

dSEC-7

A Size Exclusion Column Designed for
AAV Aggregate Analysis



Robust and reliable aggregate analysis that achieves:

- Baseline resolution of monomer/aggregate species through 700 Å pore size
- Reduction in sample consumption by up to 90 % compared to traditional SEC columns
- Reduction in method times by up to 50 % when compared to traditional SEC columns

Customers Talked & We Listened

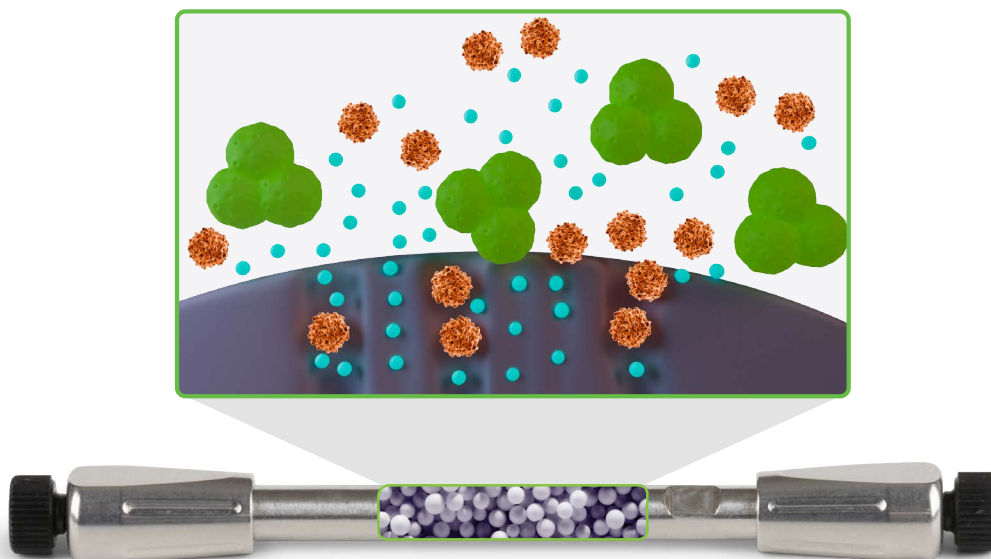
In response to the resonating voices of our customers, we've embarked on a mission of addressing traditional challenges associated with LC-based AAV analysis. Our goal was clear: deliver reliable results at an accelerated pace without compromising chromatographic integrity or data quality.

What our customers asked for:

- More applicable pore size(s) and column dimensions
- Gains in efficiency, robustness, specificity and reproducibility
- Simplified method implementation and transferability
- Reduced sample consumption without sacrificing sensitivity

Feature	Benefit
700 Å Pore Size	Optimized pore size for AAVs and other large biomolecules
3 µm Particle Size	Increased efficiency as well as compatibility across both HPLC and UHPLC platforms
2.1 / 4.6 mm Column Diameter	Less sample consumption compared to 7.8 mm columns

Biozen dSEC-7 columns are packed with large pore silica coupled with a proprietary hydrophilic diol-type bonded surface chemistry that ensures silica surface interactions are mitigated.



Novel Size Exclusion Chromatography (SEC) Columns

Developed for Aggregate Analysis

Unparalleled performance when compared to conventional aggregate analysis techniques such as Analytical Ultracentrifugation (AUC).

Biozen dSEC-7 provides:

- Baseline resolution between monomer and aggregate species through 700 Å pore size
- Lower sample volume consumption and reduced run times through optimized column IDs (4.6 & 2.1 mm ID) and lengths
- Mitigation of unwanted surface interactions through proprietary hydrophilic diol-type surface chemistry



Sample Consumption

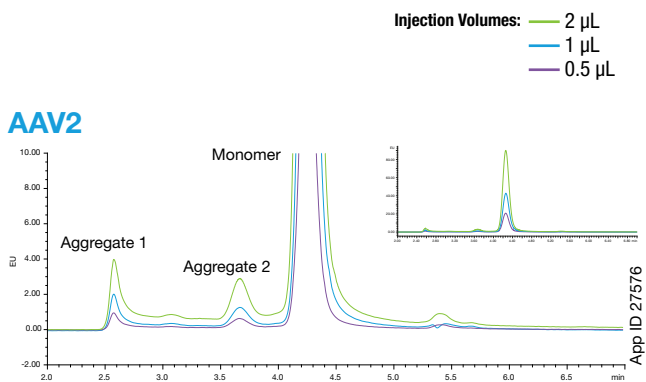
Shorter length and narrower bore columns result in both faster methods while requiring less high-value sample.

	dSEC-7	Traditional SEC	AUC
Sample Consumption (µL)	2	20	400
Run Time (min)	7	14	90
Baseline Resolution of Monomer / Aggregate Species	✓	✗	✓

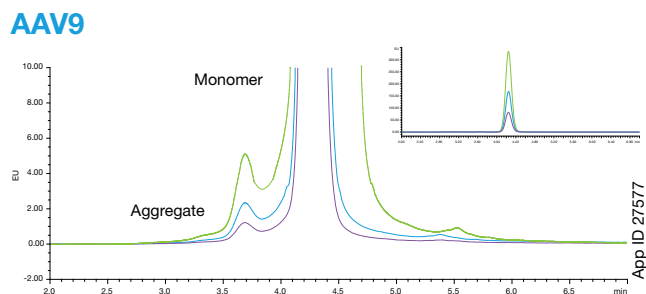
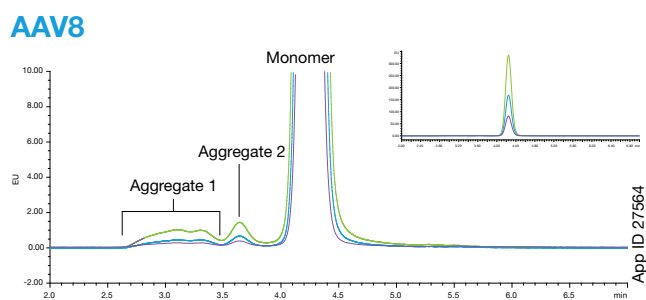
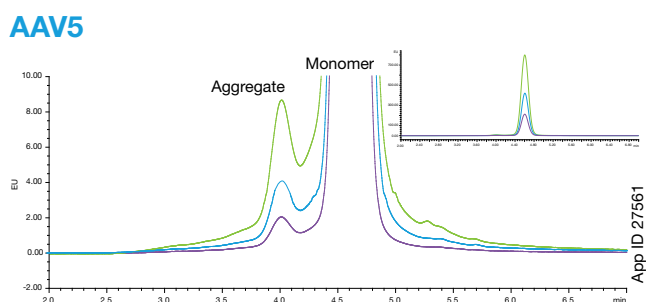
Innovatively addressing the limitations of traditional SEC columns for larger biomolecules, Biozen dSEC-7 represents a breakthrough. Developed by a dedicated team of R&D scientists committed to overcoming analytical challenges linked to AAVs. Biozen dSEC-7 delivers the highest resolution by utilizing optimized pore sizes, column dimensions, and an enhanced particle chemistry. This robust column ensures swift outcomes without compromising data quality, empowering scientists to make critical decisions with confidence.

Optimize Your Loading Capabilities

SEC analysis traditionally requires large sample loads to ensure accurate quantitation of both low concentration monomer and higher order aggregate species. Biozen dSEC-7 offers optimized column dimensions to provide improved resolution and reproducibility at lower sample loads to reduce sample consumption.



LC Conditions
Column: Biozen 3 μ m dSEC-7
Dimension: 150 x 4.6 mm
Part No.: 00F-4789-E0
Mobile Phase: 20 mM Sodium Phosphate, pH 6.6 + 350 mM Potassium Chloride
Flow Rate: 350 μ L/min (Isocratic)
Temperature: 25 $^{\circ}$ C
Injection: 0.5 μ m, 1, and 2 μ L
Instrument: Waters[®] ACQUITY[®] H-Class
Detection: FLR - Ex 280 nm, Em 350 nm
 Sampling Rate: 40 Hz
Sample: 1. AAV2-CAG-GFP, 2E13 vg/mL
 2. AAV5-CMV-GFP, 2E13 vg/mL
 3. AAV8-CMV-GFP, 2E13 vg/mL
 4. AAV9-CMV-GFP, 2E13 vg/mL

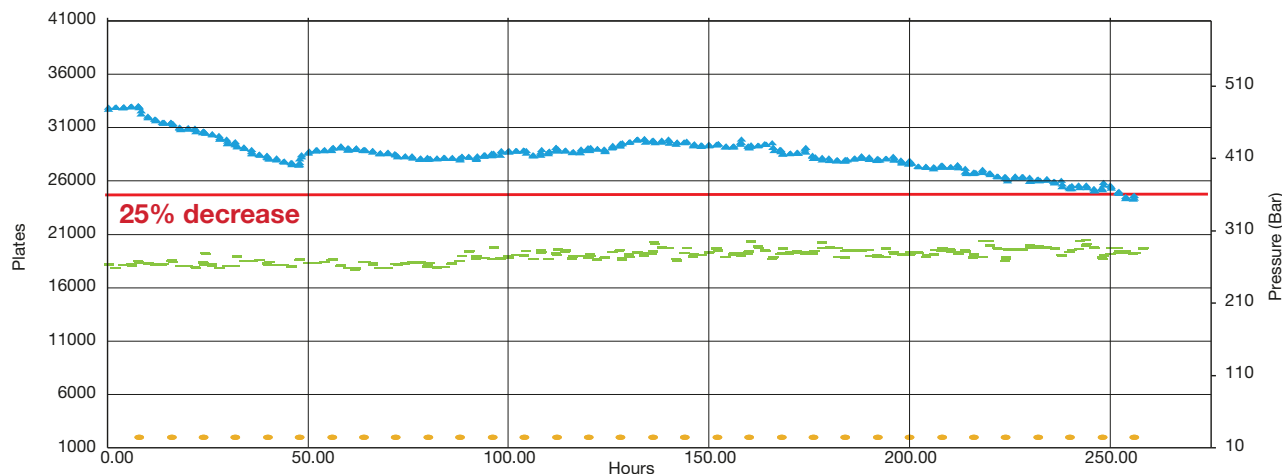


Serotype	Injection Volume (μ L)	Peak	% Area	Resolution
AAV2	0.5	Aggregate 1	3.19	2.20
		Aggregate 2	2.65	
		Monomer	94.05	
	1	Aggregate 1	3.12	2.20
		Aggregate 2	2.46	
		Monomer	94.42	
2	Aggregate 1	2.89	2.20	
	Aggregate 2	2.46		
	Monomer	94.05		
AAV5	0.5	Aggregate 1	0.95	1.60
		Monomer	99.05	
	1	Aggregate 1	1.00	1.50
		Monomer	99.00	
	2	Aggregate 1	0.95	1.60
		Monomer	99.05	
AAV8	0.5	Aggregate 1	1.10	2.40
		Aggregate 2	0.50	
		Monomer	98.40	
	1	Aggregate 1	1.10	2.00
		Aggregate 2	0.50	
		Monomer	98.40	
2	Aggregate 1	1.14	2.20	
	Aggregate 2	0.50		
	Monomer	98.39		
AAV9	0.5	Aggregate 1	1.52	1.60
		Monomer	98.53	
	1	Aggregate 1	1.47	1.70
		Monomer	98.48	
	2	Aggregate 1	1.59	2.00
		Monomer	98.51	

Increase Your Column Lifetime

Larger pore size SEC columns suffer from shorter lifetimes due to their decreased mechanical strength. Our patented, pore controlled, hydrophilic surface particle technology ensures mechanical stability and mitigates any hydrophobic interactions. Thus, improving column lifetime and performance.

Column Stability Over 250 Hours

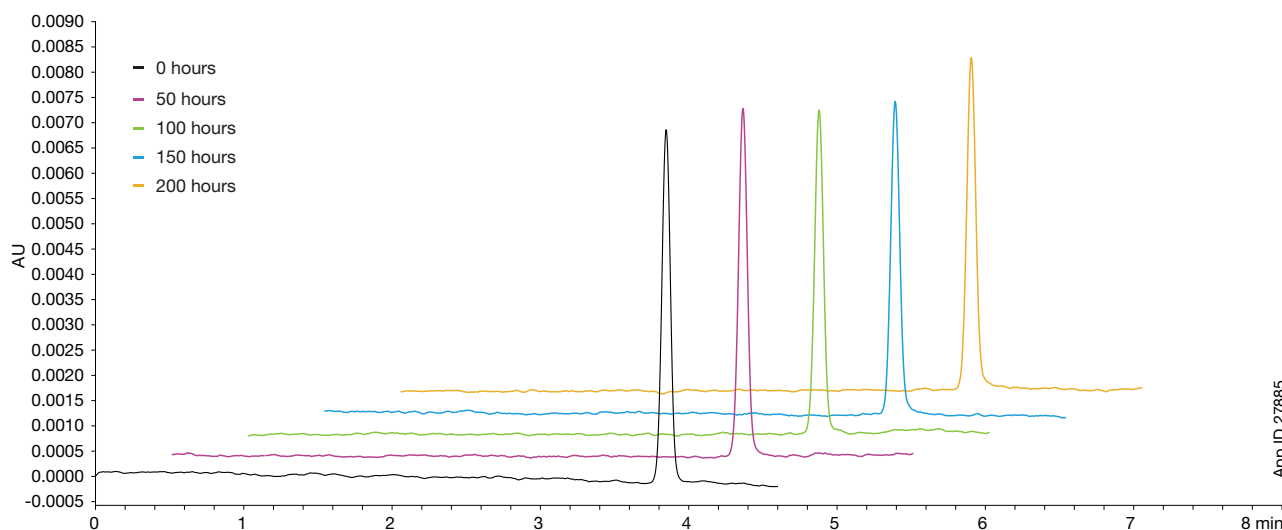


LC Conditions

Column: Biozen 3 μm dSEC-7
Dimension: 150 x 4.6 mm
Part No.: [00F-4789-E0](#)
Mobile Phase: A: 100 mM Sodium Phosphate + 250 mM Sodium Chloride, pH 6.8 + 0.025% Sodium Azide
 B: Isopropanol
 A / B (51:49, v/v)
Flow Rate: 500 $\mu\text{L}/\text{min}$
Temperature: 25 $^{\circ}\text{C}$
Injection: 0.7 μm
Instrument: Waters[®] ACQUITY[®] H-Class Bio
Detection: UV @ 280 nm
Detector: Waters ACQUITY H-Class PDA FLR Detector
Sample: Uridine, 0.05 mg/mL

▲ USP Plate Count
● Stop Flow for 8 Hours
— Final Pressure (Bar)

Chromatogram Overlays at 0, 50, 100, 150 and 200 Hours Runtime



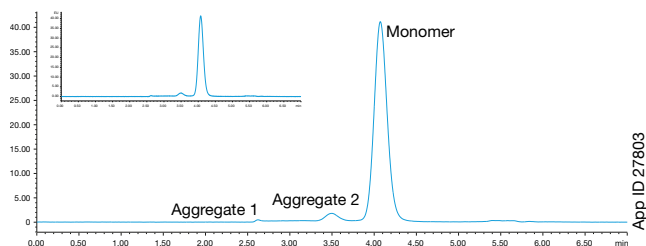
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Batch-to-Batch Reproducibility

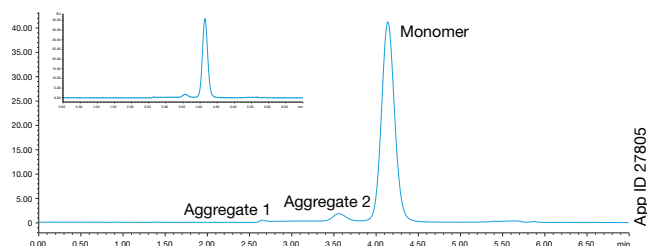
Batch-to-batch reproducibility is pivotal to mitigating risks during biopharmaceutical development and commercialization. Consistency from column to column safeguards product quality and ensures high confidence in data quality throughout a product's lifecycle.

AAV2 Aggregate Reproducibility Across 4 Column Batches

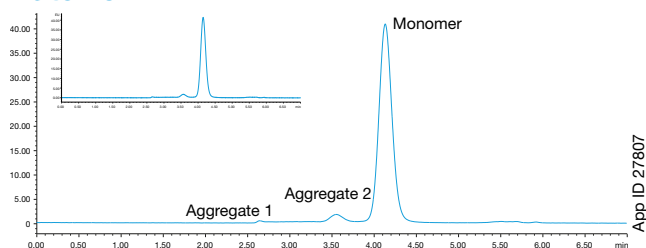
Batch 1



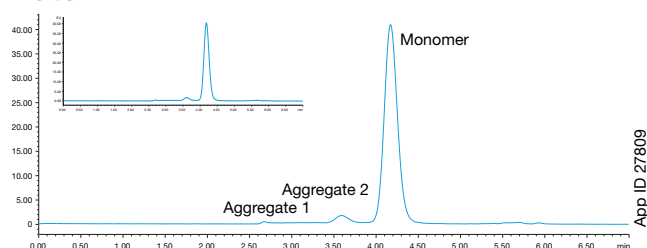
Batch 2



Batch 3



Batch 4



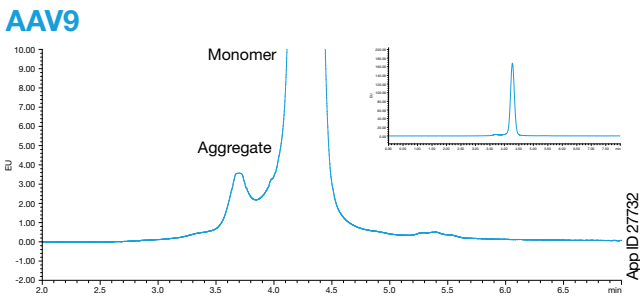
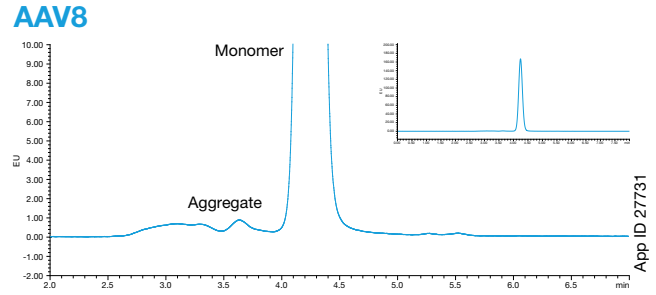
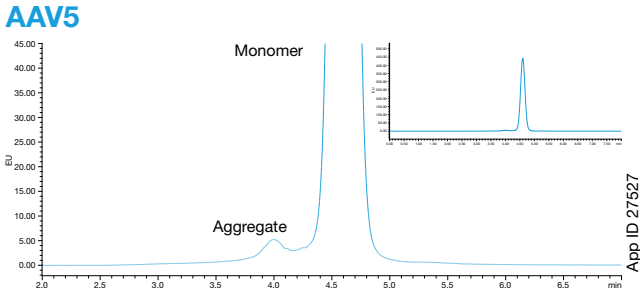
LC Conditions

Column: Biozen 3 μ m dSEC-7
Dimension: 150 x 4.6 mm
Part No.: [00F-4789-E0](#)
Mobile Phase: 20 mM Sodium Phosphate, pH 6.6 + 350 mM Potassium Chloride
Flow Rate: 350 μ L/min
Temperature: 25 $^{\circ}$ C
Injection: 1 μ L
Instrument: Waters[®] ACQUITY[®] H-Class Bio
Detection: UV @ 280 nm
 FLR – Ex 280 nm, Em 348 nm
Detector: Waters ACQUITY H-Class PDA FLR Detector
Sample: AAV2-CMV-GFP, 2E13 vg/mL

Batch	Aggregate 1 Area	Aggregate 2 Area	Monomer Area	Aggregate 1 % Area	Aggregate 2 % Area	Monomer % Area	USP Resolution (HH)
1	27012	160612	4412459	0.60	3.50	95.90	2.07
2	29803	180077	4470739	0.60	3.90	95.50	1.97
3	30729	177282	4459870	0.70	3.80	95.50	2.08
4	25813	173059	4414968	0.60	3.80	95.70	1.98
Average	28339.25	172757.50	4439509.00	0.60	3.70	95.70	2.03
% RSD	8.15	4.98	0.68	7.50	4.30	0.20	2.87

Mobile Phase Flexibility

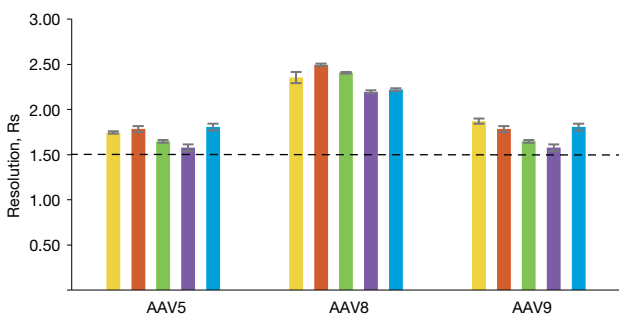
Increasing ionic strength and/or organic composition is a common solution to mitigate undesired secondary interactions. However, optimizing an array of mobile phase conditions increases method development time and limits both detector compatibility and method standardization across projects. dSEC-7 ensures mobile phase optimization is flexible and seamless thus reducing method development times while allowing the use of simple physiological buffer systems.



LC Conditions

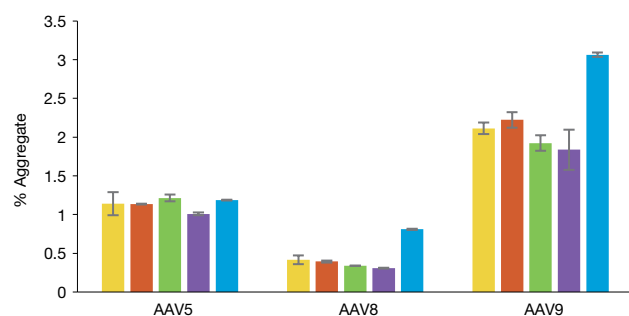
- Column:** Biozen 3 μm dSEC-7
- Dimension:** 150 x 4.6 mm
- Part No.:** [00F-4789-EQ](#)
- Mobile Phase:** 20 mM Sodium Phosphate, pH 6.6 + 350 mM Potassium Chloride
- Flow Rate:** 350 $\mu\text{L}/\text{min}$ (Isocratic)
- Temperature:** 25 $^{\circ}\text{C}$
- Injection:** 1 μL
- LC System:** Waters[®] ACQUITY[®] H-Class
- Detection:** FLR - Ex 280 nm, Em 350 nm
- Sampling Rate:** 40 Hz
- Sample:** 1. AAV5 CMV GFP, 2E13 vg/mL (AAV5)
3. AAV8 CMV GFP, 2E13 vg/mL (AAV8)
4. AAV9 CMV GFP, 2E13 vg/mL (AAV9)

Aggregate Resolution of AAVs Under Different Mobile Phase Conditions



- 20 mM Sodium Phosphate, pH 6.6 + 350 mM Potassium Chloride
- 20 mM Sodium Phosphate, pH 6.6 + 500 mM Potassium Chloride
- DPBS
- DPBS + 10 % Ethanol
- 50 mM Potassium Phosphate Dibasic + 250 mM Potassium Chloride

% Aggregate of AAVs Under Different Mobile Phase Conditions

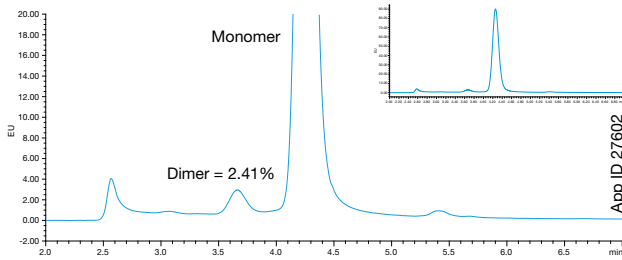


- 20 mM Sodium Phosphate, pH 6.6 + 350 mM Potassium Chloride
- 20 mM Sodium Phosphate, pH 6.6 + 500 mM Potassium Chloride
- DPBS
- DPBS + 10 % Ethanol
- 50 mM Potassium Phosphate Dibasic + 250 mM Potassium Chloride

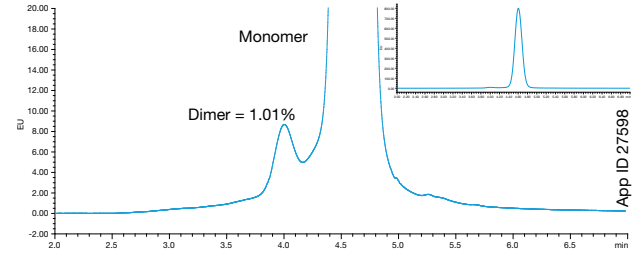
Serotype Evaluation

Evaluating different AAV serotypes is essential for optimizing the design and effectiveness of gene therapies as different AAV serotypes have varying tropisms and immunogenic profiles. Knowing you can effectively select and evaluate the most appropriate serotypes for the desired therapeutic outcome ensures confidence in both patient safety and drug quality.

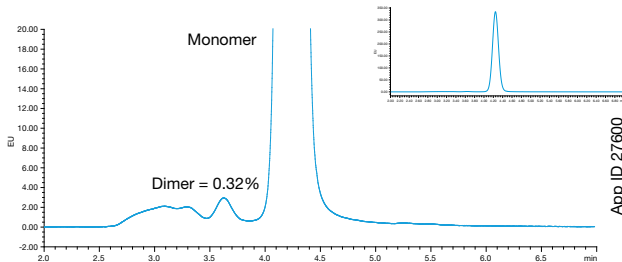
AAV2



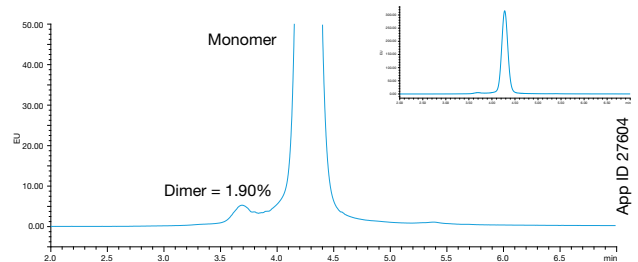
AAV5



AAV8



AAV9



Serotype	Peak	Retention Time (min)	%Area	Resolution
AAV2	Monomer	4.26	94.05	2.20
	Dimer	3.68	2.57	
AAV5	Monomer	4.60	99.05	1.60
	Dimer	4.00	0.95	
AAV8	Monomer	4.25	98.39	2.20
	Dimer	3.64	0.50	
AAV9	Monomer	4.28	98.51	2.00
	Dimer	3.67	1.59	

LC Conditions

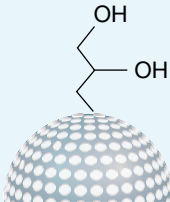
- Column: Biozen 3 μ m dSEC-7
- Dimension: 150 x 4.6 mm
- Part No.: [00F-4789-E0](#)
- Mobile Phase: 20 mM Sodium Phosphate, pH 6.6 + 350 mM Potassium Chloride
- Flow Rate: 350 μ L/min (Isocratic)
- Temperature: 25 $^{\circ}$ C
- Injection: 2 μ L
- Instrument: Waters[®] ACQUITY[®] H-Class
- Detection: FLR - Ex 280 nm, Em 350 nm
Sampling Rate: 40 Hz
- Sample: 1. AAV2-CAG-GFP, 2E13 vg/mL (AAV2)
2. AAV5-CMV-GFP, 2E13 vg/mL (AAV5)
3. AAV8-CMV-GFP, 2E13 vg/mL (AAV8)
4. AAV9-CMV-GFP, 2E13 vg/mL (AAV9)

View more applications and easily order online:
www.phenomenex.com/dSEC-7

Expand Your Biotherapeutic Characterization Capabilities

Biozen dSEC-7 for AAV Aggregate Analysis

NEW dSEC-7



Biozen dSEC-7
3 μm

4 Particle Platforms



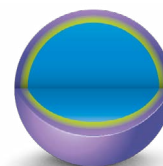
Pore Controlled Technology



Thermally Modified Fully Porous

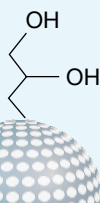


Core-Shell Technology




Monosized Polymeric Non-Porous

SEC



Biozen dSEC-2
1.8 μm and 3 μm

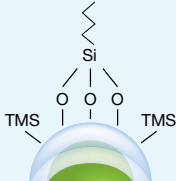
Inert, high-strength porous particle for the separation and quantitation of monoclonal antibody aggregate and fragments.



Biozen SEC-3
1.8 μm

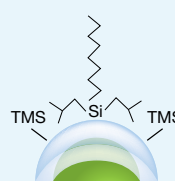
Extremely inert, high density fully porous particle with high efficiency and high molecular weight (HMW) separation range of 10 k–700 kDa.

Intact



Biozen WidePore C4
2.6 μm

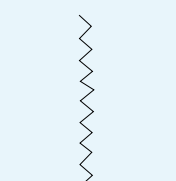
Core-shell particle with butyl stationary phase and optimal wide pore size distribution for better resolution of large biologics, including monoclonal antibodies and subunit analysis.



Biozen Intact XB-C8
3.6 μm

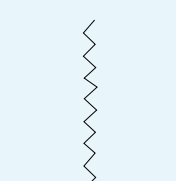
Large pore core-shell particle for fast intact and subunit biologic entry. C8 provides highly useful moderate hydrophobic selectivity.

Peptide



Biozen Peptide XB-C18
1.7 μm and 2.6 μm

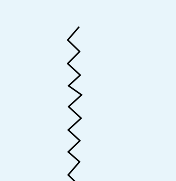
Overall retention of both acidic and basic peptides through C18 stationary phase with di-isobutyl side chains.



Biozen Peptide PS-C18
1.6 μm and 3 μm

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

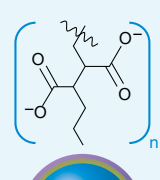
Oligonucleotides



Biozen Oligo
1.7 μm and 2.6 μm

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.

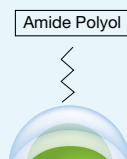
Ion-Exchange



Biozen WCX
6 μm

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

Glycan



Biozen Glycan
2.6 μm

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

Part of a Full Bio Portfolio

Phases	Description	Pore Size (Å)	Surface Area (m ² /g)	Effective Carbon Load (%)	pH stability	Shipping Solvent	Max Pressure (psi/bar)	Temp (°C)	Mode of Analysis
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, v/v)	15,000/1050	60	RP
Biozen 2.6 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, v/v)	8,700/600	60	RP
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)	15,000/1030	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.	100	260	9	1.5-8.5 ***	Acetonitrile / Water (65:35, v/v)	5,000/340	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)	15,000/1050	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.	100	200	10	1.5-9 **	Acetonitrile/Water (65:35, v/v)	8,700/600	90*	RP
Biozen 3.6 µm Intact XB-C8	Large pore core-shell particle for fast intact biological entry. C8 provides highly useful moderate hydrophobic selectivity.	200	20	–	1.5-9**	Acetonitrile/Water (65:35, v/v)	8,700/600	90*	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 sub-unit analysis	400	25	–	1.5-9**	Acetonitrile/Water (65:35, v/v)	12500	90*	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)	8,700/600	60	HILIC
Biozen 3 µm dSEC-7	Inert, high-strength porous particle for the separation and quantitation of AAVs, IgMs and other large biotherapeutic aggregate and fragment analysis.	700	–	–	2.5-7.5	0.1 M Sodium Phosphate, pH 6.8 w/ 0.025 % NaN3	6500/450	50	SEC
Biozen 1.8 µm SEC-3	Extremely inert, high density fully porous particle with high efficiency and high molecular weight (HMW) separation range of 10-700 kDa.	300	–	–	1.5-8.5	0.1 M Phosphate Buffer, pH 6.8 w/ 0.025 % NaN3	7000/480	50	SEC/GFC
Biozen 1.8 µm dSEC-2	Inert, high-strength porous particle for the separation and quantitation of monoclonal antibody, biosimilar and biotherapeutic aggregate and fragment analysis.	200	–	–	2.5-7.5	0.1 M Sodium Phosphate, pH 6.8 w/ 0.025 % NaN3	8000/550	50	SEC/GFC
Biozen 3 µm dSEC-2	Inert, high-strength porous particle for the separation and quantitation of monoclonal antibody, biosimilar and biotherapeutic aggregate and fragment analysis.	200	–	–	2.5-7.5	0.1 M Sodium Phosphate, pH 6.8 w/ 0.025 % NaN3	4000/275	50	SEC/GFC
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 NaN3, 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.



- Any Chromatographic Inquiry
- Method Optimization
- Product Recommendations
- Provide Quotes for Easy Purchasing

Ordering Information

Biozen™ Products - Powered by Biocompatible Hardware

NEW	Biozen Columns (mm)						Guard Columns		
	50 x 2.1	150 x 2.1	150 x 4.6	300 x 4.6	150 x 7.8	300 x 7.8	30 x 2.1	30 x 4.6	40 x 7.8
Biozen 3 µm dSEC-7	—	00F-4789-AN	00F-4789-EQ	00H-4789-EQ	—	—	03A-4789-AN	03A-4789-EQ	—
Biozen 1.8 µm dSEC-2	00B-4787-AN	00F-4787-AN	00F-4787-EQ	00H-4787-EQ	—	—	—	03A-4788-EQ	—
Biozen 3 µm dSEC-2	—	—	00F-4788-EQ	00H-4788-EQ	00F-4788-KQ	00H-4788-KQ	—	03A-4788-EQ	03Q-4788-KQ

Biozen Columns (mm)	Biocompatible Guard Cartridges											
	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	300 x 4.6	for 2.1 mm	for 4.6 mm	Holder
Biozen 2.6 µm Glycan	00B-4773-AN	00D-4773-AN	00F-4773-AN	—	—	—	—	—	—	AJ0-9800	—	AJ0-9000
Biozen 1.6 µm Peptide PS-C18	00B-4770-AN	00D-4770-AN	00F-4770-AN	—	—	—	—	—	—	AJ0-9803	—	AJ0-9000
Biozen 3 µm Peptide PS-C18	00B-4771-AN	—	00F-4771-AN	—	00B-4771-EQ	—	00F-4771-EQ	—	—	AJ0-7605*	AJ0-7606*	KJ0-4282
Biozen 1.7 µm Peptide XB-C18	00B-4774-AN	00D-4774-AN	00F-4774-AN	—	—	—	—	—	—	AJ0-9806	—	AJ0-9000
Biozen 2.6 µm Peptide XB-C18	00B-4768-AN	00D-4768-AN	00F-4768-AN	00G-4768-AN	00B-4768-EQ	—	00F-4768-EQ	—	—	AJ0-9806	AJ0-9808	AJ0-9000
Biozen 2.6 µm WidePore C4	00B-4786-AN	00D-4786-AN	00F-4786-AN	—	00B-4786-EQ	00D-4786-EQ	00F-4786-EQ	00G-4786-EQ	—	AJ0-9816	AJ0-9818	AJ0-9000
Biozen 3.6 µm Intact XB-C8	00B-4766-AN	00D-4766-AN	00F-4766-AN	—	00B-4766-EQ	—	00F-4766-EQ	—	—	AJ0-9812	AJ0-9814	AJ0-9000
Biozen 6 µm WCX	00B-4777-AN	00D-4777-AN	00F-4777-AN	00G-4777-AN	00B-4777-EQ	00D-4777-EQ	00F-4777-EQ	00G-4777-EQ	—	AJ0-9400*	AJ0-9401*	KJ0-4282
Biozen 1.7 µm Oligo	00B-4791-AN	00D-4791-AN	00F-4791-AN	—	—	—	—	—	—	AJ0-9820	AJ0-9822	AJ0-9000
Biozen 2.6 µm Oligo	00B-4790-AN	00D-4790-AN	00F-4790-AN	—	00B-4790-EQ	00D-4790-EQ	00F-4790-EQ	—	—	AJ0-9820	AJ0-9822	AJ0-9000
Biozen 1.8 µm SEC-3	00B-4772-AN	—	—	—	—	00D-4772-EQ	00F-4772-EQ	—	00H-4772-EQ	—	AJ0-9851	AJ0-9000

*10/pkg

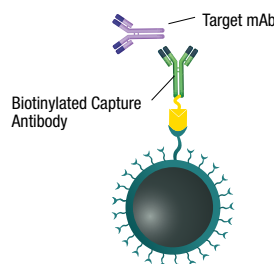
Sample Preparation

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



Biozen MagBeads Streptavidin Coated

Formats	Part No.	Concentration	Bead Size
25 mg (≈50 samples)	KS0-9531	20 mg/mL	1.0 µm
50 mg (≈100 samples)	KS0-9532		
500 mg (≈1000 samples)	KS0-9533		



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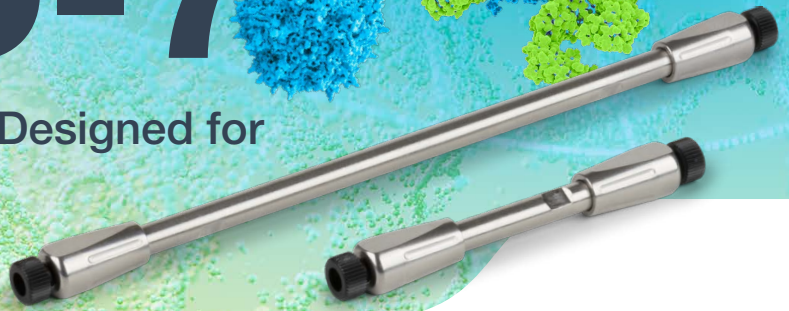
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Australia
t: +61 (0)2-9428-6444
auinfo@phenomenex.com

Austria
t: +43 (0)1-319-1301
anfrage@phenomenex.com

Belgium
t: +32 (0)2 503 4015 (French)
t: +32 (0)2 511 8666 (Dutch)
beinfo@phenomenex.com

Canada
t: +1 (800) 543-3681
www.phenomenex.com/chat

China
t: +86 400-606-8099
cninfo@phenomenex.com

Czech Republic
t: +420 272 017 077
cz-info@phenomenex.com

Denmark
t: +45 4824 8048
nordicinfo@phenomenex.com

Finland
t: +358 (0)9 4789 0063
nordicinfo@phenomenex.com

France
t: +33 (0)1 30 09 21 10
franceinfo@phenomenex.com

Germany
t: +49 (0)6021-58830-0
anfrage@phenomenex.com

Hong Kong
t: +852 6012 8162
hkinfo@phenomenex.com

India
t: +91 (0)40-3012 2400
indiainfo@phenomenex.com

Indonesia
t: +62 21 3952 5747
indoinfo@phenomenex.com

Ireland
t: +353 (0)1 247 5405
eireinfo@phenomenex.com

Italy
t: +39 051 6327511
italiainfo@phenomenex.com

Japan
t: +81 (0) 120-149-262
jpinfo@phenomenex.com

Luxembourg
t: +31 (0)30-2418700
nlinfo@phenomenex.com

Mexico
t: 01-800-844-5226
tecnicomx@phenomenex.com

The Netherlands
t: +31 (0)30-2418700
nlinfo@phenomenex.com

New Zealand
t: +64 (0)9-4780951
nzinfo@phenomenex.com

Norway
t: +47 810 02 005
nordicinfo@phenomenex.com

Poland
t: +48 22 104 21 72
pl-info@phenomenex.com

Portugal
t: +351 221 450 488
ptinfo@phenomenex.com

Singapore
t: 800-852-3944
sginfo@phenomenex.com

Slovakia
t: +420 272 017 077
sk-info@phenomenex.com

Spain
t: +34 91-413-8613
espinfo@phenomenex.com

Sweden
t: +46 (0)8 611 6950
nordicinfo@phenomenex.com

Switzerland
t: +41 (0)61 692 20 20
swissinfo@phenomenex.com

Taiwan
t: +886 (0) 0801-49-1246
twinfo@phenomenex.com

Thailand
t: +66 (0) 2 566 0287
thaiinfo@phenomenex.com

United Kingdom
t: +44 (0)1625-501367
ukinfo@phenomenex.com

USA
t: +1 (310) 212-0555
www.phenomenex.com/chat

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