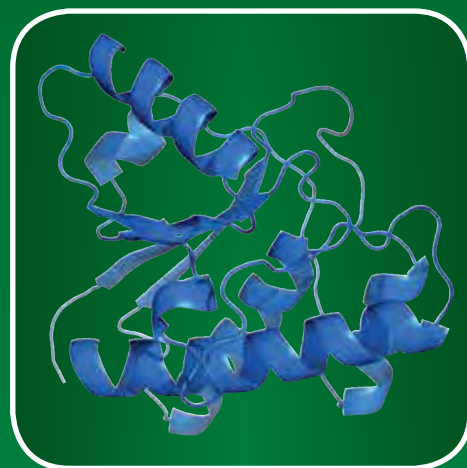
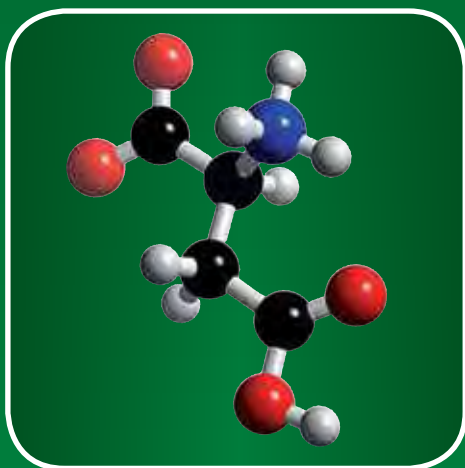


YMC Phases for Biochromatography



IEX
SEC
RP
NP/HILIC



YMC Phases for Biochromatography

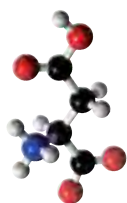
Historically, small molecules have played the major role in diagnosis and therapy. However with the recent developments in the fields of genomics, proteomics and metabolomics, biological molecules have become an important tool for the treatment of diseases or help understanding biological processes.

YMC has always played an important role in the provision of materials for bioseparations. With the constant driving force of innovation, the focus has always been on column design and stationary phase manufacturing. As a consequence, YMC offers state of the art reversed phase, ion-exchange, size exclusion and normal phase/HILIC columns and bulk materials.

Contents

Selection Guide for Biochromatography page 04-05

Ion Exchange (IEX) page 06-18



Size Exclusion (SEC) page 19-34

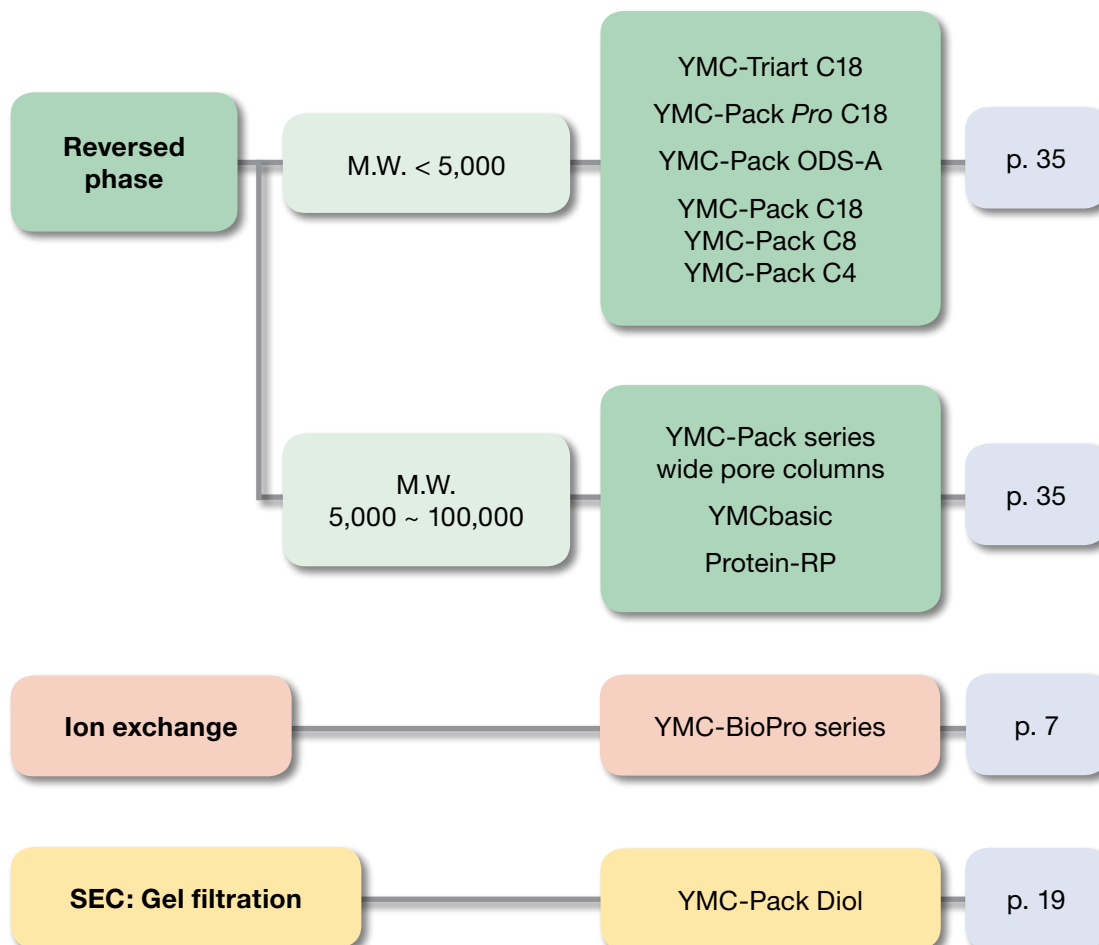
Reversed Phase (RP)..... page 35-46



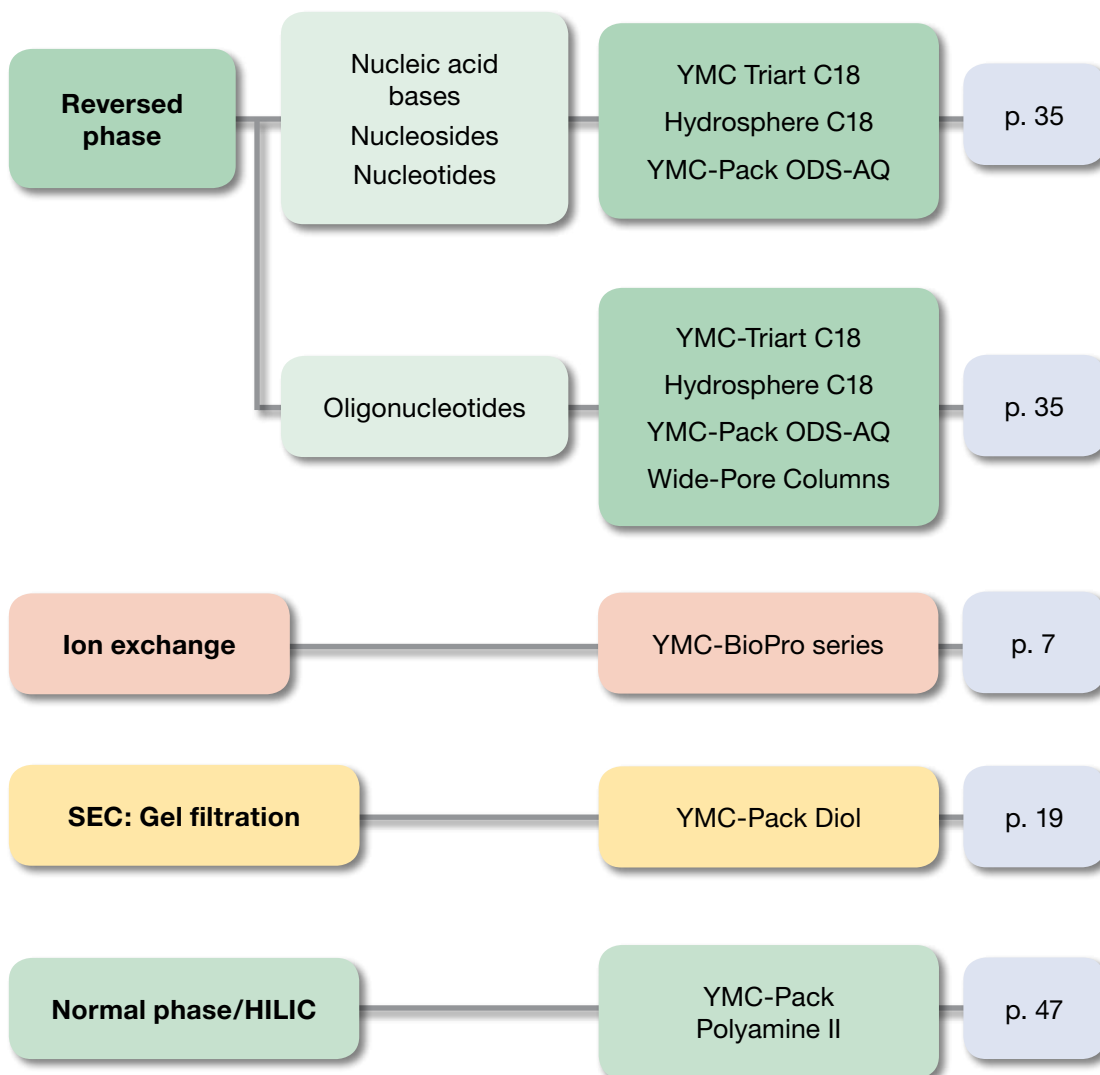
Normal Phase (NP) / Hydrophilic interaction (HILIC) page 47-50

Glass Columns page 51-63

Proteins, Peptides



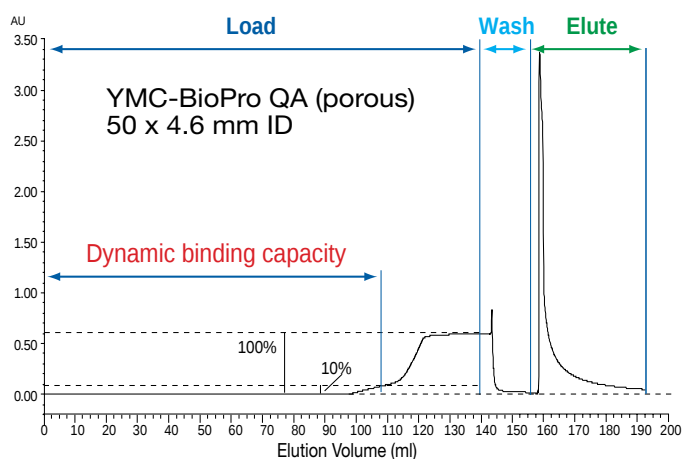
Nucleic acids



Polysaccharides



Determination of DBC*



* Application data by courtesy YMC Co., Ltd.

Before determination, equilibrate the column with equilibration buffer.

Step 1: Load

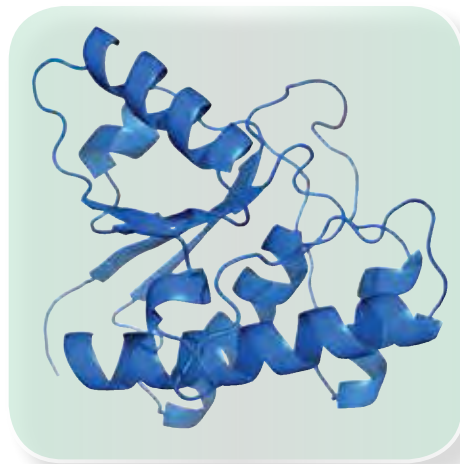
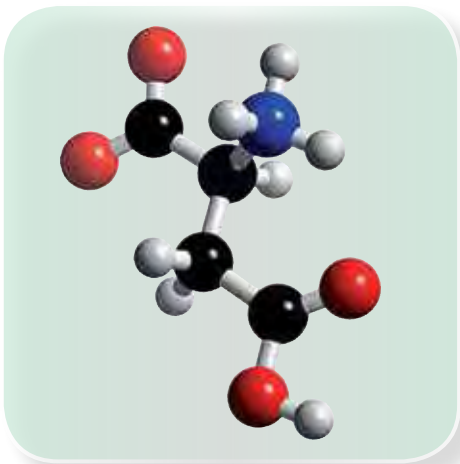
A protein solution of known concentration is continuously loaded at the desired flow rate and the absorbance of the eluate is monitored until full saturation is achieved (100% UV absorbance of the pure sample solutions).

Step 2: Wash

Wash the column with equilibration buffer until no more protein elutes (0% UV absorbance).

Step 3: Elute

The DBC of the medium is a measure of the volume of protein solution that has been applied up to a specific breakthrough point (usually 5 or 10%).



IEX

YMC-BioPro: IEX-Columns

Ion exchange chromatography (IEX) is widely used for analysis and purification of biomolecules. YMC-BioPro ion exchange columns are specifically designed for separation of proteins, peptides and nucleic acids.

YMC-BioPro IEX columns are based on 5 µm porous and non-porous hydrophilic polymer beads with low nonspecific adsorption.

They also show higher binding capacity and higher recovery of biomolecules compared to conventional IEX-columns.

The completely spherical, monodisperse beads, together with optimal packing technology, provide high theoretical plate numbers and symmetrical peak shapes!

High binding capacity and high recovery for porous type

The porous version of YMC-BioPro show high dynamic binding capacity and excellent recovery, making them useful for semi-preparative separations of proteins and antibodies.

Comparison of dynamic binding capacity (DBC) for BSA

	Dynamic binding capacity (mg/ml-gel, 10% breakthrough)	Eluted amount (mg/ml-gel)	Recovery* (%)
YMC-BioPro QA	126	120	95
Mono Q (GE Healthcare)	100	35	35
BioAssist Q (Tosoh Bioscience)	73	58	79

* Recovery: (Eluted amount/Dynamic binding capacity) x 100

Compared with conventional porous polymer anion exchange columns, YMC-BioPro QA gives higher DBC and recovery rates. This indicates that YMC-BioPro has a much lower nonspecific adsorption compared to conventional columns.

High recovery rates for YMC-BioPro



Porous polymer beads

YMC-BioPro QA / YMC-BioPro SP

Pore size / nm: 100
Particle size / µm: 5
Charged group: $-\text{CH}_2\text{N}^+(\text{CH}_3)_3 /$
 $-(\text{CH}_2)_3\text{SO}_3^-$
Counter ion: $\text{Cl}^- / \text{Na}^+$
pH range: 2.0 - 12.0

Also available in 30 µm and 75 µm for preparative scale

YMC-BioPro QA-F / YMC-BioPro SP-F

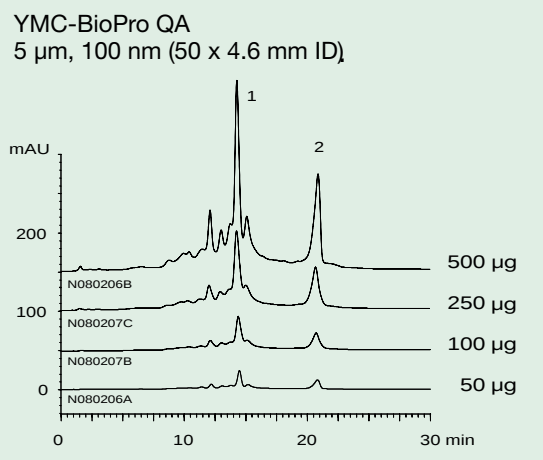
Pore size / nm: non-porous
Particle size / µm: 3; 5
Charged group: $-\text{CH}_2\text{N}^+(\text{CH}_3)_3 /$
 $-(\text{CH}_2)_3\text{SO}_3^-$
Counter ion: $\text{Cl}^- / \text{Na}^+$
pH range: 2.0 - 12.0



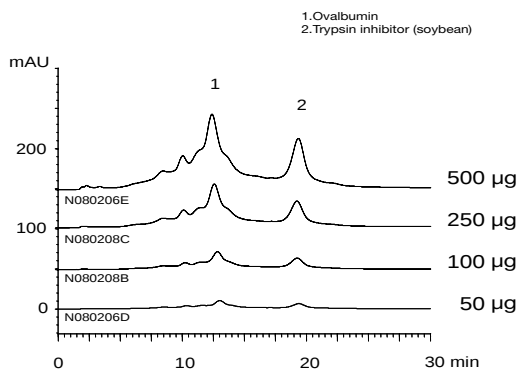
Nonporous polymer beads

Applications for porous YMC-BioPro

Loading study for YMC-BioPro QA (porous) – Proteins*



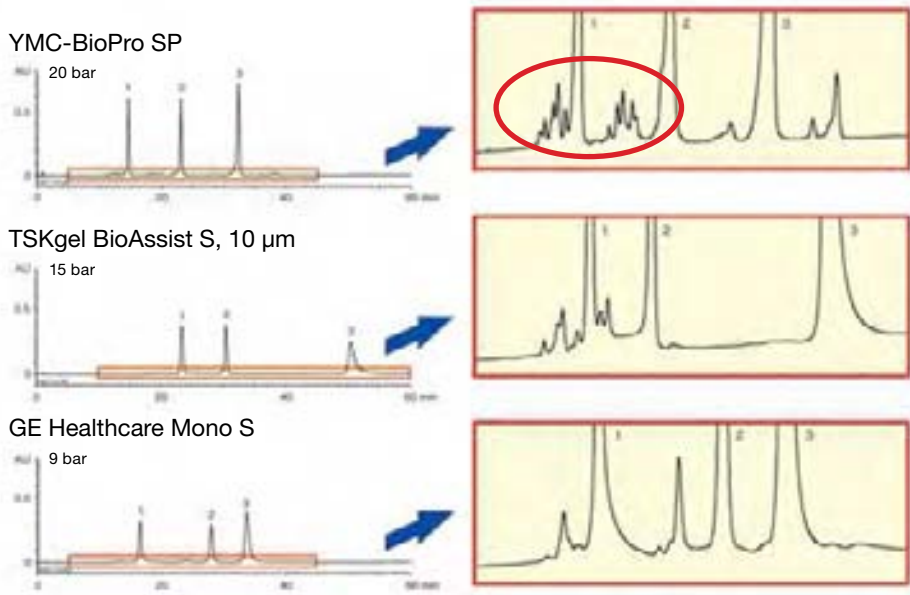
GE Healthcare (Mono Q)
10 μ m (50 x 5.0 mm ID)



Eluent: A) 20 mM Tris-HCl (pH 8.1)
B) 20 mM Tris-HCl (pH 8.1) containing 0.5 M NaCl
Gradient: 10-80%B (0-30 min)
Flow rate: 0.5 ml/min
Temperature: 25°C
Detection: UV at 280 nm
Injection: 100 μ l

Superior resolution

Comparison of standard protein separation on YMC-BioPro SP and commercial SP or S type products*



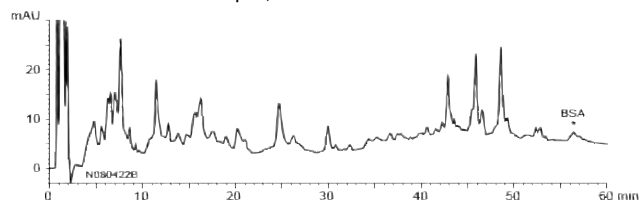
Eluent: A) 20 mM KH_2PO_4 - K_2HPO_4 (pH 6.8)
B) 20 mM KH_2PO_4 - K_2HPO_4 (pH 6.8) containing 0.5 M NaCl
Gradient: 0-100%B (0-60 min)
Flow rate: YMC-BioPro SP, TSKgel BioAssist S 0.5 ml/min
GE Healthcare Mono S 0.59 ml/min
Temperature: 25°C
Detection: UV at 220 nm
Injection: YMC-BioPro SP, TSKgel BioAssist S 20 μ l
GE Healthcare Mono S 23.6 μ l

Sample: 1. Ribonuclease A (0.5 mg/ml)
2. Cytochrome c (0.5 mg/ml)
3. Lysozyme (0.5 mg/ml)

Applications for porous YMC-BioPro

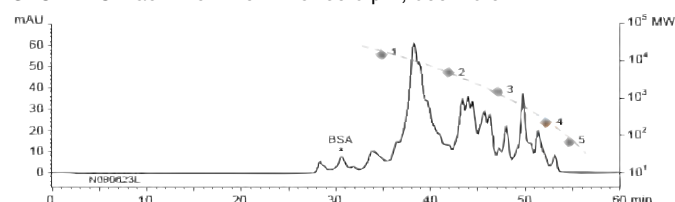
Peptide mapping*

IEX: YMC-BioPro QA 5 µm, 50 x 4.6 mm ID



Eluent: A) 20 mM Tris-HCl (pH 8.6)
B) 20 mM Tris-HCl (pH 8.6)
+ 0.5 M NaCl
0-15% B (0-30 min), 15-60% B (30-60 min)
Flow rate: 0.5 ml/min
Temperature: 25 °C
Detection: UV at 220 nm
Injection: 20 µl

SEC: YMC-Pack Diol-120 x Diol-60 5 µm, 500 x 8.0 mm ID x 2

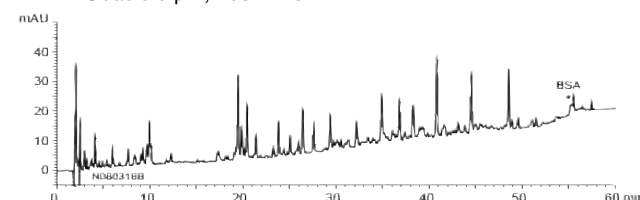


Calibration curve of proteins and peptides

1. Myoglobin (MW 17,000)
2. Insulin (Bovine) (MW 5,700)
3. Neurotensine (MW 1,672)
4. Tetraglyzine (MW 246)
5. Glyzine (MW 75)

Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 7.0)
+ 0.2 M NaCl/Acetonitrile (70/30)
Flow rate: 0.7 ml/min
Temperature: 25 °C
Detection: UV at 220 nm
Injection: 5 µl

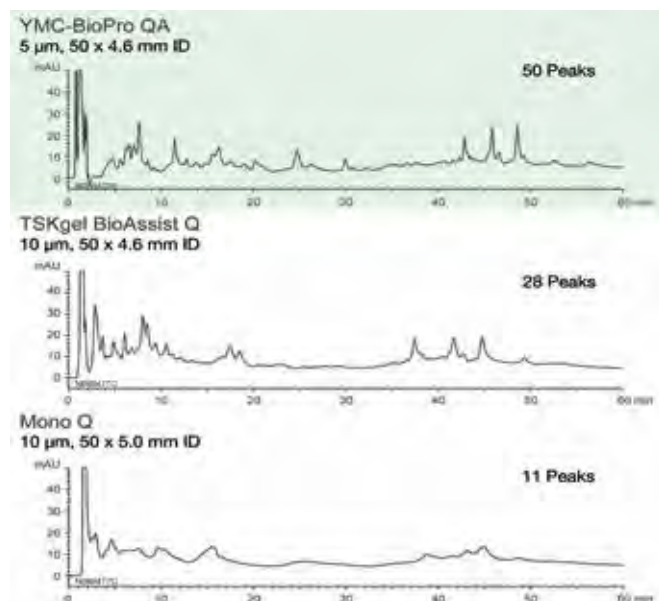
RP: YMCbasic 5 µm, 150 x 2.0 mm ID



Eluent: A) Water/TFA (100/0.1)
B) Acetonitrile/TFA (100/0.1)
5-35% B (0-50 min), 35-45% B (50-55 min)
45% B (55-60 min)
Flow rate: 0.2 ml/min
Temperature: 37 °C
Detection: UV at 220 nm
Injection: 1 µl

Tryptic digest of BSA (MW: 66,000)

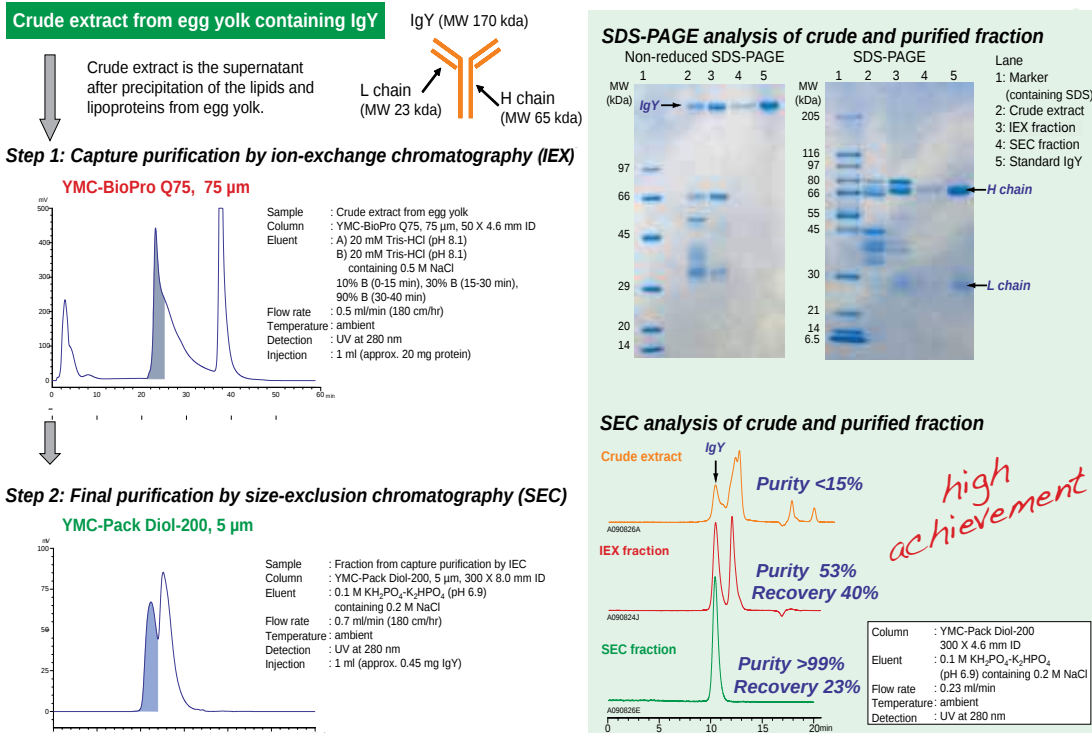
Peptide mapping of tryptic digest of BSA*



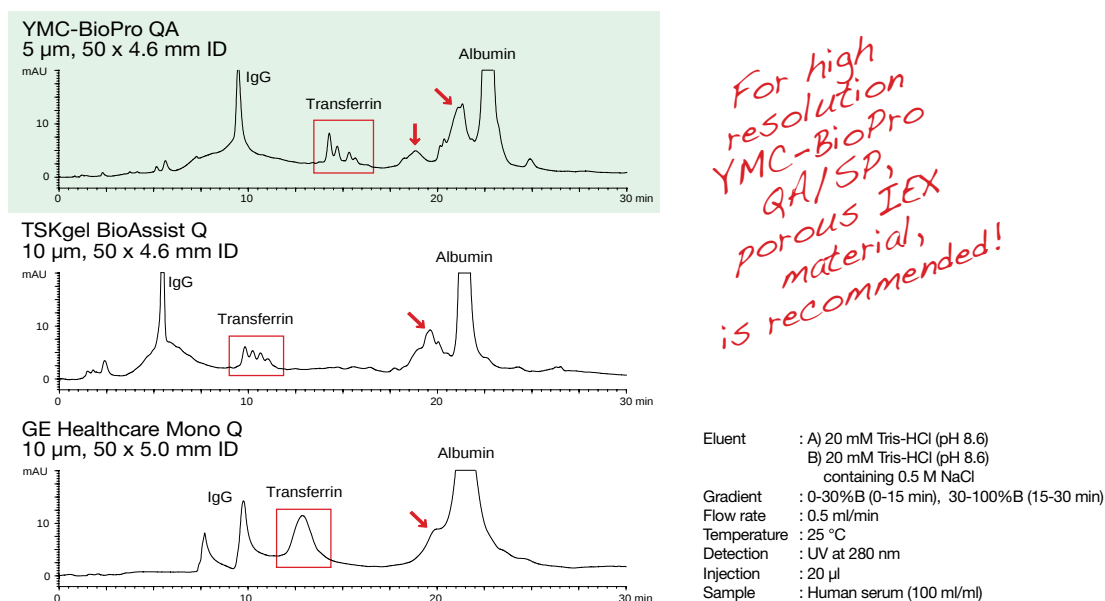
Eluent: A) 20 mM Tris-HCl (pH 8.6)
B) 20 mM Tris-HCl (pH 8.6)
containing 0.5 M NaCl
Gradient: 0-15% B (0-30 min), 15-60% B (30-60 min)
Flow rate: 0.5 ml/min
Temperature: 25 °C
Detection: UV at 220 nm
Injection: 20 µl
Sample: Tryptic digest of BSA

Capture purification by ion-exchange chromatography (IEX)

Two step purification of IgY to produce reference standard material from crude egg yolk extract*

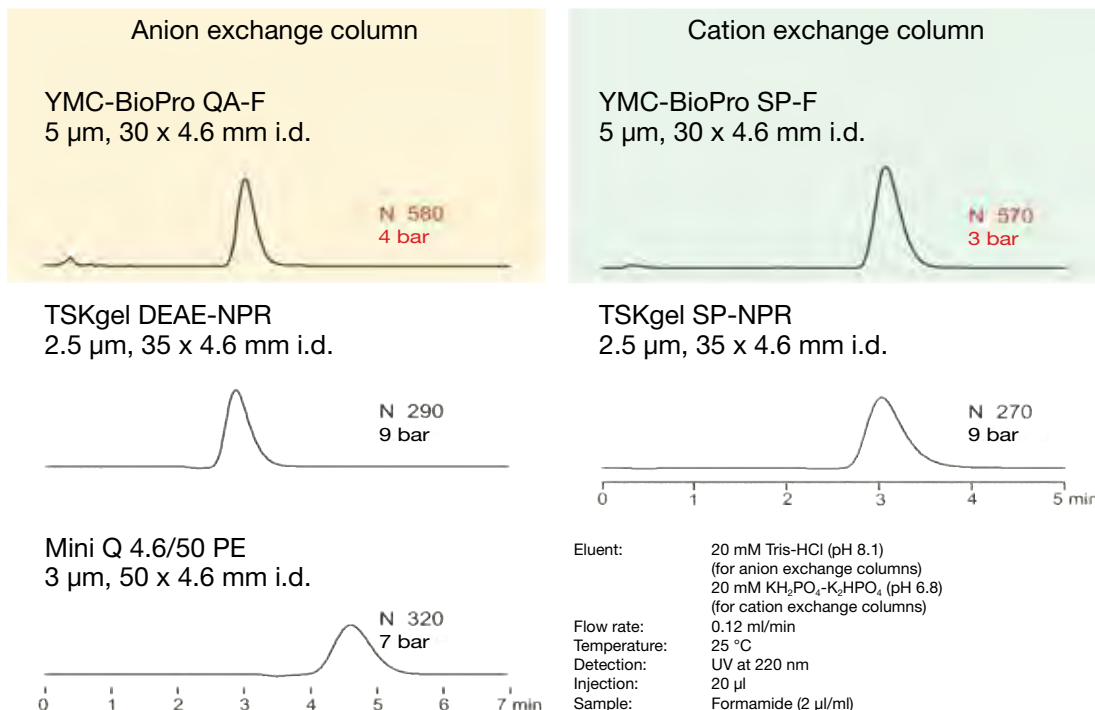


Separation of proteins in human serum on YMC-BioPro QA and commercial Q type products*



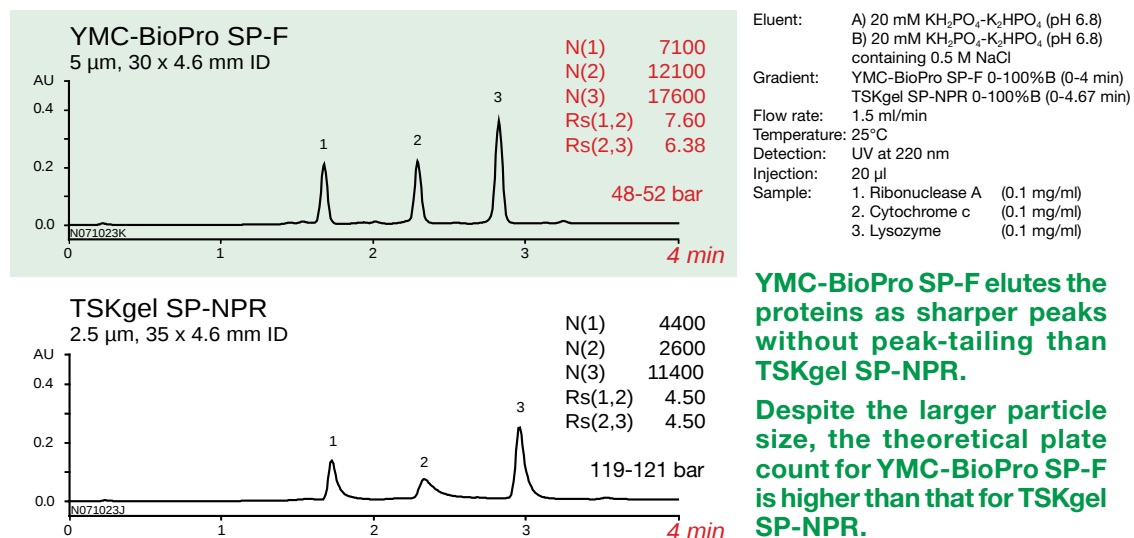
Applications for non-porous YMC-BioPro: High Throughput IEX

High efficiency with a lower column pressure with non-porous type*



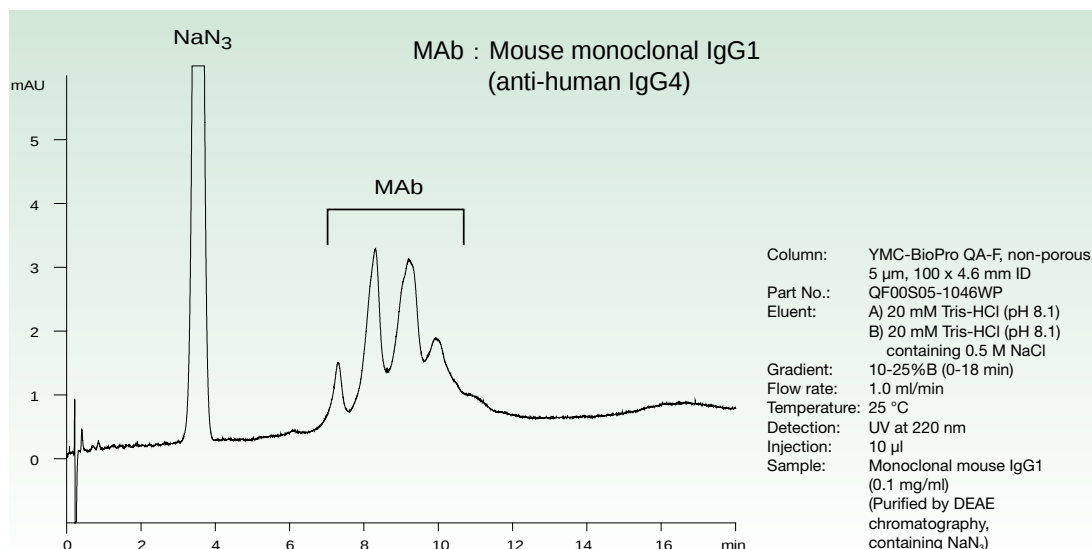
Compared to the competitors' columns, YMC-BioPro QA-F and SP-F show higher theoretical plate counts, excellent peak shapes, and lower backpressure. This makes YMC-BioPro QA-F and SP-F most suitable for high-throughput analysis.

Comparison of standard protein separation on YMC-BioPro SP-F and a commercial SP-type product*



Applications for non-porous YMC-BioPro

Analysis of monoclonal antibody (MAb) against human IgG4*



The optimum package!

YMC-BioPro IEX + ECO/ECO^{PLUS} Glass Columns



YMC's ECO/ECO^{PLUS} Glass Columns

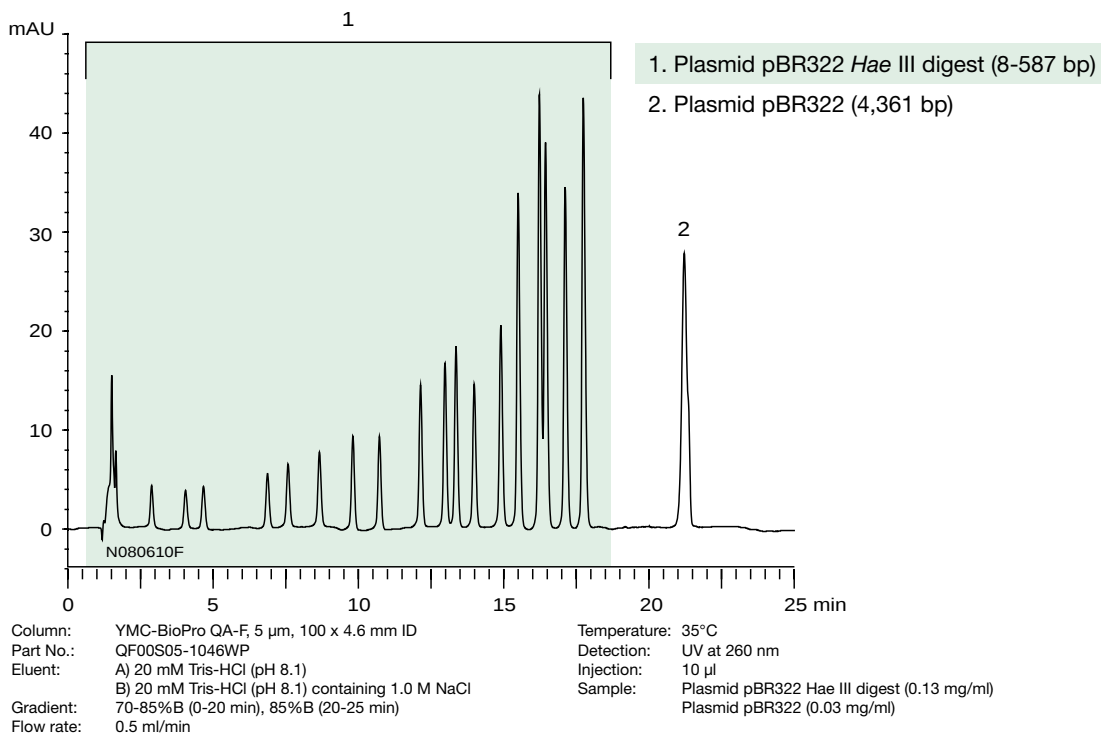
- biocompatible
- easy to use
- compatible with any LC systems
- solvent resistant version (optional)



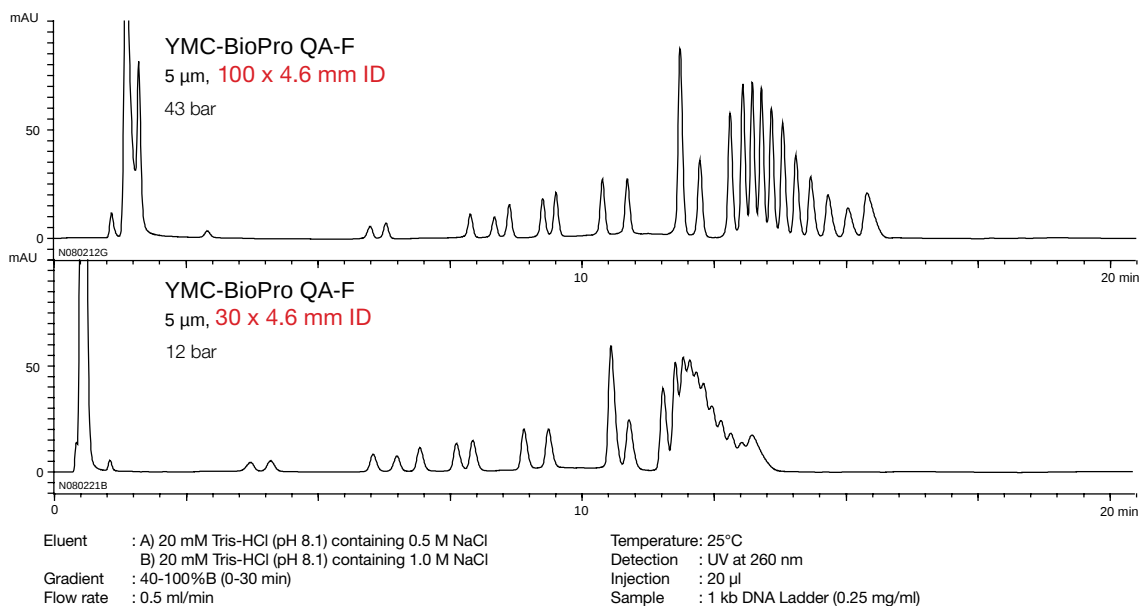
—> Find more at page 51!

Applications for non-porous YMC-BioPro: High Throughput IEX

Fast analysis on non-porous YMC-BioPro QA-F*



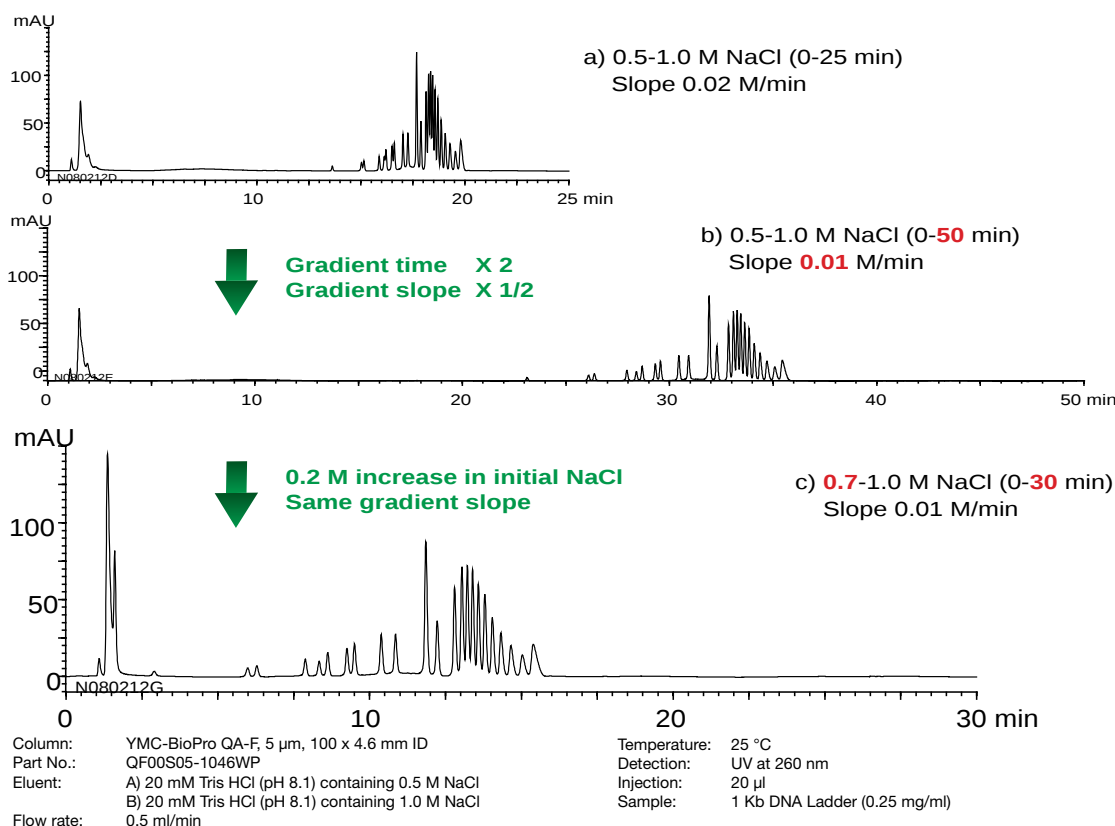
Excellent resolution in analysis of complex mixtures*



Comparison of DNA fragment separation on 100 mm and 30 mm length YMC-BioPro QA-F columns.

Applications for non-porous YMC-BioPro: High Throughput IEX

Method development for DNA-fragments*



Elution of DNA fragments is optimised on 100 mm columns. The sensitivity is improved by reducing the gradient development time by half. In addition, the analysis time is reduced by increasing the buffer concentration, while maintaining excellent resolution.

Ordering information

3 μ m analytical columns

Phase	Column dimension		
	30 x 4.6 mm ID	50 x 4.6 mm ID	100 x 4.6 mm ID
YMC-BioPro QA-F	QF00S03-0346WP	QF00S03-0546WP	QF00S03-1046WP
YMC-BioPro SP-F	SF00S03-0346WP	SF00S03-0546WP	SF00S03-1046WP

5 μ m analytical columns

Phase	Column dimension		
	30 x 4.6 mm ID	50 x 4.6 mm ID	100 x 4.6 mm ID
YMC-BioPro QA	—	QAA0S05-0546WP	QAA0S05-1046WP
YMC-BioPro SP	—	SPA0S05-0546WP	SPA0S05-1046WP
YMC-BioPro QA-F	QF00S05-0346WP	QF00S05-0546WP	QF00S05-1046WP
YMC-BioPro SP-F	SF00S05-0346WP	SF00S05-0546WP	SF00S05-1046WP

Other dimensions on demand

Preparative grade YMC-BioPro also available as bulk media! (See next page!)

Ordering information

Bulk media, strong exchangers

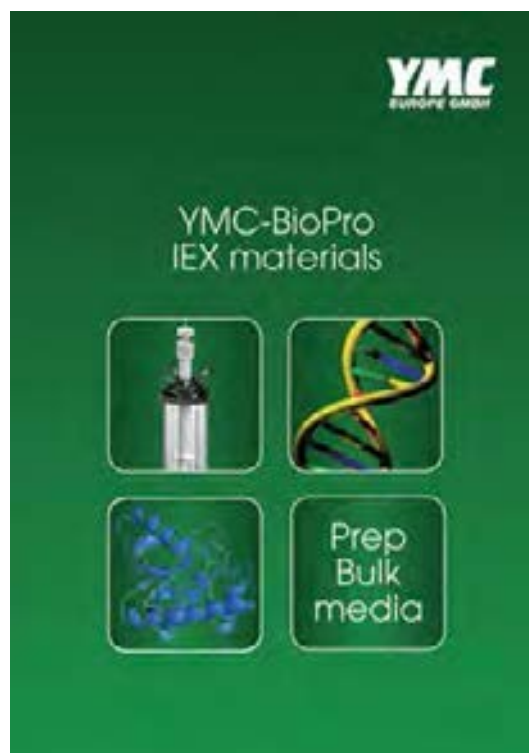
Phase	Particle Size	Part-No.
YMC-BioPro SmartSep Q10	10 µm	QSA0S10
YMC-BioPro SmartSep S10	10 µm	SSA0S10
YMC-BioPro SmartSep Q30	30 µm	QSA0S30
YMC-BioPro SmartSep S30	30 µm	SSA0S30
YMC-BioPro Q75	75 µm	QAA0S75
YMC-BioPro S75	75 µm	SPA0S75

Conventional YMC-BioPro Q10/S10 (QAA0S10/SPA0S10) and Q30/S30 (QAA0S30/SPA0S30) available on request.

Bulk media, weak exchangers

Phase	Particle Size	Part-No.
YMC-BioPro DA60	60 µm	DAM99S60
YMC-BioPro CM60	60 µm	CMM99S60

Further information about YMC-BioPro IEX bulk media can be found in the following brochure:



Preparative Screening Kits

The YMC-BioPro Ion Exchange Screening Kits consist of columns that are packed with resins designed for the separation of proteins, nucleotides,

and other biomolecules. Various types of kit offer significant advantages and efficiencies in resin screening and purification method development.

Laboratory scale column sizes

1 ml Type (26 x 7.0 mm ID)



- Resin screening
- Purification method development

5 ml Type (26 x 15.6 mm ID)



- Purification method development
- Loadability studies

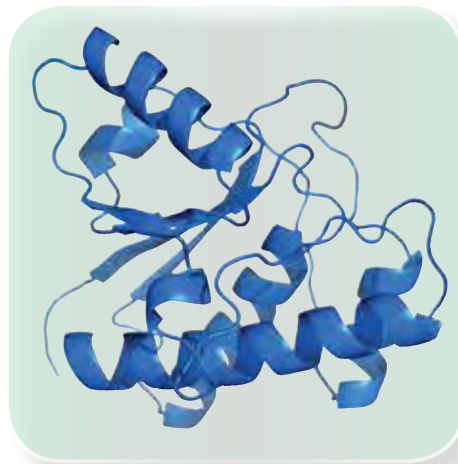
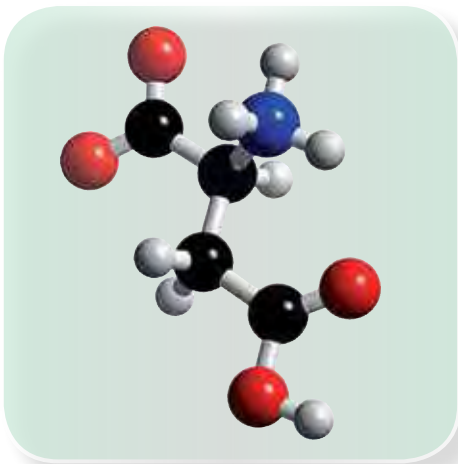
Specification

	Strong Anion Exchanger YMC-BioPro (SmartSep) Q	Strong Cation Exchanger YMC-BioPro (SmartSep) S	Weak Anion Exchanger YMC-BioPro DA	Weak Cation Exchanger YMC-BioPro CM
Matrix	Porous hydrophilic polymer		Porous methacrylate polymer	
Particle size (μm)	30, 75	30, 75	60	60
Ion exchanger	$-\text{CH}_2\text{N}^+(\text{CH}_3)_3$	$-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{SO}_3^-$	$-\text{R}-\text{N}(\text{CH}_3)_2$	$-\text{R}-\text{COOH}$
pH range	2 - 12	2 - 12	Regular use: 3 - 12 Short term: 1 - 13	Regular use: 3 - 12 Short term: 1 - 13

Ordering information

Preparative Screening Kits

Product name	Particle Size	Specification	Column volume	Product number
Ion Exchange Selection Kit (YMC-BioPro Q75/S75/DA60/CM60)	75 µm / 60 µm	1 each x 4 types	1 ml	BPIESKS99-01PK
YMC-BioPro Q75	75 µm	5 / pack	1 ml	BPQAA0S75-01PK
		5 / pack	5 ml	BPQAA0S75-05PK
YMC-BioPro SmartSep Q30	30 µm	5 / pack	1 ml	BPQSA0S30-01PK
		5 / pack	5 ml	BPQSA0S30-05PK
YMC-BioProS75	75 µm	5 / pack	1 ml	BPSPA0S75-01PK
		5 / pack	5 ml	BPSPA0S75-05PK
YMC-BioPro SmartSep S30	30 µm	5 / pack	1 ml	BPSSA0S30-01PK
		5 / pack	5 ml	BPSSA0S30-05PK
YMC-BioPro DA60	60 µm	5 / pack	1 ml	BPDAM99S60-01PK
		5 / pack	5 ml	BPDAM99S60-05PK
YMC-BioPro CM60	60 µm	5 / pack	1 ml	BPCMM99S60-01PK
		5 / pack	5 ml	BPCMM99S60-05PK



SEC

YMC Column for SEC: YMC-Pack Diol

Size Exclusion Chromatography (SEC) also referred to as Gel Permeation Chromatography (GPC) is a mode of liquid chromatography in which the components of a mixture are separated according to differences in their size. It is an important tool for the analysis and separation of natural and synthetic biopolymers. The column

packing for SEC is a rigid, totally porous silica gel that is derivatised with 1,2-dihydroxypropylsilane and has pores of known size. The variety of available pore sizes allows the analysis of compounds over a broad range of molecular weights, starting from about 1000 g/mol for oligomers and going up to 1,000,000 g/mol.

What is special about YMC SEC columns?

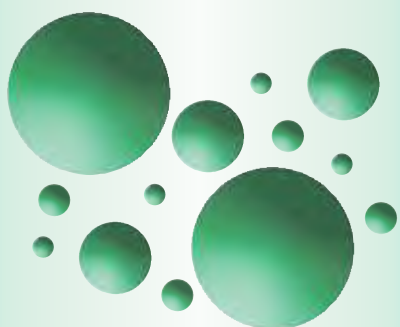
- Method development
- Scaleability
- Reproducibility
- Cost-efficiency

YMC-Pack Diol is available in four porosities and is, therefore, suitable for separation and molecular weight determination of a wide range of peptides, proteins, oligonucleotides, carbohydrates and other biopolymers with molecular weights of 10,000 to several hundred thousand.

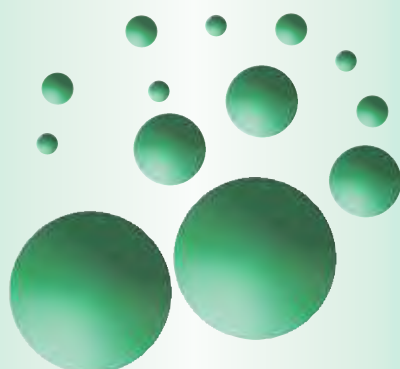
Furthermore, YMC offers a wide range of column dimensions suitable for analytical determinations to preparative separations.

YMC-Pack Diol Columns

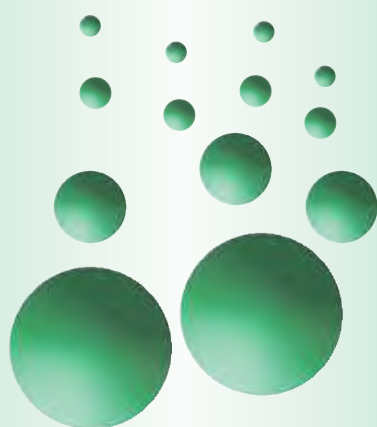
YMC-Pack Diol	for peptides and small proteins	for intermediate proteins	for large proteins	for very large proteins
pore size / nm	6	12	20	30
particle size / μm	3; 5	3; 5	3; 5	3; 5
surface area / m^2g^{-1}	650	330	175	100
recommended pH range	5.0 - 7.5	5.0 - 7.5	5.0 - 7.5	5.0 - 7.5



1. Injection



2. Separation



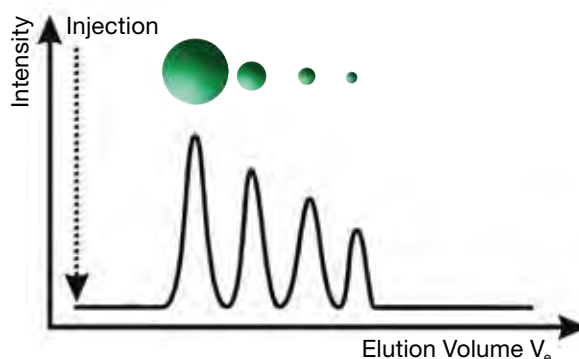
3. Elution of Fraction

Principles of separation

Molecules with shapes such as rigid rods, random chains and spheres but with the same molecular weight behave differently in SEC. The principle of separation is based on differences in the hydrodynamic radius of the molecules in solution.

Molecules with a larger radius elute earlier and those with the smallest radius are retained longer.

The separation limit is such that only those compounds which differ by more than 10% in MW can be separated by SEC.

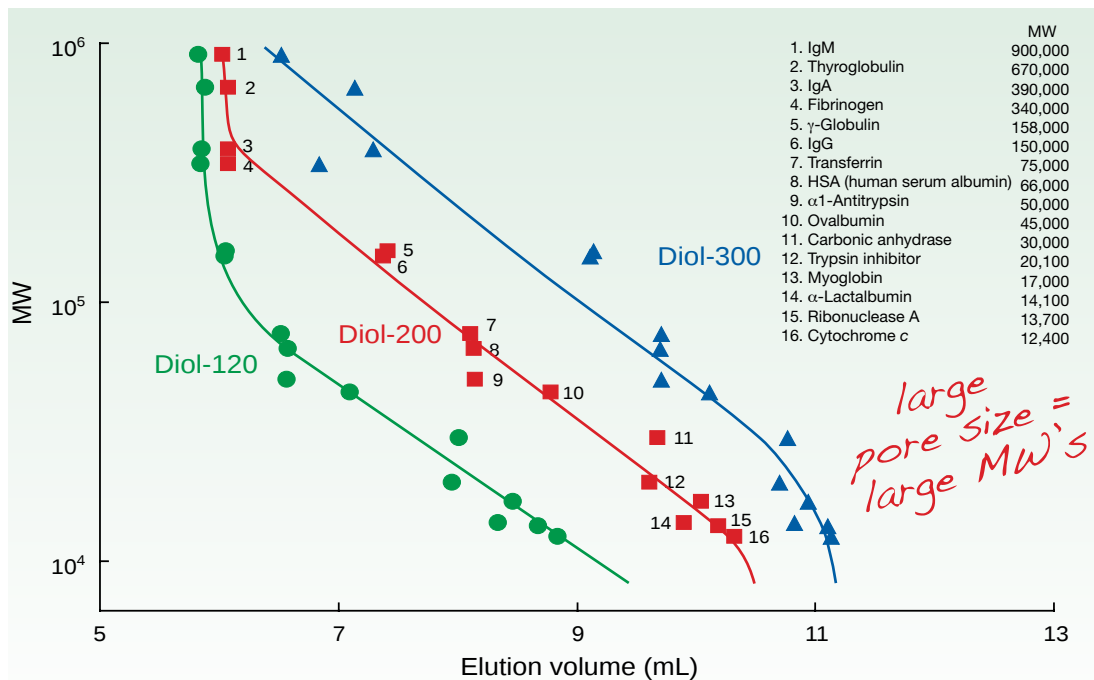


small molecules = long retention time
bigger molecules = short retention time

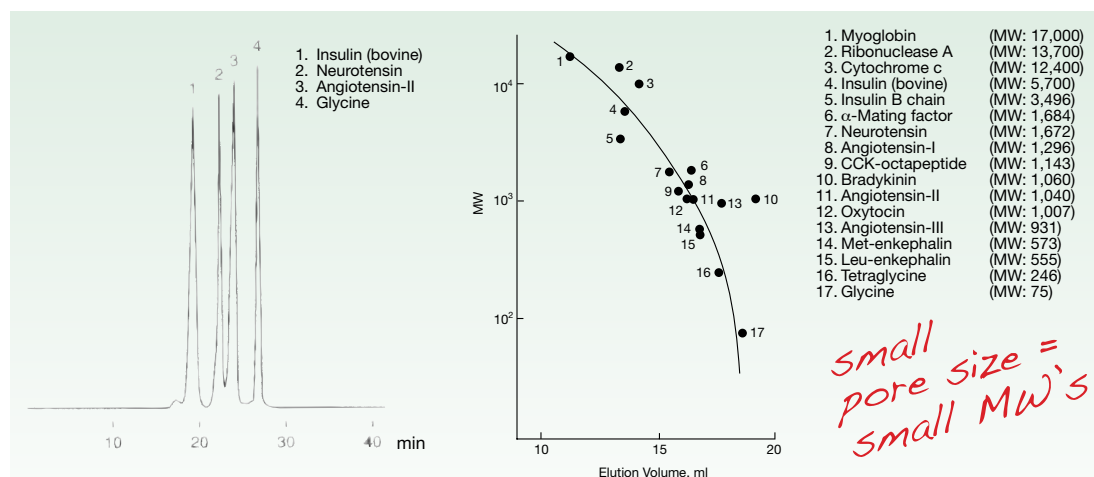
Large molecules exit the column more rapidly as they cannot permeate the porous structure of stationary phase. Smaller ones with the lowest hydrodynamic volume elute with longer retention times because they are able to penetrate some or all of the pores of the stationary phase. Molecules of intermediate size elute in an intermediate position.

SEC Applications for YMC-Pack Diol

For separation of proteins with molecular weights from 10.000 to several 100.000

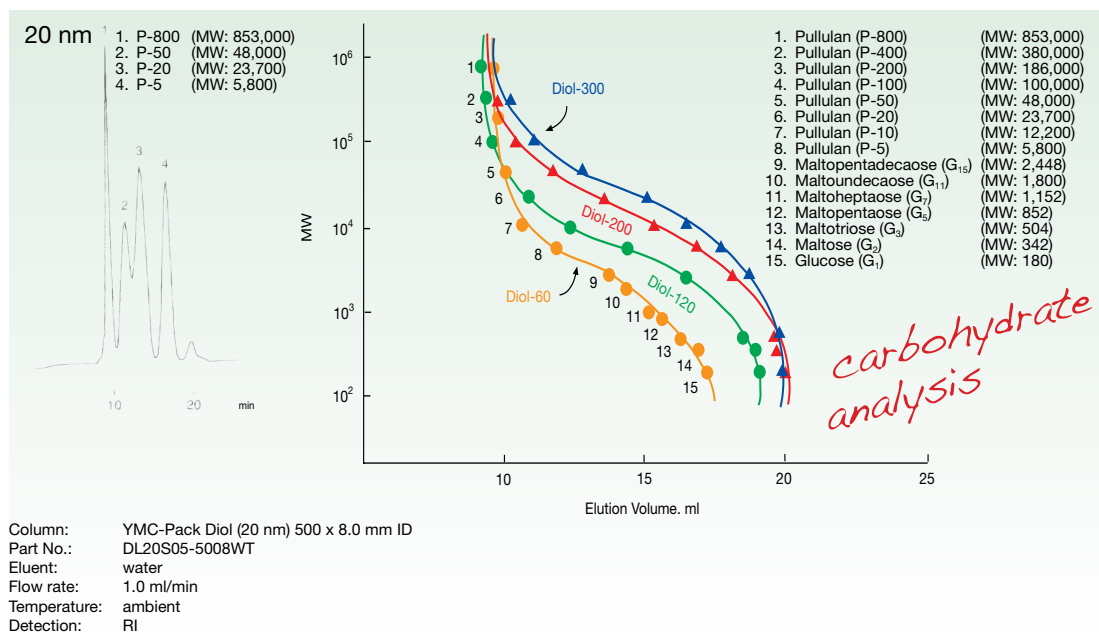


For separation of proteins with molecular weights below 10.000



SEC Applications for YMC-Pack Diol

For molecular weight determination of oligosaccharides and polysaccharides

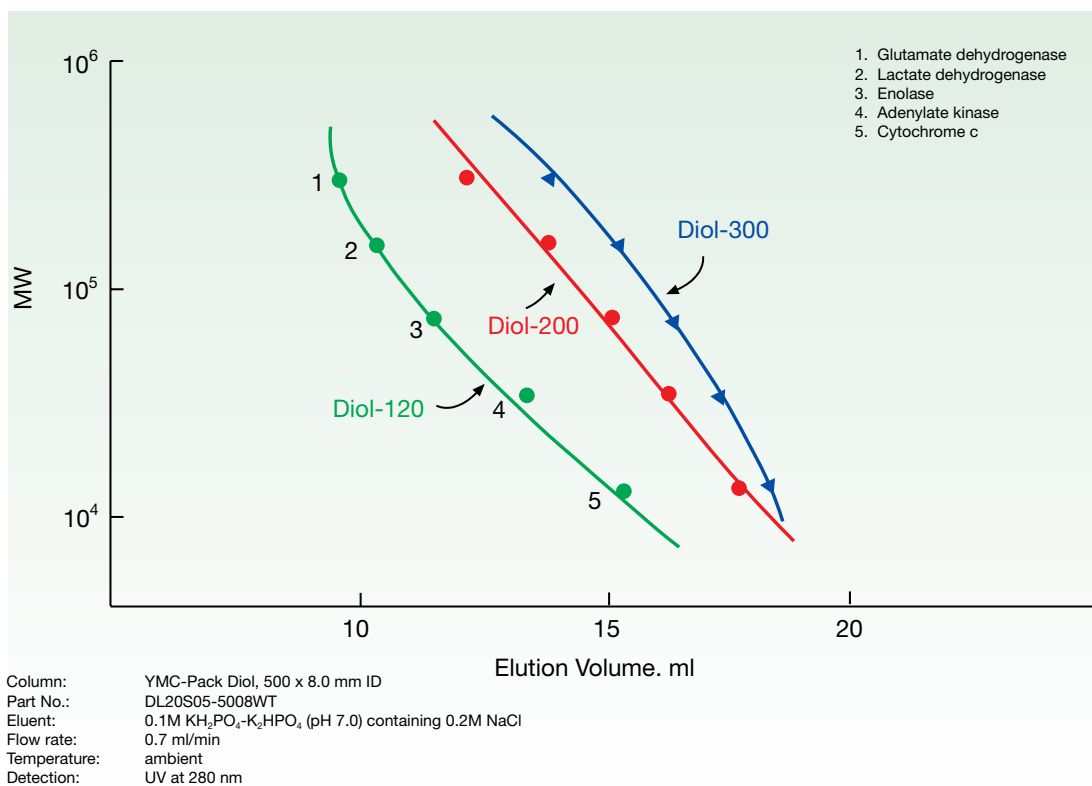


Column Selection Tool

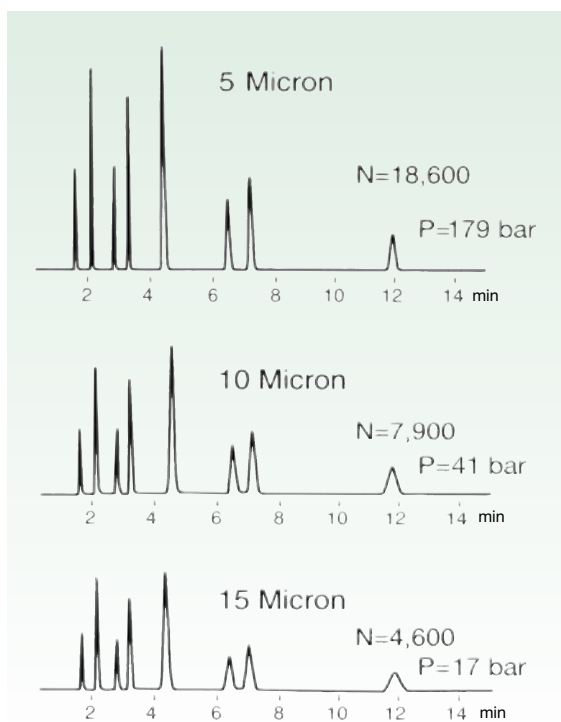
YMC-Pack Diol-60	for MW < 10,000
YMC-Pack Diol-120	for MW 5,000 to 100,000
YMC-Pack Diol-200	for MW 10,000 to several 100,000
YMC-Pack Diol-300	for MW several 10,000 to 1,000,000

High flexibility

Proteins and Peptides*



Scalability

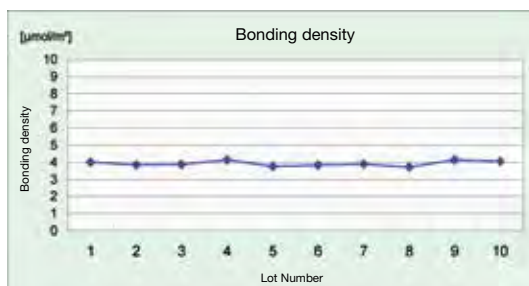
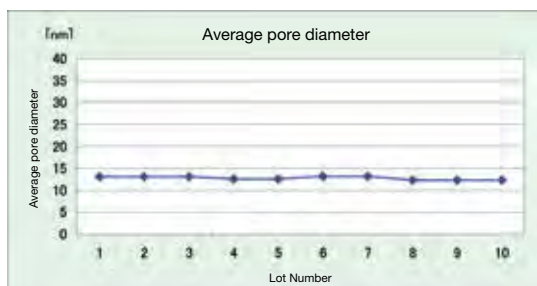


*YMC guarantees
a seamless,
reproducible
scale up through
all particle sizes
for all
stationary phases*

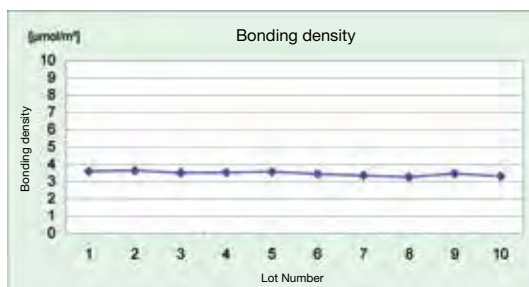
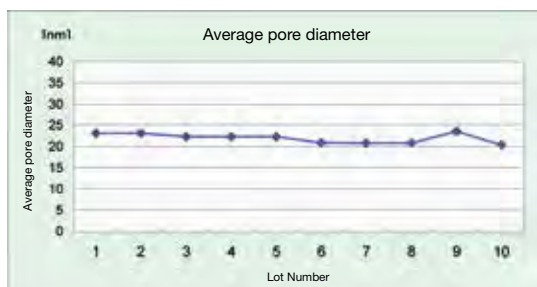
Reproducibility

YMC-Pack Diol columns have the reputation, not only for their high versatility and excellent cost/performance ratio, but also for their high degree of lot-to-lot reproducibility.

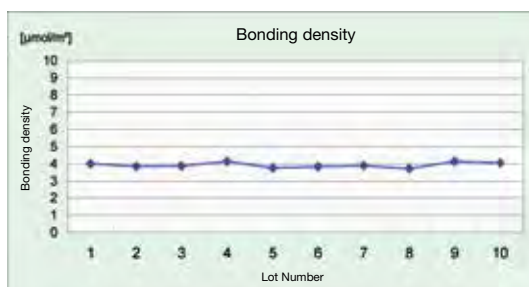
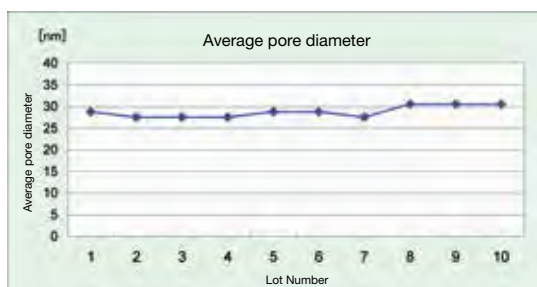
YMC-Pack Diol-120



YMC-Pack Diol-200

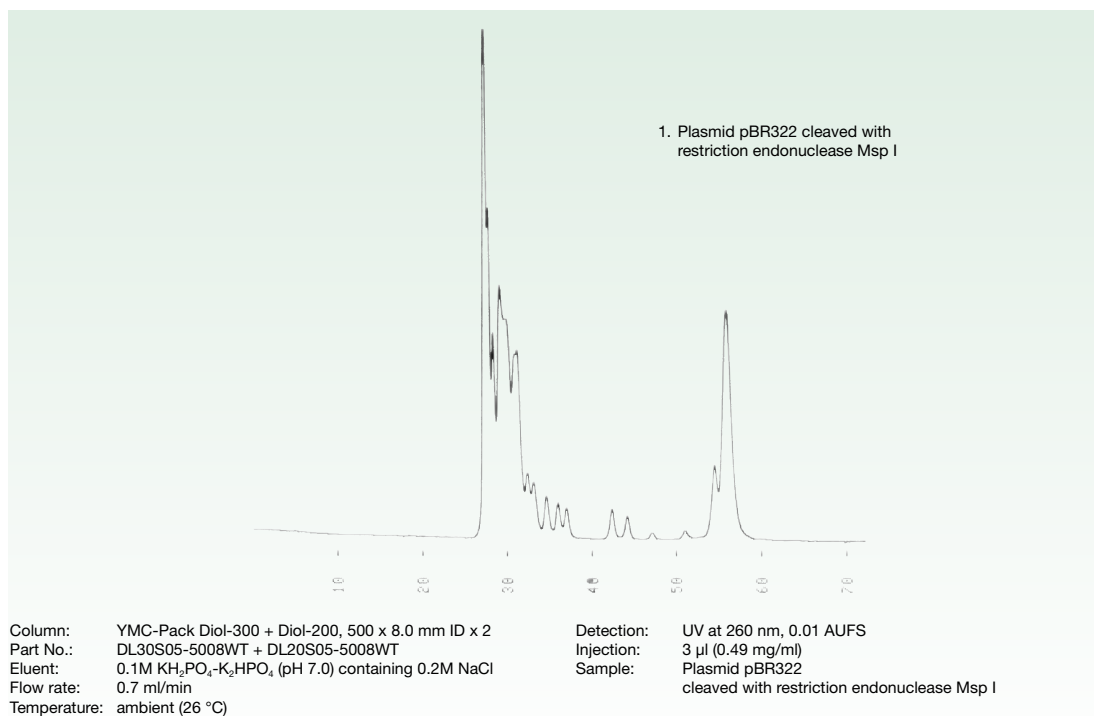


YMC-Pack Diol-300

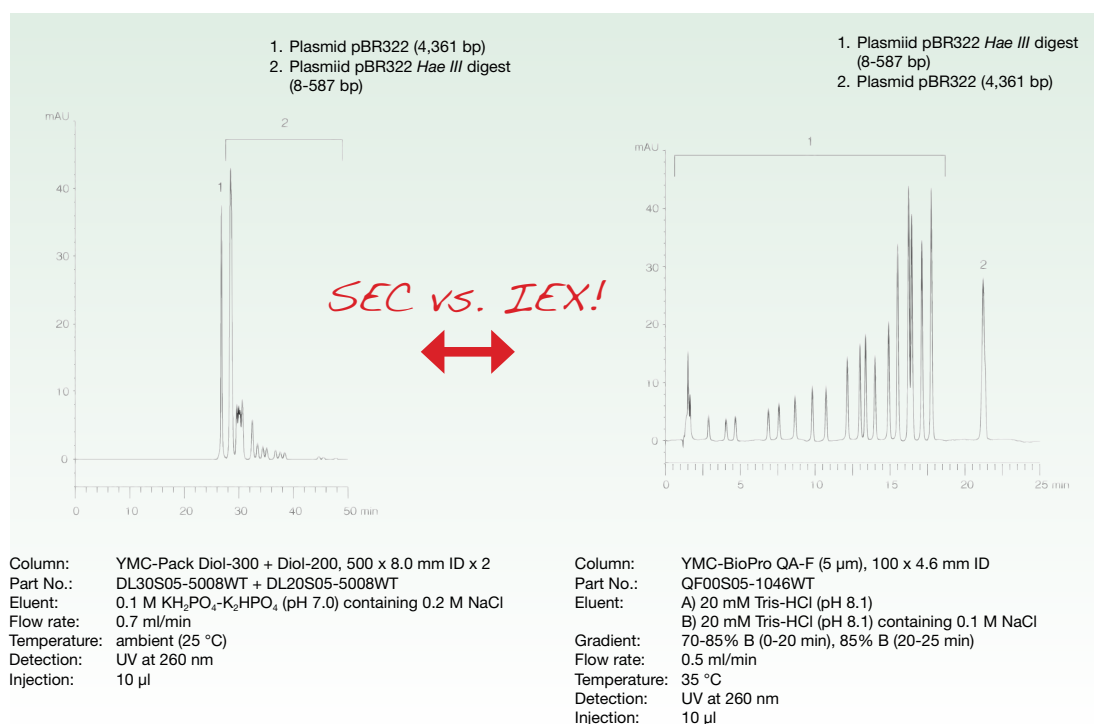


SEC Applications for YMC-Pack Diol

Plasmid pBR322 restriction fragment

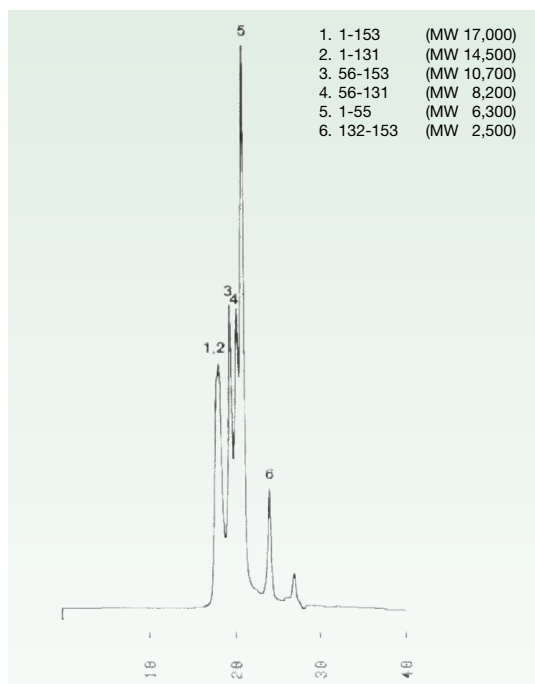


Plasmid pBR322 restriction and pBR322 *Hae* III restriction fragment



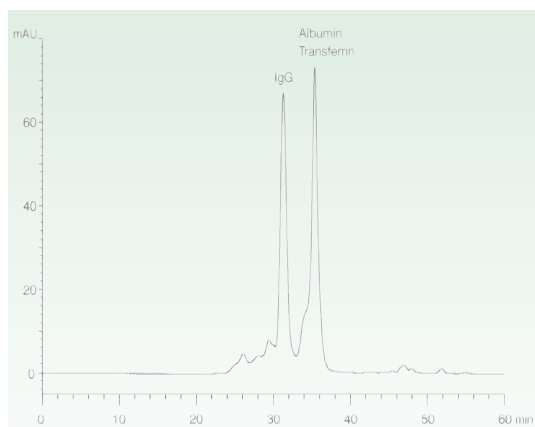
SEC Applications for YMC-Pack Diol

Peptide fragments from myoglobin



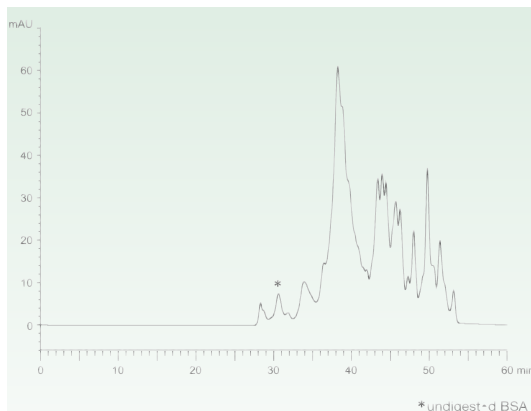
Column: YMC-Pack Diol-120, 500 x 8.0 mm ID
 Part No.: DL12S05-5008WT
 Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 7.0) containing 0.2 M NaCl/ acetonitrile (70/30)
 Flow rate: 0.7 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 215 nm, 0.32 AUFS
 Injection: 20 μl (2.0 mg/ml)
 Sample: Cyanogen bromide cleavages of horse heart myoglobin. Molecular Weight Marker for proteins, manufactured by Fluka Chemie AG.

Proteins in mouse ascites fluid



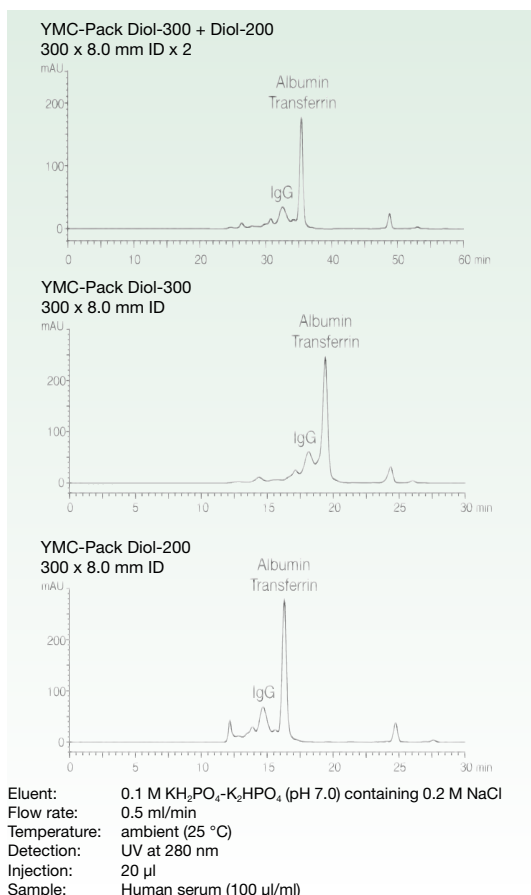
Column: YMC-Pack Diol-300 + Diol-200, 300 x 4.6 mm ID x 2
 Part No.: DL30S05-3046WT + DL20S05-3046WT
 Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 7.0)
 Flow rate: 0.17 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 220 nm
 Injection: 10 μl (60 times dilution with water)

Peptide mapping



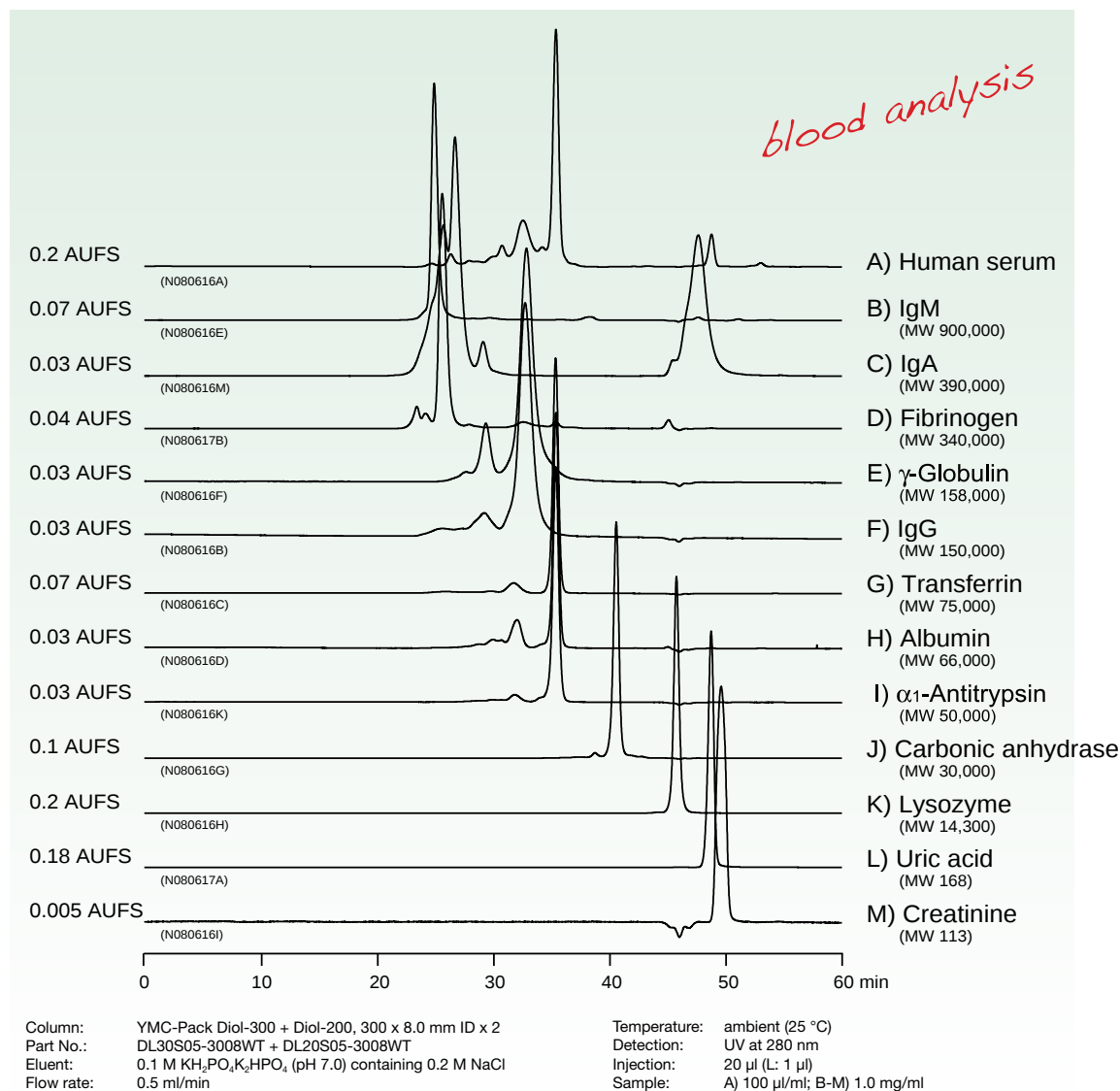
Column: YMC-Pack Diol-120 + Diol-60, 500 x 8.0 mm ID x 2
 Part No.: DL12S05-5008WT + DL06S05-5008WT
 Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 7.0) containing 0.2 M NaCl/ acetonitrile (70/30)
 Flow rate: 0.7 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 220 nm
 Injection: 5 μl
 Sample: Tryptic digest of BSA

Proteins in human serum



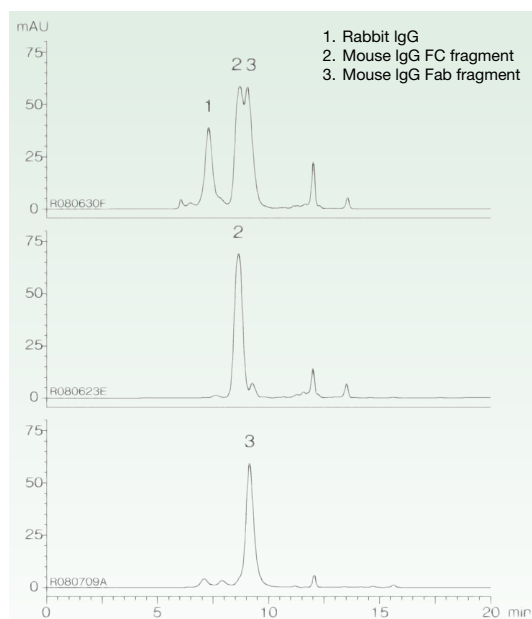
SEC Applications for YMC-Pack Diol

Plasma constituents



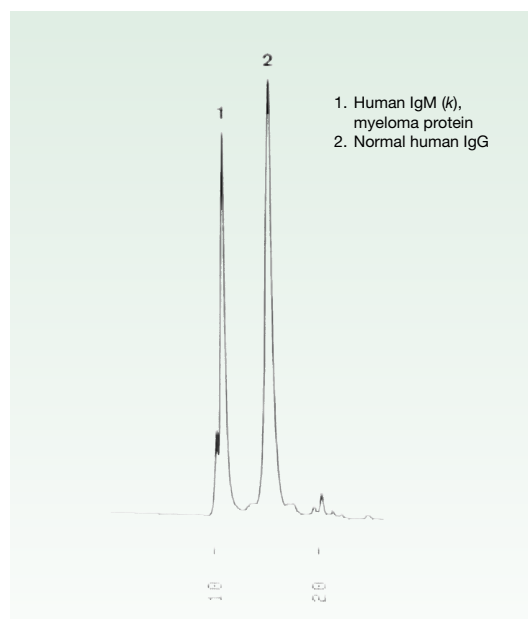
SEC Applications for YMC-Pack Diol

IgG, Fab and Fc fragments



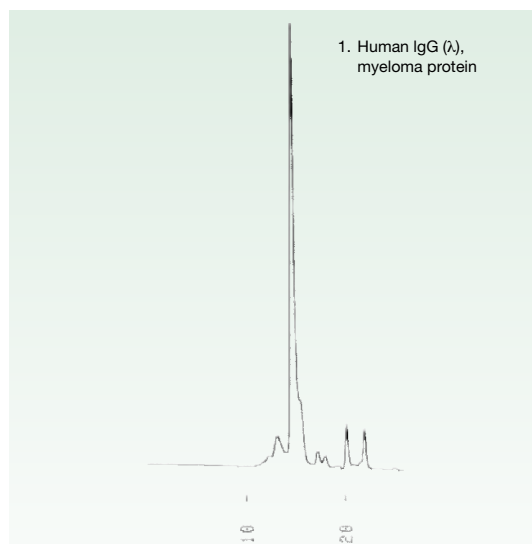
Column: YMC-Pack Diol-200, 300 x 8.0 mm ID
 Part No.: DL20S05-3008WT
 Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 6.9) containing 0.2 M NaCl
 Flow rate: 1.0 ml/min
 Temperature: ambient (27 °C)
 Detection: UV at 220 nm
 Injection: 5 μl (0.4, 0.5 mg/ml)

Human Immunglobulin



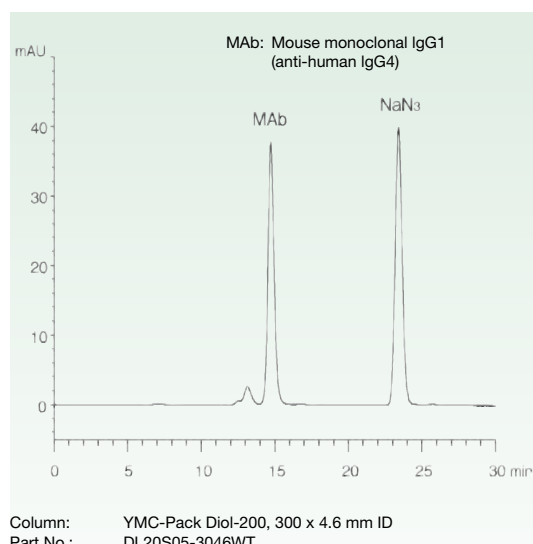
Column: YMC-Pack Diol-300, 500 x 8.0 mm ID
 Part No.: DL30S05-5008WT
 Eluent: 0.1M NaH_2PO_4 - Na_2HPO_4 (pH 6.8) containing 0.1M Na_2SO_4
 Flow rate: 1.0 ml/min
 Temperature: ambient (24 °C)
 Detection: UV at 280 nm, 0.04 AUFS
 Injection: 40 μl (0.5 mg/ml)

Human IgG (λ), myeloma protein



Column: YMC-Pack Diol-300 + Diol-200, 500 x 8.0 mm ID x 2
 Part No.: DL30S05-5008WT + DL20S05-5008WT
 Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 7.0) containing 0.2 M NaCl
 Flow rate: 0.7 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 260 nm
 Injection: 10 μl

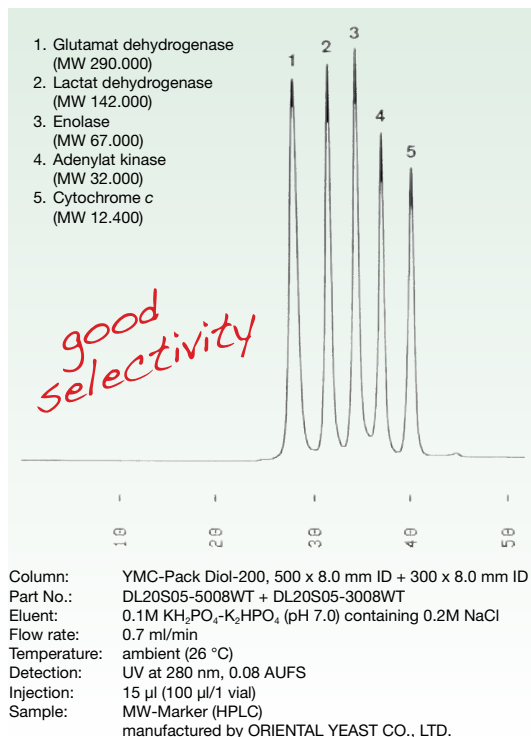
Monoclonal antibody (MAb)



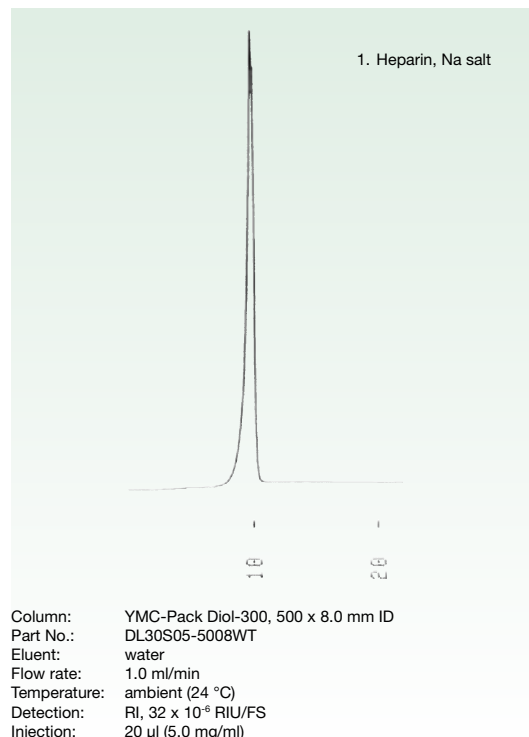
Column: YMC-Pack Diol-200, 300 x 4.6 mm ID
 Part No.: DL20S05-3046WT
 Eluent: 0.1 M KH_2PO_4 - K_2HPO_4 (pH 7.0)
 Flow rate: 0.17 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 220 nm
 Injection: 10 μl
 Sample: a commercially available mouse monoclonal IgG1 (0.05 mg/ml) (purified by DEAE chromatography, containing NaN_3)

SEC Applications for YMC-Pack Diol

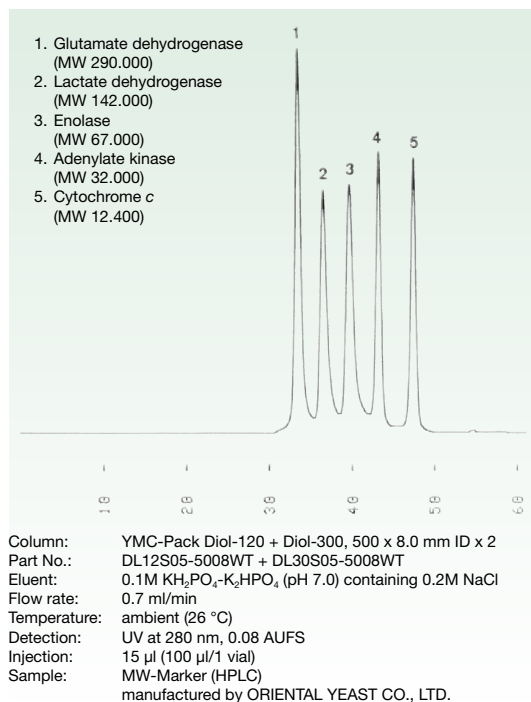
Proteins for molecular weight markers



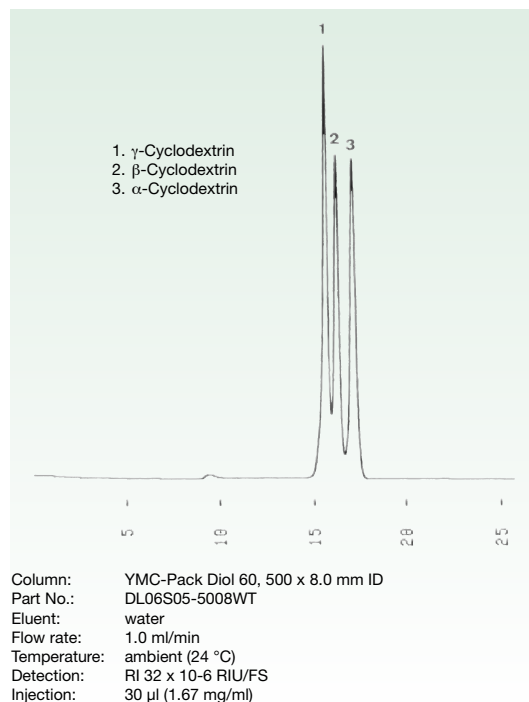
Heparin



Proteins for molecular weight markers

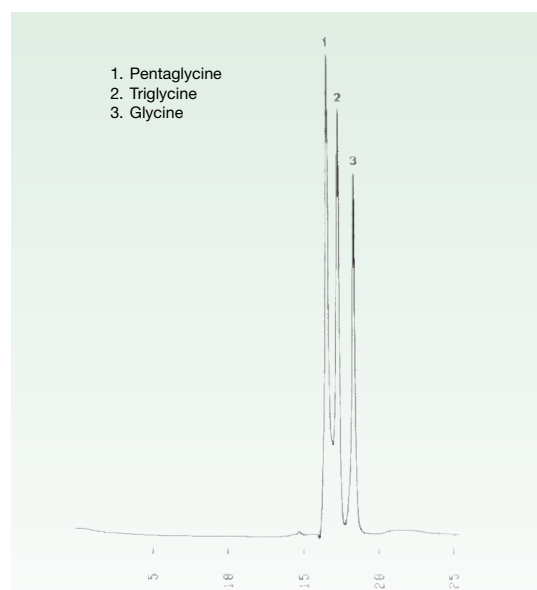


Cyclodextrins



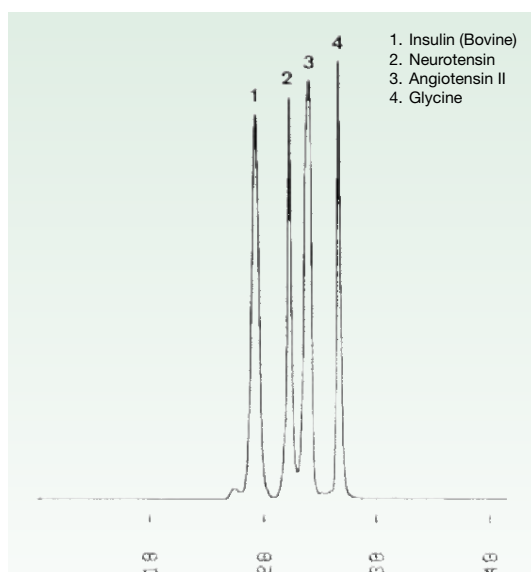
SEC Applications for YMC-Pack Diol

Glycine oligomers



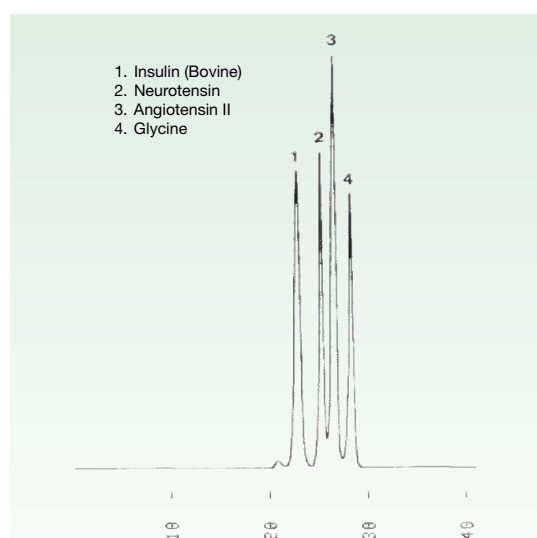
Column: YMC-Pack Diol-60, 500 x 8.0 mm ID
 Part No.: DL06S05-5008WT
 Eluent: 0.1M KH_2PO_4 - K_2HPO_4 (pH 7.0) / acetonitrile (70/30)
 Flow rate: 1.0 ml/min
 Temperature: ambient (24 °C)
 Detection: UV at 215 nm, 0.08 AUFS
 Injection: 20 μl (0.25 ~ 2.5 mg/ml)

Peptides



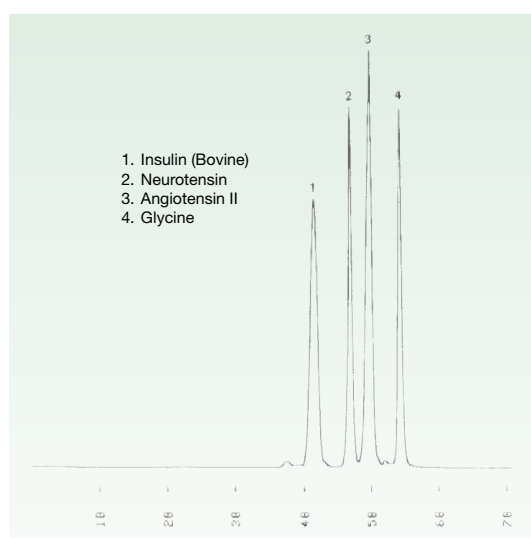
Column: YMC-Pack Diol-60, 500 x 8.0 mm ID
 Part No.: DL06S05-5008WT
 Eluent: 0.1M KH_2PO_4 - K_2HPO_4 (pH 7.0) / containing 0.2 M NaCl / acetonitrile (70/30)
 Flow rate: 0.7 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 215 nm, 0.16 AUFS
 Injection: 25 μl (0.07 ~ 5.3 mg/ml)

Peptides



Column: YMC-Pack Diol-120, 500 x 8.0 mm ID
 Part No.: DL12S05-5008WT
 Eluent: 0.1M KH_2PO_4 - K_2HPO_4 (pH 7.0) / containing 0.2 M NaCl / acetonitrile (70/30)
 Flow rate: 0.7 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 215 nm, 0.16 AUFS
 Injection: 25 μl (0.07 ~ 5.3 mg/ml)

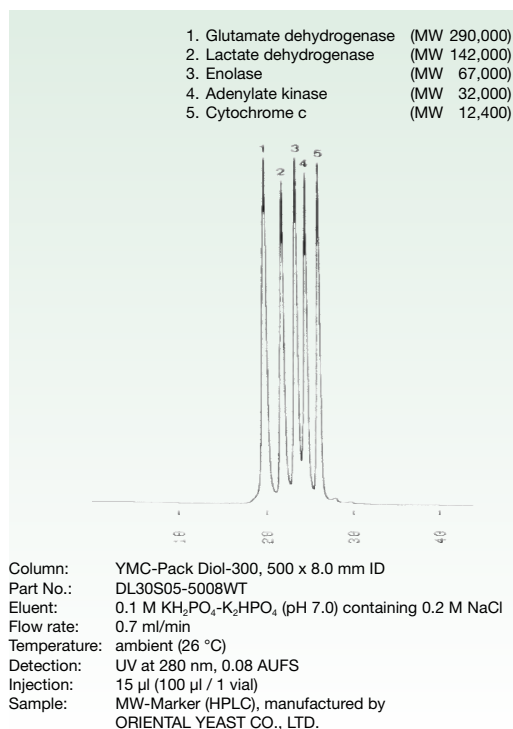
Peptides



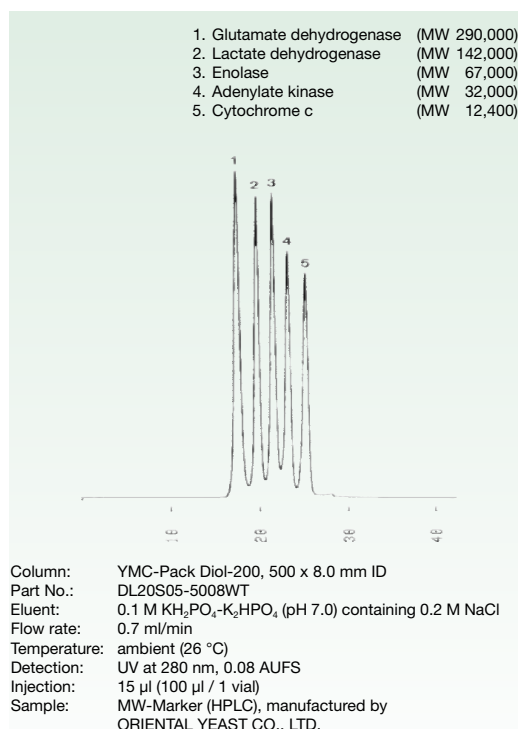
Column: YMC-Pack Diol-120 + 60, 500 x 8.0 mm ID x 2
 Part No.: DL12S05-5008WT + DL06S05-5008WT
 Eluent: 0.1M KH_2PO_4 - K_2HPO_4 (pH 7.0) / containing 0.2 M NaCl / acetonitrile (70/30)
 Flow rate: 0.7 ml/min
 Temperature: ambient (25 °C)
 Detection: UV at 215 nm, 0.16 AUFS
 Injection: 25 μl (0.07 ~ 5.3 mg/ml)

SEC Applications for YMC-Pack Diol

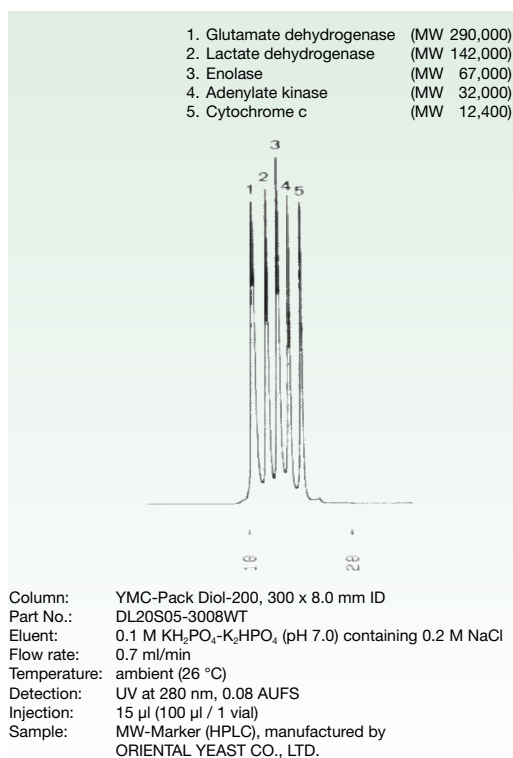
Proteins for molecular weight markers



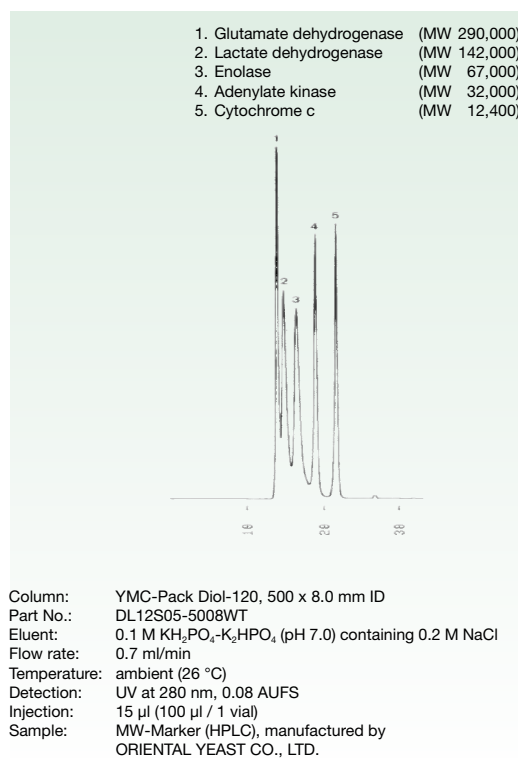
Proteins for molecular weight markers



Proteins for molecular weight markers



Proteins for molecular weight markers



Ordering Information

YMC-Pack Diol, 6 nm, 3 µm

Column length	4.6	Column ID (mm)	
		6.0	8.0
250 mm	DL06S03-2546WT	n.a.	n.a.
300 mm	DL06S03-3046WT	DL06S03-3006WT	DL06S03-3008WT

YMC-Pack Diol, 12 nm, 3 µm

Column length	4.6	Column ID (mm)	
		6.0	8.0
250 mm	DL12S03-2546WT	n.a.	n.a.
300 mm	DL12S03-3046WT	DL12S03-3006WT	DL12S03-3008WT

YMC-Pack Diol, 20 nm, 3 µm

Column length	4.6	Column ID (mm)	
		6.0	8.0
250 mm	DL20S03-2546WT	n.a.	n.a.
300 mm	DL20S03-3046WT	DL20S03-3006WT	DL20S03-3008WT

YMC-Pack Diol, 30 nm, 3 µm

Column length	4.6	Column ID (mm)	
		6.0	8.0
250 mm	DL30S03-2546WT	n.a.	n.a.
300 mm	DL30S03-3046WT	DL30S03-3006WT	DL30S03-3008WT

Guard Columns are available for the different column dimensions.
For more details please contact us: Phone 02064-427-0 or E-Mail info@ymc.de.

Ordering Information

YMC-Pack Diol, 6 nm, 5 µm

Column length	Column ID (mm)			
	4.6	6.0	8.0	10.0
250 mm	DL06S05-2546WT	DL06S05-2506WT	n.a.	DL06S05-2510WT
300 mm	DL06S05-3046WT	DL06S05-3006WT	DL06S05-3008WT	DL06S05-3010WT
500 mm	n.a.	DL06S05-5006WT	DL06S05-5008WT	DL06S05-5010WT

YMC-Pack Diol, 12 nm, 5 µm

Column length	Column ID (mm)			
	4.6	6.0	8.0	10.0
250 mm	DL12S05-2546WT	DL12S05-2506WT	n.a.	DL12S05-2510WT
300 mm	DL12S05-3046WT	DL12S05-3006WT	DL12S05-3008WT	DL12S05-3010WT
500 mm	n.a.	DL12S05-5006WT	DL12S05-5008WT	DL12S05-5010WT

YMC-Pack Diol, 20 nm, 5 µm

Column length	Column ID (mm)			
	4.6	6.0	8.0	10.0
250 mm	DL20S05-2546WT	DL20S05-2506WT	n.a.	DL20S05-2510WT
300 mm	DL20S05-3046WT	DL20S05-3006WT	DL20S05-3008WT	DL20S05-3010WT
500 mm	n.a.	DL20S05-5006WT	DL20S05-5008WT	DL20S05-5010WT

YMC-Pack Diol, 30 nm, 5 µm

Column length	Column ID (mm)			
	4.6	6.0	8.0	10.0
250 mm	DL30S05-2546WT	DL30S05-2506WT	n.a.	DL30S05-2510WT
300 mm	DL30S05-3046WT	DL30S05-3006WT	DL30S05-3008WT	DL30S05-3010WT
500 mm	n.a.	DL30S05-5006WT	DL30S05-5008WT	DL30S05-5010WT

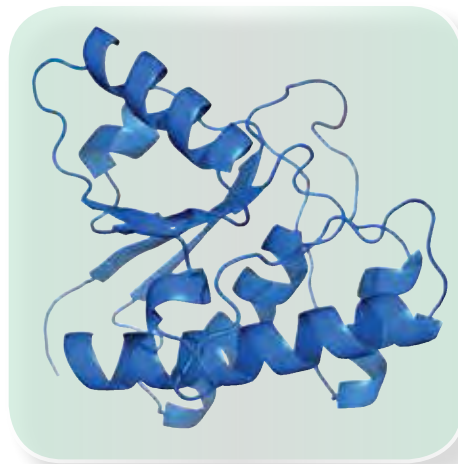
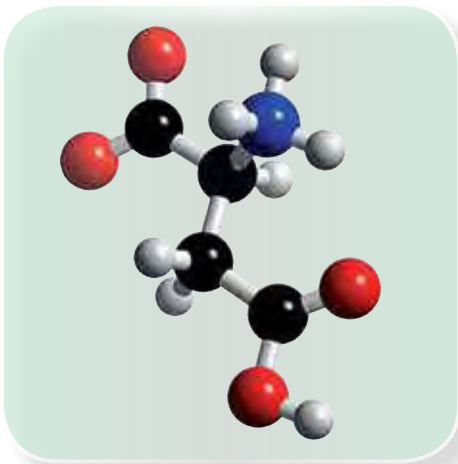
Guard Columns are available for the different column dimensions.
For more details please contact us: Phone 02064-427-0 or E-Mail info@ymc.de.

Bulk media

Phase	Pore Size	Particle Size	Part-No.
YMC*Gel Diol-HG	12	10 µm	DLG12S11
		15 µm	DLG12S16
		20 µm	DLG12S21
YMC*Gel Diol-HG	20	10 µm	DLG20S11
		15 µm	DLG20S16
		20 µm	DLG20S21
YMC*Gel Diol-HG	30	10 µm	DLG30S11
		15 µm	DLG30S16
		20 µm	DLG30S21

Pack Sizes: 100 g; 500 g; 1 kg; 5 kg; 10 kg; 25 kg

NOTE: customised particle sizes and pore sizes are available on request.
Contact YMC Europe GmbH for details and ordering information.



RP

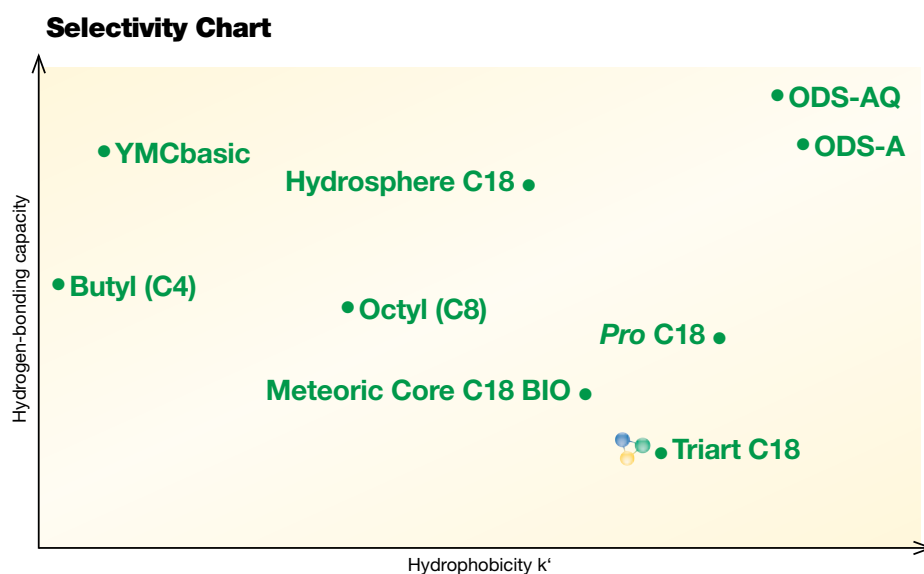
Bioseparation columns

C18-Selectivities for peptides

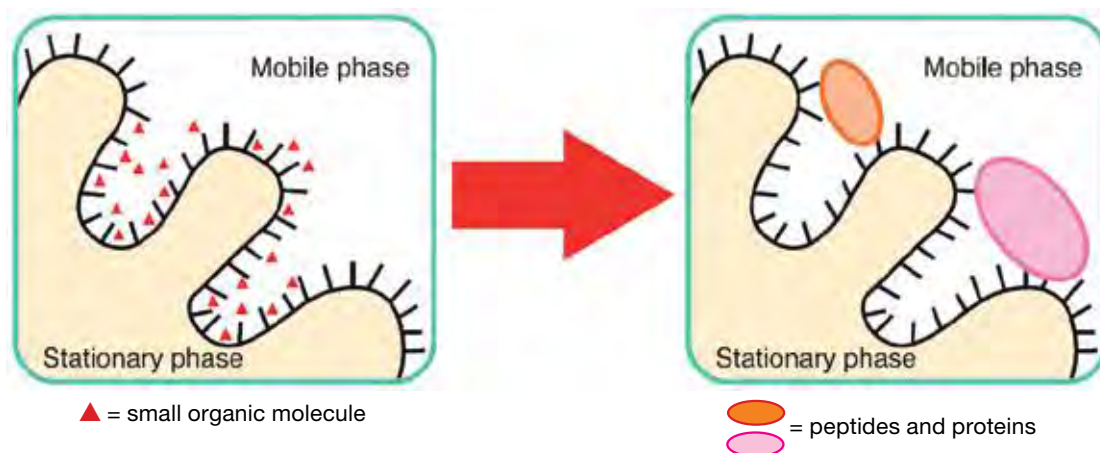
	YMC-Triart C18	YMC-Pack Pro C18	YMC-Pack ODS-A	YMC-Pack ODS-AQ	Hydrosphere C18	Meteoric Core C18 BIO
Particle size / μm	1.9; 3; 5	2; 3; 5	3; 5	3; 5	2; 3; 5	2.7
Pore size / nm	12	12	12; 20; 30	12; 20	12	16
Carbon content / %	20	17	17; 12; 7	14; 10	12	5
pH range	1.0 - 12.0	2.0 - 8.0	2.0 - 7.5	2.0 - 7.5	2.0 - 8.0	1.5 - 10.0

C8- and C4-Selectivities for peptides and proteins

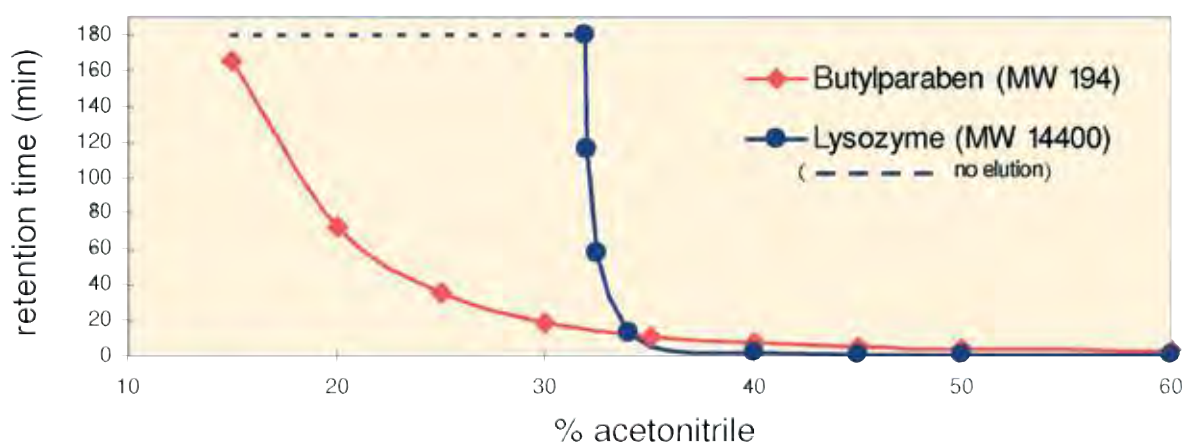
	YMC-Pack C8	YMCbasic	YMC-Pack C4	YMC-Pack Protein RP
Particle size / μm	3; 5	3; 5	3; 5	5
Pore size / nm	12; 20; 30	20	12; 20; 30	20
Carbon content / %	10; 7; 4	7	7; 5; 3	4
pH range	2.0 - 7.5	2.0 - 7.5	2.0 - 7.5	1.5 - 7.5



Retention mechanism for peptides and proteins



ON-OFF mechanism



By monitoring the dependency between the retention time of analytes and the percentage of organic solvent being used, an interesting difference in behaviour between small organic molecules and proteins is revealed.

Small organic molecules such as butylparaben are retained/eluted by a distribution mechanism

as shown in the linear relationship between retention time and percentage of organic modifier. This is in sharp contrast to the retention behaviour of peptides and proteins, e.g. lysozyme. These are retained/eluted by an adsorption-desorption (on-off) mechanism and as a result the pore size has to be carefully considered.

Chromatographers know the problems during method development: “Which phase is suitable and allows a simple and robust separation?”

In the field of biochromatography, phase selection is a key to success!

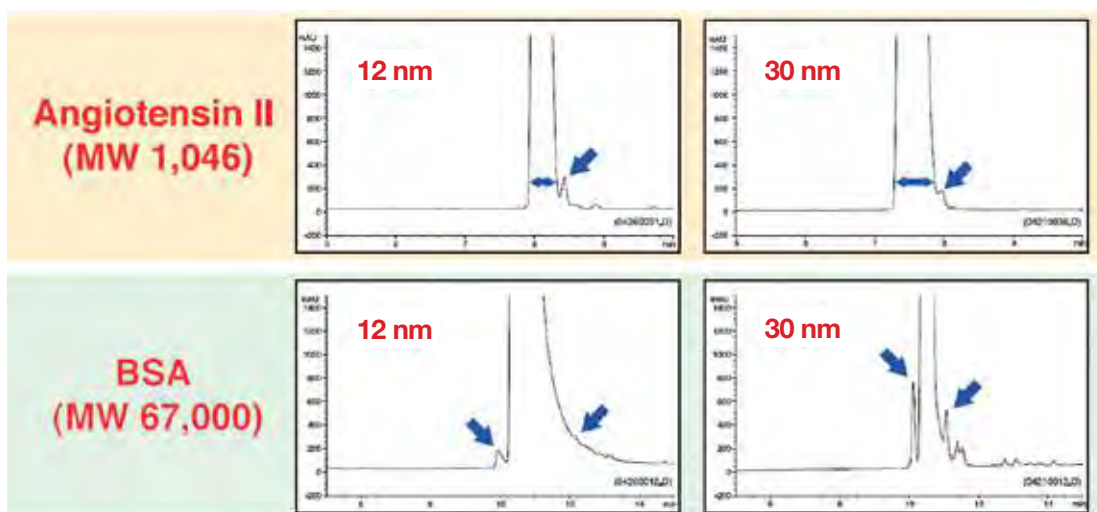
With the YMC's "Column Selection Tool" for Bio-LC, stationary phase selection is almost too easy.

As shown in the table (below), the C18 column with 12 nm pore size is suitable for small peptides up to a MW 5000. The best efficiency for large peptides or small proteins can be obtained by employing a C8 phase characterised by a 20 nm pore size.

Furthermore, most proteins are eluted effectively by a C4 column with 30 nm.

However, the separation may also be influenced by the hydrophobicity of the peptide/protein and the nature of the column's bonded phase. Therefore, for initial method development, it might be useful, in the first instance, to follow the arrow shown in the table for method optimisation.

Comparison of peaks on C4 with 12 nm and 30 nm pore sizes



For smaller peptides a small pore size is more successful. Larger molecules are separated much better with larger pore sizes!

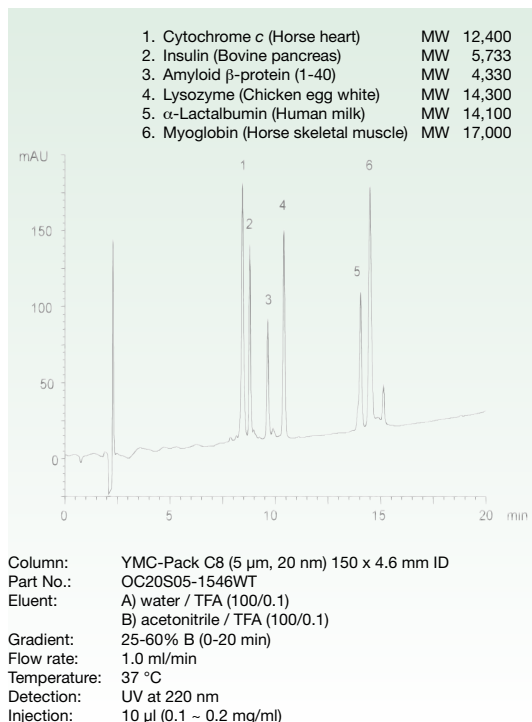
Column Selection Tool*

MW		C18	C8	C4
5000 20000 100000	12 nm	⊙	○	△
	20 nm	○	⊙	○
	30 nm	△	○	⊙

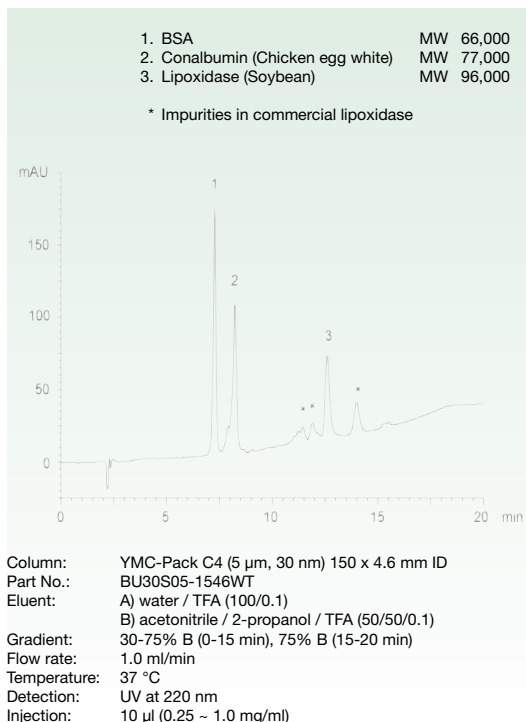
⊙ : excellent, ○ : good, △ : moderate

Peptide and Protein Applications

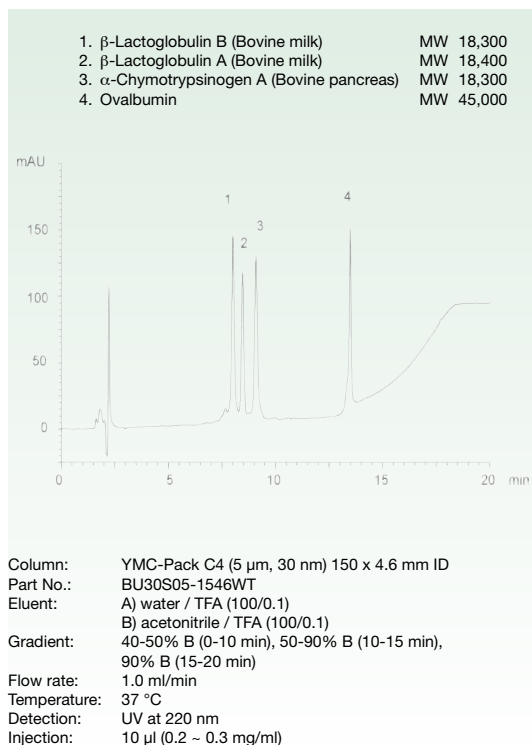
Peptides and Proteins



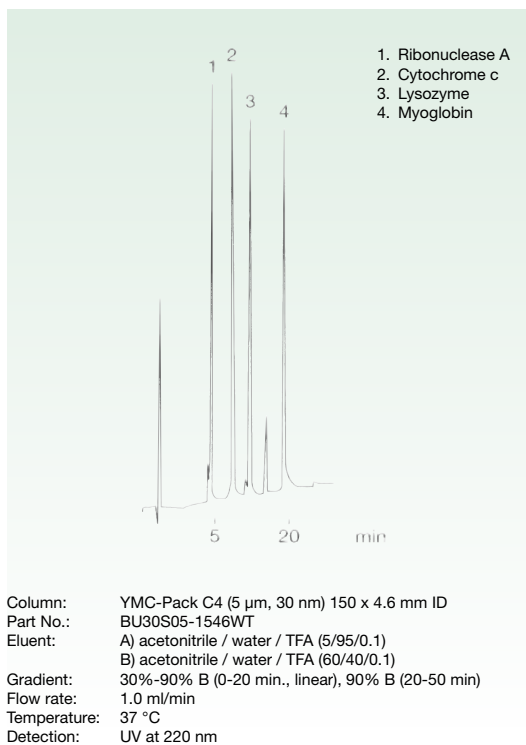
Proteins



Proteins

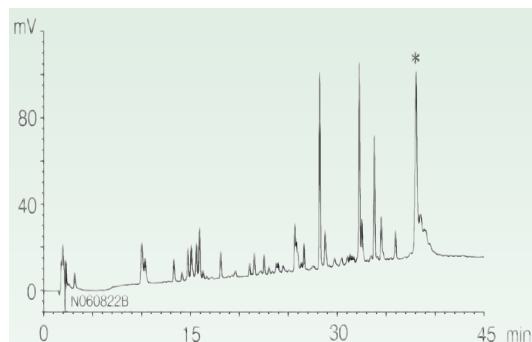


Proteins



Peptide and Protein Applications

Peptide mapping - excellent reproducibility between 5 µm and 2 µm

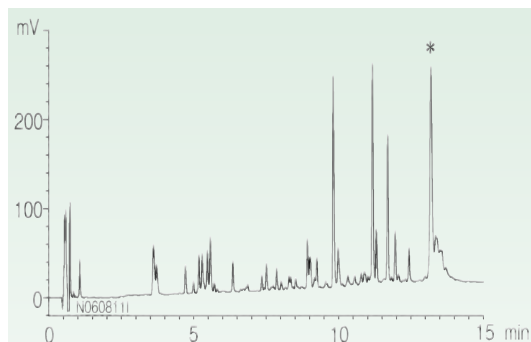


*undigested Cytochrome c

Column: YMC-UltraHT Pro C18 (5 µm, 12 nm) 150 × 2.0 mm ID
 Part No.: AS12S05-1502QT
 Eluent: A) acetonitrile/water/trifluoroacetic acid (10/90/0.1)
 B) acetonitrile/water/trifluoroacetic acid (35/65/0.1)
 Gradient:

Time	A (in %)	B (in %)
0	100	0
5	100	0
40	0	100
45	0	100

 Flow rate: 0.2 ml/min
 Temperature: 37 °C
 Detection: UV at 220 nm
 Injection: 1 µl
 Sample: Tryptic digest of Cytochrome c



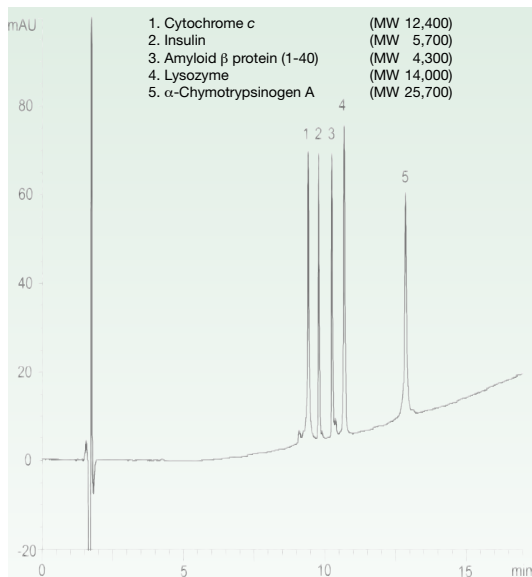
*undigested Cytochrome c

Column: YMC-UltraHT Pro C18 (2 µm, 12 nm) 50 × 2.0 mm ID
 Part No.: AS12S02-0502WT
 Eluent: A) acetonitrile/water/trifluoroacetic acid (10/90/0.1)
 B) acetonitrile/water/trifluoroacetic acid (35/65/0.1)
 Gradient:

Time	A (in %)	B (in %)
0	100	0
1.65	100	0
13.35	0	100
15.00	0	100

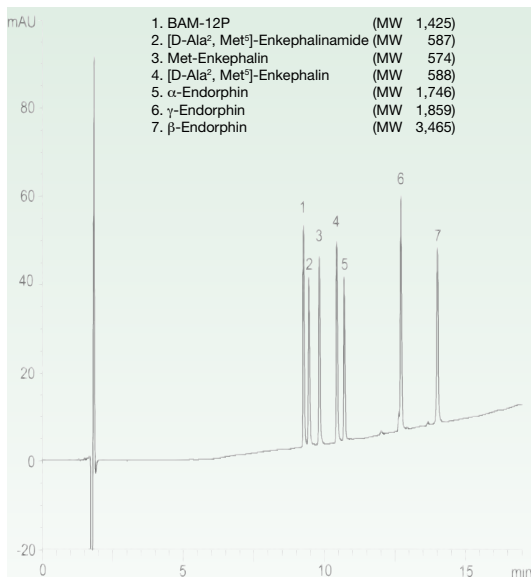
 Flow rate: 0.2 ml/min
 Temperature: 37 °C
 Detection: UV at 220 nm
 Injection: 1 µl
 Sample: Tryptic digest of Cytochrome c

Peptides and proteins



1. Cytochrome c (MW 12,400)
 2. Insulin (MW 5,700)
 3. Amyloid β protein (1-40) (MW 4,300)
 4. Lysozyme (MW 14,000)
 5. α-Chymotrypsinogen A (MW 25,700)
 Column: Meteoric Core C18 BIO (2.7 µm, 16 nm) 150 × 2.1 mm ID
 Part No.: CAW08SQ7-15Q1PT
 Eluent: A) water/TFA (100/0.1)
 B) acetonitrile/TFA (100/0.1)
 20-70% B (0-15 min), 70% B (15-17 min)
 Flow rate: 0.2 mL/min
 Temperature: 40 °C
 Detection: UV at 220 nm
 Injection: 2 µl (0.05-0.2 mg/mL)
 Pressure: 12.8-16.1 MPa (1860-2330 psi)

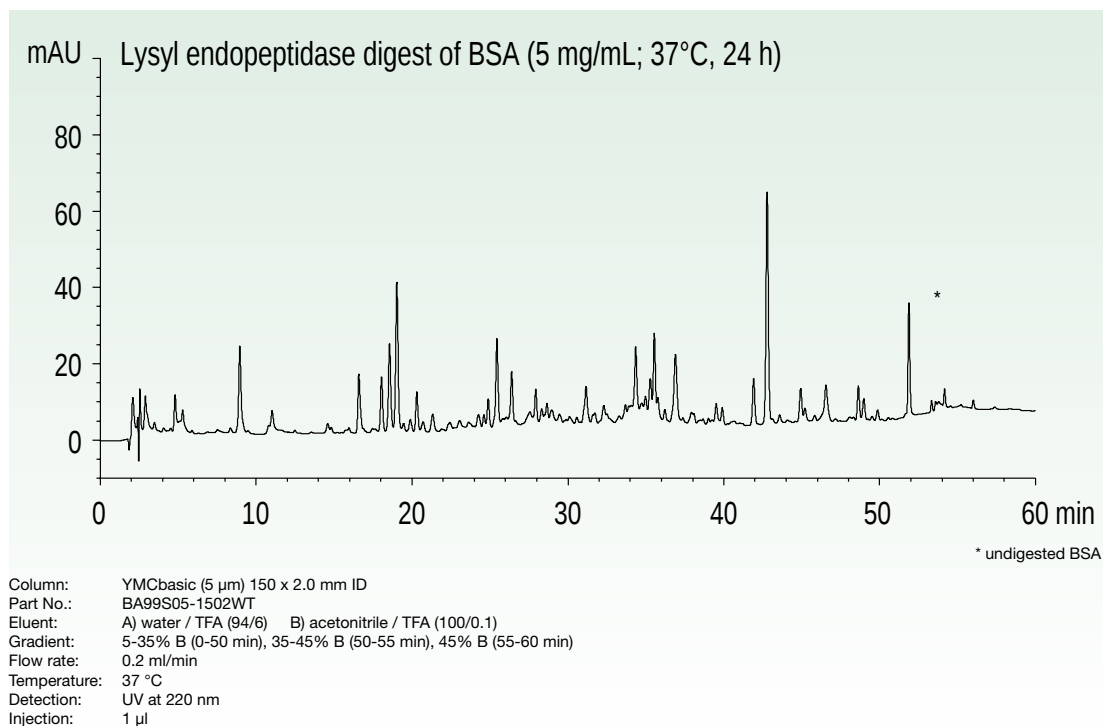
Peptides



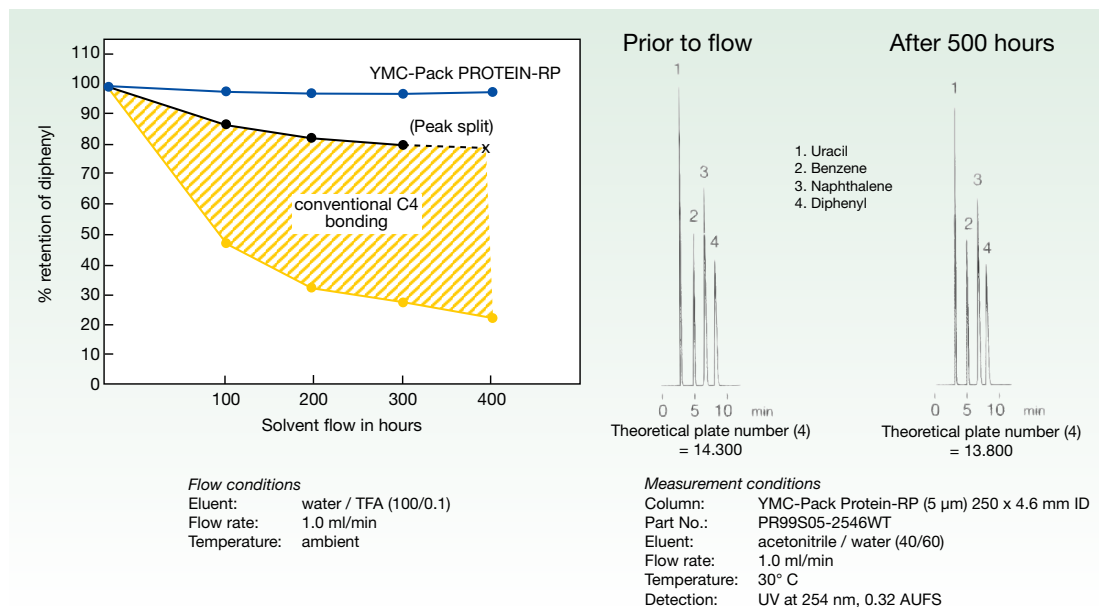
1. BAM-12P (MW 1,425)
 2. [D-Ala², Met⁵]-Enkephalinamide (MW 587)
 3. Met-Enkephalin (MW 574)
 4. [D-Ala², Met⁵]-Enkephalin (MW 588)
 5. α-Endorphin (MW 1,746)
 6. γ-Endorphin (MW 1,859)
 7. β-Endorphin (MW 3,465)
 Column: Meteoric Core C18 BIO (2.7 µm, 16 nm) 150 × 2.1 mm ID
 Part No.: CAW08SQ7-15Q1PT
 Eluent: A) water/TFA (100/0.1)
 B) acetonitrile/TFA (100/0.1)
 15-55% B (0-15 min), 55% B (15-17 min)
 Flow rate: 0.2 mL/min
 Temperature: 40 °C
 Detection: UV at 220 nm
 Injection: 2 µl (0.02-0.5 mg/mL)
 Pressure: 14.9-16.1 MPa (2160-2330 psi)

Peptide and Protein Applications

Peptides mapping



Improved durability when used with TFA solution

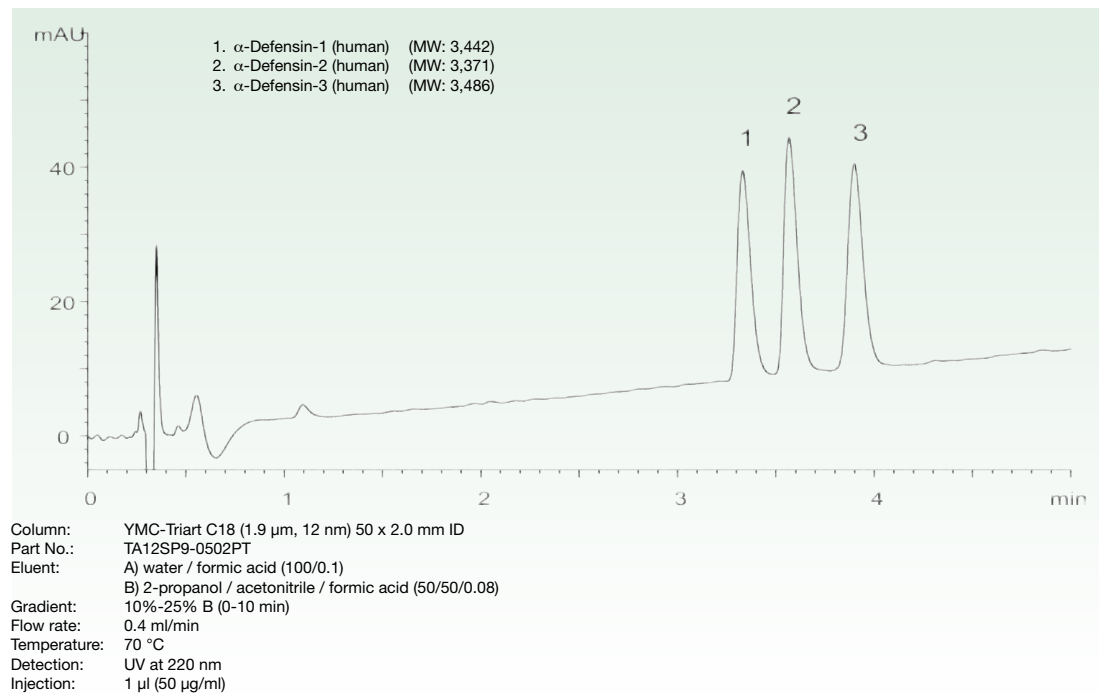


The selectivity of YMC-Pack Protein-RP is different from that seen with conventional wide pore butyl phases and it is specifically suited for the protein analysis.

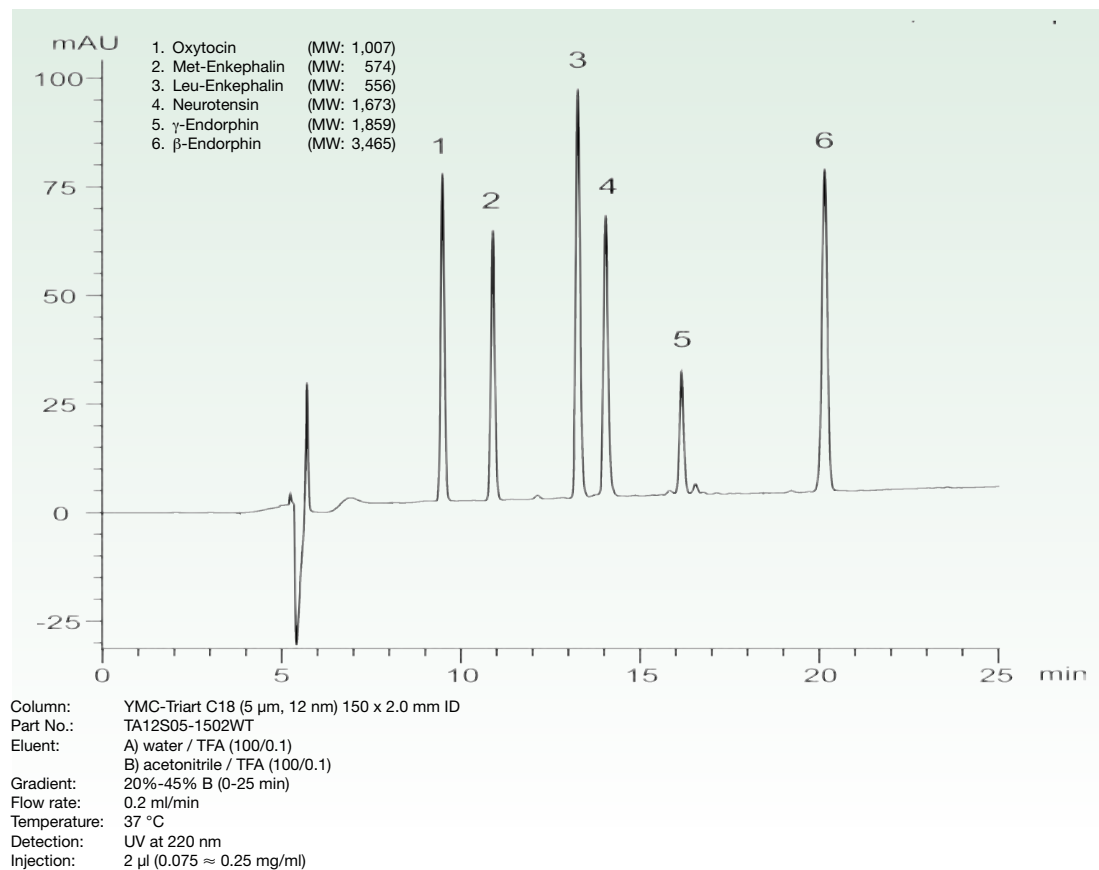
In the applications below it effectively separates both low molecular weight compounds and high molecular weight proteins, with equally good peak shapes being obtained.

Peptide and Protein Applications

Antimicrobial peptides

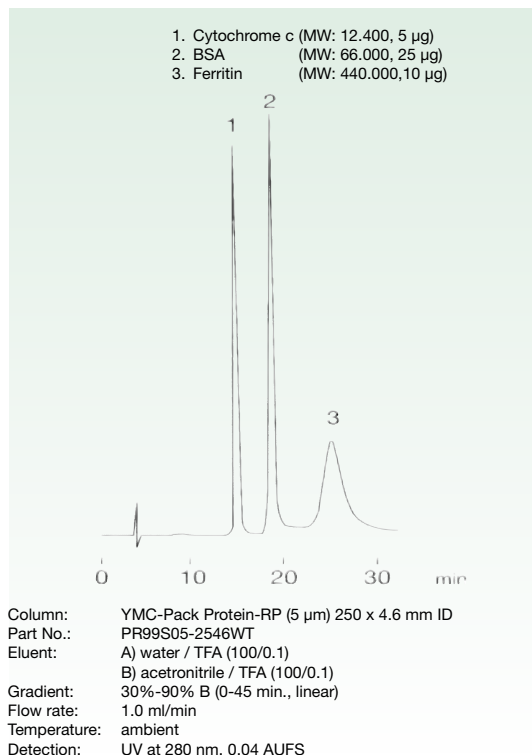


Peptides

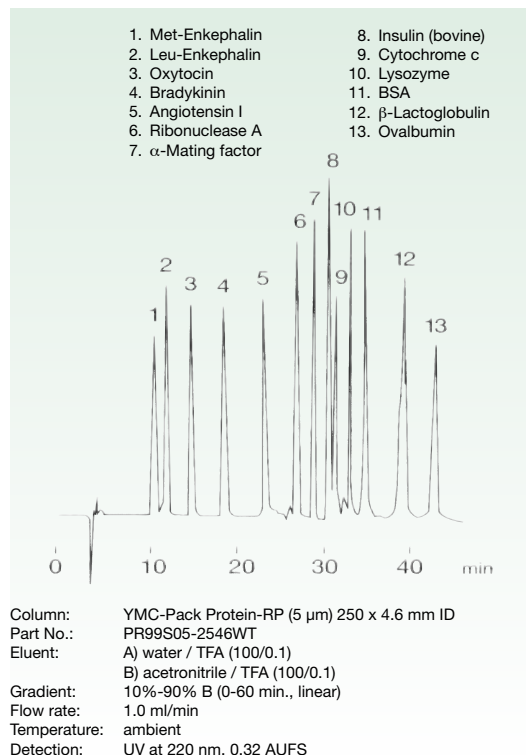


Peptide and Protein Applications

Proteins

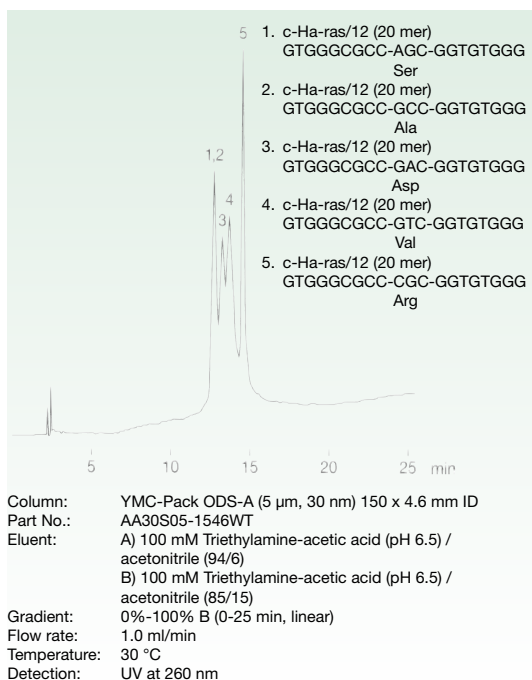


Proteins and peptides

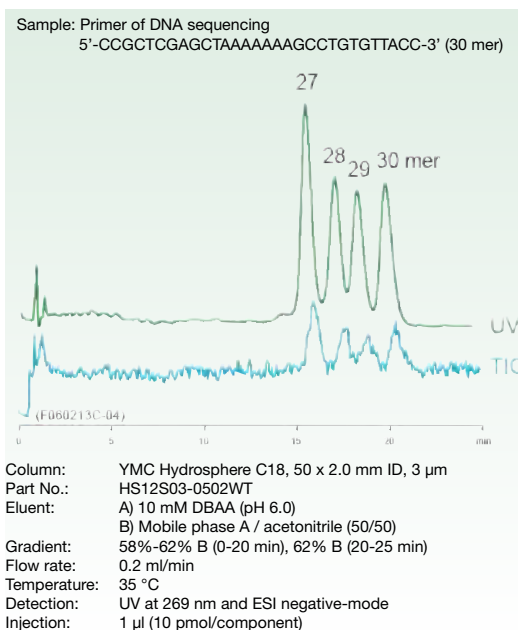


Oligonucleotide Applications

Oligonucleotides

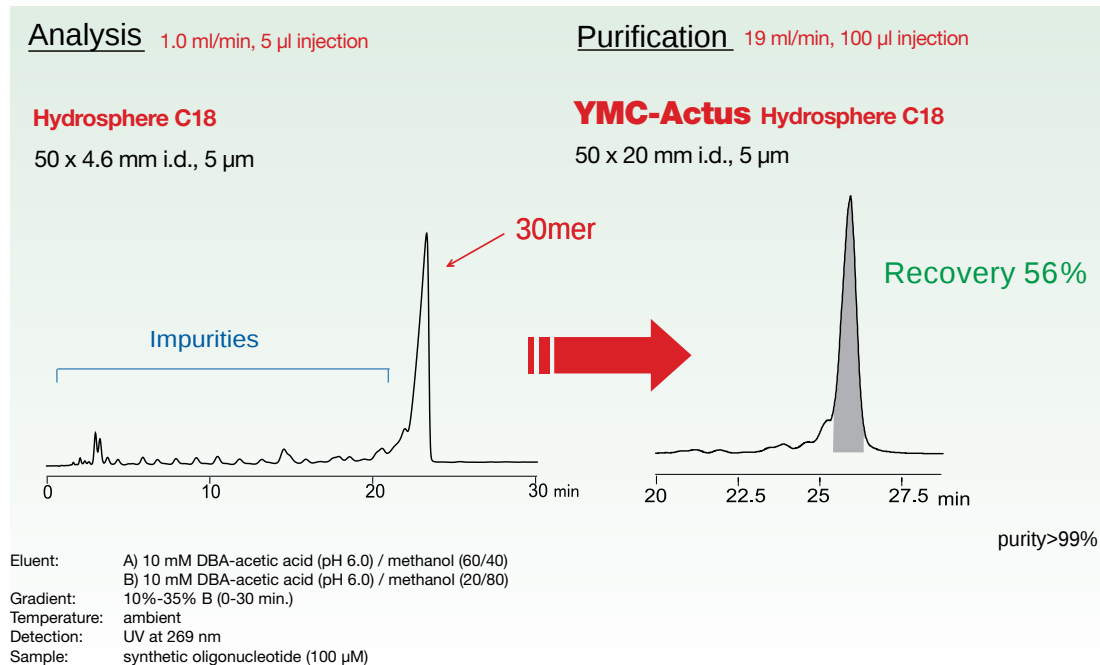


LC-MS analysis of synthetic 27-30 mer oligonucleotides

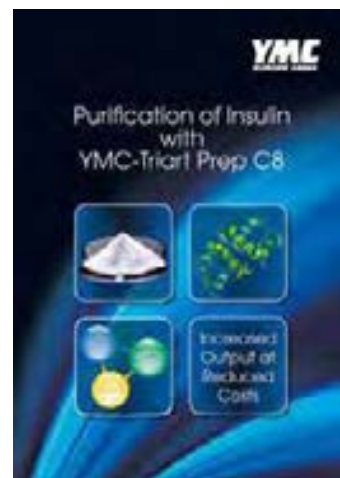


Outstanding separation of highly polar compounds

Crude synthetic 30mer oligonucleotide



Further information about preparative grade RP bulk media can be found in the following brochures:



Ordering information

1.9/2 µm analytical columns, C18

Phase	Column dimension			
	30 x 2.0 mm ID	50 x 2.0 mm ID	100 x 2.0 mm ID	150 x 2.0 mm ID
YMC-Triart C18	TA12SP9-0302PT	TA12SP9-0502PT	TA12SP9-1002PT	TA12SP9-1502PT
YMC-UltraHT Pro C18	AS12S02-0302WT	AS12S02-0502WT	AS12S02-1002WT	AS12S02-1502WT
YMC-UltraHT Hydrosphere C18	HS12S02-0302WT	HS12S02-0502WT	HS12S02-1002WT	HS12S02-1502WT

1.9/2 µm analytical columns, C18

Phase	Column dimension			
	30 x 3.0 mm ID	50 x 3.0 mm ID	100 x 3.0 mm ID	150 x 3.0 mm ID
YMC-Triart C18	TA12SP9-0303PT	TA12SP9-0503PT	TA12SP9-1003PT	TA12SP9-1503PT
YMC-UltraHT Pro C18	AS12S02-0303WT	AS12S02-0503WT	AS12S02-1003WT	AS12S02-1503WT
YMC-UltraHT Hydrosphere C18	HS12S02-0303WT	HS12S02-0503WT	HS12S02-1003WT	HS12S02-1503WT

2.7/3 µm analytical columns, C18

Phase	Column dimension				
	150 x 2.0 mm ID	150 x 3.0 mm ID	150 x 4.6 mm ID	250 x 3.0 mm ID	250 x 4.6 mm ID
YMC-Triart C18	TA12S03-1502WT	TA12S03-1503WT	TA12S03-1546WT	TA12S03-2503WT	TA12S03-2546WT
YMC-Pack ODS-A (C18)	AA12S03-1502WT	AA12S03-1503WT	AA12S03-1546WT	AA12S03-2503WT	AA12S03-2546WT
YMC-Pack ODS-AQ (C18)	AQ12S03-1502WT	AQ12S03-1503WT	AQ12S03-1546WT	AQ12S03-2503WT	AQ12S03-2546WT
YMC-Pack Pro C18	AS12S03-1502WT	AS12S03-1503WT	AS12S03-1546WT	AS12S03-2503WT	AS12S03-2546WT
Hydrosphere C18	HS12S03-1502WT	HS12S03-1503WT	HS12S03-1546WT	HS12S03-2503WT	HS12S03-2546WT
Meteoric Core C18 BIO	CAW08SQ7-15Q1PT	CAW08SQ7-1503WT	CAW08SQ7-1546PT	—	—

3 µm analytical columns, C8 & C4

Phase	Column dimension				
	150 x 2.0 mm ID	150 x 3.0 mm ID	150 x 4.6 mm ID	250 x 3.0 mm ID	250 x 4.6 mm ID
YMC-Pack Octyl (C8)	OC12S03-1502WT	OC12S03-1503WT	OC12S03-1546WT	OC12S03-2503WT	OC12S03-2546WT
YMCbasic (eq. C8)	BA99S03-1502WT	BA99S03-1503WT	BA99S03-1546WT	BA99S03-2503WT	BA99S03-2546WT
YMC-Pack Butyl (C4)	BU12S03-1502WT	BU12S03-1503WT	BU12S03-1546WT	BU12S03-2503WT	BU12S03-2546WT

Ordering information

5 µm analytical columns, C18

Phase	Column dimension				
	150 x 2.0 mm ID	150 x 3.0 mm ID	150 x 4.6 mm ID	250 x 3.0 mm ID	250 x 4.6 mm ID
YMC-Pack ODS-A (C18)	AA12S05-1502WT	AA12S05-1503WT	AA12S05-1546WT	AA12S05-2503WT	AA12S05-2546WT
YMC-Pack ODS-AQ (C18)	AQ12S05-1502WT	AQ12S05-1503WT	AQ12S05-1546WT	AQ12S05-2503WT	AQ12S05-2546WT
YMC-Pack <i>Pro</i> C18	AS12S05-1502WT	AS12S05-1503WT	AS12S05-1546WT	AS12S05-2503WT	AS12S05-2546WT
Hydrosphere C18	HS12S05-1502WT	HS12S05-1503WT	HS12S05-1546WT	HS12S05-2503WT	HS12S05-2546WT
YMC-Triart C18	TA12S05-1502WT	TA12S05-1503WT	TA12S05-1546WT	TA12S05-2503WT	TA12S05-2546WT

5 µm analytical columns, C8 & C4

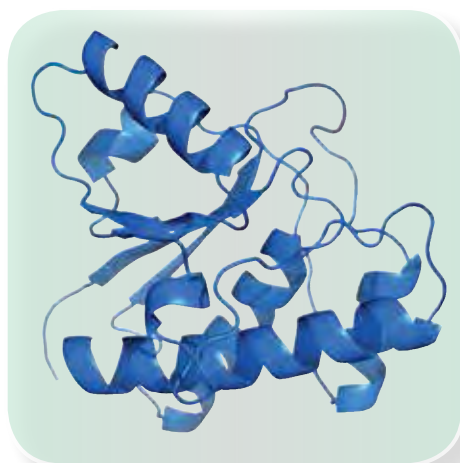
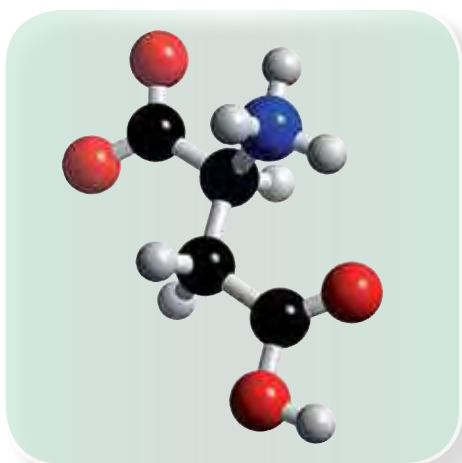
Phase	Column dimension				
	150 x 2.0 mm ID	150 x 3.0 mm ID	150 x 4.6 mm ID	250 x 3.0 mm ID	250 x 4.6 mm ID
YMC-Pack Octyl (C8)	OC12S05-1502WT	OC12S05-1503WT	OC12S05-1546WT	OC12S05-2503WT	OC12S05-2546WT
YMCbasic (eq. C8)	BA99S05-1502WT	BA99S05-1503WT	BA99S05-1546WT	BA99S05-2503WT	BA99S05-2546WT
YMC-Pack Butyl (C4)	BU12S05-1502WT	BU12S05-1503WT	BU12S05-1546WT	BU12S05-2503WT	BU12S05-2546WT
YMC-Pack Protein-RP (eq. C4)	PR12S05-1502WT	PR12S05-1503WT	PR12S05-1546WT	PR12S05-2503WT	PR12S05-2546WT

5 µm semi-preparative columns

Phase	Column dimension				
	150 x 20 mm ID	150 x 30 mm ID	250 x 10 mm ID	250 x 20 mm ID	250 x 30 mm ID
YMC-Pack ODS-A (C18)	AA12S05-1520WX	AA12S05-1530WX	AA12S05-2510WT	AA12S05-2520WX	AA12S05-2530WX
YMC-Pack ODS-AQ (C18)	AQ12S05-1520WX	AQ12S05-1530WX	AQ12S05-2510WT	AQ12S05-2520WX	AQ12S05-2530WX
YMC-Pack <i>Pro</i> C18	AS12S05-1520WX	AS12S05-1530WX	AS12S05-2510WT	AS12S05-2520WX	AS12S05-2530WX
Hydrosphere C18	HS12S05-1520WX	HS12S05-1530WX	HS12S05-2510WT	HS12S05-2520WX	HS12S05-2530WX
YMC-Triart C18	TA12S05-1520WX	TA12S05-1530WX	TA12S05-2510WT	TA12S05-2520WX	TA12S05-2530WX
YMC-Pack Octyl (C8)	OC12S05-1520WT	OC12S05-1530WT	OC12S05-2510WT	OC12S05-2520WT	OC12S05-2530WT
YMC-Pack Butyl (C4)	BU12S05-1520WT	BU12S05-1530WT	BU12S05-2510WT	BU12S05-2520WT	BU12S05-2530WT
YMCbasic (eq. C8)	BA99S05-1520WX	BA99S05-1530WX	BA99S05-2510WT	BA99S05-2520WX	BA99S05-2530WX
YMC-Pack Protein-RP (eq. C4)	PR12S05-1520WT	PR12S05-1530WT	PR12S05-2510WT	PR12S05-2520WT	PR12S05-2530WT

Guard Columns are also available.

For more details please contact us: Phone 02064-427-0 or E-Mail info@ymc.de.



NP/
HILIC

Hydrophilic Interaction Chromatography (HILIC)

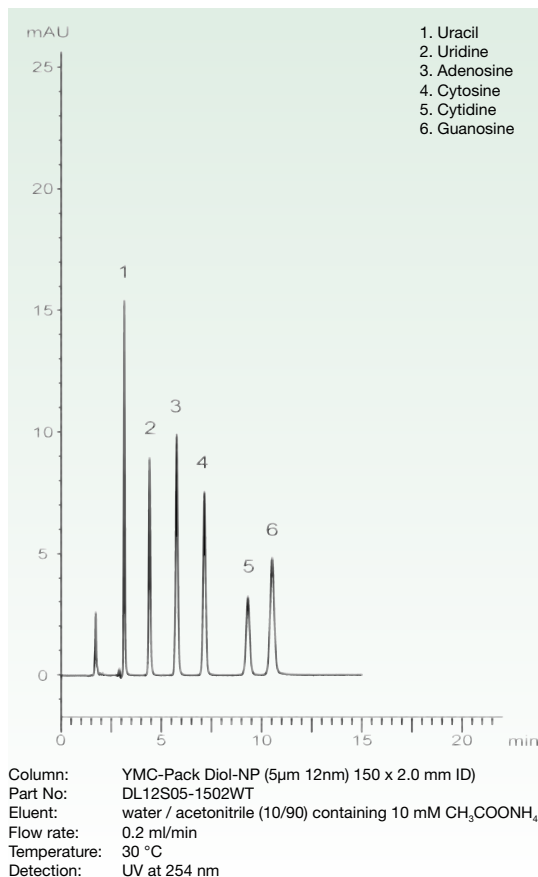
Hydrophilic Interaction Chromatography is a technique which has attracted more and more attention since it offers an alternative approach for the separation of highly polar compounds. The method itself, although it has been known for more than 25 years, has become more popular recently due to the introduction of several specialised HILIC phases. However it is not well known that HILIC separations can be ac-

complished using any highly polar stationary phase. This opens up a large range of materials which are suitable for HILIC separations. HILIC separations traditionally use a highly polar stationary phase and a non polar mobile phase e.g. functionalised silica with a hydrophilic coating and an acetonitrile/water mixture (90/10) for small molecules but application to larger biomolecules is becoming increasingly more popular.

YMC Columns for HILIC:

	YMC-Pack Silica	PVA-Sil	Polyamine II	YMC-Pack Amino	YMC-Pack Diol	YMC-Triart Diol-HILIC
Particle size / μm	3; 5	5	5	3; 5	5	1.9; 3; 5
Pore size / nm	6; 12; 20; 30	12	12	12	12; 20; 30	12
pH range	2.0 - 7.5	2.0 - 9.5	2.0 - 7.5	2.0 - 7.5	2.0 - 7.5	2.0 - 10.0

Nucleosides and bases



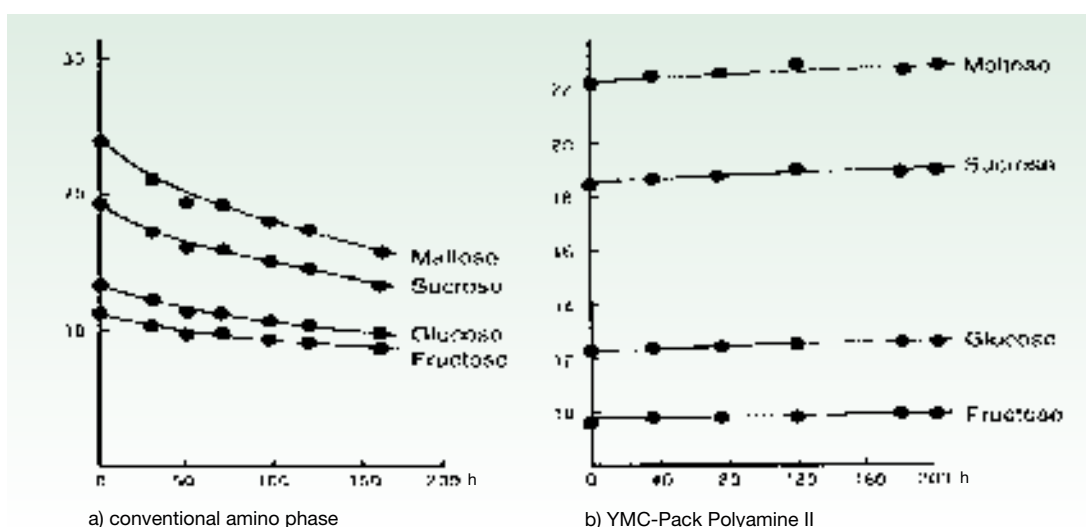
*Outstanding
Retention
and Resolution
with YMC HILIC!*

YMC-Pack Polyamine II

YMC-Pack Polyamine II is a unique phase, based on ultrapure YMC silica as a support material. The functionality of the stationary phase is achieved by a covalently bonded polymer layer containing secondary (2°) and tertiary (3°) amino groups. The 2° and 3° amino groups of YMC-Pack Polyamine II are only weakly nucleophilic, exhibiting a significantly reduced reactivity towards carbonyl compounds.

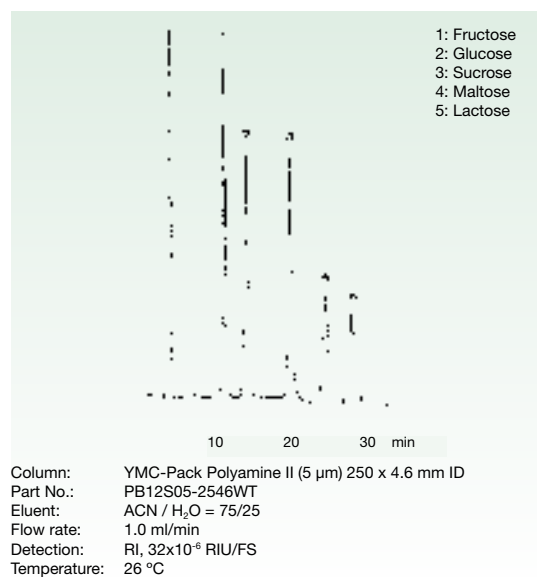
Therefore, unlike conventional amino phases with primary n-propylamino ligands, YMC-Pack Polyamine II does not form Schiff' bases or other stable condensation products. In addition, the 2° and 3° amino groups of the polymer layer are to a large extent resistant to oxidation and hydrolysis (as shown in the figure below).

Stability of amino type packings

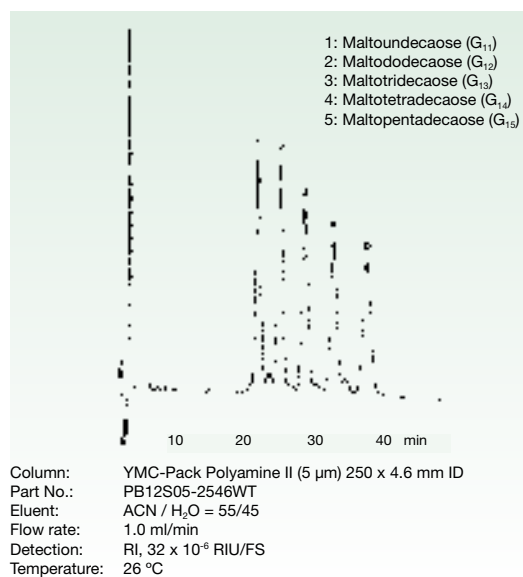


Applications

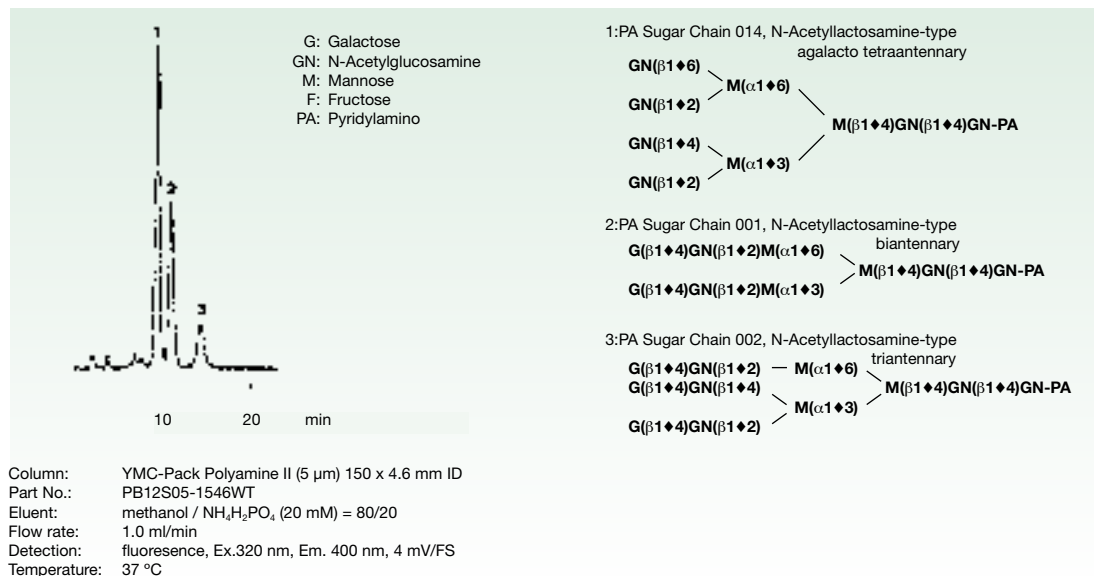
Mono- and Di-saccharides



Malto-oligosaccharides



Pyridylamino (PA)-Sugar chains



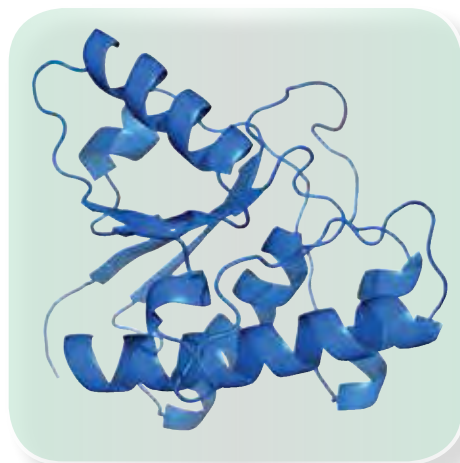
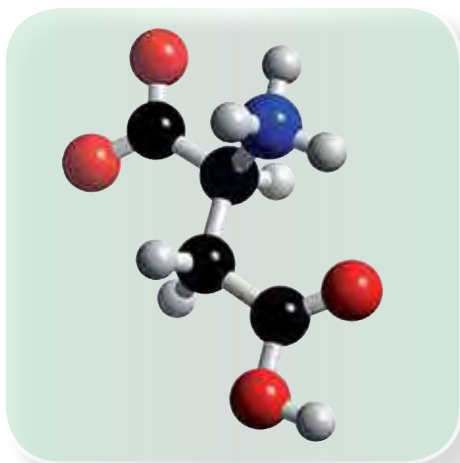
Ordering Information

YMC-Pack Polyamine II, 12 nm, 5 µm

Column length	Column ID (mm)			
	2.1	3.0	4.0	4.6
33 mm	PB12S05-0302QT	PB12S05-0303QT	PB12S05-0304QT	PB12S05-0346WT
50 mm	PB12S05-0502QT	PB12S05-0503QT	PB12S05-0504QT	PB12S05-0546WT
100 mm	PB12S05-1002QT	PB12S05-1003QT	PB12S05-1004QT	PB12S05-1046WT
150 mm	PB12S05-1502QT	PB12S05-1503QT	PB12S05-1504QT	PB12S05-1546WT
250 mm	PB12S05-2502QT	PB12S05-2503QT	PB12S05-2504QT	PB12S05-2546WT

Guard Columns are also available.

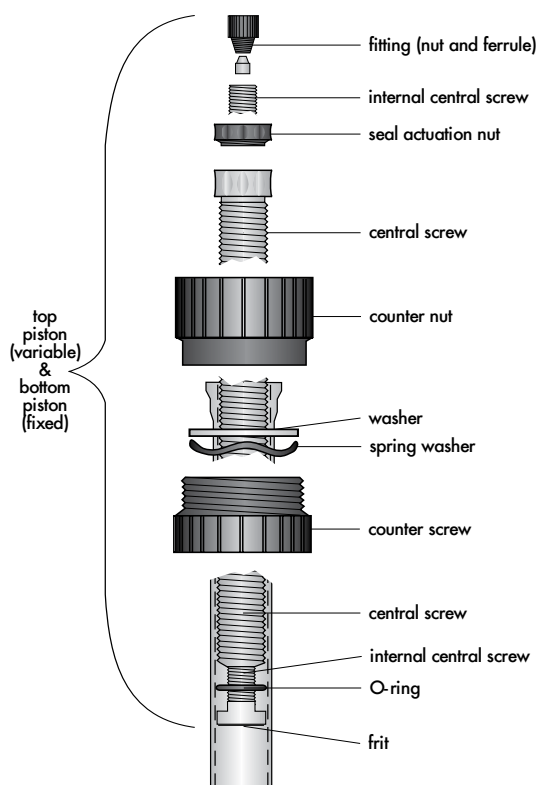
For more details please contact us: Phone 02064-427-0 or E-Mail info@ymc.de.



GLASS
COLUMNS

ECO Glass Columns

- biocompatible
- solvent resistant version (optional)
- easy to use
- low temperature application
- 2 adjustable length plungers (Multivario) supplied on request
- compatible with any LC system
- water-jacketed version available on request



ECO Column ID 10-50 mm

General

ECO columns are glass columns for almost all types of soft gel and low pressure (pressure limit 5 - 30 bar) liquid chromatography applications. With a choice of one or two adjustable length plungers, they are available in two forms: AB (aqueous buffer) for use with aqueous buffers and cold room applications and SR (solvent resistant) for all forms of normal and reversed phase chromatography.

ECO columns are produced by high-precision CNC manufacturing. They are competitively priced and equipped with a screw-lock system which makes it possible to open and seal the column simply and quickly. Each column passes a quality control pressure test. A water-jacketed option can be supplied on request.

Versions available

Version	Temperature Range [°C]	Plunger	Seal	Frit
ECO AB (Aqueous Buffer)	4 - 40	POM	Viton® O-ring EPDM	Porous glass (ID 10 - 50 mm) Polyethylene (ID 70 - 80 mm)
ECO SR (Solvent Resistant)	4 - 40	PVDF	Kalrez® O-ring	Porous glass (ID 10 - 50 mm) Stainless steel (ID 70 - 80 mm)

Characteristics

Pressure limit:	5 - 30 bar (depending on diameter)
Temperature range:	aqueous buffer version (AB): 4 - 40 °C solvent resistant version (SR): 4 - 40 °C
Wetted parts:	borosilicate glass aqueous buffer version (AB): POM, sintered glass frit and Viton® seal (ID 10 - 50 mm) POM, polyethylene frit and EPDM seal (ID 70 - 80 mm) solvent resistant version (SR): PVDF, sintered glass frit and Kalrez® seal (ID 10 - 50 mm) PVDF, stainless steel frit and Kalrez® seal (ID 70 - 80 mm)
Diameters:	10 mm, 15 mm, 25 mm, 50 mm, 70 mm, 80 mm
Bed lengths:	120 mm, 200 mm, 450 mm, 750 mm, 1000 mm
Height adjustment:	Adjustable plunger provides up to 120 mm bed height adjustment (2 adjustable plungers supplied on request).
Connections:	The columns are supplied with different adaptors to allow direct connection to any LC-system.

Specifications

ID [mm]*	Pressure limit [bar]	Vario		Multivario	
		Bed length [mm]	Volume [ml]	Bed length [mm]	Volume [ml]
10	30	0-120	0-9.4	0-120	0-9.4
		80-200	6.3-16	0-200	0-16
		330-450	26-35	210-450	17-35
		630-750	50-59	510-750	40-59
		880-1000	69-79	760-1000	60-79
15	25	0-120	0-21	0-120	0-21
		80-200	14-35	0-200	0-35
		330-450	58-80	210-450	37-80
		630-750	111-133	510-750	90-133
		880-1000	156-177	760-1000	134-177
25	15	0-120	0-59	0-120	0-59
		80-200	39-98	0-200	0-98
		330-450	162-221	210-450	103-221
		630-750	309-368	510-750	250-368
		880-1000	432-491	760-1000	373-491
50	10	0-120	0-236	0-120	0-236
		80-200	157-393	0-200	0-393
		330-450	648-884	210-450	412-884
		630-750	1237-1473	510-750	1001-1473
		880-1000	1728-1964	760-1000	1492-1964
70	5	—	—	0-120	0-462
				0-200	0-770
				90-450	356-1732
				390-750	1501-2886
				640-1000	2463-3848
80	5	—	—	0-120	0-603
				0-200	0-1005
				90-450	452-2262
				390-750	1960-3770
				640-1000	3217-5026

* Columns with inner diameter of 20 and 32 mm are available upon request

Accessories supplied

All columns: 1x frit removal tool / 2x plugs, PTFE (1/4"-28G)

and for each specific diameter the following tubing, nuts and ferrules:

ID 10-15 mm: 1x 1m FEP-tubing (0.8 x 1.6 mm); 4x 1/4"-28G nuts and ferrules (collapsible) for 1/16" tubing;
2x M6 nuts and ferrules for 1/16" tubing and 2x 10-32 nuts and ferrules for 1/16" tubing

ID 25-80 mm: 1x 1m FEP-tubing (1.6 or 2.4 x 3.2 mm); 4x 1/4"-28G nuts and ferrules (collapsible) for
1/8" tubing and 2x M6 nuts and ferrules for 1/8" tubing

Ordering guide

The part numbers for the columns contain information on the column type, inner diameter, column length, plunger type, frit porosity and seal (O-ring) material.

Inner diameter ID [mm]*	Pressure limit [bar]	Order code
10	30	ECO10/
15	25	ECO15/
25	15	ECO25/
50	10	ECO50/
70	5	ECO70/
80	5	ECO80/

* Columns with inner diameter of 20 and 32 mm are available upon request

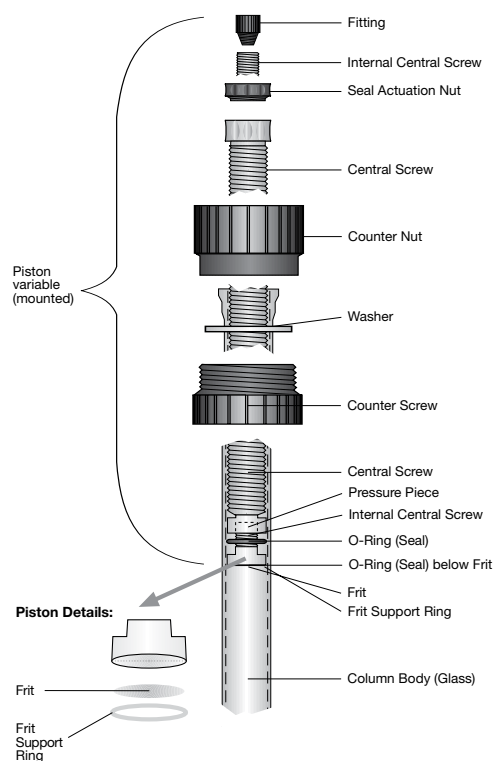
Max. bed length [mm]	Order code
120	120
200	200
450	450
750	750
1000	999

Longer columns are available on request.

No. of adjustable plungers	Order code
1 adjustable plunger (Vario)	V
2 adjustable plungers (Multivario)	M
up to 120 mm bed variability each	

Frit porosity [µm]	Order code
10	0
16 - 40	3
40 - 100	4

Other frit porosities are available on request.



ECO Column ID 70-80mm

Column version	Seal O-ring material	Order code
ECO AB (Aqueous Buffer)	Viton® / EPDM	V
ECO SR (Solvent Resistant)	Kalrez®	K

Option	Order code
Water-jacket version*	-K

*(only in combination with Multi Vario plunger)

Ordering guide

Examples

To order an aqueous buffer ECO column with an inner diameter of 15 mm, a column length of 120 mm, with 1 adjustable plunger and a frit porosity of 16 - 40 µm, a Viton O-ring and without the water-jacket option, please use the corresponding part number ECO15/120V3V.

Part Number: ECO15/120V3V

Example	ECO	15/	120	V	3	V
Column type	ECO					
Inner diameter		15/				
Max. bed length			120			
Plunger type				V		
Frit porosity					3	
Seal O-ring material						V

To order a solvent resistant ECO column with an inner diameter of 10 mm, a column length of 120 mm, with 2 adjustable plungers and a frit porosity of 10 µm, a Kalrez O-ring and with the water-jacket option, please use the corresponding part number ECO10/120M0K-K.

Part Number: ECO10/120M0K-K

Example	ECO	10/	120	M	0	K	-K
Column type	ECO						
Inner diameter		10/					
Column length			120				
Plunger type				M			
Frit porosity					0		
Seal O-ring material						K	
Water-jacket version							-K

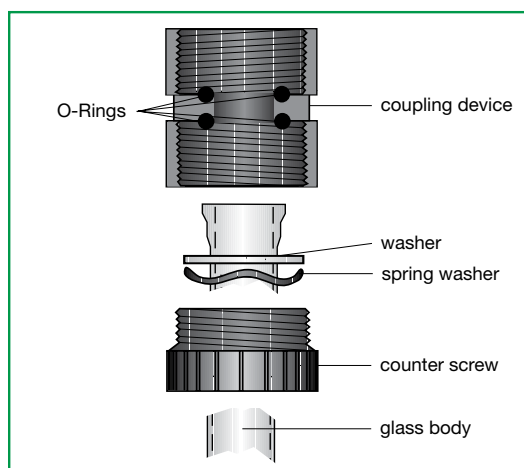
Packing Adaptors

The ECO series packing adaptors consist of a column coupler and an empty glass body. These must be of the same diameter as the column to be packed and must be used as packing adaptors, not for extending the length of a column body. The length of the additional glass body used should be selected to allow:

- Double the volume of slurry compared to the required packed bed volume if packing silica materials
- Triple the volume of slurry for softer packing materials

The product manual supplied with each column contains detailed examples of dry packing and slurry packing techniques.

For ordering information please see next page.



column coupler

GLASS COLUMNS

Ordering information for ECO packing adaptors

Inner Diameter*	Description	Length	Part Number
10	Column Coupler (no Glass Body) including Viton® O-Ring		ECO10KU/V-2
15	Column Coupler (no Glass Body) including Viton® O-Ring		ECO15KU/V-2
25	Column Coupler (no Glass Body) including Viton® O-Ring		ECO25KU/V-2
50	Column Coupler (no Glass Body) including Viton® O-Ring		ECO50KU/V-2
70	Column Coupler (no Glass Body) including EPDM O-Ring		ECO70KU/E-2
80	Column Coupler (no Glass Body) including EPDM O-Ring		ECO80KU/E-2
10	Glass Body for use with Column Coupler	120	ECO10/120
		200	ECO10/200
		450	ECO10/450
		750	ECO10/750
		1000	ECO10/999
15	Glass Body for use with Column Coupler	120	ECO15/120
		200	ECO15/200
		450	ECO15/450
		750	ECO15/750
		1000	ECO15/999
25	Glass Body for use with Column Coupler	120	ECO25/120
		200	ECO25/200
		450	ECO25/450
		750	ECO25/750
		1000	ECO25/999
50	Glass Body for use with Column Coupler	120	ECO50/120
		200	ECO50/200
		450	ECO50/450
		750	ECO50/750
		1000	ECO50/999
70	Glass Body for use with Column Coupler	120	ECO70/120
		200	ECO70/200
		450	ECO70/450
		750	ECO70/750
		1000	ECO70/999
80	Glass Body for use with Column Coupler	120	ECO80/120
		200	ECO80/200
		450	ECO80/450
		750	ECO80/750
		1000	ECO80/999

* Column Couplers for columns with inner diameter of 20 and 32mm are available upon request

ECO^{PLUS} Glass Columns

- **Suitable for universal use**
- **Biocompatible**
- **Simple to use**
- **Compatible to any LC system**
- **Height-adjustable pistons at both ends**
- **Suitable for cold rooms from 4 - 40 °C (with polyethylene piston and EPDM O ring)**
- **SR-Version resistant to organic solvents (SR = Solvent Resistant)**



General

Biochromatography is widely applied in high-performance downstream processing techniques that can be used for a range of compounds, such as proteins, peptides or nucleic acids. When using various chromatographic techniques such as ion exchange, affinity or gel permeation chromatography, increasingly high-performance separation media are used and, as a result, higher demands are made on the quality of the column hardware. ECO^{PLUS} glass columns meet the highest criteria for professional laboratory use. Particular attention has been paid to the column volume ranges that are as wide as possible (0.4 - 982 ml) and to the

high pressure resistance (up to 80 bar / 1160 psi), so that high flow rates and performance/efficiency can be achieved.

We have selected high-quality, inert materials to make sure ECO^{PLUS} glass columns are biocompatible and offer the best conditions for high recovery with no loss of bio-activity of your biomolecules. Thanks to the "Quick-Lock" seal and the two adjustable pistons, the columns are fully adjustable and easy to use.

Given the wide range of diameters, frit porosities and lengths available, you can use ECO^{PLUS} glass columns for the most diverse of applications.

„Quick-Lock“ Fitting



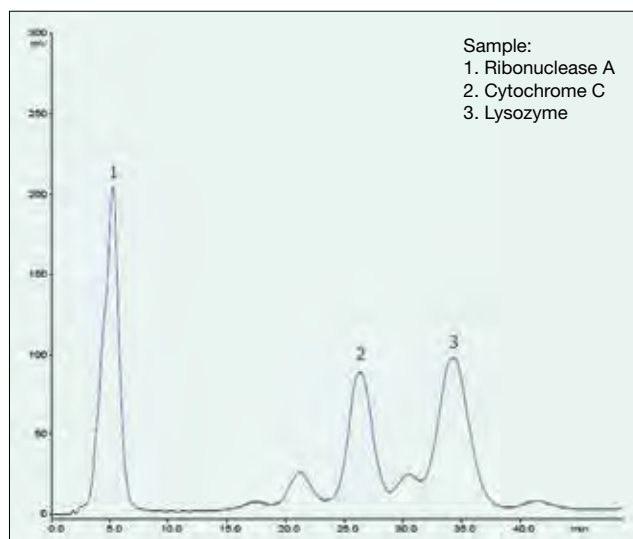
No more than a quarter turn is needed to seal the column. Piston height adjustment is done by turning the locked "Quick-Lock" fitting.

GLASS COLUMNS

Application Examples

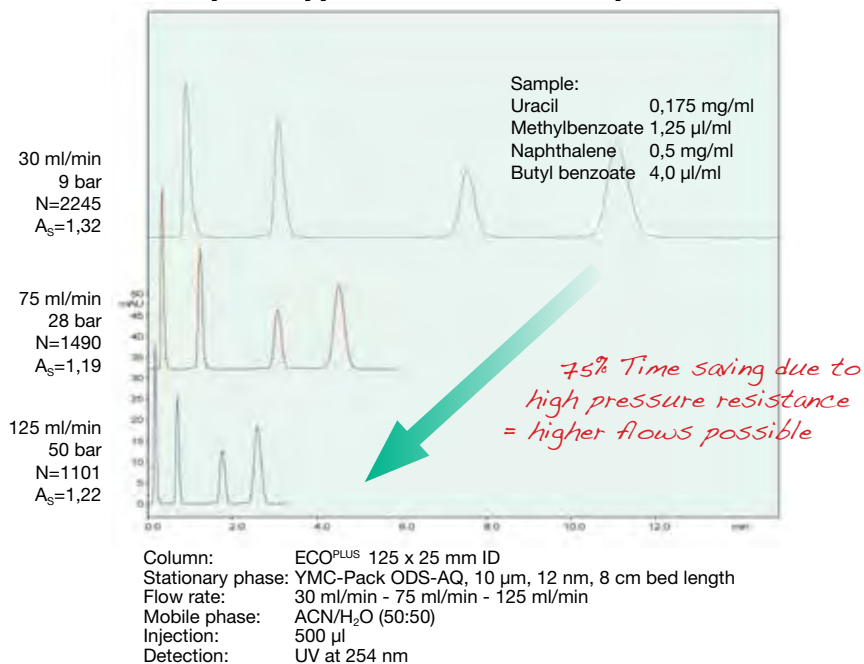
In reversed phase and adsorption chromatography, the possibilities for using glass columns are often limited due to high back pressures generated by small particles. The high pressure resistance of the ECO^{PLUS} glass columns allow you to achieve high flow rates for demanding separations. The example shows that this enables a considerable acceleration of the separation, which means that you can achieve significant time savings.

Separation of a standard test mixture of proteins



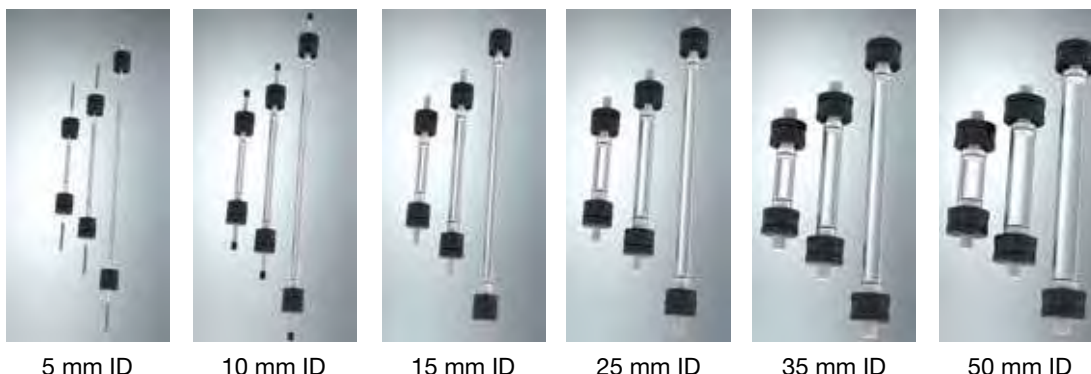
Column: ECO^{PLUS} 250 x 15 mm ID
 Stationary phase: YMC-BioPro SP, 30 µm (bed length 170 mm)
 Mobile phase: A) 20 mM KH₂PO₄*K₂HPO₄ (pH 6.8)
 B) 20 mM KH₂PO₄*K₂HPO₄ (pH 6.8) containing 0.5 M NaCl
 Gradient: 40-80% B
 Flow rate: 6 ml/min
 Temperature: 25°C
 Detection: UV at 220 nm
 Injection: 100 µl

Example of application with reversed phase media



Product options

ECO^{PLUS} laboratory glass columns are routinely available in three different lengths (125, 250, 500 mm) and three combinations of pistons (Short, Short/long, Long) in order to accommodate different volume configurations.



5 mm ID

10 mm ID

15 mm ID

25 mm ID

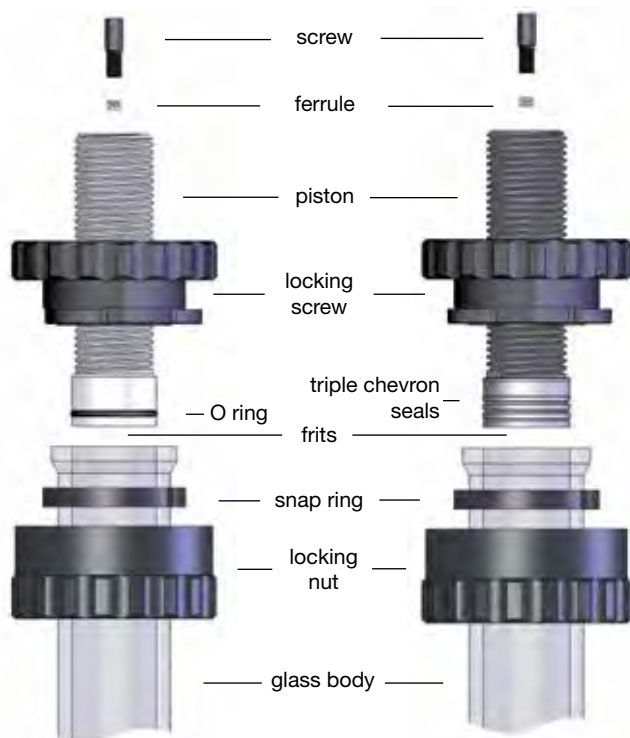
35 mm ID

50 mm ID

The modular construction allows for a range of piston variations to provide the ideal column volume.

Standard Version for aqueous buffers (AB)

Optional Version Solvent Resistant (SR)



ECO^{PLUS} glass columns are multi-purpose columns for all liquid chromatography applications (with pressure limits of 30 to 80 bar (435 to 1160 psi) - depending on column diameter as shown in the table on page 6). ECO^{PLUS} glass columns are available in two versions:

Standard-Version

(AB = Aqueous Buffer) for aqueous buffers and applications in cold rooms.

Optional-Version

(SR = Solvent Resistant) for normal and reversed phase chromatography.

The height-adjustable pistons (standard) at each end of the ECO^{PLUS} glass column with Teflon ribs (SR-version) are suitable for the entire spectrum of normal phase and reversed phase chromatography as well as biochromatography above ambient temperature.

All ECO^{PLUS} glass columns are made with high-precision CNC machines and undergo several rigorous quality controls before they are delivered.

GLASS COLUMNS

Versions available / materials used / components in contact with media

All the columns are made of borosilicate glass 3.3 (calibrated precision glass - KPG®)

Version*	Temperature range [°C]	max. Pressure [bar]	Piston	Seal	Frits
ECO ^{PLUS} AB (Aqueous buffer)	4 - 40	ID 05 mm: 80 ID 10 mm: 80 ID 15 mm: 70 ID 25 mm: 50 ID 35 mm: 40 ID 50 mm: 30	Polyethylene	O ring EPDM (ethylene-propylene-diene-M-class rubber)	Column ID 5-50 mm: Polyethylene
ECO ^{PLUS} SR (solvent resistant)	16 - 40	ID 05 mm: 80 ID 10 mm: 50 ID 15 mm: 50 ID 25 mm: 50 ID 35 mm: 40 ID 50 mm: 25	PTFE (Teflon)	PTFE (Teflon)	Column ID 5-15 mm: sintered glass Column ID 25-50 mm: Stainless steel (SS)

* Material certificates for wetted parts are available upon request.

Specifications

ID [mm]	Short pistons		Short/long piston		Long pistons	
	Bed length [mm]	Volume [ml]	Bed length [mm]	Volume [ml]	Bed length [mm]	Volume [ml]
5	22 - 125	0.4 - 2.5	0 - 125	0 - 2.5	0 - 125	0 - 2.5
	147 - 250	2.9 - 4.9	67 - 250	1.3 - 4.9	0 - 250	0 - 4.9
	397 - 500	7.8 - 9.8	317 - 500	6.2 - 9.8	237 - 500	4.7 - 9.8
10	32 - 125	2.5 - 9.8	0 - 125	0 - 9.8	0 - 125	0 - 9.8
	157 - 250	12 - 20	77 - 250	6.0 - 20	0 - 250	0 - 20
	407 - 500	32 - 39	327 - 500	26 - 39	247 - 500	19 - 39
15	24 - 125	4.2 - 22	0 - 125	0 - 22	0 - 125	0 - 22
	149 - 250	26 - 44	69 - 250	12 - 44	0 - 250	0 - 44
	399 - 500	71 - 88	319 - 500	56 - 88	239 - 500	42 - 88
25	28 - 125	14 - 61	0 - 125	0 - 61	0 - 125	0 - 61
	153 - 250	75 - 123	73 - 250	36 - 123	0 - 250	0 - 123
	403 - 500	198 - 245	323 - 500	159 - 245	243 - 500	119 - 245
35	30 - 125	29 - 120	0 - 125	0 - 120	0 - 125	0 - 120
	155 - 250	149 - 241	75 - 250	72 - 241	0 - 250	0 - 241
	405 - 500	390 - 481	325 - 500	313 - 481	245 - 500	236 - 481
50	36 - 125	71 - 245	0 - 125	0 - 245	0 - 125	0 - 245
	161 - 250	316 - 491	81 - 250	159 - 491	0 - 250	0 - 491
	410 - 500	805 - 982	331 - 500	650 - 982	250 - 500	491 - 982

Standard accessories (included with the column)

All glass columns include: 1x frit ejector / 2x plugs, PTFE (1/4"-28G),

plus the screws, ferrules and capillaries required to link up to any LC system, depending on the tube ID:

ID 5 mm: 1x 1m ETFE 1/16" capillary tubing pre-assembled / 4x 1/4"-28G screws / ferrules for 1/16" tubing / 2x M6 screws / ferrules for 1/16" tubing / 2 x 10-32 screws / ferrules for 1/16" tubing.

ID 10-15 mm: 1x 1m FEP 1/16" capillary tubing (0.8 x 1.6 mm) / 4x 1/4"-28G screws / ferrules for 1/16" tubing / 2x M6 screws / ferrules for 1/16" tubing / 2x 10-32 screws / ferrules for 1/16" tubing.

ID 25-50 mm: 1x 1m FEP 1/8" capillary tubing (1.6 x 3.2 mm) / 4x 1/4"-28G screws / ferrules for 1/8" tubing / 2x M6 screws / ferrules for 1/8" tubing.

Accessories / Replacement parts

To allow packing of a glass column, you can use the ECO^{PLUS} column coupler to join a glass body to a column. For this to work, it must have the same inside diameter as the column.

The length of the extra glass body required for column packing depends on the packing material being used and can be calculated from the packing instructions for the chosen packing material.

Column couplers consist of:

- ECO^{PLUS} connection screw with Teflon insert (assembled)
- Column coupler counter screw with snap ring
- Counter nut (bayonet) with snap ring
- AB-version has two sets (4 items) of Viton® O rings
- SR-version has two Kalrez® O rings



ECO^{PLUS} column coupler

Column ID [mm]	AB-Version column couplers* Part-No.	SR-Version column couplers* Part-No.
5	TAC05KU-AB	TAC05KU-SR
10	TAC10KU-AB	TAC10KU-SR
15	TAC15KU-AB	TAC15KU-SR
25	TAC25KU-AB	TAC25KU-SR
35	TAC35KU-AB	TAC35KU-SR
50	TAC50KU-AB	TAC50KU-SR

* the connection piece does not include a glass body: please order this separately

ECO^{PLUS} glass bodies

Column ID [mm]	max. bed length 125 mm Part-No.	max. bed length 250 mm Part-No.	max. bed length 500 mm Part-No.
5	TAC05/125-2	TAC05/250-2	TAC05/500-2
10	TAC10/125-2	TAC10/250-2	TAC10/500-2
15	TAC15/125-2	TAC15/250-2	TAC15/500-2
25	TAC25/125-2	TAC25/250-2	TAC25/500-2
35	TAC35/125-2	TAC35/250-2	TAC35/500-2
50	TAC50/125-2	TAC50/250-2	TAC50/500-2

GLASS COLUMNS

Part numbers

The part number for an ECO^{PLUS} glass column consists the identification of the inner diameter, maximum bed length, piston set type, frit porosity and material, plus the model type (SR or AB version).

To order a solvent-resistant ECO^{PLUS} glass column with an inner diameter of 25 mm, a maximum bed length of 500 mm, 2 short pistons and stainless steel frits with a porosity of 2 µm, please use the following order number: TAC25/500S2-SR-2 (see example).

Combination options	TAC05/ (5 mm ID)	125 (125 mm max. bed length)	— Standard version has 2 short pistons: no product coding required;	PE Polyethylene (AB-Version)	2 (2 µm)	-AB-2 (aqueous buffer)
	TAC10/ (10 mm ID)			G Sintered glass (SR-Version with ≤ 15 mm ID)	5 (5 µm only poly- ethylene frits availa- ble)	-SR-2 (solvent restistant)
	TAC15/ (15 mm ID)	250 (250 mm max. bed length)	For other versions, please insert either:			
	TAC25/ (25 mm ID)	500 (500 mm max. bed length)	SL (1 short/1 long piston)			
	TAC35/ (35 mm ID)		or		S Stainless steel (SS) (SR-Version with ≥ 25 mm ID)	
	TAC50/ (50 mm ID)		L (2 long pistons)			

Example	TAC25/	500		S	2	-SR-2
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Inner diameter 25 mm

max. bed length		500 mm				
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Piston type

Frit material				Stainless steel		
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Frit porosity 2 µm

Version						SR- Version
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