

Thermo Scientific
Accucore Vanquish UHPLC Columns



Powerful separations
are our core performance

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Accucore Vanquish UHPLC Columns Delivering Powerful Separations

Founded on state-of-the-art Core Enhanced Technology™ and utilizing vast experience in phase bonding and packing, Thermo Scientific™ Accucore™ Vanquish™ C18+ UHPLC columns provide a robust chromatography solution to enhance laboratory workflows and productivity. These columns, in combination with the Vanquish UHPLC system, deliver powerful separations to solve your analytical challenges faster and more effectively.

This next-generation UHPLC columns features 1.5 µm solid core particles and combines the benefits of a solid core material and the increased chromatographic efficiency of a sub-2 µm particle.

Modern analytical laboratories continue to be driven towards higher throughput workflows which require better separations, more results and easier interaction at a reduced cost. Accucore Vanquish UHPLC columns enable you to achieve this by delivering:

- Better separations: The high efficiency offered by Accucore Vanquish UHPLC columns enables the resolution of very complex mixtures
- More results: High efficiency is maintained even at high flow rates enabling fast separations
- Easier interaction: Accucore Vanquish UHPLC columns, the Vanquish UHPLC System and the Thermo Scientific™ Dionex™ Chromeleon™ Chromatography Data System are combined into a seamless workflow solution, which allows for simple and easy to implement separations

How Core Enhanced Technology Delivers Better Separations

Accucore Vanquish UHPLC columns extend chromatographic efficiency. The solid core particle delivers this, giving the flexibility for fast and highly efficient separations.

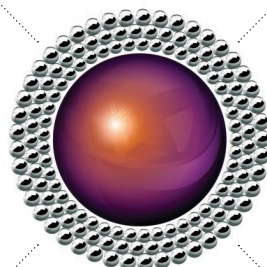
Key Components

Solid Core Particles

With a solid central core and porous outer layer, these particles generate high speed, high resolution separations

Automated Packing Process

Enhanced automated procedures ensure that all columns are packed with the highest quality



Tight Control of Particle Diameter

Enhanced selection process keeps particle size distribution to a minimum and produces high efficiency columns

Advanced Bonding Technology

Optimized phase bonding creates a high coverage, robust phase

Why Core Enhanced Technology Works

The factors that affect chromatographic efficiency are Eddy diffusion, longitudinal diffusion and resistance to mass transfer, the A, B and C terms respectively from the van Deemter equation.

$$H = Au^3 + \frac{B}{u} + Cu$$

H Height equivalent to a theoretical plate (column length/efficiency)

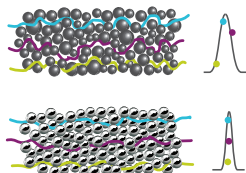
B Longitudinal diffusion

C Resistance to mass transfer

A Eddy diffusion

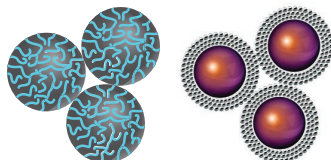
u Mobile phase linear velocity

A Term



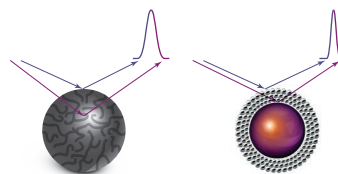
The tightly controlled 1.5 μm diameter of Accucore Vanquish particles and the frictional forces associated with their roughened surfaces results in a tight, highly uniform packed bed that minimizes Eddy diffusion.

B Term



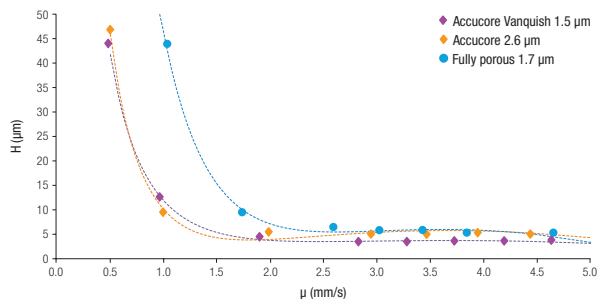
The solid core design of the particles reduces the amount of mobile phase in the column resulting in a reduced void volume and less longitudinal diffusion. This effect can be seen in the lower t_0 values obtained with Accucore Vanquish UHPLC columns compared to columns of the same dimensions packed with fully porous materials.

C Term



Resistance to mass transfer is minimized by the solid core design as the diffusional path of analytes is limited by the depth of the outer porous layer. The effect of this minimization is most noticeable for larger molecules.

Efficiency



Accucore Vanquish UHPLC columns are more efficient at optimum flow than sub-2 μm fully porous and 2.6 μm solid core columns. Efficiency is maintained over a wider linear velocity range.

Backpressure

The equation below shows how backpressure is related to particle diameter.

$$\frac{\Delta P}{L} = \frac{A\eta(1-\epsilon_0)^2\mu_0}{\epsilon_0^2 d_p^2}$$

ΔP Pressure drop across column

ϵ_0 Porosity of the packed bed

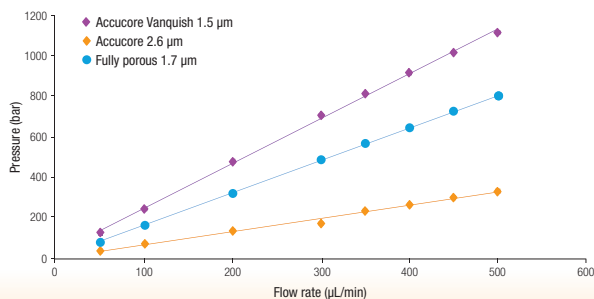
L Length of column

μ_0 Superficial velocity

η Fluid viscosity

d_p Particle diameter

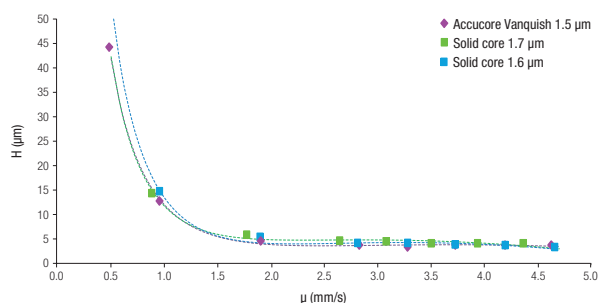
A Constant dependent on the topography of the column



Accucore Vanquish UHPLC columns achieve their efficiency without excessive backpressure.

How Core Enhanced Technology Delivers More Results

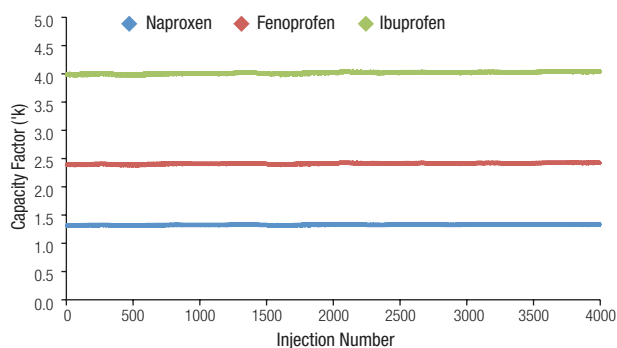
The separation power of 1.5 µm Accucore Vanquish UHPLC columns, in combination with the Vanquish UHPLC system, allows you to run at higher flow rates, achieving a greater number of separations.



Columns:	Accucore Vanquish C18+ 1.5 µm Solid Core C18 1.7 µm Solid Core C18 1.6 µm
Mobile Phase:	Water:acetonitrile (50:50)
Flow Rate:	0.1 to 0.6 mL/min
Temp.:	30 °C

Reproducibility

The advanced bonding and automated packing technology used in the manufacture of Accucore Vanquish UHPLC columns results in exceptionally reproducible chromatography.



Column:	Accucore Vanquish C18+ 1.5 µm
Mobile Phase:	Acetonitrile:20 mM ammonium formate pH 3.0 (50:50)
Flow Rate:	0.4 mL/min
Temp.:	30 °C

%RSD for 4000 injections	Naproxen	Fenoprofen	Ibuprofen
Retention time	0.19	0.25	0.29
Capacity factor	0.41	0.42	0.41
Efficiency	2.94	2.74	2.80
Asymmetry	0.92	0.87	1.09
Peak area	0.53	0.50	0.55
Peak height	1.13	1.02	0.91
Pressure	0.53		

- RSD for retention time less than 0.3%
- RSD for peak area less than 0.6%
- RSD for peak height less than 1.2%
- Column pressure stable over 4000 injections (RSD 0.53%)
- Pressure 500 bar

How Core Enhanced Technology Delivers Easier Interaction

High efficiency Accucore Vanquish UHPLC columns allow the use of fast generic gradients to separate a wide range of compounds, reducing method development time and generating rapid separations.

Simple Method Transfer

A few simple steps are required to transfer a method to an Accucore Vanquish UHPLC column.

Method Transfer Tool

A convenient method transfer tool is available at the Chromatography Columns and Consumables Technical Support Website www.thermoscientific.com/chromexpert

- **Adjust Flow Rate**

Keep linear velocity constant between original and new method, taking into account particle size and column geometry

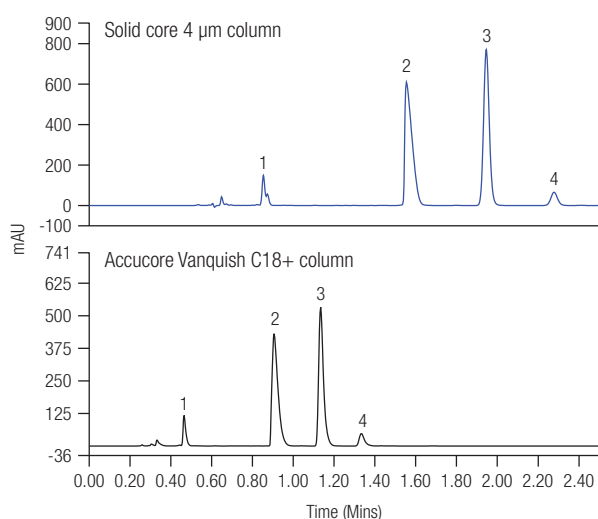
- **Adjust Injection Volume**

Keep the ratio of injection volume to column volume constant

- **Adjust Gradient Profile**

Keep the number of column volumes constant for each gradient segment

The following example shows scale down method for ibuprofen impurity analysis, from an Accucore XL C18 4 μm column to an Accucore Vanquish C18+ 1.5 μm column.



Chromatographic separation of ibuprofen (2), valerophenone (3), and ibuprofen-related compound C (4). Peaks labeled (1) are unknown impurities.

Method 1: Accucore XL C18, 4 μm column

Mobile Phase:	Water + 1% chloroacetic acid (pH 3)/acetonitrile (40:60 v/v)
Flow Rate:	2 mL/min
Temp.:	30 °C
Inj. Volume:	5 μL
Detection:	UV at 254 nm (0.1 s rise time, 50 Hz, 8 nm slit width)
Viper Connections:	Autosampler to column 0.1 \times 250 mm (P/N 6040.2225) Column to detector 0.075 \times 350 mm (P/N 6041.5735)
UHPLC Column:	Accucore XL C18, 4 μm , 150 \times 4.6 mm

Method 2: Accucore Vanquish C18+, 1.5 μm column

Mobile Phase:	Water + 1% chloroacetic acid (pH 3)/acetonitrile (40:60 v/v)
Flow Rate:	0.65 mL/min
Temp.:	30 °C
Inj. Volume:	1 μL
Detection:	UV at 254 nm (0.1 s rise time, 50 Hz, 8 nm slit width)
Viper Connections:	Autosampler to column 0.1 \times 250 mm (P/N 6040.2225) Column to detector 0.075 \times 350 mm (P/N 6041.5735)
UHPLC Column:	Accucore Vanquish C18+, 1.5 μm , 100 \times 2.1 mm

Core Enhanced Technology

Accucore HPLC and UHPLC Column Range

Founded on state-of-the-art Core Enhanced Technology and utilizing vast experience in phase bonding and packing, Accucore HPLC and UHPLC columns provide a robust chromatography solution to enhance laboratory workflow and efficiency. Available in a wide range of stationary phase selectivities and compatible with almost any instrument, these columns provide an excellent return on investment.

Accucore HPLC Columns

Containing solid core particles, which are engineered to a diameter of 2.6 μm and a very narrow particle size distribution. Accucore HPLC columns allow high speed, high resolution separations.

Accucore HPLC Columns for Biomolecules

The range of Accucore HPLC columns packed with 150 Å pore diameter particles allows biomolecule separations to benefit from the superb resolution and high speed enabled by Core Enhanced Technology.

Accucore XL HPLC Columns

Using 4 μm solid core particles, Accucore XL HPLC columns allow users of conventional HPLC methods to enjoy performance far beyond that of columns packed with 5 μm , 4 μm or even 3 μm fully porous particles.

Accucore Vanquish UHPLC Columns

Using 1.5 μm solid core particles, Accucore Vanquish UHPLC columns allow UHPLC users to enjoy performance benefits over columns packed with conventional sub-2 μm fully porous particles.

Ordering Information

Description	Particle Size	Length	Diameter (ID)	Part Number
Accucore Vanquish C18+	1.5 μm	50 mm	2.1 mm	27101-052130
Accucore Vanquish C18+	1.5 μm	100 mm	2.1 mm	27101-102130
Accucore Vanquish C18+	1.5 μm	150 mm	2.1 mm	27101-152130



The Vanquish UHPLC System Offers Better Separations, More Results, Easier Interaction

Achieving better chromatographic performance should not require more effort. However, every breakthrough begins with a challenge. That challenge should be your application, not your instrument.

The Vanquish UHPLC system and Accucore Vanquish UHPLC columns have been designed around the user to solve chromatographic challenges by:

- Separating more complex samples in less time with 1500 bar pressure and low dispersion volumes from the pump and Thermo Scientific™ Viper™ fluidics
- Maintaining peak shapes due to consistent temperature distribution, provided by the advanced oven thermostating, even at very high pressures
- Keeping up with faster separations with increased sample capacity from the sampler and plate feeder
- Seeing more of the sample with lower limits of detection and improved quantification from the Thermo Scientific™ LightPipe™ technology
- Getting that extra level of identification, by partnering with state-of-the-art mass spectrometers such as the Thermo Scientific™ TSQ Quantiva™ and the Thermo Scientific™ TSQ Endura™

The total solution offers operational simplicity with efficient control and data handling with the Chromeleon Chromatography Data System.

VANQUISH UHPLC System

thermoscientific.com/Vanquish



A comprehensive product offering for your complete chromatography workflow



www.thermoscientific.com/accuore

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