Custom Packed GC Columns

Packed GC Column

- Custom-packed to your specifications
- Quality supports and stationary phases
- Includes standard brass fittings
- Fast delivery - made in our own facility

For Glass GC Columns , see pages 30 - 33

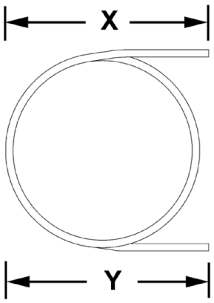
We make custom-packed GC columns using high-quality materials. Any stationary phase can be chosen from our listings on page 36 - 37, in combination with nearly all listed supports. The use of other stationary phases and those not listed in the Packing Surcharge Table are subject to special quotation.

Columns are supplied as 6" diameter coils, unless instrument make and model is specified or dimensions are specified.

Stationary Phases

Usually the solid support will be coated with a liquid stationary phase. Exceptions are molecular sieves and porous polymers such as HayeSep®, Porapak® or Chromosorb Century Series®, which are normally used un-coated. For a complete listing of available stationary phases, see pages 36 - 37.

Length of injector arm.



Length of detector arm.

Span, the distance between arms, tube center to tube center.

Solid Supports

Diatomaceous Earth Supports

- Chromosorb® G (AW, NAW, AW-DMCS)
- Chromosorb P (AW, NAW, AW-DMCS, HMDS)
- Chromosorb W (AW, NAW, AW-DMCS, HMDS, HP)

Porous Polymer Supports

- Chromosorb 101,102, 103, 104, 105, 106, 107, 108
- HaySep A, B, C, D, DB, DIP, N, P, Q, R, S, T
- Tenax®
- Porapak N, PS, Q, QS, R, S, T

Molecular Sieves

- 4A, 5A, 13X

Miscellaneous Supports

- Chromosorb T (PTFE)
- Carbon Molecular Sieves

Note*

- NAW - not acid washed
- AW - acid washed
- AW-DMCS - acid washed and silanized
- HMDS - silanized with hexamethyl disilazane
- High Performance (HP) - specially treated for superior inertness and column efficiency

**For complete descriptions, see individual listings on pages 34 - 39. For other supports, please call 800-327-3800 for a quote.*

Custom Packed GC Columns

To Order a Custom Column

Use the catalog number from the Item Number Guide to indicate column diameter and approximate length. Then specify the exact length needed, as well as other requirements for the solid support and stationary phase, using the listings below.

Item Number Guide

Length Meters	Length Feet	1/8" OD	1/4" OD	1/16" OD	3/16" OD
0.3 - 1.1	1 - 3.9	**455501**	**455521**	**455541**	**455502**
1.2 - 2.1	4 - 6.9	**455503**	**455523**	**455543**	**455504**
2.2 - 3.0	7 - 9.9	**455505**	**455525**	**455545**	**455506**
3.1 - 3.9	10 - 12.9	**455507**	**455527**	**455547**	**455508**
4.0 - 4.8	13 - 15.9	**455509**	**455529**	**455549**	**455510**
4.9 - 5.7	16 - 18.9	**455511**	**455531**	**455542**	**455512**
5.8 - 6.6	19 -21.9	**455513**	**455533**	**455544**	**455514**
6.7 - 7.5	22 - 24.9	**455515**	**455535**	**455546**	**455516**
7.6 - 8.5	25 - 28	**455517**	**455537**	**455548**	**455518**

Custom Column Ordering

To completely specify a custom column, please provide the information requested below.

1. Item Number
2. Length - feet or meters
3. Tubing Material - stainless steel
4. Stationary Phase** - see listings page 36 - 37. *Phases subject to surcharges; see Table 1*
   A) Stationary Phase 1, plus % loading
   B) Stationary Phase 2* (if dual phase), plus % loading
5. Solid Support - specify material and grade (for example, Chromosorb® W-AW; HayeSep® D)
   Expensive supports have surcharges; see Table 2
   A) Support
   B) Mesh Size - specify one 60/80, 80/100 or 100/120
6. Instrument Manufacturer
7. Model Number
8. Fittings - brass or stainless steel*
9. Configuration (optional) - for instruments or shapes not shown on pages 31 - 33, please include a drawing with accurate dimensions

Table 1
Stationary Phase Surcharges
Surcharges apply to the following expensive phases:
- EGSS-X
- OV-225
- OV-275
- OV-330
- OV-1701
- Polyphenylether
- Silars
- Dexsils

Table 2
Support Surcharges
- Chromosorb T
- Carbon Molecular Sieves
- HayeSep
- Porapak®
- Chromosorb 101 - 109
- Tenax®
- Carbopacks

**Surcharge will be added*
***Not required with solid adsorbents such as HayeSep, Molecular Sieves, etc.*

Glass Columns - Silane Treated

Glass Column

- Custom Packed to your specifications
- Silanized for inertness
- High quality
- Available for most instruments

**For Stainless Steel columns see pages 28 - 29*

CRS's glass columns are made from 1/4" OD precision-bore borosilicate tubes (5 mm OD for Shimadzu instruments), which are silanized for inertness. They are individually packaged for safe shipment. All glass columns include 1/4" brass fittings and graphite ferrules (except columns for Shimadzu instruments, provided with graphite ferrules only).

Column Configuration (pages 31 - 33). The length of the "arms" is indicated by dimensions X and Y. These dimensions along with the span between the arms allows confirmation that the column will fit correctly in your instrument.

Column Installation All of our glass columns are supplied with nuts and graphite ferrules. We recommend graphite ferrules because they are soft, to seal securely around the column without excessive tightening. They will not stick to the glass, for easy removal. Complete installation instructions are included with each column.

Recommended Accessories:

- **1/4" Graphite ferrules (10/pk) -** Item 211400

To Order a Packed Column

Specify the "empty" catalog number with a "P" added to the end, and specify the packing (example: 3% OV-225 on Chromosorb® W-HP, 80/100 mesh). Some expensive packing materials are subject to a surcharge; see the Surcharge Table.

1. Catalog Number
2. Stationary Phase (see listings on page 36 - 37)

   Expensive phases have surcharges; see Surcharge Table

   A) Stationary Phase 1

   % Loading

   B) Stationary Phase 2 - Surcharge for dual phase columns

   % Loading
3. Solid Support - Specify material and grade (example: Chromosorb W-AW; HayeSep® D)

   Expensive supports have surcharges; see Surcharge Table

   C) Support

   D) Mesh Size- specify one: 60/80, 80/100, or 100/120

Surcharge Table: Surcharges apply to the following expensive phases:

Stationary Phase Surcharges

- Dexsils
- EGSS-X
- OV-225
- OV-275
- OV-330
- OV-1701
- Polyphenylether
- Silars

Support Surcharges

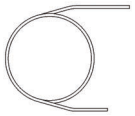
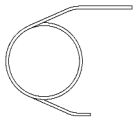
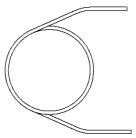
- Chromosorb T
- Carbon Molecular Sieves
- HayeSep
- Porapak®
- Chromosorb 101 - 109
- Tenax®
- Carbopacks

Glass Columns- Silane Treated

When Ordering a Packed Column

Add a “P” to the empty column part number, for example 220-022P, and specify the packing (example: 3% OV-225 on Chromosorb W-HP, 80/100 mesh). Please provide information on the packing support and stationary phase needed, see page 30.

For Agilent Instruments

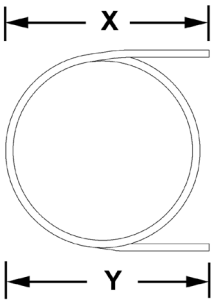
Agilent Instrument	Drawing (not to scale)	Column Dimensions	Length	2mm ID Item No.	4mm ID Item No.
5880, 5890, 5987, 6890 Configuration A OCI		X= 280 mm	2ft	**220-022**	
		Y= 230 mm	3ft	**220-032**	
		S= 229 mm	4ft	**220-042**	**220-044**
			6ft	**220-062**	**220-064**
			2m	**220-2.0M2**	**220-2.0M4**
			8ft	**220-082**	
			10ft	**220-102**	
			other	**220-S2**	**220-S4**
Configuration B OCI		X= 280 mm	2ft	**221-022**	**221-024**
		Y= 180 mm	6ft	**221-062**	**221-064**
		S= 229 mm	other	**221-S2**	**221-S4**
5830, 5840, 5985 OCI 152 mm span		X= 272 mm	3ft	**216-032-6**	**216-034-6**
		Y= 180 mm	4ft	**216-042-6**	**216-044-6**
		S= 152 mm	6ft	**216-062-6**	**216-064-6**
			8ft	**216-082-6**	
			10ft	**216-102-6**	
			other	**216-S2-6**	**216-S4-6**
OCI, 229 mm span		X= 272 mm	3ft	**216-032-9**	
		Y= 182 mm	6ft	**216-062-9**	**216-064-9**
		S= 229 mm	8ft	**216-082-9**	
			10ft	**216-102-9**	
			other	**216-S2-9**	**216-S4-9**
5830, 5840, 5985 NOCI		X= 227 mm	2ft	**217-022-6**	
		Y= 235 mm	3ft	**217-032-6**	
		S= 152 mm	6ft	**217-062-6**	**217-064-6**
			10ft	**217-102-6**	
			other	**217-S2-6**	**217-S4-6**
NOCI, 229 mm span		X= 227 mm	2ft	**217-022-9**	
		Y= 235 mm	6ft	**217-062-9**	
		S= 229 mm	other	**217-S2-9**	**217-S4-9**

X = Injector arm
Y = Detector arm
S = Span (distance between arms)

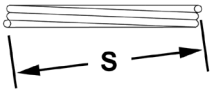
Note
NOCI = not on-column injection
HOCI = heated on-column injection
OCI = on-column injection

Glass Columns - Silane Treated

Length of injector arm.



Length of detector arm.

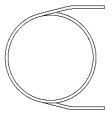
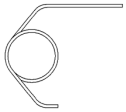
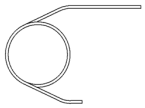
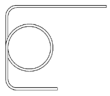
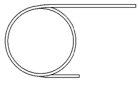


Span, the distance between arms, tube center to tube center.

When Ordering a Packed Column

Add a “P” to the empty column part number, for example 220-022P, and specify the packing (example: 3% OV-225 on Chromosorb W-HP, 80/100 mesh). Please provide information on the packing support and stationary phase needed, see page 30.

For PerkinElmer Instruments

PerkinElmer Instrument	Drawing (not to scale)	Column Dimensions	Length	2mm ID Item No.	4mm ID Item No.
115, 900, 990, F30, 2000 2100, 3920, Sigma Series NOCI		X= 219 mm	2ft	**222-022**	**222-024**
		Y= 219 mm	3ft	**222-032**	**222-034**
		S= 222 mm	4ft	**222-042**	**222-044**
			6ft	**222-062**	**222-064**
			8ft	**222-082**	
			other	**222-S2**	**222-S4**
3920, 910, 990, HOCI All glass system		X= 260 mm	3ft	**224-032**	
		Y= 117 mm	6ft	**224-062**	
		S= 222 mm	10ft	**224-102**	
			other	**224-S2**	**224-S4**
Sigma Series HOCI		X= 320 mm	3ft	**223-032**	
		Y= 181 mm	6ft	**223-062**	**223-064**
		S= 222 mm	10ft	**223-102**	
			other	**223-S2**	**223-S4**
Sigma 2000		X= 270 mm	3ft	**290-032**	
		Y= 139 mm	6ft	**290-062**	**290-064**
		S= 222 mm	other	**290-S2**	**290-S4**
Autosystem 8000, 8300 Series NOCI		X= 173 mm	3ft	**226-032**	**226-034**
		Y= 173 mm	6ft	**226-062**	**226-064**
		S= 165 mm	other	**226-S2**	**226-S4**
Autosystem 8000, 8300 Series OCI		X= 305 mm	3ft	**227-032**	**227-034**
		Y= 173 mm	6ft	**227-062**	**227-064**
		S= 165 mm	other	**227-S2**	**227-S4**

X = Injector arm
Y = Detector arm
S = Span (distance between arms)

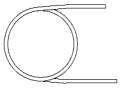
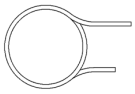
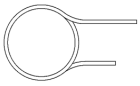
Note
NOCI = not on-column injection
HOCI = heated on-column injection
OCI = on-column injection

Glass Columns - Silane Treated

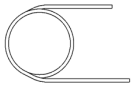
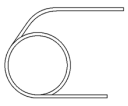
For Shimadzu Instruments - Fittings are not supplied with Shimadzu columns

Shimadzu Instrument	Drawing (not to scale)	Column Dimensions	Length	3mm ID Item No.
GC-4BM, 14A/B, GC-6A, -7AG, -9A, 15A, 16A		X= 335 mm	1.7 m	**284-1.7M3**
		Y= 282 mm	2.5 m	**284-2.5M3**
		S= 40 mm	2.0 m	**284-2.0M3**
			other	**284-S3**
17A, 2010, 2014		X= 192 mm	1.7 m	**288-1.7M3**
		Y= 192 mm	2.0 m	**288-2.0M3**
		S= 205 mm		

For Thermo Instruments

Thermo Instruments Instrument	Drawing (not to scale)	Column Dimensions	Length	2mm ID Item No.	4mm ID Item No.
Trace 2000, NOCI Left to Left Det. Rt. to Rt. Det.		X= 180 mm	0.9 m	**297-0.9M2**	**297-0.9M4**
		Y= 200 mm	1.8 m	**297-1.8M2**	**297-1.8M4**
		S= 135 mm	2 m	**297-2M2**	**297-2M4**
			other	**297-S2**	**297-S4**
Trace 2000, NOCI Left to Rt. Det. Rt. to Left Det.		X= 200 mm	0.9 m	**296-0.9M2**	**296-0.9M4**
		Y= 175 mm	1.8 m	**296-1.8M2**	**296-1.8M4**
		S= 78 mm	2.0 m	**296-2M2**	**296-2M4**
			other	**296-S2**	**296-S4**
Trace 2000, OCI Left to Rt. Det. Rt. to Left Det.		X= 245 mm	1.8 m	**298-1.8M2**	**298-1.8M4**
		Y= 203 mm	2.0 m	**298-2M2**	**298-2M4**
		S= 78 mm			

For Varian Instruments

Varian Instrument	Drawing (not to scale)	Column Dimensions	Length	2mm ID Item No.	4mm ID Item No.
3700,4400, 4600, 6000 Vista Series, FID, ECD TSD		X= 236 mm	3ft	**248-032**	**248-034**
		Y= 203 mm	4ft	**248-042**	
		S= 140 mm	6ft	**248-062**	**248-064**
			2m	**248-2M2**	**248-2M4**
			8ft	**248-082**	
			10ft	**248-102**	**248-104**
			other	**248-S2**	**248-S4**
3300, 3400, 3600 Inj. A to Det. A		X= 203 mm	3ft	**255-032**	**255-034**
		Y= 236 mm	6ft	**255-062**	**255-064**
		S= 140 mm	other	**255-S2**	**255-S4**
Inj. B to Det. B		X= 236 mm	3ft	**256-032**	**256-034**
		Y= 203 mm	6ft	**256-062**	**256-064**
		S= 173 mm	other	**256-S2**	**256-S4**

Solid Supports and Adsorbents

Chromosorb® Supports

These are based on diatomaceous earths and are the traditional supports for gas chromatography. To alter their characteristics or make them more inert, several treatments have been developed. These include

- **NAW** (non-acid washed) - untreated
- **AW** (acid washed) - hydrochloric acid washed to remove minerals and reduce activity
- **AW-DMCS** (acid washed; Dimethyldichlorosilane treated) - silanization greatly reduces surface activity and peak tailing
- **HP** (high performance) - proprietary treatment featuring superior inertness

Chromosorb W

Chromosorb W

This is the most popular grade for GC work. It is white and relatively non adsorptive. Flux calcined. Care is needed when preparing packings and filling columns to avoid damaging the support. Maximum loading of stationary phase is 15% by weight. 100g/ bottle

Chromosorb W		Mesh Size		
Type	**Weight, g**	**60/80**	**80/100**	**100/120**
NAW	100	**480001**	**480002**	**480013**
AW	100	**480003**	**480004**	**480005**
AW-DMCS	100	**480006**	**480008**	**480009**
HP	100	**480010**	**480011**	**480012**

Chromosorb P

Chromosorb P

Chromosorb P is orange-pink and relatively hard. It is a calcined diatomite made from firebrick. Its structure makes it sturdy and capable of adsorbing more liquid phase than other supports. Maximum loading of stationary phase is 30% by weight. 100g/ bottle

Chromosorb P				Mesh Size	
Type	**Weight, g**	**45/60**	**60/80**	**80/100**	**100/120**
NAW	100	**482001**	**482002**	**482003**	
AW	100		**482005**	**482006**	
AW-DMCS	100		**482008**	**482009**	**482010**

Supports and Adsorbents

Chromosorb Century Series®

These are synthetic cross-linked porous polymer supports that are often used alone; they provide separations based on their pore sizes and adsorptive effects. 50g/ bottle

- **Chromosorb 101** - Proprietary polymer. For aqueous samples - alcohols, fatty acids, glycols, ethers, esters, vinyl chloride, acrylonitrile and chlorinated solvents
- **Chromosorb 102** - Styrene/ divinylbenzene. For gases and low -boiling compounds.
- **Chromosorb 103** - For amines and basic compounds
- **Chromosorb 105** - Polyaromatic resin. Separates formaldehyde from water and methanol; acetylene from lower hydrocarbons, good for most organics < 200°C
- **Chromosorb 106** - Styrene-divinylbenzene; non-polar. Gases and low-boiling compounds
- **Chromosorb 107** , **108** - Moderately polar acrylic ester resin. 107 has a surface area between 400 - 500 m^2/g; 108 between 100 - 200 m^2/g. 107 is preferred for trapping and analyzing vinyl acetate; 108 is for gases and aqueous compounds

Chromosorb Century Series		Mesh Size		
Type	**Weight, g**	**60/80**	**80/100**	**100/120**
101	50	**483601**	**483701**	**483801**
102	50	**483602**	**483702**	**483802**
103	50	**483603**	**483703**	**483803**
105	50	**483605**	**483705**	**483805**
106	50	**483606**	**483706**	**483806**
107	50	**483607**	**483707**	**483807**
108	50	**483608**	**483708**	**483808**

Chromosorb 101

Molecular Sieves

Molecular sieves are synthetic alumino-silicates of sodium, potassium or calcium, of various pore sizes. The pores are precisely uniform in size. Molecular Sieves are used to separate the fixed gases. CO, CH_4, O_2 and Ar are easily separated at room temperature. 100g/ bottle

	Mesh Size			
Support	**40/60**	**60/80**	**80/100**	**100/120**
Molecular Sieve 4A, 100 g	**485320**	**485323**	**485326**	**485330**
Molecular Sieve 5A, 100 g	**485333**	**485336**	**485339**	**485442**
Molecular Sieve 13X, 100g	**485445**	**485448**	**485451**	**485454**

Molecular Sieve 5A

Tenax®

Tenax is a porous polymer based on 2,6-diphenyl-p-phenylene oxide, used both as a column packing material and for trapping volatiles and organics. It is especially suited for high boiling liquids because of its thermal stability; the maximum temperature limit is 375°C. Tenax is an excellent trapping material since it adsorbs volatiles at room temperature, and efficiently desorbs the same materials at 300°C. Surface area 35 m^2/g. Requires preconditioning.

		Mesh Size		
Support	**Weight, g**	**35/60**	**60/80**	**80/100**
Tenax	5	**482021**	**482022**	**482023**
Tenax	25	**482025**	**482026**	**482028**
Tenax	100	**482029**	**482030**	**482031**

Stationary Phases

Description	Sugg. Subst.	Sol	McReynold's 1	2	3	4	5	°C Min/Max	Item No.	Qty
Apiezon L		C	32	22	15	32	42	20/300	**010017**	50 g
Bentone 34		T,C						20/200	**010030**	50 g
Carbowax 400 (G20)		T	343	653	430			20/100	**010051**	*
Carbowax 1000 (G14)		M	347	607	418	626	589	40/150	**010059**	50 g
Carbowax 1500		C						40/200	**010061**	*
Carbowax 1540		C	371	639	453	666	641	40/200	**010063**	50 g
Carbowax 4000 (G15)		C	317	545	378	578	521	60/200	**010065**	50 g
Carbowax 20M (G16)		C	322	536	368	572	510	60/200	**010069**	50 g
Carbowax 20M Terephthalic acid (TPA)(G25)		C	321	537	367	573	520	60/250	**010071**	50 g
Dexsil 300 (G33)		T	47	80	103	148	96	20/450	**010093**	5 g
Dexsil 400		T	59	114	140	187	173	20/450	**010094**	5 g
Dexsil 410		T	85	165	169	242	180	20/450	**010095**	5 g
Dibutyl phthalate		M						-20/100	**010099**	*
Diethylene glycol adipate (DEGA)		A	378	603	460	665	658	20/190	**010103**	25 g
Diethylene glycol succinate (DEGS) (G4)		A	496	746	590	837	835	20/200	**010105**	25 g
Di (2-Ethylhexyl) phthalate (Octoil)		M	135	254	213	320	235	20/150	**010107**	50 g
Di (2-Ethylhexyl) sebacate (Octoil S) (G12)		A	72	168	108	180	125	-20/125	**010109**	50 g
Diisodecyl phthalate (DIDP) (G24)		A	84	173	137	218	155	-20/150	**010115**	50 g
Dimethylsulfolane		M						20/50	**010129**	10 g
Dinonyl phthalate		A	83	183	147	231	159	20/150	**010133**	25 g
Dioctyl phthalate		A	92	186	150	230	167	-20/100	**010135**	50 g
Ethylene glycol adipate		T	372	577	455	658	619	100/200	**010145**	50 g
FFAP	OV-351	C	340	580	397	602	627	50/250	**010156**	25 g
Glycerol		M						20/100	**010161**	50 g
Halocarbon Oil 14-25		C						20/150	**010163**	50 g
Igepal CO-880		C	259	461	311	482	426	100/200	**010179**	50 g
Kel-F Oil No. 10		A						20/100	**010189**	50 g
B, B-Oxydipropiontirile		M						20/100	**010221**	*
Phenyldiethanolamine (G12)		A						0/150	**010225**	*
Polyphenyl ether (5 rings) OS-124		T	176	227	224	306	283	20/200	**010233**	*
Polyphenyl ether (6 rings) OS-138		T	182	233	228	313	293	0/250	**010235**	*
Sebaconitrile		C						0/75	**010244**	*
Silar (see Silicone Silar)										
Silicone DC-200, 350cstk	OV-101	T	16	57	45	66	43	20/250	**001010**	50 g
Silicone DC-200, 12,500cstk	OV-101	T	16	57	45	66	43	0/200	**001012**	50 g
Silicone DC-550 (G28)	OV-101	T	81	124	124	189	145	20/225	**001015**	50 g
Silicone DC-710	OV-101	A	107	149	153	228	190	20/225	**001018**	50 g
Silicone DC-QF-1	OV-210	A	144	233	355	463	305	20/250	**001021**	50 g
Silicone GE-SE-30	OV-1	T	15	53	44	64	41	50/300	**001023**	50 g
Silicone GE-SE-52	OV-73	T	32	72	65	98	67	50/300	**001025**	50 g
Silicone GE-SE-54	OV-73	T	33	72	66	99	67	100/300	**001026**	50 g
Silicone GE-SF-96	OV-101	T	12	53	42	61	37	20/250	**001027**	*
Silicone GE-XE-60	OV-225	A	204	381	340	493	367	20/250	**001029**	*

McReynold's Code
1 = Benzene
2 = Butanol
3 = 2-Pentanone
4 = Nitropropane
5 = Pyridine

Solvent Code
A = Acetone
T = Toluene
C = Chloroform
M = Methanol

**Available in packed columns only.*

Stationary Phases

Description	Sugg. Subst.	Sol	McReynold's 1	2	3	4	5	°C Min/Max	Item No.	Qty
Silicone OV-1 (Dimethyl) (G2)		T	16	55	44	65	42	100/350	**001041**	10 g
Silicone OV-3 (Methyl 10% Phenyl)		A	44	86	81	124	88	20/350	**001042**	25 g
Silicone OV-7 (80% Methyl 20% Phenyl)		A	69	113	111	171	128	20/350	**001043**	25 g
Silicone OV-17 (50% Methyl 50% Phenyl)		A	119	158	162	243	202	20/350	**001045**	25 g
Silicone OV-25 (Phenylmethyldiphenyl) (G17)		A	178	204	208	305	280	20/350	**001047**	10 g
Silicone OV-61 (Diphenyldimethyl)		A	101	143	142	213	174	20/250	**001048**	10 g
Silicone OV-73 (Diphenyldimethyl Gum) (G27)		T	40	86	76	114	85	20/350	**001049**	10 g
Silicone OV-101 (Dimethyl) (G1)		T	17	57	45	67	43	20/350	**001050**	20 g
Silicone OV-105 (Cyanopropyldimethyl)		A	36	108	93	139	86	20/250	**001051**	10 g
Silicone OV-202 (Trifluoropropylmethyl) (G6)		T	146	238	358	468	310	0/275	**001052**	10 g
Silicone OV-210 (Trifluoropropylmethyl)		T	146	238	358	468	310	20/275	**001053**	25 g
Silicone OV-215 (Trifluoropropylmethyl Gum)		T	149	240	363	478	315	20/275	**001057**	10 g
Silicone OV-225 (Cyanopropylmethyl phenyl)		A	228	369	338	493	386	20/250	**001054**	10 g
Silicone OV-275 (Dicyanoallyl)		A	629	872	763	1106	849	20/275	**001055**	5 g
Silicone OV-330 (Carbowax-Silicone)		A	222	391	273	417	368	30/250	**001056**	5 g
Silicone OV-351 (Replaces FFAP)		T	335	552	382	583	540	50/250	**001058**	10 g
Silicone OV-1701 (Dimethylphenylcyano)		A	67	170	153	228	171	20/325	**001059**	3 g
Silicone Silar 5CP		T	316	494	637	531		50/275	**001083**	5 g
Silicone Silar 10CP		T	520	757	660	941	890	50/276	**001086**	5 g
Silicone UCC W-982 (G9)	OV-1	T						0/300	**001035**	*
SP-2100	OV-101	T	17	57	45	67	43	20/350	-	
SP-2250	OV-17	A	119	158	162	243	202	20/350	-	
SP-2401	OV-202	T	146	238	358	468	310	0/275	-	
SP-1000	OV-351	T	332	555	393	583	546	50/250	-	
SP-2310	CRS-7CP	T	440	637	605	840	670	50/275	-	
SP-2330	CRS-9CP	T	490	725	630	913	778	50/275	-	
SP-2300	CRS-5CP	A	316	495	446	637	530	50/275	-	
SP-2340	CRS-10C	T	520	757	659	942	800	50/275	-	
Squalane		T	0	0	0	0	0	20/150	**010325**	*
Squalene		T	152	341	238	329	344	20/150	**010327**	*
THEED		M	463	942	626	801	893	20/125	**010347**	*
Triethanolamine		M						25/75	**010355**	*
1,2,3-Tris (2-Cyanoethoxy) Propane (TCEP)		M	594	857	759	1031	917	29/150	-	
Triton X-305		A	262	467	314	488	430	20/250	**010365**	*
UCON 50-HB-280-X		M	177	362	227	351	302	20/200	**010381**	50 g
UCON 50-HB-2000		A	202	394	253	392	341	20/200	**010383**	50 g
UCON 50-HB-5100		M	214	418	278	421	375	20/200	**010385**	50 g
Versamid 900								190/275	**010389**	*

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M = Methanol

**Available in packed columns only.*

Solid Supports and Adsorbents

HayeSep D

HayeSep® Porous Polymers

These polymer supports are suitable for a wide range of separations. HayeSep polymers are direct replacements for the equivalent type of Porapak®; for example HayeSep Q can be directly substituted for methods developed with PoraPak Q. Since there are virtually no chemically active sites in HayeSep polymers, silylation is not required.

HayeSep D - This is a high-purity divinylbenzene polymer with 80% highly-crosslinked DVB. It combines high surface area with a high operating temperature. HayeSep D polymers offer superior separation characteristics for light gases; significant separation abilities include the separation of CO and CO_2 from room air at ambient temperatures and the separation of acetylene prior to other C_2's. It is highly recommended for the separation of water and hydrogen sulfide. HayeSep D is available in three different porosities with surface areas from 774 to 800 m^2/g. This range is especially useful for certain difficult separations; for example water elutes before ethane with DB, but after ethane with Dip. Relative polarity for other HayeSep polymers is shown below; 1 is least polar and 10 is most polar.

See HayeSep Chromatograms page 40 - 41.

Type	Composition	Max. Temp*	Surface Area	Polarity**
A	DVB/EGDM	165°C	526 m^2/g	7
B	DVB/PEI	190	608	8
C	DVB/ACN	250	442	6
D	DVB, 80%	290	803	1
D_B	DVB, 80%	290	781	1
D_{IP}	DVB, 80%	290	774	1
N	DVB, EGDM	165	405	9
P	DVB, Styrene	250	165	3
Q	DVB, 60%	275	582	2
R	DVB/NVP	250	344	5
S	DVB/VP	250	583	4
T	EGDM	165	250	10

** Oxygen-free carrier gas*
*** 1 = lowest, 10 = highest*

Polymer Materials:

- **ACN** - Acrylonitrile
- **EGDM** - Ethyleneglycoldimethacrylate
- **NVP** - N-Vinyl-2-Pyrollidinone
- **PEI** - Polyethyleneimine
- **VP** - 4-Vinylpyridine
- **DVB** - Divinyl Benzene

HayeSep Polymers - 75 cc/ bottle

	Mesh Size		
Type	60/80	80/100	100/120
A	**483021**	**483022**	**483023**
B	**483024**	**483025**	**483026**
C	**483028**	**483029**	**483030**
D	**483031**	**483032**	**483033**
D_B	**483041**	**483042**	**483043**
D_{IP}	**483034**	**483035**	**483036**
N	**483001**	**483002**	**483003**
P	**483004**	**483005**	**483006**
Q	**483014**	**483015**	**483016**
R	**483008**	**483009**	**483010**
S	**483011**	**483012**	**483013**
T	**483018**	**483019**	**483020**

Solid Supports and Adsorbents

Porapaks®

Porapak column packing materials consist of spherical polymer beads. These packings are chemically and physically stable with consistent particle size, porosity and surface area.

Versatility for Special Applications

Porapak packing is a versatile polymer material available in different chemistries which increase in polarity and vary in retention properties for the efficient analysis of many compounds. These packing materials offer many advantages:

- Polar molecules elute quickly making analysis simple and straightforward
- No liquid phase eliminates stationary phase bleed
- No surface hydroxyl groups eliminates tailing of highly polar molecules orof large sample loads for trace analysis and preparative GC
- Stable baselines at high temperatures

Porapak Q

Porapak Retention Data - minutes*

Compound	P	Q	R	S	N	T
Air	.23	.24	.24	.24	.24	.24
Carbon Dioxide	.36	.65	.60	.66	.90	1.26
Nitric Oxide	.27	.30	.28	.26	.28	.28
Nitrous Oxide	.42	.76	.66	.81	.94	1.22
Methane	.26	.35	.32	.38	.35	.39
Ethylene	.45	1.15	.90	1.01	1.22	1.32
Acetylene	.53	1.15	1.16	1.20	2.00	2.96
Ethane	.54	1.15	1.16	1.36	1.50	1.54
Chlorodifluoromethane	1.22	4.32	5.61	5.61	10.99	13.88
Acetic Acid	.39	1.08	2.14	3.68	4.18	5.21
Propionic Acid	.65	2.42	4.75	9.05	9.11	10.68
Methanol	.24	.35	.39	.48	.61	.69
Ethanol	.30	.60	.63	.76	1.21	1.20
Benzene	.87	2.76	2.56	3.00	4.00	3.74
Toluene	1.33	5.72	5.31	6.41	8.54	7.61
Ethyl Benzene	2.09	11.60	10.69	12.98	17.58	15.05
o-Xylene	2.52	13.48	12.53	15.32	15.32	18.05
Methylene Chloride	.41	.98	.94	1.09	1.48	1.67
Carbon Tetrachloride	.75	2.87	2.42	2.98	3.49	3.04
Methyl Acetate	.38	1.01	.97	1.11	1.74	1.75
Ethylene Glycol	.94	2.39	3.36	4.19	9.34	12.43
Glycerol	4.92	19.15	-	-	-	-

**Operating conditions: 1m x 2.3 mm ID stainless steel column, 80/100 mesh, 175°C, 25 mL/ min helium flow; FID detector.*

Porapak Packings - Sold in bottles of approximately 75 cc

		Mesh Size		
Type	Weight, g	50/80	80/100	100/120
P	20	**489021**	**489022**	**489023**
Q	26	**489054**	**489055**	**489066**
R	24	**489088**	**489009**	**489010**
S	26	**489011**	**489012**	**489013**
N	29	**489001**	**489002**	**489003**
T	31	**489018**	**489019**	**489020**
QS*	26	**489014**	**489015**	**489016**
PS*	20	**489004**	**489005**	**489006**

**Silanized*

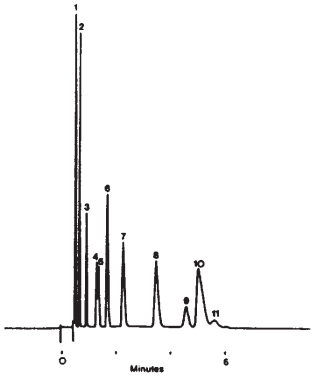
HayeSep® Applications

HayeSep columns are available in glass or metal, for most instruments. HayeSep porous polymers allow a range of separations still difficult to achieve with capillary columns.

HayeSep® Q For Sulphur Gas and Hydrocarbons

Column: 8' x 1/8" packed with HayeSep®, 80/100 mesh
Column Temp: 90°C
Flow: He 30cc/min.

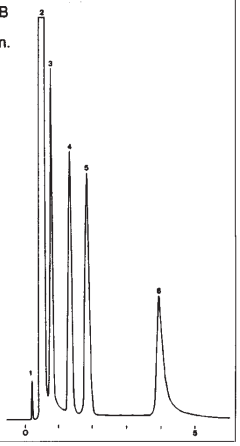
1. Air
2. Methane
3. Carbon Dioxide
4. Ethylene
5. Acetylene
6. Ethane
7. Hydrogen sulfide
8. Carbonyl Sulfide
9. Propylene
10. Propane
11. Propadiene



HayeSep® B for Amines

Column: 5' x 1/8" SS packed with HayeSep® B 80/100 mesh
Column Temp: 140°C up to 190°C at 16°C/min.
Injector Temp: 150°C
Detector: P.E. 900 T.C. 175 ma. 180°C
Attenuation x 8
Flow: He 30cc/min.
Sample: 0.2 ml with on-column injection

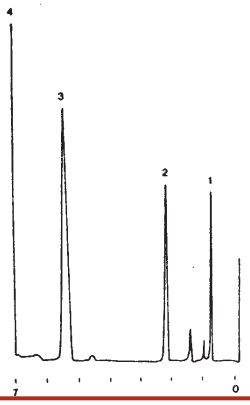
1. Air
2. Water
3. Methylamine
4. Dimethylamine
5. Trimethylamine
6. Ethylene diamine



HayeSep® R for Trace Water Analysis

Column: 9' x 1/8" Ni packed with HayeSep® R, 80/100 mesh
Column Temp: 118°C
Flow: He at 30cc/min.
Detector: Varain TC with Bendix On-Line analyzer
Sample: 10 microliter, Ethyl chloride

1. Air
2. Water 12ppm
3. Hydrogen Chrloside
4. Ethyl Chloride

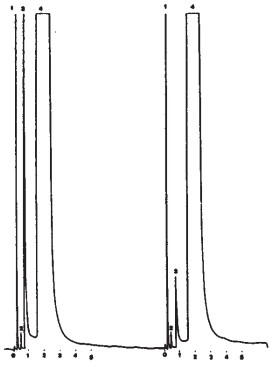


HayeSep® C for Trace Ammonia in Water

Column: 5' x 1/8" SS HayeSep® 80/100 mesh
Flow: He 30cc/min. 1ml sample
Column: 115°C
Injection: 140°C
Detector: 180°C P.E. 900 T.C. 225 ma
Attenuation x 2
Chart speed: 1 cm/min.

Trace 1
1. Air
2. Carbon Dioxide
3. 300 ppm Ammonia
4. Balance Water

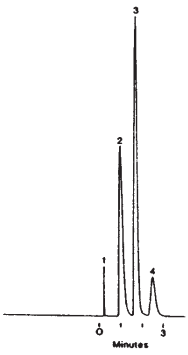
Trace 2
1. Air
2. Carbon Dioxide
3. 100 ppm Ammonia
4. Balance Water



HayeSep® T for Formaldehyde

Column: 5' x 1/8" packed with HayeSep® T, 100/120 mesh
Column Temp: 132°C
Injector Temp: 165°C
Detector: P.E. 900 T.C. 175 ma, 180°C
Attenuation x 32
Flow: He 30 cc/min.
Sample: 0.2 ml

1. Air
2. Formaldehyde
3. Water
4. Methanol

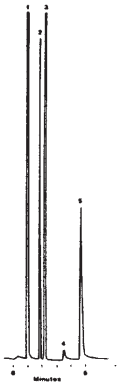


HayeSep® Applications

Gas Mixture

Column: 10' x 1/8" SS packed with HayeSep® D, 100/120 mesh
Column Temp: 80°C
Injector Temp: 140°C
Detector: PE 900 TC, 225ma, Att. x4
Flow: He at 30cc/min.
Sample: Valco Valve, 100 microliter

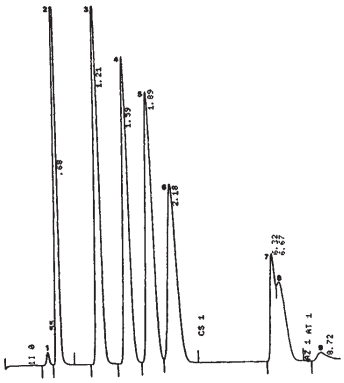
1. Nitrogen (balance)
2. Carbon Dioxide 2%
3. Nitrous Oxide 3%
4. Water 0.5%
5. Hydrogen Sulphide 3%



HayeSep® A for Hydrocarbon Gases

Column: 6' x 1/8" SS packed with HayeSep® A 60/80 mesh

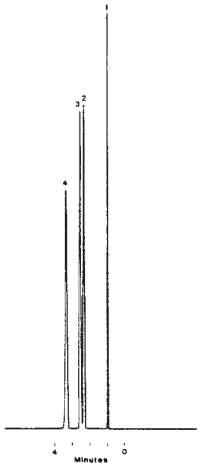
1. Air
2. Methane
3. Carbon Dioxide
4. Ethylene
5. Ethane
6. Acetylene
7. Propylene
8. Propane
9. Hydrogen



C1 - C2's

Column: 10' x 1/8" SS packed with HayeSep D, 100/120 mesh
Column Temp: 80°C Isothermal
Detector: 3700 Varian FID
Range: 10⁻¹¹ Att. x 16
Flow: Helium 35 cc/min

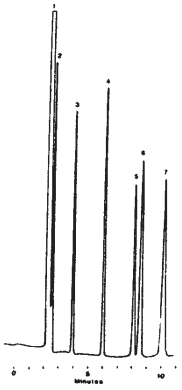
1. Methane 1%
2. Acetylene 1%
3. Ethylene 1%
4. Ethane 1%



Scott Mix 216 (Programmed)

Column: 20' x 1/8" Ni packed with HayeSep® D, 100/120 mesh
Column Temp: 40°C/2 min. programmed up to 110°C at 24°C/min.
Injector Temp: 100°C
Detector: PE 900 TC, 225ma, 140°C, Att. x 2
Flow: He at 30cc/min.
Sample: Valco Valve, 100 microliter (ambient)

1. Nitrogen (balance)
2. Carbon Monoxide 1%
3. Methane 1%
4. Carbon Dioxide 1%
5. Acetylene 1%
6. Ethylene 1%
7. Ethane 1%



Trace Acetaldehyde in Air 2500 ppm

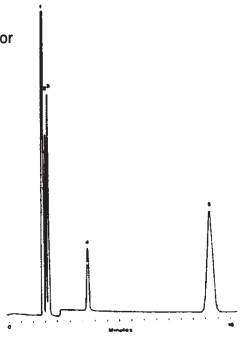
Column: 3' x 1/8" ss packed with HayeSep® D, 100/120 mesh
Column Temp: 100°C
Injector Temp: 140°C
Detector: PE 900 TC, 225 ma, 140°C
Flow: He at 30cc/min.
Sample: Valco Valve, 100 microliter

1. Air
2. Water
3. Acetaldehyde 2500ppm (vol.)

Scott Mix 237

Column: 20" x 1/8" Ni packed with HayeSep® D, 100/120 mesh
Column Temp: 25°C
Injector Temp: 100°C
Detector: PE 900 TC, 225ma, 140°C
Flow: He at 30cc/min.
Sample: Valco Valve, 50 microliter vapor

1. Nitrogen (balance)
2. Oxygen 7%
3. Carbon Monoxide 7%
4. Methane 4.5%
5. Carbon Dioxide 15%



Custom-Coated Packings

444444

CRS provides custom-coated GC packings made to your specifications, using any of the stationary phases listed on page 36 - 37, and all common solid supports. The price of custom packings is based on the support used. Expensive stationary phases are subject to surcharge. To order, please specify the following:

- **Item No. 444444**
- **Solid Support -** ex. Chromosorb W-HP
- **Stationary phase -** ex. Carbowax 20M
- **Loading percent-** 15% maximum for Chromosorb W; 30% maximum for Chromosorb P
- **Mesh Size -** ex. 80/100
- **Quantity -** specify 20 g, 50 g, or 100 g

Support Guide

Support	Mesh Sizes Available		
Chromosorb® W-HP (higher quality W-AW-DMCS)	60/80	80/100	100/120
Chromosorb G-HP	60/80	80/100	100/120
Chromosorb 750 (newer version of W-HP)	60/80	80/100	100/120
Chromosorb 101, 102, 103, 105, 106, 107, 108	60/80	80/100	100/120
Chromosorb P (NAW, AW, HMDS, AW-DMCS)	60/80	80/100	100/120
Chromosorb G (NAW, AW, AW-DMCS)	60/80	80/100	100/120
Chromosorb W (NAW, AW, HMDS, AW-DMCS)	60/80	80/100	100/120
Chromosorb T	30/60	40/60	
HayeSep® (Type A through T)	60/80	80/100	100/120
Porapaks®	50/80	80/100	

Stationary Phase Surcharge Table

The following phases are subject to surcharge:

- EGSS-X
- OV-225
- OV-275
- OV-330
- OV-1701
- Polyphenylether (6-ring)
- Silars
- Dexsils
- Tenax®

Dual phases are subject to surcharge.

Packing Accessories

Glass Wool; Quartz Wool

CRS offers five kinds of glass or quartz wool, for nearly all chromatographic needs. These are recommended for use in injection liners, and as end plugs in packed columns. Glass wool is sold in 50 g quantities; quartz wool is sold in 10 g quantities.

- **Untreated** - soft, fine-denier Pyrex® wool
- **Silane Treated** - treated with dimethyldichlorosilane (TMCS) to yield an inert material for all-around use
- **Phosphoric Acid Treated** - recommended for analysis of acidic compounds such as free acids, phenols and glycols
- **HMDS Treated** - a superior method of deactivation, using hexamethyldisilazne. Pesticide grade 10 g
- **Quartz Wool** - made from high purity quartz with low metal-oxide impurities. Ideal for use with injection port liners. Fibers have 9 um nominal diameter

Glass Wool

Description	Item No.
Untreated Glass Wool	**486315**
Phosphoric Treated Glass Wool	**486316**
Silane Treated Glass Wool	**486318**
HMDS Treated Glass Wool, 10 g	**486319**
Quartz Wool	**486320**

FID Cleaning Kit

Use this kit to clean both the jet tip and collector. It includes three jet reamers 0.016”, 0.019” and 0.024” OD; one mini-drill bit 0.0102” OD, two wire mini-brushes, one brass and one stainless steel; and a dual ended handle for the reamers and brushes.

205220

Description	Item No.
FID Cleaning Kit	**205220**

Glass Wool Inserter

Used for inserting glass wool into packed columns. Simply wrap a small piece of glass wool around the tip to push it into the column.

486310

Description	Item No.
Glass Wool Inserter	**486310**

Glass Wool Puller

This is used for pulling glass wool out of packed columns, traps or injection port liners. It has a 1 1/4” spiral barb cut into the tip, which acts as a ratchet. For 1/4” to 2 mm IDs.

486313

Description	Item No.
Glass Wool Puller	**486313**

Accessories

GC End Caps

End Caps

Flexible and soft, to easily fit over the outside diameter of tubing. They are useful for sealing GC columns for storage.

Description	Qty.	Item No.
GC End Caps, 1/16”	100/pk	**205121**
GC End Caps, 1/8”	100/pk	**205122**
GC End Caps, (3/16”) 5 mm	100/pk	**205123**
GC End Caps, 1/4”	100/pk	**205124**

Vibrograver

Vibrograver

Permanently engraves all hard and semi-hard surfaces; recommended for making column tags and tools. The etched information cannot be erased, wiped off, or rubbed out. Comes with a carbide tip.

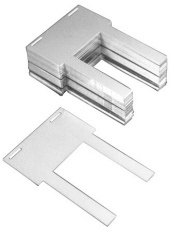
Description	Voltage	Item No.
Vibrograver	110/120	**486211**
Vibrograver	230/240	**486212**
Spare Diamond Tip		**486213**
Spare Carbide Tip		**486214**

205250

Packed Column Change Kit

The Column Change Kit includes three ratchet wrenches, 7/16”, 1/2” and 9/16”; one Imp® Tubing cutter, and one roll of 12.5 mm PTFE tape. The ratchet wrenches are ideal for tight spaces; the ratchet tips can be opened, then snapped closed around the fittings.

Description	Item No.
Column Change Kit	**205250**



486111

Column Tags, Aluminum

For packed columns; also useful for labeling computer cables, gas lines, etc. Aluminum tags are easy to inscribe and provided permanent record that cannot be erased. 22 mm x 41 mm.

Description	Qty.	Item No.
Packed Column Tags	100/pk	**486111**

To Order a Packed Column

To Order a Packed Column

1. Catalog Number

- Specifies the type of material - glass or stainless steel
- Specifies the length of the material - 3ft, 6ft, etc
- Specifies the shape of the column - which instrument it fits

2. Which support is required? The most common are listed below:

- Chromosorb Century Series®
- Chromosorb W
- Chromosorb P
- Molecular Sieve
- HayeSep®
- Porapak®

3. Specify the type of support

- Chromosorb Century Series - 101, 102, 103, 105, 106, 107, 108
- Chromosorb W - W-NAW, W-AW, W-AW-DMCS, W-HP
- Chromosorb P - P-PAW, P-AW, P-AW-DMCS
- Molecular Sieve - 4A, 5A, 13X
- HayeSep - A, B, C, D, N, P, Q, R, S, T
- Porapak - P, Q, R, S, N, T

4. What mesh size is required?

- Chromosorb - 60/80, 80/100, 100/120
- Molecular Sieve - 40/60, 60/80, 80/100, 100/120
- HayeSep - 60/80, 80/100, 100/120
- Porapak - 50/80, 80/100, 100/120

5. What type of Stationary Phase is needed (if any)? Up to 2 phases

- Chromosorb Century Series, Molecular Sieve, HayeSep, Porapaks do not require a stationary phase
- Chromosorb W and Chromosorb P require a stationary phase

6. What % loading is needed on the stationary phase?

- Chromosorb W - maximum loading is 15%
- Chromosorb P - maximum loading is 30%

Surcharge Table: Surcharges apply to the following expensive phases

Stationary Phase Surcharges

- Dexsils
- EGSS-X
- OV-225
- OV-275
- OV-330
- OV-1701
- Polyphenylether
- Silars

Support Surcharges

- Chromosorb T
- Carbon Molecular Sieves
- HayeSep
- Porapak
- Chromosorb 101 - 109
- Tenax®
- Carbopacks