



Waters

Waters Quality Parts[®], Chromatography Columns and Supplies Catalog

2005—2006

For Complete  Confidence

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Dear Colleague,

We are pleased to present the newly combined 2005-2006 Waters Quality Parts®, Chromatography Columns and Supplies Catalog. This is a newly formatted catalog combining the Waters Chromatography Columns and Supplies Catalog with the Waters Quality Parts® and Supplies Catalog. We hope this combination simplifies access to information and products and enhances our efforts to make this catalog a true informational resource.

Along with an extensive product offering (also available online at www.waters.com—click on Shop), application guides, and discussions on theory and separation modes, we have included the Waters Column Brand classification, based on the new USP L1 discussion forums.

Our goal is to help make you and your separations as successful as possible by offering a variety of avenues to get the information you need when you need it.

Achieving the highest quality separations—whether the critical need is sample enrichment, isolation, purification, higher throughput or information about chemical structure or composition – demands not only the best technology, but a partner with a full set of capabilities to deliver that technology to you in a way that ensures your success.

You can find out about our capabilities when you telephone one of our 54 worldwide offices, interact with our highly trained account specialists, visit our website, www.waters.com, to access 25,000+ applications in our Information Center (click on Applications), or attend an educational webcast (click on Web Seminars).

No other company is as dedicated to customer commitment, product capability and performance. We invite you to learn more about us, our technology, our resources and our capabilities—from our global presence and world-class manufacturing facilities, to our extraordinary technical support and product quality, backed by the best warranty in the business.

Mark Baynham Ph.D.

Director
Chemistry Operations Marketing

Pete Boler

Director
Services Marketing

Waters



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Introduction

Preparative chromatography is used to isolate and purify compounds. As in analytical chromatography, some purification analyses may need to be done only once and some will need to be done repeatedly. These two circumstances may require different approaches. In both cases, it is advisable to optimize the separation and maximize the sample load on a small column. This information can be used to estimate the size of column needed for the purification or isolation, as well as the amount of material that can be loaded onto the column for the desired purity and recovery.

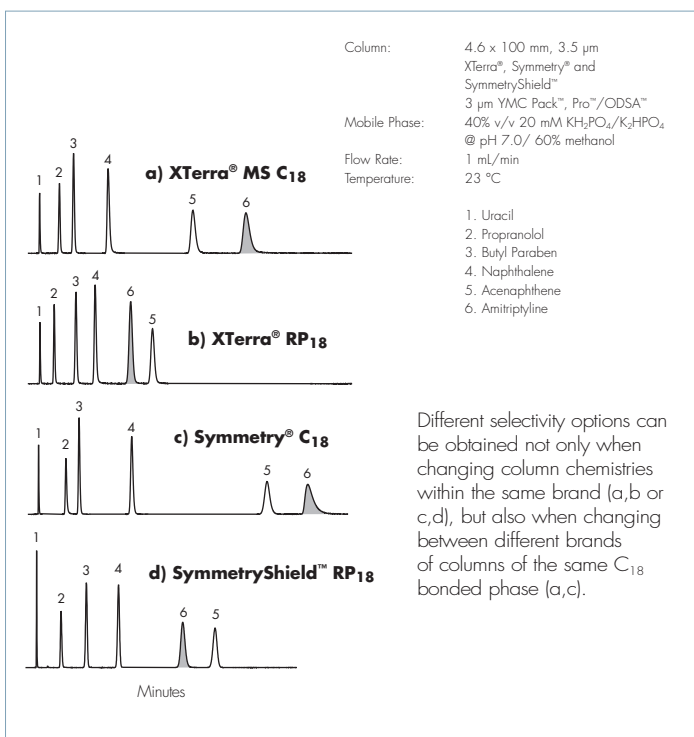
What Are the Important Factors in Preparative Separations

The factors that govern a purification are very similar to those that influence an analytical separation. Plate count (N), the capacity factor (k'), and the selectivity (α) will all affect the resolution. The particle size of the packing material and the column length can affect the column efficiency and the speed of the separation. Altering any one of these parameters can have multiple effects on the separation, and knowing which one to alter is important for overall strategy.

Altering Selectivity to Improve Column Load and Speed

An improvement in α, the separation between the peak of interest and the nearest contaminant, results in higher sample loads with no compromise in product purity. Small increases in α, especially when α is low, will also result in significantly increased speed and throughput. Mobile phases are often manipulated to cause this change in selectivity, however altering the stationary phase can also play a significant role.

Selectivity Differences



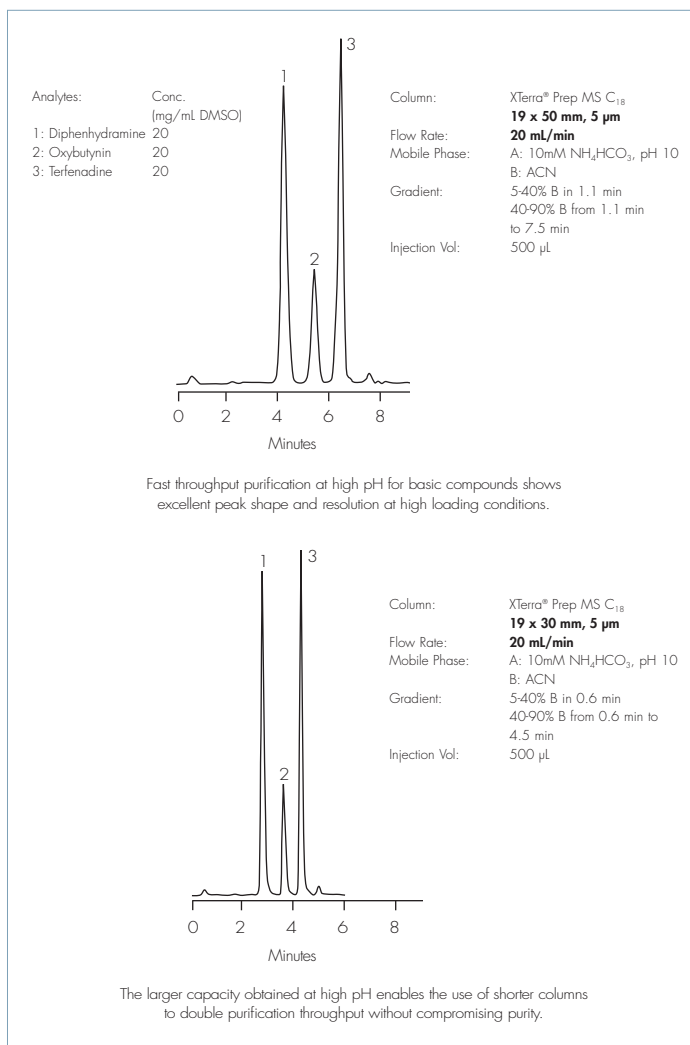
Adjusting Column Parameters for More Concentrated Fractions

Using shorter columns with small particle-size packings yields the same column efficiency as longer columns packed with large particle-size packings. The use of these shorter, high resolution columns will typically reduce solvent consumption and result in more concentrated fractions.

Increased Speed While Maintaining Resolution

Waters Prep columns deliver the speed you need for high throughput lead generation—speed that enables rapid analysis and purification of thousands of samples. Now you can screen and purify your libraries twice as fast as compared to traditional silica-based columns.

Optimization of High Throughput Applications



How to Scale Up a Separation

Step 1

Once the analytical separation has been optimized a loading study on the analytical column is performed to determine the capacity of the particular packing material. Because the large scale separation should be identical to the small scale separation, the maximum sample load will be dependent upon the complexity of the analytical separation.

Step 2

The next step is to determine how much mass you need to purify or isolate.

Step 3

Once the desired purified mass is established some simple equations may be used to determine the required column size for purification.

Scale-up factor

$$\text{Scale-up factor} = \frac{(\text{Diameter prep})^2 \times \text{Length prep}}{(\text{Diameter analytical})^2 \times \text{Length analytical}}$$

Once determined, the scale-up factor is used to multiply the analytical column sample loading capacity to predict the loading capacity for the larger dimension column. Table 1 has general mass loading guidelines for common column dimensions. Remember, many factors affect the mass capacity of preparative columns. A brief list of modifying factors should be considered:

1. Capacity is higher for strongly retained material.
2. Capacity is higher for simple mixtures
3. Capacity is higher for gradient separations vs isocratic
4. Capacity is lower where higher resolution is required
5. Capacity is limited by loading volume
6. Capacity is limited by sample solubility
7. Capacity can be affected by choice of sample solvent

Consider scaling up from a 3.9 x 150 mm column to a 19 x 150 mm column:

$$\text{Scale-up factor} = \frac{(19)^2 \times 150}{(3.9)^2 \times 150} = 23.7$$

Applying the scale-up factor, we can predict that approximately 24–142 mg of sample could be applied to the larger column (packed with the same material as the analytical column). This range is based on an analytical (3.9 mm i.d.) mass load of 1–6 mg.

Flow Rate

$$\text{Flow rate (prep)} = \text{Flow rate (anal)} \times \frac{(\text{Diameter prep})^2}{(\text{Diameter anal})^2}$$

The calculated flow rate may be used for the larger column to ensure the same linear velocity of mobile phases as used in the analytical run. However, reasonable flow rates are based on column diameters. Systems will be limited by increasing backpressure with increasing length and decreasing particle size.

Gradient Duration (GD)

$$\text{GD (prep)} = \text{GD (anal)} \times \frac{\text{Length (prep)}}{\text{Length (anal)}} \times \frac{\text{Diameter (prep)}^2}{\text{Diameter (anal)}^2} \times \frac{\text{Flow rate (anal)}}{\text{Flow rate (prep)}}$$

The calculated prep gradient duration is entered into the pump's gradient separation over the same number of column volumes as was used in the analytical run.

MASS LOAD CHART (MGS)*

Length (mm)	Diameter (mm)											
	3.9 mm	4.6 mm	7.8 mm	8 mm	10 mm	19 mm	20 mm	25 mm	30 mm	40 mm	47 mm	50 mm
50 mm	2	3	8		15	45	50		110			310
100 mm	4	5	15	15	25	90	100	155	225	400		620
150 mm	6	8	25		40	135	150		335			930
200 mm				30				310		795		
250 mm	10	13	40		60	225	250		560			1550
300 mm	12	16	45	50	75	270	300	470	670	1195	1650	1860
Reasonable Flow Rate (mL/min)	1.0	1.4	4.0	4.2	6.6	24	27	42	60	105	145	164
Reasonable Injection** Volume (µL)	15	20	60	65	100	350	390	610	880	1565	2160	2450

* Mass loads were obtained experimentally using water-soluble compounds: oxacillin, cloxacillin and dicloxacillin. These are general mass loads, please refer to the scale factor section above for more information on mass loading.

** Reasonable injection volumes are based on column diameter at a length of 50 mm with relatively strong solvents. Increased length is compatible with larger injection, but not proportionately so. Weaker solvents allow for significantly increased injection volumes.

Selecting the Column Packing

Waters column packing materials bring you the best in preparative chromatography options. For optimum flexibility, our column packing materials are available in a range of steel columns. A complete list of preparative packing materials and their characteristics is shown in the following table.

Preparative Packing Characteristics

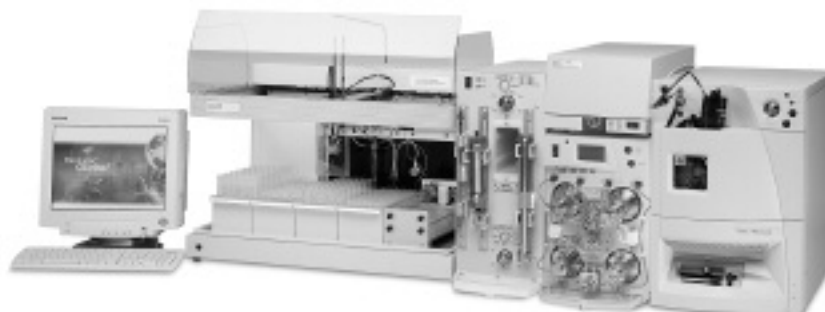
Packing	Chemistry	Particle Size	Pore Size	Particle Shape	Carbon Load	End-capped
XTerra® MS	C ₁₈	5, 10 µm	125Å	Spherical	15.5%	Yes
	C ₈	5, 10 µm	125Å	Spherical	12.0%	Yes
XTerra® RP	C ₁₈	5, 10 µm	125Å	Spherical	15%	Yes
	C ₈	5, 10 µm	125Å	Spherical	13.5%	Yes
SunFire™	C ₁₈	5, 10 µm	100Å	Spherical	16%	Yes
	C ₈	5, 10 µm	100Å	Spherical	11.5%	Yes
Atlantis®	dC ₁₈	5 µm	100Å	Spherical	11%	Yes
	HILIC	5 µm	100Å	Spherical	0%	No
Symmetry®	C ₁₈	5, 7 µm	100Å	Spherical	19%	Yes
	C ₈	5, 7 µm	100Å	Spherical	12%	Yes
SymmetryShield™	C ₁₈	5, 7 µm	100Å	Spherical	15%	Yes
	C ₈	5, 7 µm	100Å	Spherical	17%	Yes
Symmetry300™	C ₁₈	5, 7 µm	300Å	Spherical	8.5%	Yes
	C ₄	5, 7 µm	300Å	Spherical	2.8%	Yes
Prep Nova-Pak® HR	C ₁₈	6 µm	60Å	Spherical	7%	Yes
	Silica	6 µm	60Å	Spherical	N/A	N/A
µBondapak™	C ₁₈	10 µm	125Å	Irregular	10%	Yes
	Phenyl	10 µm	125Å	Irregular	8%	Yes
	CN	10 µm	125Å	Irregular	6%	Yes
	NH ₂	10 µm	125Å	Irregular	3.5%	No

No matter how you collect fractions, whether by mass spec, UV, or other detector signals, the Waters Autopurification systems will meet your needs. These systems provide simplicity, scalability, and speed with a variety of available configurations. The market leading Fractionlynx™ Application Manager provides an intuitive interface to manage the purification process from sample acquisition to reporting.



Packing	Chemistry	Particle Size	Pore Size	Particle Shape	Carbon Load	End-capped
Bondapak®	C ₁₈	15-20 µm	125Å	Irregular	10%	Yes
		37-55 µm	125Å	Irregular	10%	Yes
Bondapak® HC ₁₈ HA	C ₁₈	37-55 µm	125Å	Irregular	14%	Yes
µPorasil™	Silica	10 µm	125Å	Irregular	N/A	N/A
Porasil®	Silica	15-20 µm	125Å	Irregular	N/A	N/A
		37-55 µm	125Å	Irregular	N/A	N/A
Delta-Pak™	C ₁₈	15 µm	100Å	Spherical	17%	Yes
			300Å	Spherical	7%	Yes
Delta-Pak™	C ₄	15 µm	100Å	Spherical	7%	Yes
			300Å	Spherical	3%	Yes
Prep	C ₁₈	55-105 µm	125Å	Irregular	11%	Yes
			125Å	Irregular	N/A	N/A

Pictured here is the Waters Fractionlynx™ MS with a 2767 Sample Manager for inject/collect/re-inject, 2525 Binary Gradient Module for high pressure mixing, Column Fluidics Organizer for software-controlled valving, fluidics, and column management, 2996 PDA and ZQ™ Mass Detector.



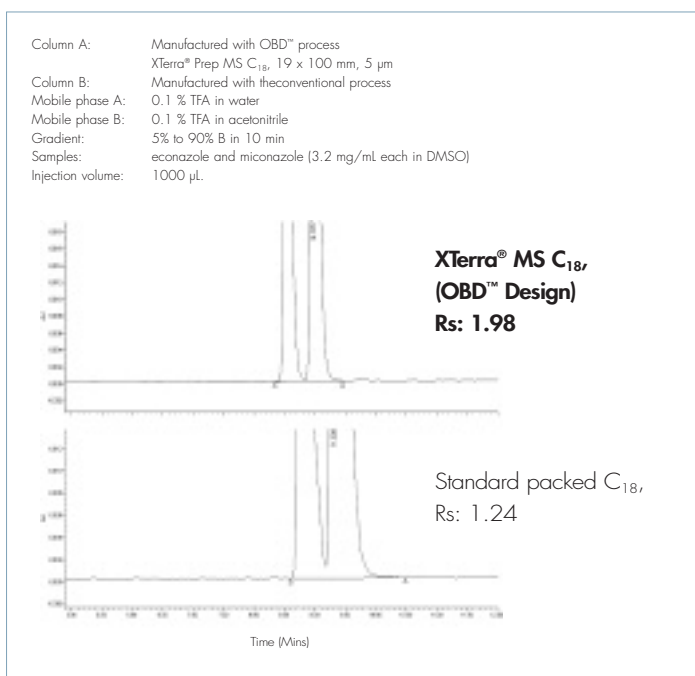
Introducing Waters Optimum Bed Density OBD™ Preparative Columns

In today's drug purification environment, the demand for timely, high purity places strong emphasis on the integrity and stability of the preparative column. Complex starting samples require high efficiency columns containing smaller particles (< 10 µm) than were conventionally used for purification. The challenge for the column manufacturer is to reproducibly produce preparative columns with the same performance and stability as analytical columns. A proprietary new procedure has been developed to manufacture preparative columns with inner diameters of 19, 30 and 50 mm, and lengths from 30 to 250 mm. This new procedure yields columns having identical packed bed density as the equivalent analytical column, resulting in durable stability, direct scalability, better efficiency and higher loadability than preparative columns packed using traditional methodology.

Efficiency and Scalability

The Optimum Bed Density OBD™ packing procedure results in preparative columns with much greater efficiency than those packed with conventional techniques. This feature ensures greater resolution and direct scalability from analytical to preparative separations.

Comparisons of Column Resolutions under Same Unit Loading



Stability and Reliability

Reversed phase HPLC purification is commonly performed with compounds of limited solubility dissolved in strong organic solvents. This combination often results in partial precipitation and injection pressure shocks which leads to poor and inconsistent column lifetime. Waters OBD™ preparative columns are designed to resist mechanical bed failure and deliver consistent column to column performance.

Consistent Column-to-Column Performance

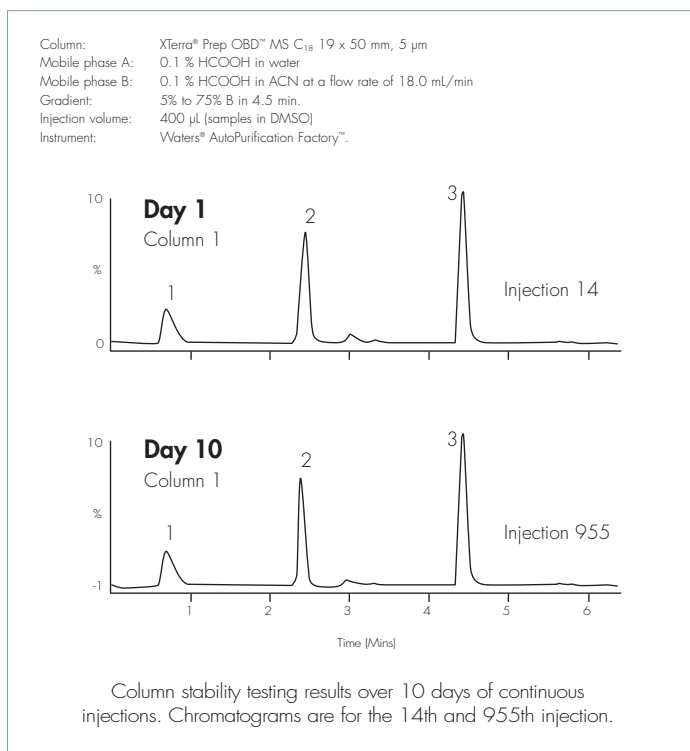


Table 1. Reproducibility results for four XTerra® Prep OBD™ MS C₁₈ columns.

Column	New Columns		Post 1000 Injections		% Change in Efficiency
	Plates	USP Tail	Plates	USP Tail	
1	4,278	1.14	3,927	1.17	-8.2
2	4,430	1.05	4,129	1.07	-6.8
3	3,943	1.02	4,054	1.08	2.8
4	4,093	1.03	3,945	1.13	-3.6
Average	4,186	1.06	4,014	1.11	-4.0

All of the modern preparative offered by Waters Corporation are manufactured according to this new OBD™ process, ensuring stable, reliable and efficient columns for all preparative separation requirements.

XTerra® Prep OBD™ Columns— Bridging the Performance Gap from Analytical to Prep



Introducing the new XTerra® Prep OBD™ columns from Waters that deliver analytical performance in preparative dimensions with maximum column stability the result of patent-pending Optimum packed Bed Density (OBD™) design. Combining OBD™ design with the unique chromatographic properties of XTerra® Hybrid Particle Technology, provides a range of high performance preparative columns with unprecedented flexibility, both through the range of analytes—basic, acidic and polar—and the wide operating range of mobile phases necessary for successful, predictable preparative scale-up.

XTerra® Chemistries

XTerra® MS

XTerra® MS C₁₈ and MS C₈ columns were designed to be compatible with Mass Spectrometry applications and provide sharp peaks, good sensitivity, and large peak capacities. These chemistries exhibit peak shape usually only achievable with columns employing embedded polar group technology (see XTerra® RP columns). The tri-functional bonding chemistries of XTerra® MS columns deliver the longest lifetimes over the widest pH range (pH 1-12) and provide maximum throughput with excellent resolution and ultra-low bleed.

XTerra® RP

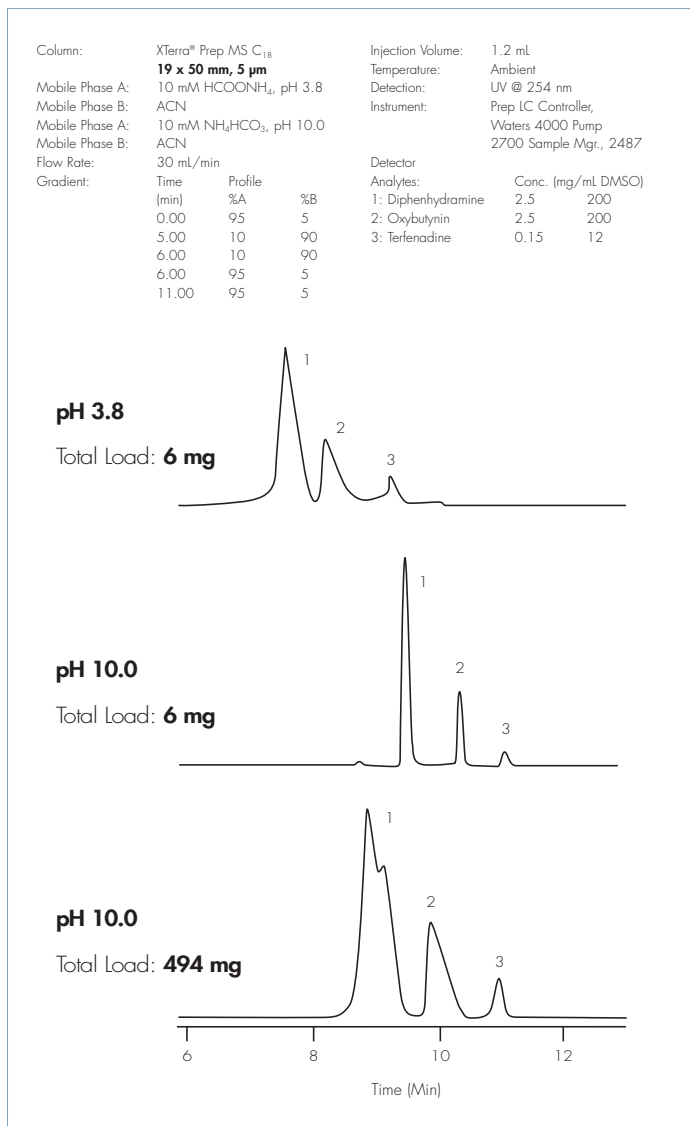
XTerra® RP₁₈ and RP₈ columns combine Hybrid Particle Technology with Shield Technology* by incorporating an embedded polar group to deliver the best possible peak shape. These general purpose columns allow fast method development by offering unique selectivity. Like all XTerra® columns, the shielded XTerra® RP columns exhibit excellent water wettability, even in 100% aqueous mobile phases. The combination of a greatly widened pH range for selectivity choices and the additional selectivity options of two ligands are often the only tools necessary for successful method development.

Increase Mass Capacity for Drug Development

Interaction between basic analytes and ionizable silanols on silica surfaces results in poor peak shape. Separation of basic compounds is therefore often done at low pH to suppress silanol ionization and thereby reduce peak tailing. However, in this mode, basic analytes are protonated and are not retained well by reversed-phase sorbents.

However, XTerra® Prep columns with Hybrid Particle Technology—unlike traditional silica columns—can be used routinely at high pH so that basic compounds can be separated in their neutral form. This results in a tremendous improvement, not only in peak shape, but in loadability—up to 60x. Moving from an isocratic to a gradient separation mode further increases capacity.

Low vs High pH Loading



High Throughput Cartridges for Faster Purification

A high throughput cartridge in a format designed to accelerate the purification of μg to low mg quantities of your compounds is also available. The wider diameter and reduced column length enable ballistic purification without compromising resolution. These cartridges are 10 mm in length and are available in 3 diameters (7.8, 10, and 19 mm) and may be used to protect a longer column without sacrificing resolution.

The example shown is typical of the situations faced by today's high throughput purification chemist. The desired goal is to load the largest possible amount of compound in the smallest possible injection volume, thus necessitating the use of strong solvents such as DMSO or DMF. It is well recognized that use of such solvents contributes to reduced column lifetime.

Unlike conventional preparative guard column design where a loss in the overall chromatographic performance is expected, the addition of a high efficiency cartridge into the purification system will not only significantly increase column lifetime, but may also enhance the loadability of the system.



Purification and Isolation Cartridge Holders

Description	Part No.
7.8 x 10 Cartridge Holder	186000708
10 x 10 Cartridge Holder	289000779
19.0 x 10 Cartridge Holder	186000709
Replacement o-ring 7.8 mm, 2 pkg	700001019
Replacement o-ring 10 mm, 2 pkg	700001436
Replacement o-ring 19 mm, 2 pkg	700001020

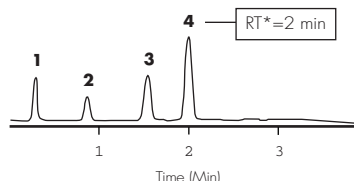
Cartridge: XTerra® Prep MS C₁₈
19 x 10 mm, 5 μm
 Column: XTerra® Prep MS C₁₈
19 x 50 mm, 5 μm
 Mobile Phase A: 0.1% CF₃COOH in H₂O
 Mobile Phase B: 0.08% CF₃COOH in ACN
 Flow Rate: 30 mL/min
 Gradient:

Time (min)	%A	%B
0.00	95	5
4.00	30	70

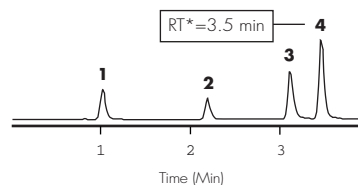
 Instrument: Waters Autopurification System

Analytes in DMSO:
 1. 1-Hydroxy-7-aza-benzotriazole
 2. 4-Methoxybenzenesulfonamide
 3. Methyl-3-amino-2-thiophenecarboxylate
 4. 4-Aminobenzophenone

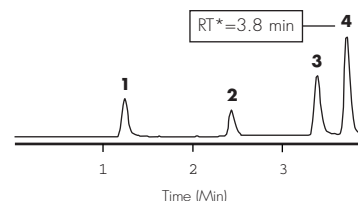
19 x 10 mm Cartridge



19 x 50 mm Column



19 x 10 + 19 x 50 mm Cartridge & Column Combined



* RT = Retention Time

XTerra® high throughput cartridges are manufactured to the same demanding specifications as their larger column counterparts in order to deliver equivalent performance.

Combination of the cartridge and column allows protection of the main column without sacrificing resolution.

Register to receive a **FREE**, updated Preparative Column Calculator at www.waters.com/prepcolumn



Designed to simplify common preparative calculations:

- Column/tubing backpressure
- Mass load scale-up
- Gradient scale-up
- Gradient designs

To order your Waters Preparative Optimum Bed Density (OBD™) columns, call your local Waters Sales Office

XTerra® Prep Columns

ID (mm)	Length (mm)	Particle Size	Type	MS C ₁₈	MS C ₈	RP ₁₈	RP ₈
7.8 mm	10 mm	5 µm	Cartridge	186001168 ⁶	186001169 ⁶	186001170 ⁶	186001171 ⁶
7.8 mm	10 mm	10 µm	Cartridge	186001172 ⁶	186001173 ⁶	186001174 ⁶	186001175 ⁶
7.8 mm	50 mm	5 µm	Column	186001152	186001153	186001154	186001155
7.8 mm	100 mm	5 µm	Column	186001156	186001157	186001158	186001159
7.8 mm	150 mm	5 µm	Column	186001475	186001476	186001477	186001478
7.8 mm	150 mm	10 µm	Column	186001160	186001161	186001162	186001163
7.8 mm	300 mm	10 µm	Column	186001164	186001165	186001166	186001167
10 mm	10 mm	5 µm	Cartridge	186001001 ⁷	186001004 ⁷	186001006 ⁷	186001008 ⁷
10 mm	10 mm	10 µm	Cartridge	186001002 ⁷	186001005 ⁷	186001007 ⁷	186001009 ⁷
10 mm	30 mm	5 µm	Column	186001010	186001011	186001012	186001013
10 mm	50 mm	5 µm	Column	186001014	186001015	186001016	186001017
10 mm	100 mm	5 µm	Column	186001018	186001019	186001020	186001021
10 mm	150 mm	5 µm	Column	186001479	186001480	186001481	186001482
10 mm	150 mm	10 µm	Column	186001022	186001023	186001024	186001025
10 mm	250 mm	10 µm	Column	186001026	186001027	186001028	186001029
10 mm	300 mm	10 µm	Column	186001030	186001031	186001032	186001033
19 mm	10 mm	5 µm	Cartridge	186001104 ⁸	186001105 ⁸	186001106 ⁸	186001107 ⁸
19 mm	10 mm	10 µm	Cartridge	186001034 ⁸	186001035 ⁸	186001036 ⁸	186001037 ⁸
19 mm	30 mm	5 µm	OBD™ Column	186002383	186002384	186002385	186002386
19 mm	50 mm	5 µm	OBD™ Column	186001930	186001931	186001932	186001933
NEW 19 mm	50 mm	10 µm	OBD™ Column	186002254	—	—	—
19 mm	100 mm	5 µm	OBD™ Column	186001934	186001935	186001936	186001937
19 mm	150 mm	5 µm	OBD™ Column	186002379	186002380	186002381	186002382
19 mm	150 mm	10 µm	OBD™ Column	186002255	186002256	186002257	186002258
19 mm	250 mm	10 µm	OBD™ Column	186002259	186002260	186002261	186002262
19 mm	300 mm	10 µm	OBD™ Column	186002263	186002264	186002265	186002266
30 mm	50 mm	5 µm	OBD™ Column	186001938	186001939	186001940	186001941
30 mm	75 mm	5 µm	OBD™ Column	186002387	186002388	186002389	186002390
30 mm	100 mm	5 µm	OBD™ Column	186001942	186001943	186001944	186001945
30 mm	150 mm	10 µm	OBD™ Column	186002267	186002268	186002269	186002270
30 mm	250 mm	10 µm	OBD™ Column	186002271	186002272	186002273	186002274
30 mm	300 mm	10 µm	OBD™ Column	186002275	186002276	186002277	186002278
50 mm	50 mm	5 µm	OBD™ Column	186002218	186002219	186002220	186002221
50 mm	50 mm	10 µm	OBD™ Column	186002279	186002280	186002281	186002282
50 mm	100 mm	5 µm	OBD™ Column	186002222	186002223	186002224	186002225
50 mm	150 mm	10 µm	OBD™ Column	186002843	186002844	186002845	186002846
50 mm	250 mm	10 µm	OBD™ Column	186002847	186002848	186002849	186002850

6. Needs 7.8 x 10 mm Cartridge Holder Part No. 186000708

7. Needs 10 x 10 mm Cartridge Holder Part No. 289000779

8. Needs 19 x 10 mm Cartridge Holder Part No. 186000709

NEW SunFire™ Prep OBD™ Columns— Bridging the Performance Gap from Analytical to Prep



SunFire™ columns set a new standard as the state-of-the-art bonded C₁₈ and C₈ silica HPLC column. Through years of research and product development, SunFire™ columns represent the best in particle and bonding expertise for a new level of chromatographic performance.

Loadability by Design

Successful scale-up of an isolation and purification process is not only a function of column efficiency, but is also related to the loadability of the chromatographic material.

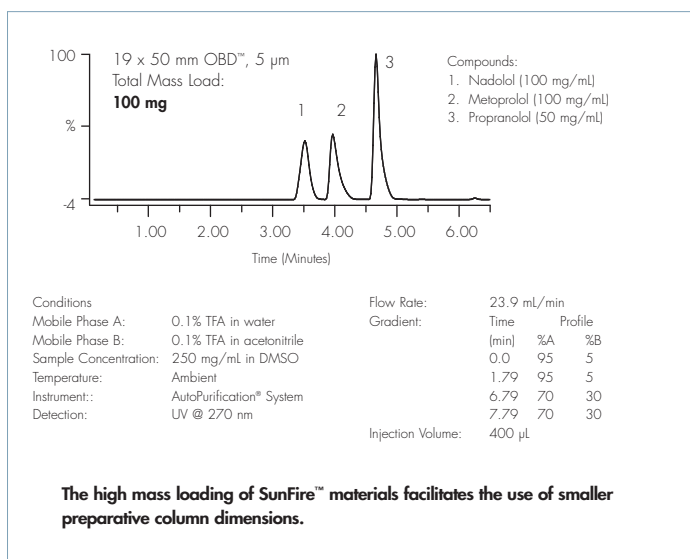
The physical characteristics of preparative phases, such as surface area and ligand density, do not always correlate well with the mass loadability of ionizable compounds. SunFire™ Prep silica particles have been synthetically designed under cGMP protocols to deliver maximum loadability in acidic to moderate pH mobile phase conditions.

Efficiency and Scalability

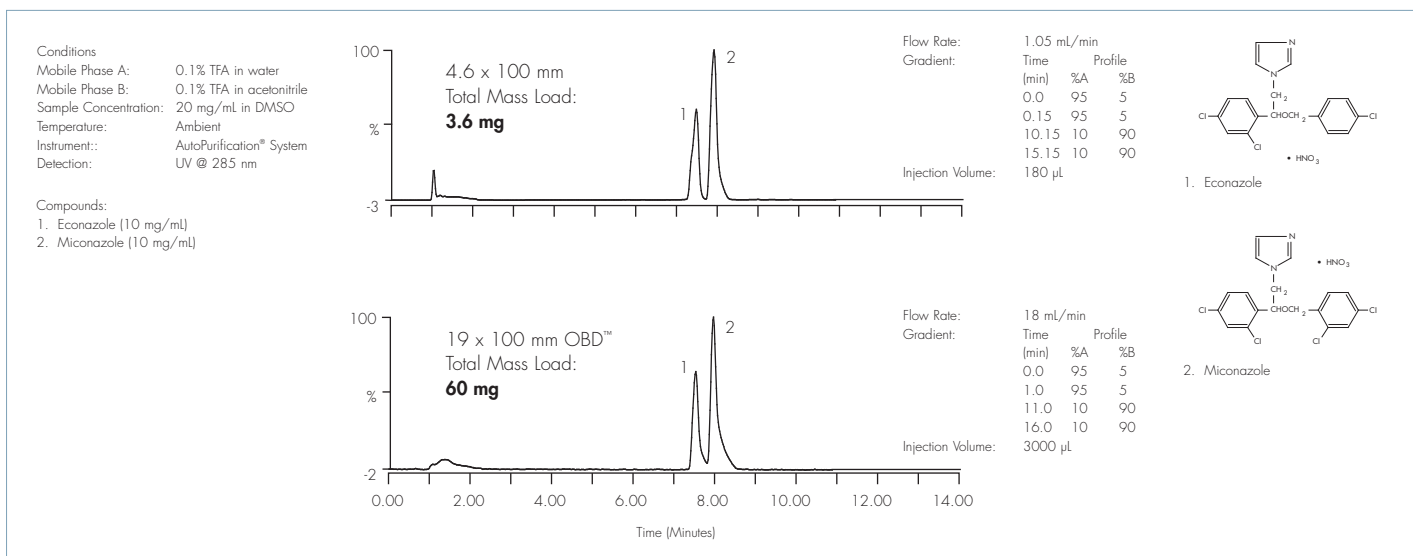
The isolation and purification of critical compound pairs is a major challenge to purification scientists. Often a successful analytical separation will not scale up directly due to the reduced performance of the preparative column.

The OBD™ design in combination with the efficient SunFire™ particles ensures equivalent chromatographic performance from analytical to preparative dimensions, eliminating the need for any subsequent time consuming method redevelopment.

SunFire™ Columns — Loadability



Scale-up of the Separation of Two Antifungal Critical pairs on SunFire™ Columns



SunFire™ Prep 5 µm Columns

Partide Size	Dimensions	C ₁₈	C ₈
5 µm	10 x 50 mm	186002561	186002746
5 µm	10 x 100 mm	186002562	186002747
5 µm	10 x 150 mm	186002563	186002748
5 µm	10 x 250 mm	186002564	186002749
5 µm	10 x 10 mm Guard	186002565 ¹	186002750 ¹
5 µm	OBD™ 19 x 50 mm	186002566	186002751
5 µm	OBD™ 19 x 100 mm	186002567	186002752
5 µm	OBD™ 19 x 150 mm	186002568	186002753
5 µm	19 x 10 mm Guard	186002569 ²	186002754 ²
5 µm	OBD™ 30 x 50 mm	186002570	186002755
5 µm	OBD™ 30 x 75 mm	186002571	186002756
5 µm	OBD™ 30 x 100 mm	186002572	186002757
5 µm	OBD™ 30 x 150 mm	186002797	186002795

SunFire™ Prep 10 µm Columns

Partide Size	Dimensions	C ₁₈	C ₈
10 µm	10 x 150 mm	186002664	186002759
10 µm	10 x 250 mm	186002665	186002760
10 µm	10 x 10 mm Guard	186002663 ¹	186002758 ¹
10 µm	OBD™ 19 x 50 mm	186002667	186002762
10 µm	OBD™ 19 x 150 mm	186002668	186002763
10 µm	OBD™ 19 x 250 mm	186002669	186002764
10 µm	19 x 10 mm Guard	186002666 ²	186002761 ²
10 µm	OBD™ 30 x 150 mm	186002670	186002765
10 µm	OBD™ 30 x 250 mm	186002671	186002766

¹ Requires 10 x 10 mm Prep Guard Cartridge Holder 289000779

² Requires 19 x 10 mm Prep Guard Cartridge Holder 186000709

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Waters Online Store

It's safe. It's easy to find parts (especially with the Waters Quality Parts® Locator). It's the only website you need to search for and buy genuine Waters Quality Parts®, chromatography columns, sample preparation products and accessories.

www.waters.com—click on “shop”

Atlantis® Prep OBD™ Columns

Ease of Scale-Up and Long, Predictable Column Lifetimes



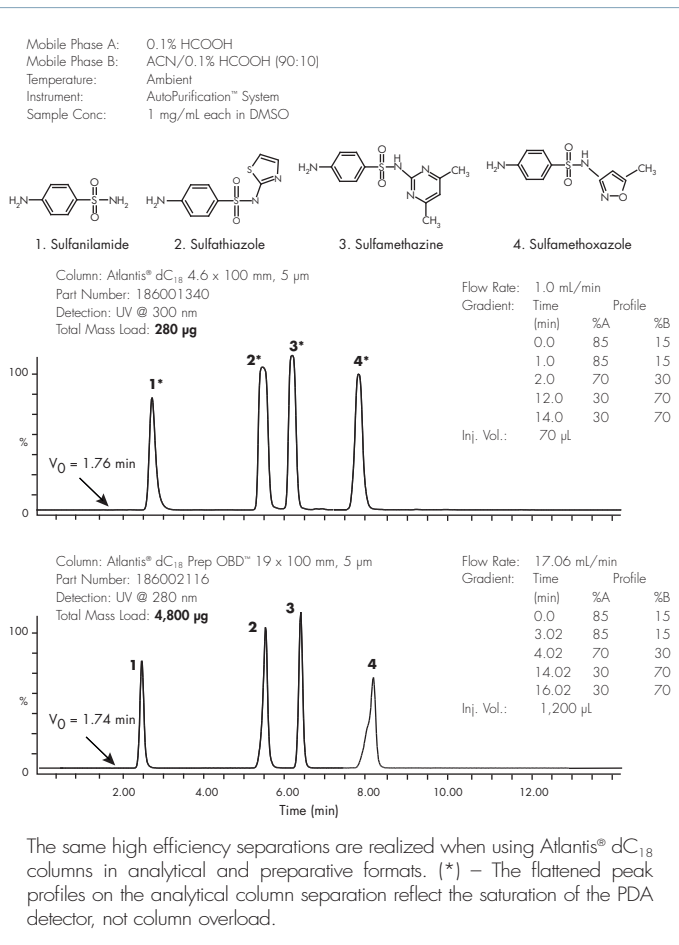
Atlantis®
Columns

One of the most frustrating and time-consuming aspects of the isolation and purification process is when an analytical separation does not scale-up linearly. In these situations, the preparative separation method must then be “redeveloped” in order to obtain and mimic the required resolution of the previously developed analytical separation. This delays moving potential new drugs from lead generation to lead optimization.

Separations that do not scale-up occur when the preparative column contains a different and/or lower cost material than the analytical column. Successful scale-up can only occur when the same stationary phase material in the analytical column is present in the preparative column. All Atlantis® dC₁₈ columns contain the same high-quality, fully tested stationary phase material in analytical and preparative column formats, thus ensuring trouble-free, linear scale-up.

Atlantis® dC₁₈ preparative columns also benefit from Waters’ new patent pending optimum packed bed density design which provides maximum bed column stability even when injecting high concentration samples dissolved in DMSO. And for the first time, analytical column performance in preparative column formats has been realized. More importantly, Atlantis® dC₁₈ preparative columns can be used in UV or mass directed, multiple preparative column systems (i.e., MUX™) with greater confidence during long, unattended preparative runs.

Linear Scale-up of Sulfa Medicines (Sulfonamides)

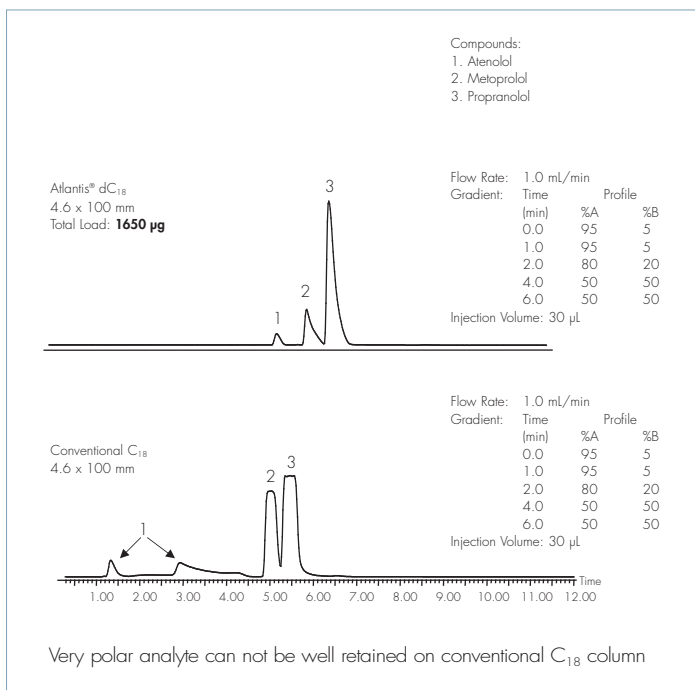


Optimal Retention and High Mass Loading

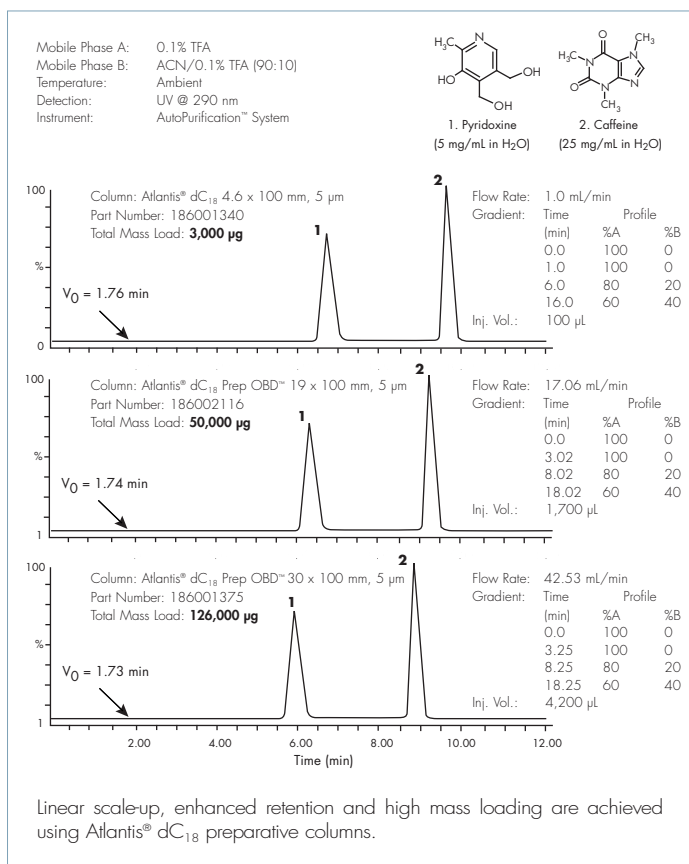
Polar compounds present a unique and difficult challenge since these unretained and/or poorly separated analytes must be re-analyzed separately, thus becoming a bottleneck in the high-throughput laboratory. If some analyte separation is realized, the peak fraction is a highly aqueous, non-volatile solvent (i.e., very weak mobile phase) that requires long evaporation times. Since Atlantis® dC₁₈ preparative columns retain compounds longer, stronger mobile phases and/or steeper gradient profiles can now be used. This optimal retention results in more volatile peak fractions, faster fraction evaporation, less sample handling and higher recoveries.

Atlantis® dC₁₈ preparative columns also provide high mass loading for polar compounds. The isolation and purification scientist can choose to use either a larger preparative column which provides a capacity safety margin for unknown sample sets or a smaller preparative column to decrease solvent consumption, operating backpressures and peak volumes. This ability to inject high mass loads translates into less preparative runs and faster library screening and purification.

Enhanced Retention of Polar Analytes



High Mass Loading of Water-Soluble Vitamins



Atlantis® dC₁₈ Preparative Columns

Type	Dimensions	Particle Size	Part No.
Guard	10 x 10 mm	5 µm	186002300 ⁵
Guard	10 x 10 mm	10 µm	186002452 ⁵
Column	10 x 50 mm	5 µm	186002298
Column	10 x 100 mm	5 µm	186002299
Column	10 x 150 mm	10 µm	186002453
Column	10 x 250 mm	10 µm	186002454
Guard	19 x 10 mm	5 µm	186001361 ⁵
Guard	19 x 10 mm	10 µm	186001363 ⁵
OBD™ Column	19 x 50 mm	5 µm	186001365
OBD™ Column	19 x 100 mm	5 µm	186001367
OBD™ Column	19 x 150 mm	5 µm	186002800
OBD™ Column	19 x 150 mm	10 µm	186001369
OBD™ Column	19 x 250 mm	10 µm	186001371
OBD™ Column	30 x 50 mm	5 µm	186001373
OBD™ Column	30 x 100 mm	5 µm	186001375
OBD™ Column	30 x 150 mm	5 µm	186002801
OBD™ Column	30 x 150 mm	10 µm	186002417
OBD™ Column	30 x 250 mm	10 µm	186002418

5. Requires Cartridge Guard Holder 289000779

6. Requires Cartridge Guard Holder 186000709

Symmetry® Packings



Symmetry® columns provide the highest standard of reproducibility for total confidence in the long term compliance of your HPLC methods. Symmetry® columns demonstrate excellent peak symmetry for maximum sensitivity and accurate quantitation. Use SymmetryPrep™ columns for lead generation and optimization for development of validated assays for stability testing and impurity profiles.

SymmetryShield™ Packing

SymmetryShield™ columns with Shield Technology contain a patented chemistry for reversed-phase HPLC that delivers significant changes in selectivity for polar and basic compounds. SymmetryShield™ columns deliver unique reversed-phase selectivity with significantly improved peak shape and resolution even for the most challenging analytes.

Symmetry300™ Packing

Symmetry300™, reversed-phase columns are designed specifically for high recoveries of peptides and proteins. Symmetry300™ columns are the best solution for validation compliance regarding identity, purity and stability.

SymmetryPrep™ Packing

SymmetryPrep™ 7 micron columns are manufactured for the chemist who needs to purify new chemical entities or isolate impurities or degradants. The new SymmetryPrep™ 7 micron products are a family of high-capacity, high-efficiency high-performance liquid chromatography (HPLC) columns that have identical selectivity to the Symmetry® 3.5 and 5 micron particle size analytical columns. This guarantees direct method scale-up with no further development. SymmetryPrep™ columns deliver the advantages of unmatched peak shape and resolution using simple volatile mobile phase buffers such as TFA and ammonium acetate. All of these features result in a tremendous time reduction in your research and development programs.

SymmetryPrep™ Columns for Purification and Isolation

Dimension	Particle Size	Part No. C ₁₈	Part No. C ₈
7.8 x 10 mm	5 µm	186000711	186000712
7.8 x 50 mm	5 µm	186000208	186000214
7.8 x 100 mm	5 µm	186000209	186000215
19 x 10 mm	5 µm	186000715	186000716
19 x 50 mm	5 µm	186000210	186000216
19 x 100 mm	5 µm	186000211	186000229
30 x 50 mm	5 µm	186000235	186000237
30 x 100 mm	5 µm	186000236	186000238
7.8 x 10 mm	7 µm	186000713	186000714
7.8 x 150 mm	7 µm	WATO66288	WATO66285
7.8 x 300 mm	7 µm	WATO66235	WATO66225
19 x 10 mm	7 µm	186000717	186000718
19 x 150 mm	7 µm	WATO66240	WATO66228
19 x 300 mm	7 µm	WATO66245	WATO66230

SymmetryShield™ Columns for Purification and Isolation

Dimension	Particle Size	Part No. RP ₁₈	Part No. RP ₈
19 x 10 mm	5 µm	186001835	186001841
19 x 50 mm	5 µm	186001836	186001842
19 x 100 mm	5 µm	186001837	186001843
19 x 150 mm	5 µm	186001838	186001844
19 x 150 mm	7 µm	186001839	186001845
19 x 300 mm	7 µm	186001840	186001846

Symmetry300™ Columns for Purification and Isolation

Dimension	Particle Size	Part No. C ₁₈
19 x 10 mm	5 µm	186001847
19 x 50 mm	5 µm	186001848
19 x 100 mm	5 µm	186001849
19 x 150 mm	5 µm	186001850

Symmetry300™ is also available as C₄ chemistry and in a 7 µm particle size. Please inquire.

Purification and Isolation Cartridge Holders

Description	Part No.
7.8 x 10 mm Cartridge Holder	186000708
19.0 x 10 mm Cartridge Holder	186000709
Replacement o-ring 7.8 mm, 2 pkg	700001019
Replacement o-ring 19 mm, 2 pkg	700001020



Waters Spherisorb® Packing

Waters Spherisorb® columns are the most widely referenced HPLC columns in scientific literature. There are over 2000 abstracts published on Spherisorb columns, providing a tremendous range of validated methods and applications to assist you in your method development process.

Waters Spherisorb® 10 µm Semiprep Columns

Chemistry	10 x 250 mm	20 x 250 mm
S10 ODS2	PSS832585	PSS832595
S10 ODS1	PSS830785	PSS830795
S10 C8	PSS832885	PSS832895
S10 C6	PSS833285	PSS833295
S10 C1	PSS833085	PSS833095
S10 NH2	PSS833685	PSS833695
S10 P	PSS833885	PSS833895
S10 CN	PSS833585	PSS833595
S10 W	PSS830285	PSS830295
Ion-Exchange		
S10 SAX	PSS833985	PSS833995
S10 SCX	PSS837685	PSS837695

Prep Nova-Pak® HR Packing

Prep Nova-Pak® HR 6 micron, ultra high-efficiency packing materials can be used in shorter columns to obtain the same resolution as longer columns with larger particle size packing materials. Shorter columns mean faster separation, lower solvent consumption and more concentrated fractions. Prep Nova-Pak® HR has the same selectivity and retention characteristics as the analytical 4 micron Nova-Pak® material. The Prep Nova-Pak® HR packing materials are ideal for the separation of a wide range of compounds such as organic synthesis intermediates or natural products.

Prep Nova-Pak® HR Columns

Description	Particle Size	Pore Size	Dimensions	Part No.
Prep Nova-Pak® HR C ₁₈	6 µm	60Å	3.9 x 300 mm	WATO38500
			7.8 x 300 mm	WATO25820
			19 x 300 mm	WATO25822
			30 x 300 mm	WATO25824
			50 x 300 mm	WATO25826
Prep Nova-Pak® HR Silica	6 µm	60Å	3.9 x 300 mm	WATO38501
			7.8 x 300 mm	WATO25821
			19 x 300 mm	WATO25823
			30 x 300 mm	WATO25825
			50 x 300 mm	WATO25827

Bondapak®/Porasil® Packing

The popular Bondapak® C₁₈ chemistry and Porasil® silica packing materials are available in three different particle sizes, 10, 15-20 and 37-55 micron, providing easy transfer of chromatography methodology from one particle size to another. You can utilize your existing 10 micron Bondapak® or Porasil® chromatography as a starting point for scale-up or, if you are developing a new purification protocol, investigate which preparative particle size provides the best balance between resolution, throughput and cost.

The preparative Bondapak® HC₁₈ HA (high-carbon load, high-activity silica) is a highly carbon-loaded packing that provides different selectivity over the standard Bondapak® packing materials. The higher carbon load on the silica surface typically results in a higher loading capability. Bondapak® HC₁₈ HA is available in a 37-55 micron particle size.

The Prep family of packing materials is based on a 55-105 micron Porasil® silica and provides a cost effective means for scale-up of preparative processes. The selectivity of Prep silica is identical to 10, 15-20 and 37-55 micron Porasil® while Prep C₁₈ has a slightly different selectivity than Bondapak® packings.

Bondapak®/Porasil® Columns

Description	Particle Size	Pore Size	Dimensions	Part No.
µBondapak® C ₁₈	10 µm	125Å	3.9 x 300 mm	WATO27324
			7.8 x 300 mm	WATO84176
			19 x 150 mm	WATO88500
			19 x 300 mm	WATO25828
			30 x 300 mm	WATO25854
Bondapak® C ₁₈	15-20 µm	125Å	3.9 x 300 mm	WATO25875
			7.8 x 300 mm	WATO25832
			19 x 300 mm	WATO25834
			30 x 300 mm	WATO25836
			50 x 300 mm	WATO25838
µBondapak® Phenyl	10 µm	125Å	3.9 x 300 mm	WATO27198
			7.8 x 300 mm	WATO84179
µBondapak® CN	10 µm	125Å	7.8 x 300 mm	WATO84177
µBondapak® NH ₂	10 µm	125Å	3.9 x 300 mm	WATO84040
			7.8 x 300 mm	WATO84178
µPorasil®	10 µm	125Å	3.9 x 300 mm	WATO27477
			7.8 x 300 mm	WATO84175
			19 x 150 mm	WATO91648
			19 x 300 mm	WATO25829
			30 x 300 mm	WATO25855
Porasil®	15-20 µm	125Å	50 x 300 mm	WATO25857
			3.9 x 300 mm	WATO25874
			7.8 x 300 mm	WATO25833
			19 x 300 mm	WATO25835
			30 x 300 mm	WATO25837
			50 x 300 mm	WATO25839

Delta-Pak™ Packing

Delta-Pak™ packing materials are ideal for the separation of peptides, proteins, and natural products. The isolation and purification of a peptide is usually a multi-step procedure with the fractions from the first run being re-chromatographed on the same preparative column to obtain pure product. Delta-Pak™ packing materials are based on a highly stable, bonded, endcapped 5 and 15 micron packing. The 5 micron packing is available in analytical scale dimensions for preliminary preparative chromatographic studies, peptide mapping, and fraction purity assays. The chemistry characteristics of the packing materials are independent of the particle size.

Delta-Pak™ Columns

Description	Particle Size	Pore Size	Dimensions	Part No.
Delta-Pak™ C ₁₈	15 µm	100Å	3.9 x 300 mm	WAT011797
		300Å	3.9 x 300 mm	WAT011802
		100Å	7.8 x 300 mm	WAT011798
		300Å	7.8 x 300 mm	WAT011803
		100Å	19 x 300 mm	WAT011799
		300Å	19 x 300 mm	WAT011804
		100Å	30 x 300 mm	WAT011800
		300Å	30 x 300 mm	WAT011805
		100Å	50 x 300 mm	WAT011801
Delta-Pak™ C ₄	15 µm	100Å	3.9 x 300 mm	WAT011807
		300Å	3.9 x 300 mm	WAT011812
		100Å	7.8 x 300 mm	WAT011808
		300Å	7.8 x 300 mm	WAT011813
		100Å	19 x 300 mm	WAT011809
		300Å	19 x 300 mm	WAT011814
		100Å	30 x 300 mm	WAT011810
		300Å	30 x 300 mm	WAT011815

Preparative Bulk for Lab to Process Scale Purifications

Waters offers a number of different bulk packing materials for lab to process scale purifications. All our packing materials are manufactured under cGMP (current Good Manufacturing Practices) ensuring a reproducible material for long term reproducibility. Our manufacturing facilities are ISO 9002 certified and are registered with the FDA as a medical device manufacturing facility. Bulk materials are available packaged in quantities of 100 grams up to 5 kilograms. For larger quantity purchases, contact us for pricing and availability.



All bulk packings are carefully quality controlled using a wide array of physical and chemical tests to ensure consistent batch-to-batch reproducibility.

Normal Phase Bulk Packings

Description	Particle Size	Pore Size	Dimensions	Part No.
Porasil® Silica	15-20 µm	125Å	100 g	WAT020731
			1 kg	WAT020732
			5 kg	WAT020733
Porasil® Silica	37-55 µm	125Å	100 g	WAT020721
			1 kg	WAT020722
			5 kg	WAT020723
Prep Silica	55-105 µm	125Å	100 g	WAT020587
			1 kg	WAT010004
			5 kg	WAT020588

Reversed-Phase Bulk Packings

Description	Particle Size	Pore Size	Dimensions	Part No.
Bondapak® C ₁₈	15-20 µm	125Å	100 g	WAT020739
			1 kg	WAT020740
			5 kg	WAT020741
Bondapak® C ₁₈	37-55 µm	125Å	100 g	WAT030632
			1 kg	WAT030633
			5 kg	WAT030634
Bondapak® HC ₁₈ HA	37-55 µm	125Å	100 g	WAT035672
			1 kg	WAT035674
			5 kg	WAT035676
Prep C ₁₈	55-105 µm	125Å	100 g	WAT020594
			1 kg	WAT010001
			5 kg	WAT020595

Introduction to Radial Compression Technology

Waters Radial Compression Technology for Analytical and Preparative Chromatography

Waters patented radial compression technology requires the use of flexible-walled column segments and a holder. The column segment is inserted in the holder and pressure is exerted on the flexible walls of the column segments by a compressing fluid. The packing material inside the column segment is radially compressed by this pressure, to create a tightly packed bed. This radial compression also significantly reduces the voids along the column walls.

Radial compression increases column lifetime and stability because the column segment is effectively repacked each time it is recompressed. This radial compression of the column eliminates voids and channels.

Near the rigid wall of a conventional steel column, there is lower resistance to flow due to the lower density of the packed bed. This "wall effect" constitutes a significant source of band broadening (Figure 1A).

Radial compression greatly improves flow characteristics close to the column wall (Figure 1B). The flexible wall of the column segment actually molds itself around the silica particles to significantly reduce voids near the column wall. The efficiency of a radial compression column segment has been shown to be 25% higher than that of a packed steel column.

Figure 1A

Rigid Steel Wall

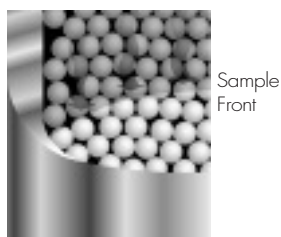
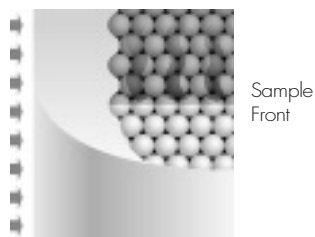


Figure 1B

Flexible Plastic Wall



Radial Compression Column Segments

We offer a wide selection of Waters column segments for analytical and preparative chromatography. Each column segment is used in conjunction with a radial compression holder to provide an economical and high-performance solution for your separations.

The RadialPak™ column segments have an internal diameter of 5 mm or 8 mm and can be used for analytical and semi-preparative chromatography. The PrepLC™ column segments have larger internal diameters (25 and 40 mm) for preparative scale work. Both types come with a wide range of high resolution stationary phases capable of solving the most difficult separation problems.

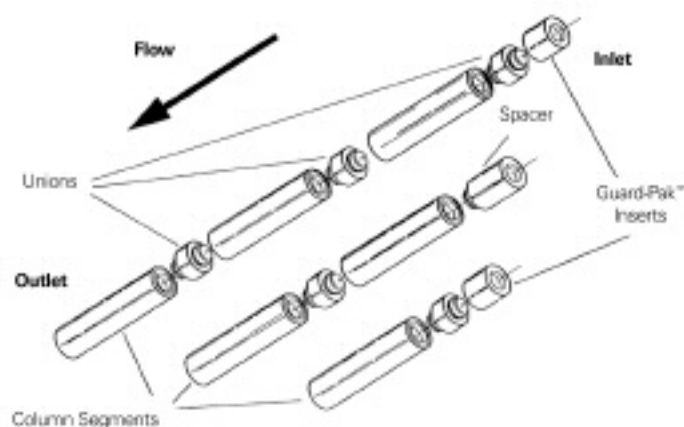
These radial compression column segments are packed in lengths of 100 mm, which can be used alone or connected in series to create 200 mm and 300 mm long preparative columns, a concept known as Segmented Column Technology (SCT). Using SCT, you can easily develop the optimum column length, volume, and efficiency for your purification.

A single 100 mm column segment can be used for fast isocratic or gradient separations that are less dependent on column length or efficiency. The shorter run and equilibration time reduces solvent consumption. Also the smaller column volume allows fractions to be eluted in a more concentrated volume, minimizing sample dilution and facilitating product recovery.

Two or three columns can be used in series for difficult separations, to achieve higher purity, or to accommodate greater sample load. Guard Pak™ inserts are also available to further extend column segment lifetimes.

How Does Segmented Column Technology (SCT) Save Money

SCT offers several cost benefits over standard 200 mm to 300 mm length steel columns. Initial costs are lowered because you use only the number of 100 mm column segments needed to achieve the required performance. Also column lifetime can be increased by using Guard-Pak inserts which can protect the column. Or, when using more than one column in tandem, replace the first column (which is generally the target of most abuse generated by dirty samples) with a new column. Column costs are dramatically reduced because only a portion of the column is replaced (the contaminated 100 mm lead column segment) instead of the entire 200 or 300 mm column.



Preparative Column Configurations

Radial-Pak™ column segments can be used as a semi-preparative purification column or as a scaling column when developing methods for large scale purifications. Separations done on 8 x 100 mm Radial-Pak™ column segments can be scaled-up 10-fold to the PrepLC™ 25 x 100 mm columns, 25-fold to the PrepLC™ 40 x 100 mm columns and 100-fold to the PrepPak® 47 x 300 mm cartridges.

The economical PrepLC™ 25 x 100 mm column segments can be used to purify materials in the 25-300 mg range depending on the difficulty of the separation. These PrepLC™ columns can be used on either an analytical or preparative HPLC system.

The PrepLC™ 40 x 100 mm column segments are economical columns for lab scale purifications (50 mg-750 mg). These columns should be used in conjunction with an HPLC system capable of delivering at least 25 mL/min.

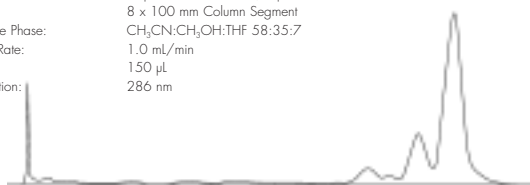
PrepPak® 47 x 300 mm cartridges can be used to achieve higher loads than on the PrepLC™ 40 x 100 mm column segments. These columns should be used with systems capable of delivering at least 50 mL/min.

We also offer an extensive selection of prepacked steel preparative columns in ranges of 3.9 mm I.D. to 50 mm I.D. packed with a variety of chemistries in different particle and pore sizes.

Prep Guard-Pak™ inserts are 10 mm in length and they are packed with the same material used in the PrepLC™ 25 mm and 40 x 100 mm columns. No special hardware is necessary since they are integrated into the appropriate PrepLC™ column holder.

Scale-up of Carotenoid Separation

Sample: Crude Carrot Extract
 Column: Prep Nova-Pak® HR C₁₈ 6 µm
 8 x 100 mm Column Segment
 Mobile Phase: CH₂CN:CH₃OH:THF 58:35:7
 Flow Rate: 1.0 mL/min
 Load: 150 µL
 Detection: 286 nm



Sample: Crude Carrot Extract
 Column: Prep Nova-Pak® HR C₁₈ 6 µm
 25 x 100 mm Column Segment
 Mobile Phase: CH₂CN:CH₃OH:THF 58:35:7
 Flow Rate: 10.0 mL/min
 Load: 1500 µL
 Detection: 286 nm

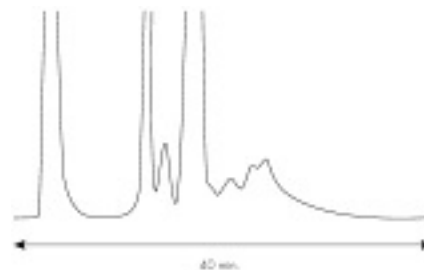


This application illustrates the straightforward 10-fold scaleup from a Radial-Pak™ 8 mm I.D. column segment to a PrepLC™ 25 mm I.D. column segment with identical resolution and chromatographic profiles.

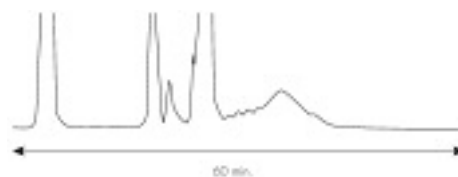
Scale-up of Human Milk Whey

Sample: Human Milk Whey
 Column: Delta-Pak™ C₁₈, 1.5 µm, 300 Å
 Solvent A: Water/0.1% TFA
 Solvent B: Acetonitrile/0.1% TFA
 Flow Rate: 19.5 mL/min
 Detection: UV at 280 nm

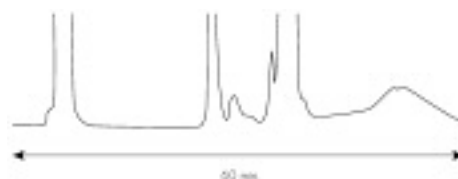
A: 1 Column Segment (25 x 100 mm)
 Gradient: 30% B for 3 min to 48% B in 12 min to
 80% B in 8 min hold 5 min
 Load: 7 mL



B: 2 Column Segments (25 x 200 mm)
 Gradient: 30% B for 6.5 min to 48% B in 24 min to
 80% B in 16 min hold
 Load: 14 mL



C: 3 Column Segments (25 x 300 mm)
 Gradient: 30% B for 8.9 min to 48% B in 36 min to
 80% B in 24 min hold 15 min
 Load: 21 mL



These chromatograms illustrate the advantages of using different column segment lengths for the purification of proteins from human milk whey. All separations were run at the same flow rate (19.5 mL/min) and as a result, purification times increased as cartridges were added. The efficiency of the column coupling system is highlighted by the increased resolution with larger column lengths at constant loads.

Radial Compression Modules

We carry a complete inventory of accessories and spare parts for the Waters patented Radial Compression Modules for use with the 5 mm and 8 mm I.D. Radial-Pak™ column segments, the 25 mm and 40 mm I.D. PrepLC™ column segments, and the 47 mm and 57 mm I.D. PrepPak® cartridges.

8x10 Holder

8x10 Holder for 8 x 100 mm and 5 x 100 mm Radial-Pak™ column segments



Description	Part No.
8x10 Holder	WAT082887
8x10 Extension Kit (includes 1 extension tube, union, o-rings)	WAT038846
Cartridge Union	WAT038849

PrepLC™ 25 mm Module

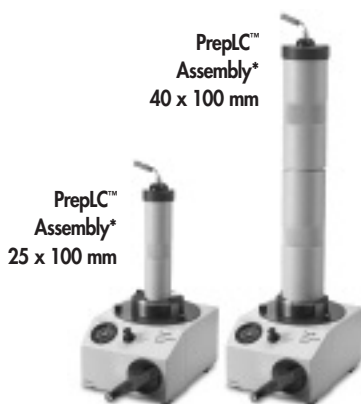
PrepLC™ 25 mm Module for 25 x 100 mm column segments



Description	Part No.
PrepLC™ 25 mm Module	WAT015814
PrepLC™ 25 mm Extension Kit (includes 1 extension tube, union, o-rings)	WAT022180
Extension tube	WAT019311

PrepLC™ Assemblies

PrepLC™ Assembly for 40 x 100 mm and 25 x 100 mm column segments



Description	Part No.
PrepLC™ 40 mm Assembly (includes PrepLC™ Universal Base and PrepLC™ 40 mm Chamber)	WAT022441
PrepLC™ Universal Base	WAT027577
PrepLC™ 40 mm Chamber (includes o-rings, spacer and union)	WAT027578
PrepLC™ 40 mm Extension Kit (includes extension tube, union, o-rings)	WAT022365
PrepLC™ 25 mm Chamber (includes o-rings, spacer and union)	WAT033994
PrepLC™ 25 mm Extension Kit (includes 1 extension tube, union, o-rings)	WAT022180
PrepLC™ Scale-up Kit with capability for 40 mm or 25 x 300 length, includes:	WAT022440
1 - PrepLC™ Universal Base	
2 - PrepLC™ Chambers (one each of 40 mm and 25 mm)	
2 - PrepLC™ 25 mm Extension Kits	
2 - PrepLC™ 40 mm Extension Kits	

* Note: Up to two extension tubes can be attached for a combined cartridge length of 300 mm

Nova-Pak® and Prep Nova-Pak™ Radial Compression Column Segments and PrepPak® Cartridges

Column	Particle Size	Pore Size	Dimensions	Part No.
Nova-Pak® Radial-Pak™ Column Segments				
Nova-Pak™ C ₁₈	4 µm	60Å	5 x 100 mm	WAT080100
			8 x 100 mm	WAT086342
Nova-Pak™ C ₈	4 µm	60Å	5 x 100 mm	WAT035890
			8 x 100 mm	WAT035884
Nova-Pak™ Phenyl	4 µm	60Å	5 x 100 mm	WAT010657
			8 x 100 mm	WAT010658
Nova-Pak™ CN HP	4 µm	60Å	5 x 100 mm	WAT010224
			8 x 100 mm	WAT010223
Nova-Pak™ Silica	4 µm	60Å	5 x 100 mm	WAT010986
			8 x 100 mm	WAT010987
Prep Nova-Pak™ HR Radial-Pak™ Column Segments				
Prep Nova-Pak™ HR C ₁₈	6 µm	60Å	8 x 100 mm	WAT025843
Prep Nova-Pak™ HR Silica	6 µm	60Å	8 x 100 mm	WAT025844
Prep Nova-Pak™ HR PrepLC™ 25 mm Column Segments				
Prep Nova-Pak™ HR C ₁₈	6 µm	60Å	25 x 100 mm	WAT038510
Prep Nova-Pak™ HR Silica	6 µm	60Å	25 x 100 mm	WAT038511
Prep Nova-Pak™ HR 25x10 Guard-Pak™ Inserts (2/pkg)				
Prep Nova-Pak™ HR C ₁₈	6 µm	60Å	25 x 10 mm	WAT038528
Prep Nova-Pak™ HR Silica	6 µm	60Å	25 x 10 mm	WAT038530
Prep Nova-Pak™ HR PrepLC™ 40 mm Column Segments				
Prep Nova-Pak™ HR C ₁₈	6 µm	60Å	40 x 100 mm	WAT037704
Prep Nova-Pak™ HR Silica	6 µm	60Å	40 x 100 mm	WAT037708
Prep Nova-Pak™ HR 40x10 Guard-Pak™ Inserts (2/pkg)				
Prep Nova-Pak™ HR C ₁₈	6 µm	60Å	40 x 10 mm	WAT037854
Prep Nova-Pak™ HR Silica	6 µm	60Å	40 x 10 mm	WAT037857

Resolve® Radial Compression Column Segments and PrepPak® Cartridges*

Column	Particle Size	Pore Size	Dimensions	Part No.
Resolve™ C ₁₈	5 µm	90Å	8 x 100 mm	WAT084624
Resolve™ C ₁₈	10 µm	90Å	5 x 100 mm	WAT084620
			8 x 100 mm	WAT084720
Resolve™ C ₈	10 µm	90Å	5 x 100 mm	WAT085672
			8 x 100 mm	WAT085670
Resolve™ CN	10 µm	90Å	5 x 100 mm	WAT084626
			8 x 100 mm	WAT084636
Resolve™ Silica	5 µm	90Å	8 x 100 mm	WAT084634
Resolve™ Silica	10 µm	90Å	5 x 100 mm	WAT084630
			8 x 100 mm	WAT084730

* All column segments and cartridges require the appropriate holder/module

Bondapak®/Porasil® Radial Compression Column Segments and PrepPak® Cartridges*

Column	Particle Size	Pore Size	Dimensions	Part No.
Bondapak®/Porasil® Radial-Pak™ Column Segments				
μBondapak® C ₁₈	10 μm	125Å	8 x 100 mm	WAT085721
μBondapak® NH ₂	10 μm	125Å	8 x 100 mm	WAT085724
μBondapak® Phenyl	10 μm	125Å	8 x 100 mm	WAT085722
μPorasil®	10 μm	125Å	8 x 100 mm	WAT085720
Bondapak® C ₁₈	15-20 μm	125Å	8 x 100 mm	WAT025841
Bondapak® HC ₁₈ HA	37-55 μm	125Å	8 x 100 mm	WAT036561
Bondapak®/Porasil® PrepLC™ 25 mm Column Segments				
μBondapak® C ₁₈	10 μm	125Å	25 x 100 mm	WAT038505
Bondapak® C ₁₈	15-20 μm	125Å	25 x 100 mm	WAT038503
		300Å	25 x 100 mm	WAT038575
Bondapak® HC ₁₈ HA	37-55 μm	125Å	25 x 100 mm	WAT056970
μPorasil®	10 μm	125Å	25 x 100 mm	WAT038504
Porasil®	15-20 μm	125Å	25 x 100 mm	WAT038502
Bondapak®/Porasil® Prep 25x10 Guard-Pak™ Inserts (2/pkg)				
μBondapak® C ₁₈	10 μm	125Å	25 x 10 mm	WAT038518
Bondapak® C ₁₈	15-20 μm	125Å	25 x 10 mm	WAT038514
μPorasil®	10 μm	125Å	25 x 10 mm	WAT038516
Porasil®	15-20 μm	125Å	25 x 10 mm	WAT038512
Bondapak®/Porasil® PrepLC™ 40 mm Column Segments				
μBondapak® C ₁₈	10 μm	125Å	40 x 100 mm	WAT037684
Bondapak® C ₁₈	15-20 μm	125Å	40 x 100 mm	WAT037676
		300Å	40 x 100 mm	WAT037712
Bondapak® C ₈	15-20 μm	300Å	40 x 100 mm	WAT037720
μPorasil®	10 μm	125Å	40 x 100 mm	WAT037680
Porasil®	15-20 μm	125Å	40 x 100 mm	WAT037672
Bondapak®/Porasil® Prep 40x10 Guard-Pak™ Inserts (2/pkg)				
μBondapak® C ₁₈	10 μm	125Å	40 x 10 mm	WAT037839
Bondapak® C ₁₈	15-20 μm	125Å	40 x 10 mm	WAT037833
Bondapak® C ₈	15-20 μm	300Å	40 x 10 mm	WAT037863
μPorasil®	10 μm	125Å	40 x 10 mm	WAT037836
Porasil®	15-20 μm	125Å	40 x 10 mm	WAT037830

* All column segments and cartridges require the appropriate holder/module, see page 152

Delta-Pak™ Radial Compression Column Segments and PrepPak® Cartridges*

Column	Particle Size	Pore Size	Dimensions	Part No.
Delta-Pak™ Radial-Pak™ Column Segments				
Delta-Pak™ C ₁₈	15 μm	100Å	8 x 100 mm	WAT025846
		300Å	8 x 100 mm	WAT025845
Delta-Pak™ C ₄	15 μm	100Å	8 x 100 mm	WAT025848
		300Å	8 x 100 mm	WAT025847
Delta-Pak™ PrepLC™ 25 mm Column Segments				
Delta-Pak™ C ₁₈	15 μm	100Å	25 x 100 mm	WAT038506
		300Å	25 x 100 mm	WAT038507
Delta-Pak™ C ₄	15 μm	100Å	25 x 100 mm	WAT038508
		300Å	25 x 100 mm	WAT038509
Delta-Pak™ Prep 25x10 Guard-Pak™ Inserts (2/pkg)				
Delta-Pak™ C ₁₈	15 μm	100Å	25 x 10 mm	WAT038520
		300Å	25 x 10 mm	WAT038522
Delta-Pak™ C ₄	15 μm	100Å	25 x 10 mm	WAT038524
		300Å	25 x 10 mm	WAT038526
Delta-Pak™ PrepLC™ 40 mm Column Segments				
Delta-Pak™ C ₁₈	15 μm	100Å	40 x 100 mm	WAT037688
		300Å	40 x 100 mm	WAT037692
Delta-Pak™ C ₄	15 μm	100Å	40 x 100 mm	WAT037696
		300Å	40 x 100 mm	WAT037700
Delta-Pak™ Prep 40x10 Guard-Pak™ Inserts (2/pkg)				
Delta-Pak™ C ₁₈	15 μm	100Å	40 x 10 mm	WAT037842
		300Å	40 x 10 mm	WAT037845
Delta-Pak™ C ₄	15 μm	100Å	40 x 10 mm	WAT037848
		300Å	40 x 10 mm	WAT037851

PrepPak® Cartridges

Requires PrepPak® 1000 Module (Part No. WAT089592).



Column	Particle Size	Pore Size	Dimensions	Part No.
Bondapak® C ₁₈	15-20 μm	125Å	47 x 300 mm	WAT091784
Bondapak® C ₁₈	15-20 μm	300Å	47 x 300 mm	WAT038571
Bondapak® C ₁₈	37-55 μm	125Å	47 x 300 mm	WAT025873
Bondapak® HC ₁₈ HA	37-55 μm	125Å	47 x 300 mm	WAT038570
Bondapak® NH ₂	55-105 μm	125Å	47 x 300 mm	WAT091631
Delta-Pak™ C ₁₈	15 μm	100Å	47 x 300 mm	WAT015401
		300Å	47 x 300 mm	WAT010988
Delta-Pak™ C ₄	15 μm	100Å	47 x 300 mm	WAT011633
		300Å	47 x 300 mm	WAT011669
Prep C ₁₈	55-105 μm	125Å	47 x 300 mm	WAT025876
Porasil® Silica (single)	15-20 μm	125Å	47 x 300 mm	WAT025852
(Case of 10)				WAT025878
Porasil® Silica (single)	37-55 μm	125Å	47 x 300 mm	WAT025853
(Case of 10)				WAT025877
Prep Silica (single)	55-105 μm	125Å	57 x 300 mm	WAT050041
(Case of 10)				WAT050040
PrepPak® 1000 Module for 47 x 300 mm and 57 x 300 mm PrepPak™ Cartridges				WAT089592

Accessories and Spare Parts for Waters Radial Compression Cartridge Holders and Modules

We carry a complete inventory of accessories and spare parts for Waters patented Radial Compression Modules for use with the 5 mm and 8 mm i.d. x 100 mm long Radial-Pak™ column segments, 25 mm and 40 mm i.d. x 100 mm long PrepLC™ column segments, and 47 mm or 57 mm i.d. x 300 mm long PrepPak® cartridges.

8x10 Cartridge Holder, Parts and Accessories

Description	Part No.
8x10 Holder	WAT082887
8x10 Extension Kit (Includes 1 extension tube, union, o-rings)	WAT038846
Column segment union	WAT038849
O-ring for extension tube	WAT038851
Connector assembly (non-metallic)	WAT015898
Connector tubing assembly (non-metallic)	WAT088919
Connector assembly (stainless steel)	WAT082892
Washer for connectors 10/pk	WAT005147
Pressure relief plug	WAT088027
Check valve	WAT082888
O-ring (large) for connector 10/pk	WAT005130
O-ring (small) for connector (normal phase) 4/pk	WAT015797
O-ring (small) for connector (reversed-phase) 10/pk	WAT005129
O-ring for filling port 10/pk	WAT005129
O-ring for pressure piston	WAT088494
Gripper ring replacement kit (Includes 10 gripper rings, 20 washers, 10 ferrules and tool)	WAT021908

PrepLC™ 25 mm Module, Parts and Accessories

Description	Part No.
PrepLC™ 25 mm Module	WAT015814
PrepLC™ 25 mm Extension Kit (Includes 1 extension tube, union, o-rings)	WAT022180
Extension tube	WAT019311
O-ring for extension tube	WAT015831
O-ring (large) for connector	WAT015833
O-ring (small) for connector (normal phase)	WAT015848
O-ring (small) for connector (reversed-phase)	WAT015834
O-ring for filling port 10/pk	WAT005129
O-ring for pressure piston	WAT015854
Union coupling assembly	WAT015860
Union, 1/8 to 1/16 inch tubing 5/pk	WAT005137

PrepLC™ Spare Parts

Description	Part No.
PrepLC™ Universal Base Spare Parts	
O-ring removal tool	WAT082853
O-ring for pressure piston	WAT022281
O-ring for filling port	WAT005129
Filling port plug	WAT027509
Ferrules and compression fittings (stainless steel) 5/pkg	WAT025604
PrepLC™ 40 mm Chamber Spare Parts	
Column segment union	WAT033996
Cartridge spacer	WAT033997
O-ring, base plate (small)	WAT022453
O-ring, base plate (large)	WAT022454
O-ring, chamber top	WAT022280
O-ring (normal phase) cartridge top and bottom, spacers and unions	WAT027519
O-ring (normal phase) chamber bottom	WAT022299
O-ring (normal phase) inner connector, top and bottom	WAT022297
O-ring (reversed-phase) cartridge top and bottom, spacers and unions	WAT027518
O-ring (reversed-phase) chamber bottom	WAT022283
O-ring (reversed-phase) inner connector, top and bottom	WAT015835
O-ring, extension tube	WAT022454
Tubing Fluid Path Kit* (PEEK) (Includes inner connectors, tubing, ferrules and compression screws)	WAT022398
PrepLC™ 25 mm Chamber Spare Parts	
Column segment union	WAT015860
Segment spacer	WAT015859
O-ring, base plate (small)	WAT022276
O-ring, base plate (large)	WAT015831
O-ring, chamber top	WAT015833
O-ring, (normal phase) cartridge top and bottom, spacers and unions	WAT015848
O-ring (normal phase) chamber bottom	WAT022298
O-ring (normal phase) inner connector, top and bottom	WAT022297
O-ring (reversed-phase) cartridge, top and bottom, spacers and union	WAT015834
O-ring (reversed-phase) chamber bottom	WAT022282
O-ring (reversed-phase) inner connector, top and bottom	WAT015835
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3. When will I receive my order?

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You select the transportation best suited to your needs. Waters offers FedEx and UPS as our standard carriers offering 3-day ground saver, Priority 1, 10:30 a.m. Next Day; Standard, 3:00 p.m. Next Day; and Economy Two-Day Service.

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Outside the U.S.A., please refer to the back of this catalog for the address and telephone number of your local Waters office.



How to reach us

Australia

Waters Australia Pty. Limited
Unit 3, 38-46 South Street
P.O. Box 84
Rydalmere BC NSW 2116
Tel: 2 9933 1777
Fax: 2 9898 1455

Austria and European Export

(Central South Eastern Europe,
CIS and Middle East)
Waters Ges.m.b.H.
Hietzinger Hauptstrasse 145
A-1130 Vienna
Tel: 431 877 18 07
Fax: 431 877 18 08

Belgium

Waters S.A.-N.V.
Raketstraat 60
Rue de la Fusée 60
1130 Brussels
Tel: 32 2 726 1000
Fax: 32 2 726 1100

Brazil

Waters Technology
Do Brasil LTDA
Avenida Morumbi
8411 Sala 14
04703-004 Sao Paulo SP
Tel: 55 11 5543 7788
Fax: 55 11 5093 1624

Canada

Waters Limited
6427 Northam Drive
Mississauga
Ontario L4V 1J2
Tel: 800 252 4752
Fax: 905 678 9237

China

Waters China Limited
Representative Office
580 A Nathan Road
Room 1104
Chow Tai Fook Centre
Kowloon, Hong Kong
Tel: 86-10-84518918
Fax: 86-10-84518928

CIS/Russia

Waters Ges.m.b.H.
Representation Office
ul. Miklukho-Maklaia 16/10
117871 Moscow
Tel: (7) 095 931 9193
Fax: (7) 095 336 7000

Czech Republic

Waters Ges.m.b.H.
Psohlavcu 43
147 00 Prague 4
Tel: 42 02 617 11384
Fax: 42 02 617 11386

Denmark

Waters A/S
Baldersbuen 46
2640 Hedehusene
Tel: 45 46 59 8080
Fax: 45 46 59 8585

Finland

Waters Oy
Kuparitie 1
00440 Helsinki
Tel: +358 9 506 4140
Fax: +358 9 506 41411

France

Waters S.A.
B.P. 608
78056 Saint-Quentin
En Yvelines, Cedex
Tel: (33) 1 30 48 72 00
Fax: (33) 1 30 48 72 11

Germany

Waters GmbH
Hauptstrasse 87
65760 Eschborn
Tel: 49 6196 400600
Fax: 49 6196 482388

Hungary

Waters kft
Vaci ut 202
H-1138 Budapest
Tel: 36 1 350 5086
Fax: 36 1 350 5087

Hong Kong

Waters China Ltd.
Room 901, 9/F
102 Austin Road
Kowloon
Tel: 852 29 64 1800
Fax: 852 25 49 6802

India

Waters India Pvt. Ltd.
36A, II Phase
Peenya Industrial Park
Bangalore 560058
Tel: 91 80 2 837 1900
Fax: 91 80 2 839 2157

Ireland

Waters Chromatography
Ireland Ltd., Unit 3.1
Woodford Business Park
Santry, Dublin 9, Ireland
Tel: 353 1 448 1500
Fax: 353 1 448 1510

Italy

Waters S.P.A.
Via Achille Grandi, 27
20090 Vimodrone MI
Tel: 39 02 274 211
Fax: 39 02 250 1827

Japan

Nihon Waters K.K.
Dai-5. Koike Bldg.
1-3-12 Kita-shinagawa
Shinagawa-ku, Tokyo 140-0001
Tel: (81) 3 3471 7191
Fax: (81) 3 3471 7116

Korea

Waters Korea Limited,
Seum Bldg San 10-7
Sangdo 2-Dong, Dongjak-Gu
Seoul 156-837
Tel: (82) 2 820 2700
Fax: (82) 2 820 8730

Mexico

Waters S.A. DE C.V.
Moras No 822
Del Benito Juarez , Col Acacias
C.P. 03230, Mexico D.F.
Tel: 5255 5524 7636
Fax: 5255 5524 9376

The Netherlands

Waters Chromatography B.V.
Florijnstraat 19
Postbus 379
4870 AJ Etten-Leur
Tel: 0031 (0)76-50.87.200
Fax: 0031 (0)76-50.87.280

Norway

Waters AS
Hvamstuppen 17
N-2013 Skjetten
Tel: 47 63 84 60 50
Fax: 47 63 84 60 51

Poland

Waters Sp z o.o
ul. Lektykarska 25 m 10
01-687 Warszawa
Tel: (48) 22 833 4400
Fax: (48) 22 833 0987

Puerto Rico

Waters Technologies Corporation
P.O. Box 6870 , Urb. San Alfonso
Degetau Ave. No. A-1 Suite 104
Caguas 00726
Tel: 787 747 8445
Fax: 787 747 8448

Singapore

Waters Asia Ltd.
396 Alexandra Road
#04-06 BP Tower
Singapore 119954
Tel: 65 6278 7997
Fax: 65 6278 7557

Spain

Waters Cromatografia, S.A.
Ronda Can Fatjó, 7-A
Parc Tecnològic del Vallès
08290 Cerdanyola del Vallès
Barcelona
Tel: 34 93 600 93 00
Fax: 34 93 600 93 60

Sweden

Djupdalsvägen 12-14
SE-192 51 Sollentuna
Tel: 46 8 555 11500
Fax: 46 8 555 11550

Switzerland

Waters AG
Dorfstrasse 10
5102 Rapperswil
Tel: 41 62 889 2030
Fax: 41 62 889 2059

Taiwan

Waters Asia Ltd.
4th-3 Floor
23 Chang An East Road
Section 1, Taipei
Tel: 886 2 2543 1898
Fax: 886 2 2543 1918

United Kingdom

Waters U.K. Ltd.
730-740 Centennial Court
Centennial Park, Elstree,
Hertfordshire WD6 3SZ
Tel: 44 208 238 6100
Fax: 44 208 207 7070

All Other Countries

Waters Corporation
34 Maple Street
Milford, MA 01757 USA
Tel: 508 478 2000
800 252 4752
Fax: 508 872 1990

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