Lab Logistics Group

LABORATORY CATALOGUE

CHROMATOGRAPHY

Here everything fits perfectly together!

Product choice · Price · Service · Quality

Vials
Micro-Inserts
Micro-Vials
Metal and plastic closures
Crimping tools
Septa and stoppers
Vial Kits

LLG® LABWARE

Contents

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LLG Vials and Caps

NEW!

General Information – Vials / Caps

Glass Vials and Micro-inserts

According to the high requirements of chemical analyses, especially with regard to reproducibility combined with high detection sensitivity, the container material for the respective samples is of decisive importance. Therefore sample vials for usage in chromatography are generally made of 1st hydrolytic class glass.
Borosilicate glasses like Duran®, Pyrex®, Fiolax® and others belong to this group of glass which is also often called neutral glass. It shows a very good chemical resistance against acidic and neutral solutions. The relatively low alkali content also permits good values with regard to chemical resistance against alkaline solutions.
Except for the snap cap vials for storage of powdery samples, all of our vials and micro-inserts are produced from 1st hydrolytic class glass and thus are in accordance with Eu.Ph. VI Ed., U.S.P. XXXI Ed., DAB-10, Ph. Jap. 13.
The dimensions indicated in our catalog for the vial diameter and for the vial height are exact data. Please consider that some other suppliers in the market often use rounded data (e.g. 12 x 32 mm instead of 11.6 x 32), however, their actual real dimensions are the same due to the requirements of the instrument.
Our data with regard to volume aren't calculatory determined data, but defined realistically usable filling volumes. Due to safety reasons these always have been set up at the lower end. There might be deviations to other suppliers here as well, as they either indicate the calculatory volume (e.g. 2 mL instead of 1.5 mL) or a defined realistic filling volume more at the upper end (e.g. 1.8 mL instead of 1.5 mL).

Septa guide

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

Autosampler compatibility chart

The autosampler compatibility chart generally shows the most typical vials and closures for usage on instruments of a certain manufacturer. Besides these there also may be further products in our catalog which may technically and functionally be suitable, but which aren't necessarily actively promoted by that instrument manufacturer in his range of autosampler consumables. We will gladly provide you with appropriate recommendations.

Compatibility charts have been set up for the following instrument manufacturers:
Agilent, CTC, Dionex, PerkinElmer, Shimadzu, Thermo Scientific, Varian, (VWR (Merck® / Hitachi), Waters®. Each table has been divided by applications (GC / HPLC / Headspace), if applicable for that instrument manufacturer.
We generally recommend to ask in advance for cost-free samples for testing purposes, as even technically comparable products may differ in their optical appearance from those of the instrument company.
We kindly ask for your understanding that we do not take over any guarantee for the correctness nor for the completeness of the data indicated here.

LLG Vials: Autosampler Compatibility List

Agilent

Main chapter		**Most popular LLG products for use on Agilent instruments** (comparable product nos. of Agilent in brackets)
GC:		
N 8 Crimp (microsampling)	Vials:	**4.001 554** (5180-0841/500), **6.235 606** (5180-0844/500)
	Closures:	**9.003 444** (5180-0842/500)
N 9 Screw (standard samples)	Vials:	**9.003 448** (5182-0714/100; 5183-2067/1000), **4.008 247, 4.008 249** (5183-2030)
	Inserts:	**7.401 744** (5183-2085/100), **6.093 247** (5181-1270/100), **4.008 196** (5181-3377/500)
	Closures:	**4.008 228** (5182-0717/100; 5185-5820/500), **9.003 451** (5182-0720/100; 5185-5863/500), **4.008 218** (5182-0723/100; 5185-5862/500), **4.008 216** (5182-0717/100; 5185-5820/500), **4.008 214** (5185-5823)
N 11 Crimp (standard samples)	Vials:	**7.086 520** (5181-3375/100; 5183-4491/1000), **4.001 565** (5182-3454)
	Inserts:	**7.401 744** (5183-2085/100), **6.093 247** (5181-1270/100), **4.008 196** (5181-3377)
	Closures:	**7.060 469, 4.008 239, 4.008 243** (all please see 5181-1210/100, 5183-4498/1000, 5061-3370/500), **9.003 446** (5182-0552/100, 5183-4500/1000), **7.050 759** (5181-1211/100, 5183-4499/1000), **4.001 564** (5188-5386/100) (for GC PAL)
HPLC:		
N 9 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally the following closures with slit septum: **4.001 521** (5183-2076/100; 5185-5865/500), **4.008 215** (5185-5824)
N 11 Crimp (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally the following closures with slit septum: **4.001 555**
N 11 Snap (standard samples)	Vials:	**6.073 833** (5182-0544/100; 5183-4504/1000),
	Inserts:	**7.401 744** (5183-2085/100), **6.093 247** (5181-1270/100), **4.008 196** (5181-3377/500)
	Closures:	**4.008 257** (5182-3458/100), **4.008 258** (5182-0541/100; 5185-5916/500), **4.008 256** (5183-4511/100), **4.008 259** (5182-0566/100)
Headspace:		
N 18 Screw (Combi PAL + G 1888A)	Vials:	**9.003 466** (5188-5392), **4.008 270** (5188-2753)
	Closures:	**4.008 268** (5188-2759)
N 20 Crimp	Vials:	**7.050 285** (5182-0838), **9.003 452** (5182-0837), **9.003 453** (5183-4474)
	Closures:	**9.003 430** (5183-4479), **9.003 447** (5183-4477), **4.001 553**

LLG Vials: Autosampler Compatibility List

CTC

Main chapter		**Most popular LLG products for use on CTC instruments**
GC:		
N 8 Crimp (microsampling)	Vials:	**4.001 554, 6.235 606, 4.001 515, 6.902 044, 4.008 202, 4.008 203**
	Closures:	**9.003 444, 4.008 198**
N 9 Screw (standard samples)	Vials:	**9.003 448, 4.008 247, 4.008 249**
	Inserts:	**7.401 744, 6.093 247, 4.008 196**
	Closures:	**9.003 451, 4.008 218, 4.008 214, 4.008 215**
N 11 Crimp (standard samples)	Vials:	**7.086 520, 4.001 565**
	Inserts:	**7.401 744, 6.093 247, 4.008 196**
	Closures:	**4.001 564 (for GC PAL), 9.003 446, 7.050 759**
HPLC:		
N 9 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally the following closures with slit septum: **4.001 521, 4.008 215**
N 11 Crimp (standard samples)	Vials:	**7.086 520, 4.001 565**
	Inserts:	**7.401 744, 6.093 247, 4.008 196**
	Closures:	**9.003 446, 7.050 759**
N 11 Snap (standard samples)	Vials:	**7.051 4044**
	Inserts:	**7.401 744, 6.093 247, 4.008 196**
	Closures:	**4.008 258, 4.008 260, 4.008 259**
Headspace:		
N 18 Screw (Combi PAL)	Vials:	**9.003 466, 4.008 270**
	Closures:	**4.008 268, 6.241 111**
N 20 Crimp	Vials:	**7.850 009, 9.003 453**
	Closures:	**7.850 010, 6.234 541**

Dionex

Main chapter		**Most popular LLG products for use on Dionex instruments**
HPLC:		
N 8 Crimp (microsampling)	Vials:	**4.008 206, 6.235 606, 4.001 554**
	Closures:	**4.008 200, 9.003 444**
N 8 Screw (standard samples)	Vials:	**9.003 481, 9.003 480, 4.001 563**
	Closures:	**9.003 484, 6.232 178**
N 9 Screw (standard samples)	Vials:	**9.003 448, 4.008 247, 4.008 249**
	Inserts:	**7.401 744, 6.093 247, 4.008 196**
	Closures:	**9.003 451, 4.001 521, 4.008 214, 4.008 215**
N 11 Crimp (standard samples)	Vials:	**7.086 520, 4.001 565**
	Closures:	**9.003 446, 4.001 555, 7.060 469**
N 11 Snap (standard samples)	Vials:	**7.051 4044**
	Closures:	**4.008 258, 4.008 260**

LLG Vials: Autosampler Compatibility List

PerkinElmer

Main chapter		**Most popular LLG products for use on PerkinElmer instruments** (comparable product nos. of PerkinElmer in brackets)
GC:		
N 8 Crimp (microsampling)	Vials:	**9.003 427** (N9301069/200), **6.235 606** (N9302136/500)
	Closures:	**9.003 443** (03300806/1000), **4.001 558** (N9302140/1000), **4.008 200** (03300806/1000)
N 9 Screw (standard samples)	Vials:	**9.003 448** (N9306201), **4.008 247** (N9306220)
	Inserts:	**6.093 247** (N9300703/100; N9302681/1000 + N9302682‡), **4.008 196** (N9300704)
	Closures:	**4.008 228** (N9306200), **9.003 451** / **4.008 214** (N9306202/100)
N 10 Screw (standard samples)	Vials:	**6.242 103**
	Inserts:	**6.093 247** (N9300703/100; N9302681/1000 + N9302682‡), **4.008 196** (N9300704)
	Closures:	**4.008 234** / **4.008 235** (N9306205/100)
N 11 Crimp (standard samples)	Vials:*	**7.085 511** (N9301385), **7.089 998** (N9302680)
(* small opening vials / inserts;	Inserts:*	**4.001 556** (N9300705), **4.008 194** (N9300706)
** wide opening vials / inserts)	Vials:**	**7.086 520** (N9306231), **4.001 565**
	Inserts:**	**6.093 247** (N9300703/100; N9302681/1000 + N9302682‡), **4.008 196** (N9300704)
	Closures:	**7.060 469** / **4.008 243** (N9306230, N9306015), **4.001 522** (N9302684), **7.300 348** (N9302685), **6.900 233** (N9302686), **9.003 446** (N9306228), **7.050 759** (N9306229/100)
HPLC:		
N 8 Crimp (microsampling)	Vials:	**6.235 606** (N9302136/500)
	Closures:	**9.003 443** / **4.008 200** (03300806/1000)
N 9 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally the following closures with slit septum: **4.001 521** / **4.008 215** (N9306203)
N 10 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally the following closures with slit septum: **4.008 237** (N9306052)
N 11 Crimp (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally the following closures with slit septum: **4.001 555**
N 11 Snap (standard samples)	Vials:	**6.073 833** (N9303418)
	Inserts:	**6.093 247** (N9300703/100; N9302681/1000 + N9302682‡), **4.008 196** (N9300704)
	Closures:	**4.008 256** (N9303416), **6.073 555** (N9303417), **4.001 544** (N9303419)
Headspace:		
N 18 Screw (CTC Combi PAL + TurboMatrix™ HS 16 + 40)	Vials:	**9.003 466** (N6356479/100), **4.008 270** (N9306075/100; N9306078/1000; N9306241/1000‡; N9306240/100‡)
	Closures:	**4.008 268** (N6356476; N9306077‡; N6356474‡), **6.241 111** (N63566475; N9306077‡; N6356474‡)
N 20 Crimp (CTC Combi PAL)	Vials:	**7.850 009** (N6356478), **9.003 453** (N6356471)
	Closures:	**7.850 010** (N6356559; N6356558‡), **6.234 541** (N6356566; N6356565), **6.902 419** (N6356562), **6.229 635** / **4.001 548**‡‡ (N6356560)
N 20 Crimp (TurboMatrix™ HS 16, 40 + 110) *** not suitable for TurboMatrix™ 110	Vials:	**7.052 186***** (N9302134/125; B104235/100), **7.060 463** (N9306079/100; B0104236/1000), **4.008 281** (N9303349/100; N9303348/1000)
	Closures:	**4.001 557** / **9.003 455** / **4.008 276**‡‡: (N9306264/1000‡; N9306266/100‡; N9306267/1000‡; B0104239/100‡; B0104240/1000‡; B4000025/1000, montiert‡), **9.003 456** / **7.050 286** (B0104241/100‡; B0104242/1000‡; B4000022/1000 pre-ass.‡), **7.060 477** (B0110728/1000), **7.060 433** (B0038137/100)

‡ Alternative PerkinElmer product with different design, may be replaced by given LLG reference; ‡‡ alternative LLG product

LLG Vials: Autosampler Compatibility List

Shimadzu

Main chapter		**Most popular LLG products for use on Shimadzu instruments** (comparable product nos. of Shimadzu Europe in brackets)
GC:		
N 8 Crimp (microsampling)	Vials:	**4.001 554, 6.235 606, 4.001 515, 6.902 044, 4.008 202, 4.008 203**
	Closures:	**9.003 444, 4.008 198**
N 9 Screw (standard samples)	Vials:	**9.003 448, 4.008 247, 4.008 249**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**9.003 451, 4.008 218, 4.008 214**
N 10 Screw (standard samples)	Vials:	**6.242 103**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**4.008 234, 4.008 235, 4.008 236**
N 11 Crimp (standard samples)	Vials:	**7.086 520** (980-01705), **4.001 565**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**4.001 564** (for AOC5000, 0980-01706), **9.003 446, 7.050 759**
N 13 Screw (large sample volumes)	Vials:	**9.003 482, 7.058 142**
	Inserts:	**7.055 486** + spring **4.001 567**
	Closures:	**7.510 053**
HPLC:		
N 8 Crimp (microsampling)	Vials:	**4.001 554, 6.235 606**
	Closures:	**4.008 200, 9.003 444, 4.008 198**
N 9 Screw (standard samples)	Vials:	**9.003 448, 4.008 247, 4.008 249**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**9.003 451, 4.008 222, 4.008 224, 4.008 225, 4.008 214, 4.001 521, 4.008 223, 4.008 226, 4.008 215, 4.008 221**
N 10 Screw (standard samples)	Vials:	**6.242 103**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**4.008 234, 4.008 235, 4.008 237**
N 11 Crimp (standard samples)	Vials:	**7.086 520** (980-01705), **4.001 565, 4.001 516**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**4.008 243, 9.003 446, 4.001 555**
N 11 Snap (standard samples)	Vials:	**6.073 833, 6.224 358**
	Inserts:	**7.401 744** (980-04987), **6.093 247** (980-01707), **4.008 196**
	Closures:	**4.008 256, 4.008 260, 4.001 544, 4.008 258**
N 8 + N11 Shell Vials (standard samples)	Vials + Plugs:	**7.300 174 + 7.300 175, 4.008 205 + 7.300 175, 4.008 248 + 4.008 265**
Headspace:		
N 18 Screw (AOC 5000)	Vials:	**9.003 466** (980-00247), **4.008 270** (961-00915)
	Closures:	**4.008 268** (961-00914), **6.241 111** (980-01708)
N 20 Crimp (AOC 5000)	Vials:	**7.850 009** (980-00664), **9.003 453** (980-00111)
	Closures:	**7.850 010** (961-01256), **6.234 541** (980-03372), **6.229 635 / 4.001 548**‡ (980-00112)
N 20 Crimp (HT200H)	Vials:	**7.050 285, 9.003 453** (980-00111)
	Closures:	**9.003 447, 4.001 553**

‡ Alternative LLG product

LLG Vials: Autosampler Compatibility List

Thermo Scientific

Main chapter		**Most popular LLG products for use on Thermo Scientific instruments** (comparable product nos. of Thermo Scientific in brackets)
GC:		
N 8 Crimp (microsampling)	Vials:	**9.003 427** (60180-707/1000), **4.001 554, 6.235 606, 4.008 206** (60180-501/125), **4.001 515, 6.902 044, 4.008 202, 4.008 203**
	Closures:	**9.003 443** (60180-708/1000‡), **4.008 200, 9.003 444** (60180-525/100; 60180-709/1000), **4.008 198**
N 8 Screw (standard samples)	Vials:	**9.003 481, 9.003 480, 4.001 563**
	Inserts:	**7.401 066** (60180-265), **9.003 435, 4.001 556** (60180-721/1000), **4.008 194** (60180-722/1000)
	Closures:	**4.008 209, 9.003 484** (60180-719/1000), **4.008 207**
N 9 Screw (standard samples)	Vials:	**9.003 448, 4.008 247, 4.008 249**
	Inserts:	**7.401 744, 6.093 247** (60180-734/1000), **4.001 547** (60180-266), **4.008 196** (60180-735/1000)
	Closures:	**4.008 228, 9.003 451, 4.008 218, 4.008 214**
N 11 Crimp (standard samples)	Vials:	**7.086 520, 4.001 565, 4.001 516**
	Inserts:	**7.401 744, 6.093 247** (60180-734/1000), **4.001 547** (60180-266), **4.008 196** (60180-735/1000)
	Closures:	**4.001 564** (GC PAL), **4.008 239** / **7.060 469** / **4.008 243** (60180-705/1000‡), **9.003 446** (60180-526/100; 60180-706/1000), **7.050 759**
HPLC:		
N 8 Crimp (microsampling)	Vials:	**4.001 554, 6.235 606, 4.008 206** (60180-501/125), **4.001 515, 6.902 044, 4.008 202, 4.008 203**
	Closures:	**9.003 443** (60180-708/1000‡), **4.008 200, 9.003 444** (60180-525/100; 60180-709/1000), **4.008 198**
N 8 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC
N 9 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC
N 11 Crimp (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, however, not seal 4.001 564
N 11 Snap (standard samples)	Vials:	**6.073 833, 6.224 358**
	Inserts:	**7.401 744, 6.093 247** (60180-734/1000), **4.001 547** (60180-266), **4.008 196** (60180-735/1000)
	Closures:	**4.008 256, 4.008 260, 4.001 544, 4.008 258** (60180-713/1000), **4.008 261, 4.008 257** (60180-712/1000‡)
Headspace:		
N 18 Screw (Combi PAL)	Vials:	**9.003 466, 4.008 270**
	Closures:	**4.008 268, 6.241 111**
N 20 Crimp (Combi PAL)	Vials:	**7.850 009** (60180-504/125), **9.003 453** (60180-506/125)
	Closures:	**7.850 010, 6.234 541** (60180-520)
N 20 Crimp (HS850/HS200)	Vials:	**7.850 009** (60180-504/125), **9.003 453** (60180-506/125)
	Closures:	**4.001 553** (60180-511), **9.003 454** / **4.001 549** (60180-513/100; 60180-746/1000)

‡ Alternative Thermo Scientific product with different design, may be replaced by given LLG reference.

LLG Vials: Autosampler Compatibility List

Varian

Main chapter		**Most popular LLG products for use on Varian instruments** (comparable product nos. of Varian in brackets)
GC:		
N 8 Crimp (microsampling)	Vials:	**4.001 554** (R005403CVG, CP958690), **6.235 606** (R05402CTVG, CP959485), **4.008 206, 4.001 515, 6.902 044**, **4.008 202** (CP10370), **4.008 203**
	Closures:	**9.003 444** (CP959183), **4.008 198**
N 8 Screw (standard samples)	Vials:	**9.003 481** (392611639/100; 392620550/1000; CP10271), **9.003 480** (392611640/100; 392620552/1000), **4.001 563**
	Inserts:	**7.401 066** (392611593/100; 392620546/1000; R005402MTV; CP10381), **4.001 556** (392611591/100; 392620548/1000)
	Closures:	**4.008 209** (392611645/100, 392620559/1000), **9.003 484** (392611641/100; 392620558/1000; 392612023/100; 392620557/1000; 99778800/144; CP959894), **4.008 207** (392611644)
N 9 Screw (standard samples)	Vials:	**9.003 448** (392611653/100; 392620500/1000; CP10290), **4.008 247** (392611654/100; 392620502/1000), **4.008 249** (CP959946)
	Inserts:	**7.401 744** (392611596/100; 392620536/1000; CP10580), **6.093 247** (392611594/100; 392620538/1000), **4.001 547** (CP957233), **4.008 196** (912322)
	Closures:	**4.008 228** (CP914610), **9.003 451** (CP958914), **4.008 222** (392611659/100; 392620506/1000; 392620504/100; 392620505/1000), **4.008 218** (392611658), **4.008 214**
N 11 Crimp (standard samples)	Vials:	**7.086 520** (392611634/100; 392620517/1000; CP10525), **4.001 565**
	Inserts:	**7.401 744** (392611596/100; 392620536/1000; CP10580), **6.093 247** (392611594/100; 392620538/1000), **4.001 547** (CP957233), **4.008 196** (912322)
	Closures:	**4.001 564** (for GC PAL, MLA110040M), **7.060 469** (392611632/100; 392620524/1000; CP10210), **9.003 446** (392611631/100; 392620523/1000; 392620521/100; 392620522/1000; CP959268), **7.050 759**

LLG Vials: Autosampler Compatibility List

Varian

Main chapter		**Most popular LLG products for use on Varian instruments** (comparable product nos. of Varian in brackets)
HPLC:		
N 8 Crimp (microsampling)	Vials/Closures:	As indicated under GC, but additionally closures **9.003 443, 4.008 200**
N 8 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally closure **6.232 178**
N 9 Screw (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, but additionally closure **4.008 223** (392611660)
N 10 Screw (standard samples)	Vials:	**6.242 103** (190010201)
	Inserts:	**7.401 744** (392611596/100; 392620536/1000; CP10580), **6.093 247** (392611594/100; 392620538/1000), **4.001 547** (CP957233), **4.008 196** (912322)
	Closures:	**4.008 234** / **4.008 235** (392611650), **4.008 236** (392611652), **6.242 104** (392611651)
N 11 Crimp (standard samples)	Vials/Inserts/ Closures:	As indicated under GC, however, not seal 4.001 564
N 11 Snap (standard samples)	Vials:	**6.073 833** (CP10390), **6.224 358** (392611666)
	Inserts:	**7.401 744** (392611596/100; 392620536/1000; CP10580), **6.093 247** (392611594/100; 392620538/1000), **4.001 547** (CP957233), **4.008 196** (912322)
	Closures:	**4.008 256, 4.008 260** (392611874; CP10130), **4.001 544, 4.008 258** (392611871‡; 392611875‡; CP10131‡), **4.008 261, 4.008 257** (392611873; CP10132) **6.073 555** (392611872)
Headspace:		
N 18 Screw (Combi PAL)	Vials:	**9.003 466** (392620102), **4.008 270** (392620202; CP910346)
	Closures:	**4.008 268** (392620304; CP910347), **6.241 111** (392620302), **4.008 294** (392620306‡)
N 20 Crimp (Combi PAL)	Vials:	**7.850 009** (392612020; RK60827510/125; MLA201000; CP738200), **9.003 453** (MLA202100; CP910124; 392612021)
	Closures:	**7.850 010** (MLA200051ML; CP738201), **6.234 541** (392612017)
N 20 Crimp (CP-9020/9025, CP-9060, Genesis)	Vials:	**7.850 009** (392612020; RK60827510/125; MLA201000; CP738200), **7.050 285** (392611677; CP10090), **9.003 452** (392611675; CP10070)
	Closures:	**4.001 553** (392611858; CP10475), **9.003 430** (392611859; CP10213), **9.003 454** / **4.001 549**

‡ Alternative Varian product with different design, may be replaced by given LLG reference.

LLG Vials: Autosampler Compatibility List

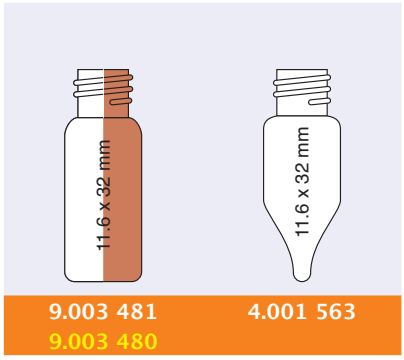
VWR (Merck® / Hitachi)

Main chapter		**Most popular LLG products for use on VWR instruments** (comparable product nos. of VWR Europe in brackets)
HPLC:		
N 8 Crimp (microsampling)	Vials:	**6.235 606** (548-0078), **4.001 554** (548-0080)
	Closures:	**9.003 444** (548-0040), **4.008 198** (548-0038)
N 8 Screw (standard samples)	Vials:	**9.003 481** (548-0018), **9.003 480** (548-0448), **4.001 563** (548-0419)
	Inserts:	**7.401 066** (548-0020), **9.003 435** (548-0308), **4.001 556** (548-0083), **4.008 194** (548-0780)
	Closures:	**4.008 209** (548-3322), **9.003 484** (548-0024), **6.232 178** (548-0834)
N 9 Screw (standard samples)	Vials:	**9.003 448** (548-0028), **4.008 247**
	Inserts:	**7.401 744** (548-0006), **4.001 547** (548-0310), **6.093 247** (548-0002)
	Closures:	**9.003 451** (548-0085), **4.001 521** (548-0088), **4.008 214** (548-0372), **4.008 215** (548-0373), **4.008 221** (548-0089)
N 11 Snap (standard samples)	Vials:	**6.073 833** (548-0011)
	Inserts:	**7.401 744** (548-0006), **4.001 547** (548-0310), **6.093 247** (548-0002)
	Closures:	**4.008 257** (548-3360/548-0897), **4.008 258** (548-0432/548-3208), **4.008 260** (548-0435/548-3210)
N 13 Screw (large sample volumes)	Vials:	**9.003 482** (548-0051), **7.058 142** (548-0052)
	Inserts:	**7.055 486** (548-0093) + spring **4.001 567** (548-0094)
	Closures:	**7.510 053** (548-0054), **7.071 151** (548-0096) + **7.058 143** (548-0111)

Waters®

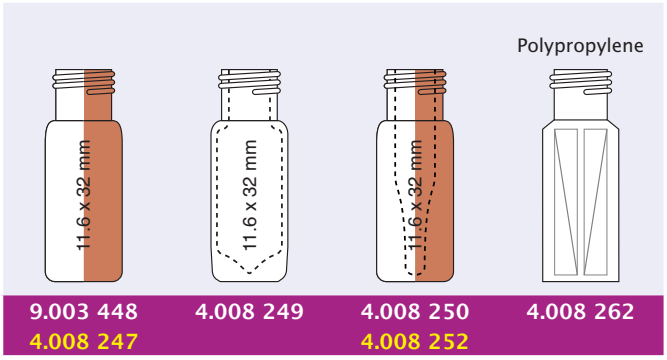
Main chapter		**Most popular LLG products for use on Waters® instruments** (comparable product nos. of Waters® in brackets)
HPLC:		
N 9 Screw (standard samples)	Vials:	**9.003 448, 4.008 247, 4.008 249** (186002802), **4.008 250** (186002804), **4.008 252** (186002803)
	Inserts:	**6.093 247** (WAT094170)
	Closures:	**4.008 214** (186000274), **4.008 215** (186000305)
N 10 Screw (standard samples)	Vials:	**6.242 103** (WAT063300)
	Inserts:	**6.093 247** (WAT094170)
	Closures:	**4.008 234** (WAT058874), **4.008 235, 4.008 237**
N 11 Snap (standard samples)	Vials:	**6.073 833**
	Inserts:	**6.093 247** (WAT094170)
	Closures:	**4.008 258** (186000303), **4.008 260** (186000304)
N 8 Shell Vials (standard samples)	Vials + Plugs:	**7.300 174** + **7.300 175** (WAT025054C/250), **4.008 205** + **7.300 175** (WAT025053C/250)
N 13 Screw (large sample volumes)	Vials:	**9.003 482** (186000840), **7.058 142** (186001135)
	Inserts:	**7.055 486** (WAT072704/100; WAT015199/144) + spring **4.001 567** (WAT072708)
	Closures:	**7.510 053** (186000841/100; 186000965/1000), **7.071 151** (WAT072711/144) + **7.058 143** (WAT072714/144; WAT073005/1440)

Screw neck vials N 8



9.003 481	4.001 563
9.003 480	

Screw neck vials N 9

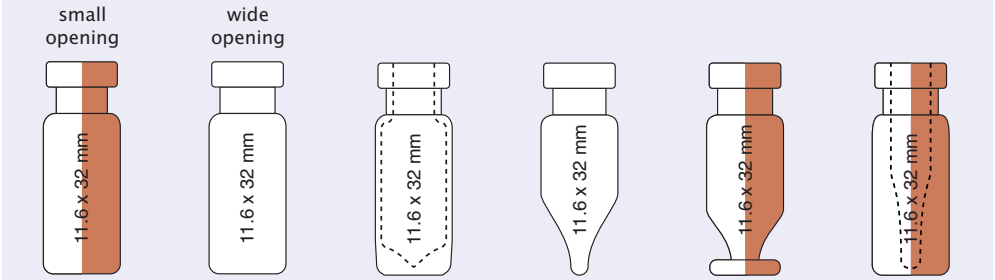


9.003 448	4.008 249	4.008 250	4.008 262
4.008 247		4.008 252	

Vial N 10

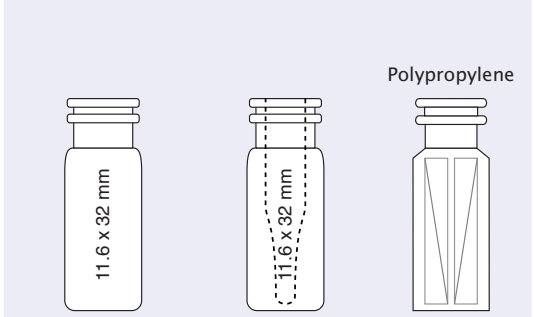
6.242 103

Crimp neck vials N 11



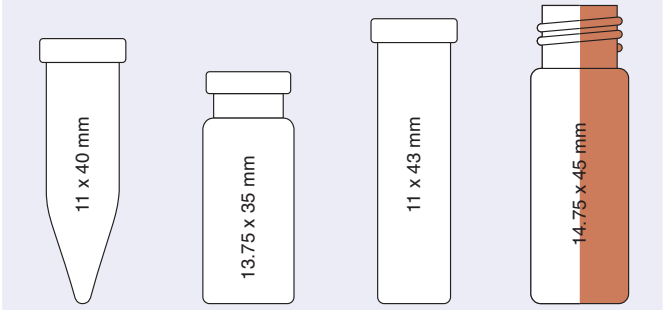
7.085 511	7.086 520	4.001 565	4.001 516	4.008 253	6.233 918
7.089 998				4.008 254	4.008 251

Snap ring vials N 11



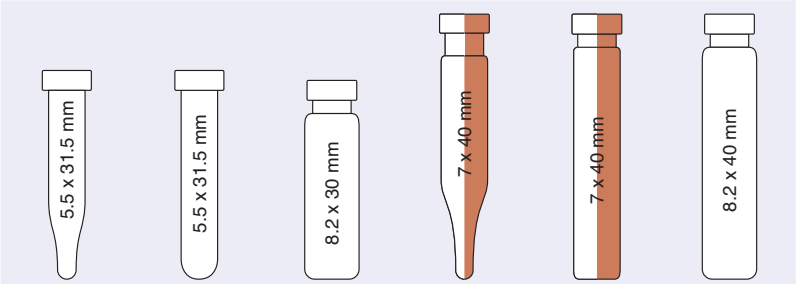
6.073 833	4.008 255	6.224 358

Crimp and screw neck vials N 13



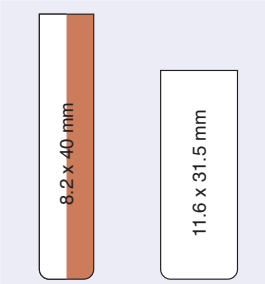
4.001 530	9.003 422	7.080 866	9.003 482
			7.058 142

Crimp neck vials N 8



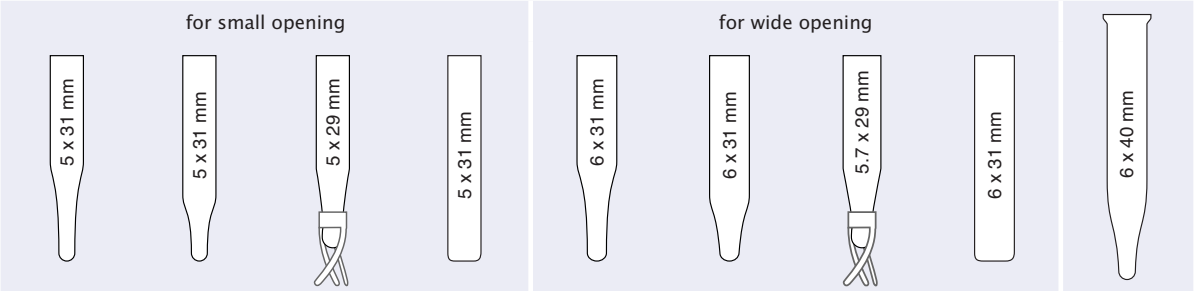
6.235 606	4.001 554	9.003 427	4.001 515	4.008 202	4.008 206
			6.902 044	4.008 203	

Shell vials



7.300 174	4.008 248
4.008 205	

Inserts for vials N 8, N 9, N 10, N 11, and N 13

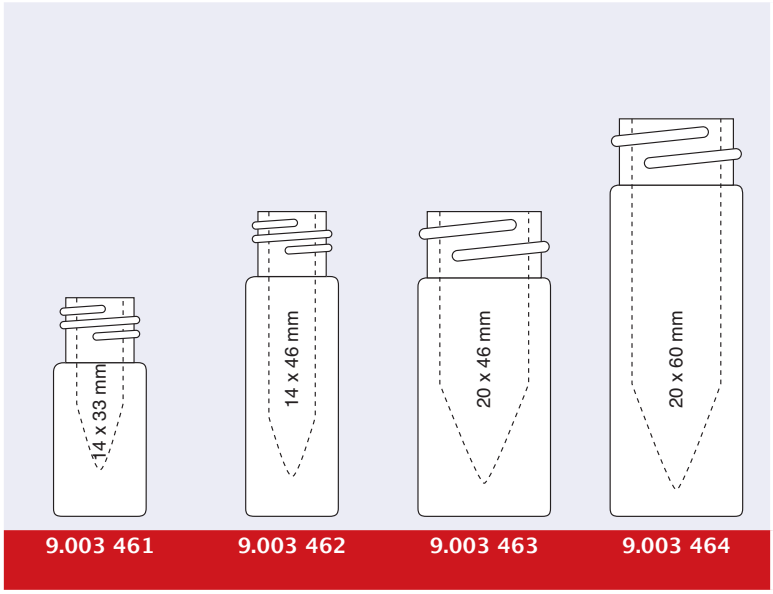


7.401 066	9.003 435	4.001 556	4.008 194	7.401 744	4.001 547	6.093 247	4.008 196	7.055 486

Snap cap vials N 18 and N 22

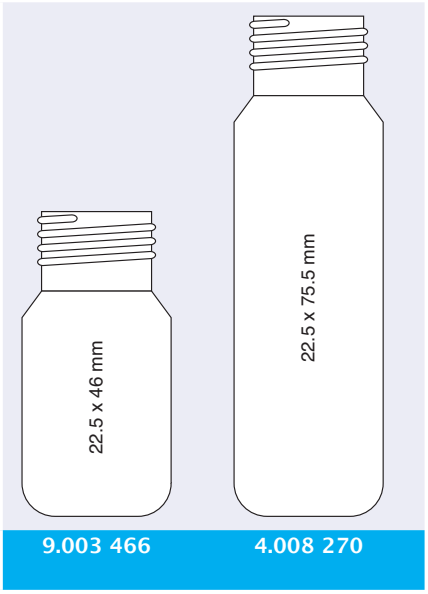
7.051 404	6.803 717	4.008 282	7.090 616

Micro reaction vials N 13 and N 20



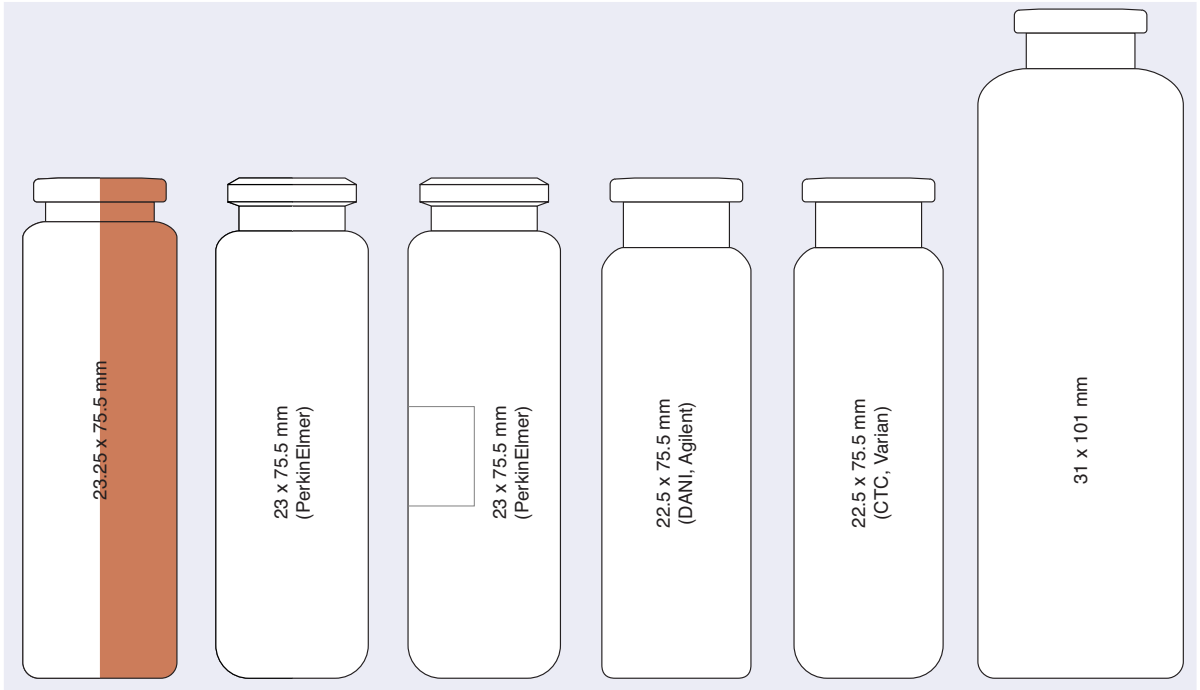
9.003 461 | 9.003 462 | 9.003 463 | 9.003 464

Screw neck vials N 18



9.003 466 | 4.008 270

Crimp neck vials N 20: 20 and 50 mL

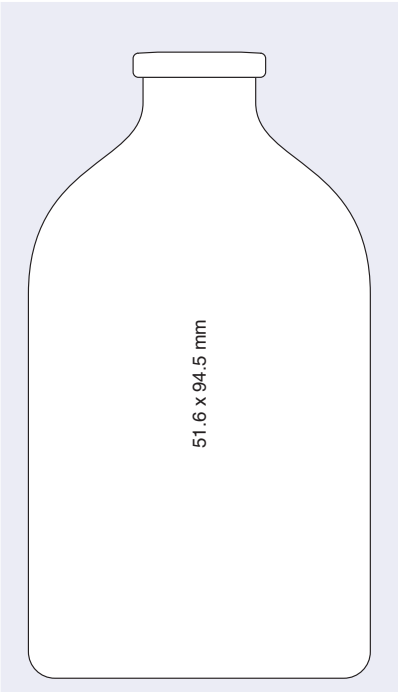


7.401 840
7.080 450 | 7.060 463 | 4.008 281 | 9.003 452 | 9.003 453 | 7.060 459

Crimp neck vials N 20: 5–10 mL

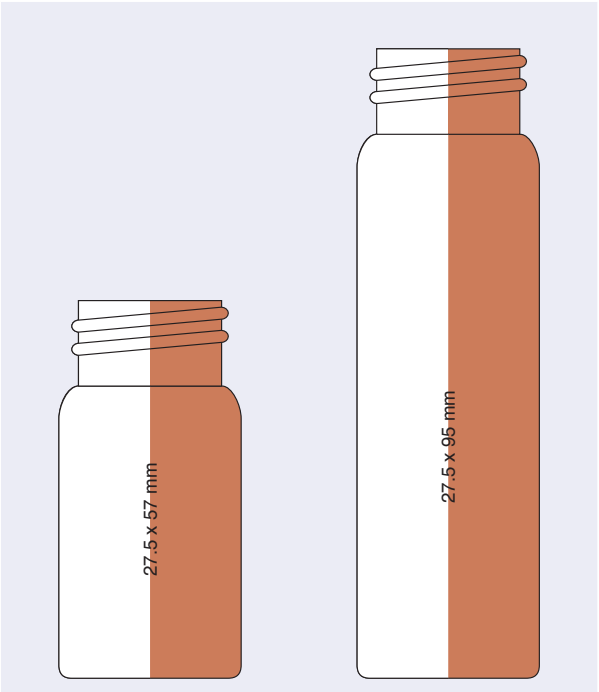
9.003 425 7.060 457	7.052 186	4.008 285	9.003 426 7.080 947	7.050 285	7.850 009

Vials N 20: 100 mL



7.060 465

Screw neck vials N 24



4.008 204 4.008 298	4.008 297 4.008 299

LLG Crimp neck vials N 8

Capacity	ml	0.20	0.30	0.80	0.60	0.60	0.70	0.70	1.20
o.d. x Height	mm	5,5 x 31,5	5,5 x 31,5	8,2 x 30	7 x 40	7 x 40	7 x 40	7 x 40	8,2 x 40
Colour		clear	clear	clear	clear	amber	clear	amber	clear
Form		conical	round bottom	flat bottom	conical	conical	flat bottom	flat bottom	flat bottom
PK		100	100	100	100	100	100	100	100
Cat. No.		**6.235 606**	**4.001 554**	**9.003 427**	**4.001 515**	**6.902 044**	**4.008 202**	**4.008 203**	**4.008 206**

1

1 LLG Crimping tools N 8

Description	PK	Cat. No.
Manual crimper for 8 mm aluminium caps	1	**9.003 470**
Manual decapper for 8 mm aluminium caps	1	**9.003 511**

LLG Crimp closures N 8, ready assembled, Aluminium and plain caps N 8

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	Aluminium, silver, center hole	PTFE virginal, white	53° shore D	0.25	100	**4.001 558**
	Aluminium, silver, center hole	Natural rubber / Butyl redorange / TEF colourless	45° shore A	1.00	100	**9.003 443**
	Aluminium, silver, center hole	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 200**
	Aluminium, silver, center hole	Silicone white / PTFE red	40° shore A	1.00	100	**9.003 444**
	Aluminium, silver, center hole	PTFE red / Silicone white / PTFE red	40° shore A	1.00	100	**4.008 198**
	Aluminium, silver, center hole (no liner)				100	**4.001 552**

LLG Screw neck vials N 8, small opening

Capacity	ml	1.50	1.50	1.10
o.d. x Height	mm	11.6 x 32	11.6 x 32	11.6 x 32
Colour		clear	amber	clear
Form		flat bottom	flat bottom	conical
PK		100	100	100
Cat. No.		**9.003 481**	**9.003 480**	**4.001 563**

Inserts for LLG Screw neck vials N 8, small opening

					
Capacity	ml	0.10	0.15	0.10	0.25
o.d. x Height	mm	5 x 31	5 x 31	5 x 29	5 x 31
Colour		clear	clear	clear	clear
Form		conical, 15mm tip*	conical, 9mm tip*	with plastic spring	flat bottom
PK		100	100	100	100
Cat. No.		**7.401 066**	**9.003 435**	**4.001 556**	**4.008 194**

* Optionally you may use metal springs **7.086 408** in combination with these products to push them up in the vial

1

1 Container for LLG - Crimp neck vials N 8

81- position container, blue, coded, with transparent lid (suitable for freezers).

Dimensions (L x W x H) mm	**PK**	**Cat. No.**
130 x 130 x 45	1	**6.225 649**

LLG Screw closures N 8, PP, assembled, and plain screw caps N 8

		Caps	**Septa**	**Hardness**	**Thickness mm**	**PK**	**Cat. No.**
		black, centre hole	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 209**
		black, closed	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 210**
		black, centre hole	Silicone white / PTFE red	40° shore A	1.30	100	**9.003 484**
		black, closed	Silicone white / PTFE red	40° shore A	1.30	100	**4.008 208**
		black, centre hole	Silicone white / PTFE blue, slit	40° shore A	1.00	100	**6.232 178**
		black, centre hole	PTFE red / Silicone white / PTFE red	40° shore A	1.00	100	**4.008 207**
		black, centre hole	no liner	-		100	**7.060 421**
		black, closed	no liner	-		100	**7.075 960**

LLG Septa for screw caps N 8, bulk

	Septa	**Hardness**	**Thickness mm**	**PK**	**Cat. No.**
	PTFE virginal, white	53° shore D	0.25	100	**7.085 238**
	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 197**
	Silicone white / PTFE red	40° shore A	1.30	100	**7.060 419**
	Silicone white / PTFE blue, slit	40° shore A	1.00	100	**7.085 892**

LLG Screw neck vials and inserts N 9, wide opening

							
o.d. x Height	mm	11,6 x 32	11,6 x 32	6 x 31	6 x 31	5,7 x 29	6 x 31
Capacity	ml	1.50	1.50	0.20	0.25	0.10	0.30
Colour		clear	amber	clear	clear	clear	clear
Form		flat bottom	flat bottom	conical 15mm tip	conical 12mm tip	with plastic spring	flat bottom
PK		100	100	100	100	100	100
Cat. No.		**9.003 448**	**4.008 247**	**7.401 744**	**4.001 547**	**6.093 247**	**4.008 196**

LLG Screw neck vials N 9, wide opening, for small sample volumes

					
Capacity	ml	1.10	0.20	0.20	0.30
o.d. x Height	mm	11.6 x 32	11.6 x 32	11.6 x 32	11.6 x 32
Colour		clear	clear	amber	transparent
Form		flat bottom, 15µl funnel in solid glas bottom	flat bottom with integrated 0.2mL insert	flat bottom with integrated 0.2mL insert	PP, with inner cone
PK		100	100	100	100
Cat. No.		**4.008 249**	**4.008 250**	**4.008 252**	**4.008 262**

1 Container for LLG Screw neck vials N 9

81- position container, blue, coded, with transparent lid (suitable for freezers).

Dimensions (W x D x H) mm	**PK**	**Cat. No.**
130 x 130 x 45	1	**6.225 649**

1

LLG Screw closures N 9, PP, assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	transparent, centre hole	PTFE virginal, white	53° shore D	0.25	100	**4.008 220**
	blue, centre hole	PTFE virginal, white	53° shore D	0.25	100	**4.008 221**
	blue closed	PTFE virginal, white	53° shore D	0.25	100	**7.930 366**
	transparent, centre hole	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 229**
	blue, centre hole	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 228**
	blue closed	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 230**
	transparent, centre hole	Silicone white / PTFE red	40° shore A	1.00	100	**7.076 778**
	blue, centre hole	Silicone white / PTFE red	40° shore A	1.00	100	**9.003 451**
	black, centre hole	Silicone white / PTFE red	40° shore A	1.00	100	**4.008 225**
	red, centre hole	Silicone white / PTFE red	40° shore A	1.00	100	**4.008 222**
	green, centre hole	Silicone white / PTFE red	40° shore A	1.00	100	**4.008 224**
	blue closed	Silicone white / PTFE red	40° shore A	1.00	100	**4.008 227**
	transparent, centre hole	Silicone white / PTFE blue, slit	40° shore A	1.00	100	**7.200 809**
	blue, centre hole	Silicone white / PTFE blue, slit	40° shore A	1.00	100	**4.001 521**
	black, center hole	Silicone white / PTFE blue, slit	40° shore A	1.00	100	**4.008 226**
	red, centre hole	Silicone white / PTFE blue, slit	40° shore A	1.00	100	**4.008 223**
	transparent, centre hole	PTFE red / Silicone white / PTFE red	40° shore A	1.00	100	**6.225 427**
	blue, centre hole	PTFE red / Silicone white / PTFE red	40° shore A	1.00	100	**4.008 218**

LLG Septa for screw caps N 9, bulk

	Septa	Hardness	Thickness mm	PK	Cat. No.
	PTFE virginal, white	53° shore D	0.25	100	**4.008 211**
	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 213**
	Silicone white / PTFE red	40° shore A	1.00	100	**4.008 212**

Bonded LLG screw closures N 9, PP

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	N 9 PP bonded screw cap*, blue, center hole	Red Rubber / TEF colourless	65° shore A	1.00	100	**4.008 216**
	N 9 PP bonded screw cap*, blue, center hole	Silicone beige / PTFE white	45° shore A	1.30	100	**4.008 214**
	N 9 PP bonded screw cap*, blue, center hole	Silicone beige / PTFE white, slit	45° shore A	1.30	100	**4.008 215**

*septa firmly connected with the cap; cannot be separated

LLG Screw neck vials and inserts N 10, wide opening

						
Capacity	ml	1.50	0.20	0.25	0.10	0.30
o.d. x Height	mm	11,6 x 32	6 x 31	6 x 31	5,7 x 29	6 x 31
Colour		clear	clear	clear	clear	clear
Form		flat bottom	conical, 15mm tip	conical, 12mm tip	with plastic spring	flat bottom
PK		100	100	100	100	100
Cat. No.		**6.242 103**	**7.401 744**	**4.001 547**	**6.093 247**	**4.008 196**

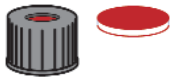
1 Container for LLG Screw neck vials N 10

81- position container, blue, coded, with transparent lid (suitable for freezers).

Dimensions (L x W x H) mm	**PK**	**Cat. No.**
130 x 130 x 45	1	**6.225 649**

1

LLG Screw closures N 10, PP and plain screw caps N 10, PP

	Caps	**Septa**	**Hardness**	**Thickness mm**	**PK**	**Cat. No.**
	bonded*, black, center hole	Red Rubber / TEF colourless	65° shore A	1.00	100	**6.242 104**
	bonded*, black, center hole	Silicone white / PTFE beige	45° shore A	1.50	100	**4.008 234**
	bonded*, black, center hole	Silicone white / PTFE red	45° shore A	1.50	100	**4.008 235**
	bonded*, black, center hole	Silicone white / PTFE blue, slit	45° shore A	1.50	100	**4.008 237**
	black, center hole (ready assembled)	PTFE red / Silicone white / PTFE red	45° shore A	1.00	100	**4.008 236**
	black, center hole (no liner)				100	**4.008 231**

*septa firmly connected with the cap; cannot be separated

LLG Crimp neck vials N 11, flat bottom

				
Capacity	ml	1.50	1.50	1.50
o.d. x Height	mm	11.6 x 32	11.6 x 32	11.6 x 32
Colour		clear	amber	clear
Form		small opening	small opening	wide opening
PK		100	100	100
Cat. No.		**7.085 511**	**7.089 998**	**7.086 520**

Inserts for LLG Crimp neck vials N 11

Capacity	ml	0.10	0.15	0.10	0.25	0.20	0.25	0.10	0.30
o.d. x Height	mm	5 x 31	5 x 31	5 x 29	5 x 31	6 x 31	6 x 31	5,7 x 29	6 x 31
Colour		clear	clear	clear	clear	clear	clear	clear	clear
Form		for small opening, conical, 15mm tip	for small opening, conical, 9mm tip	for small opening, with plastic spring	for small opening, flat bottom	for wide opening, conical, 15mm tip	for wide opening, conical, 12mm tip	for wide opening, with plastic spring	for wide opening, flat bottom
PK		100	100	100	100	100	100	100	100
Cat. No.		**7.401 066**	**9.003 435**	**4.001 556**	**4.008 194**	**7.401 744**	**4.001 547**	**6.093 247**	**4.008 196**

LLG Crimp neck vials N 11 for small sample volumes

Capacity	ml	1.10	1.10	1.10	1.10	0.20	0.20
o.d. x Height	mm	11,6 x 32	11,6 x 32	11,6 x 32	11,6 x 32	11,6 x 32	11,6 x 32
Colour		clear	clear	clear	amber	clear	amber
Form		flat bottom, 15 µl funnel in solid glass bottom	conical	conical with a round pedestal glass plate	conical with a round pedestal glass plate	flat bottom, with integrated 0.2 mL insert	flat bottom, with integrated 0.2 mL insert
PK		100	100	100	100	100	100
Cat. No.		**4.001 565**	**4.001 516**	**4.008 253**	**4.008 254**	**6.233 918**	**4.008 251**

1

1 LLG Crimping tools N 11

Description	PK	Cat. No.
Manual crimper, height adjustable, for 11 mm aluminium crimp caps	1	**9.003 471**
Manual decapper for 11 mm aluminium crimp caps	1	**9.003 367**
Pneumatic crimping tool for 11 mm aluminium crimp caps (complete with **hand switch**)	1	**7.095 791**
Pneumatic crimping tool for 11 mm aluminium crimp caps (complete with **foot switch**)	1	**6.802 617**
Crimping head *without* pneumatic basic tool for 11 mm aluminium crimp caps	1	**4.003 923**
Decapping head *without* pneumatic basic tool for 11 mm aluminium crimp caps	1	**4.003 929**
Pneumatic basic tool with **hand switch**	1	**4.003 925**
Pneumatic basic tool with **foot switch**	1	**4.003 926**

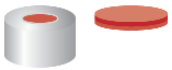
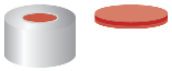
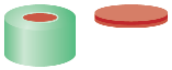
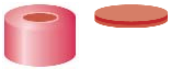
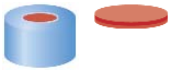
2

2 Containers for LLG Crimp neck vials N 11

Blue 81 position container, coded, with transparent lid (suitable for freezers).

Dimensions (L x W x H) mm	PK	Cat. No.
130 x 130 x 45	1	**6.225 649**

LLG Crimp closures N 11, Aluminium, assembled and plain crimp caps N 11

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	aluminium, silver, centre hole	PTFE virginal, white	53° shore D	0.25	100	**4.001 559**
	aluminium, silver, centre hole	Natural rubber / Butyl red-orange / TEF colourless	45° shore A	1.30	100	**9.003 441**
	aluminium, silver, centre hole	Natural rubber red-orange / TEF colourless (corresponds to Agilent quality)	60° shore A	1.00	100	**4.008 239**
	aluminium, silver, centre hole	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 243**
	aluminium, silver, centre hole	Natural rubber / Butyl red-orange / TEF colourless	45° shore A	1.00	100	**7.060 469**
	aluminium, green, centre hole	Natural rubber / Butyl red-orange / TEF colourless	45° shore A	1.00	100	**4.001 522**
	aluminium, red, centre hole	Natural rubber / Butyl red-orange / TEF colourless	45° shore A	1.00	100	**7.300 348**
	aluminium, blue, centre hole	Natural rubber / Butyl red-orange / TEF colourless	45° shore A	1.00	100	**6.900 233**
	aluminium, gold, centre hole	Natural rubber / Butyl red-orange / TEF colourless	45° shore A	1.00	100	**9.003 459**
	aluminium, silver, centre hole	Silicone white / PTFE red	40° shore A	1.30	100	**9.003 446**
	aluminium, silver, centre hole	Silicone white / PTFE blue, cross-slit	40° shore A	1.50	100	**4.001 555**
	aluminium, silver, centre hole	PTFE red / Silicone white / PTFE red	40° shore A	1.00	100	**7.050 759**
	**magnetic**, gold, centre hole	Silicone white / PTFE red	55° shore A	1.00	100	**4.001 564**
	aluminium, silver, centre hole (no liner)				100	**7.510 176**

LLG Septa for crimp caps N 11, bulk

	Septa	Hardness	Thickness mm	PK	Cat. No.
	PTFE virginal, white	53° shore D	0.25	100	**4.001 535**
	Red Rubber / FEP colourless	40° shore A	1.00	100	**4.008 238**
	Silicone white / PTFE red	40° shore A	1.30	100	**7.054 037**
	PTFE red / Silicone white / PTFE red	40° shore A	1.00	100	**6.801 244**

LLG Snap ring vials and inserts N 11, wide opening

Capacity	ml	1.50	0.20	0.25	0.10	0.30	0.20	0.30
o.d. x Height	mm	11,6 x 32	6 x 31	6 x 31	5,7 x 29	6 x 31	11,6 x 32	11,6 x 32
Colour		clear	clear	clear	clear	clear	clear	PP, transparent
Form		flat bottom	conical, 15mm tip	conical, 12mm tip	with plastic spring	flat bottom	flat bottom, integrated 0.2mL insert	with inner cone
PK		100	100	100	100	100	100	100
Cat. No.		**6.073 833**	**7.401 744**	**4.001 547**	**6.093 247**	**4.008 196**	**4.008 255**	**6.224 358**

LLG Snap ring closures N 11, PE, assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	transparent, centre hole	Red Rubber / TEF colourless	65° shore A	1.00	100	**4.008 261**
	blue, centre hole	Red Rubber / TEF colourless	65° shore A	1.00	100	**4.008 257**
	transparent, centre hole	Silicone white / PTFE red	55° shore A	1.00	100	**4.001 544**
	blue, centre hole	Silicone white / PTFE red	55° shore A	1.00	100	**4.008 258**
	transparent, centre hole	Silicone white / PTFE blue, cross-slit	55° shore A	1.00	100	**4.008 256**
	snap ring cap, blue, centre hole	Silicone white / PTFE blue, cross-slit	55° shore A	1.00	100	**6.242 212**
	transparent, centre hole	PTFE red / Silicone white / PTFE red	45° shore A	1.00	100	**6.073 555**
	blue, centre hole	PTFE red / Silicone white / PTFE red	45° shore A	1.00	100	**4.008 259**

LLG Crimp neck vials N 13

Capacity	ml	1.00	2.00	2.00
o.d. x Height	mm	11 x 40	13,75 x 35	11 x 43
Colour		clear	clear	clear
Form		conical	flat bottom	flat bottom
PK		100	100	100
Cat. No.		**4.001 530**	**9.003 422**	**7.080 866**

1

1 LLG Crimping tools N 13

Description	PK	Cat. No.
Manual crimper, height adjustable, for 13 mm aluminium crimp caps	1	**9.003 473**
Manual crimper, height adjustable, for 13 mm flip top/flip off caps	1	**4.008 266**
Manual decapper for 13 mm aluminium crimp caps	1	**9.003 368**

LLG Crimp closures N 13, Aluminium, assembled and plain crimp caps N 13

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	aluminium crimp cap, silver, centre hole	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	2.00	100	**7.060 475**
	aluminium centre tear off cap, gold	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	2.00	100	**9.003 442**
	aluminium crimp cap, silver, centre hole (no liner)	-			100	**6.801 727**
	aluminium centre tear off cap, coppery (no liner)	-			100	**6.210 199**
	- (stopper only)	Bromobutyl stopper, grey	45° shore A		100	**6.210 200**

LLG Crimp neck vials N 13

					
Capacity	ml	4.00	4.00	0.30	
o.d. x Height	mm	14.75 x 45	14.75 x 45	6 x 40	
Colour		clear	amber	clear	
Form		flat bottom	flat bottom	conical, metal sprint necessary	spring for insert (7.055 486)
PK		100	100	100	100
Cat. No.		**9.003 482**	**7.058 142**	**7.055 486**	**4.001 567**

1 Containers for LLG Crimp and screw neck vials N 13

49 position container blue, with transparent lid (suitable for freezers).

Dimensions (L x W x H) mm	PK	Cat. No.
130 x 130 x 50	1	**4.001 527**

1

LLG Screw closures N 13, PP, assembled and plain screw caps N 13

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	black, centre hole	Red Rubber / FEP colourless	40° shore A	1.50	100	**6.242 468**
	black, closed top	Red Rubber / FEP colourless	40° shore A	1.50	100	**4.008 267**
	black, centre hole	Silicone white / PTFE red	40° shore A	1.30	100	**7.510 053**
	black, closed top	Silicone white / PTFE red	40° shore A	1.30	100	**6.242 267**
	black, centre hole				100	**7.071 151**
	black, closed top				100	**7.060 437**

LLG Septa for screw caps N 13, bulk

	Septa	Hardness	Thickness mm	PK	Cat. No.
	PTFE virginal, white	53° shore D	0.25	100	**7.058 143**
	Red Rubber / FEP colourless	40° shore A	1.50	100	**4.008 264**
	Silicone white / PTFE red	40° shore A	1.30	100	**4.008 263**

LLG Micro reaction vials complete with screw caps and septa

					
Capacity	ml	0.25	0.75	3.00	4.50
o.d. x Height	mm	14 x 33	14 x 46	20 x 46	20 x 60
Colour		clear	clear	clear	clear
Form		with inner conical funnel in solid, flat glass bottom	with inner conical funnel in solid, flat glass bottom	with inner conical funnel in solid, flat glass bottom	with inner conical funnel in solid, flat glass bottom
PK		1	1	1	1
Cat. No.		**9.003 461**	**9.003 462**	**9.003 463**	**9.003 464**

LLG Replacement screw caps with septa for micro reaction vials

		Description	Hardness	Thickness mm	PK	Cat. No.
		N 13 PP screw cap with silicone white/ PTFE red septum, (assembled)	40° shore A	1.30	100	**7.510 053**
		N 20 phenolic screw cap with butyl red / PTFE grey septum, (unassembled)	55° shore A	1.30	48	**4.001 519**

LLG Replacement septa for micro reaction vials

	Description	Hardness	Thickness mm	PK	Cat. No.
	N 12 Silicone white / PTFE red	40° shore A	1.30	100	**4.008 263**
	N 18 Butyl red / PTFE grey	55° shore A	1.30	48	**6.225 736**

LLG Shell vials (fire-polished neck) N 8/N 12

				
Capacity	ml	1.00	1.00	2.00
o.d. x Height	mm	8.2 x 40	8.2 x 40	11.6 x 31,5
Colour		clear	amber	clear
Form		N 8, flat bottom	N 8, flat bottom	N 12, flat bottom
PK		100	100	100
Cat. No.		**7.300 174**	**4.008 205**	**4.008 248**

LLG Plugs, PE

	For	PK	Cat. No.
	N 8	100	**7.300 175**
	N 12	100	**4.008 265**

LLG Snap cap vials N 18 and N 22

For storage of powdery samples.

					
Capacity	ml	5.00	10.00	15.00	25.00
o.d. x Height	mm	20 x 40	22 x 50	26 x 48	26 x 65
Colour		clear	clear	clear	clear
Form		N 18, flat bottom	N 18, flat bottom	N 22, flat bottom	N 22, flat bottom
PK		100	100	100	100
Cat. No.		**7.051 404**	**6.803 717**	**4.008 282**	**7.090 616**

LLG Snap caps, PE

	For	PK	Cat. No.
	N 18	100	**6.051 403**
	N 22	100	**7.090 617**

LLG Screw neck Headspace vials N 18

	Capacity ml	o.d. x Height mm	Colour	Form	PK	Cat. No.
	10.00	22,5 x 46	clear	rounded bottom	100	**9.003 466**
	20.00	22,5 x 75,5	clear	rounded bottom	100	**4.008 270**

LLG Magnetic screw closures N 18, ready assembled

		Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
		silver, center hole	Silicone blue transparent/ PTFE white	45° shore A	1.50	100	**6.241 111**
		silver, center hole	Silicone white / PTFE blue	55° shore A	1.50	100	**4.008 268**
		silver, center hole	Red Rubber / TEF colourless	65° shore A	1.50	100	**4.008 269**

LLG Crimp neck vials N 20: 5 - 10 mL








Capacity	ml	5.00	5.00	6.00	5.00	10.00	10.00	10.00	10.00
o.d. x Height	mm	20,5 x 38	20,5 x 38	22 x 38,25	21,7 x 38,25	20,5 x 54,5	20,5 x 54,5	22,5 x 46	22,5 x 46
Colour		clear	amber	clear	clear	clear	amber	clear	clear
Form		flat bottom flat DIN crimp neck	flat bottom flat DIN crimp neck	rounded bottom bevelled HS crimp neck	flat bottom bevelled HS crimp neck	flat bottom flat DIN crimp neck	flat bottom flat DIN crimp neck	flat bottom flat DIN crimp neck	rounded bottom bevelled HS crimp neck
For		Varian	Varian	PerkinElmer	Metrohm	Varian	Varian	DANI, Agilent	CTC, Varian
PK		100	100	100	100	100	100	100	100
Cat. No.		**9.003 425**	**7.060 457**	**7.052 186**	**4.008 285**	**9.003 426**	**7.080 947**	**7.050 285**	**7.850 009**

1

1 LLG Crimping tools N 20

Description	PK	Cat. No.
Manual crimper, height adjustable, for 20mm aluminium crimp caps	1	**9.003 475**
Manual crimper, height adjustable, for 20mm flip top/flip off caps	1	**4.008 278**
Manual decapper for 20mm aluminium crimp caps	1	**9.003 369**
Pneumatic crimping tool for 20mm aluminium crimp caps (complete with **hand switch**)	1	**4.003 922**
Pneumatic crimping tool for 20mm aluminium crimp caps (complete with **foot switch**)	1	**7.300 513**
Crimping head *without* pneumatic basic tool for 20mm aluminium crimp caps	1	**4.003 924**
Decapping head *without* pneumatic basic tool for 20mm aluminium crimp caps	1	**4.003 927**
Pneumatic basic tool with **hand switch**	1	**4.003 925**
Pneumatic basic tool with **foot switch**	1	**4.003 926**

LLG Crimp neck vials N 20: 20 and 50 mL







Capacity	ml	20.00	20.00	20.00	20.00	20.00	20.00	50.00
o.d. x Height	mm	23.25 x 75.5	23.25 x 75.5	23 x 75.5	23 x 75.5	22.5 x 75.5	22.5 x 75.5	31 x 101
Colour		clear	amber	clear	clear, with label	clear	clear	clear
Form		flat bottom flat DIN crimp neck	flat bottom flat DIN crimp neck	rounded bottom bevelled HS crimp neck	rounded bottom bevelled HS crimp neck	flat bottom flat DIN crimp neck	rounded bottom flat DIN crimp neck	flat bottom flat DIN crimp neck
For				PerkinElmer	PerkinElmer	DANI, Agilent	CTC, Varian	
PK		100	100	100	100	100	100	100
Cat. No.		**7.401 840**	**7.080 450**	**7.060 463**	**4.008 281**	**9.003 452**	**9.003 453**	**7.060 459**

2

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

25 position container blue for 10mL + 20mL screw neck vials N 18 and crimp neck vials N 20, with transparent lid (suitable for freezers).

Dimensions (L x W x H) mm	PK	Cat. No.
130 x 130 x 80	1	**4.001 528**

LLG Crimp closures N 20, Aluminium, ready assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	silver, center hole	Butyl red / PTFE grey	50° shore A	3.00	100	**9.003 454**
	silver, center hole	Butyl light grey / PTFE dark grey	50° shore A	3.00	100	**4.001 549**
	silver, center hole	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**9.003 430**
	gold, center hole	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**4.008 275**
	silver, center hole	Butyl stopper, grey unassembled (separate parts)	37° shore A		100	**7.060 477**
	silver, center hole	Silicone blue / PTFE colourless	40° shore A	3.00	100	**4.001 553**
	silver, center hole	Silicone white / PTFE beige	40° shore A	3.00	100	**9.003 460**

LLG Crimp closures N 20, pressure release caps, Aluminium, assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	silver, centre hole	Butyl red / PTFE grey	50° shore A	3.00	100	**9.003 455**
	silver, centre hole	Butyl light grey / PTFE dark grey	50° shore A	3.00	100	**4.001 557**
	silver, centre hole	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**4.008 276**
	silver, centre hole	Silicone blue / PTFE colourless	40° shore A	3.00	100	**7.050 286**
	silver, centre hole	Silicone beige / PTFE grey	40° shore A	3.00	100	**9.003 456**
	silver, centre hole (no liner)				100	**4.008 271**

LLG Crimp closures N 20, center tear off caps, Aluminium, ready assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	gold	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**9.003 445**
	silver	Butyl stopper, grey unassembled (separate parts)	37° shore A		100	**7.087 863**

LLG Crimp closures N 20, complete tear off caps, Aluminium, assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	silver	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**7.060 471**
	silver	Butyl stopper, grey unassembled (separate parts)	37° shore A		100	**7.060 479**
	silver (no liner)				100	**7.056 751**

LLG Bi-metal crimp caps N 20, assembled

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	blue/silver, centre hole	Butyl light grey / PTFE dark grey	50° shore A	3.00	100	**9.003 457**
	blue/silver, centre hole	Silicone blue / PTFE colourless	40° shore A	3.00	100	**6.234 541**
	blue/silver, centre hole	Silicone beige / PTFE grey	40° shore A	3.00	100	**9.003 458**
	blue/silver, centre hole (no liner)				100	**4.008 272**

LLG Magnetic crimp caps N 20

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	silver, center hole 8 mm	Butyl red / P TFE grey	50° shore A	3.00	100	**4.001 548**
	silver, center hole 8 mm	Butyl light grey / PTFE dark grey	50° shore A	3.00	100	**6.229 635**
	silver, center hole 8 mm	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**6.902 419**
	silver, center hole 8 mm	Silicone blue / PTFE colourless	40° shore A	3.00	100	**7.850 010**
	silver, center hole 8 mm (no liner)				100	**7.625 012**

LLG Septa for crimp caps N 20, bulk

	Septa	Hardness	Thickness mm	PK	Cat. No.
	Butyl red / PTFE grey	50° shore A	3.00	100	**7.060 427**
	Butyl light grey / PTFE dark grey	50° shore A	3.00	100	**4.008 273**
	Butyl dark grey / PTFE grey (only centrically laminated, typically called Pharma-Fix)	50° shore A	3.00	100	**7.071 063**
	Silicone blue / PTFE colourless	40° shore A	3.00	100	**4.008 274**
	Silicone beige / PTFE grey	40° shore A	3.00	100	**7.050 202**
	Silicone white / Aluminium foil silver	50° shore A	3.00	100	**4.001 550**

LLG Stoppers N 20

	Description	Hardness	PK	Cat. No.
	butyl grey	37° shore A	100	**7.060 433**
	bromobutyl red	45° shore A	100	**6.900 963**

LLG Caps N 20, PE, transparent and suitable septa, bulk

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	height 8.4mm, for bevelled top crimp neck N 20, centre hole 4.3mm (no liner)				100	**6.227 768**
	height 9.1mm, for flat DIN crimp neck N 20, centre hole 4.3mm (no liner)				100	**7.052 184**
		Butyl beige / PTFE grey	55° shore A	1.30	100	**7.060 425**
		Natural rubber red-orange/ TEF colourless	45° shore A	1.30	100	**7.051 039**

1 LLG Vial and cap N 20 for doping control

100 mL crimp neck vial, 51.6 x 94.5mm, clear, flat bottom, flat DIN crimp neck

Description	Caps	PK	Cat. No.
Vials only		88	**7.060 465**
Caps only	N 20 aluminium safety cap; silver, closed/centrical PTFE lamination grey, 50° shore A, 3 mm (typically called Pharma-Fix)	100	**4.001 551**
Pack of presealed vials	7.060 465 crimped with N 20 flip tear up cap blue; Butyl red, 3 mm	88	**4.001 570**

LLG Screw neck vials N 24 (EPA)

					
Capacity	ml	20.00	20.00	40.00	40.00
o.d. x Height	mm	27.5 x 57	27.5 x 57	27.5 x 95	27.5 x 95
Colour		clear	amber	clear	amber
Form		flat bottom	flat bottom	flat bottom	flat bottom
PK		100	100	100	100
Cat. No.		**4.008 204**	**4.008 298**	**4.008 297**	**4.008 299**

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

	Caps	Septa	Hardness	Thickness mm	PK	Cat. No.
	bonded*, white, center hole	Silicone white / PTFE beige	45° shore A	3.20	100	**4.008 293**
	bonded*, white, closed top	Silicone white / PTFE beige	45° shore A	3.20	100	**4.008 292**
	bonded*, white, center hole	Red Rubber / TEF colourless	65° shore A	2.50	100	**4.008 294**
	white, center hole	no liner			100	**4.008 295**
	white, closed top	no liner			100	**4.008 296**
		Silicone natural / PTFE beige	45° shore A	3.20	100	**4.008 291**

*septa firmly connected with the cap; cannot be separated

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Micro-Inserts
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Septa and stoppers
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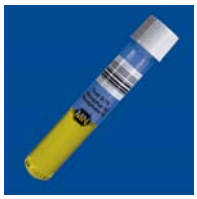

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Chromatography

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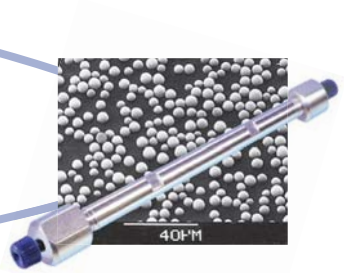

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1982:
first fused silica capillary columns for GC

1987:
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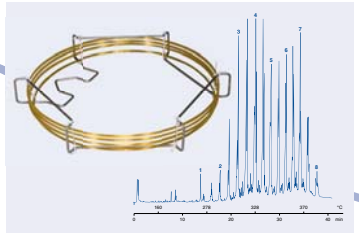
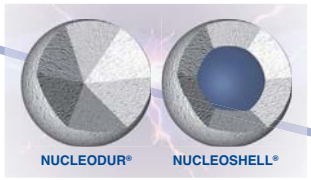


1994:
OPTIMA® capillary columns for optimum GC separations

2002:
NUCLEODUR® high purity spherical silica for HPLC



2011:
NUCLEOSHELL® core shell silica for highest efficiency in HPLC

1 Syringe Terminations

1

Syringe terminations are offered in a number of different configurations designed to accommodate a broad range of applications. From cemented to removable needles, and luer taper /PTFE luer-lock to special syringe fittings, syringe barrel terminations serve a key function at the interface of a syringe and its mating connection. *Hamilton*

N, NR (Cemented Needle, Rheodyne)
Needles are cemented into the glass syringe barrel at a point corresponding to the zero graduation mark.
NR stands for syringes with Rheodyne specified needles.

LTN (Luer Tip Cemented Needle)
Needles are cemented into the conical glass luer tip of the barrel at a point corresponding to the zero graduation mark.

SN (Special Needle)
Hamilton offers customized syringes with special needles. State the following details: needle length, gauge, point style, and whether electro-tapered. Example of a correct specification: 701 SN, 70mm, gauge 25, point style 3, not electrotapered. Without these details the corresponding standard syringe 701 N will be supplied.

RN (Removable Needle)
Removable needles seat precisely to the zero graduation mark of the syringe. Allows the use of different specification needles on the same syringe barrel.

LT (Luer Tip)
Ground glass syringe barrel with a male luer taper accepts most hypodermic needles. Use Kel-F hub needles and connectors for a tight seal.

KH (Knurled Hub)
Removable needle, knurled hub is used on 7000 Series syringes, exclusively. The attachment of a spacer enables repeatable depth injections.

C (Cheminert)
1/4"-28 UNF, male fitting. Used in low volume applications where system dead volumes need to be minimized.

TLL, TLLX (PTFE Luer-Lock)
Male luer taper with nickel-plated brass hub accepts, and locks in place, luer hub needles and connectors.
The X-style plunger stop incorporates a 6-32 UNC female thread on the end of the stop to allow attachment to drive arm mechanisms, such as on the Microlab 500 Series diluters/dispensers.

AD (AccuDil®)
M8 x 0.75, male fitting. Used with Microlab 1000 PLUS diluter/dispenser.

DAD (Diluter AccuDil®)
M8 x 0.75 male fitting with M6 x 1 side port. Used with Microlab 1000 Plus diluter/dispenser.

SL (SampleLock)
On/Off syringe valve with RN needle is cemented to a syringe barrel. Used for headspace, environmental sample collection and storage, pre-pressurization of gaseous samples for GC analysis, and sample spiking.

2 Microlitre syringes, Needle Types

2

Point Style 2 (pst2): 12° bevelled non-coring needle point recommended for septum penetration. Ideal for gas chromatographic applications. *Hamilton*

Point Style 3 (pst3): Blunt needle point (90°) for use with HPLC injection valves. Also recommended for applications where exact dosing is required (e.g. thin layer chromatographs).

Point Style 4 (pst4): 10-12° bevelled needle point recommended for life science applications; sharp point for animal injection.

Point Style 5 (pst5): Conical needle with side port for penetration of septa, thin-gauged vinyls and plastics without coring; minimizes septum damage

Point Style AS (pstAS): Special conical style needle point (8° taper) designed to withstand the demands of multiple injections; exclusively used on GC autosampler syringes

1 Microlitre syringes, 700 series, with fixed needle

With fixed needle (N, NR). NR stands for syringes with Rheodyne specified needles. Plungers are individually fitted, therefore cannot be interchanged and are not available as replacement parts. Needles are electro-tapered.

Hamilton

Needle length 51mm

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
75 N	5	26s	2 (GC)	1	**9.221 001**
701 N	10	26s	2 (GC)	1	**9.221 002**
701 N	10	26s	2 (GC)	6	**9.221 010**
702 N	25	22s	2 (GC)	1	**9.221 003**
705 N	50	22s	2 (GC)	1	**9.221 004**
710 N	100	22s	2 (GC)	1	**9.221 005**
725 N	250	22s	2 (GC)	1	**9.221 006**
750 N	500	22s	2 (GC)	1	**9.221 007**
75 N	5	26s	3 (HPLC)	1	**9.221 011**
701 N	10	26s	3 (HPLC)	1	**9.221 012**
702 NR	25	22s	3 (HPLC)	1	**9.221 013**
705 NR	50	22s	3 (HPLC)	1	**9.221 014**
710 NR	100	22s	3 (HPLC)	1	**9.221 015**
725 NR	250	22s	3 (HPLC)	1	**9.221 016**
750 N	500	22s	3 (HPLC)	1	**6.055 335**

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Microlitre syringes, 700 series, for removable needles

- 5µl - 500µl
- For use with liquids
- Removable needles (RN9, or luer tip (LT)
- Plungers and Syringe barrels are not interchangeable or replaceable
- Tight tolerances between the plunger and the barrel

Hamilton

Needle length 51mm
Point style 2 (GC)

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
75 RN	5	26s	2 (GC)	1	**9.221 080**
701 RN	10	26s	2 (GC)	1	**9.221 081** 2
701 RN	10	26s	2 (GC)	6	**6.059 899**
702 RN	25	22s	2 (GC)	1	**9.221 082**
705 RN	50	22s	2 (GC)	1	**9.221 083**
710 RN	100	22s	2 (GC)	1	**9.221 084**
725 RN	250	22s	2 (GC)	1	**9.221 085**
750 RN	500	22s	2 (GC)	1	**9.221 086**
701 LT*	10	26s		1	**9.221 021** 3
702 LT*	25	22s		1	**9.221 022**
705 LT*	50	22s		1	**9.221 023**
710 LT*	100	22s		1	**9.221 024**
725 LT*	250	22s		1	**9.221 025**
750 LT*	500	22s		1	**9.221 026**

* Needle - please order separately.

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9.221 081

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9.221 021

4 Needles for RN syringes

Removable. Not for use in HPLC applications.

Hamilton

Length 51mm
Point style 2

Type	Ext. diam. mm	Int. dia. mm	Gauge	Volume	PK	Cat. No.
7758-02	0.5	0.13	26s	2,5 µl - 100 µl	6	**9.221 692**
7758-03	0.7	0.15	22s	2,5 µl - 100 µl	6	**9.221 693**
7779-01	0.7	0.41	22s	250 µl - 10 ml	6	**9.221 694**
7779-03	0.7	0.15	22s	250 µl - 10 ml	6	**9.221 695**

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1 Microlitre syringes, 800 series, with cemented/ removable needles

Hamilton

With cemented-in, standard needles (N).
With metal handle. Plungers are individually fitted, therefore cannot be interchanged and are not available as replacement parts. Needles are electro-tapered.

With removable needle (RN).
Type RN complete with metal plunger handles.
Type RN B/P are syringes only without metal plunger (replacement syringes).

Needle length 51mm
Point style 2 (GC)

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
85 N		26s	2	1	**9.221 105**
801 N	10	26s	2	1	**9.221 110**
802 N	25	22s	2	1	**9.221 111**
805 N	50	22s	2	1	**9.221 112**
810 N	100	22s	2	1	**9.221 113**
85 RN	5	26s	2	1	**9.221 115**
801 RN	10	26s	2	1	**9.221 116**
802 RN	25	22s	2	1	**9.221 117**
805 RN	50	22s	2	1	**9.221 118**
810 RN	100	22s	2	1	**9.221 119**
825 RN	250	22s	2	1	**9.221 120**
85 RN	5	26s		1	**6.803 384**
801 RN	10	26s		1	**6.222 013**
810 RN	100	22s		1	**6.231 153**
801 RN B/P	10			1	**9.221 172**

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9.221 210

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9.221 251

Microlitre syringes, 1700/1000 series, with LT and gas-tight

Hamilton

Glass barrel with PTFE-coated plunger, seal and with Luer Tip (LT).
Gas-tight microlitre syringe without needle.
MS = Plunger stop fitted to prevent damage to the PTFE seal.
Prevents the plunger tip from reaching the end of the syringe.

Type	Capacity µl	Grad. µl	PK	Cat. No.
1710 LT	100	1	1	**9.221 210** 2
1725 LT	250	5	1	**9.221 225**
1750 LT	500	10	1	**9.221 250**
1001 LT	1000	10	1	**9.221 251** 3
1002 LT	2500	50	1	**9.221 252**
1005 LT	5000	100	1	**9.221 255**

4

9.221 300

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9.221 348

Microlitre syringes, 1700/1000 series, with TLL/ TLLX and gas tight

Hamilton

Glass barrel with PTFE-coated plunger and seal, and Luer lock outlet (TLL).
TLLX with 6-32 UNC female thread. Allows attachment to drive arm mechanisms, e.g. Microlab 500 Series diluters/dispensers.
Gas-tight microlitre syringe without needle.
MS = Plunger stop fitted to prevent damage to the PTFE seal.
Prevents the plunger tip from reaching the end of the syringe.

Type	Capacity µl	Grad. µl	PK	Cat. No.
1702 TLLX, TLL with stop	25	0,25	1	**9.221 300** 4
1705 TLLX, TLL with stop	50	0,5	1	**9.221 305**
1710 TLLX, TLL with stop	100	1	1	**9.221 310**
1725 TLLX, TLL with stop	250	5	1	**9.221 315**
1750 TLLX, TLL with stop	500	10	1	**9.221 320**
1001 TLL	1000	10	1	**9.221 348** 5
1001 TLL W/S	1000	20	1	**9.221 325**
1001 TLLX	1000	0,01	1	**9.221 328**
1002 TLL	2500	50	1	**9.221 330**
1005 TLL	5000	100	1	**9.221 335**
1010 TLL	10000	200	1	**9.221 340**
1025 TLL	25000	500	1	**9.221 347**
1025 TLL	25000	500	1	**9.221 345**

1 Needles for LT/TLL/TLLX syringes

Removable. With Luer tip made of Kel-F. All hypodermic needles available according to specification in 10mm to max. 1000mm lengths. Further point styles available on request. *Hamilton*

Needle length 51mm

Type	Ext. diam. mm	Int. dia. mm	Gauge	Point style	PK	Cat. No.
KF 726s pst2	0.47	0.13	26s	2 (GC)	6	**9.221 609**
KF 726 pst2	0.46	0.26	26s	2 (GC)	6	**9.221 626**
KF 725 pst2	0.51	0.26	25s	2 (GC)	6	**9.221 625**
KF 724 pst2	0.57	0.31	24s	2 (GC)	6	**9.221 624**
KF 723 pst2	0.64	0.34	23s	2 (GC)	6	**9.221 623**
KF 722s pst2	0.72	0.15	22s	2 (GC)	6	**9.221 607**
KF 722 pst2	0.72	0.41	22s	2 (GC)	6	**9.221 622**
KF 721 pst2	0.82	0.51	21s	2 (GC)	6	**9.221 621**
KF 720 pst2	0.91	0.60	20s	2 (GC)	6	**9.221 620**
KF 726s pst3	0.47	0.13	26s	3 (HPLC)	6	**9.221 709**
KF 726 pst3	0.46	0.26	26s	3 (HPLC)	6	**9.221 726**
KF 725 pst3	0.51	0.26	25s	3 (HPLC)	6	**9.221 735**
KF 724 pst3	0.57	0.31	24s	3 (HPLC)	6	**9.221 724**
KF 723 pst3	0.64	0.34	23s	3 (HPLC)	6	**9.221 723**
KF 722s pst3	0.72	0.15	22s	3 (HPLC)	6	**9.221 707**
KF 722 pst3	0.72	0.41	22s	3 (HPLC)	6	**9.221 722**
KF 721 pst3	0.82	0.51	21s	3 (HPLC)	6	**9.221 721**
KF 720 pst3	0.91	0.60	20s	3 (HPLC)	6	**9.221 720**

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Microlitre syringes, 1700/1000 series, with removable needle

Gas-tight microlitre syringes with removable needle (RN). *Hamilton*

Needle length 51mm
Point style 2 (GC)

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
1701 RN	10	26s	2 (GC)	1	**9.221 487** 2
1702 RN	25	22s	2 (GC)	1	**9.221 488**
1702 RN	50	22s	2 (GC)	1	**9.221 489**
1710 RN	100	22s	2 (GC)	1	**9.221 490**
1725 RN	250	22s	2 (GC)	1	**9.221 491**
1750 RN	500	22s	2 (GC)	1	**9.221 492**
1001 RN	100	22s	2 (GC)	1	**9.221 493** 3
1002 RN	2500	22s	2 (GC)	1	**9.221 494**

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9.221 487

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9.221 493

Microlitre syringes, 1700/1000 series, with cemented needle

With PTFE plunger seal. *Hamilton*
Gastight microlitre syringes with cemented-in needles (N).
Needles are electro-tapered (LTN).

Needle length 51mm
Point style 2 (GC)

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
1701 N	10	26s	2 (GC)	1	**9.221 448** 4
1702 N	25	22s	2 (GC)	1	**9.221 449**
1705 N	50	22s	2 (GC)	1	**9.221 450**
1710 N	100	22s	2 (GC)	1	**9.221 455**
1725 N	250	22s	2 (GC)	1	**9.221 460**
1750 LTN	500	22s	2 (GC)	1	**9.221 465**
1001 LTN	1000	22s	2 (GC)	1	**9.221 470** 5
1002 LTN	2500	22s	2 (GC)	1	**9.221 475**
1005 LTN	5000	22s	2 (GC)	1	**9.221 480**
1010 LTN	10000	22s	2 (GC)	1	**9.221 485**

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9.221 448

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9.221 470

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1 Microlitre syringes, 1800 series, with ceneted or removable needle

10µl to 250µl *Hamilton*

- for use with gases and liquids
- removable needles (RN) or cemented needles (N)
- precision-machined PTFE-tipped plungers
- reinforced plungers
- plunger assemblies and glass barrels are replaceable

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
1801 N	10	26s	2	1	**9.221 836**
1802 N	25	22s	2	1	**9.221 837**
1805 N	50	22s	2	1	**9.221 838**
1810 N	100	22s	2	1	**9.221 839**
1825 N	250	22s	2	1	**9.221 840**
1801 RN	10	26s	2	1	**9.221 831**
1802 RN	25	22s	2	1	**9.221 832**
1805 RN	50	22s	2	1	**9.221 833**
1810 RN	100	22s	2	1	**9.221 834**
1825 RN	250	22s	2	1	**9.221 835**

2

2 Microlitre syringes, 7000 series, with removable needle

- 0.5µl - 5µl *Hamilton*
- For use with liquids
- Removable needles (KH)
- Positive displacement
- Sample contained in the needle
- No dead volume
- Replaceable syringe parts

Needle length 70mm

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
7000.5 KH	0.5	50s	2	1	**6.700 111**
7001 KH	1.0	47s	2	1	**9.221 121**
7101 KH	1.0	70s	2	1	**6.802 391**
7002 KH	2.0	50s	2	1	**6.204 624**
7102 KH	2.0	63s	2	1	**6.801 037**
7105 KH	5.0	56s	2	1	**9.221 125**
7000.5OC KH	0.5	23s	3	1	**9.221 590**
7000.5 KH	0.5	50s	3	1	**9.221 126**
7001 KH	1.0	47s	3	1	**6.802 598**
7101 KH	1.0	70s	3	1	**9.221 131**
7002 KH	2.0	50s	3	1	**9.221 122**
7102 KH	2.0	63s	3	1	**9.221 132**
7105 KH	5.0	56s	3	1	**6.050 160**

Spare unit for Microlitre syringes, 7000 series

Hamilton

Type	PK	Cat. No.
Spare unit for syringes 7000.5	1	**9.221 181**
Spare unit for syringes 7001	1	**9.221 182**
Spare unit for syringes 7002	1	**9.221 183**
Spare unit for syringes 7105	1	**9.221 184**
Spare unit for syringes 7101	1	**9.221 185**
Spare unit for syringes 7102	1	**9.221 186**

3

3 Microlitre syringe needles for HPLC

Removable. For use with Rheodyne valves and Valco system VSF 2. *Hamilton*
Fit Hamilton syringes from 5µl to 100µl capacity.

Needle length 51mm

Type	Volume litres	Gauge	Point style	PK	Cat. No.
7780-04	250 µl - 1000 µl	22s	3 (HPLC)	6	**6.203 934**
7770-01	2,5 µl - 100 µl	22s	3 (HPLC)	6	**9.221 603**

Microlitre syringes for GC-autosamplers A

With cemented-in needles (N). For GC-autosamplers Agilent 7670 A, 7671 A, 7672 A and CTC GC PAL autosampler. *Hamilton*

Syringe types with Special needle (SN) available on request.
Needle length 51mm

Type	Capacity µl	Gauge	Point style	PK	Cat. No.
75 N CTC	5.0	26s	AS	1	**6.304 828**
701 N	10.0	26s	2 (GC)	1	**9.221 002** 1
701 N CTC	10.0	26s	2 (GC)	1	**6.301 578**
701 N CTC	10.0	26s	AS	1	**6.303 229**
7701.2 CTC	1.2	26s	AS	1	**6.900 991**
1701 N	10.0	26s	2 (GC)	1	**9.221 448**
1702 N CTC Slim Line	25.0	26s	AS	1	**9.221 040**
1702 N CTC	25.0	26s	AS	1	**6.239 337**
1710 CTC	100.0	26s	AS	1	**6.206 124**
1725 N CTC	250.0	26s	AS	1	**6.239 360** 2
1750 N CTC	500.0	26s	AS	1	**9.221 041**

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9.221 002

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6.239 360

Microlitre syringe for GC-Autosampler

With cemented-in needles (N). For autosamplers Agilent 7673 - 7683, 6850 ALS and CTC GC PAL instruments. *Hamilton*

Syringe types with Special needle (SN) available on request.
Gauge: 23s

Type	Capacity µl	Point style	Needle length	PK	Cat. No.
701 N CTC	10	2	51	1	**9.221 063**
701 N CTC	10	AS	51	1	**7.636 288** 4
701 ASN	10	AS	43	1	**9.221 196** 3

3

9.221 196

4

7.636 288

5 6 GC-Syringes CTC Headspace®

The new High Dynamic (HD-) plunger has been optimised for higher throughput in the headspace technique. This headspace syringe has been designed for the CTC PAL autosampler system. Modern GC Headspace analysis requires injecting over large temperature ranges. Traditional headspace syringes are composed of rubber O-ring sealed plungers which have a limited sealing performance at high temperatures. *Hamilton*

Advantages:
- New sealing system based on a novel metal spring allows working with enhanced tightness
- Excellent performance over a large temperature range and temperature gradients
- Increased life-time compared to traditional headspace syringes
- Increased accuracy and reproducibility of headspace GC analysis

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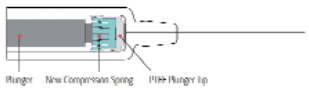

Type	Capacity µl	Gauge	Needle length mm	Point style	PK	Cat. No.
1001	1000	23	56	5	1	**6.200 515**
1001	1000	26	56	5	1	**6.303 926**
1002	2500	23	51	5	1	**6.201 089**
1002	2500	26	51	5	1	**6.801 137**
1005	5000	23	51	5	1	**6.235 326**
1005	5000	26	51	5	1	**9.221 065**

7 Microlitre syringe C-Line for HPLC-Autosampler, for CTL autosampler

With cemented-in needles (N). *Hamilton*

Replacement plungers available on request.
Gauge 22s
Needle length 51mm
Point style 3 (HPLC)

Type	Capacity µl	PK	Cat. No.
700 Slim Line	10	1	**6.200 686**
1700 Slim Line	10	1	**9.221 052**
1700	25	1	**6.200 903**
1700 Slim Line	25	1	**6.236 085**
1700 Slim Line	100	1	**7.200 498**
1700	250	1	**6.803 417**
1700	500	1	**9.221 051**
1000	1000	1	**7.210 113**
1000	2500	1	**7.210 114**
1000	5000	1	**9.221 053**

7

Microliter™ Syringes

For Chromatography

For more than 50 years, Hamilton has been satisfying customer needs in the field of precision fluid measuring. It all started with syringes. Not commercial, mass-produced medical syringes, but precision measuring instruments. We at Hamilton combine top quality materials with skilled workmanship, ensuring the highest possible performance level of every precision fluid device we manufacture. With proper care and handling, Hamilton syringes will provide unsurpassed performance in precision fluid handling year after year.

HAMILTON

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Solid phase extraction

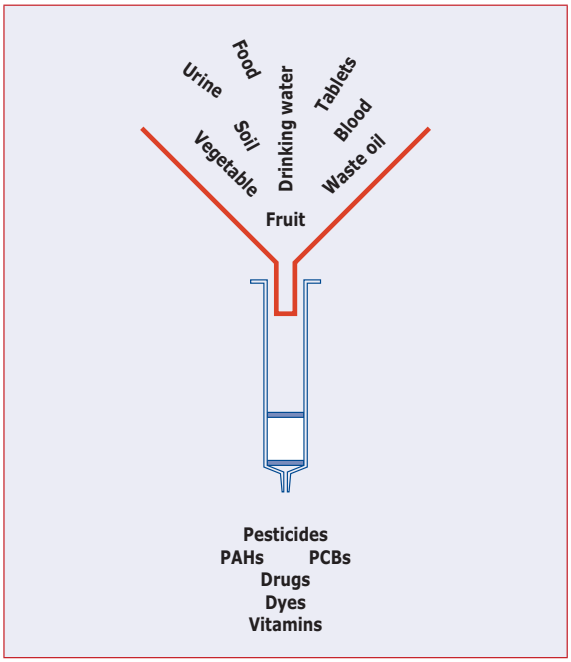
Basic principles of SPE

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

More than 20 years ago MACHEREY-NAGEL designed and introduced CHROMABOND® SPE cartridges containing silica-based adsorbents. Since then we developed the widest range of phases and products for SPE based on silica and polymeric materials.

SPE has capabilities in a broad range of applications:

- environmental analyses
- pharmaceutical and biochemical analyses
- organic chemistry
- food analysis



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

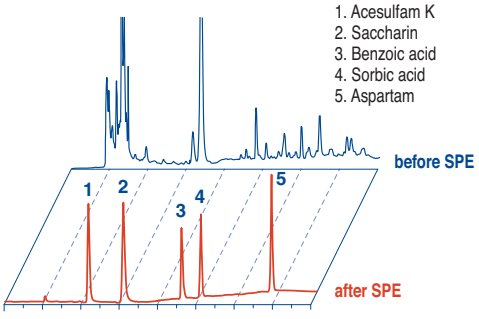
In general, SPE is used for three important purposes in state-of-the-art analyses:

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

Advantages of SPE compared to classical liquid-liquid extraction:

- lower consumption of solvents
- faster – enormous time savings
- lower costs per sample
- potential for automation
- high consistency in individual sample handling
- more specific selectivity because of the broad range of adsorbents and different retention mechanisms
- optimisation of extraction by variation or adjusting of the solid phase and chromatographic conditions

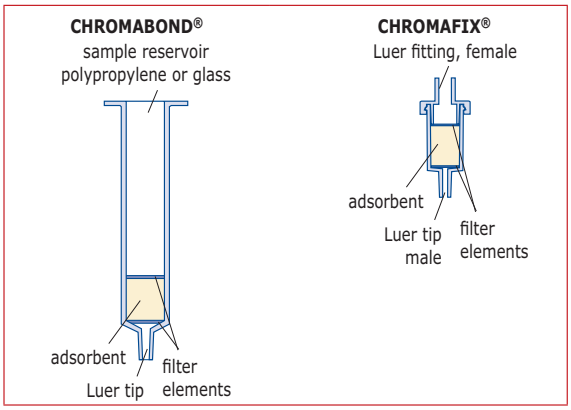
Separation of food additives



Basic principles and summary of MN phases for SPE

Design of columns and cartridges

All CHROMABOND® columns and CHROMADIX® cartridges are manufactured from polypropylene (PP) with lowest content of extractables (plasticizers, stabilisers, ...) offering blank value free results by usage of most common solvents. The high quality CHROMABOND® adsorbents are kept in place by chemically very inert polyethylene filter elements (PE, standard pore size 20 µm). Funnel-shaped large volume columns, 96-well plates and cartridges for automated and on-line SPE packed with CHROMABOND® adsorbents are available on request.



CHROMABOND® polypropylene columns

- PP columns with PE filter elements
- different sizes from 1, 3, 6 up to 150 ml
- adsorbent weights from 20 mg to 50 g
- male luer tip as exit
- compatible with most robots (e.g., Gilson ASPEC™, Caliper AutoTrace®)

CHROMABOND® glass columns are available on request.

CHROMAFIX® cartridges

- PP cartridges with PE filter elements
- three different sizes with different adsorbent weights: **S**mall (0.4 ml), **M**edium (0.8 ml), **L**arge (1.8 ml))
- female Luer tip at the inlet, male Luer tip as exit
- offers alternative way of handling using positive pressure by syringes or peristaltic pumps
- especially suited for convenient SPE of small sample volumes

Phase	Matrix	Modification / Application	Similar phases*
RP phases			
HR-X	PS/DVB		ENVI-Chrom P, Strata™-X, Oasis® HLB, Nexus
PS-RP	PS/DVB	removal of organic components	Strata™ SDB-L, Bond Elut® ENV, Bond Elut® LMS, DCS-PS/DVB, ENV PS-DVB, Bakerbond™ H_2O-phobic DVB, Isolute® 101
C_{18}	silica	octadecyl, not endcapped	Strata™ C18-U, Accubond® C18, Bakerbond™ PolarPlus, Isolute® C18, LiChrolut® RP-18
C_{18} Hydra	silica	octadecyl, not endcapped, for polar analytes	
Normal phases			
SiOH	silica	unmodified	Strata™ Si-1, Bond Elut® silica, DSC-Si, LC-Si, CLEAN-UP® silica, Accubond® silica, Bakerbond™ silica gel, Isolute® silica, LiChrolut® Si
NH_2	silica	aminopropyl	Strata™ NH_2, Sep-Pak® NH_2, Bond Elut NH_2, DSC-NH_2, LC-NH_2, CLEAN-UP® aminopropyl, Accubond® NH_2, Bakerbond™ amino, Isolute® NH_2, LiChrolut® NH_2
OH	silica	diol	DSC-Diol, LC-Diol, Accubond® Diol (OH)
Alox A/N/B	aluminium oxide	acidic / neutral / basic	LC-Alumina-A/N/B, Accubond® aluminium oxide A/N/B
Florisil®	magnesium silicate		Strata™ FL-PR, Sep-Pak® Florisil®, Bond Elut® Florisil®, ENVI-Florisil®, LC-Florisil®, CLEAN-UP® Florisil®, Accubond® Florisil®, Bakerbond™ Florisil®, Isolute® FL, LiChrolut® Florisil®
PA	polyamide 6		DPA-6S
Ion exchangers			
SA	silica	benzenesulphonic acid cation exchanger (SCX)	Strata™ SCX, Bond Elut® SCX, DSC-SCX, LC-SCX, CLEAN-UP® Benzenesulfonic Acid, Accubond® SCX, Bakerbond™ Aromatic Sulfonic Acid, Isolute® SCX, LiChrolut® SCX
PSA	silica	propylsulphonic acid cation exchanger	
PS-OH^-	PS/DVB	strong anion exchanger, OH^- form	Oasis® MAX
PS-H^+	PS/DVB	strong cation exchanger, H^+ form	Oasis® MCX, Strata™ X-C
PS-Ag^+	PS/DVB	strong cation exchanger, Ag^+ form	
PS-Ba^{2+}	PS/DVB	strong cation exchanger, Ba^{2+} form	
Phases for special applications			
Drug	silica	bifunctional C_8/SA, for enrichment of drugs from urine	Strata™ Screen-C, Bond Elut® Certify I, DSC-MCAX, Clean Screen® DAU, Accubond® Evidex, Bakerbond™ Narc-2, Isolute® HCX, LiChrolut® TSC
Drug II	silica	bifunctional C_8/SB, for extraction of THC and derivatives as well as acidic analytes from biological fluids	Strata™ Screen-A, Bond Elut Certify II, Clean Screen® THC, Bakerbond® Narc-1, Isolute® HAX
CN/SiOH	silica	combination phase for PAHs from soil	
NH_2/C_{18}	silica	combination phase for PAHs from water	
Na_2SO_4/Florisil®		combination phase for extraction of hydrocarbons from water (DIN H-53 / ISO DIS 9377-4)	
SA/SiOH	silica	combination phase for PCBs from waste oil	
Diamino	silica	**p**rimary and **s**econdary amine functions (PSA), for determination of pesticides in food (QuEChERS method)	Supelclean PSA, Bond Elut PSA

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

1 CHROMABOND® HR-X

Spherical, hydrophobic polystyrene-divinylbenzene resin for SPE *MACHEREY-NAGEL*

Hydrophobic polystyrene-divinylbenzene copolymer pH stability 1 to14. High-purity material with highest reproducibility and lowest blank values due to a novel manufacturing process, spherical particles 85mm; pore size 55 to 60Å. Very high surface 1000m²/g; capacity 390mg/g (caffeine in water). Excellent recovery rates especially for the enrichment of pharmaceuticals/active ingredients due to the spherical structure of the particles, very homogeneous surface, and optimised pore structure.

Recommended applications: pharmaceuticals/active ingredients from tablets, creams and water/waste water, drugs and pharmaceuticals from urine, blood, serum and plasma trace analysis of pesticides.

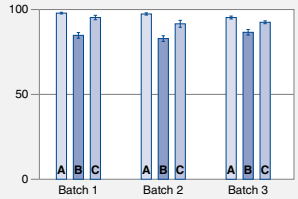
Capacity ml	Capacity mg	PK	Cat. No.
1	30	30	**4.003 808**
3	60	30	**4.003 811**
1	100	30	**4.003 809**
6	200	30	**4.003 814**
3	500	30	**4.003 813**
15	500	20	**4.003 819**
15	1000	20	**4.003 820**
3	200	250	**4.003 806**
6	200	250	**4.003 815**

BIGpacks: 4.003 806/4.003 815
Cartridges in further sizes and phases of the HR-X poduct range available on request.

Highest reproducibility

✓ within each batch ✓ from batch to batch

Compounds:
A phenobarbital
B pentobarbital
C hexobarbital



Barbiturates from serum

Column type:
CHROMABOND® HR-X
3 ml / 200 mg
Sample: 100 ng/ml each in serum
Column conditioning: 5 ml methanol, 5 ml dist. water
Sample application: 1 ml spiked serum
Column washing: 5 ml water
Elution: after drying 3 x 2 ml methanol

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

MN Appl. No. 304290

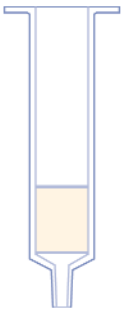
Standard protocol for method development with CHROMABOND® HR-X

Column type:
CHROMABOND® HR-X
3 ml / 200 mg
Sample pretreatment: if necessary, adjust pH value
Column conditioning: 5 ml methanol
Equilibration: 5 ml water
Sample application: slowly aspirate the sample through the column
Column washing: 5 ml water – methanol (95:5, v/v)
Elution: after drying 3 x 2 ml methanol

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

MN Appl. No. 304310

2 CHROMABOND® C_{18}



Octadecyl modified silica phase for SPE, not endcapped *MACHEREY-NAGEL*

Base material silica, pore size 60Å, particle size 45µm for C_{18}, specific surface 500m²/g, pH stability 2 to 8 octadecyl phases, not endcapped, carbon content 14% possesses more free silanols (SiOH), which allow secondary interactions with polar groups of the analytes.

Recommended applications: non-polar compounds, pesticides.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**6.226 798**
3	200	50	**9.003 487**
3	500	50	**9.003 488**
6	500	30	**6.902 222**
6	2000	30	**4.003 512**
6	1000	30	**6.234 031**
15	2000	20	**4.003 464**
45	5000	20	**6.700 747**
70	10000	10	**4.003 561**
3	500	250	**4.003 433**
6	500	250	**4.003 435**
6	1000	250	**4.003 437**

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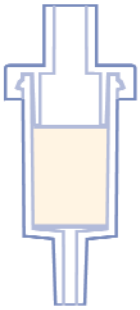

1 CHROMAFIX® C18

Octadecyl modified silica phase, not endcapped. *MACHEREY-NAGEL*

Size	Capacity mg	PK	Cat. No.
S	270	50	**7.083 665**
M	530	50	**7.079 617**
L	950	50	**4.003 838**

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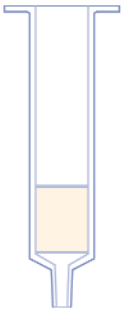


2 CHROMABOND® C_{18} Hydra

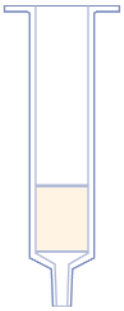
Octadecyl modified silica phase for SPE of polar analytes *MACHEREY-NAGEL*

Base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8, special octadecyl phase for polar analytes, not endcapped, carbon content 15%.

Recommended applications: more polar compounds like pesticides and their polar degradation products, phenols, phenoxycarboxylic acids, nitroaromatics, pharmaceuticals.

Capacity ml	Capacity mg	PK	Cat. No.
1	50	100	**4.003 565**
1	100	100	**4.003 566**
3	200	50	**4.003 567**
3	500	50	**4.003 569**
6	500	30	**4.003 573**
3	1000	50	**4.003 571**
6	1000	30	**4.003 575**
6	2000	30	**4.003 576**
6	3000	30	**4.003 577**

3



3 CHROMABOND® NH_2

Aminopropyl modified silica phase for SPE *MACHEREY-NAGEL*

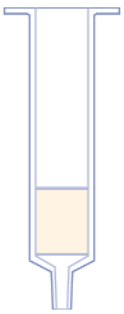
Base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8, aminopropyl phase, carbon content 3.5%, polar, weak anion exchanger.

Recommended applications: trace elements, lipids.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**4.003 465**
3	200	50	**4.003 609**
3	500	50	**6.228 063**
3	500	250	**4.003 466**
6	500	30	**6.224 868**
6	1000	30	**6.224 845**

BIGpacks: 4.003 466

4



4 CHROMABOND® OH (Diol)

Diol modified silica phase for SPE *MACHEREY-NAGEL*

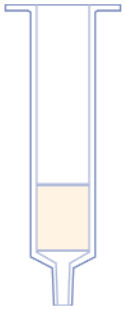
Base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8, diol phase, carbon content 5.5%, polar properties similar to SiOH.

Recommended application: antibiotics, prostaglandins.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**4.003 470**
3	200	50	**4.003 610**
3	500	50	**4.003 471**
6	500	30	**6.224 847**

1 CHROMABOND® SiOH

1



Unmodified silica phase for SPE *MACHEREY-NAGEL*

Unmodified, weakly acidic silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8, very polar, adsorbs humidity from air, for this reason it should be kept well closed and if necessary dried before use due to its high affinity for polar compounds it should not be conditioned with polar (e.g. methanol) or water-containing solvents.

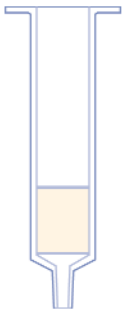
Recommended applications: aflatoxins, chloramphenicol, pesticides, steroids, vitamins.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**6.225 223**
3	200	50	**4.003 547**
3	500	50	**7.085 047**
6	500	30	**6.801 894**
6	1000	30	**4.003 481**
6	2000	30	**4.003 498**
15	2000	20	**4.003 550**
45	5000	20	**4.003 605**
70	10000	10	**6.202 850**
150	50000	10	**4.003 630**
3	500	250	**4.003 477**
6	1000	250	**4.003 482**
6	2000	250	**4.003 499**

BIGpacks: 4.003 477/4.003 482/4.003 499

2 CHROMABOND® Alox A/Alox N/Alox B

2



aluminium oxide, acidic, neutral, basic *MACHEREY-NAGEL*

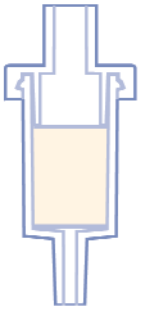
aluminium oxide, high purity, pore volume 0.90ml/g, particle size 60 to 150µm, specific surface 150m²/g, acidic, pH 4 ±0.5, recommended application: together with phase SA for PCB and pesticides.

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

Phase	Capacity ml	Capacity mg	PK	Cat. No.
Alox A	3	500	50	**4.003 621**
Alox A	6	500	30	**4.003 622**
Alox A	6	1000	30	**4.003 456**
Alox A	45	4000	20	**4.003 623**
Alox N	3	500	50	**4.003 619**
Alox N	6	500	30	**4.003 620**
Alox N	6	1000	30	**6.224 843**
Alox N	45	4000	20	**6.226 917**
Alox B	3	500	50	**4.003 615**
Alox B	6	500	30	**4.003 628**
Alox B	6	1000	30	**4.003 458**
Alox B	45	4000	20	**4.003 629**

3 CHROMAFIX® Alox N

3



Aluminium oxide, neutral, pH 7 ±0.5 *MACHEREY-NAGEL*

Size	Capacity mg	PK	Cat. No.
S	850	50	**4.003 853**
L	1700	50	**4.003 854**

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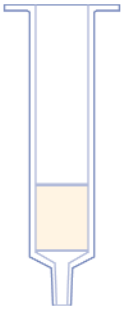


1 CHROMABOND® Florisil®

Magnesium silicate for SPE *MACHEREY-NAGEL*

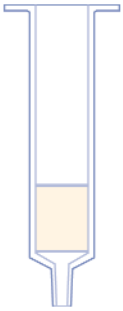
Matrix magnesium silicate (MgO to SiOH 15:85), high purity, particle size 150 to 250µm.

Recommended application: organic tin compounds, aliphatic carboxylic acids, PCB, PAH.

Capacity ml	Capacity mg	PK	Cat. No.
3	200	50	**4.003 624**
3	500	50	**4.003 488**
6	500	30	**4.003 557**
6	1000	30	**6.224 842**
6	1000	250	**4.003 489**
6*	1000	30	**4.003 490**

BIGpacks: 4.003 489
*Glass columns

2



2 CHROMABOND® PA

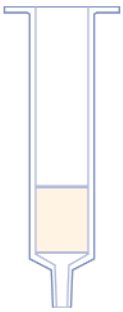
Polyamide 6 for SPE *MACHEREY-NAGEL*

Matrix polyamide 6, unmodified, high purity, particle size 40 to 80µm.

Recommended application: flavonoids, PAH.

Capacity ml	Capacity mg	PK	Cat. No.
3	200	50	**4.003 595**
3	500	50	**4.003 511**
6	500	30	**7.089 089**
6	1000	30	**7.400 537**

3



3 CHROMABOND® PSA

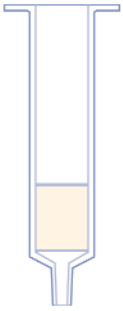
Propylsulphonic acid modified silica cation exchanger for SPE *MACHEREY-NAGEL*

Base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8,
propylsulphonic acid modified silica, very strong cation exchanger (capacity ~ 0.7meq/g),
contrary to the SA phase no P-P interactions.

Recommended applications: weak cations.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**4.003 626**
3	500	50	**4.003 627**
6	1000	30	**6.206 233**

4



4 CHROMABOND® SA

Benzenesulphonic acid modified silica cation exchanger for SPE (SCX) *MACHEREY-NAGEL*

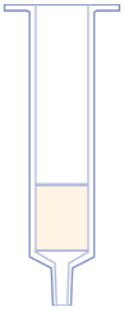
Base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8,
benzenesulphonic acid modified silica, strongly acidic cation exchanger (capacity ~ 0.5meq/g).
Adsorbent with hydrophobic and Π-Π interactions (benzene ring).
Ion exchange of organic compounds from aqueous matrix.
Elution of interesting compounds with solvent systems, which compensate the ionic and nonpolar interactions,
e.g. methanolic HCl.

Recommended application: amino acids, amines, chlorophyll, PCB.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**6.314 563**
3	200	50	**4.003 563**
3	500	50	**7.051 056**
6	500	30	**4.003 613**
6	1000	30	**6.224 846**
3	500	250	**4.003 485**

BIGpack: 4.003 485

1 SPE phases for RP/ ion chromatography



SPE phases for polymer-based RP and ion chromatography *MACHEREY-NAGEL*

Base material: high-purity polystyrene-divinylbenzene copolymers (PS/DVB)
pore size 100 Å, paricle size 100µm. Verly low degree of swelling, thus very well suited for chromatography.
Reliable function over the whole pH range from 0-14. Different modifications for different applications from elimination of nonpolar compounds up to removal of specific polar comonents.

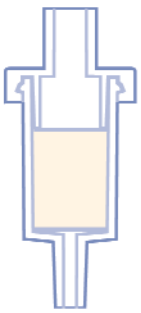
Recommended application:
Removal of interfering compounds
- improves chromatographic separtions, if the interfering components overlap with the analyte in the chromatogram
- improves lifetime of the chromatographic column, since interfering components can irreversibly block the column packing

Enrichment of the analytes

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

Phase	Capacity ml	Capacity mg	PK	Cat. No.
PS-OH-	3	200	30	**4.003 600**
PS-H+	3	200	30	**4.003 702**
PS-OH-	3	500	30	**4.003 581**
PS-H+	3	500	30	**4.003 589**
PS-OH-	6	500	30	**4.003 591**
PS-H+	6	500	30	**4.003 590**

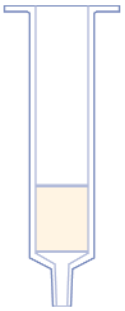
2 CHROMAFIX® PS



MACHEREY-NAGEL

Phase	Size	Capacity mg	PK	Cat. No.
PS-RP	S	200	50	**4.003 869**
PS-OH-	S	200	50	**4.003 867**
PS-H+	S	230	50	**4.003 866**
PS-Ag+	S	240	50	**4.003 865**
PS-Ba2+	S	280	50	**4.003 868**
PS-RP	M	320	50	**6.228 258**
PS-OH-	M	380	50	**4.003 861**
PS-H+	M	430	50	**7.401 474**
PS-Ag+	M	480	50	**4.003 864**
PS-Ba2+	M	550	50	**7.402 218**
PS-OH	L	800	50	**4.003 862**
PS-H+	L	900	50	**4.003 863**

3 CHROMABOND® Drug



Special silica phase for SPE enrichment of drugs from urine or plasma *MACHEREY-NAGEL*

Base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8,
special bifunctional modification - C_8/SA (strong cation exchanger - benzenesulphonic acid).

Recommended application: enrichment of acidic, neutral and basic drugs from urine or plasma.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**4.003 696**
3	200	50	**6.802 715**
3	500	50	**4.003 699**
6	500	30	**4.003 697**

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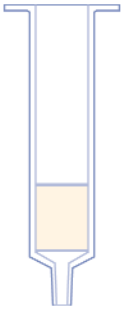


1 CHROMABOND® Drug II

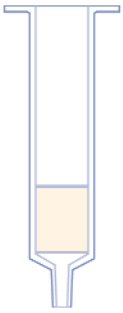
Special silica phase for SPE of THC and derivatives acidic analytes from biological fluids (urine, blood ...) *MACHEREY-NAGEL*

base material silica, pore size 60Å, particle size 45µm, specific surface 500m²/g, pH stability 2 to 8, special bifunctional modification - C_8/SB (strong anion exchanger - quaternary amine).

Recommended applications: extraction of THC and derivatives from urine, blood, serum, plasma, acidic analytes from biological fluids.

Capacity ml	Capacity mg	PK	Cat. No.
1	100	100	**4.003 700**
3	200	50	**4.003 695**
3	500	50	**4.003 701**
6	500	30	**4.003 698**

2



2 CHROMABOND® NH_2/C_{18}

Combination phase for SPE analysis of PAH from water containing humic acids *MACHEREY-NAGEL*

Special combination phase: aminopropyl phase for removal of interfering humic acids, octadecyl phase for enrichment of PAH.

Recommended application: PAH from water containing humic acids.

Capacity ml	Capacity ml / mg	PK	Cat. No.
6	500 / 500	30	**6.228 257**
6	500 / 1000	30	**4.003 675**

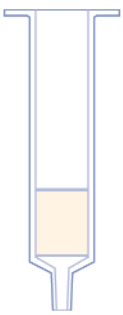
Glass columns available on request.

PAHs from water containing humic acids

Column type:
CHROMABOND® NH_2/C18, 6 ml, 500 mg/1 g glass column
Sample pretreatment:
mix 500 ml water sample with 25 ml 2-propanol
Column conditioning: 10 ml dichloromethane, 10 ml methanol, then 10 ml dist. water – 2-propanol (9:1, v/v)
Sample application: aspirate 500 ml of the pretreated water sample through the column (~ 5 ml/min)
Washing: 2 ml dist. water – 2-propanol (9:1, v/v), then dry column (about 20 min, vacuum)
Elution: 4 x 0.5 ml CH_2Cl_2 (percolate first 0.5 ml into the column packing without vacuum, the apply light vacuum), if necessary evaporate in a stream of nitrogen and fill up with a suitable solvent

MN Appl. No. 301260

3



3 CHROMABOND® CN/SiOH

Combination phase for SPE analysis of PAH *MACHEREY-NAGEL*

Special combination phase, cyanopropyl phase for selective adsorption of polycyclic aromatics via Π-Π interactions, unmodified silica phase for removal of polar compounds.

Recommended applications: Extraction of the 16 PAHs according to EPA from soil samples.

Capacity ml	Capacity ml / mg	PK	Cat. No.
3	500 / 1000	50	**4.003 507**
6	500 / 1000	30	**6.233 128**
6	500 / 1000	250	**4.003 514**

BIGpack: 4.003 514

PAHs from soil

Column type:
CHROMABOND® CN/SiOH,
6 ml, 500/1000 mg

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

Column conditioning: 4 ml petroleum ether

MN Appl. Nr. 301310

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

Washing: 2 ml petroleum ether

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

Further analysis: HPLC, e.g. with column 250 x 3 mm NUCLEOSIL® 5 C_{18} PAH
recovery rates see application 301310 at *www.mn-net.com*

1 CHROMABOND® Na_2SO_4/Florisil®

Combination phase for SPE of hydrocarbons from water acc. to DIN H53/ISO DIS 9377-4

MACHEREY-NAGEL

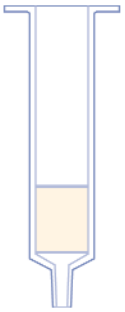
Special combination phase of sodium sulphate and Florisil®.

Recommended application: hydrocarbons from drinking, surface and waste waters.

Capacity ml	Capacity ml / mg	PK	Cat. No.
6	2000 / 2000	30	**4.003 558**
6*	2000 / 2000	30	**6.900 415**
6*	2000 / 2000	250	**4.003 559**

BIGpacks: 4.003 559
*Glass columns

1



Hydrocarbons from water

Column type:
CHROMABOND® Na_2SO_4/Florisil®,
2000/2000 mg, 6 ml glass column

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

Sample pretreatment: adjust 900 ml water (10 °C) with HCl (12 mol/l) to pH 2 and add 80 g $MgSO_4$. Add 50 ml of the extraction solution, close the bottle and stir the suspension intensely for 30 min.

Add enough dist. water to separate the organic from the aqueous phase.

Column conditioning: 5 ml petroleum ether

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

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

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

MN Appl. No. 302090

2 CHROMABOND® SA/SiOH

Combination phase for SPE analysis of PCB

MACHEREY-NAGEL

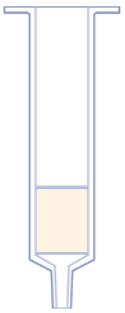
Special combination phase:
SA: strongly acidic cation exchanger based on silica with benzenesulphonic acid modification.
SiOH: unmodified silica for removal of polar compounds.

Recommended application: extraction of PCB from waste oil (hexane extract).

Capacity ml	Capacity ml / mg	PK	Cat. No.
3	500 / 500	50	**6.901 798**
3	500 / 500	250	**4.003 513**

BIGpack: 4.003 513

2



PCBs from waste oil

Column type:
CHROMABOND® SA/SiOH, 3 ml, 500/500 mg

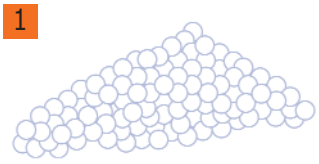
Column conditioning: 1 ml *n*-hexane
Sample application:
apply 250 µl waste oil to the column and aspirate or force it into the adsorbent with 2 x 1 ml *n*-hexane

MN Appl. No. 301390

Elution: aspirate or force another 2 x 500 µl *n*-hexane through the column; collect all *n*-hexane fractions and if necessary adjust to a concentration suitable for subsequent analysis by either evaporting *n*-hexane in a stream of nitrogen or by dilution with *n*-hexane

Recovery rates:
PCB-28 97 %, PCB-52 96 %. PCB-101 95 %, PCB-138 90 %, PCB-153 95 %, PCB-180 96 %, PCB-209 100 %

1



1 Adsorbent CHROMABOND® Diamino

MACHEREY-NAGEL

Weight g	PK	Cat. No.
100	100	**4.003 688**
20	20	**4.003 689**

2

2 Accessories CHROMABOND® QuEchERS

MACHEREY-NAGEL

Type	PK	Cat. No.
50ml PP-centrifuge tube with crew cap	50	**4.003 552**

3

3 CHROMABOND® vacuum manifolds and accessories

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

MACHEREY-NAGEL

Vacuum manifold complete consists of: glass cabinet with lid and lid gasket, removable needles on lower side of lid, vacuum gauge, control valve, valves and caps, variable rack.

Description	PK	Cat. No.
Vacuum manifold complete for up to 12 columns or cartridges (incl. reservoir tank)	1	**9.003 479**
Vacuum manifold complete for up to 16 columns or cartridges	1	**4.003 586**
Vacuum manifold complete for up to 24 columns or cartridges	1	**7.056 914**
Lids with gaskets for 12 columns (incl. Luer fittings and valves), plastic	1	**4.003 530**
Gaskets for lid with 12 positions (4.003 530, 9.003 479)	2	**6.801 608**
Luer fittings for lid, female	12	**4.003 534**
Luer fittings for lid, male	12	**4.003 535**
Valves, plastic	12	**7.089 161**
Stainless steel needles	12	**7.079 432**
Drying attachment for 12 columns	1	**4.003 536**
Products for protection from cross contamination valve, brass, tarnished	1	**4.003 538**
Products for protection from cross contamination valve as above	12	**7.089 162**
Products for protection from cross contamination stainless steel connectors E & OE.	12	**7.079 431**
Tubing adaptor for 1,3 and 6 ml polypropylene columns (PTFE)	4	**6.900 713**

Syringe filters CHROMAFIL®

Sample clarification

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

Advantages:

- **Polypropylene housing**
  considerably better solvent stability compared to acrylate and polystyrene filters, low content of extractable substances
- **Housing ultrasonically sealed, not glued**
  no extractable components from glues
- The special **thick rim** of the housing is ideal for use of the filters in laboratory robots (e.g. Benchmate™).
- **Filtration in both directions** possible, the liquid cannot bypass the membrane
- **Luer lock on side of entry**
  safe connection on the "high pressure" side
- **Luer exit**
  standard luer for 25 mm filters, minispike luer with low dead volume and small OD for 15 mm filters. Filter inlet and filter exit can be fitted to the CHROMABOND® columns for selective sample preparation with the aid of a special adaptor.
- **Deflector**
  the stream of liquid is broken and distributed, and does not directly hit the membrane: this prevents rupture of the membrane
- **Star-shaped distribution device**
  the liquid is evenly distributed to the whole membrane surface: this results in a better utilisation of the total area; the filter is not plugged up rapidly; high flow efficiency
- **Colour coded filters**
  filters with 0.2 µm pores have a yellow upper shell, that of filters with 0.45 µm pores is colourless; the different membrane types are distinguished by different colours of the lower shell
- Available **pore sizes** 0.2 and 0.45 µm (exceptions: PET filters with 1.2 µm, glass fibre filters with 1 µm, PES filters with 5 µm)
- **Filter sizes:** 25 and 15 mm diameter The small diameter filters are especially recommended for very small samples, which require extremely low dead volumes: 80 µl for 25 mm ∅, 12 µl for 15 mm ∅
- All filters can be **autoclaved** at **121 °C** and **1.1 bar** for 30 min.

Recommended filter size depending on sample volume

sample volume	recommended filter diameter
1 – 10 ml	15 mm
10 – 100 ml	25 mm

CHROMAFIL® BIG-BOXES

- 400 (25 mm) or 800 (15 mm) quality syringe filters
- food safe PE box with screw cap
- economical price

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

Material
Polyester (PET) with or without glass fibre prefilter **Regenerated cellulose** (RC) **Teflon®** (PTFE) **Cellulose mixed esters** (MV) **Cellulose acetate** (CA) · sterile and non-sterile **Polyamide / Nylon** (PA) **Polyethersulfone** (PES) · sterile **Polyvinylidene difluoride** (PVDF) with or without glass fibre prefilter **Glass fibre** (GF)

Chemical compatibility of filter materials

The following table lists the chemical compatibility of our CHROMAFIL® materials. The chemical compatibility depends on several parameters such as time, pressure, temperature and concentration.

In most cases, CHROMAFIL® filters will have only short contact with a solvent. In these cases they may be used despite of limited compatibility.

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

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

Data not guaranteed. ⊕ resistant, ⊖ not resistant, ○ limited resistance

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

Syringe filters CHROMAFIL®

CHROMAFIL® Xtra *MACHEREY-NAGEL*

labelled for method validation and cerification

Xtra: imprint for direct identification of membrane type, diameter and pore size
Xtra: low bleeding polypropylene housing
Xtra: colour-free plain polypropylene

CHROMAFIL® syringe filters with polyester (PET) membrane

hydrophilic multipurpose membrane *MACHEREY-NAGEL*

For polar as well as non-polar solvents. The HPLC filter, especially suited for mixtures of water and organic solvents; for TOC/DOC determination; not cytotoxic, does not inhibit the growth of microorganisms and higher cells.

Polyester filter with integrated glass fibre prefilter (GF/PET): recommended for solutions with a high load of particulate matter or for highly viscous solutions.

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
PET-20/25	0.20	25	labelled		100	**4.003 417**
PET-45/25	0.45	25	labelled		100	**6.232 548**
PET-120/25	1.20	25	labelled		100	**6.232 549**
PET-20/25	0.20	25	labelled		400	**4.003 418**
PET-45/25	0.45	25	labelled		400	**4.003 416**
PET-120/25	1.20	25	labelled		400	**6.233 172**
PET-20/15 MS*	0.20	15	yellow	orange	800	**4.003 397**
PET-45/15 MS*	0.45	15	colourless	orange	800	**4.003 398**
GF/PET-20/25	1.0/0.20	25	blue	orange	100	**9.049 079**
GF/PET-45/25	1.0/0.45	25	black	orange	100	**9.049 080**
GF/PET-20/25	1.0/0.20	25	blue	orange	400	**9.049 020**
GF/PET-45/25	1.0/0.45	25	black	orange	400	**9.049 021**

MS = minispike on filter exit
CHROMAFIL® Xtra: 4.003 417/6.232 548/6.232 549/4.003 418/4.003 416/6.233 172
BIG-BOX: 4.003 418/4.003 416/6.233 172/4.003 397/4.003 398/9.049 020/9.049 021
*also available as small pack with 100 pieces

1 CHROMAFIL® syringe filters with regenerated cellulose (RC) membrane

hydrophilic membrane with very low adsorption *MACHEREY-NAGEL*

for aqueous and organic/aqueous liquids i.e. polar and medium polar sample solutions.
Binding capacity for proteins 84µg/25mm filter.

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
RC-20/25	0.20	25	labelled		100	**4.003 424**
RC-45/25	0.45	25	labelled		100	**4.003 426**
RC-20/25	0.20	25	labelled		400	**4.003 425**
RC-45/25	0.45	25	labelled		400	**6.233 891**
RC-20/15 MS	0.20	15	yellow	blue	100	**9.049 025**
RC-20/15 MS	0.20	15	yellow	blue	800	**4.003 399**
RC-45/15 MS	0.45	15	colourless	blue	100	**9.049 026**
RC-45/15 MS	0.45	15	colourless	blue	800	**4.003 400**

MS = minispike on filter exit
BIG-BOX: 4.003 425/6.233 891/4.003 399/4.003 400
CHROMAFIL® Xtra: 4.003 424/4.003 426/4.003 425/6.233 891

1

1

1 CHROMAFIL® PTFE (Polytetrafluorethylene)

hydrophobic membrane *MACHEREY-NAGEL*

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

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
PTFE-20/25	0.20	25	labelled		100	**4.003 409**
PTFE-45/25	0.45	25	labelled		100	**9.049 059**
PTFE-20/25	0.20	25	labelled		400	**4.003 410**
PTFE-45/25	0.45	25	labelled		400	**9.049 060**
O-20/3	0.20	3	natural	natural	100	**9.049 053**
O-45/3	0.45	3	natural	natural	100	**9.049 054**
O-20/15 MS	0.20	15	yellow	natural	100	**9.049 055**
O-45/15 MS	0.45	15	natural	natural	100	**9.049 056**
O-20/15 MS	0.20	15	yellow	natural	800	**4.003 394**
O-45/15 MS	0.45	15	natural	natural	800	**4.003 395**

MS = minispike on filter exit
BIG-BOX: 4.003 410/9.049 060/4.003 394/4.003 395
CHROMAFIL® Xtra: 4.003 409/9.049 059/4.003 410/9.049 060

2

2 CHROMAFIL® MV (cellulose mixed membrane)

Hydrophilic membrane *MACHEREY-NAGEL*
- for aqueous or polar solutions
- CHROMAFIL® Xtra

Type	Pore size µm	Membrane dia. mm	PK	Cat. No.
MV-20/25	0.20	25	100	**4.003 407**
MV-45/25	0.45	25	100	**4.003 405**
MV-20/25	0.20	25	400	**4.003 408**
MV-45/25	0.45	25	400	**4.003 406**

BIG-BOX: 4.003 408/4.003 406

3

3 CHROMAFIL® CA (cellulose acetate)

hydrophilic membrane *MACHEREY-NAGEL*

For filtration of water-soluble oligomers and polymers, especially suited for biological macromolecules.
Very high shape stability in aqueous solutions extremely low binding capacity for proteins (21µg/ 25mm filter).

Available in a sterile package (S) for filtration under sterile conditions (each filter individually sealed).

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
CA-20/25	0.20	25	labelled		100	**4.003 419**
CA-45/25	0.45	25	labelled		100	**4.003 421**
CA-20/25	0.20	25	labelled		400	**4.003 420**
CA-45/25	0.45	25	labelled		400	**4.003 422**
CA-20/25 S*	0.20	25	yellow	red	50	**9.049 036**
CA-45/25 S*	0.45	25	natural	red	50	**9.049 037**

BIG-BOX: 4.003 420/4.003 422
*sterile pack
CHROMAFIL® Xtra: 4.003 419/4.003 421/4.003 420/4.003 422

4

4 CHROMAFIL® PA (Polyamide = Nylon)

rather hydrophilic membrane *MACHEREY-NAGEL*

for aqueous and organic/aqueous medium polar liquids

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
PA-20/25	0.20	25	labelled		100	**4.003 411**
PA-45/25	0.45	25	labelled		100	**6.232 389**
PA-20/25	0.20	25	labelled		400	**4.003 412**
PA-45/25	0.45	25	labelled		400	**6.234 011**
AO-20/3	0.20	3	light beige	light beige	100	**9.049 047**
AO-45/3	0.45	3	light beige	light beige	100	**9.049 048**

BIG-BOX: 4.003 412/6.234 011
CHROMAFIL® Xtra: 4.003 411/6.232 389/4.003 412/6.234 011

1 CHROMAFIL® Polyvinylidene difluoride (PVDF)

hydrophilic membrane *MACHEREY-NAGEL*

for polar and nonpolar solutions, water-soluble oligomers and polymers like proteins
binding capacity for proteins 82µg/25mm filter. The PVDF filter with integrated glass fibre prefilter (GF/P) is recommended for filtration of biological samples with high particle loads.
This filter features a high binding capacity for proteins.
Also suited for filtration of polar and non-polar solutions.

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
PVDF-20/25	0,20	25	labelled		100	**4.003 413**
PVDF-45/25	0,45	25	labelled		100	**9.049 063**
PVDF-20/25	0,20	25	labelled		400	**4.003 414**
PVDF-45/25	0,45	25	labelled		400	**4.003 415**
GF/P-45/25	1,0/0,45	25	black	white	400	**4.003 402**
GF/P-45/25	1,0/0,45	25	black	white	100	**4.003 401**

CHROMAFIL® Xtra: 4.003 413/9.049 063/4.003 414/4.003 415 BIG-BOX: 4.003 414/4.003 402/4.003 415

2 CHROMAFIL® Glass fibre (GF)

inert filter *MACHEREY-NAGEL*

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

Type	Pore size µm	Membrane dia. mm	Housing colour top	Housing colour base	PK	Cat. No.
GF- 100/25	nom. 1.0	25	labelled		100	**6.232 362**
GF- 100/25	nom. 1.0	25	labelled		400	**4.003 423**
GF- 100/15 MS	nom. 1.0	15	blue	natural	100	**9.049 077**

MS = minispike on filter exit CHROMAFIL® Xtra: 6.232 362/4.003 423 BIG-BOX: 4.003 423

3 CHROMAFIL® MULTI 96 filter plates

96-well polypropylene plates for simultaneous filtration of 96 samples *MACHEREY-NAGEL*

Advantages of this high-throughput system are:
- economical by saving time and solvent
- use of multi-channel pipettors facilitates liquid transfer steps
- readily adaptable to all common automated/robotic handling systems
-minimised dead volume (≤ 40µl)
- membrane materials correspond to the respective CHROMAFIL® syringe filters

Description	PK	Cat. No.
Filter plates with cellulose mixed ester filter elements (0.20 µm)	1	**4.003 976**
Filter plates with cellulose mixed ester filter elements (0.45 µm)	1	**4.003 977**
Filter plates with RC filter elements (regenerated cellulose, 0.2 µm)	1	**4.003 971**
Filter plates with RC filter elements (regenerated cellulose, 0.45 µm)	1	**6.227 345**
Filter plates with PTFE filter elements (0.2 µm)	1	**6.227 343**
Filter plates with PTFE filter elements (0.45 µm)	1	**6.227 344**
Filter plates with PTFE filter elements (1.0 µm)	1	**4.003 974**
Filter plates with PTFE filter elements (3.0 µm)	1	**4.003 975**
Filter plates with PE filter elements (20 µm)	1	**4.003 970**
Filter plates with PE filter elements (50 µm)	1	**4.003 973**
Filter plates with glass fibre filter elements (nominal 1 µm)	1	**6.227 346**
Filter plates with glass fibre filter elements (nominal 3 µm)	1	**4.003 972**
Vacuum manifold for monoblocks, with reservoir tank, vacuum gauge and control valve, required for filtration with 96-well filter plates	1	**4.003 962**

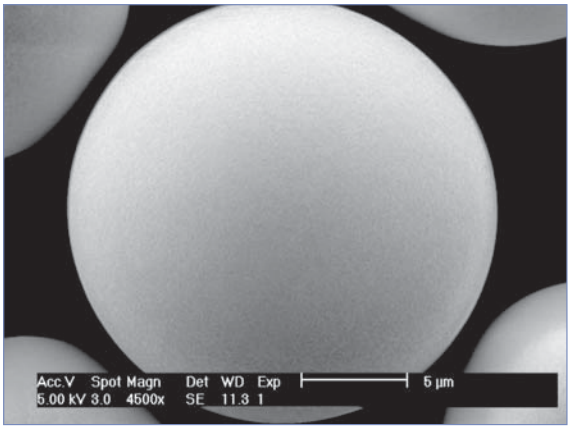
NUCLEODUR® high purity silica for HPLC

NUCLEODUR® is a fully synthetical 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:

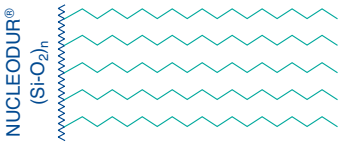
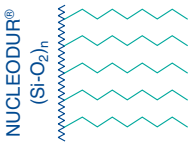
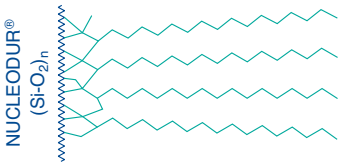
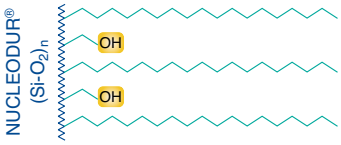
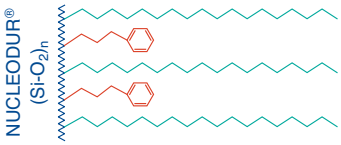
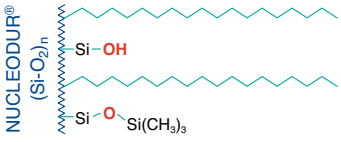
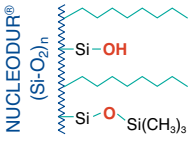
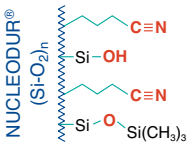
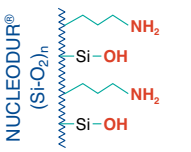
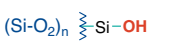
- NUCLEODUR® C_{18} Gravity and C_8 Gravity
- NUCLEODUR® C_{18} Isis
- NUCLEODUR® C_{18} Pyramid
- NUCLEODUR® Sphinx RP
- NUCLEODUR® CN and CN-RP
- NUCLEODUR® NH_2 and NH_2-RP
- NUCLEODUR® C_{18} ec and C_8 ec

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

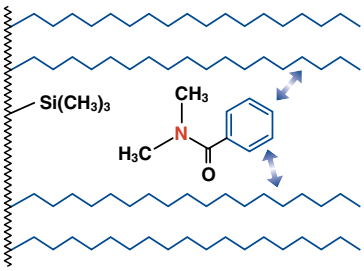
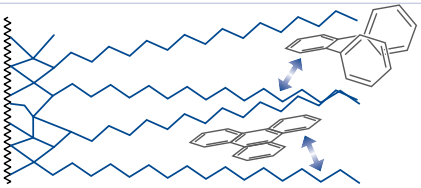
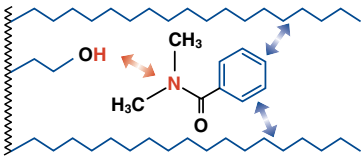
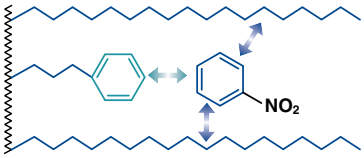
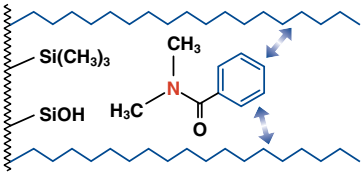
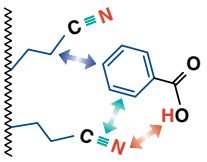
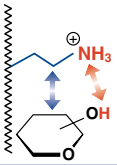
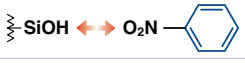
Columns for HPLC

Overview of NUCLEODUR® HPLC phases

Columns for HPLC

Phase	Specification	Characteristics* A	B	C	Stability	Structure
C_{18} Gravity	octadecyl phase, high density coating multi-endcapping 18 % C · USP **L1**	⬢⬢⬢⬢⬢	◖	⬢⬢◖	pH stability 1 – 11, suited for LC/MS	
C_8 Gravity	octyl phase, high density coating multi-endcapping 11 % C · USP **L7**	⬢⬢◖	⬢	⬢◖	pH stability 1 – 11, suited for LC/MS	
C_{18} Isis	octadecyl phase with specially crosslinked surface modification endcapping 20 % C · USP **L1**	⬢⬢⬢⬢◖	⬢⬢	⬢⬢⬢⬢◖	pH stability 1 – 10, suited for LC/MS	
C_{18} 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	
C_{18} ec	octadecyl phase, medium density coating endcapping 17.5 % C · USP **L1**	⬢⬢⬢◖	⬢	⬢⬢◖	pH stability 1 – 9	
C_8 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	
NH_2 / NH_2-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

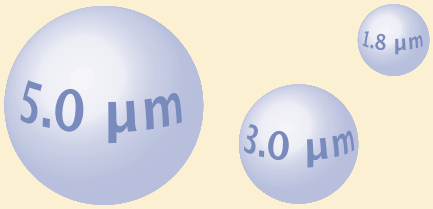
Application	Similar phases**	Separation principle · Retention mechanism	
in general compounds with ionizable functional groups such as basic pharmaceuticals and pesticides	**NUCLEOSIL® C_{18} HD** Waters Xterra® RP_{18} / MS C_{18}; Phenomenex Luna® C18 (2), Synergi™ und Max RP; Zorbax® Extend C18; Inertsil® 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® C_8 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® C_{18} 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® C_{18}** 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® C_8 ec / C_8** 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® NH_2 / NH_2-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

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: C_{18} Gravity, C_8 Gravity, C_{18} Isis, C_{18} 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

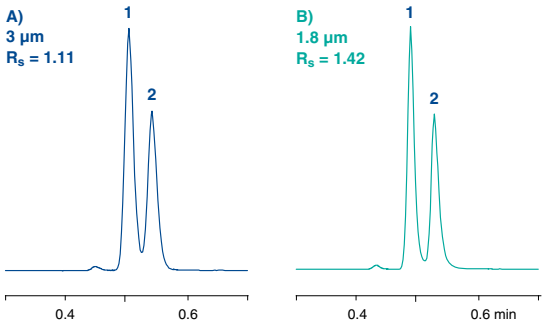
	NUCLEODUR® C_{18} Gravity	Competitor A
3 µm	70 bar	–
1.8 µm	130 bar	170 bar

- **shorter run times**

Resolution as a function of particle size

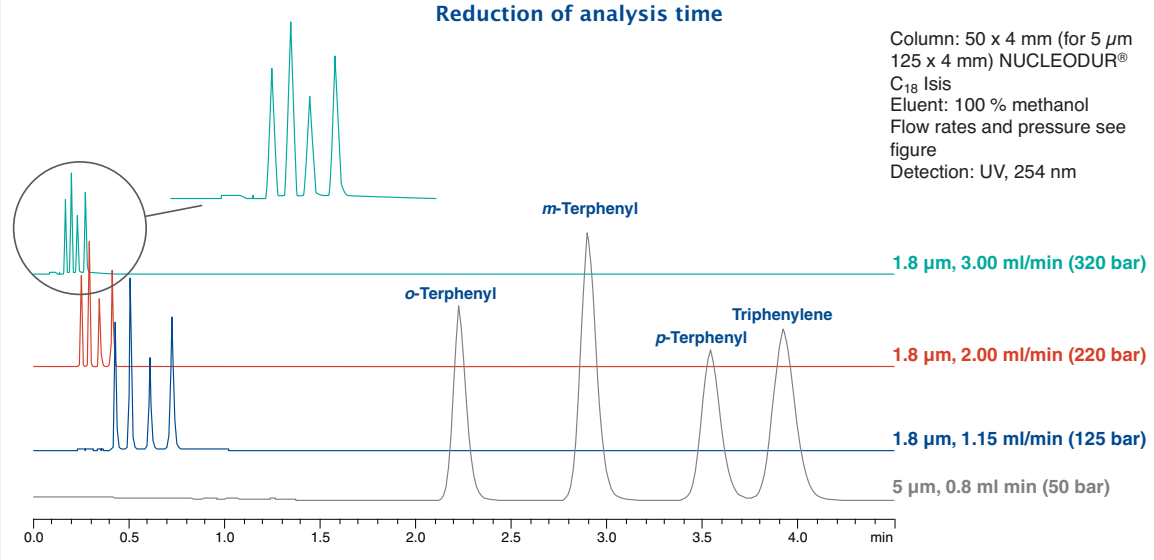
Column: 50 x 4 mm NUCLEODUR® C_{18} Gravity A) 3 µm, B) 1.8 µm
Eluent: acetonitrile – water (80:20, v/v)
Flow rate: 2 ml/min
Pressure: A) 80 bar, B) 160 bar
Detection: UV, 254 nm

Peaks:
1. Naphthalene
2. Ethylbenzene



Reduction of analysis time

Column: 50 x 4 mm (for 5 µm 125 x 4 mm) NUCLEODUR® C_{18} Isis
Eluent: 100 % methanol
Flow rates and pressure see figure
Detection: UV, 254 nm



Columns for HPLC

1

1 HPLC columns with NUCLEODUR® Phasen

NUCLEODUR® C18 - C 8 Gravity nonpolar high density phases *MACHEREY-NAGEL*

available as octadecyl (C18 -USP L!) and octyl (C8 - USP L7) modifications
Pore size 110 Å; particle sizes 1.8µm, 3µm and 5µm for C18, 1.8 and 5µm for C8
7, 10, 12 and 16µm particles for preparative separations on request
carbon content 18 %C for C18 , 11%C for C8
ideal for method development
allows HPLC at pH extremes (pH 1 - 11)
suitable for **LC/MS** due to low bleeding characteristics
recommended for overall sophisticated analytical separations
optimal for: pharmaceuticals, e.g. analgesics, antiinflammatory drugs, antidepressants; herbicides; phytopharmaceuticals; immunosppressants

EC analytical columns NUCLEODUR® C_8 Gravity, 1.8µm

particle size 1.8µm, 11% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

EC analytical columns NUCLEODUR® C_8 Gravity, 5µm

particle size 5µm, 11% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 543**
3.0	50	1	**4.004 544**
4.0	50	1	**4.004 545**
4.6	50	1	**4.004 546**
2.0	125	1	**4.004 547**
3.0	125	1	**4.004 548**
4.0	125	1	**4.004 549**
4.6	125	1	**4.004 550**
2.0	150	1	**4.004 551**
3.0	150	1	**4.004 552**
4.0	150	1	**4.004 553**
4.6	150	1	**4.004 554**
2.0	250	1	**4.004 555**
3.0	250	1	**4.004 556**
4.0	250	1	**4.004 557**
4.6	250	1	**4.004 558**

Guard columns for EC columns NUCLEODUR® C8 Gravity, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 719**
for 4 and 4.6 mm i.d.	3	**4.004 720**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

VarioPrep preparative columns NUCLEODUR® C8 Gravity

particle size 5µm, 11%C *MACHEREY-NAGEL*

Available on request.

EC analytical columns NUCLEODUR® C18 Gravity, 1.8µm

particle size 1.8µm, 18% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

1 EC analytical columns NUCLEODUR® C18 Gravity, 3µm

1

particle size 3µm, 18% C. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

Guard columns for EC columns NUCLEODUR® C18 Gravity, 3µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 624**
for 4 and 4.6 mm i.d.	3	**4.004 625**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® C_{18} Gravity, 5µm

particle size 5µm, 18% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 422**
3.0	50	1	**4.004 423**
4.0	50	1	**4.004 424**
4.6	50	1	**4.004 425**
2.0	125	1	**4.004 415**
3.0	125	1	**4.004 416**
4.0	125	1	**4.004 417**
4.6	125	1	**4.004 418**
2.0	150	1	**4.004 426**
3.0	150	1	**4.004 427**
4.0	150	1	**4.004 428**
4.6	150	1	**4.004 429**
2.0	250	1	**4.004 419**
3.0	250	1	**4.004 420**
4.0	250	1	**6.224 511**
4.6	250	1	**4.004 421**

Guard columns for EC columns NUCLEODUR® C_{18} Gravity, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**7.510 912**
for 4 and 4.6 mm i.d.	3	**4.004 626**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

VarioPrep preparative columns NUCLEODUR® C_{18} Gravity

Particle size 5µm, 18% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10	50	1	**4.004 773**
10	250	1	**4.004 775**
8*	10	2	**4.004 780**

*10 x 8mm ID VarioPrep guard columns require the VP guard column holder 8mm (4.002 176) and fit on 10mm ID VP columns.

VarioPrep preparative columns NUCLEODUR® C_{18} Gravity

particle size 10µm, 18% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
40.0	250	1	**4.004 782**

NUCLEODUR® C18 Isis phase with high steric selectivity

MACHEREY-NAGEL

C18 phase with special polymeric, crosslinked surface modification - USP L1
pore size 110 Å, particle sizes 1.8µm, 3µm and 5µm; 20%C
high steric selectivity
outstanding surface deactivation
suitable for **LC/MS** due low bleeding characteristics
pH stability 1 - 10
broad range of application: steroids, (o,p,m-) substituted aromatics, fat-soluble vitamins

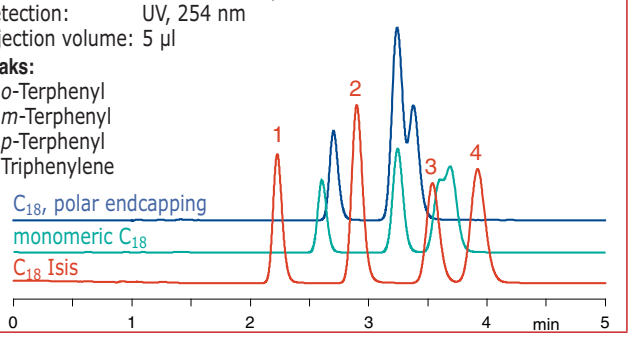
Surface modification

By use of specific C_{18} silanes and appropriate polymeric bonding technologies a dense shield of alkyl chains protects the subjacent silica matrix. Elemental analysis of NUCLEODUR® C_{18} Isis shows a carbon load of 20%.

The target crosslinking of the C_{18} 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.

Steric selectivity of NUCLEODUR® C_{18} Isis

Columns: 125 x 4 mm; **NUCLEODUR® C_{18} Isis**, **monomerically coated C_{18} phase**, **C_{18} 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

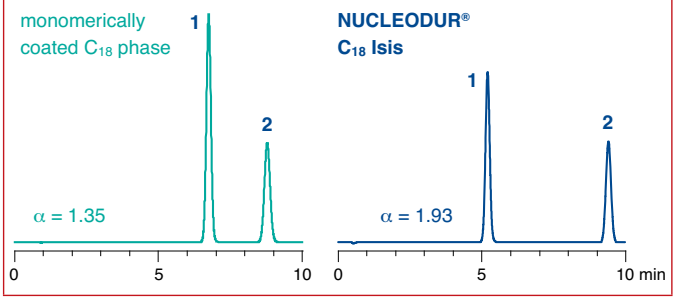


The separation of *o*-terphenyl and triphenylene is a concrete example to evaluate the selectivity potential of a reversed phase column in terms of the different shape of two molecules. The phenyl rings of *o*-terphenyl are twisted out of plane while triphenylene has a planar geometry.

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® C_{18} Isis compared to a conventional C_{18} column.

Steric selectivity of NUCLEODUR® C_{18} 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



EC analytical columns NUCLEODUR® C18 Isis, 1.8µm

particle size 1.8µm, 20% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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 EC analytical columns NUCLEODUR® C18 Isis, 3µm

particle size 3µm, 20% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 481**
3.0	50	1	**4.004 482**
4.0	50	1	**4.004 483**
4.6	50	1	**4.004 484**
4.6	100	1	**4.006 020**
2.0	125	1	**4.004 485**
3.0	125	1	**4.004 486**
4.0	125	1	**4.004 487**
4.6	125	1	**4.004 488**
2.0	150	1	**4.004 489**
3.0	150	1	**4.004 490**
4.0	150	1	**4.004 491**
4.6	150	1	**4.004 492**
2.0	250	1	**4.004 493**
3.0	250	1	**4.004 494**
4.0	250	1	**4.004 495**
4.6	250	1	**4.004 496**

Guard columns for EC columns NUCLEODUR® C18 Isis, 3µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 629**
for 4 and 4.6 mm i.d.	3	**4.004 630**

Guard columns for EC columns require the guard column adapter EC (Cat. No. 7.081 898).

EC analytical columns NUCLEODUR® C18 Isis, 5µm

particle size 5µm, 20% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 505**
3.0	50	1	**4.004 506**
4.0	50	1	**4.004 507**
4.6	50	1	**4.004 508**
4.6	100	1	**4.006 021**
2.0	125	1	**4.004 509**
3.0	125	1	**4.004 510**
4.0	125	1	**4.004 511**
4.6	125	1	**4.004 512**
2.0	150	1	**4.004 513**
3.0	150	1	**4.004 514**
4.0	150	1	**4.004 515**
4.6	150	1	**4.004 516**
2.0	250	1	**4.004 517**
3.0	250	1	**4.004 518**
4.0	250	1	**4.004 519**
4.6	250	1	**4.004 520**

Guard columns for EC columns NUCLEODUR® C18 Isis, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 640**
for 4 and 4.6 mm i.d.	3	**4.004 641**

Guard columns for EC columns require the guard column adapter EC (Cat. No. 7.081 898).

2 VarioPrep preparative columns NUCLEODUR® C_{18} Isis

particle size 5µm, 20% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
21.0	50	1	**4.004 801**
10.0	250	1	**4.004 797**

VarioPrep columns for preparative HPLC NUCLEODUR® C18 Isis, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 10 mm i.d.	2	**4.004 802**
for 21 mm i.d.	2	**4.004 803**

10 x 8mm ID VarioPrep guard columns require the VP 8mm guard column holder and are suited for 8 and 10mm ID VP columns,
20 x 16mm ID VarioPrep guard columns require the VP guard column holder 16mm and are used for 16 and 21mm ID VP columns.

NUCLEODUR® C18 Pyramid phase for highly aqueous eluents

MACHEREY-NAGEL

stabel in 100 % aqueous eluent systems- USP L1
pore size 110 Å, particle sizes 1.8µm, 3µm and 5µm; 14 % C
7 and 10µm particles for preparative separations on request
interesting polar selectivity features
excellent base deactivation; suitable for **LC/MS** due low bleeding characteristics
pH stability 1 - 9
Ideal for: analgesics, penicillin antibiotics, nucleic acid bases, water-soluble vitamins, complexing agetns, organic acids

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

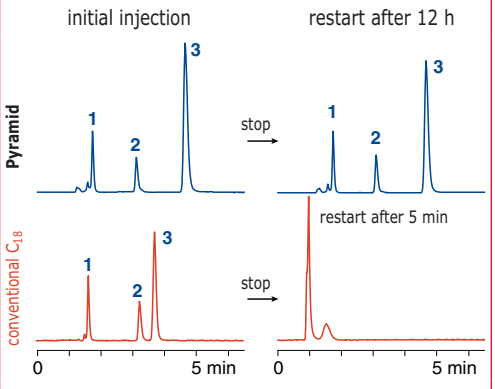
NUCLEODUR® C_{18} Pyramid is a silica phase with hydrophilic endcapping, designed especially for use in eluent systems of up to 100% water. The stability test shows the retention behaviour of tartaric, acetic and maleic acid under purely aqueous conditions on NUCLEODUR® C_{18} Pyramid in comparison with a conventionally bonded RP phase.

It can be shown that the retention times for NUCLEODUR® C_{18} 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 C_{18} 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.

Stability test

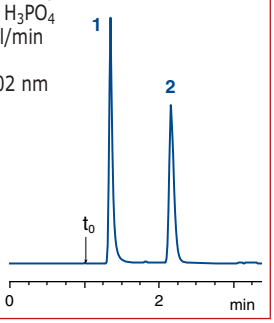


both columns 125 x 4 mm ID; 50 mM KH_2PO_4 pH 2.5, 0.7 ml/min; 25 °C; UV, 210 nm; injection volume 1 µl
Peaks: 1. tartaric acid, 2. acetic acid, 3. maleic acid
MN Appl. No. 120870

Separation of very polar compounds

Column:	125 x 4 mm NUCLEODUR® C_{18} Pyramid, 5 µm
Eluent:	0.2 % H_3PO_4
Flow rate:	1,0 ml/min
Temperature:	22 °C
Detection:	UV, 202 nm
Injection volume:	2 µl

Peaks:
1. Formic acid
2. Acetic acid



MN Appl. No. 119170

1 EC analytical columns NUCLEODUR® C18 Pyramid, 1.8µm

1

particle size 1.8µm, 14% C. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

EC analytical columns NUCLEODUR® C18 Pyramid, 3µm

particle size 3µm, 14% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

Guard columns for EC columns NUCLEODUR® C18 Pyramid, 3µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 739**
for 4 and 4,6 mm i.d.	3	**4.004 740**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® C_{18} Pyramid, 5µm

particle size 5µm, 14% C *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 443**
3.0	50	1	**4.004 444**
4.0	50	1	**4.004 445**
4.6	50	1	**4.004 446**
2.0	125	1	**4.004 447**
3.0	125	1	**4.004 448**
4.0	125	1	**4.004 449**
4.6	125	1	**4.004 450**
2.0	150	1	**4.004 454**
3.0	150	1	**4.004 455**
4.0	150	1	**4.004 456**
4.6	150	1	**4.004 457**
2.0	250	1	**4.004 451**
3.0	250	1	**4.004 452**
4.0	250	1	**6.226 913**
4.6	250	1	**4.004 453**

Guard columns for EC columns NUCLEODUR® C18 Pyramid, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2mm and 3mm i.d.	3	**4.004 721**
for 4mm and 4.6mm i.d.	3	**4.004 722**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

VarioPrep preparative columns NUCLEODUR® C_{18} Pyramid

particle size 5µm, 14% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	250	1	**4.004 783**
21.0	250	1	**4.004 785**

VarioPrep columns for preparative HPLC C_{18} Pyramid, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 10 mm i.d.	2	**4.004 788**
for 21 mm i.d.	2	**4.004 789**

VarioPrep guard columns require the 8mm VP guard column holder and are suited for 8 and 10mm ID VP columns,
20 x 16mm ID VarioPrep guard columns require the 16mm VP guard column holder and are used for 16 and 21mm ID VP columns.

NUCLEODUR® Sphinx RP bifunctional RP phase

MACHEREY-NAGEL

distinct selectivity based on bifunctional surface coverage - USP L1 and USP L11
pore size 110 Å, particle sizes 1.8µm, 3µm and 5µm; 14 %C
high density of covalently bonded silanes for tailing-free peaks widens the scope for method development
pH stability 1 - 10
suitable for **LC/MS** due low bleeding characteristics
high reproducibility and consistent quality due to tight QC procedures
range of application: quinolone antibiotics, sulfonamides, xanthines, substituted aromatics

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 C_{18} 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.

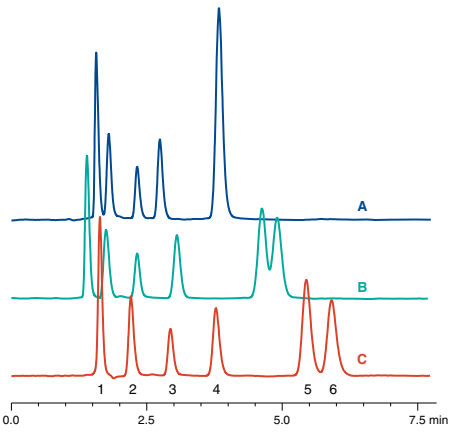
Due to the additional intermolecular interactions NUCLEODUR® Sphinx RP is an interesting replenishment to the high density bonded phases NUCLEODUR® C_8/C_{18} Gravity and the polar endcapped NUCLEODUR® C_{18} Pyramid.

Separation of flavonoids on 3 different NUCLEODUR® phases

Columns: 150 x 4.6 mm
A) NUCLEODUR® C_8 Gravity, 5 µm
B) NUCLEODUR® C_{18} 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



1 EC analytical columns NUCLEODUR® Sphinx RP, 1.8µm

1

particle size 1.8µm, 14% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

EC analytical columns NUCLEODUR® Sphinx RP, 3µm

particle size 3µm, 14% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 586**
3.0	50	1	**4.004 587**
4.0	50	1	**4.004 588**
4.6	50	1	**4.004 589**
2.0	125	1	**4.004 590**
3.0	125	1	**4.004 591**
4.0	125	1	**4.004 592**
4.6	125	1	**4.004 593**
2.0	150	1	**4.004 582**
3.0	150	1	**4.004 583**
4.0	150	1	**4.004 584**
4.6	150	1	**4.004 585**
2.0	250	1	**4.004 594**
3.0	250	1	**4.004 595**
4.0	250	1	**4.004 596**
4.6	250	1	**4.004 597**

Guard columns for EC columns NUCLEODUR® Spinx RP, 3µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 696**
for 4 and 4.6 mm i.d.	3	**4.004 697**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® Sphinx RP, 5µm

particle size 5µm, 14% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 567**
3.0	50	1	**4.004 568**
4.0	50	1	**4.004 569**
4.6	50	1	**4.004 570**
2.0	125	1	**4.004 571**
3.0	125	1	**4.004 572**
4.0	125	1	**4.004 573**
4.6	125	1	**4.004 574**
2.0	150	1	**4.004 575**
3.0	150	1	**4.004 576**
4.0	150	1	**6.225 971**
4.6	150	1	**4.004 577**
2.0	250	1	**4.004 578**
3.0	250	1	**4.004 579**
4.0	250	1	**4.004 580**
4.6	250	1	**4.004 581**

Guard columns for EC columns NUCLEODUR® Spinx RP, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 681**
for 4 and 4,6 mm i.d.	3	**4.004 682**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

VarioPrep preparative columns NUCLEODUR® Sphinx RP

particle size 5µm, 14% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	50	1	**4.004 790**
10.0	250	1	**4.004 791**

VarioPrep columns for preparative HPLC NUCLEODUR® Sphinx RP, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
10 mm i.d.	2	**4.004 795**

10 x 8mm ID VarioPrep guard columns require the 8mm VP guard column holder and are suited for 8 and 10mm ID VP columns,

NUCLEODUR® C_{18} ec - C_8 ec nonpolar phases for routine analyses

Available with medium density octadecyl (C18 - USP L1) and octyl (C8 - USP L7) modification pore size 110 Ä, particle sizes, 3µm and 5µm; 7µm, 10µm, 12µm, 16µm, 20µm, 30µm und 50µm for preparative separations on request for daily routine analysis and up-scaling for preparative HPLC, pH stability 1 - 9. Carbon content 17.5%C for C18 , 10.5%C for C8, high reproducibility from lot to lot for standard routine applications in reversed phase chromatography. — *MACHEREY-NAGEL*

NUCLEODUR® C_{18} 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® C_{18} 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.

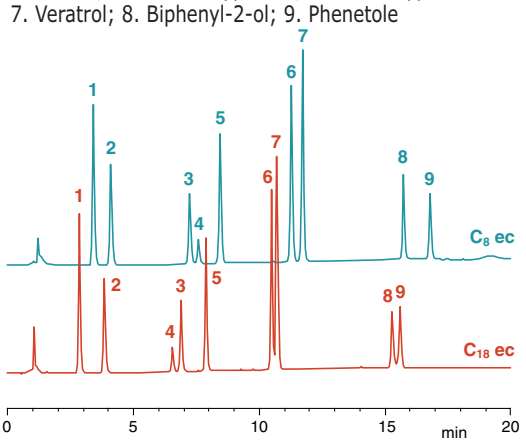
NUCLEODUR® octyl phases

Based on the same totally spherical and highly pure silica the C_8 phases exhibit the same excellent chemical and mechanical stability features as the C_{18} 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 C_{18} phases).

Separation of phenols

Columns: 250 x 4 mm NUCLEODUR® 100-5 C_8 ec / C_{18} ec
Eluent: A) water, B) methanol
Gradient for C_8: 2 min 20 % B, then to 60 % B in 12 min; gradient for C_{18}: 2 min 25 % B, then to 65 % B in 12 min
Flow rate 1.0 ml/min, temperature 25 °C
Detection UV 275 nm, injection volume 10 µl

Peaks:
1. Resorcinol; 2. Pyrocatechol; 3. 4-Methoxyphenol
4. Phenol; 5. 2-Methoxyphenol; 6. 2-Ethoxyphenol
7. Veratrol; 8. Biphenyl-2-ol; 9. Phenetole



MN Appl. No. 120890/120891

Some general principles are:

- High density C_8 and C_{18} phases allow tailing-free elution even for very polar compounds
- Octyl phases (C_8) show superior polar selectivity
- Octadecyl phases (C_{18}) show superior hydrophobic selectivity
- Hydrophobic compounds show shorter retention times on C_8 phases

1 EC analytical columns NUCLEODUR® 100-3 C8 ec, 3 µm

1

Octyl phases, 10.5% C, particle size 3µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

Guard columns for EC columns NUCLEODUR® 100-3 C8 ec, 3 µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 607**
for 4 and 4.6 mm i.d.	3	**4.004 608**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® 100-5 C8 ec, 5 µm

Octyl phases, 10.5% C, particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 521**
3.0	50	1	**4.004 522**
4.0	50	1	**4.004 523**
4.6	50	1	**4.004 524**
2.0	125	1	**4.004 525**
3.0	125	1	**4.004 526**
4.0	125	1	**4.004 527**
4.6	125	1	**4.004 528**
4.6	150	1	**4.004 529**
2.0	250	1	**4.004 530**
3.0	250	1	**4.004 531**
4.0	250	1	**4.004 532**
4.6	250	1	**6.228 531**

Guard columns for EC Columns NUCLEODUR® 100-5 C8 ec, 5 µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2mm and 3mm i.d. EC columns	3	**4.004 708**
for 4mm and 4.6mm i.d. EC columns	3	**4.004 709**

2 VarioPrep preparative columns NUCLEDUR® 100-5 C_8 ec, 5 µm

2

Octyl phases, 10.5% C, particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	50	1	**4.004 767**
10.0	250	1	**4.004 761**

VarioPrep columns for preparative HPLC, NUCLEODUR® 100-5 C8 ec, 5 µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 10mm i.d.	2	**4.004 771**
for 21mm i.d.	2	**4.004 772**

10 x 8mm ID VarioPrep guard columns require the 8mm VP guard column holder and are suited for 8mm and 10mm ID VP columns,
20 x 16mm ID VarioPrep guard columns require the 16mm VP guard column holder and are used for 16mm and 21mm ID VP columns.

EC analytical columns NUCLEODUR® 100-3 C18 ec, 3 µm

Octadecyl phases, 17.5% C — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

Guard columns for EC columns NUCLEODUR® 100-3 C18 ec, 3 qm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 3 mm i.d.	3	**9.003 794**
for 4 mm i.d.	3	**9.003 795**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® 100-5 C18 ec, 5µm

Octadecyl phases, 17.5% C, particle size 5µm — *MACHEREY-NAGEL*

1

Int. dia. mm	Length mm	PK	Cat. No.
2.0	50	1	**4.004 368**
3.0	50	1	**4.004 369**
4.0	50	1	**4.004 370**
4.6	50	1	**4.004 371**
4.6	100	1	**4.006 934**
2.0	125	1	**9.003 816**
3.0	125	1	**9.003 817**
4.0	125	1	**9.003 818**
4.6	125	1	**9.003 819**
4.6	150	1	**9.003 820**
2.0	250	1	**9.003 821**
3.0	250	1	**9.003 822**
4.0	250	1	**9.003 823**
4.6	250	1	**9.003 824**

Guard columns for EC columns NUCLEODUR® 100-5 C18 ec, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 3 mm i.d.	3	**9.003 814**
for 4 mm i.d.	3	**9.003 815**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

1 VarioPrep preparative columns NUCLEODUR® 100-5 C_{18} ec, 5µm

Octadecyl phases, 17.5% C. Particle size 5µm — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	250	1	**4.004 752**

VarioPrep preparative columns NUCLEODUR® 100-7 C18 ec, 7µm

Octadecyl phases, 17.5% C, particle size 7µm — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	50	1	**4.004 759**
10.0	250	1	**4.004 757**

1 VarioPrep preparative columns NUCLEODUR® 100-10 C_{18} ec, 10µm

1

Octadecyl phases, 17.5% C, particle size 10µm — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	50	1	**4.004 749**
21.0	50	1	**4.004 751**
10.0	250	1	**4.004 745**

VarioPrep columns for preparative HPLC, NUCLEODUR® 100-5, 100-7, 100-10, C18 ec

MACHEREY-NAGEL

Type	PK	Cat. No.
for 10mm i.d.	2	**4.004 769**
for 20mm i.d.	2	**4.004 770**

10 x 8mm ID VarioPrep guard columns require the 8mm VP guard column holder and are suited for 8mm and 10mm ID VP columns,
20 x 16mm ID VarioPrep guard columns require the 16mm VP guard column holder and are used for 16mm and 21mm ID VP columns.

NUCLEODUR® CN/CN-RP cyano-modified high purity silica phase

MACHEREY-NAGEL

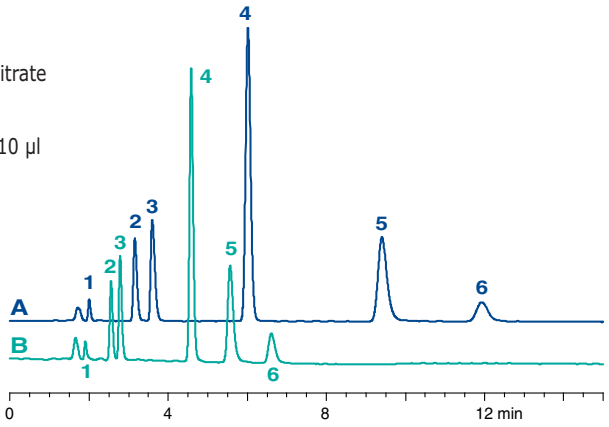
pore size 110 Å, particle sizes 3µm and 5µm; 7%C - USP L10
multi-mode columns (RP and NP)
widens the scope in selectivity
differnet retention characteristics compared to C8 and C18
stable against hydrolysis at low pH values, working range pH 1-8
high reproducibility from lot to lot
ideal for: tricyclic antidepressants, steroids, organic acids

Separation of cold medicine ingredients on two different NUCLEODUR® phases

Columns:
A) 250 x 4 mm NUCLEODUR® 100-5 C_{18} 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



2 EC analytical columns NUCLEODUR® 100-3 CN-RP, 3µm

2

eluent in column acetonitrile, particle size 3µm. — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

Guard columns for EC columns NUCLEODUR® 100-3 CN-RP, 3µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 2 and 3 mm i.d.	3	**4.004 663**
for 4 and 4.6 mm i.d.	3	**4.004 664**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

1

1 EC analytical columns NUCLEODUR® 100-5 CN-RP, 5µm

eluent in column acetonitrile, particle size 5µm — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.0	125	1	**4.004 436**
4.6	125	1	**4.004 437**
4.6	150	1	**4.004 438**
4.0	250	1	**4.004 434**
4.6	250	1	**4.004 435**

Guard columns for EC columns NUCLEODUR® 100-5 CN-RP, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4mm and 4.6mm i.d.	3	**4.004 655**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® 100-5 CN, 5µm

Eluent in column *n*-heptane, particle size 5µm. — *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.0	125	1	**4.004 432**
4.6	125	1	**4.004 433**
4.0	250	1	**4.004 430**
4.6	250	1	**4.004 431**

Guard columns for EC columns NUCLEODUR® 100-5 CN, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4 and 4.6 mm i.d.	3	**4.004 654**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

NUCLEODUR® NH2/NH2 -RP amino-modified high purity silica phase

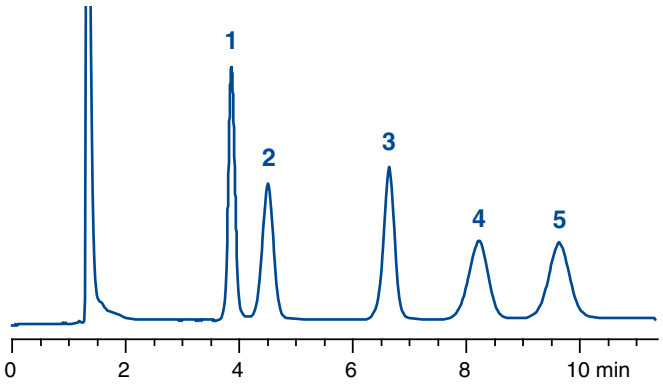
pore size 110 Å, particle sizes 3 and 5µm; 2.5%C; not endcapped - USP L8 — *MACHEREY-NAGEL*
multi-mode columns (RP and NP)
normal phase chromatography (NP) with hexan, dichloromethane or 2-propanol as mobile phase for polar compounds such as substituted anilines, esters, chlorinated pesticides
reversed phase chromatography (RP) of polar compounds like sugars in aqueous-organic eluent systems
ion exchange chromatography of anions and organic acids using common buffers and organic modifiers
stable against hydrolysis at low pH, working range pH 2-8, 100% stable in water, suitable for LC-MS
Ideal for:
polar compounds under RP conditions (sugars, DNA bases), hydrocarbons under NP conditions
Eluent in column is *n*-heptane for the NP mode - RP columns are delivered in acetonitrile - water.
For changing the solvent system a rinsing step with THF may be necessary.

Reversed phase separation of sugars

Column: 250 x 4 mm NUCLEODUR® 100-5 NH_2-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



1 EC analytical columns NUCLEODUR® 100-3 NH2-RP, 3µm

eluent in column acetonitrile, particle size 3µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.6	150	1	**9.003 875**

Guard columns for EC columns NUCLEODUR® 100-3 NH2-RP, 3µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4.6 mm ID	1	**9.003 878**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® 100-5 NH2-RP, 5µm

eluent in column acetonitrile, particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.0	125	1	**4.004 538**
4.6	125	1	**4.004 539**
4.6	150	1	**4.004 540**
4.0	250	1	**4.004 541**
4.6	250	1	**4.004 542**

Guard columns for EC columns NUCLEODUR® 100-5 NH2-RP, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4mm and 4.6mm i.d.	3	**4.004 628**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® 100-5 NH2, 5µm

eluent in column *n*-heptane, particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.0	125	1	**4.004 533**
4.6	125	1	**4.004 534**
4.6	150	1	**4.004 535**
4.0	250	1	**4.004 536**
4.6	250	1	**4.004 537**

Guard columns for EC columns NUCLEODUR® 100-5 NH2, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4 and 4.6 mm i.d.	3	**4.004 627**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

1

Unmodified NUCLEODUR® for normal phase separations

totally spherical high purity silica - USP L3 pore size 110 Å, pore volume 0.9ml/g, surface (BET) 340m²/g, density 0.47g/ml, pressure stability 800 bar, pH stability 2 - 8; available particle sizes 3µm and 5µm; larger particles (10, 12, 16, 20 , 30 and 50µm) for preparative applications are available as bulk materials. *MACHEREY-NAGEL*

1

1 EC analytical columns NUCLEODUR® 100-3

Particle size 3µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.6	150	1	**9.003 876**

Guard columns for EC columns NUCLEODUR® 100-3 SioH (unmodified), 3µm

MACHEREY-NAGEL

Type	Length mm	PK	Cat. No.
for 4.6 mm i.d.	8	3	**4.004 606**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEODUR® 100-5

particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.6	150	1	**4.004 374**
4.0	250	1	**4.004 372**
4.6	250	1	**4.004 373**

Guard columns for EC-columns NUCLEODUR® 100-5 SioH (unmodified), 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4 and 4.6 mm i.d.	3	**4.004 623**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

2

2 VarioPrep preparative columns NUCLEODUR® 100-5 SioH (unmodified), 5µm

particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
10.0	250	1	**4.004 743**

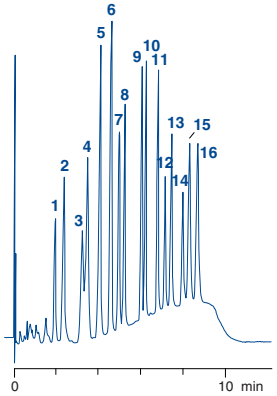
NUCLEOSIL® 100-5 C18 PAH special octadecyl phase for PAH analysis

Base material NUCLEOSIL® silica, particle size 5µm, pore size 110 Å; polymeric coating - USP L1; eluent in column acetonitrile/water 70:30; allows efficient gradient separation of the 16 PAH in accordance with EPA, detection of the separated PAH by UV (250 to 280nm), with diode array or with fluorescence detection at different wavelegths for excitation and emission (acenaphthylene cannot be analysed with fluorescence detection). *MACHEREY-NAGEL*

Rapid separation of 16 PAH according to EPA

Column: 50 x 4 mm NUCLEOSIL® 100-5 C_{18} PAH
Eluents: A) water; B) acetonitrile
Gradient: from 55 to 100 % B in 2.5 min; then 3.5 min at 100 % B; finally in 0.1 min from 100 to 55 % B
Flow rate: 1 ml/min; pressure 25 – 30 bar
Temperature: 25 °C
Detection: UV, 260 nm
Injection volume: 10 µl

Peaks:
1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenantrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benz[a]anthracene
10. Chrysene
11. Benzo[b]fluoranthene
12. Benzo[k]fluoranthene
13. Benzo[a]pyrene
14. Dibenz[ah]anthracene
15. Benzo[ghi]perylene
16. Indeno[1,2,3-cd]pyrene



MN Appl. No. 115030

EC analytical columns NUCLEOSIL® 100-5 C18 PAH, 5µm

octadecyl phase PAH, particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
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**

Guard columns for EC columns NUCLEOSIL® 100-5 C_{18} PAH, 5µm

MACHEREY-NAGEL

On request.

Column Protection System

Innovative and universal guard column holder system

- Cartridges filled with special NUCLEODUR®, NUCLEOSIL® and NUCLEOSHELL® HPLC adsorbents (ask for individual part numbers)
- UNIVERSAL RP guard columns suitable for all HPLC columns under RP conditions
- Ideal protection for your analytical main column: significant increase in column lifetime
- Suitable for all analytical HPLC columns with 1/16" fittings
- Minimized dead volume: suitable also for ultra-fast HPLC
- Special ferrules: pressure stability up to 1034 bar (15 000 psi)
- Guard column length 4 mm, 2 mm ID (for main columns with 2 mm ID) and 3 mm ID (for main columns with 3, 4 and 4.6 mm)

Content of the Column Protection System

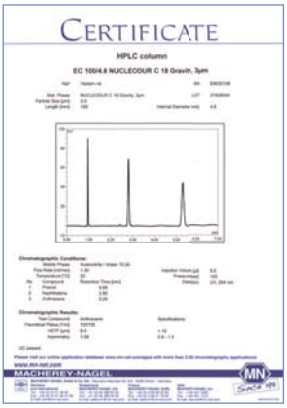
Description	PK	Cat. No.
Column Protection System	1	**9.003 845**
		Contents
Cartridge holder		1
Capillaries		2
Ferrules		3
Wrenches		2
Manual		1

Cartridges filled with special NUCLEODUR®, NUCLEOSIL® and NUCLEOSHELL® HPLC adsorbents on request

UNIVERSAL RP guard columns	PK	Cat. No.
EC 4/3 UNIVERSAL RP guard column (for main columns with 2 mm ID)	3	**9.003 846**
EC 4/3 UNIVERSAL RP guard column (for main columns with 2 mm ID), value pack	9	**9.003 847**
EC 4/3 UNIVERSAL RP guard column (for main columns with 3, 4 and 4.6 mm ID)	3	**9.003 848**
EC 4/3 UNIVERSAL RP guard column (for main columns with 3, 4 and 4.6 mm ID), value pack	9	**9.003 849**

MACHEREY-NAGEL HPLC QC policy

- **Highest production standard**
  our facilities are EN ISO 9001:2008 certified
- **Strict quality specifications**
  for outstanding reliability
- **Perfect reproducibility** from batch to batch and within each lot
- Each column is individually tested and supplied with test chromatogram and test conditions.



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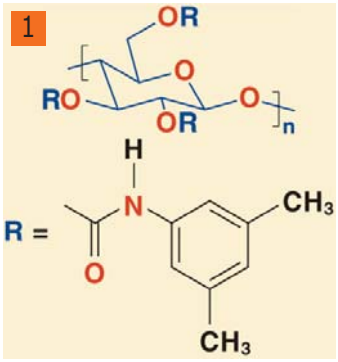


1 HPLC columns for enantiomer separation

NUCLEOCEL *DELTA* enantiomer separation based on cellulose derivatives *MACHEREY-NAGEL*

base material silica,
chiral selector Cellulosetris-(3.5-dimethylphenylcarbamate) - USP L40
similar phases: Chiralcel® OD, Kromasil®, CelluCoat™, Eurocel® 01
standard particle size 10µm

S-Type for high resolution, allows use of shorter columns (150 mm) for faster separations,
pressure stability up to ~ 150 bar (2000 psi)

NUCLEOCEL *DELTA* for normal phase applications:
eluent in column *n*-heptane - propanol-2 (90:10, v/v)
typical eluents are heptane - propanol mixtures

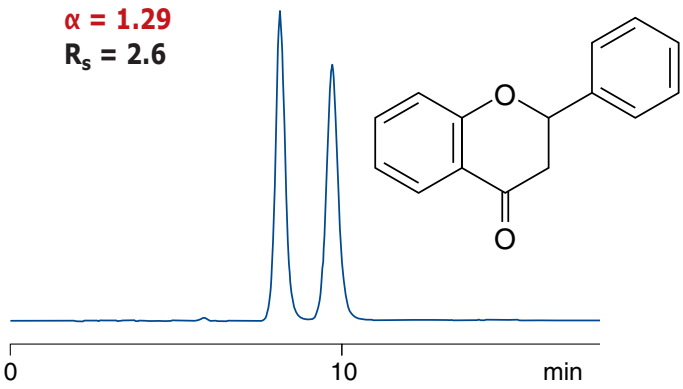
NUCLEOCEL *DELTA-RP* for reversed phase applications:
eluent in column acetonitrile - water (40:60), v/v)
designed for use either in polar organic mode or with eluents containing high concentrations of chaotropic salts such as perchlorate

recommended applications: pharmaceutically active compounds, chiral pollutants (e. g. herbicides, PCB), chiral compounds in food (dyes, preservatives), chiral catalysts and bioorganic compounds.

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



EC analytical columns NUCLEOCEL *DELTA S*, 5µm

eluent in column *n*-heptane - propanol-2, particle size 5µm *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.6	150	1	**4.002 446**
4.6	250	1	**4.002 445**

Guard columns for EC colums NUCLEOCEL *DELTA S*, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4.6 mm i.d.	1	**4.002 511**

Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

EC analytical columns NUCLEOCEL *DELTA-RP S*, 5µm

Eluent in column acetonitrile - water, particle size 5µm. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
4.6	150	1	**4.002 449**
4.6	250	1	**4.002 448**

Guard columns for EC columns NUCLEOCEL *DELTA-RP S*, 5µm

MACHEREY-NAGEL

Type	PK	Cat. No.
for 4.6 mm i.d.	1	**4.002 512**

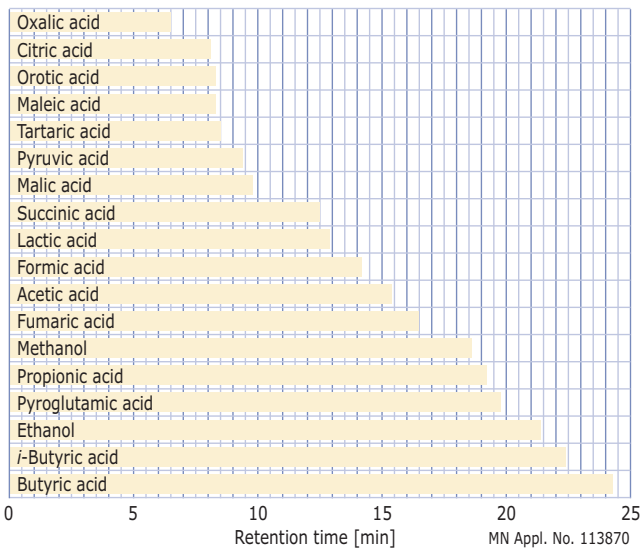
Guard columns for EC columns require guard column adapter EC (Cat. No. 7.081 898)

NUCLEOGEL® SUGAR 810 separation of sugars

sulphonated polystyrene/divinylbenzene resins in diffent ionic forms *MACHEREY-NAGEL*
and RP chromatography
separation mechanism includes ion exclusion, ion exchange, size exclusion, ligand exchange as well as NP and RP chromatography
H^+ form: separation of sugars, sugar alcohols and organic acids - USP L17 - eluent in column 0.01 N H_2SO_4
Ca^{2+} form: separation of mono-, di- and oligosaccharides - USP L19
eluent in column water

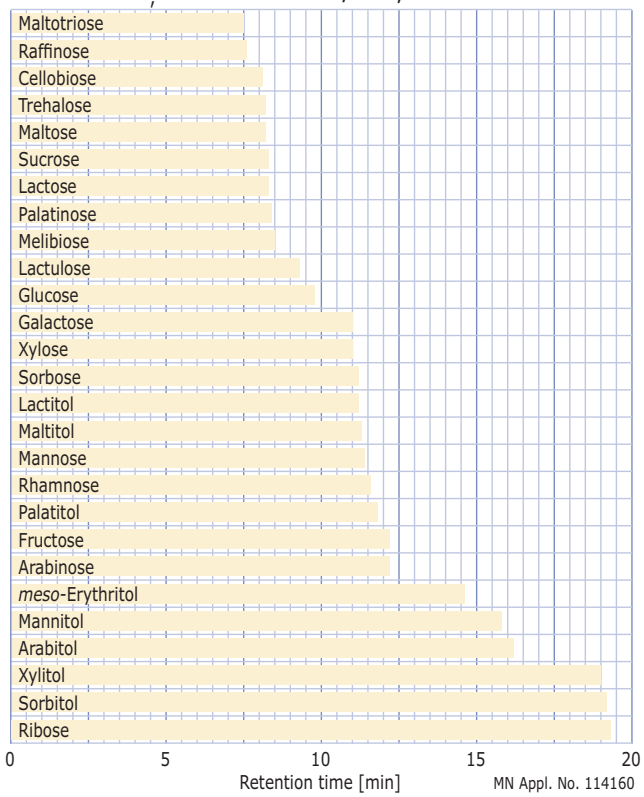
Organic acids and alcohols

Column: 300 x 7.8 mm NUCLEOGEL® SUGAR 810 H
Injection volume: 5 µl
Eluent: 5 mmol H_2SO_4
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

Valco type columns for separation of sugars, sugar alcohols and organic acids - USP L17 eluent in column 0.01N H_2SO_4 *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
7.8	300	1	**4.002 276**

Guard columns for NUCLEOGEL® SUGAR 810 H columns

MACHEREY-NAGEL

Type	PK	Cat. No.
for 7,8 mm i.d.	2	**4.002 277**

This guard columns require the CC column holder 30mm (Cat. No. 4.002 762).

NUCLEOGEL® SUGAR 810 Ca

Valco type columns for separation of mono-, di- and oliogosaccharides - USP L19 eluent in column water. *MACHEREY-NAGEL*

Int. dia. mm	Length mm	PK	Cat. No.
7.8	300	1	**4.002 274**

Guard columns for NUCLEOGEL® SUGAR 810 Ca columns

MACHEREY-NAGEL

Type	PK	Cat. No.
for 7.8 mm i.d.	2	**4.002 275**

This guard columns require the CC column holder 30 mm (Cat. No. 4.002 762).

MN column systems

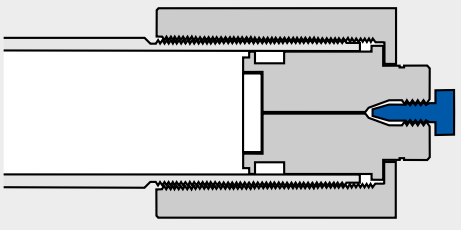
VarioPrep columns *MACHEREY-NAGEL*

column system for preparative HPLC manufactured from stainless steel with two adjustable end fittings, allows compensation of a dead volume, which could result at the column inlet after some time of operation, without need for opening the column, packed with NUCLEODUR® and NUCLEOSIL® spherical silica.

Available standard dimensions of VarioPrep columns with axially adjustable end fitting

ID [mm]	Length [mm] 10*	15*	50	75	100	125	150	250	500
8	x		x		x	x	x	x	
10			x		x	x	x	x	
16	x		x		x	x	x	x	
21			x	x	x	x	x	x	
32		x			x		x	x	
40			x		x	x	x	x	x
50		x			x		x	x	
80								x	x

End fitting design



* 10 x 8, 10 x 16, 15 x 32 and 15 x 50 mm ID columns are used as guard columns and require adequate holders.

1 VarioPrep guard column holders and replacement parts

O-rings available on request. *MACHEREY-NAGEL*

Description	PK	Cat. No.
VP guard column holder 8 mm for VarioPrep columns with 8 and 10 mm ID	1	**4.002 176**
VP guard column holder 16 mm for VarioPrep columns with 16 and 21 mm ID	1	**4.002 175**

1 Accessories for VarioPrep

MACHEREY-NAGEL

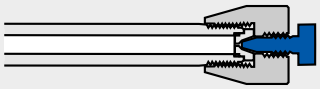
Description	PK	Cat. No.
VP plunger fitting 10 mm	1	**4.002 209**
VP nut 10 mm, without sealing ring	1	**4.002 210**
VP sealing element set 10 mm	1	**4.002 218**
VP sealing ring set 10 mm	1	**4.002 212**
VP MN Inert sealing combination 10 mm	1	**4.002 211**
VP plunger fitting 21 mm, without sealing ring	1	**4.002 215**
VP nut 21 mm	1	**4.002 216**
VP sealing element set 21 mm	1	**4.002 213**
VP sealing ring set 21 mm	1	**4.002 214**
VP MN Inert sealing combination 21 mm	1	**4.002 217**

MN column systems

EC standard columns for analytical HPLC *MACHEREY-NAGEL*

analytical column system manufactured from stainless steel M 8 outer threads on both ends combination of sealing element and very fine-meshed stainless steel screen, PTFE sealing ring and fitting adaptor column heads SW 12 with inner threads M8 x 0.75 and UNF 10-32, as built -in guard columns use ChromCart® guard column cartridges with 8mm lenght with the guard column adaptor EC, packed with NUCLEODUR® spherical silica.

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

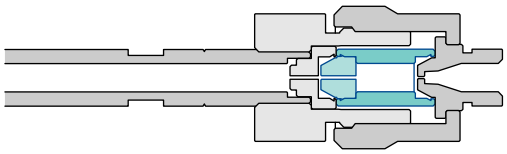
ID [mm]	Length [mm] 8*	20	30	50	75	100	125	150	200	250	300	End fitting design
2	–	x	x	x	x	x	x	x	x	x	x	
3	x	x	x	x	x	x	x	x	x	x	x	
4	x	x	x	x	x	x	x	x	x	x	x	
4,6	–	x	x	x	x	x	x	x	x	x	x	

* 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



Accessories and replacement parts for EC columns

MACHEREY-NAGEL

Description	PK	Cat. No.
Guard column adapter EC	1	**7.081 898**
1/16" nut for connecting 1/16" capillaries	5	**4.002 179**
1/16" ferrule	5	**4.002 180**
1/16" end cap, plastic	4	**4.002 178**
EC fitting adaptor	1	**4.002 219**
EC column head (nut)	1	**4.002 220**
EC PTFE sealing ring	4	**4.002 221**
3-part sealing combination for EC columns	1	**4.002 222**

1 CHROMABOND® Flash cartridges for Biotage® systems

Product range designed for use in Flash systems of Biotage AB (Flash 12i™ and FlashMaster™) without additional connectors or capillaries. *MACHEREY-NAGEL*

on request all column types listed below can be packed with any CHROMABOND® adsorbent (please note that other packings often result in differing adsorbent weights).
CHROMABOND® Flash RS columns for Teledyne Isco® systems (RS) on request.

Description	Column Length cm	Int. dia. mm	Capacity g	PK	Cat. No.
Flash FM 15/2 SiOH	9.0	15.80	2.0	50	**4.003 785**
Flash FM 25/5 SiOH	10.0	20.50	5.0	50	**4.003 792**
Flash FM 25/10 SiOH	10.0	20.50	10.0	50	**4.003 693**
Flash FM 70/10 SiOH	15.4	26.80	10.0	30	**4.003 787**
Flash FM 70/20 SiOH	15.4	26.80	20.0	30	**4.003 799**
Flash FM 70/25 SiOH	15.4	26.80	25.0	30	**4.003 793**
Flash FM 150/25 SiOH	17.0	38.20	25.0	20	**4.003 694**
Flash FM 150/50 SiOH	17.0	38.20	50.0	20	**4.003 789**
Flash FM 150/70 SiOH	17.0	38.20	70.0	10	**4.003 784**
Flash FM 15/2 C_{18} ec	9.0	15.80	2.0	50	**4.003 791**
Flash FM 25/5 C_{18} ec	10.0	20.50	5.0	20	**4.003 786**
Flash FM 70/10 C_{18} ec	15.4	26.80	10.0	20	**4.003 788**
Flash FM 150/50 C_{18} ec	17.0	38.20	50.0	10	**4.003 790**
Flash FM 70/10 NH_2	15.4	26.80	10.0	1	**4.003 731**
Flash FM 70/20 NH_2	15.4	26.80	20.0	1	**4.003 730**

Silica adsorbents for low pressure column chromatography

standard silica 60, pore size ~ 60 Å; pore volume ~ 0.75ml/g; spec. surface BET ~500m²/g. *MACHEREY-NAGEL*
highly porous, amorphous silicic acid in the form of hard, opalescent particles, prepared by precipitation of water glass with sulphuric acid. For higher demands on the performance of column packings we recommend our high-purity irregular Polygoprep silicas. Silica FIA for the fluorescence indicator adsorption procedure for the determination of hydrocarbon groups in the testing of liquid fuels in accordance with DIN 51791 and ASTM D 1319-58T. The FIA method determines saturated hydrocarbons, olefins and aromatic hydrocarbons of a sample chromatographically by adsorption and desorption in a column filled with FIA silica, in the presence of a fluorescent dye mixture.

Description	Particle size	Weight kg	PK	Cat. No.
Silica 60, 0.015 - 0.04 mm		1	1	**4.004 999**
Silica 60, 0.025 - 0.04 mm		1	1	**4.004 948**
Silica 60, 0.04 - 0.063 mm	230 - 400 mesh	1	1	**4.004 968**
Silica 60 M, 0.04 - 0.063 mm	230 - 400 mesh	1	1	**4.004 971**
Silica 60, 0.05 - 0.1 mm	130 -270 mesh	1	1	**4.004 974**
Silica 60, 0.05 - 0.2 mm	70 -270 mesh	1	1	**4.004 954**
Silica 60, 0. 063 - 0.2 mm	70 - 230 mesh	1	1	**4.004 957**
Silica 60, < 0.063 mm	+ 230 mesh	1	1	**4.004 977**
Silica 60, < 0.08 mm	+ 190 mesh	1	1	**4.004 951**
Silica 60, 0.1 - 0.2 mm	70 - 130 mesh	1	1	**4.004 960**
Silica 60, 0.2 - 0.5 mm	35 - 70 mesh	1	1	**4.004 962**
Silica 60, 0.5 - 1.0 mm	18 - 35 mesh	1	1	**4.004 965**
Silica 60, 0.015 - 0.04 mm		5	1	**4.005 001**
Silica 60, 0.025 - 0.04 mm		5	1	**4.004 950**
Silica 60, 0.04 - 0.063 mm	230 - 400 mesh	5	1	**4.004 970**
Silica 60 M, 0.04 - 0.063 mm	230 - 400 mesh	5	1	**4.004 973**
Silica 60, 0.05 - 0.1 mm	130 - 270 mesh	5	1	**4.004 976**
Silica 60, 0.05 - 0.2 mm	70 - 270 mesh	5	1	**4.004 956**
Silica 60, 0. 063 - 0.2 mm	70 - 230 mesh	5	1	**4.004 959**
Silica 60, < 0.063 mm	+ 230 mesh	5	1	**4.004 979**
Silica 60, < 0.08 mm	+ 190 mesh	5	1	**4.004 953**
Silica 60, 0.1 - 0.2 mm	70 - 130 mesh	5	1	**4.004 961**
Silica 60, 0.2 - 0.5 mm	35 - 70 mesh	5	1	**4.004 964**
Silica 60, 0.5 - 1.0 mm	18 - 35 mesh	5	1	**4.004 967**
Silica 60, 0.015 - 0.04 mm		25	1	**4.005 000**
Silica 60, 0.025 - 0.04 mm		25	1	**4.004 949**
Silica 60, 0.04 - 0.063 mm	230 - 400 mesh	25	1	**4.004 969**
Silica 60 M, 0.04 - 0.063 mm	230 - 400 mesh	25	1	**4.004 972**
Silica 60, 0.05 - 0.1 mm	130 - 270 mesh	25	1	**4.004 975**
Silica 60, 0.05 - 0.2 mm	70 - 270 mesh	25	1	**4.004 955**
Silica 60, 0. 063 - 0.2 mm	70 - 230 mesh	25	1	**4.004 958**
Silica 60, < 0.063 mm	+ 230 mesh	25	1	**4.004 978**
Silica 60, < 0.08 mm	+ 190 mesh	25	1	**4.004 952**
Silica 60, 0.2 - 0.5 mm	35 - 70 mesh	25	1	**4.004 963**
Silica 60, 0.5 - 1.0 mm	18 - 35 mesh	25	1	**4.004 966**
Silicia FIA fine	0,071 - 0,16 mesh	1	1	**4.004 980**
Silicia FIA coarse	0,071 - 0,63 mesh	1	1	**4.004 981**

Florisil® adsorbent for column chromatography

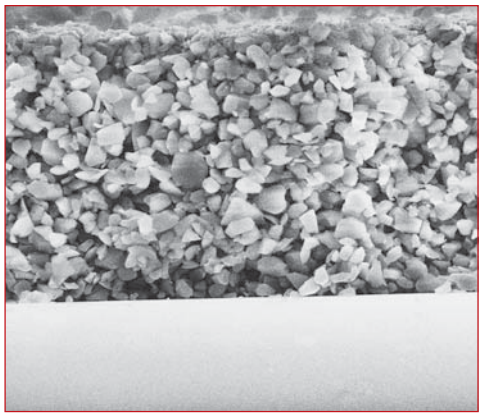
hard granular magnesia silica gel: MgO 15.5±0.5%, SiO_2 84.0 ±0.5%, Na_2SO_4 ≤1.0%; *MACHEREY-NAGEL*
60/100 mesh
typical applications: sample preparation (SPE); clean-up of pesticide residues, separation of chlorinated pesticides, extraction of steroids, sex hormones, antibiotics, lipids etc.

Description	Particle size	Weight kg	PK	Cat. No.
Florisil standard 60 / 100 mesh	0.15 / 0.25 mm	1	1	**6.232 873**
Florisil standard 60 / 100 mesh	0.15 / 0.25 mm	5	1	**4.005 002**

MN ready-to-use layers for TLC

Advantages

- **continuous high quality**
  guaranteed by stringent production control including standardised lot tests, surface checks for roughness or cracks as well as hardness and adherence checks
- **comprehensive range of phases for TLC / HPTLC**
  there is no universal TLC plate which meets all possible types of analyses. Our versatile range of TLC ready-to-use layers covers many different types of applications.
- **immediately ready for chromatographic separation**
  coatings or impregnations are not necessary
- **homogeneous, smooth, well adhering layers**
  an important criterium especially for reproducible quantitative evaluation



Electron microscopic photograph of a cross section through a glass plate with silica layer (magnification x 500)

1 2 Chromatographic columns with Frit, PTFE- /or Valve Stopcock

Length mm	Int. dia. mm	Capacity ml	Description	PK	Cat. No.
200	10	15	without frit NS 14/23	1	**4.008 398**
400	20	125	without frit NS 29/32	1	**4.008 399**
600	30	430	without frit NS 29/32	1	**4.008 400**
200	10	15	with frit (P=0) NS 14/23	1	**4.008 401**
200	15	35	with frit (P=0) NS 14/23	1	**4.008 403**

3 4 5 Chromatographic columns, PTFE- or Valve Stopcock

DURAN® tubing. *Lenz*
Chromatography columns with sintered frit, porosity 0.
Available in three versions:
- with beaded rim and PTFE stopcock
- with NS socket and PTFE stopcock
- with NS socket and valve stopcock (bore 0 - 2.5mm)

Length mm	Int. dia. mm	Capacity ml	Description	Stopcock	PK	Cat. No.
200	15	35	beaded rim	PTFE	1	**6.205 017**
400	20	125	beaded rim	PTFE	1	**6.202 416**
600	30	430	beaded rim	PTFE	1	**6.202 417**
800	40	1000	beaded rim	PTFE	1	**6.202 418**
100	10	8	socket NS 14/23	PTFE	1	**6.225 859**
200	10	15	socket NS 14/23	PTFE	1	**9.025 912**
300	10	23	socket NS 14/23	PTFE	1	**9.025 913**
200	15	35	socket NS 14/23	PTFE	1	**9.025 914**
400	20	125	socket NS 29/32	PTFE	1	**6.203 961**
600	30	430	socket NS 29/32	PTFE	1	**6.303 297**
200	15	35	socket NS 29/32	Valve	1	**6.223 574**

1 Chromatography columns, DURAN®, ground glass joint, PTFE Stopcock

Made of DURAN® tubing. *Lenz*
With PTFE stopcock.
With NS ground socket neck as indicated
Indents are moulded in above the stopcock for holding cotton wool plug supports.

Length mm	Int. dia. mm	Capacity ml	Description	PK	Cat. No.
200	10	15	with NS 14 / 23 socket	1	**9.025 932**
400	20	125	with NS 29 / 32 socket	1	**9.025 934**
600	30	430	with NS 29 / 32 socket	1	**9.025 936**

2 Ion exchange papers

A thin (0.20mm) DEAE cellulose paper-a weakly basic anion exchanger with diethylaminoethyl functional groups. The ion exchange capacity is 1.7µeq/cm2 and flow rate is 95mm/30 min. For use with reverse transcriptase assays and DNA polymerase. *GE Healthcare*

Grade	Diam. mm	PK	Cat. No.
DE81	23	400	**9.950 335**

3 Glass wool

Extra fine. In packs as outlined below.

Capacity g	PK	Cat. No.
30	1	**9.114 303**
1000	1	**9.114 310**

4 Quartz wool

Silica. Fibre thickness 4µm to 12µm. Supplied in packs as outlined below. *proQuarz GmbH*

Capacity g	PK	Cat. No.
25	1	**9.114 321**
100	1	**9.114 330**
500	1	**9.114 331**

Safety Caps

Scat

The integral air filter blocks hazardous vapours and cleans the inflowing air from dust and dirt particles.
With various connectors for capillaries and tubes. Safety Caps are available for most common glass bottles (e.g. thread size GL45).
They can be customised for other container sizes by using different adapters. Especially recommended for HPLC use: Solvents stay clean and components of solvent mixtures can not evaporate. Optimum protection against health hazards caused by evaporation and insufficient sealing.

Key advantages:
- no evaporation of hazardous gases
- no contamination of solvents
- no crimping of connection tubing
- easy container exchange
- no air intake (HPLC)
- cost efficiency (save expensive solvents by avoiding evaporation)

Safety Caps

Scat

Safe solvent supply. With integral air filter vent. For maximum efficiency, we recommend that the vent is changed every 6 months. The filter membrane absorbs dust and dirt particles to protect your solvent reservoirs. The vent is universally suitable for all Safety Caps. It also works with your current Safety Caps, simply replace the old vent with the new one.

Description	Connections	PK	Cat. No.	
Safety Caps I, GL45	1 capillary (3.2mm o.d.)	1	**9.139 850**	1
Safety Caps II, GL45	2 capillaries (3.2mm o.d.)	1	**9.139 851**	
Safety Caps III, GL45	3 capillaries (3.2mm o.d.)	1	**9.139 852**	
Safety Caps IV, GL45	4 capillaries (3.2mm o.d.)	1	**9.139 853**	2
Safety Caps VI, GL45	6 capillaries (3.2mm o.d.)	1	**9.139 854**	
Safety Caps I, with 1 stopcock, GL45	1 capillary (3.2mm o.d.)	1	**9.139 855**	
Safety Caps II, with 2 stopcocks, GL45	2 capillaries (3.2mm o.d.)	1	**9.139 856**	
Safety Caps III, with 3 stopcocks, GL45	3 capillaries (3.2mm o.d.)	1	**9.139 857**	
Safety Caps IV, with 4 stopcocks, GL45	4 capillaries (3.2mm o.d.)	1	**9.139 858**	
Safety Caps VI, with 6 stopcocks, GL45	6 capillaries (3.2mm o.d.)	1	**9.139 859**	
Safety Caps II, combined, GL45 (1with stopcock / 1 without stopcock)	2 capillaries (3.2mm o.d.)	1	**9.139 860**	
Safety Caps III, combined, GL45 (2 with stopcocks / 1 without stopcock)	3 capillaries (3.2mm o.d.)	1	**9.139 861**	
Safety Caps I, for 3/16", GL45	1 capillary (3/16" o.d.)	1	**9.139 862**	
Safety Caps II for NS 29/32 bottles	2 capillaries (3.2mm o.d.)	1	**9.139 863**	

1

9.139 850

2

9.139 853

2 Pressure relief valve for SafetyCaps

Scat

Pressure relief valve for SafetyCaps, with integral air filter.
The valve opens when the HPLC pump is operated, and allows air to flow into the bottle - this prevents a vacuum buiding up in the bottle. As soon as the pump stops, the membrane immediately seals shut and no dangerous solvent vapours can escape.

Description	PK	Cat. No.
Pressure relief valve for SafetyCaps	1	**9.139 864**
Pressure relief valve for SafetyCaps (refill pack)	10	**4.005 886**

2

Summary of MN phases for GC

MN offers more than 40 different phases for gas chromatography from very nonpolar to polar columns.

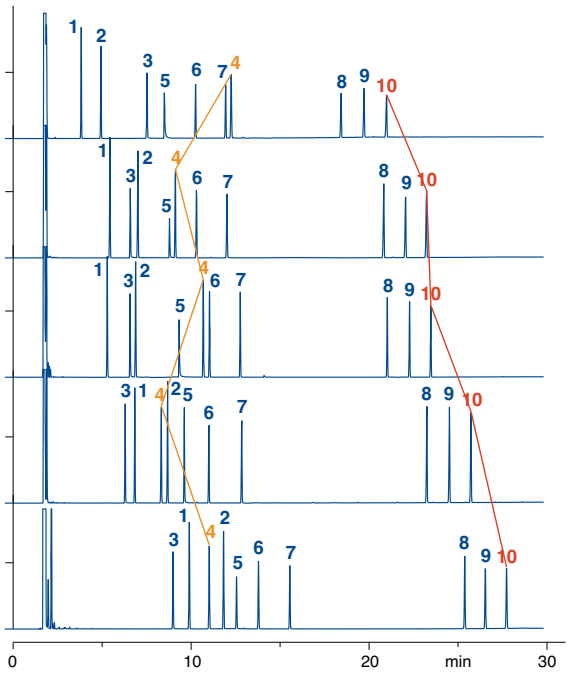
Nonpolar stationary phases (e.g. 100 % dimethylpolysiloxane phases) separate by volatility (i.e. boiling point) only. Typical analytes are linear hydrocarbons (*n*-alkanes).

Polar phases offer additional interactions, which may improve a separation. When increasing the polarity, e.g. by introducing phenyl and / or cyanopropyl groups, separation is increasingly influenced by differences in dipole moment and by charge transfer effects (e.g. for 5 – 50 % diphenylpolysiloxane phases). Typical analytes are hydrocarbons, which contain oxygen, sulphur, nitrogen, phosphorus or halogen atoms, unsaturated molecules which can be polarised and aromatics.

For components featuring different hydrogen bonding capacities and the ability to form strong hydrogen bonds, polyethylene glycol phases (WAX) are the best choice for a separation. Typical analytes are alcohols and carboxylic acids.

Selectivity has to be optimized for the critical pair of components or for the main component. You should always select the least polar column which solves your separation task. About 70 % of all separations can be performed on non- to midpolar columns. These columns generally feature high temperature stability.

Comparison of separation properties of selected OPTIMA® phases



OPTIMA® 225
max. temp. 260/280 °C

OPTIMA® 1701
max. temp. 320/340 °C

OPTIMA® 17
max. temp. 320/340 °C

OPTIMA® 5
max. temp. 340/360 °C

OPTIMA® 1
max. temp. 340/360 °C

increasing polarity

All columns:	0.5 µm film, 30 m x 0.32 mm ID
Sample:	MN-OPTIMA® test mixture
Injection:	1.0 µl, split 1:50
Carrier gas:	80 kPa N_2
Temperature:	80 °C → T_{max} (isothermal), 8 °C/min
Detector:	FID, 260 – 300 °C, 2^6

Peaks:
1. Undecane
2. Dodecane
3. Octanol
4. Dimethylaniline
5. Decylamine
6. Methyl decanoate
7. Methyl undecanoate
8. Henicosane
9. Docosane
10. Tricosane

Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules. Column ends are melted or closed with septa, and thus protected from atmospheric oxygen. Additionally, we include the corresponding test mixture with each column.

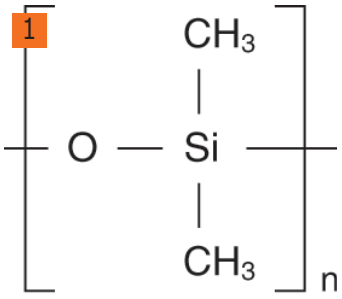
On request, all columns can be supplied with a 5 inch / 13 cm cage for the Agilent GC 6850.

Summary of MN phases for GC

Phase	Composition	max. temperature [1]	USP	Similar phases [2]	Page
Standard phases					
OPTIMA® 1	100 % dimethylpolysiloxane	340/360 °C	G1 G2 G38	PERMABOND® SE-30, OV-1, DB-1, SE-30, HP-1, SPB-1, CP-Sil 5 CB, Rtx®-1, 007-1, BP1, MDN-1, AT™-1, ZB-1, OV-101	86
OPTIMA® 1 MS Accent	100 % dimethylpolysiloxane	340/360 °C	G1 G2 G38	Ultra-1, DB-1MS, HP-1MS, Rtx®-1MS, Equity™-1, AT™-1MS, VF-1MS, CP-Sil 5 CB MS	88
OPTIMA® 5	5 % phenyl – 95 % methylpolysiloxane	340/360 °C	G27 G36	PERMABOND® SE-52, SE-54, SE-52, DB-5, HP-5, SPB-5, CP-Sil 8, Rtx®-5, 007-5, BP5, MDN-5, AT™-5, ZB-5	89
OPTIMA® 5 MS	5 % diphenyl - 95 % dimethylpolysiloxane	340/360 °C	G27 G36	DB-5MS, HP-5MS, Ultra-2, Equity™-5, CP-Sil 8CB low bleed/MS, Rtx®-5SIL-MS, Rtx®-5MS, 007-5MS, BPX5, MDN-5S, AT™-5MS, VF-5MS	90
OPTIMA® 5 MS Accent	silarylene phase with selectivity similar to 5 % diphenyl – 95 % dimethylpolysiloxanphasee	340/360 °C	G27 G36		91
OPTIMA® 17	phenylmethylpolysiloxane, 50 % phenyl	320/340 °C	G3	OV-17, DB-17, HP-50+, HP-17, SPB-50, SP-2250, Rtx®-50, CP-Sil 24 CB, 007-17, ZB-50	92
OPTIMA® 624	6 % cyanopropylphenyl – 94 % dimethylpolysiloxane	280/300 °C	G43	HP-624, HP-VOC, DB-624, DB-VRX, SPB-624, CP-624, Rtx®-624, Rtx®-Volatiles, 007-624, BP624, VOCOL	94
OPTIMA® 624 *LB*	as above, low bleed phase	280/300 °C	G43		
OPTIMA® 1701	14 % cyanopropylphenyl – 86 % dimethylpolysiloxane	300/320 °C	G46	OV-1701, DB-1701, CP-Sil 19 CB, HP-1701, Rtx®-1701, SPB-1701, 007-1701, BP10, ZB-1701	93
OPTIMA® 225	50 % cyanopropylmethyl – 50 % phenylmethylpolysiloxane	260/280 °C	G7 G19	DB-225, HP-225, OV-225, Rtx®-225, CP-Sil 43, 007-225, BP225	95
OPTIMA® WAX	polyethylene glycol 20000 Dalton	240/250 °C	G16	PERMABOND® CW 20 M, DB-Wax, Supelcowax™, HP-Wax, HP-INNOWax, Rtx®-Wax, CP-Wax 52 CB, Stabilwax, 007-CW, BP20, AT™-Wax, ZB-Wax	96
OPTIMA® FFAP	polyethylene glycol-2-nitro-terephthalate	250/260 °C	G25 G35	PERMABOND® FFAP, DB-FFAP, HP-FFAP, CP-SIL 58 CB, 007-FFAP, CP-FFAP CB, Nukol	97
Phases for special separations					
OPTIMA® 5 Amine	5 % phenyl – 95 % methylpolysiloxane, specially deactivated for amine separations	300/320 °C	G27 G36	Rtx-5 Amine, PTA-5	98
LIPODEX® E	octakis-(2,6-di-O-pentyl-3-O-butyryl)-γ-cyclodextrin for enantiomer separation	200/220 °C	–	–	99
HYDRODEX β-6TBDM	heptakis-(2,3-di-O-methyl-6-O-t-butyldimethyl-silyl)-β-cyclodextrin for enantiomer separation	230/250 °C	–	–	100
HYDRODEX β-TBDAc	heptakis-(2,3-di-O-acetyl-6-O-t-butyldimethyl-silyl)-β-cyclodextrin for enantiomer separation	220/240 °C	–	–	100

[1] first temperature for isothermal operation, second value for short isotherms in a temperature programme. Please note, that for columns with 0.53 mm ID and for columns with thicker films temperature limits are generally lower. For details refer to the description of individual phases.

[2] phases which provide a similar selectivity based on chemical and physical properties



1 OPTIMA® 1 high performance capillary columns for GC

100% dimethylpolysiloxane *MACHEREY-NAGEL*

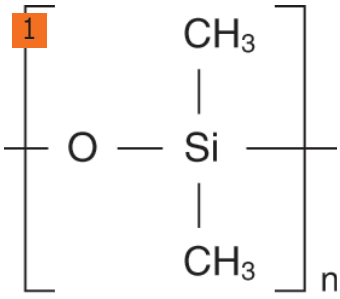
nonpolar phase separation of components according to boiling points thick film columns ≥3µm film are especially recommended for solvent analysis.
Similar phases: Permabond® SE-30, OV-1, DB-1, SE-30, HP-1, SPB-1, CP-Sil 5 CB, Rtx-1, 007-1, BP1, MDN-1, AT-1, ZB-1, OV-101.
For columns with 0.25 to 0.32 mm ID and films <3µm the max. temperature for isothermal operation is 340°C, the max. temperature for short isotherms in a temperature programme is 360°C.
For 0.53mm ID columns with films <3µm the max. temperatures are 320 and 340°C, resp. for thick film columns with films ≥3µm the max. temperatures are 300 and 320 °C, resp.

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.10	25	1	**9.003 657**
0.25	0.4	0.25	25	1	**9.003 662**
0.25	0.4	0.50	25	1	**9.003 667**
0.25	0.4	1.00	25	1	**9.003 671**
0.25	0.4	0.10	30	1	**9.003 658**
0.25	0.4	0.25	30	1	**9.003 663**
0.25	0.4	0.50	30	1	**9.003 668**
0.25	0.4	1.00	30	1	**9.003 672**
0.25	0.4	0.25	50	1	**9.003 664**
0.25	0.4	0.50	50	1	**9.003 669**
0.25	0.4	1.00	50	1	**9.003 673**
0.25	0.4	0.10	60	1	**9.003 659**
0.25	0.4	0.25	60	1	**9.003 665**
0.25	0.4	0.50	60	1	**9.003 670**
0.25	0.4	1.00	60	1	**9.003 674**
0.32	0.5	0.10	25	1	**9.003 676**
0.32	0.5	0.25	25	1	**9.003 682**
0.32	0.5	0.35	25	1	**9.003 686**
0.32	0.5	0.50	25	1	**9.003 691**
0.32	0.5	1.00	25	1	**9.003 697**
0.32	0.5	3.00	25	1	**9.003 701**
0.32	0.5	5.00	25	1	**9.003 706**
0.32	0.5	0.10	30	1	**9.003 677**
0.32	0.5	0.25	30	1	**9.003 683**
0.32	0.5	0.35	30	1	**9.003 687**
0.32	0.5	0.50	30	1	**9.003 692**
0.32	0.5	1.00	30	1	**9.003 698**
0.32	0.5	3.00	30	1	**9.003 702**
0.32	0.5	5.00	30	1	**9.003 707**
0.32	0.5	0.10	50	1	**9.003 678**
0.32	0.5	0.25	50	1	**9.003 684**
0.32	0.5	0.35	50	1	**9.003 688**
0.32	0.5	0.50	50	1	**9.003 693**
0.32	0.5	1.00	50	1	**9.003 699**
0.32	0.5	3.00	50	1	**9.003 703**
0.32	0.5	5.00	50	1	**9.003 708**
0.32	0.5	0.10	60	1	**9.003 679**
0.32	0.5	0.25	60	1	**9.003 685**
0.32	0.5	0.35	60	1	**9.003 689**
0.32	0.5	0.50	60	1	**9.003 694**
0.32	0.5	1.00	60	1	**9.003 700**
0.32	0.5	3.00	60	1	**9.003 704**
0.53	0.8	0.50	25	1	**4.003 149**
0.53	0.8	1.00	25	1	**4.003 164**
0.53	0.8	2.00	25	1	**4.003 152**
0.53	0.8	5.00	25	1	**4.003 265**
0.53	0.8	0.50	30	1	**4.003 150**
0.53	0.8	1.00	30	1	**4.003 165**
0.53	0.8	2.00	30	1	**4.003 153**
0.53	0.8	5.00	30	1	**4.003 266**
0.53	0.8	5.00	50	1	**4.003 267**

Custom-made columns to your specifications available on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules.

Column ends are melted or closed with septa, and thus protected from atmospheric oxygen. Additionally, we supply the corresponding test mixture with each column.

1 OPTIMA® 1 MS Accent ultra-low bleed capillary columns for GC



100 % dimethylpolysiloxane *MACHEREY-NAGEL*

nonpolar phase with ultra-low bleeding, ideal for ion trap and quadrupol MS detectors increased sensitivity
due to an unmatched low background level perfect inertness for basic compounds
solvent rinsing for removal of impurities applicable
application areas: all-round phase for environmental analyses, trace analyses, EPA methods, pesticides, PCB, food and drug analyses
similar phases: Ultra-1, DB-1 MS, HP-1 MS, Rtx-1 MS, Equity™1, AT-1 MS, VF-1 MS, CP-Sil 5 CB MS
max. temperature for isothermal operation 340°C,
max. temperature for short isotherms in a temperature programme 360°C

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.25	30	1	**4.003 001**
0.25	0.4	0.50	30	1	**4.003 003**
0.25	0.4	0.25	60	1	**4.003 002**
0.25	0.4	0.50	60	1	**4.003 004**
0.32	0.5	0.25	30	1	**4.002 998**
0.32	0.5	0.50	30	1	**4.003 005**
0.32	0.5	0.25	60	1	**4.002 999**
0.32	0.5	0.50	60	1	**4.003 006**

Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules. Column ends are melted or closed with septa, and thus protected from atmospheric oxygen.
Additionally, we supply the corresponding test mixture with each column.

EPA 8140 / 8141 / 8141 A org. P pesticides

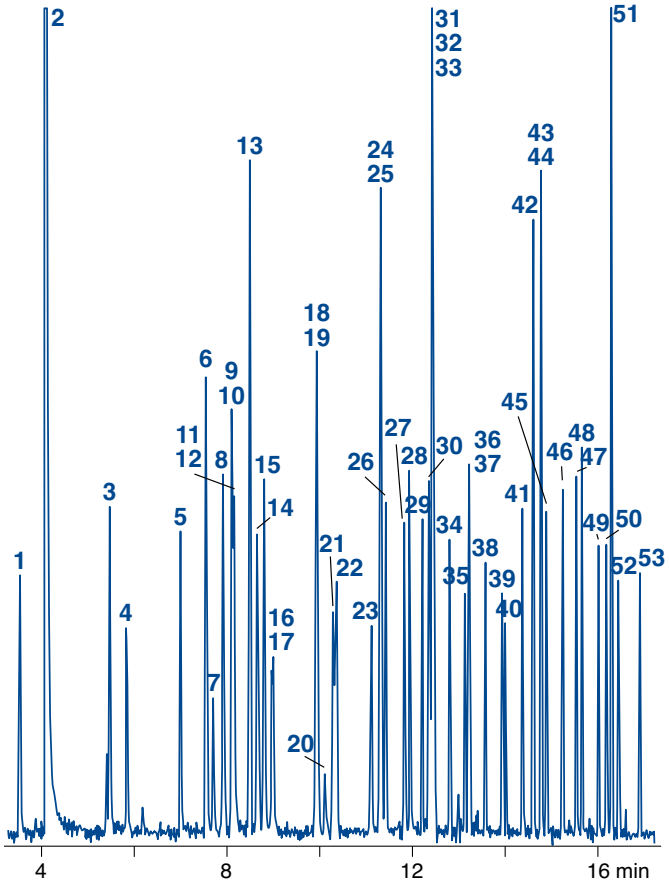
Column: OPTIMA® 1 MS Accent, 0.50 µm film, 30 m x 0.32 mm ID

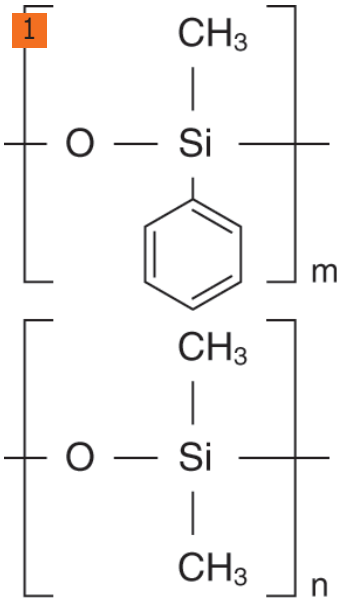
Sample: 0.2 µg/ml in hexane, 8140/8141 OP pesticides calibration mix A + 8141 OP pesticides calibration mix B;
IS triphenyl phosphate and tributyl phosphate

Injection splitless (for 1 min); inj. temperature 250 °C
Carrier gas He, 1 ml/min, constant pressure
Temperature 100 °C → 180 °C, 10 °C/min (2 min) → 300 °C, 18 °C/min (3 min)
Detector: FPD (flame photometric detector), 280 °C

Peaks:
1. Dichlorvos, 2. Hexamethylphosphoramide, 3. Mevinphos, 4. Trichlorfon, 5. TEPP, 6. Thionazin, 7. Demeton-O, 8. Ethoprop 9. Tributyl phosphate (IS), 10. Dicrotophos, 11. Monocrotophos, 12. Naled, 13. Sulfotepp, 14. Phorate, 15. Dimethoate, 16. Demeton-S, 17. Dioxathion, 18. Terbufos, 19. Fonophos, 20. Phosphamidon-Isomer, 21. Diazinon, 22. Disulfoton, 23. Phosphamidon, 24. Dichlorofenthion, 25. Parathion-methyl, 26. Chlorpyrifos methyl, 27. Ronnel, 28. Fenitrothion, 29. Malathion, 30. Fenthion, 31. Aspon, 32. Parathion-ethyl, 33. Chlorpyrifos, 34. Trichloronate, 35. Chlorfenvinphos, 36. Merphos, 37. Crotoxyphos, 38. Stirofos, 39. Tokuthion, 40. Merphos oxidation product, 41. Fensulfothion, 42. Famphur, 43. Ethion, 44. Bolstar, 45. Carbophenothion, 46. Triphenyl phosphate (IS), 47. Phosmet, 48. EPN, 49. Azinphos-methyl, 50. Leptophos, 51. Tri-*o*-cresyl phosphate, 52. Azinphos-ethyl, 53. Coumaphos

MN Appl. No. 213030





1 OPTIMA® 5 capillary columns for GC

5% phenyl - 95% dimethylpolysiloxane *MACHEREY-NAGEL*

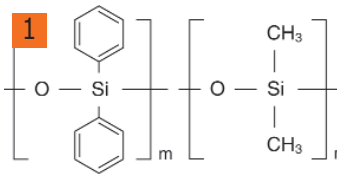
USP G27, G36 nonpaolar standard phase with large range of application similar phases:
Permabond® SE-52 , SE-54, SE-52, DB-5, HP-5, SPB-5, CP-Sil 8, Rtx-5, 007-5, BP5, MDN-5, AT-5, ZB-5
for columns with 0.1 to 0.32mm ID and films <3µm the max. temperature for isothermal operation is 340°C, the max. temperature for short isotherms in a temperature programme is 360°C for 0.53mm ID columns with films < 3µm the max. temperatures are 320 and 340°C, resp. for thick film columns with films ≥ 3µm the max. temperatures are 300 and 320°C, resp.

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.10	0.4	0.10	10	1	**4.003 235**
0.25	0.4	0.10	25	1	**9.003 709**
0.25	0.4	0.25	25	1	**9.003 715**
0.25	0.4	0.35	25	1	**9.003 719**
0.25	0.4	0.50	25	1	**9.003 723**
0.25	0.4	1.00	25	1	**9.003 727**
0.25	0.4	0.10	30	1	**9.003 710**
0.25	0.4	0.25	30	1	**9.003 716**
0.25	0.4	0.35	30	1	**9.003 720**
0.25	0.4	0.50	30	1	**9.003 724**
0.25	0.4	1.00	30	1	**9.003 728**
0.25	0.4	0.10	50	1	**9.003 711**
0.25	0.4	0.25	50	1	**9.003 717**
0.25	0.4	0.35	50	1	**9.003 721**
0.25	0.4	0.50	50	1	**9.003 725**
0.25	0.4	1.00	50	1	**9.003 729**
0.25	0.4	0.10	60	1	**9.003 712**
0.25	0.4	0.25	60	1	**9.003 718**
0.25	0.4	0.35	60	1	**9.003 722**
0.25	0.4	0.50	60	1	**9.003 726**
0.25	0.4	1.00	60	1	**9.003 730**
0.32	0.5	0.10	25	1	**9.003 733**
0.32	0.5	0.25	25	1	**9.003 738**
0.32	0.5	0.35	25	1	**9.003 742**
0.32	0.5	0.50	25	1	**9.003 746**
0.32	0.5	1.00	25	1	**9.003 751**
0.32	0.5	3.00	25	1	**9.003 755**
0.32	0.5	5.00	25	1	**9.003 760**
0.32	0.5	0.10	30	1	**9.003 734**
0.32	0.5	0.25	30	1	**9.003 739**
0.32	0.5	0.35	30	1	**9.003 743**
0.32	0.5	0.50	30	1	**9.003 747**
0.32	0.5	1.00	30	1	**9.003 752**
0.32	0.5	3.00	30	1	**9.003 756**
0.32	0.5	5.00	30	1	**9.003 761**
0.32	0.5	0.10	50	1	**9.003 735**
0.32	0.5	0.25	50	1	**9.003 740**
0.32	0.5	0.35	50	1	**9.003 744**
0.32	0.5	0.50	50	1	**9.003 748**
0.32	0.5	1.00	50	1	**9.003 753**
0.32	0.5	3.00	50	1	**9.003 757**
0.32	0.5	0.10	60	1	**9.003 736**
0.32	0.5	0.25	60	1	**9.003 741**
0.32	0.5	0.35	60	1	**9.003 745**
0.32	0.5	0.50	60	1	**9.003 749**
0.32	0.5	1.00	60	1	**9.003 754**
0.32	0.5	3.00	60	1	**9.003 758**
0.53	0.8	0.50	25	1	**4.003 155**
0.53	0.8	1.00	25	1	**4.003 168**
0.53	0.8	2.00	25	1	**4.003 158**
0.53	0.8	5.00	25	1	**4.003 261**
0.53	0.8	0.50	30	1	**4.003 156**
0.53	0.8	1.00	30	1	**4.003 169**
0.53	0.8	2.00	30	1	**4.003 159**
0.53	0.8	5.00	30	1	**4.003 262**
0.53	0.8	2.00	50	1	**4.003 160**
0.53	0.8	5.00	50	1	**4.003 263**
0.53	0.8	2.00	60	1	**4.003 161**

Custom-made columns to your specifications available on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules. Column ends are melted or closed with septa, and thus protected from atmospheric oxygen.
Additionally, we supply the corresponding test mixture with each column.

1 OPTIMA® 5 MS capillary columns for GC

5% diphenyl - 95% dimethylpolysiloxane *MACHEREY-NAGEL*



nonpolar phase with low bleeding, deal for GC/MS and ECD applications and general analyses at trace level perfect inertness for basic compounds.
Similar phases: DB-5 MS, HP-5 MS, Ultra-2, Equity-5, CP-Sil 8 CB low bleed/MS, Rtx-5SIL-MS, Rtx-5 MS, 007-5 MS, BPX5, MDN-5S, AT-5 MS, VF-5 MS.
max. temperature for isothermal operation: 340°C,
max. temperature for short isotherms in a temperature programme: 360°C

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.25	30	1	**7.080 092**
0.25	0.4	0.50	30	1	**4.003 099**
0.25	0.4	1.00	30	1	**4.003 101**
0.25	0.4	0.25	60	1	**4.003 098**
0.25	0.4	0.50	60	1	**4.003 100**
0.32	0.5	1.00	25	1	**4.003 091**
0.32	0.5	0.25	30	1	**6.700 690**
0.32	0.5	0.50	30	1	**4.003 093**
0.32	0.5	1.00	50	1	**4.003 092**
0.32	0.5	1.00	60	1	**7.080 742**

Custom-made columns to your specifications available on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules. Column ends are melted or closed with septa, and thus protected from atmospheric oxygen.
Additionally, we supply the corresponding test mixture with each column.

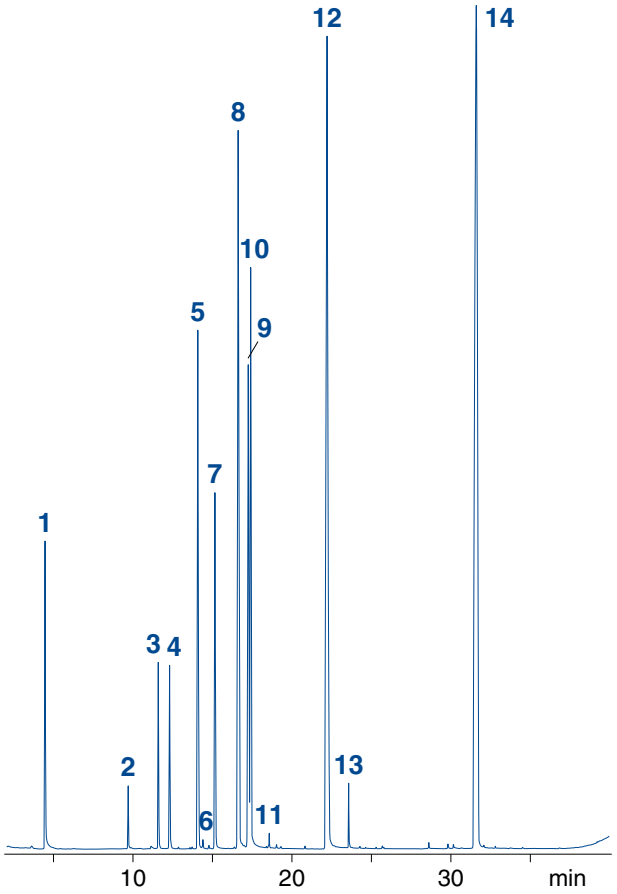
Analysis of various phenols

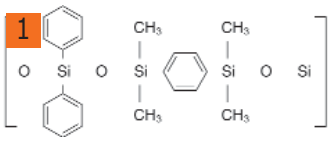
Column: OPTIMA® 5 MS, 30 m x 0.25 mm ID, 0.25 µm film, max. temperature 340/360 °C
Sample: 5 ppm each except *N*-*i*-propylaniline (9.4 ppm)
Method: SPME
Temperature: 40 °C (2 min) → 240 °C, 6 °C/min → 320 °C, 20 °C/min
Detector: MSD

Peaks:
1. Toluene-D_8
2. Phenol
3. 2-Methylphenol (*o*-Cresol)
4. Nitrobenzene-D_5
5. *N*-*i*-Propylaniline
6. 2,4-Dichlorophenol
7. 4-Chlorophenol
8. 4-Bromo-2-chlorophenol
9. 3-Bromophenol
10. 4-Chloro-3-methylphenol
11. 2,4-Dibromophenol
12. 2-Hydroxybiphenyl
13. 2-Cyclohexylphenol
14. Hexafluorobisphenol A

courtesy of Riedel-de-Haën, Seelze, Germany

MN Appl. No. 210110





1 OPTIMA® 5 MS Accent capillary columns for GC

silarylene phase *MACHEREY-NAGEL*

with polarity similar to a 5 % diphenyl -95 % dimethylpolysiloxane phase.
USP G27, G36
lowest column bleed, nonpolar phase, ideal for ion trap and quadrupol MS detectors solvent rinsing for removal of impurities applicable
application areas: all-round phase for environmental analyses, trace analyses, EPA methods, pesticides, PCB, food and drug analyses
similar phases: DB-5 MS, HP-5 MS, Ultra-2, Equity-5, CP-Sil 8 CB low bleed/MS, Rtx-5SIL-MS, Rtx-5 MS, 007-5 MS, BPX5, MDN-5S, AT-5 MS, VF-5 MS

max. temperature for isothermal operation: 340°C,
max. temperature for short isotherms in a temperature programme: 360°C
for cloumns with film thicknesses > 5.5 µm the max. temperatures are 320 and 340°C

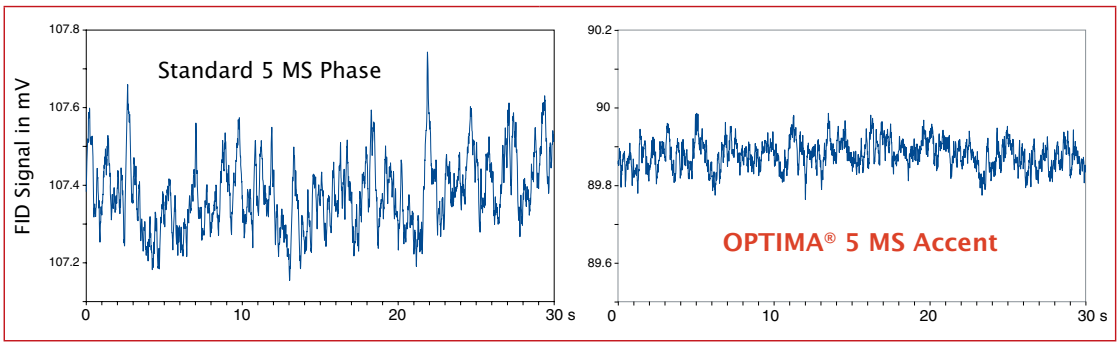
Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.25	30	1	**4.003 017**
0.25	0.4	0.50	30	1	**4.003 019**
0.25	0.4	1.00	30	1	**4.003 021**
0.25	0.4	0.25	60	1	**4.003 018**
0.25	0.4	0.50	60	1	**4.003 020**
0.25	0.4	1.00	60	1	**4.003 022**
0.32	0.5	1.00	25	1	**4.003 011**
0.32	0.5	0.25	30	1	**4.003 009**
0.32	0.5	0.50	30	1	**4.003 013**
0.32	0.5	0.25	60	1	**4.003 010**
0.32	0.5	1.00	60	1	**4.003 012**

Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules. Column ends are melted or closed with septa, and thus protected from atmospheric oxygen.
Additionally, we supply the corresponding test mixture with each column.

The bleed comparison test of the OPTIMA® 5-MS Accent with a conventional 5-MS phase shows the outstanding performance of the silarylene phase.

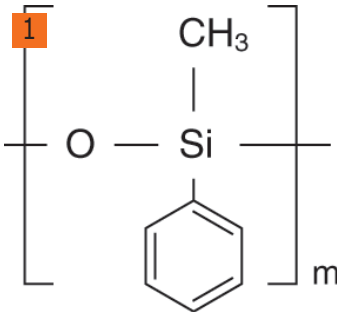
Background noise at 340 °C

The unmatched low background level of the OPTIMA® 5 MS Accent, which is approximately three times lower compared to a 5 MS brand column, provides significantly increased sensitivity and allows the application in trace analyses particularly of high-boiling compounds.



1 Optima® 17 capillary columns for GC

phenylmethylpolysiloxane (50 % phenyl) *MACHEREY-NAGEL*



medium polar phase
preferred applications: steroids, pesticides, drug analyses
USP G3
similar phases: OV-17, DB-17, HP50+, HP17, SPB-50, SP-2250, Rtx-50, CP-Sil 24 CB, 007-17, ZB50

max. temperature for isothermal operation: 320°C, max. temperature for short isotherms in a temperature programme: 340°C, for 0.53mm ID columns the max. temperatures are 300 and 320°C, resp.

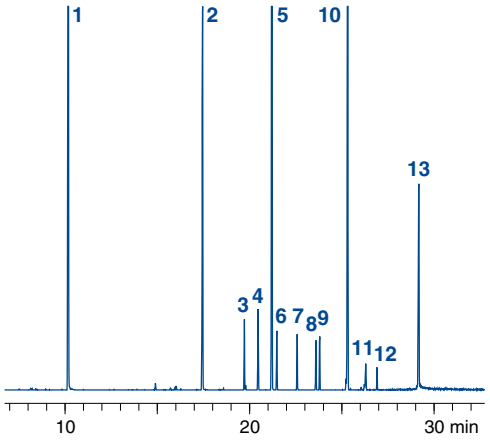
Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.10	0.4	0.10	10	1	**4.003 236**
0.25	0.4	0.15	25	1	**4.003 181**
0.25	0.4	0.25	25	1	**4.003 026**
0.25	0.4	0.50	25	1	**4.003 046**
0.25	0.4	0.15	30	1	**4.003 182**
0.25	0.4	0.25	30	1	**4.003 027**
0.25	0.4	0.50	30	1	**4.003 047**
0.25	0.4	0.15	50	1	**4.003 183**
0.25	0.4	0.25	50	1	**4.003 028**
0.25	0.4	0.50	50	1	**4.003 048**
0.25	0.4	0.15	60	1	**4.003 184**
0.25	0.4	0.25	60	1	**4.003 029**
0.25	0.4	0.50	60	1	**4.003 049**
0.32	0.5	0.25	25	1	**4.003 112**
0.32	0.5	0.35	25	1	**4.003 194**
0.32	0.5	0.50	25	1	**4.003 185**
0.32	0.5	0.15	30	1	**4.003 193**
0.32	0.5	0.25	30	1	**4.003 113**
0.32	0.5	0.35	30	1	**4.003 195**
0.32	0.5	0.50	30	1	**4.003 186**
0.32	0.5	0.25	50	1	**4.003 114**
0.32	0.5	0.35	50	1	**4.003 196**
0.32	0.5	0.50	50	1	**4.003 187**
0.32	0.5	0.25	60	1	**4.003 115**
0.32	0.5	0.35	60	1	**4.003 197**
0.32	0.5	0.50	60	1	**4.003 188**
0.53	0.8	1.00	25	1	**4.003 191**
0.53	0.8	1.00	30	1	**4.003 192**

In addition to this standard programme we will be happy to supply columns custom-made to your specifications.

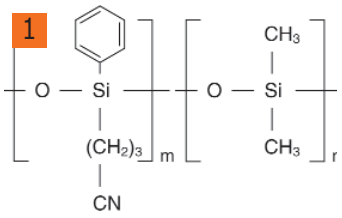
Analysis of pesticides

Column: OPTIMA® 17, 0.20 µm film, 25 m x 0.20 mm ID, max. temperature 320/340 °C,
Sample: pesticide standard of the cantonal laboratory Schaffhausen (Switzerland), 0.1 mg/ml or 0.01 mg/ml each
Inj. volume: 1.0 µl
Carrier gas: He, 25 cm/s, 3 s without split
Temperature: 100 °C (3 min), 8 °C/min → 250 °C, 10 °C/min → 320 °C
Detector: MSD HP 5971

MN Appl. No. 200930



Peaks:
1. Dichlorphos
2. Naled
3. Vinclozolin
4. Chlorthalonil
5. Chlorpyrifos
6. Dichlofluanid
7. Procymidon
8. Captan
9. Folpet
10. Carbophenothion
11. Iprodion
12. Captafol
13. Coumaphos



1 Optima® 1701 capillary columns for GC

14 % Cyanopropyl-phenyl - 86 % Dimethylpolysiloxane *MACHEREY-NAGEL*

USP G46
medium polar phase
special selectivity due to high cyanopropyl content
reference column for structure identification, e.g. in combination with Optima 5
film thickness 1 µm for solvent analyses
similar phases: OV-1701, DB-1701, CP?Sil 19 CB, HP-1701, Rtx-1701, SPB-1701, 007-1701, BP10, ZB-1701

max. temperature for isothermal operation: 300°C, max. temperature for short isotherms in a temperature programme: 320°C for 0.53mm ID columns the max. temperatures are 280 and 300°C, resp.

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.25	25	1	**4.003 035**
0.25	0.4	0.25	30	1	**4.003 036**
0.25	0.4	0.50	30	1	**4.003 039**
0.25	0.4	1.00	30	1	**4.003 272**
0.25	0.4	0.25	50	1	**4.003 037**
0.25	0.4	0.25	60	1	**4.003 038**
0.25	0.4	0.50	60	1	**4.003 040**
0.32	0.5	0.25	25	1	**4.003 103**
0.32	0.5	0.35	25	1	**4.003 222**
0.32	0.5	0.50	25	1	**4.003 107**
0.32	0.5	1.00	25	1	**4.003 268**
0.32	0.5	0.25	30	1	**4.003 104**
0.32	0.5	0.35	30	1	**4.003 223**
0.32	0.5	0.50	30	1	**4.003 108**
0.32	0.5	1.00	30	1	**4.003 269**
0.32	0.5	0.25	50	1	**4.003 105**
0.32	0.5	0.35	50	1	**4.003 224**
0.32	0.5	1.00	50	1	**4.003 109**
0.32	0.5	1.00	50	1	**4.003 270**
0.32	0.5	0.25	60	1	**4.003 106**
0.32	0.5	0.35	60	1	**4.003 225**
0.32	0.5	0.50	60	1	**7.088 327**
0.32	0.5	1.00	60	1	**4.003 271**
0.53	0.8	1.00	25	1	**4.003 172**
0.53	0.8	2.00	25	1	**4.003 178**
0.53	0.8	1.00	30	1	**4.003 173**
0.53	0.8	2.00	30	1	**4.003 179**
0.53	0.8	2.00	50	1	**4.003 180**

Custom-made columns to your specifications on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules.
Column ends are melted or closed with septa, and thus protected from Additionally, we supply the corresponding test mixture with each column.

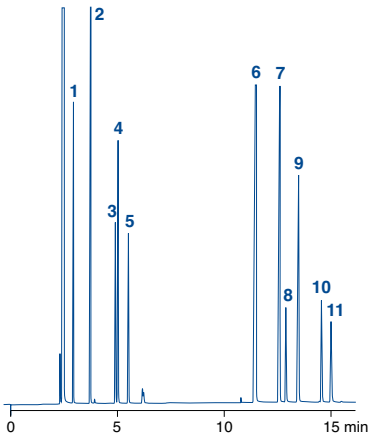
Analysis of aromatic hydrocarbons

Column: OPTIMA® 1701, 0.25 µm film, 25 m x 0.32 mm ID, max. temp. 300/320 °C
Inj. volume: 1 µl
Carrier gas: 0.6 bar N_2
Split: 1:40
Temperature: 60 °C → 120 °C, 4 °C/min
Detector: FID 260 °C

Peaks:

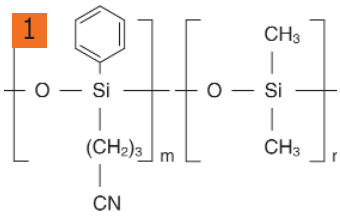
1. Benzene
2. Toluene
3. Ethylbenzene
4. *p*-Xylene
5. *o*-Xylene
6. Phenol
7. 2-Methylphenol
8. 2,6-Dimethylphenol
9. 4-Methylphenol
10. 2,4-Dimethylphenol
11. 2,4,6-Trimethylphenol

MN Appl. No. 200400



1 Optima® 624 capillary columns for GC

6% cyanopropyl-phenyl - 94% dimethylpolysiloxane *MACHEREY-NAGEL*



USP G43
medium polar phase
recommended for environmental analyses
similar phases: HP-624, HP-VOC, DB-624, DB-VRX, SPB-624, CP-624, Rtx-624, Rtx-Volatiles, 007-624, BP624, VOCOL

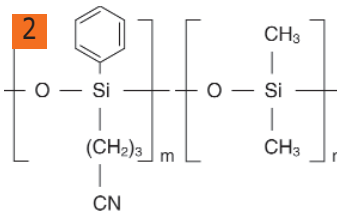
max. temperature for isothermal operation: 280°C,
max. temperature for short isotherms in a temperature programme: 300°C

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	1.40	30	1	**4.003 211**
0.25	0.4	1.40	50	1	**4.003 212**
0.25	0.4	1.40	60	1	**4.003 213**
0.25	0.5	1.80	30	1	**4.003 217**
0.32	0.5	1.80	50	1	**4.003 218**
0.32	0.5	1.80	60	1	**4.003 219**
0.53	0.8	3.00	25	1	**4.003 220**
0.53	0.8	3.00	30	1	**4.003 221**

Custom-made columns to your specifications avaialble on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules.
Column ends are melted or closed with septa. Additionally, we supply the corresponding test mixture with each column.

2 Optima® 624 *LB* capillary columns for GC

6% cyanopropyl-phenyl - 94% dimethylpolysiloxane *MACHEREY-NAGEL*



USP G 43
medium polar phase
low bleed columns for halogenated hydrocarbons, volatiles, aromatic compounds, solvents etc.
similar phases: HP-624, HP-VOC, DB-624, DB-VRX, SPB-624, CP-624, Rtx-624, Rtx-Volatiles, 007-624, BP624, VOCOL

max. temperature for isothermal operation: 280°C,
max. temperature for short isotherms in a temperature programme: 300°C

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.32	0.5	1.80	30	1	**4.003 214**
0.32	0.5	1.80	50	1	**4.003 215**

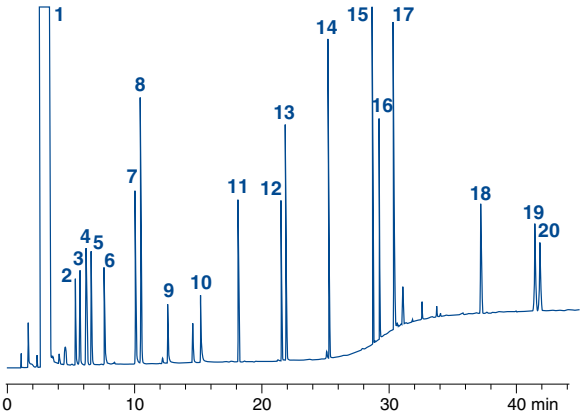
Custom-made columns to your specifications available on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules.
Column ends are melted or closed with septa. Additionally, we supply the corresponding test mixture with each column.

Solvents and semi-volatiles

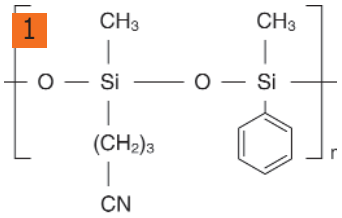
Column: OPTIMA® 624 *LB*, 1.8 µm film, 30 m x 0.32 mm ID; Retention Gap Phe-Sil 0.5 m x 0.53 mm
Carrier gas: 1.1 bar He
Temperature: 45 °C (3 min) → 150 °C (6 °C/min) → 300 °C (18 °C/min), 20 min 300 °C
Injection: 1 µl (10 ppm per substance in acetone), cold on-column
Detection: FID 280 °C

Peaks:

1. Acetone
2. Ethyl acetate
3. Tetrahydrofuran
4. Cyclohexane
5. Methyl-2-butanol-2
6. Butanol-1
7. Pyridine
8. Toluene
9. Dimethylformamide
10. Dimethylsulphoxide
11. Decane
12. Octanol-1
13. Acetophenone
14. Butyrophenone
15. Heptanophenone
16. Methoxy-5-indole
17. Dibenzylamine
18. Methyl eicosanoate
19. Methyl *cis*-13-docosenoate
20. Methyl docosanoate



MN Appl. No. 212520



1 OPTIMA® 225 capillary columns for GC

50% cyanopropylmethyl - 50% phenylmethylpolysiloxane *MACHEREY-NAGEL*

USP G7/G19
middle polar phase
recommended for fatty acid analyses
similar phases: DB-225, HP-225, OV-225, Rtx-225, CP-Sil 43, 007-225, BP225

max. temperature for isothermal operation: 260°C,
max. temperature for short isotherms in a temperature programme: 280°C

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.10	0.4	0.10	10	1	**4.003 050**
0.25	0.4	0.25	30	1	**4.003 066**
0.25	0.4	0.25	50	1	**4.003 067**
0.25	0.4	0.25	60	1	**4.003 068**
0.32	0.5	0.25	30	1	**4.003 117**
0.32	0.5	0.25	50	1	**4.003 118**
0.32	0.5	0.25	60	1	**4.003 119**

Custom-made columns to your specifications available on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules.
Column ends are melted or closed with septa. Additionally, we supply the corresponding test mixture with each column.

Analysis of FAME in porcine fat

Column: OPTIMA® 225, 0.25 µm film, 25 m x 0.32 mm ID, max. temperature 260/280 °C
Carrier gas: 60 kPa H_2, injection volume 1 µl, split 1:40
Temperature: 50 °C (2 min) → 125 °C, 30 °C/min → 160 °C, 5 °C/min → 180 °C, 20 °C/min → 200 °C, 3 °C/min → 220 °C, 20 °C/min (10 min)
Detector: FID 260 °C

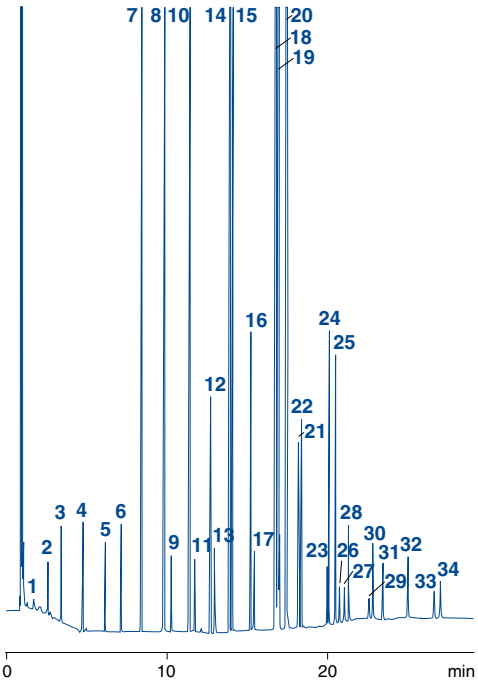
Peaks:

1. C4:0
2. C5:0
3. C6:0
4. C8:0
5. C10:0
6. C11:0
7. C12:0
8. C13:0
9. C13:1
10. C14:0
11. C14:1
12. C15:0
13. C15:1
14. C16:0
15. C16:1
16. C17:0
17. C17:1
18. C18:0
19. C18:1
20. C18:2
21. C18:3
22. C19:0
23. C20:0
24. C20:1
25. C20:2
26. C20:4
27. C20:3
28. C20:5
29. C22:0
30. C22:1
31. C22:2
32. C22:6
33. C24:0
34. C24:1

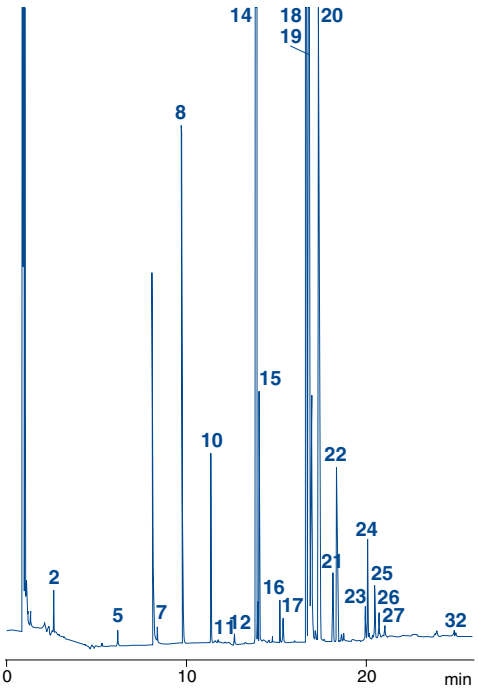
courtesy of Dr. Bantleon, Mr. Leusche, Mr. Hagemann, VFG-Labor, Versmold, Germany

MN Appl. No. 210060

FAME standard

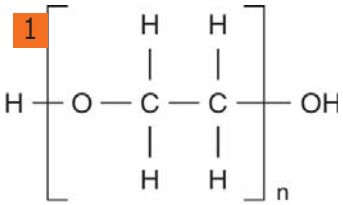


FAME in porcine fat



1 Optima® WAX capillary columns for GC

polyethylene glycol 20000 daltons *MACHEREY-NAGEL*



USP G16
polar phase
recommended for solvent analysis and alcohols
suitable for aqueous solutions
similar phases: Premabond® CW 20 M_, DB-Wax, Supelcowax, HP-Wax, HP-INNOWAX, Rtx-Wax, CP-Wax 52 CB, Stabilwax, 007-CW, BP20, AT-Wax, ZB-Wax

max. temperature for isothermal operation 240°C, max. temperature for short isotherms in a temperature programme: 250°C, for 0.53 mm ID columns the max. temperatures are 220 and 240°C, resp.

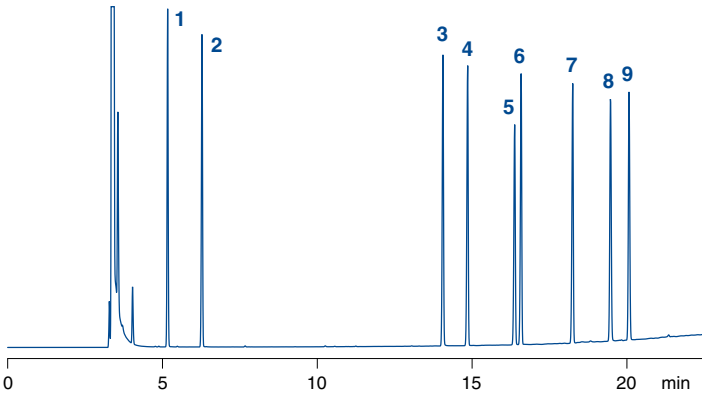
Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.25	25	1	**9.003 762**
0.25	0.4	0.25	30	1	**9.003 763**
0.25	0.4	0.25	50	1	**9.003 764**
0.25	0.4	0.25	60	1	**9.003 765**
0.32	0.5	0.25	25	1	**9.003 766**
0.32	0.5	0.50	25	1	**9.003 770**
0.32	0.5	0.25	30	1	**9.003 767**
0.32	0.5	0.50	30	1	**9.003 771**
0.32	0.5	0.25	50	1	**9.003 768**
0.32	0.5	0.50	50	1	**9.003 772**
0.32	0.5	0.25	60	1	**9.003 769**
0.32	0.5	0.50	60	1	**9.003 773**
0.53	0.8	1.00	25	1	**4.003 175**
0.53	0.8	1.00	30	1	**4.003 176**
0.53	0.8	2.00	30	1	**4.003 174**

Custom-made columns to your specifications available on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules.
Column ends are melted or closed with septa. Additionally, we supply the corresponding test mixture with each column.

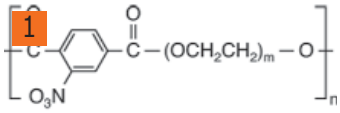
Modified Grob test

Column: OPTIMA® WAX, 0.5 µm film, 50 m x 0.32 mm ID, max. temperature 250/260 °C
Inj. volume: 1 µl
Carrier gas: 1,2 bar He
Split: 1:20
Temperature: 80 °C → 250 °C, 8 °C/min
Detector: FID 250 °C

Peaks:
1. Decane
2. Undecane
3. Octanol
4. Methyl decanoate
5. Dicyclohexylamine
6. Methyl undecanoate
7. Methyl dodecanoate
8. 2,6-Dimethylaniline
9. 2,6-Dimethylphenol



MN Appl. No. 211170



1 Optima® FFAP capillary columns for GC

polyethylene glycol 2-nitroterephthalate *MACHEREY-NAGEL*

close equivalent USP G25/G35
polar phase
recommended for FAME, free carboxylic acids
similar phases: Permabond FFAP , DB-FFAP, HP-FFAP, CP-Sil 58 CB, 007-FFAP, CP-FFAP CB, Nukol

for columns with 0.10 to 0.32mm ID the max. temperature for isothermal operation is 250°C, the max. temperature for short isotherms in a temperature programme is 260°C for 0.53mm ID columns the max. temperatures are 220 and 240°C, resp.

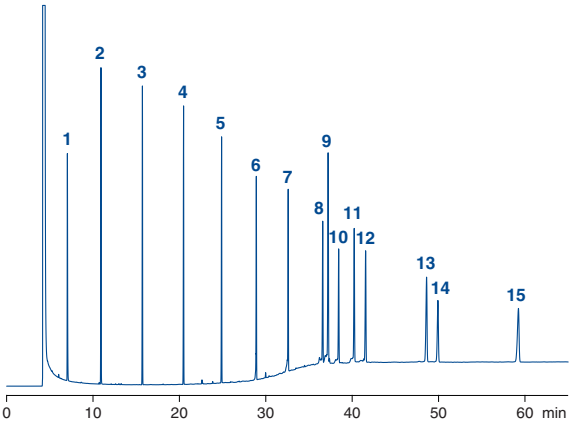
Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.10	0.4	0.10	10	1	**4.003 079**
0.25	0.4	0.25	25	1	**9.003 774**
0.25	0.4	0.25	30	1	**9.003 775**
0.25	0.4	0.25	50	1	**9.003 776**
0.25	0.4	0.25	60	1	**9.003 777**
0.32	0.5	0.25	25	1	**9.003 778**
0.32	0.5	0.50	25	1	**9.003 782**
0.32	0.5	0.25	30	1	**9.003 779**
0.32	0.5	0.50	30	1	**9.003 783**
0.32	0.5	0.25	50	1	**9.003 780**
0.32	0.5	0.50	50	1	**9.003 784**
0.32	0.5	0.25	60	1	**9.003 781**
0.53	0.8	1.00	25	1	**4.003 111**
0.53	0.8	0.50	30	1	**4.003 110**

Custom-made columns to your specifications on request.
Each column is individually tested and supplied with test certificate and test chromatogram, but without fittings or ferrules. Column ends are melted or closed with septa, and thus protected from atmospheric oxygen.
Additionally, we supply the corresponding test mixture with each column.

FAME test

Column: OPTIMA® FFAP, 0.25 µm film, 60 m x 0.32 mm ID, max. temperature 250/260 °C
Carrier gas: 1.2 bar He, split
Temperature: 55 °C → 250 °C, 6 °C/min
Injection: 1,0 µl, 220 °C
Detector: FID 220 °C

Peaks:
1. C4
2. C6
3. C8
4. C10
5. C12
6. C14
7. C16
8. C18
9. C18:1 *cis/trans*
10. C18:2
11. C18:3
12. C20
13. C22
14. C22:1
15. C24



MN Appl. No. 211140

Optima® 5 Amine GC capillary columns for amine separation

especially deactivated for the analysis of polyfunctional amines such as ethanolamines, amino-functionalised diols and similar compounds, which are important base materials in industrial chemistry, and shows strong tailing on standard-deactivated columns; similar phases: Rtx-5 Amine, PTA-5; USP G27/G36; improved linearity for analyses of active components at trace levels: no amine absorptions even for aliphatic and aromatic amines at concentrations of 100 pg/peak; tested with the Optima® Amine test mixture, which among others also contains diethanolamine and propanol-pyridine (this test mixture is supplied with each column). Max. temperature for isothermal operation: 300°C, max. temperature for short isotherms in a temperature programme: 320°C. *MACHEREY-NAGEL*

Int. dia. mm	Ext. diam. mm	Film thickness µm	Length m	PK	Cat. No.
0.25	0.4	0.50	30	1	**6.900 659**
0.25	0.4	1.00	30	1	**4.003 123**
0.32	0.5	0.25	30	1	**4.003 125**

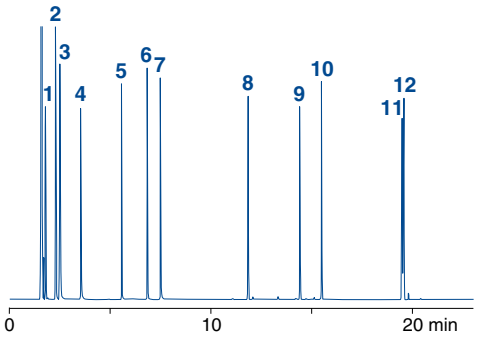
Separation of secondary and tertiary amines

Column: OPTIMA® 5 Amine, 0.5 µm film, 30 m x 0.25 mm ID, max. temperature 300/320 °C
Injection volume: 1 µl
Carrier gas: 0,6 bar H_2, Split 1:100
Temperature: 100 °C (3 min) → 280 °C, 10 °C/min
Detector: FID 280 °C

Peaks:

1. Diethylamine
2. Di-isopropylamine
3. Triethylamine
4. Di-*n*-propylamine
5. Di-*n*-butylamine
6. Tri-*n*-propylamine
7. Di-isobutylamine
8. Tri-*n*-butylamine
9. Di-isohexylamine
10. Dicyclohexylamine
11. Dibenzylamine
12. Tri-*n*-hexylamine

MN Appl. No. 210280



GC Capillary columns for special separations

LIPODEX® cyclodextrin phase for enantiomer separation *MACHEREY-NAGEL*

base material: cyclic oligosaccharide consisting of eight glucose units bonded through α-1.4-linkages (γ-cylodextrin) regioselective alkylation and acylation of the hydroxyl groups leads to a lipophilic phase, which is well suited for GC enantiomer analyses; important advantage: many compounds can be analysed without derivatisation (however, for certain substances enantioselectivity can be favourably influenced by formation of derivatives)

LIPODEX® E is suitable for a broad application range.

LIPODEX® E · octakis-(2.6-di-O-pentyl-3-O-butyryl)-γ-cyclodextrin

recommended for α-amino acids, α- and β-hydroxycarboxylic acid esters, alcohols (TFA), diols (TFA), ketones, pheromones (cyclic acetals), amines, alkyl halides, lactones. *MACHEREY-NAGEL*

max. temperature for isothermal operation: 200°C,
max. temperature for short isotherms in a temperature programme: 220°C

Int. dia. mm	Ext. diam. mm	Length m	PK	Cat. No.
0.25	0.4	25	1	**4.002 925**
0.25	0.4	50	1	**4.002 926**

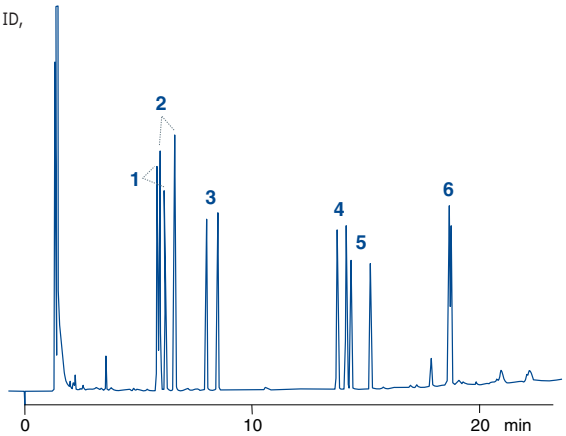
Enantiomer separation of amino acid methyl esters (TFA)

Column: FS-LIPODEX® E, 25 m x 0.25 mm ID, max. temp. 200/220 °C
Volume: 1 µl
Carrier gas: 60 kPa H_2
Split: ~ 1:100
Temperature: 90 → 190 °C, 4 °C/min
Detector: FID, 250 °C, AT 2

Peaks:
(D is eluted before L except for proline: L before D)

1. Alanine
2. Valine
3. Leucine
4. Proline
5. Aspartic acid
6. Phenylalanine

MN Appl. No. 202592



HYDRODEX cyclodextrin phases for enantiomer separation

cyclodextrin derivatives with high melting point: *MACHEREY-NAGEL*
for GC-enantiomer separation diluted with polysiloxanes

HYDRODEX β-6TBDM
Heptakis-(2.3-di-O-methyl-6-O-t-butyldimethyl-silyl)-β-cyclodextrin

phase diluted with optimised polysiloxane *MACHEREY-NAGEL*
recommended for γ-lactones, cyclopentanones, terpenes, esters, tartrates

max. temperature for isothermal operation: 230°C,
max. temperature for short isotherms in a temperature programme: 250°C

Int. dia. mm	Ext. diam. mm	Length m	PK	Cat. No.
0.25	0.4	25	1	**4.002 931**
0.25	0.4	50	1	**4.002 932**

HYDRODEX β-TBDAC
Heptakis-(2.3-di-O-acetyl-6-O-t-butyldimethyl-silyl)-β-cyclodextrin

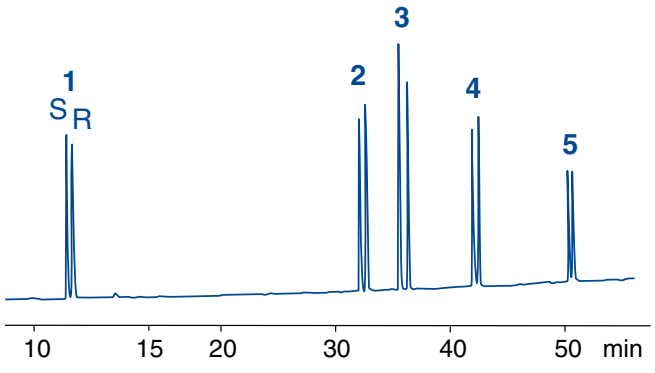
phase diluted with optimised polysiloxane *MACHEREY-NAGEL*
recommended for alcohols, esters, ketones, aldehydes, δ-lactones
max. temperature for isothermal operation: 220°C,
max. temperature for short isotherms in a temperature programme: 240°C

Int. dia. mm	Ext. diam. mm	Length m	PK	Cat. No.
0.25	0.4	25	1	**4.002 935**
0.25	0.4	50	1	**4.002 936**

Separation of isomeric antiinflammatory drugs

Courtesy of Prof. W.A. König, Hamburg, Germany
Column: HYDRODEX β-6TBDM, 25 m x 0.25 mm ID, max. temperature 250 °C
Carrier gas: He
Temperature: 135 °C → 200 °C, 1 °C/min
Detector: FID

Peaks:
1. Ibuprofen
2. Flurbiprofen
3. Fenoprofen
4. Naproxen
5. Ketoprofen

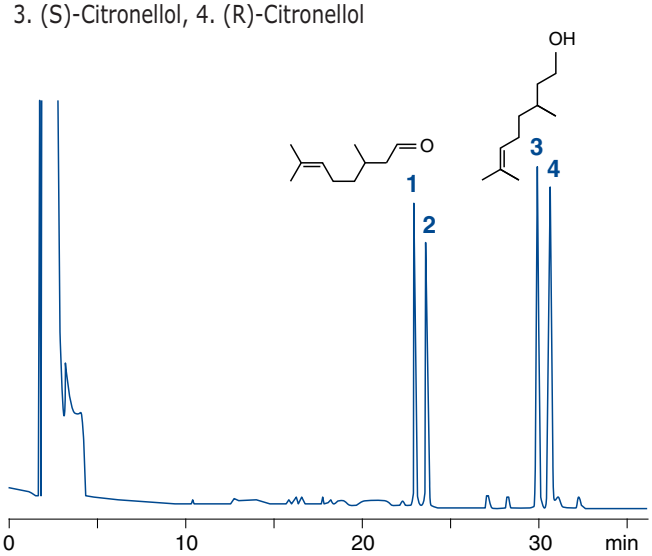


MN Appl. No. 250180

Separation of (R/S) citronellol + citronellal

Column: FS-HYDRODEX β-TBDAc, 50 m x 0.25 mm ID, max. temperature 220/240 °C
Carrier gas: 1.5 bar H_2, split 25 ml/min
Temperature: 100 °C
Injection: 1 µl, 1:1000 in CH_2Cl_2
Detector: FID, 220 °C

Peaks:
1. (R)/(S)-Citronellal, 2. (S)/(R)-Citronellal
3. (S)-Citronellol, 4. (R)-Citronellol



MN Appl. No. 212440

Reagents and methods for derivatisation

Derivatisation reagents *MACHEREY-NAGEL*

for improved volatility, better thermal stability or low limit of detection in gas chromatography prerequisite: quantitative, rapid and reproducible formation of only on derivative halogen atoms introduced by derivatisation (e.g. trifluoroacetates) allow specific detection (ECD) with the advantage of high sensitivity elution order and fragmentation patterns in MS can be influenced by a specific derivatisation
reagents for **silylation - alkylation (methylation) - acylation** are available

These products contain harmful substances which must be specially labelled as hazardous. For detailed information please see the MSDS, which can be downloaded under www.mn-net.com.

Selection guide for derivatisation of important functional groups in GC

Function	method	derivative	recommended reagents
Alcohols, phenols	silylation	R'O – TMS	MSTFA
	acylation	R'O – CO – R	HFBA, MBTFA
R'OH	alkylation	R'O – R	TMSH
sterically hindered	silylation	R'O – TMS	BSTFA, SILYL-991
Amines	silylation	R' – NR'' – TMS	MSTFA, SILYL-991
primary, secondary	acylation	R' – NR'' – CO – R	HFBA, MBTFA
hydrochlorides	silylation	R' – NR'' – TMS	MSTFA
Amides	silylation	not stable	
	acylation	R' – CO – NH – CO – R	MBTFA, HFBA
Amino acids	silylation	R' – CH(NH – TMS) – CO – O – TMS	BSTFA, MSTFA
	alkylation (a) + acylation (b)	R' – CH(NH – CO – R) – CO – O – R	a) TMSH b) HFBA, MBTFA
Carboxylic acids	silylation	R' – CO – O – TMS	MSTFA
(fatty acids)		susceptible to hydrolysis	
	alkylation	R' – CO – O – R	TMSH
Carbohydrates	silylation		MSTFA
	acylation		MBTFA
Steroids	acylation		MBTFA, HFBA

Derivatisation method development kit

Which type of derivatisation is best suited for your sample (alkylation, acylation or silylation)? *MACHEREY-NAGEL*

Content	PK	Cat. No.
2 x 1 ml each for TMSH, MSTFA, MBTFA	1	**4.001 514**

Acylation kit

Which is the proper reagent for acylation? *MACHEREY-NAGEL*

Content	PK	Cat. No.
2 x 1 ml each for MBTFA , TFAA, MBHFBA	1	**6.207 118**

Alkylation kit

Which is the proper reagent for methylation? *MACHEREY-NAGEL*

Content	PK	Cat. No.
3x1 ml each for TMSH, DMF-DMA	1	**4.001 513**

Silylation kit

Which is the proper reagent for silylation? *MACHEREY-NAGEL*

Content	PK	Cat. No.
2 x 1 ml each for MSTFA, BSTFA, TSIM, MSHFBA	1	**6.704 458**

Acylation reagents for GC - Anhydrides

MACHEREY-NAGEL

by-products of acylation with anhydrides: corresponding acids
excess reagent and the acid formed have to be removed
Acylation with fluorinated acid anhydrides can be used for alcohols, phenols, carboxylic acids, amines, amino acids and steroids forming volatile, stable derivatives suited for FID as well as for ECD detection.

Heptafluorobutyric acid anhydride (HFBA)
m.w. 410.06, Bp 106 - 107°C (760mm Hg),
C_3F_7 - CO - O - CO - C_3F_7
density d20°/4° = 1.665

	Capacity ml	PK	Cat. No.
HFBA	1	20	**4.001 480**
HFBA	10	1	**4.001 479**
HFBA	10	5	**4.001 481**

Methods for acylation

Acylation with fluorinated acid anhydrides:

Acylation with HFBA can be used for alcohols, phenols, carboxylic acids, amines, amino acids and steroids forming volatile, stable derivatives suited for FID as well as for ECD detection.

Procedure:
Dissolve 0.1 to 1 mg of the sample in 0.1 ml solvent, add 0.1 ml HFBA and heat to 60 – 70 °C for 1 – 2 hours. If the sample need not be concentrated prior to the analysis and if there is no danger of catalytically induced side reactions, pyridine is used as solvent. The reaction solution can be injected directly into the gas chromatograph. Otherwise use a volatile solvent and evaporate solvent, excess derivatisation reagent and free acid in a stream of nitrogen. Dissolve the residue in 50 µl hexane, chloroform etc. and inject aliquot portions.

MN Appl. No. 213042

Acylation with fluorinated acid amides:

This method is recommended for alcohols, primary and secondary amines as well as thiols under mild, neutral conditions. MBTFA also forms very volatile derivatives with carbohydrates [J. Sullivan and L. Schewe, J. Chromatogr. Sci. 15 (1977) 196 – 197].

Procedure:
Add 0.5 ml MBTFA to about 2 mg sample. If there is no reaction at ambient temperature, heat the reaction mixture to 120 °C. Compounds which are difficult to dissolve, can be trifluoracetylated in suitable solvent mixtures. It is recommended to use a ratio of solvent to MBTFA of 4 : 1. The reaction mixture can be chromatographed directly.

MN Appl. No. 213051

Acylation reagents for GC - Bisacylamides

MACHEREY-NAGEL

by-products: corresponding neutral acylamides, which can be easily removed due to their high volatility; because of neutral conditions and favourable chromatographic properties often removal of the bisacylamide is not necessary. Thus sample preparation is much more convenient.

Acylation with fluorinated acid amides is recommended for alcohols, primary and secondary amines as well as for thiols under mild, neutral conditions. MBTFA also forms very volatile derivatives with carbohydrates.

MBTFA /MBHFBA
N-methyl-bis(trifluoroacetamide) MBTFA
m.w. 223.08, Bp 123 - 124°C (760mm Hg), density d20°/4° = 1.55,
CF_3 - CO - $N(CH_3)$ - CO - CF_3

	Capacity ml	PK	Cat. No.
MBTFA	1	20	**7.401 143**
MBTFA	10	1	**7.510 796**
MBTFA	10	5	**6.228 605**

Due to their purpose, derivatisation reagents are very reactive substances. For this reason they should be stored cool and protected from moisture.
The derivatisation reagents are supplied in vials with crimp caps for easy access with a syringe. Vials with pierced sealing disks have limited stability and should be used soon.

Alkylation reagents for GC - Trimethylsulphonium hydroxide

MACHEREY-NAGEL

TMSH (0.2M in methanol) M.G. 94.06

	Capacity ml	PK	Cat. No.
TMSH	1	10	**7.086 147**
TMSH	1	20	**7.083 308**
TMSH	10	5	**4.001 512**

Silylation reagents

MACHEREY-NAGEL

Usually the term silylation in GC stands for replacement of active hydrogen atoms by a trimethylsilyl group (TMS derivative). Sometimes, however, trialkylsilyl groups or dimethylalkylsilyl groups with longer alkyl chains are used for derivatisation. The trialkylsilyl group increases volatility and enhances thermal stability of the sample. Silylation can be catalysed either acidic by addition of TMCS or basic by addition of pyridine (e. g. for sterically hindered functionalities like tert. alcohols)

Silylation reagents - BSTFA, SILYL-991

MACHEREY-NAGEL

N,O-bis-trimethylsilyl-trifluoroacetamide
m.w. 257.4, Bp 40°C (12mm Hg), density d20°/4° = 0.961
BSTFA:
R = CF_3
powerful trimethylsilyl donor with approximately the same donor strength as the non-fluorinated analogue BSA
advantage of BSTFA over BSA: greater volatility of its reaction products (particularly useful for GC of some lower boiling TMS amino acids.

BSTFA is nonpolar (less polar than MSTFA), and can be mixed with acetonitrile for improved solubility. For silylating fatty acid amides, hindered hydroxyls and other compounds, which are difficult to silylate (like secondary alcohols and amines), we recommend BSTFA + 1% trimethylchlorosilane (TMCS), available under the designation SILYL-991.

Description	Capacity ml	PK	Cat. No.
BSTFA	1	20	**4.001 486**
BSTFA	10	1	**6.803 320**
BSTFA	10	5	**4.001 487**
SILYL-991 (BSTFA - TMCS (99:1)	1	20	**4.001 511**
SILYL-991 (BSTFA - TMCS (99:1)	50	1	**4.001 510**
SILYL-991 (BSTFA - TMCS (99:1)	100	1	**4.001 509**

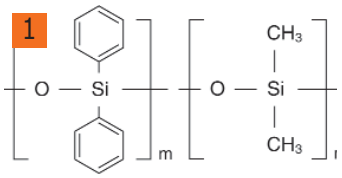
Due to their purpose, derivatisation reagents are very reactive substances. For this reason they should be stored cool and protected from moisture.
The derivatisation reagents are supplied in vials with crimp caps for easy access with a syringe. Vials with pierced sealing disks have limited stability and should be used immediately.

Silylation with BSTFA or SILYL-991 (BSTFA + 1 % TMCS)

Procedure:
Add 0.5 ml silylation reagent to 1 – 10 mg sample; if necessary, add some solvent (normally pyridine or DMF [dimethylformamide] are used). Heat to 60 – 80 °C for 20 min to increase the reaction rate.

BSTFA MN Appl. No. 213092 · SILYL-991 MN Appl. No. 213093

1



1 Silylation reagents - MSTFA

N-methyl-N-trimethylsilyl-trifluoroacetamide *MACHEREY-NAGEL*
m.w. 199.1, Bp 70°C (75mm Hg), density d20°/4° = 1.11
MSTFA:
R' = CF_3, R" = CH_3
the most volatile trimethylsilyl amide available
very strong TMS donor which does not cause any noticeable fouling of the FID burning chamber even after long-time measuring series
The already good solution characteristics can be improved by addition of submolar quantities of protic solvents (e.g. TFA for extremely polar compounds such as hydrochlorides) or pyridine (e.g. for carbohydrates).

recommended application: carboxylic acids, hydroxy and ketocarboxylic acids, amino acids, amines, alcohols, polyalcohols, sugars, mercaptans and similar compounds with active hydrogen atoms. Even amine hydrochlorides can be silylated directly.
advantages: complete reaction with high reaction rates, even without a catalyst (1 to 2% TMCS or TSIM)
the by-product of the reaction (N-methyltrifluoroacetamide) features high volatility and short retention time.

Description	Capacity ml	PK	Cat. No.
MSTFA	1	20	**7.055 892**
MSTFA	10	1	**6.704 091**
MSTFA	10	5	**6.085 475**
MSTFA	100	1	**6.227 683**
MSTFA	50	6	**6.227 450**
MSTFA	100	6	**4.001 493**
MSTFA	100	12	**4.001 492**

Due to their purpose, derivatisation reagents are very reactive substances. For this reason they should be stored cool and protected from moisture.
The derivatisation reagents are supplied in vials with crimp caps for easy access with a syringe. Vials with pierced sealing disks have limited stability and should be used soon.

Silylation with MSTFA

Procedure:
Dissolve 10 – 15 mg sample in 0.8 ml solvent, then add 0.2 ml MSTFA. The reaction mixture can be heated to 60 – 70 °C for up to 1 h and can be analysed directly. If TFA is used as a solvent, proceed as follows [M. Donike, J. Chromatogr. 85 (1973) 1 – 7]: Dissolve 1 – 2 mg sample in 100 µl TFA. Dropwise add 0.9 ml MSTFA.
After cooling the sample can be chromatographed directly.

MN Appl. No. 213111

2

2 Three-layer septa for GC inlet

Low density silicone wad sandwiched between two high density silicone layers. *Hamilton*
Working temperature max. 200°C.

Diam. mm	PK	Cat. No.
6.35	12	**9.221 801**
8.00	12	**9.221 802**
9.00	12	**9.221 803**
9.50	12	**9.221 804**
10.00	12	**9.221 805**
12.70	12	**9.221 806**
11.00	12	**9.221 807**
13.00	12	**9.221 809**
16.00	12	**9.221 808**

Ready-to-use layers layers for TLC

Support materials for TLC ready-to-use layers *MACHEREY-NAGEL*

Glass plates: glass, ~ 1.3mm thick, high requirements for weight, packaging and storage, ideal torsional strength, high temperature stability, susceptible to breakage, can not be cut with scissors, high resistance against solvents, mineral acids and conc. ammonia, suitability for aqueous detection reagents depends on the phase

POLYGRAM®: polyester, ~ 0.2mm thick, low requirements for weight, packaging and storage, low torsional strength, max. 185°C temperature stability, not susceptible to breakage, can be cut with scissors, high resistance against solvents, mineral acids and conc. ammonia, very suitable for aqueous detection reagents

ALUGRAM®: aluminium, ~ 0.15mm thick, low requirements for weight, packaging and storage, relatively high torsional strength, high temperature stability, not susceptible to breakage, can be cut with scissors, high resistance against solvents, low resistance against mineral acids and conc. ammonia, limited suitable for aqueous detection reagents

ADAMANT unmodified standard silica layers for TLC

Silica 60, specific surface (BET) ~ 500m²/g, mean pore size 60Å, specific pore volume 0.75ml/g, particle size 5 to 17µm. Outstanding hardness and abrasion resistance due to an optimized binder system. Increased separation efficiency due to an optimized particle size distirbution. High suitability for trace analyses resulting from a UV indicator with brilliance and a low-noise background of the layer. *MACHEREY-NAGEL*

Available as glass plates with or without fluorescent indicator (UV254).

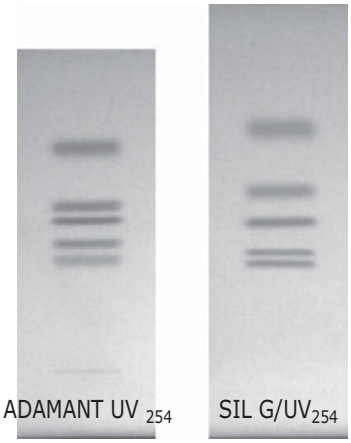
Type	Plate format cm	Path length mm	PK	Cat. No.
ADAMANT UV254	2.5 x 7.5	0.25	100	**4.005 060**
ADAMANT	5 x 10	0.25	50	**4.005 067**
ADAMANT UV254	5 x 10	0.25	50	**4.005 061**
ADAMANT	5 x 10	0.25	200	**4.005 068**
ADAMANT UV254	5 x 10	0.25	200	**4.005 062**
ADAMANT UV254	5 x 20	0.25	100	**4.005 063**
ADAMANT	10 x 10	0.25	25	**4.005 069**
ADAMANT UV254	10 x 10	0.25	25	**4.005 064**
ADAMANT UV254	10 x 20	0.25	50	**4.005 065**
ADAMANT	20 x 20	0.25	25	**4.005 070**
ADAMANT UV254	20 x 20	0.25	25	**4.005 066**
ADAMANT	10 x 20	0.25	25	**9.003 472**

Separation of steroids

Layers: ADAMANT UV_{254}, SIL G/UV_{254}; eluent: trichloromethane – methanol (97:3)
Developing time: 10 minutes; 0.1 % solution in $CHCl_3$

R_f	ADAMANT	SIL G
Cortisone	0.37	0.27
Corticosterone	0.43	0.30
Testosterone	0.50	0.39
Desoxycorticosterone	0.55	0.46
Progesterone	0.73	0.62
Migration distance	5.0 cm	5.7 cm

MN Appl. No. 402930



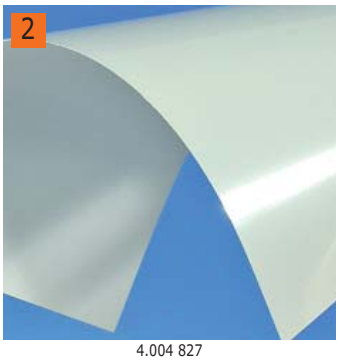
SIL G unmodified standard silica layers for TLC, glass plates/ POLYGRAM®

glass plates, POLYGRAM®, ALUGRAM® *MACHEREY-NAGEL*

silica 60, specific surface (BET) ~500m²/g, mean pore size 60 Å, specific pore volume 0.75 ml/g, particle size 5 to 17µm; standard grade; thickness of layer for analytical plates 0.25mm, for preparative plates 0.5 and 1mm; for 2mm preparative layers a slightly coarser material is used indicators: manganese activated zinc silicate with green fluorescence for short-wave UV (254nm); special inorganic fluorescent pigment with blue fluorescence for long-wave UV (366nm)
binders: highly polymeric products, which are stable in almost all organic solvents and resistant towards aggressive visualisation reagents; binder system for Polygram® sheets is also completely stable in purely aqueous eluents
available as glass plates, Polygram polyester sheets and Alugram aluminium sheets.
Available as glass plates with or without fluorescent indicator (UV254).

Type	Plate format cm	Path length mm	PK	Cat. No.	
Glass plates SIL G-25 UV_{254}	2.5 x 7.5	0.25	100	**4.004 850**	1
Glass plates SIL G-25	5 x 10	0.25	50	**6.230 729**	
Glass plates SIL G-25	5 x 10	0.25	50	**4.004 848**	
Glass plates SIL G-25	5 x 10	0.25	200	**4.004 847**	
Glass plates SIL G-25	5 x 10	0.25	200	**4.004 849**	
Glass plates SIL G-25	5 x 20	0.25	100	**4.004 846**	
Glass plates SIL G-25 UV_{254}	5 x 20	0.25	100	**6.232 660**	
Glass plates SIL G-25 UV_{254}	10 x 10	0.25	25	**9.003 474**	
Glass plates SIL G-25	10 x 20	0.25	50	**6.227 917**	
Glass plates SIL G-25 UV_{254}	10 x 20	0.25	50	**6.230 274**	
Glass plates SIL G-25	20 x 20	0.25	25	**9.003 491**	
Glass plates SIL G-25 UV_{254}	20 x 20	0.25	25	**9.003 492**	
Glass plates SIL G-100	20 x 20	1.00	15	**4.004 853**	
Glass plates SIL G-100 UV_{254}	20 x 20	1.00	15	**7.300 555**	
Glass plates SIL G-200	20 x 20	2.00	12	**6.224 417**	
Glass plates SIL G-200 UV_{254}	20 x 20	2.00	12	**4.004 854**	
POLYGRAM® polyester sheets SIL G	2.5 x 7.5	0.20	200	**4.004 827**	2
POLYGRAM® polyester sheets SIL G UV_{254}	2.5 x 7.5	0.20	200	**4.004 826**	
POLYGRAM® polyester sheets SIL G	4 x 8	0.20	50	**4.004 825**	
POLYGRAM® polyester sheets SIL G UV_{254}	4 x 8	0.20	50	**9.003 493**	
POLYGRAM® polyester sheets SIL G	5 x 20	0.20	50	**6.803 651**	
POLYGRAM® polyester sheets SIL G UV_{254}	5 x 20	0.20	50	**9.003 476**	
POLYGRAM® polyester sheets SIL G	20 x 20	0.20	25	**6.202 190**	
POLYGRAM® polyester sheets SIL G UV_{254}	20 x 20	0.20	25	**9.003 494**	
POLYGRAM® polyester sheets SIL G	40 x 20	0.20	25	**4.004 822**	
POLYGRAM® polyester sheets SIL G UV_{254}	40 x 20	0.20	25	**4.004 824**	
ALUGRAM® aluminium sheets SIL G UV_{254}	2.5 x 7.5	0.20	200	**4.005 043**	3
ALUGRAM® aluminium sheets SIL G UV_{254}	4 x 8	0.20	50	**9.003 496**	
ALUGRAM® aluminium sheets SIL G	5 x 7.5	0.20	20	**4.005 042**	
ALUGRAM® aluminium sheets SIL G UV_{254}	5 x 7.5	0.20	20	**6.227 948**	
ALUGRAM® aluminium sheets SIL G	5 x 10	0.20	50	**6.802 883**	
ALUGRAM® aluminium sheets SIL G UV_{254}	5 x 10	0.20	50	**9.003 477**	
ALUGRAM® aluminium sheets SIL G	5 x 20	0.20	50	**7.084 918**	
ALUGRAM® aluminium sheets SIL G UV_{254}	5 x 20	0.20	50	**9.003 478**	
ALUGRAM® aluminium sheets SIL G	10 x 20	0.20	20	**4.005 052**	
ALUGRAM® aluminium sheets SIL G UV_{254}	10 x 20	0.20	20	**6.233 568**	
ALUGRAM® aluminium sheets SIL G	20 x 20	0.20	25	**7.059 745**	
ALUGRAM® aluminium sheets SIL G UV_{254}	20 x 20	0.20	25	**9.003 497**	
ALUGRAM® aluminium sheets SIL G UV_{254}	20 x 20	0.20	25	**6.242 312**	
ALUGRAM® aluminium sheets SIL G	20 x 20	0.20	25	**9.003 465**	

4.004 850



4.004 827

4.005 043

1 TLC plates, Silica gel 60 F 254

Merck

Material	Gel thickness mm	Width mm	Length mm	PK	Cat. No.
Glass	0.25	20.0	20.0	25	**9.130 050**
Glass	0.25	10.0	20.0	50	**9.130 051**
Glass	0.25	5.0	20.0	100	**9.130 052**
Glass	0.25	5.0	20.0	25	**9.130 053**
Glass	0.25	5.0	10.0	200	**9.130 054**
Glass	0.25	5.0	10.0	25	**9.130 055**
Glass	0.25	2.5	7.5	100	**9.130 056**
Glass	0.25	2.5	7.5	500	**9.130 057**
Aluminium	0.20	20.0	20.0	25	**9.130 058**
Aluminium	0.20	5.0	10.0	50	**9.130 059**
Aluminium	0.20	5.0	7.5	20	**9.130 060**
Plastic	0.20	20.0	20.0	25	**9.130 063**

TLC plates

Silica gel 60 F_{254}

Merck

Material	Gel thickness mm	Dimensions mm	PK	Cat. No.
Glass backed	0.5	20 x 20	20	**9.130 061**
Glass backed	2	20 x 20	12	**9.130 062**

2 ALUGRAM® Nano-SIL unmodified Nano-silica layers for HPTLC

ALUGRAM®

MACHEREY-NAGEL

Nano silica 60, specific surface (BET) ~ 500m²/g, mean pore size 60Å, specific pore volume 0.75ml/g, particle size 2 to 10µm. Indicator: manganese activated zinc silicate with green fluorescence for short-wave UV (254nm).

Binder: highly polymeric product, which is stable in almost all organic solvents and resistant towards aggressive visualisation reagents. Narrow fractionation of the silica particles allows sharper separations, shorter developing times, shorter migration distances, smaller samples and an increased detection sensitivity compared to SIL G plates.

Available as glass plates with or without fluorescent indicator (UV254).

Type	Plate format cm	Path length mm	PK	Cat. No.
ALUGRAM® NANO-SIL G	5 x 20	0.20	50	**4.005 044**
ALUGRAM® NANO-SIL G UV254	5 x 20	0.20	50	**6.227 900**
ALUGRAM® NANO-SIL G	20 x 20	0.20	25	**6.227 899**
ALUGRAM® NANO-SIL G UV254	20 x 20	0.20	25	**4.005 045**

1

4.004 880

2

7.400 375

RP-18 W/UV254 octadecyl-modified nano silica layers for HPTLC

glass plates, ALUGRAM® *MACHEREY-NAGEL*

base material: Nano-K silica 60, specific surface (BET) ~500m²/g, mean pore size 60Å, specific pore volume 0.75ml/g, particle size 2 to 10 µm; for preparative plates (1 mm thickness of layer) standard silica 60, particle size 5 to 17 µm, pH stability 2 to 10 indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254nm); UV-absorbing substances apppear as dark-blue to black spots on a light-blue background; partial octadecyl modification, wettable with water, carbon content 14%. 18-100 normal phase or reversed phase separation modes with eluents from anhydrous solvents to mixtures with high concentrations of water (see figure); the relative polarity of the eluent determines the polarity of the layer.
Recommended application: aminophenols, barbiturates, preservatives, nucleobases, polycyclic aromatic hydrocarbons, steroids, tetracyclines, plasticizers (phthalates).

Available as glass plates with or without fluorescent indicator (UV254).

Type	Plate format cm	Path length mm	PK	Cat. No.
ALUGRAM® Glass plates RP-18 W UV_{254}	5 x 20	0.25	50	**4.004 880** 1
ALUGRAM® Glass plates RP-18 W UV_{254}	10 x 10	0.25	25	**6.206 173**
ALUGRAM® Glass plates RP-18 W UV_{254}	10 x 20	0.25	50	**4.004 879**
ALUGRAM® Glass plates RP-18 W UV_{254}	20 x 20	0.25	25	**4.004 878**
ALUGRAM® Glass plates RP-18 W UV_{254}	20 x 20	1.00	15	**4.004 881**
ALUGRAM® aluminium sheets RP-18 W UV_{254}	4 x 8	0.15	50	**7.400 375** 2
ALUGRAM® aluminium sheets RP-18 W UV_{254}	5 x 10	0.15	50	**6.901 143**
ALUGRAM® aluminium sheets RP-18 W UV_{254}	5 x 20	0.15	50	**4.005 046**
ALUGRAM® aluminium sheets RP-18 W UV_{254}	10 x 10	0.15	25	**4.005 047**
ALUGRAM® aluminium sheets RP-18 W UV_{254}	20 x 20	0.15	25	**6.704 046**

3

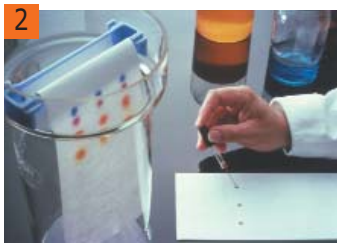
3 Aluminium oxide layers for TLC

Standard, rigid TLC plates in a choice of media, backing materials, and with dimensions as outlined below. *MACHEREY-NAGEL*

Material	Gel thickness mm	Dimensions mm	PK	Cat. No.
POLYGRAM aluminium oxide*	0,2	200 x 200	25	**9.003 495**
ALUGRAM aluminium oxide*	0,2	200 x 200	25	**9.003 498**

*with 254 nm UV indicator

1 2 Chromatography paper/Ion exchange papers



Whatman chromatography papers are the most widely used papers for chromatography worldwide. *GE Healthcare*
This acceptance and usage reflects the purity, high quality and consistency of Whatman papers.
These qualities are relied upon by chromatographers and essential to successful reproducible chromatography.
Whatman chromatography paper media are made from specially selected cotton cellulose.
They are rigorously quality controlled for characteristics important to the chromatographer and to ensure uniformity within the grade.
1 Chr world standard chromatography paper. A smooth surface, 0.18 mm thick with a linear flow rate (water) of 130 mm/30 min. Good resolution for general analytical separations.
3MM Chr widely used as a blotting paper, 3MM Chr is used in both electrophoresis and for general chemistry. A medium thickness paper (0.34 mm) used extensively for general chromatography and electrophoresis. Flow rate is 130 mm/30 min.
3 Chr medium thickness paper (0.36 mm) with a flow rate of 130 mm/30 min. For general applications with medium/heavy solute loadings. Frequently used for separation of inorganic compounds and for electrophoresis.
17 Chr thick (0.92 mm) and highly absorbent paper with a very high flow rate of 190 mm/30 min. Suitable for the heaviest loadings and ideal for preparative paper chromatography and electrophoresis.

Ion exchange papers
DE81: A thin (0.20 mm) DEAE cellulose paper-a weakly basic anion exchanger with diethylaminoethyl functional groups. The ion exchange capacity is 1.7 µeq/cm² and flow rate is 95 mm/30 min. For use with reverse transcriptase assays and DNA polymerase.
SG81: A unique paper (0.27 mm thick) combining cellulose and large pore silica gel. Suitable for separations in which both partition and adsorption are important, including the separation of phospholipids, steroids, phenols and dyes. Flow rate is 110 mm/30 min.
P81: A thin (0.23 mm) cellulose phosphate paper. Strong cation exchanger of high capacity. Ion exchange capacity is 18.0 µeq/cm² and the flow rate is 125 mm/30 min. For use with protein kinase assay with peptide substrates.

Grade	Dimensions mm	PK	Cat. No.
1Chr	100 x 300	100	**9.950 308**
1Chr	200 x 200	100	**9.950 309**
1Chr	250 x 250	100	**9.950 310**
1Chr	460 x 570	100	**9.950 311**
3MMChr	200 x 200	100	**9.950 312**
3MMChr	315 x 355	100	**9.950 313**
3Chr	460 x 570	100	**9.950 314**
3MMChr	460 x 570	100	**9.950 371**
3MMChr	580 x 680	100	**9.950 315**
4Chr	460 x 570	100	**9.950 316**
17Chr	460 x 570	25	**9.950 317**
DE81	460 x 570	25	**9.950 318**
SG81	460 x 570	25	**9.950 319**
P81	460 x 570	25	**9.950 320**

3 Chromatography paper, reels

Chromatography Paper 1 CHR *GE Healthcare*
The standard chromatography paper. Good resolution for general analytical separations.
Pure cellulose. Thickness 0.18mm. Capillary rise (water) 130mm/30 min.

Chromatography Paper 3MM CHR
Used in electophoresis, in general chemistry and as blotting paper. Pure cellulose. Thickness 0.34mm.
Capillary rise (water) 130mm/30 min.

Grade	Width mm	Length mm	PK	Cat. No.
1Chr	10	1000	1	**9.950 322**
1Chr	20	1000	1	**9.950 323**
1Chr	30	1000	1	**9.950 324**
1Chr	40	1000	1	**9.950 325**
1Chr	50	1000	1	**9.950 326**
1Chr	100	1000	1	**9.950 328**
1Chr	150	1000	1	**9.950 329**
3MMChr	20	1000	1	**9.950 327**
3MMChr	100	1000	1	**9.950 330**
3MMChr	150	1000	1	**9.950 331**
3MMChr	190	1000	1	**9.950 332**
3MMChr	230	1000	1	**9.950 333**
3MMChr	270	1000	1	**9.950 334**

Chromatography strips

Divided into 12 bands, each of 15mm wide, for parallel separation of 12 samples. *GE Healthcare*

Grade	Width mm	Length mm	PK	Cat. No.
1Chr CRL	110	213	100	**9.950 321**

1 Standard separating chamber with knob lid/ ground cover plate

With absolutely flat, chamber floor, ground flange rim and lid for all TLC plates up to 200mm x 200mm.

Other separating chambers available on request.

Type	PK	Cat. No.
Separating chamber with knob lid	1	**9.020 160**
Separating chamber with ground cover plate	1	**9.020 173**
Knob lid for 9.020 160	1	**9.020 163**
Glass cover disc for 9.020 173	1	**9.020 177**

2 Simultaneous developing chamber and DC accessories

MACHEREY-NAGEL

Type	PK	Cat. No.
DC simultaneous chamber for up to 5 plates, 20cm x 20cm	1	**9.003 500**
Laboratory atomiser, glass with rubber bulb	1	**4.004 909**
Glass capillary 1µl	150	**7.056 849**
Outlining templates	2	**4.004 903**
Chromatography Paper MN 260, 7.5cm x 17cm (for saturating)	100	**4.004 907**

3 Nano separating chambers, with knob/ stainless lid

The use of quantitative TLC on nano or HPTLC gel layer plates is increasing. Nano separating chambers have been developed for the more popular 100mm x 100mm and 200mm x 100mm plate formats and have all the advantages of standard separating chambers.

Type	PK	Cat. No.
Nano separating chamber 100mm x 100mm, with knob lid	1	**9.020 210**
Nano separating chamber 100mm x 100mm, with stainless steel lid	1	**9.020 212**
Nano stainless steel lid, 200mm x 100mm	1	**9.020 117**
Nano knob lid, 100mm x 100mm	1	**9.020 211**
Nano stainless steel lid, 100mm x 100mm	1	**9.020 213**
Nano filter paper for vapour conditioning the chamber, 210mm x 110mm, 25 sheets	25	**9.020 214**

4 H separating chamber

The H separating chambers make optimum use of HPTLC gel layer advantages. *Sarstedt (Desaga)*
Small particle size 5µm, stringently controlled pore size and distribution, and more theoretical bases.
Excellent value for money and can be supplied for time and cost saving in 50mm x 50mm plate format or traditional 100mm x 100mm format. Optimum separations are achieved even on the shortest runs.

Type	Width mm	Length mm	PK	Cat. No.
H separation chamber	50	50	1	**9.023 150**
H separation chamber	100	100	1	**9.023 160**
Frit rods		50	5	**9.023 955**
Cover plate	50	50	1	**9.023 956**
Cover plate	100	100	1	**9.023 957**

1 Chromatography sprayer SG 1

Spraying with powerful and quiet pump.The finest spray is produced even when the battery power is low.
Liquids, up to the viscosity of light oil, can be finely sprayed at the touch of a button. Particle diameter 5µm to 10µm with a throughput of 20ml/min. based on water. The reservoir bottle for the spray reagent is made of borosilicate glass. The bottle is screwed into the high-grade PTFE nozzle and can be changed in seconds. With quick-charging dock as a storage base. Overload protection enables continuous storage of the sprayer in the charging station.
Supplied with battery, battery charger, bottle and nozzle.

Type	PK	Cat. No.
SG 1	1	**9.539 045**
Reservoir, 50 ml	10	**9.539 046**

2 Special atomiser, with rubber blowball

With rubber blowball for nebulising reagents. Can be connected to other compressed air supplies.

Type	PK	Cat. No.
Special atomiser	1	**9.024 000**

3 Test tube atomiser, glass

Glass atomiser for nebulising small amounts of reagents. Atomiser can be inserted in a 12ml test tube with a ground joint and held in position with a spring clip.

Type	PK	Cat. No.
Test tube atomiser	1	**9.023 990**

4 UV analysis lamps HP-UVIS®

For UV analysis without a darkroom. High-pressure mercury lamp emits very intense radiation at 366nm for fluoro-chemical analytical evaluation. Specially selected 254nm filters enable optimal contrast.
Minimal footprint in spite of simultaneous observation points for two 200mm x 200mm plates.
Inclined plate angle gives comfortable viewing.
Dimensions (WxDxH) 325mm x 280mm x 475mm. Supply requirements 230V.

Type	PK	Cat. No.
HP-UVIS®	1	**9.539 360**

5 UV irradiation system BIO-LINK, BLX 254

- Compact and powerful, ideal for a broad range of applications
- Precise measurement and control technology, non-ageing UV sensors
- Choice for irradiation parameter energy or time
- Easy operation: Programme memory, storage of the last parameters, programme resumes after opening of the door, auto-restart after power failure
- Secure and stable construction, very easy to use
- Easy exchange of the UV tubes for wavelength change

Dimensions (WxDxH)
Housing: 350 x 360 x 305mm
Interior: 260 x 330 x 145mm

Type	Description	Tubes W	Wave-length nm	PK	Cat. No.
BLX-254	UV crosslinker	5 x 8	254	1	**9.971 923**

Other models available on request.

1

1 TLC Viewing cabinets, CN-6/ CN-15

Model CN-6:
- for one or two UV hand lamps model BVL-6; choice of combined wavelengths 254nm, 312nm and 365nm
- cabinet dimensions (WxDxH): 300mm x 280mm x 240mm; easy access also for large samples

Model CN-15:
- integral high intensity UV lamps, extra large capacity; easy access also for large samples; white-light bulb for normal observation
- removable bottom panel for use with an BETXF Professional Line transilluminator
- cabinet dimensions (W x D x H): 505mm x 415mm x 280mm

Type	Description	Tubes W	Wave-length nm	PK	Cat. No.
CN-6	without UV handlamps	-	-	1	**9.971 926**
CN-15.LC*	with integrated UV tubes and white-light source	2 x 15	365 / 254	1	**9.971 927**

* Other models available on request.

2

2 TLC Imaging system BIO-CHROM II

- Scientific imaging system for documentation and analysis of TLC plates
- Easy acquisition and storage of the data via PC
- High-intensity epi-UV illumination
- Easy access to the darkroom through large front-opening
- Extensive UV protection
- Removable bottom panel for optional use with an UV transilluminator

All models with the following standard components:
- Scientific s/w CCD camera with 1 MP resolution (4 MP EP) and USB 2.0 port
- High aperture zoom with UV/VIS spectral filter
- Darkroom CN-15 with 2 x 15W tubes 365nm, 2 x 15W tubes 254nm and white light source
- Light protecting hood and camera stand
- Free PC image acquisition and analysis software BIO-CAPT with basic modules for MW, densitometric and R(f) analyses

Type	Description	PK	Cat. No.
BIO-CHROM II	With standard components	1	**7.930 261**

3

3 Universal application and evaluation templates

Plexiglass. Simplifies application, marking and evaluation of thin layer chromatograms. Size 200mm x 200mm.

Type	PK	Cat. No.
Universal application and evaluation templates	1	**9.020 131**

4

4 Outlining templates

With limit stops for precise positioning of the plate on the template. Provide precise pipette guidance due to triangular apertures in a 5mm spaced grid, providing 9, 19 or 39 outlining points, depending on the size of the template.
A non-slip coating means that the outlining template does not slide on the bench.

Width mm	Length mm	PK	Cat. No.
100	100	1	**9.020 134**
50	50	1	**9.020 135**
100	200	1	**9.020 136**
200	200	1	**9.020 137**

5

5 TLC plate cutter

For scoring and cutting glass backed TLC plates. For cost-effectiveness in plate use, or in order to give individual plates different derivatives after separation. Supplied with cutting ring and template.

Type	PK	Cat. No.
TLC plate cutter	1	**9.539 041**

Notes












LLG
LABWARE
1000ml
PP
125°C
MAX
APPROXIMATE VOLUMES
1000
900
800
700
600
500
400
300
200
100

Good quality!
Great value!!!


200
LLG Micropipette



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