



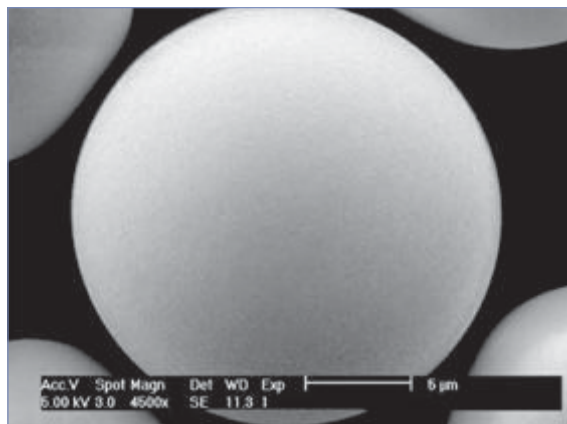
NUCLEODUR® high purity silica for HPLC

NUCLEODUR® is a fully synthetic type B silica (silica of 3rd generation) offering highly advanced physical properties like **totally spherical** particle shape, outstanding **surface microstructure**, high **pressure stability** and **low metal content**.

NUCLEODUR® as a state-of-the-art silica is the ideal base material for modern HPLC phases. It is the result of MACHEREY-NAGEL's pioneering research in chromatography for more than 40 years and succeeds MN's famous NUCLEOSIL® silica.

In RP liquid chromatography the efficiency of the packing is strongly affected by the quality of the base silica itself. Shortcomings in the surface geometry of the particles or metal contaminants are the main reasons for inadequate coverage with the covalently bonded alkylsilanes in the subsequent derivatization steps. It is well known, that poor surface coverage and, in consequence, high activity of residual free silanols often results in peak tailing or adsorption, particularly with basic compounds.

Particle shape and surface symmetry



NUCLEODUR® silicas are synthesized in a unique and carefully controlled manufacturing process which provides silica particles, which are totally spherical. The picture shows the outstanding smoothness of the NUCLEODUR® surface.

Purity

As already mentioned above, a highly pure silica is required for achieving symmetric peak shapes and maximum resolution. Inclusions of e. g. iron or alkaline earth metal ions on the silica surface are largely responsible for the unwanted interactions with ionizable analytes, e. g. amines or phenolic compounds.

NUCLEODUR® is virtually free of metal impurities and low acidic surface silanols. Elemental analysis data of NUCLEODUR® 5 µm measured by AAS are listed below.

Elementary analysis (metal ions) of NUCLEODUR® 100-5

Aluminium	< 5	ppm
Iron	< 5	ppm
Sodium	< 5	ppm
Calcium	< 10	ppm
Titanium	< 1	ppm
Zirconium	< 1	ppm
Arsenic	< 0.5	ppm
Mercury	< 0.05	ppm

Pressure stability

The totally spherical and 100% synthetic silica gel exhibits an outstanding mechanical stability, even at high pressures up to 800 bar and elevated eluent flow rates.

In addition, after several cycles of repeated packing, no significant drop in pressure can be observed. The latter is of prime importance for preparative and process-scale applications.

Physical properties of NUCLEODUR®

Surface (BET)	340 m ² /g
Pore size	110 Å
Pore volume	0.9 ml/g

NUCLEODUR® modifications

Several different surface modifications based on NUCLEODUR® silica have been developed over the last years providing a full range of specified HPLC phases and an ideal tool for every separation:

- ✦ NUCLEODUR® C₁₈ Gravity and C₈ Gravity
- ✦ NUCLEODUR® C₁₈ Isis
- ✦ NUCLEODUR® C₁₈ Pyramid
- ✦ NUCLEODUR® Sphinx RP
- ✦ NUCLEODUR® CN and CN-RP
- ✦ NUCLEODUR® NH₂ and NH₂-RP
- ✦ NUCLEODUR® C₁₈ ec and C₈ ec

For important properties of NUCLEODUR® phases please see our summary.

14. Cromatografia

Cromatografia liquida/HPLC



Overview of NUCLEODUR® HPLC phases

Columns for HPLC

Phase	Specification	Characteristics*			Stability	Structure
		A	B	C		
C₁₈ Gravity	octadecyl phase, high density coating multi-endcapping 18 % C · USP L1				pH stability 1 - 11, suited for LC/MS	
C₈ Gravity	octyl phase, high density coating multi-endcapping 11 % C · USP L7				pH stability 1 - 11, suited for LC/MS	
C₁₈ Isis	octadecyl phase with specially crosslinked surface modification endcapping 20 % C · USP L1				pH stability 1 - 10, suited for LC/MS	
C₁₈ Pyramid	C ₁₈ modification with polar endcapping 14 % C · USP L1				stable in 100 % aqueous eluents without phase collapse, pH stability 1 - 9, suited for LC/MS	
Sphinx RP	bifunctional RP phase, balanced ratio of propyl-phenyl and C ₁₈ ligands; endcapping 15 % C; USP L1 and L11				pH stability 1 - 10, suited for LC/MS	
C₁₈ ec	octadecyl phase, medium density coating endcapping 17.5 % C · USP L1				pH stability 1 - 9	
C₈ ec	octyl phase, medium density coating endcapping 10.5 % C · USP L7				pH stability 1 - 9	
CN / CN-RP	cyano (nitrile) phase for NP and RP separations 7 % C · USP L10			-	pH stability 1 - 8, suited for mobile phases with high contents of water	
NH₂ / NH₂-RP	amino phase for NP and RP separations 2.5 % C · USP L8			-	pH stability 2 - 8, suited for mobile phases with high contents of water	
SiOH	unmodified USP L3	-	n.a.	-	pH stability 2 - 8	

* A = hydrophobic selectivity, B = polar / ionic selectivity, C = steric selectivity

An optimised phase for every separations



Application	Similar phases**	Separation principle · Retention mechanism	
in general compounds with ionizable functional groups such as basic pharmaceuticals and pesticides	NUCLEOSIL® C₁₈ HD Waters Xterra® RP ₁₈ / MS C ₁₈ ; Phenomenex Luna® C18 (2), Synergi™ und Max RP; Zorbax® Extend C18; Inertsil® ODS III; Purospher® RP-18, Star RP-18	only hydrophobic interactions (van der Waals interactions)	
like C ₁₈ Gravity, however generally shorter retention times for nonpolar compounds	NUCLEOSIL® C₈ HD Waters Xterra® RP ₈ / MS C ₈ ; Phenomenex Luna® C8; Zorbax® Eclipse; XDB-C8		
high steric selectivity, thus suited for separation of positional and structural isomers, planar / non-planar molecules	NUCLEOSIL® C₁₈ AB Inertsil® ODS-P; YMC® Pro C18RS	steric interactions and hydrophobic interactions	
basic pharmaceutical ingredients, very polar compounds, organic acids	Phenomenex Aqua®; YMC® AQ; Waters Atlantis® dC18	hydrophobic interactions and polar interactions (H bonds)	
compounds with aromatic and multiple bond systems	no similar phases	π-π interactions and hydrophobic interactions	
robust C ₁₈ phase for routine analyses	NUCLEOSIL® C₁₈ Spherisorb® ODS II; Hypersil® ODS; Waters Symmetry® C18; Inertsil® ODS II; Kromasil® C18; LiChrospher® RP 18	only hydrophobic interactions (van der Waals interactions) some residual silanol interactions	
robust C ₈ phase for routine analyses	NUCLEOSIL® C₈ ec / C₈ Spherisorb® C8; Hypersil® MOS; Waters Symmetry® C8; Kromasil® C8; LiChrospher® RP 8		
polar organic compounds (basic drugs, molecules containing π electron systems)	NUCLEOSIL® CN / CN-RP	π-π interactions, polar interactions (H bonds), hydrophobic interactions	
sugars, sugar alcohols and other hydroxy compounds, DNA bases, polar compounds in general	NUCLEOSIL® NH₂ / NH₂-RP	polar / ionic interactions, hydrophobic interactions	
polar organic compounds in general	unmodified NUCLEOSIL®	polar / ionic interactions	

** phases which provide a similar selectivity based on chemical and physical properties

Columns for HPLC

14. Cromatografia

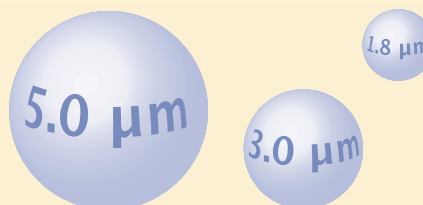
Cromatografia liquida/HPLC



Particle size and separation efficiency

1.8 μm particles for increased separation efficiency

- decrease of analysis time (ultra fast HPLC)
- shorter columns with high separation efficiency
- significant improvement of resolution
- increased detection sensitivity
- suitable for LC/MS due to low bleeding characteristics
- all NUCLEODUR® premium phases are available in 1.8 μm : C₁₈ Gravity, C₈ Gravity, C₁₈ Isis, C₁₈ Pyramid, Sphinx RP
- NUCLEODUR® 1.8 μm particles are fractionated to limit the increase in back pressure



Now available: 1.8 μm particle size!

Features of 1.8 μm NUCLEODUR® silica particles

- increase of separation efficiency by higher number of theoretical plates (N)
- significant improvement in resolution
- low column back pressure

Comparison of back pressure:

Eluent: 100 % methanol
Flow rate: 1.5 ml/min
Temperature: 22 °C
Column dimension: 50 x 4.6 mm

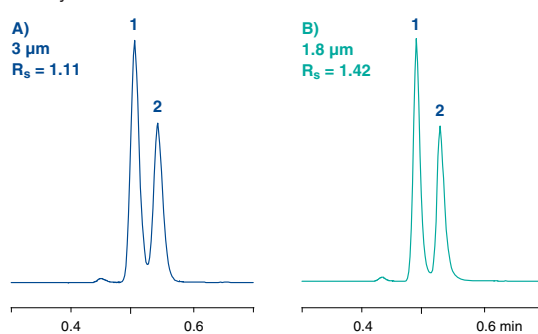
	NUCLEODUR® C ₁₈ Gravity	Competitor A
3 μm	70 bar	-
1.8 μm	130 bar	170 bar

- shorter run times

Resolution as a function of particle size

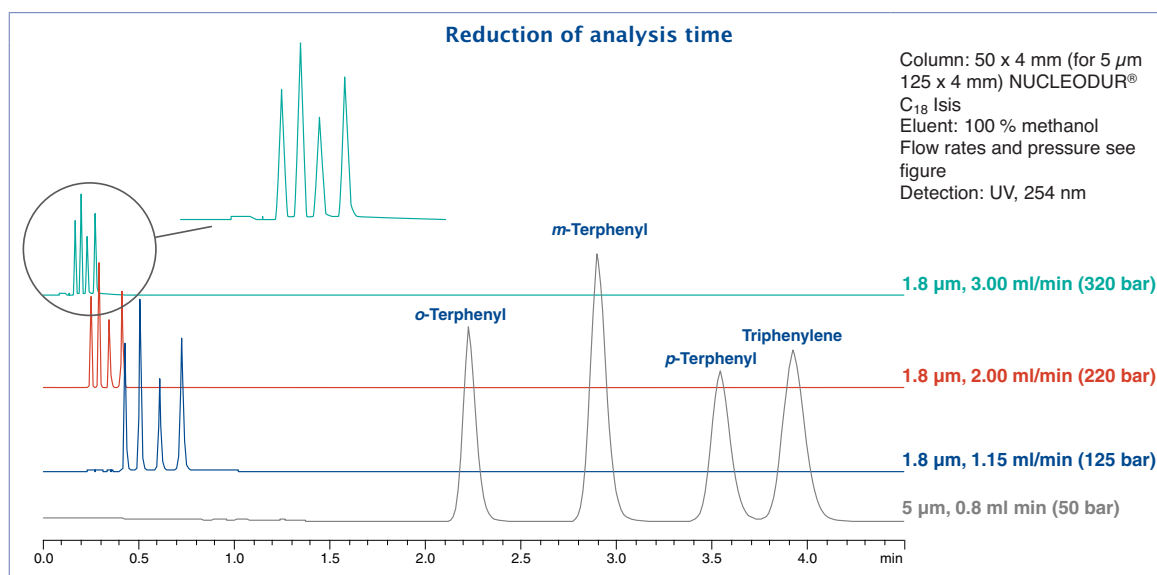
Column: 50 x 4 mm NUCLEODUR® C₁₈ Gravity
A) 3 μm , B) 1.8 μm
Eluent: acetonitrile – water (80:20, v/v)
Flow rate: 2 ml/min
Pressure: A) 80 bar, B) 160 bar
Detection: UV, 254 nm

Peaks:
1. Naphthalene
2. Ethylbenzene



Columns for HPLC

Reduction of analysis time



1 Colonne HPLC con fase NUCLEODUR®

NUCLEODUR® C18 Gravity - C8 Gravity fase ad alta densità non polare

MACHEREY-NAGEL

- disponibile come Octadecyl- (C18 - USP L1) e Octyl- (C8 - USP L7)
- Pori 110 Å; dimensioni particelle 1,8 µm, 3 µm e 5 µm per C18, 1,8 e 5 µm per C8
- particelle di 7, 10, 12 e 16 µm per separazioni preparative disponibili su richiesta.
- Contenuto di carbonio 18 % C per C18, 11 % C per C8
- ideale per sviluppo di metodi
- permette HPLC a pH estremi (pH 1 - 11)
- adatte per **LC/MS** grazie alle basse caratteristiche di legante
- raccomandate per un vasto campo di applicazioni sofisticate.
- Classi di prodotti separati velocemente: prodotti farmaceutici, es. analgesici, antiinfiammatori, antidepressivi; erbicidi; fitofarmaci; immunosoppressori.

1



NUCLEODUR® C₈ Gravity, 1,8 µm

colonne analitiche EC, dimensioni particelle 1,8 µm, 11% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	30	1	4.004 563
3,0	30	1	4.004 564
4,0	30	1	4.004 565
4,6	30	1	4.004 566
2,0	50	1	4.004 559
3,0	50	1	4.004 560
4,0	50	1	4.004 561
4,6	50	1	4.004 562

NUCLEODUR® C18 Gravity, 1.8 µm

colonne analitiche EC, dimensione particelle 1.8 µm, 18% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	30	1	4.004 392
3,0	30	1	4.004 393
4,0	30	1	4.004 394
4,6	30	1	4.004 395
2,0	50	1	4.004 396
3,0	50	1	4.004 397
4,0	50	1	4.004 398
4,6	50	1	4.004 399

NUCLEODUR® C18 Gravity, 3 µm

colonne analitiche EC, dimensioni particelle 3 µm, 18% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	50	1	4.004 400
3,0	50	1	4.004 401
4,0	50	1	4.004 402
4,6	50	1	4.004 403
2,0	125	1	4.004 404
3,0	125	1	6.232 333
4,0	125	1	4.004 405
4,6	125	1	4.004 406
2,0	150	1	4.004 411
3,0	150	1	4.004 412
4,0	150	1	4.004 413
4,6	150	1	4.004 414
2,0	250	1	4.004 407
3,0	250	1	4.004 408
4,0	250	1	4.004 409
4,6	250	1	4.004 410

Precolonne per colonne EC NUCLEODUR® C18 Gravity, 3 µm

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
per 2 e 3 mm diam.int.	3	4.004 624
per 4 e 4.6 mm diam.int.	3	4.004 625

Le precolonne per colonne EC richiedono adattatore per precolonne EC (cod. 7.081 898)

SONO DISPONIBILI ARTICOLI ALTERNATIVI: CONTATTATECI!

14. Cromatografia

Cromatografia liquida/HPLC

1 Colonne preparative VarioPrep NUCLEODUR® C18 Gravity



Dimensioni particelle 5 µm, 18% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
10	50	1	4.004 773
10	250	1	4.004 775
8*	10	2	4.004 780

*Precolonna 10 x 8mm diam. int. VarioPrep richiedono il supporto per precolonna VP 8mm (4.002 176) e stanno su colonne VP diam.int. 10mm

NUCLEODUR® C18 Isis Phase con alta selettività sterica

Fase C18 con polimeri speciali, USP L1
dimensioni pori 110Å, dimensioni particelle 1,8 µm, 3 µm e 5 µm; 20% C
alta selettività sterica
Notevole superficie di deattivazione
ideale per LC/MS grazie alla bassa capacità legante.
stabilità pH da 1 a 10
ampio range di applicazioni: steroidi, (o,p,m), vitamine solubili ect.

MACHEREY-NAGEL

Surface modification

By use of specific C₁₈ silanes and appropriate polymeric bonding technologies a dense shield of alkyl chains protects the subjacent silica matrix. Elemental analysis of NUCLEODUR® C₁₈ Isis shows a carbon load of 20%.

The target crosslinking of the C₁₈ chains on the surface enables the separation of compounds with similar molecular structure but different stereochemical properties. The technical term for this feature is steric selectivity.

The separation of *o*-terphenyl and triphenylene is a concrete example to evaluate the selectivity potential of a reversed phase column in terms of the different shape of two molecules. The phenyl rings of *o*-terphenyl are twisted out of plane while triphenylene has a planar geometry.

The separation factor (α value) is a measure for the steric selectivity. As is shown in the following chromatograms the α value is considerable larger on NUCLEODUR® C₁₈ Isis compared to a conventional C₁₈ column.

Steric selectivity of NUCLEODUR® C₁₈ Isis

Columns: 125 x 4 mm; **NUCLEODUR® C₁₈ Isis, monomerically coated C₁₈ phase, C₁₈ phase with polar endcapping**

Eluent: methanol – water (90:10, v/v)

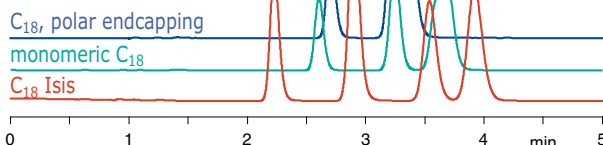
Flow rate: 1 ml/min, temperature 35 °C

Detection: UV, 254 nm

Injection volume: 5 µl

Peaks:

1. *o*-Terphenyl
2. *m*-Terphenyl
3. *p*-Terphenyl
4. Triphenylene



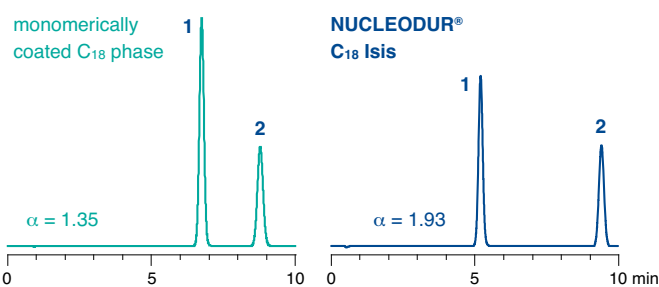
Steric selectivity of NUCLEODUR® C₁₈ Isis

Columns 125 x 4 mm; eluent methanol – water (80:20, v/v)

Flow rate: 1 ml/min, temperature 40 °C

Detection: UV, 254 nm, injection volume 1 µl

Peaks: 1. *o*-Terphenyl, 2. Triphenylene



NUCLEODUR® C18 Isis, 1,8 µm

colonne analitiche EC, dimensioni particelle 1.8 µm, 20% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	30	1	4.004 501
3,0	30	1	4.004 502
4,0	30	1	4.004 503
4,6	30	1	4.004 504
2,0	50	1	4.004 497
3,0	50	1	4.004 498
4,0	50	1	4.004 499
4,6	50	1	4.004 500
2,0	100	1	4.006 019

1 Fase NUCLEODUR® C18 Pyramid per eluenti altamente acquosi.

Stabile in sistemi eluenti 100% acquosi- USP L1
porosità 110Å, dimensioni particelle 1,8 µm, 3 µm, e 5µm ; carbonio 14%
particelle da 7 e 10 µm per separazioni preparative dipsonibili su richiesta.
selettività di composti polari d'interesse
eccellente deattivazione. Idonea per LC/MS per la bassa capacità legante.
stabilità pH 1-9

MACHEREY-NAGEL

Ideale per: analgesici, penicillina, antibiotici, acidi nucleici, vitamine solubili in acqua, agenti complessi, acidi organici

1



RP HPLC with highly aqueous eluents

Conventional reversed phase columns often display stability problems in eluent systems with high percentage of water (> 95%) as evidenced by a sudden decrease of retention time and overall poor reproducibility. This phenomenon is described as phase collapse caused by the mobile phase expelled from the pores due to the fact, that hydrophobic RP phases are incompletely wetted with the mobile phase.

Different approaches can be used to increase column stability with highly aqueous mobile phase systems. The most promising concepts are incorporating a polar group in the hydrophobic alkyl chain, or using hydrophilic endcapping procedures to improve the wettability of the reversed phase modification.

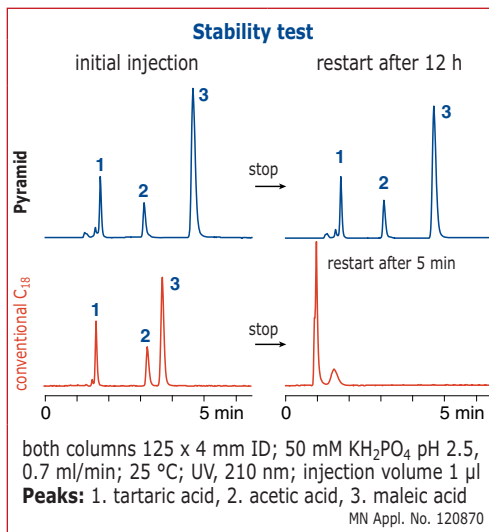
Stability features

NUCLEODUR® C₁₈ Pyramid is a silica phase with hydrophilic endcapping, designed especially for use in eluent systems of up to 100% water. The stability test shows the retention behaviour of tartaric, acetic and maleic acid under purely aqueous conditions on NUCLEODUR® C₁₈ Pyramid in comparison with a conventionally bonded RP phase.

It can be shown that the retention times for NUCLEODUR® C₁₈ Pyramid remain nearly unchanged between initial injection and restart after the flow has been stopped for 12 hours, whilst the performance of the conventional RP column collapsed totally after 5 min.

Retention characteristics

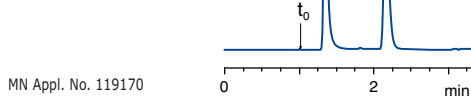
The polar surface derivatization exhibits retention characteristics, which differentiate the "Pyramid" from conventional C₁₈ stationary phases. The chromatogram at right shows the improved retention behaviour of very polar compounds such as short chain organic acids, which are insufficiently retained on RP columns with predominantly hydrophobic surface properties.



Separation of very polar compounds

Column: 125 x 4 mm NUCLEODUR® C₁₈ Pyramid, 5 µm
Eluent: 0.2 % H₃PO₄
Flow rate: 1,0 ml/min
Temperature: 22 °C
Detection: UV, 202 nm
Injection volume: 2 µl

Peaks:
1. Formic acid
2. Acetic acid



NUCLEODUR® C18 Pyramid, 1,8 µm

colonne analitiche EC, dimensione particelle 1,8 µm, 14% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	30	1	4.004 473
3,0	30	1	4.004 474
4,0	30	1	4.004 475
4,6	30	1	4.004 476
2,0	50	1	4.004 477
3,0	50	1	4.004 478
4,0	50	1	4.004 479
4,6	50	1	4.004 480

14. Cromatografia

Cromatografia liquida/HPLC

1



1 NUCLEODUR® C18 Pyramid, 3 µm

colonne analitiche EC, dimensioni particelle 3 µm, 14% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	50	1	4.004 469
3,0	50	1	4.004 470
4,0	50	1	4.004 471
4,6	50	1	4.004 472
2,0	125	1	4.004 458
3,0	125	1	4.004 459
4,0	125	1	4.004 460
4,6	125	1	6.232 796
2,0	150	1	4.004 461
3,0	150	1	4.004 462
4,0	150	1	4.004 463
4,6	150	1	4.004 464
2,0	250	1	4.004 465
3,0	250	1	4.004 466
4,0	250	1	4.004 467
4,6	250	1	4.004 468

Precolonne per colonne EC NUCLEODUR® C18 Pyramid, 3 µm

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
per 2 e 3 mm diam.int.	3	4.004 739
per 4 e 4.6 mm diam.int.	3	4.004 740

Le precolonne per colonne EC richiedono adattatore per precolonne EC (Cod. 7.081 898)

Possiamo fornire l'intera
gamma di articoli di
questo produttore.



NUCLEODUR® Sphinx RP fase bifunzionale RP

selettività distintiva basata sulla superficie bifunzionale - USP L1 e USP L11
 dimensione pori 110Å, dimensione particelle 1,8 µm, 3 µm e 5 µm; 14 % C
 alta densità di legami covalenti silani per picchi scodati per allargare lo sviluppo del metodo
 stabilità pH 1 - 10
 adatte per LC/MS grazie alle caratteristiche di basso spurgo
 alta riproducibilità e consistente qualità grazie alle strette procedure QC
 range applicativo: antibiotici al chinolone, sulfamidici, xantine, sostituti aromatici

MACHEREY-NAGEL

Alternative RP selectivity

NUCLEODUR® Sphinx RP is characterized by exceptional selectivity features generated by a well-balanced ratio of covalently bonded octadecyl and phenyl groups. The combination of classical hydrophobic with π-π interactions (aromatic ring system) expands the scope of selectivity in comparison with conventional reversed phase packings. NUCLEODUR® Sphinx RP is particularly suited for the separation of molecules containing aromatic and multiple bonds. For the separation of polar compounds NUCLEODUR® Sphinx RP can be especially recommended and can also outperform many customary C₁₈ phases.

In addition, exhaustive endcapping steps minimize unwanted surface silanol activity and guarantee excellent peak shapes even for strongly basic analytes.

Different from standard phenyl phases, NUCLEODUR® Sphinx RP is far more stable towards hydrolysis and is also suggested for LC/MS applications.

Due to the additional intermolecular interactions NUCLEODUR® Sphinx RP is an interesting replenishment to the high density bonded phases NUCLEODUR® C₈/C₁₈ Gravity and the polar endcapped NUCLEODUR® C₁₈ Pyramid.

Separation of flavonoids on 3 different NUCLEODUR® phases

Columns: 150 x 4.6 mm

A) NUCLEODUR® C₈ Gravity, 5 µm

B) NUCLEODUR® C₁₈ Gravity, 5 µm

C) NUCLEODUR® Sphinx RP, 5 µm

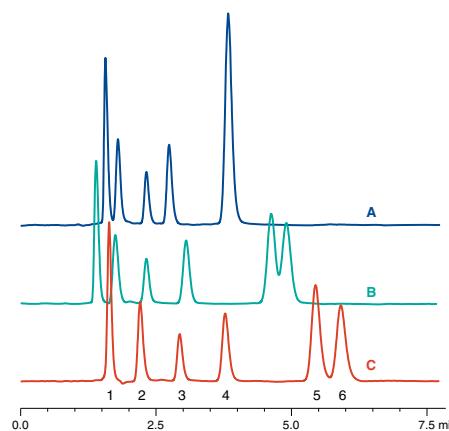
Eluent: water – methanol (40:60, v/v), 1 ml/min, 30 °C

Detection: UV, 270 nm; injection volume: 3 µl

Peaks:

1. Catechin, 2. Rutin, 3. Fisetin, 4. Quercetin
5. Kaempferol, 6. Isorhamnetin

MN Appl. No. 119830



Colonne analitiche EC NUCLEODUR® Sphinx RP, 1.8µm

dimensioni particelle 1.8µm, 14% C

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	30	1	4.004 598
3,0	30	1	4.004 599
4,0	30	1	4.004 600
4,6	30	1	4.004 601
2,0	50	1	4.004 602
3,0	50	1	4.004 603
4,0	50	1	4.004 604
4,6	50	1	4.004 605

14. Cromatografia

Cromatografia liquida/HPLC

NUCLEODUR® C18 ec - C8 fase non polare per analisi di routine

Disponibile con octadecyl a media densità (C18 - USP L1) e octyl (C8 - USP L7)

MACHEREY-NAGEL

modificati, dimensione pori 110Å, dimensione particelle 3 µm e 5 µm; su richiesta 7 µm, 10 µm, 12 µm, 16 µm, 20 µm, 30 µm e 50 µm per separazioni preparative, per analisi giornaliere di routine e rilevamento per HPLC preparativa, stabilità pH 1 - 9. Contenuto carbone 17.5% C per C18, 10,5% C per C8, alta riproducibilità da lotto a lotto, per applicazioni standard di routine in cromatografia in fase inversa.

NUCLEODUR® C₁₈ ec for daily routine analysis and up-scaling in preparative HPLC

The efficiency of a separation is controlled by particle size and selectivity of the stationary phase. The exceptional surface coverage of monomeric bonded alkylsilanes, combined with an exhaustive endcapping, results in a surface with lowest silanol activity. This allows the tailing-free elution of polar compounds such as basic drugs. NUCLEODUR® C₁₈ ec is also ideal for scale-up purposes.

Chemical stability

The utmost purity of the base silica and the exceptional silane bonding chemistry minimizes the risk of dissolution, or hydrolysis at pH extremes.

High loadability

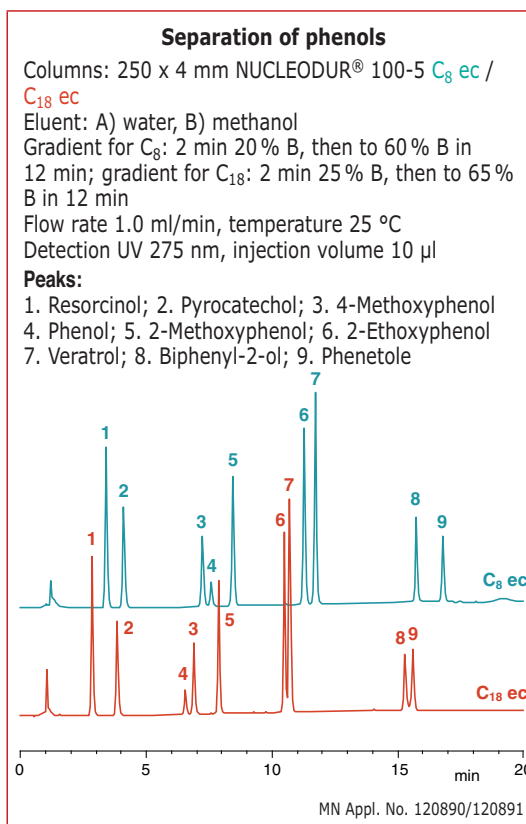
Loadability, probably the most important feature for preparative LC, is determined by pore size, pore volume and surface area of the packing.

NUCLEODUR® octyl phases

Based on the same totally spherical and highly pure silica the C₈ phases exhibit the same excellent chemical and mechanical stability features as the C₁₈ counterparts. Due to the shorter chain and less hydrophobic properties of the stationary phase the retention of nonpolar compounds is decreased, and in consequence a reduction in time of analysis can be achieved. Moreover a stronger polar selectivity, particularly with the separation of ionizable analytes is frequently observed (as distinct from the C₁₈ phases).

Some general principles are:

- High density C₈ and C₁₈ phases allow tailing-free elution even for very polar compounds
- Octyl phases (C₈) show superior polar selectivity
- Octadecyl phases (C₁₈) show superior hydrophobic selectivity
- Hydrophobic compounds show shorter retention times on C₈ phases



Colonne analitiche EC NUCLEODUR® 100-3 C8 ec, 3 µm

Fase ottadecil, 10.5%, dimensione particelle 3µm

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	50	1	4.004 388
3,0	50	1	4.004 389
4,0	50	1	4.004 390
4,6	50	1	4.004 391
2,0	125	1	4.004 379
3,0	125	1	4.004 380
4,0	125	1	4.004 381
4,6	125	1	4.004 382
4,6	150	1	4.004 383
2,0	250	1	4.004 384
3,0	250	1	4.004 385
4,0	250	1	4.004 386
4,6	250	1	4.004 387

Precolonne per colonne EC NUCLEODUR® 100-3 C8 ec, 3 µm

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
per 2 e 3 mm diam.int.	3	4.004 607
per 4 e 4.6 mm diam.int.	3	4.004 608

Le precolonne per colonne EC richiedono un adattatore per precolonna EC (Cod. 7.081 898)

14. Cromatografia

Cromatografia liquida/HPLC

1 Colonne analitiche EC NUCLEODUR® 100-3 C18 ec, 3 µm

Fase Ottadecil, 17,5 %, dimensione particelle 3 µm.

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	50	1	4.004 375
3,0	50	1	4.004 376
4,0	50	1	4.004 377
4,6	50	1	4.004 378
4,6	100	1	4.006 933
2,0	125	1	9.003 796
3,0	125	1	9.003 797
4,0	125	1	9.003 798
4,6	125	1	9.003 799
4,6	150	1	9.003 800
2,0	250	1	9.003 801
3,0	250	1	9.003 802
4,0	250	1	9.003 803
4,6	250	1	9.003 804

1



Precolonne per colonne EC NUCLEODUR® 100-3 C18ec, 3µm

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
per 3 mm diam.int.	3	9.003 794
per 4 mm diam.int.	3	9.003 795

Le precolonne oper colonne EC richiedono un adattatore per precolonna EC (Cod. 7.081 898)



SONO DISPONIBILI ARTICOLI ALTERNATIVI: CONTATTATECI!

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14. Cromatografia

Cromatografia liquida/HPLC

Fase silice ad alta purezza NUCLEODUR® CN/CN-RP ciano-modificata

dimensione pori 110Å, dimensione particelle 3 µm e 5 µm;

7 % C - USP L10

colonne multi-modo (RP ed NP)

selettività ampliata

caratteristiche diverse di ritenzione rispetto a C8 e C18

stabile contro idrolisi a bassi valori di pH, range di lavoro pH 1-8

alta riproducibilità da lotto a lotto

ideale per: antidepressivi triciclici, steroidi, acidi organici

MACHERY-NAGEL

Separation of cold medicine ingredients on two different NUCLEODUR® phases

Columns:

A) 250 x 4 mm NUCLEODUR® 100-5 C₁₈ ec

B) 250 x 4 mm NUCLEODUR® 100-5 CN-RP

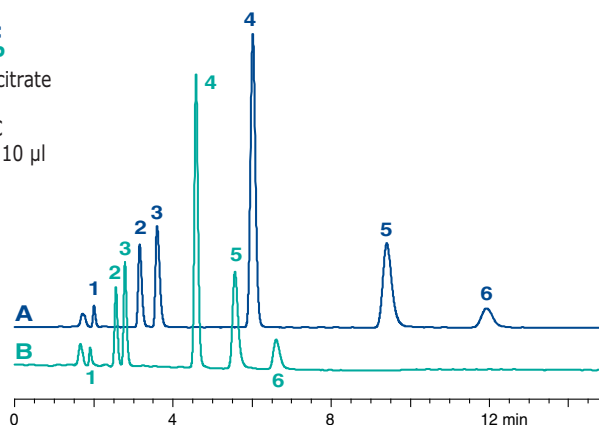
Eluent: acetonitrile – 100 mM sodium citrate
pH 2.5 (15:85, v/v)

Flow rate: 1.0 ml/min, temperature 25 °C

Detection: UV, 270 nm, injection volume: 10 µl

Peaks:

1. Maleic acid
2. Norephedrine
3. Ephedrine
4. Acetaminophen
5. Chlorpheniramine
6. Brompheniramine



MN Appl. No. 119340

Colonne analitiche EC NUCLEODUR® 100-3 CN-RP, 3 µm

Eluente in colonna Acetonitrile, dimensione particelle 3 µm.

MACHERY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
2,0	50	1	4.004 442
3,0	125	1	4.004 441
4,0	150	1	4.004 439
4,6	150	1	4.004 440

Precolonne per colonne EC NUCLEODUR® 100-3 CN-RP, 3 µm

MACHERY-NAGEL

Tipo	Pz./Cf.	Codice
per 2 e 3 mm diam.int.	3	4.004 663
per 4 e 4.6 mm diam.int.	3	4.004 664

Le precolonne per colonne EC richiedono l'adattatore per precolonne EC (Cod. 7.081 898)



Fase silice ad alta purezza NUCLEODUR® NH₂/NH₂-RP amino-modificata

dimensione pori 110Å, dimensione particelle 3 e 5 µm; 2,5 % C, non endcapped - USP L8

MACHEREY-NAGEL

colonne multi-mode (RP ed NP)

fase cromatografica normale (NP) con esano, diclorometano o 2-propanolo come fase mobile per composti polari come aniline sostituite, esteri, pesticidi clorinati

fase cromatografica inversa (RP) di composti polari come zuccheri in sistemi eluenti acquoso-organici

cromatografia a scambio ionico di anioni e acidi organici usando tamponi comuni e organico modificati

stabile contro idrolisi a basso pH, range di lavoro pH 2-8, 100% stabile in acqua, adatta per LC-MS

ideale per:

composti polari in condizioni RP (zuccheri, basi del DNA), idrocarburi in condizioni NP

L'Eluente in colonna è n-eptano per il modo NP - le colonne RP sono consegnate in acetonitrile - acqua.

Per sostituire il sistema solvente è necessario un passaggio di risciacquo con THF

Reversed phase separation of sugars

Column: 250 x 4 mm NUCLEODUR® 100-5 NH₂-RP

Eluent: acetonitrile - water (79:21, v/v)

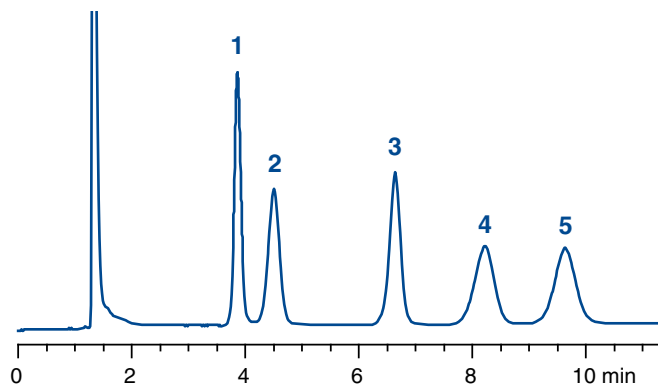
Flow rate: 2 ml/min

Detection: RI

Peaks:

1. Fructose
2. Glucose
3. Saccharose
4. Maltose
5. Lactose

MN Appl. No. 122160



Colonna analitica EC NUCLEODUR® 100-3 NH₂-RP, 3 µm

Eluente in colonna acetonitrile, dimensioni particelle 3µm.

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
4,6	150	1	9.003 875

Precolonna per colonna EC NUCLEODUR® 100-3 NH₂-RP, 3µm

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
4,6 mm ID	1	9.003 878

La precolonna per colonna EC richiede l'adattatore per precolonna EC (Cod. 7.081 898)

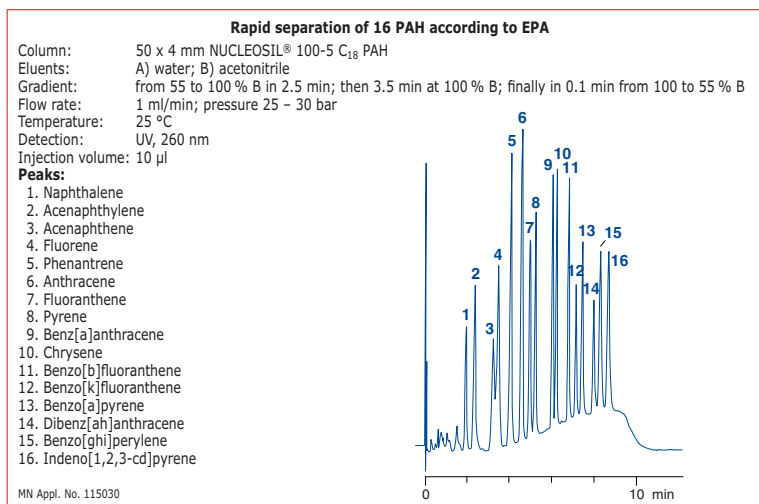
14. Cromatografia

Cromatografia liquida/HPLC

Fase speciale octadecil NUCLEOSIL® 100-5 C18 per analisi PAH

materiale di base silice NUCLEOSIL®, dimensione particelle 5 µm, dimensione pori 110 Å, rivestimento polimerico - USP L1; eluente in colonna acetonitrile/acqua 70:30, consente separazioni gradiente efficienti del 16 PAH in accordo con EPA, rilevamento delle PAH separate per UV (da 250 a 280 nm), con diode array o con rilevatore fluorescenza a diverse lunghezza d'onda per eccitazione ed emissione (acenaphtylene non può essere analizzato in fluorescenza).

MACHERY-NAGEL



Colonne analitiche EC NUCLEOSIL® 100-5 C18 PAH, 5 µm

Fase ottadecil PAH, dimensione particelle 5 µm.

MACHERY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
4,0	50	1	4.002 491
3,0	150	1	4.002 493
4,0	150	1	4.002 494
2,0	250	1	7.089 855
3,0	250	1	4.002 372
4,0	250	1	4.002 373
4,6	250	1	4.002 374

Precolonne per colonne EC NUCLEOSIL® 100-5 C18 PAH, 5 µm

MACHERY-NAGEL

Su richiesta.

Possiamo fornire l'intera
gamma di articoli di
 questo produttore.



1 Colonne HPLC per separazione enantiomera

separazione **NUCLEOCEL ALPHA** basata su derivati di amilosio

MACHEREY-NAGEL

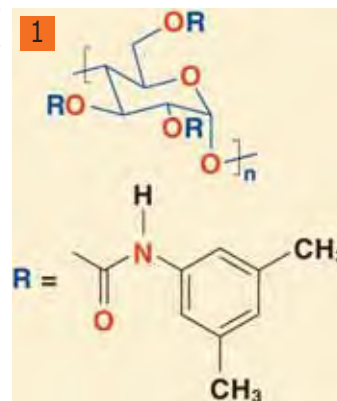
materiale di base silice,
selettore chirale amilosio-(3,5 dimetilfenilcarbammato)- USP L51
fasi similari: Chiralpak® AD, Kromasil®, AmyCoat®, Europak 01
tipo (S) ad alta risoluzione con dimensione particelle 5 µm, consente l'uso di colonne corte (150mm) per separazioni più veloci, stabilità pressione fino a circa 150 bar (2000 psi)

NUCLEOCEL ALPHA per applicazioni con fase normale:
eluente in colonna n-eptano-2-propanolo (90:10, v/v)
gli eluenti tipici sono miscele di eptano - propanolo

NUCLEOCEL ALPHA-RP per applicazioni in fase inversa:
eluente in colonna acetonitrile -acqua (50:50 v/v)
per uso sia in modi organici polari sia con eluenti contenenti alte concentrazioni di sali caotropici come perclorati

applicazioni consigliate:

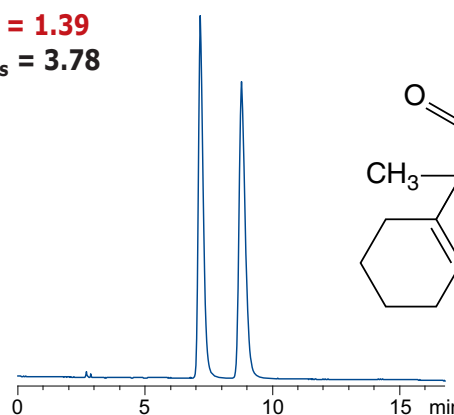
composti farmaceuticamente attivi, chirali
inquinanti (es. erbicidi, PCB), composti chirali in cibi (coloranti, conservanti), catalizzatori chirali e composti bioorganici



Enantiomer separation of hexobarbital

Column: 250 x 4.6 mm NUCLEOCEL ALPHA S
Eluent: n-heptane - 2-propanol (80:20, v/v)
Flow rate: 1 ml/min
Temperature: 22 °C
Detection: UV, 210 nm
Injection volume: 5 µl
Concentration: 1 µg/µl

$\alpha = 1.39$
 $R_s = 3.78$



MN Appl. No. 121940

Colonne analitiche EC NUCLEOCEL ALPHA S, 5 µm

Eluente in colonna n-eptano - 2-propanolo, dimensione particelle 5 µm

MACHEREY-NAGEL

Precolonne per colonne EC Nucleocel ALPHA S, 5 µm

Le precolonne per colonne EC richiedono un adattatore per precolonne EC (Cod. 7.081 898).

MACHEREY-NAGEL

NUCLEOCEL ALPHA-RP S, 5 µm

Colonne analitiche EC eluente in colonna acetonitrile - acqua, dimensione particelle 5µm

MACHEREY-NAGEL

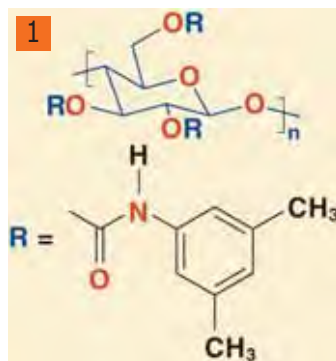
Precolonna per colonna EC NUCLEOCEL ALPHA-RP S, 5 µm

Le precolonne per colonne EC richiedono un adattatore per precolonne EC (Cod. 7.081 898).

MACHEREY-NAGEL

14. Cromatografia

Cromatografia liquida/HPLC



1 Colonne HPLC per separazione enantiomera

NUCLEOCEL DELTA separazione enantiomera basata su derivati di cellulosa

MACHEREY-NAGEL

materiale base, silice
 selettore chirale Cellulosetris-(3,5-dimetilfenilcarbammato)
 - USP L40
 fasi similari: Chiralcel® OD, Kromasil®, CelluCoat™, Eurocel® 01
 dimensione particelle standard 10 µm,

Tipo-S per alta risoluzione, consente l'uso di colonne più corte (150 mm) per separazioni più rapide, stabilità pressione fino a circa 150 bar (2000 psi)

NUCLEOCEL DELTA per applicazioni con fase normale:
 eluente in colonna n-eptano - 2-propanolo (90:10, v/v)
 gli eluenti tipici sono miscele di eptano-propanolo

NUCLEOCEL DELTA-RP per applicazioni in fase inversa:
 eluente in colonna acetonitrile - acqua (40:60, v/v)
 progettati per uso sia con modo polare organico sia con eluenti contenenti elevate concentrazioni di sali caotropici come perclorati

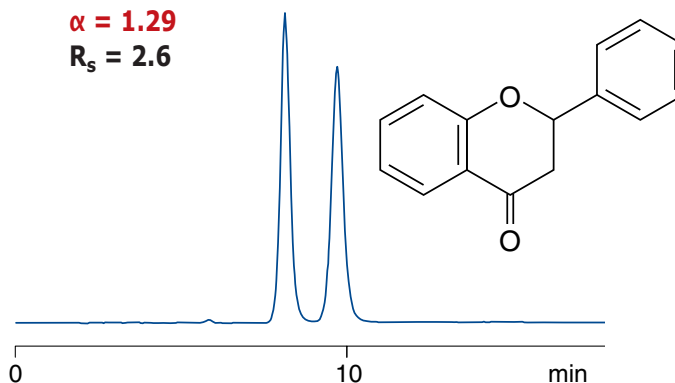
applicazioni consigliate: composti farmaceuticamente attivi, chirali inquinanti (es. erbicidi, PCB), composti chirali in cibi (coloranti, conservanti), catalizzatori chirali e composti bioorganici.

Enantiomer separation of flavanone

Column: 250 x 4.6 mm NUCLEOCEL DELTA S
 Eluent: n-heptane - 2-propanol (90:10, v/v)
 Flow rate: 1 ml/min
 Temperature: 25 °C
 Detection: UV, 254 nm
 Injection volume: 5 µl
 Concentration: 1 µg/µl

MN Appl. No. 121260

$\alpha = 1.29$
 $R_s = 2.6$



NUCLEOCEL DELTA S, 5 µm

Colonne preparative EC eluente in colonna n-eptano - 2-propanolo, dimensioni particelle 5µm

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
4,6	150	1	4.002 446
4,6	250	1	4.002 445

Precolonna per colonne EC NUCLEOCEL DELTA S, 5 µm

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
per 4,6 mm diam. int.	1	4.002 511

Le precolonne per colonne EC richiedono un adattatore per precolonne EC (Cod. 7.081 898).

NUCLEOCEL DELTA-RP S, 5 µm

Colonne analitiche EC. Eluente in colonna acetonitrile - acqua, dimensione particelle 5µm

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
4,6	150	1	4.002 449
4,6	250	1	4.002 448

14. Cromatografia

Cromatografia liquida/HPLC

Precolonna per colonna EC NUCLEOCEL DELTA-RP S, 5 µm

MACHERY-NAGEL

Tipo	Pz./Cf.	Codice
per 4,6 mm diam. int. Le precolonne per colonne EC richiedono un adattatore per precolonne EC (Cod. 7.081 898).	1	4.002 512

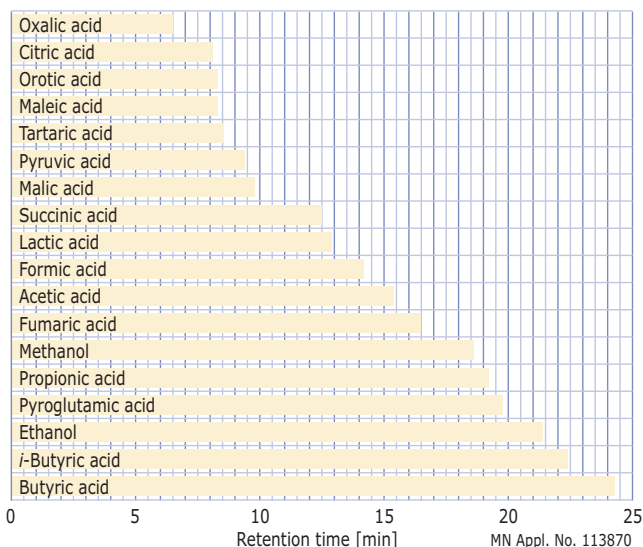
NUCLEOGEL® SUGAR 810 separazione di zuccheri

MACHERY-NAGEL

resine polistirene sulfonato/divinilbenzene in diverse forme ioniche e cromatografia RP
il meccanismo di separazione comprende esclusione ioni, scambio ionico, esclusione dimensioni, esclusione legante oltre che come cromatografia NP ed RP
forma H⁺: separazione di zuccheri, zucchero alcoli ed acidi organici - USP L17 - eluente in colonna 0.01 N H₂SO₄
forma Ca²⁺: separazione di mono-, di- ed oligosaccaridi - USP L19
eluente in colonna acqua

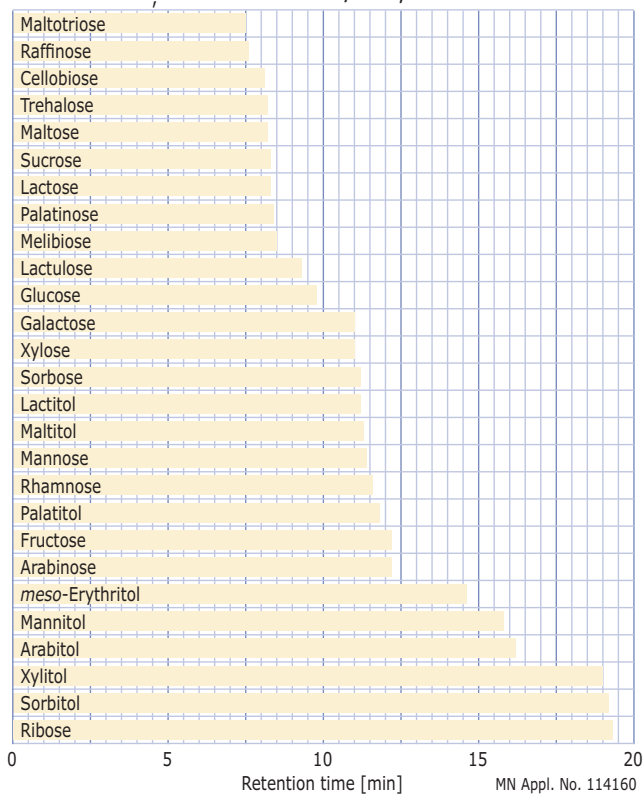
Organic acids and alcohols

Column: 300 x 7.8 mm NUCLEOGEL®
SUGAR 810 H
Injection volume: 5 µl
Eluent: 5 mmol H₂SO₄
Flow rate: 0.6 ml/min
Temperature: 35 °C
Detection: RI



Sugars and sugar alcohols

Column: 300 x 7.8 mm NUCLEOGEL® SUGAR 810 Ca
Eluent water, flow rate 0.6 ml/min, detection RI



NUCLEOGEL® SUGAR 810 H

Colonne tipo Valco separazione di zuccheri, zucchero alcoli ed acidi organici, USP
L17 eluente in colonna 0.01N H₂SO₄

MACHERY-NAGEL

Ø int.	Lungh.	Pz./Cf.	Codice
mm	mm		
7,8	300	1	4.002 276

Precolonna per colonna NUCLEOGEL® SUGAR 810 H

MACHERY-NAGEL

Tipo	Pz./Cf.	Codice
per 7,8 mm diam. int. Questa precolonna richiede il supporto per colonne CC 30mm (Cod. 4.002 762).	2	4.002 277

SONO DISPONIBILI ARTICOLI ALTERNATIVI: CONTATTATECI!

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14. Cromatografia

Cromatografia liquida/HPLC

NUCLEOGEL® SUGAR 810 Ca

Colonne tipo Valco. Separazione di mono-, di ed oligosaccaridi - USP L19 eluente in colonna acqua.

MACHEREY-NAGEL

Ø int. mm	Lungh. mm	Pz./Cf.	Codice
7,8	300	1	4.002 274

Precolonna per colonna NUCLEOGEL® SUGAR 810 Ca

MACHEREY-NAGEL

Tipo	Pz./Cf.	Codice
per diam. int. 7, 8 mm	2	4.002 275

Questa precolonna richiede il supporto per colonna CC 30mm (Cod. 4.002 762).

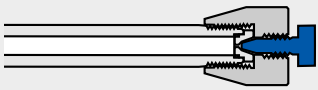
Sistemi colonna MN

Colonne standard EC per HPLC analitica

MACHEREY-NAGEL

sistemi colonna analitici prodotti in acciaio inossidabile filetto esterno M 8 su entrambi i lati combinazione di elementi sigillanti e vagli in acciaio inossidabile a maglia fine, anelli di tenuta in PTFE e adattatori di fissaggio colonna SW 12 con filetto interno M8 x 0,75 e UNF 10-32, come precolonna si impiegano cartucce precolonna ChromCart® con lunghezza 8 mm con adattatore EC, impaccate con silice sferica NUCLEODUR®.

Available standard dimensions of EC columns · please ask for availability of certain phases

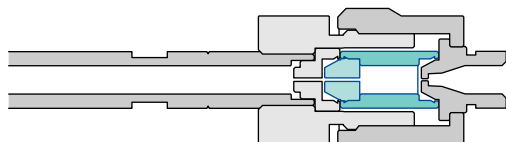
ID [mm]	Length [mm]											End fitting design	
	8*	20	30	50	75	100	125	150	200	250	300		
2	-	X	X	X	X	X	X	X	X	X	X	X	
3	X	X	X	X	X	X	X	X	X	X	X		
4	X	X	X	X	X	X	X	X	X	X	X		
4,6	-	X	X	X	X	X	X	X	X	X	X		

* Please note that 3 mm ID guard column cartridges are applicable for 2 mm ID and 3 mm ID EC columns, while 4 mm ID guard column cartridges are also used for 4.6 mm ID EC columns.

Installation of the EC guard column adaptor (Cat.No. 7.081 898)



EC column with CC guard column



Accessori e parti di ricambio per colonne EC

MACHEREY-NAGEL

Descrizione	Pz./Cf.	Codice
Adattatore per precolonna EC	1	7.081 898
dado 1/16" per collegamento capillari 1/16"	5	4.002 179
ferrule 1/16"	5	4.002 180
tappo di chiusura 1/16", plastica	4	4.002 178
adattatore per montaggio EC	1	4.002 219
EC testa colonna (dado)	1	4.002 220
EC anello di tenuta PTFE	4	4.002 221
combinazione di tenuta 3-parti per colonne EC	1	4.002 222