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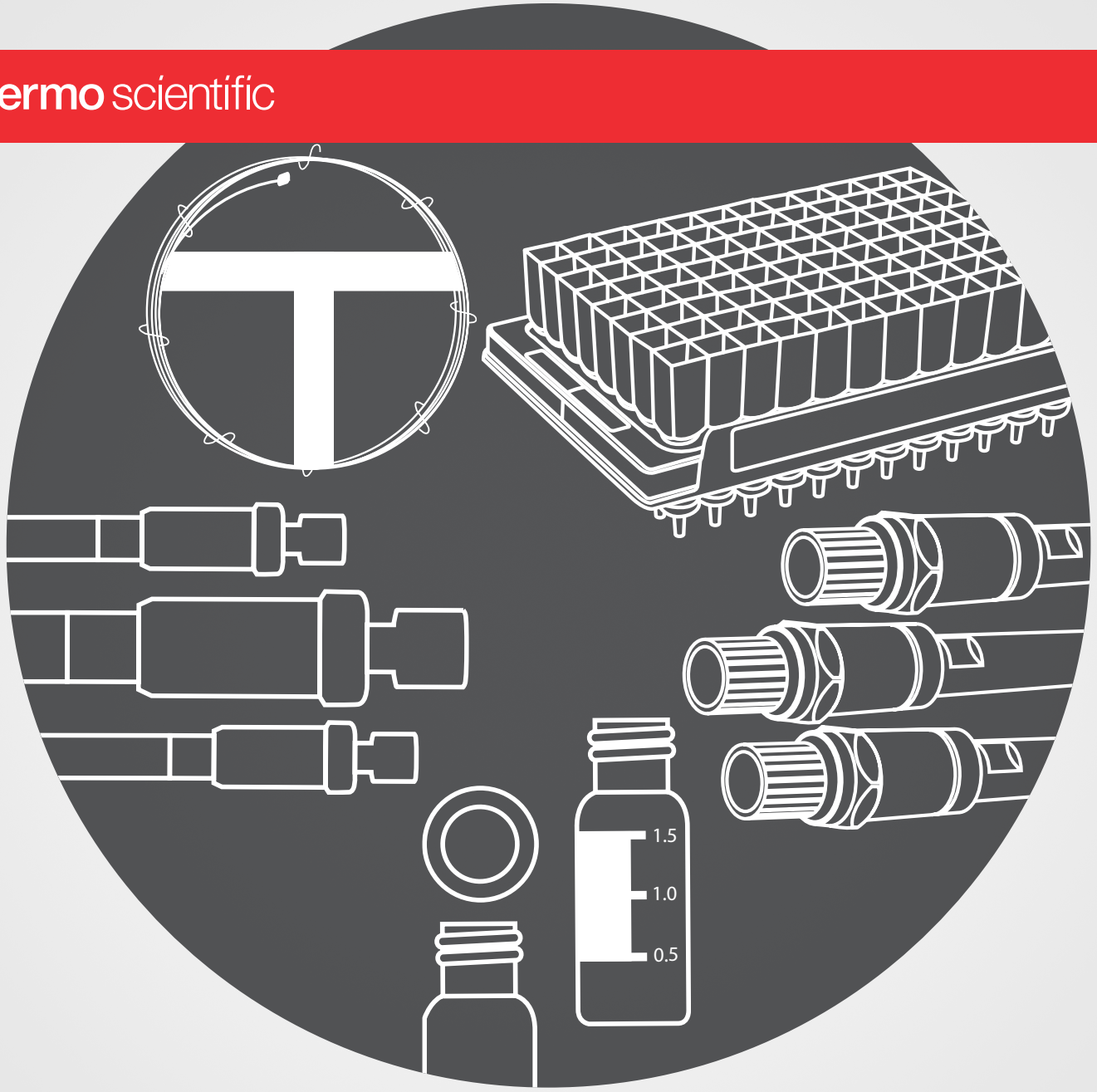

Sample handling solutions

Technical resources document

ThermoFisher SCIENTIFIC

Contents

Septum selection guide

Septa for use with general chromatography vials, liquid injection

PTFE/natural red rubber

PTFE/natural red rubber are moderately priced seals for GC and HPLC with good chemical properties. They are ideal for multiple injections due to high resealability, but not as easy to penetrate as PTFE/RR. Natural rubber septa are offered assembled into aluminum crimp seals.

PTFE/Synthetic red rubber septa: (PTFE/RR)

PTFE/Synthetic red rubber septa are an economical choice for general GC and HPLC applications. Used primarily for routine analysis in gas chromatography with FID, TCD and FPD detectors or HPLC with UV/Vis or RI detectors, PTFE/Synthetic red rubber septa offer good resealability and excellent chemical inertness before puncture. The low durometer of red rubber allows for easy needle penetration even with thin bore GC needles. PTFE/Red rubber septa are not recommended for multiple injections with long run times or retention of samples for further analysis after initial puncture.

PTFE/Silicone septa: (T/S)

PTFE/Silicone is the most versatile septum material offered in various formulations to address specific applications requirements. Extractables from PTFE/Silicone septa are generally at lower levels compared to other resealable materials. PTFE/Silicone septa are formulated for different hardness (durometer) meeting requirements of various needle types. Formulations offering highly consistent performance, lowest background/blank value, and good chemical compatibility, effective sealing/resealing and low penetration force make PTFE/silicone septa suitable for all types of chromatographic applications. A thin film of PTFE is laminated to the side of the septum that faces the sample to limit exposure of the elastomer to the solvent. PTFE/Silicone septa are ideal for use in most HPLC and GC applications where resealability and purity are critical.

Pre-slit PTFE/Silicone septa

Pre-slit septa are offered in many of the same formulations as for non-slit PTFE/silicone septa and shares most of the physical and chemical characteristics. The septum is provided with a thin 0.005” PTFE layer laminated to highly pure silicone, and slit through the center for easier needle penetration and to release the vacuum that forms when a large volume of sample is withdrawn from a vial. This septum provides chromatographic characteristics similar to that of a septum without a slit, except that the ability to withstand exposure to aggressive solvents is slightly lessened. Pre-slit septa are highly recommended for Shimadzu, Hitachi, and other autosamplers with thin gauge needles.

PTFE/Silicone/PTFE septa: (T/S/T)

A layer of inert PTFE film is laminated to each side of high-purity, medium durometer silicone to form a septum that is resistant to coring, but still maintains good resealing characteristics. T/S/T septa are recommended for the most critical applications such as ultratrace analysis, where there is a longer time between injections. T/S/T septa provide superior performance with any autosampler employing a large diameter, blunt-tip needle. T/S/T septa can have benefits when working with solvents that tend to attack silicone by protecting both sides of the elastomer.

PTFE Disk septa

A solid disk of 0.010” thick pure PTFE offers superior chemical inertness against the most aggressive solvents. The thin membrane allows for penetration by most normal gauge metal HPLC needles. PTFE septa are not resealable and should not be used with highly volatile solvents, short cycle times or multiple injection methods. PTFE septa are rarely used for GC applications.

Polyethylene (PE) septa and Integral Molded Closures

Chemically resistant polyethylene septa are molded into single-piece caps. The surface for needle penetration is 0.01" thick, allowing for use with most HPLC autosamplers. Polyethylene septa are not resealable and are intended for single injection use with aqueous based sample mixtures.

Polypropylene (PP) septa and integral molded closures

Chemically resistant polypropylene septa are available molded into single piece caps or as 0.01" thick disks inserted into closures. The surface for needle penetration is 0.01" thick, allowing for use with most HPLC autosamplers. Polypropylene septa are not resealable and are intended for single injection use with aqueous based sample mixtures. Polypropylene septa offer better solvent compatibility compared to polyethylene, but piercing force is slightly higher.

Viton septa

Viton septa are used in situations where a resealable septum is required for a sample matrix that aggressively attacks all other materials. Viton offers chemical resistance similar to PTFE along with limited ability to reseal after initial puncture. Viton septa have a high resistance to piercing and due to their high cost are considered to be the septum of last resort when all other materials are unsuitable.

Septum selection guide

20 mm headspace septa

Gray butyl stopper

An economical septum for lower temperature (125°C) or low-pressure applications. Gray butyl stoppers do not provide a PTFE film barrier and are not suitable for use with alkanes, benzene, chlorinated solvents or cyclohexane. Butyl rubber stoppers are preferred for analysis of fixed gases and where absolute resistance to moisture penetration is required.

Gray PTFE/Red rubber septa

Good solvent resistance, good resealing characteristics, resistant to coring. An economical choice where a PTFE barrier is desired. PTFE facing improves solvent compatibility until initial puncture.

PTFE/White silicone purepack septa

Excellent choice for general volatiles analysis. Septa are packed in a glass PurePak jar to assure low background, low permeability, and the highest performance of any headspace septum. PTFE/Silicone septa provide excellent resealing characteristics and broad chemical compatibility.

Gray PTFE/Molded black butyl septa (Pharmafix style)

C4020-36 is a molded septum featuring a PTFE-faced center surface that does not extend to the edges of the septum. The PTFE center area provides good resistance to a wide variety of solvents. The center puncture area is resistant to coring and will reseal after several punctures. The grey butyl outer sealing edge conforms well to the rim of the vial affecting a more positive seal against loss of fixed gases.

PTFE/Blue high-purity silicone septum

Translucent blue silicone is specially formulated and treated to reduce background from extractables or outgassing of volatile contaminants. The silicone elastomer layer is dense but still easily pierced by most headspace sampling needles.

Black Rubber septa

Black Rubber septa are molded from a higher density rubber compound compared to the standard red rubber. This septum has characteristics similar to the gray butyl stopper. The Black rubber septum is an economical choice for applications where reduced levels of vapor penetration are desired.

Temperature stability chart

	Min. temp °C	Max. temp °C	Min. temp °F	Max. temp °F
PTFE/Natural red rubber	-10	+85	14	+185
PTFE/Synthetic: (PTFE/RR) red rubber septa	-30	+110	-22	+230
PTFE/ High-perfomance red rubber septa	-40	+110	-40	+230
PTFE/Silicone septa: (T/S)	-60	+200	-76	+392
PTFE/Silicone/PTFE septa: (T/S/T)*	-60	+200	-76	+392
PTFE septa*	-200	+250	-328	+482
Polyethylene (PE)*	-50	+80	-58	+176
Polypropylene (PP)*	0	+121	32	+250
Butyl/Chlorobutyl/Bromobutyl stopper or septa	-20	+125	-4	+257
Gray PTFE/Red rubber	-40	+120	-40	+248
PTFE/White silicone purepack septa	-60	+200	-76	+392
Gray PTFE/Molded black butyl (pharmafix) septa	-20	+125	-4	+257
Black rubber septa	-20	+100	-4	+212

*This septum is used for liquid injection. 20 mm version is not available.

Deactivated glass vials and inserts

We use only the highest-quality glass to manufacture vials and inserts. Clear and amber glass tubes have been selected for their consistent composition, dimensional stability and cleanliness. The vast majority of chemical compounds demonstrate no interaction with our standard, untreated glass products. Strongly polar compounds present at trace concentrations may exhibit lower than expected recoveries due to interactions with Si-OH active sites that are present in all borosilicate glass. The use of a deactivated sample vial is recommended for these samples.

We employ two methods of surface treatment to produce a deactivated product for those instances where a specific compound displays an undesirable interaction with the standard glass product. Most reactive compounds will give a similar improvement in results for either deactivation method.

A few compounds will give a better result in one treatment compared to the other.
We recommend that compound recovery be first evaluated in our standard glass product, followed by the silanized product and finally in our Kimshield deactivated product.

The following are general descriptions of the glass deactivation treatments available.

Silanized products

Silanized glassware is the most widely applicable and popular deactivation method in use for improving the recovery of reactive compounds from glass vials and inserts. A proprietary methylating agent is introduced by vapor phase deposition onto the surface of the glassware. Our controlled vapor phase deposition process assures complete and uniform surface coverage. Silanization lowers the surface tension of the glass and forms a hydrophobic barrier that discourages leaching of trace glass constituents into aqueous solutions and adsorption of trace sample components onto the surface of the glass. Vapor phase deposition leaves no liberated acids or other residues that are common with other treatment methods. Our automated silanization process assures that every vial will be consistently treated – leaving a minimum of unreacted silanol groups.

Kimshield deactivation

Kimshield deactivation is also a vapor deposition method employing a proprietary silicone fluid to coat the surface of the glass. Kimshield deactivation lowers the surface tension of the glass and forms a hydrophobic barrier similar to silanization, but with a slightly different functionality.

As with silanized products, Kimshield deactivated vials and inserts do not release acids, solvents or other residues. Kimshield deactivation is slightly less durable compared to silanization, but will withstand exposure to most solvents that are compatible with borosilicate glass.

Seal hardness

The hardness testing of plastics is most commonly measured by the shore (durometer) test. This method measures the resistance of plastics toward indentation and provides an empirical hardness value. Shore hardness, is the preferred method for rubbers/elastomers and is also commonly used for 'softer' plastics such as fluoropolymers. Most septa hardness values are stated in shore A. The results obtained from this test are a useful measure of relative resistance to piercing of various grades of polymers. This gives guidance on the type of needle that will penetrate the seal and whether thinner gauge needles may be used.

Seals in 8 mm, 9 mm, 11 mm, 12 mm caps

Seal material	Hardness °shore	Thickness (mm)
TST1 Red PTFE/white silicone/red PTFE	57	1.0
CBT1 Gray chlorobutyl/PTFE	52	1.0
ST14 Blue silicone/PTFE	50	1.2
6RT1/AC6 Synthetic rubber/PTFE	38	1.0
ST101 Blue silicone/PTFE	30	1.0
ST143 White silicone/PTFE	20	1.4
ST144 Blue silicone/red PTFE	20	1.4
V1 Viton	62	1.0
AC7 Natural rubber/PTFE	60	1.0
8RT1 Synthetic rubber/PTFE	58	1.0
ST2 White silicone/red PTFE	57	2.0
ST18 White silicone/red PTFE	57	1.8
ST15 White silicone/red PTFE	57	1.5
ST1 White silicone/red PTFE	57	1.0

Seals in 18 mm and 20 mm caps

Seal material	Hardness °shore	Thickness (mm)	Max. temp °C
CBT3B bromobutyl/PTFE (moulded)	52	3	120
CBT3 bromobutyl/PTFE	52	3	120
CB3 chlorobutyl	52	3	120
ST3 blue silicone/PTFE	45	3	200
ST3HT red silicone/PTFE	45	3	300
ST201 blue silicone/PTFE	45	2	200
AS3 white silicone/aluminium	45	3	170
ASH3 red silicone/aluminium	45	3	250

Seal properties

Rubber	Used primarily for routine analysis in gas chromatography. Offers moderate resealability and good chemical inertness. Not recommended for multiple injections or holding samples for further analysis. PTFE is protective layer that once broken exposes rubber to chemical attack
PTFE/red rubber – AC6, 6RT1	Low durometer of rubber allows ease of needle penetration. A popular and economical septa for general GC purposes
PTFE/rubber – AC7, 8RT1	Harder grade of rubber for use with piercing needle. Most popular and economical septa for general GC purposes in Agilent systems
Pre-slit PTFE/red rubber – 8RT1X	Pre-slit, high quality red rubber with a thin (0.003") layer PTFE. For applications using a very thin-gauge syringe needle or in instances when a vacuum may form in the vial
Silicone rubber	High quality, silicone rubber laminated to PTFE. Use when excellent resealing qualities are a must. Septum resists coring and is recommended when multiple injections are required. Preferred septa for use in liquid chromatography applications
PTFE/silicone – ST1, ST15, ST18, ST2	A white medium hardness silicone with red PTFE protective layer available in a range of thickness
PTFE/silicone – ST101, ST14	• A very pure soft silicone laminated to PTFE. Septum resists coring and is recommended for instruments with fine gauge needles • Also recommended for LC-MS and GC-MS due to high purity
PTFE /silicone – ST143, ST144	A very soft silicone laminated to PTFE. Use with flexible needle
PTFE /silicone/PTFE – TST1, TST11	• A layer of PTFE on each side of medium hardness silicone. Most resistant to coring with above average resealing characteristics • Recommended for most demanding applications such as trace analysis, longer time between injections or for internal standards • Use with Gilson instruments and with any autosampler using large diameter, blunt-tip syringe needles
Pre-slit PTFE/silicone – ST1X, ST101X, ST14X	Pre-slit, high quality pure white silicone faced with PTFE. For applications using a very thin-gauge syringe needle or in instances when a vacuum may form in the vial. Highly recommended for Shimadzu and Hitachi autosampler units
PTFE and fluoropolymers	Very good chemical resistance and used as a protective layer for less resistant elastomers
PTFE – T, T02	For single injections and short sample cycles. This type of septa is not resealable
Viton – V1	Viton provides the best chemical resistance with limited resealability. Recommended for chlorinated solvents. Due to Viton's intrinsic hardness, these septa are not suitable for finer-gauge syringe needles
Integral plastic seal	Moulded as part of the cap
Polyethylene – PE, Polypropylene – PP	Chemically resistant but for one time use only with no resealability. Free of Fluoropolymer coating so suitable for PFOA analysis

20 mm seal selection for headspace and sample preparation applications

Butyl rubber/chlorobutyl rubber	An economical choice for low temperature (< 125°C) or low-pressure applications. Not suitable for alkanes, benzene, chlorinated solvents or cyclohexane without a protective PTFE layer.
Grey bromobutyl stopper – B3P	Does not provide PTFE barrier. Use for gas sampling due to low permeability
Black chlorobutyl – CB3	Does not provide PTFE barrier. Use for gas sampling due to low permeability
Grey bromobutyl/black PTFE – CBT3	Has PTFE barrier that makes it suitable for work with general organic solvents with low gas permeability
Grey PTFE/black bromobutyl molded – CBT3B	Specially molded seal with PTFE insert. Sealing surface of Butyl and PTFE affects a more positive seal than non-PTFE-faced septa. Ideal choice for temperatures below 125°C. Good sealing characteristics, excellent resistance to most solvents with reduced coring and high puncture tolerance. PTFE provides increased chemical resistance
Silicone rubber	Excellent septa choice for volatiles with very low background peaks and low permeability. Also ideal for alcohols and aqueous samples. Good resealing characteristics and resistant to coring
Natural PTFE/blue silicone – ST3, ST201	Best septa choice when temperatures are over 125°C
Natural PTFE/red silicone – ST3HT	High temperature formulated seal with low bleed. Best septa choice when temperatures are up to 300°C
Blue silicone/red PTFE – ST144	Thin 1.4 mm seal with PTFE face for use with Fisons® and Carlo Erba® instruments. Resealing capability limited due to thinner silicone layer
Aluminum/white silicone – AS3	Reflective aluminium face protects the silicone seal. The white silicone is suitable for use up to 170°C
Aluminum/red silicone – ASH3	Reflective aluminium face protects the silicone seal. The red silicone is suitable for use at temperatures up to 250°C
Blue silicone/natural PTFE – ST101	Soft silicone with clean formulation for minimal interference. Thinner seal suitable for solvent washing, solvent extraction and SPME applications with some resealing. Not for direct headspace applications
Freezer bungs – 2FB3	Butyl bungs for sealing of lyophilized products. Compatible with low storage temperatures and low gas permeability
PTFE/silicone ring – LLX	Thin PTFE layer with sealing ring to give secure closure for strong solvents. For use in liquid extraction or SPME stage during sample preparation. Does not reseal. Single use only

Solvent contability

Key: The first character indicates the characteristics of the seal prior to any injection

The second character in ( ) indicates the potential characteristics of the seal after an injection.

A = Recommended B = Suitable for most purposes C = Use with care D = Not advisable – = Not tested

	Sealing material									
Solvent	**AC6**	**AC7**	**B3P**	**CBT1**	**CB3**	**CBT3**	**LDPE**	**HDPE**	**PP**	**PTFE**
Acetic acid aqueous	A(A)	A(B)	A(B)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Acetone	A(A)	A(C)	A(A)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Acetonitrile	A(A)	A(A)	–	A(A)	A(A)	A(A)	–	–	–	A(A)
Alcohols(aromatic)	A(B)	A(D)	–	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Alcohols(aliphatic)	A(A)	A(B)	A(B)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Amyl acetate	A(A)	A(D)	A(C)	A(A)	A(A)	A(A)	D(D)	D(D)	–	A(A)
Aqueous solutions dilute	A(A)	A(A)	–	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Benzene	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Butyl alcohol	A(B)	A(A)	A(B)	A(B)	B(B)	A(B)	B(B)	B(B)	B(B)	A(A)
Carbon disulphide	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Carbon tetrachloride	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Chloroform	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Cyclohexane	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	–	–	–	A(A)
Cyclohexanol	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	B(B)	A(A)
Diethyl ether	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Dimethyl sulphoxide	A(C)	A(D)	D(D)	A(C)	C(C)	A(C)	–	–	–	A(A)
Dioxane	A(B)	A(D)	A(B)	A(B)	B(B)	A(B)	–	–	–	A(A)
Esters	A(B)	A(D)	A(C)	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Ethyl acetate	A(B)	A(D)	A(B)	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Ethyl alcohol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Ethylene chloride	A(D)	A(D)	A(C)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Ethylene glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Formaldehyde	A(B)	A(B)	A(A)	A(B)	B(B)	A(B)	A(A)	A(A)	A(A)	A(A)
Glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Halogenated hydrocarbons	A(D)	A(C)	A(B)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Hexane	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	–	–	–	A(A)
Hydrochloric acid dilute	A(A)	A(C)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Iso-octane	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	–	–	–	A(A)
Ketones	A(A)	A(C)	A(B)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
MeOH/H_2O/Acetonitrile	A(A)	A(–)	–	A(A)	A(A)	A(A)	–	–	–	A(A)
Methanol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	–	–	–	A(A)
Methyl chloride	A(C)	A(D)	A(C)	A(C)	C(C)	A(C)	D(D)	D(D)	D(D)	A(A)
Methyl acetate	A(B)	A(C)	A(A)	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Methyl ethyl ketone	A(A)	A(D)	A(B)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Methylene chloride	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Nitric acid dilute	A(A)	A(D)	A(B)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Pentane	A(D)	A(–)	–	A(D)	D(D)	A(D)	–	–	–	A(A)
Petroleum ether	A(D)	A(–)	–	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Sodium hydroxide	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Sulphuric acid dilute	A(D)	A(C)	A(B)	A(D)	D(D)	A(D)	A(A)	A(A)	A(A)	A(A)
Surfactants	A(A)	A(–)	–	A(A)	A(A)	A(A)	–	–	–	A(A)
Toluene	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	B(B)	A(A)
Trichloroethylene	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Water	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)

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A = Recommended B = Suitable for most purposes C = Use with care D = Not advisable – = Not tested

	Sealing material										
Solvent	**ST3/ ST201**	**ST2**	**ST18**	**ST15/ ST1**	**ST14**	**ST144**	**ST143**	**ST101**	**TST11**	**TST1**	**VITON**
Acetic acid aqueous	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	D(D)
Acetone	A(D)	A(B)	A(A)	A(A)	A(A)	A(D)	A(B)	A(A)	A(A)	A(B)	D(D)
Acetonitrile	A(A)	A1(–)	A(A)	A(A)	A(A)	A(A)	A(–)	A(A)	A(A)	A(–)	B(B)
Alcohols(Aromatic)	A(B)	A(A)	A(A)	A(A)	A(A)	A(B)	A(–)	A(A)	A(A)	A(–)	–
Alcohols(Aliphatic)	A(B)	A(–)	A(A)	A(A)	A(A)	A(B)	A(–)	A(A)	A(A)	A(–)	–
Amyl acetate	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	D(D)
Aqueous solutions dilute	A(A)	A(–)	A(A)	A(A)	A(A)	A(A)	A(–)	A(A)	A(A)	A(–)	–
Benzene	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Butyl alcohol	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(A)
Carbon disulphide	A(D)	A(–)	A(A)	A(A)	A(A)	A(D)	A(–)	A(A)	A(A)	A(–)	A(A)
Carbon tetrachloride	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Chloroform	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Cyclohexane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Cyclohexanol	A(D)	A(–)	A(B)	A(B)	A(B)	A(D)	A(–)	A(B)	A(B)	A(–)	A(A)
Diethyl ether	A(D)	A(–)	A(B)	A(B)	A(B)	A(D)	A(–)	A(B)	A(B)	A(–)	D(D)
Dimethyl sulphoxide	A(D)	A(–)	A(A)	A(A)	A(A)	A(D)	A(–)	A(A)	A(A)	A(–)	C(C)
Dioxane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	D(D)
Esters	A(B)	A(–)	A(B)	A(B)	A(B)	A(B)	A(–)	A(B)	A(B)	A(–)	–
Ethyl acetate	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	D(D)
Ethyl alcohol	A(A)	A(B)	A(A)	A(A)	A(A)	A(A)	A(B)	A(A)	A(A)	A(B)	–
Ethylene chloride	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	–
Ethylene glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Formaldehyde	A(B)	A(B)	A(A)	A(A)	A(A)	A(B)	A(B)	A(A)	A(A)	A(B)	D(D)
Glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	–
Halogenated hydrocarbons	A(D)	A(–)	A(A)	A(A)	A(A)	A(D)	A(–)	A(A)	A(A)	A(–)	–
Hexane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	–
Hydrochloric acid dilute	A(D)	A(–)	A(A)	A(A)	A(A)	A(D)	A(–)	A(A)	A(A)	A(–)	A(A)
Iso-Octane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	–
Ketones	A(D)	A(–)	A(B)	A(B)	A(B)	A(D)	A(–)	A(B)	A(B)	A(–)	–
MeOH/H_2O/Acetonitrile	A(A)	A(A)	A(B)	A(B)	A(B)	A(A)	A(–)	A(B)	A(B)	A(–)	–
Methanol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	D(D)
Methyl chloride	A(D)	A(D)	A(A)	A(A)	A(A)	A(D)	A(D)	A(A)	A(A)	A(D)	A(A)
Methyl acetate	A(D)	A(D)	A(B)	A(B)	A(B)	A(D)	A(D)	A(B)	A(B)	A(D)	D(D)
Methyl ethyl ketone	A(D)	A(D)	A(A)	A(A)	A(A)	A(D)	A(D)	A(A)	A(A)	A(D)	D(D)
Methylene chloride	A(D)	A(B)	A(B)	A(B)	A(B)	A(D)	A(–)	A(B)	A(B)	A(–)	–
Nitric acid dilute	A(D)	A(B)	A(B)	A(B)	A(B)	A(D)	A(B)	A(B)	A(B)	A(B)	A(A)
Pentane	A(D)	A(C)	A(C)	A(C)	A(C)	A(D)	A(–)	A(C)	A(C)	A(–)	–
Petroleum ether	A(D)	A(–)	A(C)	A(C)	A(C)	A(D)	A(–)	A(C)	A(C)	A(–)	–
Sodium hydroxide	A(A)	A(B)	A(A)	A(A)	A(A)	A(A)	A(B)	A(A)	A(A)	A(B)	D(D)
Sulphuric acid dilute	A(D)	A(D)	A(B)	A(B)	A(B)	A(D)	A(D)	A(B)	A(B)	A(D)	A(A)
Surfactants	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(–)	A(A)	A(A)	A(–)	–
Toluene	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Trichloroethylene	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Water	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	B(B)

Chemical resistance reference chart

This chart provides a guideline for the chemical resistance of materials used for vials and closures. Because so many factors can affect chemical resistance, it may be necessary to test your product under your actual conditions of use.

Effects of chemicals on plastics

Chemicals can affect the strength, flexibility, surface appearance, color, dimensions, and weight of a plastic. These changes are caused by (1) an attack on the polymer chain resulting in oxidation, reaction of functional groups, and depolymerization; (2) dissolution in a solvent and solvent absorption or permeation that causes softening and swelling; and (3) stress cracking from a "stress-cracking agent."

Environmental stress cracking is the failure of a plastic in the presence of certain types of chemicals, but it is not a result of a chemical attack. Simultaneous presence of three factors causes stress cracking: tensile stress in the plastic, its inherent stress-cracking susceptibility, and a stress-cracking agent. Common stress-cracking agents are detergents, surface active chemicals, lubricants, oils, ultrapure water, and plating additives such as brighteners and wetting agents. Relatively small concentrations of stress-cracking agent may be sufficient to cause cracking.

Mixing and/or diluting certain chemicals in plastic labware can be potentially hazardous. The reactive combination of compounds of two or more classes may cause a synergistic or undesirable chemical effect, resulting in an increased temperature that can affect chemical resistance (as temperature increases, resistance to attack decreases), causing product failure. Other factors that also affect chemical resistance include pressure, internal or external stresses (e.g., centrifugation), length of exposure, and concentration of the chemical. Always pre-test your specific usage and follow correct lab safety procedures.

Attention: Please be aware that, although several polymers may have excellent resistance to various flammable organic chemicals and solvents, OSHA H CFR 29 1910.106 for flammable and combustible materials or other local regulations may restrict the volume of solvents that may legally be stored in an enclosed area.

Effects of chemicals on glass

Clear and amber borosilicate glass exhibit a high degree of chemical resistance with a few exceptions: Some chemicals can etch the surface of glass. Surface etching does not usually affect the dimensional characteristics of glass, but it can release chemical components into the sample solution.

Physical characteristics of plastic resin and septa

Code	Description	Appearance	Temp max °c	Temp min °c	Autoclavable	Dry heat	Gamma	Microwavable	Ethylene oxide	Analytical purity	Fragmentation*	Hardness†	Resealability‡
HDPE	High-density polyethylene	Opaque	120	-35	No	No	Yes	Yes	Yes	Method dependent	Medium	Hard	No resealability
LDPE	Low-density polyethylene	Translucent	100	-40	No	No	Yes	Yes	Yes	Method dependent	Low	Medium hard	No resealability
TPX	Polymethylpentene	Transparent	175	0	Yes	No	Yes	Yes	Yes	Method dependent	Low	Very hard	N/A
PP	Polypropylene	Translucent	135	-20	Yes	No	No	Yes	Yes	Method dependent	Low	Medium hard	No resealability
PTFE	Polytetrafluoroethylene	White	260	-200	Yes	Yes	Yes	Yes	Yes	Very high	Low	Very hard (very thin)	No resealability
RR	RedRubber/PTFE	Red/ivory	110	-30	No	No	No	No	No	Medium	Medium	Medium hard	Medium
Butyl	Gray butyl rubber	Opaque gray	125	-20	Yes	No	Yes	Yes	Yes	Method dependent	Low to medium	Soft to medium	Highly resealable
T/S	Silicon/PTFE	White/red	200	-60	Yes	Yes	Yes	Yes	Yes	High	Low to medium	Soft	Highly resealable
T/S/T	PTFE/Silicon/PTFE	Red/white/red	200	-60	Yes	Yes	Yes	Yes	Yes	High	Very low	Soft	Good resealability
	Viton®	Black	230	-30	Yes	Yes	Yes	Yes	Yes	Medium	Medium	Hard	Low to medium

* Due to hardness and molecular structure (coring)
† Needle penetration
‡ In case of multiple injections

How to use the chemical compatibility chart

The following chart contains information regarding the expected effects of 7 day direct solvent exposure on materials used for production of vials, caps and septa. Materials commonly used for vials include glass, polypropylene and TPX. Materials commonly used for caps include polypropylene, low density and high density polyethylene, and urea resin. Materials commonly used for septa include PTFE, silicone, natural red rubber, butyl rubber, Viton, polypropylene and polyethylene.

PTFE is often laminated onto the sample facing side of a resealable septum to improve solvent exposure characteristics. Laminated septa will generally exhibit greater chemical resistance until the PTFE layer is punctured.

Other factors that can affect chemical compatibility are temperature, pressure, whether there is direct contact between the material and the solvent and concentration of the solvent. Solvent mixtures can both increase and decrease chemical attack.

In the chart below, the letter rating indicates the general ability of each material to resist chemical attack on direct exposure to the solvent. The number following the rating indicates the highest temperature at which this rating can be considered valid. When evaluating a laminated material, both the rating for the PTFE barrier layer and the secondary material should be examined. In general, the PTFE layer will provide effective protection but extra care is required to avoid breaking through this layer before the initial puncture for sample injection. It is always preferable to select combinations where both layers exhibit some degree of resistance to attack from a specific solvent.

This chart is provided as a general guide and to the best of our knowledge this information represents the expected performance of materials used in our products. However, Thermo Fisher Scientific assumes no liability whatsoever for the results obtained under individual circumstances. This chemical resistance chart is to be used as a guide in determining of the suitability of materials only. There is no warranty expressed or implied for a specific purpose. Testing of specific products under your actual conditions is recommended and the final determination of material suitability is the responsibility of the user.

Key to chart on following pages

E – Excellent chemical resistance, low background extractables, recommended

G – Good chemical resistance, Some background extractable possible, suitable for general analysis

F – Fair chemical resistance, significant background extractables possible, for short term use

SE – Surface effects possible after short exposure, always evaluate suitability before use.

C – Conditions of exposure can affect compatibility and extractables. Solvent produces noticeable physical effects, use with extreme caution

X – Not Recommended. Immediate physical failure likely regardless of temperature, high levels of background contaminants likely

--- – Not tested, No data available

– Numerical values after the compatibility code indicate highest temperature where performance data is available

General chemical compatibility of materials used in chromatography vials and closures

	Vial and cap materials					Septum materials					
Chemical	Glass	PP	TPX	HDPE	Urea	PTFE	LDPE	SIL	RR	BUTYL	Viton
1,4-Dioxane	E20	F20	G20	G20	---	E20	G20	---	---	---	---
2,2,4-Trimethylpentane	E20	F20	F20	F20	---	E20	F20	---	---	---	---
2-Methoxyethanol	E20	GE	E50	E50	---	E20	E20	---	---	---	---
Acetaldehyde	E20	C20	C20	G20	C20	E20	C20	G20	G20	E20	---
Acetamide, sat.	E100	E50	E50	E50	---	E50	E50	G20	X	E20	E100
Acetic acid, 5%	E100	E50	E50	E50	G20	E100	E50	E20	G20	G20	E50
Acetic acid, 50%	E100	E50	E50	E20	F20	E100	G20	G20	G20	G20	X
Acetic acid, glacial	E20	E20	G20	G20	C20	E20	C20	G20	F20	G20	X
Acetic anhydride	E20	G20	E20	C20	X	E20	X	G20	F20	G20	X
Acetone	E20	C20	E50	X	X	E20	X	F20	F20	E20	E20
Acetonitrile	E20	E20	F20	E50	F20	E20	E20	E20	F20	F20	F20
Acetophenone	E20	F20	C20	C20	X	E20	X	C20	C20	E20	X
Acrylonitrile	E20	E20	F20	E20	X	E20	E20	X	X	X	X
Adipic acid	E50	E50	E50	E50	E50	E50	E20	---	E20	E50	E50
Alanine	E50	E50	E50	E50	---	E50	E50	---	---	---	---
Allyl alcohol	E20	E20	E20	E20	---	E20	E20	---	E20	E20	E20
Aluminum chloride	E200	E50	E50	E50	E50	E100	E50	G20	E20	E20	E100
Aluminum hydroxide	SE100	E20	E20	E50	---	E100	E20	E20	G20	E50	C20
Amino acids	E50	E50	E50	E50	E20	E50	E50	E50	E20	E20	E50
Ammonia (pure)	SE100	E50	E50	E50	X	E100	E50	E20	X	G20	X
Ammonia, 25%	SE100	E50	E50	E50	C20	E100	E50	E20	X	E20	C20

	Vial and cap materials					Septum materials					
Chemical	Glass	PP	TPX	HDPE	Urea	PTFE	LDPE	SIL	RR	BUTYL	Viton
Ammonium acetate, sat.	E100	E50	E50	E50	---	E100	E50	---	---	---	X
Ammonium chloride	E100	E50	E50	E50	E20	E100	E50	E20	E20	E20	E50
Ammonium glycolate	E50	E20	E20	E50	---	E50	E20	---	---	---	---
Ammonium hydroxide, 5%	SE100	E50	E50	E50	G20	E100	E50	E20	C20	E20	C20
Ammonium oxalate	E100	E20	E20	E50	---	E100	E20	---	---	---	---
Amyl alcohol	E20	F20	G20	E20	X	E20	E20	X	E20	E20	F20
Amyl chloride	E100	X	C20	F20	C20	E100	X	X	X	X	E20
Aniline	E50	E20	G20	G20	X	E50	E20	X	X	G20	E20
Aqua regia	SE100	X	X	X	X	E100	X	X	X	X	G20
Arsenic acid	E20	E50	E50	E50	C20	E20	G20	G20	G20	E20	G20
Benzaldehyde	E20	E20	F20	C20	X	E20	E20	F20	X	E20	X
Benzenamine	E20	E20	G20	G20	F20	E20	E20	---	X	X	G20
Benzene	E20	X	X	X	X	E20	X	X	X	X	G20
Benzoic acid, sat.	E50	E20	E50	E50	X	E50	E50	G20	X	X	G50
Benzyl acetate	E20	E20	E20	E20	---	E20	E20	---	X	F20	X
Benzyl alcohol	E20	G20	G20	F20	X	E20	X	F20	X	G20	E20
Boric acid	E200	E50	E50	E50	E20	E100	E50	E20	E20	E20	E20
Bromine	E20	X	X	F20	---	E20	X	X	X	X	G20
Bromobenzene	E20	X	X	X	X	E20	X	X	X	X	F20
Bromoform	E20	X	X	X	---	E20	X	---	---	---	---
Butadiene	E20	X	X	F20	X	E20	X	X	X	X	E20
Butyl acetate	E20	F20	C20	G20	X	E20	G20	X	X	G20	X
Butyl chloride	E20	X	F20	X	---	E20	X	---	X	F20	G20
Butyric acid	E20	X	X	F20	---	E20	X	X	C20	C20	E20
Calcium chloride	E200	E50	E50	E50	E50	E100	E50	E50	E50	E50	E50
Calcium hydroxide, conc.	SE100	E50	E50	E50	E50	E100	E50	E50	E50	E50	E50
Calcium hypochlorite, sat.	E20	E20	E20	E20	X	E20	E20	G20	C20	G20	C20
Carbazole	E20	E20	E20	E20	---	E20	E20	---	---	---	---
Carbon disulfide	E20	X	X	X	X	E20	X	X	C20	X	E20
Carbon tetrachloride	E20	G20	X	G20	X	E20	F20	C20	C20	X	E20
Caustic potash	SE100	E50	E50	E50	---	E100	E50	E20	---	---	E20
Caustic soda, 1%	SE100	E50	E50	C20	---	E100	E50	E20	E20	E20	F20
Caustic soda	SE100	E50	E50	G20	---	E100	G20	G20	G20	E20	F20
Cedarwood oil	E100	X	X	F20	C20	E100	X	SE20	C20	C20	---
Cellosolve acetate	E20	F20	E20	E20	X	E20	E20	X	X	G20	X
Chlorine water	E20	F20	X	G20	---	E20	C20	C20	X	C20	E20
Chlorine, 10% (moist)	E20	F20	X	G20	---	E20	C20	C20	X	C20	E20
Chlorine, 10% in air	E20	F20	C20	F20	---	E20	C20	C20	X	C20	E20
Chloroacetic acid	E50	E20	E20	E50	X	E50	E50	F20	X	G20	X
Chlorobenzene	E20	X	X	X	X	E20	X	X	X	X	E20
Chloroform	E20	X	X	F20	X	E20	F20	F20	X	X	E20
Chromic acid, 10%	E300	E50	E50	E50	X	E100	E50	F20	X	F20	G20
Chromic acid, 20%	E300	G20	E50	E50	X	E100	E50	C20	X	C20	F20
Chromic acid, 50%	E300	G20	G20	E50	X	E100	E50	C20	X	C20	F20
Chromic:sulfuric	E300	X	X	X	X	E100	E50	C20	X	C20	F20
Cinnamon oil	E20	X	X	X	---	E20	X	---	---	---	---
Citric acid, 10%	E50	E50	E50	E50	E50	E100	E50	E50	E50	E50	E20
Copper sulfate	E100	E50	E50	E50	G20	E100	E50	E20	F20	E20	E50
Cresol	E20	G20	X	F20	X	E20	X	X	X	X	E20
Cyclohexane	E20	C20	X	F20	G20	E20	F20	C20	C20	X	C20
Cyclohexanone	E20	F20	G20	F20	X	E20	X	X	X	F20	X
Cyclopentane	E20	F20	F20	F20	---	E20	X	---	X	X	X
Decahydronapthtalene	E20	X	F20	E20	---	E20	G20	---	---	---	---
Decalin	E20	X	F20	E20	X	E20	G20	X	X	X	E20
Diacetone	E20	G20	C20	X	X	E20	X	C20	X	F20	X
Diacetone alcohol	E20	G20	E20	E20	X	E20	X	F20	X	G20	X
Dibutylphthalate	E20	C20	G20	F20	X	E20	F20	G20	X	C20	G20
Diethyl benzene	E20	X	X	F20	X	E20	X	X	X	X	E20
Diethyl ether	E20	F20	X	F20	G20	E20	X	X	X	X	C20

	Vial and cap materials						Septum materials				
Chemical	Glass	PP	TPX	HDPE	Urea	PTFE	LDPE	SIL	RR	BUTYL	Viton
Diethyl ketone	E20	G20	G20	X	---	E20	X	---	F20	G20	X
Diethyl malonate	E20	E20	E20	E20	---	E20	E20	---	---	---	---
Diethylamine	E20	C20	C20	F20	F20	E20	X	G20	F20	G20	X
Diethylene dioxide	E20	X	F20	G20	---	E20	G20	---	---	---	---
Diethylene glycol	E50	E50	E50	E50	X	E50	E50	E20	E20	E20	E20
Diethylene glycol ethyl ether	E20	E20	E20	E20	---	E20	E20	---	---	---	---
Dimethyl acetamide	E20	E20	F20	E20	---	E20	F20	---	---	---	---
Dimethyl formamide	E20	E20	E20	E20	---	E20	E20	G20	C20	G20	X
Dimethylsulfoxide (dmso)	E20	E20	E20	E20	---	E20	E20	G20	---	---	x
Dioxane	E20	X	F20	G20	X	E20	G20	X	X	G20	X
Dipropylene glycol	E100	E50	E50	E50	---	E100	E50	G20	E20	E20	E50
Ethyl acetate	E20	C20	F20	E20	X	E20	E20	G20	X	G20	X
Ethyl alcohol (absolute)	E20	E20	E20	E20	C20	E20	E20	E20	G20	G20	G20
Ethyl alcohol, 40%	E20	E20	E20	E20	F20	E20	E20	E20	E20	E20	G20
Ethyl alcohol, 96%	E20	E20	E20	E20	C20	E20	E20	E20	G20	G20	G20
Ethyl benzene	E20	X	X	F20	X	E20	X	X	X	X	E20
Ethyl benzoate	E20	G20	G20	G20	---	E20	C20	X	E20	E20	---
Ethyl butyrate	E20	C20	F20	G20	---	E20	C20	---	---	---	---
Ethyl chloride	E20	F20	F20	X	C20	E20	F20	X	X	C20	E20
Ethyl chloride, liquid	E20	F20	F20	C20	C20	E20	F20	X	X	C20	E20
Ethyl cyanoacetate	E20	E20	E20	E20	---	E20	E20	---	---	---	---
Ethyl lactate	E50	E50	E50	E50	---	E50	E50	---	---	---	---
Ethylene chloride	E20	X	X	X	X	E20	X	X	X	C20	G20
Ethylene glycol	E200	E50	E50	E50	E20	E100	E50	E50	E50	E50	E100
Ethylene glycol monomethyl ether	E20	G20	E50	E50	---	E20	E20	---	---	---	---
Ethylene oxide	E20	F20	F20	G20	X	E20	C20	C20	X	C20	X
Fatty acids	E20	E20	E20	E20	C20	E20	E20	G20	C20	C20	G20
Fluorides	E20	E50	E50	E50	---	E50	E50	---	---	---	---
Fluorine	E20	X	F20	C20	X	E20	F20	X	X	C20	F20
Formaldehyde, 10%	E50	E50	E50	E50	X	E50	E50	X	G20	E20	E20
Formaldehyde, 40%	E20	E20	E20	E20	X	E20	E20	X	G20	E20	G20
Formalin, 10%	E20	E20	E20	E20	---	E20	E20	G20	G20	E20	E20
Formalin, 40%	E20	E20	E20	E20	---	E20	E20	G20	G20	E20	E20
Formic acid, 3%	E50	E50	E50	E50	C20	E50	E20	E20	G20	E20	X
Formic acid, 100%	E20	E20	E20	E20	X	E20	G20	G20	F20	E20	X
Formic acid, 50%	E20	E20	E20	E20	X	E20	G20	G20	F20	E20	X
Formic acid, 85%	E20	E20	E20	E20	X	E20	G20	G20	F20	E20	X
Freon tf	E20	E20	F20	E20	---	E20	E20	X	C20	X	G20
Fuel oil	E20	F20	G20	G20	X	E20	F20	X	X	X	F20
Gasoline	E20	F20	G20	F20	F20	E20	X	X	X	X	E20
Glutaraldehyde	E20	E20	C20	E20	---	E20	E20	---	---	---	---
Glycerine	E50	E50	E50	E50	X	E50	E50	E20	E20	E20	C20
Glycerol	E50	E50	E50	E50	X	E50	E50	E20	E20	E20	C20
Hexane	E20	G20	F20	G20	G20	E20	X	C20	C20	X	E20
Hydrazine	E20	X	X	X	X	E20	X	C20	F20	E20	X
Hydrobromic acid, 69%	E20	E20	E20	E20	X	E20	E20	C20	C20	F20	E20
Hydrochloric acid, 5%	E100	E50	E50	E50	G20	E100	E50	G20	C20	F20	E50
Hydrochloric acid, 20%	E50	E50	E50	E50	C20	E50	E50	C20	C20	F20	E50
Hydrochloric acid, 35%	E20	E20	E20	E20	X	E20	E20	X	C20	C20	E20
Hydrofluoric acid, 4%	SE100	E20	E20	E20	X	E100	E20	X	X	F20	E20
Hydrofluoric acid, 48%	SE50	E20	E20	E50	X	E50	E50	X	X	F20	G20
Hydrogen peroxide, 3%	E100	E20	E50	E50	---	E100	E50	E50	X	F20	G50
Hydrogen peroxide, 30%	E100	F20	E20	E50	---	E100	E50	E20	X	C20	G50
Hydrogen peroxide, 90%	E50	F20	E20	E50	---	E50	E50	G20	X	X	G20
Iodine crystals	E20	E20	C20	X	---	E20	X	E20	C20	F20	E20
Isobutyl alcohol	E20	E20	E20	E20	G20	E20	E20	G20	G20	E20	E20
Isooctane	---	---	---	---	E20	E20	---	X	X	X	E20
Isopropyl acetate	E20	G20	G20	E20	X	E20	G20	X	X	F20	X
Isopropyl alcohol, 100%	E20	E50	E20	E20	C20	E20	E20	E20	E20	E20	E20
Isopropyl benzene	E20	F20	X	F20	---	E20	F20	---	---	---	---

	Vial and cap materials					Septum materials					
Chemical	Glass	PP	TPX	HDPE	Urea	PTFE	LDPE	SIL	RR	BUTYL	Viton
Isopropyl ether	E20	X	X	F20	G20	E20	X	X	X	X	X
Jet fuel	E20	F20	F20	F20	---	E20	F20	X	X	X	E20
Kerosene	E20	F20	G20	F20	E20	E20	F20	X	X	X	E20
Lacquer thinner	E20	F20	C20	F20	X	E20	X	X	X	C20	X
Lactic acid, 3%	E50	E50	E20	E50	E20	E50	E20	E20	E20	E20	E20
Lactic acid, 85%	E50	E20	E20	E50	E20	E50	E20	E20	G20	E20	E20
Lead acetate	E50	E50	E50	E50	X	E50	E50	X	E20	G20	C20
Magnesium chloride	E50	E50	E50	E50	---	E50	E50	E20	E20	E20	E20
Mercuric chloride	E20	E20	E20	E20	---	E20	E20	E20	---	---	E20
Mercury	E20	E20	E20	E20	G20	E20	E20	E20	E20	E20	E20
Methoxyethyl oleate	E50	E20	E20	E50	---	E50	E20	---	---	---	---
Methyl acetate	E20	G20	E20	C20	X	E20	G20	X	X	F20	X
Methyl alcohol 100%	E50	E50	E20	E50	C20	E50	E20	E20	E20	E20	E20
Methyl ethyl ketone (MEK)	E20	E20	F20	X	X	E20	X	X	X	G20	X
Methyl isobutyl ketone (MIBK)	E20	G20	C20	X	X	E20	X	X	X	C20	X
Methyl isopropyl ketone	E20	G20	C20	F20	X	E20	X	---	X	F20	X
Methyl-t-butyl ether (MTBE)	E20	F20	E50	F20	---	E20	X	---	---	F20	X
Methylene chloride (DCM)	E20	F20	G20	F20	X	E20	X	C20	C20	X	G20
Mineral oil	E100	F20	E20	F20	E20	E100	C20	E20	X	C20	E100
Mineral spirits	E20	F20	E50	F20	---	E20	F20	---	X	X	E20
n-amyl acetate	E20	G20	G20	E20	X	E20	G20	X	X	G20	X
n-butyl alcohol	E20	E20	E20	E20	G20	E20	E20	G20	E20	E20	E20
n-decane	E20	F20	F20	F20	X	E20	E20	C20	C20	C20	E20
n-heptane	E20	C20	C20	C20	X	E20	E20	C20	C20	X	E20
n-octane	E20	E20	E20	E20	X	E20	E20	C20	C20	X	E20
Nitric acid, 10%	E20	E50	E20	E20	C20	E20	E20	G20	C20	G20	E20
Nitric acid, 20%	E20	C20	E50	G20	---	E20	E20	---	C20	F20	E20
Nitric acid, 50%	E20	F20	F20	F20	---	E20	G20	C20	X	X	F20
Nitric acid, 70%	E20	X	F20	F20	---	E20	G20	X	X	X	C20
Nitrobenzene	E20	X	F20	X	X	E20	X	X	X	C20	F20
Nitromethane	E20	F20	F20	F20	X	E20	X	X	F20	F20	X
o-dichlorobenzene	E20	F20	F20	X	X	E20	F20	X	X	X	E20
Orange oil	E20	G20	C20	G20	---	E20	F20	---	---	---	---
Oxalic acid, 10%	E20	E20	E20	E20	E20	E20	E20	E20	C20	E20	E20
Ozone	E20	F20	E20	C20	G20	E20	C20	E20	C20	G20	F20
p-chloroacetophenone	E20	E20	E20	E20	---	E20	E20	---	---	---	---
p-dichlorobenzene	E20	G20	G20	X	X	E20	F20	X	X	X	E20
Perchloric acid, concentrated (70%)	E20	C20	C20	C20	X	G20	C20	X	X	F20	G20
Perchloroethylene	E20	X	X	X	X	E20	X	C20	X	X	E20
Petroleum	E100	X	G20	C20	G20	E100	X	F20	C20	C20	E20
Phenol, 50%	E20	X	X	X	X	E20	X	X	X	E20	E20
Phenol, crystals	E20	C20	FG	G20	X	E20	X	C20	X	E20	E20
Phenol, liquid	E20	X	X	X	X	E20	X	X	X	G20	E20
Phosphoric acid, 5%	E100	E50	E50	E50	C20	E100	E50	E20	E20	E20	E20
Phosphoric acid, 85%	SE100	E20	E20	E50	X	E100	G20	G20	E20	E20	E20
Picric acid	E20	X	E20	X	X	E20	X	X	G20	G20	G20
Pine oil	E50	E20	G20	F20	C20	E50	C20	C20	X	X	E20
Potassium chloride	E300	E50	E50	E50	E20	E100	E50	E50	E50	E50	E50
Potassium hydroxide, 10%	SE50	E50	E50	C20	C20	E50	E50	E20	E20	E20	C20
Potassium hydroxide, 30%	SE50	E50	E50	E50	C20	E50	E50	E20	E20	E20	X
Potassium hydroxide, concentrated	C100	E50	E50	E50	X	E100	E50	E20	E20	E20	X
Potassium permanganate	E50	E20	E50	E50	---	E50	E50	E20	---	---	E20
Propane gas	E20	X	X	E20	---	E20	X	C20	X	X	E20
Proprionic acid	E20	E20	F20	F20	---	E20	F20	---	---	---	---
Propylene glycol	E50	E50	E50	E50	E20	E50	E50	E20	E20	E20	E50
Propylene oxide	E20	E20	E20	E20	E20	E20	E20	G20	E20	G20	E20
Pyridine	E20	E20	F20	X	X	E20	X	X	X	F20	X

	Vial and cap materials					Septum materials					
Chemical	Glass	PP	TPX	HDPE	Urea	PTFE	LDPE	SIL	RR	BUTYL	Viton
Resorcinol, sat.	E20	E20	E20	E20	C20	E20	E20	---	---	---	---
Salicylaldehyde	E20	E20	E20	E20	---	E20	E20	---	---	---	E20
Salicylic acid, powder	E50	E50	E50	E50	E20	E50	E50	E20	E20	E20	E20
Salicylic acid, sat.	E50	E50	E20	E50	E20	E50	E50	E20	E20	E20	E20
Sec-butyl alcohol	E20	E20	E20	E20	---	E20	E20	---	---	---	---
Silicone oil	E100	E50	E50	E50	---	E100	E20	G20	E20	E20	E50
Silver acetate	E50	E50	E50	E50	---	E50	E50	---	---	---	---
Silver nitrate	E20	E20	E20	E20	E20	E20	E20	E20	E20	E20	E20
Skydrol ld4	E100	E20	E20	E20	F20	E100	G20	C20	X	G20	C20
Sodium acetate, sat.	E50	E50	E50	E50	E20	E50	E50	X	G20	G20	E20
Sodium carbonate	E100	E50	E50	E50	E20	E100	E50	E20	E20	E20	E20
Sodium dichromate	E50	E50	E50	E50	---	E50	E50	G20	C20	E20	E20
Sodium hydroxide, 1%	F100	E50	E50	C20	E20	E100	E50	E20	E20	E20	G20
Sodium hydroxide, 10%	SE100	E50	E50	E50	G20	E100	E50	E20	E20	E20	C20
Sodium hydroxide, concentrated (50%)	SE100	E50	E50	E50	G20	E100	E50	E20	E20	E20	C20
Sodium hypochlorite, 15%	E20	F20	E50	E20	X	E20	F20	E20	X	G20	E20
Stearic acid	E50	E50	E50	G20	E20	E50	E50	E20	X	G20	E20
Stearic acid, crystals	E50	E50	E50	E50	E20	E50	E50	E20	X	G20	E20
Sulfur dioxide, liquid	E20	X	X	F20	---	E20	X	E20	C20	F20	C20
Sulfur dioxide, wet or dry gas	E50	E50	E50	E50	---	E100	X	E20	C20	G20	F20
Sulfuric acid, 6%	E100	E50	E50	E50	G20	E100	E50	F20	E20	E20	E20
Sulfuric acid, 20%	E100	E50	E50	E50	F20	E100	E50	C20	E20	E20	E20
Sulfuric acid, 30%	G100	E50	E50	E50	C20	E100	E50	C20	G20	E20	E20
Sulfuric acid, 60%	SE100	G20	E20	E20	X	E100	E20	X	X	X	E20
Sulfuric acid, 98%	SE100	F20	G20	F20	X	E100	G20	X	X	X	C20
Tartaric acid	E20	E20	E20	E20	F20	E20	E20	E20	C20	G20	E20
tert-butyl alcohol	E20	E20	E20	E20	X	E20	E20	G20	E20	E20	E20
Tetrahydrofuran (THF)	E20	G20	C20	F20	X	E20	F20	X	X	X	X
Thionyl chloride	E20	X	X	X	X	E20	X	X	X	X	X
Tincture of iodine	E50	E50	X	G20	---	E50	X	G20	C20	---	E20
Toluene	E20	X	C20	X	X	E20	F20	X	X	C20	F20
Tributyl citrate	E20	G20	G20	E20	---	E20	G20	---	---	---	---
Trichloroacetic acid	E20	G20	E20	F20	X	E20	F20	X	C20	F20	C20
Trichloroethane	E20	X	X	X	X	E20	X	X	X	X	G20
Trichloroethylene	E20	X	X	X	X	E20	X	X	X	X	G20
Triethylene glycol	E50	E50	E50	E50	---	E50	E50	---	E20	E20	E20
Tripropylene glycol	E100	E50	E50	E50	---	E100	E50	---	---	---	---
Tris buffer, solution	E100	E20	E20	E20	E20	E100	E20	E20	G20	E20	E20
Trisodium phosphate	E100	E50	E50	E50	E20	E100	E50	E20	E20	E20	E20
Turpentine	E20	F20	F20	F20	E20	E20	F20	X	X	X	E20
Undecyl alcohol	E20	E20	E20	E20	---	E20	F20	---	---	---	---
Urea	E50	E50	E20	E50	E20	E50	E50	E20	E20	E20	E20
Vinylidene chloride	E20	X	X	F20	---	E20	X	---	---	---	---
Xylene	E20	X	X	F20	C20	E20	X	X	X	X	G20
Zinc chloride, 10%	E100	E50	E50	E50	E20	E100	E50	E20	E20	E20	E20
Zinc stearate	E50	E50	E50	E50	---	E50	X	---	---	---	---
Zinc sulfate, 10%	E50	E50	E50	E50	E20	E50	E50	E20	G20	E20	E50

Properties of glass

Vials and inserts are manufactured from the highest-quality borosilicate glass, selected for its purity and dimensional stability

Clear glass type 33 expansion products are manufactured from 33 expansion borosilicate glass, have a low coefficient of expansion and very high resistance to chemical attack. It has low alkali content and is free of elements from the calcium, magnesium, and zinc group of heavy metals. The total of combined oxides of arsenic and antimony is less than 0.005%. 33 expansion borosilicate glass meets the requirements for Type I class A glass of ASTM E438.

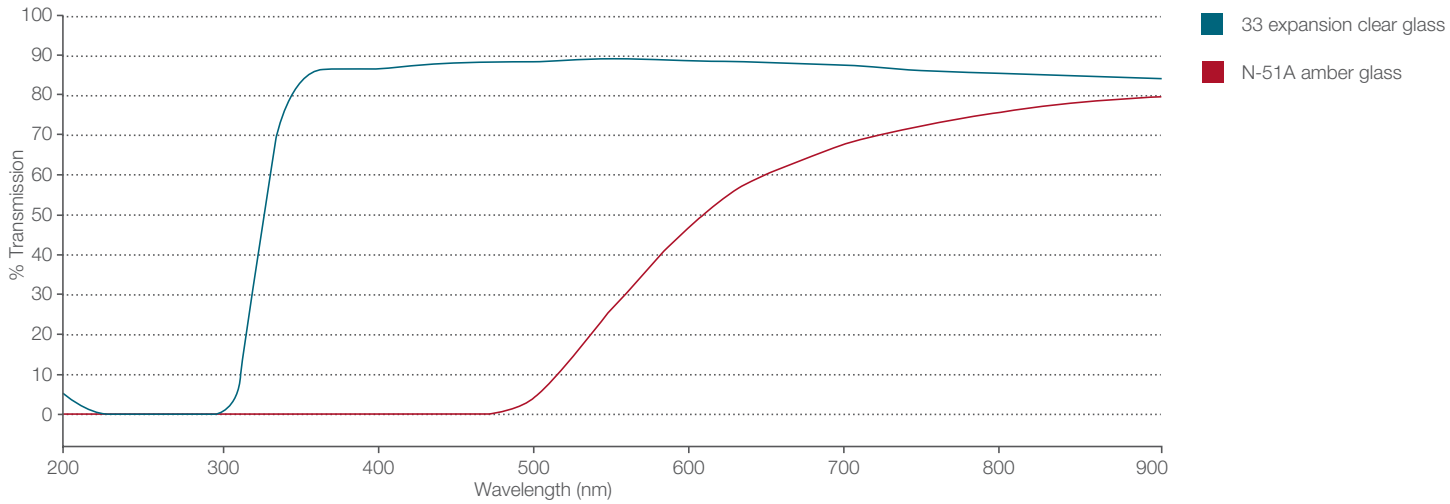
Chromacol GOLD glass is a low expansion high purity glass with an extremely low concentration of active sites. This gives a low activity surface with high recovery of basic and polar samples that may show adsorption on more typical glass surfaces.

Clear and amber glass products manufactured from N-51A borosilicate glass, have a relatively low coefficient of expansion and high chemical durability. N-51A borosilicate glass meets the requirements for Type I class B glass of ASTM E438.

Unless otherwise stated, all autosampler vials offered through this catalog (clear and amber glass) are classified as Type I in accordance with the U.S.Ph. 33th ed. and the European Ph. 7th ed, as well as other Pharmacopoeias or E.P. definitions of type 1 hydrolytic class glass including e.g. the Japanese, Italian and DAB Pharmacopoeias.

Approximate chemical composition for borosilicate glass

	33 expansion & Chromacol GOLD grade clear glass	51 expansion clear glass	51 expansion amber glass	70 expansion clear glass
Silicium dioxide (SiO_2)	80%	75%	70%	67% - 74%
Boron oxide (B_2O_3)	13%	10.5%	7%	0.5% - 12%
Aluminum oxide (Al_2O_3)	3%	5%	6%	1% - 8%
Calcium oxide (CaO)	0.1%	1.5%	1%	2% - 11%
Magnesium oxide (MgO)	Not detected	Not detected	Not detected	0.2% - 3%
Sodium oxide (Na_2O)	4%	7%	7%	9% - 16%
Potassium oxide (K_2O)	0.1%	Not detected	1%	1% - 5%
Barium oxide (BaO)	<0.1%	<1%	2%	0.1% - 1%
Iron oxide (Fe2O3)	Not detected	Not detected	1%	Not detected
Other impurities	Not detected	Not detected	Not detected	1% - 2%



Autosampler compatibility table

Certain autosamplers require the purchase of optional vial trays and, in few cases, programming upgrades to use all of the vials listed. Below are categories of vials that are compatible with various models of autosamplers.

Autosampler compatibility		8 mm Crimp Top vials	8 mm Crimp Top vials and 1 mL Shell vials	8 mm Crimp Top vials	8-425 Standard Opening Screw Thread vials and 2 mL Shell vials	9 mm Wide Opening Screw Thread vials	10 mm Wide Opening Screw Thread vials	11 mm Wide Opening Crimp Top and Snap-It vials	13-425 Screw Thread vials and 4 mL Shell vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp and 18 mm Screw Thread vials	24-400 Screw vials (EPA)	Well Plates
Manufacturer	Model	7 mm OD	8 mm OD	6 mm OD	12 mm OD	12 mm OD	12 mm OD	12 mm OD	15 mm OD	22 mm OD	23mm OD	22.5-23 mm OD	28 mm OD	-
Agilent	1100 / 1200 / 1290 Infinity					X		X						X
Agilent	1260 Infinity					X		X						
Agilent	G1888A / HS7694 / HS7694								X			X		
Agilent	7673A			X		X		X						
Agilent	7683A	X		X		X		X						
Agilent	7695A / Tekmar SOLATek72 / Archon Pluge + Trap / AQUATek 70												X	
Agilent	79855(A) / 5880 / 5890 / 6850 (27 Pos. Tray) / 6890					X		X						
Agilent	CTC HTS + HTC PAL + CTC GC PAL	X		X		X		X						X
Agilent	CTC Combi PAL											X		X
Agilent	7693A		X		X			X	X					
Agilent	7697A											X		
Agilent	7650A				X	X	X	X						
Analytik Jena	multi N/C 3000 (TOC)												X	
Antec Leyden	Alexys				X	X		X						
Antec Leyden	AS 100 / AS 110				X	X	X	X						
Antek	736 Unisampler / 738				X	X	X	X						
GL Sciences/ATAS	Focus (PAL)				X	X		X						
Beckman	501 / 502 / 502e / 507 / 507e			X	X	X	X	X						
Beckman	504 / Triathlon, Micro-Tray	X												
Beckman	508 (System Gold)					X						X		
Beckman	Marathon / Promis				X	X		X						
Beckman	Triathlon, Standard Tray				X	X		X		X		X		
Beckman	Triathlon, LSV Tray			X					X					
Beckman	Triathlon, Super-LSV Tray											X		
Bruker	LC51								X					
Bruker	Mapi1													X
Ellutia/Cambridge Scientific Instruments	205 Series				X	X	X	X	X					
Ellutia/Cambridge Scientific Instruments	300 Series / EL28OT					X	X	X	X					
Ellutia/Cambridge Scientific Instruments	EL2000H									X	X	X		
Ellutia/Cambridge Scientific Instruments	EL3000A / EL3100A / EL3200A / 500 Series				X	X	X	X	X					
CE Instruments/Cora Erba	AS100 / AS300	X		X	X	X		X						
CE Instruments/Cora Erba	AS200 / A200LC / AS200S	X			X	X		X						
CE Instruments/Cora Erba	AS800, 42 vial tray				X	X		X						
CE Instruments/Cora Erba	AS800, 60 vial tray		X	X	X	X		X						
CE Instruments/Cora Erba	HS250 / HS500 / HS800 / HS850											X		
CE Instruments/Cora Erba	HT3000A / HT4000L / HT1500L				X	X	X	X	X					
CE Instruments/Cora Erba	HT2000H									X	X	X		
Cecil Instruments	CE4800				X	X	X	X						
Cecil Instruments	AutoQuest		X				X	X	X					
CTC (LEAP)	LC PAL (216 Pos.)				X	X	X	X				X		X
CTC (LEAP)	HTX PAL, HTC PAL, HTS PAL (200 Pos. Tray) / Combi PAL (200 Pos. Tray), GC PAL (200 Pos. Tray)	X												X

Autosampler compatibility

Manufacturer	Model	7 mm OD	8 mm OD	6 mm OD	12 mm OD	12 mm OD	12 mm OD	12 mm OD	15 mm OD	22 mm OD	23mm OD	22.5-23 mm OD	28 mm OD	-
		8 mm Crimp Top vials	8 mm Crimp Top vials and 1 mL Shell vials	8 mm Crimp Top vials	8-425 Standard Opening Screw Thread vials and 2 mL Shell vials	9 mm Wide Opening Screw Thread vials	10 mm Wide Opening Screw Thread vials	11 mm Wide Opening Crimp Top and Snap-It vials	13-425 Screw Thread vials and 4 mL Shell vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp and 18 mm Screw Thread vials	24-400 Screw vials (EPA)	Well Plates
CTC (LEAP)	HTX PAL, HTC PAL, HTS PAL (54/98 Pos. Tray)			X	X	X	X	X				X		X
CTC (LEAP)	HTX PAL, HTC PAL, HTS PAL (32 Pos. Tray) / Combi PAL (32 Pos. Tray), GC PAL (32 Pos. Tray) / Combi PAL SPME Mode (32 Pos. Tray)											X		
CTC (LEAP)	Combi PAL (98 Pos. Tray), GC PAL (98 Pos. Tray)			X		X		X						X
CTC (LEAP)	Combi PAL SPME Mode (98 Pos. Tray)					X		X						X
CTC	PAL HPLC-Systems / PAL Combi-xt Liqid Mode / PAL HTC-xt	X			X	X	X	X				X		X
CTC	Combi-xt Headspace Option							X				X		
CTC	GC-xt Headspace Option/A200 LC	X			X	X	X	X				X		
CTC	Combi-xt SPME Options							X				X		X
CTC	A200S	X			X	X	X	X						
CTC	HS 500											X		
CTC	PAL RTC / PAL RSI											X		
CTC	PAL LSI				X	X	X	X	X					X
DANI	ALS 39.80 / ALS 86.80 / ALS 1000					X		X						
DANI	HS39.50 / HS86.50											X		
DANI	Master AS					X		X				X		
DANI	Master SHS Static Headspace Sampler											X		
DANI	HSS 86.50 Plus										X	X		
Dionex	Gina 50		X			X		X	X					
Dimatec	Dimatoc 200 / 300 / 400												X	
ESA	542 HPLC Autosampler / 540 HPLC Autosampler				X	X	X	X	X					
ESA	540 MicroTiter HPLC Autosampler				X	X	X	X	X					X
EST Analytical	AS 120				X	X	X	X	X					
GBC	LC 1650				X			X						
GE Healthcare	Ettan A-905							X						
GE Instruments	Sievers 900												X	
Gerstel	MPS2	X		X				X				X		X
Gilson	201 / 202 / 221 / 222 / Aspec				X	X			X					
Gilson	231 / 401 / 232 / 402 / Aspec Xli / Aspec XL4				X	X								
Gilson	221XL / 222XL	X		X (only f. 221XL)										
Gilson	223	X												
Gilson	231XL / 232XL / 233XL	X		X (only f. 231XL)										
Gilson	Nano Injektor				X	X								
Gilson	235 / 235P/SP 235/SP 235P	X			X	X								
Hach Lange	IL 550 TOC-TN												X	
HTA	HT200H											X		
HTA	HT250D / HT280T / HT300L				X	X	X	X				X		
HTA	HT300A / HT310A				X	X	X	X						
HTA	HT 3000A / HT3100A / HT3200A				X	X	X	X	X					
HTA	HT2000H / HT2100H / HT2800T									X	X	X		
ICI	LC1600	X						X						
IMT GmbH	VSP4000												X	
IMT GmbH	PTA3000									X	X	X		
Jasco	AS 2055 / AS 2055 (i) / AS 2057 / AS 2057 (i) / L4000 Series			X	X	X	X	X						
Jasco	AS 2059			X	X	X	X	X						X
Knauer	K-3800 (Basic Marathon) / Smartline K-3950				X	X		X		X				
Knauer	PLATINblue AS-1				X	X		X						
Knauer	AS 6.1L				X	X	X	X	X					
Konik -Tech	Robokrom Static HS										X	X		
Konik -Tech	Robokrom HRGC		X					X						
Konik -Tech	Robokrom HPLC				X	X		X	X					
LDC	713-60		X	X										
LDC	Marathon/Promis				X	X		X						
LEAP	pls. see CTC													
O.I. Analytical	1020A / 1088 / 1096+ / 4551A / 1552												X	

Autosampler compatibility

Manufacturer	Model	7 mm OD	8 mm OD	6 mm OD	12 mm OD	12 mm OD	12 mm OD	12 mm OD	15 mm OD	22 mm OD	23mm OD	22.5-23 mm OD	28 mm OD	-
		8 mm Crimp Top vials	8 mm Crimp Top vials and 1 mL Shell vials	8 mm Crimp Top vials	8-425 Standard Opening Screw Thread vials and 2 mL Shell vials	9 mm Wide Opening Screw Thread vials	10 mm Wide Opening Screw Thread vials	11 mm Wide Opening Crimp Top and Snap-It vials	13-425 Screw Thread vials and 4 mL Shell vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp and 18 mm Screw Thread vials	24-400 Screw vials (EPA)	Well Plates
PerkinElmer	Series 200, 25 vial tray									X				
PerkinElmer	Series 200, 85 vial tray						X	X		X				
PerkinElmer	Series 200, 81 / 100 vial tray						X	X						
PerkinElmer	Series 200, 205 vial tray / ISS-225, 205 vial tray			X			X	X						
PerkinElmer	Series 200, 225 vial tray			X										
PerkinElmer	AI-1 / AS-100 / AS-100B		X	X				X						
PerkinElmer	AS2000 / AS2000B	X	X				X	X						
PerkinElmer	AS-300 / AS8300 / Autosystem		X	X				X						
PerkinElmer	HS 6 / ISS-225, 25 vial tray									X				
PerkinElmer	HS40 / HS100/101									X	X			
PerkinElmer	TurboMatrix HS16 / HS40 / HS40 XL / HS40 Trap / HS110 / HS110 Trap									X*	X	X**		
PerkinElmer	Integral 4000 / ISS-100, 100 vial tray / ISS-200, 100 vial tray / ISS-225, 100 vial tray + 80 vial tray / LC 600, 60 vial tray						X	X						
PerkinElmer	ISS-100, 85 vial tray / ISS-200, 85 vial tray / ISS-225, 100 vial tray + 80 vial tray						X	X		X				
PerkinElmer	ISS-200, 145 vial tray			X										
PerkinElmer	LC 600, 42 vial tray		X											
PerkinElmer	Clarus 400, 500, 600/590 GC, 690 GC							X						
PerkinElmer	Flexar FX-20 UHPLC; LC				X	X	X	X						
Pharmacia	LKB 2157-010, 2 mL, 11 mm Crimp-Top				X	X		X						
Pharmacia	Akta A-900, 1.5 mL				X			X						
Pharmacia	LKB 2157-020	X						X						
Polymer Laboratories	GPC 110 / 210 / PL-AS RT				X	X	X	X	X					
Quma Elektronik	QHSS-40											X		
Selerity	3100				X			X						
Sedere	-					X		X						
Sepiatec	-													X
SGE	LS-3200	X		X				X						
Shimadzu	AOC-5000	X		X		X		X				X		
Shimadzu	AOC-14 / 1400 / AOC-17 / AOC-20 / 20i / 20s 150 Pos. Tray				X	X	X	X	X			X		
Shimadzu	AOC-20 / 20i / 20s 96 Pos. Tray / SIL-10A / SIL-10AF / SIL-10AP / SIL-10Ai / SIL-10AxL / Rack L 80 Pos. / SIL-10HTA / SIL-10HTC 100 Pos. Tray / SIL-20A / Sil-20AC (Prominence) 50 vial tray, LC2010C / LC2010A 100 Pos. Tray								X					
Shimadzu	LC-20A / SIL-6B / SIL-7A / SIL-8A / SIL-9A / X2 UHPLC System (Nexera) 324 - 1.5 mL vials / SIL-30ACMP / Nexera MP (6 - 1.5 vial trays)				X	X	X	X	X					
Shimadzu	SIL-2AS / SIL-6A			X	X	X	X	X	X					
Shimadzu	SIL-10A / SIL-10AF / SIL-10AP / SIL-10Ai / SIL-10AxL / Rack S 100 Pos. / SIL-20A (Prominence) 105 vial tray / SIL-20AC (Prominence) 70 vial tray			X	X	X	X	X						
Shimadzu	SIL-10A / SIL-10AF / SIL-10AP / SIL-10Ai 5 mL / SIL-10AxL / Rack MTP2 192 Pos. / SIL-10HTA / SIL-10HTC 350 Pos. Tray / SIL-20A / Sil-20AC (Prominence) 175 vial tray / LC2010C + LC2010A 350 Pos. Tray		X											
Shimadzu	SIL-10HTA / SIL-10HTC 140 Pos. Tray / LC2010C + LC2010A 140 Pos. Tray				X	X	X	X						
Shimadzu	SIL-10ADvp		X		X	X	X	X	X					
Shimadzu	HTA 200 H / HSS-2B											X		
Shimadzu	LC2010C + LC2010A 100 Pos. Tray								X					
Shimadzu	ASI-V												X	
Shimadzu	SIL 30-ACMP				X	X		X						
Shimadzu	SIL-20AXR / SIL-20ACXR (Prominence) 175 (1 mL vials), 70 (1.5 mL vials), 50 (4 mL vials) / SIL-30AC (Nexera) 175 (1 mL vials), 105 (1.5 mL vials), 50 (4 mL vials)		X		X	X		X	X					
Shimadzu	SIL-20ACHT, SIL-20AHT	X	X	X	X	X	X	X	X					X
Sievers (GE Instruments)	Sievers 900												X	

X* (not suitable for Turbomatrix 110)
X** (for Turbomatrix 16, 40, 110 produced after 1.9.06)

Autosampler compatibility

Manufacturer	Model	7 mm OD	8 mm OD	6 mm OD	12 mm OD	12 mm OD	12 mm OD	12 mm OD	15 mm OD	22 mm OD	23mm OD	22.5-23 mm OD	28 mm OD	-
		8 mm Crimp Top vials	8 mm Crimp Top vials and 1 mL Shell vials	8 mm Crimp Top vials	8-425 Standard Opening Screw Thread vials and 2 mL Shell vials	9 mm Wide Opening Screw Thread vials	10 mm Wide Opening Screw Thread vials	11 mm Wide Opening Crimp Top and Snap-It vials	13-425 Screw Thread vials and 4 mL Shell vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp and 18 mm Screw Thread vials	24-400 Screw vials (EPA)	Well Plates
Spark	Marathon Basic, Standard 96 Pos. Tray / Triathlon, Standard 96 Tray / Endurance 48 Pos. Tray / Dried Blood Spot (DBS) / Integrity / Optimas / Promis				X	X		X						
Spark	Marathon Basic Präp King Size 48 Pos. Tray									X				
Spark	Midas, Standard 84 Pos. Tray / Optimas 96 Pos. (2 mL) 24 Pos. (10 mL) / Alias				X	X		X				X		
Spark	Midas, Large Capacity 96 Pos. Tray				X	X		X						
Spark	Midas, Large Volume 24 Pos. Tray / Triathlon, Super-LSV 32 Pos. Tray											X		
Spark	Alias				X	X		X			X			
Spark	SPH 125 / Interity					X		X						
Spark	Triathlon, LSV 72 Pos. Tray								X					
Spark	Triathlon, Micro 160 Pos. Tray	X												
Spark	Reliance 48 Pos. Tray / Integrity 108 Pos. (2 mL) 2 x plates, IntegrityPlus 2x108 Pos. (2 mL) 4 x plates				X	X		X						X
Spark	Prospekt 2							X						
Spark	Reliance / Symbiosis Pharma							X						X
Spectra-Physics	8875 / 8880				X	X		X						
Spectra-Physics	SpectraSYSTEM AS1000 / SpectraSYSTEM AS 3500	X		X	X	X		X						
Spectra-Physics	SpectraSYSTEM AS 3000	X	X	X	X	X		X						
Sykam	S 5200 / S 5300 / S 5250					X								
Talbot						X		X						
Teledyne Tekmar	7000 / 7000HT / 7050 / ASTM F1884-04										X			
Teledyne Tekmar	AQUATek 70 / SOLATek 72 / STS 8000 TOC												X	
Teledyne Tekmar	HT3										X	X		
Thermo Fisher Scientific	Thermo Scientific™ Nicolet™ ASI 100, Micro-Tray (192 Pos.)		X											
Thermo Fisher Scientific	Thermo Scientific™ Nicolet™ 100, Analytical-Tray (117 Pos.)				X	X		X						
Thermo Fisher Scientific	Thermo Scientific™ Nicolet™ ASI 100, Semiprep.-Tray (63 Pos.)								X					
Thermo Fisher Scientific	Thermo Scientific™ Famos™ (LC Packings/ Dionex) / Dionex™ UltiMate™ Analytical, cylindrical, WPS-3000 SL, 120 Pos. Rack (2 mL)				X	X	X	X				X		
Thermo Fisher Scientific	UltiMate Analytical, conical, WPS-3000 SL, 120 (3 x 40) Pos. Rack (1.1 mL = 2 mL w. inserts)							X				X		
Thermo Fisher Scientific	Thermo Scientific™ UltiMate™ Micro, conical, WPS-3000 SL, 120 (3 x 40) Pos. Rack (250 µl)			X								X		
Thermo Fisher Scientific	Thermo Scientific™ UltiMate™ Semipreparative, WPS-3000 SL, 66 (3 x 22) Pos. Rack (4 mL)								X			X		
Thermo Fisher Scientific	Thermo Scientific™ UltiMate™ Nano / Cap / Micro, WPS-3000 SL, 216 (3 x 72) Pos. Rack (1.2 mL)		X									X		
Thermo Fisher Scientific	AS-HV													
Thermo Fisher Scientific	AS-AP* (120 Pos. 1.5 mL), (3 x plates)				X	X	X	X						X
Thermo Fisher Scientific	AS-DV (50 x 0.5 mL and 50 x 5.0 mL)													
Thermo Fisher Scientific	AS1000 (Thermo Scientific™ Trace™ GC) / AS300	X		X	X	X		X						
Thermo Fisher Scientific	AS200	X			X	X		X						
Thermo Fisher Scientific	AS2000 30 vial tray / HS250 / HS500/ HS800 / HS2000											X		
Thermo Fisher Scientific	AS2000 90 vial tray (Trace GC)		X		X	X		X						
Thermo Fisher Scientific	AI3000 (II) / AS3000 (II) AS3500 (Trace GC + Focus GC)	X		X		X		X				X		
Thermo Fisher Scientific	A200LC / Thermo Scientific™ Accela™ Open Autosampler	X			X	X		X						
Thermo Fisher Scientific	Thermo Scientific™ SpectraSYSTEM™ AS 1000/ AS 3500 / AS100 / Accela™ High Speed LC Autosampler (200 Pos.)	X		X	X	X		X						
Thermo Fisher Scientific	Thermo Scientific™ SpectraSYSTEM AS 3000	X	X	X	X	X		X						
Thermo Fisher Scientific	A200S	X			X	X		X						
Thermo Fisher Scientific	AS800, 42 vial tray				X	X		X						
Thermo Fisher Scientific	AS800, 60 vial tray		X	X	X	X		X						
Thermo Fisher Scientific	Thermo Scientific™ Dionex™ AS-AP				X	X	X	X		X				

* Split septa are required

Autosampler compatibility

Manufacturer	Model	8 mm Crimp Top vials	8 mm Crimp Top vials and 1 mL Shell vials	8 mm Crimp Top vials	8-425 Standard Opening Screw Thread vials and 2 mL Shell vials	9 mm Wide Opening Screw Thread vials	10 mm Wide Opening Screw Thread vials	11 mm Wide Opening Crimp Top and Snap-It vials	13-425 Screw Thread vials and 4 mL Shell vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp and 18 mm Screw Thread vials	24-400 Screw vials (EPA)	Well Plates
		7 mm OD	8 mm OD	6 mm OD	12 mm OD	12 mm OD	12 mm OD	12 mm OD	15 mm OD	22 mm OD	23mm OD	22.5-23 mm OD	28 mm OD	-
Thermo Fisher Scientific	Thermo Scientific™ Dionex™ UltiMate WPS-3000	X	X		X	X	X	X	X	X				
Thermo Fisher Scientific	Thermo Scientific™ Dionex™ AS 40								X					
Thermo Fisher Scientific	Thermo Scientific™ TriPlus™ (=GC PAL) (AS+Duo)	X	X	X	X	X		X				X		X
Thermo Fisher Scientific	Thermo Scientific™ TriPlus™ HS / SPME											X		
Thermo Fisher Scientific	Thermo Scientific™ TriPlus™ RSH / Surveyor (Surveyor Plus)	X		X	X	X		X				X		X
Thermo Fisher Scientific	Thermo Scientific™ TriPlus™ 300											X		
Thermo Fisher Scientific	HiPerTOC												X	
Thermo Fisher Scientific	Thermo Scientific™ Trace™ 1300 Series / Trace™ 1310 Series /AI/AS 1310 Series / TriPlus™ 100 LS				X	X	X	X		X	X	X		
Thermo Fisher Scientific	Thermo Scientific™ Vanquish™ Split / Vanquish™ Dual Split			X	X	X		X	X					X
Thermo Fisher Scientific	Thermo Scientific™ UltiMate™ WPS-3000RS / TRS / UltiMate™ WPS-3000TFC /TBFC / UltiMate™ OAS-3000TXRS / UltiMate™ WPS-3000TXRS / UltiMate™ WPS-3000TBRS			X	X	X	X	X						X
Tosoh	AS 8010 / TSK-6080					X		X						
Tracor	770 / 771 / 772				X	X		X						
Unicam	4247 / 4710				X	X		X						
Unicam	4700 (GC) / S4 / S8	X												
Unicam	4700 (LC)	X			X	X								
Unicam	LC-XP				X	X		X	X					
Varian	ProStar 400, Standard 96 Pos. Tray / ProStar 410, Large Capacity 96 Pos. Tray / ProStar 420, Standard 96 Pos. Tray				X	X	X	X						
Varian	ProStar 400, King Size 48 Pos. Tray / Marathon Basic, Prep, King Size 48 Pos. Tray									X				
Varian	ProStar 410, Standard 84 Pos. Tray				X	X	X	X				X		
Varian	ProStar 410, Large Volume 24 Pos. Tray / CP-9020 / CP-9025 / CP-9060 / Genesis / COMBI PAL (32 Pos. Tray) GC PAL (32 Pos. Tray) / COMBI PAL SPME mode (32 Pos. Tray)											X		
Varian	ProStar 420, LSV 72 Pos. Tray			X					X					
Varian	ProStar 420, Super-LSV 32 Pos. Tray									X		X		
Varian	ProStar 420, Micro 160 Pos. Tray	X												
Varian	ProStar 430, 48 Pos. Tray/8000/8100/ CP-910, 911, 912				X	X		X						
Varian	8035 / Marathon Basic, Standard 96 Pos. Tray / Vista				X	X								
Varian	8400 (100 Pos.) / 8410-Autoinjector (10 x 2 mL; 6 x 5 mL; 5 x 10 mL)				X	X		X						
Varian	8200				X	X	X	X						
Varian	LC 9100 / LC 9095 / LC 9090					X		X						
Varian	Archon												X	
Varian	COMBI PAL (200 Pos. Tray) GC PAL (200 pos. Tray)	X										X		X
Varian	COMBI PAL (98 Pos. Tray) GC PAL (98 Pos. Tray)			X		X		X				X		X
Varian	COMBI PAL SPME mode (98 Pos. Tray)					X		X				X		X
Varian	Marathon Basic, Standard 96 Pos. Tray / CP-9010				X	X		X						
Varian	920-LC / 940-LC				X									
Varian	CP-8410 / 8034 / 8035 / 8100 / 8200				X			X						
Viscotek	Vortex												X	
Viscotek	GPC Autosampler				X	X	X							
Viscotek	GPC max, 120 vials				X	X	X	X	X					
VWR (Merck) / Hitachi	Hitachi Chromaster				X	X		X	X					

Autosampler compatibility

Manufacturer	Model	7 mm OD	8 mm OD	6 mm OD	12 mm OD	12 mm OD	12 mm OD	12 mm OD	15 mm OD	22 mm OD	23mm OD	22.5-23 mm OD	28 mm OD	-
		8 mm Crimp Top vials	8 mm Crimp Top vials and 1 mL Shell vials	8 mm Crimp Top vials	8-425 Standard Opening Screw Thread vials and 2 mL Shell vials	9 mm Wide Opening Screw Thread vials	10 mm Wide Opening Screw Thread vials	11 mm Wide Opening Crimp Top and Snap-It vials	13-425 Screw Thread vials and 4 mL Shell vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp vials	20 mm Headspace Crimp and 18 mm Screw Thread vials	24-400 Screw vials (EPA)	Well Plates
VWR (Merck) / Hitachi	HPLC-System Primaide				X	X	X	X	X					
VWR (Merck) / Hitachi	L2200 (LaChrom Elite) / L2200-U (LaChrom Ultra) (200 Pos. Tray) / L7200 (LaChrom) (80 Pos. Tray) / L7250 (LaChrom) (120 Pos. Tray) / 655-A40 (108 Pos. Tray) / L-9100				X	X								
VWR (Merck) / Hitachi	L2200 (LaChrom Elite) (128 Pos. Tray)								X					
VWR (Merck) / Hitachi	L7250 (LaChrom) (Rack Holder for combination Racks)			X	X	X			X				X	
VWR (Merck) / Hitachi	AS 2000 (50 Pos. Tray) / AS 4000 (150 Pos. Tray)				X	X		X						
VWR (Merck) / Hitachi	AS 4000 (198 Pos. Tray)			X										
VWR (Merck) / Hitachi	5210 (Chromaster) 195 Pos (1 mL), 120 Pos 1.5 mL (Standard), 72 Pos. (4 mL), 2 x MTP (96,384)		X		X	X		X	X					X
VWR(Merck) / Hitachi	AS 6000			X	X	X								
Waters	ACQUITY UPLC Systeme					X			X***					
Waters	Wisp 48 position								X					
Waters	Wisp 96 position / 717, 96 Position Carousel		X											
Waters	717 plus	X	X	X	X	X	X	X	X					
Waters	717, 48 Position Carousel								X					
Waters	Alliance					X	X	X						X
Waters	Alliance GPC 2000								X			X		
Waters	Alliance HT Syst. / Alliance 2790 / 2795 / Alliance 2690 / 2695					X	X	X						
Waters	Acquity Sample Organizer / Acquity / CapLC / Waters / Nano Acquity					X								X
Waters	Acquity H-Class / Alliance HTS													X
Waters	Model 2767 / Model 2707 / Model 2777					X		X						X

X*** (for 24 Position Plate)

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