

PSS HighSpeed™ Columns

Version: 01-00



The **fastest product** of the PSS GPC-column family, developed for rapid **GPC analysis**.



Key benefits

- Time needed for analysis reduced by up to 90 %
- Sample throughput up to 10 times higher
- Rapid product screening
- "Just in time" process control
- Excellent reproducibility for high flow rates
- Extremely small shear rates

PSS HighSpeed™ columns allow for a complete GPC analysis in less than 3 minutes.

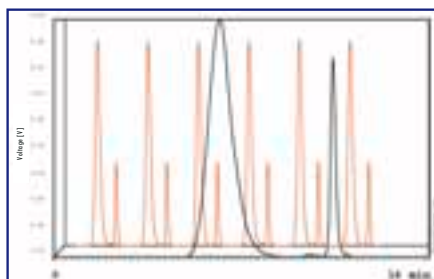


PSS HighSpeed™ - Applications



Real-time recording of a calibration curve using PSS **polystyrene** ReadyCal™ Standards in THF on a PSS HighSpeed™ column; detector: UV; flow rate: 6.25 ml/min.

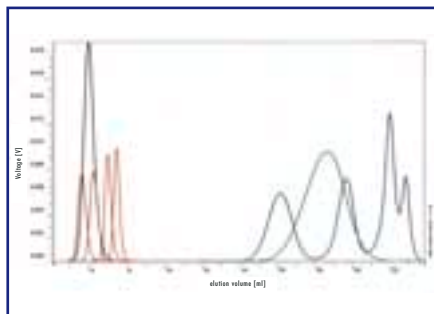
Total analysis time for a calibration curve from a triple injection is approximately 10.5 min.



Analysis times for broad **polystyrene** standards in THF on a

- (a) Conventional SDV® GPC column (8 x 300 mm); black line; flow rate: 1 ml/min.; total analysis time: 14 min.; detector: UV
- (b) HighSpeed™ SDV® column; red line; flow rate: 6.25 ml/min.; total analysis time: 2.3 min.; detector: UV

During the same 14 minutes 6 GPC HighSpeed™ runs can be measured versus 1 conventional run.



Analysis times for broad **dextran** and **pullulan** standards in aqueous 0.1M NaNO₃ solution on a

- (a) Conventional SUPREMA™ GPC column (8 x 300 mm); green line: dextran; blue line: pullulan; flow rate: 1 ml/min.; total analysis time: 22 minutes; detector: RI
- (b) HighSpeed SUPREMA™ column; black line: dextran; red line: pullulan; flow rate: 3.13 ml/min.; total analysis time: 7 minutes; detector: RI

During the same 22 minutes 3 GPC HighSpeed™ runs can be measured versus 1 conventional run.

PSS HighSpeed™ - Return on investment

number of samples		analysis time		instruments required	
per year	per day	conventional	PSS HighSpeed™	conventional	PSS HighSpeed™
20,000	100	15,000 h 2,000 days	1,500 h 200 days	10	1
200	10	1,500 h 200 days	150 h 20 days	1	«1

calculation based on: conventional columns: 10 runs/8 h at = 45 min/run;
HighSpeed™ columns: 100 runs/8 h at = 4.5 min/run;
7h/day and 200 days per year.



PSS HighSpeed™ - Specifications

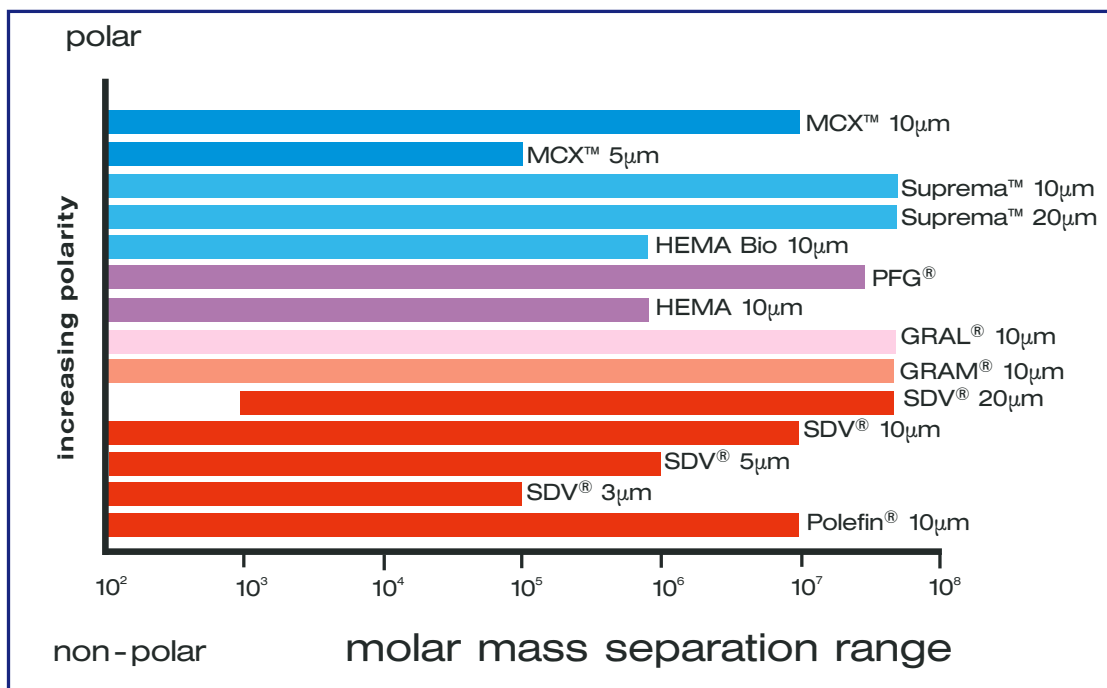
sorbent type	particle size [µm]	recommended eluent	plate count /m	pressure stability [bar]	column pressure [bar]	working temp. [C°]
Polefin®	10	organic	35,000 *	120	3 *	200
SDV®	3	organic	80,000 *	150	8 *	150
SDV®	5	organic	50,000 *	100	5 *	150
SDV®	10	organic	35,000 *	100	3 *	150
SDV®	20	organic	20,000 *	100	2 *	150
GRAM®	10	organic/aqueous	20,000 **	80	3 **	90
GRAL®	10	organic/aqueous	20,000 **	80	3 **	90
PFG®	7	organic	35,000 *	200	5 *	100
HEMA	10	aqueous/organic	20,000 **	100	3 **	90
HEMA BIO	10	aqueous	20,000 **	100	3 **	90
SUPREMA™	10	aqueous/organic	20,000 **	80	3 **	90
SUPREMA™	20	aqueous/organic	20,000 **	80	3 **	90
MCX™	5	aqueous	40,000 **	150	12 **	90
MCX™	10	aqueous	20,000 **	100	3 **	90

Typical properties of the PSS HighSpeed™ columns, sorted by decreasing polarity. The medium polar sorbents (GRAM™, GRAL™, HEMA, SUPREMA™) can be used in organic and aqueous solvents.

* Measurement conditions: solvent THF; flow rate: 1ml/min.; 20°C; injection volume: 20 µl, 0.2 g/l BHT

** Measurement conditions: solvent: H₂O + 0.05m NaN₃; flow rate: 1ml/min.; 20°C; injection volume: 20µl, 1.0 g/l ethylene glycol

PSS HighSpeed™ - Separation ranges



Typical molar mass separation ranges for PSS HighSpeed™ columns.

The separation range of a sorbent can be expanded by combining of different porosities.



PSS HighSpeed™ - Benefits

Reduced analysis times

- The use of a higher flow rate reduces analysis times up to 90%
- Real time online process control is possible.
- Molar mass distribution analysis in less than 3 minutes.



Stress free sample testing of polymers

- PSS HighSpeed™ columns produce low back pressures which minimize shear stress during testing.
- High molecular weight polymers are not shear degraded when run on PSS HighSpeed™ columns.

Rapid 2D-chromatography and product screening

- Rapid 2D-chromatography analysis and product screening.
- Run times for 2D-chromatography (HPLC-GPC-coupling) is reduced from 2-3 hours run-times to less than 30 minutes.
- Fast screening of the products for combinatorial chemistry.

Increased sample throughput

- Accelerated analysis times result in a factor of 10 increase in sample throughput.
- Money saved due to the reduced number of required HPLC instruments.



Polymer stability using high temperature GPC

- Shorter run times minimize the probability of thermal degradation reactions.
- Less temperature stress for the polymers.





PSS HighSpeed™ - Concept

Users require increased sample throughput to increase productivity.

To meet this request, PSS has developed a new type of column that reduces analysis time.

PSS HighSpeed™ columns use the same linear flow rate as conventional columns, while retaining plate count and resolution.

An optimal linear flow of 2 cm/min. equals a flow rate of 1 ml/min. for conventional columns. PSS HighSpeed™ columns operate at a flow rate of 6.25 ml/min., accelerating analysis times by a factor of 6.25.

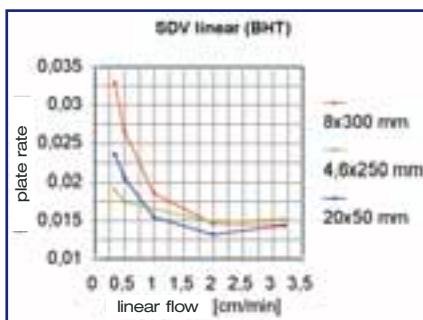


Fig.: Comparison of the van Deemter Curve" for different SDV® columns; reference material: Bi-tert-butylmethylphenol "BHT" (20 x 50 mm PSS HighSpeed™ column, 4.6 x 250 mm PSS Microbore column, 8 x 300 mm PSS conventional GPC column). All column types reach their minimum plate height and their best performance at a linear flow of 2 cm/min.

A sophisticated frit in the column head allows for fast and steady distribution of the sample inside the column. The column gel material is designed to minimize column back pressure at high flow rates.

Modern design and optimized column gels lead to the outstanding product properties for this column type: maximum plate height at high flow rates with low back pressure.



The PSS HighSpeed™-columns are recommended for:

- Labs with a high sample throughput
- Screening of products (good/bad comparison)
- High temperature GPC
- GPC for less stable products (High Mw polymers)
- "Just in time" process control



PSS HighSpeed™ Catalog

PSS Polymer Standards Service

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Your local partner:

product codes HighSpeed™ columns:

SDV®		
particle size	porosity	product code
3 µm	1e3 Å	sd s2005 03 1e3
3 µm	1e4 Å	sd s2005 03 1e4
3 µm	1e5 Å	sd s2005 03 1e5
3 µm	linear S	sd s2005 03 lis
3 µm	linear M	sd s2005 03 lim
5 µm	1e3 Å	sd s2005 05 1e3
5 µm	1e4 Å	sd s2005 05 1e4
5 µm	1e5 Å	sd s2005 05 1e5
5 µm	1e6 Å	sd s2005 05 1e6
5 µm	linear S	sd s2005 05 lis
5 µm	linear M	sd s2005 05 lim
5 µm	linear XL	sd s2005 05 lxl
10 µm	1e3 Å	sd s2005 10 1e3
10 µm	1e4 Å	sd s2005 10 1e4
10 µm	1e5 Å	sd s2005 10 1e5
10 µm	1e6 Å	sd s2005 10 1e6
10 µm	1e7 Å	sd s2005 10 1e7
10 µm	1e8 Å	sd s2005 10 1e8
10 µm	linear S	sd s2005 10 lis
10 µm	linear M	sd s2005 10 lim
10 µm	linear XL	sd s2005 10 lxl
20 µm	1e3 Å	sd s2005 20 1e3
20 µm	1e4 Å	sd s2005 20 1e4
20 µm	1e5 Å	sd s2005 20 1e5
20 µm	1e6 Å	sd s2005 20 1e6
20 µm	1e7 Å	sd s2005 20 1e7
20 µm	1e8 Å	sd s2005 20 1e8
20 µm	linear M	sd s2005 20 lim
20 µm	linear XL	sd s2005 20 lxl

PFG®		
particle size	porosity	product code
7 µm	6e1 Å	pf s2005 07 6e1
7 µm	1e2 Å	pf s2005 07 1e2
7 µm	3e2 Å	pf s2005 07 3e2
7 µm	1e3 Å	pf s2005 07 1e3
7 µm	4e3 Å	pf s2005 07 4e3
7 µm	linear M	pf s2005 07 lim
7 µm	linear XL	pf s2005 07 lxl

MCX™		
particle size	porosity	product code
5 µm	1e3 Å	mc s2005 05 1e3
10 µm	1e3 Å	mc s2005 10 1e3
10 µm	1e5 Å	mc s2005 10 1e5
10 µm	1e6 Å	mc s2005 10 1e6

POLEFIN®		
particle size	porosity	product code
10 µm	linear XL	po s2005 10 lxl

SUPREMA™		
particle size	porosity	product code
10 µm	3e1 Å	su s2005 10 3e1
10 µm	1e2 Å	su s2005 10 1e2
10 µm	1e3 Å	su s2005 10 1e3
10 µm	3e3 Å	su s2005 10 3e3
10 µm	1e4 Å	su s2005 10 1e4
10 µm	3e4 Å	su s2005 10 3e4
10 µm	linear M	su s2005 10 lim
10 µm	linear XL	su s2005 10 lxl
20 µm	1e2 Å	su s2005 20 1e2
20 µm	1e3 Å	su s2005 20 1e3
20 µm	3e3 Å	su s2005 20 3e3
20 µm	1e4 Å	su s2005 20 1e4
20 µm	3e4 Å	su s2005 20 3e4
20 µm	linear XL	su s2005 20 lxl

GRAL™		
particle size	porosity	product code
10 µm	3e1 Å	al s2005 10 3e1
10 µm	1e2 Å	al s2005 10 1e2
10 µm	1e3 Å	al s2005 10 1e3
10 µm	3e3 Å	al s2005 10 3e3
10 µm	1e4 Å	al s2005 10 1e4
10 µm	linear	al s2005 10 lin

GRAM™		
particle size	porosity	product code
10 µm	3e1 Å	am s2005 10 3e1
10 µm	1e2 Å	am s2005 10 1e2
10 µm	1e3 Å	am s2005 10 1e3
10 µm	3e3 Å	am s2005 10 3e3
10 µm	1e4 Å	am s2005 10 1e4

HEMA		
particle size	porosity	product code
10 µm	4e1 Å	he s2005 10 4e1
10 µm	1e2 Å	he s2005 10 1e2
10 µm	3e2 Å	he s2005 10 3e2
10 µm	1e3 Å	he s2005 10 1e3
10 µm	linear	he s2005 10 lin

HEMA BIO		
particle size	porosity	product code
10 µm	4e1 Å	hb s2005 10 4e1
10 µm	1e2 Å	hb s2005 10 1e2
10 µm	3e2 Å	hb s2005 10 3e2
10 µm	1e3 Å	hb s2005 10 1e3
10 µm	linear	hb s2005 10 lin

When ordering, please state the mobile phase you will be using with the column.

Please note: For the analysis of oligomeric samples we recommend our conventional analytical columns.