Solid Phase Extraction (SPE)

Sample clarification

Vials, closures, and accessories

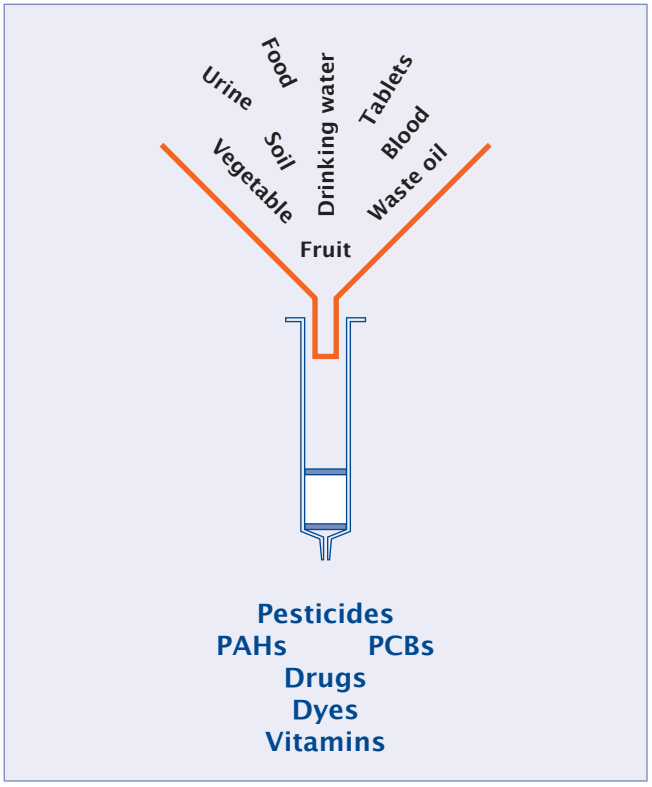
Basic principles of SPE

Solid phase extraction (SPE) is a powerful method for sample preparation and is used by most chromatographers today.

About 25 years ago MACHEREY-NAGEL designed and introduced CHROMABOND® SPE cartridges containing silica-based adsorbents. Since then we developed the widest range of phases and products for SPE based on silica and polymeric materials.

SPE has capabilities in a broad range of applications:

- Environmental analyses
- Pharmaceutical and biochemical analyses
- Organic chemistry
- Food analysis



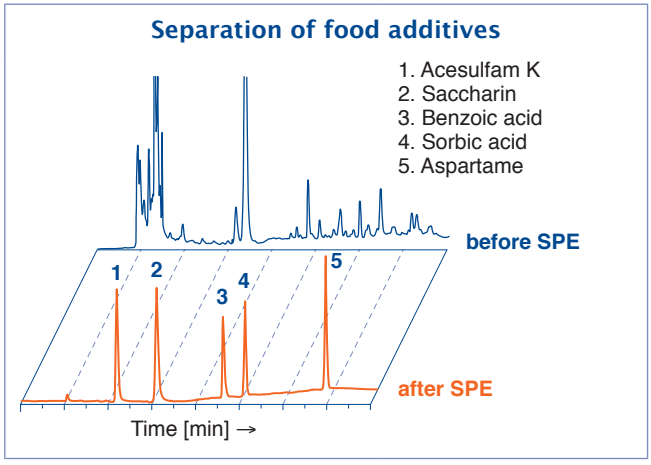
SPE is a form of digital (step-wise) chromatography designed to extract, partition, and / or adsorb one or more components from a liquid phase (sample) onto a stationary phase (adsorbent or resin). An adsorbed substance can be removed from the adsorbent by step-wise increase of elution strength of the eluent (step gradient technique). SPE extends a chromatographic system's lifetime, improves qualitative and quantitative analysis, and the demand placed on an analytical instrument is considerably lessened.

In general, SPE is used for three important purposes in state-of-the-art analyses:

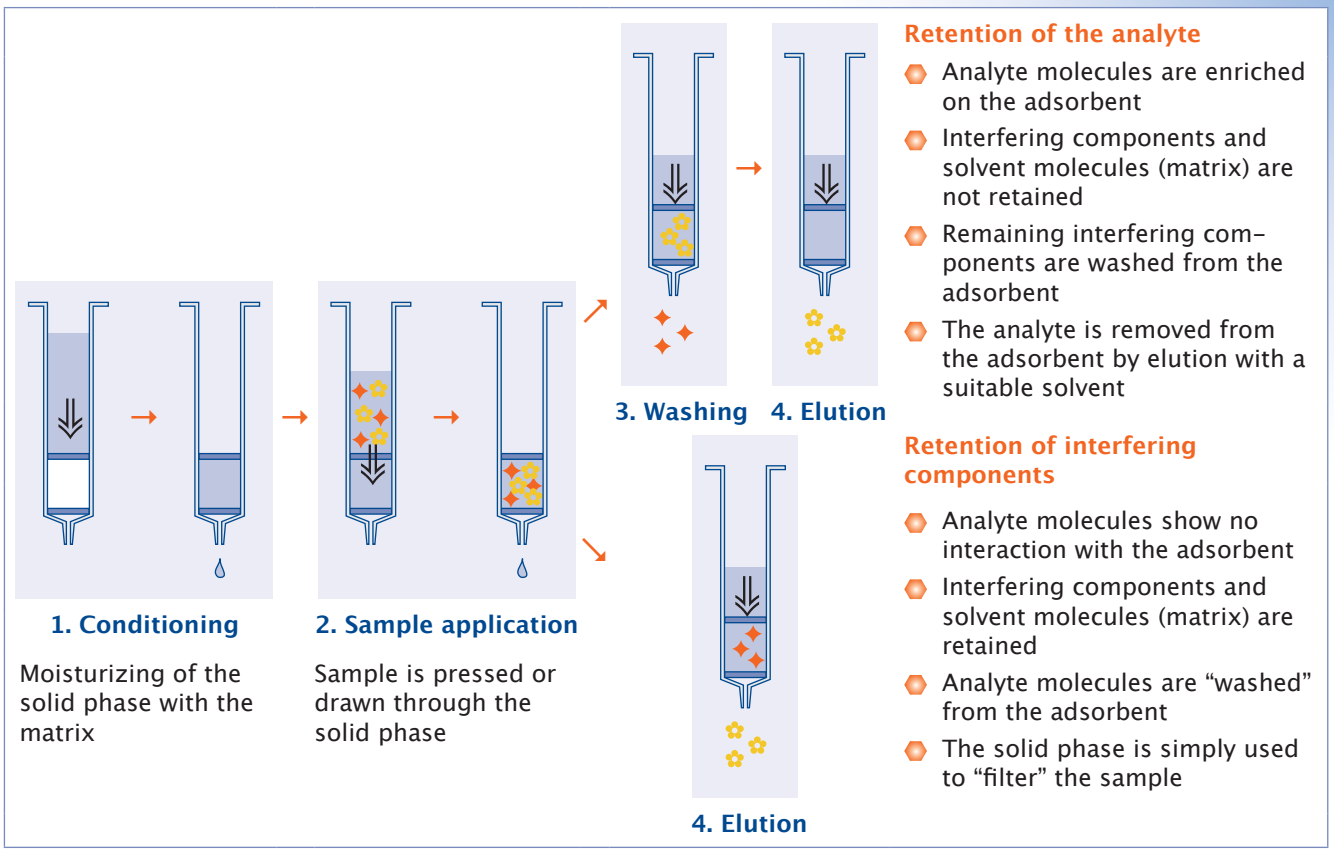
- Concentration of the analyte (up to factor 10.000 - increase of chromatographic sensibility and improved limits of detection)
- Removal of interfering compounds (protection of subsequent analyses like HPLC, GC, TLC, UV or IR spectroscopy, ...)
- Changing an analyte's environment to a simpler matrix more suitable for subsequent analyses

Advantages of SPE compared to classical liquid-liquid extraction:

- Lower consumption of solvents
- Faster - enormous time savings
- Lower costs per sample
- Potential for automation
- High consistency in individual sample handling
- More specific selectivity because of the broad range of adsorbents and different retention mechanisms
- Optimization of extraction by variation or adjusting of the solid phase and chromatographic conditions



Basic principles of SPE



Retention of the analyte

- Analyte molecules are enriched on the adsorbent
- Interfering components and solvent molecules (matrix) are not retained
- Remaining interfering components are washed from the adsorbent
- The analyte is removed from the adsorbent by elution with a suitable solvent

Retention of interfering components

- Analyte molecules show no interaction with the adsorbent
- Interfering components and solvent molecules (matrix) are retained
- Analyte molecules are "washed" from the adsorbent
- The solid phase is simply used to "filter" the sample

1. Conditioning

Moisturizing of the solid phase with the matrix

2. Sample application

Sample is pressed or drawn through the solid phase

Since analytes can be either adsorbed on the SPE packing material or directly flow through while the interfering substances are retained, two general separation procedures are possible – both cases are shown in the figure above.

Main steps of the SPE procedure

1. Conditioning of the adsorbent

Conditioning of the adsorbent is necessary in order to ensure reproducible interaction with the analyte. Conditioning, also called solvation, results in a wetting of the adsorbent and thus produces an environment, which is suitable for adsorption of the analyte. Nonpolar adsorbents are usually conditioned with 2–3 column volumes of a solvent, which is miscible with water (methanol, THF, 2-propanol etc.), followed by the solvent in which the analyte is dissolved (pure matrix, e.g., water, buffer). Polar adsorbents are conditioned with nonpolar solvents.

After the conditioning step the adsorbent bed **must not run dry**, because otherwise solvation is destroyed (deconditioning).

2. Sample application (adsorption)

Sample application can be performed with positive or negative pressure with a flow rate of ~3 mL/min. Sample volumes vary from a few mL up to liters.

3. Washing of the adsorbent

Washing of the adsorbent is usually achieved with a special wash solution; however, in some cases it may not be necessary. If the polarity difference between wash solution and eluent is very large, or if both are not miscible, drying of the adsorbent bed after washing is recommended to improve elution and recovery.

4. Elution

Elution with a suitable eluent should not be too fast. The elution speed depends on the column or cartridge dimension and the quantity of adsorbent (about 1 mL/min).

Basic principles of SPE

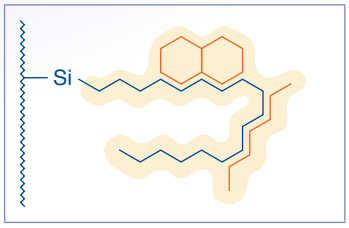
Molecular interactions in SPE

SPE adsorbents are most commonly categorized by the nature of their primary interaction mechanism with the analyte of interest. The three most common extraction mechanisms used in SPE are reversed phase (RP), normal phase (NP) and ion exchange.

Typical extraction mechanisms

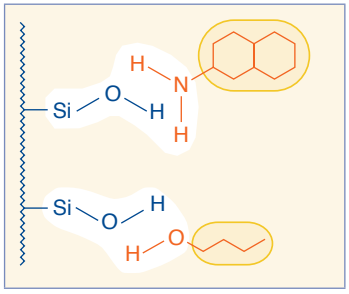
Reversed Phase	Extraction of hydrophobic or polar organic analytes from aqueous matrix
Normal Phase	Extraction of polar analytes from non-polar organic solvents
Ion Exchange	Extraction of charged analytes from aqueous or non-polar organic samples

Types of retention mechanisms:



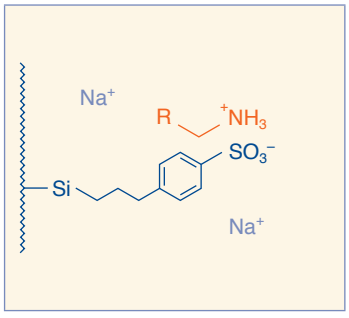
Nonpolar interactions

Silica-based:	C_{18} ec, C_{18}, C_{18} Hydra, C_8
Polymer-based:	HR-X, HR-P, Easy, PS-RP
Interactions:	hydrophobic
Sample:	mostly aqueous
Elution:	solvents with lower polarity (compared to water) CH_3OH, CH_2Cl_2, $CHCl_3$, hexane



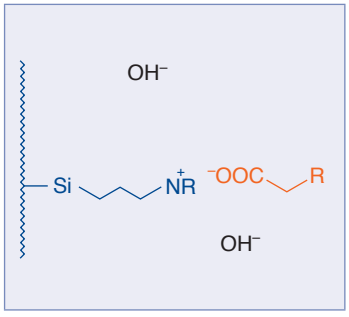
Polar interactions

Silica-based:	SiOH, CN, NH_2, OH (diol), C_6H_5
Other:	Alox, Florisil®
Interactions:	hydrogen bonds, dipole-dipole and π-π interactions
Sample:	mostly organic
Elution:	polar solvents (compared to sample solvent), e.g., (nonprotic) ethers, ketones (MTBE, THF, acetone) CH_2Cl_2, $CHCl_3$



Cation exchangers

Silica-based:	SA (SCX), PCA (WCX), PSA,
Polymer-based:	HR-XC, HR-XCW, PS-H^+
Interaction:	between charged analytes and functional group of cation exchanger
Sample:	aqueous (pH 3-5)
Elution:	acidic: pH 2 (e.g., HCl, or 20 % AcOH in CH_3OH - CH_3CN) basic: pH 8-9 (e.g., 5 % NH_3 in CH_3OH - CH_3CN) solvents or buffers with higher ionic strength and counter ions with high selectivity (e.g., Ca^{2+})



Anion exchangers

Silica-based:	SB (SAX), NH_2, DMA
Polymer-based:	HR-XA, HR-XAW, PS-OH^-
Interaction:	between charged analytes and functional group of anion exchanger
Sample:	aqueous (pH 8-9)
Elution:	basic: pH 10 (e.g., 20 % NH_3 in CH_3OH - CH_3CN) acidic: pH 4-5 (e.g., HCl, or 5 % AcOH in CH_3OH - CH_3CN) solvents or buffers with higher ionic strength and counter ions with high selectivity (e.g., citrate)

It should be noted, that in SPE the interactions described above are not found in pure form, but in combination. For example, modified silicas, unless they have been subjected to endcapping (silanization of residual silanol groups with short-chain silanes), still possess free silanol groups, which can enter into secondary interactions.

Sample pretreatment

For direct extraction with adsorbents the sample matrix (sample environment) has to fulfill three conditions:

- The matrix has to be liquid, if possible with low viscosity.
- Solids should be removed from the liquid matrix.
- The matrix (sample environment) should be suitable for retention of the analyte.

For solid samples there are different methods to convert the sample into a suitable matrix:

- Dissolution of the solid sample in a suitable solvent
- Lyophilization of the sample and dissolution in a suitable solvent
- Extraction of the solid sample with a suitable solvent
- Homogenization of the sample in a suitable solvent

In order to find the suitable solvent, one has to consider all desired sample components. Also, the suitable solvent should enhance retention of the analyte. For example, samples with large contents of solids are often homogenized in nonpolar solvents like hexane, while for samples with high water content dissolution in acids, bases, buffers or very polar solvents such as methanol is recommended.

Additionally, SPE allows to alter the properties of the sample matrix. If, for example, natural products are extracted with methanol or acetone, the polarity of the extracts can be increased by dilution with water, in order to enhance nonpolar solid phase extraction on the C_{18} material.

Our CHROMABOND® QC policy

- **Highest production standard**
  our facilities are EN ISO 9001:2008 certified
- All of our bonded phases and SPE products are vigorously tested for perfect **reproducibility** from lot-to-lot and within every single batch

  Careful attention to particle size distribution and pore diameters assures consistent column flow

  Chemical reproducibility is guaranteed by strict quality control throughout manufacturing
- All products are individually tested to meet our **strict quality specifications**, ensuring our outstanding product reproducibility, reliability and performance
- Each product is supplied with a **certificate of analysis** stating the results of internal examinations and quality control


Certificate

Phase: CHROMABOND® HR-X
LOT: 1211/1

Technical Data

Parameter | Result

Confirmation

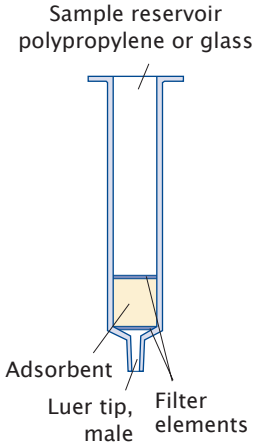
Visit our Online Application Database: www.mn-net.com/apps
3000 free chromatography applications – without registration

...find Your application!

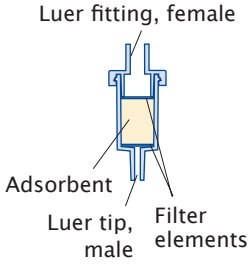
Solid Phase Extraction

Basic principles of SPE

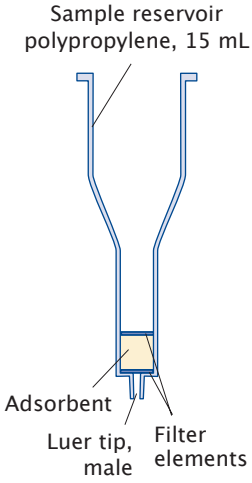
CHROMABOND®



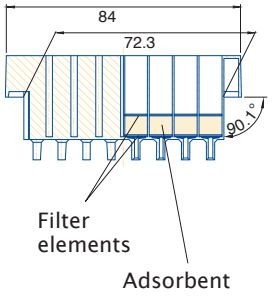
CHROMAFIX®



CHROMABOND® LV



CHROMABOND® MULTI 96



Design of columns, cartridges and 96-well plates

All CHROMABOND® columns, cartridges and 96-well plates are manufactured from polypropylene (PP) with lowest content of extractables (plasticizers, stabilizers, ...) offering blank value free results when using most common solvents. The high quality CHROMABOND® adsorbents are kept in place by chemically very inert polyethylene filter elements (PE, standard pore size 20 µm).

CHROMABOND® polypropylene columns

- PP columns with PE filter elements
- Different sizes from 1, 3, 6 up to 150 mL
- Adsorbent weights from 20 mg to 50 g
- Male Luer tip as exit
- Compatible with most robots (e.g., Gilson ASPEC™, Caliper AutoTrace®)

CHROMABOND® glass columns

- Glass columns with chemically very inert glass fiber filter elements (nominal pore size 1 µm)
- Two different sizes: 3 and 6 mL
- Available with all CHROMABOND® phases
- Excludes any influence from the column material (e.g., plasticizers)

CHROMAFIX® cartridges

- PP cartridges with PE filter elements
- Three different sizes with different adsorbent weights: **S**mall (0.4 mL), **M**edium (0.8 mL), **L**arge (1.8 mL)
- Female Luer tip at the inlet, male Luer tip as exit
- Offers alternative way of handling using positive pressure by syringes or peristaltic pumps
- Especially suited for convenient solid phase extraction of small sample volumes

CHROMABOND® LV columns

- Large volume PP columns with PE filter elements
- Three different adsorbent weights (100, 200 and 500 mg)
- Funnel-shaped reservoir with 15 mL volume
- Especially for clinical samples – the whole sample (e.g., urine, serum, blood) can be applied to the column in one step
- Can be directly used in the Zymate® lab robots of Zymark

CHROMABOND® MULTI 96 · SPE in 96-well format

- 96-well PP plates with PE filter elements
- Cavity volume 1.5 mL
- Adsorbent weights 10, 25, 50 and 100 mg
- Supplied with any CHROMABOND® SPE adsorbents
- For simultaneous preparation of 96 samples
- Easy method transfer from CHROMABOND® columns or CHROMAFIX® cartridges to CHROMABOND® MULTI 96
- Readily adaptable to all common automated / robotic handling systems (for details see page 54)

Online-SPE (see page 53)

- Online columns and cartridges
- SPE columns with caps and needles for the Gerstel MultiPurposeSampler (MPS)
- Columns for Gilson ASPEC™ systems (ASP)

SPE method development kits

For the development kits as well as for all individual CHROMABOND®, CHROMABOND® LV and CHROMAFIX® types columns are sealed in units of five columns each to prevent adsorption of contaminants from the environment, e.g., laboratory air.

Ordering information

Designation	Contents of the kit	REF
Investigating the best separation mechanism for a clean-up procedure		
CHROMABOND® HR-X*pert* development kit I	columns with 3 mL, 60 mg each (particle size 45 µm): 10 columns with HR-X; 5 columns each with HR-XC, HR-XA, HR-XCW, HR-XAW	**730723**
CHROMABOND® HR-X*pert* development kit II	columns with 3 mL, 200 mg each (particle size 85 µm): 10 columns with HR-X; 5 columns each with HR-XC, HR-XA, HR-XCW, HR-XAW	**730726**
CHROMABOND® polymer development kit	5 columns each with 3 mL, 200 mg: HR-X, HR-XC (MCX), HR-XA (MAX), HR-P, Easy, PS-H^+, PS-OH^-	**730288**
CHROMABOND® standard development kit	5 columns each with 3 mL, 500 mg: C_{18}, C_{18} ec, C_8, C_6H_5, NH_2, DMA, OH, CN, SiOH, SA (SCX), SB (SAX)	**730496**
Selecting the optimum RP phase for a clean-up procedure		
CHROMABOND® RP development kit I	10 columns each with 3 mL, 500 mg: C_{18}, C_{18} ec, C_8, C_4 and 10 columns each with 3 mL, 200 mg HR-P, HR-X	**730197**
CHROMABOND® RP development kit II	10 columns each with 1 mL, 100 mg: C_{18}, C_{18} ec, C_8, C_4, HR-P, HR-X	**730207**
CHROMAFIX® RP development kit I	10 cartridges each CHROMAFIX® S: C_{18}, C_{18} ec, C_8, C_4, HR-P, HR-X	**731883**
CHROMABOND® RP development kit III	10 columns each with 3 mL, 500 mg: C_{18}, C_{18} ec, C_{18} Hydra, C_8 and 10 columns each with 3 mL, 200 mg HR-P, HR-X	**730490**
CHROMABOND® RP development kit IV	10 columns each with 1 mL, 100 mg: C_{18}, C_{18} ec, C_{18} Hydra, C_8, HR-P, HR-X	**730491**
CHROMAFIX® RP development kit II	10 cartridges each CHROMAFIX® S: C_{18}, C_{18} ec, C_{18} Hydra, C_8, HR-P, HR-X	**731886**
CHROMABOND® RP development kit V	10 columns each with 3 mL, 500 mg: C_6H_5, NO_2, C_6H_{11} ec, C_4, C_2	**730492**
CHROMABOND® RP development kit VI	10 columns each with 1 mL, 100 mg: C_6H_5, NO_2, C_6H_{11} ec, C_4, C_2	**730493**
CHROMAFIX® RP development kit III	10 cartridges each CHROMAFIX® S: C_6H_5, NO_2, C_6H_{11} ec, C_4, C_2	**731887**
Selecting the optimum polar phase for a clean-up procedure		
CHROMABOND® polar development kit I	10 columns each with 3 mL, 500 mg: SiOH, Florisil®, NH_2, CN, OH	**730199**
CHROMABOND® polar development kit II	10 columns each with 1 mL, 100 mg: SiOH, Florisil®, NH_2, CN, OH	**730208**
CHROMAFIX® polar development kit	10 cartridges each CHROMAFIX® S: SiOH, Florisil®, NH_2, CN, OH	**731884**
Selecting the optimum ion exchanger for a clean-up procedure		
CHROMABOND® ion exchange development kit I	10 columns each with 3 mL, 500 mg: SA (SCX), SB (SAX), HR-XC (MCX), HR-XA (MAX), PS-OH^-, PS-H^+, DMA	**730206**
CHROMABOND® ion exchange development kit II	10 columns each with 1 mL, 100 mg: SA (SCX), SB (SAX), HR-XC (MCX), HR-XA (MAX), PS-OH^-, PS-H^+, DMA	**730209**
CHROMAFIX® ion exchange development kit I	10 cartridges each CHROMAFIX® S: SA (SCX), SB (SAX), HR-XC (MCX), HR-XA (MAX), PS-OH^-, PS-H^+, DMA	**731885**
CHROMABOND® cation exchange development kit I	10 columns each with 3 mL, 500 mg: SA (SCX), PSA, PCA, HR-XC (MCX), HR-XCW (WCX), PS-H^+	**730494**
CHROMAFIX® cation exchange development kit	10 cartridges each CHROMAFIX® S: SA (SCX), PSA, PCA, HR-XC (MCX), HR-XCW (WCX), PS-H^+	**731888**
Phase selection for clean-up procedures for environmental samples		
CHROMABOND® kit I for environmental sample preparation	10 columns each with 3 mL, 200 mg HR-P, 6 mL, 1000 mg C_{18} ec, 6 mL, 2000 mg C_{18} PAH, 6 mL, 500/1000 mg CN/SiOH, 3 mL, 500/500 mg SA/SiOH	**730205**
CHROMABOND® kit II for environmental sample preparation	5 columns each with 3 mL, 500/500 mg SiOH-H_2SO_4/SA, 3 mL, 500 mg SiOH, 6 mL, 1000 mg Florisil, 3 mL, 500/500 mg SA/SiOH, 6 mL, 700/2000/700 mg NAN	**730349**

Summary of MN phases for SPE

Code	Matrix	Modification / Application	Similar phases*	Page
Reversed phases				
HR-X	PS/DVB		ENVI-Chrom P · Strata™-X · Oasis® HLB · Nexus	14
Easy	PS/DVB	polar, bifunctional	Strata™-X · Oasis® HLB · Porapak™ RDX · Nexus, Bond Elut® PPL, Focus™ ·Styre Screen® DVB Bakerbond™ H_2O-philic DVB · Isolute® ENV+	20
HR-P	PS/DVB		Strata™ SDB-L ·Bond Elut® ENV, Bond Elut® LMS · DCS-PS/DVB, ENV PS-DVB · Bakerbond™ H_2O-phobic DVB · Isolute® 101 · LiChrolut® EN	21
PS-RP	PS/DVB	removal of organic components	like HR-P	22
C_{18} ec	silica	octadecyl, endcapped	Strata™ C18-E · Sep-Pak® tC18 · Bond Elut® C18 · DSC-18(Lt), ENVI-18, LC-18 · CLEAN-UP® C18, Bakerbond® Octadecyl · Isolute® C18(EC), LiChrolut® RP-18 E	23
C_{18} ec f	silica	as above, fast flow		23
C_{18}	silica	octadecyl, not endcapped	Strata™ C18-U · AccuBond® C18 · Bakerbond™ PolarPlus · Isolute® C18 · LiChrolut® RP-18	24
C_{18} f	silica	as above, fast flow		24
C_{18} PAH	silica	special octadecyl phase, for enrichment of PAHs from water	Bakerbond™ Octadecyl Lightload	42
C_{18} Hydra	silica	octadecyl, not endcapped, for polar analytes		25
C_8	silica	octyl	Strata™ C8 · Sep-Pak® C8 · Bond Elut® C8 · DSC-8, ENVI-8, LC-8 · CLEAN-UP® C8 · AccuBond® C8 · Bakerbond™ Octyl · Isolute® C8(EC)	26
C_4	silica	butyl		27
C_2	silica	dimethyl	Bond Elut® C2	27
C_6H_{11} ec	silica	cyclohexyl, endcapped	Bond Elut® CH	28
C_6H_5	silica	phenyl	Strata™ PH · Bond Elut® PH · DSC-Ph · CLEAN-UP® Phenyl · AccuBond® Phenyl · Bakerbond™ Phenyl · Isolute PH(EC)	29
Normal phases				
SiOH	silica	unmodified	Strata™ Si-1 · Bond Elut® silica · DSC-Si, LC-Si · CLEAN-UP® silica · Accubond® silica, Bakerbond™ silica gel · Isolute® silica · LiChrolut® Si	32
NH_2	silica	aminopropyl	Strata™ NH_2 · Sep-Pak® NH_2 · Bond Elut NH_2 · DSC-NH_2, LC-NH_2 · CLEAN-UP® aminopropyl · Accubond® NH_2 · Bakerbond™ amino · Isolute® NH_2 · LiChrolut® NH_2	31
OH (Diol)	silica	diol	DSC-Diol, LC-Diol · Accubond® Diol (OH)	30
CN	silica	cyano	Strata™ CN · Sep-Pak® CN · Bond Elut® CN-U· DSC-CN, LC-CN · CLEAN-UP® CN · Accubond® CN · Bakerbond™ cyano· Isolute® CN · LiChrolut® CN	30
Alox A	aluminium oxide acidic		LC-Alumina-A · Accubond® aluminium oxide A	33
Alox N	aluminium oxide neutral		LC-Alumina-N · Accubond® aluminium oxide N	33
Alox B	aluminium oxide basic		LC-Alumina-B · Accubond® aluminium oxide B	33
Florisil®	magnesium silicate		Strata™ FL-PR · Sep-Pak® Florisil® · Bond Elut® Florisil® · ENVI-Florisil®, LC-Florisil® · CLEAN-UP® Florisil® · Accubond® Florisil® · Bakerbond™ Florisil® · Isolute® FL · LiChrolut® Florisil®	34
PA	polyamide 6		DPA-6S	34
Ion exchangers				
SB	silica	quaternary ammonium anion exchanger (SAX)	Strata™ SAX, Sep-Pak® SAX, Bond Elut® SAX · DSC-SAX, LC-SAX · CLEAN-UP® Quaternary Amine · Accubond® SAX · Bakerbond™ Quaternary Amine · Isolute® SAX · LiChrolut® SAX	37

* Phases which provide a similar selectivity based on chemical or physical properties (list not complete)

Summary of MN phases for SPE

Code	Matrix	Modification / Application	Similar phases*	Page
SA	silica	benzenesulfonic acid cation exchanger (SCX)	Strata™ SCX · Bond Elut® SCX · DSC-SCX, LC-SCX · CLEAN-UP® Benzenesulfonic Acid · Accubond® SCX · Bakerbond™ Aromatic Sulfonic Acid · Isolute® SCX · LiChrolut® SCX	36
PCA	silica	propylcarboxylic acid cation exchanger (WCX)	Strata™ WCX · Bond Elut® CBA · DSC-WCX, LC-WCX · CLEAN-UP® Carboxylic Acid · Bakerbond™ Carboxylic Acid · Isolute® CBA	35
PSA	silica	propylsulfonic acid cation exchanger		35
HR-XC	PS/DVB	strong mixed mode cation exchanger for basic analytes (MCX)	Oasis® MCX · Strata™-X-C · HyperSep™ Retain™-CX· Styre Screen® DBX	16
HR-XA	PS/DVB	strong mixed mode anion exchanger for acidic analytes (MAX)	Oasis® MAX · Strata™-X-A · HyperSep™ Retain™-AX · Styre Screen® QAX	17
HR-XCW	PS/DVB	weak mixed mode cation exchanger for basic analytes (WCX)	Oasis® WCX · Strata™ X-CW	18
HR-XAW	PS/DVB	weak mixed mode anion exchanger for acidic analytes (WAX)	Oasis® WAX · Strata™ X-AW	19
PS-OH^-	PS/DVB	strong anion exchanger in OH^- form		22
PS-H^+	PS/DVB	strong cation exchanger in H^+ form		22
PS-Mix	PS/DVB	mixture of PS-OH^- and PS-H^+		22
PS-Ag^+	PS/DVB	strong cation exchanger in Ag^+ form		22
PS-Ba^{2+}	PS/DVB	strong cation exchanger in Ba^{2+} form		22
Phases for special applications				
Dry	Na_2SO_4	for drying organic samples		47
Drug	silica	bifunctional C_8/SA, for enrichment of drugs from urine	Strata™ Screen-C · Bond Elut® Certify I · DSC-MCAX · Clean Screen® DAU · Accubond® Evidex · Bakerbond™ Narc-2 · Isolute® HCX · LiChrolut® TSC · HyperSep™ Verify CX	38
Drug II	silica	bifunctional C_8/SB, for extraction of THC and derivatives and of acidic analytes from biological fluids	Strata™ Screen-A · Bond Elut Certify II · Clean Screen® THC · Bakerbond® Narc-1 · Isolute® HAX · HyperSep™ Verify AX	39
Crosslinks	cellulose	for enrichment of collagen crosslinks		40
Tetracycline	silica	special octadecyl phase, for enrichment of tetracyclines		40
HR-P-AOX	PS/DVB	for extraction of AOX from water (DIN 38409 - H22)		41
CN/SiOH	silica	combination phase for enrichment of PAHs from soil		44
NH_2/C_{18}	silica	combination phase for enrichment of PAHs from water		42
Na_2SO_4/Florisil®		combination phase for extraction of hydrocarbons from water (DIN H-53 / ISO DIS 9377-4)		43
SA/SiOH	silica	combination phase for enrichment of PCB from waste oil	Bakerbond™ PCB-N	45
SiOH-H_2SO_4/SA	silica	combination phase, used together with SiOH for enrichment of PCB from oil		46
NAN	silica / $AgNO_3$ + Na_2SO_4	combination phase for enrichment of PCB from sludge		44
ABC18	silica	octadecyl, with ion exchange functions, for acrylamide analysis	Isolute® M-M	47
Diamino	silica	primary and secondary amine functions (PSA), for determination of pesticides in food samples (QuEChERS method)	Supelclean™ PSA, Bond Elut® PSA	48
Phase separation		CHROMABOND® PTL/PTS		58
Liquid-liquid extraction		CHROMABOND® XTR	EXtrelut® · Chem Elut™ · Hydromatrix™	56

* Phases which provide a similar selectivity based on chemical or physical properties (list not complete)

CHROMABOND® HR-X*pert*

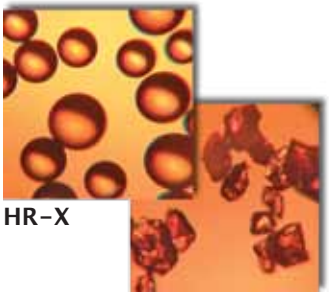
The professional concept of innovative SPE phases

The CHROMABOND® HR-X*pert* family comprises 5 polymer-based RP and mixed-mode ion exchange phases:

- **CHROMABOND® HR-X** hydrophobic PS/DVB copolymer
- **CHROMABOND® HR-XC** strong mixed-mode cation exchanger
- **CHROMABOND® HR-XA** strong mixed-mode anion exchanger
- **CHROMABOND® HR-XCW** weak mixed-mode cation exchanger
- **CHROMABOND® HR-XAW** weak mixed-mode anion exchanger

These innovative SPE phases offer

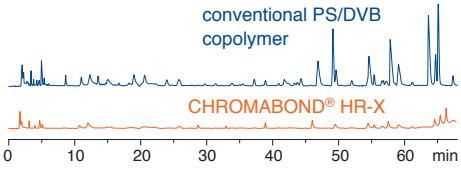
- **State-of-the-art spherical polymer**
  - Two particle sizes (45 µm and 85 µm) adequate for different sample volumes and matrices
  - Broad spectrum of application with special suitability for enrichment of pharmaceuticals from biological matrices
  - Ideal flow properties due to low content of particulate matter
- **Optimized pore structure** and **high specific surface**
  - High loadability and outstanding elution properties
  - Low solvent consumption
  - Rapid, economical analyses
- **High-purity adsorber material**
  - Allows highest reproducibility with extremely low blind values
  - Reliable analyses at ultra trace level
  - No method adaptation for new batches necessary



HR-X

conventional PS/DVB copolymer

Adsorbent blind values:



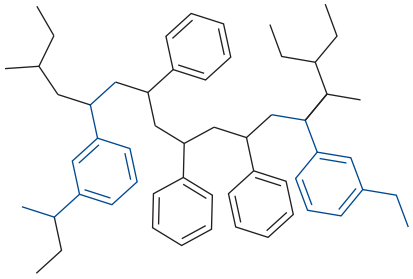
The HR-X*pert* concept guarantees:

- RP and mixed-mode SPE phases with distinct ion exchange and reversed phase properties: excellent enrichment of neutral, acidic and basic compounds
- Modern, spherical support polymer with optimized pore structure and high surface: good reproducibility, reliable and cost-efficient analysis
- Possibility for more aggressive washing procedures for matrix removal: cleaner samples and protection of your HPLC and GC instruments
- Quantification of analytes also from heavily contaminated samples: lower limits of detection also for critical matrices

CHROMABOND® HR-X*pert* is the perfect combination for all tasks in sample preparation

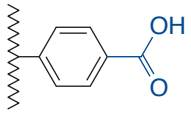
Chemical structures of the phases:

CHROMABOND® HR-X



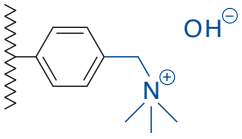
Hydrophobic
polystyrene-divinylbenzene copolymer
spherical base material for efficient enrichment and ideal flow behavior

CHROMABOND® HR-XCW



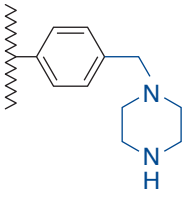
weak acidic
cation exchanger

CHROMABOND® HR-XA



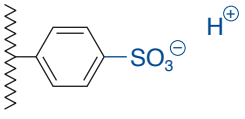
strong basic
anion exchanger

CHROMABOND® HR-XAW



weak basic
anion exchanger

CHROMABOND® HR-XC



strong acidic
cation exchanger

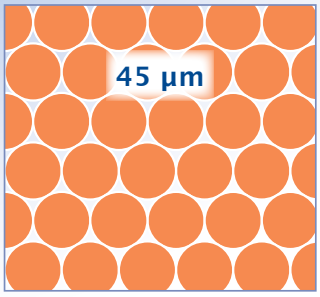
Similar phases:

CHROMABOND® HR-X:	Oasis® HLB, Strata™-X, Nexus, ENVI-Chrom P
CHROMABOND® HR-XC:	Oasis® MCX, Strata™-X-C, HyperSep™ Retain™-CX, StyreScreen® DBX
CHROMABOND® HR-XA:	Oasis® MAX, Strata™-X-A, HyperSep™ Retain™-AX, StyreScreen® QAX
CHROMABOND® HR-XCW:	Oasis® WCX, Strata™-X-CW
CHROMABOND® HR-XAW:	Oasis® WAX, Strata™-X-AW

CHROMABOND® HR-X*pert*

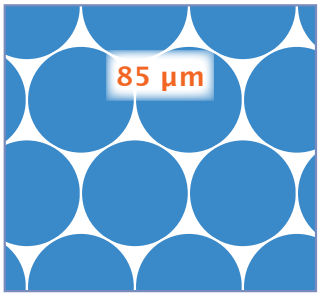
2 particle sizes – 1 goal: HR-X*pert* for optimized sample preparation

For different application requirements the particle sizes complement each other perfectly.



Ideal for:

+ smaller sample volumes
+ smaller adsorbent weights
+ lower elution volumes



Recommended for:

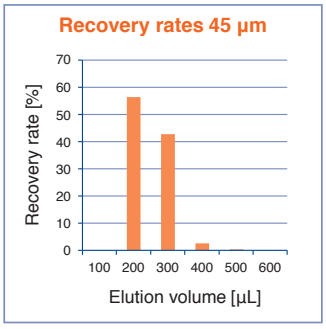
+ large volume or viscous samples, heavy matrix load
+ operation without vacuum possible (e.g., for volatile analytes)
+ higher adsorbent weight without increase in back pressure

Features of 45 µm particles

- About half the radius results in 8fold particle number per volume for approx. equal adsorbent weight
- Same specific surface for both particle sizes:
  → considerably larger freely accessible external surface for 45 µm particles
- Denser adsorbent packing:
  → enhanced interaction of the analyte with the adsorbent, better extraction results

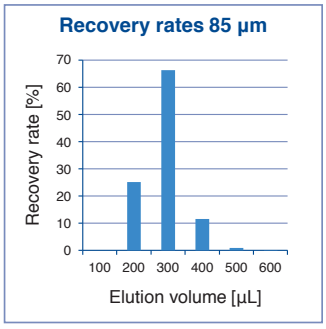
Ideal elution characteristics

Method: 1 mL column with 30 mg CHROMABOND® HR-X, 1 mL standard solution (1 mg/mL hexobarbital), drying, elution in portions of 100 µL with methanol (see application 305490 at ***www.mn-net.com/apps***)



Advantages of 45 µm particles:

+ faster elution
+ lower elution volumes required



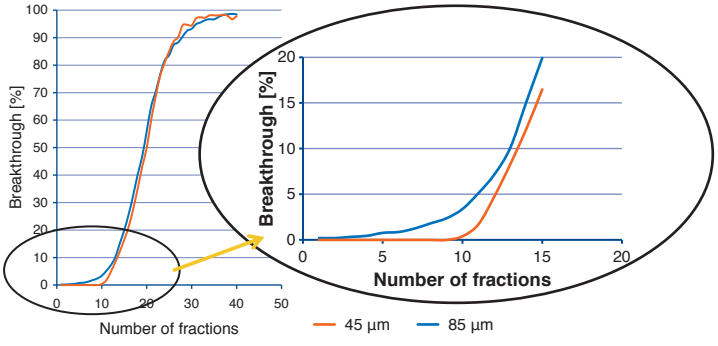
Breakthrough behavior in enrichment

Method: 1 mL column with 15 mg CHROMABOND® HR-X, apply portions of 1 mL standard solution (250 µg/mL hexobarbital in water), collect eluates (see application 305480 at ***www.mn-net.com***)

45 µm (red)
The analyte is completely retained up to fraction 10.

85 µm (blue)
Small amounts even break through with fraction 4.

45 µm particles provide better enrichment and breakthrough behavior for small adsorbent weights. When using larger adsorbent weights this effect is less pronounced, since then analytes have sufficient contact with the 85 µm adsorbent particles as well.

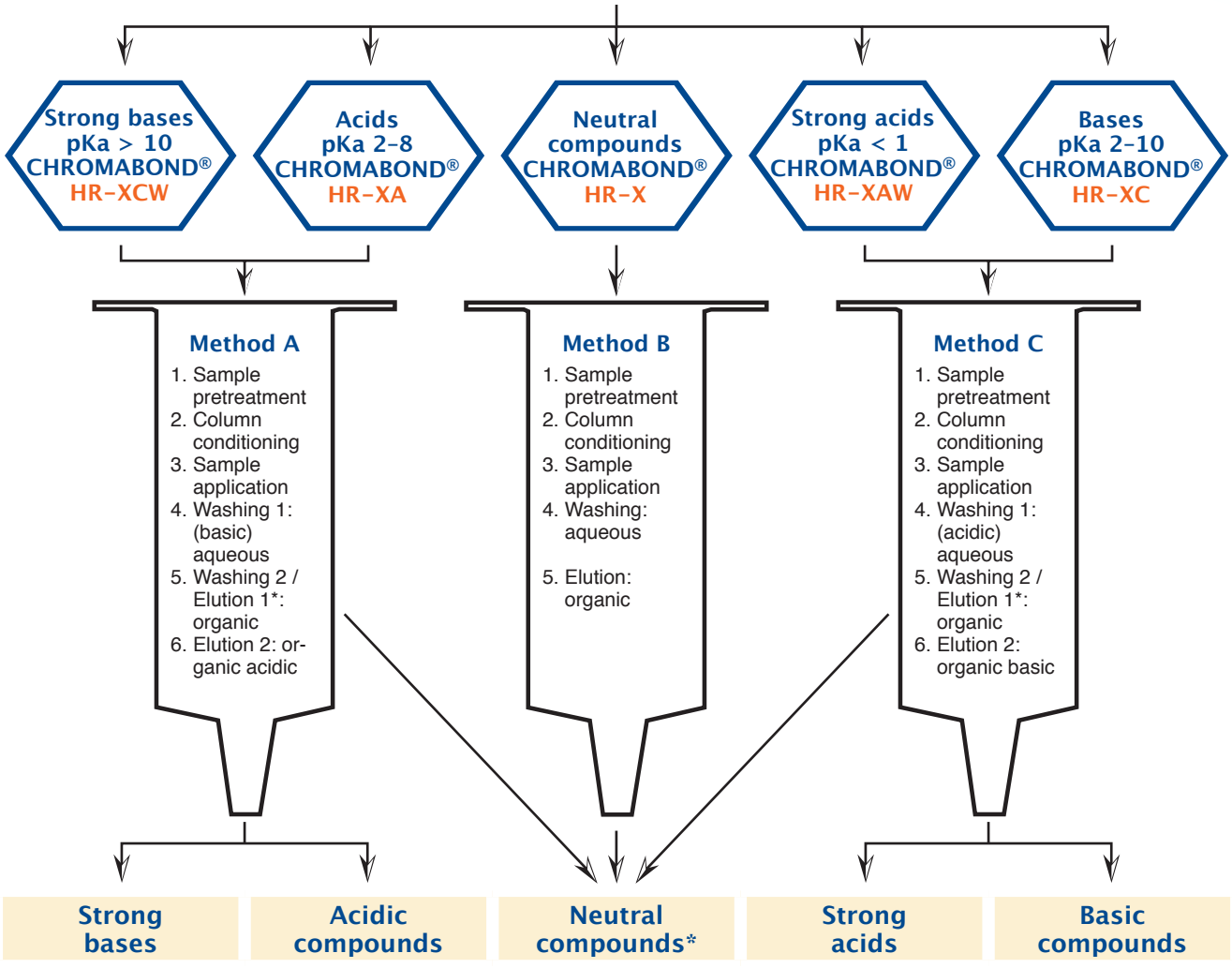


45 µm particles are ideal for small sample and elution volumes, while for large amounts of sample and adsorbent 85 µm particles show advantages due to better flow properties.

The CHROMABOND® HR-X*pert* concept for neutral, acidic and basic analytes

3 paths – 1 goal: cleaner samples

Depending on the character of the analytes HR-X*pert* offers suitable adsorbents and optimal methods for sample preparation, cleaning and concentration.



*** Under organic washing and elution conditions the following compounds will be also eluted:**

HR-X:	polar compounds such as organic acids and bases
HR-XC, HR-XCW:	acidic components and impurities
HR-XA, HR-XAW:	basic components and impurities

Polymer-based reversed phases for SPE

HR-X spherical, hydrophobic polystyrene-divinylbenzene adsorbent resin

- Hydrophobic polystyrene-divinylbenzene copolymer
  pH stability 1–14
  High-purity material with highest reproducibility and lowest blank values due to an optimized manufacturing process
  Spherical particles, size 45 µm and 85 µm (standard)
  pore size 55–60 Å; very high surface 1000 m^2/g
  capacity 390 mg/g (caffeine in water)
  Excellent recovery rates especially for the enrichment of pharmaceuticals and active ingredients due to the spherical structure of the particles, very homogeneous surface, and optimized pore structure
- Recommended application:
  Pharmaceuticals / active ingredients from tablets, creams and water / waste water
  Drugs and pharmaceuticals from urine, blood, serum and plasma
  Trace analysis of pesticides, herbicides, phenols, PAHs and PCBs from water

Drugs from water

Column type:
CHROMABOND® HR-X, 3 mL, 200 mg
REF 730931
Sample: 1 µg/mL each in water
Column conditioning: 5 mL methanol, 5 mL dist. water
Sample application: slowly aspirate 500 mL water (pH 3) through the column
Column washing: 5 mL water
Elution: after drying 3 x 2 mL acetonitrile

Further analysis: HPLC on NUCLEODUR® C_{18} Gravity, 5 µm; see MN Appl. No. 121690

Recovery rate [%]

Compound	HR-X	Strata™ X
Ketoprofen	98	92
Ibuprofen	91	93
Pentobarbital	99	95
Meclofenamic acid	92	93
Protriptyline	63	45
Nortriptyline	53	39

MN Appl. No. 304240

Pesticides from water

Column type:
CHROMABOND® HR-X, 3 mL, 200 mg
REF 730931
Sample pretreatment: samples are spiked with 500 ng of each pesticide in 1000 mL water, adjusted to pH 2 with HCl or pH 7
Column conditioning: 10 mL methanol, 10 mL dist. water
Sample application:
slowly pass 1000 mL spiked water sample through the column with the aid of a tubing adapter (REF 730243)
Elution: after drying 5 mL methanol – THF (1:1, v/v)

Further analysis: HPLC

Recovery rates [%]

Compound	HR-X pH 2
Metamitron	86
Quinmerac	90
Chloridazon	93
Picloram	83
Metribuzin	84
Cyanazine	83
Metabenzthiazuron	94
Chlortoluron	91
Isoproturon	89
Diuron	91
Dimethenamid-P	89
Linuron	94
Epoxyconazole	85
Penconazole	90
Alachlor	93
Propiconazole-1	89
Flufenacet	91
Diflufenicam	58
Triallate	42

Compound	HR-X pH 7
Desisopropylatrazine	90
2,4-Dichlorobenzamide	95
Desethylatrazine	89
Hexazinone	95
Bromacil	103
Simazine	91
Desethylterbuthylazine	89
Atrazine	88
Metalaxyl	97
Metazachlor	93
Propazine	88
Terbuthylazine	86
Metolachlor	97

MN Appl. No. 304250/304260

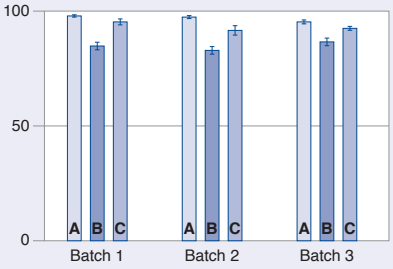
Options for online-SPE and automated SPE see page 53

Polymer-based reversed phases for SPE

Highest reproducibility

✓ within each batch ✓ from batch to batch

Compounds:
- A phenobarbital
- B pentobarbital
- C hexobarbital



Barbiturates from serum

Column type:
CHROMABOND® HR-X, 3 mL, 200 mg
REF 730931

Sample: 100 ng/mL each in serum
Column conditioning: 5 mL methanol, 5 mL dist. water
Sample application: 1 mL spiked serum
Column washing: 5 mL water
Elution: after drying 3 x 2 mL methanol

Further analysis: HPLC on NUCLEODUR® 100-5 C_{18} ec, see MN Appl. No. 117820

MN Appl. No. 304290

Standard protocol for CHROMABOND® HR-X

Column type:
CHROMABOND® HR-X, 3 mL, 200 mg
REF 730931

Sample pretreatment: if necessary, adjust pH value
Column conditioning: 5 mL methanol
Equilibration: 5 mL water
Sample application:
slowly aspirate the sample through the column
Column washing: 5 mL water – methanol (95:5, v/v)
Elution: after drying 3 x 2 mL methanol

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

MN Appl. No. 304310

Ordering information

CHROMABOND® HR-X polypropylene columns (85 µm)

Volume	30 mg	60 mg	100 mg	200 mg	500 mg	1 g	Pack of
1 mL	730934		730935				30
3 mL		730936		730931	730937		30
6 mL				730938	730939		30
15 mL					730940	730941	20

CHROMABOND® HR-X polypropylene columns (85 µm) · BIGpacks

Volume	200 mg	500 mg	Pack of
3 mL	730931.250		250
6 mL	730938.250	730939.250	250

CHROMABOND® HR-X polypropylene columns (45 µm) · *NEW!*

Volume	30 mg	60 mg	100 mg	200 mg	Pack of
1 mL	730934P45		730935P45		30
3 mL		730936P45		730931P45	30

CHROMABOND® LV-HR-X (85 µm)

Volume	30 mg	60 mg	200 mg	Pack of
15 mL	732130	732131	732132	30

CHROMABOND® MULTI 96 HR-X

96 x 10 mg (45 µm)	96 x 25 mg (45 µm)	96 x 50 mg (85 µm)	96 x 100 mg (85 µm)	Pack of
738530.010M	738530.025M	738530.050M	738530.100M	1

CHROMABOND® HR-X adsorbent (85 µm)

			730663	20 g

Solid Phase Extraction

Polymer-based ion exchangers for SPE

HR-XC

strong cation exchanger

- Strong acidic benzenesulfonic acid cation exchanger
  exchange capacity 1.0 meq/g, pKa < 1

  Base material polystyrene-divinylbenzene copolymer
  pH stability 1–14; high purity material, highest reproducibility and lowest blank values due to an optimized production process

  Spherical particles, size 45 µm and 85 µm (standard); pore size 65–75 Å
  very large specific surface 800 m^2/g; pore volume 1.4 cm^3/g
  RP capacity 300 mg/g (caffeine in water)

  Outstanding recovery rates especially for the enrichment of basic analytes

- Recommended application:

  Basic active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum

  Fungicides from food, melamine from milk

  Basic analytes like, e.g., amines; bases with **pKa 2–10**

Standard protocol for CHROMABOND® HR-XC

Column type:
CHROMABOND® HR-XC, 3 mL, 200 mg
REF 730952

Sample pretreatment: individual sample preparation with reference to analytes and matrix
Column conditioning: 5 mL methanol
Equilibration: 5 mL water
Sample application: slowly aspirate sample through the column
Washing 1: 2 mL 0.1 mol/L HCl in water
Washing 2 / Elution 1: 2 mL methanol (neutral and acidic compounds); if necessary, further washing steps
Elution 2: after drying 5 mL methanol – 5 % NH_3 (basic compounds)

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

MN Appl. No. 304740

Fractionation of acidic, neutral and basic

Column type:
CHROMABOND® HR-XC, 3 mL, 200 mg
REF 730952

Sample: 1 mL spiked matrix, acidified with 200 µL 2 % H_3PO_4
Column conditioning: 5 mL methanol, then 5 mL water
Sample application: slowly aspirate sample through the column
Washing: 2 mL 0.1 mol/L HCl
Elution: 2.5 mL methanol (fraction A: neutral and acidic analytes); then 5 mL methanol – NH_3 90:10, v/v (fraction B: basic analytes)

Further analysis for fraction A: HPLC, e.g., on NUCLEODUR® C_{18} Gravity, see MN Appl. No. 122230; for fraction B: HPLC on NUCLEODUR® C_8 Gravity, see MN Appl. No. 118520

Recovery rates [%]

Fraction A: neutral and acidic analytes

Compound	HR-XC
Suprofen	108
Naproxen	85
Tolmetin	73
Phenobarbital	108
Indomethacin	33
Hexobarbital	80

Fraction B: basic analytes

Compound	HR-XC	Oasis® MCX	Strata™ X-C
1. Doxepin	101	68	82
2. Imipramine	95	71	85
3. Amitriptyline	94	72	78
4. Trimipramine	92	70	81

MN Appl. No. 304780

Ordering information

Volume	Adsorbent weight						Pack of
CHROMABOND® HR-XC polypropylene columns (85 µm)							
	30 mg	60 mg	100 mg	150 mg	200 mg	500 mg	
1 mL	**730969**		**730049**				30
3 mL		**730956**			**730952**	**730953**	30
6 mL				**730957**		**730955**	30
CHROMABOND® HR-XC polypropylene columns (45 µm) · *NEW!*							
1 mL	**730969P45**		**730049P45**				30
3 mL		**730956P45**			**730952P45**		30
CHROMAFIX® HR-XC cartridges (85 µm)							
Size		**S**		**M**		**L**	
adsorbent weight ∅		155 mg		240 mg		500 mg	
		731755		**731756**		**731757**	30
CHROMABOND® HR-XC adsorbent (85 µm)							
						730664	100 g

Polymer-based ion exchangers for SPE

HR-XA

strong anion exchanger

- Strong basic quaternary ammonium anion exchanger
  exchange capacity 0.25 meq/g, pKa ~ 18

  Base material polystyrene-divinylbenzene copolymer
  pH stability 1–14; high purity material with highest reproducibility and lowest blank values due to an optimized production process

  Spherical particles, size 45 µm and 85 µm (standard); pore size 55–65 Å
  very large specific surface 850 m^2/g; pore volume 1.4 cm^3/g
  RP capacity 350 mg/g (caffeine in water)

  Outstanding recovery rates especially for the enrichment of acidic analytes

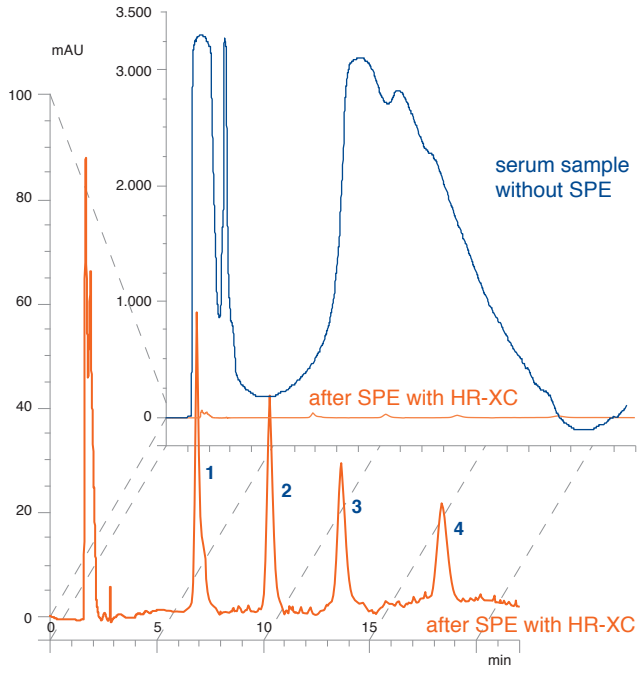
- Recommended application:

  Acidic active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum

  Phenolic acids, acidic herbicides

  Weak/medium-strength acids with **pKa 2–8**

analytes from serum



Standard protocol for CHROMABOND® HR-XA

Column type:
CHROMABOND® HR-XA, 3 mL, 200 mg
REF 730951

Sample pretreatment: individual sample preparation with reference to analytes and matrix
Conditioning: 5 mL methanol
Equilibration: 5 mL water
Sample application: slowly aspirate sample through the column
Washing 1: 2 mL 0.1 mol/L NaOH in water
Washing 2/Elution 1: 2 mL methanol (neutral and basic compounds), if necessary, further washing steps
Elution 2: after drying 5 mL methanol – 1 to 10 % formic acid (acidic compounds)

Further analyses: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

MN Appl. No. 304970

For further applications on CHROMABOND® polymer phases see our online application database at

www.mn-net.com/apps

Ordering information

	Volume	Adsorbent weight						Pack of
	CHROMABOND® HR-XA polypropylene columns (85 µm)							
		30 mg	60 mg	100 mg	150 mg	200 mg	500 mg	
	1 mL	**730968**		**730727**				30
	3 mL		**730950**			**730951**	**730954**	30
	6 mL				**730958**		**730966**	30
	CHROMABOND® HR-XA polypropylene columns (45 µm) · *NEW!*							
	1 mL	**730968P45**		**730727P45**				30
	3 mL		**730950P45**			**730951P45**		30
	CHROMAFIX® HR-XA cartridges (85 µm)							
	Size	**S**		**M**			**L**	
	adsorbent weight ∅	155 mg		240 mg			500 mg	
		731768		**731769**			**731770**	50
	CHROMABOND® HR-XA adsorbent (85 µm)							
							730671	100 g

Polymer-based ion exchangers for SPE

HR-XCW

weak cation exchanger

- Weak acidic carboxylic acid cation exchanger
  exchange capacity >0.7 meq/g, pKa ~ 5
  Base material spherical PS/DVB copolymer, pH stability 1–14
  high purity material, highest reproducibility and
  lowest blank values due to an optimized production process
  Spherical particles, size 45 µm and 85 µm (standard); pore size 50–60 Å
  very large specific surface 850 m^2/g; pore volume 1.2–1.4 cm^3/g
  RP capacity 350 mg/g (caffeine in water)
  Outstanding recovery rates especially for enrichment of strongly basic analytes
- Recommended application:
  Basic compounds like quaternary amines
  Active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum
  Strong bases with **pKa > 10**

Standard protocol for CHROMABOND® HR-XCW

Column type:
CHROMABOND® HR-XCW, 3 mL, 200 mg
REF 730739

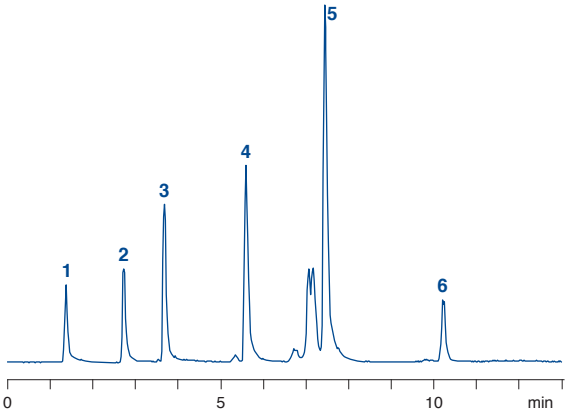
Sample pretreatment: individual sample preparation with reference to analytes and matrix
Column conditioning: 5 mL methanol
Equilibration: 5 mL acidified water
Sample application: slowly aspirate sample through the column
Washing 1: 2 mL acidified water
Washing 2 / Elution 1: 2 mL methanol (neutral and acidic compounds), if necessary, further washing steps
Elution 2: after drying 2 x 2 mL methanol – 1 to 5 % formic acid (strongly basic compounds)

Further analysis: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

MN Appl. No. 305300

Analysis of perfluorinated

Column: 125 x 2 mm NUCLEODUR® Sphinx RP, 3 µm
Eluent: A) 10 mmol/L NH_4Ac in water – methanol (75:25, v/v); B) 10 mmol/L NH_4Ac in acetonitrile – methanol (75:25, v/v)
10–30 % B in 3 min, 30–55 % B in 8 min, 55–10 % B in 4 min
Flow rate: 0.30 mL/min, temperature 50 °C
Injection: 2.5 µL (5 mg/L each after SPE enrichment)
Detection: MS, ESI negative



MN Appl. No. 123340

Ordering information

Volume	Adsorbent weight						Pack of
CHROMABOND® HR-XCW polypropylene columns (85 µm)							
	30 mg	60 mg	100 mg	150 mg	200 mg	500 mg	
1 mL	**730731**		**730733**				30
3 mL		**730735**			**730739**	**730741**	30
6 mL				**730737**		**730743**	30
CHROMABOND® HR-XCW polypropylene columns (45 µm) · *NEW!*							
1 mL	**730731P45**		**730733P45**				30
3 mL		**730735P45**			**730739P45**		30
CHROMAFIX® HR-XCW cartridges (85 µm)							
Size		**S**		**M**		**L**	
adsorbent weight ∅		155 mg		240 mg		500 mg	
		731774		**731775**		**731776**	50
CHROMABOND® HR-XCW adsorbent (85 µm)							
						730674	100 g

HR-XAW

weak anion exchanger

- Weak basic secondary and tertiary ammonium anion exchanger
  exchange capacity >0.5 meq/g, pKa ~ 6
  Base material spherical PS/DVB copolymer, pH stability 1–14
  high purity material with highest reproducibility and
  lowest blank values due to an optimized production process
  Spherical particles, size 45 µm and 85 µm (standard); pore size 55–65 Å
  very large specific surface 850 m^2/g; pore volume 1.2–1.4 cm^3/g
  RP capacity 350 mg/g (caffeine in water)
  Outstanding recovery rates especially for enrichment of acidic analytes

- Recommended application:
  Perfluorinated surfactants
  Acidic compounds like sulfonates
  Active ingredients from heavily matrix-contaminated samples like, e.g., urine, plasma, serum
  Strong acids with **pKa < 1**

surfactants from water

Application in accordance with DIN 38407-42

Column type:
CHROMABOND® HR-XAW, 3 mL, 60 mg
REF 730747

Sample: 500 mL water, spiked with 1 mL standard solution (20 µg/L of each compound)
Conditioning: 2 mL methanol + 5 % ammonia, then 2 mL methanol, finally 2 mL water
Sample application: slowly aspirate sample through the column
Washing: 2 mL water, then 2 mL acetone – acetonitrile – formic acid (50:50:1, v/v/v), finally 2 mL methanol
Elution: 2 mL methanol with 5 % ammonia

Further analysis: evaporate to dryness in a stream of nitrogen under slight heating, and redissolve in a suitable solvent for HPLC

Recovery rates [%]:

Compound	Recovery
1 Perfluoropropionic acid (PFPrA)	103
2 Perfluoropentanoic acid (PFPeA)	94
3 Perfluorohexanoic acid (PFHxA)	94
4 Perfluorooctanoic acid (PFOA)	95
5 Perfluorooctane sulfonate K salt (PFOS)	81
6 Perfluorododecanoic acid (PFDoDA)	82

MN Appl. No. 305140

impregnated with fluorosurfactants?

Standard protocol for CHROMABOND® HR-XAW

Column type:
CHROMABOND® HR-XAW, 3 mL, 200 mg
REF 730748

Sample pretreatment: individual sample preparation with reference to analytes and matrix
Conditioning: 5 mL methanol
Equilibration: 5 mL water
Sample application: slowly aspirate sample through the column
Washing 1: 25 mmol/L ammonium acetate
Washing 2 / Elution 1: 2 mL methanol (neutral and basic compounds), if necessary, further washing steps
Elution 2: after drying 2 x 2 mL methanol – 1 to 5 % ammonia (strongly acidic compounds)

Further analyses: if necessary, evaporate and redissolve in a suitable solvent; HPLC or GC

MN Appl. No. 305200

Ordering information

Volume	Adsorbent weight						Pack of
CHROMABOND® HR-XAW polypropylene columns (85 µm)							
	30 mg	60 mg	100 mg	150 mg	200 mg	500 mg	
1 mL	**730728**		**730729**				30
3 mL		**730747**			**730748**	**730744**	30
6 mL				**730749**		**730745**	30
CHROMABOND® HR-XAW polypropylene columns (45 µm) · *NEW!*							
1 mL	**730728P45**		**730729P45**				30
3 mL		**730747P45**			**730748P45**		30
CHROMAFIX® HR-XAW cartridges (85 µm)							
Size		**S**		**M**		**L**	
adsorbent weight ∅		155 mg		240 mg		500 mg	
		731771		**731772**		**731773**	50
CHROMABOND® HR-XAW adsorbent (85 µm)							
						730673	100 g

Polymer-based reversed phases for SPE

Easy polar, bifunctionally modified polystyrene-divinylbenzene copolymer

- Polar modified polystyrene-divinylbenzene copolymer with a weak anion exchanger
  Specific surface 650–700 m^2/g, particle size 80 µm, pore size 50 Å, pH stability 1–14

The Easy effect:

- Without preconditioning
- Due to bifunctional modification much more hydrophilic than conventional polystyrene-divinylbenzene polymers
- Easily wettable with water

- Recommended application:
  polar herbicides and pesticides from water (acidic, neutral, basic)
  polar phenols from water
  polyaromatic compounds
  polychlorinated biphenyls
  drug analysis from urine, blood, serum, plasma, pharmaceuticals and active ingredients from tablets, creams

Recovery of pesticides

Private communication: Mr. Kühn, GUB, Waldshut Tiengen, Germany

Column type:
CHROMABOND® Easy, 3 mL, 200 mg
REF 730754
Column conditioning:
1 mL water, 3 mL methanol, 1 mL water
Sample application:
aspirate the sample through the column
Elution:
3 x 1 mL acetone

Further analysis:
HPLC with NUCLEOSIL® 120-5 C_{18}

MN Appl. No. 303220

Recovery rates [%]:

Compound	Recovery	Compound	Recovery
Desisopropylatrazine	90	Metalaxyl	96
2,6-Dichlorobenzamide	93	Isoproturon	94
Desethylatrazine	93	Diuron	94
Hexazinone	69	Metazachlor	97
Terbacil	65	Propazine	95
Simazine	81	Terbuthylazine	93
Cyanazine	93	Linuron	96
Desethylterbuthylazine	91	Metolachlor	97
Methabenzthiazuron	94	Triallate	61
Chlortoluron	91	Standard	64
Atrazine	92		

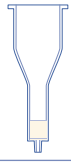
Ordering information

CHROMABOND® Easy polypropylene columns

Volume	30 mg	60 mg	100 mg	200 mg	500 mg	1 g	Pack of
1 mL	730751		730752				30
3 mL		730753		730754	730759		30
6 mL				730755	730756		30
15 mL					730757	730758	20

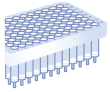
CHROMABOND® Easy polypropylene columns · BIGpacks

Volume	200 mg	Pack of
3 mL	730754.250	250
6 mL	730755.250	250



CHROMABOND® LV-Easy

Volume	200 mg	Pack of
15 mL	732472	30



CHROMABOND® MULTI 96 Easy

96 x 25 mg	96 x 50 mg	96 x 100 mg	
738520.025M	738520.050M	738520.100M	1

CHROMABOND® Easy adsorbent

730661		20 g

Glass columns on request.

HR-P

polystyrene-divinylbenzene adsorbent resin

- Highly porous polystyrene-divinylbenzene copolymer
  specific surface 1200 m^2/g
  particle size 50–100 µm
  very high binding capacity, up to 30% of adsorbent weight (for comparison: silica adsorbents about 3%)
- Recommended application:
  aromatic compounds
  phenols from water
  nitroaromatics from water
  pesticides from water
  PAHs from oil

Aromatic amines from water samples

Private communication M. Leß, T.C. Schmidt, Department of Chemistry, University Marburg, 1997

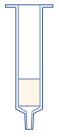
Compounds investigated: aromatic amines
Column type:
CHROMABOND® HR-P, 3 mL, 200 mg
REF 730108
Sample pretreatment: adjust to pH 9 using 10 mol/L NaOH
Column conditioning: 2 mL each of methanol, acetonitrile and 10^{-5} mol/L sodium hydroxide

Sample application:
aspirate sample through the column with about 10 mL/min
Column washing:
wash with 2 mL dist. water, dry 5 min under vacuum
Elution: 3 x 1 mL methanol – acetonitrile (1:1, v/v)

For recovery rates of numerous aromatic amines please see application 301810 at ***www.mn-net.com/apps***.

MN Appl. No. 301810

Ordering information



CHROMABOND® HR-P polypropylene columns

Volume	Adsorbent weight				Pack of
	100 mg	200 mg	500 mg	1 g	
1 mL	**730280**				30
3 mL		**730108**	**730117**		30
6 mL		**730119**	**730111**	**730118**	30

CHROMABOND® HR-P polypropylene columns · BIGpack

Volume	Adsorbent weight	Pack of
	200 mg	
3 mL	**730108.250**	250

CHROMABOND® HR-P glass columns

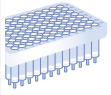
Volume	Adsorbent weight			Pack of
	200 mg	500 mg	1 g	
3 mL	**730108G**			30
6 mL		**730111G**	**730118G**	30

CHROMABOND® LV-HR-P

Volume	Adsorbent weight	Pack of
	200 mg	
15 mL	**732108**	30

CHROMAFIX® HR-P cartridges

Size	S	M	L	
Adsorbent weight ∅	200 mg	330 mg	680 mg	
	731839	**731840**	**731841**	50



CHROMABOND® MULTI 96 HR-P

	96 x 100 mg	
	738111.100M	1

CHROMABOND® HR-P adsorbent

	730615	20 g

Polymer-based phases for SPE

PS-RP / PS-OH⁻ / PS-H⁺ PS-Mix / PS-Ag⁺ / PS-Ba²⁺

phases for RP and ion chromatography

- Base material high purity polystyrene-divinylbenzene copolymers (PS/DVB), pore size 100 Å, particle size 100 µm

  Very low degree of swelling, thus very well suited for chromatography

  Reliable function over the whole pH range from 0–14

  Different modifications for different applications from elimination of nonpolar compounds up to the removal of specific polar components

- Recommended application:

  Removal of interfering compounds

  - Improves chromatographic separation, if the interfering components overlap with the analyte in the chromatogram
  - Improves lifetime of the chromatographic column, since interfering components can irreversibly block the column packing

  Enrichment of the analytes

Properties of the individual modifications:

PS-RP	hydrophobic PS/DVB copolymer	removal of organic interfering components from water
PS-OH⁻	strong PS/DVB anion exchanger, OH^- form capacity 0.6 meq/g	removal or concentration of anions from water increasing the pH value in acidic samples
PS-H⁺	strong PS/DVB cation exchanger, H^+ form capacity 2.9 meq/g	removal or concentration of cations from water decreasing the pH value of basic samples
PS-Mix	mixture of PS-OH⁻ and PS-H⁺	desalting of water
PS-Ag⁺	strong PS/DVB cation exchanger, Ag^+ form	removal of halide ions from water
PS-Ba²⁺	strong PS/DVB cation exchanger, Ba^{2+} form	removal of sulfate ions from water

Application 301930/302750: removal of halides from aqueous samples shown for the trace analysis of nitrate besides an excess of chloride or bromide

Compounds investigated: 20 ppm nitrate besides 2500 ppm chloride or 500 ppm bromide, respectively

Column type:
CHROMAFIX® PS-Ag⁺ (M)
0.8 mL, ∅ 480 mg, REF 731865

Column conditioning: 1 mL dist. water

Sample application and elution:
apply 4 x 1 mL sample fractions to the cartridge, discard 1st mL, collect 2nd, 3rd and 4th mL separately

Further analysis: HPLC with column 250 x 4 mm NUCLEOSIL® Anion II; eluent 2 mmol/L K H phthalate pH 6, 2 mL/min; detection: indirect UV, 280 nm (see applications 110440 and 110450 at ***www.mn-net.com/apps***)

Ordering information

CHROMABOND® PS polypropylene columns

Phase	3 mL 200 mg	3 mL 500 mg	6 mL 500 mg	6 mL 900 mg	Pack of
PS-RP	**730765**	**730692**	**730693**		30
PS-OH⁻	**730396**	**730344**	**730378**		30
PS-H⁺	**730690**	**730376**	**730377**		30
PS-Mix		**730394**		**730310**	30

CHROMAFIX® PS cartridges

Phase	Size S	Adsorbent weight ∅	Size M	Adsorbent weight ∅	Size L	Adsorbent weight ∅	Pack of
PS-RP	**731877**	200 mg	**731875**	320 mg			50
PS-OH⁻	**731868**	200 mg	**731860**	380 mg	**731862**	800 mg	50
PS-H⁺	**731867**	230 mg	**731861**	430 mg	**731863**	900 mg	50
PS-Mix	**731909**	230 mg					50
PS-Ag⁺	**731866**	240 mg	**731865**	480 mg			50
PS-Ba²⁺	**731871**	280 mg	**731870**	550 mg			50

C_{18} ec / C_{18} ec f (f = fast flow)

octadecyl silica, endcapped

- Base material silica, pore size 60 Å, particle size 45 µm for **C_{18} ec**, 100 µm for **C_{18} ec f** (for fast flow), specific surface 500 m^2/g, pH stability 2–8
- Octadecyl phases, endcapped, carbon content 14 %
- Very nonpolar, hydrophobic interactions with a wide variety of organic compounds
- Advantageous for clean-up of samples with large structural variations (polarity differences)
- Recommended application:
  nonpolar compounds
  aflatoxins, amphetamines, antibiotics, antiepileptics, barbiturates, caffeine, drugs, preservatives, fatty acids, nicotine, PAHs, pesticides, PCBs, heavy metals, vitamins
- very well suited for desalting of samples
- **C_{18} ec f** for viscous samples

Ordering information

CHROMABOND® C_{18} ec polypropylene columns

Volume	100 mg	200 mg	500 mg	1 g	2 g	5 g	10 g	Pack of
1 mL	**730011**							100
3 mL		**730012**	**730013**					50
6 mL			**730014**	**730015**	**730141**			30
15 mL					**730404**			20
45 mL						**730405**		20
70 mL							**730259**	10

CHROMABOND® C_{18} ec polypropylene columns · BIGpacks

Volume	500 mg	1 g	Pack of
3 mL	**730013.250**		250
6 mL	**730014.250**	**730015.250**	250

CHROMABOND® C_{18} ec glass columns

Volume	200 mg	500 mg	1 g	Pack of
3 mL	**730012G**	**730013G**		50
6 mL		**730014G**	**730015G**	30

CHROMABOND® LV-C_{18} ec

Volume	200 mg	500 mg	Pack of
15 mL	**732012**	**732013**	30

CHROMAFIX® C_{18} ec cartridges

Size	S	M	L	
Adsorbent weight ∅	270 mg	530 mg	950 mg	
	731804	**731805**	**731806**	50

CHROMABOND® MULTI 96 C_{18} ec

96 x 25 mg	96 x 50 mg	96 x 100 mg	
738011.025M	**738011.050M**	**738011.100M**	1

CHROMABOND® C_{18} ec adsorbent

		730611	100 g

CHROMABOND® C_{18} ec f polypropylene columns (fast flow)

Volume	200 mg	500 mg	1 g	Pack of
3 mL	**730269**	**730018**		50
6 mL		**730016**	**730010**	30

CHROMABOND® C_{18} ec f adsorbent (fast flow)

		730613	100 g

Silica-based reversed phases for SPE

C_{18} / C_{18} f (f = fast flow)

octadecyl silica

- Base material silica, pore size 60 Å, particle size 45 µm for **C_{18}**, 100 µm for **C_{18} f** (for fast flow), specific surface 500 m^2/g, pH stability 2–8
  Octadecyl phases, not endcapped, carbon content 14 %
  Similar to C_{18} ec, however possesses more free silanols (SiOH), which allow secondary interactions with polar groups of the analytes
- Recommended application:
  nonpolar compounds
  pesticides
  C_{18} f for viscous samples

Ordering information

CHROMABOND® C_{18} polypropylene columns

Volume	100 mg	200 mg	500 mg	1 g	2 g	5 g	10 g	Pack of
1 mL	730001							100
3 mL		730002	730003					50
6 mL			730004	730005	730130			30
15 mL					730028			20
45 mL						730400		20
70 mL							730261	10

CHROMABOND® C_{18} polypropylene columns · BIGpacks

Volume	500 mg	1 g	Pack of
3 mL	730003.250		250
6 mL	730004.250	730005.250	250

CHROMABOND® C_{18} glass columns

Volume	500 mg	1 g	Pack of
3 mL	730003G		50
6 mL	730004G	730005G	30

CHROMABOND® LV-C_{18}

Volume	200 mg	Pack of
15 mL	732002	30

CHROMAFIX® C_{18} cartridges

Size	S	M	L	
Adsorbent weight ∅	240 mg	480 mg	950 mg	
	731801	731802	731803	50

CHROMABOND® MULTI 96 C_{18}

96 x 25 mg	96 x 100 mg	
738001.025M	738001.100M	1

CHROMABOND® C_{18} adsorbent

730602	100 g

CHROMABOND® C_{18} f polypropylene columns (fast flow)

Volume	200 mg	500 mg	1 g	Pack of
3 mL	730402	730008		50
6 mL		730403	730009	30

CHROMABOND® C_{18} f adsorbent (fast flow)

730612	100 g

C_{18} Hydra

octadecyl silica for polar analytes

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8

  Special octadecyl phase for polar analytes, not end-capped, carbon content 15 %

- Recommended application:

  more polar compounds like pesticides and their polar degradation products, phenols, phenoxycarboxylic acids, nitroaromatics, pharmaceuticals

Pesticides from water

Compounds investigated: triazines and carboxylic amides

Column type:
CHROMABOND® C_{18} Hydra, 6 mL, 2 g
REF 730301

Sample pretreatment: adjust 1000 mL water to pH 7–8 with diluted NH_3 and add 100 µL of the internal standards (1 µg/L).

Column conditioning: 2 x 5 mL methanol, then 2 x 5 mL dist. water

Sample application: force or aspirate the sample through the column. Then dry for 2 h with 2 bar N_2.

Elution: slowly aspirate 10 mL methanol through the column. Evaporate the eluate to dryness in a tapered flask with a rotation evaporator at 30 °C and store in a refrigerator for ~ 15 min. Redissolve the residue in 200 µL cold, fresh *n*-hexane and transfer the solution to a conic HPLC vial (e.g., REF 702891). Store the solution in a refrigerator until chromatography.

Recovery rates: between 95 and 100 %

Further analysis: GC with OPTIMA® δ-3 or OPTIMA® δ-6 (e.g., application 250420) or HPLC in accordance with EN ISO 11369: 1997 on NUCLEOSIL® 120-3 C_{18} (application 110880)

MN Appl. No. 302060

Ordering information

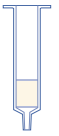
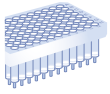
Volume	Adsorbent weight							Pack of
CHROMABOND® C_{18} Hydra polypropylene columns								
	50 mg	100 mg	200 mg	500 mg	1 g	2 g	3 g	
1 mL	**730294**	**730295**						100
3 mL			**730296**	**730297**	**730298**			50
6 mL				**730299**	**730300**	**730301**	**730302**	30
CHROMABOND® C_{18} Hydra glass columns								
			200 mg	500 mg	1 g			
3 mL			**730296G**	**730297G**	**730298G**			50
6 mL				**730299G**	**730300G**			30
CHROMABOND® LV-C_{18} Hydra								
			200 mg					
15 mL			**732295**					30
CHROMAFIX® C_{18} Hydra cartridges								
Size			**S**		**M**		**L**	
Adsorbent weight ∅			270 mg		530 mg		950 mg	
			731730		**731731**		**731732**	50
CHROMABOND® MULTI 96 C_{18} Hydra								
							96 x 100 mg	
							738294.100M	1
CHROMABOND® C_{18} Hydra adsorbent								
							730628	100 g

Silica-based reversed phases for SPE

C_8 — octyl silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Octyl phase, not endcapped, carbon content 8%
  Similar to C_{18}, however slightly more polar secondary interactions with polar compounds are more pronounced due to shorter alkyl chains
- Recommended application: pesticides, PCB

Ordering information

	Volume	Adsorbent weight				Pack of
	**CHROMABOND® C_8 polypropylene columns**					
		100 mg	200 mg	500 mg	1 g	
	1 mL	**730021**				100
	3 mL		**730022**	**730023**		50
	6 mL			**730024**	**730134**	30
	CHROMABOND® C_8 glass columns					
				500 mg		
	6 mL			**730024G**		30
	**CHROMABOND® LV-C_8**					
				500 mg		
	15 mL			**732023**		30
	**CHROMAFIX® C_8 cartridges**					
	Size			M		
	Adsorbent weight ∅			520 mg		
				731808		50
	**CHROMABOND® MULTI 96 C_8**					
					96 x 100 mg	
					738021.100M	1
	**CHROMABOND® C_8 adsorbent**					
					730601	100 g

C_4 butyl silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Butyl phase, not endcapped, carbon content 7%
  Slightly more polar than C_{18} or C_8, due to shorter alkyl chains the silica surface is not completely shielded
- Recommended application:
  compounds, which are too strongly retained on C_{18} or C_8
  e.g., analgetics from blood

Ordering information

Volume	Adsorbent weight			Pack of
CHROMABOND® C_4 polypropylene columns				
	100 mg	500 mg		
1 mL	**730225**			100
3 mL		**730227**		50
CHROMAFIX® C_4 cartridges				
Size	**S**	**M**		
Adsorbent weight ∅	220 mg	440 mg		
	731740	**731741**		50
CHROMABOND® C_4 adsorbent				
			730651	100 g

Glass columns, LV columns and MULTI 96 on request.

C_2 dimethyl silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Dimethyl phase, not endcapped, carbon content 4%
  Similar to C_4
- Recommended application:
  e.g., antiepileptics from plasma

Ordering information

Volume	Adsorbent weight			Pack of
CHROMABOND® C_2 polypropylene columns				
	100 mg	500 mg	1 g	
1 mL	**730169**			100
3 mL		**730221**		50
6 mL		**730409**	**730410**	30
CHROMABOND® C_2 adsorbent				
			730652	100 g

Glass columns, LV columns, CHROMAFIX® cartridges and MULTI 96 on request.

Silica-based reversed phases for SPE

C_6H_{11} ec — cyclohexyl silica, endcapped

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Cyclohexyl phase, endcapped, carbon content 9%
  Alternative phase for the midpolar range
- Recommended application:
  phenols from water
  chloroanilines from waste water
  anthelmintics from tissue

Comparison of different phases for phenol analysis

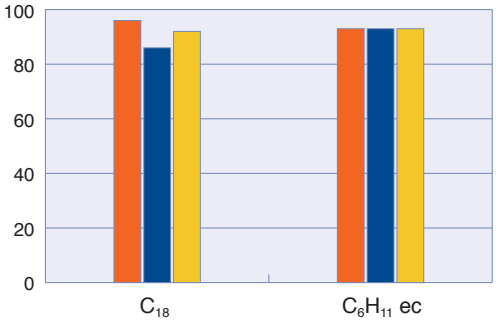
Compounds investigated:
phenol, 2,4-dinitrophenol, pentachlorophenol

Column types:
CHROMABOND® C_{18}, 6 mL, 2000 mg, REF 730130
CHROMABOND® C_6H_{11} ec, 6 mL, 2000 mg, REF 730469

Column conditioning:
10 mL acetone, 10 mL methanol, and 10 mL dist. water (pH 2)

Sample application:
aspirate the sample through the column.

Elution:
10 mL methanol



MN Appl. No. 302150

Ordering information

	Volume	Adsorbent weight		Pack of
	CHROMABOND® C_6H_{11} ec polypropylene columns			
		500 mg	1 g	
	3 mL	**730442**		50
	6 mL	**730443**	**730444**	30
	CHROMABOND® C_6H_{11} ec adsorbent			
			730631	100 g

Glass columns, LV columns, CHROMAFIX® cartridges and MULTI 96 on request.

For further applications on CHROMABOND® phases see our online application database at

www.mn-net.com/apps

C_6H_5 — phenyl silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8

  Phenyl phase, carbon content 8%

  Polarity similar to C_8

  In addition to hydrophobic interactions more selective adsorption is possible by π–π interactions due to the electron density of the phenyl ring.

- Recommended application:

  aflatoxins
  caffeine
  phenols

Flavor compounds from brandy

Compounds investigated: asarone, quinine, coumarin, quassin

Column type:
CHROMABOND® C_6H_5, 6 mL, 1000 mg
REF 730412

Sample pretreatment:
mix 10 mL sample with 90 mL water and 10 g sodium chloride and adjust to pH 7 with 0.1 mol/L sodium hydroxide solution

Column conditioning:
10 mL methanol, then 10 mL dist. water

Sample application:
slowly force or aspirate the sample through the column

Column washing:
2.5 mL water, then 2.5 mL pentane

Elution:
1) 2 x 2.5 mL pentane – diethyl ether (7:3, v/v): asarone, coumarin
2) 10 mL 1 mol/L basic methanol – diethyl ether (9:1, v/v): quinine
3) 5 mL chloroform: quassin

MN Appl. No. 300170

Ordering information

Volume	Adsorbent weight			Pack of
CHROMABOND® C_6H_5 polypropylene columns				
	100 mg	200 mg	500 mg	
1 mL	**730083**			100
3 mL		**730411**	**730084**	50
CHROMABOND® C_6H_5 adsorbent				
			730606	100 g

Glass columns, LV columns, CHROMAFIX® cartridges and MULTI 96 on request.

Silica-based normal phases for SPE

CN

cyanopropyl silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Cyanopropyl phase, carbon content 5.5 %
  Polar to midpolar
  In addition to weak hydrophobic interactions selective interactions are possible due to the high electron density of the CN group.
- Recommended application:
  cyclosporins
  carbohydrates

Ordering information

Volume	Adsorbent weight			Pack of
CHROMABOND® CN polypropylene columns				
	100 mg	200 mg	500 mg	
1 mL	**730061**			100
3 mL		**730420**	**730063**	50
6 mL			**730421**	30
CHROMABOND® CN adsorbent				
			730607	100 g

Glass columns, LV columns, CHROMAFIX® cartridges and MULTI 96 on request.

OH (Diol)

diol silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Diol phase, carbon content 5.5 %
  Polar
  Properties similar to SiOH
- Recommended application:
  antibiotics
  prostaglandins

Ordering information

Volume	Adsorbent weight			Pack of
CHROMABOND® OH (Diol) polypropylene columns				
	100 mg	200 mg	500 mg	
1 mL	**730051**			100
3 mL		**730417**	**730053**	50
6 mL			**730418**	30
CHROMABOND® OH (Diol) adsorbent				
			730605	100 g

Glass columns, LV columns, CHROMAFIX® cartridges and MULTI 96 on request.

Silica-based normal phases for SPE

NH_2 — aminopropyl silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Aminopropyl phase, carbon content 3.5 %
  Polar, weak anion exchanger
- Recommended application:
  trace elements
  lipids

Metals: trace elements from water

Compounds investigated: Al, Be, Cu, Cr(VI), Mo(VI), V(V)

Column type:
CHROMABOND® NH_2, 3 mL, 500 mg
REF 730033

Sample pretreatment:
mix 100 mL water sample with 5 mL 0.001 % alizarinsulfonic acid solution and adjust to pH 5.5 with acetic acid or sodium acetate

Column conditioning:
2 column volumes 1 mol/L nitric acid, then 2 column volumes dist. water

Sample application:
force or aspirate sample through the column with 3–4 mL/min

Column washing:
2 mL dist. water; dry column under vacuum for 4 min

Elution:
2 column volumes 2 mol/L nitric acid

MN Appl. No. 301910

Ordering information

Volume	Adsorbent weight				Pack of
CHROMABOND® NH_2 polypropylene columns					
	100 mg	200 mg	500 mg	1 g	
1 mL	**730031**				100
3 mL		**730413**	**730033**		50
6 mL			**730180**	**730626**	30
CHROMABOND® NH_2 polypropylene columns · BIGpack					
			500 mg		
3 mL			**730033.250**		250
CHROMABOND® NH_2 glass columns					
			500 mg	1 g	
3 mL			**730033G**		50
6 mL			**730180G**	**730626G**	30
CHROMABOND® LV-NH_2					
			500 mg		
15 mL			**732033**		30
CHROMAFIX® NH_2 cartridges					
Size		**S**			
Adsorbent weight ∅		220 mg			
		731813			50
CHROMABOND® MULTI 96 NH_2					
				96 x 100 mg	
				738031.100M	1
CHROMABOND® NH_2 adsorbent					
				730603	100 g

Silica-based normal phases for SPE

SiOH

unmodified silica

- Unmodified, weakly acidic silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8

  Very polar

  Adsorbs humidity from air, for this reason it should be kept well closed and if necessary dried before use

  Due to its high affinity for polar compounds it should not be conditioned with polar (e.g., methanol) or water-containing solvents.

- Recommended application:

  aflatoxins
  chloramphenicol
  pesticides
  steroids
  vitamins

Ordering information

CHROMABOND® SiOH polypropylene columns

Volume	100 mg	200 mg	500 mg	1 g	2 g	5 g	10 g	50 g	Pack of
1 mL	**730071**								100
3 mL		**730214**	**730073**						50
6 mL			**730070**	**730075**	**730107**				30
15 mL					**730217**				20
45 mL						**730406**			20
70 mL							**730072**		10
150 mL								**730473**	10

CHROMABOND® SiOH polypropylene columns · BIGpacks

Volume	500 mg	1 g	2 g	Pack of
3 mL	**730073.250**			250
6 mL		**730075.250**	**730107.250**	250

CHROMABOND® SiOH glass columns

Volume	200 mg	500 mg	1 g	2 g	Pack of
3 mL	**730214G**	**730073G**			50
6 mL		**730070G**	**730075G**	**730107G**	30

CHROMABOND® LV-SiOH

Volume	200 mg	500 mg	Pack of
15 mL	**732072**	**732073**	30

CHROMAFIX® SiOH cartridges

Size	S	M	L	
Adsorb. weight ∅	230 mg	420 mg	880 mg	
	731828	**731829**	**731830**	50

CHROMABOND® MULTI 96 SiOH

96 x 100 mg	
738071.100M	1

CHROMABOND® SiOH adsorbent

730608	100 g

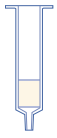
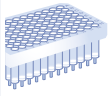
Alox A / Alox N / Alox B — aluminium oxide, acidic, neutral, basic

Aluminium oxide, high purity, pore volume 0.90 mL/g, particle size 60–150 µm, specific surface 150 m^2/g

Properties of the individual modifications:

Alox A:	aluminium oxide, acidic	pH value 4 ± 0.5
Alox N:	aluminium oxide, neutral	pH value 7 ± 0.5
Alox B:	aluminium oxide, basic	pH value 9.5 ± 0.5

Ordering information

	Phase	Volume	Adsorbent weight			Pack of
	**CHROMABOND® Alox polypropylene columns**					
			500 mg	1 g	4 g	
	Alox A	3 mL	**730452**			50
	Alox A	6 mL	**730453**	**730017**		30
	Alox A	45 mL			**730455**	20
	Alox N	3 mL	**730446**			50
	Alox N	6 mL	**730447**	**730139**		30
	Alox N	45 mL			**730250**	20
	Alox B	3 mL	**730429**			50
	Alox B	6 mL	**730466**	**730020**		30
	Alox B	45 mL			**730467**	20
	CHROMABOND® Alox glass columns					
				1 g		
	Alox N	6 mL		**730139G**		30
	Alox B	6 mL		**730020G**		30
	**CHROMABOND® LV-Alox**					
				1 g		
	Alox A	15 mL		**732210**		30
	Alox N	15 mL		**732091**		30
	Alox B	15 mL		**732205**		30
	**CHROMAFIX® Alox cartridges**					
		Size	**M**		**L**	
		Adsorb. weight ∅	850 mg		1700 mg	
	Alox N		**731844**		**731845**	50
	**CHROMABOND® MULTI 96 Alox**					
				96 x 100 mg		
	Alox A			**738253.100M**		1
	Alox N			**738251.100M**		1
	Alox B			**738252.100M**		1
	**CHROMABOND® Alox adsorbents**					
	Alox A				**730642**	100 g
	Alox N				**730641**	100 g
	Alox B				**730640**	100 g

Normal phases for SPE

Florisil®

magnesium silicate

- Matrix magnesium silicate (MgO – SiOH 15:85), high purity, particle size 150–250 µm
- Recommended application: organic tin compounds, aliphatic carboxylic acids, PCBs, PAHs

Ordering information

Volume	Adsorbent weight				Pack of
CHROMABOND® Florisil® polypropylene columns					
	200 mg	500 mg	1 g	2 g	
3 mL	**730457**	**730081**			50
6 mL		**730238**	**730082**	**730239**	30
CHROMABOND® Florisil® polypropylene columns · BIGpack					
			1 g		
6 mL			**730082.250**		250
CHROMABOND® Florisil® glass columns					
		500 mg	1 g	2 g	
6 mL		**730238G**	**730082G**	**730239G**	30
CHROMAFIX® Florisil® cartridges					
Size			**L**		
Adsorbent weight ∅			990 mg		
			731848		50
CHROMABOND® Florisil® adsorbent					
			730622		100 g

LV columns and MULTI 96 on request

PA

polyamide 6

- Matrix polyamide 6, unmodified, high purity, particle size 40–80 µm
- Recommended application: flavonoids, PAHs

Ordering information

Volume	Adsorbent weight			Pack of
CHROMABOND® PA polypropylene columns				
	200 mg	500 mg	1 g	
3 mL	**730384**	**730126**		50
6 mL		**730007**	**730127**	30
CHROMAFIX® PA cartridges				
Size	**S**		**L**	
Adsorbent weight ∅	170 mg		620 mg	
	731849		**731851**	50
CHROMABOND® PA adsorbent				
			730660	100 g

Glass columns, LV columns and MULTI 96 on request

PCA propylcarboxylic acid cation exchanger based on silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Propylcarboxylic acid modified silica
  Weakly acidic cation exchanger (WCX)
- Recommended application: strong cations

Ordering information

	Volume	Adsorbent weight			Pack of
	CHROMABOND® PCA polypropylene columns				
		500 mg	1 g		
	3 mL	**730482**			50
	6 mL	**730483**	**730484**		30
	CHROMABOND® LV-PCA				
		500 mg			
	15 mL	**732482**			30
	CHROMABOND® PCA adsorbent				
				730629	100 g

Glass columns, CHROMAFIX® cartridges and MULTI 96 on request.

PSA propylsulfonic acid cation exchanger based on silica

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Propylsulfonic acid modified silica
  Very strong cation exchanger (capacity ~ 0.7 meq/g)
  Contrary to the SA phase no π–π interactions
- Recommended application: weak cations

Ordering information

	Volume	Adsorbent weight				Pack of
	CHROMABOND® PSA polypropylene columns					
		100 mg	500 mg	1 g		
	1 mL	**730460**				100
	3 mL		**730462**			50
	6 mL			**730464**		30
	CHROMABOND® PSA adsorbent					
					730630	100 g

Glass columns, LV columns, CHROMAFIX® cartridges and MULTI 96 on request.

Silica-based ion exchangers for SPE

SA — benzenesulfonic acid cation exchanger based on silica (SCX)

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Benzenesulfonic acid modified silica
  strongly acidic cation exchanger (capacity ~ 0.5 meq/g)
  adsorbent with hydrophobic and π–π interactions (benzene ring)
  Ion exchange of organic compounds from aqueous matrix
  elution of interesting compounds with solvent systems, which compensate the ionic and nonpolar interactions, e.g., methanolic HCl

- Recommended application:
  amino acids
  amines
  chlorophyll
  PCB

Sulfonamides in meat and kidney

B. Pacciarelli et al., Mitt. Gebiete Lebensm. Hyg. 82 (1991) 45–55

Compounds investigated: sulfaguanidine, sulfanilamide, sulfadiazine, sulfathiazole, sulfapyridine, sulfamerazine, sulfamethizole, sulfadimidine, sulfamethoxypyridazine, sulfachlorpyridazine, sulfadoxine, sulfadimethoxine

Column type:
CHROMABOND® SA (≡ SCX), 3 mL, 500 mg
REF 730077

Sample pretreatment: homogenize 10 g sample and 60 mL dichloromethane – acetone (1:1, v/v) for 30 s with a Polytron. Centrifuge the homogenate for 10 min at 2500 rpm. Filter the organic phase and wash the filter residue with a little dichloromethane – acetone. Add 5 mL glacial acetic acid to the filtered extract.

Column conditioning: apply 6 mL hexane and suck air until the column is dry (10 min). Then apply 6 mL dichloromethane – acetone – glacial acetic acid (10:10:1, v/v/v). Now the column must not run dry.

Sample application: 1/10 of the extract volume, flow rate about 2 mL/min; the column must not run dry

Column washing: 5 mL water, then 5 mL methanol; dry for 10 min under vacuum. Now suck NH_3 gas through the column until the acid is neutralized. To control the neutralization process, press air through the column: a wet pH paper should indicate a neutral or basic pH value.

Elution: 3 mL methanol (1–2 mL/min); carefully concentrate the eluate on a rotation evaporator (40 °C/100 mbar), dissolve the residue in 0.5 mL of 5.5 % acetonitrile in buffer (1.641 g sodium acetate in 1 L water, adjusted to pH 5 with glacial acetic acid) and centrifuge.

Further analysis: HPLC

MN Appl. No. 302710

Ordering information

Volume	Adsorbent weight				Pack of
CHROMABOND® SA polypropylene columns					
	100 mg	200 mg	500 mg	1 g	
1 mL	**730076**				100
3 mL		**730275**	**730077**		50
6 mL			**730425**	**730212**	30
CHROMABOND® SA polypropylene columns · BIGpack					
			500 mg		
3 mL			**730077.250**		250
CHROMABOND® LV-SA					
			500 mg		
15 mL			**732083**		30
CHROMAFIX® SA cartridges					
Size	**S**		**M**	**L**	
Adsorbent weight ∅	220 mg		450 mg	920 mg	
	731831		**731832**	**731833**	50
CHROMABOND® MULTI 96 SA					
				96 x 100 mg	
				738141.100M	1
CHROMABOND® SA adsorbent					
				730609	100 g

Glass columns on request

SB quaternary ammonium anion exchanger based on silica (SAX)

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Silica modified with quaternary amine
  strongly basic anion exchanger (capacity ~ 0.3 meq/g)
  Not suited for very strong anions such as sulfonic acids, because these are difficult to elute
- Recommended application:
  organic acids
  caffeine
  saccharin

Vitamins: folic acid from food (e.g., wheat germs)

Column type:
CHROMABOND® SB (≡ SAX), 3 mL, 500 mg
REF 730079

Sample pretreatment:
homogenize 10 g food sample in 100 mL 0.01 mol/L phosphate buffer pH 7.4 and filter

Column conditioning: 2 column volumes *n*-hexane, then 2 column volumes methanol, finally 2 column volumes dist. water

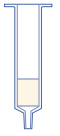
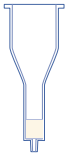
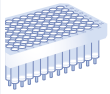
Sample application: force or aspirate 10 mL of the filtrate through the column

Column washing: 2 column volumes dist. water

Elution: 5 mL 10 % sodium chloride in 0.1 mol/L sodium acetate buffer

MN Appl. No. 300650

Ordering information

	Volume	Adsorbent weight				Pack of
	**CHROMABOND® SB polypropylene columns**					
		100 mg	200 mg	500 mg	1 g	
	1 mL	**730078**				100
	3 mL		**730322**	**730079**		50
	6 mL			**730426**	**730323**	30
	CHROMABOND® SB polypropylene columns · BIGpack					
				500 mg		
	3 mL			**730079.250**		250
	**CHROMABOND® LV-SB**					
				500 mg		
	15 mL			**732088**		30
	**CHROMAFIX® SB cartridges**					
	Size	**S**		**M**	**L**	
	Adsorbent weight ∅	230 mg		460 mg	920 mg	
		731834		**731835**	**731836**	50
	**CHROMABOND® MULTI 96 SB**					
					96 x 100 mg	
					738101.100M	1
	**CHROMABOND® SB adsorbent**					
					730610	100 g

Glass columns on request

Special SPE phases · pharmaceutical analyses

Drug

special silica phase for drug analysis

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Special bifunctional modification – C_8 / SA (strong cation exchanger – benzenesulfonic acid)
- Recommended application:
  enrichment of acidic, neutral and basic drugs from urine or plasma

Drugs from blood serum

W. Weinmann, M. Renz, C. Pelz, P. Brauchle, S. Vogt, S. Pollak, Blutalkohol **35** (1998), 1–9

Compounds investigated:
benzoylecgonine, amphetamine, codeine, morphine

Column type:
CHROMABOND® Drug, 3 mL, 200 mg
REF 730168

Sample pretreatment:
0.1 mL blood serum are mixed with 1.4 mL of a 0.1 mol/L KH_2PO_4 buffer (pH 6) and centrifuged

Column conditioning:
2 mL methanol, then 2 mL 0.1 mol/L KH_2PO_4 buffer (pH 6)

Sample application:
slowly force or aspirate the supernatant from the sample pretreatment through the column

Column washing:
2 mL 0.1 mol/L KH_2PO_4 buffer (pH 6), then 1 mL 0.1 mol/L acetic acid, then 2 mL methanol;
finally dry the column first by centrifugation (2 min, 4000 U/min), then under vacuum for 10 min

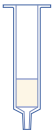
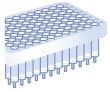
Elution:
1.5 mL dichloromethane – 2-propanol – 25 % ammonia solution (80:20:2, v/v/v)

Further analysis: HPLC with NUCLEOSIL® 100-5 C_{18} AB (application 110240) or GC/MS after derivatization with perfluoropropanoic acid anhydride/pentafluoropropanol, e.g., with column OPTIMA® 5 MS, 0.25 mm film, 30 m x 0.25 mm ID, (REF 726220.30)

MN Appl. No. 302020

Poppy seeds as source of opiates

Ordering information

	Volume	Adsorbent weight			Pack of
	**CHROMABOND® Drug polypropylene columns**				
		100 mg	200 mg	500 mg	
	1 mL	**730681**			100
	3 mL		**730168**	**730684**	50
	6 mL			**730682**	30
	CHROMABOND® Drug polypropylene columns · BIGpack				
			200 mg		
	3 mL		**730168.250**		250
	**CHROMABOND® LV-Drug**				
			200 mg		
	15 mL		**732168**		30
	**CHROMABOND® MULTI 96 Drug**				
				96 x 100 mg	
				738161.100M	1

Drug II

extraction of THC and derivatives, acidic analytes from biological fluids (urine, blood, etc.)

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8

  Special bifunctional modification – C_8 / SB (strong anion exchanger – quaternary amine $-NR_3^+$)

  Two primary retention mechanisms facilitate use of very strong interferant-eluting solvents, resulting in very pure extracts

- Recommended application:

  extraction of THC and derivatives from urine, blood, serum, plasma

  acidic analytes from biological fluids

11-nor-Δ9-THC-carboxylic acid from urine

Compounds investigated:
tetrahydrocannabinol, 11-nor-Δ9-THC-carboxylic acid

Column type:
CHROMABOND® Drug II, 3 mL, 200 mg
REF 730680

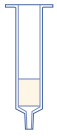
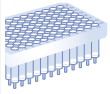
Sample pretreatment: add 300 µL 10 mol/L potassium hydroxide solution and internal standard (for GC/MS deuterium labeled 11-nor-9-THC-carboxylic acid) to 5 mL urine. Vortex the sample and then hydrolyze at 60 °C for 15 min. Cool sample and add 200 µL glacial acetic acid and 2 mL 50 mmol/L ammonium acetate solution. If necessary, adjust sample pH to 6–7.
Column conditioning: 2 mL methanol, 2 mL dist. water; equilibrate column with 2 mL 50 mmol/L ammonium acetate buffer
Sample application: slowly force or aspirate the sample through the column (1–2 mL/min)
Column washing: elute interferants with 10 mL methanol – water (1:1, v/v); dry the column for 10 min at high vacuum; further wash the column with 2 mL acetonitrile and dry for another 2 min
Elution: elute THC metabolites with 3 mL hexane – ethyl acetate – glacial acetic acid (75:25:1, v/v/v)

Further analysis: we recommend GC/MS on an OPTIMA® 5 MS column after derivatization with 50 µL SILYL-991 (REF 701480; BSTFA – TMCS 99:1) at 70 °C for 20 min; inject 1–2 µL onto the GC column.

Recovery rates: 70–80 %

MN Appl. No. 303880

Ordering information

	Volume	Adsorbent weight			Pack of
	**CHROMABOND® Drug II polypropylene columns**				
		100 mg	200 mg	500 mg	
	1 mL	**730685**			100
	3 mL		**730680**	**730686**	50
	6 mL			**730683**	30
	**CHROMABOND® LV-Drug II**				
			200 mg		
	15 mL		**732681**		30
	**CHROMABOND® MULTI 96 Drug II**				
				96 x 100 mg	
				738680.100M	1

SPE phases for pharmaceutical applications

Crosslinks — special phase for enrichment of collagen crosslinks

- Special cellulose phase for enrichment of collagen crosslinks
- Recommended application: collagen crosslinks in urine

Pyridinoline and deoxypyridinoline are collagen crosslinks occurring in bones and cartilage. If these substances are released, they can be detected in the urine. In cases of increased bone catabolism (e.g., during osteoporosis) the urine concentrations of pyridinoline and deoxypyridinoline are increased.

Pyridinium crosslinks from urine

Compounds investigated: pyridinoline, deoxypyridinoline

Column type:
CHROMABOND® Crosslinks, 3 mL, 300 mg
REF 730458

Sample pretreatment: 250 µL urine and 50 µL of an internal standard (e.g., pyridoxine) are hydrolyzed in 250 µL conc. HCl at about 100–105 °C for 12–16 h. Then 2.5 mL wash solution (*n*-butanol – glacial acetic acid 80:20, v/v) are added to the hydrolyzate.

Column conditioning:
5 mL of the wash solution

Sample application:
force or aspirate the pre-treated sample through the column. Discard the flow-through. Wash with 15–25 mL of the wash solution.

Elution:
force or aspirate 3–5 mL dist. water through the column

MN Appl. No. 302070

Ordering information

Volume	Adsorbent weight	Pack of
CHROMABOND® Crosslinks polypropylene columns		
	300 mg	
3 mL	**730458**	50

Product for research purposes only (see page 325)

Tetracycline — special phase for enrichment of tetracyclines

- Silica phase with special C_{18} modification, tested for tetracyclines
  Constant recovery rates for the title compounds (every batch individually tested)
- Recommended application: tetracyclines from biological samples

Tetracyclines from musculature

Private communication of Mr. Lippold, Chemisches Landesuntersuchungsamt (Chem. Research Agency) Freiburg, Germany

Compounds investigated:
tetracycline, oxytetracycline, chlorotetracycline (100–500 mg/kg)

Column type:
CHROMABOND® Tetracycline, 6 mL, 500 mg
REF 730315

Sample pretreatment:
see detailed description in appl. 302030 at
www.mn-net.com/apps

Column conditioning:
1 column volume methanol, 1 column volume dist. water, then 1 column volume EDTA – succinate buffer
CAUTION: DO NOT LET THE COLUMN RUN DRY!

Sample application:
force or aspirate 50 mL of the eluate from the sample pretreatment through the CHROMABOND® column

Column washing:
2 mL dist. water (removal of Cu ions), 2 mL *n*-hexane

Elution: 7.5 mL methanol into a 25-mL tapered flask. Add 1 mL of an ethylene glycol – methanol mixture (22 g ethylene glycol filled up to 100 mL with methanol) and evaporate to dryness with a rotation evaporator (max. 40 °C). Fill up the residue to 400 mL with 0.1 mol/L McIlvain-EDTA buffer (52.5 g citric acid · H_2O, 44.5 g $Na_2HPO_4 \cdot H_2O$ and 93 g Titriplex III dissolved in 2.5 L dist. water, adjusted to pH 4 with NaOH).

Further analysis:
HPLC with column 250 x 4 mm NUCLEOSIL® 100-5 C_{18} HD (application 110710)
Recovery rates: tetracycline, chlorotetracycline ~ 50–70 %, oxytetracycline ~ 60–80 %

MN Appl. No. 302030

Ordering information

	Volume	Adsorbent weight	Pack of
	CHROMABOND® Tetracycline polypropylene columns		
		500 mg	
	6 mL	**730315**	30
	Product for research purposes only (see page 325)		

HR-P-AOX

AOX from waters with high salt loads (DIN 38409 – H22)

- Special PS/DVB phase
- Recommended application:
  extraction of AOX (adsorbable organically bonded halogens) from waters containing high salt loads or organic pollutants in accordance with DIN 38409 – H22

AOX from water (DIN 38409 – H22)

Column type:
CHROMABOND® HP-P-AOX, 6 mL, 500 mg
REF 730111.AOX

Column conditioning:
5 mL methanol, 10 mL dist. water.
Do not let the column run dry!

Sample application:
force or aspirate 100 mL original or diluted sample (pH 1) through the column (3–5 mL/min).
Do not let the column run dry!

Column washing:
50 mL nitrate rinsing solution (dissolve 17 g $NaNO_3$ in 100 mL dist. water, add 1.4 mL HNO_3 10 mol/L, fill up to 1000 mL; take 50 mL and fill to 1000 mL with dist. water). Discard the flow-through.

Elution:
slowly aspirate 1 x 1 mL, then 1 x 4 mL methanol and 10 mL dist. water through the column.
Collect eluates in 100 mL volumetric flask and fill to 100 mL with dist. water.

MN Appl. No. 302080

Ordering information

	Volume	Adsorbent weight		Pack of
	CHROMABOND® HR-P-AOX polypropylene columns			
		200 mg	500 mg	
	6 mL	**730119.AOX**	**730111.AOX**	30

SPE phases for environmental analysis

C_{18} PAH

octadecyl silica for PAH analysis

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Special octadecyl modification for enrichment of PAH, not endcapped, carbon content 14 %
- Recommended application:
  PAHs from water

PAHs from water

Column type:
CHROMABOND® C_{18} PAH, 6 mL, 2 g
REF 730166

Sample pretreatment:
mix 1000 mL water sample with 10 mL methanol

Column conditioning:
1 column volume methanol, then 1 column volume dist. water

Sample application: aspirate 1000 mL water sample through the column (~ 15–20 mL/min), then dry column (stream of nitrogen or 24 h in a desiccator over P_2O_5)

Elution: elute with 4 mL acetonitrile – toluene (3:1, v/v) and then evaporate or fill up to the volume required

Recovery rates (50 ng/L per component): naphthalene 87 %, acenaphthylene 89 %, acenaphthene 90 %, fluorene 82 %, phenanthrene 85 %, anthracene 90 %, fluoranthene 89 %, pyrene 89 %, benz[a]anthracene 87 %, chrysene 95 %, benzo[b]-fluoranthene 91 %, benzo[k]fluoranthene 89 %, benzo[a]pyrene 90 %, dibenz[ah]anthracene 97 %, benzo[ghi]perylene 91 %, indeno[1,2,3-cd]pyrene 96 %

MN Appl. No. 301250

Ordering information

	Volume	Adsorbent weight	Pack of
	CHROMABOND® C_{18} PAH polypropylene columns		
		2 g	
	6 mL	**730166**	30
	CHROMABOND® C_{18} PAH glass columns		
	6 mL	**730166G**	30
	**CHROMABOND® C_{18} PAH adsorbent**		
		730616	100 g

NH_2/C_{18}

combination phase for PAH analysis

- Special combination phase:
  aminopropyl phase for removal of interfering humic acids
  octadecyl phase for enrichment of PAH
- Recommended application:
  PAHs from water containing humic acids

PAHs from water containing humic acids

Column type:
CHROMABOND® NH_2/C_{18}, 6 mL, 500 mg/1 g glass column
REF 730620G

Sample pretreatment:
mix 500 mL water sample with 25 mL 2-propanol

Column conditioning: 10 mL dichloromethane, 10 mL methanol, then 10 mL dist. water – 2-propanol (9:1, v/v)

Sample application: aspirate 500 mL prepared water sample through the column (~ 5 mL/min)

Column washing: 2 mL dist. water – 2-propanol (9:1, v/v), then dry column (about 20 min, vacuum)

Elution: 4 x 0.5 mL CH_2Cl_2 (let percolate first 0.5 mL into the column packing without vacuum, then apply light vacuum), if necessary evaporate in a stream of N_2 and fill up with a suitable solvent

MN Appl. No. 301260

Ordering information

Volume	Adsorbent weight		Pack of
CHROMABOND® NH_2/C_{18} polypropylene columns			
	500/500 mg	500 mg/1 g	
6 mL	**730618**	**730620**	30
CHROMABOND® NH_2/C_{18} glass columns			
6 mL	**730618G**	**730620G**	30

Na_2SO_4/Florisil®

hydrocarbons from water in accordance with DIN H-53 / ISO DIS 9377-4

- Special combination phase of sodium sulfate and Florisil®
- Recommended application: hydrocarbons from drinking, surface and waste waters

Hydrocarbons from water

Column type:
CHROMABOND® Na_2SO_4/Florisil®, 6 mL, 2 g/2 g, glass column, REF 730249G

Internal standard solution:
dissolve 20 mg *n*-tetracontane ($C_{40}H_{82}$) in petroleum ether, add 20 mL *n*-decane ($C_{10}H_{22}$) and fill up to one liter with petroleum ether. For preparation of the extraction solution dilute standard solution 1:10 with petroleum ether.

Sample pretreatment:
adjust 900 mL water (10 °C) with HCl (12 mol/L) to pH 2 and add 80 g $MgSO_4$. Add 50 mL of the extraction solution, close the bottle and stir the suspension intensely for 30 min. Add enough dist. water to separate the organic from the aqueous phase.

Column conditioning: 5 mL petroleum ether

Sample application:
slowly aspirate or force the sample through the column

Elution:
wash with 10 mL petroleum ether. Evaporate the combined solution from sample application and elution to 1 mL at about 75 °C. If necessary, fill up to 1 mL again. (If the hydrocarbon content is high, evaporation to 1 mL may not be necessary.)

Recovery rates: must be > 80 % for *n*-tetracontane.

MN Appl. No. 302090

Ordering information

Volume	Adsorbent weight	Pack of
CHROMABOND® Na_2SO_4/Florisil® polypropylene columns		
	2 g/2 g	
6 mL	**730249**	30
CHROMABOND® Na_2SO_4/Florisil® glass columns		
	2 g/2 g	
6 mL	**730249G**	30
CHROMABOND® Na_2SO_4/Florisil® glass columns · BIGpack		
	2 g/2 g	
6 mL	**730249G.250**	250

SPE phases for environmental analysis

CN/SiOH — combination phase for PAH analysis

- Special combination phase
  cyanopropyl phase for selective adsorption of polycyclic aromatics via π–π interactions
  unmodified silica phase for removal of polar compounds
- Recommended application:
  extraction of the 16 PAHs according to EPA from soil samples

PAHs from soil

Column type:
CHROMABOND® CN/SiOH, 6 mL, 500/1000 mg
REF 730135

Sample pretreatment:
dry 30 g soil with sodium sulfate and reflux 4 h with 250 mL petroleum ether in a Soxhlet extractor. For low PAH contents (colorless or weakly colored extracts) concentrate extract to 1/10 of its volume in a rotation evaporator.

Column conditioning:
4 mL petroleum ether

Sample application:
aspirate 20 mL of the extract through the column

Column washing: 2 mL petroleum ether

Elution:
2 x 2 mL acetonitrile – toluene (3:1, v/v), then evaporate or fill to the volume required

Further analysis: HPLC, e.g., with column 100 x 4 mm NUCLEODUR® C_{18} PAH, 3 µm, REF 760783.40 according to application 123820 (see page 168)

For recovery rates see application 301310 at ***www.mn-net.com***

MN Appl. No. 301310

Ordering information

Volume	Adsorbent weight	Pack of
CHROMABOND® CN/SiOH polypropylene columns		
	500 mg/1 g	
3 mL	**730112**	50
6 mL	**730135**	30
CHROMABOND® CN/SiOH polypropylene columns · BIGpack		
	500 mg/1 g	
6 mL	**730135.250**	250
CHROMABOND® CN/SiOH glass columns		
	500 mg/1 g	
6 mL	**730135G**	30

NAN — special phase for PCB analysis

- Special combination phase:
  N: sodium sulfate for removal of trace water;
  A: SiOH/$AgNO_3$ phase for removal of sulfur, sulfur-containing and polar compounds
- Recommended application
  extraction of PCB from sludge

PCB from sludge

Compounds investigated: polychlorinated biphenyls (PCB)
This method can also be used for soil samples.

Column type:
CHROMABOND® NAN, 6 mL, 700/2000/700 mg
REF 730149

Sample pretreatment: extract 2 g lyophilized sludge with 70 mL *n*-hexane, evaporate extract and fill to 10 mL with *n*-hexane

Column conditioning: 10 mL *n*-hexane
Sample application: aspirate 2 mL extract into the column
Elution: slowly aspirate 40 mL *n*-hexane through the column with light vacuum, then evaporate and fill to 5 mL with *n*-hexane
Recovery rates:
PCB-28 104 %, PCB-52 100 %, PCB-101 99 %, PCB-138 98 %, PCB-153 101 %, PCB-180 98 %, PCB-209 104 %

MN Appl. No. 301400

Ordering information

Volume	Adsorbent weight	Pack of
CHROMABOND® NAN polypropylene columns		
	400/1400/400 mg	700/2000/700 mg	
3 mL	**730109**		50
6 mL		**730149**	30
CHROMABOND® NAN polypropylene columns · BIGpack		
		700/2000/700 mg	
6 mL		**730149.250**	250
CHROMABOND® NAN glass columns		
		700/2000/700 mg	
6 mL		**730149G**	30
CHROMABOND® NAN adsorbent		
		730619*	100 g

* This product contains harmful substances which must be specially labeled as hazardous. For detailed information please see MSDS.

SA/SiOH — combination phase for PCB analysis

- Special combination phase:
  SA: strongly acidic cation exchanger based on silica with benzenesulfonic acid modification
  SiOH: unmodified silica for removal of polar compounds
- Recommended application:
  extraction of PCBs from waste oil (hexane extract)

PCB from waste oil

Column type:
CHROMABOND® SA/SiOH, 3 mL, 500/500 mg
REF 730132

Column conditioning: 1 mL *n*-hexane
Sample application: apply 250 µL waste oil sample to the column and aspirate or force it into the adsorbent with 2 x 1 mL *n*-hexane

MN Appl. No. 301390

Elution: aspirate or force another 2 x 500 µL *n*-hexane through the column; collect all *n*-hexane fractions and if necessary adjust concentration for subsequent analysis by either evaporating *n*-hexane in a stream of nitrogen or by dilution with *n*-hexane
Recovery rates:
PCB-28 97 %, PCB-52 96 %. PCB-101 95 %, PCB-138 90 %, PCB-153 95 %, PCB-180 96 %, PCB-209 100 %

Ordering information

Volume	Adsorbent weight	Pack of
CHROMABOND® SA/SiOH polypropylene columns		
	500/500 mg	
3 mL	**730132**	50
6 mL	**730235**	50
CHROMABOND® SA/SiOH polypropylene columns · BIGpack		
	500/500 mg	
3 mL	**730132.250**	250

SPE phases for environmental analysis

SiOH-H_2SO_4/SA — combination phase for PCB analysis

- Special combination phase

  SiOH-H_2SO_4: H_2SO_4-impregnated silica phase for oxidation of accompanying compounds to ionic and/or polar compounds

  SA: strongly acidic cation exchanger based on silica with benzenesulfonic acid modification for removal of ionic and sulfur-containing compounds

This combination column is used together with a SiOH column. Both columns together are available as Kombi-Kit PCB.

- Recommended application:

  extraction of PCBs from oil with reference to German industrial standard DIN 51527, part 1

PCB in oil samples

determination with reference to German industrial standard DIN 51527

Column type:
CHROMABOND® SiOH-H_2SO_4/SA, 3 mL, 500/500 mg and CHROMABOND® SiOH, 3 mL, 500 mg
REF 730085 and 730073
or Kombi-Kit PCB, REF 730125

Sample pretreatment:
extract oil-contaminated solids with *n*-hexane. Homogenize other oil samples and dissolve 1.5 to 2.0 g in 50 mL *n*-hexane. Water which may cause turbidity can be removed with sodium sulfate.

Column conditioning:
let 1 mL *n*-hexane flow through the CHROMABOND® SiOH-H_2SO_4/SA column

Sample application:
aspirate or force 500 µL sample through the CHROMABOND® SiOH-H_2SO_4/SA column. This phase offers better removal of interfering substances due to sulfonation. Place CHROMABOND® SiOH-H_2SO_4/SA column on top of the SiOH column with the aid of an adapter and after at least 30 s flush sample into the SiOH column with 2 x 1 mL *n*-hexane.

Elution:
elute SiOH column with 3 x 0.5 mL *n*-hexane; adjust to a suitable concentration for subsequent GC analysis by evaporation of *n*-hexane in a stream of nitrogen or by dilution with *n*-hexane

Recovery rates:
PCB-28 99 %, PCB-52 95 %, PCB-101 99 %, PCB-138 94 %, PCB-153 99 %, PCB-180 96 %, PCB-209 101 %

MN Appl. No. 301380

Ordering information

Volume	Adsorbent weight		Pack of
CHROMABOND® SiOH-H_2SO_4/SA polypropylene columns			
	500/500 mg		
3 mL		**730085**	50
CHROMABOND® SiOH-H_2SO_4/SA polypropylene columns · BIGpack			
	500/500 mg		
3 mL		**730085.250**	250
CHROMABOND® SiOH-H_2SO_4/SA glass columns			
	500/500 mg		
3 mL		**730085G**	50
Kombi-Kit for extraction of PCB from oil with reference to DIN 51527, part 1			
	25 columns each of CHROMABOND® SiOH-H_2SO_4/SA and CHROMABOND® SiOH	**730125**	1 kit

Dry (Na_2SO_4)

special phase for drying of organic samples

- Anhydrous high-purity sodium sulfate which forms Glauber's salt with traces of water

  For removal of larger quantities of water several cartridges can be combined in series.
- Recommended application:

  removal of traces of water from organic solutions

Ordering information

	Adsorbent weight			Pack of
CHROMAFIX® Dry cartridges				
Size	**S**	**M**	**L**	
Adsorbent weight ∅	780 mg	1500 mg	2800 mg	
	731852	**731853**	**731854**	50

ABC18

special phase for analysis of acrylamide in food

- Octadecyl silica phase with ion exchange functions for acrylamide analysis
- Recommended application:

  clean-up of acrylamide from ultra-heated starch-containing food, such as potato chips and other snacks, french fries, crispbread, cereals etc.

Important notes:

- For "Determination of Acrylamide in Foods, SPE Clean-up Procedure for LC-MS-MS" please see application 303580 at ***www.mn-net.com/apps***.
- Acrylamide is created at temperatures above 100 °C from sugar and proteins, e.g., from potatoes or grain during the process of frying, baking, roasting or grilling. The formation depends on temperature, starting at 120 °C and increasing with more elevated temperatures. In cooked food, no acrylamide is found.
- Minimum concentration of acrylamide should be 70 µg/kg.
- The procedure includes no concentration step.
- Acrylamide and the isotopically labeled form, is carcinogenic, mutagenic and neurotoxic.

Ordering information

Volume	Adsorbent weight	Pack of
CHROMABOND® ABC18 polypropylene columns		
	500 mg	
6 mL	**730533**	30

SPE phases for food analysis

Diamino

special silica phase for determination of pesticides in food samples

- Base material silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/g, pH stability 2–8
  Primary and **S**econdary **A**mine functions (PSA), 5 % C
  Removes polar compounds (e.g., organic acids, pigments, sugars) from matrices like fruit or vegetables
  Similar phases: Supelclean™ PSA, Bond Elut® PSA
- Recommended application:
  special SPE phase for quick and cheap determination of pesticides in strongly matrix-contaminated samples by GC or HPLC (**QuEChERS** method = **Qu**ick **E**asy **Ch**eap **E**ffective **R**ugged **S**afe)

QuEChERS method and pre-mixes

Within a few years after its development by Anastassiades et al. the QuEChERS method has gained a leading position for determination of pesticide residues in food samples by GC–MS or LC–MS, allowing rapid and cheap clean-up of strongly matrix-contaminated samples.

Standard clean-up of food samples

10 g sample are homogenized with 10 mL acetonitrile. After adding the internal standard the sample is shaken with 4 g $MgSO_4$ and 1 g NaCl and afterwards centrifuged.
1 mL of the supernatant is spiked with 25 mg CHROMABOND® Diamino and 150 mg $MgSO_4$ and shaken again. After centrifugation the supernatant is injected into GC/MS.

MN Appl. No. 303770

For optimizing the extraction of pH-dependent compounds, for minimizing decomposition of sensitive substances, and for broadening the matrix spectrum, different modifications of the QuEChERS method have been elaborated.

In addition to the required adsorbent CHROMABOND® Diamino MACHEREY-NAGEL offers a number of individually weighed and premixed extraction and buffer mixtures, specially composed for different sample matrices.

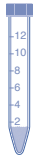
For extraction, the European standard EN 15662 recommends a citrate extraction mix (Mix I), while AOAC standard 2007.1 uses an acetate extraction mix (Mix II).

For clean-up, the Diamino phase (PSA) removes, e.g., sugars and organic acids. $MgSO_4$ removes water, C_{18} ec removes nonpolar interferences such as fats and the Carbon phase removes pigments, sterols, and nonpolar interferences.

For selection of the proper clean-up mix see table on opposite page.

For detailed instructions please visit ***www.mn-net.com*** or the original references at ***www.quechers.com***.

Ordering information

	Volume	Description		Composition	REF	Pack of
	**CHROMABOND® QuEChERS extraction buffer mixes**					
	15 mL*	Mix I	citrate extraction mix	4 g $MgSO_4$, 1 g NaCl, 0.5 g Na_2H citrate · 1.5 H_2O, 1 g Na_3 citrate · 2 H_2O	**730970**	50
	15 mL*	Mix II	acetate extraction mix	6 g $MgSO_4$, 1.5 g Na acetate	**730971**	50
	CHROMABOND® QuEChERS clean-up mixes					
	15 mL*	Mix III	Diamino clean-up mix	0.15 g CHROMABOND® Diamino with 0.9 g $MgSO_4$	**730972**	50
	15 mL*	Mix IV	Diamino/Carbon clean-up mix	0.15 g CHROMABOND® Diamino with 0.9 g $MgSO_4$ and 15 mg Carbon	**730973**	50
	15 mL*	Mix V	Diamino/Carbon clean-up mix	0.15 g CHROMABOND® Diamino with 0.9 g $MgSO_4$ and 45 mg Carbon	**730975**	50
	15 mL*	Mix VI	Diamino/C_{18} ec clean-up mix	0.15 g CHROMABOND® Diamino with 0.9 g $MgSO_4$ and 150 mg C_{18} ec	**730974**	50
	**CHROMABOND® Diamino polypropylene columns**					
	3 mL	adsorbent weight 200 mg			**730561**	50
	6 mL	adsorbent weight 500 mg			**730562**	30
	**CHROMABOND® Diamino adsorbent**					
					730653.20	20 g
					730653	100 g
	CHROMABOND® QuEChERS accessories					
		50 mL polypropylene centrifuge tube with screw cap			**730223**	50

* 15 mL centrifuge tubes with screw cap (2 mL or 50 mL centrifuge tubes on request)

A number of custom-made QuEChERS mixes is available on request.

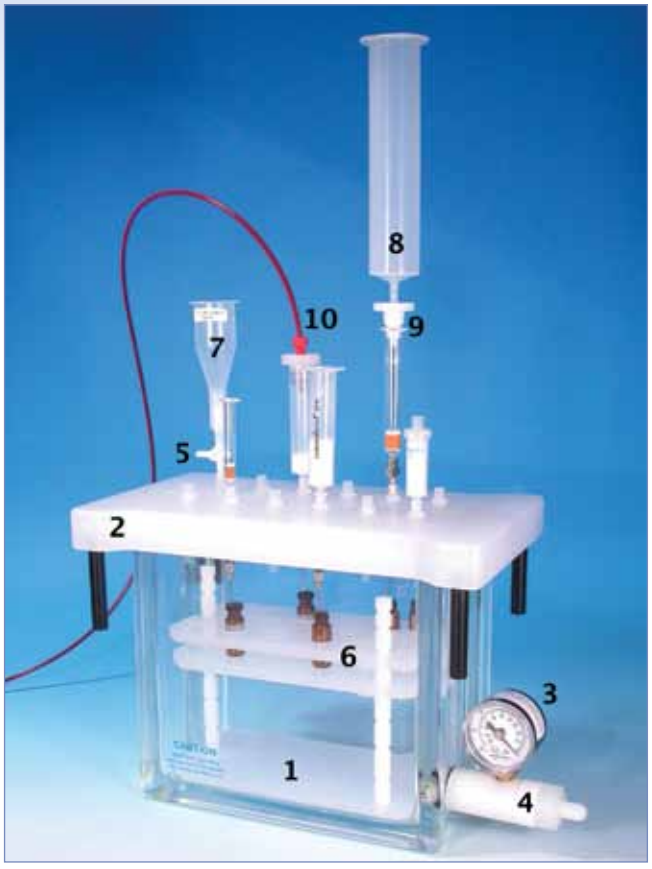
QuEChERS mixes

Sample property			
Low fat content (e.g., apples, strawberries)	Moderate content of chlorophyll and carotinoids (e.g., carrots, lettuce)	Higher content of chlorophyll and carotinoids (e.g., bell peppers, spinach)	Higher fat content (e.g., avocado)
CHROMABOND® QuEChERS extraction mixes			
Citrate or acetate extraction	Citrate or acetate extraction	Citrate extraction	Citrate extraction
Mix I or Mix II	Mix I or Mix II	Mix I	Mix I
CHROMABOND® QuEChERS clean-up mixes			
Diamino clean-up	Diamino/Carbon clean-up	Diamino/Carbon clean-up (higher Carbon content)	Diamino/C_{18} ec clean-up
Mix III	Mix IV	Mix V	Mix VI
			

Accessories for SPE

CHROMABOND® vacuum manifolds

- For simultaneous preparation of up to 12, 16 or 24 samples
- Replacement parts and accessories for special applications



Vacuum manifold for 12 columns

1 Rectangular glass cabinet; 2 sizes available:
small for up to 12 CHROMABOND® columns or CHROMAFIX® cartridges;
large for up to 16 CHROMABOND® LV columns or up to 24 CHROMABOND® columns or CHROMAFIX® cartridges (depending on lid)

2 Polypropylene lid

3 Vacuum gauge for pressure reading

4 Control valve for adjustment of vacuum

5 Replaceable valves for vacuum control of individual SPE columns

6 Variable rack with exchangeable partitions, which accept a wide variety of vessels like test tubes, measuring flasks, scintillation vials, autosampler vials, plastic vials etc.

7 CHROMABOND® LV columns with 15 mL sample reservoir for medium size samples

8 Polypropylene sample reservoirs (30 or 70 mL)

9 Adapter for sample reservoirs

10 CHROMABOND® tubing adapters

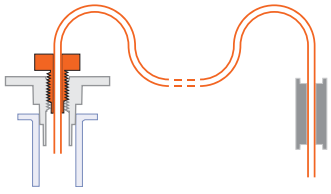
Full description and manual can be downloaded from ***www.mn-net.com***

Ordering information

Description	Pack of	REF
Vacuum manifold complete consists of glass cabinet with lid and lid gasket, removable needles on lower side of lid, vacuum gauge, control valve, valves and caps, variable rack:		
for up to 12 columns or cartridges (including PP tank)	1	**730150**
for up to 16 LV columns	1	**730360**
for up to 24 columns or cartridges	1	**730151**
Glass cabinets without accessories (1)		
for 12 columns	1	**730173**
for 16 LV or 24 columns	1	**730174**
Lids with gaskets (2)		
for 12 columns (including Luer fittings and valves **(5)**)	1	**730175**
for 16 LV columns (including Luer fittings and valves **(5)**)	1	**730365**
for 24 columns (including Luer fittings and valves **(5)**)	1	**730176**
Gaskets for lid, for 12 columns	2	**730177**
Gaskets for lid, for 24 columns	2	**730178**

Accessories for SPE

Ordering information

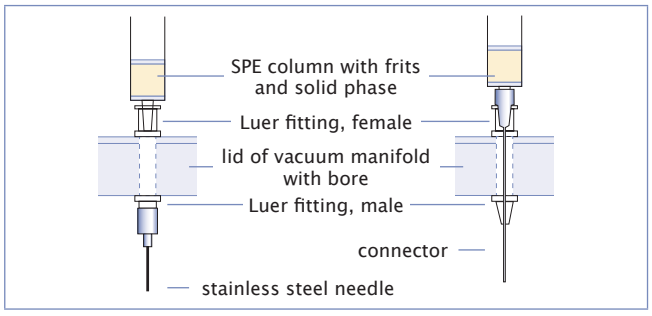
Description		Pack of	REF
General accessories for vacuum manifolds			
Luer stoppers for vacuum manifold, blue		12	**730194**
Luer fittings for lid, female	 female	12	**730183.12**
Luer fittings for lid, male	 male	12	**730184.12**
Valves, plastic		12	**730185**
Stainless steel needles		12	**730152**
Polypropylene needles		12	**730154**
PP tanks for vacuum manifold for 12 columns	(not available for 16- or 24-position manifold)	2	**730233**
Vacuum gauge, complete with accessories **(3+4)**		1	**730179**
Drying attachment and collecting racks for evaporation of eluates			
Drying attachment, with 12 positions **(11)**		1	**730187**
Drying attachment, with 16 positions		1	**730990**
Drying attachment, for 24 columns		1	**730188**
Collecting rack for 12 columns **(6)**		1	**730157**
Collecting rack for 16 LV columns		1	**730366**
Collecting rack for 24 columns		1	**730153**
Products for protection from cross contamination			
Valve, brass, tarnished		1	**730189.1**
Valves, as above		12	**730189.12**
Stainless steel connectors	(application of connectors see below)	12	**730106**
PTFE connectors		12	**730564**
Tubing adapters for application of large sample volumes (10)			
for 3 and 6 mL glass columns		4	**730387**
for 1, 3 and 6 mL polypropylene columns		4	**730243**
for 15, 45 and 70 mL polypropylene columns		4	**730386**
(PTFE tube length approx. 1 m)			

Protection from cross contamination

For special applications, which require maximum protection from cross contamination we supply chrome-plated brass valves and stainless steel or PTFE connectors, the application of which is shown below. These special connectors are fitted through the lid; thus the sample only has contact with the inert connector and can flow directly into the receptacle.

Drying attachment

If the eluate has to be evaporated, this can be performed with the so-called drying attachment (**11**, see below). This special lid has a gas connector on one side (**12**), from which the gas is fed simultaneously to the 12, 16, or 24 stations (**13**). Thus 12, 16, or 24 eluates can be evaporated simultaneously by just changing the lid and applying a stream of inert gas, e.g., nitrogen.



Accessories for SPE

CHROMABOND® empty columns and accessories

For individual packing of SPE columns with CHROMABOND® adsorbents

Ordering information

Description		Pack of	REF
Empty polypropylene columns with PE frits, 1 mL		100	**730159**
Empty polypropylene columns with PE frits, 3 mL		50	**730160**
Empty polypropylene columns with PE frits, 6 mL		30	**730161**
Empty polypropylene columns with PE frits, 15 mL	one filter element is already inserted in the polypropylene column	20	**730230**
Empty polypropylene columns with PE frits, 30 mL		20	**730380**
Empty polypropylene columns with PE frits, 45 mL		20	**730355**
Empty polypropylene columns with PE frits, 70 mL		20	**730158**
Empty polypropylene columns with PE frits, 150 mL		20	**730474**
PE frits for polypropylene columns 1 mL		250	**730164**
PE frits for polypropylene columns 3 mL		250	**730162**
PE frits for polypropylene columns 6 mL		250	**730163**
PE frits for polypropylene columns 15 mL		250	**730351**
PE frits for polypropylene columns 30 mL		250	**730034**
PE frits for polypropylene columns 45 mL		250	**730356**
PE frits for polypropylene columns 70 mL		250	**730026**
PE frits for polypropylene columns 150 mL		250	**730475**
Empty glass columns with glass fiber frits, 3 mL	one filter element is already inserted in the glass column	50	**730171**
Empty glass columns with glass fiber frits, 6 mL		30	**730172**
Glass fiber frits for glass columns 3 mL		250	**730191**
Glass fiber frits for glass columns 6 mL		250	**730192**
Empty LV polypropylene columns with PE frits, 15 mL, for 100 mg adsorbent weight		50	**732500**
Empty LV polypropylene columns with PE frits, 15 mL, for 200/500 mg adsorbent weight		50	**732501**
PE frits for LV polypropylene columns 15 mL for 100 mg adsorbent weight		250	**732019**
PE frits for LV polypropylene columns 15 mL for 200/500 mg adsorbent weight		250	**732020**
Adapters (PVDF) for glass columns (3 and 6 mL)		4	**730104.4**
Adapters as above		10	**730105**
Adapters (PP) for polypropylene columns (1, 3 and 6 mL)		4	**730100.4**
Adapters as above		10	**730101**
Adapters (PE) for polypropylene columns (15, 45, 70 mL)		4	**730350.4**
Adapters as above		10	**730385**
Adapter (PE) for polypropylene columns (30 and 70 mL)		1	**730566**
Reservoir columns for application of medium-size samples			
Reservoir column 30 mL, polypropylene, with one adapter for 1, 3, 6 mL CHROMABOND® polypropylene columns		1	**730102**
10 Reservoir columns 30 mL, polypropylene with one adapter for 1, 3, 6 mL CHROMABOND® polypropylene columns		1 kit	**730103**
Reservoir column 70 mL, polypropylene, with one adapter for 1, 3, 6 mL CHROMABOND® polypropylene columns		1	**730381**
10 Reservoir columns 70 mL, polypropylene with one adapter for 1, 3, 6 mL CHROMABOND® polypropylene columns		1 kit	**730382**
Reservoir column 70 mL, polypropylene, with one adapter for 15, 45, 70 mL CHROMABOND® polypropylene columns		1	**730388**
10 Reservoir columns 70 mL, polypropylene with one adapter for 15, 45, 70 mL CHROMABOND® polypropylene columns		1 kit	**730389**

Automated and on-line SPE

Performing Solid Phase Extraction (SPE) manually can be time consuming and nerve-racking, especially when recovery and reproducibility are lacking due to sample variability. If SPE can be reliably automated, it becomes a much more efficient and reproducible process.

On-line SPE is a powerful method in automated sample preparation where the SPE hardware is technically integrated into a HPLC system. Crude samples are placed in an autosampler and processed fully automatic prior to injection into a GC (MS) or LC (MS) system. MN offers different on-line column configurations designed to fit your on-line SPE needs and filled with a choice of different adsorbents, modifications and particle sizes:

- Ready-to-use EC columns or ChromCart® cartridges for on-line SPE (standard dimensions 20 x 2 mm or 20 x 4 mm, resp.), filled with CHROMABOND® HR-X*pert* phases (15 µm particles) or with NUCLEODUR® C_{18} ec, C_8 ec, CN (20 µm particles)

EC columns

CC cartridges

- Columns for Gilson ASPEC™ systems are ready-to-use assembled with caps. In addition to the columns and phases listed below, all 1, 3 and 6 mL CHROMABOND® polypropylene columns from our program can be supplied assembled with ASP caps.

Columns for the Gilson ASPEC™

Ordering information

Gilson ASPEC™ columns

Column size	Weight [mg]	Pack of [columns]	REF
CHROMABOND® SiOH			
1 mL	100	100	**730071ASP**
3 mL	500	100	**730073ASP**
6 mL	1000	100	**730075ASP**

Other dimensions and adsorbents on request

- Special SPE columns equipped with caps and needles to be used in the SPE unit of the Gerstel MultiPurposeSampler (MPS), available in 1, 3, 6 mL.

SPE cartridges for Gerstel MPS system

Gerstel MPS system

Ordering information

Gerstel MPS columns

Column size	Weight [mg]	Pack of [columns]	REF
CHROMABOND® SiOH			
3 mL	200	50	**730214MPS**
3 mL	500	50	**730073MPS**
6 mL	1000	30	**730075MPS**
CHROMABOND® C_{18} ec			
1 mL	100	100	**730011MPS**
3 mL	200	50	**730012MPS**
3 mL	500	50	**730013MPS**
CHROMABOND® HR-X			
1 mL	100	30	**730935MPS**
3 mL	200	30	**730931MPS**
6 mL	500	30	**730939MPS**

CHROMABOND® MULTI 96 for robot systems

Alternatively CHROMABOND® MULTI 96 plates provide a means of high throughput sample preparation by processing 96 samples in a standard 8 x 12 microcolumn plate format compatible with standard 96-well plate liquid handling technologies and injection systems. MULTI 96 plates are available for solid phase extraction (SPE) and for filtration (see page 76).

CHROMABOND® MULTI 96 · SPE in microtiter format

- 96-well PP microtiter plates with PE filter elements
- Cavity volume 1.5 mL
- Adsorbent weights 10, 25, 50, 100 mg per microcolumn
- Supplied with any CHROMABOND® SPE adsorbents
- For simultaneous preparation of 96 samples
- Easy method transfer from CHROMABOND® columns or CHROMAFIX® cartridges to CHROMABOND® MULTI 96

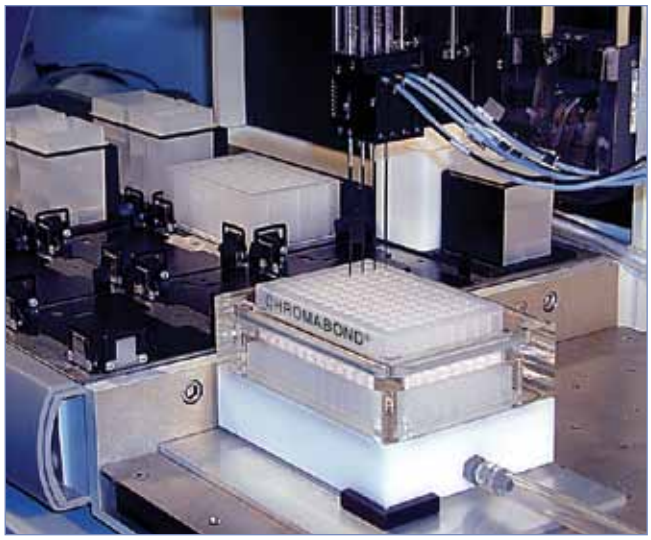
Advantages of this high-throughput system:

- Simultaneous preparation of 96 samples; this means a 4-fold increase over traditional 24-position SPE processors
- Economical by saving time and solvent
- Use of multi-channel pipettors facilitates liquid transfer steps
- Readily adaptable to all common automated and robotic handling systems
- Minimized dead volume (≤ 40 µL)

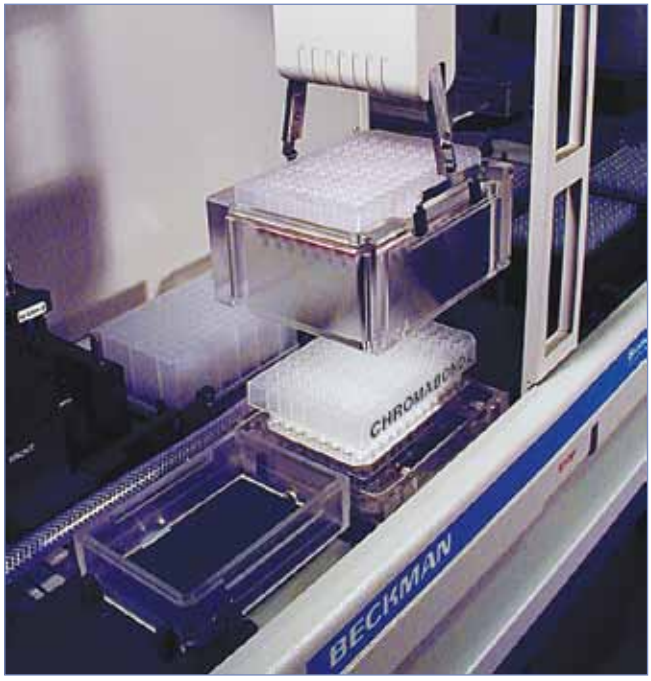
Instrument compatibility

CHROMABOND® MULTI 96 SPE microtiter plates as well as CHROMAFIL® MULTI 96 filtration plates are compatible with, e.g., the following liquid handling and SPE automation systems:

- Perkin Elmer MultiProbe® II
- Tomtec Quadra 3® and Quadra 3® SPE
- Hamilton Microlab® SPE Workstation
- Beckman Coulter Biomek® 2000
- Caliper Life Science RapidTrace®
- Gilson ASPEC™ XL4 and ASPEC™ XL
- Gilson 215 SPE Liquid Handler
- Tecan Genesis™ FE500
- Eppendorf ep*Motion*®



Multiprobe® II (Perkin-Elmer)



Biomek® 2000 (Beckman Coulter)

CHROMABOND® MULTI 96 vacuum manifold

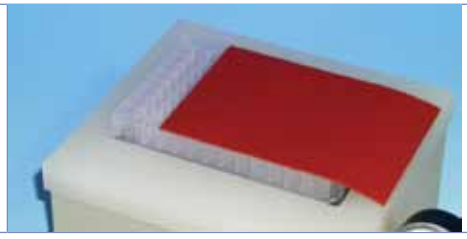
For handling of CHROMABOND® MULTI 96 SPE plates for up to 96 samples

CHROMABOND® MULTI 96 is designed for use in common robotic workstations or commercially available liquid handling systems. Alternatively, use of multichannel pipetters facilitates a manual liquid transfer. Extraction is carried our using the CHROMABOND® MULTI 96 vacuum manifold. With the help of the control valve the vacuum of the manifold can be adjusted leading to an optimum flow rate through the CHROMABOND® MULTI 96 SPE plate.

A reservoir tank and 96-well collection plates (96 x 0.5 or 96 x 2 mL) made of polypropylene can be supplied as accessories. An interesting alternative for collection of the eluates is a collection rack, which can be fitted with twelve 8-well strips of polypropylene tubes (each 1 mL). If you have to work on less than 96 samples, you can seal individual rows of the 96-well plate with a PTFE-covered rubber pad.

Ordering information

Description	Pack of	REF
CHROMABOND® MULTI 96 vacuum manifold with reservoir tank, vacuum gauge, and control valve	1	**738630.M**
96-well microtiter plates (polypropylene) 96 x 0.25 mL	10	**738651**
96-deep-well collecting plate (polypropylene) 96 x 2 mL	5	**738650.5**
Collection racks with polypropylene tube strips (twelve 8-well strips) 96 x 1.0 mL	5	**738637**
Polypropylene tube strips (twelve 8-well strips) 96 x 1.0 mL	10	**738652**
8-well strip sealing caps for PP tube strips (REF 738652)	30	**738638**
Reservoir tanks (polypropylene)	2	**738639.M**
Butyl rubber pad, PTFE covered for sealing of individual rows of the 96-well plate, 125 x 85 mm	1	**738645**



For CHROMAFIL® MULTI 96 filter plates see page 76. The ordering information of 96-well plates packed with individual CHROMABOND® adsorbents is listed with the respective phases.

Kieselguhr phase for liquid–liquid extraction

CHROMABOND® XTR — for liquid–liquid extraction

- 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
- **Application:**
  liquid–liquid extraction of highly viscous aqueous solutions such as physiological fluids (blood, plasma, and serum) in clinical chemistry, dyes in textiles, environmental and food analysis without use of a separation funnel
  High water loadability without breakthrough of water during elution with organic solvents
  also suited for removing small amounts of water from solvents which are not miscible with water
- **Advantages:**
  fast, reproducible and economical
  simultaneous preparation of several samples
  no problems with phase separation · no formation of emulsions
  high recovery rates
  saving of time and solvents
  organic solutions need not to be dried after separation

Solvents applicable for elution

- ✓ diethyl ether
- ✓ tert-butyl methyl ether
- ✓ ethyl acetate
- ✓ *n*-hexane
- ✓ cyclohexane
- ✓ toluene
- ✓ dichloromethane (methylene chloride)
- ✓ trichloromethane (chloroform)
- ✓ trichloromethane – methanol (90:10, v/v)
- ✓ trichloromethane – methanol (85:15, v/v)
- ✓ diethyl ether – ethanol (90:10, v/v)
- ✓ diethyl ether – ethanol (80:20, v/v)
- ✓ dichloromethane – 2-propanol (90:10, v/v)
- ✓ dichloromethane – 2-propanol (85:15, v/v)

Eluents with too high alcohol contents cause an increase in volume of the aqueous phase on the CHROMABOND® XTR. Here the column could be overloaded and the aqueous phase displaced from the column. In this case, a greater capacity column should be used.

Depending on the concentration of the analytes eluates can be analyzed immediately, or the organic solvent is evaporated. The pH value of the aqueous solution can be altered on the column, which enables elution of different compounds of a sample under optimized conditions. Under certain circumstances, acidic, neutral, and basic compounds can be fractionated in this way.

General column parameters

CHROMABOND® XTR Volume	Amount of adsorbent	Max. volume capacity of aq. solution	Waiting period before elution	Elution volume
1 mL	250 mg	0.25 mL	5 min	3 mL
3 mL	500 mg	0.5 mL	5 min	6 mL
6 mL	1 g	1 mL	5–10 min	8 mL
15 mL	3 g	3 mL	5–10 min	12 mL
30 mL	4.5 g	5 mL	5–10 min	16 mL
45 mL	8.3 g	10 mL	10–15 min	24 mL
70 mL	14.5 g	20 mL	10–15 min	40 mL
150 mL	37.5 g	50 mL	10–15 min	90 mL

Sample application

Adsorption of the sample

Sample elution

Kieselguhr phase for liquid–liquid extraction

Determination of azo dyes and aromatic amines in colored textile materials with reference to § 64 LFGB (formerly § 35 LMBG)

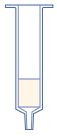
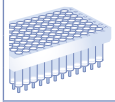
Sample pretreatment:
Weigh about 1 g cut-up textile sample (colored textiles about 0.1 g) in a 100 mL threaded vial. (Degrease leather samples before processing: cover sample with technical purity *n*-hexane and put the vial in an ultrasonic bath for 20 min. After decanting the *n*-hexane rinse with little *n*-hexane and dry sample by gentle heating and blowing with air or N_2.)
Add 250 µL internal standard (IS: 1.2 mg/mL tetramethylbenzidine in methanol – ethyl acetate (1:1, v/v)), 17.0 mL citrate buffer (pH 6) (25.05 g citric acid and 12.64 g NaOH, fill up with deionized water to 2 L) and heat 30 min at 70 °C. Then add 3 mL of a freshly prepared solution of 0.2 g/mL sodium dithionite in water and heat for exactly 30 min to 70 °C while shaking occasionally.
Sample application:
Cool the solution immediately (put vial in water – stopping of reductive cleavage). After 5–10 min pour it onto the CHROMABOND® XTR column (squeeze textile remains).

Elution:
Allow solution to be soaked up by the adsorbent for 15 min. Then elute four times with 20 mL each of diethyl ether or diethyl ether – ethanol (90:10, v/v) (depending on recovery rates), using the first 40 mL to rinse the sample remains. Evaporate eluates to 3 mL with a rotation evaporator and transfer the solution into a 10 mL measuring flask using a pasteur pipette and rinsing with methanol. Fill up to the marking with methanol, shake, and pipette about 1 mL into a vial.

Further analysis: Fast GC on OPTIMA® δ-3, 10 m, 0.1 mm ID, 0.1 µm film, REF 726410.10 (application 210820) or HPLC on NUCLEOSIL® 100-5 C_{18} HD (application 110500 at ***www.mn-net.com/apps***)

MN Appl. No. 302100

Ordering information

	Column volume	1 mL	3 mL	6 mL	15 mL	30 mL	45 mL	70 mL	150 mL
	Adsorbent weight	250 mg	500 mg	1 g	3 g	4.5 g	8.3 g	14.5 g	37.5 g
	Max. volume capacity of aqueous solution	0.25 mL	0.5 mL	1 mL	3 mL	5 mL	10 mL	20 mL	50 mL
	Pack of	100	50	30	30	30	30	30	10
	**CHROMABOND® XTR polypropylene columns**								
		730501	**730502**	**730487**	**730489**	**730505**	**730506**	**730507**	**730509**
	CHROMABOND® XTR polypropylene columns · BIGpacks								
				730487.250 (250 col.)				**730507.100** (100 col.)	
	**CHROMABOND® MULTI 96 XTR**								
	96-well plates 96 x 150 mg, packs of 1 plate, for max. 96 x 0.2 mL aqueous solution								
				738131.150M					
	**CHROMABOND® XTR adsorbent**								
	50 bags of 14.5 g, for max. 20 mL aqueous solution each)								
	for 70 mL PP columns with 100 PE filter elements	for NT20 with 50 PE filter elements (10 mm dia.)		500 g		1 kg		5 kg	
	730585	**730586**		**730595.500**		**730595.1000**		**730595.5000**	
	Accessories for liquid–liquid extraction with CHROMABOND® XTR								
	variable polypropylene rack for 24 positions, incl. 24 PP stopcocks and 24 PP needles								**730508**

For parallel processing of up to 24 CHROMABOND® XTR columns 1–150 mL we recommend the polypropylene rack REF 730508 consisting of:

two side walls (1), middle part including stopcocks and needles (2), bottom part (3), top part for stabilizing 45 mL and 70 mL CHROMABOND® XTR columns (4).

This rack can be adjusted to various heights depending on the CHROMABOND® XTR columns and the collection vials used. Each position of the middle part is equipped with a polypropylene stopcock on the top (REF 730185) and a polypropylene needle on the bottom (REF 730154).

For collection of the sample, vessels such as vials, test tubes, round bottom or tapered flasks, can be used. For our program of sample vials, please see the chapter "Vials and accessories" from page 77.

Columns for gravity flow phase separation

CHROMABOND® PTS and PTL — columns for phase separation

- Automatic separation of a two-phase mixture without separation funnel

  Two-phase mixtures are completely applied to the column and the phase boundary is determined without further work. The special membrane automatically stops the flow when the lower phase has passed. The upper phase remains in the column, thus both phases are available for further analysis.

  Columns **must not** be run with vacuum or pressure

- **PTS**

  for solvents **heavier** than water, e.g., trichloromethane, dichloromethane

  maximum size 150 mL

- **PTL**

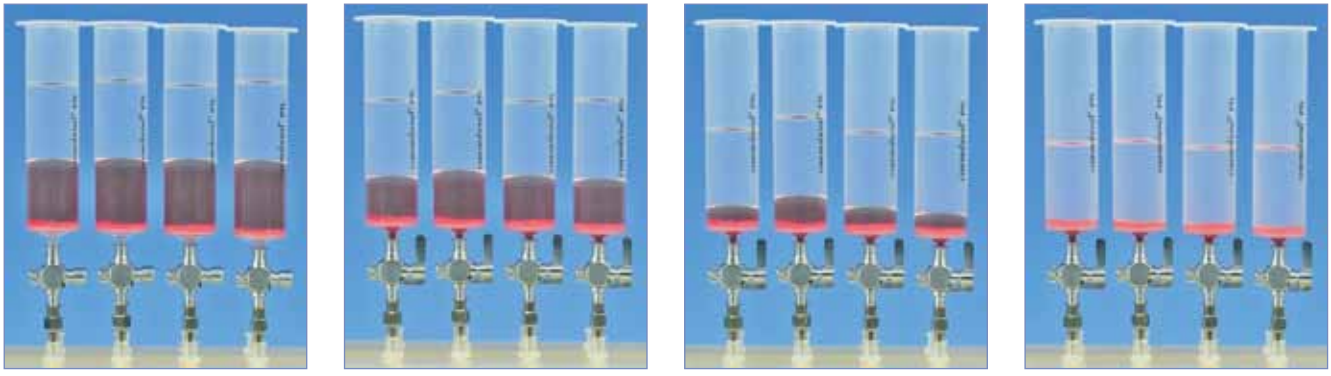
  for solvents **lighter** than water, e.g., diethyl ether, hexane

  maximum size 70 mL

Ordering information

Column volume [mL]	Pack of [columns]	REF
CHROMABOND® PTS for solvents heavier than water		
1	100	**730710**
3	100	**730712**
6	100	**730714**
15	100	**730716**
30	100	**730718**
45	50	**730720**
70	50	**730722**
150	20	**730724**
CHROMABOND® PTL for solvents lighter than water		
1	100	**730730**
3	100	**730732**
6	100	**730734**
15	100	**730736**
30	100	**730738**
45	50	**730740**
70	50	**730742**

Ideal tool for breaking emulsions



CHROMABOND® PTL in action: organic upper phase (colorless), aqueous lower phase (red)

Phase separation

Glass columns and accessories for Flash chromatography

- Economic low-tech method for the synthesis laboratory
  Suited for the separation of compounds up to gram levels
  No expensive equipment required
- MN flash chromatography kits include a glass column, eluent reservoir, silica 60 and accessories.
  Glass columns of different sizes and accessories can be ordered separately.
  These columns are normally filled to a height of about 15 cm, working pressures are 1.5 to 2 bar.
  The most used adsorbent is silica 60 with particle size 40–63 µm (see page 204), however, you may also use our ranges of other LC adsorbents and of POLYGOPREP silica phases (see page 203). Particle sizes < 25 µm should only be used with very low-viscosity mobile phases, because otherwise flow rates will be very low.
  These columns are to be packed by the user.

Ordering information

Designation	Pack of	REF
Flash chromatography kits		
Flash chromatography kit I, consists of 1 glass column 20 mm ID x 400 mm length, one 1-L eluent reservoir, 100 g silica 60 (40–63 µm), sea sand, silanized glass fiber wadding, 1 m PTFE tubing	1 kit	**727450**
Flash chromatography kit II, consists of 1 glass column 40 mm ID x 450 mm length, one 2-L eluent reservoir, 100 g silica 60 (40–63 µm), sea sand, silanized glass fiber wadding, 1 m PTFE tubing	1 kit	**727451**
Flash chromatography columns complete with adapter and PTFE tap, fitted with a polyethylene net to protect against bursting		
20 mm ID x 200 mm length	1 column	**727400**
20 mm ID x 400 mm length	1 column	**727401**
25 mm ID x 200 mm length	1 column	**727402**
25 mm ID x 400 mm length	1 column	**727403**
30 mm ID x 300 mm length	1 column	**727404**
30 mm ID x 400 mm length	1 column	**727405**
40 mm ID x 300 mm length	1 column	**727406**
40 mm ID x 450 mm length	1 column	**727407**
Accessories for flash chromatography glass columns		
1-L eluent reservoir with adapter, covered with a protective plastic sleeve for burst protection; this also prevents build-up of UV-induced radicals in the eluent	1	**727420**
2-L eluent reservoir as above	1	**727421**
Pressure gauge for controlling flow rates	1	**727422**
PTFE tubing, 3 mm OD, 2 mm ID, length 1 m	1 m	**727424**
Sea sand, acid washed and calcined	1000 g	**727423**
Glass fiber wadding, silanized	25 g	**718002**

CHROMABOND® Flash RS cartridges

CHROMABOND® Flash RS cartridges

ideal for Flash separations from 10 mg up to 160 g

- **For convenient operation and reliable upscaling**
  the complete program of ready-to-use Flash cartridges for the ISCO® Companion® and other Teledyne Isco CombiFlash® systems, or as stand-alone version for all pump/detector combinations, e.g., from Biotage®, Büchi®

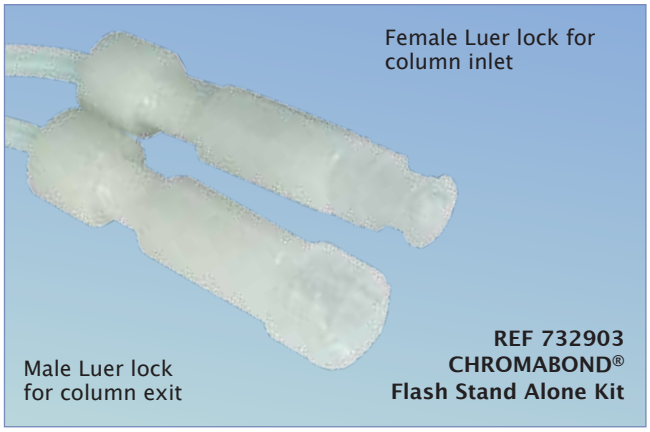
  Adsorbent weights of 4 g to 1600 g from one of the leading companies in silica and TLC business
- **Increases flexibility**
  considerable program of different phases and modifications
- **Saves time and money**
  convenient prices, short delivery times
- **Increases analytical safety**
  high pressure stability of 15 bar/220 psi (12 bar for cartridges > 200 g), excellent separation efficiency, good reproducibility

Technical features

- **Distribution of eluent stream** via highly porous frits
- **Cartridge material and geometry:**
  organic solvent resistant, low bleed polypropylene, thick column walls, one piece body, sophisticated length to diameter ratio for high plate numbers and excellent separation efficiencies
- **Column connections**

  CHROMABOND® RS cartridges are 100% compatible with the ISCO® Companion®, no additional hardware is needed for this type of purification systems.

  CHROMABOND® RS cartridges (except RS 800 and RS 1600 with Maxi Luers) can also be used as stand alone system with any pump/detector/fraction collector combination using the CHROMABOND® Flash Starter Kit (REF 730798) or the CHROMABOND® Flash Stand Alone Kit (REF 732903).



Accessories for CHROMABOND® Flash columns · Ordering information

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 RS cartridges

Description	Pack of	REF
CHROMABOND® Flash Stand Alone Kit, Luer		
consist 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**

CHROMABOND® Flash solutions for Flash instruments

- Product range designed for use in the Teledyne Isco CombiFlash® systems (Companion®, Rf etc.) and Flash systems of Biotage® AB (FlashMaster™) without additional connectors or capillaries

  On request all column types listed below can be packed with any adsorbent as described on page 8 (please note that other packings often result in differing adsorbent weights).

Ordering information

Designation	Column length [cm]	ID [mm]	Adsorbent weight [g]	Pack of [columns]	REF
CHROMABOND® Flash RS columns for Teledyne Isco® systems					
All CHROMABOND® Flash RS cartridges can be directly used in the Teledyne Isco Companion®, Rf, etc.					
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**
Corresponding TLC plates: silica, see page 213					
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**
Corresponding TLC plates: RP-18 W/UV_{254}, see page 220					
CHROMABOND® Flash RS 4 NH_2	9.8	12.4	4.3	2	**732820**
CHROMABOND® Flash RS 15 NH_2	11.6	21.2	16.4	1	**732821**
CHROMABOND® Flash RS 25 NH_2	16.5	21.2	26	1	**732822**
CHROMABOND® Flash RS 40 NH_2	17.1	26.4	43	1	**732823**
CHROMABOND® Flash RS 80 NH_2	24.0	30.8	86	1	**732824**
CHROMABOND® Flash RS 120 NH_2	25.5	36.0	130	1	**732825**
CHROMABOND® Flash RS 200 NH_2	20.0	60.0	220	1	**732826**
CHROMABOND® Flash RS 330 NH_2	27.0	60.0	360	1	**732827**
Corresponding TLC plates: Nano-SIL NH_2, see page 222					

CHROMABOND® Flash RS cartridges

Designation	Column length [cm]	ID [mm]	Adsorbent weight [g]	Pack of [columns]	REF
CHROMABOND® Flash RS 4 OH (Diol)	9.8	12.4	4.3	2	**732830**
CHROMABOND® Flash RS 15 OH (Diol)	11.6	21.2	16.4	1	**732831**
CHROMABOND® Flash RS 25 OH (Diol)	16.5	21.2	26	1	**732832**
CHROMABOND® Flash RS 40 OH (Diol)	17.1	26.4	43	1	**732833**
CHROMABOND® Flash RS 80 OH (Diol)	24.0	30.8	86	1	**732834**
CHROMABOND® Flash RS 120 OH (Diol)	25.5	36.0	130	1	**732835**
CHROMABOND® Flash RS 200 OH (Diol)	20.0	60.0	220	1	**732836**
CHROMABOND® Flash RS 330 OH (Diol)	27.0	60.0	360	1	**732837**
Corresponding TLC plates: Nano-SIL DIOL, see page 223					
CHROMABOND® Flash RS 4 CN	9.8	12.4	4.3	2	**732840**
CHROMABOND® Flash RS 15 CN	11.6	21.2	16.4	1	**732841**
CHROMABOND® Flash RS 25 CN	16.5	21.2	26	1	**732842**
CHROMABOND® Flash RS 40 CN	17.1	26.4	43	1	**732843**
CHROMABOND® Flash RS 80 CN	24.0	30.8	86	1	**732844**
CHROMABOND® Flash RS 120 CN	25.5	36.0	130	1	**732845**
CHROMABOND® Flash RS 200 CN	20.0	60.0	220	1	**732846**
CHROMABOND® Flash RS 330 CN	27.0	60.0	360	1	**732847**
Corresponding TLC plates: Nano-SIL CN, see page 221					
CHROMABOND® Flash RS 4 Alox A	9.8	12.4	8	20	**732870**
CHROMABOND® Flash RS 4 Alox N	9.8	12.4	8	20	**732871**
CHROMABOND® Flash RS 4 Alox B	9.8	12.4	8	20	**732872**
CHROMABOND® Flash RS 15 Alox A	11.6	21.2	30	20	**732874**
CHROMABOND® Flash RS 15 Alox N	11.6	21.2	30	20	**732873**
CHROMABOND® Flash RS 15 Alox B	11.6	21.2	30	20	**732875**
CHROMABOND® Flash RS 25 Alox A	16.5	21.2	50	15	**732876**
CHROMABOND® Flash RS 25 Alox N	16.5	21.2	50	15	**732877**
CHROMABOND® Flash RS 25 Alox B	16.5	21.2	50	15	**732878**
CHROMABOND® Flash RS 40 Alox A	17.1	26.4	80	15	**732879**
CHROMABOND® Flash RS 40 Alox N	17.1	26.4	80	15	**732881**
CHROMABOND® Flash RS 40 Alox B	17.1	26.4	80	15	**732880**
Corresponding TLC plates: Alox, see page 224					

CHROMABOND® Flash columns for Biotage® FlashMaster™ systems					
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**
CHROMABOND® Flash FM 70/10 NH_2	15.4	26.8	10.0	20	**730768**
CHROMABOND® Flash FM 70/20 NH_2	15.4	26.8	20.0	20	**730767**

CHROMABOND® Flash RS cartridges

Technical support

Loadability

Due to the narrow particle size distribution, the excellent packing quality and the optimized stationary phases (acid washed silica, reduced particulate matter) our cartridges can realize highest loadability at best possible separation efficiency. Additionally, the large range of different cartridge lengths and diameters eases to find the 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 CHROMABOND® Flash RS

SiOH cartridge	Average loadability per cartridge [g] **difficult** separation	**easy** separation
RS 4	0.04	0.4
RS 15	0.15	1.5
RS 25	0.25	2.5
RS 40	0.4	4
RS 80	0.8	8
RS 120	1.2	12
RS 200	2	20
RS 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.

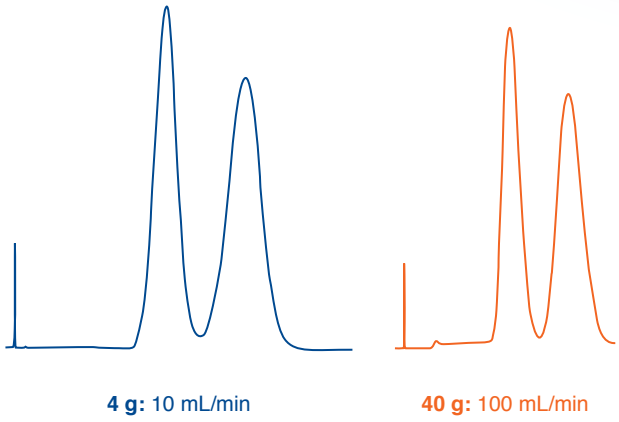
For RS cartridges the upscaling relation is simple:

The silica weight in g is proportional to the flow rate (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



Back pressure and pressure stability

The back pressure always depends on flow rate and viscosity of the eluent mixture, column length and diameter and the particle size. The high performance CHROMABOND® Flash RS cartridges up to 200 g silica are stable up to 15 bar (220 psi, > 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 RS SiOH cartridges (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 4	0.75 bar	1.5 bar					
RS 15	0.25 bar	0.75 bar	1.5 bar	2.0 bar			
RS 25	0.5 bar	1.0 bar	1.75 bar	3.0 bar	4.0 bar	5.0 bar	
RS 40		0.75 bar	1.5 bar		3.0 bar		3.5 bar
RS 80			1.5 bar	2.5 bar	3.0 bar	3.5 bar	4.0 bar
RS 120			1.0 bar	1.5 bar	2.0 bar	2.5 bar	3.0 bar
RS 200			1.0 bar		2.0 bar		3.0 bar
RS 330			1.5 bar		3.0 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 4	20 mL
RS 15	60 mL
RS 25	90 mL
RS 40	140 mL
RS 80	280 mL

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

CHROMABOND® Flash RS cartridges

TLC upscaling

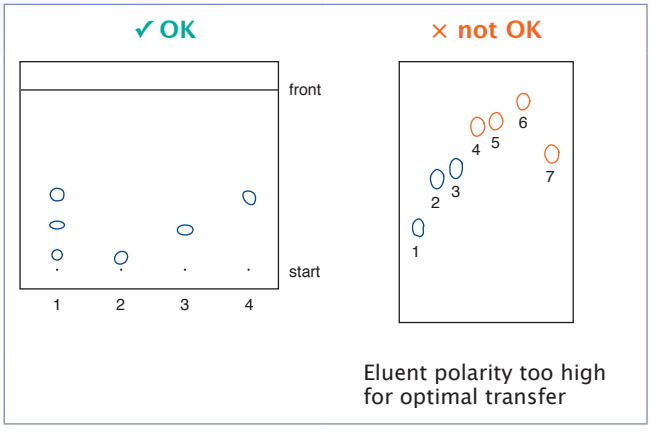
TLC is often used for the development of a selective and reproducible method in Flash chromatography, because it is often necessary to test a large number of eluent and/or adsorbent combinations. MN TLC plates and sheets are coated with the same base silica, which is used in our CHROMABOND® Flash cartridges.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

MN TLC and Flash product ensure:

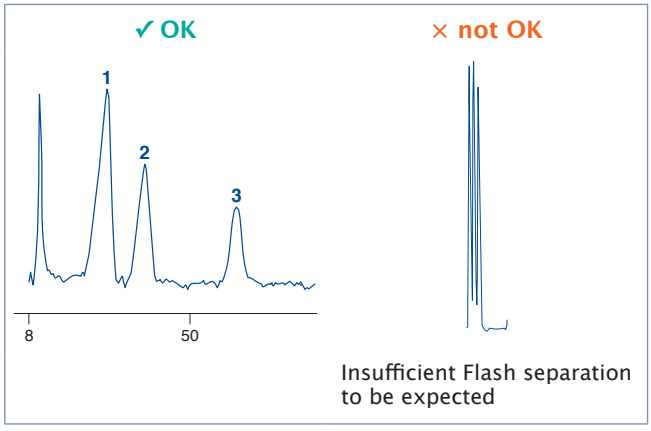
- Same selectivity and easy upscaling from TLC to Flash separations
- Saving time and money, because expensive optimizations are not required

Examples for transfer of a TLC separation to a Flash column:

R_f values of the TLC separation should be in the range of 0.1–0.4 (low height).



ΔR_f values on the TLC plate should be as high as possible.



During TLC optimization always use solvents, which are well suited for the following Flash chromatography!

MN adsorbents — a unique variety of phases

- As with our SPE products, all Flash columns and cartridges from MN are available with our whole range of CHROMABOND® phases (more than 40, e.g., C_{18}, C_8, OH, Alox as listed on page 8)

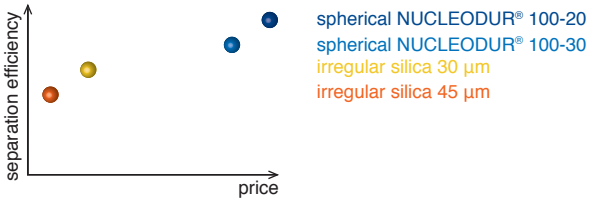
  Additionally you can choose from our range of POLYGOPREP silica packings in particle sizes from 20 to 130 µm and pore sizes from 60 to 4000 Å (see page 203).
- For high performance Flash separations you can order columns packed with spherical NUCLEODUR® featuring very high separation efficiency and extremely increased column lifetime (particle size > 20 µm as listed on page 198)

Technical silica information

Specification of modified and plain silica:
acid-washed irregular silica, pore size 60 Å, particle size 45 µm, specific surface 500 m^2/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 and very long column life



Comparison of separation efficiency and price of irregular versus spherical silica

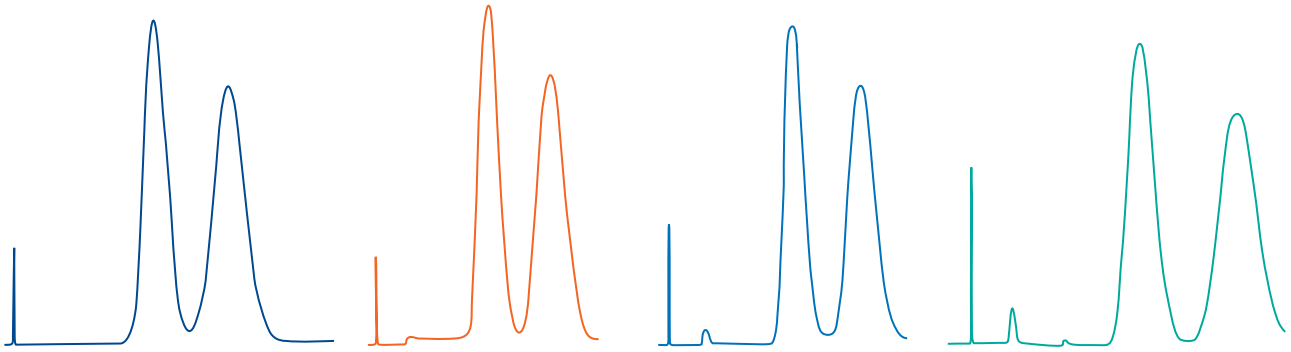
Separation efficiency and reproducibility

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).

MN, 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 step 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



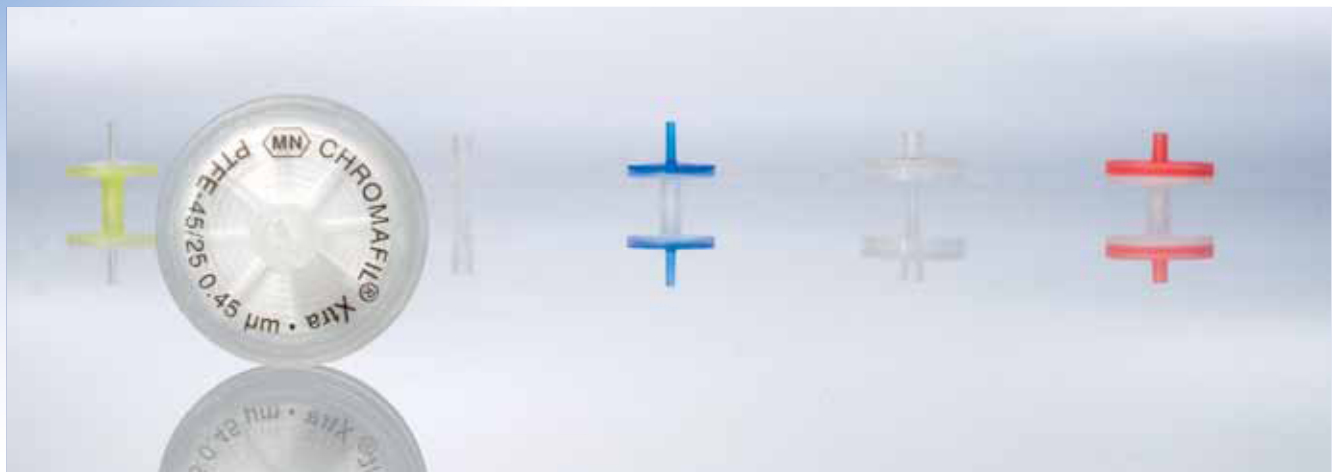
4 g, 0.25 mL sample, 10 mL/min

15 g, 1 mL sample, 40 mL/min

25 g, 1 mL sample, 80 mL/min

40 g, 1 mL sample, 160 mL/min

Syringe filters CHROMAFIL®



Syringe filters are used for filtration of suspended matter from liquid samples or gases. With CHROMAFIL®, rapid purification and removal of particles is very simple: just place the filter on the syringe, and you are ready for filtration. Special manipulations are not required. Contamination of sensitive instrumentation by solid impurities can be avoided, thus increasing lifetime of chromatographic columns and equipment.

Advantages:

Polypropylene housing

Considerably better solvent stability compared to acrylate and polystyrene filters, featuring a low content of extractable substances

Lowest content of extractable substances

The housing of every CHROMAFIL® filter is **ultrasonically sealed (welded), not glued,** because glue may have extractable ingredients. Welding leads to a tight connection between both parts, thus the filter can be used in both directions. The special **thick rim** of the housing is ideal for use in laboratory robots (e.g., SOTAX®, Benchmate™).

Luer lock on the side of entry

For a safe connection on the high-pressure side every filter provides a Luer lock on the side of entry.

Luer exit

For 25 and 3 mm filters: standard Luer exit
For 15 mm filters: minispike · This Luer configuration offers a low hold-up volume and easy filtration into autosampler vials and NMR tubes.

With the aid of a special adapter, filter inlet and filter exit can be fitted to all CHROMABOND® columns and accessories for selective sample preparation.

No rupture of membrane due to the impact plate

The input solvent stream is broken and distributed by the impact plate, and does not directly hit the membrane: this prevents rupture of the membrane. The high pressure stream is diverted into four lanes.

Optimum flow geometry because of the star-shaped distribution device

The stream of liquid is broken into 4 lanes by the impact plate and then further distributed to 8 slots in the form of a star connected with 5 or 8 circular channels (for 15 mm and 25 mm filters, respectively). Thus, the fluid is able to penetrate the membrane on the whole surface, not only on a small region; the filter is not plugged up rapidly, which results in a high flow efficiency.

Color coded filters

Filters with 0.2 µm pores have a yellow upper shell, that of filters with 0.45 µm pores is colorless; the different membrane types are distinguished by different colors of the lower shell.

Different pore sizes for versatile filtration

Standard pore sizes 0.2 and 0.45 µm (additionally: PET filters with 1.2 µm, glass fiber filters with 1 µm, PES filters with 5 µm). Filters with 0.45 µm pore size efficiently remove fine particles that can plug chromatography columns. Filters with 0.2 µm pore size are excellent for filtration of UHPLC samples or other techniques requiring high purity samples.

Filter sizes

25, 15 and 3 mm diameter: the small diameter filters are especially recommended for very small samples, which require extremely low dead volumes: 5 µL for 3 mm ∅, 35 µL for 15 mm ∅, 80 µL for 25 mm ∅

Recommended filter size depending on sample volume

Sample volume	Recommended filter diameter
≤ 1 mL	3 mm
1–5 mL	15 mm
5–100 mL	25 mm

Filters can be **autoclaved** at **121 °C, 1.1 bar** for 30 min.

All 25 mm CHROMAFIL® filters are designed to be 100% compatible and reliable for use with the SOTAX® AT70 smart fully automated dissolution testing systems.

Syringe filters CHROMAFIL®

Depending on your filtration task you can choose filter membranes made from different materials:

CHROMAFIL® BIG-BOX

- 400 (25 mm) or 800 (15 mm) color-coded quality syringe filters · 400 labeled Xtra syringe filters
- Food safe PE box with screw cap
- Economical prices

CHROMAFIL® Xtra

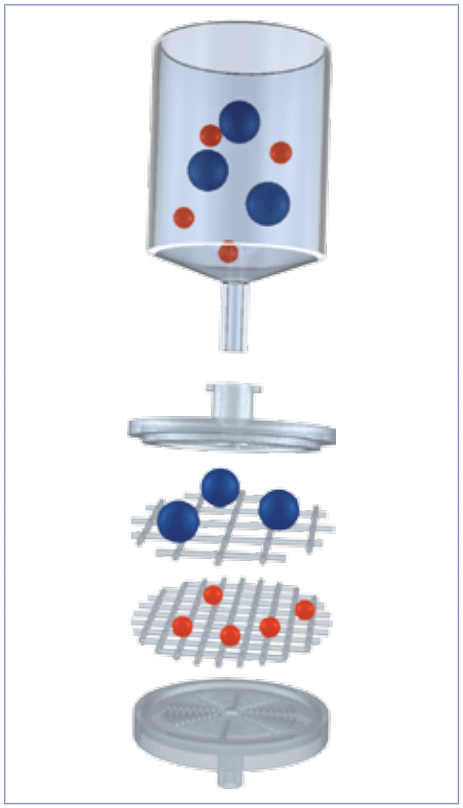
labeled for method validation and certification

Xtra: imprint for direct identification of the membrane type, diameter and pore size

Xtra: low bleeding PP housing

Xtra: color-free plain polypropylene

CHROMAFIL® Combi filters



Combi syringe filters with a coarse glass fiber prefilter and a small-pore membrane as main filter

User benefits:

- For solutions with a high load of particulate matter: lower back pressure, easy filtration
- For high yields of filtrate: more mL of pure filtrate per filter

The technology:

The glass fiber membrane (1.0 µm) removes coarse particles, before they can block the fine main membrane. This results in a better filtration efficiency, especially for highly contaminated samples.

Housing:	Solvent-resistant, ultra low bleed polypropylene
Inlet:	Luer lock
Exit:	Luer
Pore diameter:	1.0 / 0.20 µm or 1.0 / 0.45 µm
Filter diameter:	25 mm
Void volume:	< 80 µL
Packing unit:	100 filters; BIG-BOX with 400 filters

Sample clarification

CHROMAFIL® Combi filters

Polyester with glass fiber prefilter (GF/PET)

- Hydrophilic multipurpose membrane
  for polar as well as nonpolar solvents
  The HPLC filter with glass fiber prefilter, especially suited for mixtures of water and organic solvents
- Recommended for solutions with a high load of particulate matter or for highly viscous solutions

Ordering information

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
GF/PET-20/25	1.0/0.20	25	blue	orange	100	**729032**	400	**729032.400**
GF/PET-45/25	1.0/0.45	25	black	orange	100	**729033**	400	**729033.400**

Regenerated cellulose with glass fiber prefilter (GF/RC)

- Hydrophilic membrane
  for aqueous and organic-aqueous liquids,
  i.e. polar and medium polar sample solutions
- Recommended for solutions with a high load of particulate matter or for highly viscous aqueous solutions

Ordering information

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
GF/RC-20/25	1.0/0.20	25	blue	blue	100	**729050**	400	**729050.400**
GF/RC-45/25	1.0/0.45	25	black	blue	100	**729051**	400	**729051.400**

Polyvinylidene difluoride with glass fiber prefilter (GF/PVDF)

- Hydrophilic membrane
- Recommended for filtration of biological samples with high particle loads. This filter features a high binding capacity for proteins.
- Also suited for filtration of polar and nonpolar solutions

Ordering information

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
GF/P-45/25	1.0/0.45	25	black	white	100	**729039**	400	**729039.400**

Polyester (PET)

- Hydrophilic multipurpose membrane
  for polar as well as nonpolar solvents
  The HPLC filter, especially suited for mixtures of water and organic solvents
  For TOC/DOC determination
  Not cytotoxic, does not inhibit the growth of microorganisms and higher cells

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PET-20/25	0.20	25	labeled	100	**729221**	400	**729221.400**
PET-45/25	0.45	25	labeled	100	**729220**	400	**729220.400**
PET-120/25	1.2	25	labeled	100	**729229**	400	**729229.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PET-20/15 MS	0.20	15	yellow	orange	100	**729022**	800	**729022.800**
PET-45/15 MS	0.45	15	colorless	orange	100	**729023**	800	**729023.800**
PET-20/25	0.20	25	yellow	orange	100	**729021**	400	**729021.400**
PET-45/25	0.45	25	colorless	orange	100	**729020**	400	**729020.400**

MS = minispike on filter exit

Regenerated cellulose (RC)

- Hydrophilic membrane with very low adsorption
  for aqueous and organic-aqueous liquids, i.e. polar and medium polar sample solutions
- Binding capacity for proteins 84 µg per 25 mm filter

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
RC-20/25	0.20	25	labeled	100	**729230**	400	**729230.400**
RC-45/25	0.45	25	labeled	100	**729231**	400	**729231.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
RC-20/15 MS	0.20	15	yellow	blue	100	**729036**	800	**729036.800**
RC-45/15 MS	0.45	15	colorless	blue	100	**729037**	800	**729037.800**
RC-20/25	0.20	25	yellow	blue	100	**729030**	400	**729030.400**
RC-45/25	0.45	25	colorless	blue	100	**729031**	400	**729031.400**

MS = minispike on filter exit

CHROMAFIL® syringe filters

Polytetrafluoroethylene (PTFE)

- Hydrophobic membrane
  for nonpolar liquids and gases
- Very resistant towards all kinds of solvents as well as acids and bases
  Flushing with alcohol, followed by water, makes the originally hydrophobic membrane more hydrophilic.

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PTFE-20/25	0.20	25	labeled	100	**729207**	400	**729207.400**
PTFE-45/25	0.45	25	labeled	100	**729205**	400	**729205.400**
PTFE-100/25	1.0	25	labeled	100	**729247**	400	**729247.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
O-20/3	0.20	3	colorless	colorless	100	**729014**		
O-45/3	0.45	3	colorless	colorless	100	**729015**		
O-20/15 MS	0.20	15	yellow	colorless	100	**729008**	800	**729008.800**
O-45/15 MS	0.45	15	colorless	colorless	100	**729009**	800	**729009.800**
O-20/25	0.20	25	yellow	colorless	100	**729007**	400	**729007.400**

MS = minispike on filter exit

Cellulose mixed esters (MV)

- Hydrophilic membrane with very low adsorption
  for aqueous or polar solutions

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
MV-20/25	0.20	25	labeled	100	**729206**	400	**729206.400**
MV-45/25	0.45	25	labeled	100	**729204**	400	**729204.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
A-20/25	0.20	25	yellow	yellow	100	**729006**	400	**729006.400**
A-45/25	0.45	25	colorless	yellow	100	**729004**	400	**729004.400**

Sample clarification

Cellulose acetate (CA)

- Hydrophilic membrane
  for filtration of water-soluble oligomers and polymers, especially suited for biological macromolecules
- Very high shape stability in aqueous solutions
- Extremely low binding capacity for proteins (21 µg/filter)

- Also available in a sterile package (S) for filtration under sterile conditions (each filter individually sealed)

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
CA-20/25	0.20	25	labeled	100	**729226**	400	**729226.400**
CA-45/25	0.45	25	labeled	100	**729227**	400	**729227.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
CA-20/15 MS	0.20	15	yellow	red	100	**729054**	800	**729054.800**
CA-45/15 MS	0.45	15	colorless	red	100	**729055**	800	**729055.800**
CA-20/25	0.20	25	yellow	red	100	**729026**	400	**729026.400**
CA-45/25	0.45	25	colorless	red	100	**729027**	400	**729027.400**
Sterile filters								
CA-20/15 MS (S)	0.20	15	yellow	red	50	**729052**		
CA-45/15 MS (S)	0.45	15	colorless	red	50	**729053**		
CA-20/25 (S)	0.20	25	yellow	red	50	**729024**		
CA-45/25 (S)	0.45	25	colorless	red	50	**729025**		

MS = minispike on filter exit

Polyethersulfone (PES)

- Hydrophilic membrane
  for aqueous liquids and aqueous liquids with low organic contents
- Very low adsorption for pharmaceuticals and proteins
  good stability against acids and bases
- Binding capacity for proteins 29 µg per 25 mm filter

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PES-20/25	0.20	25	labeled	100	**729240**	400	**729240.400**
PES-45/25	0.45	25	labeled	100	**729241**	400	**729241.400**
PES-500/25	5.0	25	labeled	100	**729242**	400	**729242.400**

Syringe filters CHROMAFIL®

Polyamide (PA) = Nylon

- Rather hydrophilic membrane
  for aqueous and organic-aqueous medium polar liquids

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PA-20/25	0.20	25	labeled	100	**729212**	400	**729212.400**
PA-45/25	0.45	25	labeled	100	**729213**	400	**729213.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
AO-20/3	0.20	3	light beige	light beige	100	**729010**		
AO-45/3	0.45	3	light beige	light beige	100	**729011**		
AO-20/15 MS *	0.20	15	yellow	green	100	**729048**	800	**729048.800**
AO-45/15 MS *	0.45	15	colorless	green	100	**729049**	800	**729049.800**
AO-20/25	0.20	25	yellow	green	100	**729012**	400	**729012.400**
AO-45/25	0.45	25	colorless	green	100	**729013**	400	**729013.400**

Polyvinylidene difluoride (PVDF)

- Hydrophilic membrane
  for polar and nonpolar solutions, water-soluble oligomers and polymers like proteins
- Binding capacity for proteins 82 µg per 25 mm filter

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PVDF-20/25	0.20	25	labeled	100	**729218**	400	**729218.400**
PVDF-45/25	0.45	25	labeled	100	**729219**	400	**729219.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
PVDF-20/15 MS	0.20	15	yellow	white	100	**729043**	800	**729043.800**
PVDF-45/15 MS	0.45	15	colorless	white	100	**729044**	800	**729044.800**

MS = minispike on filter exit

Glass fiber (GF)

- Inert filter, nominal pore size 1 µm, allows higher flow rates than small pore filters
- For solutions with high loads of particulate matter or for highly viscous solutions (e.g., soil samples, fermentation broths)
- As prefilters for other CHROMAFIL® filters, they prevent plugging of the membrane.

Ordering information · CHROMAFIL® Xtra

Type	Pore size [µm]	Membrane diameter [mm]		Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
GF-100/25	nom. 1.0	25	labeled	100	**729228**	400	**729228.400**

Ordering information · CHROMAFIL®

Type	Pore size [µm]	Membrane diameter [mm]	Color code top	Color code bottom	Standard pack filters/pack	Standard pack REF	BIG-BOX filters/pack	BIG-BOX REF
GF-100/15 MS	nom. 1.0	15	blue	colorless	100	**729034**		
GF-100/25	nom. 1.0	25	yellow	black	100	**729028**	400	**729028.400**

MS = minispike on filter exit

CHROMAFIL® materials · compatibility

Chemical compatibility of filter materials

The following table lists the chemical compatibility of our CHROMAFIL® materials. The chemical compatibility depends on several parameters such as time, pressure, temperature and concentration. In most cases, CHROMAFIL® filters will have only short contact with a solvent. In these cases they may be used despite of limited compatibility.

For example, a PTFE filter with PP housing does not liberate any UV-detectable substances during filtration of 5 mL THF, although PP shows only limited resistance towards THF.

Solvent	Material									
	MV	CA	RC	PA	PTFE	PVDF	PES	PET	GF	PP
Acetaldehyde	⊖	⊖	⊕	○	⊕	⊕		⊕	⊕	○
Acetic acid, 100 %	⊖	⊖	⊖	⊖	⊕	⊕	⊕	⊕	⊕	⊕
Acetone	⊖	⊖	⊕	⊕	⊕	⊖	⊖	⊕	⊕	⊕
Acetonitrile	⊖	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Ammonia, 25 %	⊖	⊖	○	⊖	⊕	⊕	⊕	○	⊕	⊕
Benzene	⊕	⊕	⊕	⊕	⊕	○		⊕	⊕	○
n-Butanol	⊕	⊕	⊕	○	⊕	⊕	⊕	⊕	⊕	⊕
Cyclohexane	⊕	⊕	⊕	○	⊕	⊕	⊕	⊕	⊕	⊕
Dichloromethane	⊕	⊖	⊕	⊖	⊕	⊕	⊖	⊕	⊕	⊖
Diethyl ether	○	○	⊕	⊕	⊕	⊕	⊕	⊕	⊕	○
Dimethylformamide	⊖	⊖	○	⊕	⊕	⊖	⊖	⊕	⊕	⊕
1,4-Dioxane	⊖	⊖	⊕	⊕	⊕	○	⊖	⊕	⊕	○
Ethanol	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Ethyl acetate	⊖	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊕	○
Ethylene glycol	○	○	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Formic acid, 100 %	⊕	⊖	○	⊖	⊕	⊕	⊕	○	⊕	⊕
Hydrochloric acid, 30 %	⊖	⊖	⊖	⊖	⊕	⊕	⊕	⊖	⊕	⊕
Methanol	⊖	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Nitric acid, 65 %	⊖	⊖	⊖	⊖	○	○		○	⊕	⊖
Oxalic acid, 10 % aqueous	⊕	⊖	⊕	⊖	⊕	⊕		⊕	⊕	⊕
Petroleum ether	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Phosphoric acid, 80 %	⊖	⊖	○	⊖	⊕	○		⊕	⊕	⊕
Potassium hydroxide, 1 mol/L	⊖	⊖	○	⊕	⊕	○	⊕	○	⊕	⊕
2-Propanol	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Sodium hydroxide, 1 mol/L	⊖	⊖	○	⊕	⊕	○	○	○	○	⊕
Tetrachloromethane	⊕	⊖	⊕	⊕	⊕	○		⊕	⊕	○
Tetrahydrofuran	⊖	⊖	⊕	○	⊕	⊕	⊖	⊕	⊕	○
Toluene	⊕	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊕	○
Trichloroethene	⊕	⊕	⊕	○	⊕	⊕		⊕	⊕	○
Trichloromethane (chloroform)	⊕	⊖	⊕	⊖	⊕	⊕	⊖	⊕	⊕	⊖
Urea	⊕	⊕	⊕	⊕	⊕	⊕		⊕	⊕	⊕
Water	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Xylene	⊕	⊕	⊕	⊕	⊕	○		⊕	⊕	○

Data not guaranteed.

⊕ resistant, ⊖ not resistant, ○ limited resistance

MV = cellulose mixed esters, CA = cellulose acetate, RC = regenerated cellulose, PA = polyamide, PTFE = polytetrafluoroethylene, PVDF = polyvinylidene difluoride, PES = polyethersulfone, PET = polyester, GF = glass fiber, PP = polypropylene (housing material)

Hints for using CHROMAFIL® syringe filters

For optimum filtration results we recommend to keep the following in mind:

- Either discard the first mL or rinse the filter unit with 1 mL of the solvent prior to filtration
- Before filling the syringe, draw about 1 mL air into the syringe in order to minimize the liquid remaining in the filter
- Start filtration with a slight pressure; this will optimize the throughput of the filter. As soon as particles accumulate on the filter, filtration will become more difficult and the pressure on the filter will increase.
- Change the filter, whenever the resistance becomes too large in order to prevent rupture of the housing.
- Do not apply CHROMAFIL® syringe filters on humans; they are only intended for lab use!
- Always use syringes ≥ 10 mL; smaller syringes can easily cause pressures above the 6 bar limit of the filters.
- The temperature should not exceed 55 °C.
- Do not re-use the filters.

CHROMAFIL® filtration cartridges

- Filtration cartridges for sample clarification under vacuum (e.g., using the CHROMABOND® vacuum manifold or SPE automation systems like Gilson Aspec™, Rapidtrace®) or by gravity
- Cartridge sizes 3 mL and 6 mL
- Different membranes (PET, RC, PTFE, PVDF, GF) and pore sizes (0.2, 0.45 and 1.0 µm). Membrane materials correspond to the respective CHROMAFIL® syringe filters.

Ordering information

Description	Pore size [µm]	Pack of [cartridges]	Column volume 3 mL	Column volume 6 mL
Filtration cartridges PET (polyester)	0.20	100	**730578.320**	**730578.620**
Filtration cartridges PET (polyester)	0.45	100	**730578.345**	**730578.645**
Filtration cartridges RC (regenerated cellulose)	0.20	100	**730068.320**	**730068.620**
Filtration cartridges RC (regenerated cellulose)	0.45	100	**730068.345**	**730068.645**
Filtration cartridges PTFE (polytetrafluoroethylene)	0.20	100	**730570.320**	**730570.620**
Filtration cartridges PTFE (polytetrafluoroethylene)	0.45	100	**730570.345**	**730570.645**
Filtration cartridges PVDF (polyvinylidene difluoride)	0.20	100	**730579.320**	**730579.620**
Filtration cartridges PVDF (polyvinylidene difluoride)	0.45	100	**730579.345**	**730579.645**
Filtration cartridges GF (glass fiber)	nom. 1.0	100	**730517.3100**	**730517.6100**

96-well filter plates CHROMAFIL® MULTI 96

CHROMAFIL® MULTI 96 filter plates

- 96-well polypropylene plates for simultaneous filtration of 96 samples
- Advantages of this high-throughput system are:
  - Economical by saving time and solvent
  - Use of multi-channel pipetters facilitates liquid transfer steps
  - Readily adaptable to all common automated and robotic handling systems
  - Minimized dead volume (≤ 40 µL)
- Membrane materials correspond to the respective CHROMAFIL® syringe filters.

Sample clarification

Ordering information

Description	Pack of	REF
Filter plates with cellulose mixed ester filter elements (0.20 µm)	1	**738770.M**
Filter plates with cellulose mixed ester filter elements (0.45 µm)	1	**738771.M**
Filter plates with RC filter elements (regenerated cellulose, 0.2 µm)	1	**738656.M**
Filter plates with RC filter elements (regenerated cellulose, 0.45 µm)	1	**738657.M**
Filter plates with PTFE filter elements (0.2 µm)	1	**738660.M**
Filter plates with PTFE filter elements (0.45 µm)	1	**738661.M**
Filter plates with PTFE filter elements (1.0 µm)	1	**738662.M**
Filter plates with PTFE filter elements (3.0 µm)	1	**738663.M**
Filter plates with PE filter elements (20 µm)	1	**738655.M**
Filter plates with PE filter elements (50 µm)	1	**738659.M**
Filter plates with glass fiber filter elements (nominal 1 µm)	1	**738655.2M**
Filter plates with glass fiber filter elements (nominal 3 µm)	1	**738658.M**
CHROMABOND® MULTI 96 vacuum manifold for monoblocks, with reservoir tank, vacuum gauge, and control valve, for filtration with 96-well filter plates	1	**738630.M**

Disposable syringes with Luer tip (non-sterile, body and piston made from polypropylene)

Volume	Pack of	REF
2 mL	100	**729100**
5 mL	100	**729101**
10 mL	100	**729102**

Glass vials and inserts

According to the high requirements of chemical analyses, especially with regard to reproducibility combined with high detection sensitivity, the container material for the respective samples is of great importance. In chromatography generally vials made from 1st hydrolytic class glass are being used. This type includes borosilicate glasses like Duran®, Pyrex®, Fiolax®, and others. Glass of this class, often called neutral glass, has a very good chemical resistance towards acidic and neutral solutions. The relatively low alkali content permits good values for the resistance towards alkaline solutions, too. Except for the snap cap vials for storage of powdery samples the vials of our program are made from glass of 1st hydrolytic class (manufactured in accordance with Eu.Ph., U.S.P., DAB, Ph. Jap.).

The dimensions stated in this catalog with respect to vial diameter and height are exact values. Please note that other suppliers often list rounded values (e.g., 12 x 32 mm instead of 11.6 x 32 mm), the actual dimensions are, however, identical due to the required fit in the instrument. Our data concerning the volume are defined realistically usable volumes, not calculated values. For reasons of safety we state rather low values. Here, too, deviations from data of other suppliers may occur, which either use the calculated volume (e.g., 2 mL instead of 1.5 mL) or a defined, realistically usable volume in the upper range (e.g., 1.8 mL instead of 1.5 mL).

Septa guide

	Temperature resistance from / to	Analytical purity	Fragmentation due to hardness and molecular structure (coring)	Hardness (needle penetration)	Resealability (in case of multiple injections)
PTFE virginal	-200 °C / 260 °C	very high		very hard (but very thin material)	no resealability
Natural rubber / PTFE	-40 °C / 120 °C	low	high, big particles	very hard	high
Red Rubber / TEF (FEP)	-40 °C / 110 °C	medium	medium	medium hard	medium
Butyl	-40 °C / 120 °C	medium	medium	medium hard	medium
Butyl / PTFE	-40 °C / 120 °C	medium	medium	medium hard	medium
Silicone / PTFE	-60 °C / 200 °C	high	low to medium	soft	low to medium
PTFE / Silicone / PTFE	-60 °C / 200 °C	high	very low	soft	very low

In HPLC the septa often need to have a (cross-) slit as a penetration aid for thick and blunt needles. Furthermore, the slit avoids a vacuum in the vial during sample removal and thus guarantees constant volumes in case of multiple injections. The PTFE lamination protects the elastomeric carrier material of the septa from decomposition by aggressive samples or solvents, but also – in the other direction – the sample from possible contaminations through substances of the carrier material.

Autosampler compatibility charts (see page 103)

The autosampler compatibility charts generally show the most typical vials and closures for use on the instruments of a given manufacturer. In addition to the products listed in those charts, our catalog may contain other technically and functionally suitable products for use on a given autosampler which are not marketed actively as accessories by the respective manufacturer. We look forward to recommend any suitable product.

Compatibility charts have been compiled for the following instrument manufacturers: Agilent, CTC, Dionex, PerkinElmer, Shimadzu, Thermo Scientific, Varian (Agilent), VWR (Merck® / Hitachi), Waters®. Where applicable, each chart is divided into fields of use (GC, HPLC, Headspace).

We generally recommend that you ask for cost-free samples for testing purposes, as even technically comparable products may differ in their optical appearance.

We kindly ask for your understanding that we do not take over any guarantee for the correctness and completeness of the data indicated here.

Miscellaneous

Should you need more information concerning this product range, you can ask for our separate brochure "Vials and caps", which – among others – features 1:1 drawings of all glass products.

Except where explicitly mentioned, septa are assembled ready to use. Septa beneath or beside a cap are shown for illustration purposes only, and they are pictured upside down.

All drawings in this chapter are scale 1:2.

Should you wish to translate article numbers of other manufacturers into MACHEREY-NAGEL REFs, we recommend to use our VialFinder on the internet under ***www.mn-net.com***. Detailed information for its use are available as download.

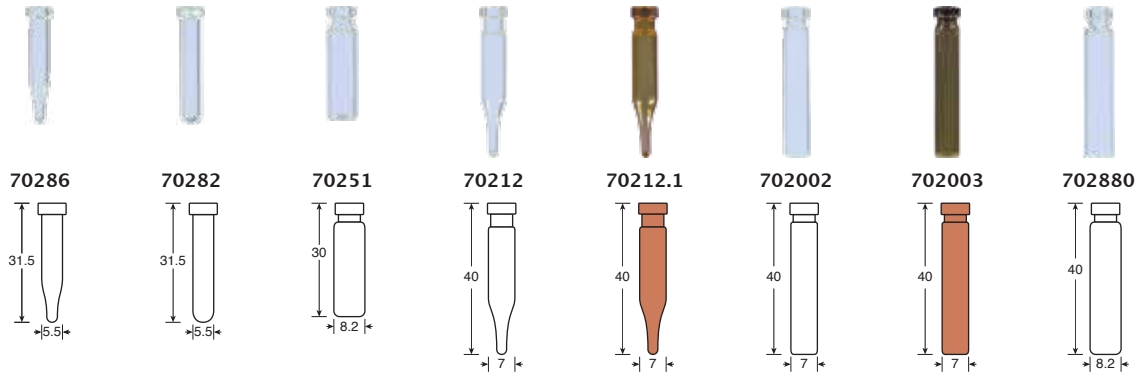
Crimp neck vials and closures N 8

Crimp neck vials and closures N 8

- **Micro-vials with 8 mm crimp neck**
  0.2–1.2 mL usable volume
  Adapter required for use in an autosampler
  Available with flat, round or conical bottom, made of clear and amber glass
- **Aluminium crimp closures N 8**
  Economic versions: three-layer septum Natural rubber / Butyl / TEF or two-layer septum Red Rubber / FEP
  For more demanding analyses: high purity Silicone / PTFE septa

Description	Dimensions (scale 1:2)	Pack of	REF

Crimp neck vials N 8



Type of vial	Usable volume	OD x height		
Clear, conical	0.2 mL	5.5 x 31.5 mm	100	**70286**
Clear, round bottom	0.3 mL	5.5 x 31.5 mm	100	**70282**
Clear, flat bottom	0.8 mL	8.2 x 30 mm	100	**70251**
Clear, conical	0.6 mL	7 x 40 mm	100	**70212**
Amber, conical	0.6 mL	7 x 40 mm	100	**70212.1**
Clear, flat bottom	0.7 mL	7 x 40 mm	100	**702002**
Amber, flat bottom	0.7 mL	7 x 40 mm	100	**702003**
Clear, flat bottom	1.2 mL	8.2 x 40 mm	100	**702880**

Ready assembled crimp closures N 8 and plain crimp caps N 8

70283	70252.1	702025	70289	702878	702800

Cap description	Septum description	Hardness	Thickness		
N 8 aluminium crimp cap, silver, center hole	PTFE virginal, white	53° shore D	0.25 mm	100	**70283**
N 8 aluminium crimp cap as above	Natural rubber / Butyl red-orange / TEF colorless	45° shore A	1.0 mm	100	**70252.1**
N 8 aluminium crimp cap as above	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702025**
N 8 aluminium crimp cap as above	Silicone white / PTFE red	40° shore A	1.0 mm	100	**70289**
N 8 aluminium crimp cap as above	PTFE red / Silicone white / PTFE red	40° shore A	1.0 mm	100	**702878**
N 8 aluminium crimp cap as above	no liner	–	–	100	**702800**

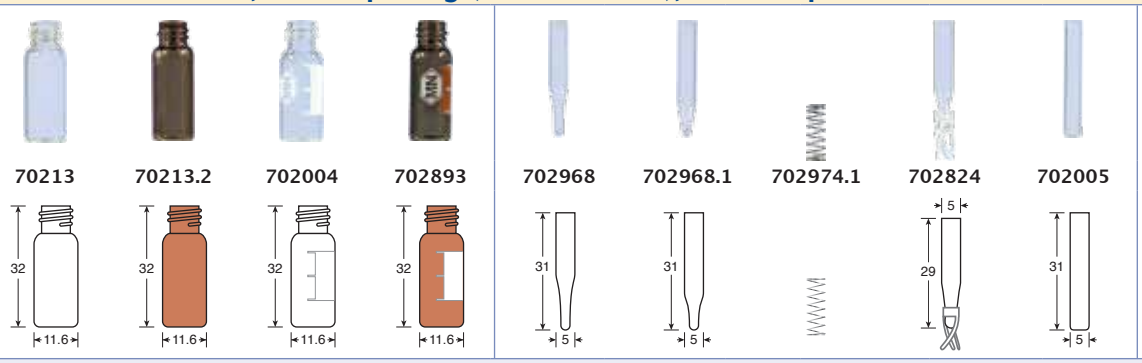
Crimping tools N 8

Manual crimper for 8 mm aluminium crimp caps	1	**735126**
Manual decapper for 8 mm aluminium crimp caps	1	**735408**

Screw neck vials and closures N 8

- Are among the oldest vials for HPLC and GC (besides crimp neck vials N 11)
- More and more replaced by screw neck vials N 9, which are easier to fill due to the wide opening compared to screw neck vials N 8 with small opening
- Due to the cap design not universally usable on all autosamplers in GC and HPLC – however, often used on instruments of VWR (Merck®) / Hitachi, Varian, Knauer, Gilson, Shimadzu and others
- In combination with closed top screw closures also used for sample storage (see page 92)

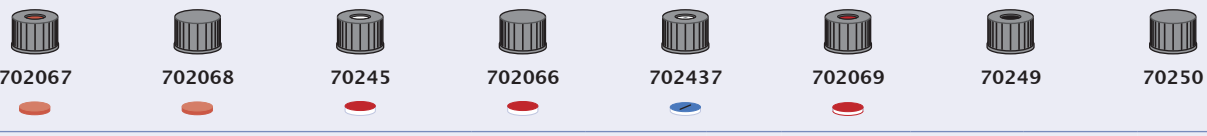
Screw neck vials N 8, small opening (8-425 thread), and compatible inserts



Type of vial	Usable volume	OD x height	Pack of	REF
Clear, flat bottom	1.5 mL	11.6 x 32 mm	100	**70213**
Amber, flat bottom	1.5 mL	11.6 x 32 mm	100	**70213.2**
Clear, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702004**
Amber, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702893**
Insert for small opening vials, clear, conical, 15 mm tip	0.1 mL	5 x 31 mm	100	**702968***
Insert for small opening vials, clear, conical, 9 mm tip	0.15 mL	5 x 31 mm	100	**702968.1***
Metal spring for conical inserts 5 x 31 mm	–	–	100	**702974.1**
Insert for small opening vials, clear, with plastic spring	0.1 mL	5 x 29 mm	100	**702824**
Insert for small opening vials, clear, flat bottom	0.25 mL	5 x 31 mm	100	**702005**
Micro-vial, clear, conical	1.1 mL	11.6 x 32 mm	100	**702860**

* Optionally you may use metal springs 702974.1 in combination with these products to push them up in the vial.

Ready assembled screw closures N 8 and plain screw caps N 8



Cap description	Septa description	Hardness	Thickness	Pack of	REF
N 8 PP screw cap, black, center hole	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702067**
as above, but with closed top	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702068**
N 8 PP screw cap, black, center hole	Silicone white / PTFE red	40° shore A	1.3 mm	100	**70245**
as above, but with closed top	Silicone white / PTFE red	40° shore A	1.3 mm	100	**702066**
N 8 PP screw cap, black, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702437**
N 8 PP screw cap, black, center hole	PTFE red / Silicone white / PTFE red	40° shore A	1.0 mm	100	**702069**
N 8 PP screw cap, black, center hole	no liner	–	–	100	**70249**
as above, but with closed top	no liner	–	–	100	**70250**

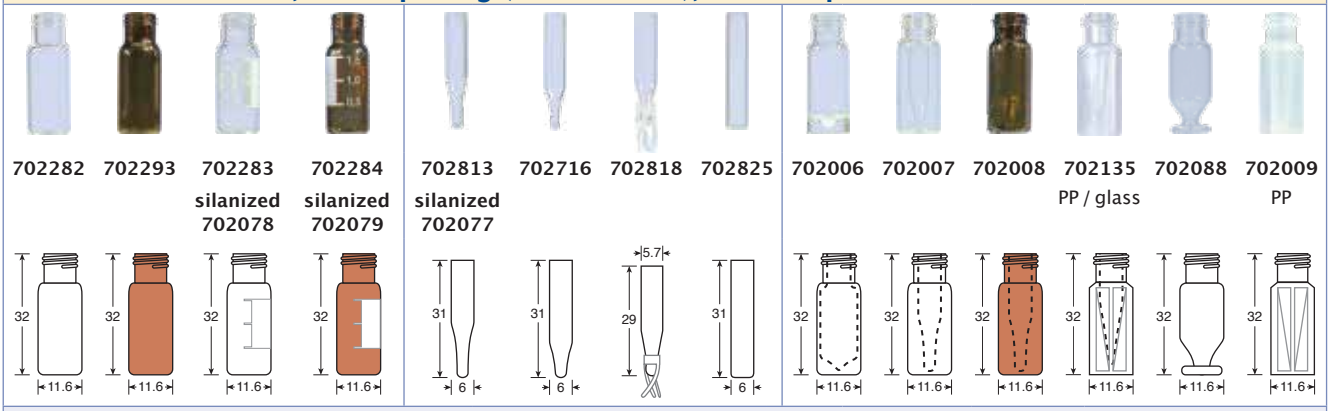
Screw neck vials, inserts, and closures N 9

Description	Dimensions (scale 1:2)			Pack of	REF
N 8 Septa for screw caps N 8					
Material	Illustration	Hardness	Thickness		
PTFE virginal, white		53° shore D	0.25 mm	100	**70261**
Red Rubber / FEP colorless		40° shore A	1.0 mm	100	**702070**
Silicone white / PTFE red		40° shore A	1.3 mm	100	**70248**
Silicone white / PTFE blue, slit		40° shore A	1.0 mm	100	**702481**

Screw neck vials and closures N 9

- Can be used on almost all HPLC and GC autosamplers
- Large range of vials and closures
- Also available as bonded closures (advantage: thick (blunt) HPLC needles cannot push the septum into the vial)
- Also available as convenient Vial Kits with 100 vials and 100 caps and as presealed vial-closure combinations

Description	Dimensions (scale 1:2)		Pack of	REF
Screw neck vials N 9, wide opening (short thread), and compatible inserts				
Type of vial	Usable volume	OD x height		
Clear, flat bottom	1.5 mL	11.6 x 32 mm	100	**702282**
Amber, flat bottom	1.5 mL	11.6 x 32 mm	100	**702293**
Clear, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702283**
as above, silanized	1.5 mL	11.6 x 32 mm	100	**702078**
Amber, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702284**
as above, silanized	1.5 mL	11.6 x 32 mm	100	**702079**
Insert for wide opening vials, clear, conical, 15 mm tip	0.2 mL	6 x 31 mm	100	**702813**
as above, silanized	0.2 mL	6 x 31 mm	100	**702077**
Insert for wide opening vials, clear, conical, 12 mm tip	0.25 mL	6 x 31 mm	100	**702716**
Insert for wide opening vials, clear, with plastic spring	0.1 mL	5.7 x 29 mm	100	**702818**
Insert for wide opening vials, clear, flat bottom	0.3 mL	6 x 31 mm	100	**702825**
Micro-vial, clear, 15 µL funnel in solid glass bottom	1.1 mL	11.6 x 32 mm	100	**702006**
Micro-vial, clear, with integrated 0.2 mL insert	0.2 mL	11.6 x 32 mm	100	**702007**
Micro-vial, amber, with integrated 0.2 mL insert	0.2 mL	11.6 x 32 mm	100	**702008**
Micro-vial, polypropylene, transparent, with integrated 0.15 mL glass insert, conical	0.15 mL	11.6 x 32 mm	100	**702135**
Micro-vial, clear, conical, with a round pedestal glass plate	1.1 mL	11.6 x 32 mm	100	**702088**
Micro-vial, polypropylene, transparent, with inner cone	0.3 mL	11.6 x 32 mm	100	**702009**



Bonded screw closures N 9 (septa firmly connected with the cap, cannot be removed)


702028


702026


702027

Cap description	Septa description	Hardness	Thickness		
N 9 PP bonded screw cap, blue, center hole	Red Rubber / TEF colorless	65° shore A	1.0 mm	100	**702028**
N 9 PP bonded screw cap, blue, center hole	Silicone beige / PTFE white	45° shore A	1.3 mm	100	**702026**
N 9 PP bonded screw cap, blue, center hole	Silicone beige / PTFE white, slit	45° shore A	1.3 mm	100	**702027**

Ready assembled screw closures N 9

702029


702031


702032

Cap description	Septa description	Hardness	Thickness		
N 9 PP screw cap, transparent, center hole	PTFE virginal, white	53° shore D	0.25 mm	100	**702029**
N 9 PP screw cap, blue, center hole	PTFE virginal, white	53° shore D	0.25 mm	100	**702031**
N 9 PP screw cap blue, closed top	PTFE virginal, white	53° shore D	0.25 mm	100	**702032**

702030


702732


702080


702081


702082


702033

N 9 PP screw cap, transparent, center hole	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702030**
N 9 PP screw cap, blue, center hole	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702732**
N 9 PP screw cap, black, center hole	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702080**
N 9 PP screw cap, red, center hole	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702081**
N 9 PP screw cap, green, center hole	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702082**
N 9 PP screw cap blue, closed top	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702033**

702287


702287.1


702036


702037


702038


702034


702107

N 9 PP screw cap, transparent, center hole	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702287**
N 9 PP screw cap, blue, center hole	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702287.1**
N 9 PP screw cap, black, center hole	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702036**
N 9 PP screw cap, red, center hole	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702037**
N 9 PP screw cap, green, center hole	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702038**
N 9 PP screw cap, yellow, center hole	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702107**
N 9 PP screw cap blue, closed top	Silicone white / PTFE red	40° shore A	1.0 mm	100	**702034**

702288


702288.1


702039


702040


702083


702109

N 9 PP screw cap, transparent, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702288**
N 9 PP screw cap, blue, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702288.1**
N 9 PP screw cap, black, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702039**
N 9 PP screw cap, red, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702040**
N 9 PP screw cap, green, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702083**
N 9 PP screw cap, yellow, center hole	Silicone white / PTFE blue, slit	40° shore A	1.0 mm	100	**702109**

702286


702035


702084


702085

N 9 PP screw cap, transparent, center hole	PTFE red / Silicone white / PTFE red	40° shore A	1.0 mm	100	**702286**
N 9 PP screw cap, blue, center hole	as above	40° shore A	1.0 mm	100	**702035**
N 9 PP screw cap, red, center hole	as above	40° shore A	1.0 mm	100	**702084**
N 9 PP screw cap, green, center hole	as above	40° shore A	1.0 mm	100	**702085**

Screw neck vials, inserts, and closures N 9

Description	Dimensions (scale 1:2)			Pack of	REF
N 9 septa for screw caps N 9					
Material	Illustration	Hardness	Thickness		
PTFE virginal, white		53° shore D	0.25 mm	100	**702043**
Red Rubber / FEP colorless		40° shore A	1.0 mm	100	**702041**
Silicone white / PTFE red		40° shore A	1.0 mm	100	**702042**

Vial Kits screw neck N 9

Packs of 100 vials and 100 closures, each

Closure → / Vial ↓	702287.1	702288.1	702732	702026	702027
702282: 1.5 mL, clear, flat bottom	**702201**	**702204**	**702207**		
702283: 1.5 mL, clear, flat bottom, label and scale	**702202**	**702205**	**702208**	**702211**	**702213**
702284: 1.5 mL, amber, flat bottom, label and scale	**702203**	**702206**	**702209**	**702212**	**702214**
702009: 0.3 mL, PP, transparent, with inner cone		**702226**			

Other Vial Kits on request

Pre-sealed vial-closure combinations with screw neck N 9

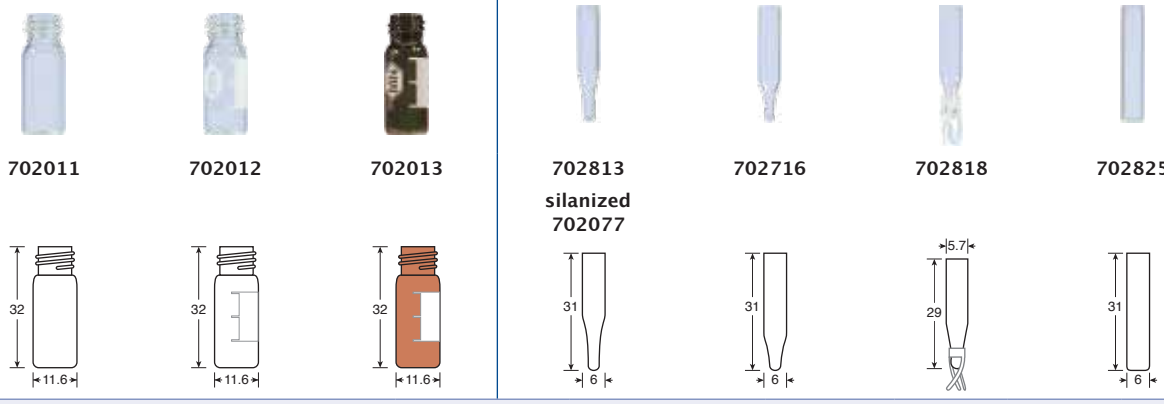
Vial description	Closure description	Pack of	REF
Pre-sealed vials 702282: 1.5 mL screw neck vial N 9, 11.6 x 32 mm, clear, flat bottom, wide opening	pre-screwed with 702732: N 9 PP screw cap, blue, center hole, Red Rubber / FEP colorless, 40° shore A, 1.0 mm	100	**702857**
Pre-sealed vials 702283: 1.5 mL screw neck vial N 9, 11.6 x 32 mm, clear, flat bottom, wide opening, label and scale	pre-screwed with 702732: N 9 PP screw cap, blue, center hole, Red Rubber / FEP colorless, 40° shore A, 1.0 mm	100	**702858**
Pre-sealed vials 702282: 1.5 mL screw neck vial N 9, 11.6 x 32 mm, clear, flat bottom, wide opening	pre-screwed with 702287.1: N 9 PP screw cap, blue, center hole, Silicone white / PTFE red, 40° shore A, 1.0 mm	100	**702874**
Pre-sealed vials 702283: 1.5 mL screw neck vial N 9, 11.6 x 32 mm, clear, flat bottom, wide opening, label and scale	pre-screwed with 702288.1: N 9 PP screw cap, blue, center hole, Silicone white / PTFE blue, slit, 40° shore A, 1.0 mm	100	**702863**
Pre-sealed vials 702284: 1.5 mL screw neck vial N 9, 11.6 x 32 mm, amber, flat bottom, wide opening, label and scale	pre-screwed with 702288.1: N 9 PP screw cap, blue, center hole, Silicone white / PTFE blue, slit, 40° shore A, 1.0 mm	100	**702873**

Other pre-sealed vial-closure combinations on request

Screw neck vials and closures N 10

- Wide opening for easy filling
- Due to the cap height not universally suitable for all instruments
- Often used on Waters®, Shimadzu, PerkinElmer and Jasco instruments

Screw neck vials N 10, wide opening (10–425 thread), and compatible inserts



			702813	702716	702818	702825
			silanized 702077			
702011	702012	702013				

Type of vial	Usable volume	OD x height	Pack of	REF
Clear, flat bottom	1.5 mL	11.6 x 32 mm	100	**702011**
Clear, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702012**
Amber, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702013**
Insert for wide opening vials, clear, conical, 15 mm tip	0.2 mL	6 x 31 mm	100	**702813**
as above, silanized	0.2 mL	6 x 31 mm	100	**702077**
Insert for wide opening vials, clear, conical, 12 mm tip	0.25 mL	6 x 31 mm	100	**702716**
Insert for wide opening vials, clear, with plastic spring	0.1 mL	5.7 x 29 mm	100	**702818**
Insert for wide opening vials, clear, flat bottom	0.3 mL	6 x 31 mm	100	**702825**

Screw closures N 10 and plain screw caps N 10

702044	702045	702046	702047	702048	702049

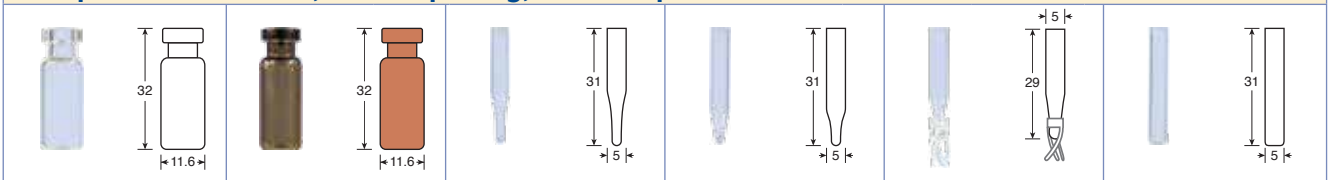
Cap description	Septa description	Hardness	Thickness	Pack of	REF
N 10 PP bonded screw cap*, black, center hole	Red Rubber / TEF colorless	65° shore A	1.0 mm	100	**702044**
N 10 PP bonded screw cap* as above	Silicone white / PTFE beige	45° shore A	1.5 mm	100	**702045**
N 10 PP bonded screw cap* as above	Silicone white / PTFE red	45° shore A	1.5 mm	100	**702046**
N 10 PP bonded screw cap* as above	Silicone white / PTFE blue, slit	45° shore A	1.5 mm	100	**702047**
* Septum firmly connected with the cap, cannot be removed					
N 10 PP screw cap, black, center hole	PTFE red / Silicone white / PTFE red	45° shore A	1.0 mm	100	**702048**
N 10 PP screw cap, black, center hole	no liner	–	–	100	**702049**

Crimp neck vials, inserts, and closures N 11

Crimp neck vials and closures N 11

- Broad variety of standard crimp neck vials (with small or wide opening), as well as crimp neck micro-vials for smaller sample volumes
- Economic closures: Natural rubber / TEF (2 layers), Natural rubber / Butyl / TEF (3 layers) and Red Rubber / FEP (2 layers)
- For more demanding analyses: analytically pure Silicone / PTFE septa with lower fragmentation
- Magnetic closure: REF 702879 for use on CTC GC PAL

Crimp neck vials N 11, small opening, and compatible inserts

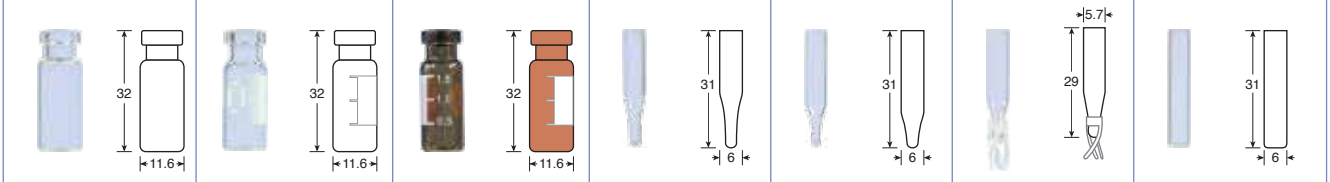


70201CG	70214CG	702968	702968.1	702824	702005

Type of vial	Usable volume	OD x height	Pack of	REF
Clear, flat bottom, small opening	1.5 mL	11.6 x 32 mm	100	**70201CG**
Amber, flat bottom, small opening	1.5 mL	11.6 x 32 mm	100	**70214CG**
Insert for small opening vials, clear, conical, 15 mm tip	0.1 mL	5 x 31 mm	100	**702968***
Insert for small opening vials, clear, conical, 9 mm tip	0.15 mL	5 x 31 mm	100	**702968.1***
Insert for small opening vials, clear, with plastic spring	0.1 mL	5 x 29 mm	100	**702824**
Insert for small opening vials, clear, flat bottom	0.25 mL	5 x 31 mm	100	**702005**

* Optionally you may use metal springs 702974.1 in combination with these products to push them up in the vial.

Crimp neck vials N 11, wide opening, and compatible inserts



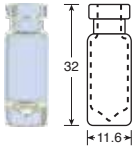
70201HP	702885 silanized 702075	702892 silanized 702076	702813 silanized 702077	702716	702818	702825

Type of vial	Usable volume	OD x height	Pack of	REF
Clear, flat bottom, wide opening	1.5 mL	11.6 x 32 mm	100	**70201HP**
Clear, flat bottom, wide opening, label and scale	1.5 mL	11.6 x 32 mm	100	**702885**
as above, silanized	1.5 mL	11.6 x 32 mm	100	**702075**
Amber, flat bottom, wide opening, label and scale	1.5 mL	11.6 x 32 mm	100	**702892**
as above, silanized	1.5 mL	11.6 x 32 mm	100	**702076**
Insert for wide opening vials, clear, conical, 15 mm tip	0.2 mL	6 x 31 mm	100	**702813**
as above, silanized	0.2 mL	6 x 31 mm	100	**702077**
Insert for wide opening vials, clear, conical, 12 mm tip	0.25 mL	6 x 31 mm	100	**702716**
Insert for wide opening vials, clear, with plastic spring	0.1 mL	5.7 x 29 mm	100	**702818**
Insert for wide opening vials, clear, flat bottom	0.3 mL	6 x 31 mm	100	**702825**

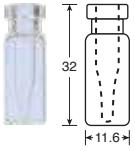
Crimp neck vials, inserts, and closures N 11

Description	Dimensions (scale 1:2)	Pack of	REF

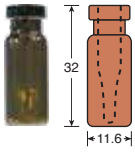
Crimp neck micro-vials N 11



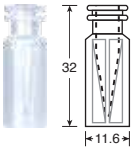
702888



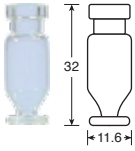
702891



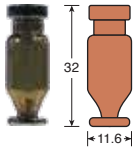
702014



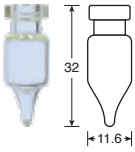
702134 PP / glass



702015



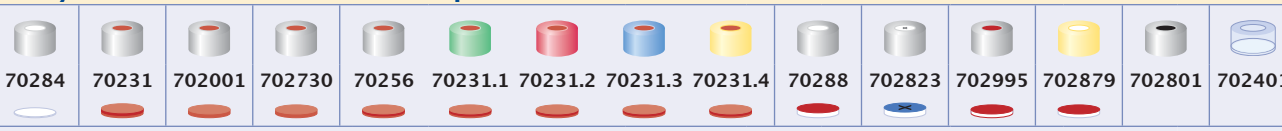
702016



702141

Type of vial	Usable volume	OD x height		
Micro-vial, clear, flat bottom 15 µL funnel in solid glass bottom	1.1 mL	11.6 x 32 mm	100	**702888**
Micro-vial, clear, with integrated 0.2 mL insert	0.2 mL	11.6 x 32 mm	100	**702891**
Micro-vial, amber, with integrated 0.2 mL insert	0.2 mL	11.6 x 32 mm	100	**702014**
Micro-vial, polypropylene, transparent, with integrated 0.15 mL glass insert, conical	0.15 mL	11.6 x 32 mm	100	**702134**
Micro-vial, clear, conical with round pedestal glass plate	1.1 mL	11.6 x 32 mm	100	**702015**
Micro-vial, amber, conical with round pedestal glass plate	1.1 mL	11.6 x 32 mm	100	**702016**
Micro-vial, clear, conical	1.1 mL	11.6 x 32 mm	100	**702141**

Ready assembled aluminium crimp closures N 11



Cap description	Septa description	Hardness	Thickness		
N 11 aluminium crimp cap, silver, center hole	PTFE virginal, white	53° shore D	0.25 mm	100	**70284**
N 11 crimp cap as above, silver	Natural rubber / Butyl red-orange / TEF colorless	45° shore A	1.3 mm	100	**70231**
N 11 crimp cap as above, silver	Natural rubber red-orange / TEF colorless (corresponds to Agilent quality)	60° shore A	1.0 mm	100	**702001**
N 11 crimp cap as above, silver	Red Rubber / FEP colorless	40° shore A	1.0 mm	100	**702730**
N 11 crimp cap as above, silver	Natural rubber / Butyl red-orange / TEF colorless	45° shore A	1.0 mm	100	**70256**
N 11 crimp cap as above, green	as above	45° shore A	1.0 mm	100	**70231.1**
N 11 crimp cap as above, red	as above	45° shore A	1.0 mm	100	**70231.2**
N 11 crimp cap as above, blue	as above	45° shore A	1.0 mm	100	**70231.3**
N 11 crimp cap as above, gold	as above	45° shore A	1.0 mm	100	**70231.4**
N 11 crimp cap as above, silver	Silicone white / PTFE red	40° shore A	1.3 mm	100	**70288**
N 11 crimp cap as above, silver	Silicone white / PTFE blue, cross-slit	40° shore A	1.5 mm	100	**702823**
N 11 crimp cap as above, silver	PTFE red / Silicone white / PTFE red	40° shore A	1.0 mm	100	**702995**
N 11 **magnetic** crimp cap, gold, center hole	Silicone white / PTFE red	55° shore A	1.0 mm	100	**702879**
N 11 aluminium crimp cap, silver, center hole	no liner	-	-	100	**702801**

N 11 PE cap, transparent, closed top, with thin piercing area	100	**702401**

N 11 Septa for crimp caps N 11

Material	Illustration	Hardness	Thickness		
PTFE virginal, white		53° shore D	0.25 mm	100	**70262**
Red Rubber / FEP colorless		40° shore A	1.0 mm	100	**702065**
Silicone white / PTFE red		40° shore A	1.3 mm	100	**70263**
PTFE red / Silicone white / PTFE red		40° shore A	1.0 mm	100	**70264**

Crimp neck vials, inserts, and closures N 11

Vial Kits crimp neck N 11

Packs of 100 vials and 100 closures, each

Closure → / Vial ↓	70288	702995	70256
70201HP: 1.5 mL, clear, flat bottom	**702215**	**702218**	**702222**
702885: 1.5 mL, clear, flat bottom, label and scale	**702216**	**702219**	**702223**
702892: 1.5 mL, amber, flat bottom, label and scale	**702217**	**702221**	**702224**

Other Vial Kits on request

Pre-sealed vial-closure combinations with crimp neck N 11

Vial description	Closure description	Pack of	REF
Pre-sealed vials 70201CG: 1.5 mL crimp neck vial N 11, 11.6 x 32 mm, clear, flat bottom, small opening	crimped with 70256: N 11 aluminium crimp cap, silver, center hole, Natural rubber / Butyl red-orange / TEF colorless, 45° shore A, 1.0 mm	100	**702881**
Pre-sealed vials 70201HP: 1.5 mL crimp neck vial N 11, 11.6 x 32 mm, clear, flat bottom, wide opening	crimped with 70256: N 11 aluminium crimp cap, silver, center hole, Natural rubber / Butyl red-orange / TEF colorless, 45° shore A, 1.0 mm	100	**702101HP**
Pre-sealed vials 702892: 1.5 mL crimp neck vial N 11, 11.6 x 32 mm, amber, flat bottom, wide opening, label and scale	crimped with 70256: N 11 aluminium crimp cap, silver, center hole, Natural rubber / Butyl red-orange / TEF colorless, 45° shore A, 1.0 mm	100	**702859**

Other pre-sealed vial-closure combinations on request

Crimping tools N 11

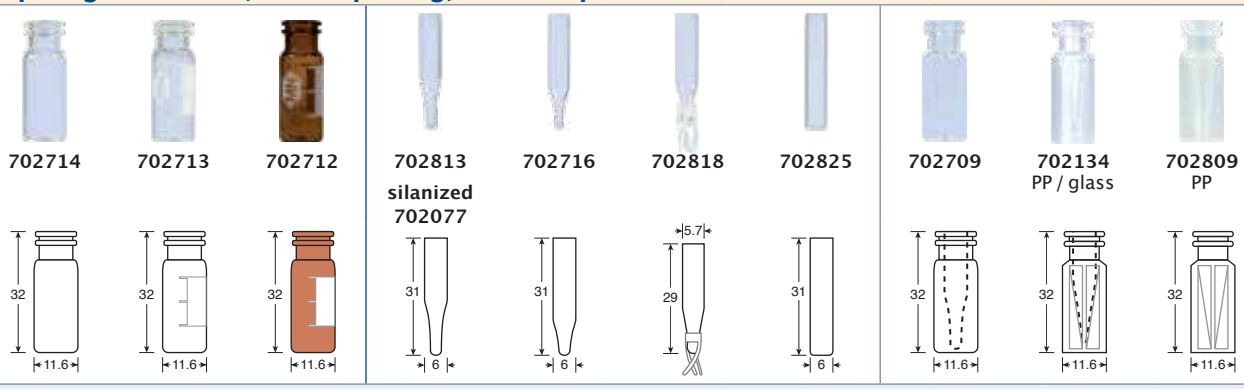
Description	Pack of	REF
Manual ergonomic crimper for 11 mm aluminium crimp caps	1	**735211**
Manual ergonomic decapper for 11 mm aluminium crimp caps	1	**735311**
Manual crimper, height adjustable, for 11 mm aluminium crimp caps	1	**735111**
Manual decapper for 11 mm aluminium crimp caps	1	**735911**
Pneumatic crimping tool for 11 mm aluminium crimp caps (complete with **hand switch**)	1	**735114**
Pneumatic crimping tool for 11 mm aluminium crimp caps (complete with **foot switch**)	1	**735117**
Crimping head N 11 (without pneumatic basic tool)	1	**735121**
Decapping head N 11 (without pneumatic basic tool)	1	**735434.1**
Pneumatic basic tool with **hand switch**	1	**735124**
Pneumatic basic tool with **foot switch**	1	**735125**

For more crimping tools N 11 see pages 100 and 101

Snap ring vials and closures N 11

- Quick, convenient sealing method which, however, should only be used in HPLC
- Can be used on all common HPLC autosamplers
- Alternatively crimp closures N 11 can be used (see preceding pages).
- 0.3 mL PP snap ring vial for special applications, e.g., in ion chromatography
- Most frequent closure: with cross-slit Silicone / PTFE septum, which supports easy penetration with the relatively thick, blunt HPLC needle

Snap ring vials N 11, wide opening, and compatible inserts



Description	Dimensions (scale 1:2)		Pack of	REF
702714				
702713				
702712				
702813				
silanized 702077				
702716				
702818				
702825				
702709				
702134 PP / glass				
702809 PP				
Type of vial	Usable volume	OD x height		
Clear, flat bottom	1.5 mL	11.6 x 32 mm	100	**702714**
Clear, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702713**
Amber, flat bottom, label and scale	1.5 mL	11.6 x 32 mm	100	**702712**
Insert for wide opening vials, clear, conical, 15 mm tip	0.2 mL	6 x 31 mm	100	**702813**
as above, silanized	0.2 mL	6 x 31 mm	100	**702077**
Insert for wide opening vials, clear, conical, 12 mm tip	0.25 mL	6 x 31 mm	100	**702716**
Insert for wide opening vials, clear, with plastic spring	0.1 mL	5.7 x 29 mm	100	**702818**
Insert for wide opening vials, clear, flat bottom	0.3 mL	6 x 31 mm	100	**702825**
Micro-vial, clear, with integrated 0.2 mL insert	0.2 mL	11.6 x 32 mm	100	**702709**
Micro-vial, polypropylene, transparent, with integrated 0.15 mL glass insert, conical	0.15 mL	11.6 x 32 mm	100	**702134**
Micro-vial, polypropylene, transparent, with conical insert	0.3 mL	11.6 x 32 mm	100	**702809**

Snap ring vials, inserts, and closures N 11

Description	Dimensions (scale 1:2)	Pack of	REF

Ready assembled snap ring closures N 11

Cap description	Septa description	Hardness	Thickness		
N 11 PE snap ring cap, blue, center hole	Red Rubber / TEF colorless	65° shore A	1.0 mm	100	**702063**
as above, transparent cap	Red Rubber / TEF colorless	65° shore A	1.0 mm	100	**702731**
N 11 PE snap ring cap, blue, center hole	Silicone white / PTFE red	55° shore A	1.0 mm	100	**702710.1**
as above, transparent cap	Silicone white / PTFE red	55° shore A	1.0 mm	100	**702710**
N 11 PE snap ring cap, blue, center hole	Silicone white / PTFE blue, cross-slit	55° shore A	1.0 mm	100	**702717.2**
as above, transparent cap	Silicone white / PTFE blue, cross-slit	55° shore A	1.0 mm	100	**702064**
N 11 PE snap ring cap, blue, center hole	PTFE red / Silicone white / PTFE red	45° shore A	1.0 mm	100	**702718.1**
as above, transparent cap	PTFE red / Silicone white / PTFE red	45° shore A	1.0 mm	100	**702718**
N 11 PE cap, transparent, closed top, with thin piercing area				100	**702401**

Vial Kits snap ring N 11

Packs of 100 vials and 100 closures, each

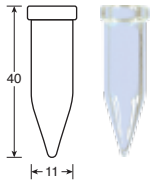
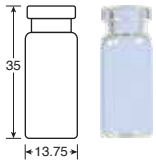
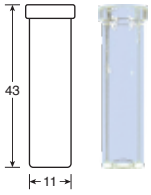
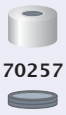
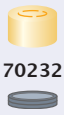
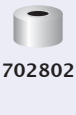
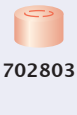
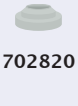
Closure → / Vial ↓	702710	702064	702731	702718
702714: 1.5 mL, clear, flat bottom	**702225**	**702228**	**702232**	**702235**
702713: 1.5 mL, clear, flat bottom, label and scale	**702719**	**702229**	**702233**	**702236**
702712: 1.5 mL, amber, flat bottom, label and scale	**702227**	**702231**	**702234**	**702237**

Other Vial Kits on request

Containers for screw neck vials N 8 / N 9 / N 10 as well as crimp neck and snap ring vials N 11

Description	Pack of	REF
81 position container blue for vials 11.6 x 32 mm, outer length 130 mm, outer width 130 mm, outer height 45 mm, coded, with transparent lid (suitable for freezers)	1	**702514**

Crimp neck vials and closures N 13

Description	Dimensions (scale 1:2)	Pack of	REF
Crimp neck vials N 13			
	 **70255**		
	 **70203**		
	 **70258**		
Type of vial	Usable volume	OD x height		
Clear, conical	1 mL	11 x 40 mm	100	**70255**
Clear, flat bottom	2 mL	13.75 x 35 mm	100	**70203**
Clear, flat bottom	2 mL	11 x 43 mm	100	**70258**
Ready assembled crimp closures N 13 and plain crimp caps N 13				
	 **70257**  **70232**  **702802**  **702803**  **702820**			
Cap description	Septa description	Hardness	Thickness		
N 13 aluminium crimp cap, silver, center hole	Butyl dark gray / PTFE gray (only centrically laminated, typically called Pharma-Fix)	50° shore A	2 mm	100	**70257**
N 13 aluminium center tear off cap, gold	Butyl dark gray / PTFE gray (only centrically laminated, typically called Pharma-Fix)	50° shore A	2 mm	100	**70232**
N 13 aluminium crimp cap, silver, center hole	no liner	–	–	100	**702802**
N 13 aluminium center tear off cap, coppery	no liner	–	–	100	**702803**
Stoppers N 13					
	N 13 Bromobutyl stopper, gray	45° shore A	–	100	**702820**

Crimping tools N 13		
Manual crimper, height adjustable, for 13 mm aluminium crimp caps	1	**735113**
Manual crimper, height adjustable, for 13 mm Flip Top/Flip Off caps	1	**735133**
Manual decapper for 13 mm aluminium crimp caps	1	**735913**

Containers for crimp and screw neck vials N 13

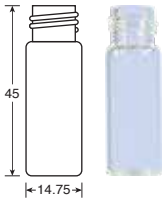
Description	Pack of	REF
49 position container blue for crimp and screw neck vials N 13, outer length 130 mm, outer width 130 mm, outer height 50 mm, with transparent lid (suitable for freezers)	1	**702515**

Screw neck vials, inserts, and closures N 13

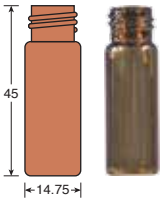
Screw neck vials and closures N 13

- Generally used for large volume samples in HPLC
- In combination with closed top screw closures suitable for sample storage (see page 92)
- Compatible insert requires metal spring for centrical alignment
- Range of ready assembled closures and plain caps with center hole or with closed top as well as separate septa (PTFE virginal, Red Rubber / FEP and Silicone / PTFE) are available.

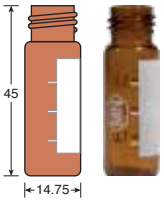
Screw neck vials N 13 (13-425 thread) and compatible insert



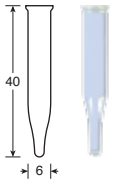
702962



702973



702089



702972

702974

Type of vial	Usable volume	OD x height		
Clear, flat bottom	4 mL	14.75 x 45 mm	100	**702962**
Amber, flat bottom	4 mL	14.75 x 45 mm	100	**702973**
Amber, flat bottom, label and scale	4 mL	14.75 x 45 mm	100	**702089**
Insert, clear, conical, metal spring required	0.3 mL	6 x 40 mm	100	**702972**
Metal spring for 702972	-	-	100	**702974**

Ready assembled screw closures and plain screw caps N 13

702103

702050

702051

702926

702052

702963

-

702966

-

Cap description	Septa description	Hardness	Thickness		
N 13 screw cap (13-425), green, closed top	F217 white / PTFE beige (firmly fixed)		1.5 mm	100	**702103**
N 13 PP screw cap, black, center hole	Red Rubber / FEP colorless	40° shore A	1.5 mm	100	**702050**
as above, but closed top	Red Rubber / FEP colorless	40° shore A	1.5 mm	100	**702051**
N 13 PP screw cap, black, center hole	Silicone white / PTFE red	40° shore A	1.3 mm	100	**702926**
as above, but closed top	Silicone white / PTFE red	40° shore A	1.3 mm	100	**702052**
N 13 PP screw cap, black, center hole	no liner	-	-	100	**702963**
as above, but closed top	no liner	-	-	100	**702966**

N 12 septa for screw caps N 13

Material	Illustration	Hardness	Thickness		
PTFE virginal, white		53° shore D	0.25 mm	100	**70260**
Red Rubber / FEP colorless		40° shore A	1.5 mm	100	**702053**
Silicone white / PTFE red		40° shore A	1.3 mm	100	**702292**

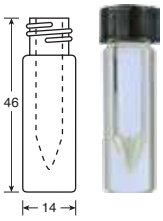
Micro reaction vials and closures

Description	Dimensions (scale 1:2)	Pack of	REF

Micro reaction vials with screw neck N 13 / N 20 and closures

N 13

702210

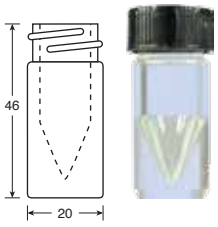


702220

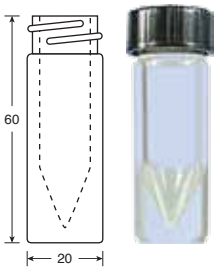
702926

702926

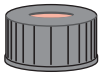
N 20



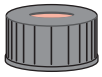
702230



702240



702280



702280

Micro reaction vials complete with screw caps and septa

Type of vial	Usable volume	OD x height		
Screw neck vials N 13 (13–425 thread), clear, with inner conical funnel in solid, flat glass bottom; complete with screw closure	0.25 mL	14 x 33 mm	1	**702210**
Screw neck vials N 13 (13–425 thread), clear, with inner conical funnel in solid, flat glass bottom; complete with screw closure	0.75 mL	14 x 46 mm	1	**702220**
Screw neck vials N 20 (20–400 thread), clear, with inner conical funnel in solid, flat glass bottom; complete with screw closure	3 mL	20 x 46 mm	1	**702230**
Screw neck vials N 20 (20–400 thread), clear, with inner conical funnel in solid, flat glass bottom; complete with screw closure	4.5 mL	20 x 60 mm	1	**702240**

Replacement screw caps with septa for micro reaction vials N 13 and N 20

Cap description	Septa description	Hardness	Thickness		
N 13 PP screw cap, black, center hole, assembled	Silicone white / PTFE red	40° shore A	1.3 mm	100	**702926**
N 20 phenolic screw cap, black, center hole (unassembled)	Butyl red / PTFE gray	55° shore A	1.4 mm	48	**702280**

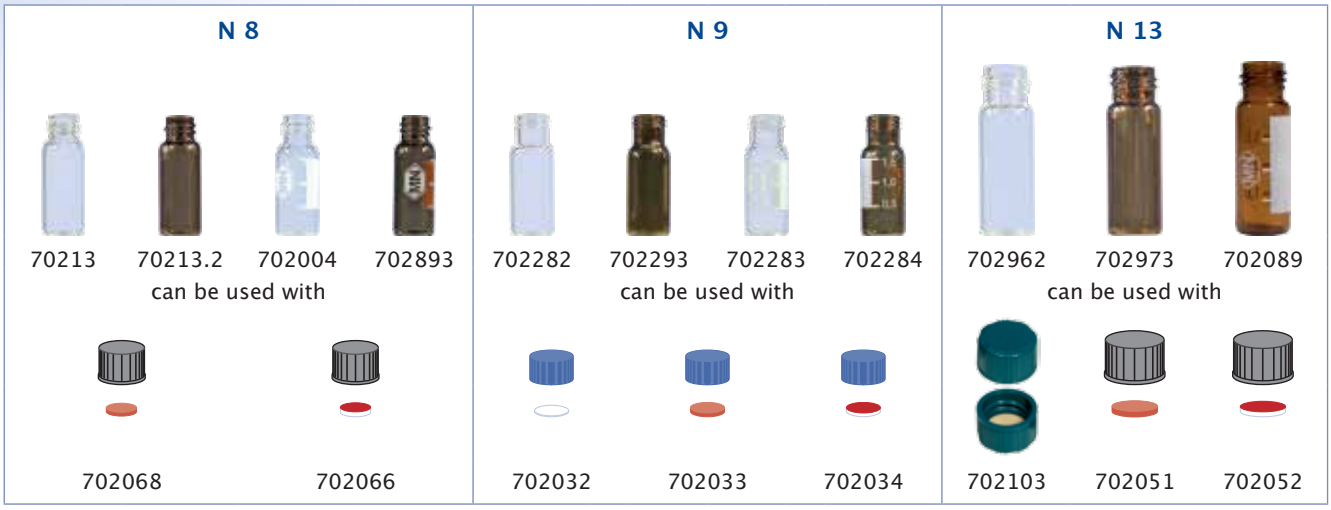
Replacement septa N 12 and N 18 for screw caps N 13 and N 20, respectively

Material	Illustration	Hardness	Thickness		
Silicone white / PTFE red		40° shore A	1.3 mm	100	**702292**
Butyl red / PTFE gray		55° shore A	1.4 mm	48	**702300**

Special vials and closures

Screw neck vials for storage of liquid samples

- Usable volumes of 1.5 up to 24 mL
- Available neck sizes N 8, N 9, N 13, N 15, N 18 and N 20
- Corresponding closed top screw closures with different septa materials



Description	Dimensions	Pack of	REF
Screw neck vials N 8, small opening (8-425 thread)			
Type of vial	Usable volume OD x height		
Clear, flat bottom	1.5 mL 11.6 x 32 mm	100	**70213**
Amber, flat bottom	1.5 mL 11.6 x 32 mm	100	**70213.2**
Clear, flat bottom, label and scale	1.5 mL 11.6 x 32 mm	100	**702004**
Amber, flat bottom, label and scale	1.5 mL 11.6 x 32 mm	100	**702893**
Closed top screw closures N 8			
Cap description	Septa description Hardness Thickness		
N 8 PP screw cap, black, closed top	Red Rubber / FEP colorless 40° shore A 1.0 mm	100	**702068**
N 8 PP screw cap, black, closed top	Silicone white / PTFE red 40° shore A 1.3 mm	100	**702066**
For drawings of vials see page 79			

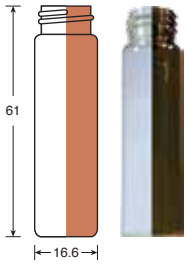
Description	Dimensions	Pack of	REF
Screw neck vials N 9, wide opening (short thread)			
Type of vial	Usable volume OD x height		
Clear, flat bottom	1.5 mL 11.6 x 32 mm	100	**702282**
Amber, flat bottom	1.5 mL 11.6 x 32 mm	100	**702293**
Clear, flat bottom, label and scale	1.5 mL 11.6 x 32 mm	100	**702283**
as above, silanized	1.5 mL 11.6 x 32 mm	100	**702078**
Amber, flat bottom, label and scale	1.5 mL 11.6 x 32 mm	100	**702284**
as above, silanized	1.5 mL 11.6 x 32 mm	100	**702079**
Closed top screw closures N 9			
Cap description	Septa description Hardness Thickness		
N 9 PP screw cap blue, closed top	PTFE virginal, white 53° shore D 0.25 mm	100	**702032**
N 9 PP screw cap blue, closed top	Red Rubber / FEP colorless 40° shore A 1.0 mm	100	**702033**
N 9 PP screw cap blue, closed top	Silicone white / PTFE red 40° shore A 1.0 mm	100	**702034**
For drawings of vials see page 80			

Description	Dimensions		Pack of	REF
Screw neck vials N 13 (13-425 thread)				
Type of vial	Usable volume	OD x height		
Clear, flat bottom	4 mL	14.75 x 45 mm	100	**702962**
Amber, flat bottom	4 mL	14.75 x 45 mm	100	**702973**
Amber, flat bottom, label and scale	4 mL	14.75 x 45 mm	100	**702089**
Closed top screw closures N 13				
Cap description	Septa description	Hardness / Thickness		
N 13 screw cap (13-425), green, closed top	F217 white / PTFE beige (firmly fixed)	1.5 mm	100	**702103**
N 13 PP screw cap, black, closed top	Red Rubber / FEP colorless	40° shore A / 1.5 mm	100	**702051**
N 13 PP screw cap, black, closed top	Silicone white / PTFE red	40° shore A / 1.3 mm	100	**702052**

For drawings of vials see page 90

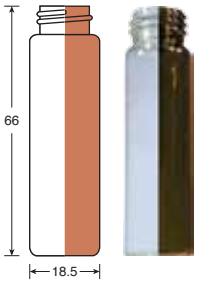
Description	Dimensions (scale 1:2)		Pack of	REF
Screw neck vials N 15, N 18, and N 20 for storage of liquid samples				

N 15



702096 / 702311

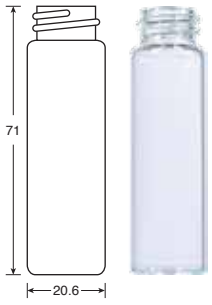
702104



70285 / 702097

702104

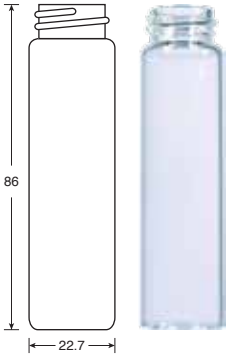
N 18



702098

702105

N 20



702099

702106

Type of vial	Usable volume	OD x height		
Screw neck vial N 15 (15-425 thread), clear, flat bottom	8 mL	16.6 x 61 mm	100	**702096**
Screw neck vial N 15 (15-425 thread), amber, flat bottom	8 mL	16.6 x 61 mm	100	**702311**
Screw neck vial N 15 (15-425 thread), clear, flat bottom	12 mL	18.5 x 66 mm	100	**70285**
Screw neck vial N 15 (15-425 thread), amber, flat bottom	12 mL	18.5 x 66 mm	100	**702097**
Screw neck vial N 18 (18-400 thread), clear, flat bottom	16 mL	20.6 x 71 mm	100	**702098**
Screw neck vial N 20 (20-400 thread), clear, flat bottom	24 mL	22.7 x 86 mm	100	**702099**
Closed top screw closures N 15, N 18, and N 20				
Cap description	Septa description	Thickness		
N 15 screw cap (15-425), green, closed top	F217 white / PTFE beige (firmly fixed)	1.5 mm	100	**702104**
N 18 screw cap (18-400), green, closed top	F217 white / PTFE beige (firmly fixed)	1.5 mm	100	**702105**
N 20 screw cap (20-400), green, closed top	F217 white / PTFE beige (firmly fixed)	1.5 mm	100	**702106**

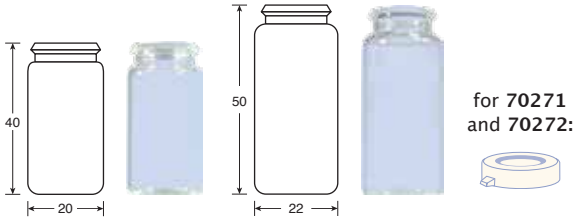
For screw neck vials with even larger volumes please see page 102.

Special vials and closures

Snap cap vials for storage of powdery samples

- Available sizes N 18 and N 22
- Usable volumes from 5 up to 25 mL
- Glass of 3rd hydrolytic class

Description	Dimensions (scale 1:2)	Pack of	REF
Snap cap vials N 18 and N 22 for storage of powdery samples			



70271 70272 70274 702019 70273 70275

Snap cap vials

Type of vial	Usable volume	OD x height	Pack of	REF
N 18, clear, flat bottom	5 mL	20 x 40 mm	100	**70271**
N 18, clear, flat bottom	10 mL	22 x 50 mm	100	**70272**
N 22, clear, flat bottom	15 mL	26 x 48 mm	100	**702019**
N 22, clear, flat bottom	25 mL	26 x 65 mm	100	**70273**

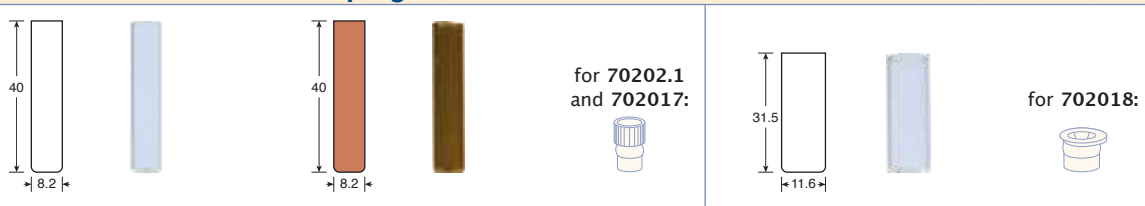
PE snap caps

N 18 PE snap cap, transparent, for 70271 and 70272			100	**70274**
N 22 PE snap cap, transparent, for 702019 and 70273			100	**70275**

Shell vials N 8 and N 12

- Economic combination of vials and closures for uncritical HPLC applications

Description	Dimensions (scale 1:2)	Pack of	REF
Shell vials N 8 and N 12 with PE plug			



70202.1 702017 702807 702018 702054

Shell vials

Type of vial	Usable volume	OD x height	Pack of	REF
N 8, clear, flat bottom	1 mL	8.2 x 40 mm	100	**70202.1**
N 8, amber, flat bottom	1 mL	8.2 x 40 mm	100	**702017**
N 12, clear, flat bottom	2 mL	11.6 x 31.5 mm	100	**702018**

PE plugs

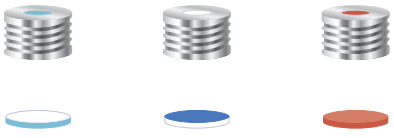
N 8 PE plug, transparent, for 70202.1 and 702017	100	**702807**
N 12 PE plug, transparent, for 702018	100	**702054**

Screw neck vials and magnetic screw closures N 18

- Headspace vials for convenient, safe and consistent handling
- High tightness and better reproducibility of the sealing process (as compared to crimping)
- Thinner septum (1.5 mm instead of 3 mm septum thickness in crimp caps), thus safe penetration of the needle and less fragmentation (especially important for SPME applications)
- Improved run in autosamplers with magnets (CTC Combi PAL and equivalent instruments), since a flat surface for the magnet is ensured, thus avoiding that the filled vial can drop from the magnet

Headspace screw neck vials N 18

702866 702826



702827 702055 702072

Type of vial	Usable volume	OD x height	Pack of	REF
Clear, rounded bottom	10 mL	22.5 x 46 mm	100	**702866**
Clear, rounded bottom	20 mL	22.5 x 75.5 mm	100	**702826**

Ready assembled, magnetic screw closures N 18

Cap description	Septa description	Hardness	Thickness	Pack of	REF
N 18 magnetic screw cap, silver, center hole	Silicone blue transparent / PTFE white	45° shore A	1.5 mm	100	**702827**
N 18 magnetic screw cap, silver, center hole	Silicone white / PTFE blue	55° shore A	1.5 mm	100	**702055**
N 18 magnetic screw cap, silver, center hole	Red Rubber / TEF colorless	65° shore A	1.5 mm	100	**702072**

N 17 septa for magnetic screw caps N 18

Material	Illustration	Hardness	Thickness	Pack of	REF
Silicone blue transparent / PTFE white		45° shore A	1.5 mm	100	**702981**
Silicone white / PTFE blue		55° shore A	1.5 mm	100	**702110**

Containers for screw neck vials N 18 and crimp neck vials N 20

Description	Pack of	REF
25 position container blue, with removable divider for headspace screw neck vials N 18 and crimp neck vials N 20; outer length 130 mm, outer width 130 mm, outer height 80 mm, with transparent lid (suitable for freezers)	1	**702516**

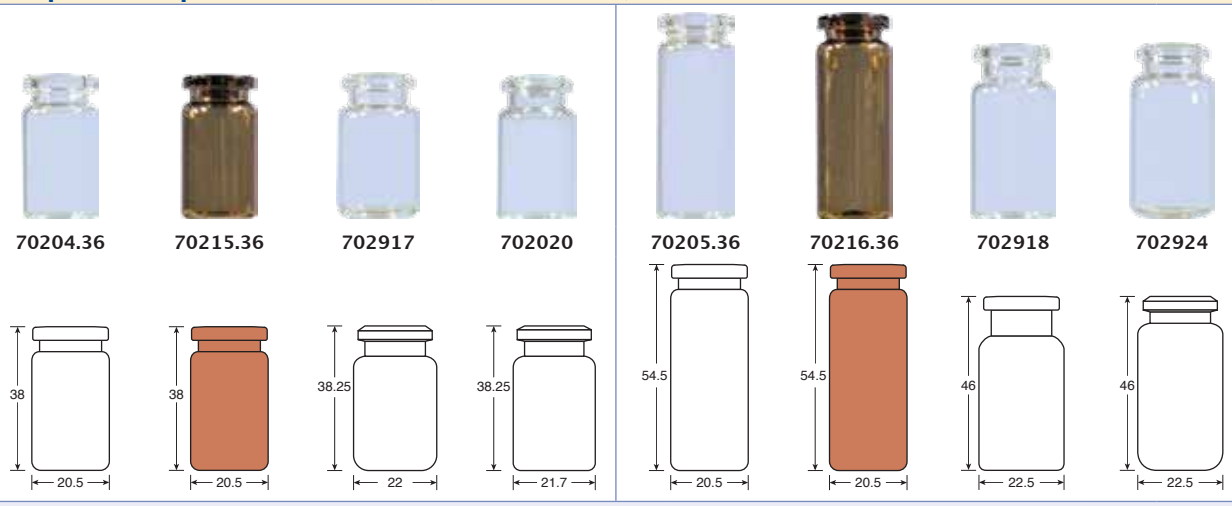
Crimp neck vials and closures N 20

Crimp neck vials and closures N 20

- Large range of Headspace crimp neck vials with different volumes and diameters
- Flat DIN crimp neck with stable bearing surface for the septum (especially suited for high vial pressures) as well as beveled HS crimp neck for instruments of certain manufacturers (PerkinElmer).
- Assignment to respective instrument manufacturers in parentheses
- Different types of crimp closures depending on instrument and application

Please consider our various crimping tools on page 100 and 101.

Headspace crimp neck vials N 20 (volume 5–10 mL)



Type of vial	Usable volume	OD x height	Pack of	REF
Clear, flat bottom, flat DIN crimp neck (Varian)	5 mL	20.5 x 38 mm	100	**70204.36**
Amber, flat bottom, flat DIN crimp neck (Varian)	5 mL	20.5 x 38 mm	100	**70215.36**
Clear, rounded bottom, beveled HS crimp neck (PerkinElmer)	6 mL	22.0 x 38.25 mm	100	**702917**
Clear, flat bottom, beveled HS crimp neck (Metrohm, Karl-Fischer titration)	5 mL	21.7 x 38.25 mm	100	**702020**
Clear, flat bottom, flat DIN crimp neck (Varian)	10 mL	20.5 x 54.5 mm	100	**70205.36**
Amber, flat bottom, flat DIN crimp neck (Varian)	10 mL	20.5 x 54.5 mm	100	**70216.36**
Clear, flat bottom, flat DIN crimp neck (Dani, Agilent)	10 mL	22.5 x 46 mm	100	**702918**
Clear, rounded bottom, beveled HS crimp neck (CTC)	10 mL	22.5 x 46 mm	100	**702924**

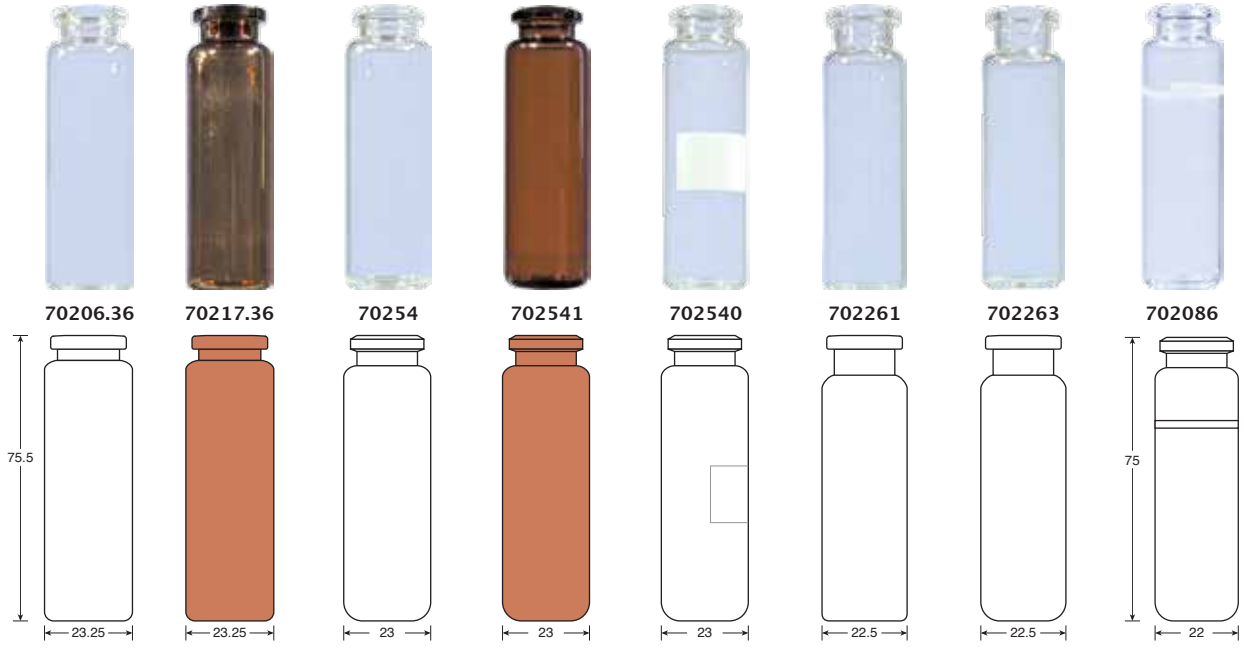
Crimping tools N 20

Manual ergonomic crimper for 20 mm aluminium crimp caps	1	**735220**
Manual ergonomic decapper for 20 mm aluminium crimp caps	1	**735320**
Manual crimper, height adjustable, for 20 mm aluminium crimp caps	1	**735120**
Manual crimper, height adjustable, for 20 mm Flip Top / Flip Off caps	1	**735132**
Manual decapper for 20 mm aluminium crimp caps	1	**735920**

For electronic crimping tools N 20 see page 101; pneumatic crimping tools are available on request.

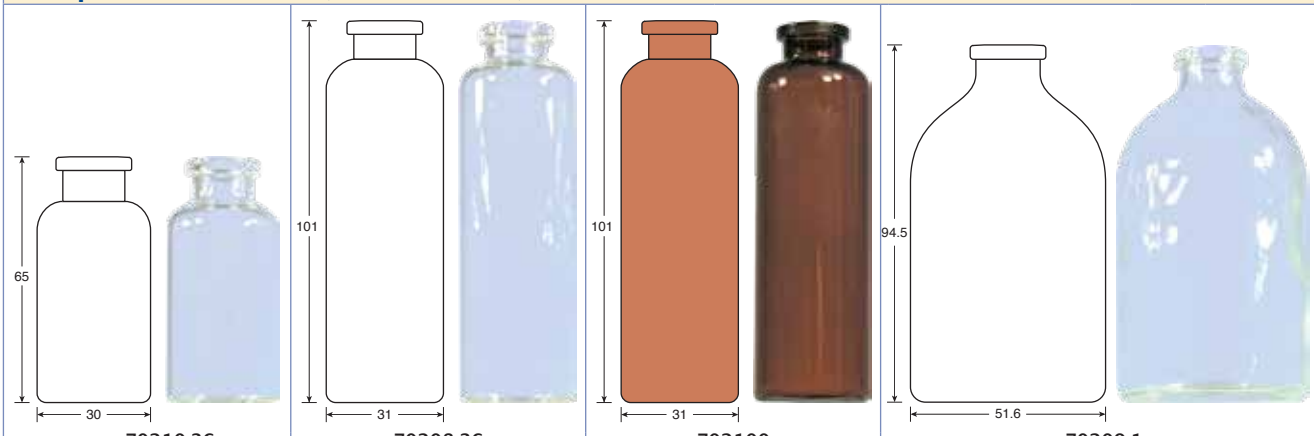
Description	Dimensions (scale 1:2)	Pack of	REF

Crimp neck vials N 20 (volume 20 mL)



Type of vial	Usable volume	OD x height		
Clear, flat bottom, flat DIN crimp neck	20 mL	23.25 x 75.5 mm	100	**70206.36**
Amber, flat bottom, flat DIN crimp neck	20 mL	23.25 x 75.5 mm	100	**70217.36**
Clear, rounded bottom, beveled HS crimp neck (PerkinElmer)	20 mL	23 x 75.5 mm	100	**70254**
Amber, rounded bottom, beveled HS crimp neck (PerkinElmer)	20 mL	23 x 75.5 mm	100	**702541**
Clear, rounded bottom, beveled HS crimp neck, label (PerkinElmer)	20 mL	23 x 75.5 mm	100	**702540**
Clear, flat bottom, flat DIN crimp neck (Dani, Agilent)	20 mL	22.5 x 75.5 mm	100	**702261**
Clear, rounded bottom, flat DIN crimp neck (CTC)	20 mL	22.5 x 75.5 mm	100	**702263**
Clear, rounded bottom, beveled HS crimp neck, graduation at 15 mL	20 mL	22 x 75 mm	100	**702086**

Crimp neck vials N 20 (volume > 20 mL)



Type of vial	Usable volume	OD x height		
Clear, flat bottom, flat DIN crimp neck	25 mL	30 x 65 mm	100	**70210.36**
Clear, flat bottom, flat DIN crimp neck	50 mL	31 x 101 mm	100	**70208.36**
Amber, flat bottom, flat DIN crimp neck	50 mL	31 x 101 mm	100	**702100**
Clear, flat bottom, flat DIN crimp neck (3rd hydrolytic class)	100 mL	51.6 x 94.5 mm	88	**70209.1**

Crimp neck vials and closures N 20

Center hole caps

Cap description	Septa description	Hardness	Thickness	Pack of	REF
N 20 aluminium crimp cap, silver, center hole	Butyl red / PTFE gray	50° shore A	3 mm	100	**702773**
as above	Butyl light gray / PTFE dark gray	50° shore A	3 mm	100	**702775**
as above	Molded septum Butyl / PTFE gray	50° shore A	3 mm	100	**70234.9**
as above	Butyl dark gray / PTFE gray*	50° shore A	3 mm	100	**70234**
N 20 aluminium crimp cap, **gold,** center hole	Butyl dark gray / PTFE gray*	50° shore A	3 mm	100	**702056**
N 20 aluminium crimp cap, silver, center hole	Butyl stopper gray, **unassembled** (separate parts)	37° shore A	–	100 each	**70237**
as above	Silicone blue transparent / PTFE colorless	40° shore A	3 mm	100	**702093**
as above	Silicone white / PTFE beige	40° shore A	3 mm	100	**702094**
as above	no liner	–	–	100	**702804**
N 20 aluminium crimp cap, **gold,** center hole	no liner	–	–	100	**702112**

Pressure release caps

with assembled septum	702836	702829	70234.8	702071	702927	702835	no liner 702799

N 20 aluminium pressure release cap, silver, center hole	Butyl red / PTFE gray	50° shore A	3 mm	100	**702836**
as above	Butyl light gray / PTFE dark gray	50° shore A	3 mm	100	**702829**
as above	Molded septum Butyl / PTFE gray	50° shore A	3 mm	100	**70234.8**
as above	Butyl dark gray / PTFE gray*	50° shore A	3 mm	100	**702071**
as above	Silicone blue transparent / PTFE colorless	40° shore A	3 mm	100	**702927**
as above	Silicone white / PTFE beige	40° shore A	3 mm	100	**702835**
as above	no liner	–	–	100	**702799**

Center tear off caps

70233	70236	70236.1	no liner

N 20 aluminium center tear off cap, gold	Butyl dark gray / PTFE gray*	50° shore A	3 mm	100	**70233**
N 20 aluminium center tear off cap, silver	Butyl stopper gray, **unassembled** (separate parts)	37° shore A	–	100 each	**70236**
N 20 aluminium center tear off cap, silver	no liner	–	–	100	**70236.1**

Complete tear off caps

70235	70238	702805	no liner

N 20 aluminium complete tear off cap, silver	Butyl dark gray / PTFE gray*	50° shore A	3 mm	100	**70235**
N 20 aluminium complete tear off cap, silver	Butyl stopper gray, **unassembled** (separate parts)	37° shore A	–	100 each	**70238**
N 20 aluminium complete tear off cap, silver	no liner	–	–	100	**702805**

* only centrically laminated, typically called Pharma-Fix

Crimp neck vials and closures N 20

Cap description	Septa description	Hardness	Thickness	Pack of	REF
Bi-metal crimp caps					
 with assembled septum	 702838	 702834	 702837	no liner 702833	
N 20 bi-metal crimp cap, blue / silver, center hole	Butyl light gray / PTFE dark gray	50° shore A	3 mm	100	**702838**
as above	Silicone blue transp. / PTFE colorless	40° shore A	3 mm	100	**702834**
as above	Silicone white / PTFE beige	40° shore A	3 mm	100	**702837**
as above	no liner	–	–	100	**702833**
Magnetic crimp caps					
 with assembled septum	 702774	 702928	 702928.9	 702929	no liner 702808
N 20 magnetic crimp cap, silver, 8 mm center hole	Butyl red / PTFE gray	50° shore A	3 mm	100	**702774**
as above	Butyl light gray / PTFE dark gray	50° shore A	3 mm	100	**702928**
as above	Butyl dark gray / PTFE gray*	50° shore A	3 mm	100	**702928.9**
as above	Silicone blue transp. / PTFE colorless	40° shore A	3 mm	100	**702929**
as above	no liner	–	–	100	**702808**

N 20 septa for crimp caps N 20					
Material	Illustration	Hardness	Thickness		
Butyl red / PTFE gray		50° shore A	3 mm	100	**70277**
Butyl light gray / PTFE dark gray		50° shore A	3 mm	100	**702057**
Molded septum Butyl / PTFE gray		50° shore A	3 mm	100	**702101**
Butyl dark gray / PTFE gray*		50° shore A	3 mm	100	**702D20TB**
Silicone blue transparent / PTFE colorless		40° shore A	3 mm	100	**702780**
Silicone white / PTFE beige		40° shore A	3 mm	100	**70278**
Silicone white / Aluminium foil silver		50° shore A	3 mm	100	**70279**

Stopper N 20					
Butyl gray		37° shore A	–	100	**702931**
Bromobutyl red		45° shore A	–	100	**702931.1**

* only centrically laminated, typically called Pharma-Fix

PE caps N 20

Description	Illustration	Hardness	Thickness	Pack of	REF
PE caps N 20					
height 8.4 mm	 **70266**  **702128**	height 9.1 mm	 **70267**  **702129**		
N 20 PE cap, transparent, for beveled HS crimp neck N 20, 4.3 mm center hole (no liner)				100	**70266**
as above, but with assembled septum natural rubber red-orange / TEF colorless, 45° shore A, 1.3 mm				100	**702128**
N 20 PE cap, transparent, for flat DIN crimp neck N 20, 4.3 mm center hole (no liner)				100	**70267**
as above, but with assembled septum natural rubber red-orange / TEF colorless, 45° shore A, 1.3 mm				100	**702129**

N 19 septa for PE caps N 20					
Butyl beige / PTFE gray		55° shore A	1.3 mm	100	**70269**
Natural rubber red-orange / TEF colorless		45° shore A	1.3 mm	100	**702904**

Manual crimping tools

Advanced ergonomic version

- **Available for 11 mm and 20 mm crimp caps**
  - More lightweighted than complete steel crimpers
  - Ergonomically designed handles
  - Adjustment by a knob on the crimping head that is easily accessible and visible
  - Activated by bottom handle motion only which allows a steadier and safer hold of the tool during crimping
  - Due to design and alignment of the crimping head better vertical clearance over the vial
- Advanced ergonomic decappers allow safe removal of caps; no adjustment required

Standard version

- **Available for 8, 11, 13, and 20 mm crimp caps**
  - Adjustable crimping height via hexagon key, which allows to move the inner part of the crimping head up and down (not possible for manual crimpers N 8)
  - Crimping pressure adjustable via screw in the handle
  - Manual crimpers for N 13 and N 20 Flip Top / Flip Off caps (pharmaceutical closures) available
  - Long life time and convenient handling
- Manual decappers (standard version) allow safe removal of caps; no adjustment required

Description	Pack of	REF
Manual crimpers (ergonomic)		
(crimping pressure adjustable by knob on the crimping head)		
Manual ergonomic crimper for 11 mm aluminium crimp caps	1	**735211**
Manual ergonomic crimper for 20 mm aluminium crimp caps	1	**735220**
Manual decappers (ergonomic)		
Manual ergonomic decapper for 11 mm aluminium crimp caps	1	**735311**
Manual ergonomic decapper for 20 mm aluminium crimp caps	1	**735320**

Manual crimpers (standard)		
Manual crimper for 8 mm aluminium crimp caps	1	**735126**
Manual crimper, height adjustable, for 11 mm aluminium crimp caps	1	**735111**
Manual crimper, height adjustable, for 13 mm aluminium crimp caps	1	**735113**
Manual crimper, height adjustable, for 13 mm Flip Top / Flip Off caps	1	**735133**
Manual crimper, height adjustable, for 20 mm aluminium crimp caps	1	**735120**
Manual crimper, height adjustable, for 20 mm Flip Top / Flip Off caps	1	**735132**
Manual decappers (standard)		
Manual decapper for 8 mm aluminium crimp caps	1	**735408**
Manual decapper for 11 mm aluminium crimp caps	1	**735911**
Manual decapper for 13 mm aluminium crimp caps	1	**735913**
Manual decapper for 20 mm aluminium crimp caps	1	**735920**

Electronic crimping tools

Battery-powered electronic crimping tools

for 11 mm and 20 mm aluminium crimp caps (not suitable for 20 mm magnetic / bi-metal crimp caps)

- Mobile tools for consistent and reproducible crimping results
  - Crimping pressure adjustable by pushing +/- buttons of the control unit on top of the tool
  - Long lasting lithium ion cell batteries (full battery charge for several hundred vials, life time of battery > 1500 charges)
  - CE certificate of conformity along with one year warranty
  - One tool each necessary for crimping and for decapping

Electronic high power crimping tool

for 11 mm and 20 mm crimp caps (also suitable for magnetic / bi-metal crimp caps)

- Due to a more powerful motor also suitable for magnetic and bi-metal crimp caps
  - Fixed power supply
  - Exchangeable crimping / decapping heads
  - Digital LED display of crimp settings; different jaw settings can be stored in separate programs
  - CE certificate of conformity along with one year warranty
  - For more convenient handling a stand is optionally available

Description	Pack of	REF
Electronic crimpers (battery-powered)		
Electronic crimper for 11 mm aluminium crimp caps	1	**735511**
Electronic crimper for 20 mm aluminium crimp caps (not suitable for magnetic / bi-metal crimp caps)	1	**735520**
Electronic decappers (battery-powered)		
Electronic decapper for 11 mm aluminium crimp caps	1	**735611**
Electronic decapper for 20 mm aluminium crimp caps (not suitable for magnetic / bi-metal crimp caps)	1	**735620**
Accessories for battery-powered electronic crimping/decapping tools		
Replacement battery 6.4 Volt, 8.6 Wh		**735500**

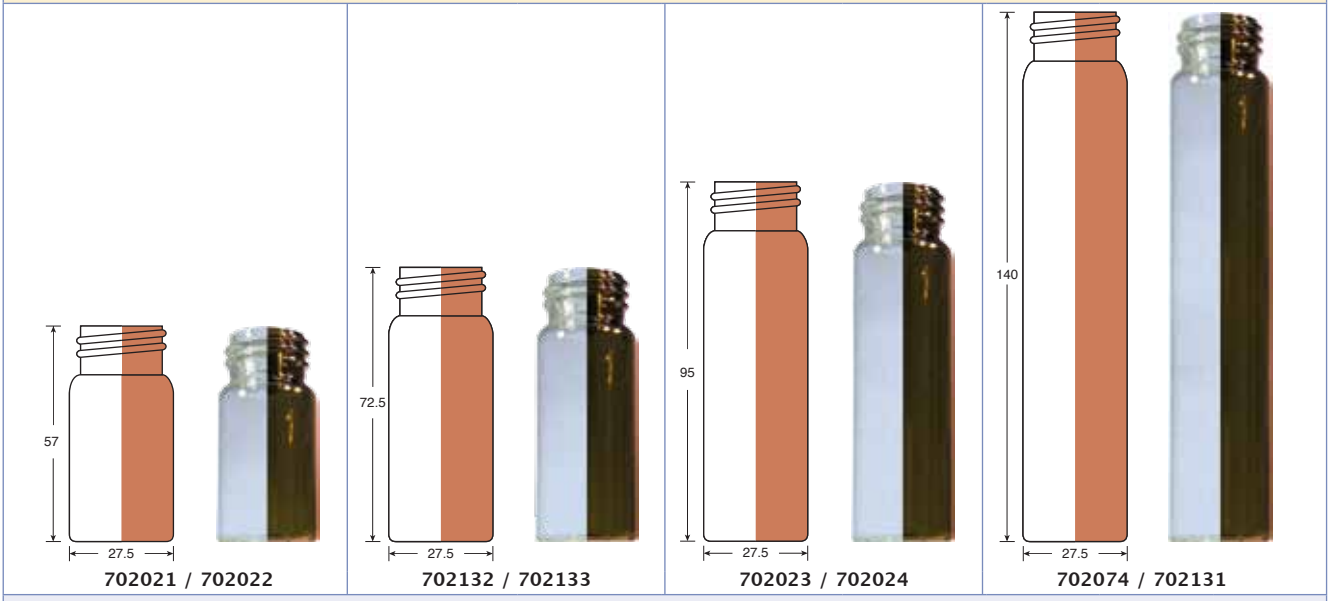
Electronic high power crimping tool		
Electronic high power crimping tool with power supply (exchangeable crimping / decapping heads separately available)	1	**735700**
Accessories for 735700		
Crimping head for 11 mm crimp caps (for electronic high power crimping tool 735700)	1	**735711**
Crimping head for 20 mm crimp caps (aluminium, magnetic, bi-metal) (for electronic high power crimping tool 735700)	1	**735720**
Decapping head for 11 mm crimp caps (for electronic high power crimping tool 735700)	1	**735811**
Decapping head for all 20 mm crimp caps (for electronic high power crimping tool 735700)	1	**735820**
Stand for electronic crimping tools	1	**735501**

Screw neck vials and closures N 24

Screw neck vials and closures N 24 (EPA)

- Recommended for VOC and TOC analyses
- Closed top screw closures for sample storage
- Most frequently used: 40 mL clear glass
- Often called EPA vials, since they are defined in the regulations of the US Environmental Protection Agency
- Due to their size mainly used as bonded closure for a firm fit of the septum
- Recommended for environmental analysis: screw closure with center hole and Silicone / PTFE septum

Description	Dimensions (scale 1:2)	Pack of	REF
Screw neck vials N 24 (EPA)			

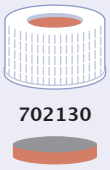


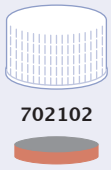
702021 / 702022 | **702132 / 702133** | **702023 / 702024** | **702074 / 702131**

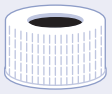
Type of vial	Usable volume	OD x height	Pack of	REF
Clear, flat bottom	20 mL	27.5 x 57 mm	100	**702021**
Amber, flat bottom	20 mL	27.5 x 57 mm	100	**702022**
Clear, flat bottom	30 mL	27.5 x 72.5 mm	100	**702132**
Amber, flat bottom	30 mL	27.5 x 72.5 mm	100	**702133**
Clear, flat bottom	40 mL	27.5 x 95 mm	100	**702023**
Amber, flat bottom	40 mL	27.5 x 95 mm	100	**702024**
Clear, flat bottom	60 mL	27.5 x 140 mm	100	**702074**
Amber, flat bottom	60 mL	27.5 x 140 mm	100	**702131**

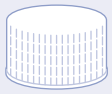
Description	Dimensions (scale 1:2)	Pack of	REF

Screw closures N 24, plain screw caps N 24 and single septa N 22









Cap description	Septum description	Hardness	Thickness		
N 24 PP bonded* screw cap, white, center hole	Silicone white / PTFE beige	45° shore A	3.2 mm	100	**702058**
as above, but closed top	Silicone white / PTFE beige	45° shore A	3.2 mm	100	**702059**
N 24 PP bonded* screw cap, white, center hole	Red Rubber / TEF colorless	65° shore A	2.5 mm	100	**702073**
* Septum firmly connected with the cap, cannot be removed					
N 24 PP screw cap, white, center hole	Butyl red / PTFE gray	50° shore A	2.4 mm	100	**702130**
as above, but closed top	Butyl red / PTFE gray	50° shore A	2.4 mm	100	**702102**
N 24 PP screw cap, white, center hole	no liner			100	**702060**
as above, but closed top	no liner			100	**702061**
N 22 septum, Silicone natural / PTFE beige		45° shore A	3.2 mm	100	**702062**
N 22 septum, Butyl red / PTFE gray		50° shore A	2.4 mm	100	**702791**

Autosampler compatibility

Agilent

Application / Type of vial	Most popular MN products fur use on Agilent instruments			Page
GC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	**70282, 70286**		**70289**	78
N 9 screw (standard samples)	**702282, 702293, 702283, 702284, 702006, 702078, 702079, 702007, 702008, 702088**	**702813, 702818, 702825, 702077**	**702732, 702082, 702081, 702080, 702287.1, 702038, 702037, 702035, 702085, 702084, 702028, 702026**	80
N 11 crimp (standard samples)	**70201HP, 702885, 702892, 702888, 702075, 702076, 702891, 702014, 702015, 702016**	**702813, 702818, 702825, 702077**	**70256, 70231.3, 70231.1, 70231.2, 702001, 702730, 70288, 702995, 702879** (for GC PAL)	84
HPLC:				
N 9 screw (standard samples)	As indicated under GC, but additionally the following closures with slit septum: **702288.1, 702083, 702040, 702027**			80
N 11 crimp (standard samples)	As indicated under GC, but additionally the following closure with slit septum: **702823**			84
N 11 snap ring (standard samples)	**702714, 702713, 702712, 702709**	**702813, 702818, 702825, 702077**	**702063, 702731, 702710.1, 702064, 702718, 702401**	87
Headspace:	Vials:		Closures:	
N 18 screw (Combi PAL + G 1888A)	**702866, 702826**		**702055**	95
N 20 crimp	**702918, 702261, 702263**		**70234, 702094, 702093, 702071, 702835, 702927**	96

Autosampler compatibility

CTC

Application / Type of vial	Most popular MN products for use on CTC instruments			Page
GC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	**70282, 70286, 70212, 70212.1, 702002, 702003**		**70289, 702878**	78
N 9 screw (standard samples)	**702282, 702293, 702283, 702284, 702006, 702078, 702079**	**702813, 702818, 702825, 702077**	**702287.1, 702035, 702026, 702027**	80
N 11 crimp (standard samples)	**70201HP, 702885, 702892, 702888, 702075, 702076**	**702813, 702818, 702825, 702077**	**702879 (for GC PAL), 70288, 702995**	84
HPLC:				
N 9 screw (standard samples)	As indicated under GC, but additionally the following closures with slit septum: **702288.1, 702027**			80
N 11 crimp (standard samples)	**70201HP, 702885, 702892, 702888, 702075, 702076**	**702813, 702818, 702825, 702077**	**70288, 702995, 702823**	84
N 11 snap ring (standard samples)	**702714, 702713, 702712**	**702813, 702818, 702825, 702077**	**702710.1, 702717.2, 702718.1**	87
Headspace:				
N 18 screw (Combi PAL)	**702866, 702826**		**702055, 702827**	95
N 20 crimp	**702924, 702263**		**702929, 702834**	96

Dionex

Application / Type of vial	Most popular MN products for use on Dionex instruments			Page
HPLC:	Vials:	Inserts:	Closures:	
N 8 screw (microsampling)	**702880, 70286, 70282**		**702025, 70289**	78
N 8 screw (standard samples)	**70213, 70213.2, 702004, 702893, 702860**	**702968, 702824, 702005**	**70245, 702437**	79
N 9 screw (standard samples)	**702282, 702293, 702283, 702284, 702006, 702078, 702079, 702007, 702008**	**702813, 702818, 702825, 702077**	**702287.1, 702288.1, 702026, 702027**	80
N 11 crimp (standard samples)	**70201HP, 702885, 702892, 702888, 702075, 702076, 702891, 702014**	**702813, 702818, 702825, 702077**	**70288, 702823, 70256**	84
N 11 snap ring (standard samples)	**702714, 702713, 702712, 702709**	**702813, 702818, 702825, 702077**	**702710.1, 702717.2**	87
IC:				
N 9 screw	**702009**		**702288.1, 702027**	80

PerkinElmer

Application / Type of vial	Most popular MN products for use on PerkinElmer instruments			Page
GC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	**70251, 70286**		**70252.1, 70283, 702025**	78
N 9 screw (standard samples)	**702282, 702293, 702283, 702284, 702078, 702079**	**702818, 702825**	**702732, 702287.1, 702026, 702028**	80
N 10 screw (standard samples)	**702012, 702013**	**702818, 702825**	**702045, 702046**	83
N 11 crimp (standard samples)	**70201CG***, **70214CG***	**702824*, 702005***	**70256, 702730, 70231.1, 70231.2, 70231.3, 70288, 702995**	84
(* small opening; ** wide opening)	**70201HP**, 702885**, 702892**, 702888**, 702075**, 702076****	**702818**, 702825****		84
HPLC:				
N 8 crimp (microsampling)	**70286**		**70252.1, 702025**	78
N 9 screw (standard samples)	As indicated under GC, but additionally the following closures with slit septum: **702288.1, 702027**			80
N 10 screw (standard samples)	As indicated under GC, but additionally the following closure with slit septum: **702047**			83
N 11 crimp (standard samples)	As indicated under GC, but additionally the following closure with slit septum: **702823**			84
N 11 snap ring (standard samples)	**702714, 702713, 702712**	**702818, 702825**	**702064, 702718, 702710, 702401**	87
Headspace:				
N 18 screw (CTC Combi PAL + TurboMatrix™ HS 16 + 40)	**702866, 702826**		**702055, 702827, 702072**	95
N 20 crimp (CTC Combi PAL)	**702924, 702263**		**702929, 702834, 702928.9, 702928, 702774**	96
N 20 crimp (TurboMatrix™ HS 16, 40 + 110) *** not suited for TurboMatrix™ 110	**702917***, 70254, 702540, 702541**		**702829, 702836, 702071, 70234.8, 702835, 702927, 702775, 702773, 70234, 70234.9, 702093, 702094, 70237, 702931**	96

Autosampler compatibility

Shimadzu

Application / Type of vial	Most popular MN products for use on Shimadzu instruments			Page
GC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	**70282, 70286, 70212, 70212.1, 702002, 702003**		**70289, 702878**	78
N 9 screw (standard samples)	**702282, 702293, 702283, 702284, 702006, 702078, 702079, 702007, 702008**	**702813, 702818, 702825, 702077**	**702287.1, 702035, 702026**	80
N 10 screw (standard samples)	**702011, 702012, 702013**	**702813, 702818, 702825, 702077**	**702045, 702046, 702048**	83
N 11 crimp (standard samples)	**70201HP, 702885, 702892, 702888, 702075, 702076, 702891, 702014**	**702813, 702818, 702825, 702077**	**702879** (for AOC5000), **70288, 702995**	84
N 13 screw (large volume samples)	**702962, 702973, 702089**	**702972** + spring **702974**	**702926**	90
HPLC:				
N 8 crimp (microsampling)	**70282, 70286**		**702025, 70289, 702878**	78
N 9 screw (standard samples)	**702282, 702293, 702283, 702284, 702006, 702078, 702079, 702009, 702007, 702008**	**702813, 702818, 702825, 702077**	**702287.1, 702037, 702038, 702036, 702026, 702288.1, 702040, 702083, 702039, 702027, 702031**	80
N 10 screw (standard samples)	**702011, 702012, 702013**	**702813, 702818, 702825, 702077**	**702045, 702046, 702047**	83
N 11 crimp (standard samples)	**70201HP, 702885, 702892, 702888, 702141, 702075, 702076, 702891, 702014**	**702813, 702818, 702825, 702077**	**702730, 70288, 702823**	84
N 11 snap ring (standard samples)	**702714, 702713, 702712, 702809**	**702813, 702818, 702825, 702077**	**702064, 702717.2, 702710, 702710.1**	87
N 8 + N 11 shell vials (standard samples)		Vials + closures:	**70202.1** + **702807, 702017** + **702807, 702018** + **702054**	94
Headspace:				
N 18 screw (AOC 5000)	**702866, 702826**		**702055, 702827**	95
N 20 crimp (AOC 5000)	**702924, 702263**		**702929, 702834, 702928, 702774**	96
N 20 crimp (HT200H)	**702918, 702263**		**702094, 702093**	96

Thermo Scientific

Application / Type of vial	Most popular MN products for use on Thermo Scientific instruments			Page
GC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	**70251, 70282, 70286, 702880, 70212, 70212.1, 702002, 702003**		**70252.1, 702025, 70289, 702878**	78

Autosampler compatibility

Application / Type of vial	Most popular MN products for use on Thermo Scientific instruments			Page
N 8 screw (standard samples)	70213, 70213.2, 702004, 702893, 702860	702968, 702968.1, 702824, 702005	702067, 70245, 702069	79
N 9 screw (standard samples)	702282, 702293, 702283, 702284, 702006, 702078, 702079, 702007, 702008	702813, 702818, 702716, 702825, 702077	702732, 702287.1, 702035, 702026	80
N 11 crimp (standard samples)	70201HP, 702885, 702892, 702888, 702141, 702075, 702076, 702891, 702014	702813, 702818, 702716, 702825, 702077	702879 (GC PAL), 702001, 70256, 702730, 70288, 702995	84
HPLC:				
N 8 crimp (microsampling)	70282, 70286, 702880, 70212, 70212.1, 702002, 702003		70252.1, 702025, 70289, 702878	78
N 8 screw (standard samples)	As indicated under GC			79
N 9 screw (standard samples)	As indicated under GC			80
N 11 crimp (standard samples)	As indicated under GC, however, not closure 702879			84
N 11 snap ring (standard samples)	702714, 702713, 702712, 702809	702813, 702818, 702716, 702825, 702077	702064, 702717.2, 702710, 702710.1, 702731, 702063	87
Headspace:				
N 18 screw (Combi PAL)	702866, 702826		702055, 702827	95
N 20 crimp (Combi PAL)	702924, 702263		702929, 702834	96
N 20 crimp (HS850/HS200)	702924, 702263		702094, 702093, 702773 / 702775 / 70234.9	96

Varian (now Agilent)

Application / Type of vial	Most popular MN products for use on Varian instruments			Page
GC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	70282, 70286, 702880, 70212, 70212.1, 702002, 702003		70289, 702878	78
N 8 screw (standard samples)	70213, 70213.2, 702004, 702893, 702860	702968, 702824	702067, 70245, 702069	79
N 9 screw (standard samples)	702282, 702293, 702283, 702284, 702006, 702078, 702079	702813, 702818, 702716, 702825, 702077	702732, 702287.1, 702037, 702035, 702026	80
N 11 crimp (standard samples)	70201HP, 702885, 702892, 702888, 702075, 702076	702813, 702818, 702716, 702825, 702077	702879 (GC PAL), 70256, 70288, 702995	84
HPLC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	As indicated under GC, but additionally closures 70252.1, 702025			78
N 8 screw (standard samples)	As indicated under GC, but additionally closure 702437			79
N 9 screw (standard samples)	As indicated under GC, but additionally closure 702040			80

Autosampler compatibility

Varian (now Agilent)

Application / Type of vial	Most popular MN products for use on Varian instruments			Page
N 10 screw (standard samples)	702011, 702012, 702013	702813, 702818, 702716, 702825, 702077	702045 / 702046, 702048, 702044	83
N 11 crimp (standard samples)	As indicated under GC, however, not closure 702879			84
N 11 snap ring (standard samples)	702714, 702713, 702712, 702809	702813, 702818, 702716, 702825, 702077	702064, 702717.2, 702710, 702710.1, 702731, 702063, 702718	87
Headspace:				
N 18 screw (Combi PAL)	702866, 702826		702055, 702827, 702073	95
N 20 crimp (Combi PAL)	702924, 702263		702929, 702834	96
N 20 crimp (CP-9020/9025, CP-9060, Genesis)	702924, 702918, 702261		702093, 70234, 702773 / 702775	96

VWR (Merck® / Hitachi)

Application / Type of vial	Most popular MN products for use on VWR instruments			Page
HPLC:	Vials:	Inserts:	Closures:	
N 8 crimp (microsampling)	70286, 70282		70289, 702878	78
N 8 screw (standard samples)	70213, 70213.2, 702004, 702893, 702860	702968, 702968.1, 702824, 702005	702067, 70245, 702437	79
N 9 screw (standard samples)	702282, 702293, 702283, 702284, 702078, 702079	702813, 702716, 702818, 702077	702287.1, 702288.1, 702026, 702027, 702031	80
N 11 snap ring (standard samples)	702714, 702713, 702712	702813, 702716, 702818, 702077	702063, 702710.1, 702717.2	87
N 13 screw (large volume samples)	702962, 702973	702972 + spring 702974	702926, 702963 + 70260	90

Waters®

Application / Type of vial	Most popular MN products for use on Waters® instruments			Page
HPLC:	Vials:	Inserts:	Closures:	
N 9 screw (standard samples)	702282, 702293, 702283, 702284, 702006, 702007, 702008, 702078, 702079, 702009	702818	702026, 702027, 702287.1, 702288.1, 702037, 702040, 702038, 702083, 702287, 702288	80
N 10 screw (standard samples)	702011, 702012, 702013	702818	702045, 702046, 702047	83
N 11 snap ring (standard samples)	702714, 702713, 702712, 702809, 702709	702818	702710.1, 702717.2	87
N 8 shell vials (standard samples)		Vials + closures:	70202.1 + 702807, 702017 + 702807	94
N 13 screw (large volume samples)	702962, 702973, 702089	702972 + spring 702974	702926, 702963 + 70260	90