avantor™ authorized channel partner

Chromatography Solutions

Avantor® ACE® HPLC and UHPLC columns product catalogue

Avantor® ACE®

Avantor® manufactures a range of cutting edge U/HPLC chromatography products from its ISO 9001/ISO 14001 production facility.

The Avantor® ACE® portfolio provides a premium quality product with unique phases that separate what other columns cannot. The range includes novel and traditional stationary phases based on ultra inert silica for excellent reproducibility.

Avantor® ACE® ultra-inert base deactivated HPLC and Avantor® ACE® Excel® UHPLC columns

THE CHOICES YOU NEED TO ACHIEVE SUCCESSFUL SEPARATIONS

20 PHASES

C18 | C18-AR | C18-PFP | C18-Amide | CN-ES | Amino | SuperC18 | SuperPhenylHexyl | HILIC-A | HILIC-B | HILIC-N | AQ | C8 | C4 | Phenyl | CN | C18-HL | Silica | Oligo | Glycan

7 PARTICLE SIZES

- 5 fully porous particles: 1.7 µm | 2 µm | 3 µm | 5 µm | 10 µm
- 2 superficially porous particles: 2.5 µm | 5 µm

4 PORE SIZES

90 Å | 95 Å | 100 Å | 300 Å

6 STANDARD COLUMN LENGTHS

50 mm | 75 mm | 100 mm | 125 mm | 150 mm | 250 mm

13 STANDARD COLUMN IDS

0.075 mm | 0.10 mm | 0.3 mm | 0.5 mm | 1.0 mm | 2.1 mm | 3.0 mm | 4.0 mm | 4.6 mm | 10.0 mm | 21.2 mm | 30.0 mm | 50.0 mm

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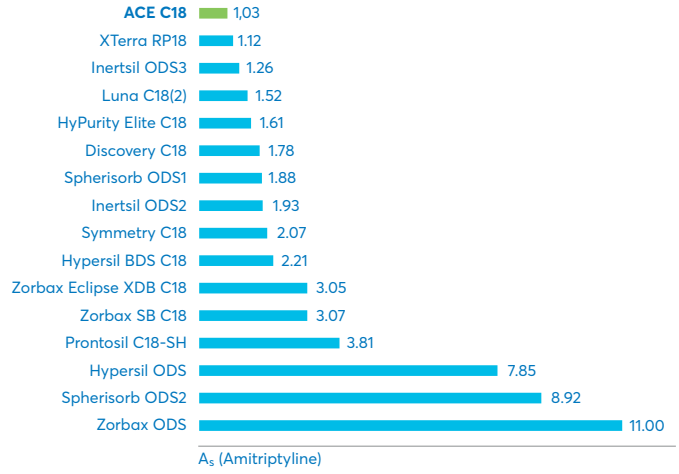
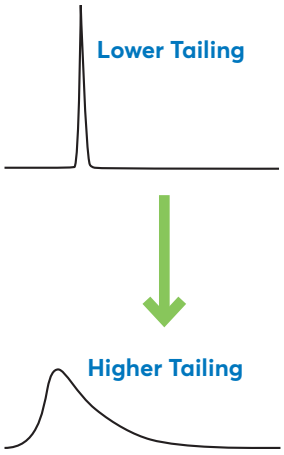
Avantor® ACE® ultra-inert, base-deactivated HPLC and UHPLC columns

INDEPENDENT TESTING SHOWS ACE HPLC COLUMNS DELIVER OUTSTANDING PEAK SHAPE

COMPARISON OF LEADING 5 µm C18 COLUMNS

Peak Asymmetry Comparison





Data obtained from the National Institute of Standards and Technology (NIST), USA

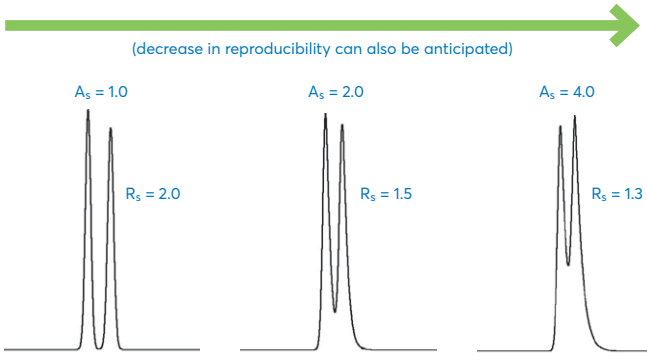
- Leading 5 µm C18 column brands
- Basic molecule testing
- Peak asymmetry investigation

"Elution of organic bases (eg amitriptyline) with severe peak tailing is often associated with high silanol activity; however, the elution of such compounds with symmetrical peak shape is considered indicative of column deactivation."

Column Dimensions: 150 x 4.6 mm, 5 µm - **Mobile Phase**: 80:20 MeOH/5 mM potassium phosphate buffer (pH 7.0) - **Flow Rate**: 2.0 ml/min - **Temperature**: 24°C
The above data was obtained from the National Institute of Standards and Technology (NIST), Certificate of Analysis for Standard Reference Material 870 - "Column Performance Test Mixture for Liquid Chromatography" at the NIST internet site http:/ois.nist.gov/srmcatalog/certificates/870.pdf in September 2002. The NIST test mixture, which is designed to characterize general aspects of HPLC was revised in December 2002. Comparative data may not be representative of all applications.

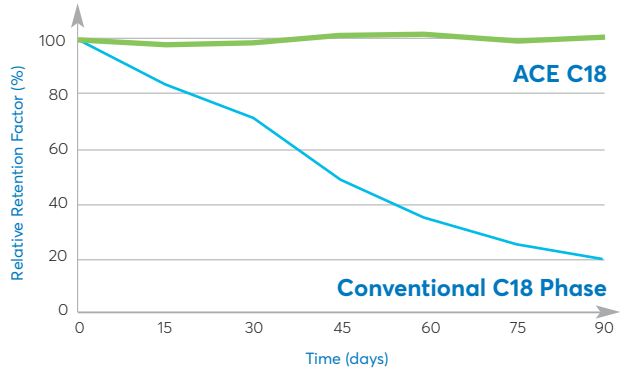
IMPORTANCE OF PEAK ASYMMETRY (A_s)

Increased Peak Tailing Decreases Resolution (R_s)

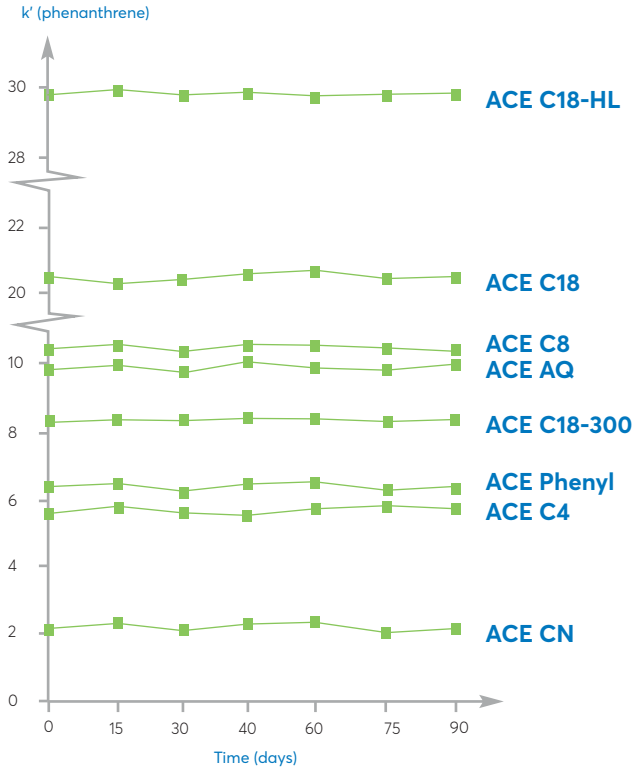


ACE U/HPLC COLUMNS DELIVER EXCELLENT LIFETIMES IN HIGHLY ACIDIC CONDITIONS

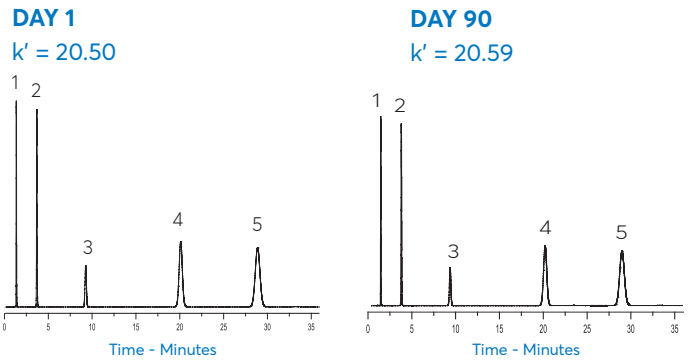
- Conventional bonded phases are susceptible to ligand cleavage in acid conditions
- ACE U/HPLC phases combine ultra-high purity silica with dense bonding techniques to effectively prevent ligand cleavage under acidic conditions



ACIDIC EXPOSURE CONDITIONS:
Mobile Phase: 50:50 MeCN/0.1% TFA in H_2O (pH 1.8)
Flow Rate: 1.0 ml/min - **Temperature:** 22˚C



AFTER 3 MONTHS USAGE AT pH 1.8, NO RETENTION LOSS IS OBSERVED WITH ANY ACE TRADITIONAL CHEMISTRY

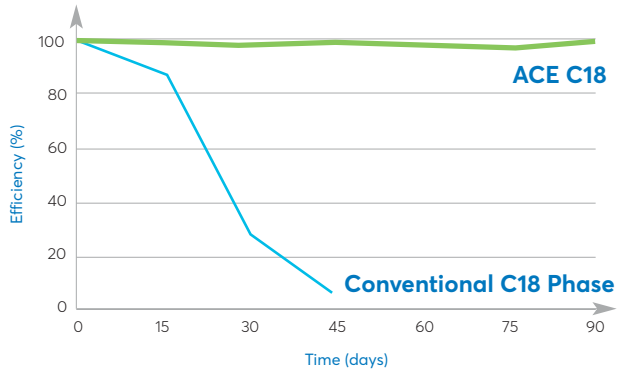


EVALUATION CONDITIONS
Column: ACE 5 C18 - Dimensions: 150 x 4.6 mm -
Sample: 1) Uracil 2) Dimethyl phthalate 3) Toluene 4) Biphenyl 5) Phenanthrene
Mobile Phase: 50:50 MeCN/H_2O - **Flow Rate:** 1.0 mL/min - **Temperature:** 22°C

ACIDIC EXPOSURE CONDITIONS
Mobile Phase: 50:50 MeCN/0.1%TFA in H_2O (pH 1.8) - **Flow Rate:** 1.0 mL/min
Temperature: 22°C

ACE U/HPLC COLUMNS DELIVER EXCELLENT LIFETIMES IN HIGHLY BASIC CONDITIONS

- At high pH, silica dissolution results in a decrease in column efficiency in conventional columns
- Once again, the ultra-high purity silica with dense bonding techniques used in the manufacture of ACE U/HPLC phases effectively prevents silica dissolution under basic conditions

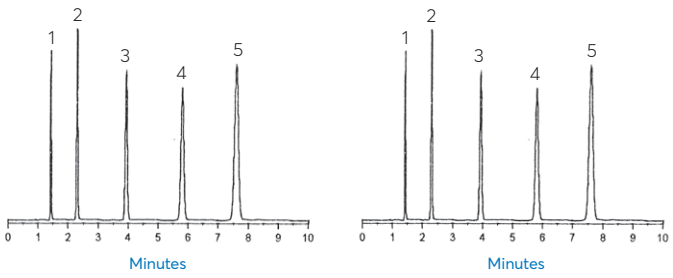


BASIC EXPOSURE CONDITIONS:
Mobile Phase: 50:50 MeCN/25 mM pyrrolidine in H_2O (pH 11.0)
Flow Rate: 1.0 ml/min - **Temperature:** 22˚C

ACE COLUMNS WITHSTAND HIGHLY ALKALINE CONDITIONS WITHOUT LOSS OF EFFICIENCY AFTER 3 MONTHS USAGE AT pH 11.0

DAY 1
$N_{0.5}$ (tol) = 113,300pl/m

DAY 90
$N_{0.5}$ (tol) = 112,000pl/m



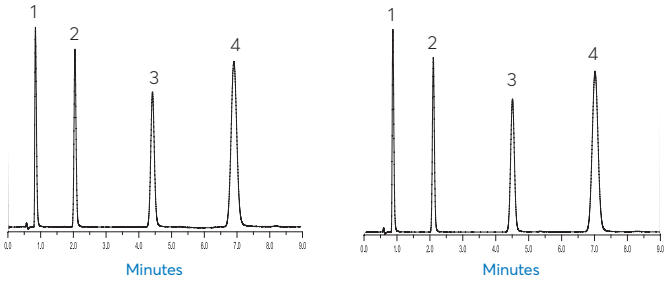
EVALUATION CONDITIONS
Column Dimensions: 150 x 4.6 mm - **Sample:** 1) Uracil 2) Dimethyl phthalate 3) Toluene 4) Biphenyl 5) Phenanthrene - **Mobile Phase:** 70:30 MeCN/H_2O - **Flow Rate:** 1.0 mL/min **Temperature:** 22°C

BASIC EXPOSURE CONDITIONS
Mobile Phase: 50:50 MeCN/25 mM pyrrolidine in H_2O (pH 11.0) - **Flow Rate:** 1.0 mL/min - **Temperature:** 22°C

ACE LC-MS COLUMNS SHOW EXCELLENT STABILITY OVER A 90-DAY TEST PERIOD WHEN USING AN LC-MS COMPATIBLE BUFFER AT pH 10.5

DAY 1
$N_{0.5}$ (bip) = 151,000pl/m

DAY 90
$N_{0.5}$ (bip) = 150,200pl/m



EVALUATION CONDITIONS
Column: ACE 3 C18 - Dimensions: 50 x 2.1 mm - **Sample:** 1) Dimethyl phthalate 2) Toluene 3) Biphenyl 4) Phenanthrene - **Mobile Phase:** 70:30 MeCN/H_2O **Flow Rate:** 0.2 mL/min - **Temperature:** 22°C

BASIC EXPOSURE CONDITIONS
Mobile Phase: 80:20 MeCN/20 mM NH_4OH in H_2O (pH 10.5) - **Flow Rate:** 0.2 mL/min - **Temperature:** 22°C

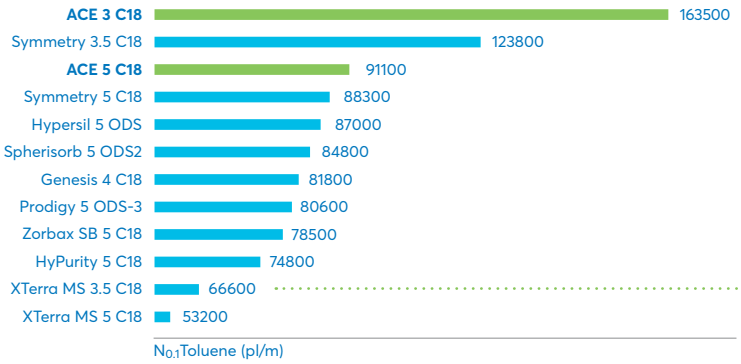
INDEPENDENT COMPARISONS SHOW THAT ACE COLUMNS SHOW HIGH EFFICIENCIES COMPARED TO OTHER BRANDS FOR ACIDIC, BASIC AND NEUTRAL ANALYTES

COMPARISON OF LEADING 100Å 3 µm AND 5 µm C18 COLUMNS

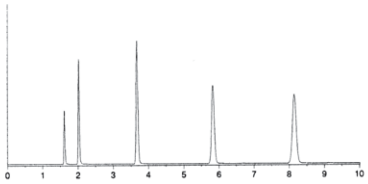
Independently tested at the University of Aberdeen, UK

- Leading 3 µm and 5 µm C18 column brands - 150 x 4.6 mm i.d.
- Acidic, basic and neutral molecule tests
- Peak efficiency and asymmetry comparison

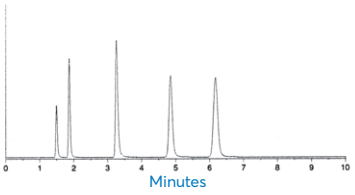
NEUTRAL MOLECULES



ACE 3 C18 - 163,500 pl/m



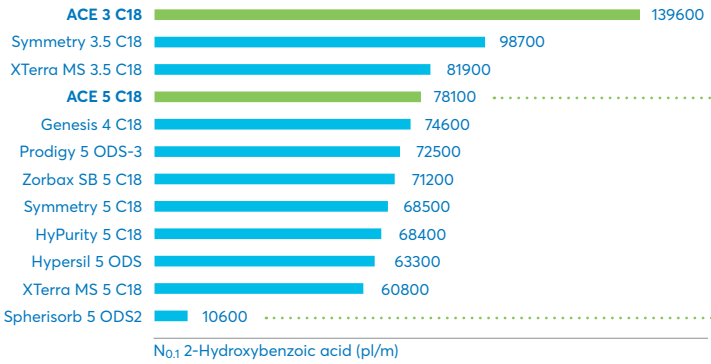
XTerra MS 3.5 C18 - 60,600 pl/m



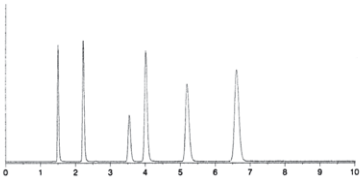
Column Dimensions: 150 x 4.6 mm id
Sample: 1) Uracil 2) Dimethyl phthalate 3) Toluene 4) Biphenyl 5) Phenanthrene
Mobile Phase: 80:20 MeOH/H_2O
Flow Rate: 1.0 ml/min - **Temperature:** 22°C
Comparative data may not be representative of all applications.

Summary:
Column efficiencies were seen to differ greatly. The use of high efficiency columns is recommended to reduce analysis time. Column length can be reduced without loss of resolution.

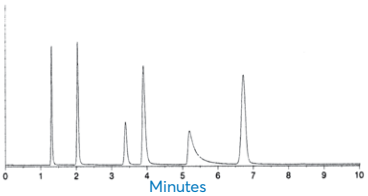
ACIDIC MOLECULES



ACE 5 C18 - 78,100 pl/m



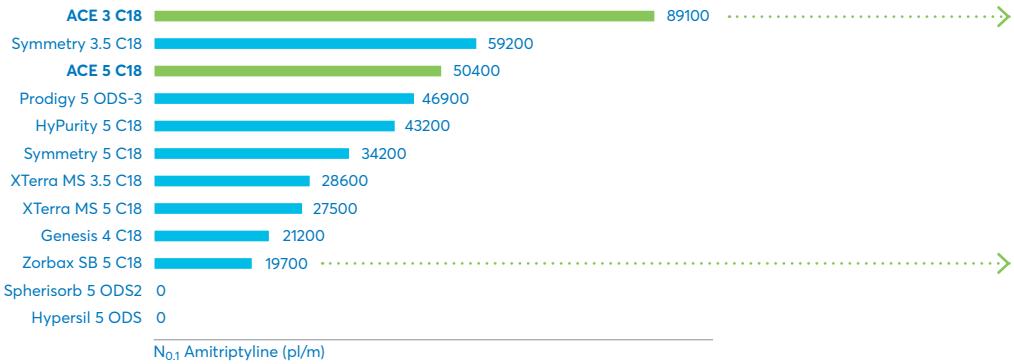
Spherisorb 5 ODS2 - 10,600 pl/m



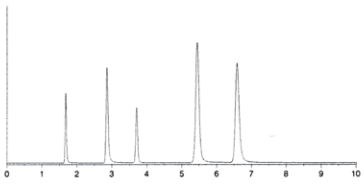
Column Dimensions: 150 x 4.6 mm id
Sample: 1) Uracil 2) 4-Hydroxybenzoic acid 3) Acetylsalicylic acid 4) Benzoic acid 5) 2-Hydroxybenzoic acid 6) Ethyl paraben
Mobile Phase: 35:65 MeCN/0.1% TFA in H_2O
Flow Rate: 1.0 ml/min - **Temperature:** 22°C

Summary:
Testing with acidic molecules shows similar trends to those seen with basic molecules. Smaller particle size, highly inert "base deactivated" phases are again seen to offer improved separations.

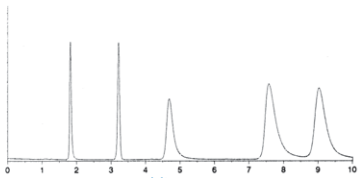
BASIC MOLECULES



ACE 3 C18 - 89,100 pl/m



Zorbax SB 5 C18 - 19,700 pl/m



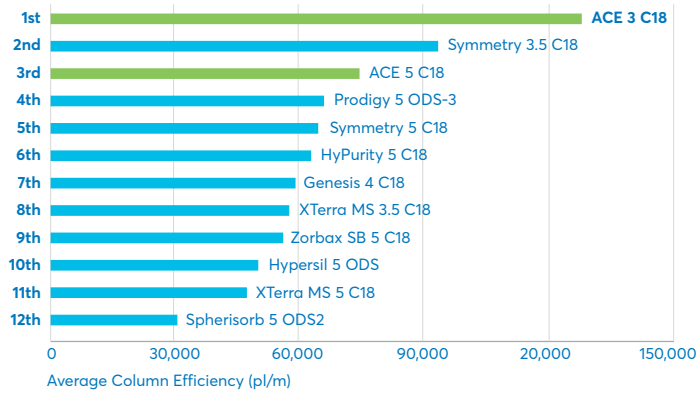
Column Dimensions: 150 x 4.6 mm id
Sample: 1) Norephedrine 2) Nortriptyline 3) Toluene 4) Imipramine 5) Amitriptyline
Mobile Phase: 80:20 MeOH/25 mM KH_2PO_4 (pH 6)
Flow Rate: 1.0 ml/min - **Temperature:** 22°C
Comparative data may not be representative of all applications.

Summary:
C18 bonded columns show significant differences in chromatography for basic compounds. These variations are generally caused by undesirable secondary silanol interactions with the silica surface. Increasing silanol activity results in a deterioration of chromatographic performance. Highly inert "base deactivated" C18 columns with very low levels of silanol activity all exhibit similar selectivity, with differences limited to efficiency and peak shape.

- Significant differences in efficiency, peak shape and selectivity are seen with C18 bonded columns when evaluating acidic and basic compounds. These variations are caused by undesirable secondary silanol interactions.
- The selection of a high efficiency base deactivated phase with very low silanol activity will prove highly beneficial for the majority of analyses.
- ACE C18 materials were the highest performing 3 µm and 5 µm phases respectively. Superior column efficiency and peak shape are combined to provide excellent separations with acidic, basic and neutral molecules.

	COLUMN EFFICIENCY (pl/m)			
COLUMN TYPE	NEUTRAL	BASIC	ACIDIC	AVERAGE
ACE 3 C18	163,500	89,100	139,600	130,700
Symmetry 3.5 C18	123,800	59,200	98,700	93,900
ACE 5 C18	91,100	50,400	78,100	73,200
Prodigy 5 ODS-3	80,600	46,900	72,500	66,700
Symmetry 5 C18	88,300	34,200	68,500	63,700
HyPurity 5 C18	74,800	43,200	68,400	62,100
Genesis 4 C18	81,800	21,200	74,600	59,200
Xterra MS 3.5 C18	60,600	28,600	81,900	57,000
Zorbax SB 5 C18	78,500	19,700	71,200	56,500
Hypersil 5 ODS	87,000	0	63,300	50,100
XTerra MS 5 C18	53,200	27,500	60,800	47,200
Spherisorb 5 ODS2	84,800	0	10,600	31,800

FINAL RANKING



Chromatographic selectivity: the Avantor® ACE® difference

RESOLUTION, SELECTIVITY, EFFICIENCY AND RETENTION

- The resolution equation identifies the parameters that contribute to resolution, efficiency (N), retention (k) and selectivity (α)
- Selectivity is the most powerful factor to affect resolution
- In reversed-phase chromatography, different types of bonded phases will offer one or more of these mechanisms of interaction including hydrophobic, π-π interactions, hydrogen bonding, dipole-dipole interaction and shape selectivity

SELECTIVITY IS THE KEY TO RESOLUTION AND EFFICIENCY BOOSTS PERFORMANCE

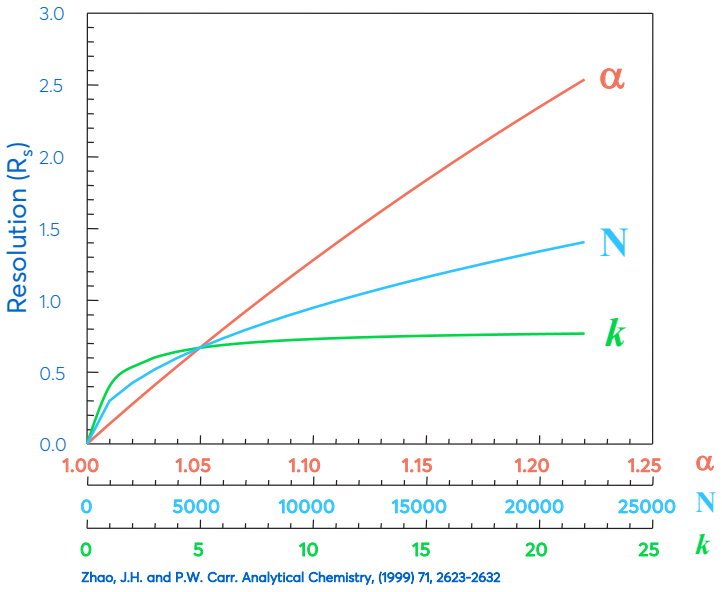
Dispersion, particle, size, column length etc

Phase design, eluent etc

Efficiency **Selectivity** **Retention**

$$R_S = \frac{\sqrt{N}}{4} \cdot \frac{\alpha-1}{\alpha} \cdot \frac{k}{1+k}$$

The resolution equation



Zhao, J.H. and P.W. Carr. Analytical Chemistry, (1999) 71, 2623-2632

FACTORS THAT IMPACT SELECTIVITY FOR ISOCRATIC AND GRADIENT HPLC SEPARATIONS

This is a list of parameters that affect reversed-phase selectivity for isocratic and gradient separations in HPLC and UHPLC. Column stationary phase is comparable to gradient time, percent organic modifier, and gradient steepness in its ability to affect relative retention, and thus, resolution[1].

WHICH FACTORS[1] AFFECT SELECTIVITY?

- Strongly influenced by physicochemical properties of the analyte, stationary phase, eluent etc
- From a practical perspective:

ISOCRATIC SEPARATIONS

- Column stationary phase type
- pH (ionisable analytes only)
- Organic modifier type
- % Organic modifier
- Buffer selection
- Column temperature
- Buffer concentration

MOST INFLUENCE

LEAST INFLUENCE

GRADIENT SEPARATIONS

- All parameters for isocratic **PLUS**
- Gradient steepness
- k* (t_G, F, V_m, $\Delta\Phi$, M)

$$k^* = \frac{t_G F}{\Delta\Phi V_m M}$$

- Dwell volume
- Column dimensions

[1] Adapted from 'Introduction to Modern Liquid Chromatography", 3rd Edition, Snyder, Kirkland, Dolan, 2010, p.29, Wiley & sons

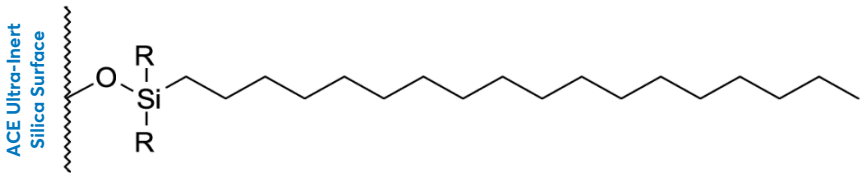
We offer both traditional and novel column stationary phases to fully exploit this parameter and give the chromatographer the best chance at achieving a good resolution whatever the nature of the sample.

PHASE	USP LISTING	FUNCTIONAL GROUP	ENDCAPPED	PARTICLE SIZE (µm)	PORE SIZE (Å)	SURFACE AREA (m^2/g)	CARBON LOAD (%)	pH RANGE	100% AQUEOUS COMPATIBLE
Avantor® ACE® Traditional Chemistries									
C18	L1	Octadecyl	Yes	1.7, 2, 3, 5, 10	100	300	15.5	2 – 8	-
C18-HL	L1	Octadecyl	Yes	3, 5, 10, 15	90	400	20	2 – 8	-
C8	L7	Octyl	Yes	2, 3, 5, 10	100	300	9	2 – 8	-
C4	L26	Butyl	Yes	2, 3, 5, 10	100	300	5.5	2 – 8	-
Phenyl	L11	Phenyl	Yes	2, 3, 5, 10	100	300	9.5	2 – 8	-
CN	L10	Cyano	Yes	2, 3, 5, 10	100	300	5.5	2 – 7	-
AQ	L1	Proprietary	Yes	2, 3, 5, 10	100	300	14	2 – 8	Yes
SIL	L3	Unbonded	No	2, 3, 5, 10	100	300	N/A	2 – 7	-
NH_2	L8	Proprietary aminopropyl	Proprietary	1.7, 3, 5	100	300	3.5	2 – 7	Yes
Avantor® ACE® Novel Chemistries									
SuperC18	L1	Octadecyl encapsulated	Encapsulated	1.7, 2, 3, 5, 10	90	400	14.8	1.5 – 11.5	-
C18-AR	L1	Octadecyl with integral phenyl	Yes	1.7, 2, 3, 5, 10	100	300	15.5	2 – 8	Yes
C18-PFP	L1	Octadecyl with integral PFP	Yes	1.7, 2, 3, 5, 10	100	300	14.3	2 – 8	Yes
C18-Amide	L1 / L60	Polar embedded amide	Yes	1.7, 2, 3, 5, 10	100	300	16.4	2 – 8	Yes
CN-ES	L10	CN with extended alkyl spacer	Yes	1.7, 2, 3, 5, 10	100	300	12.6	2 – 8	Yes
Solid Core Technology Avantor® ACE® Phases									
UltraCore SuperC18	L1	Octadecyl encapsulated	Encapsulated	2.5 5	95	130 100	7 5.4	1.5 – 11.0	-
UltraCore SuperPhenylHexyl	L11	Phenyl Hexyl encapsulated	Encapsulated	2.5 5	95	130 100	4.6 3.6	1.5 – 11.0	Yes
Large Molecule Wide Pore Avantor® ACE® Phases									
C18-300	L1	Octadecyl	Yes	3, 5, 10	300	100	9	2 – 8	Yes
C8-300	L7	Octyl	Yes	3, 5, 10	300	100	5	2 – 8	Yes
C4-300	L26	Butyl	Yes	3, 5, 10	300	100	2.6	2 – 8	Yes
CN-300	L10	Cyano	Yes	3, 5, 10	300	100	2.6	2 – 7	Yes
Phenyl-300	L11	Phenyl	Yes	3, 5, 10	300	100	5.3	2 – 8	Yes
Avantor® ACE® HILIC Phases									
HILIC-A	L3	Proprietary SIL	No	1.7, 3, 5	100	300	N/A	2 – 7	-
HILIC-B	L8	Proprietary aminopropyl	No	1.7, 3, 5	100	300	4	2 – 7	-
HILIC-N	pending	Proprietary polyhydroxy	No	1.7, 3, 5	100	300	7	2 – 7	-
Avantor® ACE® Method Development Kits (MDKs)									
Advanced MDK	3 column kit	Contains C18, C18-AR, C18-PFP columns	Yes	1.7, 2, 3, 5	Data for these categories are as above for the individual column chemistries				
Extended MDK	3 column kit	Contains SuperC18, C18-Amide, CN-ES columns	Yes	1.7, 2, 3, 5					
UltraCore MDK	2 column kit	Contains SuperC18, SuperPhenylHexyl columns	Yes	2.5, 5					
Bioanalytical MDK	3 column kit	Contains C18-300, C4-300, Phenyl-300 columns	Yes	3, 5					
HILIC MDK	3 column kit	Contains HILIC-A, HILIC-B, HILIC-N columns	No	1.7, 3, 5					

Avantor® ACE® traditional chemistries

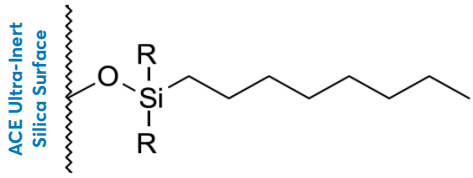
ACE C18

- Most utilised phase optimized for maximum efficiency, superior peak shape and resolution
- Utilizes ultra-high purity silica for excellent peak shape and reproducibility



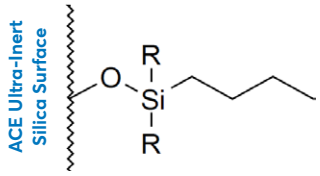
ACE C8

- Suitable for applications where analytes are too retentive on C18
- Increased bonding density compared to ACE C18. Similarly optimized for maximum efficiency, superior peak shape and resolution



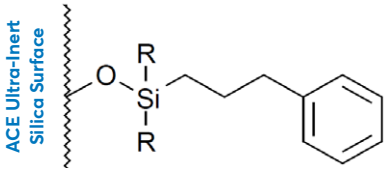
ACE C4

- Combines lower hydrophobicity with excellent chromatographic performance. Improved hydrolytic stability compared to conventional C4 phases
- Generally recommended for the analysis of biological molecules such as peptides and proteins



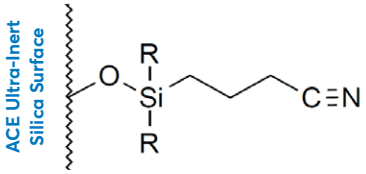
ACE PHENYL

- Separation of analytes through varying π- π interactions
- Alternative selectivity to C18 columns
- Suitable for the analysis of stereoisomers, steroids, taxanes and substituted aromatics



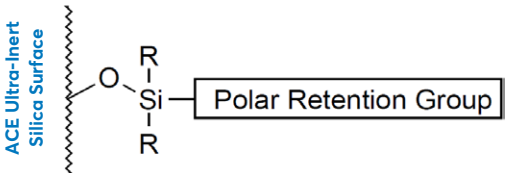
ACE CN

- Separation of polar analytes through varying dipole-dipole interactions
- Recommended for the separation of mixtures containing polar and very polar analytes



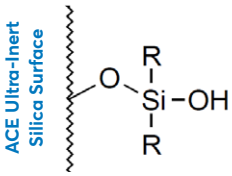
ACE AQ

- C18-like retention but suitable for use in 100% aqueous mobile phases
- Recommended for the analysis of water soluble compounds and polar acids, bases and neutrals



ACE SIL

- Ultra-pure non-bonded silica
- Suitable for polar analytes and normal-phase chromatography



Full specifications can be found on page 11. Catalogue numbers for common dimensions can be found on pages 27 - 28.

More applications can be found in the complete applications guide

EXAMPLE APPLICATIONS ON TRADITIONAL ACE CHEMISTRIES

ADDITIVES AND INTENSE SWEETENERS

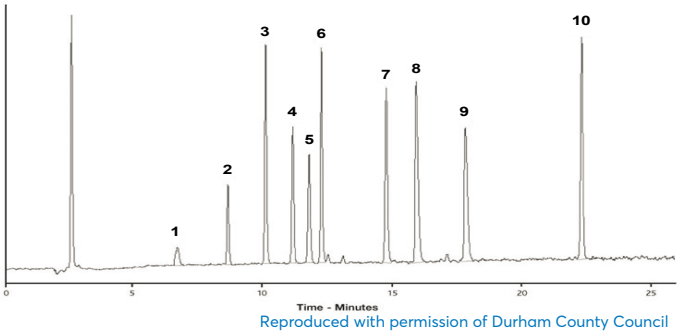
CONDITIONS

Column: **ACE 5 C18**
Dimensions: 250 x 4.0 mm
Part Number: ACE-121-2504
Mobile Phase: A: H_2O
B: MeCN
C: 1% TFA in H_2O

Time (mins)	%A	%B	%C
0	88	2	10
25	50	40	10
30	30	60	10
35	88	2	10

Flow Rate: 1 mL/min
Temperature: 30 °C
Detection: ELSD

1 Acesulfame K
2 Theobromine
3 Theophylline
4 Cyclamate
5 Saccharin
6 Caffeine
7 Sucralose
8 Quinine sulphate
9 Aspartame
10 Neohesperidin dihydrochalcone



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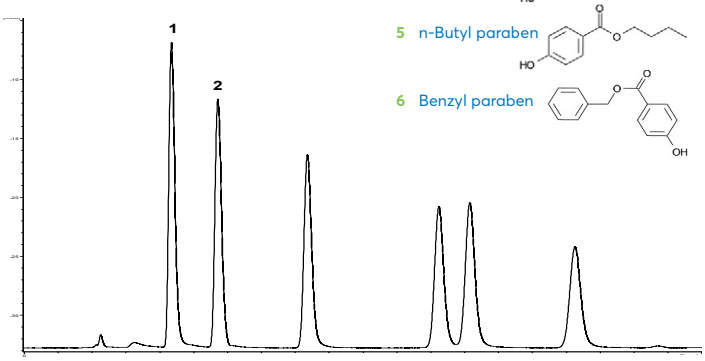
PARABEN PRESERVATIVES

CONDITIONS

Column: **ACE 3 Phenyl**
Dimensions: 150 x 2.1 mm
Part Number: ACE-115-1502
Mobile Phase: 25 mM ammonium acetate pH 6.8 in H_2O/MeOH (50:50 v/v)
Flow Rate: 0.2 mL/min
Injection: 2 µL
Temperature: 40 °C
Detection: UV, 240 nm

1 Methyl paraben
2 Ethyl paraben
3 n-Propyl paraben
4 i-Butyl paraben
5 n-Butyl paraben
6 Benzyl paraben



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VITAMINS – WATER SOLUBLE (GRADIENT 1)

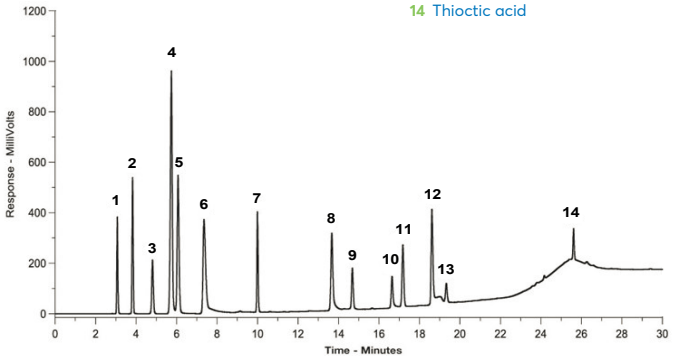
CONDITIONS

Column: **ACE 5 C8**
Dimensions: 250 x 4.6 mm
Part Number: ACE-122-2546
Mobile Phase: A: 50 mM KH_2PO_4 pH 2.5 in H_2O
B: MeOH

Time (mins)	%B
0.0	0
3.0	0
18.5	45
19.5	80

Flow Rate: 1 mL/min
Temperature: Ambient
Detection: UV, 205 nm

1 Pyridoxamine
2 Thiamine (Vitamin B1)
3 L-Ascorbic acid (Vitamin C)
4 Niacinamide (Vitamin B3)
5 Nicotinic acid
6 Pyridoxal
7 Pyridoxine
8 p-Aminobenzoic acid
9 Pantothenic acid (Vitamin B5)
10 Folic acid (Vitamin B9)
11 Cyanocobalamin (Vitamin B12)
12 Riboflavin (Vitamin B2)
13 d-Biotin (Vitamin B7)
14 Thioctic acid

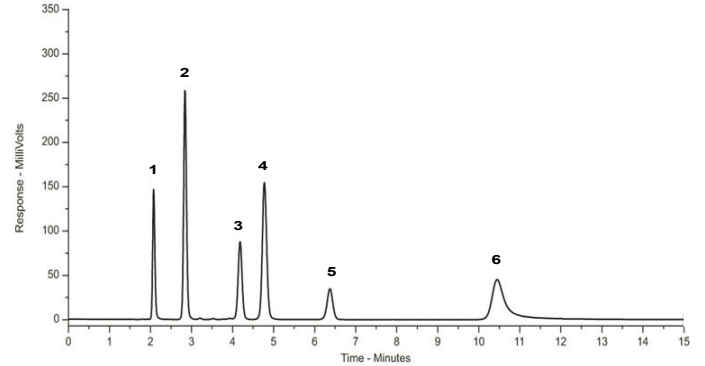


CATECHOLAMINE ANALYSIS (II)

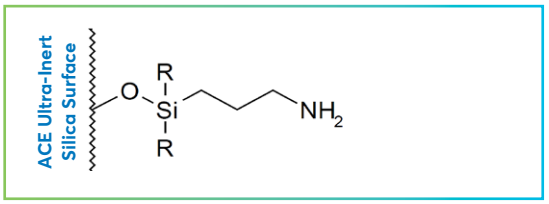
CONDITIONS

Column: **ACE 5 AQ**
Dimensions: 150 x 4.6 mm
Part Number: ACE-126-1546
Mobile Phase: 50 mM KH_2PO_4 pH 3.0 in H_2O
Flow Rate: 1 mL/min
Injection: 2 µL
Temperature: Ambient
Detection: UV, 210 nm

1 Noradrenaline
2 Adrenaline
3 L-DOPA
4 Dopamine
5 L-Tyrosine
6 VMA (Vanillylmandelic acid)



ACE NH_2 FOR SUGAR ANALYSIS



- Versatile phase usable in reversed-phase, normal-phase, weak anion exchange and HILIC modes
- Ionisable positive surface charge depending on the mobile phase pH
- Ideal phase for the analysis of sugars

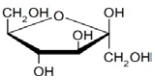
PHASE SPECIFICATIONS

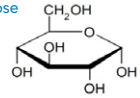
Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
NH_2	L8	Proprietary aminopropyl	proprietary	1.7, 3, 5	100	300	3.5	2-7	Yes

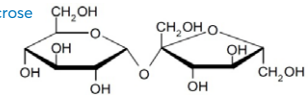
SUGARS IN ENERGY DRINK

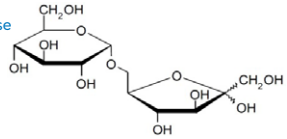
CONDITIONS

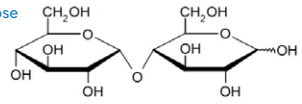
Column:	**ACE Excel 5 NH_2**
Dimensions:	250 x 4.6 mm
Part Number:	EXL-1214-2546U
Mobile Phase:	MeCN:H_2O 80:20 v/v
Flow Rate:	1.5 mL/min
Temperature:	35 °C
Detection:	Refractive Index
Sample:	Carbo Energy Drink and Sugar standards

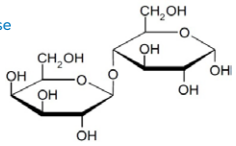
1 Fructose 

2 Glucose 

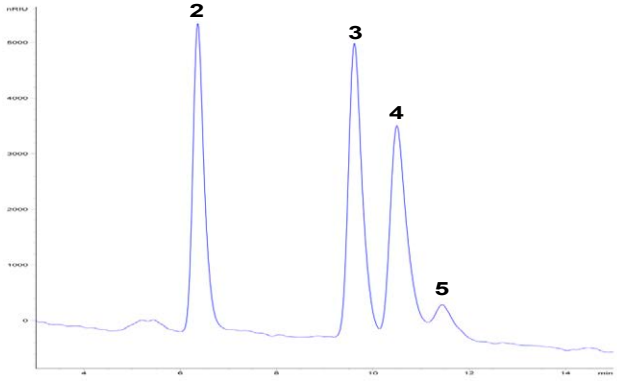
3 Sucrose 

4 Palatinose 

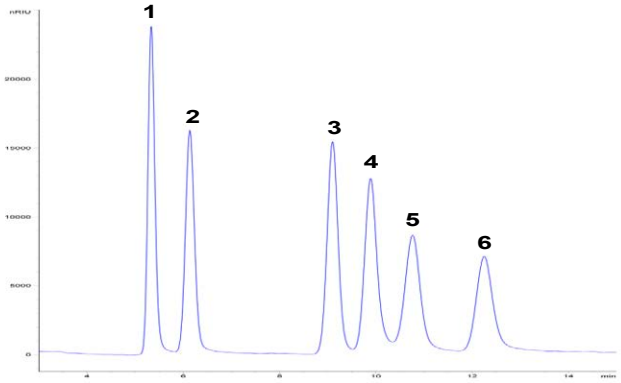
5 Maltose 

6 Lactose 

Blue Exotic Carbo Energy Drink



Sugar standards



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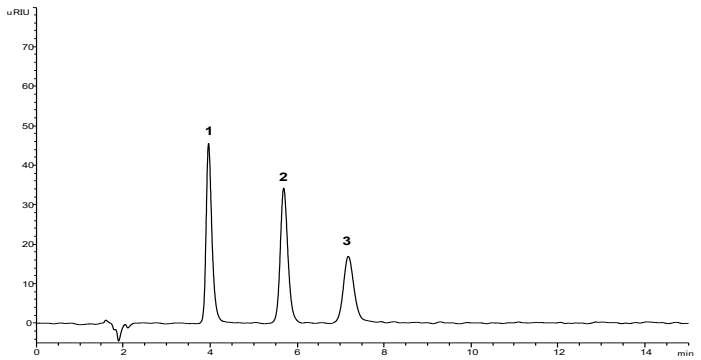
SUGARS SEPARATION

CONDITIONS

Column:	**ACE Excel 5 NH_2**
Dimensions:	150 x 4.6 mm
Part Number:	EXL-1214-1546U
Mobile Phase:	MeCN/H_2O (70:30 v/v)
Flow Rate:	1 mL/min
Injection:	10 µL
Temperature:	35 °C
Detection:	RI, 35 °C
Sample:	5 mg/mL in mobile phase
System:	Chromaster 600

1 Fructose
2 Sucrose
3 Lactose

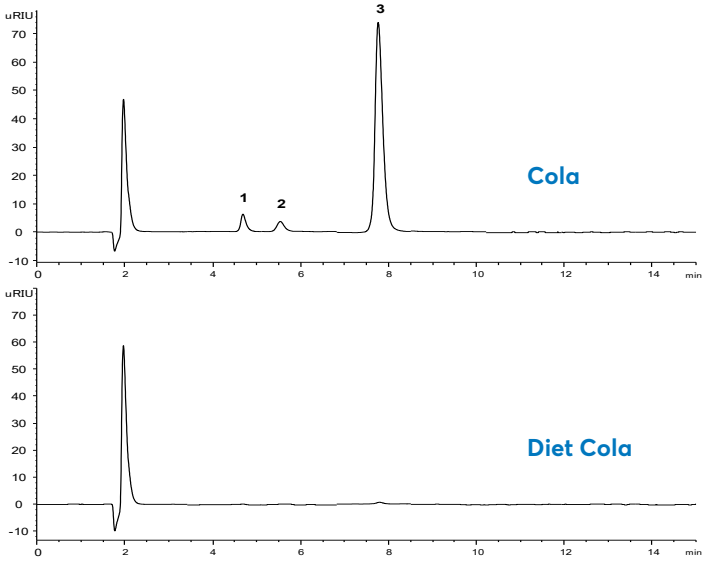


SUGARS – COLA VS DIET COLA

CONDITIONS

Column:	**ACE Excel 5 NH_2**
Dimensions:	150 x 4.6 mm
Part Number:	EXL-1214-1546U
Mobile Phase:	MeCN/H_2O (70:30 v/v)
Flow Rate:	1 mL/min
Injection:	10 µL
Temperature:	35 °C
Detection:	RI, 35 °C
Sample:	5 mg/mL in mobile phase
System:	Chromaster 600

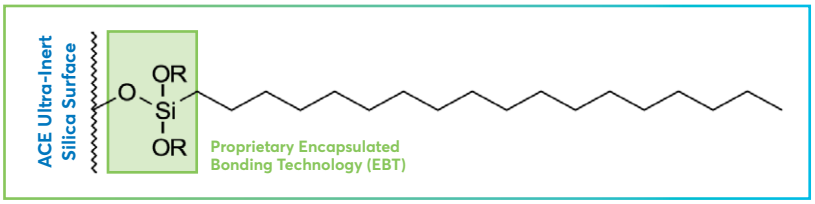
1 Fructose
2 Glucose
3 Sucrose

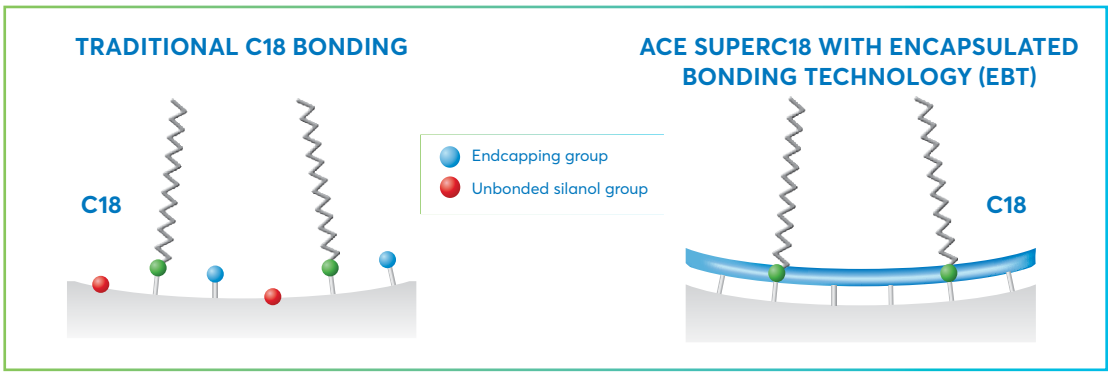


Avantor® ACE® novel chemistries

ACE SUPERC18

- Unique Encapsulated Bonding Technology (EBT) endcapped C18 phase provides pH stability from 1.5–11.5
- Ideal for method development – exploit selectivity changes at low, intermediate and high pH
- Ultra-low bleed for LC-MS compatibility
- Rapid column equilibration without memory effects





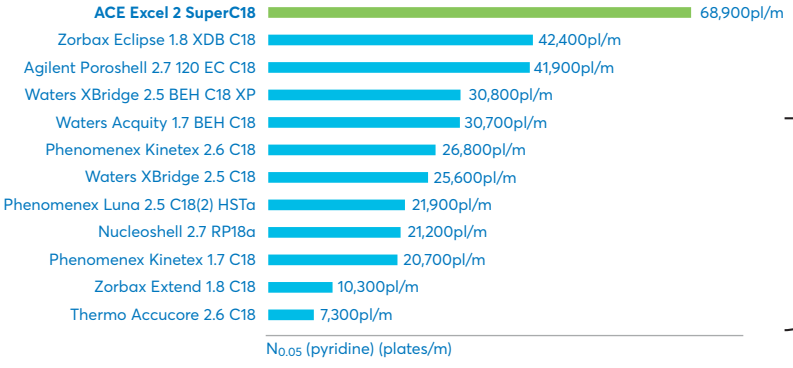
Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
SUPERC18	L1	Octadecyl	Yes (EBT)	1.7, 2, 3, 5, 10	90	400	14.8	1.5–11.5[a]	–

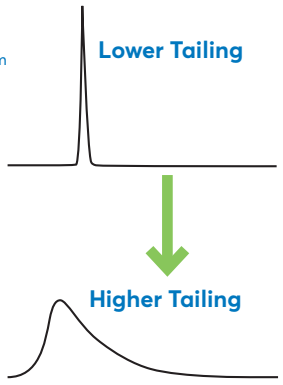
[a] ACE SuperC18 is designed for use with LC-MS compatible buffers.

RECOMMENDED APPLICATIONS

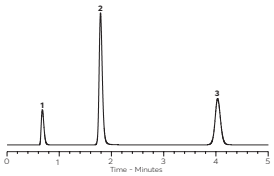
- Starting point for method development
- Analytes differing in hydrophobicity
- Polar, moderately polar and non-polar analytes
- Uncharged acids and bases
- Ionized acids and bases in their non-ionized form by using appropriate pH

Peak Efficiency Comparison

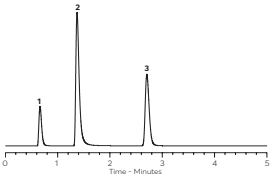




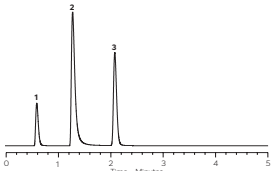
ACE Excel 2 SuperC18 (fully porous ultra-inert silica) $N_{0.05}$ (pyr) = 68,900pl/m



Waters ACQUITY 1.7 BEH C18 (hybrid particle) $N_{0.05}$ (pyr) = 30,700pl/m



Phenomenex Kinetex 1.7 C18 (core-shell particle) $N_{0.05}$ (pyr) = 20,700pl/m

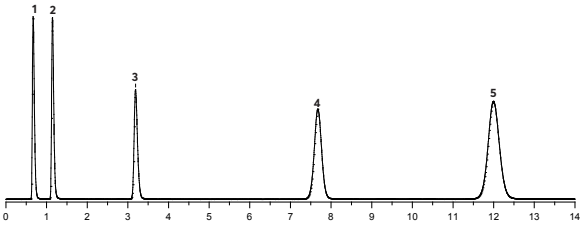


Column Dimensions: 50 x 2.1 mm (50 x 2.0 mm) **- Sample:** 1) uracil 2) pyridine 3) phenol **- Mobile Phase:** 30:70 MeOH/10 mM NH_4OAc in H_2O (pH 5.8) **- Flow Rate:** 0.20 ml/min **- Temperature:** 22 °C **- Wavelength:** 254 nm **-** Comparative data may not be representative of all applications.

EXCELLENT ACIDIC STABILITY AT pH 1.8

ACIDIC FLOW CONDITIONS
Column: ACE Excel 2 µm SuperC18, 50 x 2.1 mm
Mobile Phase: 50:50 MeOH/0.1% TFA in H_2O (pH 1.8)
Temperature: 40 °C
Flow Rate: 0.20 ml/min

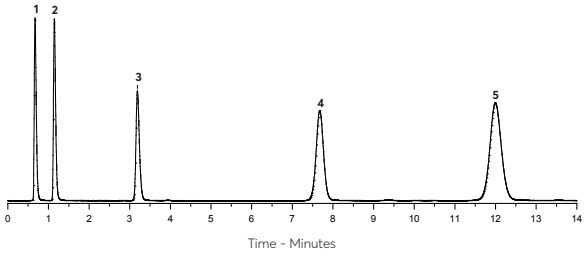
Day 1
k (phenanthrene) = 16.91



Acidic Mobile Phase (pH 1.8)
(continuous flow)

>20,000 column volumes
>2,000 injections

Day 30
k (phenanthrene) = 16.85

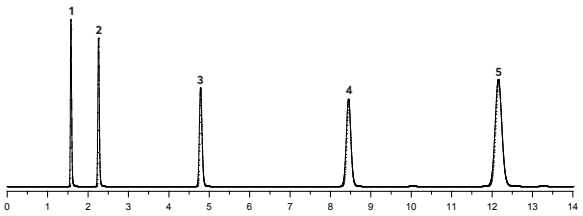


EVALUATION CONDITIONS
Sample: 1) uracil 2) dimethyl phthalate 3) toluene 4) biphenyl 5) phenanthrene
Mobile Phase: 70:30 MeOH:H_2O
Temperature: 22 °C
Flow Rate: 0.20 ml/min
Wavelength: 254nm

EXCELLENT BASIC STABILITY AT pH 10.7

BASIC FLOW CONDITIONS
Column: ACE Excel 3 µm SuperC18, 150 x 4.6 mm
Mobile Phase: 50:50 MeCN/0.1% NH_3 in H_2O (pH 10.7)
Temperature: 40°C
Flow Rate: 1.00 ml/min

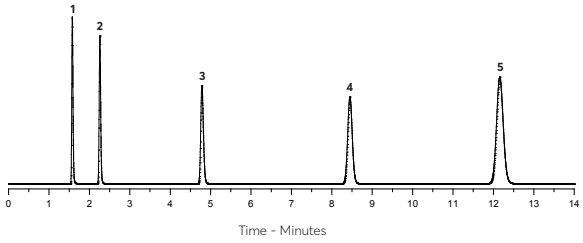
Day 1
$N_{0.5}$ (biphenyl) = 169,100pl/m



Basic Mobile Phase (pH 10.7)
(continuous flow)

>20,000 column volumes
>2,000 injections

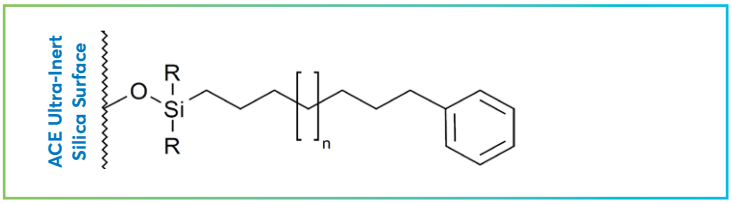
Day 30
$N_{0.5}$ (biphenyl) = 168,700pl/m



EVALUATION CONDITIONS
Sample: 1) uracil 2) dimethyl phthalate 3) toluene 4) biphenyl 5) phenanthrene
Mobile Phase: 80:20 MeOH:H_2O
Temperature: 22°C
Flow Rate: 1.00 ml/min
Wavelength: 254nm

ACE C18-AR

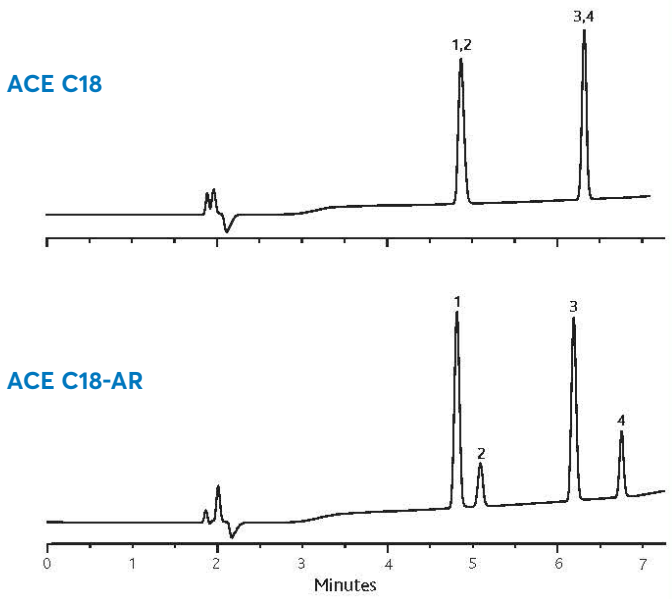
- Combines the C18 and phenyl functionalities
- Hydrophobicity, stability and low bleed characteristics of a C18 combined with the π–π interactions provided by a phenyl phase
- Unique selectivity phase can separate mixtures that cannot be readily separated by C18 or phenyl phases alone



PHASE SPECIFICATIONS

Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
C18-AR	L1	Octadecyl with integral phenyl group	Yes	1.7, 2, 3, 5, 10	100	300	15.5	2–8	Yes

ACE C18-AR SHOWS ALTERNATIVE SELECTIVITY TO C18 BONDED COLUMNS



Compounds: 1) 4-acetamidophenol 2) 4-aminobenzoic acid 3) 4-hydroxybenzoic acid 4) caffeine
Column: 150 x 4.6 mm, 3 µm - **Flow Rate:** 1.00 ml/min - **Temperature:** 40 °C - **Detection:** UV, 240 nm
Mobile Phase: A. 0.1% v/v formic acid in H_2O
B. 0.1% v/v formic acid in MeCN

Gradient:

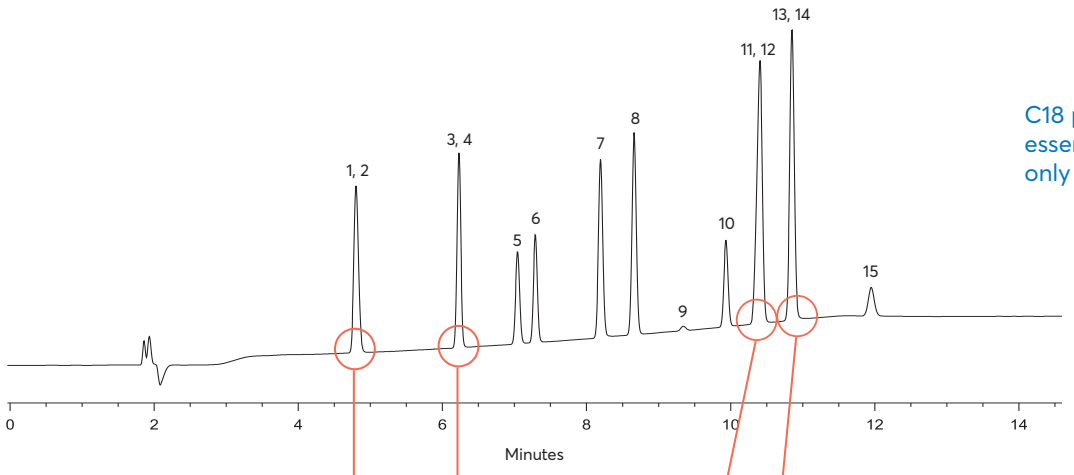
T(mins)	%B
0	5
9	35

RECOMMENDED APPLICATIONS

- Analytes with π-bonding, conjugated systems and electron-withdrawing groups such as halogens, nitro groups, ketones, esters and acids
- Stereoisomers, steroids, substituted aromatics and sulphur containing compounds
- Applications where C18 does not provide adequate separation
- Applications where conventional phenyl phases provide insufficient retention, poor stability, or significant bleed

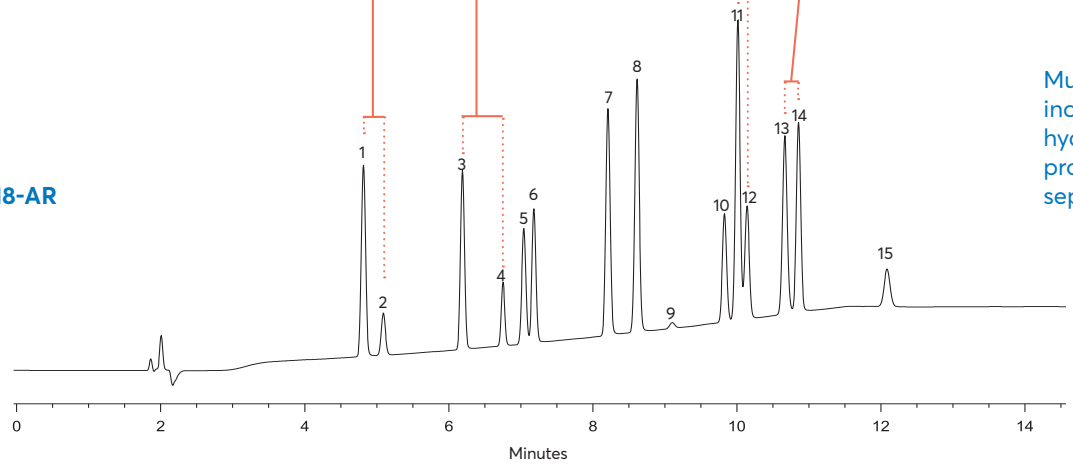
SEPARATION OF ANALGESICS

ACE 3 C18



C18 phase provides essentially hydrophobic-only interaction

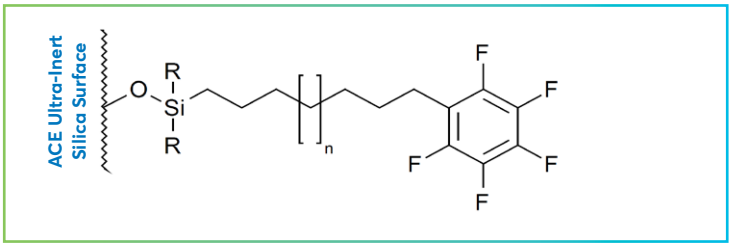
ACE 3 C18-AR



Multi-mode interaction including π - π and hydrophobic interactions provides complete separation

Sample: 1) 4-acetamidophenol 2) 4-aminobenzoic acid 3) 4-hydroxybenzoic acid 4) caffeine 5) 2-acetamidophenol 6) 3-hydroxybenzoic acid 7) salicylamide 8) acetanilide 9) phenol 10) acetylsalicylic acid 11) benzoic acid 12) sorbic acid 13) salicylic acid 14) phenylacetin 15) salicylaldehyde
Mobile Phase: A = 0.1% v/v formic acid in H_2O B = 0.1% v/v formic acid in MeCN - **Gradient**: 5 - 35% B in 9 minutes, hold at 35% B until 14 minutes
Column Dimensions: 150 x 4.6 mm - **Flow Rate**: 1.00 ml/min - **Temperature**: 40°C - **Detection**: 240nm

ACE C18-PFP



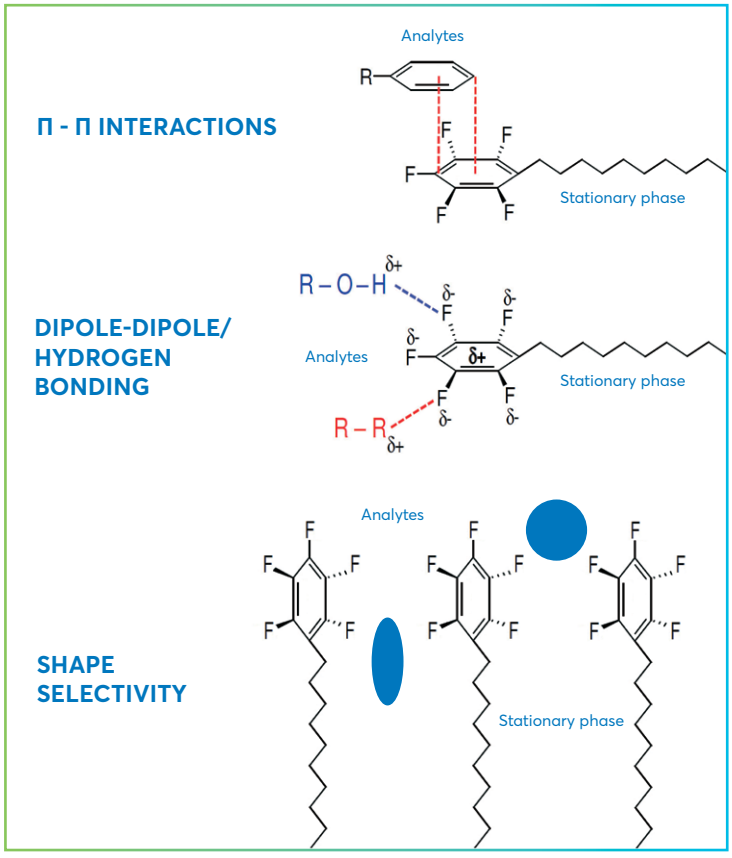
- Combines the C18 and pentafluorophenyl (PFP) functionalities
- Hydrophobicity, stability and low bleed characteristics of a C18 and the π–π interactions, dipole–dipole interactions and shape selectivity of a PFP phase
- Unique selectivity phase can separate mixtures that cannot be readily separated by either phase alone

PHASE SPECIFICATIONS

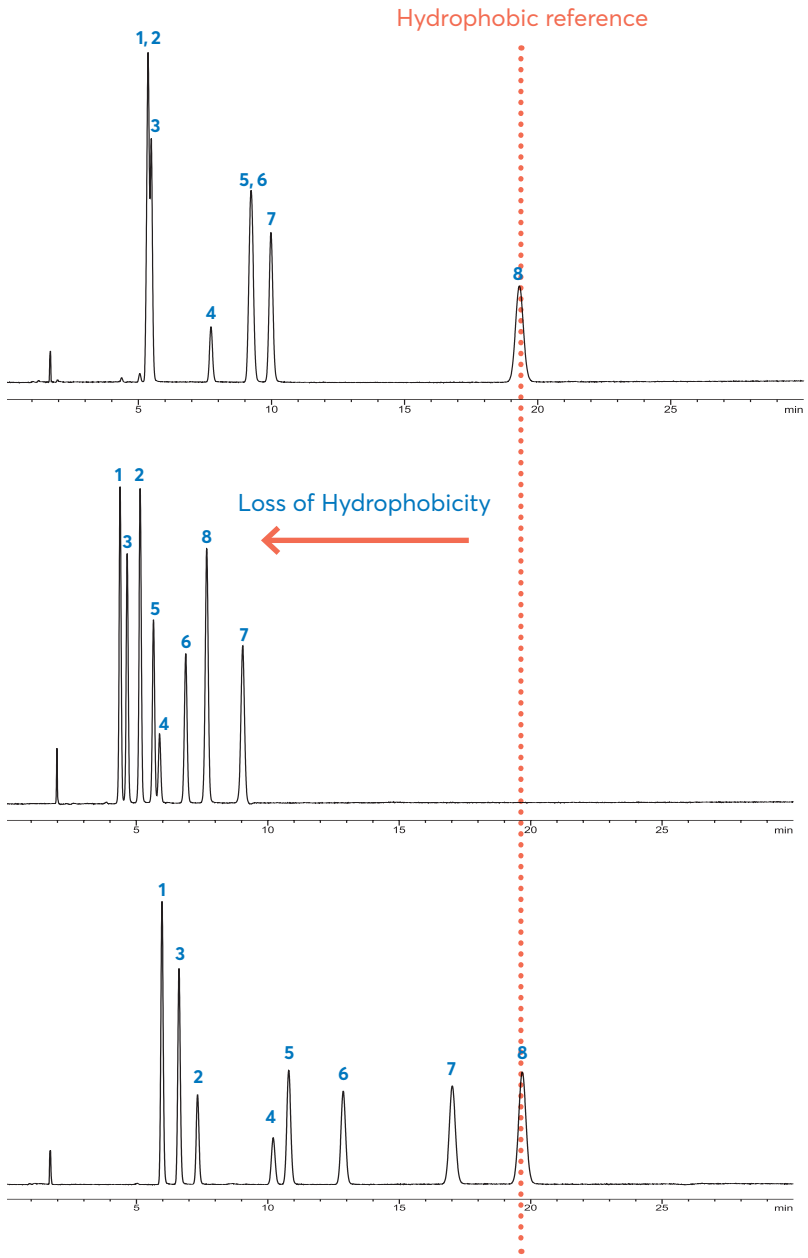
Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
C18-PFP	L1	Octadecyl with integral PFP group	Yes	1.7, 2, 3, 5, 10	100	300	14.3	2–8	Yes

RECOMMENDED APPLICATIONS

- Analytes with π-bonding, conjugated systems and electron donating groups such as phenols, aromatic ethers and amines
- Analytes with proton donor groups
- Structural isomers, steroids, substituted aromatics and taxanes
- Applications where C18 does not provide adequate separation
- Applications where conventional PFP phases provide insufficient retention, poor stability or significant bleed



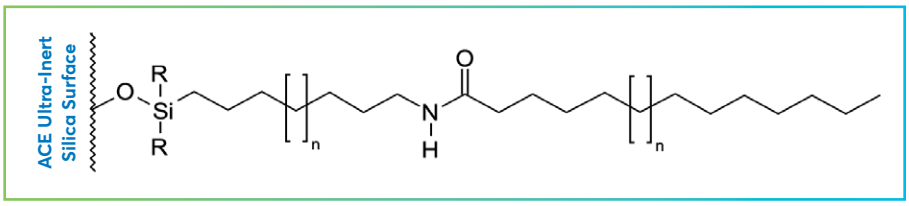
THE IMPORTANCE OF MAINTAINING HYDROPHOBICITY DURING MULTI-MODE INTERACTIONS



Sample: 1) 1,2,3-trimethoxybenzene 2) 1,2,4-trimethoxybenzene 3) 1,2-dimethoxybenzene 4) 1,4-dimethoxybenzene 5) methoxybenzene 6) 1,3-dimethoxybenzene 7) 1,3,5-trimethoxybenzene 8) neutral molecule (reference)
Column Dimensions: 150 x 4.6 mm - **Flow Rate**: 1.00 ml/min - **Temperature**: 40°C - **Detection**: UV, 254 nm - **Mobile Phase**: 50:50 v/v MeOH/H_2O
Phenomenex columns were not used in the above comparison. Comparative data may not be representative of all applications.

ACE C18-AMIDE

- A uniquely designed polar-embedded phase
- Enhanced retention and resolution of polar acidic, phenolic and hydroxyl-substituted analytes
- Alternative selectivity to C18 & other novel phases
- Suitable for use in 100% aqueous mobile phases



PHASE SPECIFICATIONS

Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
C18-AMIDE	L1/L60	Polar embedded amide	Yes	1.7, 2, 3, 5, 10	100	300	16.4	2–8	Yes

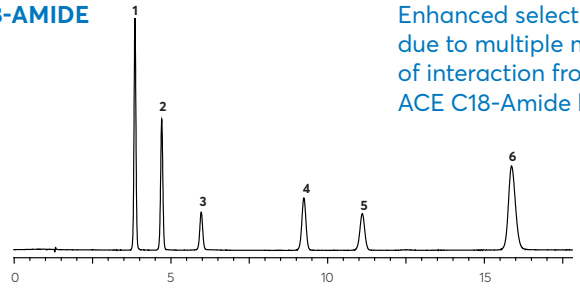
RECOMMENDED APPLICATIONS

- Water soluble analytes and polar compounds
- H-bond donors, acid, bases and phenolic compounds
- Peptides (below 5kDa) & metabolites
- Mixtures that are not resolved adequately on C18 phases

USE ACE C18-AMIDE TO ENHANCE SELECTIVITY

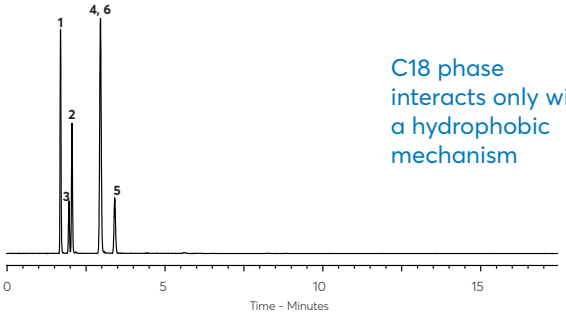
ACE EXCEL 3 C18-AMIDE

Enhanced selectivity due to multiple modes of interaction from the ACE C18-Amide ligand



ACE EXCEL 3 C18

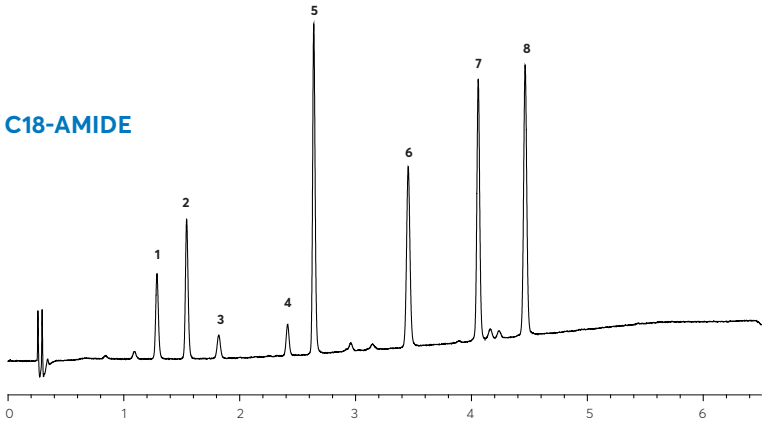
C18 phase interacts only with a hydrophobic mechanism



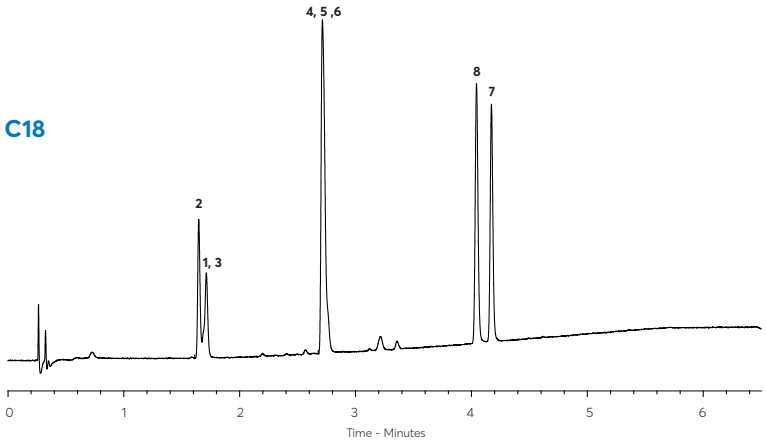
Sample: 1) resorcinol 2) catechol 3) 2-methyl resorcinol 4) 4-methyl catechol 5) 3-methyl catechol 6) 4-nitro catechol
Mobile Phase: 25:75 MeCN/27 mM H_3PO_4 in H_2O - **Column Dimensions**: 150 x 4.6 mm - **Flow Rate**: 1.50 ml/min
Temperature: 30°C - **Wavelength**: 270nm

SEPARATION OF ACIDIC, BASIC AND NEUTRAL COMPOUNDS

ACE EXCEL 3 C18-AMIDE



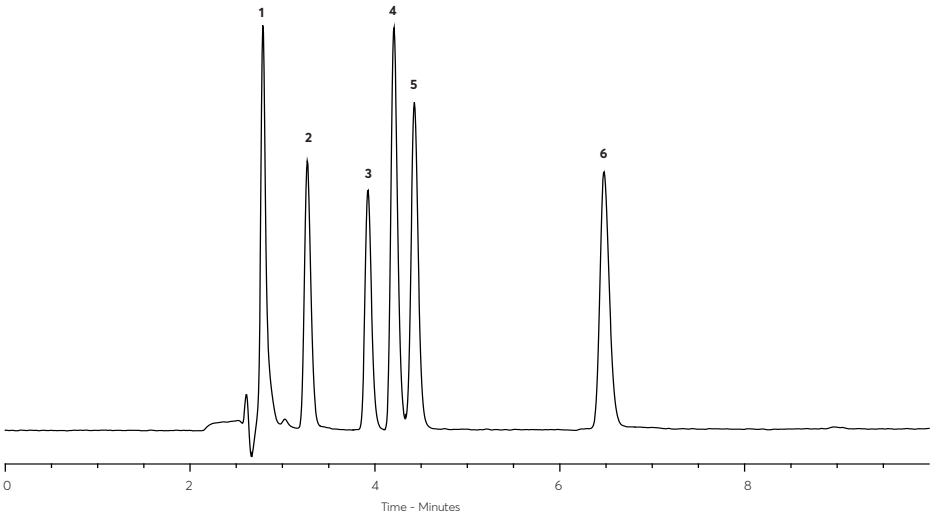
ACE EXCEL 3 C18



ACE C18-Amide phase offers complementary selectivity to C18 columns due to multiple modes of interaction from the unique C18-Amide ligand

Sample: 1) methylphenylsulphoxide 2) pindolol 3) 3-hydroxybenzoic acid 4) 1,2-dimethoxybenzene 5) berberine 6) myricetin 7) piperine 8) chrysin
Mobile Phase: A = 20 mM ammonium formate in H_2O (pH 3.0) B = 20 mM ammonium formate (pH 3.0) in 90:10 (v/v) MeOH/H_2O **Gradient**: 3 – 100% B in 5 minutes
Column Dimensions: 50 x 2.1 mm
Flow Rate: 0.60 ml/min
Temperature: 40°C
Wavelength: 254nm

SEPARATION OF ORGANIC WINE ACIDS

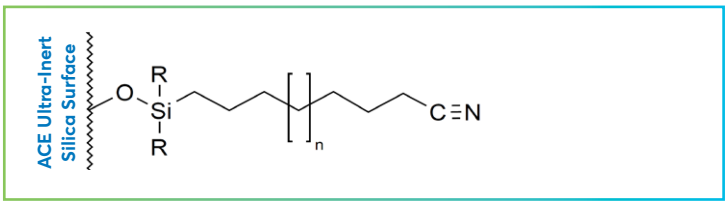


ACE C18-Amide is compatible with 100% aqueous mobile phase for maximum retention and resolution

Conventional alkyl C18 columns are not recommended with 100% aqueous conditions due to irreproducible retention loss caused by pore dewetting

Sample: 1) oxalic acid 2) tartaric acid 3) malic acid 4) lactic acid 5) ascorbic acid 6) citric acid - **Mobile Phase**: 40 mM $NH_4H_2PO_4$ in H_2O (pH 2.5)
Column: ACE Excel 3 C18-Amide, 250 x 2.1 mm - **Flow Rate**: 0.21 ml/min - **Temperature**: 25 °C - **Wavelength**: 214nm

ACE CN-ES



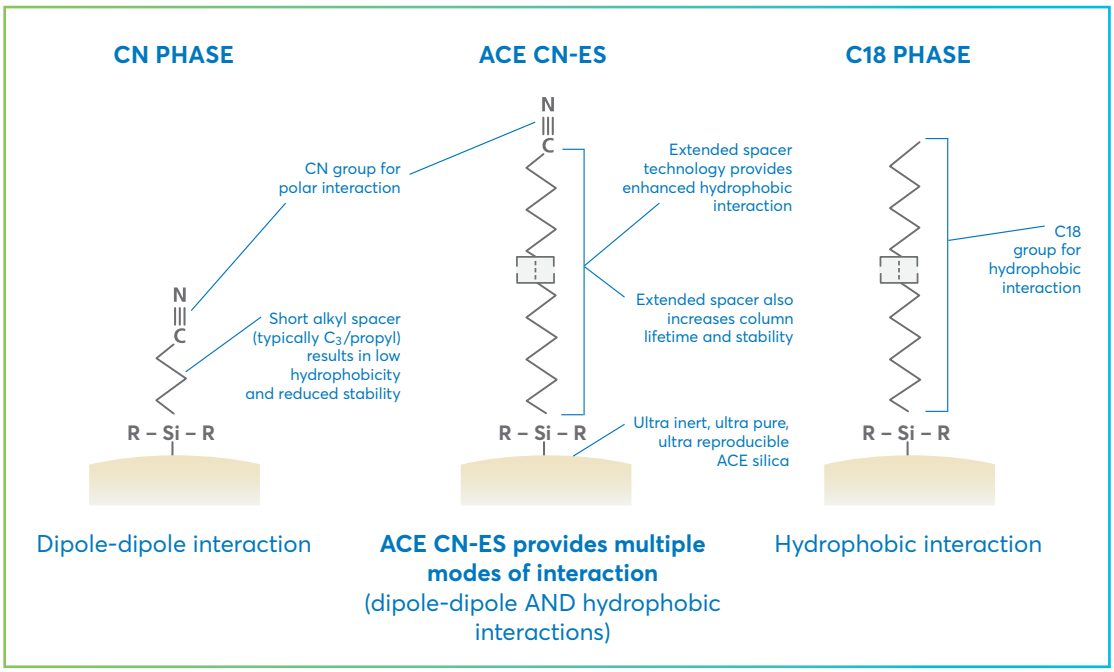
- A unique phase that has an extended alkyl chain with a terminal cyano group
- Provides C18-like retention and stability compared to commercial cyanopropyl phases
- Usable with 100% aqueous mobile phases in reversed-phase mode, and also has excellent performance in normal-phase mode

PHASE SPECIFICATIONS

Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
CN-ES	L10	Cyano with extended alkyl spacer	Yes	1.7, 2, 3, 5, 10	100	300	12.6	2–8	Yes

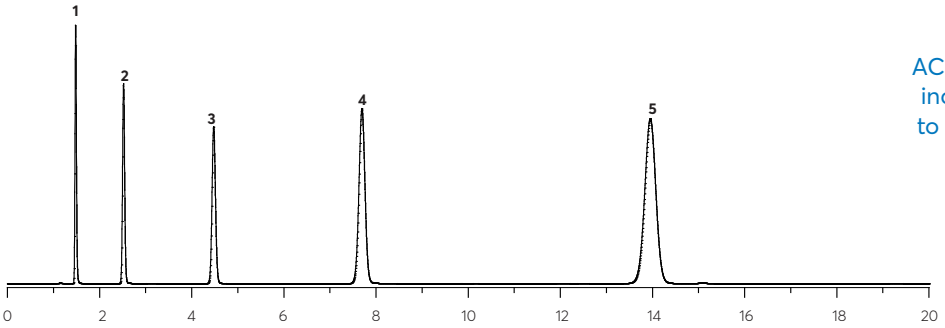
RECOMMENDED APPLICATIONS

- Analytes containing double & triple bonds
- Polar & non-polar analytes
- Mixtures that have insufficient retention on traditional CN phases



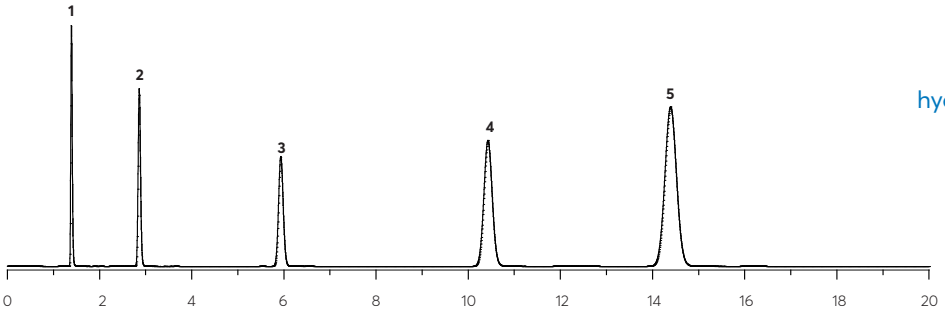
SEPARATION OF NEUTRAL COMPOUNDS UNDER RP CONDITIONS

ACE EXCEL 5 CN-ES



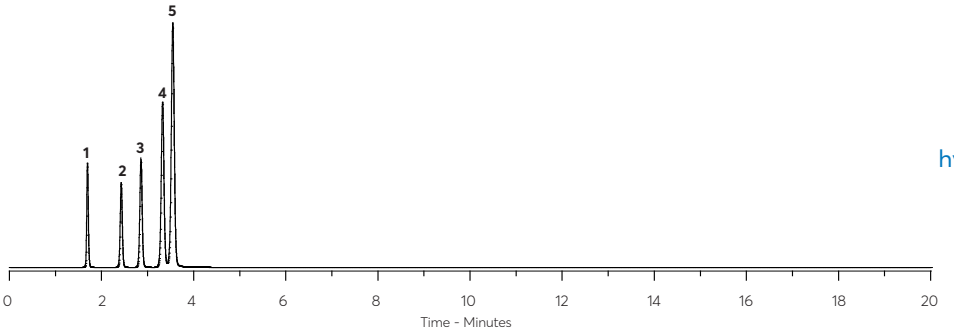
ACE CN-ES phase offers increased retention due to contribution from the extended spacer

ACE EXCEL 5 C18



C18 group provides hydrophobic interaction

ACE EXCEL 5 CN



CN phases with short alkyl spacer group show minimal hydrophobic retention

Sample: 1) uracil 2) dimethyl phthalate 3) toluene 4) biphenyl 5) phenanthrene - **Mobile Phase**: 60:40 MeCN/H_2O
Column Dimensions: 150 x 4.6 mm - **Flow Rate**: 1.00 ml/min - **Temperature**: 22 °C - **Wavelength**: 254nm

ORDERING INFORMATION

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 3 µm PARTICLES SIZES

- Part numbers beginning with ACE: HPLC hardware format with 275 bar / 4,000 psi pressure limit
- Part numbers beginning with EXL: HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	NH_2
1.0 x 50 mm	ACE-111-0501	ACE-112-0501	ACE-113-0501	ACE-114-0501	ACE-115-0501	ACE-116-0501	ACE-117-0501	ACE-1114-0501
1.0 x 75 mm	ACE-111-7501	ACE-112-7501	ACE-113-7501	ACE-114-7501	ACE-115-7501	ACE-116-7501	ACE-117-7501	ACE-1114-7501
1.0 x 100 mm	ACE-111-1001	ACE-112-1001	ACE-113-1001	ACE-114-1001	ACE-115-1001	ACE-116-1001	ACE-117-1001	ACE-1114-1001
1.0 x 125 mm	ACE-111-1201	ACE-112-1201	ACE-113-1201	ACE-114-1201	ACE-115-1201	ACE-116-1201	ACE-117-1201	ACE-1114-1201
1.0 x 150 mm	ACE-111-1501	ACE-112-1501	ACE-113-1501	ACE-114-1501	ACE-115-1501	ACE-116-1501	ACE-117-1501	ACE-1114-1501
2.1 x 50 mm	ACE-111-0502	ACE-112-0502	ACE-113-0502	ACE-114-0502	ACE-115-0502	ACE-116-0502	ACE-117-0502	EXL-1114-0502U
2.1 x 75 mm	ACE-111-7502	ACE-112-7502	ACE-113-7502	ACE-114-7502	ACE-115-7502	ACE-116-7502	ACE-117-7502	EXL-1114-7502U
2.1 x 100 mm	ACE-111-1002	ACE-112-1002	ACE-113-1002	ACE-114-1002	ACE-115-1002	ACE-116-1002	ACE-117-1002	EXL-1114-1002U
2.1 x 125 mm	ACE-111-1202	ACE-112-1202	ACE-113-1202	ACE-114-1202	ACE-115-1202	ACE-116-1202	ACE-117-1202	EXL-1114-1202U
2.1 x 150 mm	ACE-111-1502	ACE-112-1502	ACE-113-1502	ACE-114-1502	ACE-115-1502	ACE-116-1502	ACE-117-1502	EXL-1114-1502U
3.0 x 50 mm	ACE-111-0503	ACE-112-0503	ACE-113-0503	ACE-114-0503	ACE-115-0503	ACE-116-0503	ACE-117-0503	EXL-1114-0503U
3.0 x 75 mm	ACE-111-7503	ACE-112-7503	ACE-113-7503	ACE-114-7503	ACE-115-7503	ACE-116-7503	ACE-117-7503	EXL-1114-7503U
3.0 x 100 mm	ACE-111-1003	ACE-112-1003	ACE-113-1003	ACE-114-1003	ACE-115-1003	ACE-116-1003	ACE-117-1003	EXL-1114-1003U
3.0 x 125 mm	ACE-111-1203	ACE-112-1203	ACE-113-1203	ACE-114-1203	ACE-115-1203	ACE-116-1203	ACE-117-1203	EXL-1114-1203U
3.0 x 150 mm	ACE-111-1503	ACE-112-1503	ACE-113-1503	ACE-114-1503	ACE-115-1503	ACE-116-1503	ACE-117-1503	EXL-1114-1503U
4.0 x 50 mm	ACE-111-0504	ACE-112-0504	ACE-113-0504	ACE-114-0504	ACE-115-0504	ACE-116-0504	ACE-117-0504	–
4.0 x 75 mm	ACE-111-7504	ACE-112-7504	ACE-113-7504	ACE-114-7504	ACE-115-7504	ACE-116-7504	ACE-117-7504	–
4.0 x 100 mm	ACE-111-1004	ACE-112-1004	ACE-113-1004	ACE-114-1004	ACE-115-1004	ACE-116-1004	ACE-117-1004	–
4.0 x 125 mm	ACE-111-1204	ACE-112-1204	ACE-113-1204	ACE-114-1204	ACE-115-1204	ACE-116-1204	ACE-117-1204	–
4.0 x 150 mm	ACE-111-1504	ACE-112-1504	ACE-113-1504	ACE-114-1504	ACE-115-1504	ACE-116-1504	ACE-117-1504	–
4.6 x 50 mm	ACE-111-0546	ACE-112-0546	ACE-113-0546	ACE-114-0546	ACE-115-0546	ACE-116-0546	ACE-117-0546	EXL-1114-0546U
4.6 x 75 mm	ACE-111-7546	ACE-112-7546	ACE-113-7546	ACE-114-7546	ACE-115-7546	ACE-116-7546	ACE-117-7546	EXL-1114-7546U
4.6 x 100 mm	ACE-111-1046	ACE-112-1046	ACE-113-1046	ACE-114-1046	ACE-115-1046	ACE-116-1046	ACE-117-1046	EXL-1114-1046U
4.6 x 125 mm	ACE-111-1246	ACE-112-1246	ACE-113-1246	ACE-114-1246	ACE-115-1246	ACE-116-1246	ACE-117-1246	EXL-1114-1246U
4.6 x 150 mm	ACE-111-1546	ACE-112-1546	ACE-113-1546	ACE-114-1546	ACE-115-1546	ACE-116-1546	ACE-117-1546	EXL-1114-1546U
ACE guard cartridges for analytical columns (5pk)								
For 1.0 mm ID columns	ACE-111-0101GD	ACE-112-0101GD	ACE-113-0101GD	ACE-114-0101GD	ACE-115-0101GD	ACE-116-0101GD	ACE-117-0101GD	ACE-1114-0101GD
For 2.1 mm ID columns	ACE-111-0102GD	ACE-112-0102GD	ACE-113-0102GD	ACE-114-0102GD	ACE-115-0102GD	ACE-116-0102GD	ACE-117-0102GD	ACE-1114-0102GD
For 3.0-4.6 mm ID columns	ACE-111-0103GD	ACE-112-0103GD	ACE-113-0103GD	ACE-114-0103GD	ACE-115-0103GD	ACE-116-0103GD	ACE-117-0103GD	ACE-1114-0103GD
Stand-alone guard cartridge holder H0001 and column coupler C0001 will be required								

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 5 µm PARTICLES SIZES

- Part numbers beginning with ACE: HPLC hardware format with 275 bar / 4,000 psi pressure limit
- Part numbers beginning with EXL: HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	NH_2
1.0 x 50 mm	ACE-121-0501	ACE-122-0501	ACE-123-0501	ACE-124-0501	ACE-125-0501	ACE-126-0501	ACE-127-0501	ACE-1214-0501
1.0 x 75 mm	ACE-121-7501	ACE-122-7501	ACE-123-7501	ACE-124-7501	ACE-125-7501	ACE-126-7501	ACE-127-7501	ACE-1214-7501
1.0 x 100 mm	ACE-121-1001	ACE-122-1001	ACE-123-1001	ACE-124-1001	ACE-125-1001	ACE-126-1001	ACE-127-1001	ACE-1214-1001
1.0 x 125 mm	ACE-121-1201	ACE-122-1201	ACE-123-1201	ACE-124-1201	ACE-125-1201	ACE-126-1201	ACE-127-1201	ACE-1214-1201
1.0 x 150 mm	ACE-121-1501	ACE-122-1501	ACE-123-1501	ACE-124-1501	ACE-125-1501	ACE-126-1501	ACE-127-1501	ACE-1214-1501
1.0 x 250 mm	ACE-121-2501	ACE-122-2501	ACE-123-2501	ACE-124-2501	ACE-125-1501	ACE-126-2501	ACE-127-1501	ACE-1214-1501
2.1 x 50 mm	ACE-121-0502	ACE-122-0502	ACE-123-0502	ACE-124-0502	ACE-125-0502	ACE-126-0502	ACE-127-0502	EXL-1214-0502U
2.1 x 75 mm	ACE-121-7502	ACE-122-7502	ACE-123-7502	ACE-124-7502	ACE-125-7502	ACE-126-7502	ACE-127-7502	EXL-1214-7502U
2.1 x 100 mm	ACE-121-1002	ACE-122-1002	ACE-123-1002	ACE-124-1002	ACE-125-1002	ACE-126-1002	ACE-127-1002	EXL-1214-1002U
2.1 x 125 mm	ACE-121-1202	ACE-122-1202	ACE-123-1202	ACE-124-1202	ACE-125-1202	ACE-126-1202	ACE-127-1202	EXL-1214-1202U
2.1 x 150 mm	ACE-121-1502	ACE-122-1502	ACE-123-1502	ACE-124-1502	ACE-125-1502	ACE-126-1502	ACE-127-1502	EXL-1214-1502U
2.1 x 250 mm	ACE-121-2502	ACE-122-2502	ACE-123-2502	ACE-124-2502	ACE-125-2502	ACE-126-2502	ACE-127-2502	EXL-1214-2502U
3.0 x 50 mm	ACE-121-0503	ACE-122-0503	ACE-123-0503	ACE-124-0503	ACE-125-0503	ACE-126-0503	ACE-127.-0503	EXL-1214-0503U
3.0 x 75 mm	ACE-121-7503	ACE-122-7503	ACE-123-7503	ACE-124-7503	ACE-125-7503	ACE-126-7503	ACE-127-7503	EXL-1214-7503U
3.0 x 100 mm	ACE-121-1003	ACE-122-1003	ACE-123-1003	ACE-124-1003	ACE-125-1003	ACE-126-1003	ACE-127-1003	EXL-1214-1003U
3.0 x 125 mm	ACE-121-1203	ACE-122-1203	ACE-123-1203	ACE-124-1203	ACE-125-1203	ACE-126-1203	ACE-127-1203	EXL-1214-1203U
3.0 x 150 mm	ACE-121-1503	ACE-122-1503	ACE-123-1503	ACE-124-1503	ACE-125-1503	ACE-126-1503	ACE-127-1503	EXL-1214-1503U
3.0 x 250 mm	ACE-121-2503	ACE-122-2503	ACE-123-2503	ACE-124-2503	ACE-125-2503	ACE-126-2503	ACE-127-2503	EXL-1214-2503U
4.0 x 50 mm	ACE-121-0504	ACE-122-0504	ACE-123-0504	ACE-124-0504	ACE-125-0504	ACE-126-0504	ACE-127-0504	–
4.0 x 75 mm	ACE-121-7504	ACE-122-7504	ACE-123-7504	ACE-124-7504	ACE-125-7504	ACE-126-7504	ACE-127-7504	–
4.0 x 100 mm	ACE-121-1004	ACE-122-1004	ACE-123-1004	ACE-124-1004	ACE-125-1004	ACE-126-1004	ACE-127-1004	–
4.0 x 125 mm	ACE-121-1204	ACE-122-1204	ACE-123-1204	ACE-124-1204	ACE-125-1204	ACE-126-1204	ACE-127-1204	–
4.0 x 150 mm	ACE-121-1504	ACE-122-1504	ACE-123-1504	ACE-124-1504	ACE-125-1504	ACE-126-1504	ACE-127-1504	–
4.0 x 250 mm	ACE-121-2504	ACE-122-2504	ACE-123-2504	ACE-124-2504	ACE-125-2504	ACE-126-2504	ACE-127-504	–
4.6 x 50 mm	ACE-121-0546	ACE-122-0546	ACE-123-0546	ACE-124-0546	ACE-125-0546	ACE-126-0546	ACE-127-0546	EXL-1214-0546U
4.6 x 75 mm	ACE-121-7546	ACE-122-7546	ACE-123-7546	ACE-124-7546	ACE-125-7546	ACE-126-7546	ACE-127-7546	EXL-1214-7546U
4.6 x 100 mm	ACE-121-1046	ACE-122-1046	ACE-123-1046	ACE-124-1046	ACE-125-1046	ACE-126-1046	ACE-127-1046	EXL-1214-1046U
4.6 x 125 mm	ACE-121-1246	ACE-122-1246	ACE-123-1246	ACE-124-1246	ACE-125-1246	ACE-126-1246	ACE-127-1246	EXL-1214-1246U
4.6 x 150 mm	ACE-121-1546	ACE-122-1546	ACE-123-1546	ACE-124-1546	ACE-125-1546	ACE-126-1546	ACE-127-1546	EXL-1214-1546U
4.6 x 250 mm	ACE-121-2546	ACE-122-2546	ACE-123-2546	ACE-124-2546	ACE-125-2546	ACE-126-2546	ACE-127-2546	EXL-1214-2546U
ACE guard cartridges for analytical columns (5pk)								
For 1.0 mm ID columns	ACE-121-0101GD	ACE-122-0101GD	ACE-123-0101GD	ACE-124-0101GD	ACE-125-0101GD	ACE-126-0101GD	ACE-127-0101GD	ACE-1214-0101GD
For 2.1 mm ID columns	ACE-121-0102GD	ACE-122-0102GD	ACE-123-0102GD	ACE-124-0102GD	ACE-125-0102GD	ACE-126-0102GD	ACE-127-0102GD	ACE-1214-0102GD
For 3.0-4.6 mm ID columns	ACE-121-0103GD	ACE-122-0103GD	ACE-123-0103GD	ACE-124-0103GD	ACE-125-0103GD	ACE-126-0103GD	ACE-127-0103GD	ACE-1214-0103GD
Stand-alone guard cartridge holder H0001 and column coupler C0001 will be required								

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 10 µm PARTICLES SIZES

- Available in analytical column dimensions (2.1 – 4.6 mm ID)
- To discuss your requirements, please contact chromsupport@avantorsciences.com

AVANTOR® ACE® NOVEL CHEMISTRIES, 3 µm PARTICLES SIZES

- Part numbers beginning with ACE: HPLC hardware format with 275 bar / 4,000 psi pressure limit
- Part numbers beginning with EXL: HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
1.0 x 50 mm	ACE-119-0501	ACE-1110-0501	ACE-1111-0501	ACE-1112-0501	ACE-1113-0501
1.0 x 75 mm	ACE-119-7501	ACE-1110-7501	ACE-1111-7501	ACE-1112-7501	ACE-1113-7501
1.0 x 100 mm	ACE-119-1001	ACE-1110-1001	ACE-1111-1001	ACE-1112-1001	ACE-1113-1001
1.0 x 125 mm	ACE-119-1201	ACE-1110-1201	ACE-1111-1201	ACE-1112-1201	ACE-1113-1201
1.0 x 150 mm	ACE-119-1501	ACE-1110-1501	ACE-1111-1501	ACE-1112-1501	ACE-1113-1501
1.0 x 250 mm	ACE-119-2501	ACE-1110-2501	ACE-1111-2501	ACE-1112-2501	ACE-1113-2501
2.1 x 50 mm	ACE-119-0502	ACE-1110-0502	EXL-1111-0502U	EXL-1112-0502U	EXL-1113-0502U
2.1 x 75 mm	ACE-119-7502	ACE-1110-7502	EXL-1111-7502U	EXL-1112-7502U	EXL-1113-7502U
2.1 x 100 mm	ACE-119-1002	ACE-1110-1002	EXL-1111-1002U	EXL-1112-1002U	EXL-1113-1002U
2.1 x 125 mm	ACE-119-1202	ACE-1110-1202	EXL-1111-1202U	EXL-1112-1202U	EXL-1113-1202U
2.1 x 150 mm	ACE-119-1502	ACE-1110-1502	EXL-1111-1502U	EXL-1112-1502U	EXL-1113-1502U
3.0 x 50 mm	ACE-119-0503	ACE-1110-0503	EXL-1111-0503U	EXL-1112-0503U	EXL-1113-0503U
3.0 x 75 mm	ACE-119-7503	ACE-1110-7503	EXL-1111-7503U	EXL-1112-7503U	EXL-1113-7503U
3.0 x 100 mm	ACE-119-1003	ACE-1110-1003	EXL-1111-1003U	EXL-1112-1003U	EXL-1113-1003U
3.0 x 125 mm	ACE-119-1203	ACE-1110-1203	EXL-1111-1203U	EXL-1112-1203U	EXL-1113-1203U
3.0 x 150 mm	ACE-119-1503	ACE-1110-1503	EXL-1111-1503U	EXL-1112-1503U	EXL-1113-1503U
4.0 x 50 mm	ACE-119-0504	ACE-1110-0504	–	–	–
4.0 x 75 mm	ACE-119-7504	ACE-1110-7504	–	–	–
4.0 x 100 mm	ACE-119-1004	ACE-1110-1004	–	–	–
4.0 x 125 mm	ACE-119-1204	ACE-1110-1204	–	–	–
4.0 x 150 mm	ACE-119-1504	ACE-1110-1504	–	–	–
4.6 x 50 mm	ACE-119-0546	ACE-1110-0546	EXL-1111-0546U	EXL-1112-0546U	EXL-1113-0546U
4.6 x 75 mm	ACE-119-7546	ACE-1110-7546	EXL-1111-7546U	EXL-1112-7546U	EXL-1113-7546U
4.6 x 100 mm	ACE-119-1046	ACE-1110-1046	EXL-1111-1046U	EXL-1112-1046U	EXL-1113-1046U
4.6 x 125 mm	ACE-119-1246	ACE-1110-1246	EXL-1111-1246U	EXL-1112-1246U	EXL-1113-1246U
4.6 x 150 mm	ACE-119-1546	ACE-1110-1546	EXL-1111-1546U	EXL-1112-1546U	EXL-1113-1546U
ACE guard cartridges for analytical columns (5pk)					
For 1.0 mm ID columns	ACE-119-0101GD	ACE-1110-0101GD	ACE-1111-0101GD	ACE-1112-0101GD	ACE-1113-0101GD
For 2.1 mm ID columns	ACE-119-0102GD	ACE-1110-0102GD	ACE-1111-0102GD	ACE-1112-0102GD	ACE-1113-0102GD
For 3.0-4.6 mm ID columns	ACE-119-0103GD	ACE-1110-0103GD	ACE-1111-0103GD	ACE-1112-0103GD	ACE-1113-0103GD
Stand-alone guard cartridge holder H0001 and column coupler C0001 will be required.					

AVANTOR® ACE® NOVEL CHEMISTRIES, 5 µm PARTICLES SIZES

- Part numbers beginning with ACE: HPLC hardware format with 275 bar / 4,000 psi pressure limit
- Part numbers beginning with EXL: HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
1.0 x 50 mm	ACE-129-0501	ACE-1210-0501	ACE-1211-0501	ACE-1212-0501	ACE-1213-0501
1.0 x 75 mm	ACE-129-7501	ACE-1210-7501	ACE-1211-7501	ACE-1212-7501	ACE-1213-7501
1.0 x 100 mm	ACE-129-1001	ACE-1210-1001	ACE-1211-1001	ACE-1212-1001	ACE-1213-1001
1.0 x 125 mm	ACE-129-1201	ACE-1210-1201	ACE-1211-1201	ACE-1212-1201	ACE-1213-1201
1.0 x 150 mm	ACE-129-1501	ACE-1210-1501	ACE-1211-1501	ACE-1212-1501	ACE-1213-1501
1.0 x 250 mm	ACE-129-2501	ACE-1210-2501	ACE-1211-2501	ACE-1212-2501	ACE-1213-2501
2.1 x 50 mm	ACE-129-0502	ACE-1210-0502	EXL-1211-0502U	EXL-1212-0502U	EXL-1213-0502U
2.1 x 75 mm	ACE-129-7502	ACE-1210-7502	EXL-1211-7502U	EXL-1212-7502U	EXL-1213-7502U
2.1 x 100 mm	ACE-129-1002	ACE-1210-1002	EXL-1211-1002U	EXL-1212-1002U	EXL-1213-1002U
2.1 x 125 mm	ACE-129-1202	ACE-1210-1202	EXL-1211-1202U	EXL-1212-1202U	EXL-1213-1202U
2.1 x 150 mm	ACE-129-1502	ACE-1210-1502	EXL-1211-1502U	EXL-1212-1502U	EXL-1213-1502U
2.1 x 250 mm	ACE-129-2502	ACE-1210-2502	EXL-1211-2502U	EXL-1212-2502U	EXL-1213-2502U
3.0 x 50 mm	ACE-129-0503	ACE-1210-0503	EXL-1211-0503U	EXL-1212-0503U	EXL-1213-0503U
3.0 x 75 mm	ACE-129-7503	ACE-1210-7503	EXL-1211-7503U	EXL-1212-7503U	EXL-1213-7503U
3.0 x 100 mm	ACE-129-1003	ACE-1210-1003	EXL-1211-1003U	EXL-1212-1003U	EXL-1213-1003U
3.0 x 125 mm	ACE-129-1203	ACE-1210-1203	EXL-1211-1203U	EXL-1212-1203U	EXL-1213-1203U
3.0 x 150 mm	ACE-129-1503	ACE-1210-1503	EXL-1211-1503U	EXL-1212-1503U	EXL-1213-1503U
3.0 x 250 mm	ACE-129-2503	ACE-1210-2503	EXL-1211-2503U	EXL-1212-2503U	EXL-1213-2503U
4.0 x 50 mm	ACE-129-0504	ACE-1210-0504	–	–	–
4.0 x 75 mm	ACE-129-7504	ACE-1210-7504	–	–	–
4.0 x 100 mm	ACE-129-1004	ACE-1210-1004	–	–	–
4.0 x 125 mm	ACE-129-1204	ACE-1210-1204	–	–	–
4.0 x 150 mm	ACE-129-1504	ACE-1210-1504	–	–	–
4.0 x 250 mm	ACE-129-2504	ACE-1210-2504	–	–	–
4.6 x 50 mm	ACE-129-0546	ACE-1210-0546	EXL-1211-0546U	EXL-1212-0546U	EXL-1213-0546U
4.6 x 75 mm	ACE-129-7546	ACE-1210-7546	EXL-1211-7546U	EXL-1212-7546U	EXL-1213-7546U
4.6 x 100 mm	ACE-129-1046	ACE-1210-1046	EXL-1211-1046U	EXL-1212-1046U	EXL-1213-1046U
4.6 x 125 mm	ACE-129-1246	ACE-1210-1246	EXL-1211-1246U	EXL-1212-1246U	EXL-1213-1246U
4.6 x 150 mm	ACE-129-1546	ACE-1210-1546	EXL-1211-1546U	EXL-1212-1546U	EXL-1213-1546U
4.6 x 250 mm	ACE-129-2546	ACE-1210-2546	EXL-1211-2546U	EXL-1212-2546U	EXL-1213-2546U
ACE guard cartridges for analytical columns (5pk)					
For 1.0 mm ID columns	ACE-129-0101GD	ACE-1210-0101GD	ACE-1211-0101GD	ACE-1212-0101GD	ACE-1213-0101GD
For 2.1 mm ID columns	ACE-129-0102GD	ACE-1210-0102GD	ACE-1211-0102GD	ACE-1212-0102GD	ACE-1213-0102GD
For 3.0-4.6 mm ID columns	ACE-129-0103GD	ACE-1210-0103GD	ACE-1211-0103GD	ACE-1212-0103GD	ACE-1213-0103GD
Stand-alone guard cartridge holder H0001 and column coupler C0001 will be required					

For dimensions not listed here, please contact: chromsupport@avantorsciences.com

Avantor® ACE® Excel® UHPLC columns

Designed to take advantage of low dispersion, ultra-high pressure UHPLC instruments, Avantor® ACE® Excel UHPLC columns give chromatographers more choices to achieve better results.

High Efficiency 2 µm and 1.7 µm Particles

Selectivity is unchanged from the 3 µm, 5 µm and 10 µm ACE HPLC phases. Excellent peak shape, reliable column-to-column reproducibility and exceptional column stability is available to UHPLC users with ACE Excel UHPLC columns.

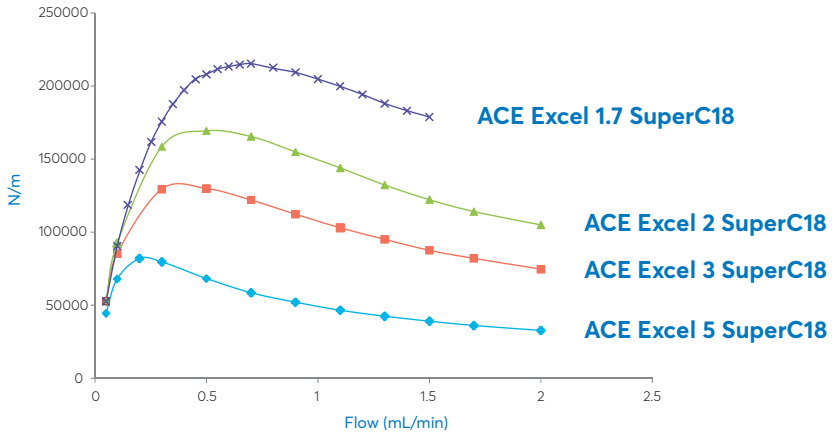
HSC High Stability Columns

ACE Excel columns are manufactured using a proprietary HSC (High Stability Column) manufacturing process that results in ultra-robust UHPLC columns.

Optimised UHPLC Hardware

ACE Excel columns utilise specially designed low dispersion hardware which enables high efficiency UHPLC separations up to a maximum pressure limit of 1,000 bar (15,000 psi).

A comparison of efficiency (N/m, plates per metre) vs. flow rate for different ACE particle sizes



Column: 50 x 2.1 mm

- Each particle size has an optimum flow rate (linear velocity) at which it shows highest efficiency (N).
- Smaller particles have a high optimum flow rate than larger particles and also have a broader optimum flow rate range than larger particles.

ACE TRANSLATOR TOOL

The ACE Translator Tool has been developed to aid the practising chromatographer to efficiently translate and transfer LC method between different columns and LC systems.
Convert your LC separation into an ultra-fast separation using ACE Excel 1.7 µm UHPLC columns today!
Contact your local distributor to request the **ACE Translator Tool**.

EXAMPLE APPLICATIONS

STEROIDS SEPARATION

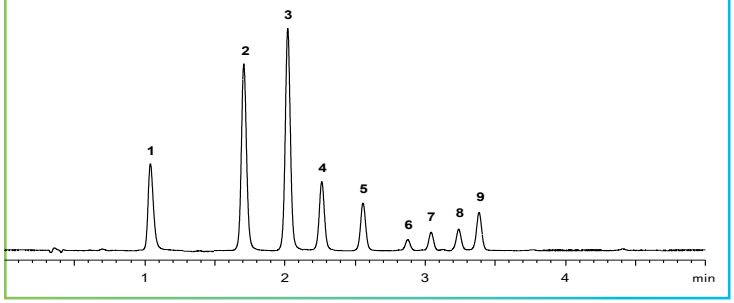
CONDITIONS

Column:	**ACE Excel 2 CN-ES**
Dimensions:	50 x 2.1 mm
Part Number:	EXL-1013-0502U
Mobile Phase:	A: 0.1% formic acid in H_2O B: 0.1% formic acid in MeOH

Time (mins)	%B
0.0	25
10.0	30
10.5	30
11.0	25

Flow Rate:	0.4 mL/min
Injection:	1 µL
Temperature:	40 °C
Detection:	UV, 214 and 260 nm

1 Cortisone
2 Corticosterone
3 11α-Hydroxyprogesterone
4 Cortisone-21-acetate
5 11-Ketoprogesterone
6 β-Estradiol
7 17α-Estradiol
8 17α-Ethinylestradiol
9 Estrone



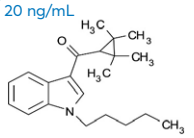
SYNTHETIC CANNABINOIDS (SPICE) FROM ORAL FLUID

CONDITIONS

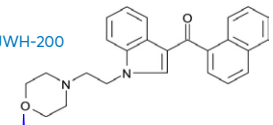
Column:	**ACE Excel 2 C18-AR**
Dimensions:	100 x 2.1 mm
Part Number:	EXL-109-1002U
Mobile Phase:	0.1% formic acid in MeOH/H_2O (85:15 v/v)
Flow Rate:	0.3 mL/min
Temperature:	Ambient
Detection:	Applied Biosystems/MDS Sciex 4000 Q-Trap Positive mode Turbo Ionspray

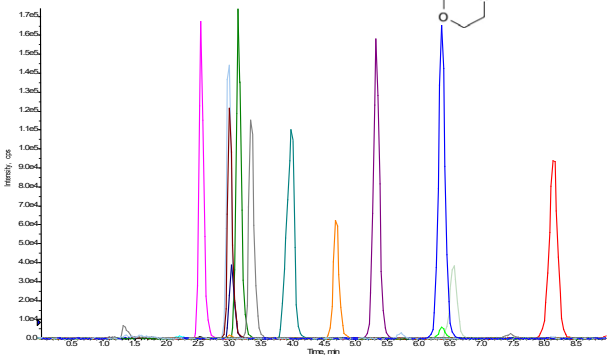
Extracted ion chromatogram for SPICE analytes fortified in neat oral fluid at 20 ng/mL

UR-144



JWH-200





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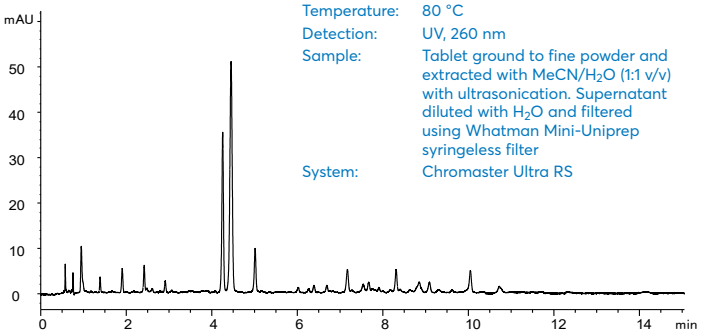
GREEN TEA EXTRACT

CONDITIONS

Column:	**ACE Excel 1.7 SuperC18**
Dimensions:	100 x 3.0 mm
Part Number:	EXL-1711-1003U
Mobile Phase:	A: 0.1% formic acid in H_2O B: 0.1% formic acid in MeCN

Time (mins)	%B
0	5
15	20
17	95
18	95
20	5
27	5

Flow Rate:	0.8 mL/min
Injection:	2 µL
Temperature:	80 °C
Detection:	UV, 260 nm
Sample:	Tablet ground to fine powder and extracted with MeCN/H_2O (1:1 v/v) with ultrasonication. Supernatant diluted with H_2O and filtered using Whatman Mini-Uniprep syringeless filter
System:	Chromaster Ultra RS



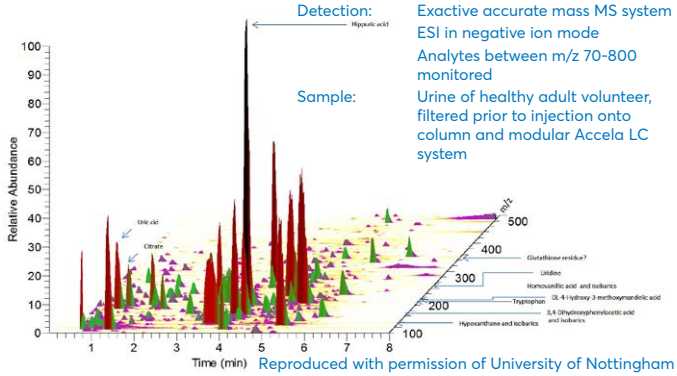
HUMAN URINE METABOLITE PROFILING BY LC-MS

CONDITIONS

Column:	**ACE Excel 1.7 C18-Amide**
Dimensions:	100 x 2.1 mm
Part Number:	EXL-1712-1002U
Mobile Phase:	A: 0.01% formic acid in H_2O B: 0.01% formic acid in MeCN

Time (mins)	%B
0.0	3
2.5	10
8.0	100
8.5	3
10.0	3

Flow Rate:	0.5 mL/min
Detection:	Exactive accurate mass MS system ESI in negative ion mode Analytes between m/z 70-800 monitored
Sample:	Urine of healthy adult volunteer, filtered prior to injection onto column and modular Accela LC system



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ORDERING INFORMATION

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 2 µm PARTICLES SIZES

– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil
2.1 x 50 mm	EXL-101-0502U	EXL-102-0502U	EXL-103-0502U	EXL-104-0502U	EXL-105-0502U	EXL-106-0502U	EXL-107-0502U
2.1 x 75 mm	EXL-101-7502U	EXL-102-7502U	EXL-103-7502U	EXL-104-7502U	EXL-105-7502U	EXL-106-7502U	EXL-107-7502U
2.1 x 100 mm	EXL-101-1002U	EXL-102-1002U	EXL-103-1002U	EXL-104-1002U	EXL-105-1002U	EXL-106-1002U	EXL-107-1002U
2.1 x 125 mm	EXL-101-1202U	EXL-102-1202U	EXL-103-1202U	EXL-104-1202U	EXL-105-1202U	EXL-106-1202U	EXL-107-1202U
2.1 x 150 mm	EXL-101-1502U	EXL-102-1502U	EXL-103-1502U	EXL-104-1502U	EXL-105-1502U	EXL-106-1502U	EXL-107-1502U
3.0 x 50 mm	EXL-101-0503U	EXL-102-0503U	EXL-103-0503U	EXL-104-0503U	EXL-105-0503U	EXL-106-0503U	EXL-107-0503U
3.0 x 75 mm	EXL-101-7503U	EXL-102-7503U	EXL-103-7503U	EXL-104-7503U	EXL-105-7503U	EXL-106-7503U	EXL-107-7503U
3.0 x 100 mm	EXL-101-1003U	EXL-102-1003U	EXL-103-1003U	EXL-104-1003U	EXL-105-1003U	EXL-106-1003U	EXL-107-1003U
3.0 x 125 mm	EXL-101-1203U	EXL-102-1203U	EXL-103-1203U	EXL-104-1203U	EXL-105-1203U	EXL-106-1203U	EXL-107-1203U
3.0 x 150 mm	EXL-101-1503U	EXL-102-1503U	EXL-103-1503U	EXL-104-1503U	EXL-105-1503U	EXL-106-1503U	EXL-107-1503U
4.6 x 50 mm	EXL-101-0546U	EXL-102-0546U	EXL-103-0546U	EXL-104-0546U	EXL-105-0546U	EXL-106-0546U	EXL-107-0546U
4.6 x 75 mm	EXL-101-7546U	EXL-102-7546U	EXL-103-7546U	EXL-104-7546U	EXL-105-7546U	EXL-106-7546U	EXL-107-7546U
4.6 x 100 mm	EXL-101-1046U	EXL-102-1046U	EXL-103-1046U	EXL-104-1046U	EXL-105-1046U	EXL-106-1046U	EXL-107-1046U
4.6 x 125 mm	EXL-101-1246U	EXL-102-1246U	EXL-103-1246U	EXL-104-1246U	EXL-105-1246U	EXL-106-1246U	EXL-107-1246U
4.6 x 150 mm	EXL-101-1546U	EXL-102-1546U	EXL-103-1546U	EXL-104-1546U	EXL-105-1546U	EXL-106-1546U	EXL-107-1546U
ACE guard cartridges (3pk)*							
2.1-3.0 mm id	ACE-1P1-GD2U	ACE-1P2-GD2U	ACE-1P3-GD2U	ACE-1P4-GD2U	ACE-1P5-GD2U	ACE-1P6-GD2U	ACE-1P7-GD2U
4.0-4.6 mm id	ACE-1P1-GD4U	ACE-1P2-GD4U	ACE-1P3-GD4U	ACE-1P4-GD4U	ACE-1P5-GD4U	ACE-1P6-GD4U	ACE-1P7-GD4U

*Require ACE UHPLC guard holder H0011 (replacement ferrules for ACE UHPLC guard holder also available F0001 10pk)

AVANTOR® ACE® NOVEL CHEMISTRIES, 2 µm PARTICLES SIZES

– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
2.1 x 50 mm	EXL-109-0502U	EXL-1010-0502U	EXL-1011-0502U	EXL-1012-0502U	EXL-1013-0502U
2.1 x 75 mm	EXL-109-7502U	EXL-1010-7502U	EXL-1011-7502U	EXL-1012-7502U	EXL-1013-7502U
2.1 x 100 mm	EXL-109-1002U	EXL-1010-1002U	EXL-1011-1002U	EXL-1012-1002U	EXL-1013-1002U
2.1 x 125 mm	EXL-109-1202U	EXL-1010-1202U	EXL-1011-1202U	EXL-1012-1202U	EXL-1013-1202U
2.1 x 150 mm	EXL-109-1502U	EXL-1010-1502U	EXL-1011-1502U	EXL-1012-1502U	EXL-1013-1502U
3.0 x 50 mm	EXL-109-0503U	EXL-1010-0503U	EXL-1011-0503U	EXL-1012-0503U	EXL-1013-0503U
3.0 x 75 mm	EXL-109-7503U	EXL-1010-7503U	EXL-1011-7503U	EXL-1012-7503U	EXL-1013-7503U
3.0 x 100 mm	EXL-109-1003U	EXL-1010-1003U	EXL-1011-1003U	EXL-1012-1003U	EXL-1013-1003U
3.0 x 125 mm	EXL-109-1203U	EXL-1010-1203U	EXL-1011-1203U	EXL-1012-1203U	EXL-1013-1203U
3.0 x 150 mm	EXL-109-1503U	EXL-1010-1503U	EXL-1011-1503U	EXL-1012-1503U	EXL-1013-1503U
4.6 x 50 mm	EXL-109-0546U	EXL-1010-0546U	EXL-1011-0546U	EXL-1012-0546U	EXL-1013-0546U
4.6 x 75 mm	EXL-109-7546U	EXL-1010-7546U	EXL-1011-7546U	EXL-1012-7546U	EXL-1013-7546U
4.6 x 100 mm	EXL-109-1046U	EXL-1010-1046U	EXL-1011-1046U	EXL-1012-1046U	EXL-1013-1046U
4.6 x 125 mm	EXL-109-1246U	EXL-1010-1246U	EXL-1011-1246U	EXL-1012-1246U	EXL-1013-1246U
4.6 x 150 mm	EXL-109-1546U	EXL-1010-1546U	EXL-1011-1546U	EXL-1012-1546U	EXL-1013-1546U
ACE guard cartridges (3pk)*					
2.1-3.0 mm id	ACE-1P9-GD2U	ACE-1P10-GD2U	ACE-1P11-GD2U	ACE-1P12-GD2U	ACE-1P13-GD2U
4.0-4.6 mm id	ACE-1P9-GD4U	ACE-1P10-GD4U	ACE-1P11-GD4U	ACE-1P12-GD4U	ACE-1P13-GD4U

*Require ACE UHPLC guard holder H0011 (replacement ferrules for ACE UHPLC guard holder also available F0001 10pk)

AVANTOR® ACE® 1.7 µm UHPLC COLUMNS

– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	C18	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES	NH_2
2.1 x 50 mm	EXL-171-0502U	EXL-179-0502U	EXL-1710-0502U	EXL-1711-0502U	EXL-1712-0502U	EXL-1713-0502U	EXL-1714-0502U
2.1 x 75 mm	EXL-171-7502U	EXL-179-7502U	EXL-1710-7502U	EXL-1711-7502U	EXL-1712-7502U	EXL-1713-7502U	EXL-1714-7502U
2.1 x 100 mm	EXL-171-1002U	EXL-179-1002U	EXL-1710-1002U	EXL-1711-1002U	EXL-1712-1002U	EXL-1713-1002U	EXL-1714-1002U
3.0 x 50 mm	EXL-171-0503U	EXL-179-0503U	EXL-1710-0503U	EXL-1711-0503U	EXL-1712-0503U	EXL-1713-0503U	EXL-1714-0503U
3.0 x 75 mm	EXL-171-7503U	EXL-179-7503U	EXL-1710-7503U	EXL-1711-7503U	EXL-1712-7503U	EXL-1713-7503U	EXL-1714-7503U
3.0 x 100 mm	EXL-171-1003U	EXL-179-1003U	EXL-1710-1003U	EXL-1711-1003U	EXL-1712-1003U	EXL-1713-1003U	EXL-1714-1003U
ACE guard cartridges (3pk)*							
2.1-3.0 mm id	ACE-1P1-GD2U	ACE-1P9-GD2U	ACE-1P10-GD2U	ACE-1P11-GD2U	ACE-1P12-GD2U	ACE-1P13-GD2U	-
*Require ACE UHPLC guard holder H0011 (replacement ferrules for ACE UHPLC guard holder also available F0001 10pk)							

AVANTOR® ACE® UHPLC GUARDS

– Specifically compatible with Avantor® ACE® Excel 1.7 & 2 µm columns
– Pressure rated to 15,000 psi (1,000 bar) for UHPLC applications
– Two different column id options : 2.1-3.0 mm id and 4.0-4.6 mm id
– Require reusable holder H0011
– Low dead volume

Avantor® ACE® 300 Å HPLC columns for biomolecules

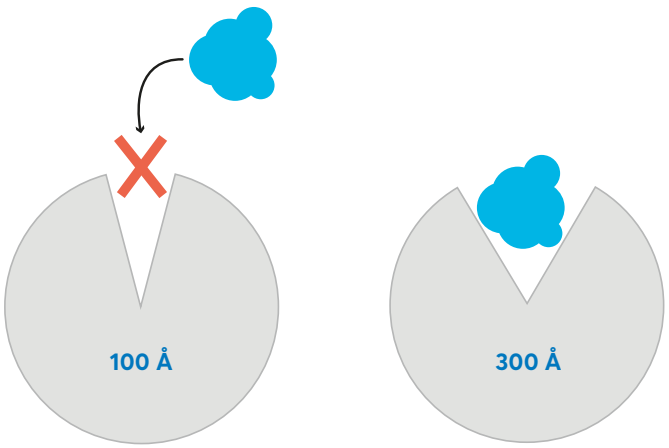
Excellent peak shape and reproducibility are the hallmarks of ACE HPLC columns. This quality is also available for protein chemists that demand the highest performance for the separation of proteins, peptides and other high molecular weight biomolecules.

- 300 Å ultra-high purity silica
- C18, C8, C4, CN and Phenyl chemistries
- Unchanged selectivity from the smaller pore phases
- Unmatched reproducibility
- Exceptional chemical stability

PHASE SPECIFICATIONS

Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range
C18-300	L1	Octadecyl	Yes	3, 5, 10	300	100	9.0	2–8
C8-300	L7	Octyl	Yes	3, 5, 10	300	100	5.0	2–8
C4-300	L26	Butyl	Yes	3, 5, 10	300	100	2.6	2–8
CN-300	L10	Cyano	Yes	3, 5, 10	300	100	2.8	2–8
PHENYL-300	L11	Phenyl	Yes	3, 5, 10	300	100	2.6	2–7

Illustration of the analysis of biomolecules using ACE 300 Å silica



Large biomolecules such as proteins and large peptides cannot enter the small pores and do not interact with the stationary phase resulting in poor retention

Using ACE 300 A phases, biomolecules can enter the pores and better interact with the stationary phase, resulting in excellent retention and peak shape

ACE 300 Å silica is superior for the separation of proteins, larger peptides and other biomolecules. Analytes enter the pore and interact with the bonded phase over the entire surface (see figure), resulting in better peak shape and retention. The table below shows the generally applicable molecular weight range for both ACE 300 Å and 100 Å phases. However, wide-pore silica can also separate smaller peptides well and may result in alternative selectivity and resolution compared with smaller pore silica.

	Molecular weight / Da				
Pore size / Å	1.000	5.000	10.000	50.000	100.000
300			←	→	
100	←	→			

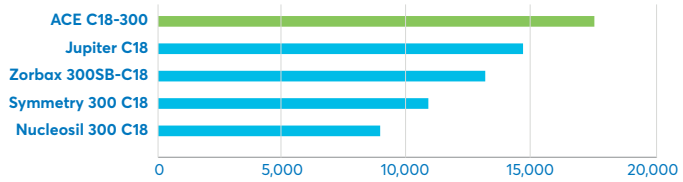
The general molecular weight range applicable to 300 Å and 100 Å phases. Hydrodynamic radius will also play a role.

Request your FREE ACE Guide to the Analysis and Purification of Proteins and Peptides!

ACE 300 Å PHASES SHOW HIGHER EFFICIENCIES FOR ACIDIC, BASIC AND NEUTRAL COMPOUNDS COMPARED TO OTHER 300 Å PHASES

Column type	Column efficiency (pl/m)			
	Neutral	Basic 1	Basic 2	Average
ACE C18-300	23,400	14,400	14,000	17,300
Jupiter C18	19,700	12,400	12,400	14,800
Zorbax 300SB-C18	18,900	14,400	6,600	13,300
Symmetry 300 C18	17,500	9,000	6,700	11,000
Nucleosil 300 C18	20,300	6,700	400	9,100

Neutral molecule: TOLUENE - 80:20 MeOH/H_2O 1.0 mL/min
Basic molecule 1: PYRIDINE - 60:40 MeOH/H_2O, 1.0 mL/min
Basic molecule 2: AMITRIPTYLINE - 80:20 MeOH/25 mM KH_2PO_4 (pH 6.0), 1.0 mL/min



- The top ranking of the ACE 300 Å columns shown in the figure above reflects their performance based on how well they are packed and also the low silanol and metal activity of the stationary phase
- Chromatographers with experience in HPLC of basic pharmaceuticals know that columns giving good results in these tests will perform best for their samples
- The benefits obtained from ultra-inert stationary phases are also important in wide-pore columns designed for the analysis of biomolecules.

PEPTIDES – SELECTIVITY CHANGES WITH BONDED PHASE AND MOBILE PHASE

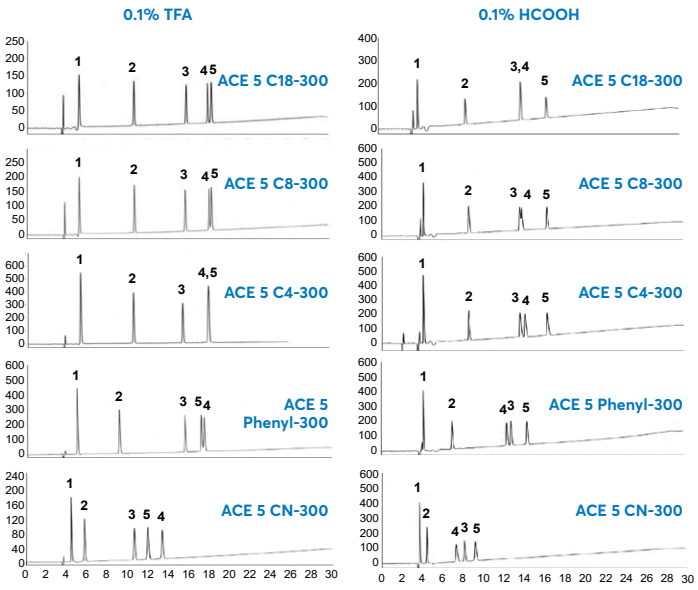
CONDITIONS

Column: ACE 5 C18-300; ACE 5 C8-300; ACE 5 C4-300; ACE 5 Phenyl-300; ACE 5 CN-300
Dimensions: 250 x 4.6 mm
Part Number: ACE-221-2546, ACE-222-2546, ACE-223-2546, ACE-225-2546, ACE-224-2546
Mobile Phase: A: 0.1% TFA or 0.1% formic acid in H_2O
B: MeCN

Time (mins)	%B
0	10
25	40

Flow Rate: 1 mL/min
Temperature: Ambient
Detection: UV, 220 nm

1 Gly-Tyr (MW: 238.34)
2 Val-Tyr-Val (MW: 379.45)
3 Methionine enkephalin (MW: 573.67)
4 Angiotensin II (MW: 1046.18)
5 Leucine enkephalin (MW: 555.62)



WHEY PROTEINS FROM WHOLE MILK

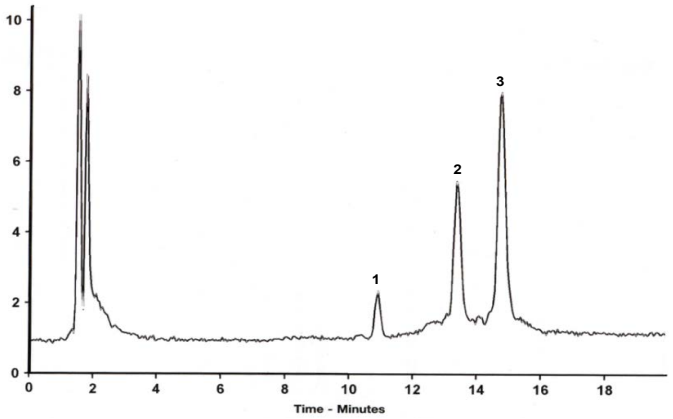
CONDITIONS

Column: ACE 3 C4-300
Dimensions: 150 x 2.1 mm
Part Number: ACE-213-1502
Mobile Phase: A: 0.5% formic acid in H_2O
B: 0.5% formic acid in MeCN

Time (mins)	%B
0	35
16	43
17	80
20	80
21	35
31	35

Flow Rate: 0.4 mL/min
Injection: 10 µL
Temperature: 40 °C
Detection: ESI-MS (+ve)

1 α-Lactalbumin
2 β-Lactoglobulin B
3 β-Lactoglobulin A



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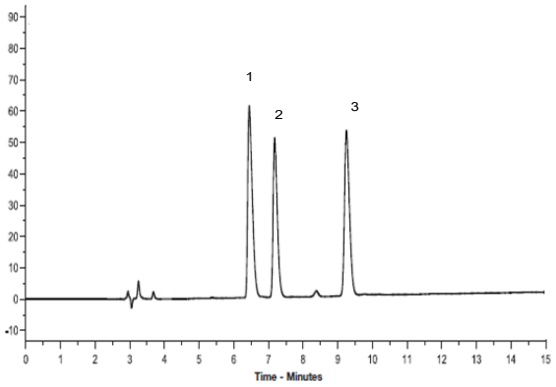
ANGIOTENSIN PEPTIDES

CONDITIONS

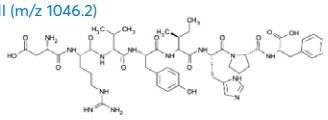
Column: **ACE 5 C18-300**
Dimensions: 250 x 4.6 mm
Part Number: ACE-221-2546
Mobile Phase: A: 0.1 % TFA in H_2O
B: 0.1% TFA in H_2O/MeCN (80:20 v/v)

Time (mins)	%B
0	25
15	40

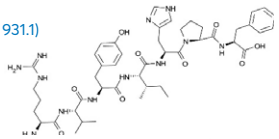
Flow Rate: 1 mL/min
Temperature: Ambient
Detection: UV, 215 nm



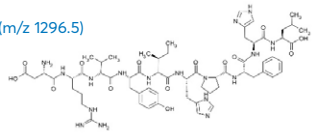
1 Angiotensin II (m/z 1046.2)



2 Angiotensin III (m/z 931.1)



3 Angiotensin I (m/z 1296.5)



ORDERING INFORMATION

AVANTOR® ACE® 300 Å PHASES, 3 µm PARTICLES SIZES

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
1.0 x 50 mm	ACE-211-0501	ACE-212-0501	ACE-213-0501	ACE-214-0501	ACE-215-0501
1.0 x 75 mm	ACE-211-7501	ACE-212-7501	ACE-213-7501	ACE-214-7501	ACE-215-7501
1.0 x 100 mm	ACE-211-1001	ACE-212-1001	ACE-213-1001	ACE-214-1001	ACE-215-1001
1.0 125 mm	ACE-211-1201	ACE-212-1201	ACE-213-1201	ACE-214-1201	ACE-215-1201
1.0 x 150 mm	ACE-211-1501	ACE-212-1501	ACE-213-1501	ACE-214-1501	ACE-215-1501
2.1 x 50 mm	ACE-211-0502	ACE-212-0502	ACE-213-0502	ACE-214-0502	ACE-215-0502
2.1 x 75 mm	ACE-211-7502	ACE-212-7502	ACE-213-7502	ACE-214-7502	ACE-215-7502
2.1 x 100 mm	ACE-211-1002	ACE-212-1002	ACE-213-1002	ACE-214-1002	ACE-215-1002
2.1 x 125 mm	ACE-211-1202	ACE-212-1202	ACE-213-1202	ACE-214-1202	ACE-215-1202
2.1 x 150 mm	ACE-211-1502	ACE-212-1502	ACE-213-1502	ACE-214-1502	ACE-215-1502
3.0 x 75 mm	ACE-211-7503	ACE-212-7503	ACE-213-7503	ACE-214-7503	ACE-215-7503
3.0 x 100 mm	ACE-211-1003	ACE-212-1003	ACE-213-1003	ACE-214-1003	ACE-215-1003
3.0 x 125 mm	ACE-211-1203	ACE-212-1203	ACE-213-1203	ACE-214-1203	ACE-215-1203
3.0 x 150 mm	ACE-211-1503	ACE-212-1503	ACE-213-1503	ACE-214-1503	ACE-215-1503
4.0 x 50 mm	ACE-211-0504	ACE-212-0504	ACE-213-0504	ACE-214-0504	ACE-215-0504
4.0 x 75 mm	ACE-211-7504	ACE-212-7504	ACE-213-7504	ACE-214-7504	ACE-215-7504
4.0 x 100 mm	ACE-211-1004	ACE-212-1004	ACE-213-1004	ACE-214-1004	ACE-215-1004
4.0 x 125 mm	ACE-211-1204	ACE-212-1204	ACE-213-1204	ACE-214-1204	ACE-215-1204
4.0 x 150 mm	ACE-211-1504	ACE-212-1504	ACE-213-1504	ACE-214-1504	ACE-215-1504
4.6 x 50 mm	ACE-211-0546	ACE-212-0546	ACE-213-0546	ACE-214-0546	ACE-215-0546
4.6 x 75 mm	ACE-211-7546	ACE-212-7546	ACE-213-7546	ACE-214-7546	ACE-215-7546
4.6 x 100 mm	ACE-211-1046	ACE-212-1046	ACE-213-1046	ACE-214-1046	ACE-215-1046
4.6 x 125 mm	ACE-211-1246	ACE-212-1246	ACE-213-1246	ACE-214-1246	ACE-215-1246
4.6 x 150 mm	ACE-211-1546	ACE-212-1546	ACE-213-1546	ACE-214-1546	ACE-215-1546
ACE guard cartridges for analytical columns (5pk)					
For 1.0 mm ID columns	ACE-211-0101GD	ACE-212-0101GD	ACE-213-0101GD	ACE-214-0101GD	ACE-215-0101GD
For 2.1 mm ID columns	ACE-211-0102GD	ACE-212-0102GD	ACE-213-0102GD	ACE-214-0102GD	ACE-215-0102GD
For 3.0-4.6 mm ID columns	ACE-211-0103GD	ACE-212-0103GD	ACE-213-0103GD	ACE-214-0103GD	ACE-215-0103GD
Stand-alone guard cartridge holder H0001 and column coupler C0001 will be required					

AVANTOR® ACE® 300 Å PHASES, 5 µm PARTICLES SIZES

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
1.0 x 50 mm	ACE-221-0501	ACE-222-0501	ACE-223-0501	ACE-224-0501	ACE-225-0501
1.0 x 75 mm	ACE-221-7501	ACE-222-7501	ACE-223-7501	ACE-224-7501	ACE-225-7501
1.0 x 100 mm	ACE-221-1001	ACE-222-1001	ACE-223-1001	ACE-224-1001	ACE-225-1001
1.0 125 mm	ACE-221-1201	ACE-222-1201	ACE-223-1201	ACE-224-1201	ACE-225-1201
1.0 x 150 mm	ACE-221-1501	ACE-222-1501	ACE-223-1501	ACE-224-1501	ACE-225-1501
1.0 x 250 mm	ACE-221-2501	ACE-222-2501	ACE-223-2501	ACE-224-2501	ACE-225-2501
2.1 x 50 mm	ACE-221-0502	ACE-222-0502	ACE-223-0502	ACE-224-0502	ACE-225-0502
2.1 x 75 mm	ACE-221-7502	ACE-222-7502	ACE-223-7502	ACE-224-7502	ACE-225-7502
2.1 x 100 mm	ACE-221-1002	ACE-222-1002	ACE-223-1002	ACE-224-1002	ACE-225-1002
2.1 x 125 mm	ACE-221-1202	ACE-222-1202	ACE-223-1202	ACE-224-1202	ACE-225-1202
2.1 x 150 mm	ACE-221-1502	ACE-222-1502	ACE-223-1502	ACE-224-1502	ACE-225-1502
2.1 x 250 mm	ACE-221-2502	ACE-222-2502	ACE-223-2502	ACE-224-2502	ACE-225-2502
3.0 x 50 mm	ACE-221-0503	ACE-222-0503	ACE-223-0503	ACE-224-0503	ACE-225-0503
3.0 x 75 mm	ACE-221-7503	ACE-222-7503	ACE-223-7503	ACE-224-7503	ACE-225-7503
3.0 x 100 mm	ACE-221-1003	ACE-222-1003	ACE-223-1003	ACE-224-1003	ACE-225-1003
3.0 x 125 mm	ACE-221-1203	ACE-222-1203	ACE-223-1203	ACE-224-1203	ACE-225-1203
3.0 x 150 mm	ACE-221-1503	ACE-222-1503	ACE-223-1503	ACE-224-1503	ACE-225-1503
3.0 x 250 mm	ACE-221-2503	ACE-222-2503	ACE-223-2503	ACE-224-2503	ACE-225-2503
4.0 x 50 mm	ACE-221-0504	ACE-222-0504	ACE-223-0504	ACE-224-0504	ACE-225-0504
4.0 x 75 mm	ACE-221-7504	ACE-222-7504	ACE-223-7504	ACE-224-7504	ACE-225-7504
4.0 x 100 mm	ACE-221-1004	ACE-222-1004	ACE-223-1004	ACE-224-1004	ACE-225-1004
4.0 x 125 mm	ACE-221-1204	ACE-222-1204	ACE-223-1204	ACE-224-1204	ACE-225-1204
4.0 x 150 mm	ACE-221-1504	ACE-222-1504	ACE-223-1504	ACE-224-1504	ACE-225-1504
4.0 x 250 mm	ACE-221-2504	ACE-222-2504	ACE-223-2504	ACE-224-2504	ACE-225-2504
4.6 x 50 mm	ACE-221-0546	ACE-222-0546	ACE-223-0546	ACE-224-0546	ACE-225-0546
4.6 x 75 mm	ACE-221-7546	ACE-222-7546	ACE-223-7546	ACE-224-7546	ACE-225-7546
4.6 x 100 mm	ACE-221-1046	ACE-222-1046	ACE-223-1046	ACE-224-1046	ACE-225-1046
4.6 x 125 mm	ACE-221-1246	ACE-222-1246	ACE-223-1246	ACE-224-1246	ACE-225-1246
4.6 x 150 mm	ACE-221-1546	ACE-222-1546	ACE-223-1546	ACE-224-1546	ACE-225-1546
4.6 x 250 mm	ACE-221-2546	ACE-222-2546	ACE-223-2546	ACE-224-2546	ACE-225-2546
ACE guard cartridges for analytical columns (5pk)					
For 1.0 mm ID columns	ACE-221-0101GD	ACE-222-0101GD	ACE-223-0101GD	ACE-224-0101GD	ACE-225-0101GD
For 2.1 mm ID columns	ACE-221-0102GD	ACE-222-0102GD	ACE-223-0102GD	ACE-224-0102GD	ACE-225-0102GD
For 3.0-4.6 mm ID columns	ACE-221-0103GD	ACE-222-0103GD	ACE-223-0103GD	ACE-224-0103GD	ACE-225-0103GD
Stand-alone guard cartridge holder H0001 and column coupler C0001 will be required					

AVANTOR® ACE® 300 Å PHASES, 10 µm PARTICLES SIZES

– 10 µm particles sizes are available in analytical column dimensions (2.1 – 4.6 mm ID)
– To discuss your requirements, please contact chromsupport@avantorsciences.com

For dimensions not listed here, please contact: chromsupport@avantorsciences.com

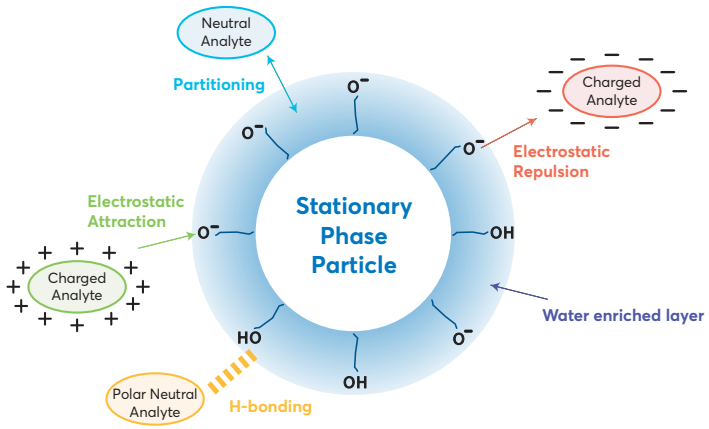
Avantor® ACE® HILIC

WHAT IS HILIC?

- Hydrophilic Interaction Liquid Chromatography (HILIC) was first described by Alpert*
- HILIC is ideal for the separation and retention of polar species including polar neutral and polar ionised analytes
- HILIC separations typically include a polar stationary phase with high organic solvent containing mobile phases
- Mechanistically HILIC is complex (Fig 1) and provides multiple modes of interaction between the analyte, stationary phase, eluent and water-enriched layer at the stationary phase particle-eluent interface**

* A. J. Alpert, J. Chromatogr., 499 (1990) 177.
** See the FREE ACE guide to reproducible HILIC method development for more information – request your copy now.

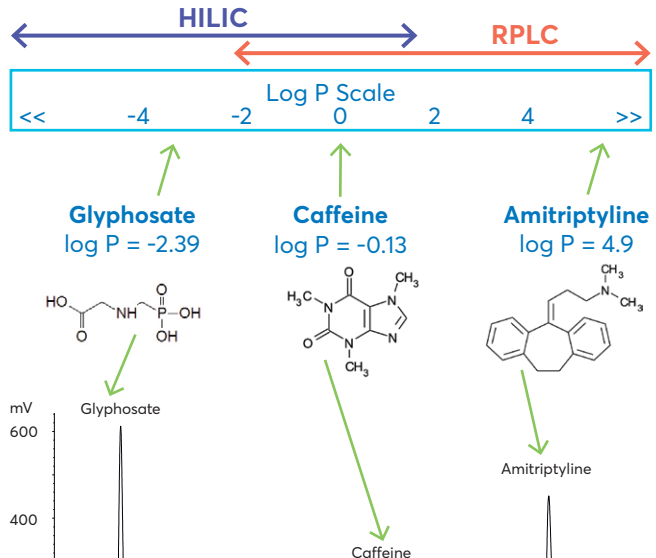
FIGURE 1. Schematic of interactions between different types of polar analytes and a stationary phase in HILIC mode



WHEN SHOULD YOU CONSIDER HILIC?

- HILIC provides the retention and separation of hydrophilic or polar to very polar analytes not well retained in reversed phase (RPLC).
- Hydrophilic or polar to very polar analytes have log P values (measure of lipophilicity) of around zero or less (Fig 2A).
- Generally, polar analytes are suitable for HILIC if they elute before caffeine in gradient RPLC (Fig 2B).

FIGURE 2A. Analyte suitability for HILIC from Log P



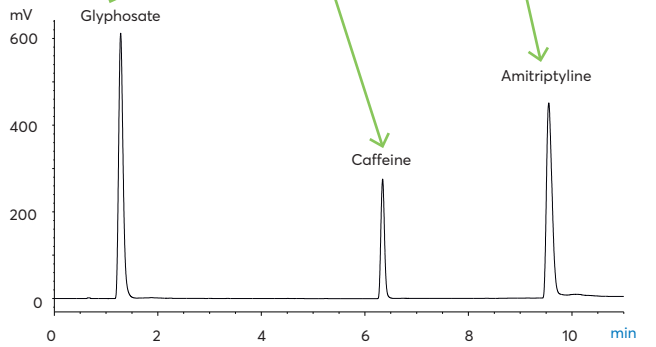


FIGURE 2B. Analyte suitability for HILIC from gradient RPLC

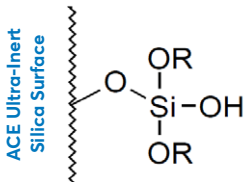
Column: ACE Excel C18, 100 x 3.0 mm, 2 µm - **Part Number**: EXL-101-1003U
Mobile Phase: A = 10 mM ammonium formate, pH 3.0 (aq) B = 10 mM ammonium formate, pH 3.0 in 90:10 v/v MeCN:H_2O - **Gradient**: 5-100 %B in 10 minutes
Detection: ELSD - **Flow Rate**: 0.4 mL/min - **Temperature**: 30 °C - **Injection**: 10 µL

ACE HILIC PHASE DESIGN

ACE HILIC phases have been developed to provide the solution to your HILIC separation needs. HILIC provides improved retention and alternative selectivity to reversed-phase chromatography for polar and very polar analytes. The three ACE HILIC phases – HILIC-A, HILIC-B and HILIC-N – provide alternative selectivity to each other. Systematic screening of these phases under the same mobile phase conditions will enable you to determine the best phase for your separation.

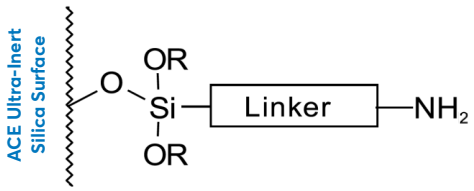
ACE HILIC-A

- Proprietary silica phase
- An acidic character phase with an ionisable surface charge depending upon the mobile phase pH



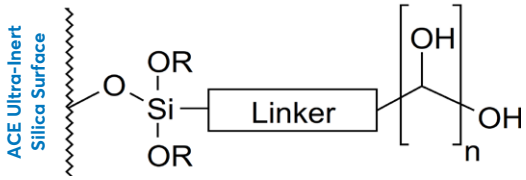
ACE HIILIC-B

- Proprietary aminopropyl phase
- A basic character phase with an ionisable positive surface charge depending upon the mobile phase pH



ACE HILIC-N

- Proprietary polyhydroxy phase
- A polar neutral character phase capable of H-bonding with other mechanisms of interaction

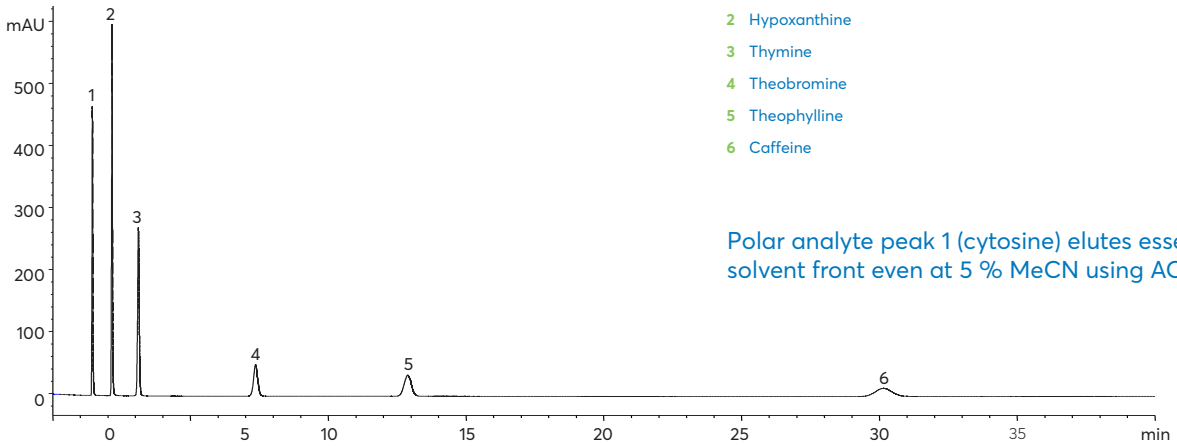


PHASE SPECIFICATIONS

Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range
HILIC-A	L3	Proprietary Sil	No	1.7, 3, 5	100	300	-	2–7
HILIC-B	L8	Proprietary Aminopropyl	No	1.7, 3, 5	100	300	4.0	2–7
HILIC-N	Pending	Proprietary Polyhydroxy	No	1.7, 3, 5	100	300	7.0	2–7

HILIC PROVIDES ALTERNATIVE SELECTIVITY AND RETENTION TO RPLC

RPLC: 1 → 6 ELUTION ORDER

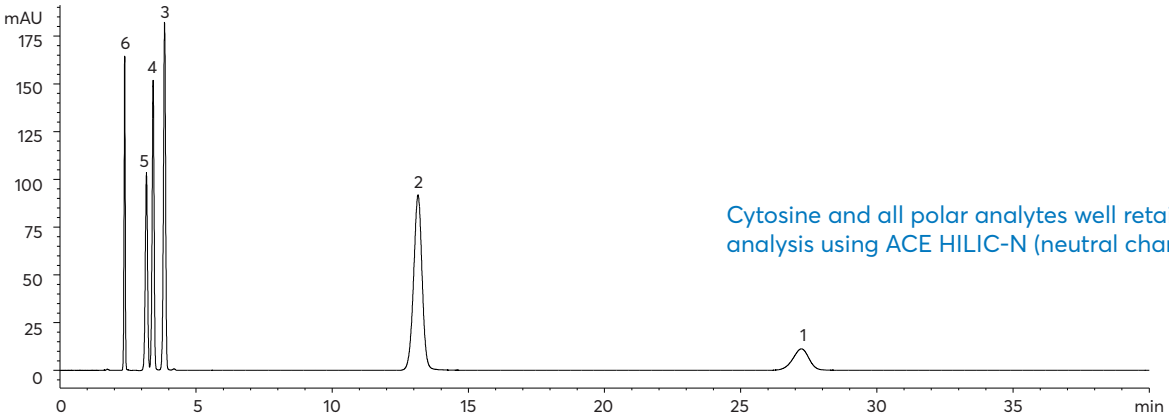


1 Cytosine
2 Hypoxanthine
3 Thymine
4 Theobromine
5 Theophylline
6 Caffeine

Polar analyte peak 1 (cytosine) elutes essentially on the solvent front even at 5 % MeCN using ACE C18 in RPLC.

Column: ACE Excel C18, 150 x 4.6 mm, 5 µm - **Part number**: EXL-121-1546U
Mobile Phase: 0.1 % acetic acid in 95:5 v/v H_2O:MeCN - **Flow Rate**: 1.0 mL/min - **Temperature**: 22 °C - **Detection**: 254 nm - **Injection**: 5 µL

HILIC: 6 → 1 ELUTION ORDER



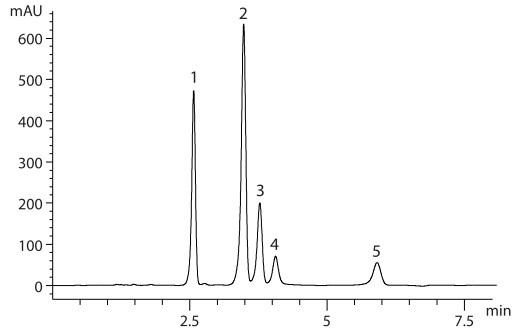
Cytosine and all polar analytes well retained with HILIC analysis using ACE HILIC-N (neutral character phase).

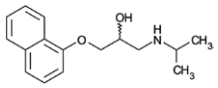
Column: ACE HILIC-N (neutral character phase), 150 x 4.6 mm, 5 µm - **Part number**: HILN-5-1546U
Mobile Phase: 0.1 % acetic acid in 5:95 v/v H_2O:MeCN - **Flow Rate**: 1.0 mL/min - **Temperature**: 22 °C - **Detection**: 254 nm - **Injection**: 5 µL

ACE HILIC-A

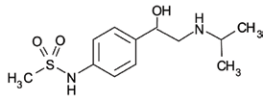
An acidic character phase with an ionisable negative surface charge depending upon mobile phase pH.

β-blockers

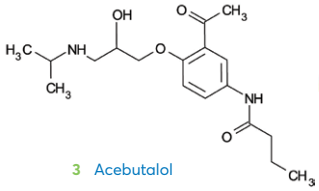




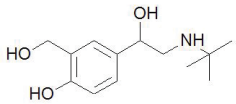
1 Propranolol



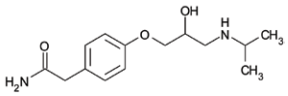
2 Sotalol



3 Acebutalol



4 Salbutamol



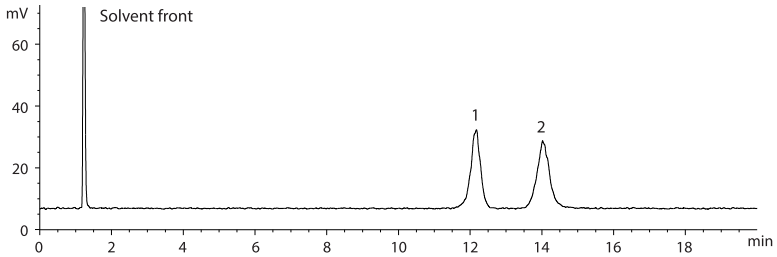
5 Atenolol

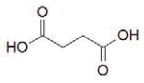
Column: ACE HILIC-A,150 x 4.6 mm, 5 µm - **Part Number**: HILA-5-1546U
Mobile Phase: 12 mM ammonium formate pH 4.7 in MeCN/H_2O (88:12 v/v) - **Flow Rate**: 1.5 mL/min - **Injection**: 2 µL - **Temperature**: 25 °C - **Detection**: 230 nm

ACE HILIC-B

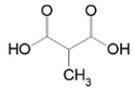
A basic character phase with an ionisable positive surface charge depending upon mobile phase pH.

Succinic acid and methylmalonic acid





1 Succinic acid



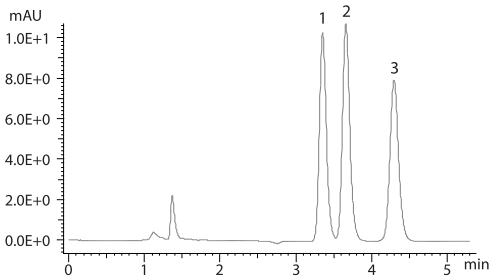
2 Methylmalonic acid

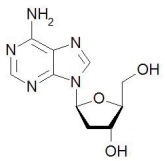
Column: ACE HILIC-B, 150 x 4.6 mm, 5 µm - **Part Number**: HILB-5-1546U - **Mobile Phase**: 10 mM ammonium formate pH 3.0 in MeCN/H_2O (90:10 v/v)
Flow Rate: 1.5 mL/min - **Temperature**: 25 °C - **Injection**: 5 µL - **Detection**: ELSD (Evaporator temp: 30 °C, Nebuliser temp: 30 °C, Gas speed: 1 SLM)

ACE HILIC-N

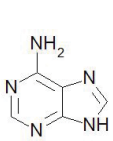
A polar neutral character phase with the capability of H-bonding amongst other mechanisms of interaction.

Nucleobases and nucleosides

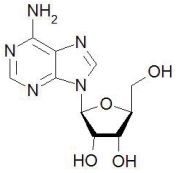




1 Deoxyadenosine



2 Adenine



3 Adenosine

Column: ACE HILIC-N, 150 x 4.6 mm, 5 µm - **Part Number**: HILN-5-1546U
Mobile Phase: 10 mM ammonium formate pH 4.7 in MeCN/H_2O (90:10 v/v) - **Flow Rate**: 1.5 mL/min - **Temperature**: 25 °C- **Injection**: 5 µL - **Detection**: 254 nm

ORDERING INFORMATION

AVANTOR® ACE® HILIC, 1.7 µm PARTICLES SIZES

– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	HILIC-A	HILIC-B	HILIC-N
2.1 x 50 mm	HILA-17-0502U	HILB-17-0502U	HILN-17-0502U
2.1 x 75 mm	HILA-17-7502U	HILB-17-7502U	HILN-17-7502U
2.1 x 100 mm	HILA-17-1002U	HILB-17-1002U	HILN-17-1002U
3.0 x 50 mm	HILA-17-0503U	HILB-17-0503U	HILN-17-0503U
3.0 x 75 mm	HILA-17-7503U	HILB-17-7503U	HILN-17-7503U
3.0 x 100 mm	HILA-17-1003U	HILB-17-1003U	HILN-17-1003U

AVANTOR® ACE® HILIC, 3 µm PARTICLES SIZES

– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	HILIC-A	HILIC-B	HILIC-N
2.1 x 50 mm	HILA-3-0502U	HILB-3-0502U	HILN-3-0502U
2.1 x 75 mm	HILA-3-7502U	HILB-3-7502U	HILN-3-7502U
2.1 x 100 mm	HILA-3-1002U	HILB-3-1002U	HILN-3-1002U
2.1 x 125 mm	HILA-3-1202U	HILB-3-1202U	HILN-3-1202U
2.1 x 150 mm	HILA-3-1502U	HILB-3-1502U	HILN-3-1502U
3.0 x 50 mm	HILA-3-0503U	HILB-3-0503U	HILN-3-0503U
3.0 x 75 mm	HILA-3-7503U	HILB-3-7503U	HILN-3-7503U
3.0 x 100 mm	HILA-3-1003U	HILB-3-1003U	HILN-3-1003U
3.0 x 125 mm	HILA-3-1203U	HILB-3-1203U	HILN-3-1203U
3.0 x 150 mm	HILA-3-1503U	HILB-3-1503U	HILN-3-1503U
4.6 x 50 mm	HILA-3-0546U	HILB-3-0546U	HILN-3-0546U
4.6 x 75 mm	HILA-3-7546U	HILB-3-7546U	HILN-3-7546U
4.6 x 100 mm	HILA-3-1046U	HILB-3-1046U	HILN-3-1046U
4.6 x 125 mm	HILA-3-1246U	HILB-3-1246U	HILN-3-1246U
4.6 x 150 mm	HILA-3-1546U	HILB-3-1546U	HILN-3-1546U
ACE guard cartidges for analytical columns (5pk)			
For 1.0 mm id columns	HILA-3-0101GD	HILB-3-0101GD	HILN-3-0101GD
For 2.1 mm id columns	HILA-3-0102GD	HILB-3-0102GD	HILN-3-0102GD
For 3.0-4.6 mm id columns	HILA-3-0103GD	HILB-3-0103GD	HILN-3-0103GD
Stand-alone guard cartidge holder H0001 and column coupler required			

AVANTOR® ACE® HILIC, 5 µm PARTICLES SIZES

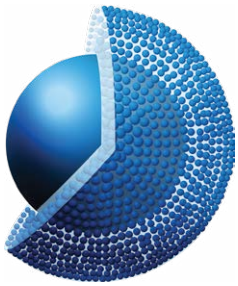
– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	HILIC-A	HILIC-B	HILIC-N
2.1 x 50 mm	HILA-5-0502U	HILB-5-0502U	HILN-5-0502U
2.1 x 75 mm	HILA-5-7502U	HILB-5-7502U	HILN-5-7502U
2.1 x 100 mm	HILA-5-1002U	HILB-5-1002U	HILN-5-1002U
2.1 x 125 mm	HILA-5-1202U	HILB-5-1202U	HILN-5-1202U
2.1 x 150 mm	HILA-5-1502U	HILB-5-1502U	HILN-5-1502U
2.1 x 250 mm	HILA-5-2502U	HILB-5-2502U	HILN-5-2502U
3.0 x 50 mm	HILA-5-0503U	HILB-5-0503U	HILN-5-0503U
3.0 x 75 mm	HILA-5-7503U	HILB-5-7503U	HILN-5-7503U
3.0 x 100 mm	HILA-5-1003U	HILB-5-1003U	HILN-5-1003U
3.0 x 125 mm	HILA-5-1203U	HILB-5-1203U	HILN-5-1203U
3.0 x 150 mm	HILA-5-1503U	HILB-5-1503U	HILN-5-1503U
3.0 x 250 mm	HILA-5-2503U	HILB-5-2503U	HILN-5-2503U
4.6 x 50 mm	HILA-5-0546U	HILB-5-0546U	HILN-5-0546U
4.6 x 75 mm	HILA-5-7546U	HILB-5-7546U	HILN-5-7546U
4.6 x 100 mm	HILA-5-1046U	HILB-5-1046U	HILN-5-1046U
4.6 x 125 mm	HILA-5-1246U	HILB-5-1246U	HILN-5-1246U
4.6 x 150 mm	HILA-5-1546U	HILB-5-1546U	HILN-5-1546U
4.6 x 250 mm	HILA-5-2546U	HILB-5-2546U	HILN-5-2546U
ACE guard cartidges for analytical columns (5pk)			
For 1.0 mm id columns	HILA-5-0101GD	HILB-5-0101GD	HILN-5-0101GD
For 2.1 mm id columns	HILA-5-0102GD	HILB-5-0102GD	HILN-5-0102GD
For 3.0-4.6 mm id columns	HILA-5-0103GD	HILB-5-0103GD	HILN-5-0103GD
Stand-alone guard cartidge holder H0001 and column coupler required			

Request **HILIC Method Development guide**

Request **Step-by-step Method Development Protocol**

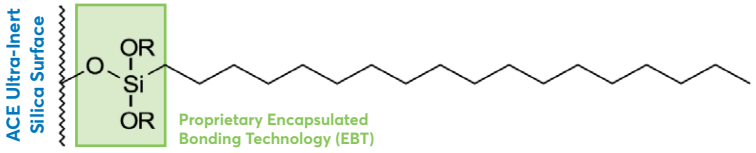
Avantor® ACE® UltraCore



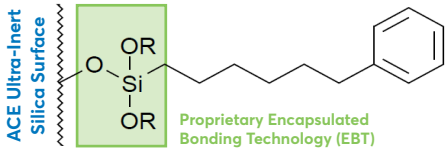
High throughput and high efficiency ultra-fast separations are achievable using ACE UltraCore – ultra-inert solid-core columns. ACE UltraCore columns utilise ultra-high purity solid-core silica with a monodisperse particle distribution to combine high efficiency with low backpressure. Achieve UHPLC-like performance using HPLC instrumentation with ACE UltraCore.

- Ultra-inert solid-core particles
- SuperC18 and SuperPhenylHexyl phases – with complementary selectivity for method development
- SuperC18 and SuperPhenylHexyl have extended pH range 1.5–11.0
- Designed for LC-MS applications

SUPERC18



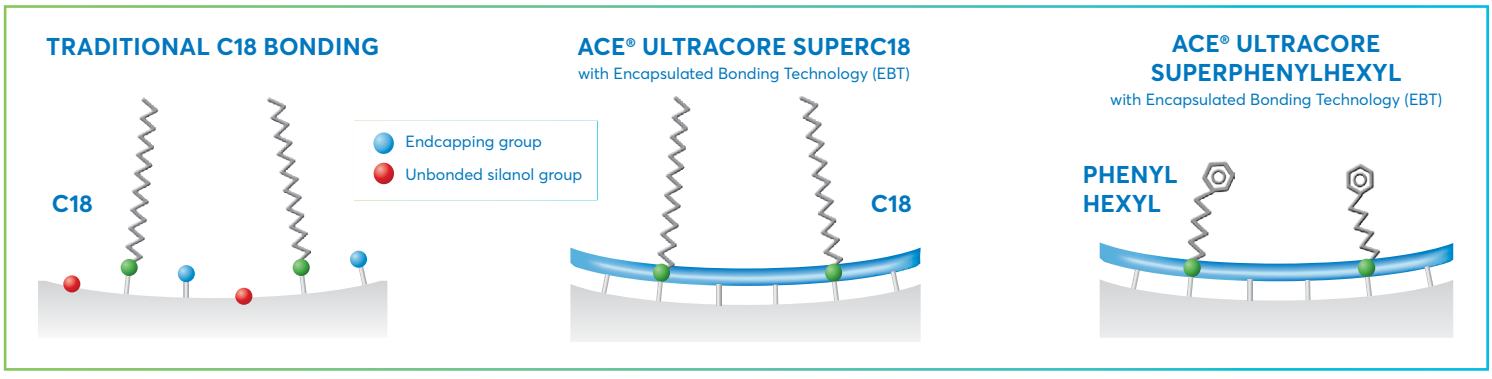
SUPERPHENYLHEXYL

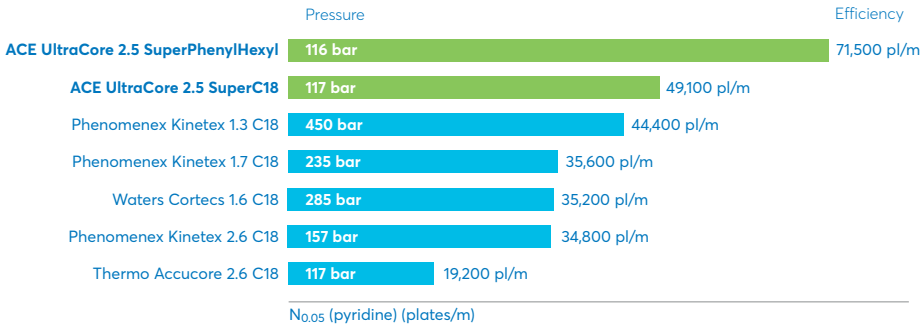


PHASE SPECIFICATIONS

Phase	USP Listing	Functional group	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range	100% aqueous compatibility
ULTRACORE SUPERC18	L1	Octadecyl	Encapsulated	2.5	95	130	7	1.5 – 11.0	-
				5		100	5.4		
ULTRACORE SUPERPHENYLHEXYL	L11	Phenyl-Hexyl	Encapsulated	2.5	95	130	4.6	1.5 – 11.0	Yes
				5		100	3.6		

ACE UltraCore SuperC18 and SuperPhenylHexyl phases are manufactured using our unique Encapsulated Bonding Technology (EBT). This technology dramatically increases ligand coverage of the silica surface and effectively eliminates the negative effects of unbonded silanol groups. The higher ligand coverage results in improved inertness, chromatographic performance and stability.

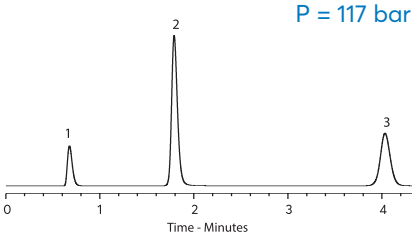




ACE ULTRACORE 2.5 SUPERC18

$N_{0.5}$(pyr) = 49,100 pl/m

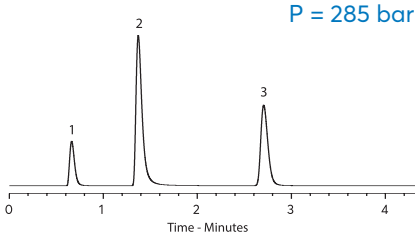
P = 117 bar



WATERS CORTECS 1.6 C18

$N_{0.5}$(pyr) = 35,200 pl/m

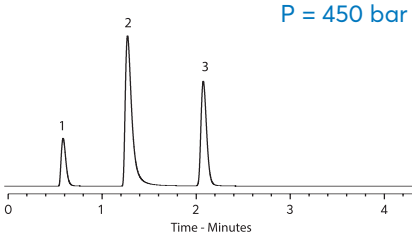
P = 285 bar



PHENOMENEX KINETEX 1.3 C18

$N_{0.5}$(pyr) = 44,400 pl/m

P = 450 bar



Column Dimensions: 50 x 2.1 mm - **Sample**: 1) uracil 2) pyridine 3) phenol - **Mobile Phase**: 30:70 (v/v) MeOH/10 mM NH_4OAc in H_2O (pH 5.8) - **Flow Rate**: 0.20 ml/min
Temperature: 22°C - **Wavelength**: 254nm.
Comparative data may not be representative of all applications.

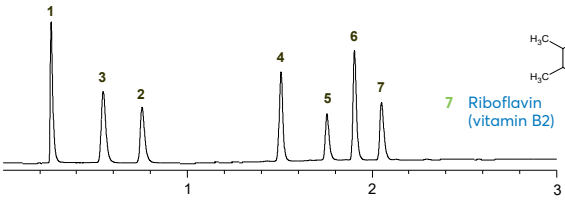
WATER SOLUBLE VITAMINS

ACE ULTRACORE 2.5 SUPERPHENYLHEXYL

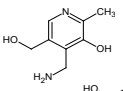
Column Dimensions: 50x2.1 mm, 2.5 µm
Gradient analysis
Mobile Phase: A: 20 mM KH_2PO_4 pH 2.7 (aq)
B: 20 mM KH_2PO_4 pH 2.7 in MeOH:Water 50:50 v/v

Time (mins)	%B
0	20
1	60
2	70

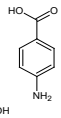
Flow Rate: 0.60 mL/min
Temperature: 40 °C
Detection: 205 nm



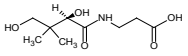
1 Pyridoxine (Vitamin B6)



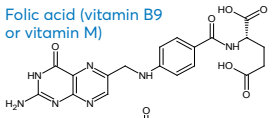
2 p-Aminobenzoic acid



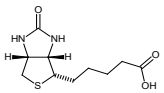
3 Pantothenic acid (vitamin B5)



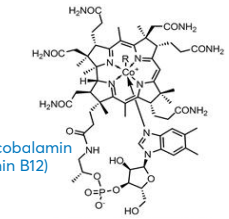
4 Folic acid (vitamin B9 or vitamin M)



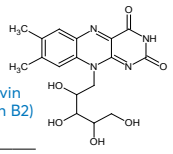
5 d-Biotin (vitamin B7 or vitamin H)



6 Cyancobalamin (vitamin B12)



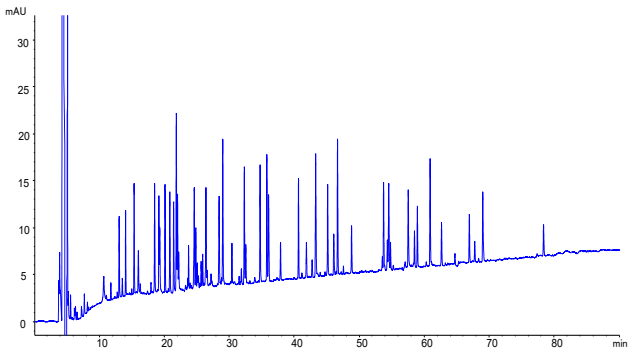
7 Riboflavin (vitamin B2)



TRYPTIC DIGEST OF BSA USING COUPLED COLUMNS

ACE ULTRACORE 2.5 SUPERC18

Column Dimensions: (3x) 150 x 2.1 mm
Part Number: CORE-25A-1502U
Mobile Phase: A: 0.05% TFA in H_2O
B: 0.05% TFA in MeCN
Gradient: 10 to 40% B in 90 mins
Flow Rate: 0.21 mL/min
Injection: 20 µL
Temperature: 60 °C
Detection: UV, 214 nm



ORDERING INFORMATION

AVANTOR® ACE® ULTRACORE, 2.5 µm PARTICLES SIZES

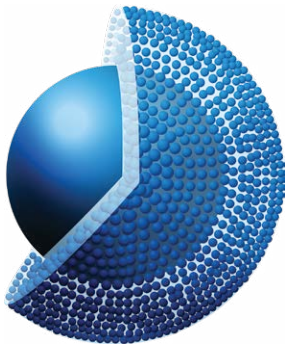
– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	SuperC18	SuperPhenylHexyl
2.1 x 50 mm	CORE-25A-0502U	CORE-25B-0502U
2.1 x 75 mm	CORE-25A-7502U	CORE-25B-7502U
2.1 x 100 mm	CORE-25A-1002U	CORE-25B-1002U
2.1 x 125 mm	CORE-25A-1202U	CORE-25B-1202U
2.1 x 150 mm	CORE-25A-1502U	CORE-25B-1502U
3.0 x 50 mm	CORE-25A-0503U	CORE-25B-0503U
3.0 x 75 mm	CORE-25A-7503U	CORE-25B-7503U
3.0 x 100 mm	CORE-25A-1003U	CORE-25B-1003U
3.0 x 125 mm	CORE-25A-1203U	CORE-25B-1203U
3.0 x 150 mm	CORE-25A-1503U	CORE-25B-1503U
4.6 x 50 mm	CORE-25A-0546U	CORE-25B-0546U
4.6 x 75 mm	CORE-25A-7546U	CORE-25B-7546U
4.6 x 100 mm	CORE-25A-1046U	CORE-25B-1046U
4.6 x 125 mm	CORE-25A-1246U	CORE-25B-1246U
4.6 x 150 mm	CORE-25A-1546U	CORE-25B-1546U
ACE guard cartidges (3pk)		
For 2.1 & 3.0mm ID columns*	CORE-A-GD2U	CORE-B-GD2U
For 4.6mm ID columns*	CORE-A-GD4U	CORE-B-GD4U
*Guards require holder H0011		

AVANTOR® ACE® ULTRACORE, 5 µm PARTICLES SIZES

– HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	SuperC18	SuperPhenylHexyl
2.1 x 50 mm	CORE-5A-0502U	CORE-5B-0502U
2.1 x 75 mm	CORE-5A-7502U	CORE-5B-7502U
2.1 x 100 mm	CORE-5A-1002U	CORE-5B-1002U
2.1 x 125 mm	CORE-5A-1202U	CORE-5B-1202U
2.1 x 150 mm	CORE-5A-1502U	CORE-5B-1502U
2.1 x 250 mm	CORE-5A-2502U	CORE-5B-2502U
3.0 x 50 mm	CORE-5A-0503U	CORE-5B-0503U
3.0 x 75 mm	CORE-5A-7503U	CORE-5B-7503U
3.0 x 100 mm	CORE-5A-1003U	CORE-5B-1003U
3.0 x 125 mm	CORE-5A-1203U	CORE-5B-1203U
3.0 x 150 mm	CORE-5A-1503U	CORE-5B-1503U
3.0 x 250 mm	CORE-5A-2503U	CORE-5B-2503U
4.6 x 50 mm	CORE-5A-0546U	CORE-5B-0546U
4.6 x 75 mm	CORE-5A-7546U	CORE-5B-7546U
4.6 x 100 mm	CORE-5A-1046U	CORE-5B-1046U
4.6 x 125 mm	CORE-5A-1246U	CORE-5B-1246U
4.6 x 150 mm	CORE-5A-1546U	CORE-5B-1546U
4.6 x 250 mm	CORE-5A-2546U	CORE-5B-2546U
ACE guard cartidges (5pk)		
For 2.1 & 3.0mm ID columns*	CORE-A-0102GD	CORE-B-0102GD
For 4.6mm ID columns*	CORE-A-0103GD	CORE-B-0103GD
*For use at HPLC pressures. Guards require holder H0001 & Coupler C0001		



Avantor® ACE® method development kits

INTELLIGENT SOLUTIONS FOR METHOD DEVELOPMENT

ACE Method Development Kits group together columns with different mechanisms of interaction to maximise selectivity and improve the likelihood of separating difficult or closely related analytes. Screening columns containing different bonded phases under the same mobile phase conditions can help you achieve your desired separation more quickly, therefore increasing productivity.

- 5 different ACE Method Development Kits available for rapid, systematic method development.
- Each kit contains carefully selected ACE phases which enables the power of selectivity to be fully exploited.
- Each ACE phase provides different selectivity due to differing interactions.

		SEPARATION MECHANISM AND RELATIVE STRENGTH [1]				
	Bonded Phase	Hydrophobic Binding	π-π Interaction	Dipole-Dipole	Hydrogen Bonding	Shape Selectivity
ACE ADVANCED METHOD DEVELOPMENT KIT	ACE C18	****	-	-	*	**
	ACE C18-AR	****	*** (donor)	*	**	***
	ACE C18-PFP	****	*** (acceptor)	****	***	****
ACE EXTENDED METHOD DEVELOPMENT KIT	ACE SuperC18	****	-	-	-	**
	ACE C18-Amide	****	-	**	****	**/***
	ACE CN-ES	***	*	***	**	*
ACE ULTRACORE METHOD DEVELOPMENT KIT	ACE UltraCore SuperC18	***	-	-	-	**
	ACE UltraCore SuperPhenylHexyl	**	*** (donor)	*	**	***
ACE BIOANALYTICAL 300Å METHOD DEVELOPMENT KIT	ACE C18-300	**	-	-	*	*
	ACE C4-300	*	-	-	-	-
	ACE Phenyl-300	*	** (donor)	*	**	**

[1] Approximate value – determined by semi-quantitative mechanism weightings and/or by reference to other ACE phases using >100 characterising analytes.

		SEPARATION MECHANISM AND RELATIVE STRENGTH [2]					
			Anionic Analyte Interactions		Cationic Analyte Interactions		
	Bonded Phase	Partitioning	Attraction	Repulsion	Attraction	Repulsion	H-bonding
ACE HILIC METHOD DEVELOPMENT KIT	ACE HILIC-A	**	-	***	****	-	*
	ACE HILIC-B	***	****	-	-	***	*
	ACE HILIC-N	****	-	-	-	-	****

[2] Approximate value – determined by semi-quantitative mechanism weightings and/or by reference to other ACE phases using >50 characterising analytes.

FREE

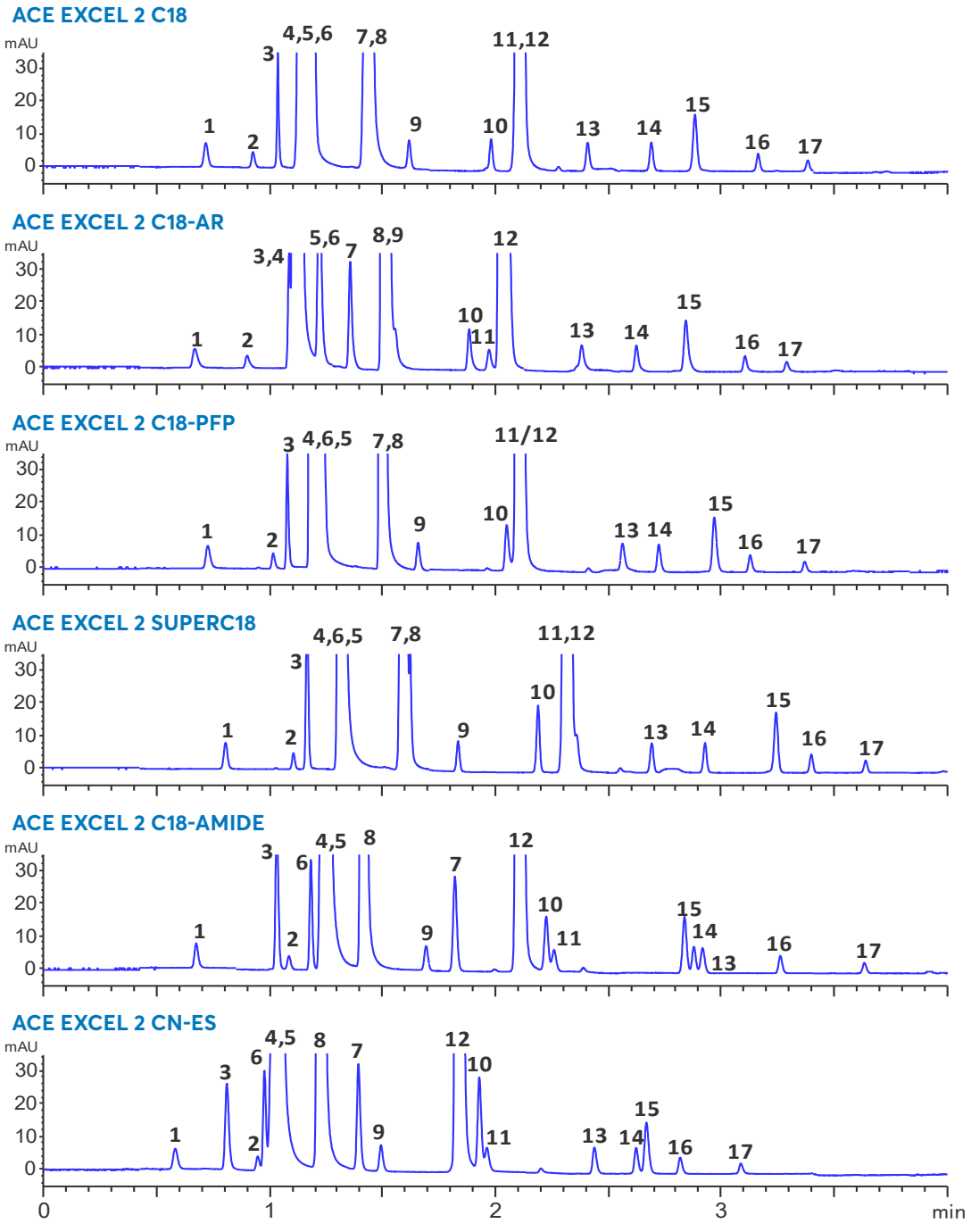
METHOD DEVELOPMENT SUPPORT!

- Not sure which ACE phase or kit will work best for your application?
- FREE Application Support and FREE Method Support Service
- Trust your method development to our experts and free up time for your other projects!

Contact our expert method development team via chromsupport@avantorsciences.com

METHOD DEVELOPMENT EXAMPLE

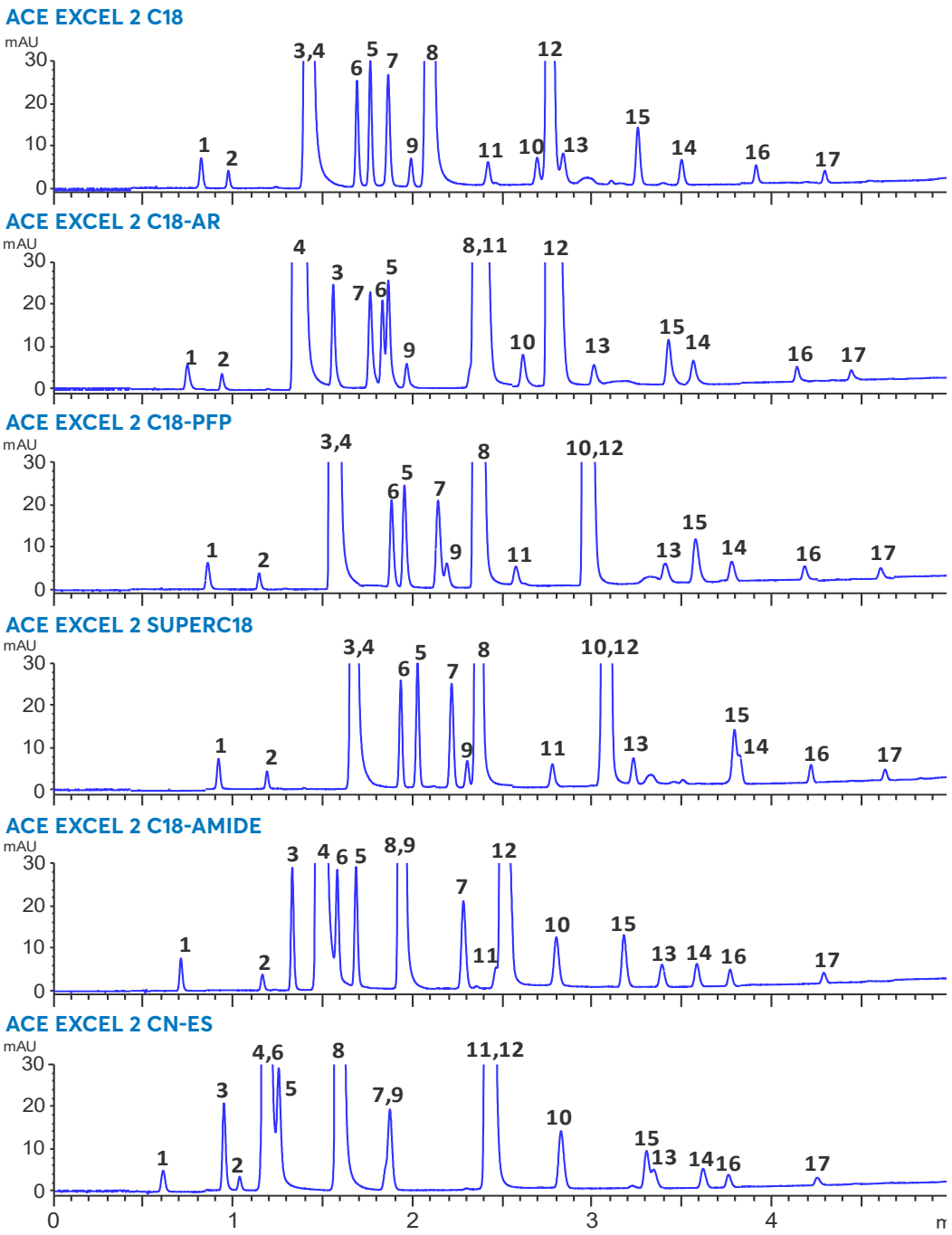
6 COLUMN SCREEN OF TRIPLE API SAMPLE – ACETONITRILE (MeCN)



Sample:	**Aspirin:** 5 mg/mL **Paracetamol:** 3.3 mg/mL **Caffeine:** 0.75 mg/mL Impurities spiked at 0.1% (wrt aspirin)
Column:	100 x 3.0 mm
System:	VWR Hitachi ChromasterUltra Rs
Mobile Phase:	**A:** 10 mM ammonium formate pH 3.0 **B1:** 10 mM ammonium formate pH 3.0 **in MeCN:**H_2O 9:1 v/v **B:** 10 mM ammonium formate pH 3.0 **in MeOH:**H2O 9:1 v/v
Gradient:	5-95% B in 5 minutes
Flow Rate:	1.2 mL/min
Temperature:	40 °C

1 2-Aminophenol
2 Hydroquinone
3 Theobromine
4 Paracetamol
5 Theophylline
6 Paraxanthine
7 4-Hydroxybenzoic acid
8 Caffeine
9 2-Acetamidophenol
10 2-Hydroxybenzoic acid
11 Phenol
12 Aspirin
13 4-Nitrophenol
14 4-Chloroacetanilide
15 2-Nitrophenol
16 Acetylsalicylsalicylic acid
17 Salsalate

6 COLUMN SCREEN OF TRIPLE API SAMPLE – METHANOL (MeOH)



Methanol provides better retention and selectivity for the more hydrophilic analytes.
The screening approach provides multiple options to pursue for obtaining a full separation.

The ACE C18, C18-AR and C18-Amide all resolve 11 of the 14 impurity peaks.

ORDERING INFORMATION

Selectivity OFFER!

Complementary phases in 1 easy kit

AVANTOR® ACE® ADVANCED METHOD DEVELOPMENT UHPLC/HPLC COLUMN KITS

- Contains 3 columns: ACE C18, ACE C18-AR and ACE C18-PFP of specified dimensions
- HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	1.7 µm	2 µm	3 µm	5 µm
2.1 x 50 mm	MDKA-17-0502U	MDKA-2-0502U	MDKA-3-0502U	MDKA-5-0502U
2.1 x 100 mm	MDKA-17-1002U	MDKA-2-1002U	MDKA-3-1002U	MDKA-5-1002U
2.1 x 150 mm	–	MDKA-2-1502U	MDKA-3--1502U	MDKA-5-1502U
2.1 x 250 mm	–	–	-	MDKA-5-2502U
3.0 x 50 mm	MDKA-17-0503U	MDKA-2-0503U	MDKA-3-0503U	MDKA-5-0503U
3.0 x 100 mm	MDKA-17-1003U	MDKA-2-1003U	MDKA-3-1003U	MDKA-5-1003U
3.0 x 150 mm	–	MDKA-2-1503U	MDKA-3-1503U	MDKA-5-1503U
3.0 x 250 mm	–	–	-	MDKA-5-2503U
4.6 x 50 mm	–	MDKA-2-0546U	MDKA-3-0546U	MDKA-5-0546U
4.6 x 100 mm	–	MDKA-2-1046U	MDKA-3-1046U	MDKA-5-1046U
4.6 x 150 mm	–	MDKA-2-1546U	MDKA-3-1546U	MDKA-5-1546U
4.6 x 250 mm	–	–	-	MDKA-5-2546U

AVANTOR® ACE® EXTENDED METHOD DEVELOPMENT UHPLC/HPLC COLUMN KITS

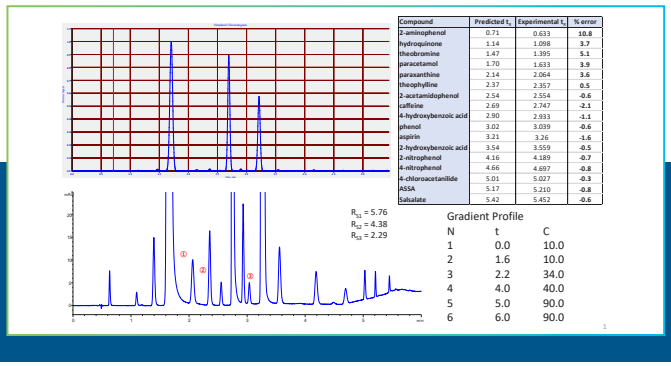
- Contains 3 columns: ACE SuperC18, ACE C18-Amide and ACE CN-ES of specified dimensions
- HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	1.7 µm	2 µm	3 µm	5 µm
2.1 x 50 mm	MDKE-17-0502U	MDKE-2-0502U	MDKE-3-0502U	MDKE-5-0502U
2.1 x 100 mm	MDKE-17-1002U	MDKE-2-1002U	MDKE-3-1002U	MDKE-5-1002U
2.1 x 150 mm	–	MDKE-2-1502U	MDKE-3--1502U	MDKE-5-1502U
2.1 x 250 mm	–	–	-	MDKE-5-2502U
3.0 x 50 mm	MDKE-17-0503U	MDKE-2-0503U	MDKE-3-0503U	MDKE-5-0503U
3.0 x 100 mm	MDKE-17-1003U	MDKE-2-1003U	MDKE-3-1003U	MDKE-5-1003U
3.0 x 150 mm	–	MDKE-2-1503U	MDKE-3-1503U	MDKE-5-1503U
3.0 x 250 mm	–	–	-	MDKE-5-2503U
4.6 x 50 mm	–	MDKE-2-0546U	MDKE-3-0546U	MDKE-5-0546U
4.6 x 100 mm	–	MDKE-2-1046U	MDKE-3-1046U	MDKE-5-1046U
4.6 x 150 mm	–	MDKE-2-1546U	MDKE-3-1546U	MDKE-5-1546U
4.6 x 250 mm	–	–	-	MDKE-5-2546U

Request your **FREE** ACE Reversed-Phase Systematic Method Development Protocol

Optimising the separation with

ChromSword 2



AVANTOR® ACE® ULTRACORE METHOD DEVELOPMENT UHPLC/HPLC COLUMN KITS

- Contains 2 columns: ACE UltraCore SuperC18 and ACE UltraCore SuperPhenylHexyl of specified dimensions
- HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	2.5 µm	5 µm
2.1 x 50 mm	MDKU-25-0502U	MDKU-5-0502U
2.1 x 100 mm	MDKU-25-1002U	MDKU-5-1002U
2.1 x 150 mm	MDKU-25--1502U	MDKU-5-1502U
2.1 x 250 mm	–	MDKU-5-2502U
3.0 x 50 mm	MDKU-25-0503U	MDKU-5-0503U
3.0 x 100 mm	MDKU-25-1003U	MDKU-5-1003U
3.0 x 150 mm	MDKU-25-1503U	MDKU-5-1503U
3.0 x 250 mm	–	MDKU-5-2503U
4.6 x 50 mm	MDKU-25-0546U	MDKU-5-0546U
4.6 x 100 mm	MDKU-25-1046U	MDKU-5-1046U
4.6 x 150 mm	MDKU-25-1546U	MDKU-5-1546U
4.6 x 250 mm	–	MDKU-5-2546U

AVANTOR® ACE® HILIC METHOD DEVELOPMENT UHPLC/HPLC COLUMN KITS

- Contains 3 columns: ACE HILIC-A, ACE HILIC-B and ACE HILIC-N of specified dimensions
- HPLC/UHPLC hardware format with 1,000 bar / 15,000 psi pressure limit

Column Dimensions	1.7 µm	3 µm	5 µm
2.1 x 50 mm	MDKH-17-0502U	MDKH-3-0502U	MDKH-5-0502U
2.1 x 100 mm	MDKH-17-1002U	MDKH-3-1002U	MDKH-5-1002U
2.1 x 150 mm	–	MDKH-3--1502U	MDKH-5-1502U
2.1 x 250 mm	–	-	MDKH-5-2502U
3.0 x 50 mm	MDKH-17-0503U	MDKH-3-0503U	MDKH-5-0503U
3.0 x 100 mm	MDKH-17-1003U	MDKH-3-1003U	MDKH-5-1003U
3.0 x 150 mm	–	MDKH-3-1503U	MDKH-5-1503U
3.0 x 250 mm	–	-	MDKH-5-2503U
4.6 x 50 mm	–	MDKH-3-0546U	MDKH-5-0546U
4.6 x 100 mm	–	MDKH-3-1046U	MDKH-5-1046U
4.6 x 150 mm	–	MDKH-3-1546U	MDKH-5-1546U
4.6 x 250 mm	–	-	MDKH-5-2546U

AVANTOR® ACE® BIOANALYTICAL METHOD DEVELOPMENT UHPLC/HPLC COLUMN KITS

- Contains 3 columns: ACE C18-300, ACE C4-300 and ACE Phenyl-300 of specified dimensions
- HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	3 µm	5 µm
2.1 x 50 mm	MDKB-3-0502U	MDKB-5-0502U
2.1 x 75 mm	MDKB-3-7502U	MDKB-5-7502U
2.1 x 100 mm	MDKB-3-1002U	MDKB-5-1002U
2.1 x 150 mm	MDKB-3--1502U	MDKB-5-1502U
2.1 x 250 mm	–	MDKB-5-2502U
3.0 x 50 mm	MDKB-3-0503U	MDKB-5-0503U
3.0 x 100 mm	MDKB-3-1003U	MDKB-5-1003U
3.0 x 150 mm	MDKB-3-1503U	MDKB-5-1503U
3.0 x 250 mm	–	MDKB-5-2503U
4.6 x 50 mm	MDKB-3-0546U	MDKB-5-0546U
4.6 x 100 mm	MDKB-3-1046U	MDKB-5-1046U
4.6 x 150 mm	MDKB-3-1546U	MDKB-5-1546U
4.6 x 250 mm	–	MDKB-5-2546U

Avantor® ACE® capillary and nano columns

- ACE traditional chemistries and novel phases are available in capillary (500 µm and 300 µm) and nano (100 µm and 75 µm) dimensions
- 100 Å and 300 Å columns available
- High efficiency, long lifetime and reproducibility
- LC-MS and LC-MS/MS applications

ACE capillary and nano HPLC columns offer high sensitivity for LC-MS applications

- Relevant in the areas of pharmacokinetics, trace analysis, bioanalysis and proteomics
- Ideal for detectors requiring low flow rates such as electrospray LC-MS

Column ID (mm)	Typical flow rate (µL/min)	Theoretical sensitivity increase[1]
4.6	1,000	1
1.0	40	21
0.5	10	85
0.3	3	235
0.1	0.5	2,100
0.075	0.3	3,760

[1] For same sample mass

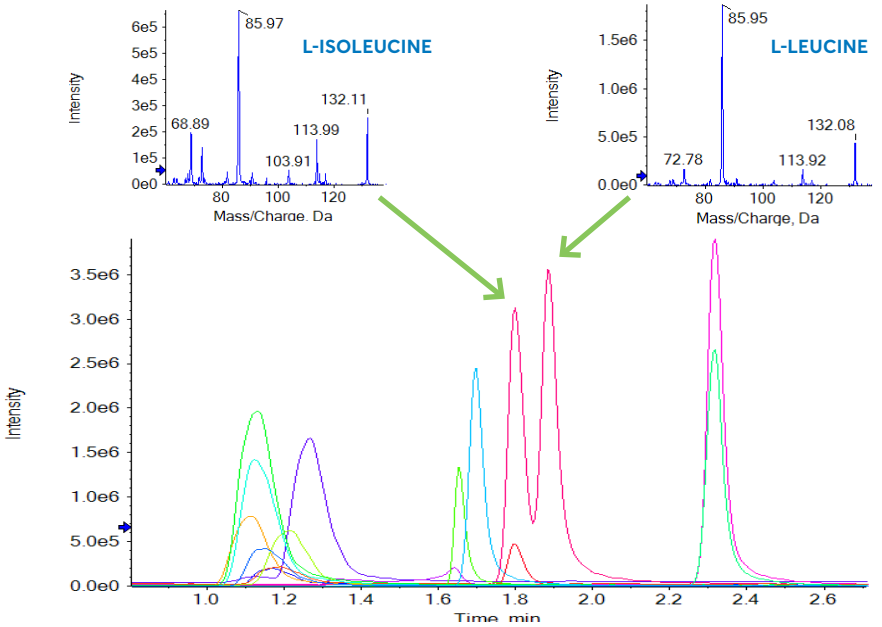
FREE AMINO ACIDS IN EXTRA-CELLULAR MATRIX

CONDITIONS

Column: **ACE 3 AQ**
Dimensions: 150 x 0.5 mm
Part Number: ACE-116-15005
Mobile Phase: A: 0.1% (v/v) formic acid in H_2O
B: 0.1% (v/v) formic acid in MeCN

Time (mins)	%B
0	2
5	20

Flow Rate: 20 µL/min
Injection: 2 µL
Detection: SCIEX QTRAP 6500 LC-MS/MS system
IonDrive Turbo V source
Positive ion MRM mode
Sample: Standard solution containing 2.5 µmol/mL each amino acid (1.25 µmol/mL cysteine). 0.5 pmol on-column (except for cysteine, 0.25 pmol on-column).
Method also applied to analysis of cell supernatant from purified peripheral blood mononuclear cells (PBMCs)

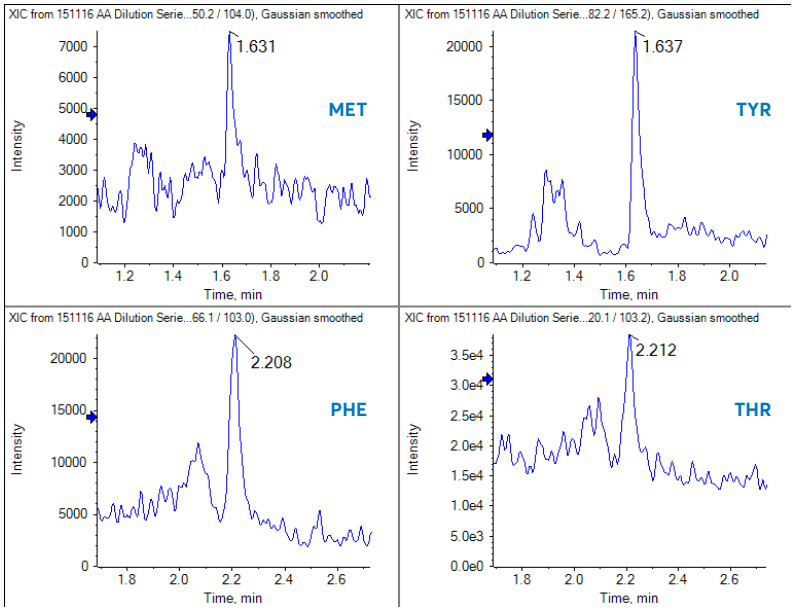


Full scan linear ion trap MS/MS data can distinguish isobaric amino acids L-isoleucine and L-leucine.

MRM transitions and limits of detection (LODs) for 17 free amino acids and their concentrations measured in diluted PBMC cell supernatant.

Peak	Analyte	Rt (mins)	MRM Transition (m/z)	LOD (fmol)	PBMC cell conc. (fmol/µL)
1	Lys	1.094	147.1 → 84	5	305
2	His	1.111	156.1 →110	5	23
3	Arg	1.117	175.2 →70	2.5	220
4	Gly	1.129	76.1 → 30	<1000	<LOD
5	Cys	1.140	241.2 → 152.1	1.25	36
6	Asp	1.155	134.1 → 74	10	26
7	Ser	1.156	106.1 → 60	50	21
8	Ala	1.189	90.1 → 44	<1000	<LOD
9	Glu	1.208	148.1 →84	5	55
10	Pro	1.262	116.1 → 70	2.5	96
11	Val	1.630	118.1 → 55	25	105
12	Met	1.645	150.2 →104	1	3
13	Tyr	1.669	182.2 →165.2	1	97
14	Ile	1.773	132.1 → 86, 69	2.5	329
15	Leu	1.858	132.1 → 86	2.5	338
16	Phe	2.273	166.1 → 103	1	100
17	Thr	2.275	120.1 → 103.2	1	97

MRM extracted ion chromatograms for four amino acids each at 1 fmol on-column



ORDERING INFORMATION

IMPORTANT NOTE:

ACE microbore columns are available with either standard 1/16" (10-32 thread) connections or 1/32" (6-40 thread) connections. For use with Eksigent micro and nano LC systems, order columns with 1/32" connections and use either ACE 6-40 fittings (ACE-MC3210, 10 pack) **or Eksigent 6-40 fittings**. For 1/16" HPLC column connections up to 6,000 psi, PEEK™ 1/16" fingertight fittings (ACE-CC10, 10 pack) are recommended. For 1/32" microbore HPLC column connections up to 6,000 psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (ACE-MC3210, 10 pack) are recommended.

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 1/16" PORT, 3 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	NH_2
0.075 x 100 mm	ACE-111-1000075	ACE-112-1000075	ACE-113-1000075	ACE-114-1000075	ACE-115-1000075	ACE-116-1000075	ACE-117-1000075	ACE-1114-1000075
0.075 x 150 mm	ACE-111-1500075	ACE-112-1500075	ACE-113-1500075	ACE-114-1500075	ACE-115-1500075	ACE-126-1500075	ACE-117-1500075	ACE-1114-1500075
0.10 x 100 mm	ACE-111-10001	ACE-112-10001	ACE-113-10001	ACE-114-10001	ACE-115-10001	ACE-116-10001	ACE-117-10001	ACE-1114-10001
0.10 x 150 mm	ACE-111-15001	ACE-112-15001	ACE-113-15001	ACE-114-15001	ACE-115-15001	ACE-116-15001	ACE-117-15001	ACE-1114-15001
0.30 x 50 mm	ACE-111-05003	ACE-112-05003	ACE-113-05003	ACE-114-05003	ACE-115-05003	ACE-116-05003	ACE-117-05003	ACE-1114-05003
0.30 x 100 mm	ACE-111-10003	ACE-112-10003	ACE-113-10003	ACE-114-10003	ACE-115-10003	ACE-116-10003	ACE-117-10003	ACE-1114-10003
0.30 x 150 mm	ACE-111-15003	ACE-112-15003	ACE-113-15003	ACE-114-15003	ACE-115-15003	ACE-116-15003	ACE-117-15003	ACE-1114-15003
0.50 x 50 mm	ACE-111-05005	ACE-112-05005	ACE-113-05005	ACE-114-05005	ACE-115-05005	ACE-116-05005	ACE-117-05005	ACE-1114-05005
0.50 x 100 mm	ACE-111-10005	ACE-112-10005	ACE-113-10005	ACE-114-10005	ACE-115-10005	ACE-116-10005	ACE-117-10005	ACE-1114-10005
0.50 x 150 mm	ACE-111-15005	ACE-112-15005	ACE-113-15005	ACE-114-15005	ACE-115-15005	ACE-116-15005	ACE-117-15005	ACE-1114-15005

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 1/16" PORT, 5 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	NH_2
0.075 x 100 mm	ACE-121-1000075	ACE-122-1000075	ACE-123-1000075	ACE-124-1000075	ACE-125-1000075	ACE-126-1000075	ACE-127-1000075	ACE-1214-1000075
0.075 x 150 mm	ACE-121-1500075	ACE-122-1500075	ACE-123-1500075	ACE-124-1500075	ACE-125-1500075	ACE-126-1500075	ACE-127-1500075	ACE-1214-1500075
0.075 x 250 mm	ACE-121-2500075	ACE-122-2500075	ACE-123-2500075	ACE-124-2500075	ACE-125-2500075	ACE-126-2500075	ACE-127-2500075	ACE-1214-2500075
0.10 x 100 mm	ACE-121-10001	ACE-122-10001	ACE-123-10001	ACE-124-10001	ACE-125-10001	ACE-126-10001	ACE-127-10001	ACE-1214-10001
0.10 x 150 mm	ACE-121-15001	ACE-122-15001	ACE-123-15001	ACE-124-15001	ACE-125-15001	ACE-126-15001	ACE-127-15001	ACE-1214-15001
0.10 x 250 mm	ACE-121-25001	ACE-122-25001	ACE-123-25001	ACE-124-25001	ACE-125-25001	ACE-126-25001	ACE-127-25001	ACE-1214-25001
0.30 x 50 mm	ACE-121-05003	ACE-122-05003	ACE-123-05003	ACE-124-05003	ACE-125-05003	ACE-126-05003	ACE-127-05003	ACE-1214-05003
0.30 x 100 mm	ACE-121-10003	ACE-122-10003	ACE-123-10003	ACE-124-10003	ACE-125-10003	ACE-126-10003	ACE-127-10003	ACE-1214-10003
0.30 x 150 mm	ACE-121-15003	ACE-122-15003	ACE-123-15003	ACE-124-15003	ACE-125-15003	ACE-126-15003	ACE-127-15003	ACE-1214-15003
0.30 x 250 mm	ACE-121-25003	ACE-122-25003	ACE-123-25003	ACE-124-25003	ACE-125-25003	ACE-126-25003	ACE-127-25003	ACE-1214-25003
0.50 x 50 mm	ACE-121-05005	ACE-122-05005	ACE-123-05005	ACE-124-05005	ACE-125-05005	ACE-126-05005	ACE-127-05005	ACE-1214-05005
0.50 x 100 mm	ACE-121-10005	ACE-122-10005	ACE-123-10005	ACE-124-10005	ACE-125-10005	ACE-126-10005	ACE-127-10005	ACE-1214-10005
0.50 x 150 mm	ACE-121-15005	ACE-122-15005	ACE-123-15005	ACE-124-15005	ACE-125-15005	ACE-126-15005	ACE-127-15005	ACE-1214-15005
0.50 x 250 mm	ACE-121-25005	ACE-122-25005	ACE-123-25005	ACE-124-25005	ACE-125-25005	ACE-126-25005	ACE-127-25005	ACE-1214-25005

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 1/32" PORT, 3 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	NH_2
0.075 x 100 mm	ACE-111-1000075S	ACE-112-1000075S	ACE-113-1000075S	ACE-114-1000075S	ACE-115-1000075S	ACE-116-1000075S	ACE-117-1000075S	ACE-1114-1000075S
0.075 x 150 mm	ACE-111-1500075S	ACE-112-1500075S	ACE-113-1500075S	ACE-114-1500075S	ACE-115-1500075S	ACE-126-1500075S	ACE-117-1500075S	ACE-1114-1500075S
0.10 x 100 mm	ACE-111-10001S	ACE-112-10001S	ACE-113-10001S	ACE-114-10001S	ACE-115-10001S	ACE-116-10001S	ACE-117-10001S	ACE-1114-10001S
0.10 x 150 mm	ACE-111-15001S	ACE-112-15001S	ACE-113-15001S	ACE-114-15001S	ACE-115-15001S	ACE-116-15001S	ACE-117-15001S	ACE-1114-15001S
0.30 x 50 mm	ACE-111-05003S	ACE-112-05003S	ACE-113-05003S	ACE-114-05003S	ACE-115-05003S	ACE-116-05003S	ACE-117-05003S	ACE-1114-05003S
0.30 x 100 mm	ACE-111-10003S	ACE-112-10003S	ACE-113-10003S	ACE-114-10003S	ACE-115-10003S	ACE-116-10003S	ACE-117-10003S	ACE-1114-10003S
0.30 x 150 mm	ACE-111-15003S	ACE-112-15003S	ACE-113-15003S	ACE-114-15003S	ACE-115-15003S	ACE-116-15003S	ACE-117-15003S	ACE-1114-15003S
0.50 x 50 mm	ACE-111-05005S	ACE-112-05005S	ACE-113-05005S	ACE-114-05005S	ACE-115-05005S	ACE-116-05005S	ACE-117-05005S	ACE-1114-05005S
0.50 x 100 mm	ACE-111-10005S	ACE-112-10005S	ACE-113-10005S	ACE-114-10005S	ACE-115-10005S	ACE-116-10005S	ACE-117-10005S	ACE-1114-10005S
0.50 x 150 mm	ACE-111-15005S	ACE-112-15005S	ACE-113-15005S	ACE-114-15005S	ACE-115-15005S	ACE-116-15005S	ACE-117-15005S	ACE-1114-15005S

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 1/32" PORT, 5 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	NH_2
0.075 x 100 mm	ACE-121-1000075S	ACE-122-1000075S	ACE-123-1000075S	ACE-124-1000075	ACE-125-1000075S	ACE-126-1000075S	ACE-127-1000075S	ACE-1214-1000075S
0.075 x 150 mm	ACE-121-1500075S	ACE-122-1500075S	ACE-123-1500075S	ACE-124-1500075S	ACE-125-1500075S	ACE-126-1500075S	ACE-127-1500075S	ACE-1214-1500075S
0.075 x 250 mm	ACE-121-2500075S	ACE-122-2500075S	ACE-123-2500075S	ACE-124-2500075S	ACE-125-2500075S	ACE-126-2500075S	ACE-127-2500075S	ACE-1214-2500075S
0.10 x 100 mm	ACE-121-10001S	ACE-122-10001S	ACE-123-10001S	ACE-124-10001S	ACE-125-10001S	ACE-126-10001S	ACE-127-10001S	ACE-1214-10001S
0.10 x 150 mm	ACE-121-15001S	ACE-122-15001S	ACE-123-15001S	ACE-124-15001S	ACE-125-15001S	ACE-126-15001S	ACE-127-15001S	ACE-1214-15001S
0.10 x 250 mm	ACE-121-25001	ACE-122-25001S	ACE-123-25001S	ACE-124-25001S	ACE-125-25001S	ACE-126-25001S	ACE-127-25001S	ACE-1214-25001S
0.30 x 50 mm	ACE-121-05003S	ACE-122-05003S	ACE-123-05003S	ACE-124-05003S	ACE-125-05003S	ACE-126-05003S	ACE-127-05003S	ACE-1214-05003S
0.30 x 100 mm	ACE-121-10003S	ACE-122-10003S	ACE-123-10003S	ACE-124-10003S	ACE-125-10003S	ACE-126-10003S	ACE-127-10003S	ACE-1214-10003S
0.30 x 150 mm	ACE-121-15003S	ACE-122-15003S	ACE-123-15003S	ACE-124-15003S	ACE-125-15003S	ACE-126-15003S	ACE-127-15003S	ACE-1214-15003S
0.30 x 250 mm	ACE-121-25003S	ACE-122-25003S	ACE-123-25003S	ACE-124-25003S	ACE-125-25003S	ACE-126-25003S	ACE-127-25003S	ACE-1214-25003S
0.50 x 50 mm	ACE-121-05005S	ACE-122-05005S	ACE-123-05005S	ACE-124-05005S	ACE-125-05005S	ACE-126-05005S	ACE-127-05005S	ACE-1214-05005S
0.50 x 100 mm	ACE-121-10005S	ACE-122-10005S	ACE-123-10005S	ACE-124-10005S	ACE-125-10005S	ACE-126-10005S	ACE-127-10005S	ACE-1214-10005S
0.50 x 150 mm	ACE-121-15005S	ACE-122-15005S	ACE-123-15005S	ACE-124-15005S	ACE-125-15005S	ACE-126-15005S	ACE-127-15005S	ACE-1214-15005S
0.50 x 250 mm	ACE-121-25005S	ACE-122-25005S	ACE-123-25005S	ACE-124-25005S	ACE-125-25005S	ACE-126-25005S	ACE-127-25005S	ACE-1214-25005S

AVANTOR® ACE® NOVEL CHEMISTRIES, 1/16" PORT, 3 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
0.075 x 100 mm	ACE-119-1000075	ACE-1110-1000075	ACE-1111-1000075	ACE-1112-1000075	ACE-1113-1000075
0.075 x 150 mm	ACE-119-1500075	ACE-1110-1500075	ACE-1111-1500075	ACE-1112-1500075	ACE-1113-1500075
0.10 x 100 mm	ACE-119-10001	ACE-1110-10001	ACE-1111-10001	ACE-1112-10001	ACE-1113-10001
0.10 x 150 mm	ACE-119-15001	ACE-1110-15001	ACE-1111-15001	ACE-1112-15001	ACE-1113-15001
0.30 x 50 mm	ACE-119-05003	ACE-1110-05003	ACE-1111-05003	ACE-1112-05003	ACE-1113-05003
0.30 x 100 mm	ACE-119-10003	ACE-1110-10003	ACE-1111-10003	ACE-1112-10003	ACE-1113-10003
0.30 x 150 mm	ACE-119-15003	ACE-1110-15003	ACE-1111-15003	ACE-1112-15003	ACE-1113-15003
0.50 x 50 mm	ACE-119-05005	ACE-1110-05005	ACE-1111-05005	ACE-1112-05005	ACE-1113-05005
0.50 x 100 mm	ACE-119-10005	ACE-1110-10005	ACE-1111-10005	ACE-1112-10005	ACE-1113-10005
0.50 x 150 mm	ACE-119-15005	ACE-1110-15005	ACE-1111-15005	ACE-1112-15005	ACE-1113-15005

AVANTOR® ACE® NOVEL CHEMISTRIES, 1/16" PORT, 5 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
0.075 x 100 mm	ACE-129-1000075	ACE-1210-1000075	ACE-1211-1000075	ACE-1212-1000075	ACE-1213-1000075
0.075 x 150 mm	ACE-129-1500075	ACE-1210-1500075	ACE-1211-1500075	ACE-1212-1500075	ACE-1213-1500075
0.075 x 250 mm	ACE-129-2500075	ACE-1210-2500075	ACE-1211-2500075	ACE-1212-2500075	ACE-1213-2500075
0.10 x 100 mm	ACE-129-10001	ACE-1210-10001	ACE-1211-10001	ACE-1212-10001	ACE-1213-10001
0.10 x 150 mm	ACE-129-15001	ACE-1210-15001	ACE-1211-15001	ACE-1212-15001	ACE-1213-15001
0.10 x 250 mm	ACE-129-25001	ACE-1210-25001	ACE-1211-25001	ACE-1212-25001	ACE-1213-25001
0.30 x 50 mm	ACE-129-05003	ACE-1210-05003	ACE-1211-05003	ACE-1212-05003	ACE-1213-05003
0.30 x 100 mm	ACE-129-10003	ACE-1210-10003	ACE-1211-10003	ACE-1212-10003	ACE-1213-10003
0.30 x 150 mm	ACE-129-15003	ACE-1210-15003	ACE-1211-15003	ACE-1212-15003	ACE-1213-15003
0.30 x 250 mm	ACE-129-25003	ACE-1210-25003	ACE-1211-25003	ACE-1212-25003	ACE-1213-25003
0.50 x 50 mm	ACE-129-05005	ACE-1210-05005	ACE-1211-05005	ACE-1212-05005	ACE-1213-05005
0.50 x 100 mm	ACE-129-10005	ACE-1210-10005	ACE-1211-10005	ACE-1212-10005	ACE-1213-10005
0.50 x 150 mm	ACE-129-15005	ACE-1210-15005	ACE-1211-15005	ACE-1212-15005	ACE-1213-15005
0.50 x 250 mm	ACE-129-25005	ACE-1210-25005	ACE-1211-25005	ACE-1212-25005	ACE-1213-25005

AVANTOR® ACE® CAPILLARY AND NANO COLUMNS, 1/32" PORT, 3 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
0.075 x 100 mm	ACE-119-1000075S	ACE-1110-1000075S	ACE-1111-1000075	ACE-1112-1000075S	ACE-1113-1000075S
0.075 x 150 mm	ACE-119-1500075S	ACE-1110-1500075S	ACE-1111-1500075S	ACE-1112-1500075S	ACE-1113-1500075S
0.10 x 100 mm	ACE-119-10001S	ACE-1110-10001S	ACE-1111-10001S	ACE-1112-10001S	ACE-1113-10001S
0.10 x 150 mm	ACE-119-15001S	ACE-1110-15001S	ACE-1111-15001S	ACE-1112-15001S	ACE-1113-15001S
0.30 x 50 mm	ACE-119-05003S	ACE-1110-05003S	ACE-1111-05003S	ACE-1112-05003S	ACE-1113-05003S
0.30 x 100 mm	ACE-119-10003S	ACE-1110-10003S	ACE-1111-10003S	ACE-1112-10003S	ACE-1113-10003S
0.30 x 150 mm	ACE-119-15003S	ACE-1110-15003S	ACE-1111-15003S	ACE-1112-15003S	ACE-1113-15003S
0.50 x 50 mm	ACE-119-05005S	ACE-1110-05005S	ACE-1111-05005S	ACE-1112-05005S	ACE-1113-05005S
0.50 x 100 mm	ACE-119-10005S	ACE-1110-10005S	ACE-1111-10005S	ACE-1112-10005S	ACE-1113-10005S
0.50 x 150 mm	ACE-119-15005S	ACE-1110-15005S	ACE-1111-15005S	ACE-1112-15005S	ACE-1113-15005S

AVANTOR® ACE® CAPILLARY AND NANO COLUMNS, 1/32" PORT, 5 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
0.075 x 100 mm	ACE-129-1000075	ACE-1210-1000075S	ACE-1211-1000075S	ACE-1212-1000075S	ACE-1213-1000075S
0.075 x 150 mm	ACE-129-1500075S	ACE-1210-1500075S	ACE-1211-1500075S	ACE-1212-1500075S	ACE-1213-1500075S
0.075 x 250 mm	ACE-129-2500075S	ACE-1210-2500075S	ACE-1211-2500075S	ACE-1212-2500075S	ACE-1213-2500075S
0.10 x 100 mm	ACE-129-10001S	ACE-1210-10001S	ACE-1211-10001S	ACE-1212-10001S	ACE-1213-10001S
0.10 x 150 mm	ACE-129-15001S	ACE-1210-15001S	ACE-1211-15001S	ACE-1212-15001S	ACE-1213-15001S
0.10 x 250 mm	ACE-129-25001S	ACE-1210-25001S	ACE-1211-25001S	ACE-1212-25001S	ACE-1213-25001S
0.30 x 50 mm	ACE-129-05003S	ACE-1210-05003S	ACE-1211-05003S	ACE-1212-05003S	ACE-1213-05003S
0.30 x 100 mm	ACE-129-10003S	ACE-1210-10003S	ACE-1211-10003S	ACE-1212-10003S	ACE-1213-10003S
0.30 x 150 mm	ACE-129-15003S	ACE-1210-15003S	ACE-1211-15003S	ACE-1212-15003S	ACE-1213-15003S
0.30 x 250 mm	ACE-129-25003S	ACE-1210-25003S	ACE-1211-25003S	ACE-1212-25003S	ACE-1213-25003S
0.50 x 50 mm	ACE-129-05005S	ACE-1210-05005S	ACE-1211-05005S	ACE-1212-05005S	ACE-1213-05005S
0.50 x 100 mm	ACE-129-10005S	ACE-1210-10005S	ACE-1211-10005S	ACE-1212-10005S	ACE-1213-10005S
0.50 x 150 mm	ACE-129-15005S	ACE-1210-15005S	ACE-1211-15005S	ACE-1212-15005S	ACE-1213-15005S
0.50 x 250 mm	ACE-129-25005S	ACE-1210-25005S	ACE-1211-25005S	ACE-1212-25005S	ACE-1213-25005S

AVANTOR® ACE® 300 Å CHEMISTRIES, 1/16" PORT, 3 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
0.075 x 100 mm	ACE-211-1000075	ACE-212-1000075	ACE-213-1000075	ACE-214-1000075	ACE-215-1000075
0.075 x 150 mm	ACE-211-1500075	ACE-212-1500075	ACE-213-1500075	ACE-214-1500075	ACE-215-1500075
0.10 x 100 mm	ACE-211-10001	ACE-212-10001	ACE-213-10001	ACE-214-10001	ACE-215-10001
0.10 x 150 mm	ACE-211-15001	ACE-212-15001	ACE-213-15001	ACE-214-15001	ACE-215-15001
0.30 x 50 mm	ACE-211-05003	ACE-212-05003	ACE-213-05003	ACE-214-05003	ACE-215-05003
0.30 x 100 mm	ACE-211-10003	ACE-212-10003	ACE-213-10003	ACE-214-10003	ACE-215-10003
0.30 x 150 mm	ACE-211-15003	ACE-212-15003	ACE-213-15003	ACE-214-15003	ACE-215-15003
0.50 x 50 mm	ACE-211-05005	ACE-212-05005	ACE-213-05005	ACE-214-05005	ACE-215-05005
0.50 x 100 mm	ACE-211-10005	ACE-212-10005	ACE-213-10005	ACE-214-10005	ACE-215-10005
0.50 x 150 mm	ACE-211-15005	ACE-212-15005	ACE-213-15005	ACE-214-15005	ACE-215-15005

AVANTOR® ACE® 300 Å CHEMISTRIES, 1/16" PORT, 5 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
0.075 x 100 mm	ACE-221-1000075	ACE-222-1000075	ACE-223-1000075	ACE-224-100007	ACE-225-1000075
0.075 x 150 mm	ACE-221-1500075	ACE-222-1500075	ACE-223-1500075	ACE-224-1500075	ACE-225-1500075
0.075 x 250 mm	ACE-221-2500075	ACE-222-2500075	ACE-223-2500075	ACE-224-2500075	ACE-225-2500075
0.10 x 100 mm	ACE-221-10001	ACE-222-10001	ACE-223-10001	ACE-224-10001	ACE-225-10001
0.10 x 150 mm	ACE-221-15001	ACE-222-15001	ACE-223-15001	ACE-224-15001	ACE-225-15001
0.10 x 250 mm	ACE-221-2500	ACE-222-25001	ACE-223-25001	ACE-224-25001	ACE-225-25001
0.30 x 50 mm	ACE-221-05003	ACE-222-05003	ACE-223-05003	ACE-224-05003	ACE-225-05003
0.30 x 100 mm	ACE-221-10003	ACE-222-10003	ACE-223-10003	ACE-224-10003	ACE-225-10003
0.30 x 150 mm	ACE-221-15003	ACE-222-15003	ACE-223-15003	ACE-224-15003	ACE-225-15003
0.30 x 250 mm	ACE-221-25003	ACE-222-25003	ACE-223-25003	ACE-224-25003	ACE-225-25003
0.50 x 50 mm	ACE-221-05005	ACE-222-05005	ACE-223-05005	ACE-224-05005	ACE-225-05005
0.50 x 100 mm	ACE-221-10005	ACE-222-10005	ACE-223-10005	ACE-224-10005	ACE-225-10005
0.50 x 150 mm	ACE-221-15005	ACE-222-15005	ACE-223-15005	ACE-224-15005	ACE-225-15005
0.50 x 250 mm	ACE-221-25005	ACE-222-25005	ACE-223-25005	ACE-224-25005	ACE-225-25005

AVANTOR® ACE® 300 Å CHEMISTRIES, 1/32" PORT, 3 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
0.075 x 100 mm	ACE-211-1000075S	ACE-212-1000075S	ACE-213-1000075S	ACE-214-1000075S	ACE-215-1000075S
0.075 x 150 mm	ACE-211-1500075S	ACE-212-1500075S	ACE-213-1500075S	ACE-214-1500075S	ACE-215-1500075S
0.10 x 100 mm	ACE-211-10001S	ACE-212-10001S	ACE-213-10001S	ACE-214-10001S	ACE-215-10001S
0.10 x 150 mm	ACE-211-15001S	ACE-212-15001S	ACE-213-15001S	ACE-214-15001S	ACE-215-15001S
0.30 x 50 mm	ACE-211-05003S	ACE-212-05003S	ACE-213-05003S	ACE-214-05003S	ACE-215-05003S
0.30 x 100 mm	ACE-211-10003S	ACE-212-10003S	ACE-213-10003S	ACE-214-10003S	ACE-215-10003S
0.30 x 150 mm	ACE-211-15003S	ACE-212-15003S	ACE-213-15003S	ACE-214-15003S	ACE-215-15003S
0.50 x 50 mm	ACE-211-05005S	ACE-212-05005S	ACE-213-05005S	ACE-214-05005S	ACE-215-05005S
0.50 x 100 mm	ACE-211-10005S	ACE-212-10005S	ACE-213-10005S	ACE-214-10005S	ACE-215-10005S
0.50 x 150 mm	ACE-211-15005S	ACE-212-15005S	ACE-213-15005S	ACE-214-15005S	ACE-215-15005S

AVANTOR® ACE® 300 Å CHEMISTRIES, 1/32" PORT, 5 µm

– HPLC hardware format with 275 bar / 4,000 psi pressure limit

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
0.075 x 100 mm	ACE-221-1000075S	ACE-222-1000075S	ACE-223-1000075S	ACE-224-1000075	ACE-225-1000075S
0.075 x 150 mm	ACE-221-1500075S	ACE-222-1500075S	ACE-223-1500075S	ACE-224-1500075S	ACE-225-1500075S
0.075 x 250 mm	ACE-221-2500075S	ACE-222-2500075S	ACE-223-2500075S	ACE-224-2500075S	ACE-225-2500075S
0.10 x 100 mm	ACE-221-10001S	ACE-222-10001S	ACE-223-10001S	ACE-224-10001S	ACE-225-10001S
0.10 x 150 mm	ACE-221-15001S	ACE-222-15001S	ACE-223-15001S	ACE-224-15001S	ACE-225-15001S
0.10 x 250 mm	ACE-221-25001	ACE-222-25001S	ACE-223-25001S	ACE-224-25001S	ACE-225-25001S
0.30 x 50 mm	ACE-221-05003S	ACE-222-05003S	ACE-v-05003S	ACE-224-05003S	ACE-225-05003S
0.30 x 100 mm	ACE-221-10003S	ACE-222-10003S	ACE-223-10003S	ACE-224-10003S	ACE-225-10003S
0.30 x 150 mm	ACE-221-15003S	ACE-222-15003S	ACE-223-15003S	ACE-224-15003S	ACE-225-15003S
0.30 x 250 mm	ACE-221-25003S	ACE-222-25003S	ACE-223-25003S	ACE-224-25003S	ACE-225-25003S
0.50 x 50 mm	ACE-221-05005S	ACE-222-05005S	ACE-223-05005S	ACE-224-05005S	ACE-225-05005S
0.50 x 100 mm	ACE-221-10005S	ACE-222-10005S	ACE-223-10005S	ACE-224-10005S	ACE-225-10005S
0.50 x 150 mm	ACE-221-15005S	ACE-222-15005S	ACE-223-15005S	ACE-224-15005S	ACE-225-15005S
0.50 x 250 mm	ACE-221-25005S	ACE-222-25005S	ACE-223-25005S	ACE-224-25005S	ACE-225-25005S

Avantor® ACE® preparative columns

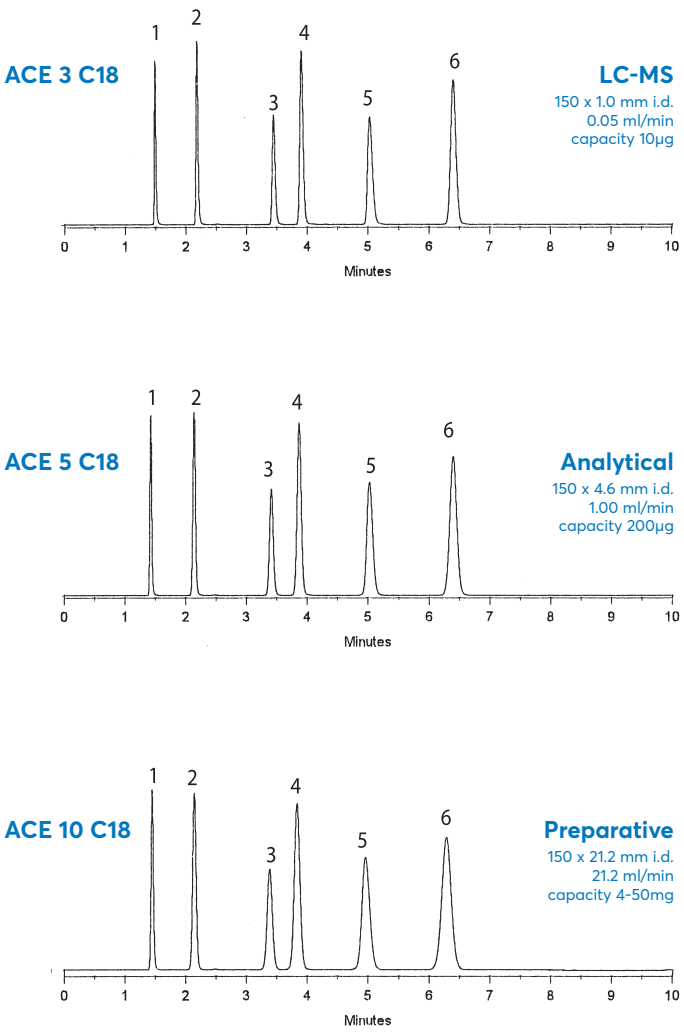
- Ultra-high purity base deactivated silica
- 5 and 10 µm particle sizes available
- Excellent reproducibility
- High surface area and carbon loads for maximum sample capacity and loadability
- High sample recovery
- Reliable, long term performance
- 100 Å and 300 Å pore sizes

Achieve reproducible high performance preparative separations with ACE preparative columns

- Chromatographers with experience in preparative HPLC know that resolution and loadability are of the utmost importance
- The higher the resolution, the higher the sample load and the faster pure sample is obtained
- The ability to optimise at the preparative scale starts with high performance and resolution separations at the analytical scale

Column Size	Column ID (mm)	Relative flow rate (mL/min)	Weight of phase (g)	Typical injection volume (µL)	Sample capacity per injection	
					Optimum	Overload
ANALYTICAL	4.6	1.0	2.5	10	2 mg	85 mg
SEMI-PREPARATIVE	7.75	2.8	7	30	6 mg	240 mg
	10.0	4.7	12	50	10 mg	400 mg
PREPARATIVE	21.2	21	53	200	45 mg	1.8 g
	30.0	42.5	106	400	90 mg	3.6 g
PROCESS	50.0	118	295	1200	250 mg	10 g
	100.0	473	1182	4800	1 g	40 g

ACE PREPARATIVE COLUMNS ARE THE IDEAL CHOICE FOR SCALE UP AND PROCESS METHODS



Sample: 1) Uracil 2) 4-Hydroxybenzoic acid 3) Acetylsalicylic acid 4) Benzoic acid 5) 2-Hydroxybenzoic acid 6) Ethyl paraben
Mobile Phase: 35:65 MeCN/0.1% TFA in H_2O - **Temperature:** 22°C - **Wavelength:** 254nm

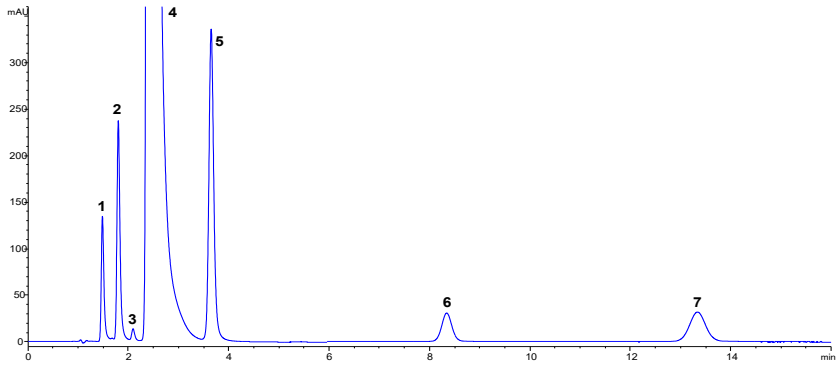
Avantor® ACE® preparative columns are available in all traditional and novel chemistries,
see page 11

PREPARATIVE SCALE SEPARATION OF ASPIRIN AND RELATED SUBSTANCES

Initial method optimised on 100 x 4.6 mm id analytical column before scaling up the method to a 100 x 21.2 mm id preparative column, fractions were collected and analysed by analytical HPLC for a 3 mL injection. For the 3 mL injection, the signal cut-off was set to 10 mAU as demonstrated in figure below which gave ~95% purity based on peak area.

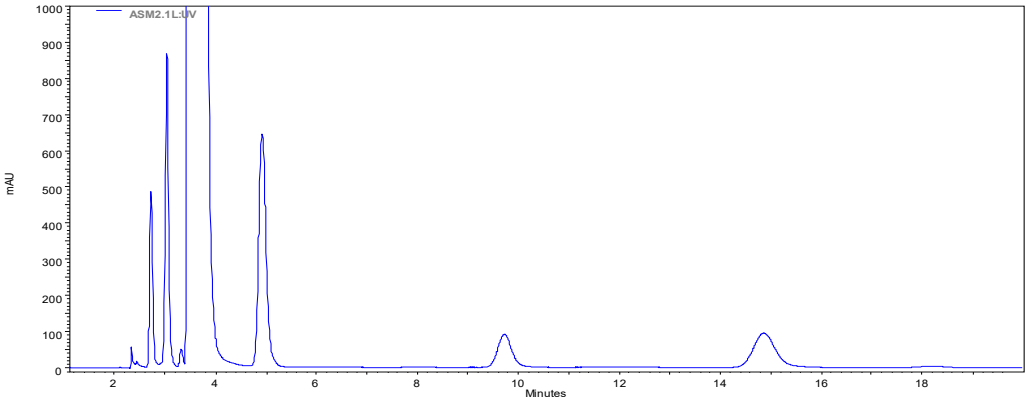
Analytical Scale: ACE EXCEL 5 C18

Dimension: 100 x 4.6 mm
Flow Rate: 1 mL/min
Injection: 10 µL
Temperature: 22 °C
Detection: UV, 214 nm



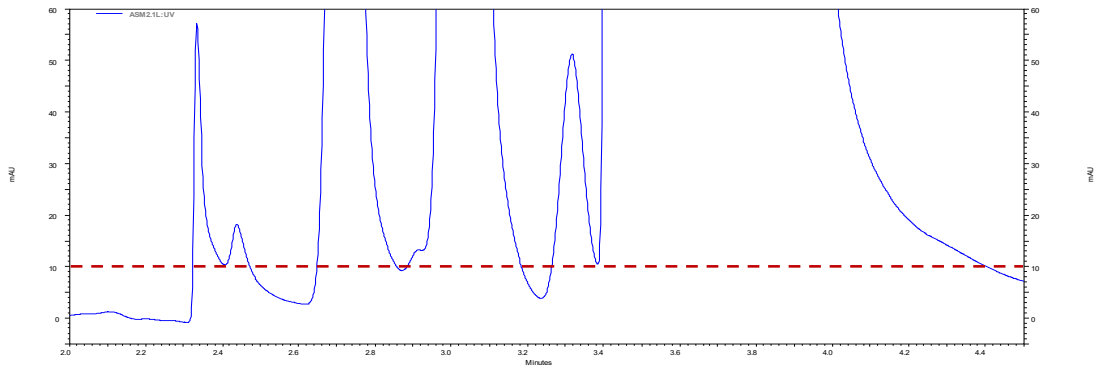
Preparative Scale: ACE 10 C18

Dimension: 100 x 21.2 mm
Flow Rate: 21.2 mL/min
Injection: 3 mL
Temperature: 22 °C
Detection: UV, 214 nm



Mobile phase: 0.1%H_3PO_4 in MeCN:MeOH:H_2O 3:1:6 (v/v/v)
Sample: 1) 4-hydroxybenzoic acid, 2) 4-hydroxyisophthalic acid, 3) unknown, 4) acetylsalicylic acid (aspirin), 5) 2-hydroxybenzoic acid, 6) acetylsalicylsalicylic acid, 7) salsalate

Signal cut-off for fraction collection set to 10 mAU



AVANTOR® ACE® C18-HL

- High surface area, high carbon load C18 phase
- Optimised for preparative and process scale applications
- Increased loading and retention
- 5 µm and 10 µm particles sizes available
- Exceptional chemical stability
- Excellent peak shape with acidic, basic and neutral molecules

ORDERING INFORMATION

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 5 µm PARTICLES SIZES

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	C18-HL	NH_2
10.0 x 50 mm	ACE-121-0510	ACE-122-0510	ACE-123-0510	ACE-124-0510	ACE-125-0510	ACE-126-0510	ACE-127-0510	ACE-321-0510	ACE-1214-0510
10.0 x 100 mm	ACE-121-1010	ACE-122-1010	ACE-123-1010	ACE-124-1010	ACE-125-1010	ACE-126-1010	ACE-127-1010	ACE-321-1010	ACE-1214-1010
10.0 x 150 mm	ACE-121-1510	ACE-122-1510	ACE-123-1510	ACE-124-1510	ACE-125-1510	ACE-126-1510	ACE-127-1510	ACE-321-1510	ACE-1214-1510
10.0 x 250 mm	ACE-121-2510	ACE-122-2510	ACE-123-2510	ACE-124-2510	ACE-125-2510	ACE-126-2510	ACE-127-2510	ACE-321-2510	ACE-1214-2510
21.2 x 100 mm	ACE-121-1020	ACE-122-1020	ACE-123-1020	ACE-124-1020	ACE-125-1020	ACE-126-1020	ACE-127-1020	ACE-321-1020	ACE-1214-1020
21.2 x 150 mm	ACE-121-1520	ACE-122-1520	ACE-123-1520	ACE-124-1520	ACE-125-1520	ACE-126-1520	ACE-127-1520	ACE-321-1520	ACE-1214-1520
21.2 x 250 mm	ACE-121-2520	ACE-122-2520	ACE-123-2520	ACE-124-2520	ACE-125-2520	ACE-126-2520	ACE-127-2520	ACE-321-2520	ACE-1214-2520
ACE guard cartridges for preparative columns (3pk)									
For 10.0-21.2 mm ID columns	ACE-121-0110GD	ACE-122-0110GD	ACE-123-0110GD	ACE-124-0110GD	ACE-125-0110GD	ACE-126-0110GD	ACE-127-0110GD	ACE-321-0110GD	ACE-1214-0110GD
Stand-alone guard cartridge holder H0002 and column coupler C0001 will be required									

AVANTOR® ACE® TRADITIONAL CHEMISTRIES, 10 µm PARTICLES SIZES

Column Dimensions	C18	C8	C4	CN	Phenyl	AQ	Sil	C18-HL
10.0 x 50 mm	ACE-131-0510	ACE-132-0510	ACE-133-0510	ACE-134-0510	ACE-135-0510	ACE-136-0510	ACE-137-0510	ACE-331-0510
10.0 x 100 mm	ACE-131-1010	ACE-132-1010	ACE-133-1010	ACE-134-1010	ACE-135-1010	ACE-136-1010	ACE-137-1010	ACE-331-1010
10.0 x 150 mm	ACE-131-1510	ACE-132-1510	ACE-133-1510	ACE-134-1510	ACE-135-1510	ACE-136-1510	ACE-137-1510	ACE-331-1510
10.0 x 250 mm	ACE-131-2510	ACE-132-2510	ACE-133-2510	ACE-134-2510	ACE-135-2510	ACE-136-2510	ACE-137-2510	ACE-331-2510
21.2 x 100 mm	ACE-131-1020	ACE-132-1020	ACE-133-1020	ACE-134-1020	ACE-135-1020	ACE-136-1020	ACE-137-1020	ACE-331-1020
21.2 x 150 mm	ACE-131-1520	ACE-132-1520	ACE-133-1520	ACE-134-1520	ACE-135-1520	ACE-136-1520	ACE-137-1520	ACE-331-1520
21.2 x 250 mm	ACE-131-2520	ACE-132-2520	ACE-133-2520	ACE-134-2520	ACE-135-2520	ACE-136-2520	ACE-137-2520	ACE-331-2520
30.0 x 100 mm	ACE-131-1030	ACE-132-1030	ACE-133-1030	ACE-134-1030	ACE-135-1030	ACE-136-1030	ACE-137-1030	ACE-331-1030
30.0 x 150 mm	ACE-131-1530	ACE-132-1530	ACE-133-1530	ACE-134-1530	ACE-135-1530	ACE-136-1530	ACE-137-1530	ACE-331-1530
30.0 x 250 mm	ACE-131-2530	ACE-132-2530	ACE-133-2530	ACE-134-2530	ACE-135-2530	ACE-136-2530	ACE-137-2530	ACE-331-2530
ACE guard cartridges for preparative columns (3pk)								
For 10.0-21.2 mm ID columns	ACE-121-0110GD	ACE-122-0110GD	ACE-123-0110GD	ACE-124-0110GD	ACE-125-0110GD	ACE-126-0110GD	ACE-127-0110GD	ACE-321-0110GD
Stand-alone guard cartridge holder H0002 and column coupler C0001 will be required								
For 30 mm ID columns	ACE-121-0120GD	ACE-122-0120GD	ACE-123-0120GD	ACE-124-0120GD	ACE-125-0120GD	ACE-126-0120GD	ACE-127-0120GD	ACE-321-0120GD
Stand-alone guard cartridge holder H0009 and column coupler C0002 will be required								

AVANTOR® ACE® NOVEL CHEMISTRIES, 5 µm PARTICLES SIZES

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
10.0 x 50 mm	ACE-129-0510	ACE-1210-0510	ACE-1211-0510	ACE-1212-0510	ACE-1213-0510
10.0 x 100 mm	ACE-129-1010	ACE-1210-1010	ACE-1211-1010	ACE-1212-1010	ACE-1213-1010
10.0 x 150 mm	ACE-129-1510	ACE-1210-1510	ACE-1211-1510	ACE-1212-1510	ACE-1213-1510
10.0 x 250 mm	ACE-129-2510	ACE-1210-2510	ACE-1211-2510	ACE-1212-2510	ACE-1213-2510
21.2 x 100 mm	ACE-129-1020	ACE-1210-1020	ACE-1211-1020	ACE-1212-1020	ACE-1213-1020
21.2 x 150 mm	ACE-129-1520	ACE-1210-1520	ACE-1211-1520	ACE-1212-1520	ACE-1213-1520
21.2 x 250 mm	ACE-129-2520	ACE-1210-2520	ACE-1211-2520	ACE-1212-2520	ACE-1213-2520
ACE guard cartridges for preparative columns (3pk)					
For 10.0-21.2 mm ID columns	ACE-129-0110GD	ACE-1210-0110GD	ACE-1211-0110GD	ACE-1212-0110GD	ACE-1213-0110GD
Stand-alone guard cartridge holder H0002 and column coupler C0001 will be required					
For 30 mm ID columns	ACE-129-0120GD	ACE-1210-0120GD	ACE-1211-0120GD	ACE-1212-0120GD	ACE-1213-0120GD
Stand-alone guard cartridge holder H0009 and column coupler C0002 will be required					

AVANTOR® ACE® NOVEL CHEMISTRIES, 10 µm PARTICLES SIZES

Column Dimensions	C18-AR	C18-PFP	SuperC18	C18-Amide	CN-ES
10.0 x 50 mm	ACE-139-0510	ACE-1310-0510	ACE-1311-0510	ACE-1312-0510	ACE-1313-0510
10.0 x 100 mm	ACE-139-1010	ACE-1310-1010	ACE-1311-1010	ACE-1312-1010	ACE-1313-1010
10.0 x 150 mm	ACE-139-1510	ACE-1310-1510	ACE-1311-1510	ACE-1312-1510	ACE-1313-1510
10.0 x 250 mm	ACE-139-2510	ACE-1310-2510	ACE-1311-2510	ACE-1312-2510	ACE-1313-2510
21.2 x 100 mm	ACE-139-1020	ACE-1310-1020	ACE-1311-1020	ACE-1312-1020	ACE-1313-1020
21.2 x 150 mm	ACE-139-1520	ACE-1310-1520	ACE-1311-1520	ACE-1312-1520	ACE-1313-1520
21.2 x 250 mm	ACE-139-2520	ACE-1310-2520	ACE-1311-2520	ACE-1312-2520	ACE-1313-2520
30.0 x 50 mm	ACE-139-0530	ACE-1310-0530	ACE-1311-0530	ACE-1312-0530	ACE-1313-0530
30.0 x 100 mm	ACE-139-1030	ACE-1310-1030	ACE-1311-1030	ACE-1312-1030	ACE-1313-1030
30.0 x 150 mm	ACE-139-1530	ACE-1310-1530	ACE-1311-1530	ACE-1312-1530	ACE-1313-1530
30.0 x 250 mm	ACE-139-2530	ACE-1310-2530	ACE-1311-2530	ACE-1312-2530	ACE-1313-2530
ACE guard cartridges for preparative columns (3pk)					
For 10.0-21.2 mm ID columns	ACE-139-0110GD	ACE-1310-0110GD	ACE-1311-0110GD	ACE-1312-0110GD	ACE-1313-0110GD
Stand-alone guard cartridge holder H0002 and column coupler C0001 will be required					
For 30 mm ID columns	ACE-139-0120GD	ACE-1310-0120GD	ACE-1311-0120GD	ACE-1312-0120GD	ACE-1313-0120GD
Stand-alone guard cartridge holder H0009 and column coupler C0002 will be required					

For dimensions not listed here, including 7.75 mm id please contact: chromsupport@avantorsciences.com

AVANTOR® ACE® PREPARATIVE COLUMNS

AVANTOR® ACE® 300 Å CHEMISTRIES, 5 µm PARTICLES SIZES

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
10.0 x 50 mm	ACE-221-0510	ACE-222-0510	ACE-223-0510	ACE-224-0510	ACE-225-0510
10.0 x 100 mm	ACE-221-1010	ACE-222-1010	ACE-223-1010	ACE-224-1010	ACE-225-1010
10.0 x 150 mm	ACE-221-1510	ACE-222-1510	ACE-223-1510	ACE-224-1510	ACE-225-1510
10.0 x 250 mm	ACE-221-2510	ACE-222-2510	ACE-223-2510	ACE-224-2510	ACE-225-2510
21.2 x 100 mm	ACE-221-1020	ACE-222-1020	ACE-223-1020	ACE-224-1020	ACE-225-1020
21.2 x 150 mm	ACE-221-1520	ACE-222-1520	ACE-223-1520	ACE-224-1520	ACE-225-1520
21.2 x 250 mm	ACE-221-2520	ACE-222-2520	ACE-223-2520	ACE-224-2520	ACE-225-2520
ACE guard cartridges for preparative columns (3pk)					
For 10.0-21.2 mm ID columns	ACE-221-0110GD	ACE-222-0110GD	ACE-223-0110GD	ACE-224-0110GD	ACE-225-0110GD
Stand-alone guard cartridge holder H0002 and column coupler C0001 will be required					

AVANTOR® ACE® 300 Å CHEMISTRIES, 10 µm PARTICLES SIZES

Column Dimensions	C18-300	C8-300	C4-300	CN-300	Phenyl-300
10.0 x 50 mm	ACE-231-0510	ACE-232-0510	ACE-233-0510	ACE-234-0510	ACE-235-0510
10.0 x 100 mm	ACE-231-1010	ACE-232-1010	ACE-233-1010	ACE-234-1010	ACE-235-1010
10.0 x 150 mm	ACE-231-1510	ACE-232-1510	ACE-233-1510	ACE-234-1510	ACE-235-1510
10.0 x 250 mm	ACE-231-2510	ACE-232-2510	ACE-233-2510	ACE-234-2510	ACE-235-2510
21.2 x 100 mm	ACE-231-1020	ACE-232-1020	ACE-233-1020	ACE-234-1020	ACE-235-1020
21.2 x 150 mm	ACE-231-1520	ACE-232-1520	ACE-233-1520	ACE-234-1520	ACE-235-1520
21.2 x 250 mm	ACE-231-2520	ACE-232-2520	ACE-233-2520	ACE-234-2520	ACE-235-2520
ACE guard cartridges for preparative columns (3pk)					
For 10-21.2 mm ID columns	ACE-231-0110GD	ACE-232-0110GD	ACE-233-0110GD	ACE-234-0110GD	ACE-235-0110GD
Stand-alone guard cartridge holder H0002 and column coupler C0001 will be required					

For dimensions not listed here, please contact: chromsupport@avantorsciences.com

Avantor® ACE® application specific chemistries

ACE EXCEL OLIGO

- Proprietary encapsulated stationary phase for oligonucleotide analysis
- Ultra-inert silica and high efficiency 1.7 and 3 µm particle sizes for optimum peak shape
- Extended pH stability up to 11.5 with LC-MS compatible buffers
- Batch tested and methods available for both UV and LC-MS applications

PHASE SPECIFICATIONS

Phase	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range
ACE EXCEL OLIGO	Yes	1.7, 3	90	400	14.8	1.5 – 11.5

ACE EXCEL GLYCAN

- Proprietary stationary phase designed for HILIC analysis of cleaved glycans
- Ultra-inert silica and high efficiency 1.7 and 3 µm particle sizes for optimum peak shape
- Batch tested with glycan ladder standard and suitable for separations of neutral and charged glycans

PHASE SPECIFICATIONS

Phase	Endcapped	Particle size (µm)	Pore size (Å)	Surface area (m^2/g)	Carbon load (%)	pH range
ACE EXCEL GLYCAN	No	1.7, 3	100	300	7.0	2.0 – 7.0

ORDERING INFORMATION

AVANTOR® ACE® EXCEL OLIGO

- U/HPLC hardware format with 1000 bar / 15,000 psi pressure limit

Column Dimensions	1.7 µm	3 µm
50 x 2.1 mm	EXL-1715-0502	EXL-1115-0502
100 x 2.1 mm	EXL-1715-1002	EXL-1115-1002
150 x 2.1 mm	-	EXL-1115-1502
50 x 4.6 mm	-	EXL-1115-0546
100 x 4.6 mm	-	EXL-1115-1046
150 x 4.6 mm	-	EXL-1115-1546
ACE Excel Oligo guard cartridges (3pk)		
For 2.1 mm ID columns	EXL-1P15-GD2U	
For 4.6 mm ID columns	EXL-1P15-GD4U	
UHPLC guard cartridge holder H0011 will be required		

AVANTOR® ACE® EXCEL GLYCAN

- U/HPLC hardware format with 1000 bar / 15,000 psi pressure limit

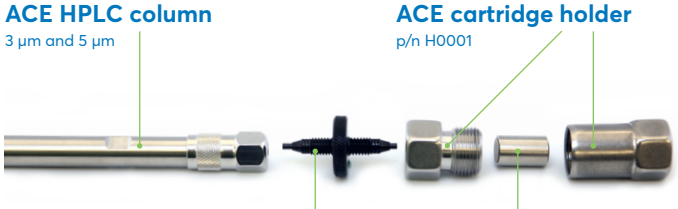
Column Dimensions	1.7 µm	3 µm
50 x 2.1 mm	EXL-1716-0502	EXL-1116-0502
100 x 2.1 mm	EXL-1716-1002	EXL-1116-1002
150 x 2.1 mm	-	EXL-1116-1502
50 x 4.6 mm	-	EXL-1116-0546
100 x 4.6 mm	-	EXL-1116-1046
150 x 4.6 mm	-	EXL-1116-1546
ACE Excel Glycan guard cartridges (3pk)		
For 2.1 mm ID columns	EXL-1P16-GD2U	
For 4.6 mm ID columns	EXL-1P16-GD4U	
UHPLC guard cartridge holder H0011 will be required		

Avantor® ACE® guards and filters

- Protection of columns from 1.0 mm to 30 mm ID
- No loss in column performance or selectivity
- Significantly extends column lifetime
- Available in cost-effective multipacks
- Available for most phases and dimensions

AVANTOR® ACE® GUARD CARTRIDGE

The use of a guard cartridge is recommended to protect the column from both frit blockage and irreversible sample adsorption. Without the use of a guard, column fouling can lead to increased column backpressures, peak splitting and/or tailing. It is generally recommended that guard cartridges should be replaced when the column backpressure increases by 10% or when column resolution or efficiency decreases by 10%.



HARDWARE REQUIRED FOR HPLC GUARD CARTRIDGES

- ACE guard cartridges require a standalone holder and coupler
- The table below summarises the hardware required for HPLC guard cartridges

	Column ID (mm)								
	1.0	2.1	3.0	4.0	4.6	7.75	10.0	21.2	30.0
CARTIDGE PACK SIZE	5					3			3
HOLDER REQUIRED	H0001					H0002			H0009
COUPLER REQUIRED	C0001					C0001			C0002

Please see page 34* for UHPLC Guard cartridge holder

AVANTOR® ACE® PRE-COLUMN FILTERS

Protect your UHPLC and HPLC columns from premature failure with high-quality pre-column filters

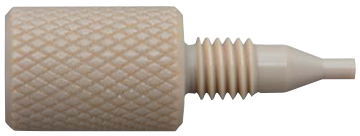
ACE UHPLC/HPLC pre-column filters may be used as protection for any analytical column to help prevent column inlet frit blocking. We offer three different types of pre-column filter depending on the column type as follows:

MICROBORE HPLC PRE-COLUMN FILTERS

For 2.1 mm id HPLC columns

- 350 bar (5000 psi) pressure rating
- Simple to install and replace
- Effective column protection for all microbore columns
- Compatible with all HPLC systems

ACE microbore HPLC Pre-Column Filter
(ACE-HP210, 10 pack)



Description	Pack	Part number
ACE Microbore HPLC Pre-column Filter For 2.1 mm id HPLC columns	5	ACE-HP205
	10	ACE-HP210

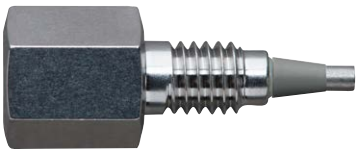
UHPLC PRE-COLUMN FILTERS

For UHPLC and UPLC columns

- 1000 bar (15000 psi) pressure rating
- Eliminates poor connections
- Compatible with all UHPLC column brands
- Compatible with all UHPLC systems including Waters Acquity®

ACE Excel UHPLC Pre-Column Filter
(EXL-PCF10, 10 pack)

ACE Excel UHPLC Pre-Column Filter (Waters Acquity® System Compatible)
(EXL-PCF10/ACQ, 10 pack)



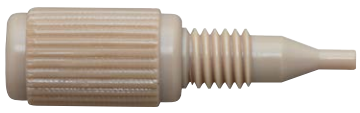
Description	Pack	Part number
ACE UHPLC Pre-column Filter for UHPLC and UPLC columns	5	EXL-PCF05
	10	EXL-PCF10
ACE UHPLC Pre-column filter Waters Acquity® system compatible	5	EXL-PCF05/ACQ
	10	EXL-PCF10/ACQ

ANALYTICAL HPLC PRE-COLUMN FILTERS

For more typical standard bore (3.0 to 4.6 mm id) HPLC columns

- 350 bar (5000 psi) pressure rating
- Simple to install and replace
- Effective column protection for all HPLC columns
- Compatible with all HPLC systems

ACE Analytical HPLC Pre-column Filter
(EXL-CS210, 10 pack)



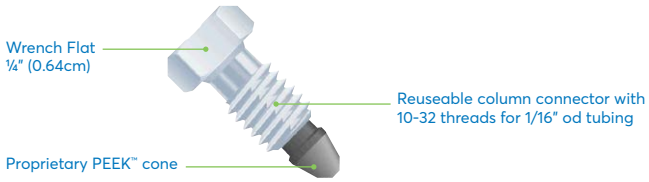
Description	Pack	Part number
ACE Analytical HPLC Pre-column Filter with 0.5 µm porosity stainless steel filter element	5	ACE-CS205
	10	ACE-CS210
ACE Analytical HPLC Pre-column Filter with 2.0 µm porosity stainless steel filter element	5	ACE-CS305
	10	ACE-CS3010

AVANTOR® ACE® COLUMN CONNECTORS

UHPLC COLUMN CONNECTORS

- Pressure rating >1700 bar (>25000 psi)
- Compatible with all UHPLC systems[1]
- Compatible with all UHPLC column brands
- Eliminates poor connections
- Innovative reusable design

ACE Excel UHPLC Column Connector
(EXL-CC10, 10 pack)



All UHPLC column brands require correct installation in order to realise maximum column efficiency. To avoid connection problems, permanently swaged fittings are not recommended as they do not allow free movement between the tubing, fitting and column inlet on installation. This can result in a poorly connected column that shows unexpected peak tailing due to the introduction of extra column volume (dead volume) to the system. Alternatively, a leak at the inlet fitting connection may be observed.

ACE Excel UHPLC Column Connectors (EXL-CC10, 10 pack) enable the inlet end of UHPLC columns to be correctly installed every time. Their unique reuseable design ensures that they maintain a 1700 bar (25000 psi) pressure rating with repeated use, yet do not permanently swage onto the inlet tubing. To maximise the lifetime of the fitting, the correct use of a torque wrench (EXL-TW) is required.

At the outlet end of the UHPLC column (where pressure demands are lower but a correct connection remains important), ACE Fingertight HPLC Column Connectors (ACE-CC10, 10 pack) may alternatively be used.

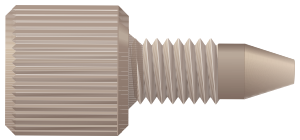
[1] **Note**: For inlet connections onto a Waters Acquity® system (containing a Waters Acquity 1/16" fitting and ferrule on the inlet tubing) the use of a pre-column filter incorporating the unique Waters Acquity® column port profile is alternatively recommended (EXL-PCF10/ACQ - 10 pack) to ensure maximum compatibility.

Description	Pack	Part number
	1	EXL-CC
ACE Excel UHPLC reusable column connector	10	EXL-CC10
Torque Wrench	1	EXL-TW
ACE Excel UHPLC column connector starter kit (contains 4* EXL-CC & 1 * EXL-TW)	1	EXL-CCSK

HPLC COLUMN CONNECTORS

- Fingertight to 350 bar (5000 psi)
- Reuseable and simple to install
- Eliminates poor connections
- Compatible with all HPLC column brands and instruments

ACE Fingertight HPLC Column Connector
(ACE-CC10, 10 pack)



ACE Fingertight HPLC Column Connectors (ACE-CC10, 10 pack) are recommended for the connection of both the inlet and outlet ends of HPLC columns.

Manufactured from premium quality PEEK™, the fittings simply hand tighten to provide a perfect column connection, and are pressure rated to 350 bar/5000 psi.

ACE Fingertight HPLC Column Connectors may additionally be used at the outlet end of UHPLC columns, where pressure demands are lower but a correct connection remains important.

Description	Pack	Part number
	1	ACE-CC
ACE PEEK™ Fingertight column connector	10	ACE-CC10

Avantor® ACE® additional services

CUSTOM PACKED COLUMNS

- In addition to the wide range of Avantor ACE column dimensions previously listed, we also routinely manufacture columns of unique dimensions which are required for a particular application.
- Additional column hardware geometries (including bioinert PEEK™ or glass-lined) are also available on request.

TECHNICAL SUPPORT FREE

For column selection guidance, troubleshooting support or advice on any other chromatography issue, our expert technical team can help with FREE, no obligation technical support.

Simply contact chromsupport@avantorsciences.com and we will be happy to help!

APPLICATIONS SERVICE FREE

Our applications database contains over 25,000 analytes separated on a wide range of column materials. Searches can be performed on a specific compound, mixture of compounds or a specific phase. Identifying a good application can give you a good head start in the method development process.

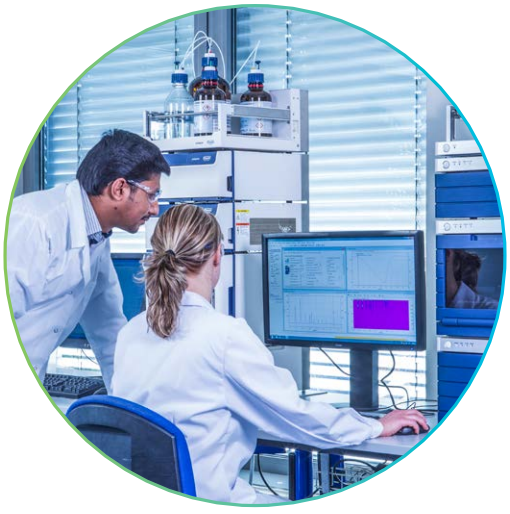
Our technical staff can discuss and recommend separation strategies for customers and, if appropriate, develop and optimise the most suitable HPLC method for you.

Contact your local distributor or email chromsupport@avantorsciences.com for more information on our **FREE** applications service.

WARRANTY

ACE products are warranted to be free from defects in materials or workmanship. Avantor will promptly replace any defective goods unless such defects are attributed to customer abuse, misuse or neglect.

Please contact chromsupport@avantorsciences.com for more information.



avantor™

Setting science in motion to create a better world

Avantor® is a leading global provider of mission critical products and services to customers in the biopharma, healthcare, education & government, and advanced technologies & applied materials industries. We operate in more than 30 countries and deliver an extensive portfolio of products and services.

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