Kromasil® Classic™

Kromasil Classic

Beyond expectations

Nouryon

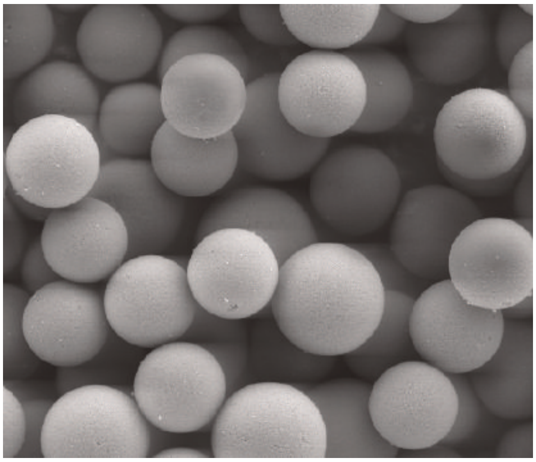
The perfectly shaped silica

The Kromasil Classic platform is based on perfectly spherical silica-based materials to improve efficiency and decrease costs in laboratory analysis and purification steps.

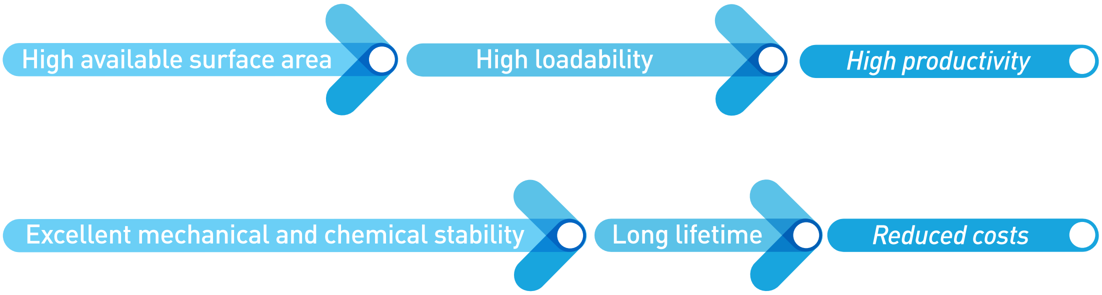
Separates most substances

Kromasil's combination of high pore volume and surface area, together with excellent mechanical and chemical stability, is unmatched for the separation of a wide variety of substances from small molecules to peptides and proteins. The pore structure is ideal for high loadability and long-term durability, making a difference in packing and performance that users have come to appreciate over time. This acceptance is valid across the wide spectrum of the Kromasil offering, from small particles packed in analytical 2.1 mm columns to larger particles packed in wide diameter columns for purifications using dynamic axial compression (DAC) equipment.

This FE-SEM[1] image of Kromasil 100 Å 3.5 µm particles is an illustration the consistent quality manufacturing of Kromasil stationary phase.



Summary of benefits for the Classic platform



Surface properties

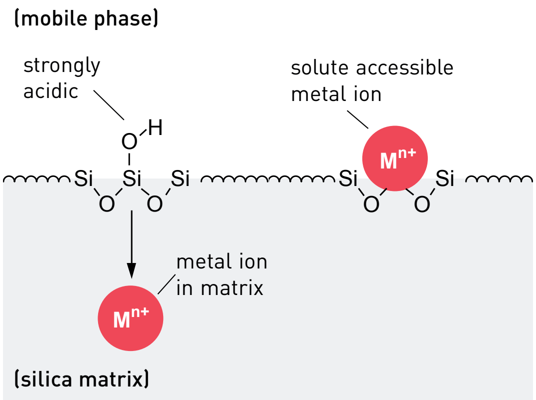
The Kromasil surface is topographically smooth and completely free from micro cavities. The surface silanol groups are evenly distributed and relatively neutral in their nature. These factors, combined with the high reproducibility of the Kromasil silica surface, are the foundation for a reproducible bonding process and derivatized product.

1: FE-SEM: Field Emission Scanning Electron Microscopy

Low metal impurities

Strongly bound metal ions present in the silica bulk and in the surface layers are in most cases an outcome of the silica manufacturing process. These metal ion species should be distinguished from adsorbed metal ion species, introduced in the final product due to use of metal ion containing solvents, chemicals etc.

It is often possible to remove adsorbed metal ion species during a regeneration process in contrast to the "built-in", strongly bound, metal ions, which are part of the final product. It is well known that strongly electronegative metal ions (e.g. bivalent iron and trivalent aluminum) in the silica matrix have the ability to enhance the acidity of silanols in their close proximity.



Increased acidity of silanols provides a higher possibility for ion-exchange interactions at any given pH. Moreover, metal ions present in the silica surface layer are able to interact directly with analytes that have Lewis-base properties.

The effect of metal ions in the silica matrix and in the silica surface layer.

The direct metal-analyte interaction is most pronounced for chelating substances, but it also affects the chromatographic behavior of acids, alcohols, and amines.

Kromasil uses a proprietary manufacturing process. The metal content in all reagents and raw materials is minimized due to a rigorous quality control procedure. The table shows information regarding the metal content in three typical batches.

	Batch no.			
Metal	**15705**	**15046**	**17365**	**17892**
Na	2.8	4.2	6.3	6.1
Al	<1	<1	<1	<1
Fe	1.1	<1	1.2	<1

Metal content in ppm in four batches of Kromasil. The metal content is measured by ICP-SFMS.

Derivatization of Kromasil silica

Even if many stationary phases are launched every year, the C18 phase is still the most popular phase on the analytical market. Independent of the product, extensive quality controls on every raw material together with several in-process controls (IPC) throughout the Kromasil manufacturing process ensure a reproducible final quality of the derivatized phases of Nouryon.

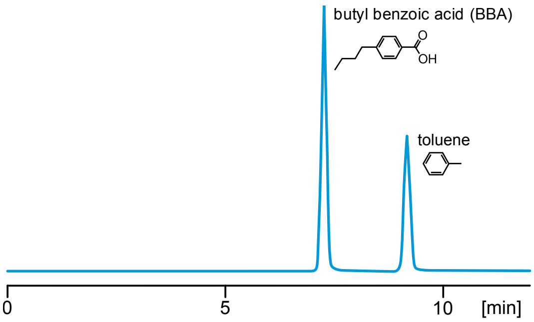
2: ICP-SFMS: Inductively coupled plasma sector field mass spectrometry

The perfectly shaped silica (cont.)

Surface coverage

To ensure high chemical stability and excellent chromatographic performance, Kromasil is produced with an optimized bonding step for surface coverage. Kromasil RP products are manufactured by using monofunctional silanes. This together with the Kromasil silica gives outstanding batch-to-batch reproducibility and high chemical stability.

Separation of butyl benzoic acid and toluene



Conditions
Column: Kromasil 100-5-C18 4.6 × 250 mm
Part number: M05CLA25
Mobile phase: acetonitrile / 25 mM potassium phosphate, pH 3.2 (65/35)
Sample: Butyl benzoic acid and toluene
Flow rate: 1.0 ml/min
Temperature: 20 °C
Detection: UV 254 nm

Hydrophobicity

The hydrophobicity of an RP-phase is related to the silica matrix, the silane used for modification, the surface coverage, and the surface distribution of functionalities. Generally, Kromasil RP-phases are considered to have high surface hydrophobicity.

This high hydrophobicity has two major advantages:

1. High surface hydrophobicity provides good separating power. The retention of analytes can then be adjusted by the mobile phase conditions, upon need.
2. High surface hydrophobicity provides good long-lasting performance, i.e. high chemical stability.

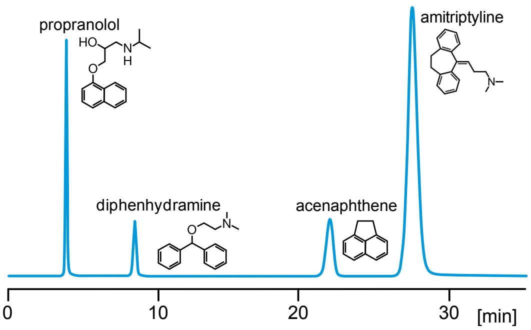
Endcapping

Endcapping is used to minimize undesired interactions between residual silanols and analytes. In the manufacturing process of Kromasil, a proprietary highly efficient technique is used to reduce these silanols.

Symmetrical peaks when using Kromasil

It is well known that residual silanol groups lead to severe peak tailing due to undesired interactions between the analyte and the stationary phase. Kromasil RP-phases show excellent peak shape for both acidic and basic compounds.

Separation of propranolol, diphenhydramine, acenaphthene and amitriptyline



Conditions
Column: Kromasil 100-5-C18 4.6 × 250 mm **Part number:** M05CLA25
Mobile phase: methanol / 20 mM potassium phosphate, pH 7.0 (65/35)
Sample: propranolol, diphenhydramine, acenaphthene, amitriptyline
Flow rate: 1.4 ml/min.
Temperature: 20 °C
Detection: UV @ 240 nm

Chemical stability

Kromasil is well known for its high performance in both analytical and preparative chromatography. Mechanical and chemical stability are the cornerstones of Kromasil, as stability determines the lifetime of columns in analysis as well as the stationary phase in purification. In general, at a low pH, bonded phases can be hydrolyzed, resulting in a less hydrophobic surface. At a higher pH, the silica matrix itself can be dissolved, which means loss of both of both the silica and bonded phase.

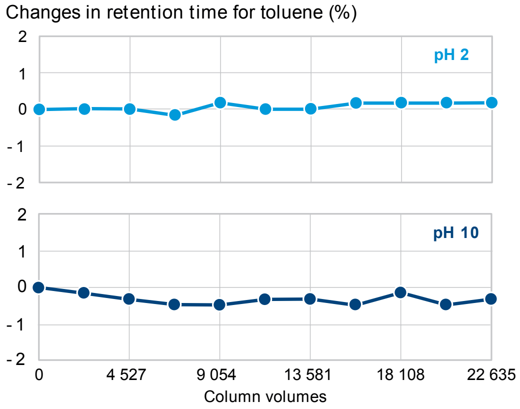
Working with silica-based materials outside their optimum pH conditions can result in changed retention times and poor peak shape. However, for Kromasil it has been shown that the product responds well to long-term exposure to pH 2 and pH 10.

Kromasil Classic products are available packed in columns, from 2.1 mm ID up to 50 mm ID, and as bulk, from gram quantities up to several metric tons.

With the Kromasil Classic range of products, users can run normal phase, reversed phase, hydrophilic interaction liquid chromatography, as well as supercritical fluid separations and purifications. The Kromasil Classic platform is available in the following particle sizes: 1.8, 2.5, 3.5, 5, 7, 10, 13 and 16 µm (larger particles can also be produced). Kromasil has narrow particle size distribution for high efficiency, low pressure drop, and best total economy in chromatographic analyses and purifications. Surface chemistries include SIL (bare silica), C4, diC4, C8, C18, C18(w), Phenyl, NH2, Diol, and CN.

The Kromasil Classic platform is organized in three families of products based on pore sizes: 60, 100 and 300 Å.

Long-term chemical stability – test under different pH conditions for a period of more than 22 000 column volumes.



Conditions
Column: Kromasil 100-5-C18 3.0 × 50 mm
Part number: M05CLC05
Mobile phase pH 2: acetonitrile / water / trifluoroacetic acid (TFA) (50/50/0.1)
Mobile phase pH 10: acetonitrile / water / triethylamine (TEA) (50/50/0.25)
Flow rate: 1.0 ml/min
Temperature: 20 °C

Pharmaceutical and natural products project stages to launch using Kromasil

Stages	Discovery	Method validation, QC	Purification	Production
Product format	columns	columns	columns/bulk media	bulk media
Scale	UHPLC/HPLC	UHPLC/HPLC	semipreparative HPLC	preparative HPLC
Column i.d. [mm]	2.1 - 4.6	2.1 - 4.6	10 - 50	≥ 50
Particle size [µm]	1.8 - 5	1.8 - 5	5 - 10	≥ 10

Kromasil 60 Å

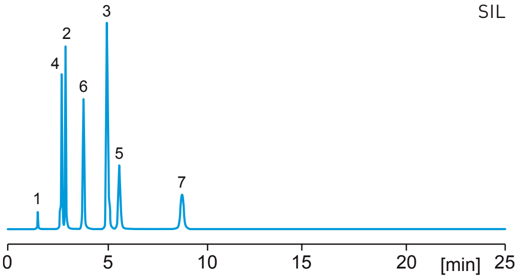
For separation of small molecules from analytical to process scale

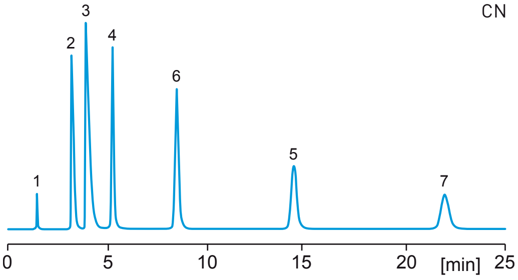
The Kromasil Classic 60 Å family of products is the choice for small, organic molecules when a large, accessible surface area is key for separating peaks in analysis. It also has the added properties of loadability and capacity required for purification.

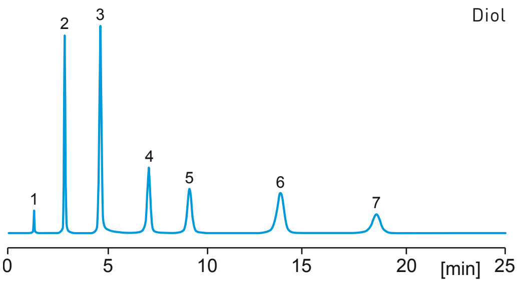
Derivatized stationary phase materials based on Kromasil 60 Å silica are developed and manufactured to give high reproducibility and chemical stability. Scientists can benefit from this range of products for applications within normal phase, reversed phase, HILIC and SFC.

Exploit selectivity differences

With the wide range of derivatizations available in Kromasil, users can test sets of columns to determine which is best for a given sample. The following three chromatograms illustrate the differences in selectivity and resolution highlighted by the exposure of the same mixture of compounds to Kromasil Diol, Silica and Cyano columns.





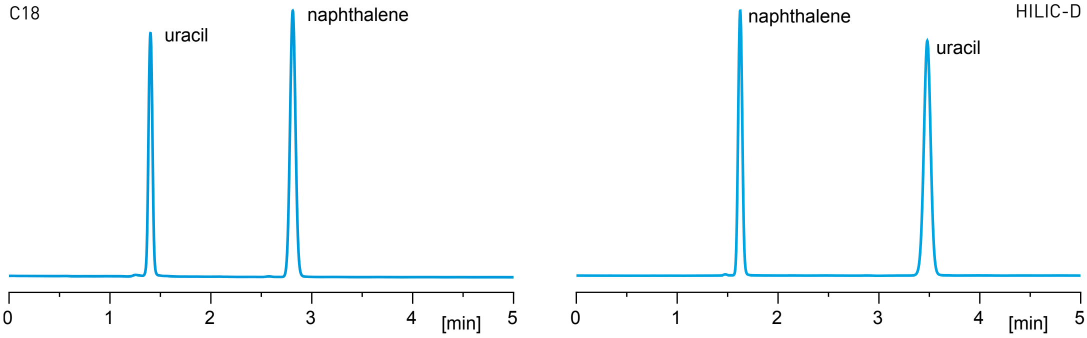


There is an increased interest within the pharmaceutical industry for polar compounds. Traditionally, it has been a challenge to separate polar compounds such as organic acids, nucleobases, and water soluble vitamins on standard reversed phase columns such as C18. For this reason, within Kromasil Classic 60 Å, Kromasil HILIC-D has been developed for optimal selectivity of polar compounds. This phase is also 100% MS compatible, which works well for laboratories using LC/MS technologies.

Conditions
Stationary phase: Kromasil 60 Å, 5 µm,
surface chemistry as in figure
Column size: 4.6 × 250 mm
Part numbers: (SIL) S05SIA25,
(CN) S05CNA25,
(Diol) S05DIA25
Mobile phase: heptane / 2-propanol (85/15)
Flow rate: 2 ml/min.
Temperature: 20 °C
Detection: UV @ 224 nm
Sample: 1 = tri-tert-butylbenzene,
2 = 2-ethoxyaniline,
3 = aniline,
4 = catechol,
5 = 2,4-dinitroaniline,
6 = hydroquinone,
7 = 4-nitroaniline

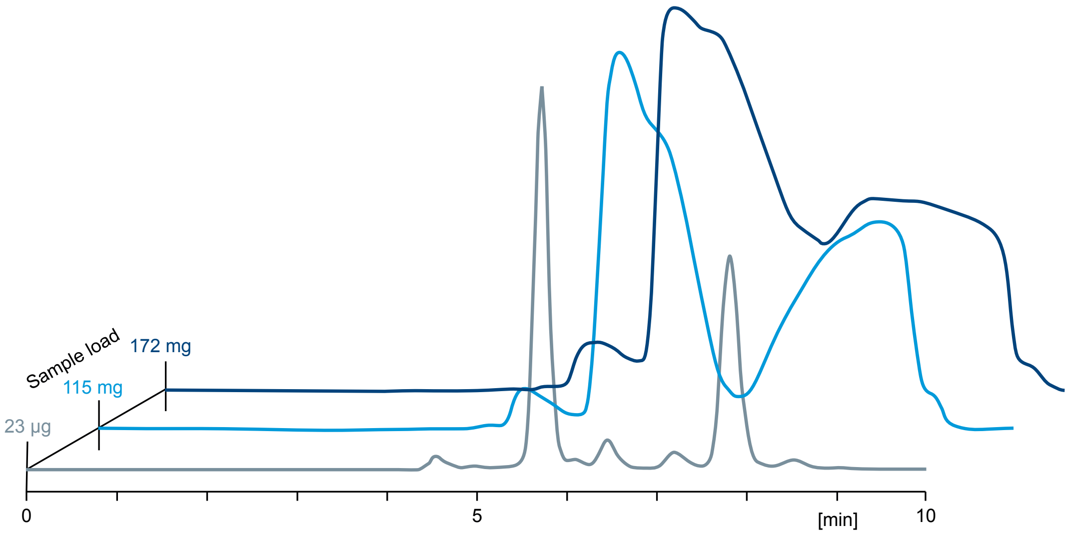
Kromasil is also recognized for its loading capacity and its benefits in the purification of compounds. The chromatogram below shows the loading of oxirane onto a 4.6 mm ID column, traditionally regarded as a column for analysis. However, this column format allows the user to perform these types of experiments to verify the loading capability of the stationary phase and then seamlessly scale up for the final purification needs.

Chromatographic results with C18 and HILIC-D. Retention times vary due to the interactions between the substance structures and the differences in principles of reversed-phase and hydrophilic interaction chromatography. Further, with this particular mixture, selectivity reversal is achieved.



Conditions
Columns: Kromasil 100-5-C18 4.6 × 150 mm
Kromasil 60-5-HILIC-D 4.6 × 150 mm
Part numbers: M05CLA15 and S05HDA15, respectively
Mobile Phase: acetonitrile / water (90/10)
Flow rate: 1 ml/min
Temperature: ambient
Detection: UV @ 254 nm

Kromasil CN (cyano) was used for the large-scale separation of a diastereomeric oxirane derivative, where the chromatograms show the scale-up experiments in analytical scale. Even at a loading corresponding to 172 mg loading in analytical scale, i.e. 86 mg crude/g of packing, 98–99% pure diastereomers could be obtained in the two collected fractions. Recovery was close to 100%.



Conditions
Columns: Kromasil 60-10-CN 4.6 × 250 mm
Part number: S10CNA25
Flow rate: 1.16 ml/min
Solute: oxirane

Kromasil 100 Å

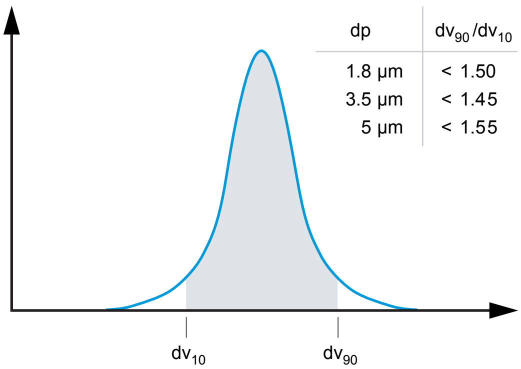
Derivatized products based on Kromasil 100 Å silica are developed and manufactured at Nouryon to achieve high reproducibility and chemical stability. The narrow and consistent particle size distribution of Kromasil 100 Å silica and its derivatizations lead to chromatographic columns with outstanding efficiency and bed stability.

For small molecules and peptides

The well-known Kromasil Classic 100 Å family of products is used to separate and purify molecules of up to about 10 000 Da. In fact, drug candidates for the pharmaceutical, natural products and API industries are separated and purified using Kromasil Classic 100 Å columns and bulk material.

Kromasil Classic 100 Å products are supplied for the analysis of mixtures, isolation of the main compound and impurity characterization as well as large-scale manufacturing. Slurry-packed columns are shipped in a variety of particle sizes and column formats. The same applies to bulk stationary phases.

Particle size distribution of Kromasil



A narrow particle size distribution allows the user to avoid high back-pressure due to low bed porosity. To define and secure a narrow particle size distribution, all Kromasil products have to pass stringent quality control specific-ations of dv90 /dv10 ratio. This specification is quite demanding on the manufacturing process, and provides a superior product compared to others in the marketplace today which only have a specification of dv_{90}/dv_{40}.

Kromasil in small particle sizes for UHPLC and HPLC

Kromasil 100 Å is available in a variety of standard particle sizes from 1.8 to 16 µm (larger particles are available upon request). All particle sizes are based on the same Kromasil silica technology. Therefore, scientists can now employ the same quality products as their counterparts across the organization, making it easier, faster and more cost-effective for a drug to reach market.

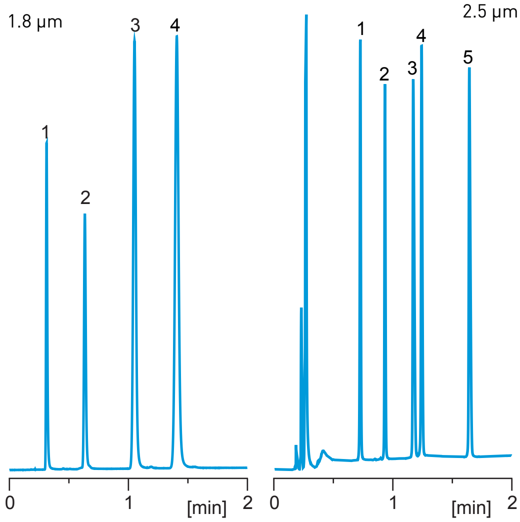
Moving faster

Kromasil UHPLC columns with 1.8 µm particles are specifically targeted for fast chromatography to screen samples under UHPLC conditions. In this case, the chromatographic results show a separation in slightly more than a minute with significant baseline resolution.

The Kromasil 2.5 µm columns are intended for laboratory flexibility, maintaining exceptional performance. These columns are packed for UHPLC conditions giving users the option to run Kromasil 2.5 µm particle-based columns under UHPLC or HPLC conditions. Scientists can choose the scale that works best in their laboratory environment, and develop and adapt methods for fast turnaround under HPLC conditions or go one step further to UHPLC methods. As with all Kromasil particle sizes, these Kromasil 2.5 µm particles are based on very narrow specification ranges, resulting in columns with excellent performance and backed by the well-known Kromasil column-to-column reproducibility.

Kromasil allows easy transfer of methods developed on 2.5 µm particles to other departments, such as method validation and quality control. Kromasil 2.5 µm columns can also be a good start in open access screening by synthetic or medicinal chemists in the step before purification of key compounds of interest.

Separation within 2 minutes



Conditions, 1.8 µm
Column: Kromasil 100-1.8-C18 2.1 × 50 mm
Part number: MF1CLD05
Mobile phase: acetonitrile / water (65/35)
Sample: 1 = dimethyl phthalate, 2 = toluene, 3 = biphenyl, 4 = phenanthrene
Flow rate: 0.6 ml/min
Temperature: 35 °C
Detection: UV @ 254 nm

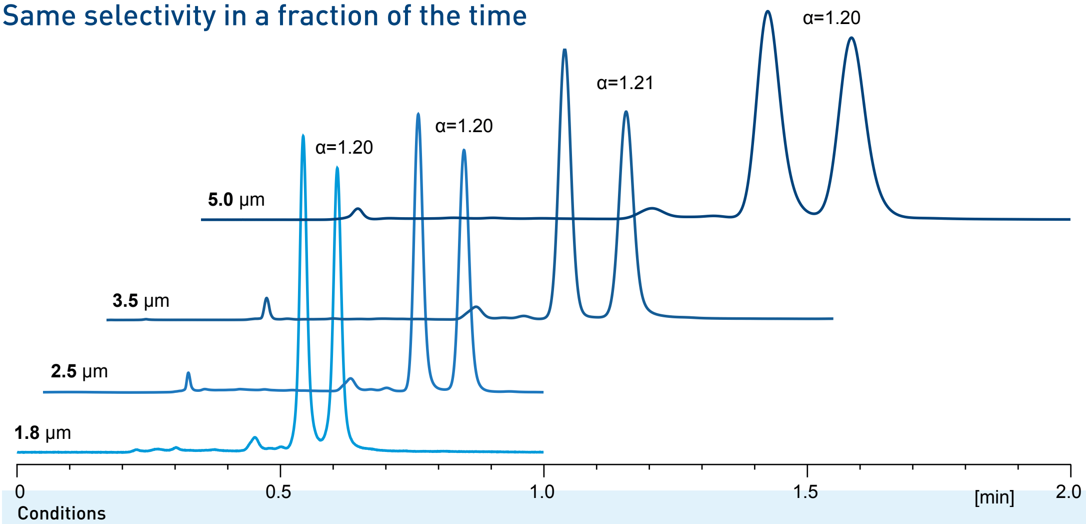
Conditions, 2.5 µm
Column: Kromasil 100-2.5-C18 4.6 × 50 mm
Part number: MH2CLA05
Mobile phase: acetonitrile / water / 0.1% TFA
Gradient: 0 min: 5%, 2.7 min: 70% acetonitrile
Sample: 1 = sotalol, 2 = nadolol, 3 = timolol, 4 = metoprolol, 5 = alprenolol
Flow rate: 3.0 ml/min
Temperature: 50 °C
Detection: UV @ 230 nm

Kromasil 100 Å (cont.)

Seamless scalability

Considering a project starts in R&D, scientists can develop a Kromasil based UHPLC method in the early stages, validate the corresponding conditions of analysis and transfer the method to HPLC scale for other departments. Being able to use the same type of stationary phase throughout discovery, development and production is a unique opportunity for chromatographic users not only due to the extent of the Kromasil phases, but also the quality and reproducibility of the materials, which is second to none.

Same selectivity in a fraction of the time



Conditions

Columns: Kromasil 100-1.8-C4 2.1 x 50 mm and Kromasil 100-dp-C4 4.6 x 50 mm for dp from 2.5 to 5 µm
Part numbers: MF1CSD05, MH2CSA05, MH3CSA05 and M05CSA05
Substances: Vitamin E & D
Mobile phase: acetonitrile
Flow rate: 5.0 µm: 1.0 ml/min, 3.5 µm: 1.5 ml/min, 2.5 µm: 2.0 ml/min, 1.8 µm: 0.6 ml/min
Temperature: 20 °C
Detection: UV @ 215 nm

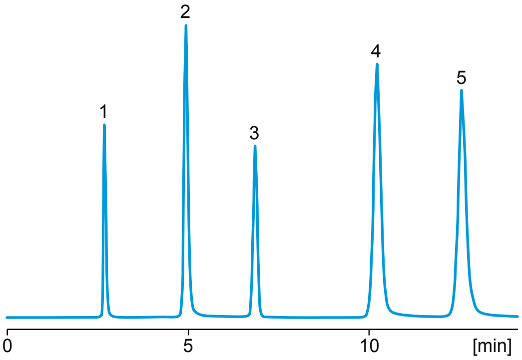
A workhorse for laboratories.

Kromasil Classic HPLC columns based on 5 µm particle technology are the workhorse in analytical laboratories.

Conditions

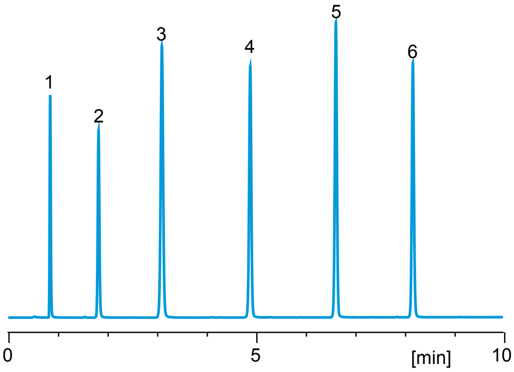
Column: Kromasil 100-5-C18 4.6 × 250 mm
Part number: M05CLA25
Mobile phase: methanol / potassium phosphate, 25 mM, pH 6.0 (80/20)
Flow rate: 1 ml/min
Temperature: ambient
Detection: UV @ 215 nm
Substances: 1 = phenylpropanolamine
2 = nortriptyline
3 = toluene
4 = imipramine
5 = amitriptyline

QC test, tricyclic antidepressants



Standards towards smaller particles

Lately, 3.5 µm particle columns are also becoming the standard for many laboratories in several sectors within pharmaceutical, food and beverage, natural products, clinical and industrial applications.



Separation of pesticides on Kromasil 3.5 µm particles

Conditions

Column: Kromasil 100-3.5-C18 4.6 × 150 mm
Part number: MH3CLA15
Mobile phase: acetonitrile/water
Gradient: 0 - 1.5 min: 40%, 10 min: 90% acetonitrile
Flow rate: 1.5 ml/min

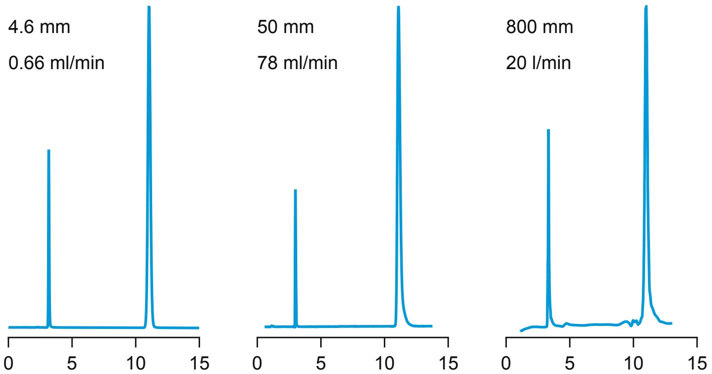
Temperature: 30 °C
Detection: UV 254 nm
Substances: 1 = uracil 2 = fenuron, 3 = monuron, 4 = diuron, 5 = linuron 6 = neburon

A disruptive technology in purification

Independent of the chromatographer's need for isolation and purification, Kromasil delivers both slurry-packed columns for development and pilot laboratory isolation and bulk material for larger purifications.

One of the main distinguishing aspects of Kromasil is that it is possible to use the same quality product whatever the scale required. This comprises the isolation and purification of compounds and their impurities for carrying out material characterization, pilot runs for campaigns in the pharmaceutical industry and full production purification including the latest polishing steps for delivery to patients.

All Kromasil pre-packed columns are delivered with a minimum performance guarantee of at least 40 000 plates/m for 10 µm particles. For larger diameters, DAC columns are recommended. The performance obtained in analytical columns can be maintained all the way up to very large industrial scale DAC columns.



Scalability

The performance of Kromasil columns is maintained across all scales.

This example illustrates the consistency of Kromasil across column dimensions.

A 80 cm ID DAC column is proven to show analytical performance.

The scale-up factor from the analytical column in this case is 30 000 times.

Conditions

Stationary phase: Kromasil 100-10-C18
Part number: M10CL000
Column length: 250 mm
Column diameter: as stated in figures

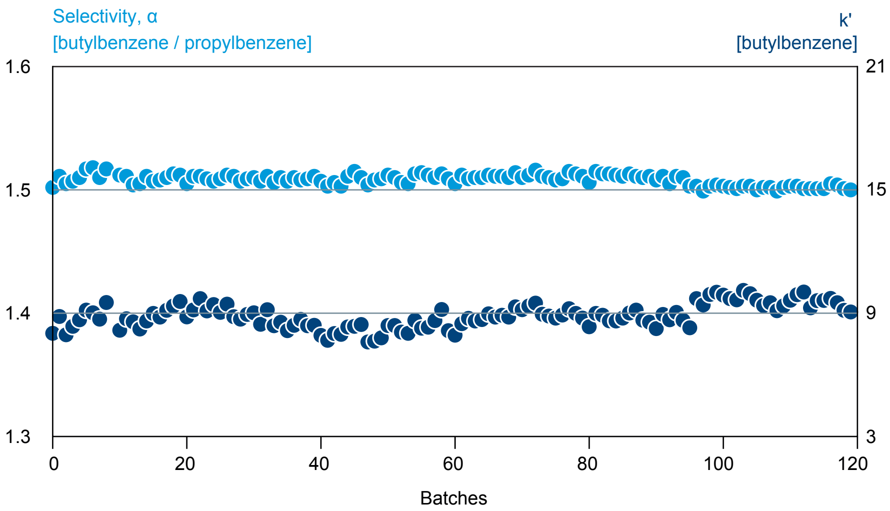
Mobile phase: acetonitrile / water (30/70)
Sample: uracil and toluene
Linear velocity: 0.66 mm/s (equivalent flow rates in figures)
Detection: UV 254 nm

Kromasil 100 Å (cont.)

Consistency from batch to batch

An important aspect in preparative chromatography is the stationary phase batch-to-batch consistency. A vast number of tests are performed in the quality assurance and control of Kromasil.

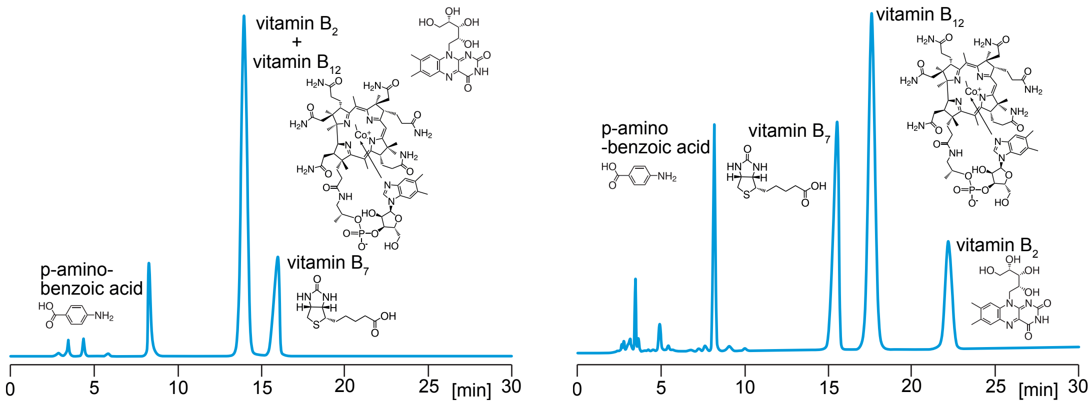
Batch-to-batch reproducibility of Kromasil, measured as selectivity and retention factor over time, for particle sizes from 7 µm to 16 µm.



Aromatic selectivity

In cases where the compounds in the sample are more polar or have aromatic moieties requiring π-π interactions between the phase and the solute, Kromasil Phenyl material can be used. Kromasil Phenyl is derivatized using a mono-functional silane, followed by an extensive endcapping. The result is a stationary phase with high stability, high reproducibility, and symmetrical peaks for basic compounds.

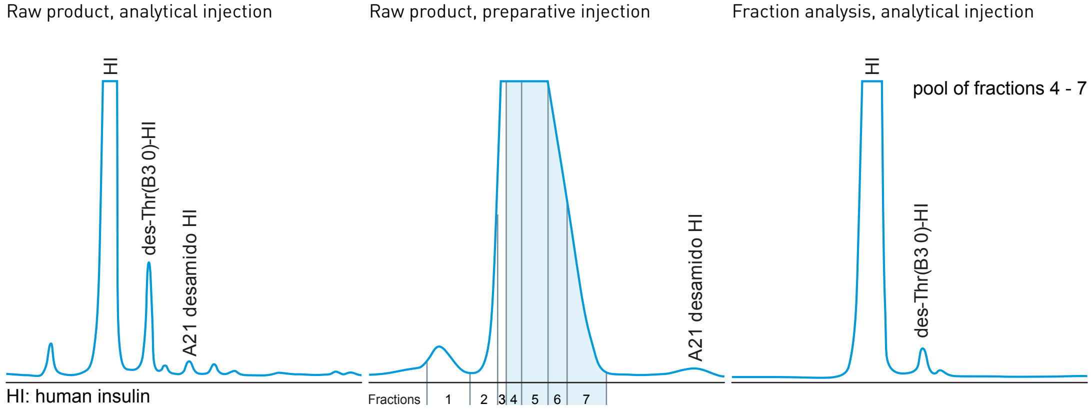
Alternative selectivity of vitamins B on Kromasil C18 and Kromasil Phenyl



Conditions

Columns: Kromasil 100-5-C18 4.6 × 250 mm
Kromasil 100-5-Phenyl 4.6 × 250 mm
Part numbers: M05CLA25 and M05PHA25 respectively
Mobile phase: acetonitrile / 20 mM ammonium phosphate (12/88)
Flow rate: 1 ml/min
Temperature: 20 °C
Detection: UV @ 254 nm

Example of scalability with insulin



Conditions
Raw product purity: 90%

Conditions, analytical injection
Column: Kromasil 100-3.5-C4 4.6 × 120 mm
Part number: MH3CSB12
Mobile phase: acetonitrile / 0.05 M sodium phosphate, 0.1 M sodium chlorate, pH 2.5
Gradient: 0 min: 30%, 55 min: 36% acetonitrile
Flow rate: 1.0 ml/min

Conditions, preparative injection
Packing material: Kromasil 100-10-C8
Column: DAC, 50 x 250 mm
Loading: 6 g/l column volume
Flow rate: 60 ml/min
Detector: UV @ 214 nm

The need for a strong material explained

Mechanical strength is required to withstand mechanical stress in an analytical or purification column. A silica packing is also often exposed to high mechanical stress when unpacked and packed again in production. Frequent packing and unpacking requires very stable packing material where no fines can be created.

The formation of fines in any part of the process leads to increasing back-pressure. Eventually the pressure limit for the system is reached, and the column has to be repacked with new material. The Kromasil particles are essentially perfectly spherical.

In addition, the pore shape and structure are more regular than other materials. The result is mechanical strength that allows extremely high piston pressure in columns.

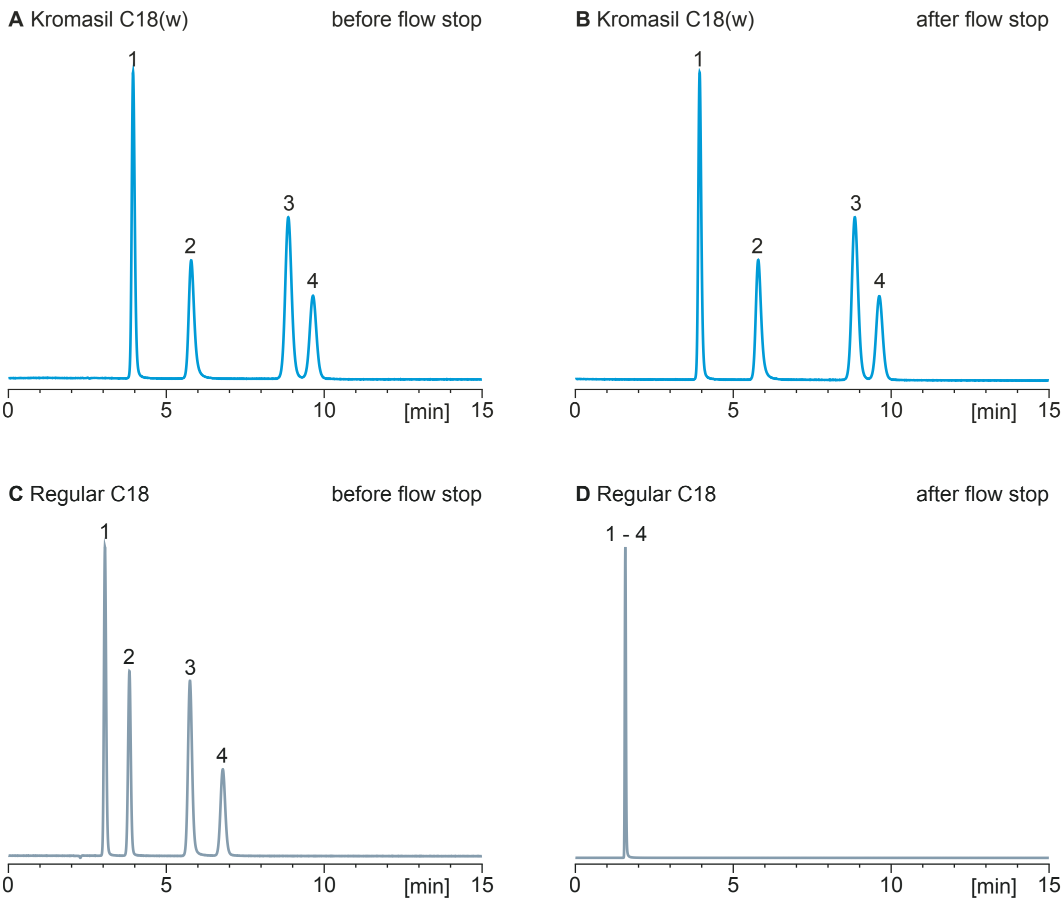
Many Kromasil customers perform cleaning-in-place (CIP) using highly alkaline conditions to remove adsorbed polypeptide impurities, especially in insulin purification. Such conditions will quickly break down less stable materials mechanically. But with Kromasil, you can apply CIP over and over again.

Kromasil 100 Å (cont.)

A wettable phase for polar compounds

Whether you are performing separation or purification of APIs, your facility may have to deal with an increasingly number of complex mixtures also containing more polar compounds. Kromasil's portfolio also includes a wettable C18 phase manufactured for separating and purifying more polar compounds, amino acids and peptides under fully aqueous conditions.

A phase that withstands collapsing



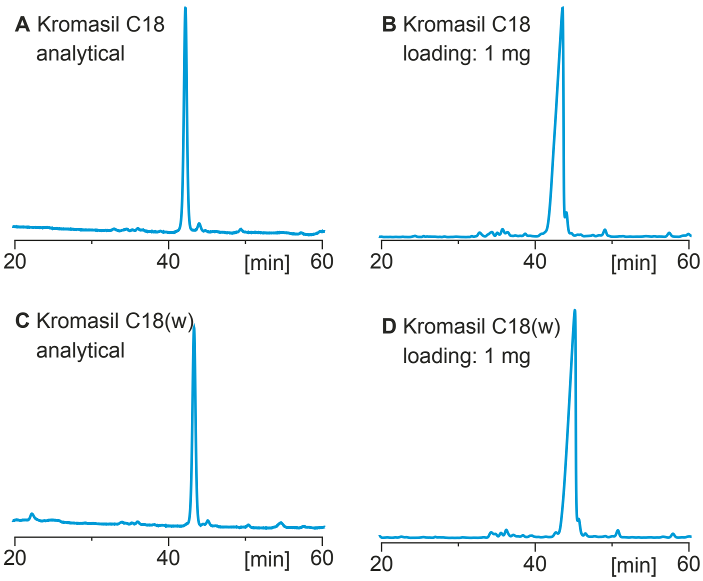
Figures A and C illustrate the difference in selectivity before anything unexpected has happened to the system, such a stop flow situation. The chromatographic result with the wettable phase in figure A shows better retention and selectivity compared to the more hydrophobic C18 in figure C.
The chromatogram in figure B illustrates that if flow stops and pressure drops the wettable C18(w) will not be affected, continuing to perform just as expected. This is one of the advantages of the wettable phase when dealing with samples that need to be injected under 100% aqueous conditions compared to traditional C18 phases where the regular C18 the surface will collapse resulting loss of separation efficiency as seen in figure D.

Conditions
Column: Kromasil 100-10-C18(w) 4.6 x 250 mm versus regular C18
Part number: M10WLA25
Substances: 1: cytosine, 2: fluorocytosine, 3: uracil, 4: fluorouracil
Mobile phase: 20 mM potassium phosphate pH 2.5
Temperature: ambient
Flow rate: 1.0 ml/min
Detection: UV @ 254 nm

Fully aqueous conditions when you need it

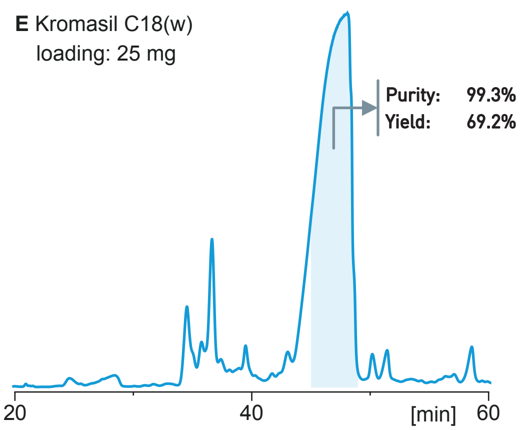
With Kromasil C18(w), you can load your preparative samples under fully aqueous conditions, increasingly important benefit for researchers today as more polar structures are being considered, reduces organic solvent consumption, cuts costs and address sustainability goals.

Kromasil C18 (w) implementation can also be of benefit for facilities that have not fully implemented explosion proof requirements to meet industry standards.



Loading of peptide sample on Kromasil C18 and Kromasil C18(w).

When comparing analytical results between Kromasil Classic C18 (figure A) and the new Kromasil C18(w) (figure C), retention times are noticeably similar for both stationary phases. Also, when proceeding to an overloaded step, retention pattern for the main peak and the impurities are comparable as seen, figures B and D.



The scale-up result of the purification on Kromasil C18(w), for this sample, is shown in figure E, where the fractions pooled provide very high purity and the given yield. If the purity requirements were lower, then more fractions could be pooled and yield increased accordingly.

Conditions

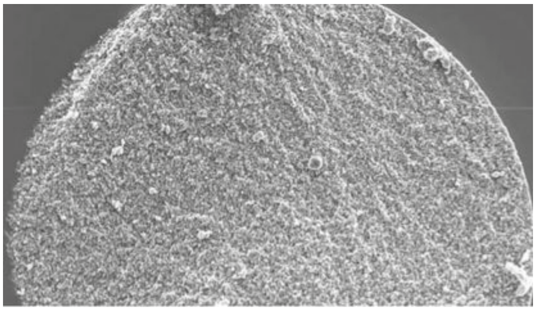
Columns: Kromasil 100-10-C18(w) 4.6 x 250 mm
Part number: M10WLA25.
Substance: crude of bivalirudine in feed solution
Temperature: 25 °C
Flow rate: 0.7 ml/min
Detection: UV @ 280 nm

Equilibrium and feed solutions:
C18: acetonitrile / ammonium acetate, 0.2 M (5/95)
C18(w): ammonium acetate, 0.2 M
Mobile phase: acetonitrile / ammonium acetate, 0.2 M
Gradient: 0 min: 10%, 60 min: 30% acetonitrile

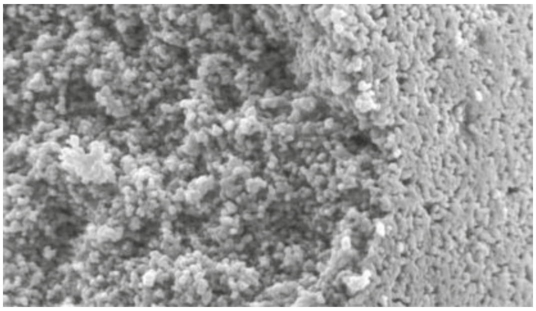
Kromasil 300 Å

Protein and biomolecule separations from analytical to process scale

The Kromasil Classic 300 Å family of products is designed to be the perfect choice for proteins and biomolecules larger than 8 – 10 kDa. This 300 Å material has a narrow pore size distribution that ensures good mass transfer for larger molecules, resulting in narrow peaks and no size-exclusion effects. The figures below show FE-SEM studies of Kromasil 300 Å, indicating a very regular pore structure, with no voids or dense clusters.

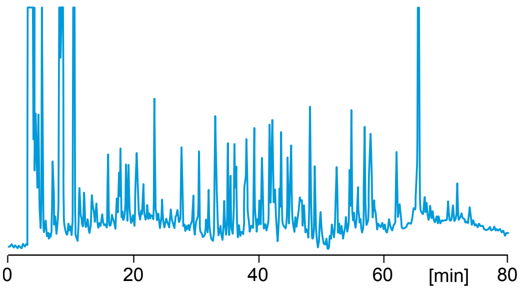


FE-SEM picture of a cut through a Kromasil 300 Å particle at 5 000 × magnification.



FE-SEM picture of a cut through a Kromasil 300 Å particle at 35 000 × magnification, showing both the outer surface and the fracture through the particle.

Tryptic digest of bovine serum albumin (BSA)



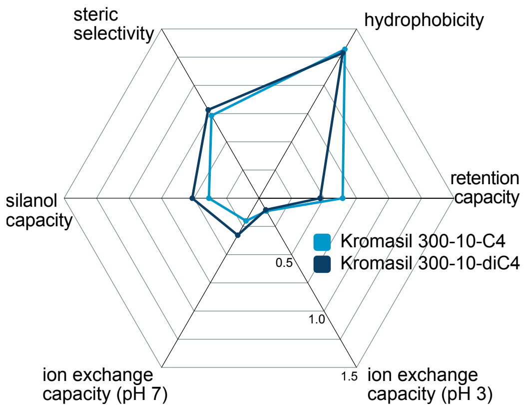
A common test for RP packings designed for the separation of biological materials is to run a tryptic digest of BSA. The digest contains fragments of various sizes, and the separation of these into individual peaks is good evidence of the power of resolution.

Conditions
Column: Kromasil 300-5-C4 4.6 × 250 mm
Part number: L05CSA25
Mobile phase: acetonitrile / water / TFA (0.1%)
Gradient: 0 min: 4%, 5 min: 4%, 80 min: 40% acetonitrile
Sample: tryptic digest of BSA
Flow rate: 1.0 ml/min
Temperature: 22 °C
Detection: UV @ 215 nm

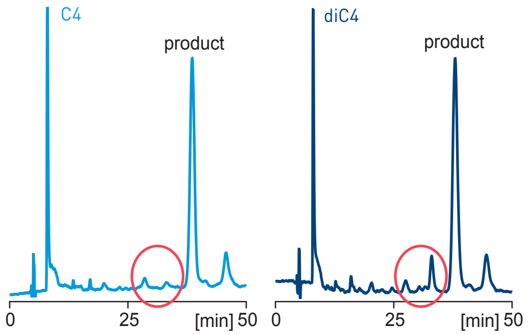
A C4 in more than one way

Kromasil diC4 is the alternative C4 with strong C4 characteristics, yet slightly higher silanol capacity and ion exchange capacity (at pH 7), and lower retention capacity.

With the 300 Å pore size, even biomolecules larger than 10 kDA can be separated on Kromasil diC4.



Tanaka test diagram of Kromasil silica phases characteristics



Selectivity changes that make a difference

Impurities that coelute with the product on a C4 column, can successfully be separated on the Kromasil diC4 column.

Elution of an insulin analogue crude on Kromasil phases

Kromasil ClassicShell

Kromasil ClassicShell is a family of columns based on solid-core particles intended for fast analytical separations to support effective and efficient laboratory turnaround.

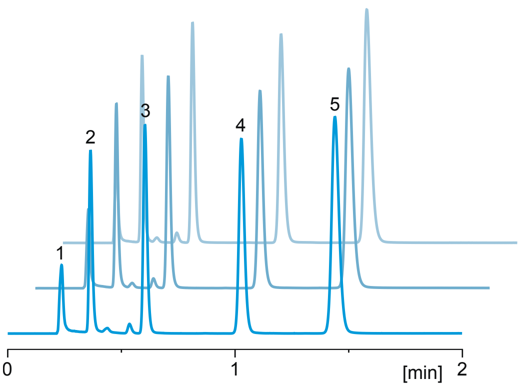
High-efficiency analytical columns

The Kromasil ClassicShell columns can be used for the analysis of sample mixtures in various areas of research as well as quality control in pharmaceutical, environmental, food and beverages and industrial laboratories.

They are packed with 2.5 µm solid-core particles and, similarly to the fully porous Kromasil Classic 1.8 and 2.5 µm particle size columns, Kromasil ClassicShell products can offer high analytical efficiency but at a lower back-pressure cost, and can therefore be used on any HPLC instrument.

Reproducible results

With ClassicShell columns comes also reproducibility, both column-to-column and batch-to-batch.

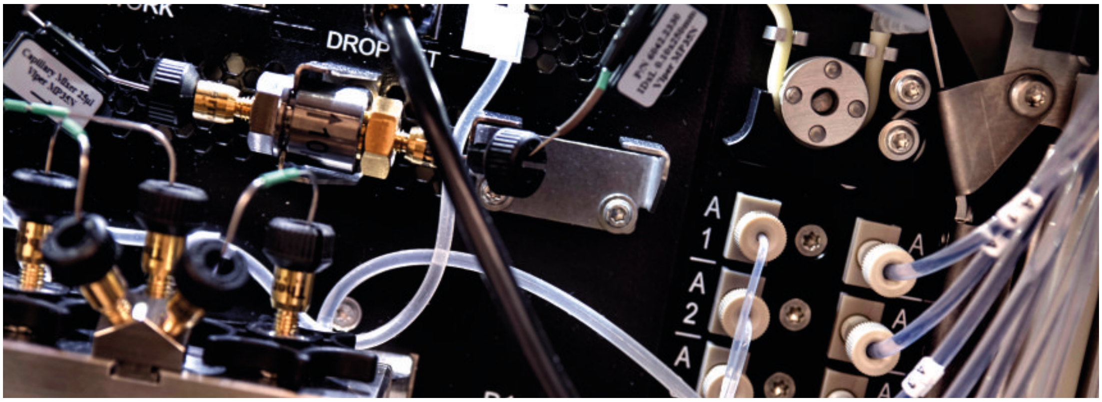


QC test with neutral substances.

Test on three columns with different batches of stationary phase.

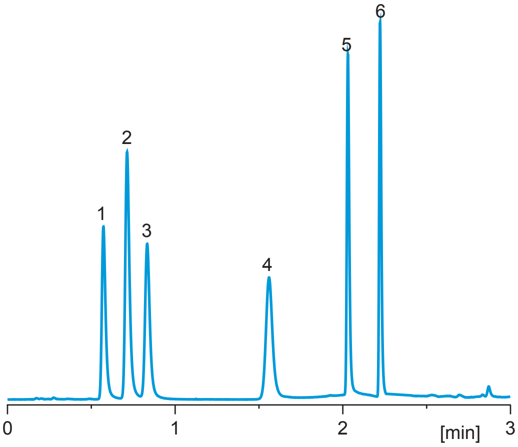
Conditions

Column: Kromasil ClassicShell-2.5-C18 2.1 × 50 mm
Part number: NH2CLD05
Substances: 1 = sodium nitrate, 2 = acetophenone, 3 = toluene, 4 = benzene, 5 = butylbenzene
Mobile phase: acetonitrile / water (70/30)
Flow rate: 0.42 ml/min
Temperature: 25 °C
Detection: UV @ 254 nm



For reversed-phase chromatography

Kromasil ClassicShell columns provide an excellent alternative for the analysis of candidate drugs as well as established pharmaceuticals under reversed phase chromatography.



Analysis of Sulfa drugs on ClassicShell C18

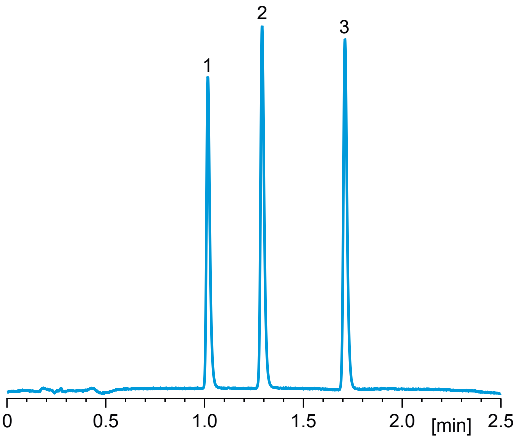
Conditions

Column: Kromasil ClassicShell-2.5-C18 2.1 x 50 mm
Part number: NH2CLD05
Substances: 1 = sulfadiazine, 2 = sulfathiazole, 3 = sulfamerazine, 4 = sulfamethoxypyridazine, 5 = sulfamethoxazole, 6 = sulfaquinoxaline
Mobile phase: acetonitrile / water / 0.1% formic acid
Gradient: 0 min: 10%, 2 min: 90% acetonitrile
Temperature: 25 °C
Flow rate: 0.7 ml/min
Detection: UV @ 254 nm

Discovery and development

Pharmaceutical drug discovery and development, food quality control and environmental monitoring require efficient sample analysis.

Kromasil ClassicShell columns offer researchers and analysts the possibility of fast runs with complete resolution, as the results illustrated here.



Analysis of xanthine class compounds

Conditions

Column: Kromasil ClassicShell-2.5-C18 2.1 x 50 mm
Part number: NH2CLD05
Mobile phase: acetonitrile / water / 0.1% formic acid
Gradient: 0 min: 3%, 4 min: 30% acetonitrile
Substances: 1 = theobromine, 2 = theophylline, 3 = caffeine
Temperature: ambient
Flow rate: 0.5 ml/min
Detection: UV @ 254 nm

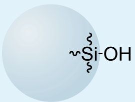
Product characteristics

Kromasil 60 Å

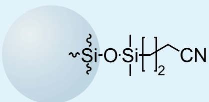
Particle size distribution *(Coulter Multisizer)*:
dv_{90}/dv_{10}: 10, 13, 16 µm <1.70
7 µm <1.60
5 µm <1.55
Chemical purity *(AAS or ICP)*:
Na <10 ppm, Al < 5 ppm, Fe < 5 ppm

Specific surface area *(multi-point BET)*: 540 m²/g
Pore volume *(N_2-adsorption)*: 1.2 ml/g
Pore size *(N_2-adsorption)*: 80 Å
Pore size distribution *(N_2-adsorption)*: 80% ± 15 Å
(97% of the surface is accessible for toluene, which indicates low amounts of inaccessible micropores.)

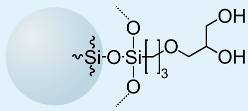
SIL
Bare silica
USP: L3
Packed density: 0.45 g/ml



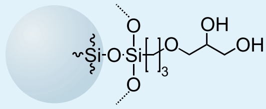
CN
Cyano
USP: L10
Coverage: 3.8 µmol/m²
Element content: 12% C and 3.8% N
Packed density: 0.48 g/ml



Diol
USP: L20
Coverage: 3.5 µmol/m²
Element content: 10% C
Packed density: 0.53 g/ml



HILIC-D
Diol
USP: L20
Coverage: 3.5 µmol/m²
Element content: 10% C
Packed density: 0.53 g/ml

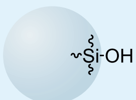


Kromasil 100 Å

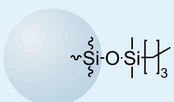
Particle size distribution *(Coulter Multisizer)*:
dv90/dv10: 10, 13, 16 µm <1.70 7 µm <1.60
5 µm <1.55
3.5 µm <1.45
2.5 µm <1.40
1.8 µm <1.50
Chemical purity *(AAS or ICP)*:
Na <10 ppm, Al < 5 ppm, Fe < 5 ppm
Specific surface area *(multi-point BET)*: 320 m²/g

Pore volume *(N_2-adsorption)*: 0.9 ml/g
Pore size *(N_2-adsorption)*: 110 Å
Pore size distribution *(N_2-adsorption)*: 80% ± 25 Å
(97% of the surface is accessible for toluene, which indicates low amounts of inaccessible micropores.)
Functionalized Kromasil 100 Å is manufactured using monofunctional silanes, and is fully end-capped, except for NH2 that uses a trifunctional silane without end-capping, and C18(w) that uses polar end-capping.

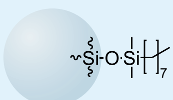
SIL
Bare silica
USP: L3
Packed density: 0.50 g/ml



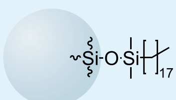
C4
Butyl
USP: L26
Coverage: 3.8 µmol/m²
Element content: 8% C
Packed density: 0.57 g/ml



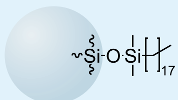
C8
Octyl
USP: L7
Coverage: 3.7 µmol/m²
Element content: 12% C
Packed density: 0.60 g/ml



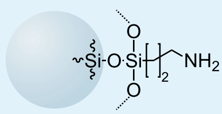
C18
Octadecyl
USP: L1
Coverage: 3.5 µmol/m²
Element content: 20% C
Packed density: 0.66 g/ml



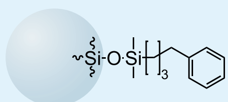
C18(w)
Octadecyl
USP: L1
Coverage: 2.5 µmol/m²
Element content: 15% C
Packed density: 0.60 g/ml



NH2
Amino
USP: L8
Coverage: 5 µmol/m²
Element content: 2% N
Packed density: 0.53 g/ml



Phenyl
Butyl phenyl
USP: L11
Coverage: 3.7 µmol/m²
Element content: 14% C
Packed density: 0.59 g/ml

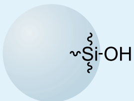


Kromasil 300 Å

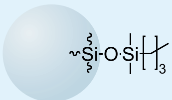
Particle size distribution *(Coulter Multisizer)*:
dv_{90}/dv_{10}: 10, 13, 16 µm <1.70
5 µm <1.55
Chemical purity *(AAS or ICP)*:
Na <10 ppm, Al < 5 ppm, Fe < 5 ppm

Specific surface area *(multi-point BET)*: 110 m²/g
Pore volume *(N_2-adsorption)*: 0.9 ml/g
Pore size *(N_2-adsorption)*: 300 Å
Pore size distribution *(N_2-adsorption)*: 80% ± 25 Å
(97% of the surface is accessible for toluene, which indicates low amounts of inaccessible micro pores.)

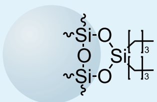
SIL
Bare silica
USP: L3
Packed density: 0.47 g/ml



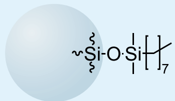
C4
Butyl
USP: L26
Coverage: 3.9 µmol/m²
Element content: 2.9% C
Packed density: 0.48 g/ml



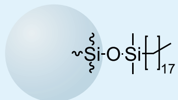
diC4
Di-butyl
Coverage: 3.0 µmol/m²
Element content: 3.0% C
Packed density: 0.48 g/ml



C8
Octyl
USP: L7
Coverage: 3.8 µmol/m²
Element content: 4.7% C
Packed density: 0.50 g/ml



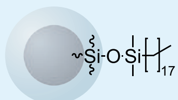
C18
Octadecyl
USP: L1
Coverage: 3.7 µmol/m²
Element content: 8.7% C
Packed density: 0.52 g/ml



Kromasil ClassicShell

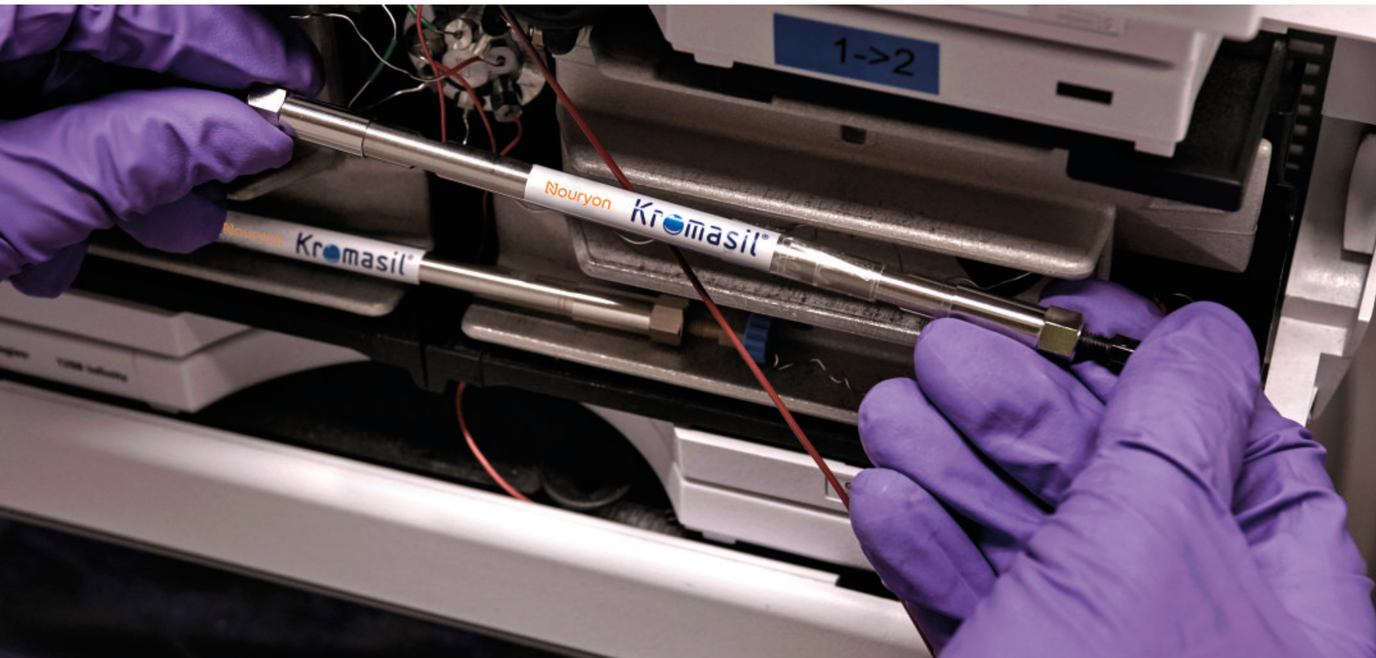
Particle size: 2.5 µm
Specific surface area: 150 m²/g
Pore size: 90 Å

C18
Octadecyl
USP: L1
Element content: 7% C
Fully endcapped



Availability

Please check the tables with part numbers in the availability part of this guide.



Ordering Kromasil Classic products

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F +1 845 277 1406

e-mail: kromasil@nouryon.com
web: www.kromasil.com

Find a distributor:

www.kromasil.com/distributor_network

Kromasil Classic bulk media

		Particle size, [µm]								
Family	Phase	1.8	2.5	3	3.5	5	7	10	13	16
60 Å	SIL					S05SIblk	S07SIblk	S10SIblk	S13SIblk	S16SIblk
60 Å	CN					●		S10CNblk		S16CNblk
60 Å	Diol					●		S10DIblk		
60 Å	HILIC-D					●		S10HDblk		
100 Å	SIL	MF1SIblk	MH2SIblk		MH3SIblk	M05SIblk	M07SIblk	M10SIblk	M13SIblk	M16SIblk
100 Å	C1					●				
100 Å	C4	●	●		●	●	M07CSblk	M10CSblk	M13CSblk	M16CSblk
100 Å	C8	●	●		●	●	M07CMblk	M10CMblk	M13CMblk	M16CMblk
100 Å	C18	●	●		●	●	M07CLblk	M10CLblk	M13CLblk	M16CLblk
100 Å	C18(w)							M10WLblk		
100 Å	NH2				●	●	M07NHblk	M10NHblk	M13NHblk	M16NHblk
100 Å	Phenyl					●		M10PHblk		M16PHblk
300 Å	SIL					L05SIblk		L10SIblk		L16SIblk
300 Å	C4					●		L10CSblk		L16CSblk
300 Å	diC4							L10DCblk		L16DCblk
300 Å	C8					●		L10CMblk		L16CMblk
300 Å	C18					●		L10CLblk		L16CLblk

● : standard product, available in bulk quantities
● : analytical product, only available in slurry-packed columns
● : bare silica product in analytical particle sizes available in bulk for contracted OEM producers

Kromasil Classic columns for UHPLC and HPLC

Kromasil Classic, 2.1 mm i.d. columns

			column size, i.d. × length [mm]		
Family	Phase	particle size [µm]	2.1 × 50	2.1 × 100	2.1 × 150
60 Å	SIL	5	S05SID05	S05SID10	S05SID15
60 Å	CN	5	S05CND05	S05CND10	S05CND15
60 Å	Diol	5	S05DID05	S05DID10	S05DID15
60 Å	HILIC-D	5	S05HDD05	S05HDD10	S05HDD15
100 Å	SIL	3.5	MH3SID05	MH3SID10	MH3SID15
100 Å	SIL	5	M05SID05	M05SID10	M05SID15
100 Å	C4	1.8	MF1CSD05	MF1CSD10	
100 Å	C4	2.5	MH2CSD05	MH2CSD10	
100 Å	C4	3.5	MH3CSD05	MH3CSD10	MH3CSD15
100 Å	C4	5	M05CSD05	M05CSD10	M05CSD15
100 Å	C8	1.8	MF1CMD05	MF1CMD10	
100 Å	C8	2.5	MH2CMD05	MH2CMD10	
100 Å	C8	3.5	MH3CMD05	MH3CMD10	MH3CMD15
100 Å	C8	5	M05CMD05	M05CMD10	M05CMD15
100 Å	C18	1.8	MF1CLD05	MF1CLD10	
100 Å	C18	2.5	MH2CLD05	MH2CLD10	
100 Å	C18	3.5	MH3CLD05	MH3CLD10	MH3CLD15
100 Å	C18	5	M05CLD05	M05CLD10	M05CLD15
100 Å	NH2	3.5	MH3NHD05	MH3NHD10	MH3NHD15
100 Å	NH2	5	M05NHD05	M05NHD10	M05NHD15
100 Å	Phenyl	5	M05PHD05	M05PHD10	M05PHD15
300 Å	SIL	5	L05SID05	L05SID10	L05SID15
300 Å	C4	5	L05CSD05	L05CSD10	L05CSD15
300 Å	C8	5	L05CMD05	L05CMD10	L05CMD15
300 Å	C18	5	L05CLD05	L05CLD10	L05CLD15

Kromasil Classic, 3.0 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 3.0 × 50	3.0 × 100	3.0 × 150	3.0 × 250
60 Å	SIL	5	S05SIC05	S05SIC10	S05SIC15	
60 Å	CN	5	S05CNC05	S05CNC10	S05CNC15	
60 Å	Diol	5	S05DIC05	S05DIC10	S05DIC15	
60 Å	HILIC-D	5	S05HDC05	S05HDC10	S05HDC15	
100 Å	SIL	3.5	MH3SIC05	MH3SIC10	MH3SIC15	
100 Å	SIL	5	M05SIC05	M05SIC10	M05SIC15	
100 Å	C4	1.8	MF1CSC05	MF1CSC10		
100 Å	C4	2.5	MH2CSC05	MH2CSC10		
100 Å	C4	3.5	MH3CSC05	MH3CSC10	MH3CSC15	
100 Å	C4	5	M05CSC05	M05CSC10	M05CSC15	
100 Å	C8	1.8	MF1CMC05	MF1CMC10		
100 Å	C8	2.5	MH2CMC05	MH2CMC10		
100 Å	C8	3.5	MH3CMC05	MH3CMC10	MH3CMC15	
100 Å	C8	5	M05CMC05	M05CMC10	M05CMC15	
100 Å	C18	1.8	MF1CLC05	MF1CLC10		
100 Å	C18	2.5	MH2CLC05	MH2CLC10		
100 Å	C18	3.5	MH3CLC05	MH3CLC10	MH3CLC15	MH3CLC25
100 Å	C18	5	M05CLC05	M05CLC10	M05CLC15	M05CLC25
100 Å	NH2	3.5	MH3NHC05	MH3NHC10	MH3NHC15	
100 Å	NH2	5	M05NHC05	M05NHC10	M05NHC15	
100 Å	Phenyl	5	M05PHC05	M05PHC10	M05PHC15	
300 Å	SIL	5	L05SIC05	L05SIC10	L05SIC15	
300 Å	C4	5	L05CSC05	L05CSC10	L05CSC15	
300 Å	C8	5	L05CMC05	L05CMC10	L05CMC15	
300 Å	C18	5	L05CLC05	L05CLC10	L05CLC15	

Kromasil Classic, 3.9 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 3.9 × 150	3.9 × 250
60 Å	CN	10		S10CNJ25
100 Å	C18	10	M10CLJ15	M10CLJ25

Kromasil 60 Å, 4.0 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.0 × 50	4.0 × 100	4.0 × 150	4.0 × 250
60 Å	SIL	5	S05SIB05	S05SIB10	S05SIB15	S05SIB25
60 Å	SIL	7	S07SIB05	S07SIB10	S07SIB15	S07SIB25
60 Å	SIL	10	S10SIB05	S10SIB10	S10SIB15	S10SIB25
60 Å	SIL	13	S13SIB05	S13SIB10	S13SIB15	S13SIB25
60 Å	SIL	16	S16SIB05	S16SIB10	S16SIB15	S16SIB25
60 Å	CN	5	S05CNB05	S05CNB10	S05CNB15	S05CNB25
60 Å	CN	10	S10CNB05	S10CNB10	S10CNB15	S10CNB25
60 Å	CN	16	S16CNB05	S16CNB10	S16CNB15	S16CNB25
60 Å	Diol	5	S05DIB05	S05DIB10	S05DIB15	S05DIB25
60 Å	Diol	10	S10DIB05	S10DIB10	S10DIB15	S10DIB25
60 Å	HILIC-D	5	S05HDB05	S05HDB10	S05HDB15	S05HDB25
60 Å	HILIC-D	10	S10HDB05	S10HDB10	S10HDB15	S10HDB25

Kromasil 100 Å, 4.0 mm i.d. columns 1(2)

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.0 × 125	4.0 × 200	4.0 × 300
100 Å	C8	5	M05CMB1F		
100 Å	C8	10			M10CMB30
100 Å	C18	5	M05CLB1F	M05CLB20	M05CLB30
100 Å	C18	10			M10CLB30

Kromasil 100 Å, 4.0 mm i.d. columns 2(2)

Family	Phase	particle size [μm]	column size, i.d. × length [mm] 4.0 × 50	4.0 × 100	4.0 × 150	4.0 × 250
100 Å	SIL	3.5	MH3SIB05	MH3SIB10	MH3SIB15	MH3SIB25
100 Å	SIL	5	M05SIB05	M05SIB10	M05SIB15	M05SIB25
100 Å	SIL	7	M07SIB05	M07SIB10	M07SIB15	M07SIB25
100 Å	SIL	10	M10SIB05	M10SIB10	M10SIB15	M10SIB25
100 Å	SIL	13	M13SIB05	M13SIB10	M13SIB15	M13SIB25
100 Å	SIL	16	M16SIB05	M16SIB10	M16SIB15	M16SIB25
100 Å	C4	3.5	MH3CSB05	MH3CSB10	MH3CSB15	MH3CSB25
100 Å	C4	5	M05CSB05	M05CSB10	M05CSB15	M05CSB25
100 Å	C4	7	M07CSB05	M07CSB10	M07CSB15	M07CSB25
100 Å	C4	10	M10CSB05	M10CSB10	M10CSB15	M10CSB25
100 Å	C4	13	M13CSB05	M13CSB10	M13CSB15	M13CSB25
100 Å	C4	16	M16CSB05	M16CSB10	M16CSB15	M16CSB25
100 Å	C8	3.5	MH3CMB05	MH3CMB10	MH3CMB15	MH3CMB25
100 Å	C8	5	M05CMB05	M05CMB10	M05CMB15	M05CMB25
100 Å	C8	7	M07CMB05	M07CMB10	M07CMB15	M07CMB25
100 Å	C8	10	M10CMB05	M10CMB10	M10CMB15	M10CMB25
100 Å	C8	13	M13CMB05	M13CMB10	M13CMB15	M13CMB25
100 Å	C8	16	M16CMB05	M16CMB10	M16CMB15	M16CMB25
100 Å	C18	3.5	MH3CLB05	MH3CLB10	MH3CLB15	MH3CLB25
100 Å	C18	5	M05CLB05	M05CLB10	M05CLB15	M05CLB25
100 Å	C18	7	M07CLB05	M07CLB10	M07CLB15	M07CLB25
100 Å	C18	10	M10CLB05	M10CLB10	M10CLB15	M10CLB25
100 Å	C18	13	M13CLB05	M13CLB10	M13CLB15	M13CLB25
100 Å	C18	16	M16CLB05	M16CLB10	M16CLB15	M16CLB25
100 Å	NH2	3.5	MH3NHB05	MH3NHB10	MH3NHB15	MH3NHB25
100 Å	NH2	5	M05NHB05	M05NHB10	M05NHB15	M05NHB25
100 Å	NH2	7	M07NHB05	M07NHB10	M07NHB15	M07NHB25
100 Å	NH2	10	M10NHB05	M10NHB10	M10NHB15	M10NHB25
100 Å	NH2	13	M13NHB05	M13NHB10	M13NHB15	M13NHB25
100 Å	NH2	16	M16NHB05	M16NHB10	M16NHB15	M16NHB25
100 Å	Phenyl	5	M05PHB05	M05PHB10	M05PHB15	M05PHB25
100 Å	Phenyl	10	M10PHB05	M10PHB10	M10PHB15	M10PHB25
100 Å	Phenyl	16	M16PHB05	M16PHB10	M16PHB15	M16PHB25

Kromasil 300 Å, 4.0 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.0 × 50	4.0 × 100	4.0 × 150	4.0 × 250
300 Å	SIL	5	L05SIB05	L05SIB10	L05SIB15	L05SIB25
300 Å	SIL	10	L10SIB05	L10SIB10	L10SIB15	L10SIB25
300 Å	SIL	16	L16SIB05	L16SIB10	L16SIB15	L16SIB25
300 Å	C4	5	L05CSB05	L05CSB10	L05CSB15	L05CSB25
300 Å	C4	10	L10CSB05	L10CSB10	L10CSB15	L10CSB25
300 Å	C4	16	L16CSB05	L16CSB10	L16CSB15	L16CSB25
300 Å	diC4	10	L10DCB05	L10DCB10	L10DCB15	L10DCB25
300 Å	diC4	16	L16DCB05	L16DCB10	L16DCB15	L16DCB25
300 Å	C8	5	L05CMB05	L05CMB10	L05CMB15	L05CMB25
300 Å	C8	10	L10CMB05	L10CMB10	L10CMB15	L10CMB25
300 Å	C8	16	L16CMB05	L16CMB10	L16CMB15	L16CMB25
300 Å	C18	5	L05CLB05	L05CLB10	L05CLB15	L05CLB25
300 Å	C18	10	L10CLB05	L10CLB10	L10CLB15	L10CLB25
300 Å	C18	16	L16CLB05	L16CLB10	L16CLB15	L16CLB25

Kromasil 60 Å, 4.6 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.6 × 50	4.6 × 100	4.6 × 150	4.6 × 250
60 Å	SIL	5	S05SIA05	S05SIA10	S05SIA15	S05SIA25
60 Å	SIL	7	S07SIA05	S07SIA10	S07SIA15	S07SIA25
60 Å	SIL	10	S10SIA05	S10SIA10	S10SIA15	S10SIA25
60 Å	SIL	13	S13SIA05	S13SIA10	S13SIA15	S13SIA25
60 Å	SIL	16	S16SIA05	S16SIA10	S16SIA15	S16SIA25
60 Å	CN	5	S05CNA05	S05CNA10	S05CNA15	S05CNA25
60 Å	CN	10	S10CNA05	S10CNA10	S10CNA15	S10CNA25
60 Å	CN	16	S16CNA05	S16CNA10	S16CNA15	S16CNA25
60 Å	Diol	5	S05DIA05	S05DIA10	S05DIA15	S05DIA25
60 Å	Diol	10	S10DIA05	S10DIA10	S10DIA15	S10DIA25
60 Å	HILIC-D	5	S05HDA05	S05HDA10	S05HDA15	S05HDA25
60 Å	HILIC-D	10	S10HDA05	S10HDA10	S10HDA15	S10HDA25

Kromasil 100 Å, 4.6 mm i.d. columns 1(3)

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.6 × 50	4.6 × 100	4.6 × 150	4.6 × 250
100 Å	SIL	3.5	MH3SIA05	MH3SIA10	MH3SIA15	MH3SIA25
100 Å	SIL	5	M05SIA05	M05SIA10	M05SIA15	M05SIA25
100 Å	SIL	7	M07SIA05	M07SIA10	M07SIA15	M07SIA25
100 Å	SIL	10	M10SIA05	M10SIA10	M10SIA15	M10SIA25
100 Å	SIL	13	M13SIA05	M13SIA10	M13SIA15	M13SIA25
100 Å	SIL	16	M16SIA05	M16SIA10	M16SIA15	M16SIA25
100 Å	C1	5				M05C1A25
100 Å	C4	2.5	MH2CSA05	MH2CSA10		
100 Å	C4	3.5	MH3CSA05	MH3CSA10	MH3CSA15	MH3CSA25
100 Å	C4	5	M05CSA05	M05CSA10	M05CSA15	M05CSA25
100 Å	C4	7	M07CSA05	M07CSA10	M07CSA15	M07CSA25
100 Å	C4	10	M10CSA05	M10CSA10	M10CSA15	M10CSA25
100 Å	C4	13	M13CSA05	M13CSA10	M13CSA15	M13CSA25
100 Å	C4	16	M16CSA05	M16CSA10	M16CSA15	M16CSA25
100 Å	C8	2.5	MH2CMA05	MH2CMA10		
100 Å	C8	3.5	MH3CMA05	MH3CMA10	MH3CMA15	MH3CMA25
100 Å	C8	5	M05CMA05	M05CMA10	M05CMA15	M05CMA25
100 Å	C8	7	M07CMA05	M07CMA10	M07CMA15	M07CMA25
100 Å	C8	10	M10CMA05	M10CMA10	M10CMA15	M10CMA25
100 Å	C8	13	M13CMA05	M13CMA10	M13CMA15	M13CMA25
100 Å	C8	16	M16CMA05	M16CMA10	M16CMA15	M16CMA25
100 Å	C18	2.5	MH2CLA05	MH2CLA10		
100 Å	C18	3.5	MH3CLA05	MH3CLA10	MH3CLA15	MH3CLA25
100 Å	C18	5	M05CLA05	M05CLA10	M05CLA15	M05CLA25
100 Å	C18	7	M07CLA05	M07CLA10	M07CLA15	M07CLA25
100 Å	C18	10	M10CLA05	M10CLA10	M10CLA15	M10CLA25
100 Å	C18	13	M13CLA05	M13CLA10	M13CLA15	M13CLA25
100 Å	C18	16	M16CLA05	M16CLA10	M16CLA15	M16CLA25
100 Å	C18(w)	10				M10WLA25
100 Å	NH2	3.5	MH3NHA05	MH3NHA10	MH3NHA15	MH3NHA25
100 Å	NH2	5	M05NHA05	M05NHA10	M05NHA15	M05NHA25
100 Å	NH2	7	M07NHA05	M07NHA10	M07NHA15	M07NHA25

Kromasil 100 Å, 4.6 mm i.d. columns 2(3)

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.6 × 50	4.6 × 100	4.6 × 150	4.6 × 250
100 Å	NH2	10	M10NHA05	M10NHA10	M10NHA15	M10NHA25
100 Å	NH2	13	M13NHA05	M13NHA10	M13NHA15	M13NHA25
100 Å	NH2	16	M16NHA05	M16NHA10	M16NHA15	M16NHA25
100 Å	Phenyl	5	M05PHA05	M05PHA10	M05PHA15	M05PHA25
100 Å	Phenyl	10	M10PHA05	M10PHA10	M10PHA15	M10PHA25
100 Å	Phenyl	16	M16PHA05	M16PHA10	M16PHA15	M16PHA25

Kromasil 100 Å, 4.6 mm i.d. columns 3(3)

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.6 × 30	4.6 × 33	4.6 × 125	4.6 × 200	4.6 × 300
100 Å	SIL	3.5			MH3SIA1F	MH3SIA20	
100 Å	C4	3.5			MH3CSA1F	MH3CSA20	
100 Å	C8	3.5			MH3CMA1F	MH3CMA20	
100 Å	C8	10				M10CMA20	M10CMA30
100 Å	C18	3.5			MH3CLA1F	MH3CLA20	
100 Å	C18	5	M05CLA03	M05CLAT3			
100 Å	C18	10				M10CLA20	M10CLA30
100 Å	NH2	3.5			MH3NHA1F	MH3NHA20	

Kromasil 300 Å, 4.6 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 4.6 × 50	4.6 × 100	4.6 × 150	4.6 × 250
300 Å	SIL	5	L05SIA05	L05SIA10	L05SIA15	L05SIA25
300 Å	SIL	10	L10SIA05	L10SIA10	L10SIA15	L10SIA25
300 Å	SIL	16	L16SIA05	L16SIA10	L16SIA15	L16SIA25
300 Å	C4	5	L05CSA05	L05CSA10	L05CSA15	L05CSA25
300 Å	C4	10	L10CSA05	L10CSA10	L10CSA15	L10CSA25
300 Å	C4	16	L16CSA05	L16CSA10	L16CSA15	L16CSA25
300 Å	diC4	10	L10DCA05	L10DCA10	L10DCA15	L10DCA25
300 Å	diC4	16	L16DCA05	L16DCA10	L16DCA15	L16DCA25
300 Å	C8	5	L05CMA05	L05CMA10	L05CMA15	L05CMA25
300 Å	C8	10	L10CMA05	L10CMA10	L10CMA15	L10CMA25
300 Å	C8	16	L16CMA05	L16CMA10	L16CMA15	L16CMA25
300 Å	C18	5	L05CLA05	L05CLA10	L05CLA15	L05CLA25
300 Å	C18	10	L10CLA05	L10CLA10	L10CLA15	L10CLA25
300 Å	C18	16	L16CLA05	L16CLA10	L16CLA15	L16CLA25

Kromasil ClassicShell columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 2.1 × 50	2.1 × 100	4.6 × 100
ClassicShell	C8	2.5	NH2CMD05	NH2CMD10	NH2CMA10
ClassicShell	C18	2.5	NH2CLD05	NH2CLD10	NH2CLA10

Kromasil 60 Å, 10 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 10 × 150	10 × 250
60 Å	SIL	5	S05SIP15	S05SIP25
60 Å	SIL	7	S07SIP15	S07SIP25
60 Å	SIL	10	S10SIP15	S10SIP25
60 Å	SIL	13	S13SIP15	S13SIP25
60 Å	SIL	16	S16SIP15	S16SIP25
60 Å	CN	5	S05CNP15	S05CNP25
60 Å	CN	10	S10CNP15	S10CNP25
60 Å	CN	16	S16CNP15	S16CNP25
60 Å	Diol	5	S05DIP15	S05DIP25
60 Å	Diol	10	S10DIP15	S10DIP25
60 Å	HILIC-D	5	S05HDP15	S05HDP25
60 Å	HILIC-D	10	S10HDP15	S10HDP25

Kromasil 60 Å, 21.2 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 21.2 × 150	21.2 × 250
60 Å	SIL	5	S05SIQ15	S05SIQ25
60 Å	SIL	7	S07SIQ15	S07SIQ25
60 Å	SIL	10	S10SIQ15	S10SIQ25
60 Å	SIL	13	S13SIQ15	S13SIQ25
60 Å	SIL	16	S16SIQ15	S16SIQ25
60 Å	CN	5	S05CNQ15	S05CNQ25
60 Å	CN	10	S10CNQ15	S10CNQ25
60 Å	CN	16	S16CNQ15	S16CNQ25
60 Å	Diol	5	S05DIQ15	S05DIQ25
60 Å	Diol	10	S10DIQ15	S10DIQ25
60 Å	HILIC-D	5	S05HDQ15	S05HDQ25
60 Å	HILIC-D	10	S10HDQ15	S10HDQ25

Kromasil 60 Å, 30 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 30 × 150	30 × 250
60 Å	SIL	5	S05SIR15	S05SIR25
60 Å	SIL	7	S07SIR15	S07SIR25
60 Å	SIL	10	S10SIR15	S10SIR25
60 Å	SIL	13	S13SIR15	S13SIR25
60 Å	SIL	16	S16SIR15	S16SIR25
60 Å	CN	5	S05CNR15	S05CNR25
60 Å	CN	10	S10CNR15	S10CNR25
60 Å	CN	16	S16CNR15	S16CNR25
60 Å	Diol	5	S05DIR15	S05DIR25
60 Å	Diol	10	S10DIR15	S10DIR25
60 Å	HILIC-D	5	S05HDR15	S05HDR25
60 Å	HILIC-D	10	S10HDR15	S10HDR25

Kromasil 60 Å, 50 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 50 × 150	50 × 250
60 Å	SIL	7	S07SIT15	S07SIT25
60 Å	SIL	10	S10SIT15	S10SIT25
60 Å	SIL	13	S13SIT15	S13SIT25
60 Å	SIL	16	S16SIT15	S16SIT25
60 Å	CN	10	S10CNT15	S10CNT25
60 Å	CN	16	S16CNT15	S16CNT25
60 Å	Diol	10	S10DIT15	S10DIT25
60 Å	HILIC-D	10	S10HDT15	S10HDT25

Kromasil 100 Å, 10 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 10 × 150	10 × 250
100 Å	SIL	5	M05SIP15	M05SIP25
100 Å	SIL	7	M07SIP15	M07SIP25
100 Å	SIL	10	M10SIP15	M10SIP25
100 Å	SIL	13	M13SIP15	M13SIP25
100 Å	SIL	16	M16SIP15	M16SIP25
100 Å	C4	5	M05CSP15	M05CSP25
100 Å	C4	7	M07CSP15	M07CSP25
100 Å	C4	10	M10CSP15	M10CSP25
100 Å	C4	13	M13CSP15	M13CSP25
100 Å	C4	16	M16CSP15	M16CSP25
100 Å	C8	5	M05CMP15	M05CMP25
100 Å	C8	7	M07CMP15	M07CMP25
100 Å	C8	10	M10CMP15	M10CMP25
100 Å	C8	13	M13CMP15	M13CMP25
100 Å	C8	16	M16CMP15	M16CMP25
100 Å	C18	5	M05CLP15	M05CLP25
100 Å	C18	7	M07CLP15	M07CLP25
100 Å	C18	10	M10CLP15	M10CLP25
100 Å	C18	13	M13CLP15	M13CLP25
100 Å	C18	16	M16CLP15	M16CLP25
100 Å	C18(w)	10		M10WLP25
100 Å	NH2	5	M05NHP15	M05NHP25
100 Å	NH2	7	M07NHP15	M07NHP25
100 Å	NH2	10	M10NHP15	M10NHP25
100 Å	NH2	13	M13NHP15	M13NHP25
100 Å	NH2	16	M16NHP15	M16NHP25
100 Å	Phenyl	5	M05PHP15	M05PHP25
100 Å	Phenyl	10	M10PHP15	M10PHP25
100 Å	Phenyl	16	M16PHP15	M16PHP25


Kromasil
Nouryon

Kromasil 100 Å, 21.2 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 21.2 × 150	21.2 × 250
100 Å	SIL	5	M05SIQ15	M05SIQ25
100 Å	SIL	7	M07SIQ15	M07SIQ25
100 Å	SIL	10	M10SIQ15	M10SIQ25
100 Å	SIL	13	M13SIQ15	M13SIQ25
100 Å	SIL	16	M16SIQ15	M16SIQ25
100 Å	C4	5	M05CSQ15	M05CSQ25
100 Å	C4	7	M07CSQ15	M07CSQ25
100 Å	C4	10	M10CSQ15	M10CSQ25
100 Å	C4	13	M13CSQ15	M13CSQ25
100 Å	C4	16	M16CSQ15	M16CSQ25
100 Å	C8	5	M05CMQ15	M05CMQ25
100 Å	C8	7	M07CMQ15	M07CMQ25
100 Å	C8	10	M10CMQ15	M10CMQ25
100 Å	C8	13	M13CMQ15	M13CMQ25
100 Å	C8	16	M16CMQ15	M16CMQ25
100 Å	C18	5	M05CLQ15	M05CLQ25
100 Å	C18	7	M07CLQ15	M07CLQ25
100 Å	C18	10	M10CLQ15	M10CLQ25
100 Å	C18	13	M13CLQ15	M13CLQ25
100 Å	C18	16	M16CLQ15	M16CLQ25
100 Å	C18(w)	10		M10WLQ25
100 Å	NH2	5	M05NHQ15	M05NHQ25
100 Å	NH2	7	M07NHQ15	M07NHQ25
100 Å	NH2	10	M10NHQ15	M10NHQ25
100 Å	NH2	13	M13NHQ15	M13NHQ25
100 Å	NH2	16	M16NHQ15	M16NHQ25
100 Å	Phenyl	5	M05PHQ15	M05PHQ25
100 Å	Phenyl	10	M10PHQ15	M10PHQ25
100 Å	Phenyl	16	M16PHQ15	M16PHQ25

Kromasil 100 Å, 30 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 30 × 150	30 × 250
100 Å	SIL	5	M05SIR15	M05SIR25
100 Å	SIL	7	M07SIR15	M07SIR25
100 Å	SIL	10	M10SIR15	M10SIR25
100 Å	SIL	13	M13SIR15	M13SIR25
100 Å	SIL	16	M16SIR15	M16SIR25
100 Å	C4	5	M05CSR15	M05CSR25
100 Å	C4	7	M07CSR15	M07CSR25
100 Å	C4	10	M10CSR15	M10CSR25
100 Å	C4	13	M13CSR15	M13CSR25
100 Å	C4	16	M16CSR15	M16CSR25
100 Å	C8	5	M05CMR15	M05CMR25
100 Å	C8	7	M07CMR15	M07CMR25
100 Å	C8	10	M10CMR15	M10CMR25
100 Å	C8	13	M13CMR15	M13CMR25
100 Å	C8	16	M16CMR15	M16CMR25
100 Å	C18	5	M05CLR15	M05CLR25
100 Å	C18	7	M07CLR15	M07CLR25
100 Å	C18	10	M10CLR15	M10CLR25
100 Å	C18	13	M13CLR15	M13CLR25
100 Å	C18	16	M16CLR15	M16CLR25
100 Å	NH2	5	M05NHR15	M05NHR25
100 Å	NH2	7	M07NHR15	M07NHR25
100 Å	NH2	10	M10NHR15	M10NHR25
100 Å	NH2	13	M13NHR15	M13NHR25
100 Å	NH2	16	M16NHR15	M16NHR25
100 Å	Phenyl	5	M05PHR15	M05PHR25
100 Å	Phenyl	10	M10PHR15	M10PHR25
100 Å	Phenyl	16	M16PHR15	M16PHR25

Kromasil 100 Å, 50 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 50 × 150	50 × 250
100 Å	SIL	7	M07SIT15	M07SIT25
100 Å	SIL	10	M10SIT15	M10SIT25
100 Å	SIL	13	M13SIT15	M13SIT25
100 Å	SIL	16	M16SIT15	M16SIT25
100 Å	C4	7	M07CST15	M07CST25
100 Å	C4	10	M10CST15	M10CST25
100 Å	C4	13	M13CST15	M13CST25
100 Å	C4	16	M16CST15	M16CST25
100 Å	C8	7	M07CMT15	M07CMT25
100 Å	C8	10	M10CMT15	M10CMT25
100 Å	C8	13	M13CMT15	M13CMT25
100 Å	C8	16	M16CMT15	M16CMT25
100 Å	C18	7	M07CLT15	M07CLT25
100 Å	C18	10	M10CLT15	M10CLT25
100 Å	C18	13	M13CLT15	M13CLT25
100 Å	C18	16	M16CLT15	M16CLT25
100 Å	NH2	7	M07NHT15	M07NHT25
100 Å	NH2	10	M10NHT15	M10NHT25
100 Å	NH2	13	M13NHT15	M13NHT25
100 Å	NH2	16	M16NHT15	M16NHT25
100 Å	Phenyl	10	M10PHT15	M10PHT25
100 Å	Phenyl	16	M16PHT15	M16PHT25

Kromasil 300 Å, 10 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 10 × 150	10 × 250
300 Å	SIL	5	L05SIP15	L05SIP25
300 Å	SIL	10	L10SIP15	L10SIP25
300 Å	SIL	16	L16SIP15	L16SIP25
300 Å	C4	5	L05CSP15	L05CSP25
300 Å	C4	10	L10CSP15	L10CSP25
300 Å	C4	16	L16CSP15	L16CSP25
300 Å	diC4	10	L10DCP15	L10DCP25
300 Å	diC4	16	L16DCP15	L16DCP25
300 Å	C8	5	L05CMP15	L05CMP25
300 Å	C8	10	L10CMP15	L10CMP25
300 Å	C8	16	L16CMP15	L16CMP25
300 Å	C18	5	L05CLP15	L05CLP25
300 Å	C18	10	L10CLP15	L10CLP25
300 Å	C18	16	L16CLP15	L16CLP25

Kromasil 300 Å, 21.2 mm i.d. columns

Family	Phase	particle size [µm]	column size, i.d. × length [mm] 21.2 × 150	21.2 × 250
300 Å	SIL	5	L05SIQ15	L05SIQ25
300 Å	SIL	10	L10SIQ15	L10SIQ25
300 Å	SIL	16	L16SIQ15	L16SIQ25
300 Å	C4	5	L05CSQ15	L05CSQ25
300 Å	C4	10	L10CSQ15	L10CSQ25
300 Å	C4	16	L16CSQ15	L16CSQ25
300 Å	diC4	10	L10DCQ15	L10DCQ25
300 Å	diC4	16	L16DCQ15	L16DCQ25
300 Å	C8	5	L05CMQ15	L05CMQ25
300 Å	C8	10	L10CMQ15	L10CMQ25
300 Å	C8	16	L16CMQ15	L16CMQ25
300 Å	C18	5	L05CLQ15	L05CLQ25
300 Å	C18	10	L10CLQ15	L10CLQ25
300 Å	C18	16	L16CLQ15	L16CLQ25

The moment you adopt our Kromasil High Performance Concept, you join thousands of chromatographers who share a common goal: to achieve better separations when analyzing or isolating pharmaceuticals or other substances.

Not only will you benefit from our patented silica technology, but you gain a strong partner with a reliable track record in the eld of silica products. For the past 70 years, we have pioneered new types of silica. Our long experience in the eld of silica chemistry is the secret behind the development of Kromasil, and the success of our Separation Products group. Kromasil is available in bulk and in high-pressure slurry-packed columns.

The production of Kromasil is ISO 9001 and 14001 certified.

Kromasil is a brand of Nouryon, a global specialty chemicals leader. Industries worldwide rely on our essential chemistry in the manufacture of everyday products. Building on our nearly 400-year history and operations in over 80 countries, the dedication of our 10 000 employees, and our shared commitment to safety, sustainability, and innovation, we have established a world-class business and built strong partnerships with our customers.

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