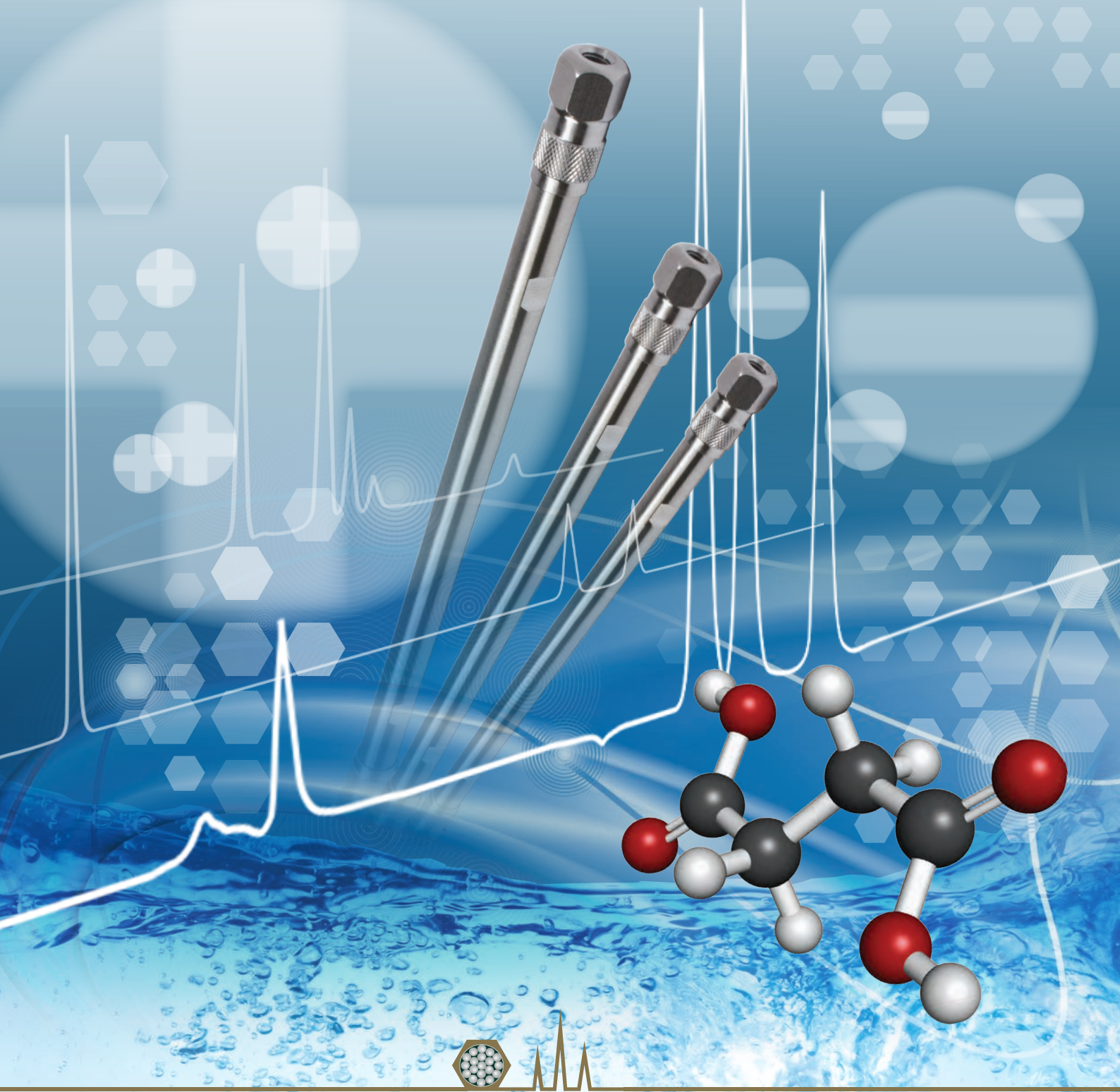


# ACE<sup>®</sup> HILIC

## UHPLC and HPLC Columns

For Reproducible Polar Analyte Separations

- Three HILIC Column Chemistries Available •



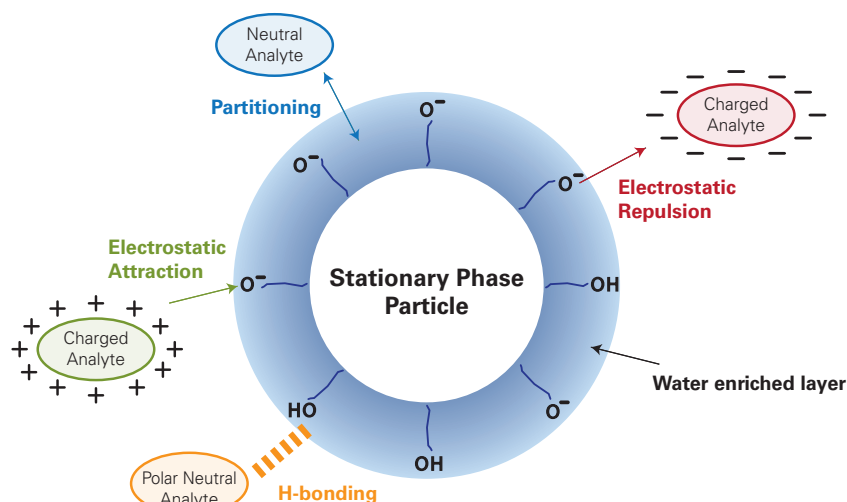
# ACE HILIC Columns

## 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 – order your copy now.



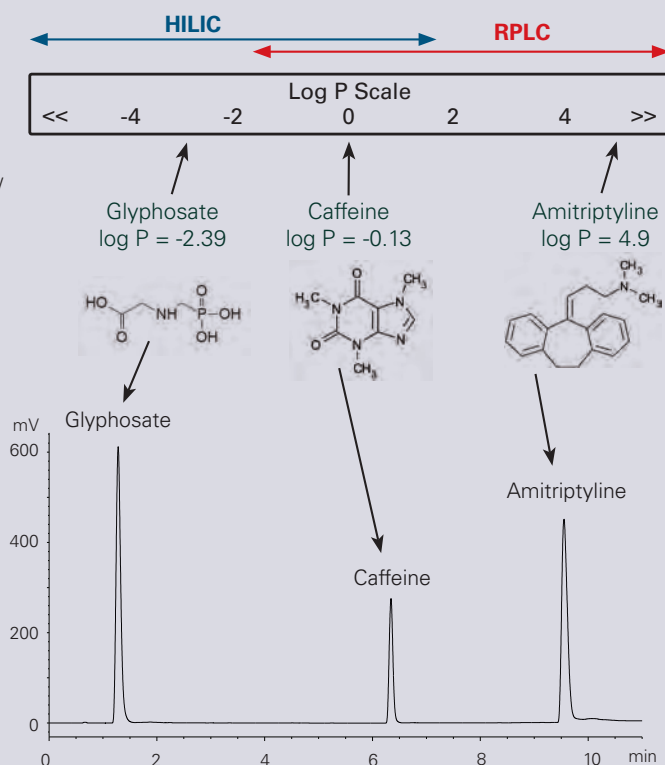
**Figure 1.** Schematic of interactions between different types of polar analytes and a stationary phase in HILIC mode

## When Should You Consider HILIC?

- HILIC provides the retention and separation of hydrophilic or polar to very polar analytes not well retained in 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 reproduced with permission. First published in Chromatography Today, Volume 8, Issue 4, November/December 2015

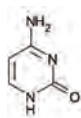


**Figure 2B.** Analyte suitability for HILIC from gradient RPLC

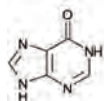
Column: ACE Excel C18, 100 x 3.0 mm, 2  $\mu$ m Part Number: EXL-101-1003U Mobile Phase: A = 10 mM ammonium formate, pH 3.0 (aq) B = 10 mM ammonium formate, pH 3.0 in 90:10 v/v MeCN:H<sub>2</sub>O Gradient: 5-100 %B in 10 minutes Detection: ELSD Flow Rate: 0.4 mL/min Temperature: 30 °C Injection: 10  $\mu$ L Analysed using VWR-Hitachi Chromaster with VWR ELSD90.

# HILIC Provides Alternative Selectivity and Retention to RPLC

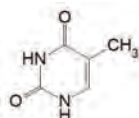
- HILIC provides improved retention and alternative selectivity to RPLC for polar and very polar analytes.
- Analysis of a six component polar analyte mixture by RPLC and HILIC shows inverted elution profiles (see below).



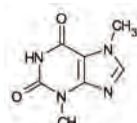
1. Cytosine  
log P = -1.13



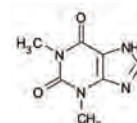
2. Hypoxanthine  
log P = -1.99



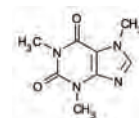
3. Thymine  
log P = -2.09



4. Theobromine  
log P = -2.08

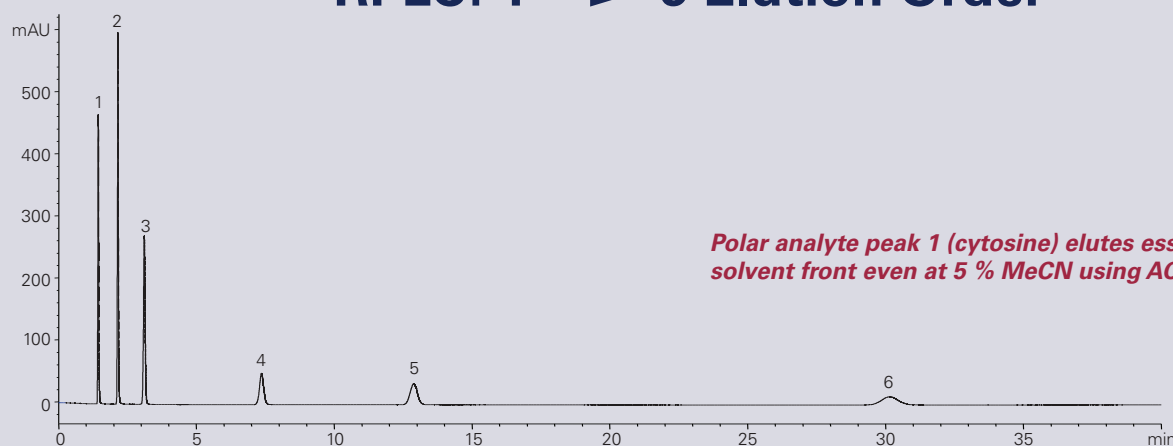


5. Theophylline  
log P = -0.17



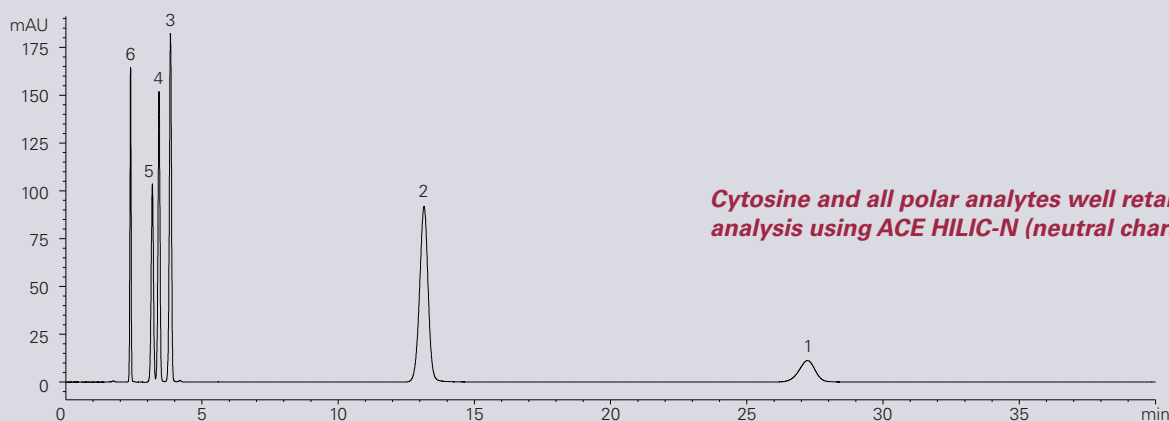
6. Caffeine  
log P = -0.13

## RPLC: 1 → 6 Elution Order



Column: ACE Excel C18, 150 x 4.6 mm, 5  $\mu$ m Part number: EXL-121-1546U Mobile Phase: 0.1 % acetic acid in 95:5 v/v H<sub>2</sub>O:MeCN Flow Rate: 1.0 mL/min Temperature: 22 °C Detection: 254 nm Injection: 5  $\mu$ L

## HILIC: 6 → 1 Elution Order



Column: ACE HILIC-N (neutral character phase), 150 x 4.6 mm, 5  $\mu$ m Part number: HILN-5-1546U Mobile Phase: 0.1 % acetic acid in 5:95 v/v H<sub>2</sub>O:MeCN Flow Rate: 1.0 mL/min Temperature: 22 °C Detection: 254 nm Injection: 5  $\mu$ L

## Conclusions

ACE HILIC columns provide alternative selectivity to ACE RPLC columns with excellent retention of polar analytes.

# ACE HILIC Columns - 3 Options

Three ACE HILIC stationary phases have been developed to provide the solution to your HILIC separation needs.

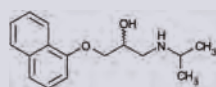
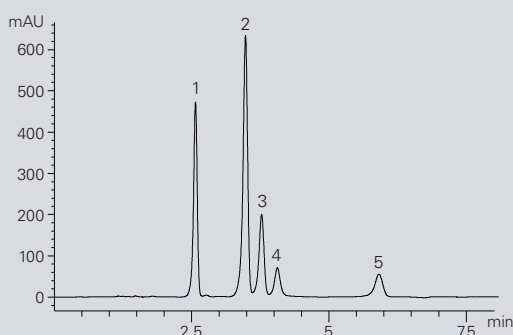
Phase	Functional Group	Endcapped	Particle Size (µm)	Pore Size (Å)	Surface Area (m <sup>2</sup> /g)	Carbon Load (%)	Recommended pH Range
ACE HILIC-A	Proprietary SIL	No	1.7, 3, 5	100	300	-	2.0 - 7.0
ACE HILIC-B	Proprietary Aminopropyl	No	1.7, 3, 5	100	300	4.0	2.0 - 7.0
ACE HILIC-N	Proprietary Polyhydroxy	No	1.7, 3, 5	100	300	7.0	2.0 - 7.0

To extend column lifetime under HPLC conditions (up to 5000 psi / 350 bar), ACE guard cartridges (5/pk) or ACE pre-column filters (5/pk) are recommended. For the guard system a guard cartridge holder (H0001) and coupler (C0001) are also required. To extend column lifetime under UHPLC conditions (up to 15000 psi / 1000 bar) an ACE UHPLC pre-column filter is recommended.

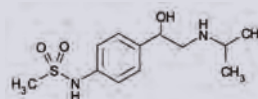
## ACE HILIC-A

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

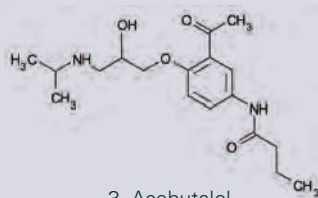
**β-blockers** (ACE AN#4530)



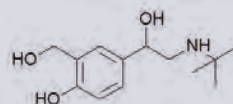
1. Propranolol



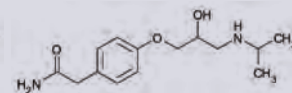
2. Sotalol



3. Acebutalol



4. Salbutamol



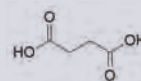
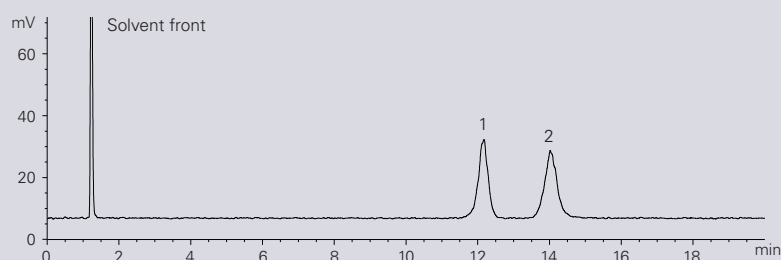
5. Atenolol

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<sub>2</sub>O (88:12 v/v)  
Flow Rate: 1.5 mL/min Injection: 2 µL Temperature: 25 °C Detection: 230 nm

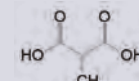
## ACE HILIC-B

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

**Succinic acid and methylmalonic acid** (ACE AN#4520)



1. Succinic acid



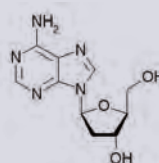
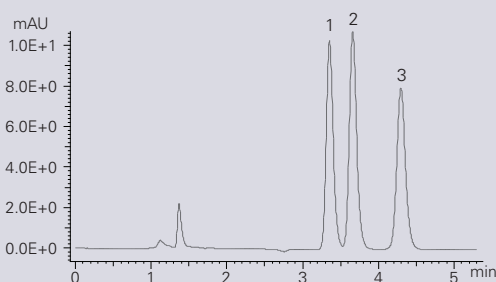
2. Methylmalonic acid

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<sub>2</sub>O (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)

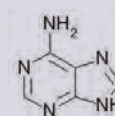
## ACE HILIC-N

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

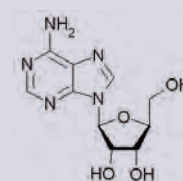
**Nucleobases and nucleosides** (ACE AN#4550)



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<sub>2</sub>O (90:10 v/v)  
Flow Rate: 1.5 mL/min Temperature: 25 °C Injection: 5 µL Detection: 254 nm



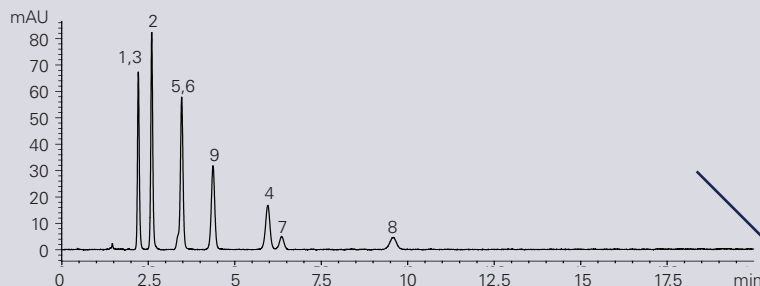
# ACE HILIC Method Development

- ACE HILIC columns provide alternative selectivity to each other.
- The power of systematic screening of different phase chemistries for HILIC method development is seen below.
- Maximise your HILIC method development success by following the ACE HILIC method development protocol using three optimised ACE HILIC column chemistries – protocol available in a FREE HILIC guide.

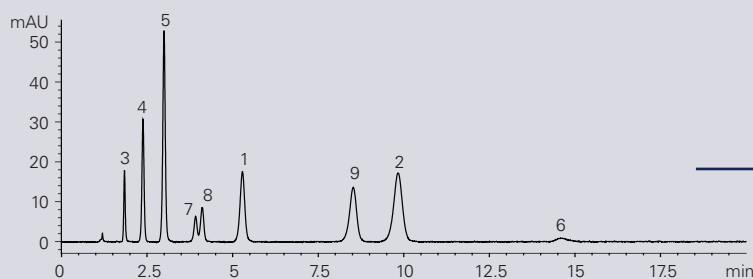
**Explore Selectivity:**  
Method Development Kits available: 3 column kit for the **same price** as a single column see page 6

## Advantages of using ACE HILIC Method Development Kits

### ACE HILIC-A

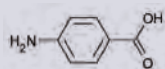
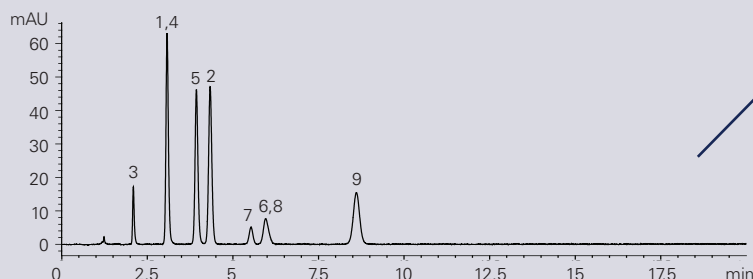


### ACE HILIC-B

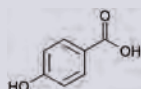


**Different Elution Orders and Retention Times Observed**

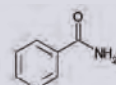
### ACE HILIC-N



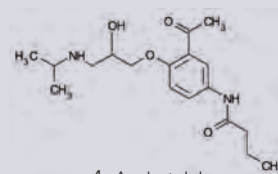
1. p-Aminobenzoic acid



2. 4-Hydroxybenzoic acid



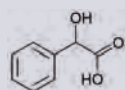
3. Nicotinamide



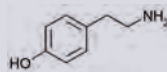
4. Acebutolol



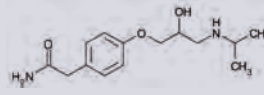
5. Adenine



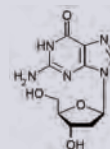
6. Mandelic acid



7. Tyramine



8. Atenolol



9. 2-Deoxyguanosine

Columns: All 150 x 4.6 mm, 5  $\mu$ m (Part numbers: ACE HILIC-A: HILA-5-1546U, ACE HILIC-B: HILB-5-1546U, ACE HILIC-N: HILN-5-1546U)  
Mobile Phase: 10 mM ammonium formate pH 4.7 in MeCN/H<sub>2</sub>O (90:10 v/v) Flow Rate: 1.5 mL/min Temperature: 25 °C Detection: 254 nm  
Sample: 1) p-Aminobenzoic acid 2) 4-Hydroxybenzoic acid 3) Nicotinamide 4) Acebutolol 5) Adenine 6) Mandelic acid 7) Tyramine 8) Atenolol 9) 2-Deoxyguanosine

## Conclusions

ACE HILIC columns provide alternative selectivity to each other – ideal for HILIC method development.

# ACE HILIC UHPLC / HPLC and Microbore Columns Part Numbers

Matched guard cartridges (for HPLC columns) or prefilters (for UHPLC columns) are available – please enquire.

## ACE HILIC Method Development Kits

(Contains 3 HILIC columns: ACE HILIC-A, ACE HILIC-B and ACE HILIC-N of specified dimensions)

(UHPLC/HPLC hardware format with 1000 bar / 15000 psi pressure limit)			
Column Dimensions	1.7 µm	3 µm	5 µm
2.1 x 20 mm	MDKH-17-0202U	MDKH-3-0202U	MDKH-5-0202U
2.1 x 30 mm	MDKH-17-0302U	MDKH-3-0302U	MDKH-5-0302U
2.1 x 35 mm	MDKH-17-3502U	MDKH-3-3502U	MDKH-5-3502U
2.1 x 50 mm	MDKH-17-0502U	MDKH-3-0502U	MDKH-5-0502U
2.1 x 75 mm	MDKH-17-7502U	MDKH-3-7502U	MDKH-5-7502U
2.1 x 100 mm	MDKH-17-1002U	MDKH-3-1002U	MDKH-5-1002U
2.1 x 125 mm	-	MDKH-3-1202U	MDKH-5-1202U
2.1 x 150 mm	-	MDKH-3-1502U	MDKH-5-1502U
2.1 x 250 mm	-	MDKH-3-2502U	MDKH-5-2502U
3.0 x 20 mm	MDKH-17-0203U	MDKH-3-0203U	MDKH-5-0203U
3.0 x 30 mm	MDKH-17-0303U	MDKH-3-0303U	MDKH-5-0303U
3.0 x 35 mm	MDKH-17-3503U	MDKH-3-3503U	MDKH-5-3503U
3.0 x 50 mm	MDKH-17-0503U	MDKH-3-0503U	MDKH-5-0503U
3.0 x 75 mm	MDKH-17-7503U	MDKH-3-7503U	MDKH-5-7503U
3.0 x 100 mm	MDKH-17-1003U	MDKH-3-1003U	MDKH-5-1003U
3.0 x 125 mm	-	MDKH-3-1203U	MDKH-5-1203U
3.0 x 150 mm	-	MDKH-3-1503U	MDKH-5-1503U
3.0 x 250 mm	-	MDKH-3-2503U	MDKH-5-2503U
4.6 x 20 mm	-	MDKH-3-0246U	MDKH-5-0246U
4.6 x 30 mm	-	MDKH-3-0346U	MDKH-5-0346U
4.6 x 35 mm	-	MDKH-3-3546U	MDKH-5-3546U
4.6 x 50 mm	-	MDKH-3-0546U	MDKH-5-0546U
4.6 x 75 mm	-	MDKH-3-7546U	MDKH-5-7546U
4.6 x 100 mm	-	MDKH-3-1046U	MDKH-5-1046U
4.6 x 125 mm	-	MDKH-3-1246U	MDKH-5-1246U
4.6 x 150 mm	-	MDKH-3-1546U	MDKH-5-1546U
4.6 x 250 mm	-	MDKH-3-2546U	MDKH-5-2546U

## ACE HILIC Microbore Method Development Kits

(Contains 3 HILIC Microbore columns: ACE HILIC-A, ACE HILIC-B and ACE HILIC-N of specified dimensions)

(HPLC hardware format with 400 bar/6000 psi recommended pressure limit)				
Column Dimensions	3 µm		5 µm	
	1/16" port	1/32" port	1/16" port	1/32" port
0.5 x 30 mm	MDKH-3-03005	MDKH-3-03005S	MDKH-5-03005	MDKH-5-03005S
0.5 x 50 mm	MDKH-3-05005	MDKH-3-05005S	MDKH-5-05005	MDKH-5-05005S
0.5 x 75 mm	MDKH-3-75005	MDKH-3-75005S	MDKH-5-75005	MDKH-5-75005S
0.5 x 100 mm	MDKH-3-10005	MDKH-3-10005S	MDKH-5-10005	MDKH-5-10005S
0.5 x 125 mm	MDKH-3-12005	MDKH-3-12005S	MDKH-5-12005	MDKH-5-12005S
0.5 x 150 mm	MDKH-3-15005	MDKH-3-15005S	MDKH-5-15005	MDKH-5-15005S
0.5 x 250 mm	-	-	MDKH-5-25005	MDKH-5-25005S
1.0 x 30 mm	MDKH-3-0301	MDKH-3-0301S	MDKH-5-0301	MDKH-5-0301S
1.0 x 50 mm	MDKH-3-0501	MDKH-3-0501S	MDKH-5-0501	MDKH-5-0501S
1.0 x 75 mm	MDKH-3-7501	MDKH-3-7501S	MDKH-5-7501	MDKH-5-7501S
1.0 x 100 mm	MDKH-3-1001	MDKH-3-1001S	MDKH-5-1001	MDKH-5-1001S
1.0 x 125 mm	MDKH-3-1201	MDKH-3-1201S	MDKH-5-1201	MDKH-5-1201S
1.0 x 150 mm	MDKH-3-1501	MDKH-3-1501S	MDKH-5-1501	MDKH-5-1501S
1.0 x 250 mm	-	-	MDKH-5-2501	MDKH-5-2501S

## ACE HILIC-A Columns

(Individual HILIC Columns of specified dimensions)

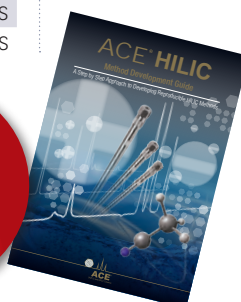
(UHPLC/HPLC hardware format with 1000 bar / 15000 psi pressure limit)			
Column Dimensions	1.7 µm	3 µm	5 µm
2.1 x 20 mm	HILA-17-0202U	HILA-3-0202U	HILA-5-0202U
2.1 x 30 mm	HILA-17-0302U	HILA-3-0302U	HILA-5-0302U
2.1 x 35 mm	HILA-17-3502U	HILA-3-3502U	HILA-5-3502U
2.1 x 50 mm	HILA-17-0502U	HILA-3-0502U	HILA-5-0502U
2.1 x 75 mm	HILA-17-7502U	HILA-3-7502U	HILA-5-7502U
2.1 x 100 mm	HILA-17-1002U	HILA-3-1002U	HILA-5-1002U
2.1 x 125 mm	-	HILA-3-1202U	HILA-5-1202U
2.1 x 150 mm	-	HILA-3-1502U	HILA-5-1502U
2.1 x 250 mm	-	HILA-3-2502U	HILA-5-2502U
3.0 x 20 mm	HILA-17-0203U	HILA-3-0203U	HILA-5-0203U
3.0 x 30 mm	HILA-17-0303U	HILA-3-0303U	HILA-5-0303U
3.0 x 35 mm	HILA-17-3503U	HILA-3-3503U	HILA-5-3503U
3.0 x 50 mm	HILA-17-0503U	HILA-3-0503U	HILA-5-0503U
3.0 x 75 mm	HILA-17-7503U	HILA-3-7503U	HILA-5-7503U
3.0 x 100 mm	HILA-17-1003U	HILA-3-1003U	HILA-5-1003U
3.0 x 125 mm	-	HILA-3-1203U	HILA-5-1203U
3.0 x 150 mm	-	HILA-3-1503U	HILA-5-1503U
3.0 x 250 mm	-	HILA-3-2503U	HILA-5-2503U
4.6 x 20 mm	-	HILA-3-0246U	HILA-5-0246U
4.6 x 30 mm	-	HILA-3-0346U	HILA-5-0346U
4.6 x 35 mm	-	HILA-3-3546U	HILA-5-3546U
4.6 x 50 mm	-	HILA-3-0546U	HILA-5-0546U
4.6 x 75 mm	-	HILA-3-7546U	HILA-5-7546U
4.6 x 100 mm	-	HILA-3-1046U	HILA-5-1046U
4.6 x 125 mm	-	HILA-3-1246U	HILA-5-1246U
4.6 x 150 mm	-	HILA-3-1546U	HILA-5-1546U
4.6 x 250 mm	-	HILA-3-2546U	HILA-5-2546U

## ACE HILIC-A Microbore Columns

(Individual HILIC Microbore Columns of specified dimensions)

(HPLC hardware format with 400 bar/6000 psi recommended pressure limit)				
Column Dimensions	3 µm		5 µm	
	1/16" port	1/32" port	1/16" port	1/32" port
0.5 x 30 mm	HILA-3-03005	HILA-3-03005S	HILA-5-03005	HILA-5-03005S
0.5 x 50 mm	HILA-3-05005	HILA-3-05005S	HILA-5-05005	HILA-5-05005S
0.5 x 75 mm	HILA-3-75005	HILA-3-75005S	HILA-5-75005	HILA-5-75005S
0.5 x 100 mm	HILA-3-10005	HILA-3-10005S	HILA-5-10005	HILA-5-10005S
0.5 x 125 mm	HILA-3-12005	HILA-3-12005S	HILA-5-12005	HILA-5-12005S
0.5 x 150 mm	HILA-3-15005	HILA-3-15005S	HILA-5-15005	HILA-5-15005S
0.5 x 250 mm	-	-	HILA-5-25005	HILA-5-25005S
1.0 x 30 mm	HILA-3-0301	HILA-3-0301S	HILA-5-0301	HILA-5-0301S
1.0 x 50 mm	HILA-3-0501	HILA-3-0501S	HILA-5-0501	HILA-5-0501S
1.0 x 75 mm	HILA-3-7501	HILA-3-7501S	HILA-5-7501	HILA-5-7501S
1.0 x 100 mm	HILA-3-1001	HILA-3-1001S	HILA-5-1001	HILA-5-1001S
1.0 x 125 mm	HILA-3-1201	HILA-3-1201S	HILA-5-1201	HILA-5-1201S
1.0 x 150 mm	HILA-3-1501	HILA-3-1501S	HILA-5-1501	HILA-5-1501S
1.0 x 250 mm	-	-	HILA-5-2501	HILA-5-2501S

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# ACE HILIC UHPLC / HPLC and Microbore Columns Part Numbers continued...

## ACE HILIC-B Columns

(Individual HILIC Columns of specified dimensions)

(UHPLC/HPLC hardware format with 1000 bar / 15000 psi pressure limit)			
Column Dimensions	1.7 $\mu$ m	3 $\mu$ m	5 $\mu$ m
2.1 x 20 mm	HILB-17-0202U	HILB-3-0202U	HILB-5-0202U
2.1 x 30 mm	HILB-17-0302U	HILB-3-0302U	HILB-5-0302U
2.1 x 35 mm	HILB-17-3502U	HILB-3-3502U	HILB-5-3502U
2.1 x 50 mm	HILB-17-0502U	HILB-3-0502U	HILB-5-0502U
2.1 x 75 mm	HILB-17-7502U	HILB-3-7502U	HILB-5-7502U
2.1 x 100 mm	HILB-17-1002U	HILB-3-1002U	HILB-5-1002U
2.1 x 125 mm	-	HILB-3-1202U	HILB-5-1202U
2.1 x 150 mm	-	HILB-3-1502U	HILB-5-1502U
2.1 x 250 mm	-	HILB-3-2502U	HILB-5-2502U
3.0 x 20 mm	HILB-17-0203U	HILB-3-0203U	HILB-5-0203U
3.0 x 30 mm	HILB-17-0303U	HILB-3-0303U	HILB-5-0303U
3.0 x 35 mm	HILB-17-3503U	HILB-3-3503U	HILB-5-3503U
3.0 x 50 mm	HILB-17-0503U	HILB-3-0503U	HILB-5-0503U
3.0 x 75 mm	HILB-17-7503U	HILB-3-7503U	HILB-5-7503U
3.0 x 100 mm	HILB-17-1003U	HILB-3-1003U	HILB-5-1003U
3.0 x 125 mm	-	HILB-3-1203U	HILB-5-1203U
3.0 x 150 mm	-	HILB-3-1503U	HILB-5-1503U
3.0 x 250 mm	-	HILB-3-2503U	HILB-5-2503U
4.6 x 20 mm	-	HILB-3-0246U	HILB-5-0246U
4.6 x 30 mm	-	HILB-3-0346U	HILB-5-0346U
4.6 x 35 mm	-	HILB-3-3546U	HILB-5-3546U
4.6 x 50 mm	-	HILB-3-0546U	HILB-5-0546U
4.6 x 75 mm	-	HILB-3-7546U	HILB-5-7546U
4.6 x 100 mm	-	HILB-3-1046U	HILB-5-1046U
4.6 x 125 mm	-	HILB-3-1246U	HILB-5-1246U
4.6 x 150 mm	-	HILB-3-1546U	HILB-5-1546U
4.6 x 250 mm	-	HILB-3-2546U	HILB-5-2546U

## ACE HILIC-B Microbore Columns

(Individual HILIC Microbore Columns of specified dimensions)

(HPLC hardware format with 400 bar/6000 psi recommended pressure limit)				
Column Dimensions	3 $\mu$ m		5 $\mu$ m	
	1/16" port	1/32" port	1/16" port	1/32" port
0.5 x 30 mm	HILB-3-0300S	HILB-3-03005S	HILB-5-0300S	HILB-5-03005S
0.5 x 50 mm	HILB-3-0500S	HILB-3-05005S	HILB-5-0500S	HILB-5-05005S
0.5 x 75 mm	HILB-3-7500S	HILB-3-75005S	HILB-5-7500S	HILB-5-75005S
0.5 x 100 mm	HILB-3-1000S	HILB-3-10005S	HILB-5-1000S	HILB-5-10005S
0.5 x 125 mm	HILB-3-1200S	HILB-3-12005S	HILB-5-1200S	HILB-5-12005S
0.5 x 150 mm	HILB-3-1500S	HILB-3-15005S	HILB-5-1500S	HILB-5-15005S
0.5 x 250 mm	-	-	HILB-5-2500S	HILB-5-25005S
1.0 x 30 mm	HILB-3-0301	HILB-3-0301S	HILB-5-0301	HILB-5-0301S
1.0 x 50 mm	HILB-3-0501	HILB-3-0501S	HILB-5-0501	HILB-5-0501S
1.0 x 75 mm	HILB-3-7501	HILB-3-7501S	HILB-5-7501	HILB-5-7501S
1.0 x 100 mm	HILB-3-1001	HILB-3-1001S	HILB-5-1001	HILB-5-1001S
1.0 x 125 mm	HILB-3-1201	HILB-3-1201S	HILB-5-1201	HILB-5-1201S
1.0 x 150 mm	HILB-3-1501	HILB-3-1501S	HILB-5-1501	HILB-5-1501S
1.0 x 250 mm	-	-	HILB-5-2501	HILB-5-2501S

**Important Note:** ACE microbore columns (1.0 mm id and 0.5 mm id) 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 (part number ACE-MC3210, 10 pack) or Eksigent 6-40 fittings (part number 5019621).

For 1/16" HPLC column connections up to 6000 psi, PEEK™ 1/16" fingertight fittings (part number ACE-CC10, 10 pack) are recommended. For 1/32" Microbore HPLC column connections up to 6000 psi, PEEK™ 1/32" (6-40 thread) fingertight fittings (part number ACE-MC3210, 10 pack) are recommended. For 1/16" UHPLC column connections up to 25000 psi, reusable 1/16" fittings (part number EXL-CC10, 10 pack) are recommended. To further extend UHPLC and HPLC column lifetimes, ACE pre-column filters are recommended. For further details please contact your distributor or visit [www.ace-hplc.com](http://www.ace-hplc.com)

## ACE HILIC-N Columns

(Individual HILIC Columns of specified dimensions)

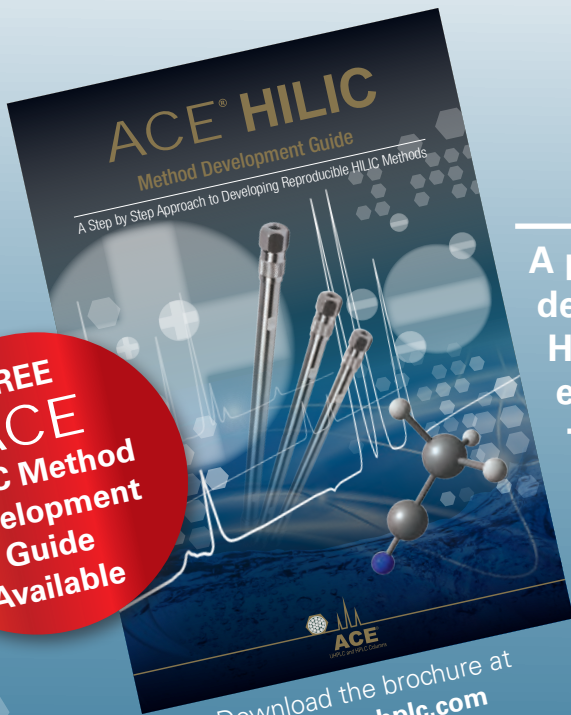
(UHPLC/HPLC hardware format with 1000 bar / 15000 psi pressure limit)			
Column Dimensions	1.7 $\mu$ m	3 $\mu$ m	5 $\mu$ m
2.1 x 20 mm	HILN-17-0202U	HILN-3-0202U	HILN-5-0202U
2.1 x 30 mm	HILN-17-0302U	HILN-3-0302U	HILN-5-0302U
2.1 x 35 mm	HILN-17-3502U	HILN-3-3502U	HILN-5-3502U
2.1 x 50 mm	HILN-17-0502U	HILN-3-0502U	HILN-5-0502U
2.1 x 75 mm	HILN-17-7502U	HILN-3-7502U	HILN-5-7502U
2.1 x 100 mm	HILN-17-1002U	HILN-3-1002U	HILN-5-1002U
2.1 x 125 mm	-	HILN-3-1202U	HILN-5-1202U
2.1 x 150 mm	-	HILN-3-1502U	HILN-5-1502U
2.1 x 250 mm	-	HILN-3-2502U	HILN-5-2502U
3.0 x 20 mm	HILN-17-0203U	HILN-3-0203U	HILN-5-0203U
3.0 x 30 mm	HILN-17-0303U	HILN-3-0303U	HILN-5-0303U
3.0 x 35 mm	HILN-17-3503U	HILN-3-3503U	HILN-5-3503U
3.0 x 50 mm	HILN-17-0503U	HILN-3-0503U	HILN-5-0503U
3.0 x 75 mm	HILN-17-7503U	HILN-3-7503U	HILN-5-7503U
3.0 x 100 mm	HILN-17-1003U	HILN-3-1003U	HILN-5-1003U
3.0 x 125 mm	-	HILN-3-1203U	HILN-5-1203U
3.0 x 150 mm	-	HILN-3-1503U	HILN-5-1503U
3.0 x 250 mm	-	HILN-3-2503U	HILN-5-2503U
4.6 x 20 mm	-	HILN-3-0246U	HILN-5-0246U
4.6 x 30 mm	-	HILN-3-0346U	HILN-5-0346U
4.6 x 35 mm	-	HILN-3-3546U	HILN-5-3546U
4.6 x 50 mm	-	HILN-3-0546U	HILN-5-0546U
4.6 x 75 mm	-	HILN-3-7546U	HILN-5-7546U
4.6 x 100 mm	-	HILN-3-1046U	HILN-5-1046U
4.6 x 125 mm	-	HILN-3-1246U	HILN-5-1246U
4.6 x 150 mm	-	HILN-3-1546U	HILN-5-1546U
4.6 x 250 mm	-	HILN-3-2546U	HILN-5-2546U

## ACE HILIC-N Microbore Columns

(Individual HILIC Microbore Columns of specified dimensions)

(HPLC hardware format with 400 bar/6000 psi recommended pressure limit)				
Column Dimensions	3 $\mu$ m		5 $\mu$ m	
	1/16" port	1/32" port	1/16" port	1/32" port
0.5 x 30 mm	HILN-3-0300S	HILN-3-03005S	HILN-5-0300S	HILN-5-03005S
0.5 x 50 mm	HILN-3-0500S	HILN-3-05005S	HILN-5-0500S	HILN-5-05005S
0.5 x 75 mm	HILN-3-7500S	HILN-3-75005S	HILN-5-7500S	HILN-5-75005S
0.5 x 100 mm	HILN-3-1000S	HILN-3-10005S	HILN-5-1000S	HILN-5-10005S
0.5 x 125 mm	HILN-3-1200S	HILN-3-12005S	HILN-5-1200S	HILN-5-12005S
0.5 x 150 mm	HILN-3-1500S	HILN-3-15005S	HILN-5-1500S	HILN-5-15005S
0.5 x 250 mm	-	-	HILN-5-2500S	HILN-5-25005S
1.0 x 30 mm	HILN-3-0301	HILN-3-0301S	HILN-5-0301	HILN-5-0301S
1.0 x 50 mm	HILN-3-0501	HILN-3-0501S	HILN-5-0501	HILN-5-0501S
1.0 x 75 mm	HILN-3-7501	HILN-3-7501S	HILN-5-7501	HILN-5-7501S
1.0 x 100 mm	HILN-3-1001	HILN-3-1001S	HILN-5-1001	HILN-5-1001S
1.0 x 125 mm	HILN-3-1201	HILN-3-1201S	HILN-5-1201	HILN-5-1201S
1.0 x 150 mm	HILN-3-1501	HILN-3-1501S	HILN-5-1501	HILN-5-1501S
1.0 x 250 mm	-	-	HILN-5-2501	HILN-5-2501S





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