

# HALO<sup>®</sup>

## PCS

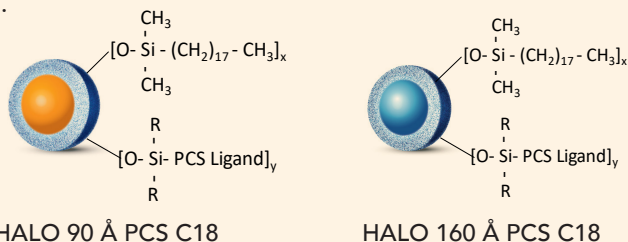
POSITIVELY EXCEPTIONAL PERFORMANCE



# HALO<sup>®</sup> PCS C18

## POSITIVE RESULTS FOR BASIC COMPOUNDS

Built upon proven Fused-Core<sup>®</sup> technology for speed and efficiency, the HALO<sup>®</sup> PCS C18 is a positively charged surface chemistry designed to deliver improved peak shapes for basic compounds. Ideal for use with low ionic strength mobile phases, HALO<sup>®</sup> PCS maintains peak symmetry at higher loading capacities and provides an alternate selectivity from other C18 bonded phases. Available in both a 90 Å and 160 Å pore size for small molecule and peptide analysis.



## FEATURES OF HALO<sup>®</sup> PCS C18

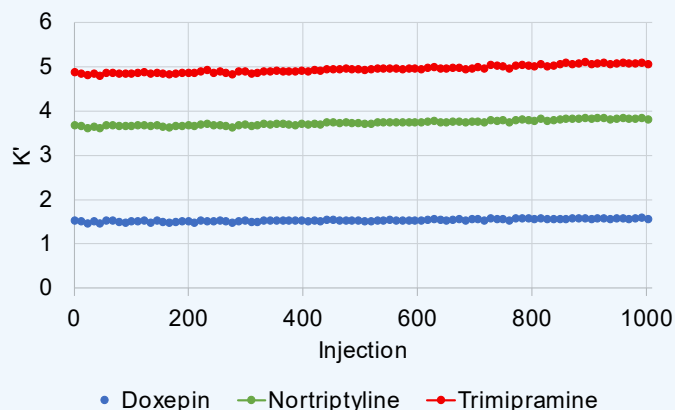
- Excellent peak shape and increased loading capacity for basic compounds
- Lot-to-Lot reproducibility
- UHPLC and LCMS compatible
- Alternate L1 selectivity
- Built upon Fused-Core<sup>®</sup> technology for fast, efficient and reliable separations

### Best Applications:

- Reversed-phase separations of basic analytes prone to peak tailing
- Peptide mapping
- Basic pharmaceutical compounds

## QUALITY YOU CAN COUNT ON

Panel of antidepressants screened over 1000 injections (10,000 column volumes) demonstrates the excellent stability of HALO<sup>®</sup> PCS C18.

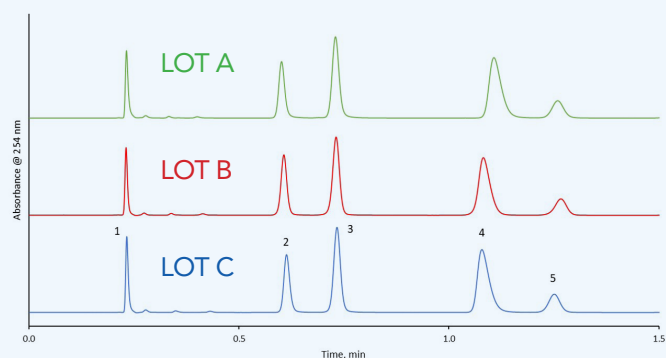


### TEST CONDITIONS:

Column: HALO 90 Å PCS C18, 2.7 µm, 2.1 x 100 mm  
 Part Number: 92812-617  
 Mobile Phase:  
 A: Water, 0.1% Formic Acid  
 B: Acetonitrile, 0.1% Formic Acid  
 Isocratic: 20% B  
 Flow Rate: 0.6 mL/min  
 Back Pressure: 244 bar

Temperature: 60 °C  
 Injection: 0.5 µL  
 Sample Solvent: 80/20 Water/ ACN  
 Wavelength: PDA, 254 nm  
 Flow Cell: 1 µL  
 Data Rate: 40 Hz  
 Response Time: 0.025 sec.  
 LC System: Shimadzu Nexera X2

Lot to Lot comparison demonstrates reproducibility and good peak shapes for basic, acidic and neutral compounds.



### PEAK IDENTITIES:

- |                          |                       |
|--------------------------|-----------------------|
| 1. Uracil                | 4. Imipramine         |
| 2. 2-Chlorobenzoic Acid  | 5. Dimethyl Phthalate |
| 3. 4-Methoxybenzoic Acid |                       |

### TEST CONDITIONS:

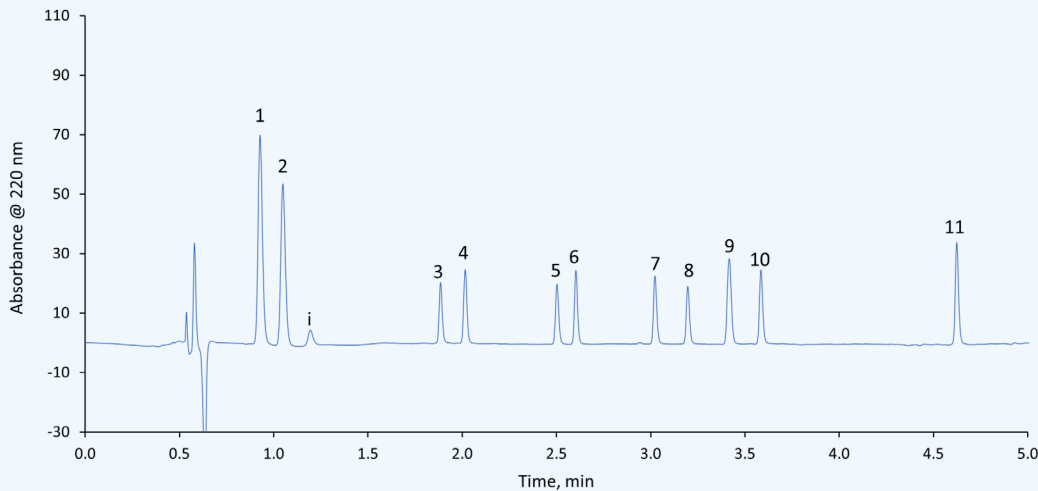
Column: HALO 90 Å PCS C18, 2.7 µm, 4.6 x 50 mm  
 Part Number: 92814-417  
 Mobile Phase:  
 A: 15 mM Ammonium Formate, 0.1% Formic Acid  
 B: Acetonitrile, 0.1% Formic Acid  
 Isocratic: 30% B  
 Flow Rate: 1.8 mL/min

Back Pressure: 225 bar  
 Temperature: 35 °C  
 Injection: 1.0 µL  
 Sample Solvent: 70/30 Water/ ACN  
 Wavelength: PDA, 254 nm  
 Flow Cell: 1 µL  
 Data Rate: 40 Hz  
 Response Time: 0.025 sec.  
 LC System: Shimadzu Nexera X2

# APPLICATIONS

## BETA BLOCKERS SEPARATION ON HALO® PCS C18

Eleven different beta blockers are separated in under 5 minutes using the HALO® PCS C18 column and demonstrating the speed and resolution of Fused-Core® technology.



### PEAK IDENTITIES:

1. Sotalol
2. Atenolol
3. Pindolol
4. Nadolol
5. Metoprolol
6. Acebutolol
7. Oxprenolol
8. Bisoprolol
9. Labetalol
10. Propranolol
11. Carvedilol

i = impurity in bisoprolol

### TEST CONDITIONS:

Column: HALO 90 Å PCS C18, 2.7 µm, 2.1 x 100 mm  
Part Number: 92812-617  
Mobile Phase:  
A: Water, 0.1% Formic Acid  
B: Acetonitrile, 0.1% Formic Acid

#### Gradient Separation:

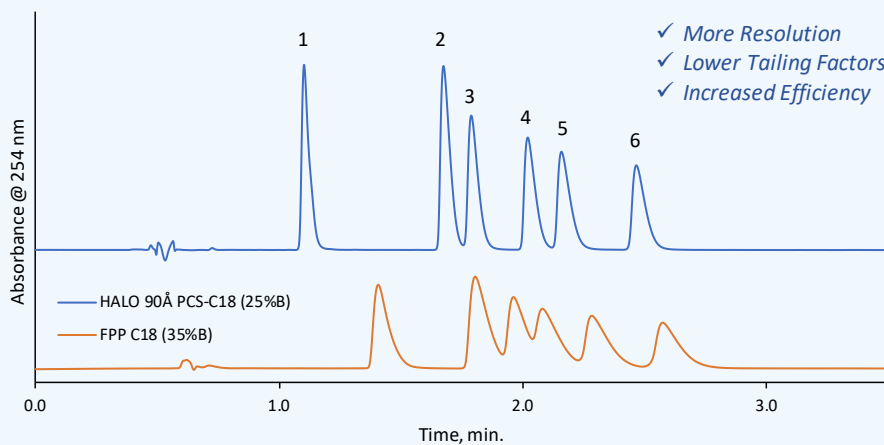
Time:	%B
0.00	3
5.00	36
6.50	100
7.50	100
8.00	3
12.00	3

Flow Rate: 0.4 mL/min  
Back Pressure: 281 bar  
Temperature: 30°C  
Injection: 1.0 µL  
Sample Solvent: 93/7 Water/ACN  
Wavelength: PDA, 220 nm  
Flow Cell: 1 µL

Data Rate: 100 Hz  
Response Time: 0.025 sec.  
LC System: Shimadzu Nexera X2

## FUSED-CORE® ADVANTAGE

As shown in this basic drug panel of antidepressants, the HALO® Fused-Core® PCS technology tolerates a higher sample load of basic compounds compared to the competitor fully porous C18 column. The positive charged surface (PCS) stationary phase is ideal for basic analytes when using low ionic strength mobile phases such as formic acid.



- ✓ More Resolution
- ✓ Lower Tailing Factors
- ✓ Increased Efficiency

### TEST CONDITIONS:

Column: HALO 90 Å PCS C18, 2.7 µm, 2.1 x 100 mm  
Part Number: 92812-617  
Competitor Column: FPP C18, 3 µm, 2.1 x 100 mm  
Mobile Phase A: Water, 0.1% Formic Acid  
Mobile Phase B: Acetonitrile, 0.1% Formic Acid  
Isocratic: HALO® PCS C18: 25% B  
FPP C18: 35% B

Flow Rate: 0.4 mL/min  
Back Pressure: 267 bar  
Temperature: 35 °C  
Injection: 0.5 µL (40 µg)  
Sample Solvent: 75/25 Water/ ACN  
Wavelength: PDA, 254 nm  
Flow Cell: 1 µL  
Data Rate: 100 Hz  
Response Time: 0.025 sec.  
LC System: Shimadzu Nexera X2

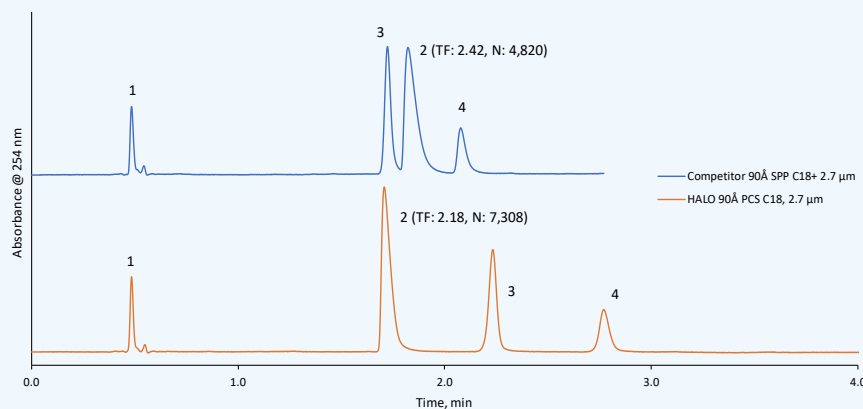
### PEAK IDENTITIES:

1. Doxepin
2. Desipramine
3. Imipramine
4. Nortriptyline
5. Amitriptyline
6. Trimipramine

# APPLICATIONS

## SPP CHARGED SURFACE COMPARISON

In a head to head comparison of SPP columns, HALO<sup>®</sup> PCS C18 delivers better resolution, improved tailing factors and more plates over the leading competitor.



### TEST CONDITIONS:

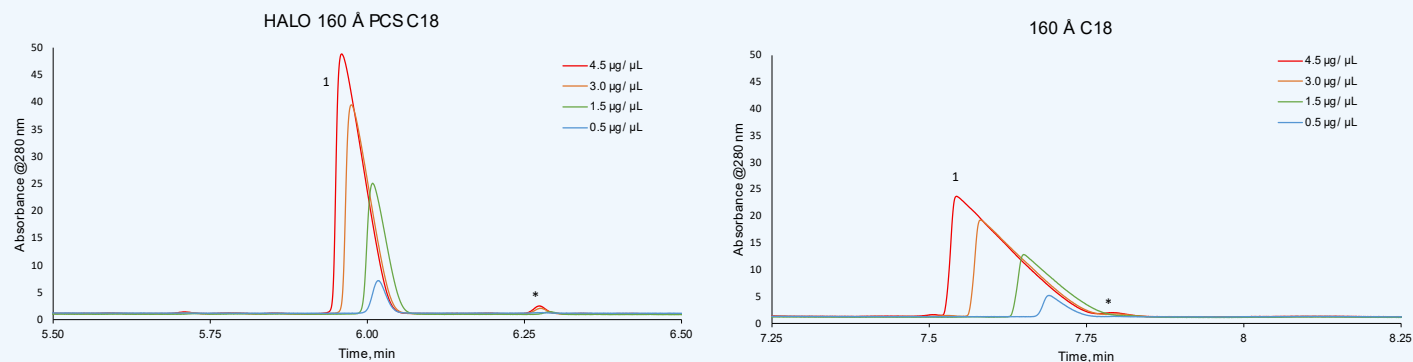
Column: HALO 90 Å PCS C18, 2.7 μm, 2.1 x 100 mm  
Part Number: 92812-617  
Mobile Phase:  
A: Water, 0.1% Formic Acid  
B: Acetonitrile, 0.1% Formic Acid  
Isocratic: HALO<sup>®</sup> PCS C18: 24% B  
Competitor C18+: 26% B  
Flow Rate: 0.4 mL/min  
Back Pressure: 238 bar  
Temperature: 35 °C  
Injection: 0.5 μL  
Sample Solvent: 70/30 Water/ ACN  
Wavelength: PDA, 254 nm  
Flow Cell: 1 μL  
Data Rate: 100 Hz  
Response Time: 0.025 sec.  
LC System: Shimadzu Nexera X2

### PEAK IDENTITIES:

1. Uracil
2. Imipramine
3. 4-Methoxybenzoic Acid
4. 2-Chlorobenzoic Acid

## PEPTIDE LOADING STUDIES

A HALO 160 Å PCS C18 column outperforms a traditional C18 column under formic acid conditions due to its positive charge surface, allowing for improved peak shape and resolution for peptides. PCS C18 also allows for a higher sample load on column for basic analytes and could potentially help pull apart closely retained impurities as seen below.



### PEAK IDENTITIES:

1. 5Y Sequence: Ac-RGVVGLYLKG-NH2 (1102 Da)
- \* Impurity

### TEST CONDITIONS:

Column: HALO 160 Å PCS-C18, 2.7 μm, 4.6 x 100 mm  
Part Number: 92814-617  
Mobile Phase A: Water/ 0.1% Formic Acid  
Mobile Phase B: Acetonitrile/ 0.1% Formic Acid  
Gradient: 

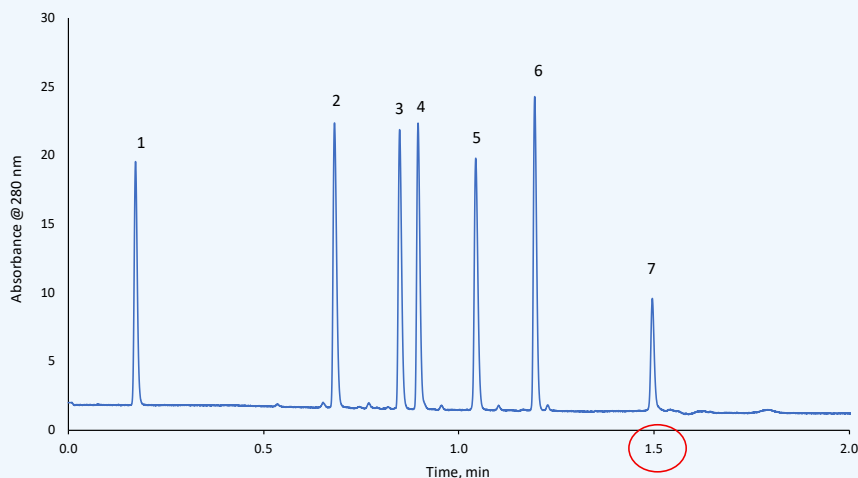
Time	% B
0.0	0
10.0	35

Flow Rate: 1.5 mL/min  
Pressure: 309 bar  
Temperature: 30 °C  
Injection Volume: 1, 5, 10, 15 μL (0.3 μg/μL)  
Wavelength: PDA, 280 nm  
Flow Cell: 1 μL  
Data Rate: 100 Hz  
Response Time: 0.025 sec.  
LC System: Shimadzu Nexera X2

# APPLICATIONS

## HALO 160 Å PCS C18 RAPID PEPTIDE SEPARATION

A separation of peptides is performed on a HALO 160 Å PCS C18 column showing excellent peak shape under formic acid conditions. With Fused-Core® technology flow rates are able to be increased while maintaining column efficiencies allowing for fast, high throughput separations.



### TEST CONDITIONS:

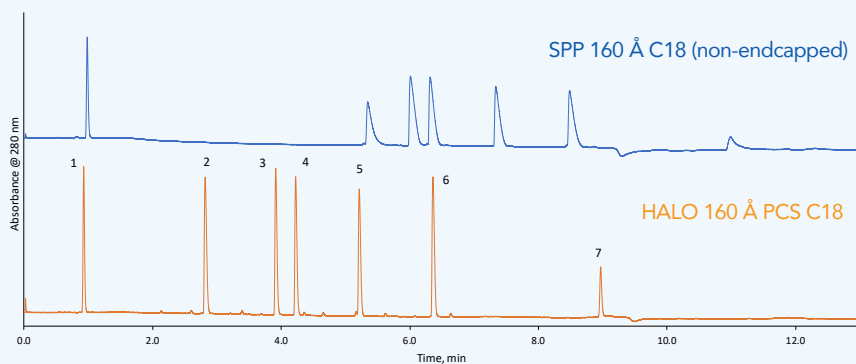
Column: HALO 160 Å PCS C18 , 2.7 µm, 2.1 x 50 mm  
Part Number: 92112-417  
Mobile Phase A: Water/ 0.1% Formic Acid  
Mobile Phase B: Acetonitrile/ 0.1% Formic Acid  
Gradient: Time % B  
0.0 0  
1.5 35  
2.0 35  
Flow Rate: 1.0 mL/min  
Pressure: 360 bar  
Temperature: 30 °C  
Injection Volume: 1.0 µL (0.3 µg/µL)  
Wavelength: PDA, 280 nm  
Flow Cell: 1 µL  
Data Rate: 100 Hz  
Response Time: 0.025 sec.  
LC System: Shimadzu Nexera X2

### PEAK IDENTITIES:

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| 1. Uracil                           | 5. S4Y2 Sequence: Ac-RGVGYLGLGK-NH2 |
| 2. S1Y Sequence: RGAGGLYLGLK-NH2    | 6. S5Y Sequence: Ac-RGVVGLYLGLK-NH2 |
| 3. S2Y Sequence: Ac-RGGGGLYLGLK-NH2 | 7. Insulin Chain B Oxidized         |
| 4. S3Y Sequence: Ac-RGAGGLYLGLK-NH2 |                                     |

## THE PCS ADVANTAGE

A synthetic panel of basic peptides is screened on the HALO 160 Å PCS C18 compared to the traditional C18 stationary phase. While using low ionic strength mobile phases such as formic acid the positively charged surface stationary phase shows significantly better peak widths and symmetry for more basic peptides when compared to a traditional non-encapped peptide C18 stationary phase.



### TEST CONDITIONS:

Column: HALO 160 Å PCS C18 , 2.7 µm, 2.1 x 100 mm  
Part Number: 92812-617  
Comparison Column: SPP 160 Å C18, 2.7 µm, 2.1 x 100mm  
Mobile Phase A: Water/ 0.1% Formic Acid  
Mobile Phase B: Acetonitrile/ 0.1% Formic Acid  
Gradient: Time % B  
0.0 2  
10.0 35  
Flow Rate: 0.3 mL/min  
Temperature: 30 °C  
Injection Volume: 1.0 µL  
Wavelength: PDA, 280 nm  
Flow Cell: 1 µL  
Data Rate: 100 Hz  
Response Time: 0.025 sec.  
LC System: Shimadzu Nexera X2

### PEAK IDENTITIES:

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| 1. Uracil                           | 5. S4Y2 Sequence: Ac-RGVGYLGLGK-NH2 |
| 2. S1Y Sequence: RGAGGLYLGLK-NH2    | 6. S5Y Sequence: Ac-RGVVGLYLGLK-NH2 |
| 3. S2Y Sequence: Ac-RGGGGLYLGLK-NH2 | 7. Insulin Chain B Oxidized         |
| 4. S3Y Sequence: Ac-RGAGGLYLGLK-NH2 |                                     |

# SPECIFICATIONS

Ligand: dimethyloctadecylsilane  
 Particle Size: 2.7  $\mu\text{m}$   
 Pore Size: 90 and 160  $\text{\AA}$   
 USP Designation: L1

Carbon Load 90  $\text{\AA}$ : 7.5%  
 Carbon Load 160  $\text{\AA}$ : 5.09%  
 Surface Area 90  $\text{\AA}$ : 135  $\text{m}^2/\text{g}$   
 Surface Area 160  $\text{\AA}$ : 90  $\text{m}^2/\text{g}$

Endcapped: Yes both 90 and 160  $\text{\AA}$   
 Low pH Limit /Max T: 2/60  $^{\circ}\text{C}$   
 High pH Limit/Max T: 7/40  $^{\circ}\text{C}$

## PART NUMBERS

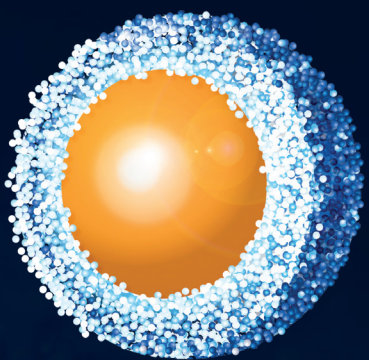
HALO 90 $\text{\AA}$ PCS C18 SMALL MOLECULE COLUMNS	
Dimensions: ID x Length (in mm)	Part Number
1.5 x 50	9281X-417
1.5 x 100	9281X-617
1.5 x 150	9281X-717
2.1 x 50	92812-417
2.1 x 100	92812-617
2.1 x 150	92812-717
3.0 x 50	92813-417
3.0 x 100	92813-617
3.0 x 150	92813-717
4.6 x 50	92814-417
4.6 x 100	92814-617
4.6 x 150	92814-717
4.6 x 250	92814-917

HALO 160 $\text{\AA}$ PCS C18 PEPTIDE COLUMNS	
Dimensions: ID x Length (in mm)	Part Number
1.5 x 50	9211X-417
1.5 x 100	9211X-617
1.5 x 150	9211X-717
2.1 x 50	92112-417
2.1 x 100	92112-617
2.1 x 150	92112-717
3.0 x 50	92113-417
3.0 x 100	92113-617
3.0 x 150	92113-717
4.6 x 50	92114-417
4.6 x 100	92114-617
4.6 x 150	92114-717

HALO 90 $\text{\AA}$ PCS C18 GUARD COLUMNS	
Guard columns, 3-pack	
Dimensions: ID x Length (in mm)	Part Number
2.1 x 5	92812-117
3.0 x 5	92813-117
4.6 x 5	92814-117
Guard Column Holder	94900-001

HALO 160 $\text{\AA}$ PCS C18 GUARD COLUMNS	
Guard columns, 3-pack	
Dimensions: ID x Length (in mm)	Part Number
2.1 x 5	92112-117
3.0 x 5	92113-117
4.6 x 5	92114-117
Guard Column Holder	94900-001

# HALO®



**Manufactured by:**



**advancedmaterialstechnology**

**halocolumns.com**

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