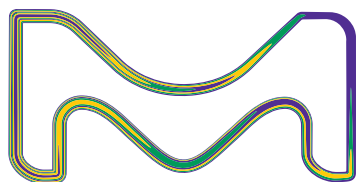


Trusted Results

SupraSolv[®] High Purity Solvents
for Gas Chromatography



SupraSolv[®] and SupraSolv[®] hypergrade Solvents for gas chromatography

As the world's leading supplier of high-purity solvents, we offer a full range of products for every gas chromatography application in the laboratory - including highly sensitive pesticide and dioxin analyses. Our SupraSolv[®] and SupraSolv[®] hypergrade solvents are developed specifically for sensitive detection processes in residue and environmental analysis. They cover all areas of application, and provide the highest level of reliability for your analytical results.

To ensure purity and suitability, we employ only the latest manufacturing processes. SupraSolv[®] solvents are recovered during special distillation cuts, and suitability testing involves a variety of detectors and highly concentrated solvents.

As a result, these high-purity products support you in countless ways during your daily work - with individual specifications that are tailored to their specific area of application.

SupraSolv[®] and SupraSolv[®] hypergrade solvents benefits

- The most comprehensive application range due to the largest retention time range
- Analytical reliability due to the highest possible purity and a minimal signal-to-noise ratio
- Time and cost savings due to the best possible batch consistency, thus avoiding analysis repetition



Supelco
Certificate of Analysis
1.06009.2500 Batch
Methanol for analysis EMSURE[®] ACS, ISO, Reag. Ph Eur
I0983509

	Spec. Values	Batch Values	%
Purity (GC)	≥ 99.9	99.9	
Identity (IR)	conforms	conforms	
Appearance	clear	clear	
Color	≤ 10	≤ 5	Hazen
Solubility in water	conforms	conforms	meq/g
Acidity	≤ 0.0002	0.0001	meq/g
Alkalinity	≤ 0.0002	< 0.0002	
Density (d ₂₀ ²⁰ °C/20 °C)	0.791 - 0.793	0.793	°C
Boiling Point	64 - 65	64	ppm
Benzene (impurity A) (GC)	≤ 0.05	< 1	%
Ethanol (GC)	≤ 0.001	≤ 0.001	%
Acetone	≤ 0.001	conforms	%
Acetaldehyde	conforms	≤ 0.001	ppm
Formaldehyde	≤ 0.001	≤ 0.00025	%
Readily carbonizable substances	≤ 0.5	≤ 0.000002	%
Carbonyl compounds (as CO)	≤ 1	≤ 0.00005	%
Chloride (Cl)	≤ 0.00025	≤ 0.000002	%
Sulfate (SO ₄)	≤ 0.00002	≤ 0.000002	%
Substances reducing potassium permanganate (as O)	≤ 0.00005	≤ 0.000001	%
Ag (Silver)	≤ 0.00002	≤ 0.000002	%
Al (Aluminum)	≤ 0.00002	≤ 0.000002	%
As (Arsenic)	≤ 0.00001	≤ 0.000005	%
Au (Gold)	≤ 0.00002	≤ 0.000005	%
Ba (Barium)	≤ 0.00005	≤ 0.000002	%
Be (Beryllium)	≤ 0.00005	≤ 0.000002	%
Bi (Bismuth)	≤ 0.00002	≤ 0.00001	%
Ca (Calcium)	≤ 0.00002	≤ 0.00002	%
Cd (Cadmium)	≤ 0.00002	≤ 0.000002	%
Co (Cobalt)	≤ 0.00001	≤ 0.000002	%
Cr (Chromium)	≤ 0.00002	≤ 0.00001	%
Cu (Copper)	≤ 0.00002	≤ 0.000002	%
Fe (Iron)	≤ 0.00002	≤ 0.000002	%
Ga (Gallium)	≤ 0.00001	≤ 0.000002	%
In (Indium)	≤ 0.00002	≤ 0.00001	%
Li (Lithium)	≤ 0.00002	≤ 0.000002	%
Mg (Magnesium)	≤ 0.00002	≤ 0.00001	%
Mn (Manganese)	≤ 0.00002	≤ 0.000002	%
Mo (Molybdenum)	≤ 0.00001	≤ 0.00001	%
Ni (Nickel)	≤ 0.00005	≤ 0.000005	%
Pb (Lead)			
Pt (Platinum)			

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The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the US and Canada. Page 1 of 2

Table of Contents

SupraSolv® and SupraSolv® hypergrade Solvents for gas chromatography	2
SupraSolv® and SupraSolv® hypergrade solvents for all your gas chromatography needs	4
SupraSolv® solvents for gas chromatography	6
SupraSolv® headspace solvents for headspace gas chromatography	8
SupraSolv® hypergrade solvents for organic trace analysis	10
SupraSolv® hypergrade solvents for organic trace analysis	12
Optimum packaging and withdrawal systems.....	14
Ordering information	16
Column Selection by GC Technique & Application	19
Reference substances for gas chromatography	21

Quality for the widest range of applications

Our solvents for gas chromatography offer the highest quality for the widest range of applications. The retention time window during which specified contaminants are lowest is broader than that of any competitor product.

Quality for the best batch consistency

Every batch that leaves our premises is tested to the same high standards of quality. This is your guarantee of consistently reliable analytical results.

Quality for reliable analyses

Our solvents for gas chromatography provide reliable, consistent analytical results without the need for costly purification and repeat analysis. As a result, they make your work easier, more efficient and more economical.

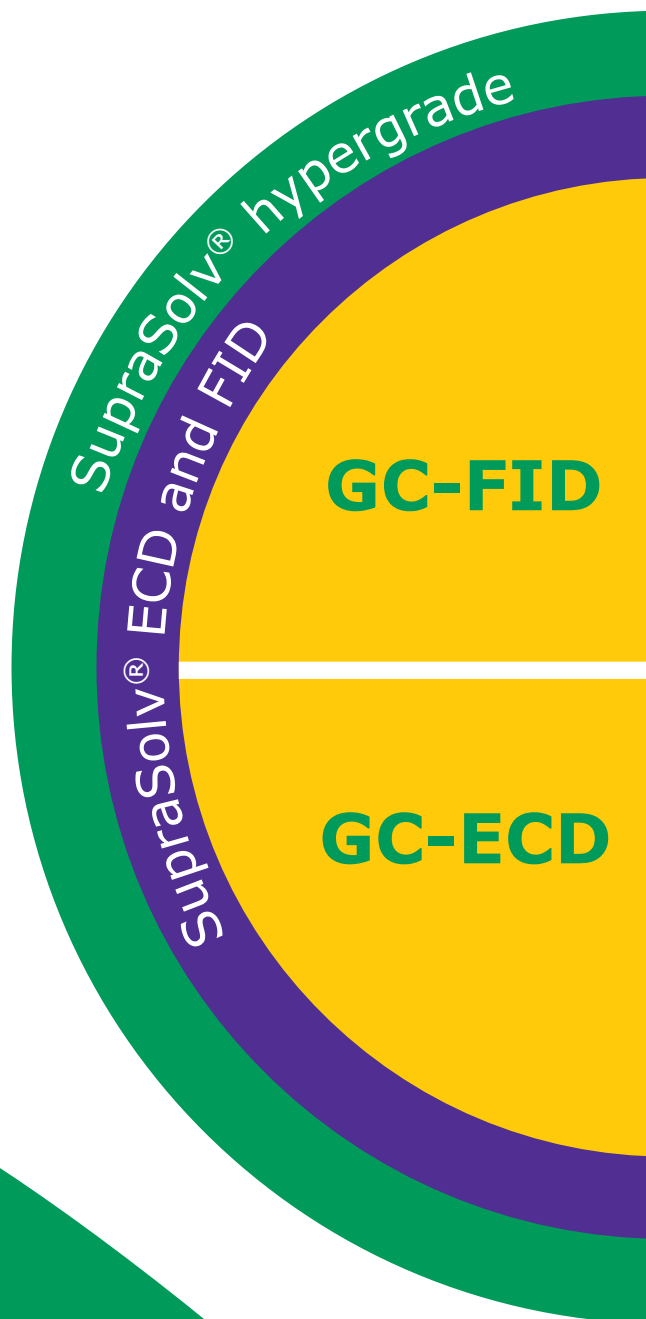
SupraSolv[®] and SupraSolv[®] hypergrade solvents for all your gas chromatography needs

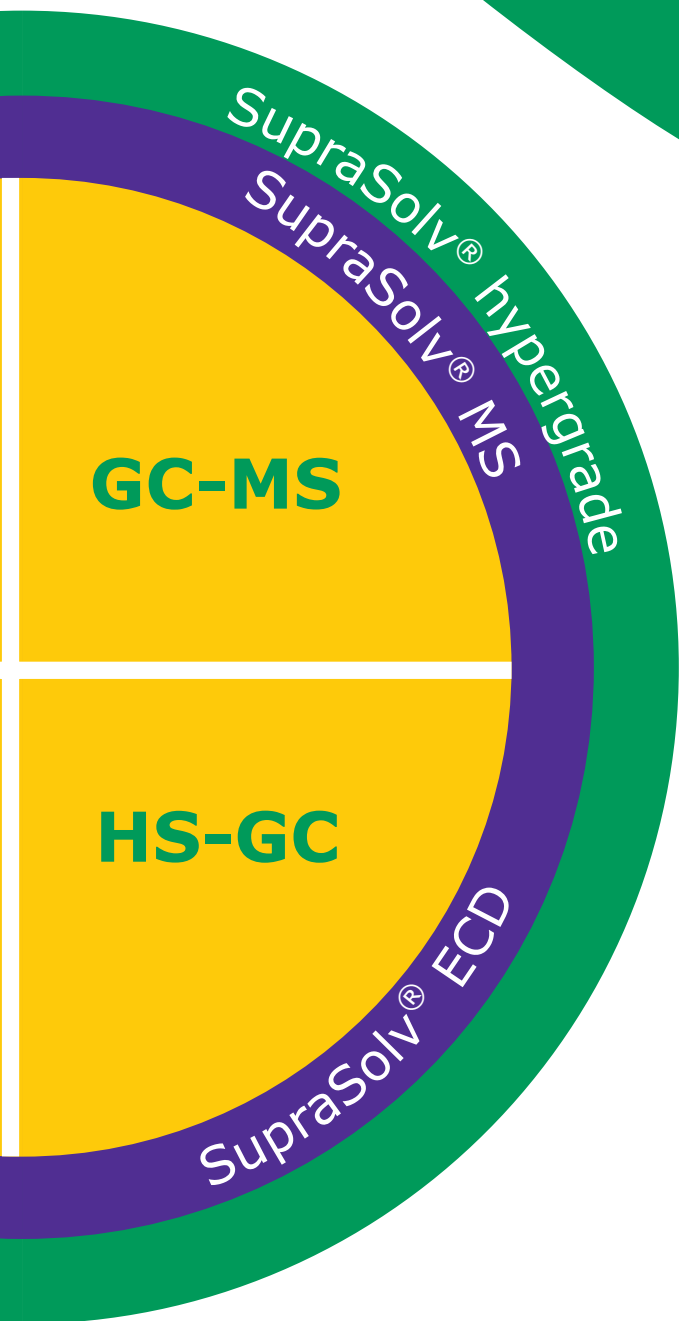
FID FLAME IONIZATION DETECTOR

- BTX (Benzene, Toluene, Xylene) - highly volatile aromatic hydrocarbons in sewage, ground-water, juices, canned fish etc.
- Hydrocarbon-oil index in water
- Determination of emissions in car cockpit material

ECD ELECTRON CAPTURE DETECTOR

- Pesticide analysis in fruits and vegetables
- Acrylamide in e.g. potato chips, crisps and crisp bread
- Polychlorinated biphenyls (PCB) in water and sludge
- DDT (preserver and insecticide) in milk, fish, meat, fruits etc.
- Highly volatile halogenated hydrocarbons in water
- Nitrate in lettuce, radish etc.





MS MASS SPECTROMETRY

- Dioxins and furans (PCDD/PCDF) in meat, fish and milk
- Polycyclic aromatic hydrocarbons (PAH) in vegetables, olive oil and broiled meat
- Pesticide analysis in fruits and vegetables
- Determination of drugs (cocaine, cannabis, ecstasy, heroine, alcohol) in human hair
- Analysis of phthalates in child care products and toys

HS-GC HEADSPACE GAS CHROMATOGRAPHY

- Analysis of residual solvents in drug substances, excipients, and drug products according to ICH guideline, Ph Eur and USP

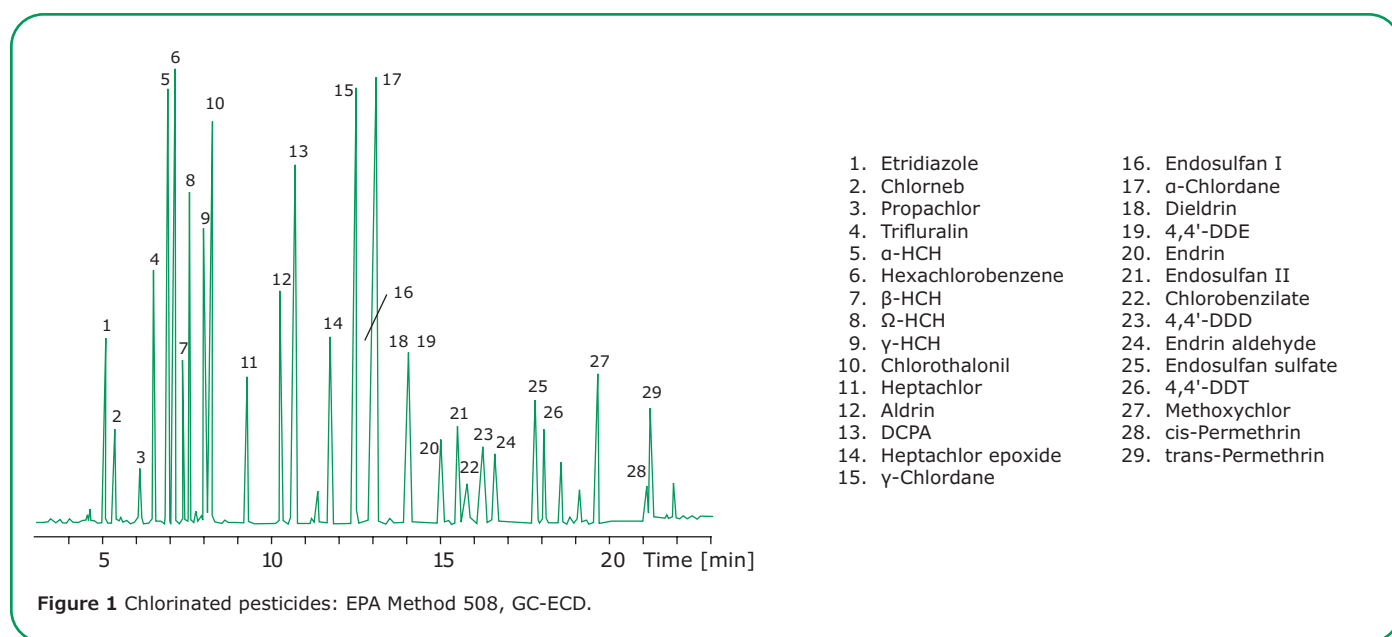
SupraSolv[®] solvents for gas chromatography

With gas chromatography, only solvents with the highest levels of purity are suitable for sample preparation tasks such as the extraction and concentration of the extracts before injection. SupraSolv[®] solvents are developed specially for this highly sophisticated application area.

Our comprehensive portfolio of GC solvents offers the right product for your specific application and detection method. SupraSolv[®] ECD and FID is specially developed and tested for ECD (Electron Capture Detector) and FID (Flame Ionization Detector). Typical applications include the determination of polychlorinated biphenyls (PCB) in water and soil or pesticides in fruits and vegetables. SupraSolv[®] MS is dedicated for use in gas chromatography coupled with mass spectrometric detection. This method is of increasing importance and used e.g. for the analysis of dioxins and furans (PCDD/PCDF) in food and water samples or for the determination of PAH (polycyclic aromatic hydrocarbons) in food. Both SupraSolv[®] qualities are carefully tested for the specific detectors and offer a clear baseline and minimal signal-to-noise ratio within a specified retention time range. Therefore SupraSolv[®] solvents help you achieve consistently accurate, reliable and reproducible results.

EPA Method 508: Determination of chlorinated pesticides in water, standard chromatogram

Classical pesticide analysis according EPA Method 508 is employed for the qualitative and quantitative determination of pesticides in food and environmental samples. This method uses gas chromatography coupled with ECD. For sample preparation, the solvents Dichloromethane Methanol, Methyl tert-butyl ether (MTBE) or Acetone are used. Due to their particular suitability for GC-ECD, as well as their high purity and minimal interference signals within the relevant retention time range, SupraSolv[®] solvents will help you to achieve consistently accurate, reliable and reproducible results in pesticide analysis. Furthermore, the specified ECD retention time range of SupraSolv[®] ECD and FID covers all analytes of interest for this application, resulting in best application security.



SupraSolv® - the reliable solution

SupraSolv® has minimal interference signals in the relevant retention time window (Fig. 2). This ensures reliable, reproducible and accurate analysis results.

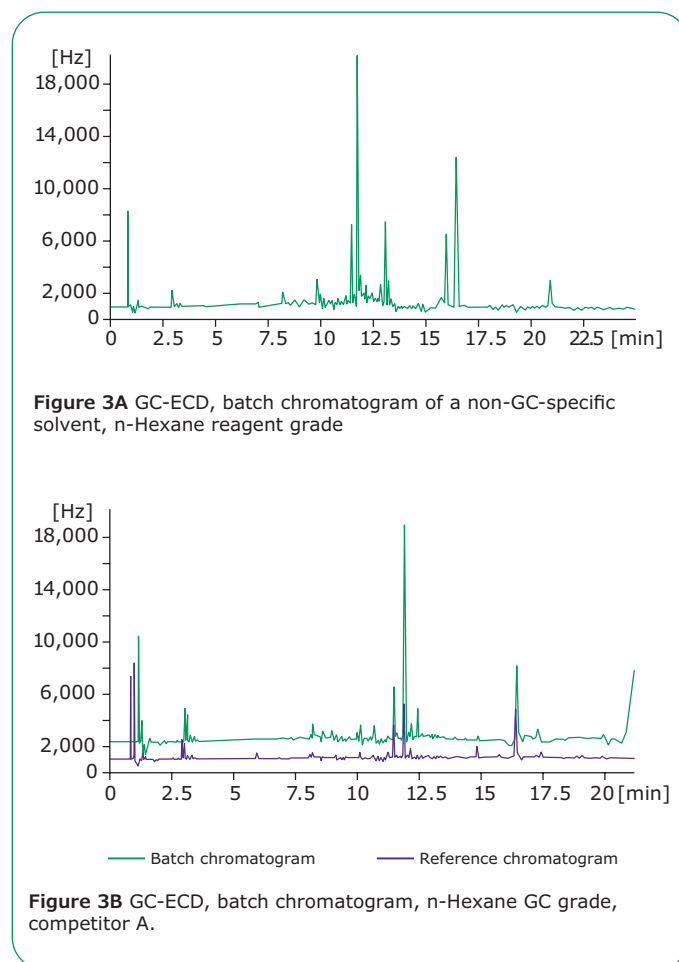
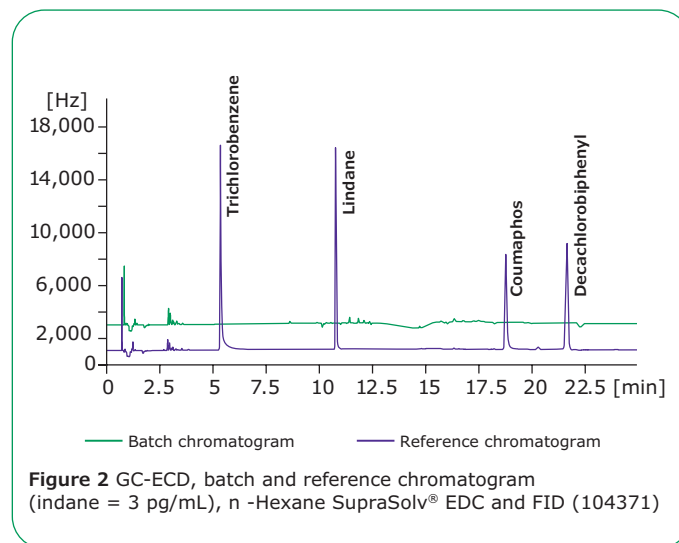
SupraSolv® ECD specification

Outstanding analytical capabilities form the basis for providing you with comprehensive quality information - the specifications document our quality level and give you the reliability you need for your day-to-day laboratory decisions.

Use of a non-specific solvent and competitor comparison

Both competitor chromatogram and the chromatogram of a non-GC-specific solvent (n-Hexane reagent grade) exhibit highly unstable baselines and many unidentifiable contaminant peaks. The competitor chromatogram also shows very low batch consistency. The bottom line: No clear analytical results, a risk of misinterpretation - and expensive, time-consuming repeat analyses.

Thanks to outstanding batch consistency, SupraSolv® also saves you time and money by making repeat analyses a thing of the past.



SupraSolv[®] headspace solvents for headspace gas chromatography

Headspace gas chromatography is a precise, well-accepted method for the analysis of residual solvents in drug substances and products. It is recommended as the preferred method of analysis for this application by the European Pharmacopoeia (Chapter 2.4.24) and the United States Pharmacopoeia (Chapter 467).

The ICH (International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use) Guideline Q3C »Impurities: Guideline for Residual Solvents« divides all residual solvents into three classes according to their harmfulness for human health, and defines permissible maximum concentrations in actives, excipients and drug products. Both the European

and the United States Pharmacopoeia refer to this guideline. Accurate analysis with headspace gas chromatography demands the use of very pure solvents with extremely low concentrations of the defined residual solvents. By specifying for SupraSolv[®] headspace the concentrations of all residual solvents of the three defined classes in the ICH guideline, we offer a precise purity window for this application — for unique, application-orientated quality. Since we also perform a headspace application test on each batch, every delivery gives you the reliability, accuracy and analytical safety you need.

SupraSolv[®] headspace solvents are specially designed for the analysis of residual solvents

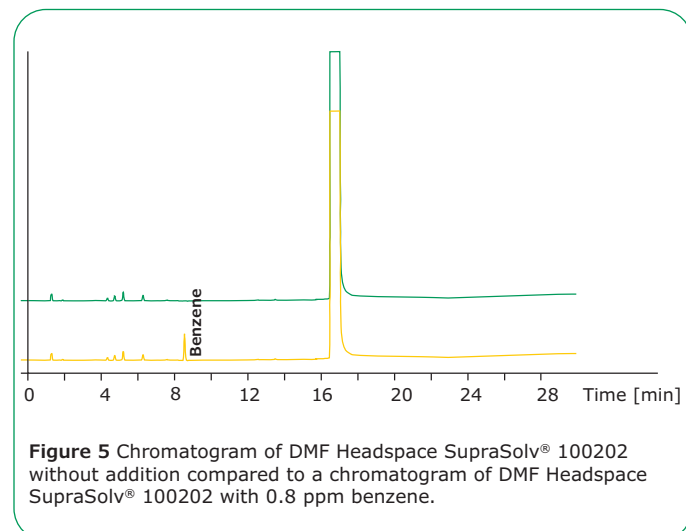
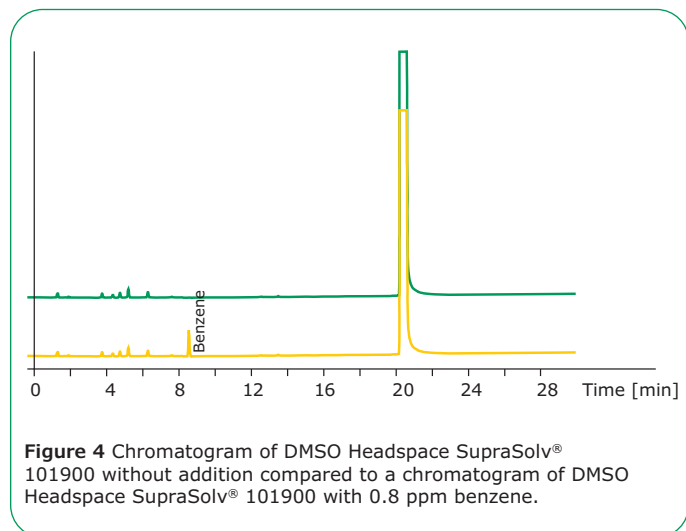
Extract of specification

ICH = International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use

Every residual solvent of class 1 acc. ICH $\leq 1 \mu\text{g/g}$

Every residual solvent of class 2 acc. ICH $\leq 10 \mu\text{g/g}$

Every residual solvent of class 3 acc. ICH $\leq 50 \mu\text{g/g}$



according to Ph Eur and USP. We have developed them in close cooperation with an experienced headspace laboratory, and manufacture them using

special production processes. As a result, these high purity products ensure reliable, accurate analytical results.

Application: Quantification of residual solvents in an API

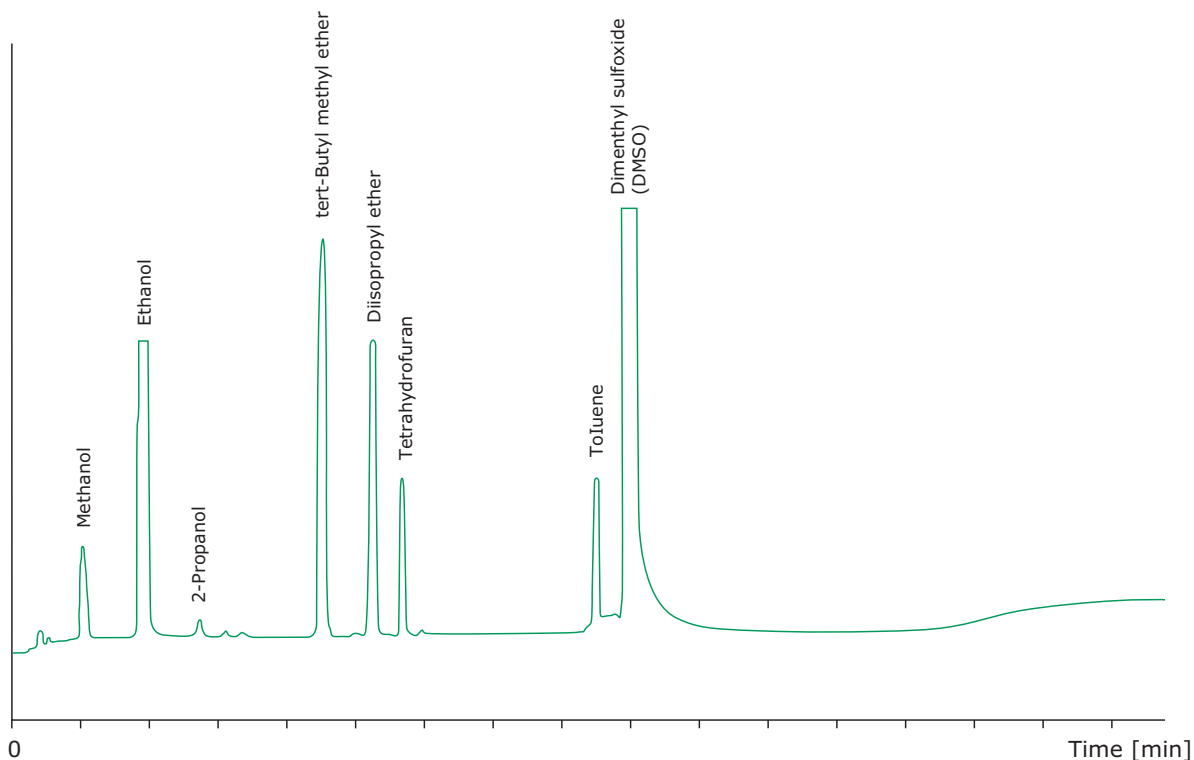


Figure 6 Quantification of residual solvents in an API using Dimethyl sulfoxide (DMSO) SupraSolv® for headspace gas chromatography (101900).

Chromatographic conditions

Column	fused silica capillary column, DB 1, length 30 m, ID 0.32 mm, film 5 µm
Pressure	0.6 bar / 8 psi (Helium)
Injection	splitless, 150 °C
Headspace conditions	
thermostating temperature	80 °C
transfer and needle temperature	130 °C
thermostating time	30 min
pressurisation	1.0 min
injection time	0.04 min
withdrawal time	0.2 min
High pressure	2 bar / 28 psi
Detection	FID, 250 °C
Temperature	50 °C for 5 min, with 8 °C/min up to 240 °C, hold 240 °C for 5 min
Method	Quantification of residual solvents in an API

Chromatographic data

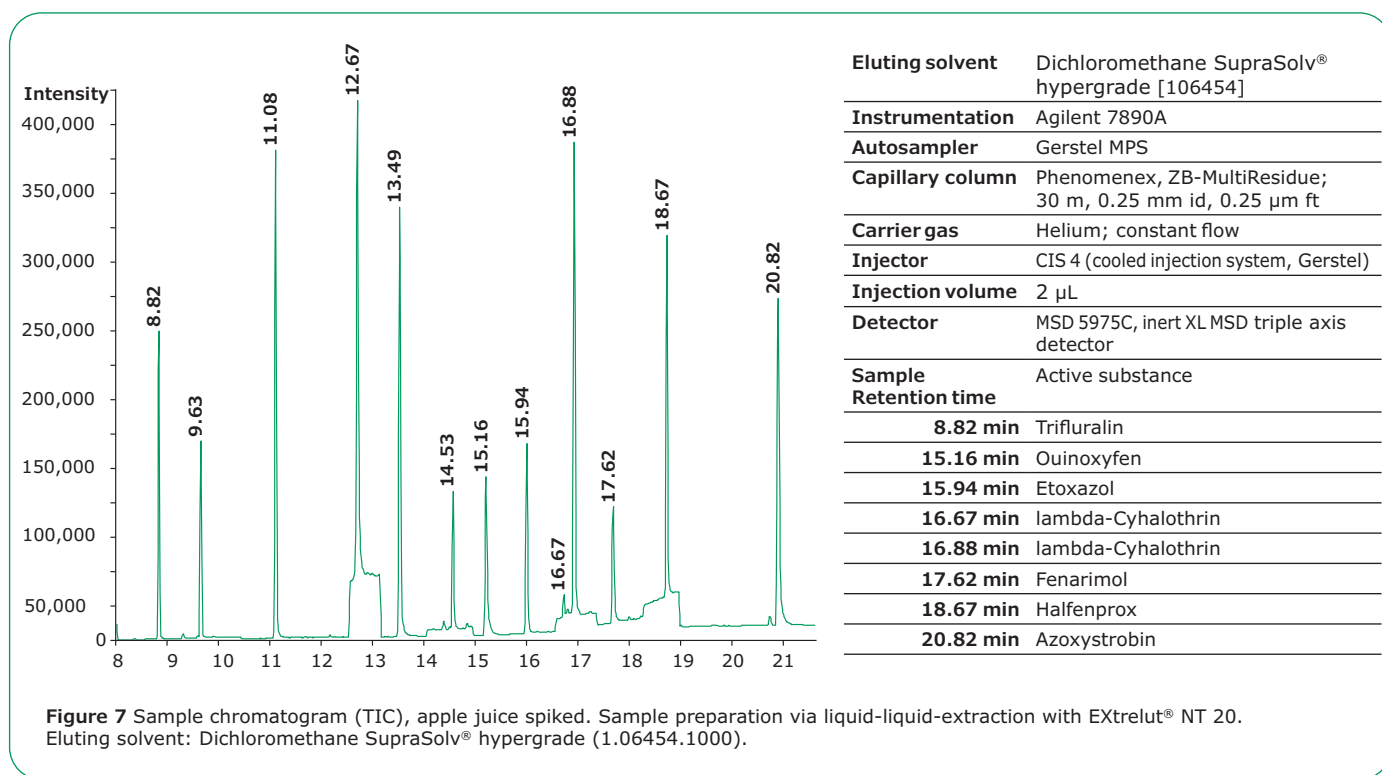
No.	Compound	Time [min]	Area
1	Methanol	2.0	12361
2	Ethanol	3.8	399048
3	2-Propanol	5.4	2368
4	tert-Butyl methyl ether	9.0	34637
5	Diisopropyl ether	10.5	43000
6	Tetrahydrofuran	11.4	14083
7	Toluene	11.5	11502

SupraSolv[®] hypergrade solvents for organic trace analysis

SupraSolv[®] hypergrade solvents offer a unique solution for all applications. The specification is even broader and higher than that of SupraSolv[®] hypergrade solvents: the specified retention time range is larger (so even low-boiling substances can be reliably detected), and the permissible concentration of interference signals within the retention time range is also lower. We recommend SupraSolv[®] solvents for all areas that demand the highest levels of reliability in analytical results — for example, environmental analyses. Intensive research — combined with ongoing product development — not only ensures reliability in standard applications, but also permits easier, more precise analyses in new fields, such as determining the Hydrocarbon-oil index of water and soil samples.

Pesticide residue analysis in apple juice with GC-MS and SupraSolv[®] hypergrade Dichloromethane

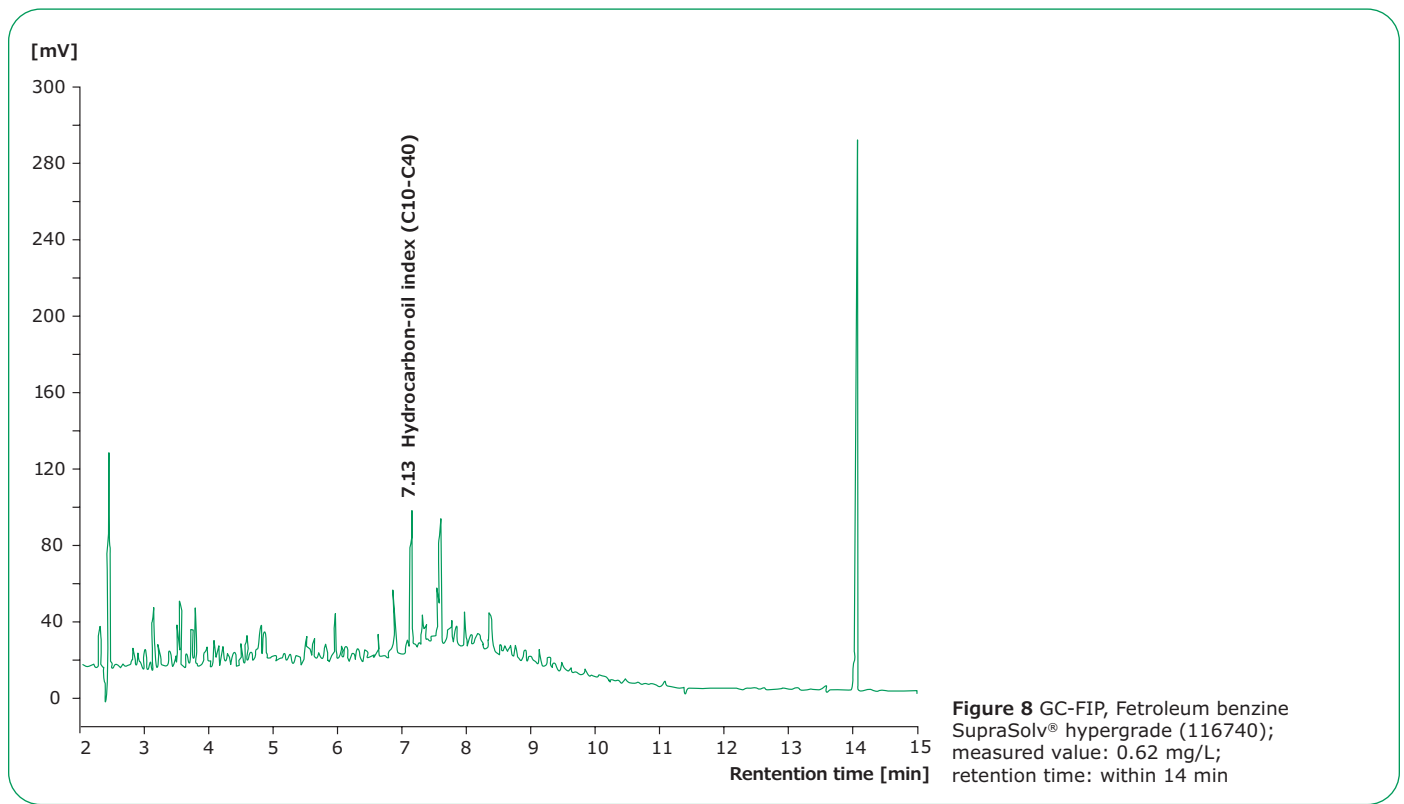
As the consumption of fruit-based soft drinks is significant in vulnerable groups, these products should be closely monitored regarding pesticides. Classical pesticide residue analysis is still performed with GC-ECD (see page 6) and SupraSolv[®] solvents n-Hexane, Ethyl acetate, Dichloromethane or Acetone. An alternative and faster method using QuEChERS sample preparation uses GC-MS instead. This method reduces manual effort, improves analytical safety, and extends the range of detectable pesticides. The extraction agent with the best dissolution properties for pesticides is Dichloromethane SupraSolv[®] (106454).



Hydrocarbon-oil index analysis (C10-C40) in water in accordance with DIN EN ISO 9377-2 (H53, 2001) using SupraSolv® hypergrade

The specifications of SupraSolv® hypergrade solvents have been fine-tuned to permit even the determination of the hydrocarbon-oil index in water (DIN EN ISO 9377-2 [H53, 2001]). SupraSolv® petroleum benzine is used as the extraction agent for this application. Its minimal signal-to-noise ratio allows the employment

of even steeper temperature gradients. For you, this means that your analysis times are reduced to a minimum, while the quality of the results remains unchanged. This allows your sample throughput to be greatly increased: an advantage from which you will profit daily.



SupraSolv[®] hypergrade solvents for organic trace analysis

No matter which gas chromatography method you use, and regardless of whether you are analyzing soil or water samples: With SupraSolv[®] hypergrade solvents, you only need to use a single quality. SupraSolv[®] hypergrade

solvents are specified for GC-ECD and GC-FID, and also for mass spectroscopy (MS), which is rapidly growing in importance for the structure determination and quantification of sample components (Fig. 9a - 11).

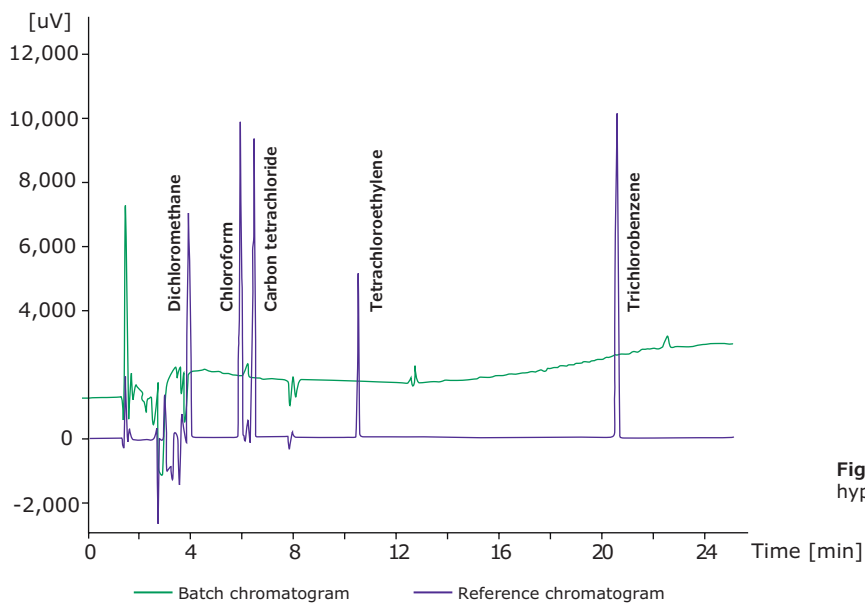


Figure 9a GC-ECD, n-Hexane SupraSolv[®] hypergrade (104369), low boiling range.

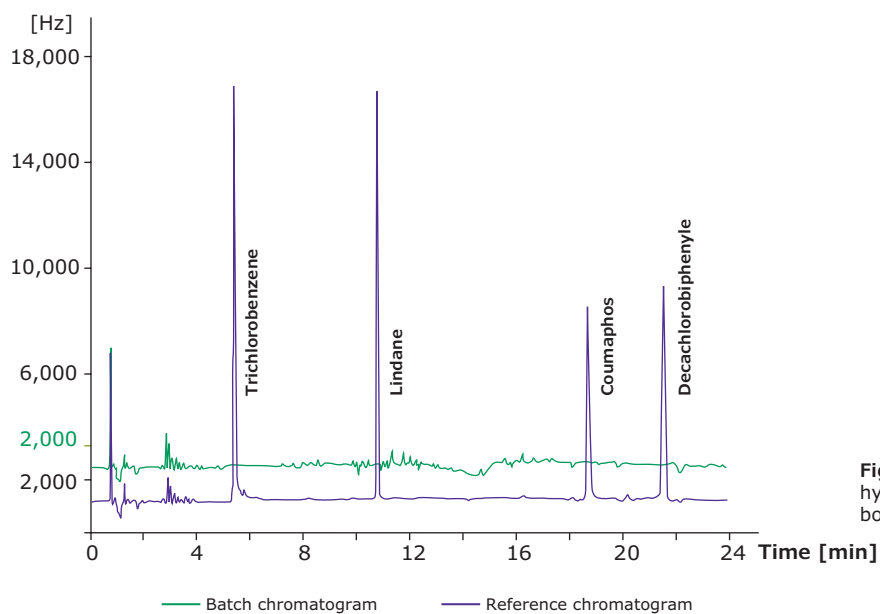


Figure 9b GC-ECD, n-Hexane SupraSolv[®] hypergrade (104369), medium- and high boiling range.

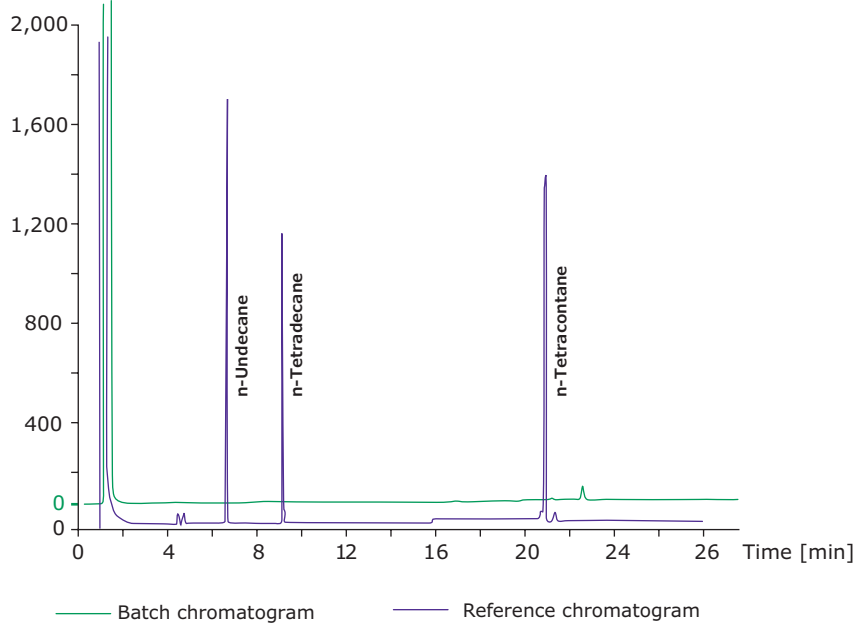


Figure 10 GC-FID, n-Hexane SupraSolv® hypergrade (104369).

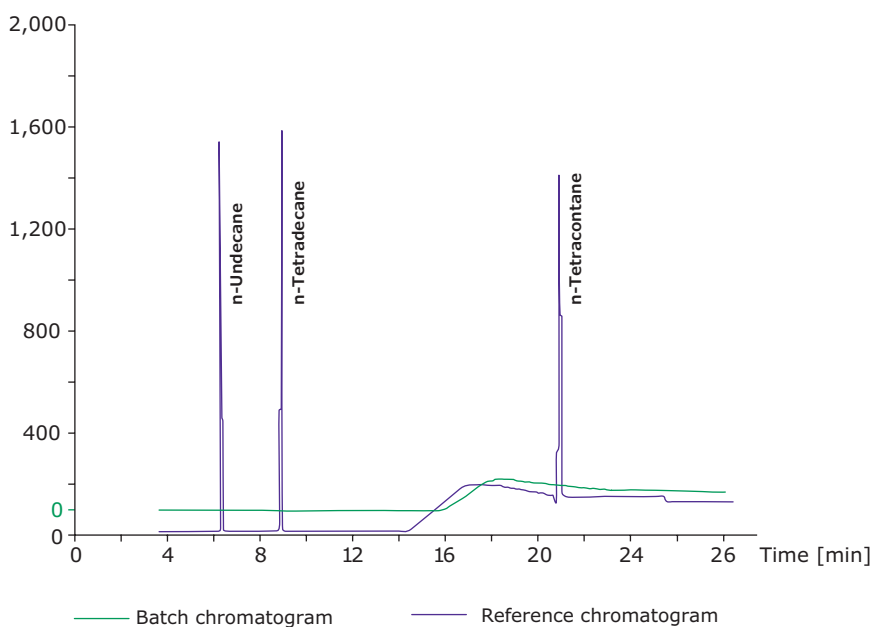


Figure 11 GC-MS, n-Hexane SupraSolv® hypergrade (104369).

	GC-ECD	GC-ECD pesticide analysis	GC-FID	GC-MS
Specifications at a glance	Dichloromethane to 1,2,4-Trichlorobenzene (Tetrachloromethane standard)	1,2,4-Trichlorobenzene to Decachlorobiphenyle (Lindane standard)	n-Undecane to n-Tetracontane (n-Tetradecane standard)	n-Undecane to n-Tetracontane; scan range 30 - 600 amu (n-Tetradecane standard)
SupraSolv® solvents for gas chromatography ECD and FID	-	max. 3 pg/mL	max. 3 ng/mL	-
SupraSolv® solvents for gas chromatography MS	-	-	-	max. 3 ng/mL
SupraSolv® hypergrade solvents for organic trace analysis	max. 1 ng/mL	max. 2 pg/mL	max. 2 ng/mL	max. 2 ng/mL

Optimum packaging and withdrawal systems

Quality for high-grade packaging

Our quality standards apply to each individual package of SupraSolv® solvents. We place great value on providing a large selection of application-orientated package sizes, from 1 liter glass bottles up to 10 and 30 liter returnable barrels made of stainless steel.

Stainless steel barrels

Optimum material characteristics (avoidance of interactions between solvents and packaging material). These stackable, returnable barrels ensure optimum emptying, and can be combined with a variety of withdrawal systems.

Glass bottles

Optimum characteristics for handling, storage and transport. Safe footprint, low center of gravity, optimum emptying. Safety screw cap S40.

10 Liter



30 Liter



Sustainable environmental protection

Stainless steel barrels are unbreakable, and help to minimize packaging waste and environmental pollution risks. By using them, suppliers and users can proactively help to protect our environment. Our stainless steel barrels are returnable, and remain the property of Merck KGaA Darmstadt, Germany throughout their life cycle. After use, empty barrels must be returned. We will then ensure they are properly cleaned, checked and refilled.

Important safety advice

Withdrawal of flammable liquids should only be made from vessels that have been properly earthed as well as the withdrawal system itself. This can be done e.g. using our antistatic device (Cat. No. 1.07070.0001).

Our withdrawal systems have been developed and optimized for the use with Supelco® containers and solvents. We therefore disclaims any warranty or liability for the operability of its withdrawal systems in connection with containers or solvents from other manufacturers. We reserve the right to refrain from the delivery of withdrawal systems if the respective order does not indicate that each withdrawal system will be used in combination with appropriate Supelco® solvents and containers.

We inform and advise our customers to the best of our knowledge and ability but without any engagement or liability on our part. Our customers must obey all existing laws and regulations. This also applies in respect of any protected rights of third parties. Our information and advice does not eliminate the need for our customers to check, on their own responsibility, that our products are suitable for the purpose envisaged.

Quality for reliable and safe dispensing

Our specially designed withdrawal systems for stainless steel containers safeguard the high quality of our solvents during dispensing. To prevent any detectable contamination, solvents, packaging and dispensing systems are optimally matched. Our withdrawal systems also provide the highest levels of safety when used in daily work.

Withdrawal system for manual pressure build-up in stainless steel barrels

System compounds: exchangeable dip tube for 10 and 30 liter stainless steel barrels, clamp for outlet tube, ball valve, pump ball, three-way stopcock.

Advantages: independent from gas supply, enables simple and safe filling of smaller bottles or containers, can be used in the laboratory, central storage possible.



1.01123.0001

Withdrawal system for inert gas pressurizing in stainless steel barrels

System compounds: 2"-thread adapter with two rapid-action connections, spiral gas feed tube for pressurizing, stainless steel-coated PTFE tube with rapid-action connector and threaded connector, self-closing stainless steel nozzle with large handle.

Advantages: flexible tubing (gas: 180 cm usable length, product: 80 cm length), enables simple and safe filling of smaller bottles or containers, central storage and supply possible.



1.06710.0001

Ordering information

SupraSolv® solvents for gas chromatography ECD and FID

	Product	Purity (GC) min. [%]	Evap. residue max. [mg/L]	Water max. [%]	Color max. [Hazen]	Content / Packaging	Cat. No.
A	Acetone	99.8	3.0	0.05	10	1 L GL	1.00012.1000
						2.5 L GL	1.00012.2500
						4 L GL	1.00012.4000
						30 L ST	1.00012.9030
	Acetonitrile	99.8	3.0	0.05	10	1 L GL	1.00017.1000
						2.5 L GL	1.00017.2500
						4 L GL	1.00017.4000
B	tert-Butyl methyl ether	99.8	3.0	0.02	10	1 L GL	1.01995.1000
						2.5 L GL	1.01995.2500
C	Chloroform, stabilized	99.8	5.0	0.01	10	1 L GL	1.02432.1000
						2.5 L GL	1.02432.2500
	Cyclohexane	99.8	3.0	0.01	10	1 L GL	1.02817.1000
						2.5 L GL	1.02817.2500
					4 L GL	1.02817.4000	
					10 L ST	1.02817.9010	
D	Dichloromethane, stabilized	99.8	5.0	0.01	10	1 L GL	1.06054.1000
						2.5 L GL	1.06054.2500
						4 L GL	1.06054.4000
						10 L ST	1.06054.9010
	Diethyl ether, stabilized	98.0	3.0	0.05	10	1 L GL	1.00931.1000
						2.5 L GL	1.00931.2500
						4 L GL	1.00931.4000
	N,N-Dimethylformamide	99.8	3.0	0.05	10	1 L GL	1.10983.1000
2.5 L GL						1.10983.2500	
E	Ethanol	99.8	3.0	0.01	10	1 L GL	1.02371.1000
						2.5 L GL	1.02371.2500
	Ethyl acetate	99.8	3.0	0.02	10	1 L GL	1.10972.1000
						2.5 L GL	1.10972.2500
						4 L GL	1.10972.4000
						10 L ST	1.10972.9010
					30 L ST	1.10972.9030	
H	n-Hexane	98.0 *	3.0	0.01	10	1 L GL	1.04371.1000
						2.5 L GL	1.04371.2500
						4 L GL	1.04371.4000
						10 L ST	1.04371.9010
						30 L ST	1.04371.9030
I	Isohexane	99.8	3.0	0.01	10	2.5 L GL	1.04340.2500
	Isooctane	99.8	3.0	0.01	10	1 L GL	1.15440.1000
						2.5 L GL	1.15440.2500
M	Methanol	99.8	3.0	0.1	10	1 L GL	1.06011.1000
						2.5 L GL	1.06011.2500
						4 L GL	1.06011.4000

	Product	Purity (GC) min. [%]	Evap. residue max. [mg/L]	Water max. [%]	Color max. [Hazen]	Content / Packaging	Cat. No.
P	n-Pentane	99.8	3.0	0.02	10	1 L GL	1.00882.1000
						2.5 L GL	1.00882.2500
	Petroleum benzine (40 - 60 °C)	-	3.0	0.01	10	1 L GL	1.01772.1000
						2.5 L GL	1.01772.2500
						4 L GL	1.01772.4000
						10 L ST	1.01772.9010
						30 L ST	1.01772.9030
	2-Propanol	99.8	3.0	0.1	10	1 L GL	1.00998.1000
						2.5 L GL	1.00998.2500
T	Toluene	99.8	3.0	0.03	10	1 L GL	1.08389.1000
						2.5 L GL	1.08389.2500
						4 L GL	1.08389.4000
						10 L ST	1.08389.9010
W	Water	-	5.0	-	10	1L GL	1.02699.1000
						2.5 L GL	1.02699.2500

GL = glass bottle I ST = stainless steel barrel I * = sum of hexane isomers + methyl cyclopentane (GC) ≥ 99.8 %

GC-ECD (retention range 1,2,4-Trichlorobenzene to Decachlorobiphenyle individual signals (Lindane standard)) :, 3 pg/mL

GC-FID (retention range n-Undecane to n-Tetracontane individual signals (n-Tetradecane standard)) :, 3 ng/mL

SupraSolv® solvents for gas chromatography MS

	Product	Purity (GC) min. [%]	Evap. residue max. [mg/L]	Water max. [0%]	Color max. [Hazen]	Content / Packaging	Ord. No.
A	Acetone	99.8	3.0	0.05	10	1 L GL	1.00658.1000
						2.5 L GL	1.00658.2500
	Acetonitrile	99.8	3.0	0.05	10	1 L GL	1.00665.1000
						2.5 L GL	1.00665.2500
C	Cyclohexane	99.8	3.0	0.01	10	1 L GL	1.00667.1000
						2.5 L GL	1.00667.2500
D	Dichloromethane, stabilized	99.8	5.0	0.01	10	1 L GL	1.00668.1000
						2.5 L GL	1.00668.2500
E	Ethyl acetate	99.8	3.0	0.02	10	1 L GL	1.00789.1000
						2.5 L GL	1.00789.2500
H	n-Hexane	98.0 *	3.0	0.01	10	1 L GL	1.00795.1000
						2.5 L GL	1.00795.2500
M	Methanol	99.8	3.0	0.1	10	1 L GL	1.00837.1000
						2.5 L GL	1.00837.2500
T	Toluene	99.8	3.0	0.03	10	1 L GL	1.00849.1000
						2.5 L GL	1.00849.2500
W	Water	-	5.0	-	10	1L GL	1.03702.1000
						2.5 L GL	1.03702.2500

GL = glass bottle I * = sum of hexane isomers + methyl cyclopentane (GC) ≥ 99.8 %

GC-MS (retention range n-Undecane to n-Tetracontane; scanning area 30 - 600 amu individual signals (n-Tetradecane standard)) ≤ 3 ng/mL

SupraSolv® headspace for the analysis of residual solvents according to ICH, Ph Eur and USP

	Product	Purity (GC) min. [%]	Evap. residue max. [mg/L]	Water max. [%]	Color max. [Hazen]	Content / Packaging	Cat. No.
	1-Methyl-2-pyrrolidone	99.8	-	0.05	10	0.5 L GL	1.02497.0500
						1 L GL	1.02497.1000
						2.5 L GL	1.02497.2500
B	Benzylalcohol	99.5	-	0.1	10	1 L GL	1.02695.1000
						2.5 L GL	1.02695.2500
D	N,N-Dimethylacetamide	99.8	3.0	0.05	10	0.5 L GL	1.00399.0500
	N,N-Dimethylacetamide	99.8	3.0	0.05	10	1 L GL	1.00399.1000
	N,N-Dimethylformamide	99.8	3.0	0.05	10	1 L GL	1.00202.1000
						2.5 L GL	1.00202.2500
	Dimethyl sulfoxide	99.8	3.0	0.05	10	1 L GL	1.01900.1000
2.5 L GL						1.01900.2500	
W	Water	-	5.0	-	-	1 L GL	1.00577.1000
						2.5 L GL	1.00577.2500

GL = glass bottle

Every residual solvent of class 1 acc. CH \leq 1 μ g/g

Every residual solvent of class 2 acc. CH \leq 10 μ g/g

Every residual solvent of class 3 acc. CH \leq 50 μ g/g

SupraSolv® hypergrade solvents for organic trace analysis

	Product	Purity (GC) min. [%]	Evap. residue max. [mg/l]	Water max. [%]	Color max. [Hazen]	Content / Packaging	Cat. No.
D	Dichloromethane	99.9	3.0	0.005	10	1 L GL	1.06454.1000
H	n-Hexane	99.0*	3.0	0.005	10	1 L GL	1.04369.1000
						2.5 L GL	1.04369.2500
P	n-Pentane	99.9	3.0	0.01	10	1 L GL	1.07288.1000
						2.5 L GL	1.07288.2500
	Petroleum benzine (40 - 60°C)	-	3.0	0.005	10	1 L GL	1.16740.1000
						2.5 L GL	1.16740.2500

GL = glass bottle

* Sum of hexane isomers + methylcyclopentane (GC) > 99.9 %

GC-ECD (retention range Dichloromethane to 1,2,4-Trichlorobenzene individual signals (Tetrachloromethane standard)) \leq 1 ng/mL

GC-ECD (retention range 1,2,4-Trichlorobenzene to Decachlorobiphenyle individual signals (Lindane standard)) \leq 2 pg/mL

GC-FID (retention range n-Undecane to n-Tetracontane individual signals (n-Tetradecane standard)) \leq 2 ng/mL

GC-MS (retention range n-Undecane to n-Tetracontane; scanning area 30 - 600 amu individual signals (n-Tetradecane standard)) \leq 2 ng/mL

Column Selection by GC Technique & Application

We have developed an extensive line of special purpose columns designed for industry specific applications. These columns are manufactured to deliver high resolution, great analyte response, low bleed, and long column life; allowing you to achieve the analytical performance you require. Look at our easy-to-read phase selection charts highlight choices for applications that are independent of any industry. Simply locate the application to identify a recommended column phase.

The stationary phase also dictates the minimum and maximum temperatures at which a column can be used. Therefore, it is critical to ensure the selected stationary phase can withstand the temperature requirements of the GC method.

Fast GC Applications

	SLB®-1ms**	Equity®-1**	SLB®-5ms**	Equity®-5**	SPB®-624	VOCOL®**	Equity®-1701**	Omegawax®**	SUPELLOWAX® 10**	SLB®-IL59	SP®-2560	SLB®-IL82	SLB®-IL100	SLB®-IL111i
Volatiles					●	●								
Semivolatiles			●											
Pesticides			●	●			●							
PCBs			●	●			●			●		●		●
Fuels by Pattern Recognition	●	●	●											
Aromatics									●	●			●	●
Sulfur Compounds										●				
Biodiesel: FAME Profile								●						●
Solvents			●						●					
Aromatic Amines (Anilines)										●				
Omega 3 and Omega 6 FAMES								●		●				
cis/trans FAME Isomers											●			●
Nitrosamines			●							●				
Essential Oils	●	●	●						●					
Drugs of Abuse			●											
General Purpose Non-Polar	●	●		●										
General Purpose Intermediate Polar							●							
General Purpose Polar									●					

** Indicated columns are available in Intuvo format

GCxGC Applications

	SLB®-5ms**	Equity®-5**	SPB®-5**	PTA-5	SAC-5	SLB®-1ms**	SPB®-1**	SUPELLOWAX® 10**	SLB®-IL60i**	SLB®-IL59	SLB®-IL61	SLB®-IL111i	SP®-2380**	SLB®-IL76i	SLB®-IL82	SP®-2331**
Non-Polar Primary (1°) Column	●	●	●	●	●	●	●									
Polar Secondary (2°) Column								●		●	●	●		●	●	
Polar Primary (1°) Column								●	●	●	●	●	●	●	●	●
Non-Polar Secondary (2°) Column	●	●				●										

** Indicated columns are available in Intuvo format

Chiral Applications

	Astec® CHIRALDEX® TA	Astec® CHIRALDEX® PN	Astec® CHIRALDEX® DP	Astec® CHIRALDEX® BP	Astec® CHIRALDEX® DM	Supelco® DEX 325	Supelco® DEX 225	Astec® CHIRALDEX® PM	Supelco® DEX 110	Supelco® DEX 120**	Astec® CHIRALDEX® DA	Astec® CHIRALDEX® PH	α-Cyclodextrins	β-Cyclodextrins	γ-Cyclodextrins
Oxygen containing analytes in the form of alcohols, ketones, acids, aldehydes, and lactones; halogenated compounds	●														
Lactones and aromatic amines; epoxides; styrene oxide		●													
Aliphatic and aromatic amines; aliphatic and some aromatic esters; polar racemates			●												
Amino acids; amines; furans				●											
Aliphatic, olefinic, and aromatic enantiomers					●	●	●					●			
Terpenes and tertiary amines								●	●	●					
Heterocyclic amines											●				
Xylenes; menthols; cresols; substituted phenols; substituted benzenes; epoxide enantiomers													●		
Acids; alcohols; amines; diols; esters; ethers; halohydrocarbons; hydrocarbons; ketones; positional isomers; silanes; terpenes; terpeneols														●	
α-BHC; carvone; carboxylic acids; methamphetamine															●

** Indicated columns are available in Intuvo format

General Purpose (non-MS) Applications

	Equity®-1**	SPB®-1**	Equity®-5**	SPB®-5**	SPB®-20**	Equity®-1701**	SPB®-35	SPB®-50	SPB®-225	PAG	SUPELLOWAX® 10**	SP®-2330	SP®-2380**	SP®-2340**
Non-Polar Column	●	●	●	●										
Intermediate Polar Column					●	●	●	●						
Polar Column									●	●	●			
Highly Polar Column												●	●	●

** Indicated columns are available in Intuvo format

Reference substances for gas chromatography

Most of the high-purity products in our »reference substances for GC« range are completely synthetic in origin, which means they are largely free from isomers that are difficult to separate by GC. Their assay is generally greater than 90%, and is usually over 99.5 or 99.7%. Every pack includes a gas chromatogram under the appropriate test conditions. These reference substances can be used when identifying unknown compounds in a gas chromatogram, as standards in quantitative GC analysis, or in the characterization of GC column properties. Reference substances belonging to the hydrocarbon group are packed in pierceable ampoules; fatty acid methyl esters and other reference substances come in screw-capped glass vials.

Ordering information

n-Hydrocarbons

Product	Chain length	Assay [%]	Content / Packaging	Cat. No.
Pentane	C5	≥99.5%	10 mL, 50 mL	76870
		≥99.7%	5 mL	1.09719
Hexane	C6	≥99.7%	10 mL, 50 mL	52750
		≥99.7%	5 mL	1.09687
Heptane	C7	≥99.8%	5 mL, 50 mL	51730
		≥99.5%	5 mL	1.09686
Octane	C8	≥99.7%	5 mL, 50 mL	74820
		≥99.0%	5 mL	1.09716
Nonane	C9	≥99.8%	50 mL	74250
Decane	C10	≥99.8%	5 mL, 25 mL	30540
		≥99.5%	5 mL	1.09603
Undecane	C11	≥99.8%	5 mL, 25 mL	94000
		≥99.5%	5 mL	1.09794
Dodecane	C12	≥99.8%	5 mL, 25 mL	44010
		≥98.5%	5 mL	1.09658
Dodecane, <i>TraceCERT</i> ®		certified content on the CoA	100 mg	92064
Tridecane	C13	≥99.5%	5 mL, 50 mL	91490
		≥99.3%	5 mL	1.09609
Tetradecane	C14	≥99.5%	5 mL, 25 mL	87139
		≥99.0%	5 mL	1.09658
Tetradecane, <i>TraceCERT</i> ®		certified content on the CoA	100 mg	04003
Pentadecane	C15	≥99.8%	5 mL	1.09658
Hexadecane	C16	≥99.8%	5 mL, 25 mL	52209
		≥99.5%	5 mL	1.09605
Heptadecane	C17	≥99.5%	1 mL, 5 mL	51578
		≥99.3%	5 mL	1.09604
Octadecane	C18	≥98.5%	1 g, 5 g	74691
Nonadecane	C19	≥99.5%	1 g, 5 g	74158
Eicosane	C20	≥99.5%	1 g, 5g	44818
Heneicosane	C21	≥99.5%	1 g, 5 g	51523
Docosane	C22	≥99.5%	1 g, 5 g	43942
Tricosane	C23	≥99.5%	1 g, 5 g	91447
Tetracosane	C24	≥99.5%	1 g, 5 g	87089
Pentacosane	C25	≥99.5%	250 mg, 1 g	76493
Hexacosane	C26	≥98.0%	250 mg, 1 g	52183
Heptacosane	C27	≥98.0%	250 mg, 1 g	51559
Octacosane	C28	≥98.0%	250 mg, 1 g	74684
Nonacosane	C29	≥98.0%	250 mg, 1 g	74156
Triacontane	C30	≥98.0%	250 mg, 1 g	90270
Hentriacontane	C31	≥98.0%	250 mg, 1 g	51529

Product	Chain length	Assay [%]	Content / Packaging	Cat. No.
Dotriacontane	C32	≥98.0%	100 mg	44253
Tritriacontane	C33	≥98.0%	250 mg	93435
Tetraatriacontane	C34	≥98.0%	250 mg, 1g	88152
Pentatriacontane	C35	≥98.0%	250 mg	76968
Hexatriacontane	C36	≥98.0%	1 g	52919
Heptatriacontane	C37	≥97.0%	100 mg, 1 g	51848
Tetracontane	C40	≥98.0%	250 mg	87086
Dotetracosane	C42	≥98.0%	100 mg	44250
Tetratetracontane	C44	≥98.0%	250 mg	88144
Hexatetracontane	C46	≥98.0%	250 mg	52913
Octatetracosane	C48	≥98.0%	100 mg	74892
Tetrapentacontane	C54	≥98.0%	500 mg	87992

Aromatic, unsaturated & branched Hydrocarbons

Product	Assay	Packaging	Cat. No.
Benzene	≥99.9%	5 mL	1.09646
	≥99.9%	5 mL, 50 mL	12540
Toluene	≥99.7%	5 mL	1.09768
	≥99.9%	5 mL, 25 mL	89680
o-Xylene	≥99.0%	5 mL	1.09798
	≥99.0%	5 mL, 50 mL	95660
m-Xylene	≥99.3%	5 mL	1.09797
	≥99.5%	5 mL, 50 mL	95670
p-Xylene	≥99.3%	5 mL	1.09799
	≥99.5%	5 mL, 50 mL	95680
2-Methylbutane	≥99.7%	5 mL, 10 mL	59060
2-Methylpentane	≥99.5%	5 mL, 50 mL	68310
2,2-Dimethylbutane	≥98.0%	5 mL, 10 mL	39730
2,3-Dimethylbutane	≥99.5%	5 mL, 10 mL	39760
3,4-Dimethylhexane	≥99.0%	1 mL	40512
2,2,4-Trimethylpentane	≥99.7%	5 mL, 10 mL, 50 mL	59030
1-Hexene	≥99.8%	5 mL, 10 mL, 50 mL	52930
1-Nonene	≥99.5%	5 mL	74323
1-Decene	≥99.0%	5 mL, 50 mL	30649
1-Dodecene	≥99.5%	5 mL	44146
1-Tetradecene	≥99.8%	5 mL, 25 mL	87187
1-Octadecene	≥99.5%	1 mL, 5 mL	74738
4-Methyl-1-pentene	≥99.5%	5 mL	68510
1,7-Hexadecadiene	≥90%	25 mg	52206

Hydrocarbon mixes and kits

Product	Description	Pck size	Cat. No.
Hydrocarbon Test mix, <i>TraceCERT</i> ®	C12, C13, C14, C15, C16, C17: varied concentrations in CHCl ₃	2 mL	48244
n-Paraffin mix C5, C6, C7, C8	varied concentrations, neat	500 mg	47100
n-Paraffin Mix C7, C8, C9, C10	varied concentrations, neat	500 mg	47101
n-Paraffin Mix C10, C12, C14, C16	varied concentrations, neat	500 mg	47102
n-Paraffin Mix C18, C20, C22, C24, <i>TraceCERT</i> ®	2% (w/w) each component in octane	5 mL	47108
Alkan standard solution C8-C20	~40mg/L each, in hexane	1 mL, 5 mL	04070
Alkane standard solution C21-C40	40mg/L each, in toluene	1 mL, 5 mL	04071
Aliphatic Hydrocarbons Kit	34 individual ampules of neat plus 6 ampules of solutions	1 each	44575-U
Florisil Applicability Test acc. to DIN EN ISO 9377-2/53, kit	Kit contains: Stearyl stearate Minal oil standard mixture type A and B (~10mg/mL in n-heptane) Extraction medium stock solution	1 each	52462

Product	Description	Pck size	Cat. No.
Extraction Medium Stock solution	Acc. to DIN EN ISO 9377-2	100 mL	49574
Mineral oil standard mixture Type A and B for EN ISO 9377-2	~10mg/L each in n-heptane	2 mL	18602
QC Standard solution for EN ISO 9377-2	Mineral oil type A and B ~5mg/L each in n-heptane	1 mL	51706
Alkane standard mixture for performance tests of GC systems	C10 – C40 (all even), 50 mg/L each in n-heptane	2 mL	68281
Hydrocarbon kit acc. to DIN EN 14039/ISO 16703		1 kit	56681
Alkane Standard Mixture for performance tests of GC-systems	C10, C20 – C40 (all even), 50 mg/L each in n-heptane	2 mL, 10 mL	94234

Fatty acid methyl esters (FAME)

Designation	Empirical formula	Assay [%]	Content / Packaging	Cat. No.
Methyl valerate	C5	≥99.8%	1 mL, 5 mL	94560
Methyl hexanoate	C6	≥99.8%	1 mL, 5 mL	21599
Methyl hexanoate, <i>TraceCERT</i> ®	C6	certified content on the CoA	50 mg	94776
Methyl heptanoate	C7	≥99.8%	1 mL, 5 mL	75218
Methyl octanoate	C8	≥99.8%	5 mL	21719
Methyl octanoate, <i>TraceCERT</i> ®	C8	certified content on the CoA	50 mg	06934
Methyl octanoate	C8	≥99.5%	5 mL	1.09633
Methyl nonanoate	C9	≥99.8%	1 mL, 5 mL	76368
Methyl decanoate	C10	≥99.5%	5 mL	1.09637
Methyl undecanoate	C11	≥99.0%	1 mL, 5 mL	94118
Methyl undecanoate, <i>TraceCERT</i> ®	C11	certified content on the CoA	100 mg	47147
Methyl laurate	C12	≥99.5%	5 mL	61689
Methyl laurate	C12	≥99.0%	5 mL	1.09693
Methyl tridecanoate	C13	≥99.5%	5 mL	91558
Methyl myristate	C14	≥99.5%	1 mL, 5 mL	70129
Methyl myristate, <i>TraceCERT</i> ®	C14	certified content on the CoA	100 mg	55791
Methyl myristate	C14	≥99.5%	5 mL	1.09736
Methyl pentadecanoate	C15	≥99.5%	1 mL, 5 mL, 25 mL	76560
Methyl palmitate	C16	≥99.0%	1 g, 5 g	76159
Methyl heptadecanoate	C17	≥99.0%	1 g, 5 g	51633
Methyl heptadecanoate, <i>TraceCERT</i> ®	C17	certified content on the CoA	100 mg	90606
Methyl margarate	C17	≥99.0%	5 mL	1.09754
Methyl stearate	C18	≥99.5%	1 g, 5 g	85769
Methyl stearate, <i>TraceCERT</i> ®	C18	certified content on the CoA	100 mg	75533
Methyl stearate	C18	≥99.0%	5 mL	1.09602
Methyl oleate (Methyl cis-9-octadecenoate)	C18-cis 9	≥99.0%	1 mL, 5 mL	75160
Methyl oleate (Methyl cis-9-octadecenoate)	C18-cis 9	≥96.0%	5 mL	1.09743
Methyl cis-11-octadecenoate	C18-cis 11	≥99.0%	100 mg	17264
Methyl trans-vaccenate	C18-trans11	≥95.0%	25 mg	07586
Methyl nonadecanoate	C19	≥98.0%	1 g, 5 g	74208
Methyl arachidate	C20	≥99.0%	1 g, 5 g	10941
Methyl cis-11-eicosenoate	C20-cis 11	≥98.5%	100 mg	17263
Methyl cis,cis-11,14-eicosadienoate	C20-cis,cis 11,14	≥98.0%	100 mg	17272
Methyl heneicosanoate	C21	≥98.5%	1 g	51535
Methyl behenate	C22	≥99.0%	1 g, 5 g	11940
Methyl tricosanoate	C23	≥99.0%	250 mg, 1 g	91478
Methyl tetracosanoate	C24	≥99.0%	250 mg, 1 g	87115
Methyl cis-15-tetracosenoate	C24-cis 15	≥99.0%	100 mg	17265
Methyl pentacosanoate	C25	≥98.0%	100 mg	76497
Methyl hexacosanoate	C26	≥99.0%	100 mg	52203
Methyl octacosanoate	C28	≥98.0%	250 mg	74701

All *TraceCERT*® branded products are certified reference materials (CRMs), produced and certified in accordance with ISO/IEC 17025 and ISO 17034. The CRM is traceable to primary material from an NMI, e.g. NIST or MNIJ.

Certified content by quantitative NMR incl. uncertainty and expiry date are given on the certificate.

Discover the GC workflow solutions

PROFICIENCY TESTING



SAMPLE PREPARATION AND COLLECTION



Proficiency testing

- Supelco® Proficiency Testing solutions represents over 20 years of experience and expertise in providing PT studies worldwide.
- Our PT samples are manufactured to CRM grade. More than 20 000 PT samples a year are sent to over 2 500 labs worldwide.
- Our quality and services allow you to work smarter, enabling us to live in a safer and healthier world.



Sample Preparation and Collection

- **SPME** - Solid Phase Micro Extraction (Fibers, Holders, Accessories)
- **SPE** (Tubes, Manifolds, Accessories, QuEChERS, Bulk Adsorbents)
- **Purge & Traps** (Traps & Purge Vessels)
- **Solvents** (Suprasolv® FID/ECD, MS, HS)
- **Milli-Q® water purification systems** and **VOC-Pak® Polisher**
- **Derivatisation Reagents**



SPE Products



Solvents



SPME Products

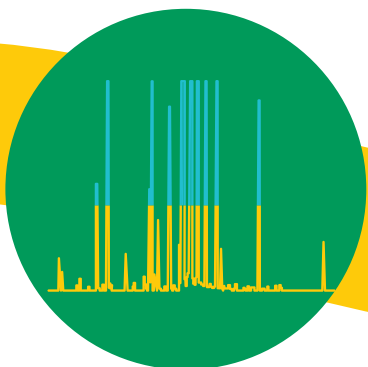


Derivatisation Reagents

Air Sampling

- **Thermal Desorption** (Adsorbent Tubes & Accessories)
- **Solvent Desorption** (Adsorbent Tubes & Accessories)
- **Whole Air** (Sampling Bags & Bulbs, Sampler)

GC ANALYSIS



DETECTION AND CALIBRATION



GC Analysis

- **GC Columns** for GC, GC/MS, Fast GC, GCxGC
- **General Purpose Columns** (e.g. SLB®-1ms, SLB®-5ms, SLB®-35ms, Equity®-1701, SUPELCO WAX®, Nukol™/FFAP)
- **Special Application Columns** (e.g. FAME, PAH, PCB, Dioxins, VOC, PLOT, Chiral)
- **Ionic Liquid Columns** (SLB®-IL i-Series, Watercol™)
- **Packed Columns** (SS & Glass)



GC Columns (Packed)



GC Columns (Capillary)

Accessories

- Liner & Septa
- Fittings, Ferrules & Column Connectors
- Flow Measurement
- Vials & Syringes
- Gas Management & Purification
 - Gas Generators
 - Gas Purifiers
 - Plumbing (Valves, Fittings & Tubing)



Vials



Gas Generators



Liner



Septa

Detection and Calibration

- Certified Reference Materials (CRMs) & Reference Standards
- Neats & Solutions (for almost every application area)
- Matrix Standards
- Pharmacopoeia & Metrological Institute Standards



Certified Reference Materials & Reference Standards

Supelco®

Analytical Products

Merck KGaA
Frankfurter Strasse 250
64293 Darmstadt, Germany

[SigmaAldrich.com/GC](https://www.sigmaaldrich.com/GC)

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Safety-related Information: [SigmaAldrich.com/safetycenter](https://www.sigmaaldrich.com/safetycenter)

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