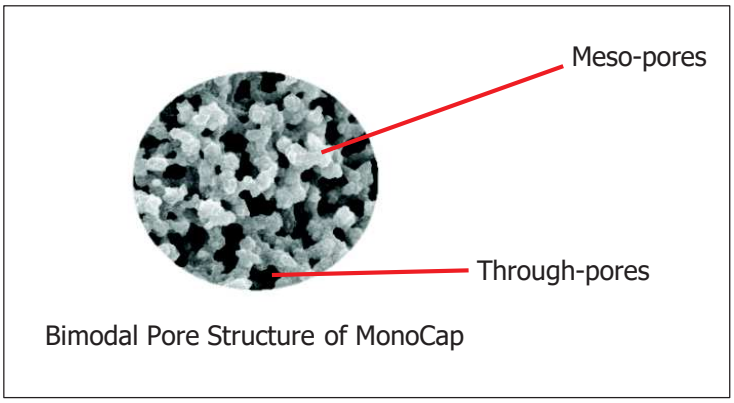
# MonoCap HighResolution 2000 Series

## Optimized for Identification of Peptides/Proteins for Proteome Research




Bimodal Pore Structure of MonoCap

MonoCap HighResolution 2000 is a 2 meter length monolithic silica capillary column which is designed for identifying extremely high number of peptides/proteins for proteome research via LC-MS/MS.

GL Sciences' MonoCap capillary columns, created synthetically via sol-gel method, and an octadecyl silane chemically bonded, has a very uniform three dimensional structure that shows excellent reproducibility from batch-to-batch.
The solid structure of GL Sciences' monolithic silica eliminates the need for frits or filters at the ends of the column, thereby reducing dead volume that might otherwise lead to band broadening or sample recovery.
The high porosity of our monolithic silica allows high flow rates to be used without loss of resolution or creation of high operating pressure. An optimized balance of through-pores and meso-pores provides the critically important combination of efficiency, separation speed, large volume sample-loading, and small volume sample-recovery.

MonoCap HighResolution provide extremely high efficiency, delivering over 200,000 plates for a 2,000 mm length column. The MonoCap HighResolution Ultra type deliver over 300,000 plates.

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap C18 HighResolution 2000 | Octadecyl Groups | 15 nm | Yes | 35 MPa |
| MonoCap C18 HighResolution Ultra 2000 | Octadecyl Groups | 11 nm | Yes | 35 MPa |
| MonoCap HILIC-UP HighResolution 2000 | Ureidopropyl Groups | 12 nm | None | 35 MPa |

Based on monolithic technology, Merck KGaA, Darmstadt, Germany.

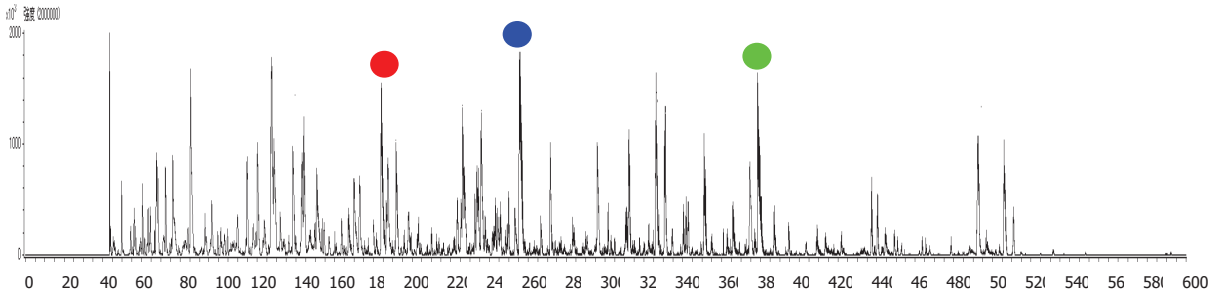
## Discover New Peptides/Proteins

As proven below, MonoCap C18 HighResolution 2000 mm length column identifies simply more peptides/proteins compared to those traditional particle packed capillary HPLC columns.

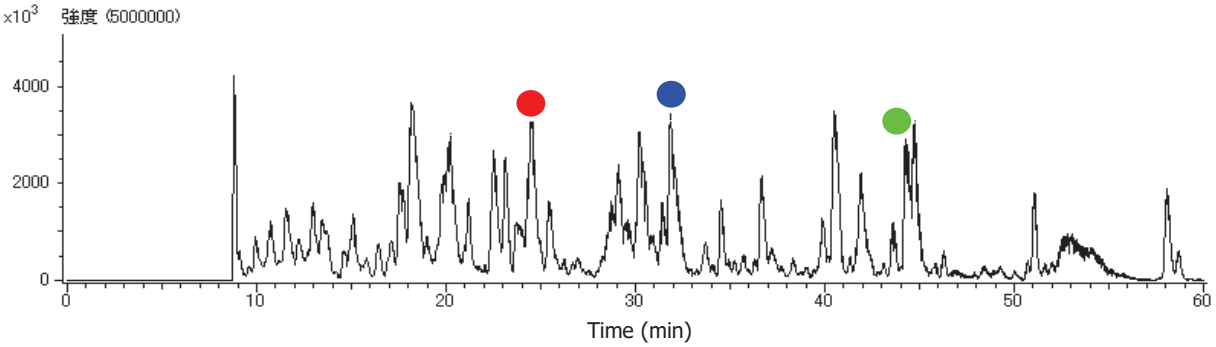
**MS:** **LTQ-Orbitrap XL (Mascot Search)**
**Sample:** **THP-1 Cell Lysate Tryptic Digest, 5 µg**

| Column Name | Number of Identified Proteins in average | Analysis Time |
|---|---|---|
| **MonoCap C18 HighResolution 2000 0.1 mm I.D. x 2000 mm** | **2,087 (2013, 2116, 2131)** | **10 Hours** |
| Particle packed column 0.1 mm I.D. x 150 mm | 680 (685, 679, 675) | 2 Hours |

### [1] MonoCap C18 HighResolution 2000 (2000 mm x 0.1 mm I.D.)




### [2] Particle Packed column (3 µm , 150 mm x 0.075 mm I.D.)




**Conditions**

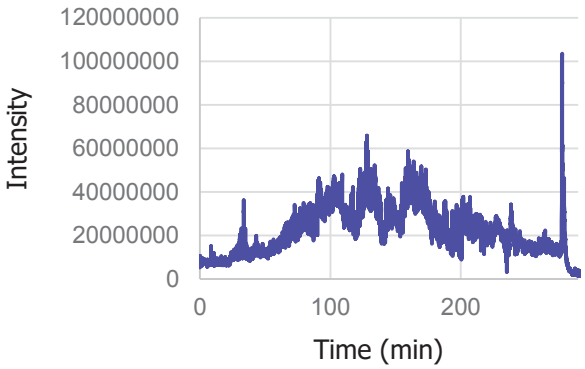
System : GLS Capillary HPLC system
Column : [1] MonoCap C18 High Resolution 2000 (2000 mm x 0.1 mm I.D)
: [2] Particle packed column (3 µm, 150 mm x 0.075 mm I.D.)
Trap column : MonoCap C18 Trap Column (50 mm x 0.075 mm I.D.)
Eluent : A) 0.1 %HCOOH in $CH_3CN$
B) 0.1 %HCOOH in $H_2O$
[1] A / B = 10 / 90 - 600 min - 45 / 55
[2] A / B = 10 / 90 - 180 min - 45 / 55

Flow Rate : [1] 0.5 µL/min
[2] 0.3 µL/min
Injection Vol.: 5 µL
Detection : MS (TIC m / z 500-1500)
Sample : Tryptic digest of proteins

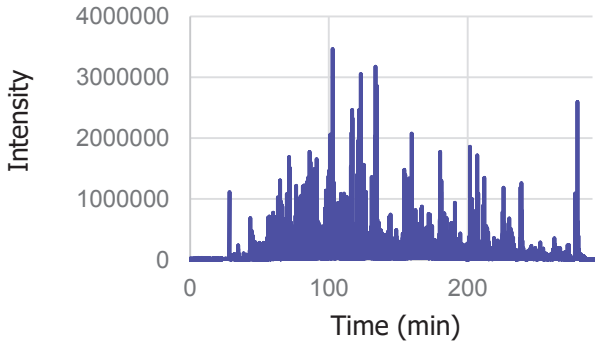
● ● ● **are analytes having the same molecular weight**

## For Identifying Highly Hydrophilic, Hydrophobic Peptides/Proteins

MonoCap HILIC-UP is an important addition to the MonoCap C18 HighResolution 2000 column series. MonoCap HILIC-UP can retain highly hydrophilic peptides/proteins which may lead to discovering new peptides/proteins where a C18 phase couldn't identify.
In HILIC, the higher the organic concentration, the greater the retention of more polar analytes. One of the biggest benefit of HILIC mode is, a high organic solvent concentration of the mobile phase will lead to a high sensitivity LC-MS/MS analysis.




Total Ion Chromatogram




Base Peak Chromatogram

**Remarks:**

**Results of MonoCap C18 HighResolution 2000**

**Number of Identified Peptides: 8,358**
**Number of Identified Proteins: 1,992**
**Gradient Program: 4 hrs**

**Results of MonoCap HILIC-UP HighResolution 2000**

**Number of Identified Peptides: 7,194 (14,736 PSM*)**
**Number of Identified Proteins: 2,201**
*** Peptide Spectrum Match**

**Conditions**

| | |
|---|---|
| Column | : MonoCap HILIC-UP High Resolution 2000 |
| Eluent | : A) $CH_3CN$ : $H_2O$=10/90 (0.5% $CH_3COOH$) |
| | B) $CH_3CN$ : $H_2O$=95/5 (0.5% $CH_3COOH$) |
| | A/B=0/100-(240 min)-20/80-(10 min)-100/0-(10 min)-100/0 |
| Flow Rate | : 0.5 µL |
| Injection Vol. | : 1 µL (1 mg/mL) |
| Detection | : TIC MS (m/z 300-1500) |
| Sample | : Tryptic Digest of Hela Cell Lysate, 5 ug |

**Reference:**
**Hydrophilic Interaction Chromatography Using a Meter-Scale Monolithic silica capillary Column for Proteomics LC-MS,**
**K Horie et al. *Anal. Chem*. 2014, 86, 3817-3824**

## References

1. M.H.M. van de Meent et al.
Improvement of the liquid-chromatographic analysis of protein tryptic digests by the use of long-capillary monolithic columns with UV and MS detection, Anal Bioanal Chem, 2007,388, 195-200

2. Mio Iwasaki et al.
One-Dimensional Capillary Liquid Chromatographic Separation Coupled with Tandem Mass Spectorometry Unveils the Escherichia coli Proteome on a Microarray Scale, Anal. Chem. 2010, 82, 2616-2620

3. Mio Iwasaki et al.
Human Proteome analysis by using reversed phase monolithic silica capillary columns with enhanced sensitivity, J Chromatogr A 2012, 1228, 292-297

4. Ryota Yamana ea al.
Rapid and deep profiling of human induced pluripotent stem cell proteome by one-shot NanoLC-MS/MS analysis with meter-scale monolithic silica columns, J Proteome Res. 2013, 12, 214-21

5. Mari Ogawa-Ohnishi et al.
Identification of three hydroxyproline O-arabinosyltransferases in Arabidopsis thaliana, Nature Chem. Biol. 2013, 9, 726-730

6. Satoru Okamoto et al.
Root-derived CLE glycopeptides control nodulation by direct binding to HAR1 receptor kinase, Nature Commun. 2013,4, 2191

7. Kanta Horie et al.
Hydrophilic interaction chromatography using a meter-scale monolithic silica capillary column for proteomics LC-MS, Anal. Chem. 2014, 86, 3817-3824

## Ordering Information

### MonoCap C18 HighResolution Ultra 2000

- End-fittings are not included.
- A column connection kit is available separately to ensure proper connections.
- Please refer to the below ordering information.

| Description | I.D. (mm) | Length (mm) | Qty | Cat. No. |
|---|---|---|---|---|
| MonoCap C18 HighResolution Ultra 2000 | 10 µm | 2000 | 1/pk | 5020-10018 |

### MonoCap C18 HighResolution 2000

- End-fittings are not included.
- A column connection kit is available separately to ensure proper connections.
- Please refer to the below ordering information.

| Description | I.D. (mm) | Length (mm) | Qty | Cat. No. |
|---|---|---|---|---|
| MonoCap C18 HighResolution 2000 | 10 µm | 2000 | 1/pk | 5020-10015 |

### MonoCap HILIC-UP HighResolution 2000

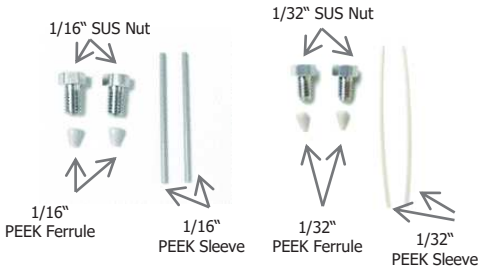
- End-fittings are not included.
- A column connection kit is available separately to ensure proper connections.
- Please refer to the below ordering information.

| Description | I.D. (mm) | Length (mm) | Qty | Cat. No. |
|---|---|---|---|---|
| MonoCap HILIC-UP HighResolution 2000 | 10 µm | 2000 | 1/pk | 5020-10019 |

### Connection Kit for MonoCap HighResolution 2000

- A dedicated connection kit for MonoCap C18 High Resolution 2000.
- Use this connection kit when connecting the column directly to the system.

| Description | Qty | Cat. No. |
|---|---|---|
| 1/16" PEEK Ferrule, SUS Nut, Sleeve, 2 pcs each.<br>1/32" PEEK Ferrule, SUS Nut, Sleeve, 2 pcs each. | 1/pk | 5020-10017 |




### Zero Dead Volume Union

- Connect the tubing from the system to this union and install the column to achieve zero dead volume.

| Description | Orifice Size | Qty | Cat. No. |
|---|---|---|---|
| U-435 | 0.25 mm | 1/pk | 6010-72352 |
| U-411 | 178 µm | 1/pk | 6010-72351 |

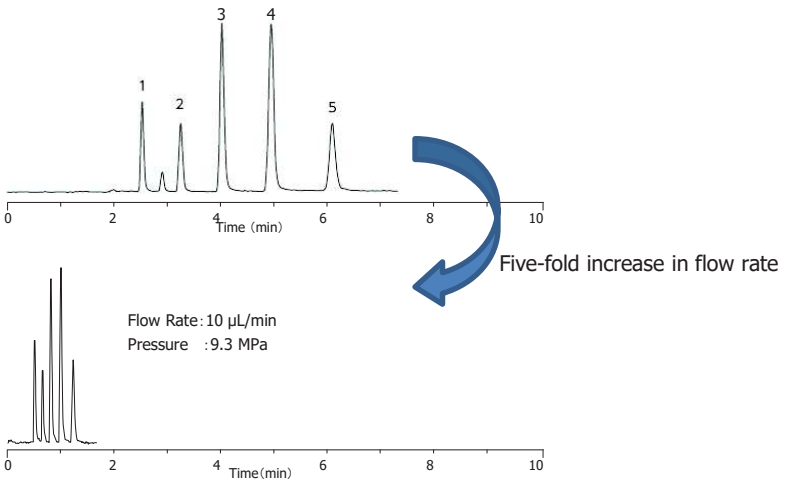
# MonoCap C18 Fast-Flow

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap C18 Fast-flow | Octadecyl Groups | 15 nm | Yes | 22 MPa |

Workable at a broad range of linear velocity from 0.5 to 5 mm/s without sacrificing efficiency and separation at high speed. The number of theoretical plates produced by MonoCap C18 Fast-Flow is nearly equivalent to a totally porous particle type capillary column packed with a 5 µm packing material. Columns are protected by either metal or PEEK hardware.

### Workable at High Flow Rates without Sacrificing Efficiency




**Conditions**
Column : MonoCap C18 for Fast-flow (150 × 0.2 mm I.D.)
Eluent : A) $CH_3CN$ B) $H_2O$ A/B=50/50 ,v/v
Col.Temp. Ambient
Detection : UV 210 nm (MU701, Cell Volume 18 nL)
Injection Vol. : 0.5 µL
Sample : 1. Thiourea
2. Acetophenone
3. Benzene
4. Toluene
5. Naphthalene

# MonoCap C18 Nano-flow

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap C18 Nano-flow | Octadecyl Groups | 11 nm | Yes | 22 MPa |

MonoCap C18 Nano-flow produces higher number of theoretical plates compared to a totally porous particle type capillary column packed with a 3 µm packing material. It can be operated at a wide range of flow rate with low back pressure and achieve very high sensitive results in Nano-LC-ESI/MS applications. Columns are protected by either metal or PEEK hardware.

# MonoCap C18 WideBore

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap C18 WideBore | Octadecyl Groups | 11 nm | Yes | 22 MPa |

The MonoCap C18 Fast-flow is also available in 0.5 mm I.D. size, which can be used at a wide range of flow rate from 6 to 100 µL/min without sacrificing efficiency. The number of theoretical plates produced by MonoCap C18 WideBore is nearly equivalent to a totally porous particle type capillary column packed with a 5 µm packing material. Columns are protected by a metal hardware.

# MonoCap C18 Trap Column

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap C18 Trap Column | Octadecyl Groups | 11 nm | Yes | 20 MPa |

MonoCap C18 Trap columns have a relatively big throughpore and workable at a high flow rate such as 10 µL/min. This benefit makes MonoCap C18 Trap columns to be appropriate for on-line preconcentration or desalting of protein and peptide samples prior to HPLC separation with mass spectrometry detection. End-fittings are 1/16” (10-32 UNF). 1/32” end-fittings are also available upon request.

# MonoCap Amide

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap Amide | Carbamoyl Groups | 15 nm | None | 22 MPa |

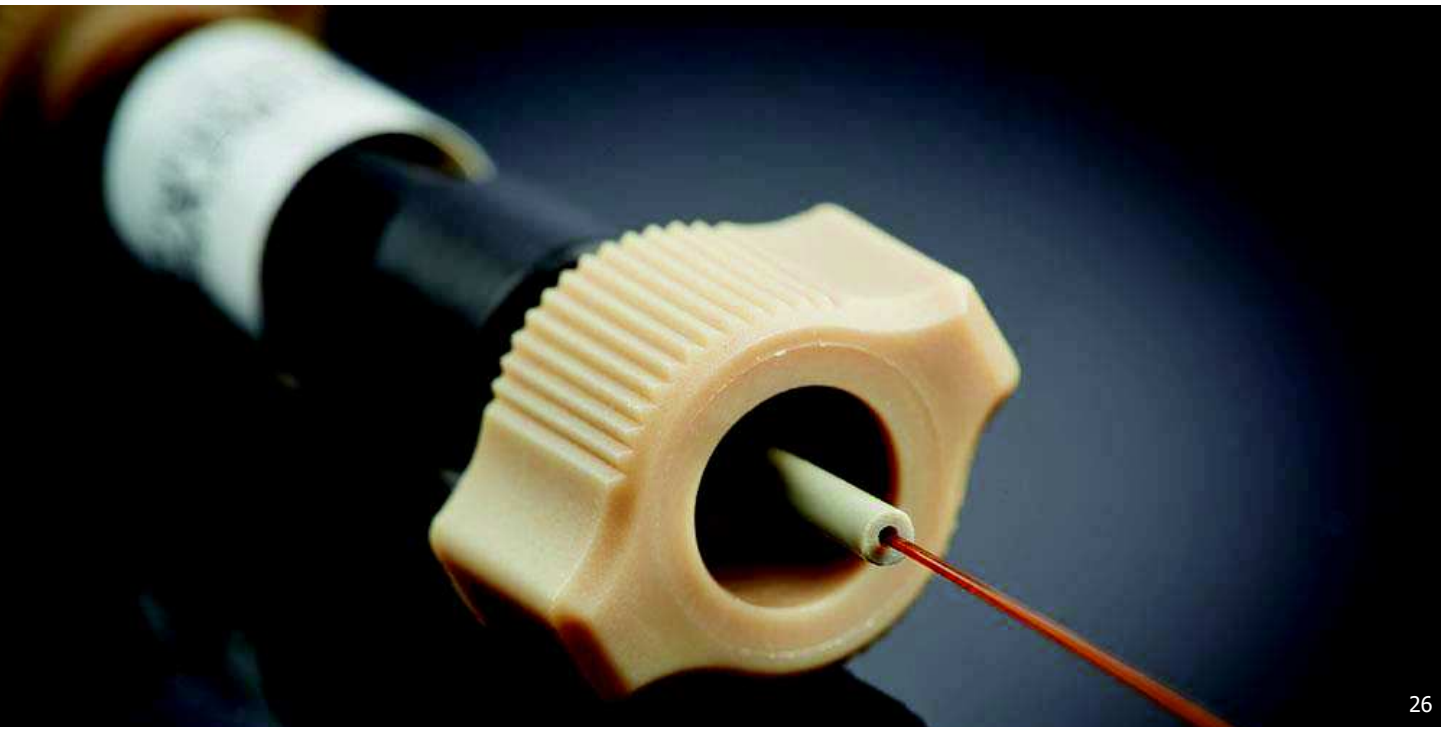
Amide groups are chemically bonded to the monolithic silica and makes it suitable for the analysis of sugars via HILIC mode. As the back pressure is significantly low, a 500 mm length MonoCap Amide column deliver over 40,000 plates offering high efficiency. Generally, HILIC mode uses acetonitrile at a concentration between 65-95 % in an aqueous buffer such as ammonium acetate or ammonium formate, which have high solubility in organic solvents. Columns are protected by either metal or PEEK hardware.

# MonoCap SCX

## Physical Properties

| Product Description | Bonded Phase | Meso-pore | End-capping | Max. Operating Pressure |
|---|---|---|---|---|
| MonoCap SCX | Benzenesulfonyl Groups | 11 nm | None | 20 MPa |

MonoCap SCX is bonded with benzene sulfonic acid groups (strong cation exchange) and appropriate for 2D LC applications for the separation of biomolecules such as peptides and proteins.



## Ordering Information

### MonoCap C18 Fast-Flow

- For end-fittings information, please refer to page 30.
- All 50 mm length PEEK columns does not come with a hardware and will be supplied with 3 pcs of columns only.

| Description | I.D. (mm) | Length (mm) | Hardware | Qty | Cat. No. |
|---|---|---|---|---|---|
| MonoCap C18 Fast-Flow | 0.05 | 50 | Metal | 1/pk | 5020-10102 |
| | | 150 | | 1/pk | 5020-10101 |
| | | 250 | | 1/pk | 5020-10100 |
| | | 50 | PEEK | 3/pk | 5020-10002 |
| | | 150 | | 1/pk | 5020-10001 |
| | | 250 | | 1/pk | 5020-10000 |
| | 0.075 | 50 | Metal | 1/pk | 5020-10211 |
| | | 150 | | 1/pk | 5020-10212 |
| | | 250 | | 1/pk | 5020-10213 |
| | | 50 | PEEK | 3/pk | 5020-10221 |
| | | 150 | | 1/pk | 5020-10222 |
| | | 250 | | 1/pk | 5020-10223 |
| | 0.1 | 50 | Metal | 1/pk | 5020-10112 |
| | | 150 | | 1/pk | 5020-10111 |
| | | 250 | | 1/pk | 5020-10110 |
| | | 50 | PEEK | 3/pk | 5020-10012 |
| | | 150 | | 1/pk | 5020-10011 |
| | | 250 | | 1/pk | 5020-10010 |
| | 0.2 | 50 | Metal | 1/pk | 5020-10122 |
| | | 150 | | 1/pk | 5020-10121 |
| | | 250 | | 1/pk | 5020-10120 |
| | | 50 | PEEK | 3/pk | 5020-10022 |
| | | 150 | | 1/pk | 5020-10021 |
| | | 250 | | 1/pk | 5020-10020 |

## Ordering Information

### MonoCap C18 Nano-Flow

- For end-fittings information, please refer to page 30.
- All 50 mm length PEEK columns does not come with a hardware and will be supplied with 3 pcs of columns only.

| Description | I.D. (mm) | Length (mm) | Hardware | Qty | Cat. No. |
|---|---|---|---|---|---|
| MonoCap C18 Nano-Flow | 0.05 | 50 | Metal | 1/pk | 5020-10143 |
| | | 150 | | 1/pk | 5020-10141 |
| | | 50 | PEEK | 3/pk | 5020-10043 |
| | | 150 | | 1/pk | 5020-10041 |
| | 0.075 | 50 | Metal | 1/pk | 5020-10231 |
| | | 150 | | 1/pk | 5020-10232 |
| | | 50 | PEEK | 3/pk | 5020-10241 |
| | | 150 | | 1/pk | 5020-10242 |
| | 0.1 | 50 | Metal | 1/pk | 5020-10153 |
| | | 150 | | 1/pk | 5020-10151 |
| | | 50 | PEEK | 3/pk | 5020-10053 |
| | | 150 | | 1/pk | 5020-10051 |
| | 0.2 | 50 | Metal | 1/pk | 5020-10163 |
| | | 150 | | 1/pk | 5020-10161 |
| | | 50 | PEEK | 3/pk | 5020-10063 |
| | | 150 | | 1/pk | 5020-10061 |

### MonoCap C18 WideBore

- For end-fittings information, please refer to page 30.

| Description | I.D. (mm) | Length (mm) | Hardware | Qty | Cat. No. |
|---|---|---|---|---|---|
| MonoCap C18 WideBore | 0.5 | 50 | Metal only | 1/pk | 5020-10202 |
| | | 150 | | 1/pk | 5020-10201 |
| | | 250 | | 1/pk | 5020-10200 |

## Ordering Information

### MonoCap C18 Trap Column

- For end-fittings information, please refer to page 30.

| Description | I.D. (mm) | Length (mm) | Hardware | Qty | Cat. No. |
|---|---|---|---|---|---|
| MonoCap C18 Trap Column | 0.05 | 50 | With Hardware | 1/pk | 5020-10026 |
| | | 100 | | 1/pk | 5020-10038 |
| | | 150 | | 1/pk | NA |
| | | 50 | Without Hardware | 1/pk | 5020-10027 |
| | | 100 | | 1/pk | 5020-10039 |
| | | 150 | | 1/pk | NA |
| | 0.075 | 50 | With Hardware | 1/pk | 5020-10028 |
| | | 100 | | 1/pk | 5020-10036 |
| | | 150 | | 1/pk | NA |
| | | 50 | Without Hardware | 1/pk | 5020-10029 |
| | | 100 | | 1/pk | 5020-10037 |
| | | 150 | | 1/pk | NA |
| | 0.2 | 50 | With Hardware | 1/pk | 5020-10033 |
| | | 100 | | 1/pk | NA |
| | | 150 | | 1/pk | NA |
| | | 50 | Without Hardware | 1/pk | 5020-10034 |
| | | 100 | | 1/pk | NA |
| | | 150 | | 1/pk | 5020-10031 |

### MonoCap Amide

- For end-fittings information, please refer to page 30.

| Description | I.D. (mm) | Length (mm) | Hardware | Qty | Cat. No. |
|---|---|---|---|---|---|
| MonoCap Amide | 0.075 | 150 | Metal | 1/pk | 5020-10191 |
| | | 250 | | 1/pk | 5020-10192 |
| | | 500 | | 1/pk | 5020-10193 |
| | | 150 | PEEK | 1/pk | 5020-10091 |
| | | 250 | | 1/pk | 5020-10092 |
| | | 500 | | 1/pk | 5020-10093 |
| | 0.1 | 150 | Metal | 1/pk | 5020-10181 |
| | | 250 | | 1/pk | 5020-10182 |
| | | 500 | | 1/pk | 5020-10183 |
| | | 150 | PEEK | 1/pk | 5020-10081 |
| | | 250 | | 1/pk | 5020-10082 |
| | | 500 | | 1/pk | 5020-10083 |
| | 0.2 | 150 | Metal | 1/pk | 5020-10171 |
| | | 250 | | 1/pk | 5020-10172 |
| | | 500 | | 1/pk | 5020-10173 |
| | | 150 | PEEK | 1/pk | 5020-10071 |
| | | 250 | | 1/pk | 5020-10072 |
| | | 500 | | 1/pk | 5020-10073 |

## Ordering Information

### MonoCap SCX

- For end-fittings information, please refer to the following information.

| Description | I.D. (mm) | Length (mm) | Hardware | Qty | Cat. No. |
|---|---|---|---|---|---|
| MonoCap SCX | 0.2 | 50 | Metal | 1/pk | 5020-10174 |
| | | 150 | | 1/pk | 5020-10175 |
| | | 250 | | 1/pk | 5020-10176 |
| | | 500 | | 1/pk | 5020-10177 |
| | | 50 | PEEK | 1/pk | 5020-10074 |
| | | 150 | | 1/pk | 5020-10075 |
| | | 250 | | 1/pk | 5020-10076 |
| | | 500 | | 1/pk | 5020-10077 |

### End-fittings of MonoCap Monolithic Capillary HPLC Columns

| Description | End-fittings Details |
|---|---|
| MonoCap C18 Fast-flow<br>MonoCap C18 Nano-flow<br>MonoCap C18 WideBore<br>MonoCap Amide<br>MonoCap SCX | 1. Metal Hardware Type<br>End-fittings are Valco 1/16" (10-32 UNF).<br>Valco 1/32" (6-40 UNF) end-fittings can also be arranged upon request, indicate "1/32" when ordering.<br><br>2. PEEK Hardware Type<br>1/16" male nut, ferrule and PTFE sleeve are included. |

### Connection Kit for MonoCap C18 Trap Column

| Description | Cat. No. |
|---|---|
| MonoCap C18 Trap Column Connection Kit 1/16"<br>(Union·Sleeve·Capillary Tubing 2 pcs each, Nut·Ferrule 4 pcs each) | 5020-10044 |
| MonoCap C18 Trap Column Connection Kit 1/32"<br>(Union·Sleeve·Capillary Tubing 2 pcs each, Nut·Ferrule 4 pcs each) | 5020-10045 |
| MonoCap C18 Trap Column Assembly Parts 1/16"<br>(Nut·Ferrule 4 pcs each) | 5020-10046 |
| MonoCap C18 Trap Column Assembly Parts 1/32"<br>(Nut·Ferrule 4 pcs each) | 5020-10047 |