

# Nano- and Micro-Flow LC-MS







# Contents

<b>ionKey/MS</b> .....	<a href="#">429</a>
Simplified Micro-Flow LC-MS with Enhanced Sensitivity.....	<a href="#">429</a>
<b>iKey Separation Device</b> .....	<a href="#">430</a>
<b>Nano- and Micro-Flow Columns and Trapping Columns</b> .....	<a href="#">432</a>
Separation Columns .....	<a href="#">432</a>
Trapping Columns .....	<a href="#">432</a>
<b>ACQUITY UPLC M-Class with HDX Technology</b> .....	<a href="#">434</a>
Enzymate Pepsin Online Digestion Column .....	<a href="#">434</a>
<b>LC-MS Accessories</b> .....	<a href="#">435</a>
TruView LCMS Certified Vials .....	<a href="#">435</a>
Waters Certified Containers.....	<a href="#">436</a>
pH Buffers.....	<a href="#">436</a>

# Nano- and Micro-Flow LC-MS

Our nano- and micro-flow LC Columns fully exploit the separation power of small, sub-2- $\mu\text{m}$  particles to deliver superior chromatographic resolution.

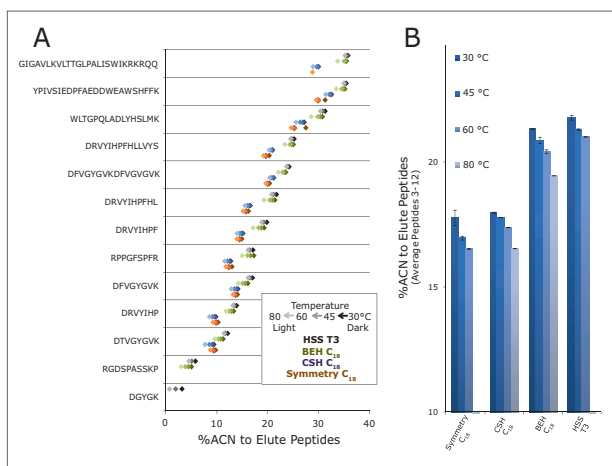
The selected stationary phases for nano-LC columns facilitate the efficiency and selectivity required for separations of complex peptide and protein separations as well as other sample-limited analyses.

Hybrid Particles		Silica-based Particles	
			
			
130 Å	300 Å	130 Å	100 Å
1.7 $\mu\text{m}$	1.7 $\mu\text{m}$	1.7 $\mu\text{m}$	1.8 $\mu\text{m}$
C <sub>18</sub>	C <sub>18</sub> , C <sub>4</sub>	C <sub>18</sub>	T <sub>3</sub>

**Peptide Separation Technology** stationary phases are specifically QC tested with tryptic digests of cytochrome c to ensure consistent performance for peptide separations.

**Protein Separation Technology** stationary phases are specifically designed for the high resolution analysis of proteins of various sizes, hydrophobicities, and isoelectric points. Particles are QC tested using a protein standard mix.

## Trap Elute Peptide Separation

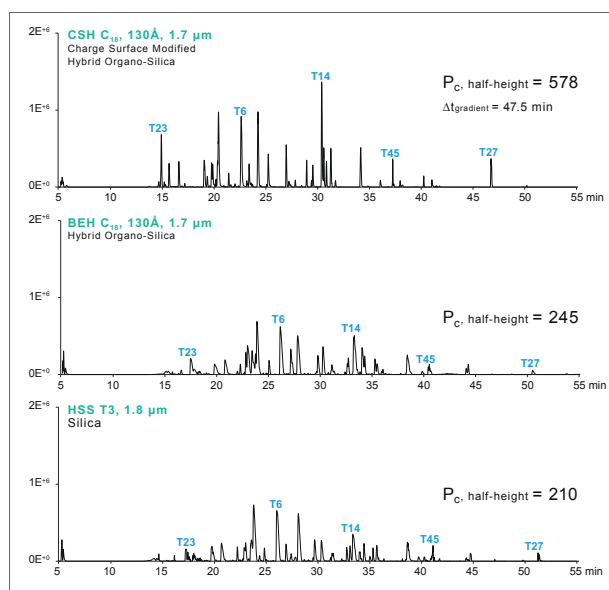


Peptide retention comparison of different stationary phases, including Symmetry Silica (the lower retention of Symmetry is used in trap-elute separations).


In nano- and micro-flow LC-MS, analyzing large-volume samples using a single column can be impractical. In such cases, you can trap analytes at higher flow rates. It is preferable to perform online trapping of analytes at microscale flow rates and to subsequently elute and separate those analytes across an analytical column, wherein a significantly lower nanoscale flow rate is employed.

To be effective, the trapping column's retentivity must be lower than that of the analytical column. This relationship between trapping and analytical columns ensures refocusing of analytes on the analytical column after elution from the trap at the start of the gradient, delivering high peak capacity separations.

## Peak Capacity and Retentivity



Comparison of a base peak ion chromatogram of MassPREP Enolase Digestion Standard, 1  $\mu\text{g}$ , direct injection on a 75  $\mu\text{m}$  (I.D.) column.

 For more information on Waters Particle Technology, please refer to [page 77](#).

Nano- and micro-flow LC-MS is commonplace in areas of bio-separation such as peptide bioanalysis, intact antibody analysis, proteomics, lipidomics and metabolomics. This technique addresses limited sample availability and the need for high sensitivity and the requirement for low limits of detection or quantification.

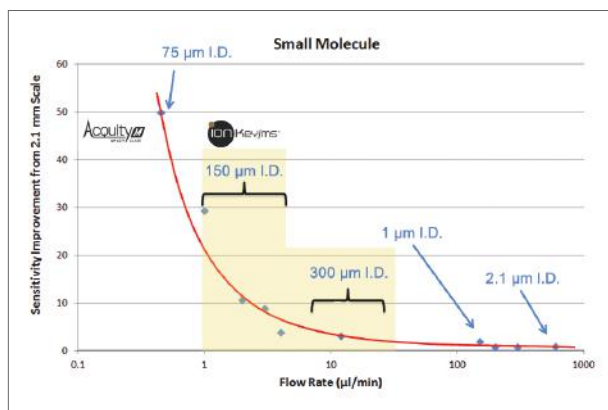
In micro-flow LC-MS, the inner diameter of the separation column, and thus the flow rate of the mobile phase can dramatically alter the sensitivity of the mass spectrometry as follows:

- By increasing sampling efficiency
- By increasing ionization efficiency
- By reducing matrix effects

Nano- LC-MS provides a higher sensitivity increase, compared with 2.1 mm UPLC Columns. Micro-flow separations, which use larger-diameter columns, increase sample throughput dramatically while continuing to deliver excellent sensitivity for many complex biomolecular analyses.

We offer solutions that satisfy the most demanding requirements for assays that rely on nano- and micro-flow LC-MS technology—solutions that ensure the assays' successful performance.

#### Gaining Sensitivity by Reducing Column Diameter and Flow Rate



Sensitivity enhancement for a series of small molecules relative to a 2.1 mm I.D. separation performed on an ACQUITY UPLC System. The volume and concentration of sample injected on each column format was identical.

#### Nano- and Micro-flow LC-MS Consumables



- Includes a 150 µm I.D. separation channel, for highest sensitivity, and a 300 µm I.D. channel, for high-throughput analysis
- Greatly simplified micro-flow LC-MS, with fitting-free connections
- The 150 µm I.D. iKey™ Separation Device demonstrates as much as 40 times the sensitivity of the 2.1 mm I.D. UPLC column
- The 300 µm I.D. iKey, during high-throughput UPLC-cycle times, delivers as much as six times the sensitivity of a 2.1 mm I.D. UPLC column
- Easy post-column addition of MS-modifier solvents
- nanoEase M/Z Columns with easy-to-use ZenFit™ Connection Technology
- Column inner diameters range from 75 to 300 µm
- Column lengths range from 50 to 250 mm
- Trapping columns range from 180 to 300 µm I.D.

## ionKey/MS

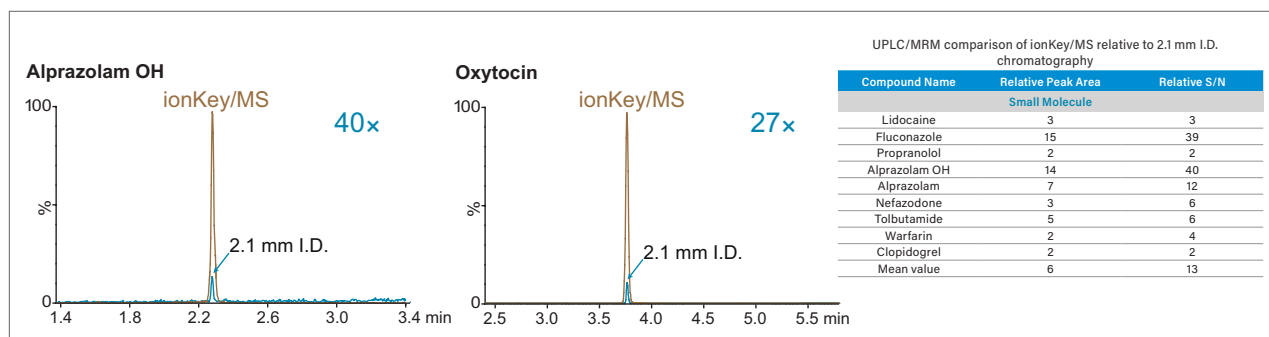
### SIMPLIFIED MICRO-FLOW LC-MS WITH ENHANCED SENSITIVITY

The ionKey/MS System integrates the micro-flow UPLC separation into the source of the mass spectrometer. This delivers LC-MS system performance and sensitivity that cannot be achieved any other way. ionKey/MS Systems are enabled by the iKey Separation Device, which replaces the need for traditional fittings and columns and simplifies the user experience. The “plug and play” design of the iKey Separation Device eliminates operator variability common in traditional micro-flow LC-MS analyses.



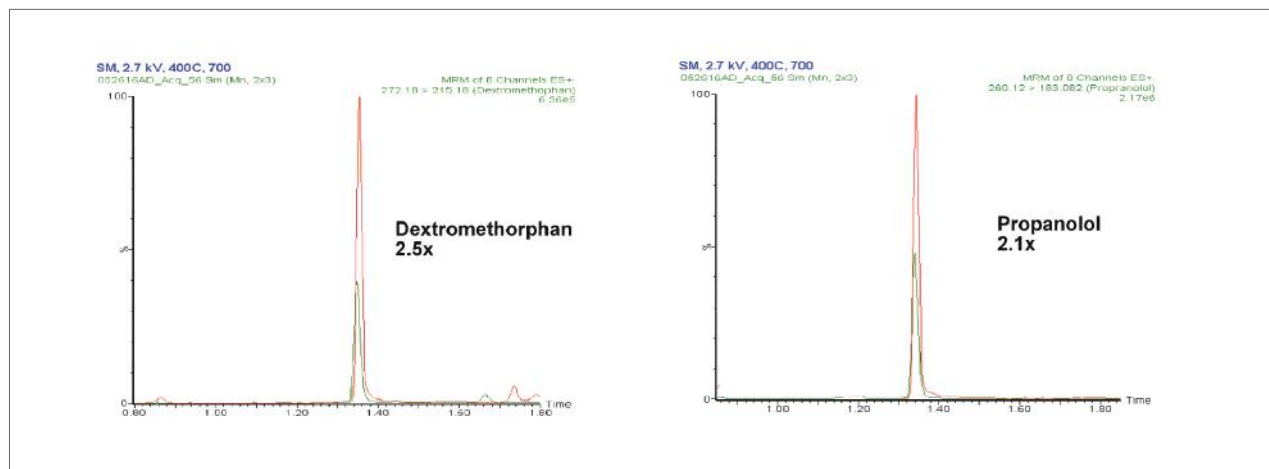
The ionKey MS System with the ACQUITY UPLC M-Class System and Xevo TQ-S Mass Spectrometer.

### 150 $\mu$ m I.D. iKey: Up to 40x Increase in Sensitivity Compared to 2.1 mm UPLC LC-MS Applications



Sensitivity comparison between ionKey/MS™ and 2.1 mm I.D. chromatography; 1  $\mu$ L injection of equal sample load on each.

### 300 $\mu$ m I.D. iKey HT: Increased LC-MS Sensitivity with UPLC Throughput

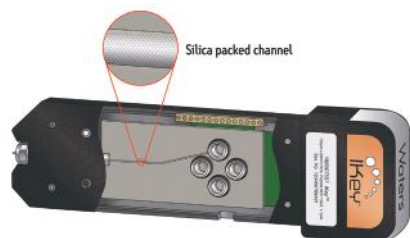


Sensitivity gains using (300  $\mu$ m  $\times$  50 mm) iKey HT BEH C<sub>18</sub> Separation Device (red) compared to (2.1 mm  $\times$  50 mm) UPLC BEH C<sub>18</sub> Column (green) under identical injection volume and gradient conditions.

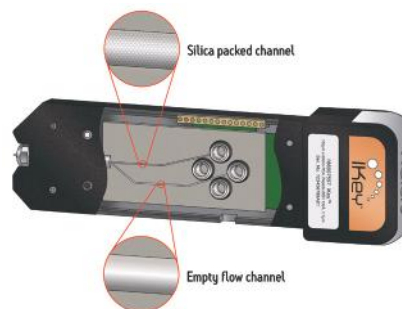
## iKey Separation Device

In an ionKey/MS System, the iKey Separation Device contains the fluid connections, electronics, ESI interface, column heater, eCord, and chemistry needed to perform UPLC separations. As such, it replaces the need for traditional fittings and columns, simplifying the user experience. The “plug and play” design of the iKey eliminates user-dependent variation in results that often occurs in traditional micro-flow LC-MS analyses, regardless of users' skill level.

iKey Separation Device



iKey Separation Device with Post-Column Addition (PCA)

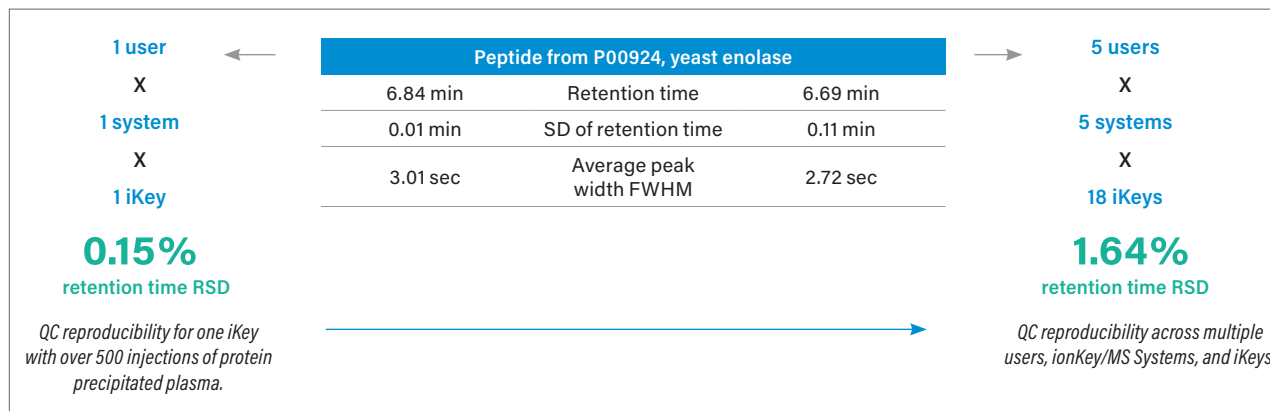


The major component of the ionKey/MS System, the iKey Separation Device performs sub-2- $\mu\text{m}$  UPLC separations, resulting in highly sensitive, efficient, micro-flow LC-MS analyses.

The iKey Separation device is available with two inner diameters: 150  $\mu\text{m}$  I.D. which provides the highest level of sensitivity, and the 300  $\mu\text{m}$  I.D. iKey HT for higher throughput separations.

The PCA iKey incorporates a separation channel as well as a post-column addition (PCA) channel. The design allows for mixing the mobile phase post separation with a desired solvent. Both effluents are merged and collected at the inlet of the emitter. Post-column addition of solvents can enhance the electrospray process and increase sensitivity without adversely affecting the separation.

### Robust, Reproducible, and Reliable



The iKey Separation Device is LC-MS tested to ensure consistent performance not only for a particular iKey but from one iKey to another. The device also exhibits robust performance—performance that achieves high-quality results, even after hundreds of injections.

## Ordering Information

### iKey Separation Devices

Particle Size: 1.7 $\mu\text{m}$		
	Dimension	P/N (1/pk)
BEH C <sub>18</sub> , 130 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186007256</a>
	150 $\mu\text{m}$ $\times$ 50 mm (PCA)	<a href="#">186007580</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186007258</a>
CSH C <sub>18</sub> , 130 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186007244</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186007245</a>
HSS T3, 100 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186007260</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186007261</a>
	300 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186008727</a>

### iKey Peptide Separation Devices

Particle Size: 1.7 $\mu\text{m}$		
	Dimension	P/N (1/pk)
BEH C <sub>18</sub> , 130 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186006764</a>
	150 $\mu\text{m}$ $\times$ 50 mm (PCA)	<a href="#">186007557</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186006766</a>
CSH C <sub>18</sub> , 130 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186007257</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186007259</a>
BEH C <sub>18</sub> , 300 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186006969</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186006970</a>

### iKey Protein Separation Devices

Particle Size: 1.7 $\mu\text{m}$		
	Dimension	P/N (1/pk)
BEH C <sub>4</sub> , 300 Å	150 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186006765</a>
	150 $\mu\text{m}$ $\times$ 100 mm	<a href="#">186006968</a>

### iKey Utility Devices

	Dimension	P/N (1/pk)
iKey Infusion Device	85 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186007049</a>
iKey Flow Injection Analysis Device	85 $\mu\text{m}$ $\times$ 50 mm	<a href="#">186007051</a>
iKey Diagnostic Device V3	n/a	<a href="#">186008450</a>

## Nano- and Micro-Flow Columns and Trapping Columns

Waters Columns for nano-to-microscale LC-MS analyses are designed for low-dispersion nano-UPLC Systems. Our rigorous quality-control measures ensure that the columns achieve their full potential for sensitivity, resolution, and reproducibility for biomarker discovery and also for identifying and characterizing peptides and proteins.

### SEPARATION COLUMNS

These columns enable nano- and microscale separations with MS detection under UPLC conditions at 15,000 psi. They take full advantage of the separation power of sub-2- $\mu$ m particle technology. Columns between 75 and 300  $\mu$ m I.D. provide chromatographic separations with flow rates between 200 nL/min and 100  $\mu$ L/min, covering a 170-fold range of sample amounts. The varying characteristics of available particle technologies provide alternate selectivity, retentivity, and loadability, and thus the flexibility to achieve the most suitable separation for complex LC-MS analyses.

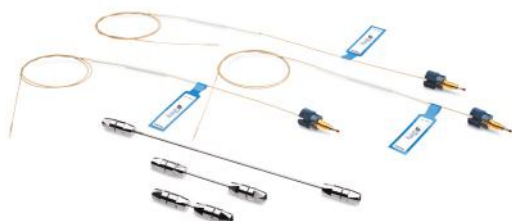
### TRAPPING COLUMNS

Trapping columns are used to desalt and enrich the sample before eluting onto the analytical column for the final separation with MS detection. For fast loading of the trap column and to reduce the cycle time, trap columns are packed with larger 5  $\mu$ m particles.

### nanoEase M/Z Columns with ZenFit Connection Technology

Waters ZenFit Connection Technology introduces easy-to-use, re-usable, fingertight, liquid-line connectors to the family of nanoEase M/Z Columns. These columns are capable of withstanding pressures as high as 15,000 psi and eliminating dead volume, a frequent source of variability associated with regular fittings. ZenFit Connection Technology does not require user training or any further special attention.

\*To use nanoEase M/Z Columns on the ACQUITY UPLC M-Class System, equip systems with the appropriate upgrade kit. The 300  $\mu$ m I.D. ACQUITY UPLC M-Class Columns and Traps are compatible with ZenFit Connections.



**i** nanoEase M/Z Columns and ACQUITY UPLC M-Class Columns are preferred for use with the ACQUITY UPLC M-Class and nanoACQUITY UPLC Systems.

## Ordering Information

### nanoEase M/Z Peptide Columns

	Particle Size: 1.7 $\mu$ m	
	Dimension	P/N (1/pk)
<b>BEH C<sub>18</sub>, 130 Å</b>	75 $\mu$ m $\times$ 100 mm	<a href="#">186008792</a>
	75 $\mu$ m $\times$ 150 mm	<a href="#">186008793</a>
	75 $\mu$ m $\times$ 200 mm	<a href="#">186008794</a>
	75 $\mu$ m $\times$ 250 mm	<a href="#">186008795</a>
	100 $\mu$ m $\times$ 100 mm	<a href="#">186008796</a>
	150 $\mu$ m $\times$ 100 mm	<a href="#">186008797</a>
<b>BEH C<sub>18</sub>, 300 Å</b>	75 $\mu$ m $\times$ 100 mm	<a href="#">186008798</a>
	75 $\mu$ m $\times$ 150 mm	<a href="#">186008799</a>
	75 $\mu$ m $\times$ 200 mm	<a href="#">186008800</a>
	75 $\mu$ m $\times$ 250 mm	<a href="#">186008801</a>
	100 $\mu$ m $\times$ 100 mm	<a href="#">186008802</a>
	150 $\mu$ m $\times$ 100 mm	<a href="#">186008803</a>
<b>CSH C<sub>18</sub>, 130 Å</b>	75 $\mu$ m $\times$ 100 mm	<a href="#">186008807</a>
	75 $\mu$ m $\times$ 150 mm	<a href="#">186008808</a>
	75 $\mu$ m $\times$ 200 mm	<a href="#">186008809</a>
	75 $\mu$ m $\times$ 250 mm	<a href="#">186008810</a>
	100 $\mu$ m $\times$ 100 mm	<a href="#">186008811</a>
	150 $\mu$ m $\times$ 50 mm	<a href="#">186008812</a>
	150 $\mu$ m $\times$ 100 mm	<a href="#">186008813</a>
	150 $\mu$ m $\times$ 150 mm	<a href="#">186008814</a>

### nanoEase M/Z Protein Columns

	Dimension	P/N (1/pk)
	Particle Size: 1.7 $\mu$ m	
<b>BEH C<sub>4</sub>, 300 Å</b>	75 $\mu$ m $\times$ 100 mm	<a href="#">186008804</a>
	100 $\mu$ m $\times$ 100 mm	<a href="#">186008805</a>
	150 $\mu$ m $\times$ 100 mm	<a href="#">186008806</a>

### nanoEase M/Z HSS Columns

	Dimension	P/N (1/pk)
	Particle Size: 1.8 $\mu$ m	
<b>HSS T3, 100 Å</b>	75 $\mu$ m $\times$ 100 mm	<a href="#">186008815</a>
	75 $\mu$ m $\times$ 150 mm	<a href="#">186008816</a>
	75 $\mu$ m $\times$ 200 mm	<a href="#">186008817</a>
	75 $\mu$ m $\times$ 250 mm	<a href="#">186008818</a>
	100 $\mu$ m $\times$ 100 mm	<a href="#">186008819</a>
	150 $\mu$ m $\times$ 100 mm	<a href="#">186008820</a>

### nanoEase M/Z Trap Columns\*

Particle Size: 5 µm		
	Dimension	P/N (1/pk)
<b>Symmetry C<sub>18</sub>, 100 Å</b>	180 µm × 20 mm	<a href="#">186008821</a>

\*For 300 µm I.D. traps please refer to M-Class Trap Columns.

### ACQUITY UPLC M-Class Columns

Particle Size: 1.8 µm		
	Dimension	P/N (1/pk)
<b>HSS T3, 100 Å</b>	75 µm × 100 mm	<a href="#">186008006</a>
	75 µm × 150 mm	<a href="#">186007473</a>
	75 µm × 200 mm	<a href="#">186008007</a>
	75 µm × 250 mm	<a href="#">186007474</a>
	100 µm × 100 mm	<a href="#">186008008</a>
	150 µm × 100 mm	<a href="#">186008009</a>
	300 µm × 50 mm	<a href="#">186007559</a>
	300 µm × 100 mm	<a href="#">186007560</a>
	300 µm × 150 mm	<a href="#">186007472</a>

### ACQUITY UPLC M-Class Trap Columns

Particle Size: 5 µm		
	Dimension	P/N (1/pk)
<b>Symmetry C<sub>18</sub>, 100 Å</b>	180 µm × 20 mm	<a href="#">186007496</a> <sup>4</sup>
	180 µm × 20 mm	<a href="#">186007497</a> <sup>5</sup>
	180 µm × 20 mm	<a href="#">186007500</a> <sup>6</sup>
	180 µm × 20 mm	<a href="#">186007592</a> <sup>7</sup>
<b>Symmetry C<sub>18</sub>, 100 Å</b>	300 µm × 25 mm	<a href="#">186007499</a> <sup>3</sup>
	300 µm × 50 mm	<a href="#">186007498</a>
<b>Peptide BEH C<sub>18</sub>, 130 Å</b>	300 µm × 50 mm	<a href="#">186007471</a>
<b>BEH C<sub>4</sub>, 300 Å</b>	300 µm × 50 mm	<a href="#">186008470</a>
<b>HSS T3, 100 Å</b>	300 µm × 50 mm	<a href="#">186008029</a>

<sup>3</sup>Configuration HCP (2D).

<sup>4</sup>Configuration: 2G, V/M.

<sup>5</sup>Configuration: 2D, V/M.

<sup>6</sup>Configuration: 2G, V/V.

<sup>7</sup>Configuration: 2D, V/V.

### ACQUITY UPLC M-Class Peptide Columns

Particle Size: 1.7 µm		
	Dimension	P/N (1/pk)
<b>BEH C<sub>18</sub>, 130 Å</b>	75 µm × 100 mm	<a href="#">186007481</a>
	75 µm × 150 mm	<a href="#">186007482</a>
	75 µm × 200 mm	<a href="#">186007483</a>
	75 µm × 250 mm	<a href="#">186007484</a>
	100 µm × 100 mm	<a href="#">186007485</a>
	150 µm × 100 mm	<a href="#">186007486</a>
	300 µm × 50 mm	<a href="#">186007564</a>
	300 µm × 100 mm	<a href="#">186007565</a>
	300 µm × 150 mm	<a href="#">186007566</a>
<b>BEH C<sub>18</sub>, 300 Å</b>	75 µm × 100 mm	<a href="#">186007487</a>
	75 µm × 150 mm	<a href="#">186007490</a>
	75 µm × 200 mm	<a href="#">186007491</a>
	75 µm × 250 mm	<a href="#">186007492</a>
	100 µm × 100 mm	<a href="#">186007488</a>
	150 µm × 100 mm	<a href="#">186007489</a>
	300 µm × 50 mm	<a href="#">186007570</a>
	300 µm × 100 mm	<a href="#">186007571</a>
	300 µm × 150 mm	<a href="#">186007572</a>
<b>CSH C<sub>18</sub>, 130 Å</b>	75 µm × 100 mm	<a href="#">186007475</a>
	75 µm × 150 mm	<a href="#">186007476</a>
	75 µm × 200 mm	<a href="#">186007477</a>
	75 µm × 250 mm	<a href="#">186007478</a>
	100 µm × 100 mm	<a href="#">186007479</a>
	150 µm × 50 mm	<a href="#">186007513</a>
	150 µm × 100 mm	<a href="#">186007480</a>
	150 µm × 150 mm	<a href="#">186007514</a>
	300 µm × 50 mm	<a href="#">186007561</a>
300 µm × 100 mm	<a href="#">186007562</a>	
300 µm × 150 mm	<a href="#">186007563</a>	

### ACQUITY UPLC M-Class Protein Columns

Particle Size: 1.7 µm		
	Dimension	P/N (1/pk)
<b>BEH C<sub>4</sub>, 300 Å</b>	75 µm × 100 mm	<a href="#">186007493</a>
	100 µm × 100 mm	<a href="#">186007494</a>
	150 µm × 100 mm	<a href="#">186007495</a>
	300 µm × 50 mm	<a href="#">186007567</a>
	300 µm × 100 mm	<a href="#">186007568</a>
	300 µm × 150 mm	<a href="#">186007569</a>

## ACQUITY UPLC M-Class with HDX Technology

Hydrogen-deuterium exchange mass spectrometry (HDX-MS) is used to study a protein's structural dynamics and conformational changes, a component of understanding its higher-order structure. Information about protein conformation from an HDX MS study can serve to compare a control compound with an analyte by measuring the relative amount of deuteriation uptake. HDX-MS can monitor domain interaction, localized-protein breathing, and folding or unfolding in the solution phase. The ACQUITY UPLC M-Class System can quantify small changes in protein conformation by extending its pressure range to effect a higher-efficiency separation. An integral part of the ACQUITY UPLC M-Class HDX System is the Waters Enzymate™ BEH Pepsin Column, which performs online protein digestion.



ACQUITY UPLC M-Class System.

The technology offers these benefits:

- True UPLC separations for peptide and protein HDX
- Reproducible, robust, and rapid separations (nano-to-micro-scale at 0 °C and pressure to 15,000 psi)

### ENZYMATE PEPSIN ONLINE DIGESTION COLUMN

Waters Enzymate Pepsin Online Digestion Column digests intact proteins into peptides. The peptic peptides are then retained on a trapping column. Peptides eluting from the trapping column are refocused onto a sub-2- $\mu\text{m}$  ACQUITY UPLC Column and then eluted into a high-resolution mass spectrometer.

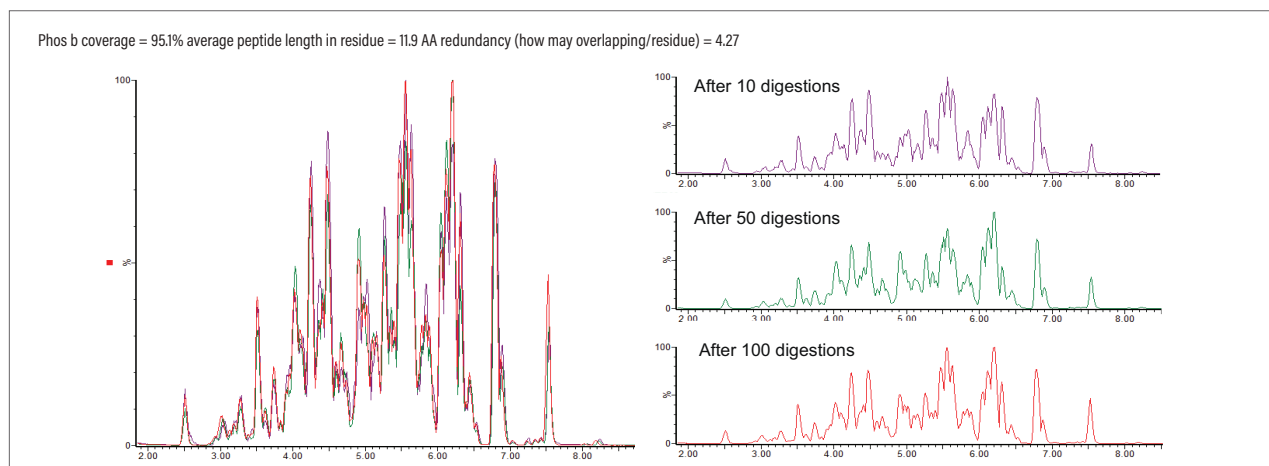
Enzymate Pepsin Online Digestion Columns, an integral part of the ACQUITY UPLC M-Class HDX System, offer these benefits:

- Fast, reproducible, and efficient online protein digestion, typically within 30 seconds
- Shortened preparation time (overall) for protein samples
- Ability to optimize the efficiency of protein digestion by changing temperature, flow rate, or both



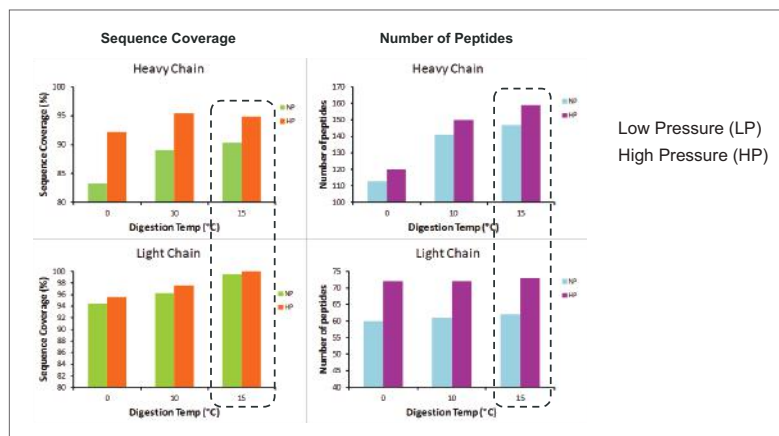
Enzymate Pepsin Online Digestion Column.

### Overlay of Three Phos B Digestions within a 130-Injection HDX MS Study



Reproducible online pepsin digestions of phosphorylase b. A total of 130 digestions were performed using an Enzymate Pepsin Column. The 10<sup>th</sup>, 50<sup>th</sup> and 100<sup>th</sup> digestions are shown. The sequence coverage is shown on the right.

## Comparisons of Low- and High-Pressure Digestion Efficiencies



The Waters Enzyme BEH Pepsin Column was used for digestion of IgG2, at 1000 psi (NP), and 13,000 psi (HP). Results show high-pressure digestion increases protein-sequence coverage and spatial resolution of IgG2, compared with low-pressure digestion.

## Ordering Information

### Enzyme Pepsin Online Digestion Column

Particle Size: 5 µm		
Description	Dimension	P/N (1/pk)
Enzyme Pepsin Online Digestion Column	2.1 × 30 mm	<a href="#">186007233</a>

## LC-MS Accessories

### TRUVIEW LCMS CERTIFIED VIALS

TruView LCMS Certified Vials include stringent dimensional tolerances plus UV and MS cleanliness testing. The additional product attribute of TruView Vials is low polar analyte adsorption. The vials are manufactured by a process that limits the concentration of free ions on the surface of glass; ionic sites can cause analyte adsorption. Waters TruView LCMS Certified Vials are tested for high recovery of analyte at 1 ng/mL concentration using UPLC-MS/MS (MRM) and yield little adsorption. These vials exhibit the lowest adsorption of autosampler vials in the market.



## Ordering Information

### TruView LCMS Certified Vials



Description	Clear Glass	Amber Glass	Max Recovery	Total Recovery	Amber Max Recovery
TruView LCMS Certified Vials, 100/pk with cap and pre-slit silicone/PTFE septa	<a href="#">186005666CV</a>	<a href="#">186005661CV</a>	<a href="#">186005662CV</a>	<a href="#">186005663CV</a>	<a href="#">186005670CV</a>
TruView LCMS Certified Vials, 100/pk with cap and silicone/PTFE septa	<a href="#">186005660CV</a>	<a href="#">186005667CV</a>	<a href="#">186005668CV</a>	<a href="#">186005669CV</a>	<a href="#">186005664CV</a>

## WATERS CERTIFIED CONTAINERS

Waters Certified Containers are uniquely processed, treated, and certified in the same unique manner as our highly regarded low TOC vials.

Ultra-clean containers can be used on any LC system, including UPLC, LC/UV, and LC-MS, among others. Manufactured to stringent standards, they prevent extraneous peaks and baseline noise stemming from high TOC. To help assist with contamination prevention and facilitate recommended care and use, each container carries the Waters certified mark for easy differentiation in operational use.



### Ordering Information

#### Certified Containers

Description	P/N
Certified Container Kit	
Kit contains: four certified 1 L bottles, three certified 500 mL bottles, one clean container cap kit	<a href="#">186007088</a>
Low Volume Certified Container Kit	
Kit contains: five certified 250 mL clear bottles, one certified 500 mL clear bottle, one clean container cap kit	<a href="#">186007278</a>
Certified Container, 1 L	<a href="#">186007089</a>
Certified Container, 500 mL	<a href="#">186007090</a>
Clean Container Cap Kit	<a href="#">205000642</a>

## pH BUFFERS

These pH Buffers are directly traceable to NIST SRMs, mercury free, guaranteed stable for at least one year after your receipt, and are supplied with a full certificate of analysis.



### Ordering Information

#### pH Buffers

Description	Volume	P/N
pH 4 Liter	1 L	129
pH 4 Buffer		
pH 7 Liter	1 L	133
pH 7 Buffer		
pH 10 Liter	1 L	137
pH 10 Buffer		
pH 4 Pint	1 pint	127
pH 4 Buffer		
pH 7 Pint	1 pint	131
pH 7 Buffer		
pH 10 Pint	1 pint	135
pH 10 Buffer		