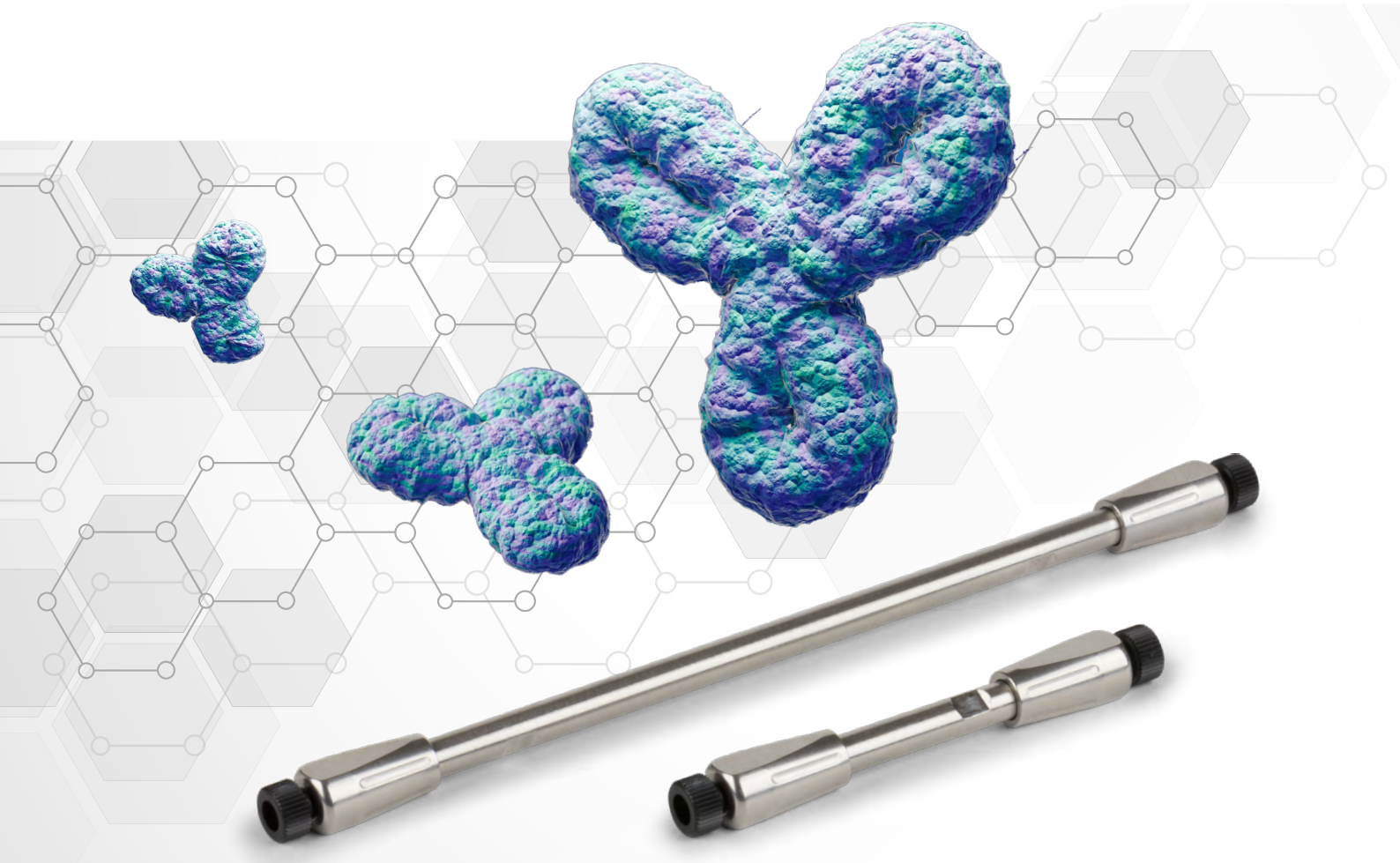


# dSEC

Size Exclusion Chromatography Columns

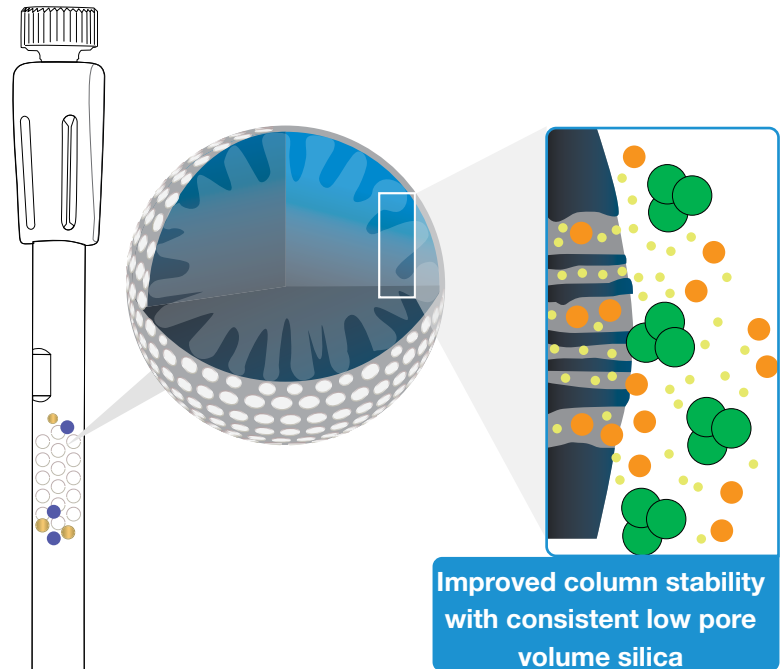


- Exceptionally Robust SEC Particle
- Extreme Stability and Exceptional Lifetime
- Reproducible Separations

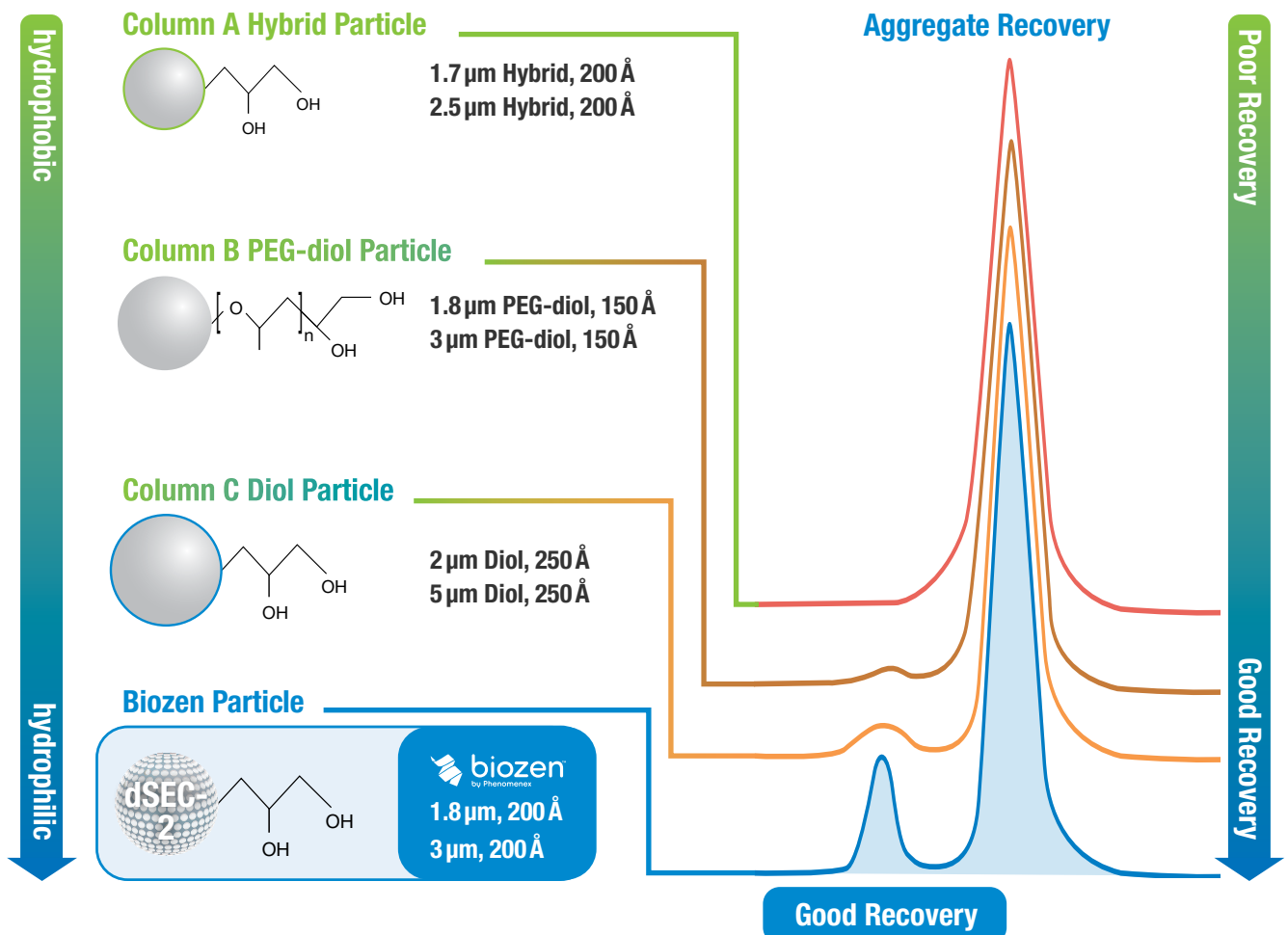
# Advanced SEC Silica Particle Technology and Surface Chemistry for Characterizing Biomolecules

## Biozen dSEC Proprietary Silica Particle Technology

The Biozen dSEC columns are packed with low pore volume silica coupled with a proprietary hydrophilic diol-type bonded surface chemistry that prevents the silica surface from interacting with protein samples.



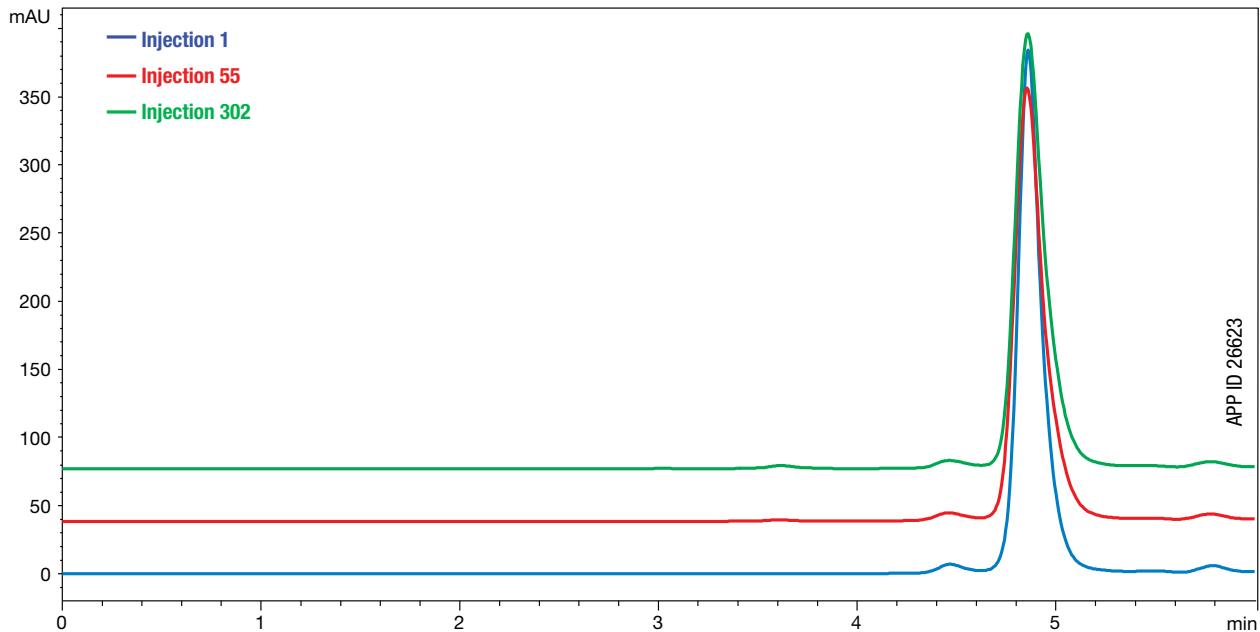
## Biozen dSEC Hydrophilic Surface Chemistry Improves Aggregate Analysis



# Improved Column Lifetime and Performance Stability

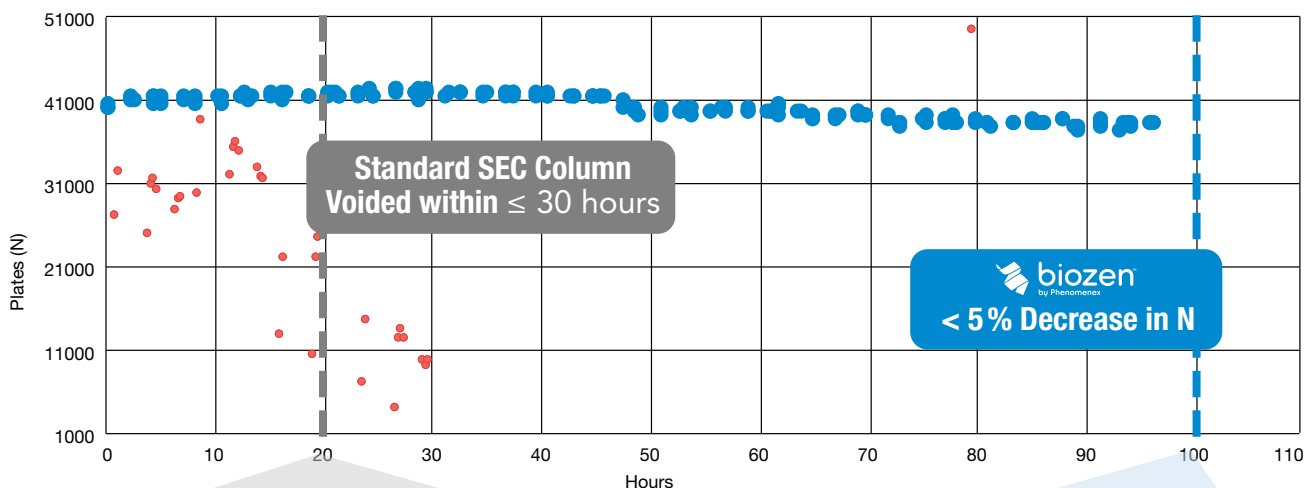
Phenomenex's optimized SEC column loading technology has significantly improved the overall packing density and silica distribution of the columns leading to improved chromatographic lifetime and stability.

## Unchanged Performance After 300 Injections



## Unchanged Performance After 100 Hours of Extreme Running Conditions

- Efficiency, Uridine (Biozen dSEC-2, 1.8  $\mu\text{m}$ , 200  $\text{\AA}$ )
- Efficiency, Uridine (SEC Column 1.8  $\mu\text{m}$ )



### Premature Failure with Standard Silica

High pore volume silica cannot withstand rigorous running conditions, leading to **erratic results** and eventually formation of column "void", leading to **premature failure**.



### Biozen SEC Consistent Results

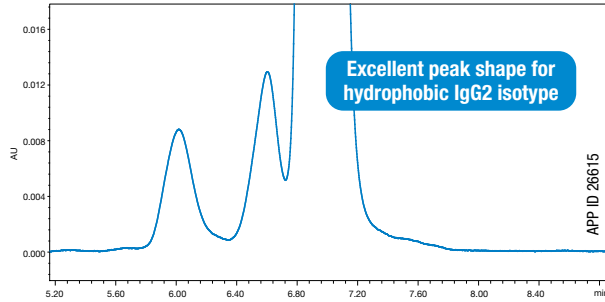
**> 50% increase in column stability** versus standard SEC column media



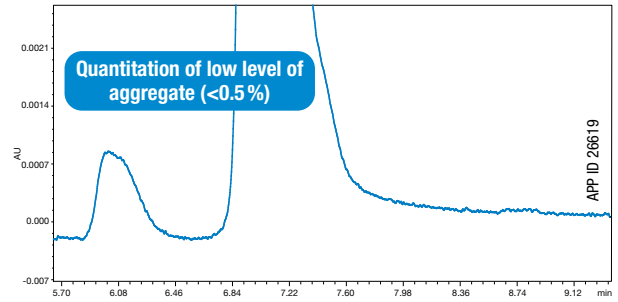
# New Standard for Platform SEC Methods

Whether IgG2 or IgG4 isotypes, bispecifics, or Fc-Fusions, dSEC-2 provides excellent separation and sample recovery for many different classes of antibodies and related recombinant proteins.

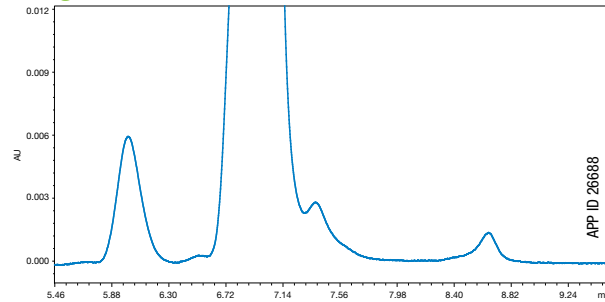
### IgG2 Panitumumab



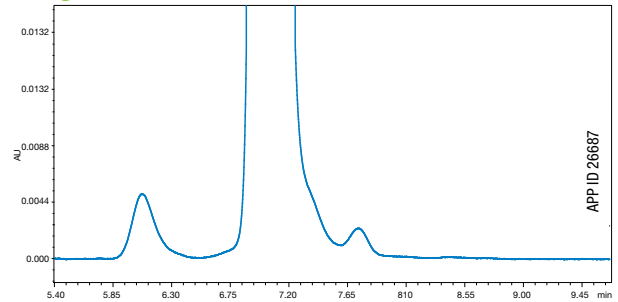
### Bispecific Emicizumab



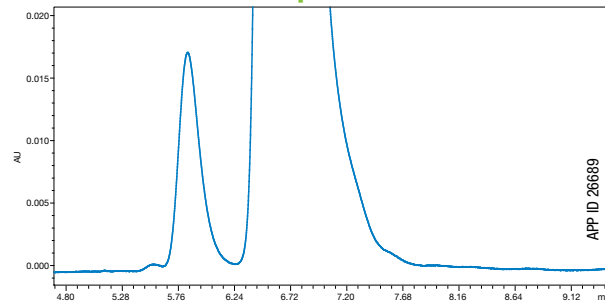
### IgG4 Nivolumab



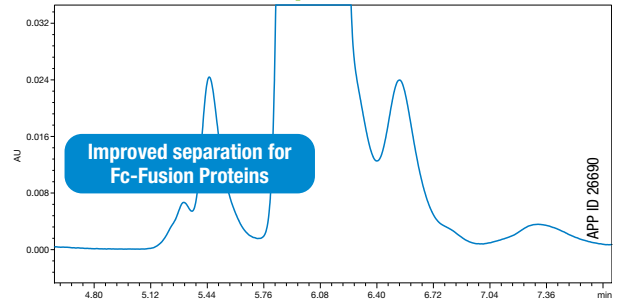
### IgG2 Denosumab



### Fc-Fusion Aflibercept



### Fc-Fusion Etanercept



Conditions for all applications:

**Column:** Biozen 1.8  $\mu$ m dSEC-2, 200 Å

**Dimension:** 300 x 4.6 mm

**Part No.:** [00H-4787-E0](#)

**Mobile Phase:** 200 Potassium Phosphate + 250 mM KCl, pH 6.2

**Flow Rate:** 0.35 mL/min

**Injection Volume:** 10  $\mu$ L

**Detector:** UV @ 280 nm

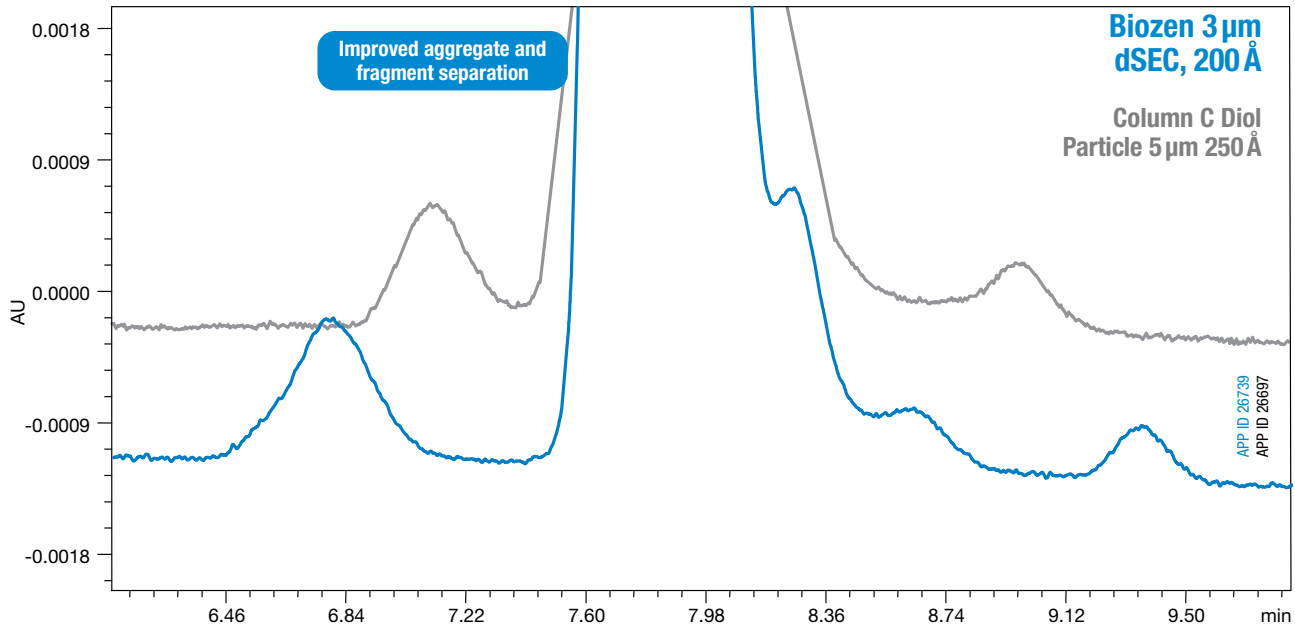
**Temperature:** 25 °C

**Sample:** Various, 10 mg/mL

# Improved Aggregate Recovery and Separation

Although many silica-based SEC columns use similar stationary phases and nominal pore diameters, pore structure and surface chemistry vary significantly. Biozen dSEC-2 columns provide the optimum pore volume and surface chemistry that has been finely tuned for monoclonal antibodies and related formats.

## Trastuzumab

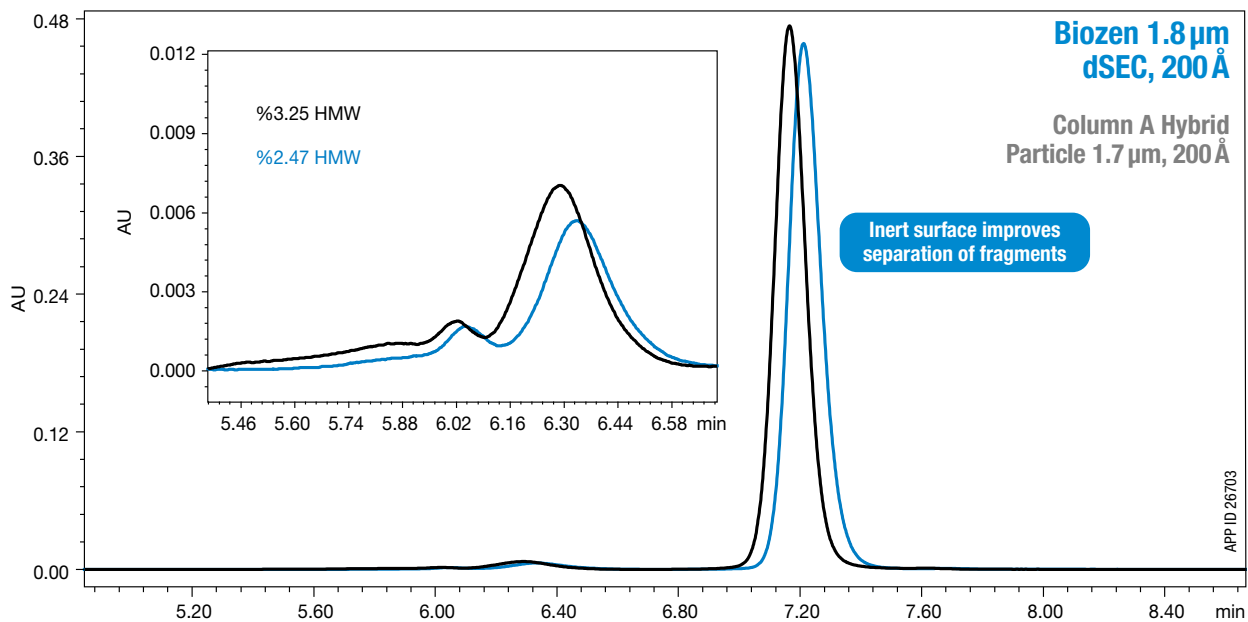


Conditions for both columns:

**Columns:** Biozen™ 3 μm dSEC-2, 200Å  
Column C 5 μm 250Å  
**Dimension:** 300 x 7.8mm  
**Part No.:** 00H-4788-K0 (Biozen)  
**Mobile Phase:** 50 mM Sodium Phosphate +  
300 mM NaCl, pH 6.8

**Flow Rate:** 1.0 mL/min  
**Injection Volume:** 10 μL  
**Temperature:** 25 °C  
**Detector:** UV @ 280 nm  
**Sample:** Trastuzumab, 10 mg/mL

## NIST mAb



Conditions for both columns:

**Columns:** Biozen™ 1.8 μm dSEC-2, 200Å  
Column A 1.7 μm, 200Å  
**Dimension:** 300 x 4.6mm  
**Part No.:** 00H-4787-E0 (Biozen)  
**Mobile Phase:** 200 Potassium Phosphate +  
250 mM Potassium Chloride pH 6.2

**Flow Rate:** 0.35 mL/min  
**Injection Volume:** 10 μL  
**Temperature:** 25 °C  
**Detector:** UV @ 280 nm  
**Sample:** NIST mAb, 10 mg/mL

# Biozen SEC Applications

The newest addition to the Biozen portfolio brings a unique combination of **improved silica particle mechanical strength** and column stability resulting in exceptional reproducibility and performance to withstand the rigors of modern aggregate analysis.

## Method Development

- [Effect of Mobile Phase pH in Aggregate Analysis of Monoclonal Antibodies by Size Exclusion Chromatography](#)
- [Improving Resolution for Size Exclusion Chromatography Methods by Optimization of Linear Velocity](#)
- [Optimizing Phosphate Concentration for Size Exclusion Chromatography Aggregate Analysis](#)
- [Organic Solvent in Size Exclusion Chromatography of an Antibody Drug Conjugate Surrogate](#)
- [The Effect of Column Inner Diameter for Robust Size Exclusion Chromatography Methods](#)
- [Arginine as a Mobile Phase Co-solvent to Improve High Molecular Weight Aggregate Recovery for Size Exclusion Chromatography](#)
- [Effect on Resolution in SEC Comparing Different Particle Sizes and Column Sizes of Biozen dSEC-2 Columns](#)
- [Method Development for ADC Kadcyła by Size Exclusion LC Using a Biozen dSEC-2 Column](#)
- [Loading Capacity of Biozen dSEC-2 Column Under SEC HRMS Conditions](#)

## Antibodies and Recombinant Proteins

- [Aggregate Analysis of Fc-Fusion Proteins](#)
- [Aggregate Analysis of an IgG2 Monoclonal Antibody](#)
- [Resiliency of Larger Particle Sizes to Systems of Differing Dwell Volume in SEC using Biozen dSEC 2 Column](#)
- [Aggregate Analysis of a Bispecific Antibody](#)
- [Aggregate Analysis of Recombinant Human Growth Hormone](#)

## SEC-MS

- [Hyphenating Size Exclusion Chromatography to High Resolution Mass Spectrometry - Bispecific Antibody](#)
- [Hyphenating Size Exclusion Chromatography to High Resolution Mass Spectrometry - IdeZ Digested Monoclonal Antibody](#)
- [Hyphenating Size Exclusion Chromatography to High Resolution Mass Spectrometry - NIST mAb](#)
- [Oligonucleotide Analysis by Size Exclusion Using a Biozen™ dSEC 2 Column](#)
- [Biozen dSEC-2 Guard column](#)
- [Heat and High pH Forced Degradation of Antibodies on a Biozen dSEC-2 Column](#)
- [Guard Column Lifetime and Capacity to Protect the Biozen™ dSEC-2 Column](#)
- [Size Exclusion Analysis Following IdeS Digestion Using a Biozen dSEC-2 Column](#)

## Materials Science and Technology

- [Assessing Column Lifetime of a UHPLC Size Exclusion Column](#)
- [High-Throughput Methods for Size Exclusion Chromatography](#)
- [Column Bed Stability During Routine Size Exclusion Chromatography](#)
- [Effect of Different Column Lengths in SEC using Biozen dSEC 2 Columns](#)
- [Assessment of Column Priming for sub-2 μm Size Exclusion Columns](#)
- [Method Robustness Assessment for sub-2 μm Size Exclusion Columns](#)
- [Generating a Calibration Curve with UHPLC Size Exclusion Column](#)
- [Improved Sensitivity and Recovery Using the Biozen™ dSEC-2 Column](#)

To view more technical notes, go to [www.Phenomenex.com/dsec](http://www.Phenomenex.com/dsec)



# Phenomenex 25+ Years of UHPLC/HPLC Chromatography Leadership and Innovation!



# Biozen Column Material Characteristics

Phases	Description	Pore Size (Å)	Surface Area (m <sup>2</sup> /g)	Carbon Load (%)	pH stability	Shipping Solvent	Max Pressure (psi/bar)	Temp (°C)	Mode of Analysis
Biozen 1.8 µm dSEC-2	Inert, high-strength porous particle for the separation and quantitation of monoclonal antibody aggregate and fragments	200	–	–	2.5-7.5	0.1 M Sodium Phosphate, pH 6.8 w/ 0.025 % NaN <sub>3</sub>	8000/570	50	SEC/GFC
Biozen 3 µm dSEC-2	Inert, high-strength porous particle for the separation and quantitation of monoclonal antibody aggregate and fragments	200	–	–	2.5-7.5	0.1 M Sodium Phosphate, pH 6.8 w/ 0.025 % NaN <sub>3</sub>	4000/285	50	SEC/GFC
Biozen 1.7 µm Oligo	The particle is an organo-silica core-shell bonded with a C18 stationary phase	100	200	11	1-12	Acetonitrile/Water (60:40)	15000/1050	60	RP
Biozen 2.6 µm Oligo							8700/600	60	RP
Biozen 2.6 µm Glycan	Provides optimal combination of high efficiency and selectivity for released glycans, suitable for HPLC and UHPLC.	100	200	–	2-7.5	Acetonitrile /0.1 M Ammonium Formate, pH 3.2 (90:10)	8700/600	60	HILIC
Biozen 1.6 µm Peptide PS-C18	Excellent retention by combined positively charged surface ligand and C18 ligand, contains a positively charged weak base that repels basic ions, suitable for use with UHPLC.	100	260	9	1.5-8.5 ***	Acetonitrile/Water (65:35 v/v)	15000/1030	90*	RP
Biozen 3 µm Peptide PS-C18	Excellent retention by combined positively charged surface ligand and C18 ligand, contains a positively charged weak base that repels basic ions, suitable for use with HPLC.						5000/340	90*	RP
Biozen 1.7 µm Peptide XB-C18	Overall retention of both acidic and basic peptides through C18 stationary phase with di-isobutyl side chains, suitable for use with UHPLC.	100	200	10	1.5-9 **	Acetonitrile/Water (65:35 v/v)	15000/1050	90*	RP
Biozen 2.6 µm Peptide XB-C18	Overall retention of both acidic and basic peptides through C18 stationary phase with di-isobutyl side chains, suitable for use with HPLC and UHPLC.						8700/600		RP
Biozen 3.6 µm Intact XB-C8	Large pore core-shell particle for fast intact and subunit biological entry. C8 provides highly useful moderate hydrophobic selectivity.	200	25	–			8700/600		RP
Biozen 2.6 µm WidePore C4	Core-shell particle with butyl stationary phase and optimal wide pore size distribution for better resolution of large biologics, including monoclonal antibodies and subunit analysis.	400	25	–			12500		RP
Biozen 6 µm WCX	Monodispersed, non-porous PS-DVB particle with a hydrophilic graft and linear carboxylate polymer chain for the separation of acidic/basic variants for proteins.	–	–	–	2-12	20 mM Sodium Phosphate + 150 mM NaCl 4 mM NaN <sub>3</sub> , pH 6.5	6000	60	IEX

\* Temperature limits are dependent on method running parameters. Suggested max temperature for these Biozen LC columns is 90°C, however temperature limits are dependent on your running parameters. Running at a pH greater than 8 and elevated temperature will compromise column lifetime. Continuous use of Biozen columns at the maximum temperature limit may compromise column longevity.

\*\* pH range is 1.5 - 9 under gradient conditions. pH range is 1.5 -10 under isocratic conditions.

\*\*\* pH range is 1.5 - 8.5 under gradient conditions. pH range is 1.5 -10 under isocratic conditions

## Chromatography Service and Support

### Accelerate your Biopharmaceutical journey with our expertise and support

Our technical support scientists handle scientific questions regarding a wide variety of applications and techniques, from supporting the discovery of new applications to optimizing protocols — as well as troubleshooting your experiments.

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- Product Recommendations
- Method Optimization
- Provide Quotes for Easy Purchasing

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**chat now**

Quotes, Methods, Tips... We're here to help

[www.Phenomenex.com/Chat](http://www.Phenomenex.com/Chat)



# Phenomenex A Danaher Life Sciences Company

Every day, scientists around the world are tackling chronic diseases and infections at the cellular level to understand causes, identify treatments and test new drugs and vaccines. Danaher's Life Sciences companies make this leading-edge scientific research possible at clinical research facilities, academic institutions, and government agencies. Our capabilities extend beyond research with the world's most advanced filtration, separation, and purification technologies, which power the creation of biopharmaceuticals, microelectronics, and more.



## Innovation Defines Our Future

- One of the most important ways Danaher drives continuous improvement is through innovation that makes a difference.
- Customers look to us to find opportunities and define the future—to deliver innovative products, service, and solutions that address their most pressing needs.
- Innovation is our ultimate competitive differentiator. We pursue out-of-the box ideas, both large and small, to add value and advance innovation.
- We improve people's lives by delivering technologies that matter. By helping our customers achieve amazing things, we enhance quality of life around the world.



### The Potential To Make a Difference

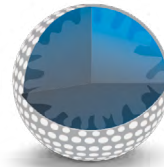
Danaher's innovative companies are developing leading edge diagnostic tools, and advancing life-saving scientific research

# Introducing A New Solution for Your mAbs and Aggregate Analysis with Biozen dSEC Column

## NEW dSEC

**Biozen dSEC**  
1.8  $\mu\text{m}$  and 3  $\mu\text{m}$

## 4 Particle Platforms



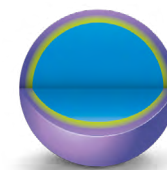
**Pore Controlled Technology**



**Thermally Modified Fully Porous**

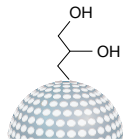


**Core-Shell Technology**



**Monosized Polymeric Non-Porous**

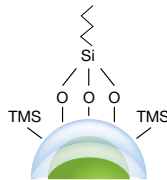
### dSEC



**Biozen dSEC**  
1.8  $\mu\text{m}$  and 3  $\mu\text{m}$

Inert, high-strength porous particle for the separation and quantitation of monoclonal antibody aggregate and fragments

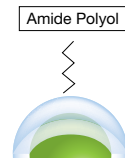
### Intact



**Biozen WidePore C4**  
2.6  $\mu\text{m}$

Core-shell particle with butyl stationary phase and optimal wide pore size distribution for better resolution of large biologics, including monoclonal antibodies and subunit analysis.

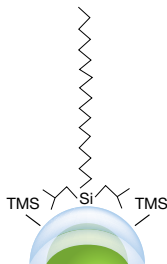
### Glycan



**Biozen Glycan**  
2.6  $\mu\text{m}$

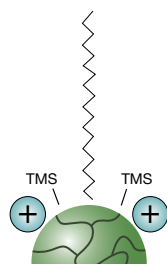
Provides optimal combination of high efficiency and selectivity for released glycans.

### Peptide



**Biozen Peptide XB-C18**  
1.7  $\mu\text{m}$  and 2.6  $\mu\text{m}$

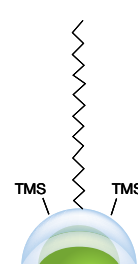
Overall retention of both acidic and basic peptides through C18 stationary phase with di-isobutyl side chains.



**Biozen Peptide PS-C18**  
1.6  $\mu\text{m}$  and 3  $\mu\text{m}$

Excellent retention by combined positively charged surface ligand and C18 ligand.

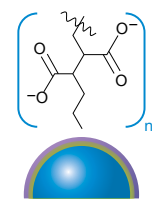
### Oligonucleotides



**Biozen Oligo**  
1.7  $\mu\text{m}$  and 2.6  $\mu\text{m}$

Organo-silica core-shell particle bonded with a C18 stationary phase offers high selectivity for even minute oligo differences alongside high and low pH robustness.

### Ion-Exchange



**Biozen WCX**  
6  $\mu\text{m}$

Monosized particles grafted with linear polycarboxylate chains to envelop and separate proteins from acidic/basic variants

# Ordering Information

## Biozen™ Products - Powered by Biocompatible Hardware

Biozen Columns (mm)								Biocompatible Guard Cartridges		
	50 x 2.1	100 x 2.1	150 x 2.1	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	for 2.1 mm	for 4.6 mm	Holder
								/3pk		ea
Biozen 2.6 µm Glycan	<a href="#">00B-4773-AN</a>	<a href="#">00D-4773-AN</a>	<a href="#">00F-4773-AN</a>	—	—	—	—	<a href="#">AJ0-9800</a>	—	<a href="#">AJ0-9000</a>
								/3pk		ea
Biozen 1.6 µm Peptide PS-C18	<a href="#">00B-4770-AN</a>	<a href="#">00D-4770-AN</a>	<a href="#">00F-4770-AN</a>	—	—	—	—	<a href="#">AJ0-9803</a>	—	<a href="#">AJ0-9000</a>
								/10pk	/10pk	ea
Biozen 3 µm Peptide PS-C18	<a href="#">00B-4771-AN</a>	—	<a href="#">00F-4771-AN</a>	<a href="#">00B-4771-E0</a>	—	<a href="#">00F-4771-E0</a>	—	<a href="#">AJ0-7605</a>	<a href="#">AJ0-7606</a>	<a href="#">KJ0-4282</a>
								/3pk		ea
Biozen 1.7 µm Peptide XB-C18	<a href="#">00B-4774-AN</a>	<a href="#">00D-4774-AN</a>	<a href="#">00F-4774-AN</a>	—	—	—	—	<a href="#">AJ0-9806</a>	—	<a href="#">AJ0-9000</a>
								/3pk	/3pk	ea
Biozen 2.6 µm Peptide XB-C18	<a href="#">00B-4768-AN</a>	<a href="#">00D-4768-AN</a>	<a href="#">00F-4768-AN</a>	<a href="#">00B-4768-E0</a>	—	<a href="#">00F-4768-E0</a>	—	<a href="#">AJ0-9806</a>	<a href="#">AJ0-9808</a>	<a href="#">AJ0-9000</a>
								/3pk	/3pk	ea
Biozen 2.6 µm WidePore C4	<a href="#">00B-4786-AN</a>	<a href="#">00D-4786-AN</a>	<a href="#">00F-4786-AN</a>	<a href="#">00B-4786-E0</a>	<a href="#">00D-4786-E0</a>	<a href="#">00F-4786-E0</a>	<a href="#">00G-4786-E0</a>	<a href="#">AJ0-9816</a>	<a href="#">AJ0-9818</a>	<a href="#">AJ0-9000</a>
								/3pk	/3pk	ea
Biozen 3.6 µm Intact XB-C8	<a href="#">00B-4766-AN</a>	<a href="#">00D-4766-AN</a>	<a href="#">00F-4766-AN</a>	<a href="#">00B-4766-E0</a>	—	<a href="#">00F-4766-E0</a>	—	<a href="#">AJ0-9812</a>	<a href="#">AJ0-9814</a>	<a href="#">AJ0-9000</a>

	50 x 2.1	150 x 2.1	150 x 4.6	300 x 4.6	150 x 7.8	300 x 7.8	for 2.1 mm	for 4.6 mm	Holder
							/3pk	/3pk	ea
Biozen 3 µm dSEC	—	—	<a href="#">00F-4788-E0</a>	<a href="#">00H-4788-E0</a>	<a href="#">00F-4788-K0</a>	<a href="#">00H-4788-K0</a>	<a href="#">AJ0-9852</a>	<a href="#">AJ0-9853</a>	<a href="#">AJ0-9000</a>
Biozen 1.8 µm dSEC	<a href="#">00B-4787-AN</a>	<a href="#">00F-4787-AN</a>	<a href="#">00F-4787-E0</a>	<a href="#">00H-4787-E0</a>	—	—	<a href="#">AJ0-9852</a>	<a href="#">AJ0-9853</a>	<a href="#">AJ0-9000</a>

NEW

	30 x 4.6	40 x 7.8
Biozen 3 µm dSEC Guard	<a href="#">03A-4788-E0</a>	<a href="#">03Q-4788-K0</a>

	50 x 2.1	100 x 2.1	150 x 2.1	250 x 2.1	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	for 4.6 mm	Holder
									/10pk	ea
Biozen 6 µm WCX	<a href="#">00B-4777-AN</a>	<a href="#">00D-4777-AN</a>	<a href="#">00F-4777-AN</a>	<a href="#">00G-4777-AN</a>	<a href="#">00B-4777-E0</a>	<a href="#">00D-4777-E0</a>	<a href="#">00F-4777-E0</a>	<a href="#">00G-4777-E0</a>	<a href="#">AJ0-9400</a>	<a href="#">KJ0-4282</a>

	50 x 2.1	100 x 2.1	150 x 2.1	50 x 4.6	100 x 4.6	150 x 4.6	for 2.1 mm	for 4.6 mm	Holder
							/3pk	/3pk	ea
Biozen 1.7 µm Oligo	<a href="#">00B-4791-AN</a>	<a href="#">00D-4791-AN</a>	<a href="#">00F-4791-AN</a>	—	—	—	<a href="#">AJ0-9820</a>	<a href="#">AJ0-9822</a>	<a href="#">KJ0-9000</a>
Biozen 2.6 µm Oligo	<a href="#">00B-4790-AN</a>	<a href="#">00D-4790-AN</a>	<a href="#">00F-4790-AN</a>	<a href="#">00B-4790-E0</a>	<a href="#">00D-4790-E0</a>	<a href="#">00F-4790-E0</a>	<a href="#">AJ0-9820</a>	<a href="#">AJ0-9822</a>	<a href="#">KJ0-9000</a>

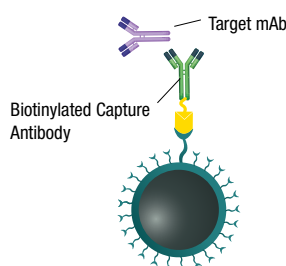
## Sample Preparation

Biozen Solid Phase Extraction	Format	Sorbent Mass	Part Number	Unit
Biozen N-Glycan Clean-Up	Microelution 96-Well Plate	5 mg/well	<a href="#">8M-S009-NGA</a>	1/box



## Biozen MagBeads Streptavidin Coated

Formats	Part No.	Concentration	Bead Size
25 mg (≈50 samples)	<a href="#">KS0-9531</a>	20 mg/mL	1.0 µm
50 mg (≈100 samples)	<a href="#">KS0-9532</a>		
500 mg (≈1000 samples)	<a href="#">KS0-9533</a>		



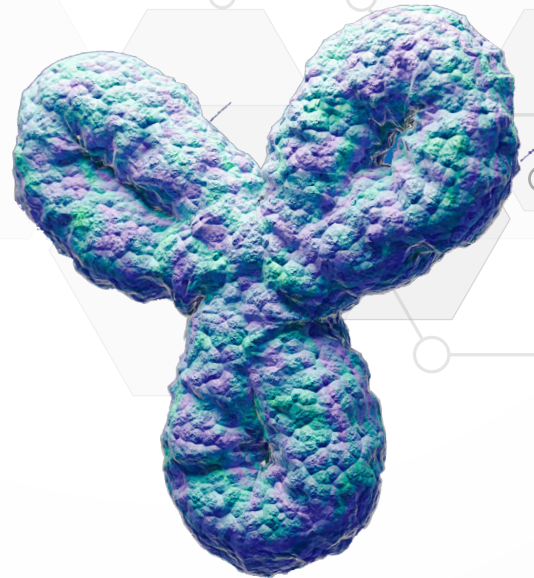
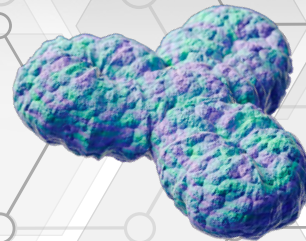
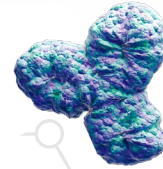
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GUARANTEE

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[www.phenomenex.com/behappy](http://www.phenomenex.com/behappy)

# dSEC

Size Exclusion Chromatography Columns



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t: +32 (0)2 511 8666 (Dutch)  
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