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# Semipreparative Columns

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## Introduction

### HPLC Columns for Semipreparative Chromatography

Semi-preparative chromatography is the link between analytical HPLC and preparative LC. Even though the chromatographic systems used for semi-preparative LC do not reach the size of preparative LC systems, the objectives remain the same:

- Purification and isolation of the maximum sample quantity
- With savings in time and costs.  
YMC's route to success!

### With YMC Time is on your side!

Moreover, YMC is one of a very few stationary phase manufacturers, who can offer full scalability from 2 micron Ultra-Fast LC, through 3 to 5 micron analytical HPLC to 10 -50 micron semi-preparative and preparative scale chromatography. This should make YMC the partner of choice for fast and easy method transfer from analytical to process scale separations.

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# Semipreparative Chromatography

## Optimisation of preparative chromatography!

The main task for a preparative chromatographer is to find the suitable system. In order to simplify the considerations YMC developed a "Preparative Column Selection Guide".

		Column efficiency <sup>※1</sup> Pressure <sup>※1</sup> Cost <sup>※1</sup>					
		High ←					→ Low
Standard sample load	Particle size (μm) Inner diameter (mm I. D.)	spherical					Irregula
		5 N = 90000 <sup>※2</sup>	10 N = 40000 <sup>※2</sup>	15 N = 20000 <sup>※2</sup>	20 N = 10000 <sup>※2</sup>	50 N = 5000 <sup>※2</sup>	230/70 mesh N = 2500 <sup>※2</sup>
	4, 6, 6.0						
	10, 20						
	50						
	100, 150						
	200						
	300 or more						

Most appropriate   
 Appropriate   
 According to the purpose

<sup>※1</sup> Value per unit length                      R&D Scale-up Kit: Analytical and semipreparative columns packed with a stationary phase from the same lot.  
<sup>※2</sup> Standard theoretical plate number per m

Source: Courtesy of YMC Co., Ltd.

The "Preparative Column Selection Guide" will help to select:-

1. the column i.d. for the required sample loading
2. the particle size for optimum efficiency
3. the column length for the necessary resolution

## Scale-Up

The YMC Scale-Up is defined by 4 steps:

1. Analytical Scale: Method Development

Determine separation conditions by using analytical columns packed with different stationary phases and various conditions.

2. Study the preparative scale. Select the particle size of the packing material and the inner diameter of column appropriate for the sample volume.

3. Optimise the separation conditions and perform loadability studies using analytical columns with inner diameter of 4.6 mm or 6.0 mm packed with the packing material selected for the preparative separation (scout column). If the particle size of the packing material is the same as in the Step 1, this process can be omitted. If the preparative column is more than 100 mm i.d., it is advisable to insert another step with a scout column of 20 mm i.d. in order to accurately predict loadability and calculate the running costs.

4. Proceed with the preparative separation with scale-up of chromatographic parameters such as flow rate/ column ID/ sample load as necessary.

From all the given steps above the most demanding step will be the scale-up of the chromatographic parameters in order to meet the preparative demands.

There are a number of scalable parameters: flow rate, column i.d., sample load, tubing i.d., sample injection concentration, volume of sample loop, consumption of solvent, dead volume, fraction mass, size of the detector cell.

## How to adjust the scalable factors?

# Semipreparative Chromatography

In order to simplify your Scale-Up the three most important scale-up factors are summarised.

Scalable factor SF	i.d. "Linear Scale-Up"	Column length	Column length and i.d. "Volume"
	$SF = r_{ID, prep}^2 / r_{ID, anal.}^2$	$SF = l_{ID, prep} / l_{ID, anal.}$	$SF = (r_{ID, prep}^2 / r_{ID, anal.}^2) / (l_{ID, prep} / l_{ID, anal.})$
Impact	Flow rate Eluent composition	Retention time Cycle time Plate number	Amount of adsorbent

## Linear Scale-Up

In most cases it is beneficial to develop a semi-preparative method on an analytical scale column. The analytical separation carried out on a 150 x 4.6 mm i.d. column has to be scaled up to 150 x 20 mm i.d. Therefore the chromatographic parameters such as flow rate and column load have to be adjusted according to the following equation:

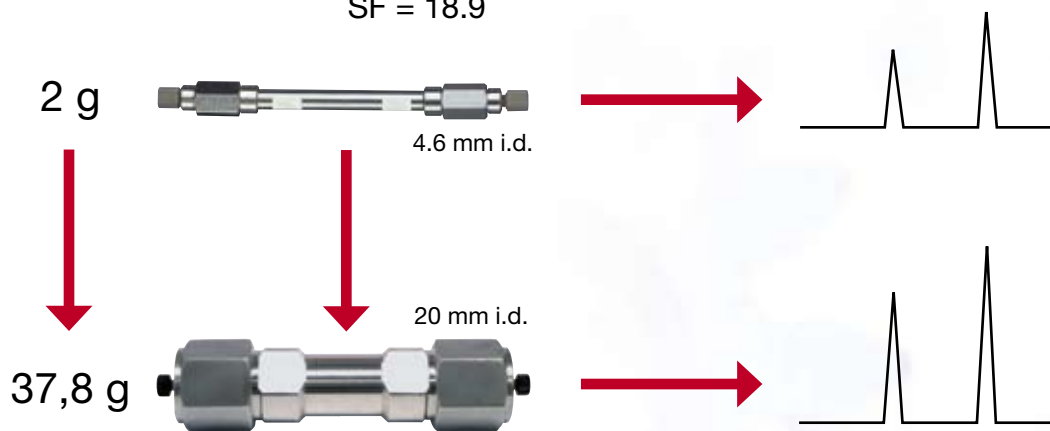
## Linear Scale-Up

$$SF = \frac{\Pi_{ID, prep}^2}{\Pi_{ID, anal.}^2} = \frac{m_{prep}}{m_{anal.}}$$

$$SF = r_{ID, prep}^2 / r_{ID, analytical}^2$$

$$SF = 20^2_{ID, prep} / 4.6^2_{ID, analytical}$$

$$SF = 18.9$$



Inner diameter → loadability / compound

## Guideline for Sample Load according to column i.d.

Column i.d. (mm)	Scale-Up factor	Loadability (mg)
4.6	1	1-4
10	4.7	5-20
20	18.9	20-80
50	118	80-350
75	266	270-980
100	472	470-1900
150	1060	1000-4200

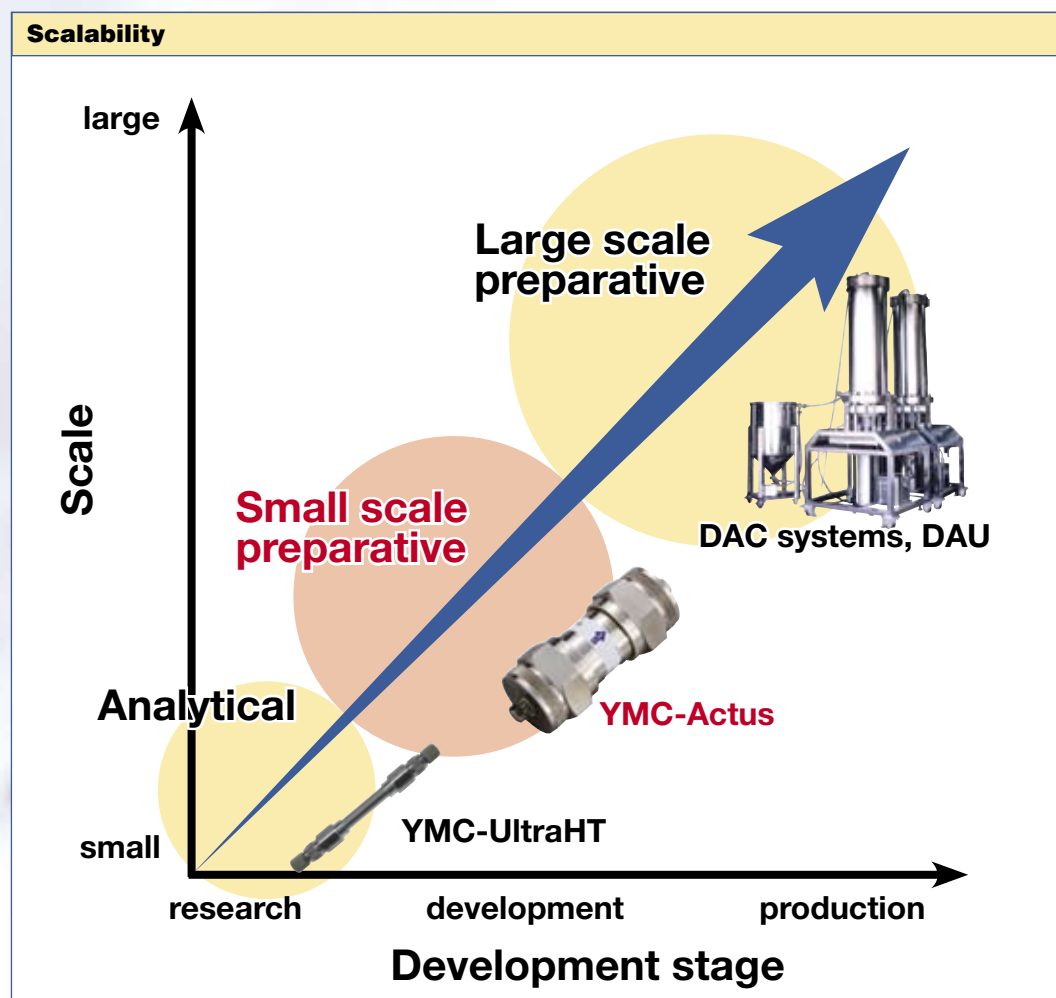
# YMC-Actus Series

- extended column lifetime
- allow high throughput for semi-preparative column
- maintain outstanding resolution



## General

YMC-Actus columns are available in the same wide choice of YMC chemistries as conventional YMC semi-prep columns. Based on knowledge gained from YMC's axial compression based products, YMC-Actus columns are available in 50 mm x 20 mm i.d. format.



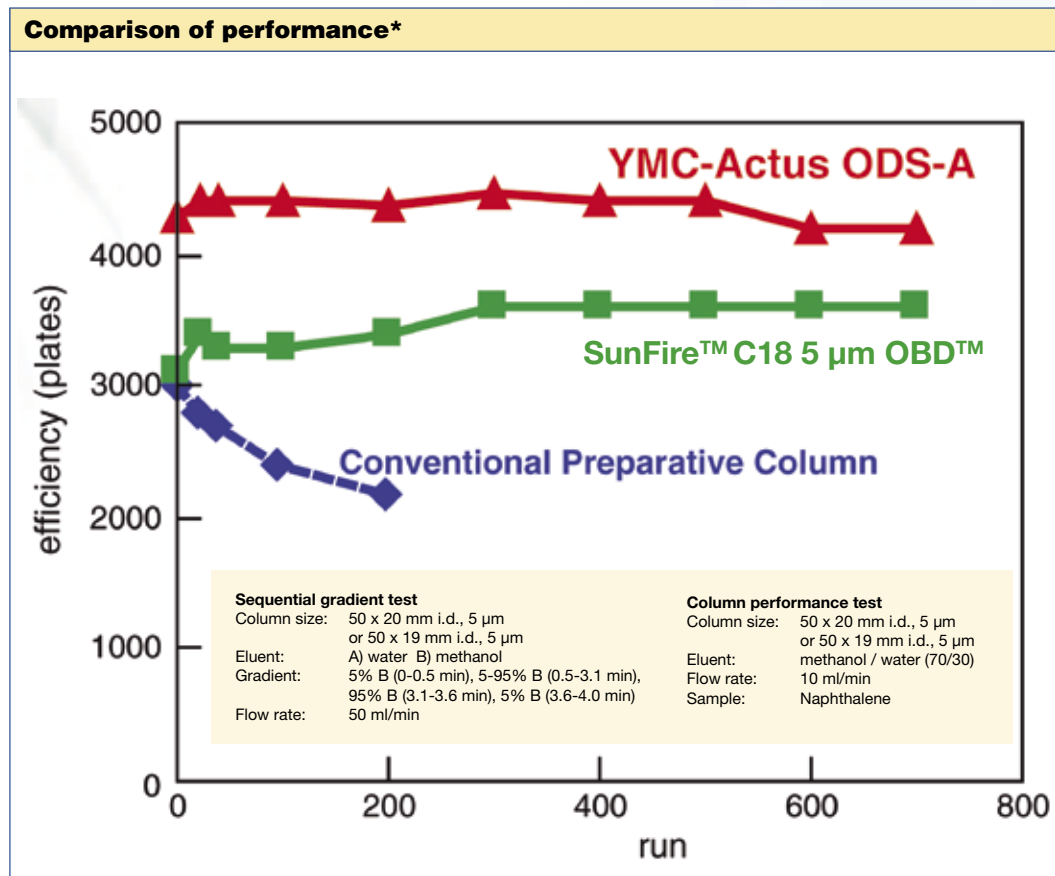
## Meeting the demands of today with technology of tomorrow

After many years of research, YMC has been successfully bridged the gap between Ultra Fast LC, analytical HPLC and large scale preparative DAC columns with the introduction of YMC-Actus.

YMC, well known for its experience in DAC column technique, modified its robust DAC-column technology for semi-preparative column design in order to provide excellent resolution and long column lifetimes, making YMC-Actus the hardware of choice for high throughput applications in semi-preparative HPLC where long column lifetime is a primary requirement.

# YMC-Actus Series

YMC-Actus columns offer outstanding efficiency without compromising resolution. Furthermore YMC-Actus columns provide reliable results, even after exposure to severe, rapid gradient conditions and multiple injections.



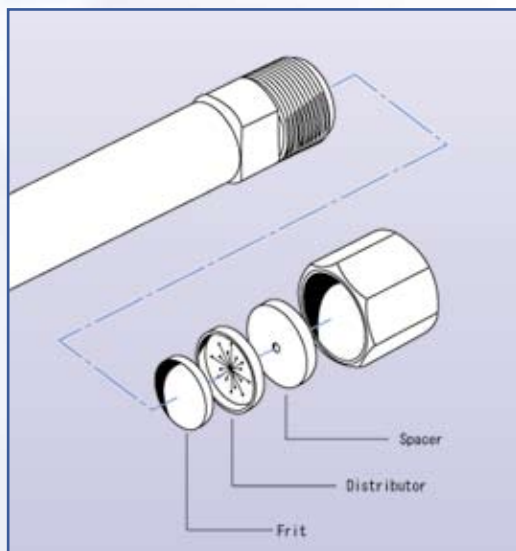
\* Source: Courtesy of YMC Co., Ltd.

## Ordering Information\*

Packing material	Particle size (µm)	Pore size (nm)	Column size length x i.d. (mm)	Product number
Pro C18	5	12	50 x 20	AS12S05-0520WX
Hydrosphere C18	5	12	50 x 20	HS12S05-0520WX
Pro C18 RS	5	8	50 x 20	RS08S05-0520WX
ODS-A	5	12	50 x 20	AA12S05-0520WX
ODS-AQ	5	12	50 x 20	AQ12S05-0520WX
Pro C8	5	12	50 x 20	OC12S05-0520WX

\* Alternative selectivities dimensions and particle sizes are available on request.

# Semipreparative Columns



## YMC semipreparative columns

YMC semipreparative columns are assembled in a similar manner to 4.6 mm i.d. analytical columns. The endfittings are screwed directly onto the external thread of the column tube to provide columns which withstand a maximum pressure up to 5000 psi. The column endfitting should not be removed as this may result in damage to the packed bed. They are available with 100, 150 and 250 mm lengths and 8, 10, 20 or 30 mm i.d. All have a distributor plate, fitted within the column endpiece to ensure homogenous distribution of the sample onto the column bed.

These columns have inlet and outlet fittings of the Waters-type with the distance between the ferrule and the end of the connecting tubing (sometimes called the pilot depth) of 0.13 inch (3.3 mm) and are identified by part numbers ending with **WT**.

mm i.d.	50 mm length	75 mm length	100 mm length	150 mm length	250 mm length
20	✓	—	✓	✓	✓
30	✓	✓	✓	✓	✓

# Semiprep Guard Cartridge System

For semi-prep columns guard cartridges and holders of 10 and 20 mm length and 8, 20 or 30 mm inner diameter are available. As the holder for these cartridges feature Valco-compatible fittings (pilot depth 0.08 inch) it is essential that fittings are made up corresponding to the port of the column endfitting so that differences between Valco-compatible, Parker-compatible (pilot depth 0.09 inch) and/or Waters-compatible (pilot depth 0.13 inch) column endfittings can be accommodated. Alternatively, slipfree fittings may be applied to avoid these vendor specific connections.

## Part numbers of Guard Column holders and cartridges

Column i.d.	Guard Column i.d.	Guard Cartridge Holder Part No		Guard Cartridge Partial Part No	
		10 mm length	20 mm length	10 mm length	20 mm length
8 mm	8 mm	XPGCE08	XPGCE08F2	... 0108FC	... 0208FC
10 mm	8 mm	XPGCE08	XPGCE08F2	... 0108FC	... 0208FC
20 mm	20 mm	XPGCE20	XPGCE20F2	... 0120FC	... 0220FC
30 mm	30 mm	n/a	XPGCE30	n/a	... 0230FC



# Ordering Information

The previous product listing represents commonly used standard column dimension. In order to identify any specific product version and order number, please see the example and the table below.

## Full listing of all chemistries and dimensions

Gel Code							Hardware Code						
Chemistry code		Pore size [nm]		Particle shape		Particle size [µm]		Length [mm]		Inner diameter [mm]		Column Type	
YMC30	CT	6	06	spherical	S	3	03	10	01	0.05	E5	Quick Seal	QT
Pro C18	AS	8	08			4	04	20	02	0.075			
Pro C18 RS	RS	12	12			5	05	33	03	0.1	F0	Waters type	WT
Hydrosphere C18	HS	20	20			6	06	50	05	0.2	G0		
ODS-A	AA	30	30					75	L5	0.3	H0		
ODS-AM	AM	100	A0			10	11	100	10	0.5	J0		
ODS-AQ	AQ	proprietary	99			15	16	125	R5	0.8	M0		
J'sphere ODS-H80	JH	non-porous	00			20	21	150	15	1.0	O1		
J'sphere ODS-M80	JM					50	50	250	25	2.1	O2		
J'sphere ODS-L80	JL					75	75			3.0	O3		
ODS-AL	AL							300	30	4.0	O4		
PAH	YP					63/210	A4						
PolymerC18	PC					150	A5	500	50	4.6	46		
Pro C8	OS							1000	A0	6.0	06		
C8 (Octyl)	OC									8.0	08		
YMCbasic	BA									10	10		
Ph (Phenyl)	PH									20	20		
Pro C4	BS									30	30		
C4 (Butyl)	BU												
Protein-RP	PR									50 (2000 psi)	52		
TMS (C1)	TM									70 (2000 psi)	72		
PVA-Sil	PV									100 (2000 psi)	A2		
Polyamine II	PB									150 (2000 psi)	B2		
NH <sub>2</sub> (Amino)	NH									200 (2000 psi)	C2		
CN (Cyano)	CN												
Diol	DL												
SIL (Silica)	SL												
BioPro-QA	QA												
BioPro-SP	SP												
BioPro-QA-F	QF												
BioPro-SP-F	SF												
Chiral NEA (R)	NR												
Chiral NEA (S)	NS												
Chiral CD BR α	DA												
Chiral CD BR β	DB												
Chiral CD BR γ	DG												
Chiral Prep CD ST	ST												
Chiral Prep CD PM	PM												

### Example

Choose your column and fill in the "Gel and Hardware Code" or detailed description (The part number consists of the "Gel Code" and the "Hardware Code").

YMC-Pack ODS-A	12 nm	spherical	3 µm	250 mm	1.0 mm	Quick Seal
<b>AA</b>	<b>12</b>	<b>S</b>	<b>03</b>	<b>25</b>	<b>01</b>	<b>QT</b>

Your column part number: **AA12S032501QT (Example)**

Please note that combinations of features cannot be selected at random, but only from the possible specifications for a chosen stationary phase. These can be determined from the individual product sections in this catalogue or from our homepage [www.ymc.de](http://www.ymc.de).

### For more details



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