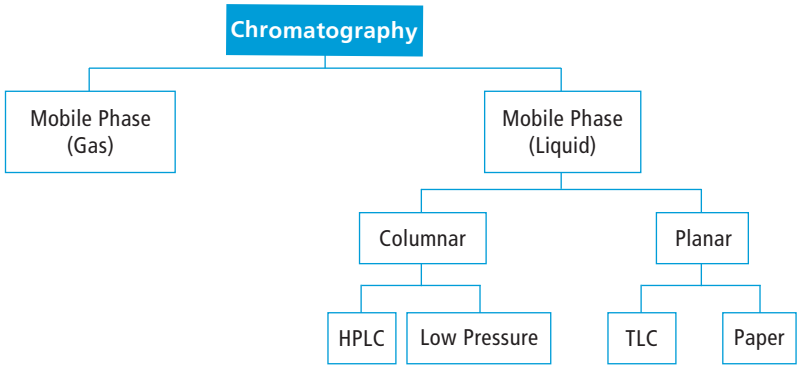
HPLC Quick Pick Reference Chart



Characteristics of HPLC Methods	
Method/Description/Column	**When is Method Preferred**
Reversed Phase Uses water/organic mobile phase Columns: C-18, C-8	First choice for non-ionized compounds that dissolve in water or organic mixtures
Ion Pair Uses water/organic mobile phase, a buffer to control pH and an ion pair reagent Columns: C-18, C-8	Good choice for ionic or ionizable compounds
Normal Phase Uses a mixture of organic solvents as mobile phase Columns: PAC, Silica	Good choice when reversed phase or ion pair are ineffective. First choice for lipophilic samples that do not dissolve well in water/organic mixtures, first choice for mixtures of isomers and preparative scale
Ion Exchange Uses aqueous mobile phase plus buffer for pH control Columns: Anion or Cation Exchange	First choice for separating mixtures of inorganic ions, good choice for separating proteins, nucleic acid samples and related compounds

Columns and Media

Partisil® HPLC Column Configurations

Whatman offers a wide range of high quality columns to meet your specific needs. In addition to the innovative Whatman Void Sealing Columns, Whatman makes available a selection of standard end fitting column configurations for your analytical and preparative needs. They are specifically designed for compatibility with all HPLC instrumentation.

Standard Analytical

4.6 mm ID x 25 cm long, standard analytical column for research, methods development and routine separations. After optimization, other sizes can be considered for greater speed or capacity. Allows direct scale-up or scale-down to other size columns. Supplied with Whatman compression screw end fittings.

RAC II

4.6 mm ID x 10 cm long. Second-generation Rapid Analysis Chromatography for faster analytical separations and reduced solvent consumption. Operates at low back pressure, even at high flow rates, prolonging column life. Connects easily to most LC instrumentation with convenient Whatman compression screw end fittings.

Magnum 9 (50 cm)

9.4 mm ID x 50 cm long. Semipreparative columns for microgram to gram quantities. Unique coned outlet allows high load capacity with minimal peak distortion. Durable construction ensures extended service. Magnum 9 columns are compatible with today's HPLC instruments, allowing you to use the same equipment for analytical and preparative work.

Magnum 9 (25 cm)

9.4 mm ID x 25 cm long.

Magnum 20 (50 cm)

22 mm ID x 50 cm long. Preparative columns for multigram separations. Coned outlet allows high load capacity with minimal peak distortion. Durable construction ensures extended service. Magnum 20 columns provide sufficient yield and resolving power to accomplish difficult separations on a single pass, achieving high product purity.

Magnum 20 (25 cm)

22 mm ID x 25 cm long.

Ordering Information (with WCS Standard End-Fittings)

Catalog Number	Particle Size (µm)	Dimensions
Bonded Phase		
Partisil Silica		
4222-220	5	4.6 x 100 mm
4215-001	5	4.6 x 250 mm
4216-001	10	4.6 x 250 mm
4230-120	10	9.4 x 250 mm
4230-220	10	9.4 x 500 mm
4232-220	10	22 x 500 mm
Partisil ODS-3		
4222-225	5	4.6 x 100 mm
4238-001	5	4.6 x 250 mm
4228-001	10	4.6 x 250 mm
4230-125	10	9.4 x 250 mm
4232-125	10	22 x 250 mm
Partisil C-8		
4222-232	5	4.6 x 100 mm
4239-001	5	4.6 x 250 mm
4229-001	10	4.6 x 250 mm
Partisil SAX		
4222-227	5	4.6 x 100 mm
4226-001	10	4.6 x 250 mm
4250-001	10	4.6 x 250 mm (with Solvecon)
4232-128	10	22 x 250 mm
Partisil SCX		
4222-228	5	4.6 x 100 mm
4227-001	10	4.6 x 250 mm
4251-001	10	4.6 x 250 mm
4232-230	10	22 x 500 mm
Partisil PAC		
4235-001	5	4.6 x 250 mm
4225-001	10	4.6 x 250 mm
Partisil 10 ODS		
4223-001	10	4.6 x 250 mm
Partisil 10 ODS-2		
4224-001	10	4.6 x 250 mm
4230-124	10	9.4 x 250 mm
Accessories		
4334-225	Frits, 1/4" diameter, 2 µm porosity	(10/pack)

Whatman Void Sealing (WVS) Columns and Media Characteristics

Whatman WVS columns are renowned for their high quality, innovative design and exceptional durability.

Features and Benefits

- Void sealing columns can last twice as long as standard end fitting columns, saving as much as 50% on cost per test
- Available packed with spherical and irregular media
- Integral void sealing mechanism prolongs column life
- Reusable, hand tightened end-fittings save money, allow for wrench-less installation and rapid column changes
- Require no holder or module, meaning fewer components, reduced cost

Typical column efficiencies for:
Partisil 10 µm media–45,000 N/m
Partisil 5 µm media–65,000 N/m
PartiSphere 5 µm media–90,000 N/m

Partisil® Irregular Media

Available in prepacked, replaceable columns and a choice of 5 µm and 10 µm phases. These include Silica, our popular ODS-3 and the other reversed phase packings ODS-2 and C-8. Also available are SAX (Strong Anion Exchanger), SCX (Strong Cation Exchanger) and PAC (Polar Amino Cyano).

Due to the greater surface area of the irregular Partisil, the medium offers enhanced selectivity and loading capacity. Through uniform particle sizing, back pressure is minimized. Also, the neutral pH of Partisil provides for better peak symmetry without the need for mobile phase modifiers.

PartiSphere® Spherical Media

Available in prepacked columns and a choice of 5 µm high performance phases. In addition to its efficient pure silica and monomeric C-18 and C-8, Whatman has added WCX (Weak Cation Exchanger) as well as SAX, SCX and PAC. PartiSphere media feature narrow particle size distribution and excellent reproducibility.

PartiSphere WVS Columns: Engineered to Provide Unsurpassed Consistency and Longevity

PartiSphere RTF

PartiSphere RTF (Reduced Tailing Factor) HPLC columns are base-deactivated columns. They employ a unique proprietary process that effectively "deactivates" the secondary chromatographic effect due to residual silanols. In addition, these columns are extremely stable and can be used from pH 2 to pH 8 with no loss in performance. Excellent for separation of basic compounds without the need for amine-modified mobile phases. PartiSphere RTF is available prepacked in Whatman Void Sealing (WVS) and Analytical (WCS) column configurations and in a choice of C-18, C-8, phenyl and cyano phases.

Features and Benefits

- All PartiSphere columns are guaranteed to perform reproducibly every time, thanks to multiple quality control tests for both primary and secondary separation mechanisms
- Polished internal column walls ensure packing symmetries and efficiencies
- PartiSphere RTF (Reduced Tailing Factor) employs a unique proprietary process that effectively "deactivates" the secondary chromatographic effect due to residual silanols

Typical Data

Partisil Bonded Phase	Other Specifications
Silica (85Å)	Irregular
ODS-3	10.5% carbon load; end capped; polymeric
ODS-2	16% carbon load; polymeric
C-8	8.5% carbon load; end capped; monomeric brush
PAC	0.85% N
SAX	0.85% -NR_{3+}
SCX	0.40% S
PartiSphere Bonded Phase	
Silica (120Å)	Spherical
C-18	10% carbon load; end capped; brush
C-8	6% carbon load; end capped; brush
PAC	0.85% N
SAX	0.8% -NR_{3+}
SCX	0.40% S
PartiSphere RTF Bonded Phase	
C-18	22% carbon load; monomeric brush
C-8	17% carbon load; monomeric brush
Phenyl	16% carbon load; monomeric brush
Cyano	7.5% carbon load; monomeric brush

Ordering Information

WVS Columns			
Catalog Number	**Particle Size (µm)**	**Column Type**	**Column Size (mm)**
Partisil[1] 5 µm & 10 µm Columns Only*			
Partisil 5 Silica			
4681-1501	5	Whatman Void Sealing	4.6 x 250
Partisil 5 ODS-3			
4681-0502	5	Whatman Void Sealing	4.6 x 125
4681-1502	5	Whatman Void Sealing	4.6 x 250
Partisil 5 SAX			
4681-0505	5	Whatman Void Sealing	4.6 x 125
4681-1505	5	Whatman Void Sealing	4.6 x 250
Partisil 5 SCX			
4681-1507	5	Whatman Void Sealing	4.6 x 250
Partisil 5 ODS-2			
4681-1509	5	Whatman Void Sealing	4.6 x 250
Partisil 10 ODS-3			
4682-1502	10	Whatman Void Sealing	4.6 x 250
Partisil 10 SAX			
4682-1505	10	Whatman Void Sealing	4.6 x 250
Partisil 10 SCX			
4682-1507	10	Whatman Void Sealing	4.6 x 250
PartiSphere[2] 5 µm Columns*			
PartiSphere Silica			
4621-0501	5	Whatman Void Sealing	4.6 x 125
4621-1501	5	Whatman Void Sealing	4.6 x 250
PartiSphere C-18			
4621-0502	5	Whatman Void Sealing	4.6 x 125
4621-1502	5	Whatman Void Sealing	4.6 x 250
PartiSphere C-8			
4621-0503	5	Whatman Void Sealing	4.6 x 125
PartiSphere SAX			
4621-0505	5	Whatman Void Sealing	4.6 x 125
4621-1505	5	Whatman Void Sealing	4.6 x 250
PartiSphere SCX			
4621-0507	5	Whatman Void Sealing	4.6 x 125
4621-1507	5	Whatman Void Sealing	4.6 x 250
PartiSphere PAC			
4621-0508	5	Whatman Void Sealing	4.6 x 125
4621-1508	5	Whatman Void Sealing	4.6 x 250
Whatman Base-Deactivated (WCS) HPLC Columns			
PartiSphere[2] 5 µm RTF (Reduced Tailing Factor)			
PartiSphere RTF C-18			
4522-0102	5	Standard Analytical	4.6 x 250
4522-0202	5	Standard Analytical	4.6 x 150
PartiSphere RTF Phenyl			
4522-0114	5	Standard Analytical	4.6 x 250

* Requires one-time purchase of 4.6 mm ID WVS end fittings, catalog number 4631-1001.

[1] Irregular Media

[2] Spherical Media

CHROMATOGRAPHY

HPLC Guard Cartridge System

The prepacked, disposable plastic guard cartridge retains unwanted materials that can harm your analytical column. Used in a wide range of applications, the HPLC guard cartridge system offers high efficiency, convenience and cost savings.

The guard cartridge holder is available in two configurations. The integral system attaches directly to and becomes an integral part of the WVS replacement column requiring no connecting tubing. Because of this, there is virtually no loss in efficiency.

The universal system can be used with any standard analytical column, bringing guard cartridge convenience to traditional HPLC columns. Guard cartridges are available in four phases: silica, reversed phase, anion exchanger and cation exchanger.

Zero-Dead-Volume

Guard columns offer protection by trapping unwanted compounds that would otherwise be strongly retained on the HPLC column. One of the problems inherent with other guard columns is that they either contribute too much dead volume or add to the analysis times of the separation (especially in short, high speed columns). Whatman has overcome this by developing a zero-dead-volume HPLC guard cartridge system which eliminates almost all extra void volume and does not detrimentally affect the separation.

Ordering Information

Catalog Number	Product	Quantity/Pack
Guard Cartridge Holders (For use with WVS Analytical Column)		
4631-1003	Integral Guard Cartridge Holder	WVS Small 1
4631-1004	Universal Guard Cartridge Holder	WCS Small 1
Guard Cartridge System Replacement Cartridges		
4641-0001	SIL Cartridge	5
4641-0002	RP Cartridge	5
4641-0005	AX Cartridge	5
4641-0007	CX Cartridge	5
4641-0008	PAC Cartridge	5
PartiSphere RTF Guard Cartridges		
4641-1002	PartiSphere RTF C-18	5
WVS Analytical Hardware		
4631-1001	Column end fittings: WVS type (for void sealing columns)	1 pair

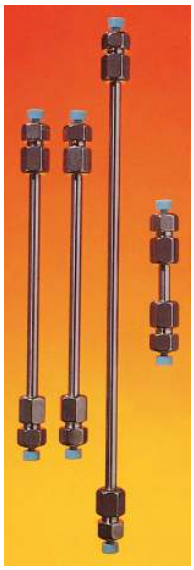
Application Specific HPLC Columns

TAC 1*

For great discoveries such as Taxol®, Whatman technology optimally separates the closely eluting Taxanes of Pacific yew trees.

Whatman worked closely with two leading customers to develop a specific bonded phase that achieves baseline resolution of the paclitaxel molecule from its closest impurity. Each lot of TAC 1 (Taxane Analysis Column) is tested with a paclitaxel chromatographic purity separation to ensure the best possible reproducibility.

*Richheimer SL et al. *Anal Chem.* 1992; 64:2323–2326



Ordering Information

Catalog Number	Product	Size (mm)	Quantity/Pack
4601-1001	TAC 1	4.6 x 250	1

NEW UniSep HPLC Column

The UniSep column is the newest C-8 reverse phase HPLC column from Whatman. Using state-of-the-art technology, UniSep was developed for conditions that call for a highly aqueous mobile phase.

The advantage of the UniSep C-8 column over a traditional C-8 column is the UniSep silica is hydrophilic, or able to be wetted out. This change in hydrophobicity is achieved by attaching an ether linkage in close proximity to the silica backbone. Since the ether group is polar, water can easily penetrate and hydrate the silica surface, allowing the analyte greater access to the binding sites.

The advantage to the chromatographer is the flexibility gained when developing a method for highly water soluble compounds.

Features and Benefits

- C-8-RP
- 5 µm
- 100Å pore size
- 16% carbon load
- Easy scale up

Applications

- Life science
- Food and beverage
- Pharmaceutical

Ordering Information

Catalog Number	Dimensions	Quantity/Pack
UniSep HPLC Column		
4550-4605	4.6 mm x 50 mm	1
4550-4610	4.6 mm x 100 mm	1
4550-4615	4.6 mm x 150 mm	1
4550-4625	4.6 mm x 250 mm	1

Media for High Performance Liquid Chromatography (HPLC)

Partisil® Silica Media Characteristics

The following describes the characteristics of each of the Partisil media.

Adsorption (Normal Phase) Media

Partisil 5

A high efficiency stationary phase for adsorption chromatography that provides good selectivity and high loading capacity for maximum resolution and fast analysis. Partisil 5 is available prepacked in Whatman Void Sealing (WVS), and Analytical and Rapid Analysis Column (RAC) configurations. Partisil 5 is the support on which the 5 µm bonded phases are based.

Partisil 10

The stationary phase for routine separations, Partisil 10 is the support material for the 10 µm bonded media. This medium is used when higher flow rates are indicated and back pressure must be minimized. In addition to bulk media, it is available prepacked in most column configurations.

Ion Exchange Media

Partisil SAX (5 µm and 10 µm)

A strong anion exchanger based on quaternary ammonium groups (-NR_{3+}). Supplied in the H_2PO_4 form in methanol, Partisil 10 SAX has been widely reported in literature and is best known for separation of nucleotides. Stable over pH range 1.5–7.5 when used in conjunction with a Solvecon mobile phase conditioning column. Obtains the highest anion exchange efficiencies and resolution. Applicable to separations of nucleic acids, organic acids and inorganic anions. Check prepacked column ordering information for availability of specific combinations of columns.

Partisil SCX (5 µm and 10 µm)

Based on aromatic benzene sulfonic acid groups. Supplied in the ammonium form (NH_{4+}). Excellent for separation of nucleic acids, amino acids, polyamines, drugs and other cationic species. Capable of being loaded with specific metallic cations for use in ligand exchange chromatography. Stable over pH range 1.5–7.0 when used in conjunction with a Solvecon mobile phase conditioning column. Exceptionally stable Si-O-Si-C bond, both thermally and chemically. Check prepacked column ordering information for availability of specific combinations of columns.

Reversed Phase Media

Partisil ODS (5 µm and 10 µm)

A C-18 phase with a 5% carbon load for both normal adsorption and reversed phase partitioning. Dual-mode operation for added selectivity with 50% residual silanols. Lightly loaded C-18 packing is particularly effective for compounds having greater water solubility when used in the reversed phase mode. Creates a moderately polar surface, different from that of a pure silica, in normal phase mode. Check prepacked column ordering information for availability of specific columns.

Partisil ODS-2 (5 µm and 10 µm)

The high carbon load (16%) of this polymeric phase makes it the most nonpolar and, therefore, the most retentive of the reversed phases. An alternative to end-capped C-18 where different elution order is desirable for optimum separation. High sample load capacity and 10 µm particle size are very suitable for preparative work. Check prepacked column ordering information for availability of specific columns.

Partisil ODS-3 (5 µm and 10 µm)

A C-18 polymeric phase with a 10.5% carbon load. Medium of choice for improved speed, efficiency and resolution in applications requiring C-18 phases. End-capped for deactivation of silanols to minimize the need for ion suppression or ion pairing agents. Used in a wide range of applications with optimal selectivity, including pharmaceuticals, natural products, food, biologicals and environmental pollutants.

Partisil C-8 (5 µm and 10 µm)

An end-capped C-8 monomeric phase with at least 8.5% carbon load. Provides high efficiency and rapid mass transfer while maintaining excellent peak shape and stability over a range of aqueous mobile phase compositions. Recommended for ion pair chromatography.

Partisil PAC (5 µm and 10 µm)

A polar amino cyano bonded phase with secondary amine groups for good thermal and chemical stability. Selectivity and rapid equilibrium allow a range of separation mechanisms to be used, including adsorption, reversed phase and weak anion exchange. Extremely fast equilibration across the entire range of solvents from heptane to water. The media of choice for carbohydrate separations.

Ordering Information

Catalog Number	Products	Package	Bonded Phase	Particle Size (µm)
Partisil Media				
4138-010	Partisil 5 ODS-3	10 g	C-18 polymeric; 10.5% carbon load; end-capped	5
4128-010	Partisil 10 ODS-3	10 g	C-18 polymeric; 10.5% carbon load; end-capped	10
4139-010	Partisil 5 C-8	10 g	C-8 monomeric; 8.5% carbon load; end-capped	5
4129-010	Partisil 10 C-8	10 g	C-8 monomeric; 8.5% carbon load; end-capped	10
4124-010	Partisil 10 ODS-2	10 g	C-18 polymeric; 16% carbon load; uncapped	10
4123-010	Partisil 10 ODS	10 g	C-18 polymeric; 5% carbon load; uncapped	10
4135-010	Partisil 5 PAC	10 g	Alkyl groups containing amino-cyano groups in a (2:1) ratio	5
4125-010	Partisil 10 PAC	10 g	Alkyl groups containing amino-cyano groups in a (2:1) ratio	10
4115-010	Partisil 5 Silica	10 g	None	5
4116-010	Partisil 10 Silica	10 g	None	10
4126-010	Partisil 10 SAX	10 g	Quaternary amino groups ($-NR_{3+}$)	10
4127-010	Partisil 10 SCX	10 g	Aromatic benzene sulfonic acid functional groups; may also be loaded with metallic cations for ligand exchange chromatography	10