit
GG	123317	7.5 to 15 cm Column Mounting Insert Kit
H	123302	30 cm Telescoping Rods, 2/pk
I	123303	40 cm Telescoping Rods, 2/pk
J	123305	50 cm Telescoping Rods, 2/pk
K	123304	60 cm Telescoping Rods, 2/pk
L	123307	70 cm Telescoping Rods, 2/pk
M	123309	80 cm Telescoping Rods, 2/pk
N	123306	90 cm Telescoping Rods, 2/pk
O	123308	100 cm Telescoping Rods, 2/pk
P	123310	120 cm Telescoping Rods, 2/pk
Q	123312	150 cm Telescoping Rods, 2/pk
R	123314	200 cm Telescoping Rods, 2/pk
S	123316	200 cm Instrument Rods, 2/pk
T	123322	"H" Base
U	123331	150 cm Support Rod, 2/pk



Aqueous column  
7.5 to 15 cm ID

See pages 12 to 14 for aqueous column replacement parts.  
See page 10 for aqueous column adjustable plungers.

## Organic Columns with Teflon Endplates



Part No.	ID (cm)	Length (cm)	Max Pressure (psi)	Volume (ml)	— Column Mount —			Tubing OD
					Stand	Clamp	Insert	
124900	0.6	15	50	4.2	A or AA	C	E	1/8
124905	0.6	20	50	5.6	A or AA	C	E	1/8
124910	0.6	30	50	8.4	A or AA	C	E	1/8
124915	0.6	40	50	11	A	C	E	1/8
124920	0.6	50	50	14	A	C	E	1/8
124925	0.6	60	50	17	A	C	E	1/8
124930	0.6	70	50	20	A	C	E	1/8
124935	0.6	80	50	22	A	C	E	1/8
124940	0.6	90	50	25	A	C	E	1/8
124945	0.6	100	50	28	T & U	C	E	1/8
125000	0.9	10	50	6.4	A or AA	C	F	1/8
125001	0.9	15	50	9.6	A or AA	C	F	1/8
125002	0.9	20	50	13	A or AA	C	F	1/8
125003	0.9	30	50	19	A or AA	C	F	1/8
125004	0.9	40	50	26	A	C	F	1/8
124950	0.9	50	50	32	A	C	F	1/8
125005	0.9	60	50	38	A	C	F	1/8
125006	0.9	70	50	45	A	C	F	1/8
124951	0.9	80	50	51	A	C	F	1/8
124952	0.9	90	50	58	A	C	F	1/8
125007	0.9	100	50	64	T & U	C	F	1/8
124970	1.5	10	45	18	A or AA	C	G	1/8
124971	1.5	15	45	26	A or AA	C	G	1/8
125009	1.5	20	45	35	A or AA	C	G	1/8
125011	1.5	30	45	53	A or AA	C	G	1/8
125013	1.5	40	45	71	A	C	G	1/8
125014	1.5	50	45	88	A	C	G	1/8
125015	1.5	60	45	106	A	C	G	1/8
125017	1.5	70	45	124	A	C	G	1/8
125018	1.5	80	45	142	A	C	G	1/8
125019	1.5	90	45	159	A	C	G	1/8
125021	1.5	100	45	177	T & U	C	G	1/8
125024	2.5	10	40	49	A or AA	C		1/8
125022	2.5	20	40	98	A or AA	C		1/8
125023	2.5	30	40	147	A or AA	C		1/8
125025	2.5	40	40	196	A	C		1/8
125027	2.5	45	40	221	A	C		1/8
125028	2.5	50	40	245	A	C		1/8
125029	2.5	60	40	295	A	C		1/8
125031	2.5	70	40	340	A	C		1/8
125030	2.5	80	40	390	A	C		1/8
125033	2.5	90	40	440	A	C		1/8
125035	2.5	100	40	490	T & U	C		1/8
125036	5.0	10	25	196	A	D		1/8
124983	5.0	20	25	390	A	D		1/8
125037	5.0	30	25	590	A	D		1/8
125039	5.0	60	25	1180	A	D		1/8
125041	5.0	90	25	1760	A	D		1/8
125043	5.0	100	25	1960	T & U	D		1/4
125044	5.0	120	25	2350	T & U	D		1/4
125045	5.0	150	25	2940	B & S	D		1/4

### Recommended tubing for Organic Columns

Size (OD)	1/8"	1/4"	1/8"	1/4"
Material	Teflon		Viton	
Package Length	30 meters (100 ft)		3 meters (10 ft)	
Part No.	123816	123832	123736	123764

Organic Column  
0.6 to 5.0 cm



Part No.	ID (cm)	Length (cm)	Max Press. (psi)	Volume (ml)	Stand	Clamp for Stand A	Rod for stand B	Tubing OD
125047	7.5	30	15	1330	A or B	C & GG	H	1/4
125048	7.5	60	15	2650	B		K	1/4
125049	7.5	90	15	4000	B		N	1/4
125050*	7.5	100	15	4400	B		O	1/4
125051*	7.5	120	15	5300	B		P	1/4
125052*	7.5	150	15	6600	B		Q	1/4
125053	10	30	10	2360	A or B	C & GG	H	1/4
125054	10	40	10	3100	A or B	C & GG	I	1/4
124953	10	50	10	3900	A or B	C & GG	J	1/4
125055	10	60	10	4700	B		K	1/4
125056	10	70	10	5500	B		L	1/4
124954	10	80	10	6300	B		M	1/4
124955	10	90	10	7100	B		N	1/4
124956*	10	100	10	7800	B		O	1/4
125057*	10	120	10	9400	B		P	1/4
125058	10	150	10	11800	B		Q	1/4
125059	15	30	10	5300	A or B	C & GG	H	1/4
125060	15	45	10	8000	A or B	C & GG	I	1/4
125061*	15	60	10	10600	B		K	1/4
125062*	15	75	10	13300	B		L	1/4
124959*	15	90	10	15900	B		N	1/4
125063*	15	120	10	21200	B		P	1/4
125065*	15	150	10	26600	B		Q	1/4
125067*	15	200	10	35000	B		R	1/4

\* A refundable crate deposit may be required on purchases of these and other large columns.

Legend	Part No.	Description
AA	123321	Bench Top Chromatography Ministand
A	123320	Bench Top Chromatography Work Station
B	123300	Floor Model Chromatography Work Station
C	123334	2.5 cm Column Support Ring (2 each required)
D	123340	5.0 cm Column Support Ring (2 each required)
E	123353	0.6 cm Column Mounting Insert Kit
F	123354	0.9 cm Column Mounting Insert Kit
G	123355	1.5 cm Column Mounting Insert Kit
GG	123317	7.5 to 15 cm Column Mounting Insert Kit
H	123302	30 cm Telescoping Rods, 2/pk
I	123303	40 cm Telescoping Rods, 2/pk
J	123305	50 cm Telescoping Rods, 2/pk
K	123304	60 cm Telescoping Rods, 2/pk
L	123307	70 cm Telescoping Rods, 2/pk
M	123309	80 cm Telescoping Rods, 2/pk
N	123306	90 cm Telescoping Rods, 2/pk
O	123308	100 cm Telescoping Rods, 2/pk
P	123310	120 cm Telescoping Rods, 2/pk
Q	123312	150 cm Telescoping Rods, 2/pk
R	123314	200 cm Telescoping Rods, 2/pk
S	123316	200 cm Instrument Rods, 2/pk
T	123322	"H" Base
U	123331	150 cm Support Rod, 2/pk

See pages 12 to 14 for organic column replacement parts.  
See page 10 for organic column adjustable plungers.



Organic Column  
7.5 to 15 cm ID



## Adjustable Plungers

Spectrum's line of adjustable plungers are adjustable length bed supports used to reduce the bed height of a column. They will go into either or both ends of a column to allow for a wide adjustment of the bed height. They are of particular use where gel packings are in short supply, where reverse (ascending) flow is used, where in-stream injection is used, and in any case where the exact bed length is of significance.

Adjustable plungers are available for all of the columns in both aqueous and organic styles. Due to mechanical constraints, there are some differences in the construction of the plungers of different sizes. The plungers for the 0.6, 0.9, 1.5, and 2.5 cm ID columns have a capillary passage which runs from the plunger face to a fitting outside the column. The larger plungers have a fitting located on the back of the plunger face and your tubing runs down the center of the plunger shaft to this fitting. Both designs are free of mixing cavities and dead volume.

The aqueous plungers make a seal to the glass column using an expanding Viton O-ring (non-expanding on the 0.6 cm column size).

The 0.9 and 0.6 cm organic plungers use a nonexpanding Viton o-ring to make a seal with the glass. The larger organic plungers use an expanding Viton o-ring with a Teflon shield to provide the ultimate in solvent resistance.

The mesh support used in the plungers is the same 2-layer support used in the column endplates. A 10 um mesh is in contact with the bed and a 50 um grid is used to support the mesh. This provides a non-clogging support that minimizes any band spreading as the eluant flows from the packing into the outlet tubing.

### Ordering Information for Adjustable Plungers

Column ID (cm)	Aqueous Plunger	Organic Plunger	Adjustment Length (cm)
0.6	124101	125100	10
0.9	124100	125101	10
1.5	124108	125109	10
2.5	124122	125123	16
5.0	124136	125139	32
7.5	124142	125141	32
10	124146	125147	32
15	124152	125149	32

## Replacement Parts for Adjustable Plungers

### Aqueous Plungers

Column ID	A Multifit Nut	B Ferrule	C Multifit	D O-Ring	E Grid	F Mesh	G Snap Ring
0.6	124564	124546	124391	124157	124229	124080	124193
0.9	124564	124546	124391	124158	124230	124080	124194
1.5	124564	124546	124391	124164	124236	124080	124200
2.5	124564	124546	124391	124170	124242	124080	124206
5.0	124564	124546	124391	124176	124248	124080	124212
7.5	124568	124550	124390	124178	124250	124082	124216
10	124568	124550	124390	124182	124254	124082	124218
15	124568	124550	124390	124188	124260	124082	124224

### Organic Plungers

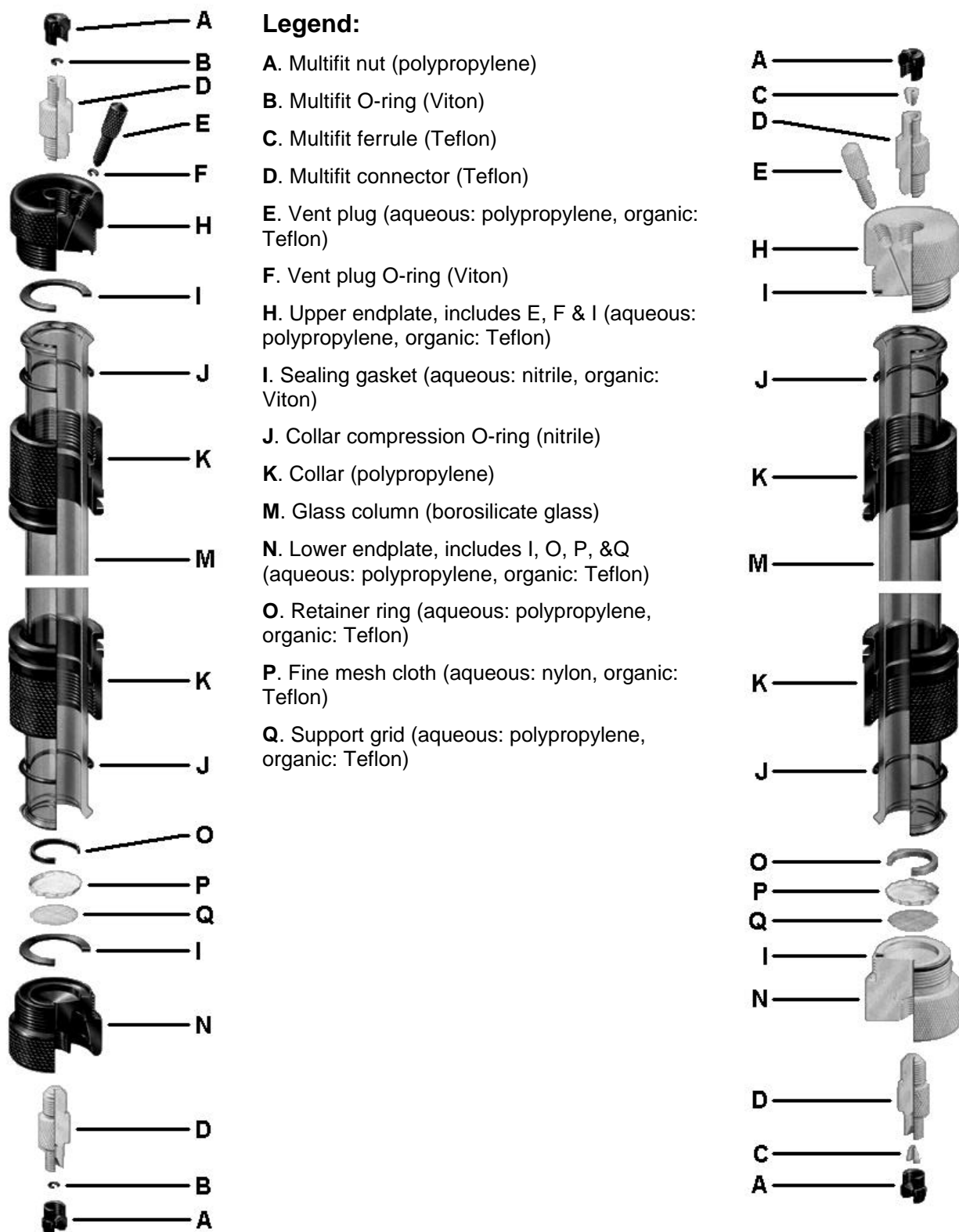
Column ID	A Multifit Nut	B Ferrule	C Multifit	D O-Ring	E Grid	F Mesh	G Snap Ring
0.6	124562	124445	124487	125154	125222	124086	125192
0.9	124562	124445	124487	125155	125223	124086	125193
1.5	124562	124445	124487	125163	125229	124086	125199
2.5	124562	124445	124487	125171	125235	124086	125205
5.0	124562	124445	124487	125179	125241	124086	125211
7.5	124568	124447	124488	125183	125243	124088	125213
10	124568	124447	124488	125187	125247	124088	125217
15	124568	124447	124488	125189	125249	124088	125218

#### Notes:

- Item C, the multifit connector, includes item A and item B.
- Items A and B are packages of 6 each, the other items are sold singly.
- Item B, the ferrule, is a machined Teflon ferrule on the organic plungers and a Viton O-ring on the aqueous plungers.



## Replacement Parts for Chromatography Columns





## Chromatography Column Replacement Parts

Part No. Aqueous	Part No. Organic	Tubing size (inches)	Qty
<b>A - Multifit Nut</b>			
124556		1/16	6
124562	124562	1/8	6
124564	124564	3/16	6
124568	124568	1/4	6
<b>B - Multifit O-ring</b>			
124538		1/16	6
124544		1/8	6
124546		3/16	6
124550		1/4	6
<b>C - Teflon Ferrule</b>			
	124445	1/8	6
	124446	3/16	6
	124447	1/4	6
<b>D - Multifit Connector</b> (includes A and B or C)			
124380		1/16	1
124384	124487	1/8	1
124391	124489	3/16	1
124399	124488	1/4	1
	124491	1/2	1
<b>E - Vent Plug</b>			
113000	513000		1
<b>F - Vent Plug O-ring</b>			
124538			6
Part No. Aqueous	Part No. Organic	Column ID (cm)	Qty
<b>H - Upper Endplate</b> (includes E, I and, if needed, F)			
111006	511006	0.6	1
111009	511009	0.9	1
111015	511015	1.5	1
111025	511025	2.5	1
111050	511050	5.0	1
111075	511075	7.5	1
111110	511110	10	1
111115	511115	15	1
<b>I - Sealing Gasket</b>			
109006		0.6	4
109009		0.9	4
109015		1.5	4
109025	509025	2.5	1
109050	509050	5.0	1
109075	509075	7.5	1
109110	509110	10	1
109115	509115	15	1

Part No. Aqueous	Part No. Organic	Column ID (cm)	Qty
<b>J - Collar Compression O-Ring</b>			
114006	114006	0.6	4
114009	114009	0.9	4
114015	114015	1.5	4
114025	114025	2.5	4
114050	114050	5.0	4
114075	114075	7.5	4
114110	114110	10	4
<b>N - Lower Endplate</b> (includes I, O, P, and Q)			
112006	512006	0.6	1
112009	512009	0.9	1
112015	512015	1.5	1
112025	512025	2.5	1
112050	512050	5.0	1
112075	512075	7.5	1
112110	512110	10	1
112115	512115	15	1
<b>O - Retainer Ring</b>			
123006	523006	0.6	1
123009	523009	0.9	1
123015	523015	1.5	1
123025	523025	2.5	1
123050	523050	5.0	1
123075	523075	7.5	1
123110	523110	10	1
123115	523115	15	1
<b>Q - Support Grid</b>			
524006	524006	0.6	1
524009	524009	0.9	1
524015	524015	1.5	1
124025	524025	2.5	1
124500	524050	5.0	1
124075	524075	7.5	1
124110	524110	10	1
124115	524115	15	1
<b>P - Fine Mesh Cloth</b>			
124080	124086	0.6 - 5.0	4" x 4"
124082	124088	7.5 - 15	6" x 6"
124084	124090		1 sq. yard

## Chromatography Column Replacement Parts

Part No.	Column ID (cm)	Column Length (cm)		Part No.	Column ID (cm)	Column Length (cm)	
<b>M - Column and Collars</b> (include K and J) (sold singly)				<b>M - Column and Collars</b> (include K and J) (sold singly)			
108614	0.6	X	10	108244	2.5	X	10
108615	0.6	X	15	108252	2.5	X	20
108620	0.6	X	20	108253	2.5	X	30
108630	0.6	X	30	108254	2.5	X	40
108640	0.6	X	40	108255	2.5	X	45
108650	0.6	X	50	108245	2.5	X	50
108660	0.6	X	60	108256	2.5	X	60
108670	0.6	X	70	108257	2.5	X	70
108680	0.6	X	80	108258	2.5	X	80
108690	0.6	X	90	108259	2.5	X	90
108611	0.6	X	100	108251	2.5	X	100
108916	0.9	X	10 (aqueous)	108260	2.5	X	120
108917	0.9	X	10	108500	5.0	X	10
108915	0.9	X	15 (aqueous)	108502	5.0	X	20
108951	0.9	X	15	108503	5.0	X	30
108920	0.9	X	20 (aqueous)	108506	5.0	X	60
108921	0.9	X	20	108509	5.0	X	90
108930	0.9	X	30 (aqueous)	108501	5.0	X	100
108931	0.9	X	30	108510	5.0	X	120
108940	0.9	X	40 (aqueous)	108505	5.0	X	150
108941	0.9	X	40	108753	7.5	X	30
108950	0.9	X	50 (aqueous)	108756	7.5	X	60
108952	0.9	X	50	108759	7.5	X	90
108960	0.9	X	60 (aqueous)	108751	7.5	X	100
108961	0.9	X	60	108752	7.5	X	120
108970	0.9	X	70 (aqueous)	108755	7.5	X	150
108971	0.9	X	70	108103	10	X	30
108980	0.9	X	80 (aqueous)	108104	10	X	40
108981	0.9	X	80	108105	10	X	50
108990	0.9	X	90 (aqueous)	108106	10	X	60
108991	0.9	X	90	108107	10	X	70
108911	0.9	X	100 (aqueous)	108108	10	X	80
108912	0.9	X	100	108109	10	X	90
108149	1.5	X	10	108100	10	X	100
108150	1.5	X	15	108102	10	X	120
108152	1.5	X	20	108115	10	X	150
108153	1.5	X	30	108513	15	X	30
108154	1.5	X	40	108514	15	X	45
108155	1.5	X	50	108516	15	X	60
108156	1.5	X	60	108517	15	X	75
108157	1.5	X	70	108519	15	X	90
108158	1.5	X	80	108512	15	X	120
108159	1.5	X	90	108520	15	X	150
108151	1.5	X	100	108525	15	X	200

### Part No. Description

#### Items Not Illustrated:

124536	Nuts and Washers for 7.5 cm diameter columns, 6/pk
124535	Thumbscrews for 10 and 15 cm diameter columns, 8/pk

## Water Jackets

Spectrum offers removable glass water jackets for use in regulating the temperature of the column packing. The jackets will fit columns from 0.6 x 15 cm to 5.0 x 150 cm. The tooled ends assure a tight fit and the nitrile O-rings prevent water leakage. The jacket slips easily over the column and is secured by clamping the jacket to a stand. A support ring should be attached to the upper column collar to prevent the column from slipping through the clamped jacket.

The water jacket hose barbs are designed to accept 1/4" ID silicone tubing.

### Ordering Information

Part No.	Column Size (cm)	Part No.	Column Size (cm)
123200	0.6 x 15	124280	0.9 x 15
123201	0.6 x 20	124281	0.9 x 20
123202	0.6 x 30	124282	0.9 x 30
123203	0.6 x 40	124283	0.9 x 40
123204	0.6 x 50	124212	0.9 x 50
123205	0.6 x 60	124284	0.9 x 60
123206	0.6 x 70	124285	0.9 x 70
123207	0.6 x 80	124213	0.9 x 80
123208	0.6 x 90	124214	0.9 x 90
123209	0.6 x 100	124286	0.9 x 100
124288	1.5 x 20	124301	2.5 x 20
124290	1.5 x 30	124302	2.5 x 30
124292	1.5 x 40	124304	2.5 x 40
		124306	2.5 x 45
124293	1.5 x 50	124307	2.5 x 50
124294	1.5 x 60	124308	2.5 x 60
124296	1.5 x 70	124310	2.5 x 70
124297	1.5 x 80	124311	2.5 x 80
124298	1.5 x 90	124312	2.5 x 90
124300	1.5 x 100	124314	2.5 x 100
		124315	2.5 x 120
124317	5.0 x 20		
124316	5.0 x 30		
124318	5.0 x 60		
124320	5.0 x 90		
124322	5.0 x 100		
124323	5.0 x 120		
124324	5.0 x 150		



## Support Ring for Water Jacket

When attached to the upper endplate of a column, this support ring prevents the column from slipping down through the jacket.

### Ordering Information

Part No.	Column ID (cm)
124326	1.5
124328	2.5
124330	5.0

## Replacement Water Jacket O-Rings

### Ordering Information

Part No.	Column ID (cm)
124331	0.6
124332	0.9
124334	1.5
124336	2.5
124338	5.0

Water jacket O-rings are sold in packages of 4. The part numbers above are for packages of 4.

## Sample Application Baskets

Sample application baskets are used for layering sample onto the column bed. They are made of a transparent acrylic shell with an open top and a base made of nylon mesh. The nylon mesh may be readily replaced if damaged. After the column is packed, a wire hook is used to place the basket beneath a layer of buffer on top of the gel. These baskets are not for use with organic solvents.

### Ordering Information

Part No.	Column ID (cm)
124261	0.6
124262	0.9
124264	1.5
124266	2.5
124268	5.0
124269	7.5
124270	10
124272	15



## Column Extenders

Column extenders are generally used to facilitate packing a column. For softer media, two columns of the same ID are attached end to end and a dilute slurry of gel is poured into the top. The gel is allowed to settle and the remaining buffer is either decanted or allowed to flow from the column outlet. The upper column is then removed and the packed lower column is used. This technique is considered to be superior to the use of funnels since it minimizes any convection currents which may disrupt the packing.

Gels which require pressure during packing are accommodated by attaching an upper endplate to the upper column and then using a pump to drive the packing buffer through the column.

### Ordering Information

Column ID (cm)	Aqueous Part No.	Organic Part No.
0.6	124339	125352
0.9	124340	125353
1.5	124342	125355
2.5	124344	125357
5.0	124346	125359
7.5	124347	125360
10	124348	125361



## Packing Reservoirs

An alternative to a second column for slurry packing is a packing reservoir. Packing reservoirs are also commonly used as solvent reservoirs in gravity flow systems.

To use a packing reservoir for packing a column, a column extender is used to connect the packing reservoir to the top of the column. The packing reservoir and column extender smoothly extend the inner bore of the column, minimizing disruption of the packed bed. The globular body of the packing reservoir provides sufficient capacity for packing most columns.

To use a packing reservoir as a solvent reservoir, an endplate (usually an upper endplate) is attached to the packing reservoir and a length of tubing is used to connect the column to the reservoir. This allows the height of the reservoir to be easily adjusted. The globular body of the reservoir minimizes the slight change in height that occurs as fluid flows through the column.

### Ordering Information

Column ID (cm)	Volume (ml)	Part No.
0.6	125	124352
0.9	300	124354
1.5	300	124356
2.5	1000	124358
5.0	3000	124360
7.5	5000	124361
10	5000	124362

Either a column extender or an endplate is normally required to use a packing reservoir. These items are sold separately.





## Column Support Accessories

Spectrum offers a broad selection of column support accessories. These include laboratory stands, rings, and heavy-duty support items for the larger columns.

To support a small column (0.6, 0.9, or 1.5 cm ID) you will need a stand, two 2.5 cm column support rings, and the mounting insert kit for the diameter of your column. The rod used to support your column should be at least 20 cm longer than the column itself, to allow for the length of the endplates and tubing connections.

Either the Bench Top Ministand (with a 50 cm rod) or the Bench Top Workstation (with two 100 cm rods) are usually satisfactory as a stand for a small column. If you need longer rods you may obtain an "H" base and a set of longer rods separately.

To support a 2.5 cm ID column, you will need a stand and two 2.5 cm column support rings, but not an insert kit. Again the rod used to support your column should be at least 20 cm longer than the column itself. Either the Bench Top Ministand (with a 50 cm rod) or the Bench Top Workstation (with two 100 cm rods) are usually satisfactory as a stand for a 2.5 cm column. If you need longer rods you may obtain an "H" base and a set of longer rods separately.

To support a 5.0 cm ID column less than 150 cm long you will need a stand and two 5.0 cm column support rings. The rod used with the stand should be at least 20 cm longer than the column.

A Bench Top workstation is the recommended stand for 5.0 cm columns less than 90 cm in length. For lengths of 90 to 120 cm the recommended stand is an "H" base and a set of 150 cm rods.

To support the 5.0 cm ID x 150 cm long column we recommend our floor model workstation, 200 cm instrument rod, and two 5.0 cm column support rings.

The 7.5, 10, and 15 cm ID columns are all supported in the same fashion. Any of these columns may be supported on our floor model workstation by adding a set of telescoping rods of the appropriate length. The shorter columns (less than 60 cm long) may also be supported on the bench top with our Bench Top Workstation, two 2.5 cm column support rings, and the 7.5 to 15 cm column mounting insert kit.

The **Bench Top Ministand** is a 5" x 8" polypropylene stand and a single 50 cm rod. We do not recommend substituting a longer rod in this base. The non-skid feet on the base also make this an excellent choice as a general laboratory stand.

The **Bench Top Workstation** is made of the "H" base and a set of 100 cm rods. This is a useful combination for many columns and accessories. The open layout of the "H" base allows heavier items to be supported directly over the center of the base.

The "H" base and rods are also sold separately. The "H" base is an aluminum base weighing about 7 lbs. It can accept up to 7 rods in different positions. The rods are also aluminum and screw into the base. They are available in lengths from 15 to 150 cm.

The column support rings are provided in two sizes. These rings grab the ends of the column endplates and secure them to any 3/4" laboratory rod. The 5.0 cm rings are only for use with 5.0 cm ID columns. The 2.5 cm rings are for use with 2.5 cm and smaller columns. To use the rings with a smaller column an insert kit must be obtained to adapt them to the smaller diameter. The rings are sold singly so that 2 are required for each column. The insert kits are sold in pairs so that only 1 kit is required for each column.

The **Floor Model Workstation** is a rugged rolling cradle, designed to protect the column and enhance its mobility. To use this workstation to support a 7.5 to 15 cm ID column a set of telescoping rods is needed. These attach to the column endplates and are secured to the cradle by a set of pins. This arrangement allows the column to be easily tilted for cleaning or other access and also secured in an upright position.

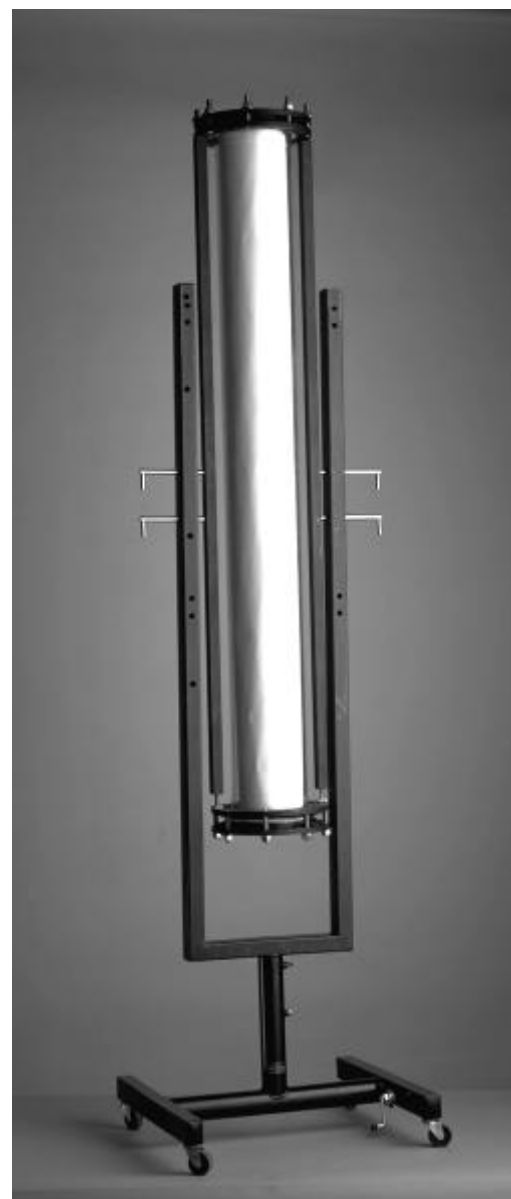
An instrument rod may also be attached to the floor model workstation. This single rod may be used to support instrumentation or a secondary column.



Typical Mounting Insert Kit

## Ordering Information

Part No.	Description
123320	Bench Top Work Station (includes 123322 and 123330)
123321	Bench Top Ministand
123322	"H" Base
123324	15 cm rod for "H" base (2/pk)
123326	30 cm rod for "H" base (2/pk)
123328	50 cm rod for "H" base (2/pk)
123330	100 cm rod for "H" base (2/pk)
123331	150 cm rod for "H" base (2/pk)
123333	2.5 cm Column Support Ring (2 required per column)
123353	Mounting Insert Kit for 0.6 cm column
123354	Mounting Insert Kit for 0.9 cm column
123355	Mounting Insert Kit for 1.5 cm column
123317	Mounting Insert Kit for 7.5 to 15 cm column
123356	Mounting Insert Kit for 0.6 cm Soft Gel column
123357	Mounting Insert Kit for 0.9 cm Soft Gel column
123358	Mounting Insert Kit for 1.5 cm Soft Gel column
123339	5.0 cm Column Support Ring (2 required per column)
123300	Floor Model Workstation
123302	Telescoping rods for 30 cm column (1 set)
123303	Telescoping rods for 40 cm column (1 set)
123305	Telescoping rods for 50 cm column (1 set)
123304	Telescoping rods for 60 cm column (1 set)
123307	Telescoping rods for 70 cm column (1 set)
123309	Telescoping rods for 80 cm column (1 set)
123306	Telescoping rods for 90 cm column (1 set)
123308	Telescoping rods for 100 cm column (1 set)
123310	Telescoping rods for 120 cm column (1 set)
123312	Telescoping rods for 150 cm column (1 set)
123314	Telescoping rods for 200 cm column (1 set)
123316	200 cm instrument rod (each)
123318	Replacement pin set, (4/pk)



Floor Model Workstation



Column Support Ring

## Replacement and Accessory Fittings



Typical Multifit Connector

### Multifit Connectors

Multifit connectors are used to connect tubing to column endplates. These connectors attach to the outside of the tubing so the tubing OD (outer diameter) should be matched to the size of the connector. Two families of multifits are available. The aqueous family uses an O-ring as the grabbing element while the organic family uses a Teflon ferrule. These fittings are not for use above 50 psi.

#### Ordering Information

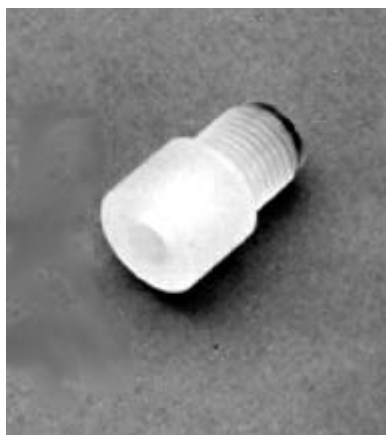
Part No.	Description
124380	Aqueous style for 1/16" OD tubing
124384	Aqueous style for 1/8" tubing
124487	Organic style for 1/8" tubing
124391	Aqueous style for 3/16" tubing
124489	Organic style for 3/16" tubing
124390	Aqueous style for 1/4" tubing
124488	Organic style for 1/4" tubing
124491	Organic style for 1/2" tubing

### Hose Barb Connectors

As an alternative to the multifit connectors, a hose barb connector may be used to connect tubing to the column endplates. Hose barb connectors attach to the inside of the tubing, so the tubing ID (inside diameter) should match the hose barb size. Hose barbs work best with softer tubing, like vinyl and silicone. These hose barbs should not be used with rigid tubing like polyethylene or Teflon. These hose barbs are made of polypropylene and may not be suitable for use with some organic solvents.

#### Ordering Information

Part No.	Description
124393	Hose barb for 3/16" ID tubing
124395	Hose barb for 1/4" ID tubing
124397	Hose barb for 3/8" ID tubing



124444

### Bushing Adapter

Many chromatographers are more comfortable using 1/4"-28 flat-bottomed fittings. They may already have an investment in these or some other component of their system may require their use. The 1/4"-28 bushing adapter may be used to replace one or both of the multifit fittings on a column. Any of the common 1/4"-28 flat-bottomed-style fittings may then be used with the adapter. The bushing adapter is made of Kel-F and Viton so that it will be resistant to most solvents.

#### Ordering Information

Part No.	Description
124444	Bushing adapter for 1/4"-28 fittings
124577	1/4"-28 flat bottomed fittings for 1/16" OD tubing, 2/pk
124578	1/4"-28 flat bottomed fittings for 1/8" OD tubing, 2/pk

### Multifit for Vent Port

A multifit connector for use in the vent port is also available. This can be used to introduce a second fluid stream to the column, to provide a continuous sampling port, as well as for other purposes. The fitting replaces the plug which is normally used in the vent port. It is made of polypropylene and will accept 1/8" OD tubing.

#### Ordering Information

Part No.	Description
124377	1/8" multifit for vent port



124420

## Multifit Valves

Often it is advantageous, or even necessary, to connect an on/off valve to one or both of the column endplates. When used on both ends of a column, they allow the columns to be disconnected from the chromatography system and moved or stored for short periods without excessive risk to the column packing. When using gravity, rather than a pump, to drive the fluid flow it is conventional to use an on/off valve at the column outlet; this allows the flow to be stopped when the column is not in use and yet prevents the column from drying out even if a small leak develops.

The multifit valves screw directly into the column endplate, replacing the standard multifit fitting. The side of the valve away from the column is a multifit connector itself, for reconnecting the tubing. You should match the size of the valve to the OD of the tubing you plan to use.

### Ordering Information

Part No.	Description
124414	Multifit valve for 1/16" OD tubing
124420	Multifit valve for 1/8" OD tubing
124426	Multifit valve for 1/4" OD tubing



124468

## Luer Fittings

Syringe needles have a long history of use as fluid connectors in the chromatography laboratory. Spectrum manufactures 3 fittings for attaching luer needles to chromatography systems. Two of these, the standard luer fitting and the luer valve, are used to connect needles directly to a column endplate. They are also effective as drip spouts for low flow rate applications.

The multifit luer connector uses a locking grip to secure a luer-lock needle to 1/8" OD tubing.

### Ordering Information

Part No.	Description
124372	Luer fitting, connects needle to column endplate
124408	Luer valve, connects needle to column endplate
124468	Multifit luer connector, connects needle to 1/8" OD tubing



124474

## Sample Injection Fittings

The simplest method of sample injection is by using an injection fitting. An injection fitting is placed in the flow path before the column. This fitting contains a septum that can be pierced with a syringe needle to inject the sample.

Spectrum manufactures 2 styles of injection fittings. One style is screwed directly into the upper column endplate, replacing the multifit fitting. This style is available in 2 sizes, one to attach to 1/8" OD tubing and the other for 3/16" OD tubing. The second style is used in-line and has 1/8" tubing fittings on both its inlet and its outlet.

Both styles use replaceable septa which are available in either silicone, for aqueous solvents, or Teflon-lined silicone for use with organic solvents.

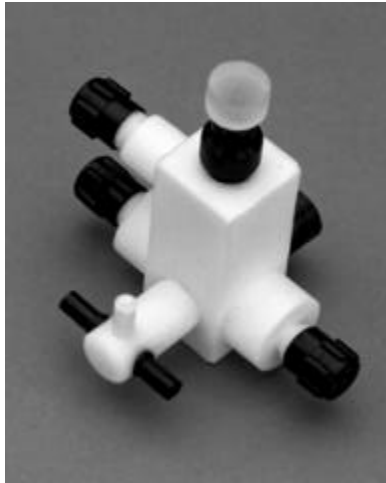
### Ordering Information

Part No.	Description
124474	In-line injection fitting for 1/8" OD tubing
124376	On-column injection fitting for 1/8" OD tubing
124378	On-column injection fitting for 3/16" OD tubing
124576	Replacement silicone septa, 6/pk
124579	Replacement Teflon-lined silicone septa, 6/pk





124432



124422



124520



Typical Multifit Union

## Metering Valves

Metering valves provide a convenient means of controlling the flow rate in low-pressure chromatography. When using gravity feed, it can be cumbersome to adjust the reservoir height to alter the flow rate. A metering valve simplifies the task of flow rate control by allowing a simple adjustment of the valve stem to control the flow rate.

Another common use for metering valves is as stream splitting devices. For high flow applications, one may need to take a continuous sample of the column effluent, for example to monitor it with a small UV detector, and yet collect the remainder of the effluent. A T-bore valve with one outlet followed by a metering valve is frequently used to provide the split needed in such an arrangement. Spectrum manufactures integrated T-bore and metering valves for such an application (124438 and 124422).

### Ordering Information

Part No.	Description
124432	Metering valve, connects to column endplate and 1/8" OD tubing
124508	Metering valve, connects to 1/8" OD tubing
124514	Metering valve, connects 1/8" OD tubing to 1/4" OD tubing
124438	Stream splitting valve, connects to column endplate and 1/8" OD tubing
124422	Stream splitting valve, connects to 1/8" OD tubing

## Multi-Port Valves

Spectrum manufactures a variety of multi-port valves for stream mixing, stream switching, sampling, and flow metering applications. Some of these valves screw onto the column endplates, replacing the existing fittings, others have only tubing fittings, for in-line use.

### Ordering Information

Part No.	Description
124410	On-column sampling/mixing valve, allows mixing and/or sampling at column endplate
124396	3-Port T-bore valve for attachment to endplate, has two 1/8" OD tubing connectors
124520	3-Port T-bore valve, has three 1/8" OD tubing connectors
124521	3-Port T-bore valve, has three 1/4" OD tubing connectors
124402	4-Port valve for attachment to endplate, has three 1/8" OD tubing connectors, connects adjacent ports
124522	4-Port valve, has four 1/8" OD tubing connectors, connects adjacent ports

## Multifit Unions

The same style of compression fittings used in our multifit fittings are also available as unions to connect 2 pieces of tubing. These are available as symmetric unions (the same size fitting on each end) or as asymmetric unions. These fittings are useful for connecting both rigid and flexible tubing and can tolerate a fair degree of size variation.

### Ordering Information

Part No.	Description
124450	Multifit union, 1/8" OD to 1/8" OD
124456	Multifit union, 1/4" OD to 1/8" OD
124462	Multifit union, 1/4" OD to 1/4" OD
124435	Multifit union, 1/16" OD to 1/8" OD
124460	Multifit union, 3/16" OD to 1/8" OD
124458	Multifit union, 1/8" OD to 5/32" OD

## Chromatography Syringes

As a complement to the Spectra/Chrom chromatographic products, Spectrum manufactures precision syringes for sample injection and collection. These syringes are designed specifically to adapt to the Spectra/Chrom injection ports for columns and fittings. Using these highly accurate instruments, even microliter quantities can be accurately and precisely measured.

### Spectrum Double Action Syringes

- Precision Glass Upper Guide Chamber
- Reinforced Upper plunger assembly
- Fixed or Removable Needles

Many syringes not specifically designed for chromatographic applications are delicate instruments easily damaged when used with valves and fittings. Spectrum has overcome this problem by introducing the double action plunger guide chamber. This feature eliminates the possibility of bending the plunger and insures the chromatographer against a short syringe life. An enlarged upper guide chamber, made of borosilicate glass, is fused to the lower barrel and houses the extra heavy duty plunger fitted with 2 Teflon guides. This portion of the overall syringe assembly acts as a handle for holding the syringe, eliminating heat transfer from the hand to the actual sample area. The natural balance of the syringe is also greatly improved resulting in a smooth, positive injection stroke. After injection, the guide chamber can be filled with solvent so the successive plunger strokes completely clean the syringe.

The lower glass barrel has an individually matched, precision ground tungsten plunger. All plungers are hand assembled to extremely close tolerances to insure exact measurements.

The Double Action micro syringes are supplied with either a fixed (cemented) needle or with a removable screw hub needle. The design of the removable needle retains fluid and allows needle replacement with ease. A Teflon seal in the hub of the needle ensures a liquid- and gas-tight assembly.

### Spectrum Double Action Removable Needle Micro Syringes

#### Glenco® Series 19913

##### Ordering Information

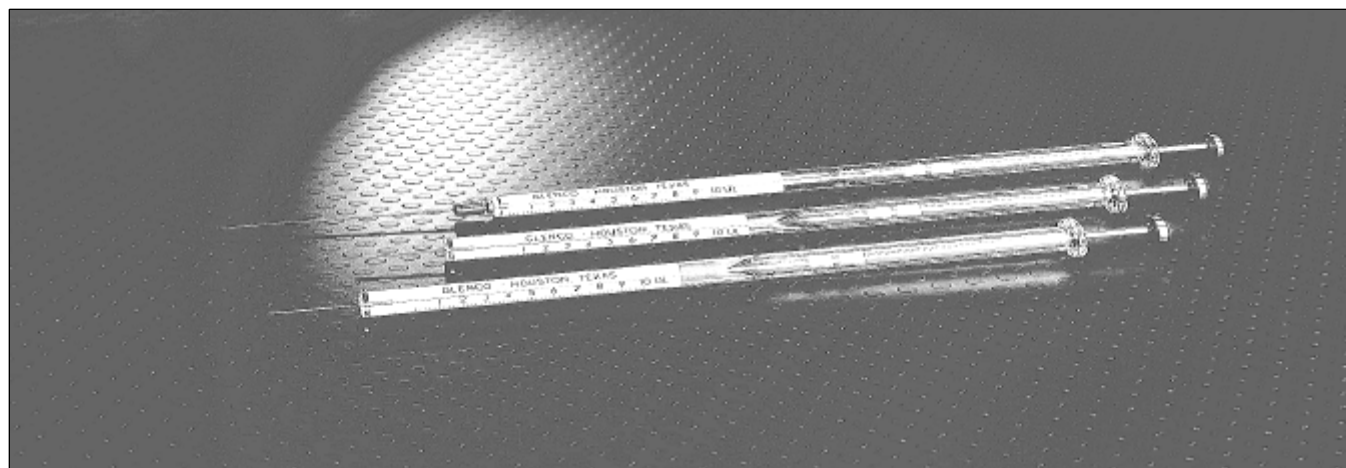
Part No.	Size (µl)	Grad.Div. (µl)	Needle Length (in) and Gauge	Needle ID x OD (in)
185500	10	0.1	1 x 26	.006 x .018
185501	10	0.1	1 x 24	.006 x .022
185101	10	0.1	2 x 26	.006 x .018
185102	10	0.1	2 x 24	.006 x .022
185502	10	0.1	3 x 26	.006 x .018
185503	10	0.1	3 x 24	.006 x .022
185103	20	0.2	2 x 26	.006 x .018
185504	20	0.2	2 x 24	.006 x .022
185104	50	1.0	2 x 26	.006 x .018
185505	50	1.0	2 x 24	.006 x .022

### Spectrum Double Action Fixed Needle Micro Syringes

#### Glenco Series 19909

##### Ordering Information

Part No.	Size (µl)	Grad.Div. (µl)	Needle Length (in) and Gauge	Needle ID x OD (in)
185506	10	0.1	1 x 26	.006 x .018
185507	10	0.1	1 x 24	.006 x .022
185108	10	0.1	2 x 26	.006 x .018
185109	10	0.1	2 x 24	.006 x .022
185508	10	0.1	3 x 26	.006 x .018
185509	10	0.1	3 x 24	.006 x .022
185110	20	0.2	2 x 26	.006 x .018
185510	20	0.2	2 x 24	.006 x .022
185111	50	1.0	2 x 26	.006 x .018
185511	50	1.0	2 x 24	.006 x .022



## Spectrum Conventional Micro Syringes

- Precision Ground Tungsten Plunger
- Hand Assembled to Extremely close tolerances
- Fixed or Removable Needles
- Precision Bore Borosilicate Glass Barrel. Highest degree of resistance to chemical attack. Bore uniformity  $\pm 0.002$ " assures the utmost accuracy in sample volume delivery.
- Precision Ground Tungsten Plunger. Individually matched to each barrel. Syringes are individually lapped and hand assembled to extremely close tolerances.
- Removable Screw Hub Needles. Recommended over fixed needle arrangement. Design of needle and stainless steel end piece eliminates dead volume, yet allows easy replacement of plugged needle.
- Fixed Needle. Epoxy cemented to the center bore of the syringe barrel terminating at a point exactly corresponding to the zero calibration mark.

### Conventional Removable Needle Micro Syringes Glenco Series 19905

#### Ordering Information

Part No.	Size ( $\mu$ l)	Grad.Div. ( $\mu$ l)	Needle Length (in) and Gauge	Needle ID x OD (in)
185115	10	0.1	2 x 26	.006 x .018
185116	20	0.2	2 x 26	.006 x .018
185117	50	1.0	2 x 26	.006 x .018

### Conventional Fixed Needle Micro Syringes Glenco Series 19901

#### Ordering Information

Part No.	Size ( $\mu$ l)	Grad.Div. ( $\mu$ l)	Needle Length (in) and Gauge	Needle ID x OD (in)
185120	10	0.1	2 x 26	.006 x .018
185121	10	0.1	2 x 24	.006 x .022
185122	20	0.2	2 x 26	.006 x .018
185124	20	0.2	2 x 24	.006 x .022
185123	50	1.0	2 x 26	.006 x .018



## Replacement Screw Hub Needles for Micro Syringes

Screw Hub Needles are offered as accessory or replacement parts for Spectrum Micro Syringes. Needles are manufactured from type 304 stainless steel, and are fixed into a stainless steel screw hub assembly. A Teflon seal at the base of the hub seats against a stainless steel end piece on the syringe, eliminating dead volume and ensuring a liquid- and gas-tight assembly.

Standard needles have ends precision ground to a 22° bevel point. Flat end needles are also readily available. Other needle lengths or diameters can be supplied by special order, contact Spectrum Chromatography at (800) 459-9700 for assistance.

**The following 22° bevel point needles will fit series 19905 and 19913 syringes. The Teflon seal is included in the hub.**

#### Ordering Information

Part No.	Needle Length (in) and Gauge	Needle ID x OD(in)	Qty/pk
185128	1 x 26	.006 x .018	2
185129	1 x 24	.006 x .022	2
185130	2 x 26	.006 x .018	2
185131	2 x 24	.006 x .022	2
185132	3 x 26	.006 x .018	2
185133	3 x 24	.006 x .022	2
185498	4 x 24	.006 x .022	2
185496	6 x 24	.006 x .022	2

**The following flat end (90°) needles will fit series 19905 and 19913 syringes. The Teflon seal is included in the hub.**

#### Ordering Information

Part No.	Needle Length (in) and Gauge	Needle ID x OD(in)	Qty/pk
185140	1 x 26	.006 x .018	2
185136	2 x 26	.006 x .018	2
185137	2 x 24	.006 x .022	2
185138	2 x 22	.006 x .028	2
185139	3 x 26	.006 x .018	2

## HPLC Injection Syringes for Valco® Sample Injection Valves

These HPLC Sample Injection Syringes are specially calibrated for use with high pressure Valco injection valves. The sample loop may be filled with a partial volume read directly from the syringe calibration scale, since the scale is offset by the volume left in the connecting flow path in the valve. Because the 3000 and 7000 psi valves have different internal passage volume, it is important that the proper model syringe be used. All of these syringes have special 22 gauge flat-end needles, 0.028" OD, 0.006" ID, and 0.75" length.

### Ordering Information

#### For 3000 psi valves - Valco CV-6-HPax

Part No.	Capacity	Grad.Div.
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185142	10 µl	0.1 µl
185143	20 µl	0.2 µl
185144	50 µl	1.0 µl

#### For 7000 psi valves - Valco CV-6-UHPa-N60

Part No.	Capacity	Grad.Div.
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185145	10 µl	0.1 µl
185146	20 µl	0.2 µl
185147	50 µl	1.0 µl

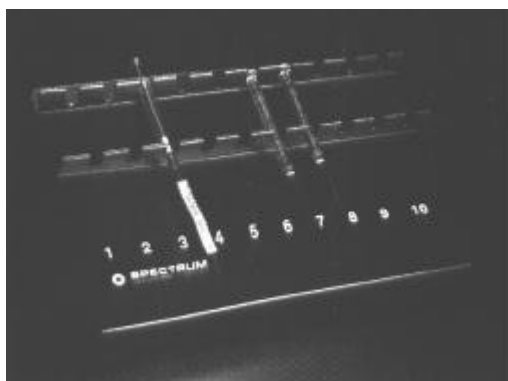
## Solvent Flushing Syringes for Valco Valves

These syringes are used to flush out the injection port, valve passages, and sample loop before loading a new sample. All of these syringes are fitted with 22 gauge flat-end needles, 0.028" OD, 0.016 " ID, and 0.75" length.

### Ordering Information

Part No.	Description
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185155	1 ml Solvent Flushing Syringe for Valco
185156	5 ml Solvent Flushing Syringe for Valco
185157	Replacement needle and seal for 185155 and 185156



## HPLC Syringes for Rheodyne® and Altex® Injection Valves

These syringes are fitted with special 22 gauge needles for use with Rheodyne and Altex sample injection valves. These needles are 0.028" OD, 0.006" ID, and 2" long.

### Ordering Information

Part No.	Size	Grad.Div.	Type
185345	10 µl	0.1 µl	Micro Injection
185350	50 µl	1.0 µl	Micro Injection
185138	Replacement Micro Injection Needle, 2/pk		
185355	1 ml	10 µl	Solvent Flushing
185384	Replacement Solvent Flushing Needle, 2/pk		

## HPLC Syringes for Waters® U6K Injection System

These syringes are fitted with special tapered 22 gauge needles especially required for the Waters U6K system. These needles are 0.028" OD, 0.006" ID and 1.97" long. They taper to 0.017" OD at their domed tip.

### Ordering Information

Part No.	Size	Grad.Div.	Type
185360	10 µl	0.1 µl	Micro Injection
185365	20 µl	0.2 µl	Micro Injection
185370	50 µl	1.0 µl	Micro Injection
185380	Replacement Micro Injection Needle, 2/pk		
185375	1 ml	10 µl	Solvent Flushing
185385	Replacement Solvent Flushing Needle, 2/pk		

## Syringe Guard Station

Store syringes in a convenient and organized manner. The new Syringe Guard Station puts all those misplaced syringes at your fingertips. No more syringe breakage or loss. Each Syringe Guard Station holds ten (10) micro syringes on a rigid metal frame. Its rubber feet securely grip the bench top to prevent sliding.

### Ordering Information

Part No.	Description
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186221	Syringe Guard Station
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## Conventional Gas/Liquid Syringes

- Capacities from 50 ml to 100 ml
- Ideally Suited for Handling Almost any Gas or Liquid
- Fixed or Removable Needle Models
- Interchangeable Plungers
- **Highest Degree of Resistance to Chemical Attack.** Only borosilicate glass and Teflon are exposed to the gas or liquid in the syringe.
- **Flat Plunger Face Contacts Bottom of Glass Barrel.** This assures that all of the liquid or gas is displaced from the measuring chamber.
- **Fixed Needle Models.** Fixed needles are permanently cemented flush with the inside flat bottom of the barrel at the zero calibration mark.
- **Removable Needle Models.** A 1/4" x 28 tpi threaded glass tip at the end of the barrel permits quick attachment or removal of any screw hub needle or accessory.
- **Accessories Feature a Flat Teflon Seal.** The Teflon seal in contact with the flat face of the glass tip of the syringe assures a leak-proof connection. The seal has been tested to 2000 psi. Continued attachment and removal of the accessories has no effect on seal performance.
- **Interchangeable Plunger with Stationary Teflon Seals at Tip.** The plungers of any given size can be interchanged between any glass barrels of the same size.

## Conventional Gas/Liquid Syringes with Removable Screw Hub Needles and Constant Tension Plunger Glenco Series 19925

### Ordering Information

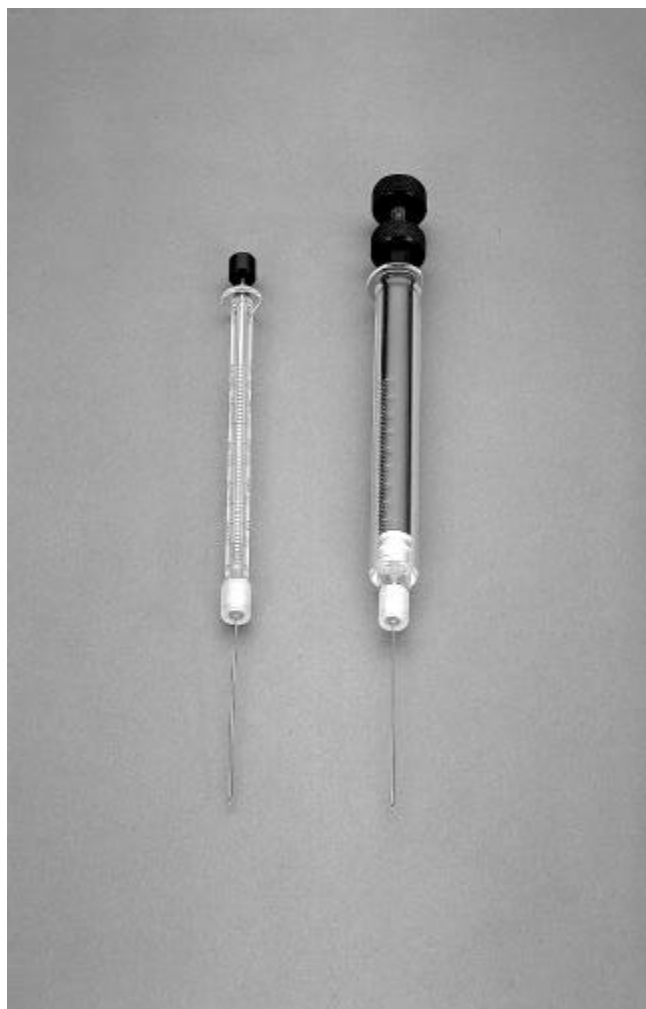
Part No.	Size	Grad. Div.	Needle Length (in) and Gauge	Needle ID x OD(in)
185190	50 µl	1 µl	2 x 22	.006 x .028
185549	50 µl	1 µl	3 x 22	.006 x .028
185191	100 µl	2 µl	2 x 22	.006 x .028
185551	100 µl	2 µl	3 x 22	.006 x .028
185192	250 µl	5 µl	2 x 22	.006 x .028
185553	250 µl	5 µl	3 x 22	.006 x .028
185193	500 µl	10 µl	2 x 22	.016 x .028
185554	500 µl	10 µl	3 x 22	.016 x .028
185194	1 ml	10 µl	2 x 22	.016 x .028
185556	1 ml	10 µl	3 x 22	.016 x .028
185195	2.5 ml	50 µl	2 x 22	.016 x .028
185390	5 ml	0.1 ml	2 x 22	.016 x .028
185391	10 ml	0.5 ml	2 x 22	.016 x .028
185392	20 ml	0.5 ml	2 x 22	.016 x .028
185393	50 ml	1.0 ml	2 x 22	.016 x .028
185394	100 ml	1.0 ml	2 x 22	.016 x .028
185558*	2.5 ml	50 µl	2 x 22	.016 x .028

\*185558 is supplied with a flat end (90°) needle, the others with a sharp (22°) needle.

## Conventional Gas/Liquid Syringes with Fixed (Cemented) Needles and Constant Tension Plunger Glenco Series 19930

### Ordering Information

Part No.	Size	Grad. Div.	Needle Length (in) and Gauge	Needle ID x OD(in)
185200	50 µl	1 µl	2 x 22	.006 x .028
185201	100 µl	2 µl	2 x 22	.006 x .028
185202	250 µl	5 µl	2 x 22	.006 x .028
185203	500 µl	10 µl	2 x 22	.016 x .028
185204	1 ml	10 µl	2 x 22	.016 x .028
185205	2.5 ml	50 µl	2 x 22	.016 x .028
185420	5 ml	0.1 ml	2 x 22	.016 x .028
185421	10 ml	0.1 ml	2 x 22	.016 x .028
185422	20 ml	0.5 ml	2 x 22	.016 x .028
185423	50 ml	1.0 ml	2 x 22	.016 x .028
185424	100 ml	1.0 ml	2 x 22	.016 x .028



## Gas/Liquid Syringes with Adjustable Plunger Seal

These unique syringes offer the same features as the conventional gas/liquid syringes, plus an adjustable expanding seal at the plunger face. Concentric plunger shafts permit the mechanical expansion of the sealing Teflon O-rings, by rotation of the plunger handle knobs in opposite directions.

## Gas/Liquid Syringes with Removable Screw Hub Needles and Adjustable Plunger Glenco Series 19925A

### Ordering Information

Part No.	Size	Grad. Div.	Needle	
			Length (in) and Gauge	Needle ID x OD (in)
185210	5 ml	0.1 ml	2 x 22	.016 x .028
185211	10 ml	0.1 ml	2 x 22	.016 x .028
185212	20 ml	0.5 ml	2 x 22	.016 x .028
185213	50 ml	1.0 ml	2 x 22	.016 x .028
185214	100 ml	1.0 ml	2 x 22	.016 x .028

## Gas/Liquid Syringes with Fixed (Cemented) Needles and Adjustable Plunger Glenco Series 19930A

### Ordering Information

Part No.	Size	Grad. Div.	Needle	
			Length (in) and Gauge	Needle ID x OD(in)
185219	5 ml	0.1 ml	2 x 22	.016 x .028
185220	10 ml	0.1 ml	2 x 22	.016 x .028
185221	20 ml	0.5 ml	2 x 22	.016 x .028
185222	50 ml	1.0 ml	2 x 22	.016 x .028
185223	100 ml	1.0 ml	2 x 22	.016 x .028



## Replacement Components for Gas/Liquid Syringes

### Glass Barrels

### Ordering Information

For use with removable needles	Syringe Size	With fixed 2" x 22 Needle
185227	50 µl	185240
185228	100 µl	185241
185229	250 µl	185242
185230	500 µl	185243
185231	1 ml	185244
185232	2.5 ml	185245
185233	5 ml	185246
185234	10 ml	185247
185235	20 ml	185248
185236	50 ml	185249
185237	100 ml	185250

### Plungers:

### Ordering Information

Constant Tension	Syringe Size	Adjustable Tension
185254	50 µl	
185255	100 µl	
185256	250 µl	
185257	500 µl	
185258	1 ml	
185259	2.5 ml	
185260	5 ml	185276
185261	10 ml	185277
185262	20 ml	185278
185263	50 ml	185279
185264	100 ml	185280

## Removable Screw Hub Needles for Gas/Liquid Syringes

Removable stainless steel screw hub needles are supplied with the staked flange and Teflon seal, but without the screw hub nut (see below). The needle points are a deflected 22° bevel to minimize septum coring.

### Ordering Information

Part No.	Needle Length (in) and Gauge	Needle ID x OD(in)	Qty/pk
185284	1 x 22	.006 x .028	2
185285	2 x 22	.006 x .028	2
185281	3 x 22	.006 x .028	2
185282	1 x 22	.016 x .028	2
185286	2 x 22	.016 x .028	2
185287	3 x 22	.016 x .028	2

## Flat End (90°) Needles For Gas/Liquid Syringes

These flat or blunt ended needles are supplied with the same flange and seal as the sharp needles above. They are for use with the removable needle gas/liquid syringes whenever a sharp needle would not be appropriate (e.g. when using an HPLC injection valve).

### Ordering Information

Part No.	Needle Length (in) and Gauge	Needle ID x OD(in)	Qty/pk
185289	1 x 22	.016 x .028	2
185290	2 x 22	.016 x .028	2
185291	3 x 22	.016 x .028	2
185384	2 x 22	.005 x .028	2

## Screw Hub Nut

These screw hub nuts are used to attach the flanged needles to the threaded tip of the gas/liquid syringes. One size fits all removable needle gas/liquid syringes.

### Ordering Information

Part No.	Description	Qty/pk
185158	Screw Hub Nut	6

## Side Port Needle

Side port needles eliminate the risk of coring septa. The side port is superior to even the deflected tip found in other Spectrum needles when the syringe is to be used to pierce a rubber septum.

### Ordering Information

Part No.	Description	Qty/pk
185602	Side Port Needle, 2" x 22 gauge 0.013" ID	2

## Accessories for Removable Needle Gas/Liquid Syringes

### Micro Valves

#### Glenco Series 925-MV

A minimum volume, Teflon and Kel-F high pressure accessory with 1/4" x 28 threads, these micro valves may be attached to the threaded tip of a syringe to provide positive "on-off" control. The valve has a straight, clear flow path, minimum dead volume, and has been tested leak-free to 2000 psi. It is ideal for use in storing samples in syringes and for pressurizing samples before injection. The outlet of the valve provides a fitting similar to that of the original syringe so that the same needles and accessories which may be used with the removable needle syringes can be connected to the valve outlet.

### Ordering Information

Part No.	Description	Bore (in)
185314	Micro Valve	0.020
185315	Micro Valve	0.040

### Luer Adapter

The Luer adapter screws onto the threaded glass tip of the removable needle gas/liquid syringes to allow the attachment of standard luer hub needles. The luer adapter has a narrow bore to minimize the connection volume. All wetted parts of the adapter are manufactured of inert fluoroplastics. The male luer has an external stainless steel shell to tightly secure luer hub needles to the Kel-F stem.

### Ordering Information

Part No.	Description	Bore (in)
185320	Male Luer Adapter	0.020
185321	Female Luer Adapter	0.040

### Syringe Closure

Designed for completely sealing off the threaded glass tip of a removable needle gas/liquid syringe. The Kel-F closure is provided with a replaceable Teflon seal that seats against the flat glass tip face of the syringe, providing a closure which has been tested leak-free to 2000 psi.

### Ordering Information

Part No.	Description	Qty/pk
185325	Syringe Closure	5

## Teflon Seals

These Teflon seals are used to provide the seal when attaching needles and accessories to the threaded glass tip of the removable needle gas/liquid syringes. One seal is included with each needle and accessory.

### Ordering Information

Part No.	Description	Qty/pk
185300	Teflon Seal	6

## 1/4-28 Coupler

A fluoroplastic coupler, with 1/4" x 28 tpi female threads, for connecting tubing fittings or other items designed for a 1/4" x 28 flat-bottomed hole to the threaded syringe tips of the removable needle gas/liquid syringes. Hold-up volume is minimized since the bottom of the tubing or other fitting seats flush with the flat end of the syringe tip. These may be used with either the flared-tube connectors or the ferruled connectors to connect tubing to these syringes.

### Ordering Information

Part No.	Description	Qty/pk
185465	1/4-28 Coupler	10

## Teflon Flared-Tube Connectors

Designed for use with 1/8" and 1/16" tubing, these connectors have a leak-free pressure rating of up to 500 psi. Each connector has a 1/4" x 28 tpi male thread and is supplied with a stainless steel washer which fits between the flared tube end and the connector body to provide a tight, leak-proof seal. A flaring tool must be used to heat flare the Teflon tubing.

### Ordering Information

Part No.	Description	Qty/pk
185470	Flared-tube connector for 1/16" tubing	10
185475	Flared-tube connector for 1/8" tubing	10

## Ferruled Connectors

Designed for use with 1/8" and 1/16" tubing, these connectors are similar to the flared tubing connectors, except that no flaring is required. Each connector has a 1/4" x 28 tpi male thread and is supplied with a ferrule used to make the seal to the tubing. These connectors are color coded for easy identification, blue for 1/16" OD tubing and yellow for 1/8" OD tubing.

### Ordering Information

Part No.	Description	Qty/pk
185480	Blue ferruled connector for 1/16" tubing	3
185485	Yellow ferruled connector for 1/8" tubing	3

## High Pressure Teflon Tubing

High pressure Teflon tubing is the final accessory used to form an inert fluid handling system using the gas/liquid syringes. It is ideally suited for handling either corrosive or easily contaminated materials. This flexible tubing makes sampling a simple task, even in hard to reach areas. The tubing is easily connected to the threaded glass tip of the removable needle gas/liquid syringes with a 1/4-28 coupler and either a flared-tube connector or a ferruled connector.

### Ordering Information

Part No.	Description
123798	Teflon tubing, 1/16" x 0.010", 3m
123802	Teflon tubing, 1/16" x 0.021", 3m
123806	Teflon tubing, 1/16" x 0.031", 3m
123814	Teflon tubing, 1/8" x 0.030", 3m
123818	Teflon tubing, 1/8" x 0.065", 3m
123822	Teflon tubing, 1/8" x 0.085", 3m



## Spectra/Chrom Laboratory Tubing

In addition to the specially manufactured peristaltic pump tubings, Spectrum Chromatography also provides tubing for general laboratory applications. Both semirigid tubing, made of Teflon or polyethylene, and flexible tubing, made of vinyl, silicone, or fluoroelastomers, are available.

The same features which make Spectra/Chrom peristaltic pump tubing the premier tubing for use in peristaltic pumps make it ideal for general laboratory use. The extra spring in the walls and the mechanical fatigue resistance provide a longer life in most general laboratory applications, as well as in peristaltic pumps.

The semirigid Teflon and polyethylene tubing, while not suited for use in peristaltic pumps, have many general lab applications. Teflon provides unparalleled solvent resistance; nearly any solvent can be used with Teflon tubing. Polyethylene tubing provides a reasonable degree of solvent resistance as well as an increase in the pressure limit of the tubing.

All of Spectrum's laboratory tubing exhibit some gas permeability. In general, silicone is the most permeable to gases and polyethylene and Teflon the least permeable.

Although all of Spectrum's tubing is designed to provide long life, it is also designed only for general laboratory applications. It is not meant to be permanently installed nor is it meant to be placed where it cannot be routinely observed. The flexible tubings will generally contain plasticizers to make them flexible. These will leach out of the tubing in time, making it more brittle, subject to easy breakage, and reducing its tolerance to pressure.

**Silicone Tubing (LPS).** This is the most commonly used material for peristaltic pump tubing. It provides the longest service life and good chemical compatibility for aqueous solvents. Its service life is about 150 hr. at 600 rpm and 825 hr. at 100 rpm. It can usually be left running on experiments during weekends without much danger of rupture. Of course a fresh section of tubing should be pulled though the pump rollers before any running peristaltic pump is left unattended for an appreciable length of time. Silicone tubing can also be autoclaved a single time on a wet cycle without a significant reduction in its life.

**Vinyl Tubing (LPV).** Vinyl tubing has the lowest per-foot cost of the available peristaltic pump tubings. It generally has only fair compatibility for most aqueous solvents and does not have a good tolerance for organic solvents. It has only about a third of the service life of vinyl tubing, 50 hr. at 600 rpm and 275 hr. at 100 rpm. It is not recommended that a peristaltic pump using vinyl tubing be left unattended. If it must be left unattended, a fresh section of tubing should be pulled though the pump rollers immediately prior to leaving. Vinyl tubing cannot be autoclaved and should not be exposed to temperatures above 80°C.

## Fluoroelastomer Tubing (LPF).

Fluoroelastomer tubing is both the most chemically inert peristaltic pump tubing and the shortest lived. It can withstand even halogenated solvents for a limited time. Its service life is only 30 hr. at 600 rpm and 165 hr. at 100 rpm. Because of its short life we do not recommend that a peristaltic pump using fluoroelastomer tubing be left unattended. If it must be left unattended, a fresh section of tubing should be pulled though the pump rollers immediately prior to leaving. Like silicone tubing, fluoroelastomer tubing can be autoclaved a single time on a wet cycle without a significant reduction in its life.

**Teflon Tubing.** Teflon is the most inert of all the tubing supplied by Spectrum. It can withstand nearly any solvent used in a modern laboratory, from distilled water to methylene chloride. Its excellent thermal characteristics allow it to be repeatedly autoclaved. However, it should not be used for fluid transport until it has cooled.

**Polyethylene Tubing.** Spectrum's polyethylene tubing is an inexpensive alternative to Teflon. Like Teflon tubing, polyethylene tubing can handle pressures significantly higher than any of the flexible tubings can. Polyethylene does not have the thermal stability of Teflon, so it should not be autoclaved, although it can be ethylene oxide sterilized.

## Spectrum Tubing Cutter

The Spectrum Tubing Cutter is designed to cut all types of polymer tubing leaving an even, flat edge. The special "V" shape of the tubing holder keeps the tubing perpendicular to the blade. The steel blade remains sharp for many cuts, but it can be easily replaced.

The Spectrum Tubing Cutter can be used on most types of tubing up to 1/2" (13 mm) OD. It is not for use on metallic tubing.

### Ordering information

Part No.	Description
123367	Spectrum Tubing Cutter
123368	Replacement Tubing Cutter Blades, 5/pk



## Spectra/Chrom<sup>®</sup> Laboratory Tubing Selection Guide

### Order from Spectrum Chromatography at (800) 459-9700

OD length⇒	ID	Wall	Vinyl		Silicone		LPF	Polyethylene		Teflon <sup>®</sup>	
			3m	30m	3m	15m	3m	3m	30m	3m	30m
<b>1/16"</b> 1.6mm	<b>0.010"</b> 0.25mm	<b>0.025"</b> 0.6mm								123798 1000 psi	123800
<b>1/16"</b> 1.6mm	<b>0.021"</b> 0.53mm	<b>0.020"</b> 0.5mm								123802 1000 psi	123804
<b>1/16"</b> 1.6mm	<b>1/32"</b> 0.8mm	<b>1/64"</b> 0.4mm								123806 1000 psi	123808
<b>1/16"</b> 1.6mm	<b>0.038"</b> 1mm	<b>0.012"</b> 0.3mm								123810	123812
<b>0.085"</b> 2.16mm	<b>0.02"</b> 0.5mm	<b>0.045"</b> 1.15mm	123700	123702	123704	123706	123708	123710	123712		
<b>1/8"</b> 3.2mm	<b>1/32"</b> 0.8mm	<b>3/64"</b> 1.2mm								123814 500 psi	123816
<b>1/8"</b> 3.2mm	<b>1/16"</b> 1.6mm	<b>1/32"</b> 0.8mm	123714 40 psi	123716	123718 21 psi	123720	123722 21 psi	123724	123726	123818 500 psi	123820
<b>1/8"</b> 3.2mm	<b>0.085"</b> 2.2mm	<b>0.020"</b> 0.5mm								123822 250 psi	123824
<b>1/8"</b> 3.2mm	<b>0.106"</b> 2.7mm	<b>0.010"</b> 0.24mm								123826 125 psi	123828
<b>5/32"</b> 4mm	<b>1/32"</b> 0.8mm	<b>1/16"</b> 1.6mm	123728	123730	123732	123734	123736	123738	123740		
<b>3/16"</b> 4.8mm	<b>1/16"</b> 1.6mm	<b>1/16"</b> 1.6mm	123742	123744	123746 32 psi	123748	123750 32 psi	123752	123754		
<b>1/4"</b> 6.4mm	<b>1/8"</b> 3.2mm	<b>1/16"</b> 1.6mm	123756 20 psi	123758	123760 18 psi	123762	123764 18 psi	123766 180 psi	123768	123830	123832
<b>1/4"</b> 6.4mm	<b>3/16"</b> 4.8mm	<b>1/32"</b> 0.8mm	123770	123772	123774 10 psi	123776	123778 10 psi	123780	123782	123834 175 psi	123836
<b>3/8"</b> 9.5mm	<b>3/16"</b> 4.8mm	<b>3/32"</b> 2.4mm	123838	123840	123842 25 psi	123844	123846 25 psi	123848	123850		
<b>3/8"</b> 9.5mm	<b>1/4"</b> 6.4mm	<b>1/16"</b> 1.6mm	123852 51 psi	123854	123856 11 psi	123858	123860 11 psi	123862 120 psi	123864		
<b>7/16"</b> 11.1mm	<b>5/16"</b> 7.9mm	<b>1/16"</b> 1.6mm	123784 46 psi	123786	123788 10 psi	123790	123792 10 psi	123794 80 psi	123796		

LPF is an abbreviation for Low-Pressure Fluoroelastomer.

Pressure recommendations are for water at 23°C. Other fluids and temperatures may have different maximum pressure recommendations.



# Also Available from Spectrum Chromatography

## Instrumentation

Spectrum Chromatography manufactures all of the instruments necessary for a complete Low Pressure Chromatography system. With the CF-1 Fraction Collector the system can be controlled to perform a complete separation once the sample has been injected. This includes shunting the void volume to waste, collecting the peaks of interest, and stopping the pump when the separation is complete. Systems ranging from simple isocratic systems using gravity flow to nonlinear gradient systems are available. Call a Spectrum Technical Service Representative at (800) 459-9700 and you will receive professional assistance in customizing a system to your individual separation requirements.



### UV Detector

The Spectra/Chrom Model 280 UV Monitor is a UV Absorbance detector suitable for use in both HPLC and low-pressure liquid chromatographic applications.

It features a fast warm-up time of 5 minutes and includes a reference flow path for background subtraction, even when using heavily absorbing solvents in gradients. The auto-zero feature makes baseline adjustments a snap.

Included with the detector is a 5 mm pathlength dual-channel flow cell and filters for use at 254 and 280 nm.

The Model 280 UV Monitor is CE marked. A variety of other options and flow cells are available, contact Spectrum for details, or view them on-line at <http://www.uvmonitor.com>.



### Solvent Saver System

The microprocessor controlled Solvent Saver System is specifically suited to both LC and HPLC. It uses a sensitive level sensing circuit to shunt the eluant to waste whenever the output from the system detector exceeds a preset level. After the contaminant (normally a component of the sample) has passed, and the output from the system detector drops below the programmed level, the uncontaminated solvent will be returned to the solvent reservoir.

The programmed level may be positive only (for use with unipolar detectors like UV absorbance monitors) or both positive and negative (for use with bipolar detectors like RI monitors). The detector can handle up to a 50% overrange and continuously displays its status and the signal level. The recycle valve can also be set manually or by remote control to remain in either the recycle or waste position. A Q.A. validation signal continuously indicates the valve's position.

## Ordering Information

Part No.	Description
142600	UV Detector, 115V, includes 254 and 280 nm and 5 mm pathlength flow cell
142602	UV Detector, 230V, includes 254 and 280 nm and 5 mm pathlength flow cell
142640	Dual flow cell, 10 mm pathlength, for Model 280 UV Monitor
142100	Solvent Saver System, 115V
142102	Solvent Saver System, 230V

## Chromatography Instrumentation



### CF-1 Fraction Collector

The CF-1 Fraction Collector is a versatile fraction collector, used in both low-pressure and HPLC applications. It can collect fractions based on time, number of drops, or amount of pumped volume. With optional racks it can accommodate up to 174 tubes that range from 10 to 28 mm in diameter. (The racks included with the fraction collector are for 12 to 13 mm diameter tubes.)

The CF-1 eliminates cross-contamination problems while giving you all the high tech features of X-Y fraction collectors. When connected to any detector or monitor with a .01 to 1 V output, the built in peak separator can be used to separate and collect peaks from the eluant stream. Unwanted peaks and the eluant between peaks

can be sent to a waste container using the optional diverter valve. Ten easy-to-program time windows allow you to completely define the collection, including rejection of the void volume.

The CF-1, like all of Spectrum's instruments, is both cold- and hot-room compatible. It can be used from -2 to +40°C, even in humid atmospheres. The internal polyolefin drip shield mitigates the effects of even large spills.

### Ordering Information

Part No.	Description
124845	CF-1 Fraction Collector, 115V, includes 124853 racks and drop counter
124846	CF-1 Fraction Collector, 230V, includes 124853 racks and drop counter
124853	Racks for CF-1 Fraction Collector, hold up to 174 12-13mm tubes
124854	Racks for CF-1 Fraction Collector, hold up to 116 10mm to 16mm tubes
124855	Racks for CF-1 Fraction Collector, hold up to 116 17-18mm tubes
124856	Racks for CF-1 Fraction Collector, hold up to 42 28mm scintillation vials
124858	Dust cover for CF-1 Fraction Collector
124849	3-Way Diverter valve for CF-1 Fraction Collector

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