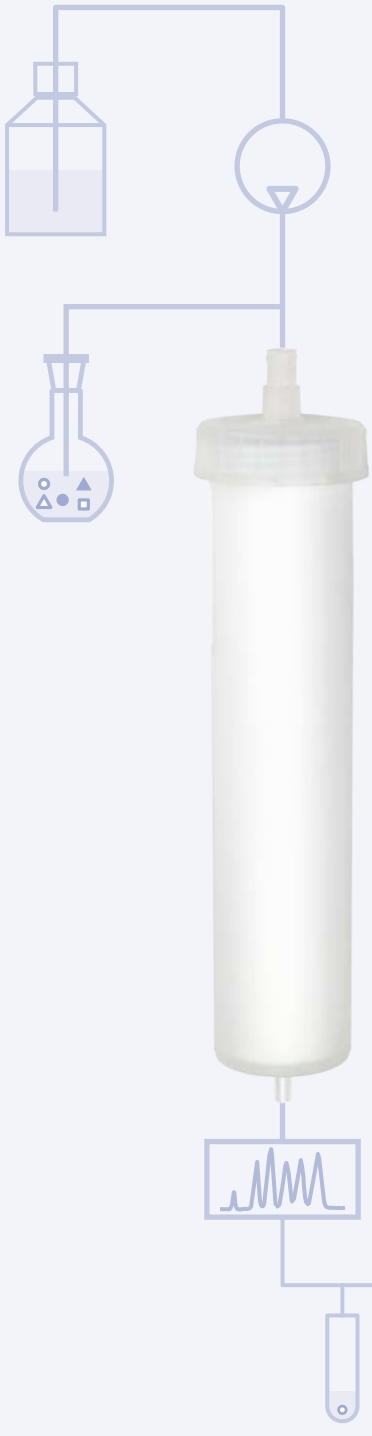
Chromatography

Flash chromatography outperforming the standard



CHROMABOND® Flash cartridges

from the silica experts

MACHEREY-NAGEL
www.mn-net.com

MN Since 1911

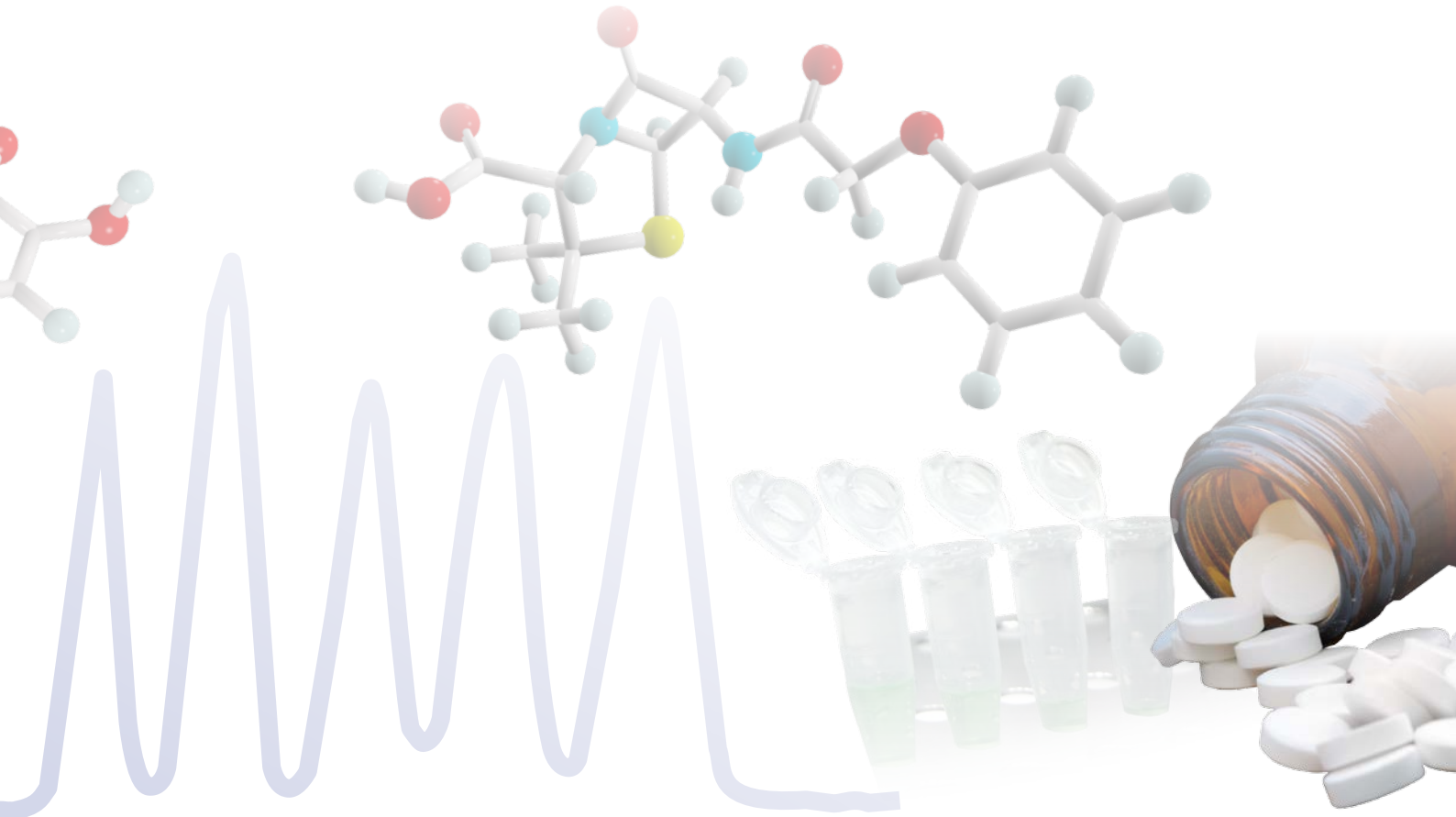
MN products for Flash chromatography

Contents

CHROMABOND® Flash cartridges

ideal for Flash separations from 10 mg up to 160 g

- **Convenient operation and reliable upscaling**
  Complete program of ready-to-use Flash cartridges for
  - Isco Companion® and other Teledyne Isco CombiFlash® systems
  - Biotage® Isolera™, Biotage® FlashMaster™
  - or as stand-alone version for all pump / detector combinations, e.g., from Biotage®, Büchi
- **Enhanced flexibility**
  - All common RP and NP phases available on request
  - Adsorbent weights from 4 g to 1600 g
- **Outstanding price-performance ratio**
- **Increased analytical safety**
  - Organic solvent resistant, low bleed polypropylene cartridges, thick column walls, one piece body, sophisticated length-to-diameter ratio for high plate numbers and excellent separation efficiencies
  - Distribution of eluent stream via highly porous frits
  - High pressure stability of 15 bar (12 bar for cartridges > 200 g), good reproducibility
- **High quality standard**
  All flash cartridges and adsorbents undergo comprehensive during- and after-production quality assurance measures to ensure that the products conform to the specification.



CHROMABOND® Flash RS cartridges

CHROMABOND® Flash RS

solutions for Isco® Flash instruments

- Heavy-duty polypropylene cartridges designed for use in Teledyne Isco CombiFlash® systems (Companion®, Rf etc.) without additional connectors or capillaries
- *Column connection:*
  cartridges up to RS 330: **female Luer lock inlet** and **male Luer outlet**
  RS 800 and RS 1600: Maxi Luers
- Using the CHROMABOND® Flash Starter Kit, REF 730798 or the CHROMABOND® Flash Stand Alone Kit, REF 732903 (see page 11) CHROMABOND® RS cartridges can also be used as stand alone system with any pump / detector / fraction collector combination (except RS 800 and RS 1600 with Maxi Luers).

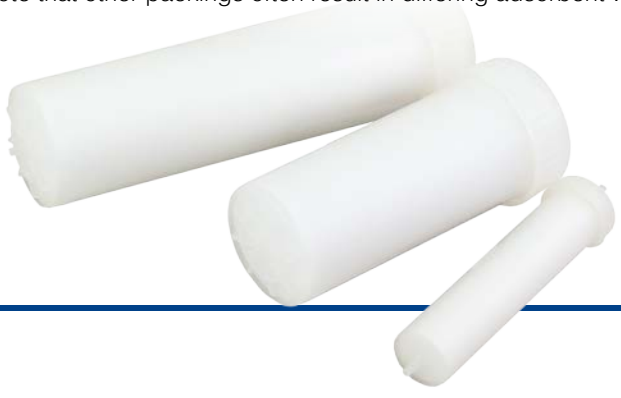
CHROMABOND® Flash RS columns with Luer exit · Ordering information

Filled with standard silica, unmodified (SiOH) or endcapped octadecyl modified (C_{18} ec);
45 µm, specific surface 500 m^2/g, pH stability 2–8

For RS columns filled with other modified silica phases and aluminium oxide see ***www.mn-net.com***

Designation	Column length [cm]	ID [mm]	Adsorbent weight [g]	Pack of [columns]	REF
CHROMABOND® Flash RS 4 SiOH	9.8	12.4	4	20	**732800**
CHROMABOND® Flash RS 15 SiOH	11.6	21.2	15	20	**732801**
CHROMABOND® Flash RS 25 SiOH	16.5	21.2	25	15	**732802**
CHROMABOND® Flash RS 40 SiOH	17.1	26.4	40	15	**732803**
CHROMABOND® Flash RS 80 SiOH	24.0	30.8	80	12	**732804**
CHROMABOND® Flash RS 120 SiOH	25.5	36.0	120	10	**732805**
CHROMABOND® Flash RS 200 SiOH	20.0	60.0	200	6	**732806**
CHROMABOND® Flash RS 330 SiOH	27.0	60.0	330	4	**732807**
CHROMABOND® Flash RS 800 SiOH	38.5	82.0	800	2	**732808**
CHROMABOND® Flash RS 1600 SiOH	43.0	104.0	1600	2	**732809**
CHROMABOND® Flash RS 4 C_{18} ec	9.8	12.4	4.3	2	**732810**
CHROMABOND® Flash RS 15 C_{18} ec	11.6	21.2	16.4	1	**732811**
CHROMABOND® Flash RS 25 C_{18} ec	16.5	21.2	26	1	**732812**
CHROMABOND® Flash RS 40 C_{18} ec	17.1	26.4	43	1	**732813**
CHROMABOND® Flash RS 80 C_{18} ec	24.0	30.8	86	1	**732814**
CHROMABOND® Flash RS 120 C_{18} ec	25.5	36.0	130	1	**732815**
CHROMABOND® Flash RS 200 C_{18} ec	20.0	60.0	220	1	**732816**
CHROMABOND® Flash RS 330 C_{18} ec	27.0	60.0	360	1	**732817**
CHROMABOND® Flash RS 800 C_{18} ec	38.5	82.0	880	1	**732818**
CHROMABOND® Flash RS 1600 C_{18} ec	43.0	104.0	1760	1	**732819**

On request, all column types listed above can be packed with any adsorbent from our program of CHROMABOND® or spherical NUCLEODUR® phases (please note that other packings often result in differing adsorbent weights).



CHROMABOND® Flash BT

solutions for Biotage® Flash instruments

- Heavy-duty polypropylene cartridges designed for use in the Biotage® Isolera™ systems without additional connectors or capillaries
- *Column connection:*
  female Luer lock inlet and **male Luer lock outlet**
- Using the CHROMABOND® Flash Starter Kit, REF 730798 or the CHROMABOND® Flash Stand Alone Kit, REF 732903 (see page 11) CHROMABOND® Flash BT cartridges can also be used as stand alone system with any pump / detector / fraction collector combination.

CHROMABOND® Flash BT columns with Luer lock exit · Ordering information

Filled with unmodified standard silica, 45 µm, specific surface 500 m^2/g, pH stability 2–8

Designation	Column length [cm]	ID [mm]	Adsorbent weight [g]	Pack of [columns]	REF
CHROMABOND® Flash BT 4 SiOH	9.8	12.4	4	20	**732960**
CHROMABOND® Flash BT 15 SiOH	11.6	21.2	15	20	**732961**
CHROMABOND® Flash BT 25 SiOH	16.5	21.2	25	15	**732962**
CHROMABOND® Flash BT 40 SiOH	17.1	26.4	40	15	**732963**
CHROMABOND® Flash BT 80 SiOH	24.0	30.8	80	12	**732964**
CHROMABOND® Flash BT 120 SiOH	25.5	36.0	120	10	**732965**
CHROMABOND® Flash BT 200 SiOH	20.0	60.0	200	6	**732966**
CHROMABOND® Flash BT 330 SiOH	27.0	60.0	330	4	**732967**

On request all column types listed above can be packed with any adsorbent from our program of CHROMABOND® or spherical NUCLEODUR® phases (please note that other packings often result in differing adsorbent weights).

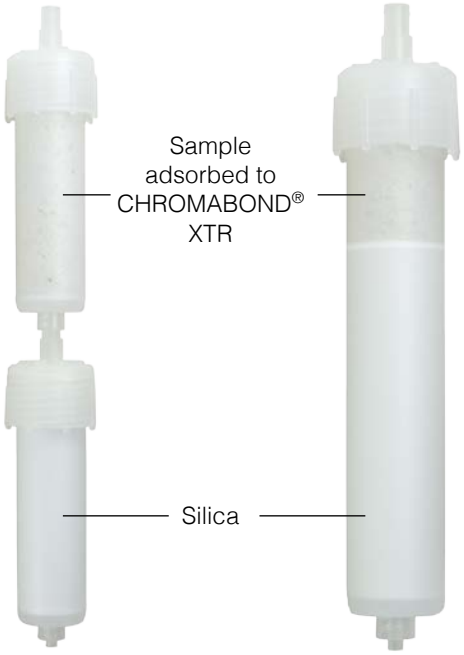
Partly filled CHROMABOND® Flash BT cartridges (e.g., filled up to 80 %) are available on request. By removal of the top cap the sample can be applied directly on to the cartridges (see page 6).

CHROMABOND® Flash DL cartridges

CHROMABOND® Flash DL cartridges

solutions for direct loading

- Suitable as **solid injection** system
- For individual **self-filling** and packing of flash cartridges
- *Column connection:*
  female Luer lock inlet and **male Luer lock outlet**.
  Each cartridge comes with 3 filter elements: one already inserted, two more filters aside.



CHROMABOND® Flash DL
cartridge filled with sample on CHROMABOND® XTR on top of CHROMABOND® Flash RS or BT silica cartridge

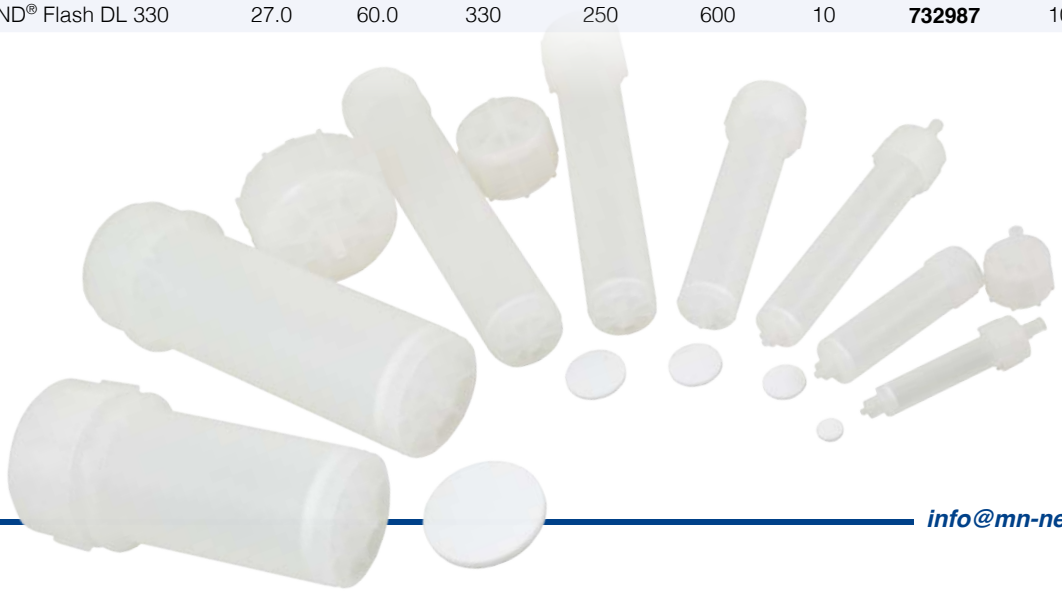
CHROMABOND® Flash BT
cartridge partly filled with silica topped with sample on CHROMABOND® XTR

Options for solid injection

The sample is dissolved in a suitable solvent and adsorbed onto CHROMABOND® XTR (diatomaceous earth, see page 11). After removal / evaporation of the residual solvent, the adsorbent is put on top of a partly filled CHROMABOND® Flash BT cartridge or into an empty CHROMABOND® Flash DL cartridge.

CHROMABOND® Flash DL empty cartridges · Ordering information

Designation	Column length [cm]	ID [mm]	for adsorbent weight [g]		Volume [mL]	Empty columns		PE filter elements	
			SiOH	Kieselguhr		Packing unit	REF	Packing unit	REF
CHROMABOND® Flash DL 4	9.8	12.4	4	3	8	50	**732980**	250	**732980FE**
CHROMABOND® Flash DL 15	11.6	21.2	15	10	30	50	**732981**	250	**732981FE**
CHROMABOND® Flash DL 25	16.5	21.2	25	15	45	50	**732982**	250	**732982FE**
CHROMABOND® Flash DL 40	17.1	26.4	40	30	75	20	**732983**	250	**732983FE**
CHROMABOND® Flash DL 80	24.0	30.8	80	60	160	20	**732984**	250	**732984FE**
CHROMABOND® Flash DL 120	25.5	36.0	120	80	220	20	**732985**	250	**732985FE**
CHROMABOND® Flash DL 200	20.0	60.0	200	150	410	10	**732986**	100	**732986FE**
CHROMABOND® Flash DL 330	27.0	60.0	330	250	600	10	**732987**	100	**732987FE**



CHROMABOND® Flash FM

solutions for FlashMaster™ instruments

- Polypropylene cartridges designed for use in the Biotage® FlashMaster™ systems without additional connectors or capillaries
- *Column connection:*
  open-tubular inlet and **male Luer outlet**

CHROMABOND® Flash FM columns · Ordering information

Filled with standard silica, unmodified (SiOH) or endcapped octadecyl modified (C_{18} ec); 45 µm, specific surface 500 m^2/g, pH stability 2–8

Designation	Column length [cm]	ID [mm]	Adsorbent weight [g]	Pack of [columns]	REF
CHROMABOND® Flash FM 15/2 SiOH	9.0	15.8	2.0	50	**730881**
CHROMABOND® Flash FM 25/5 SiOH	10.0	20.5	5.0	50	**730891**
CHROMABOND® Flash FM 25/10 SiOH	10.0	20.5	10.0	50	**730666**
CHROMABOND® Flash FM 70/10 SiOH	15.4	26.8	10.0	30	**730885**
CHROMABOND® Flash FM 70/20 SiOH	15.4	26.8	20.0	30	**730915**
CHROMABOND® Flash FM 70/25 SiOH	15.4	26.8	25.0	30	**730892**
CHROMABOND® Flash FM 150/25 SiOH	17.0	38.2	25.0	20	**730667**
CHROMABOND® Flash FM 150/50 SiOH	17.0	38.2	50.0	20	**730887**
CHROMABOND® Flash FM 150/70 SiOH	17.0	38.2	70.0	10	**730880**
CHROMABOND® Flash FM 15/2 C_{18} ec	9.0	15.8	2.0	50	**730890**
CHROMABOND® Flash FM 25/5 C_{18} ec	10.0	20.5	5.0	20	**730884**
CHROMABOND® Flash FM 70/10 C_{18} ec	15.4	26.8	10.0	20	**730886**
CHROMABOND® Flash FM 150/50 C_{18} ec	17.0	38.2	50.0	10	**730888**

Custom filling sizes are available on request.

On request all column types listed above can be packed with any adsorbent from our program of CHROMABOND® or spherical NUCLEODUR® phases (please note that other packings often result in differing adsorbent weights).

MN Flash adsorbents

a unique variety of phases

- Flash columns and cartridges from MACHEREY-NAGEL are available with all CHROMABOND® SPE / Flash packings (more than 40 phases, e.g., C_{18}, C_8, OH, Alox)

  Additionally you can choose from our range of POLYGOPREP silica packings in particle sizes from 20 to 130 µm and pore sizes from 60 to 4000 Å.
- For high performance Flash separations you can order columns custom-packed with spherical NUCLEODUR® featuring very high separation efficiency and extremely increased column lifetime (particle size > 20 µm)

Technical silica information

Specification of modified and plain silica:
acid-washed irregular silica, pore size 60 Å, particle size 45 µm, specific surface 500 m²/g, pH stability 2–8

Additionally available silicas and particle sizes:

- Irregular POLYGOPREP silica with particle sizes of 20 to 130 µm and pore sizes of 60 to 4000 Å
- Spherical high performance silica (NUCLEODUR®, 110 Å) with particle sizes of 20 or 30 µm for high separation efficiency

Comparison of separation efficiency and price of irregular versus spherical silica

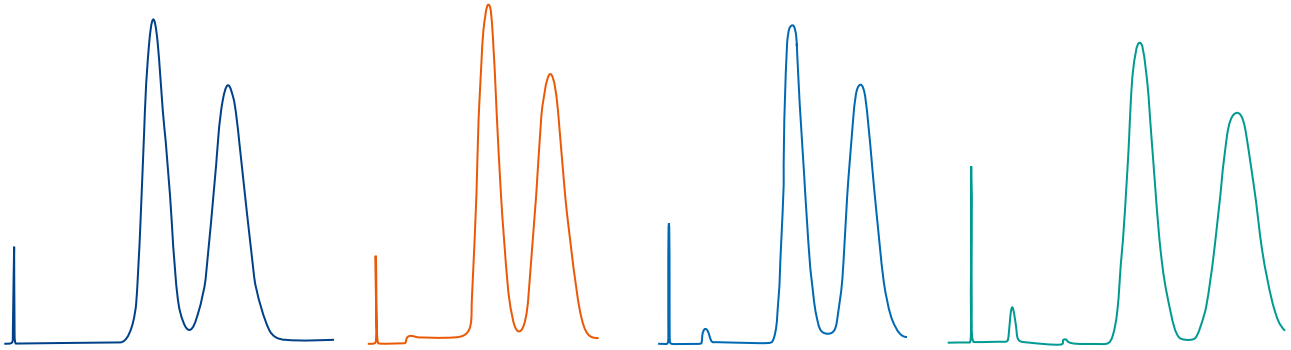
Separation efficiency and reproducibility

Our optimized automatic packing process leads to an excellent packing quality, irrespective of the phase or particle size distribution (normal phase or reversed phase, spherical or irregular particles).

MACHEREY-NAGEL, as a manufacturer of silicas, has decades of experience in the production of first class separation phases and columns. This leads to highest separation efficiencies of the columns, a constant back pressure (via controlled narrow particle size distribution) and good reproducibilities from cartridge to cartridge.

The separation efficiency is in the first place not influenced by the dimension or the geometry of the Flash RS cartridges. The chromatograms below show an identical resolution and peak form for different column dimensions, when flow and sample amount is adjusted correctly. This is advantageous for optimization and upscaling experiments.

Resolution and peak shape for different column dimensions



4 g SiOH: 0.25 mL sample, 10 mL/min

15 g SiOH: 1 mL sample, 40 mL/min

25 g SiOH: 1 mL sample, 80 mL/min

40 g SiOH: 1 mL sample, 160 mL/min

Technical support for Flash RS and Flash BT

Loadability

- Highest loadability at the best possible separation efficiency due to narrow particle size distribution, excellent packing quality and optimized stationary phases (acid washed silica, reduced particulate matter)
- Large range of different cartridge lengths and diameters allows optimum in loadability for a given sample amount

Rule of thumb for the loadability

Separation	Loadability	g sample / g adsorbent
difficult	low	≤ 1 %
easy	high	≥ 10 %

Loadability table for CHROMABOND® Flash RS and BT

SiOH cartridge	Average loadability per cartridge [g]	
	difficult separation	**easy** separation
RS / BT 4	0.04	0.4
RS / BT 15	0.15	1.5
RS / BT 25	0.25	2.5
RS / BT 40	0.4	4
RS / BT 80	0.8	8
RS / BT 120	1.2	12
RS / BT 200	2	20
RS / BT 330	3.3	33
RS 800	8	80
RS 1600	16	160

Upscaling of the optimum flow rate

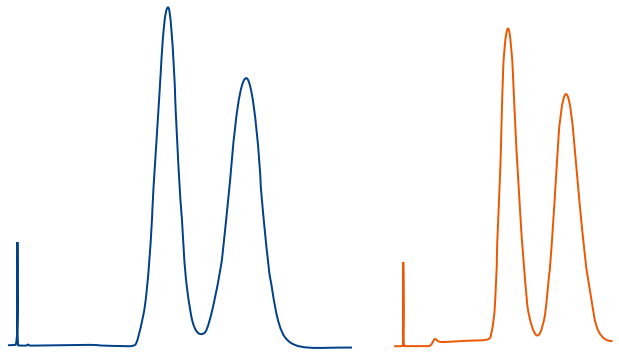
This depends on the eluent and the separation problem.

For flash cartridges the upscaling relation is simple:
The flow rate is proportional to the silica weight in g (for equal eluent polarity), e.g.,

4 g silica → optimum flow: ~ 6–12 mL/min

40 g silica → optimum flow: ~ 60–120 mL/min

Upscaling of the flow rate



4 g SiOH: 10 mL/min **40 g SiOH:** 100 mL/min

Back pressure and pressure stability

The back pressure always depends on flow rate and viscosity of the eluent mixture, column length and diameter as well as on the particle size. The high performance CHROMABOND® Flash cartridges up to 200 g silica are stable up to 15 bar (> 200 g: 12 bar). We recommend using a pressure guard, because short time pressure peaks (viscosity of eluent or gradient changes) can exceed the pressure limit.

Back pressure of CHROMABOND® Flash SiOH cartridges at typical flow rates (eluent hexane – ethyl acetate 9:1 or 8:2)

	Flow rate						
Cartridge	20 mL/min	40 mL/min	80 mL/min	120 mL/min	160 mL/min	200 mL/min	240 mL/min
RS / BT 4	**0.75 bar**	**1.5 bar**					
RS / BT 15	**0.25 bar**	**0.75 bar**	1.5 bar	2.0 bar			
RS / BT 25	**0.5 bar**	**1.0 bar**	**1.75 bar**	3.0 bar	4.0 bar	5.0 bar	
RS / BT 40		**0.75 bar**	**1.5 bar**	2.25 bar	3.0 bar	3.25 bar	3.5 bar
RS / BT 80			**1.5 bar**	**2.5 bar**	**3.0 bar**	3.5 bar	4.0 bar
RS / BT 120			**1.0 bar**	**1.5 bar**	**2.0 bar**	2.5 bar	3.0 bar
RS / BT 200			1.0 bar	**1.5 bar**	**2.0 bar**	**2.5 bar**	**3.0 bar**
RS / BT 330	**(typical flow rates)**		1.5 bar	**2.25 bar**	**3.0 bar**	**3.5 bar**	**4.0 bar**

Conditioning volumes for CHROMABOND® Flash RS cartridges (normally 1.5 column volumes of the eluent)

Cartridge	Volume of eluent for conditioning
RS / BT 4	20 mL
RS / BT 15	60 mL
RS / BT 25	90 mL
RS / BT 40	140 mL
RS / BT 80	280 mL

Cartridge	Volume of eluent for conditioning
RS / BT 120	440 mL
RS / BT 200	750 mL
RS / BT 330	1100 mL
RS 800	2900 mL
RS 1600	5000 mL

Method development · TLC upscaling

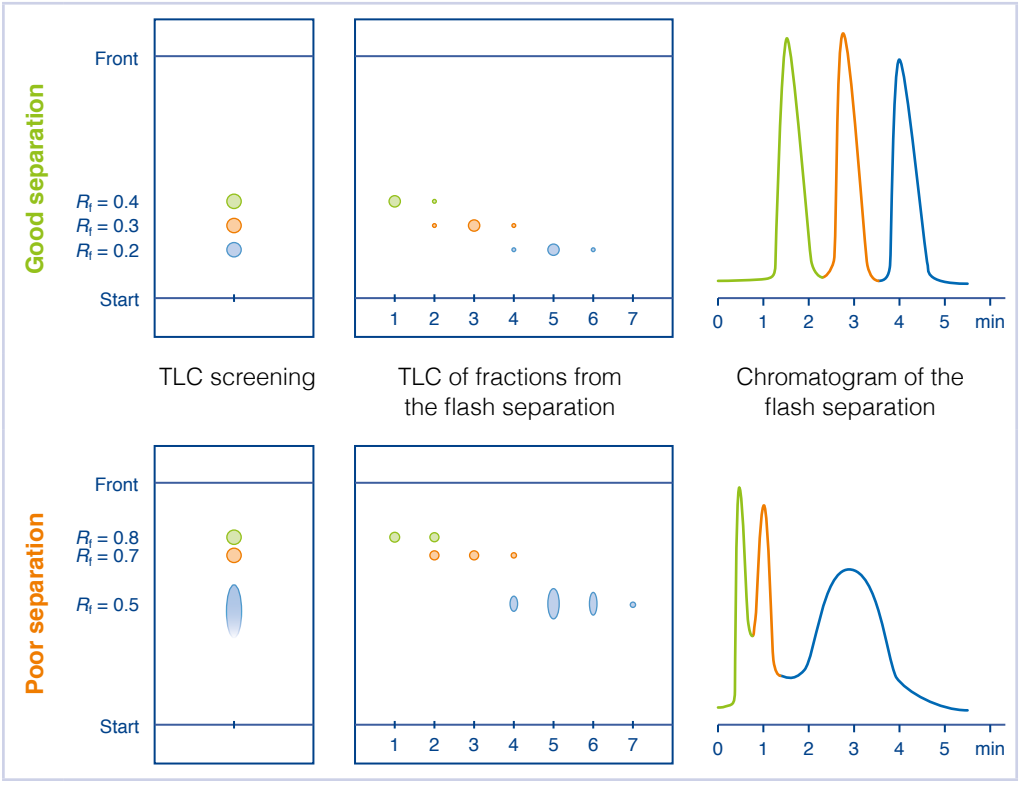
MN TLC and Flash products

- Same selectivity and easy upscaling from TLC to Flash separations
- Saving time and money, because expensive optimizations are not required

TLC is often used for the development of a selective and reproducible method in Flash chromatography, because it is often necessary to test a large number of eluent and / or adsorbent combinations. MN TLC plates and sheets are coated with the same base silica, which is used in our CHROMABOND® Flash cartridges. This is an important prerequisite for the reproducible transfer of a TLC separation to the Flash column, because the parameters are identical in both systems.

TLC screening

For TLC separation you should start with an unmodified silica and a nonpolar eluent of low viscosity (e.g., mixtures of *n*-hexane – ethyl acetate or *n*-hexane – acetone). By changing the composition of the eluent the R_f value of the TLC separation is adjusted to approx. 0.3. Increasing polarity of the eluent decreases the R_f values. The difference in R_f values between the substances to be separated should be at least 0.1 to allow a reliable separation in the subsequent flash chromatography. Variation of the eluent components (e.g., acetone, dichloromethane) can be used to enhance the separation by eluent-specific selectivity.



Selection from our program of TLC plates

SIL G · unmodified standard silica layers on glass plates

Plate size [cm] Pack of [plates]	2.5 x 7.5 100	5 x 10 50	5 x 20 100	10 x 10 25	10 x 20 50	20 x 20 25	Thickness of layer	Fluorescent indicator
SIL G-25		**809017**	**809011**		**809012**	**809013**	0.25 mm	–
SIL G-25 UV_{254}	**809028.100**	**809027**	**809021**	**809020**	**809022**	**809023**	0.25 mm	UV_{254}

ALUGRAM® Xtra SIL G · unmodified standard silica layers on aluminium sheets

Plate size [cm] Pack of [plates]	2.5 x 7.5 200	4 x 8 50	5 x 7.5 20	5 x 10 50	5 x 20 50	10 x 20 20	20 x 20 25	Thickness of layer	Fluorescent indicator
SIL G			**818230.20**	**818261**	**818232**		**818233**	0.20 mm	–
SIL G/UV_{254}	**818329**	**818331**	**818330.20**	**818360**	**818332**	**818362**	**818333**	0.20 mm	UV_{254}

CHROMABOND® XTR

adsorbent for solid injection

- Base material coarse-grained kieselguhr (also known as diatomaceous earth, hydromatrix, celite)

  Large pore size, high pore volume, constantly high batch-to-batch quality, pH working range 1–13

Ordering information

Description	Pack of	REF
CHROMABOND® XTR adsorbent	500 g	**730595.500**
	1 kg	**730595.1000**
	5 kg	**730595.5000**

Accessories for CHROMABOND® Flash columns

CHROMABOND® Flash connecting kits · Ordering information

CHROMABOND® Flash connecting kits allow to use CHROMABOND® Flash RS and BT cartridges as stand-alone system with any pump / detection / fraction collector combination.

Description	Pack of	REF
CHROMABOND® Flash Starter Kit		
consists of 1/8" PTFE tubing, 1.5 mm ID, 3 m long; 5 x 1/4"-28 PP nuts; 5 x 1/8" ETFE ferrules; 5 x 1/4"-28 nylon unions; 2 x 1/4"-28 PP Luer lock, female; 1 x 1/4"-28 PP Luer lock, male; 1 x 1/4"-28 PP Luer tip, male	1 kit	**730798**
CHROMABOND® Flash Stand Alone Kit, Luer		
consists of 1 x 1/4"-28 PP Luer lock, female; 1 x 1/4"-28 PP Luer lock, male; 2 x 1/8" ETFE ferrules; 2 x 1/4"-28 nylon unions; 2 x 1/4"-28 PP nuts	1 kit	**732903**

HPLC

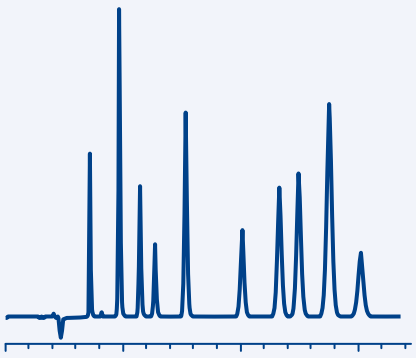
GC

TLC

SPE and Flash

Syringe filters

Vials and caps



. . . we Meet your Needs

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