

Chemical Stability of Varispenser[®] 2 and 2x

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Executive summary

In most laboratories aggressive chemicals such as acids, bases and solvents are needed on a daily basis. One example is HPLC (high performance liquid chromatography) for trace analysis. For this application mainly organic solvents are used. These chemicals carry the risk of damaging plastic materials, silicone and metal springs utilized to build liquid handling tools. This white paper shows in detail which materials are used for each part of the Varispenser[®] 2 and 2x. A list of commonly used chemicals including acids, bases and solvents is given to verify the compatibility of a chemical with the Varispenser 2 and 2x.



Introduction

Bottle-top dispensers are used in the lab for dispensing a wide range of different liquids and solvents from glass or stainless steel containers. These dispensers have to meet various requirements. For example, they should not leach any substances which may disturb trace analysis, have cytotoxic properties, distort optical tests or influence chromatographic methods and residue analysis.

Even after prolonged contact with a solvent, the materials of a bottle-top dispenser should neither be affected nor bind the solvent non-specifically. This means that there are very high demands on the chemical resistance of bottle-top dispensers. Accordingly, the bottle-top dispensers Varispenser 2 and Varispenser 2x from Eppendorf are made of materials which are particularly resistant to chemicals. Only parts made of the chemical resistant materials PFA, PTFE, FEP, ETFE, borosilicate glass and Pt-Ir (abbreviations: see tab. 1) come into contact with the solvents. The adapter rings for the screw connection are made of PP or ETFE.

Chemical residues on gloves or chemical vapors in the laboratory can come into contact with other parts of the Varispenser.

In the long run also vapors can lead to damage of some materials. Therefore it is useful to know which materials are used for each part of the Varispenser, also if not in direct liquid contact (table 2). With this knowledge the appropriate storage and cleaning solutions can be considered after dispensing highly aggressive chemicals, to avoid crystallization and increase the lifetime of the bottle-top dispenser.

Table 1: Abbreviations and chemical names of Varispenser materials

Abbreviation	Chemical name
ETFE	ethylene/tetrafluoroethylene-copolymer
FEP	tetrafluoroethylene/perfluoropropylene-copolymer
FKM	poly(vinylidene fluoride-co-hexafluoropropylene)
PFA	perfluoroalkoxy-copolymer
PP	polypropylene
PTFE	poly(tetrafluoroethylene)
Pt-Ir	platinum-iridium

Table 2: Materials of Varispenser 2 and Varispenser 2x

Part	Varispenser® 2	Varispenser® 2x
Direct contact to dispensing fluid		
Valve head	PFA	PFA
Telescopic intake tube	FEP/ PTFE	FEP/PTFE
Intake valve/valve ball	PFA/ceramic/borosilicate glass	PFA/ceramic/borosilicate glass
Cylinder	borosilicate glass	borosilicate glass
Sealing lip	PFA	PFA
Discharge valve incl. recirculation valve	–	PFA/PTFE/Pt-Ir/borosilicate glass
Discharge valve	PFA/Pt-Ir/ borosilicate glass	–
Discharge tube	FEP	FEP
Indirect contact to dispensing fluid		
Valve head casing	PP	PP
Piston rod	ETFE	ETFE
Piston seat	PP	PP
Cylinder casing	PP	PP
Protective cylinder sleeve	PP	PP
Discharge tube support	PP	PP
Discharge tube closure cap	PP	PP
Ventilation cover	PP	PP
Volume adjustment knob	PP	PP
O-ring for valve cock protection	–	FKM
Volume setting knob	PP	PP
Discharge valve toggle	–	PP
Drying tube (optional)	PP	PP
Thread adapter	PP or ETFE /PTFE	PP or ETFE /PTFE

Technical specifications subject to change! For explanations of abbreviations refer to the table on page 1.

Table 3: Chemical stability of the Varispenser 2 and 2x

For each chemical, 2 numbers are given. The numbers on the left display the stability at a test temperature of +20 °C, the numbers on the right the stability at +50 °C. Salts were tested as almost saturated solutions. All data are recommendations without warranty. 1 = usable, 2 = limited usage, 3 = not usable

Chemicals	Varispenser®		PP Adapter rings		
	20 °C	50 °C	20 °C	50 °C	
A					
Acetaldehyde	1	1	1	3	*1
Acetic acid 50 %	1	1	1	1	
Acetone *4	1	1	1	1	
Acetonitrile *4	1	1	2	3	*1
Acrylonitrile	1	1	2	3	*1
Adipic acid	1	1	1	1	
Allyl alcohol	1	1	1	1	
Aluminium chloride solution	1	1	1	1	
Aluminum hydroxide	1	1	1	1	
Amino acids	1	1	1	1	
Ammonium chloride solution	1	1	1	1	
Ammonium hydroxide ≤ 20 %	1	1	1	1	
Ammoniumfluoride	1	1	1	1	
n-Amyl acetate	1	1	2	3	
Amyl alcohol	1	1	1	1	
Amyl chloride	1	1	3	3	
Aniline	1	1	1	1	
B					
Barium chloride (BaCl ₂)	1	1	1	1	
Benzaldehyde	1	2	1	1	
Benzene	1	1	1	2	
Benzine	1	1	2	2	
Benzyl alcohol	1	1	3	3	
Boric acid ≤ 10 %	1	1	1	1	
n-Butanol	1	1	1	1	
n-Butyl acetate	1	1	2	2	

Chemicals	Varispenser®		PP Adapter rings		
	20 °C	50 °C	20 °C	50 °C	
C					
Calcium chloride	1	1	1	1	
Chloroacetic acid	1	1	1	1	
Chloroform *4 *5	2	2	3	3	
Chromic acid 10 %	1	1	1	1	
Chromic acid ≤ 50 % *2	1	1	2	2	*1
Chromic sulfuric acid, concentrated *2	1	1	3	3	*1
m- Cresol	1	1	1	2	*1
Cupric sulphate	1	1	1	1	
D/E					
Dibutyl phthalate	1	1	1	2	*1
Dichlorobenzene	1	1	2	3	*1
Dichlorethane (Ethyl dichloride) *4	1	1	2	3	
Diethylene glycol	1	1	1	1	
Diethyl ether *4	1	1	2	3	*1
Dimethylformamide	1	1	1	1	*1
1,4-Dioxan	1	1	2	2	*1
EDTA	1	1	1	1	
Ethanol 100 % (Ethyl alcohol)	1	1	1	1	
Ethyl acetate	1	1	1	1	
F/G					
Formaldehyde ≤ 40 %	1	1	1	1	
Formic acid 98–100 % *5	1	1	1	1	
Fuel oil	1	1	1	1	
Glycerol *3	1	1	1	1	
Glycol	1	1	1	1	

This information is valid for usage, only. Storage might lead to crystal formation. Please rinse device daily when chemical is subject to crystallization. The recommendations are carefully checked and correspond to the current state of knowledge. If you need statements for chemicals which are not given in the list, please do not hesitate to contact us.

Chemicals	Varispenser®		PP Adapter rings		
	20 °C	50 °C	20 °C	50 °C	
H/I/J					
Hexane	1	1	2	3	*1
Hydrochloric acid 35 % *4 *8	1	1	1	1	
Hydrochloric acid 37 % *4 *8	1	1	1	3	*1
Iodine-potassium iodide sol.	1	1	1	1	
Isobutanol (Isobutyl alcohol)	1	1	1	1	
Isopropanol (Isopropyl alcohol)	1	1	1	1	
L/M/N					
Lactic acid (Salts: Lactates)	1	1	1	1	
Magnesium chloride (MgCl)	1	1	1	1	
Mercury (I) chloride	1	1	1	1	
Methanol (Methyl alcohol) *4	1	1	1	1	
Methylisobutylketon	1	1	1	1	
Methyl propyl ketone	1	1	1	2	*1
Nitric acid ≤ 60 %	1	1	1	1	*1
Nitrobenzene	1	1	3	3	*1
O/P					
Octane/Iso octane	1	1	3	3	*1
Oil of turpentine	1	1	3	3	*1
Oxalic acid	1	1	1	1	
Perchloric acid ≤ 10 %	1	2	1	3	*1
Phenol (saturated aqueous solution)	1	1	1	1	
Phosphoric acid ≤ 85 %	2	3	1	1	
Potassium chloride	1	1	1	1	
Potassium hydroxide 50 % *8	1	2	1	1	
Potassium permanganate	1	1	1	1	
Propanol	1	1	1	1	
Propylene glycol	1	1	1	1	
Propylene oxide	1	1	1	1	
Pyridine	1	1	2	2	*1

Chemicals	Varispenser®		PP Adapter rings		
	20 °C	50 °C	20 °C	50 °C	
S					
Salicylaldehyde	1	1	1	1	
Salicylic acid	1	1	1	1	
SDS	1	1	1	1	
Silver acetate	1	1	1	1	
Silver nitrate	1	1	1	1	
Sodium acetate	1	1	1	1	
Sodium dichromate	1	1	1	1	
Sodium hydroxide 30 % *8	1	2	1	1	
Sulphuric acid 60 %	1	1	1	1	
Sulphuric acid ≤ 98 %	1	1	3	3	*1
T/U					
Tartaric acid	1	1	1	1	
Tenside (Tween®, Triton® X-, Brij®-dilutions) *6	1	1	1	1	
Toluene	1	1	2	3	*1
Triethylene glycol	1	1	1	1	
Tripropylenglycol	1	1	1	1	
Tris-HCl *5 *7	1	1	1	1	
Triton X-100	1	1	1	1	
Urea	1	1	1	1	
X					
Xylene	1 1		3 3		*1
Z					
Zinc chloride ≤ 10 %	1 1		1 1		
Zinc sulphate ≤ 10 %	1 1		1 1		

*1 ETFE adapter available
 *2 Pt-Ir can be easily loosened from the spring
 *3 Liquid with high viscosity
 *4 Liquid with high vapor pressure; gases leak (observe safety regulations)
 *5 Intensive cleaning is necessary after use
 *6 May lead to foam formation
 *7 Risk of crystallization; might attack sealing lip
 *8 Use of drying tube recommended

Ordering information

Description	Order no. international	Order no. North America
Varispenser® 2 , Bottletop dispenser, for external bottle threads of 45mm, complete with telescopic tube, tool, multiple adapters and media-specific fine adjustment. Quality certificate.		
Varispenser® 2x , same as Varispenser® 2, plus recirculation valve and valve toggle.		
Varispenser® 2 Size 1, 0.2–2 ml, included adapters: 25, 28, 32, 38, 40 mm	4966 000.010	4966000010
Varispenser® 2x Size 1, 0.2–2 mL, included adapters: 25, 28, 32, 38, 40 mm	4967 000.014	4967000014
Varispenser® 2 Size 2, 0.5–5 mL, included adapters: 25, 28, 32, 38, 40 mm	4966 000.029	4966000029
Varispenser® 2x Size 2, 0.5–5 ml, included adapters: 25, 28, 32, 38, 40 mm	4967 000.022	4967000022
Varispenser® 2 Size 3, 1–10 ml, included adapters: 25, 28, 32, 38, 40 mm	4966 000.037	4966000037
Varispenser® 2x Size 3, 1–10 ml, included adapters: 25, 28, 32, 38, 40 mm	4967 000.030	4967000030
Varispenser® 2 Size 4, 2.5–25 ml, included adapters: 25, 28, 32, 38, 40 mm	4966 000.045	4966000045
Varispenser® 2x Size 4, 2.5–25 ml, included adapters: 25, 28, 32, 38, 40 mm	4967 000.049	4967000049
Varispenser® 2 Size 5, 5–50 ml, included adapters: 32, 38, 40 mm	4966 000.053	4966000053
Varispenser® 2x Size 5, 5–50 ml, included adapters: 28, 40, 45 mm	4967 000.057	4967000057
Varispenser® 2 Size 6, 10–100 ml, included adapters: 32, 38, 40 mm	4966 000.061	4966000061
Varispenser® 2x Size 6, 10–100 ml, included adapters: 32, 38, 40 mm	4967 000.065	4967000065

About Eppendorf

Eppendorf is a leading life science company that develops and sells instruments, consumables, and services for liquid-, sample-, and cell handling in laboratories worldwide. Its product range includes pipettes and automated pipetting systems, dispensers, centrifuges, mixers, spectrometers, and DNA amplification equipment as well as ultra-low temperature freezers, fermentors, bioreactors, CO₂ incubators, shakers, and cell manipulation systems. Associated consumables like pipette tips, test tubes, microtiter plates, and disposable bioreactors complement the instruments for highest quality workflow solutions.

Eppendorf was founded in Hamburg, Germany in 1945 and has about 3,000 employees worldwide. The company has subsidiaries in 26 countries and is represented in all other markets by distributors.

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