Chemical Resistance

Data on the chemical resistancy for different materials

+GF+

GEORG FISCHER
PIPING SYSTEMS

Chemical resistance

Chemical resistance
General information regarding chemical resistance
Introduction
Plastic materials are now widely used in pipeline construction. Pipes made from plastics are used not only for drinking water, water for general use and waste water, but also for the conveyance of aggressive liquids and gases. Expensive pipe materials such as lined metal, ceramic or glass, have largely been replaced by plastic pipes. It is, however, important that the most suitable plastic material is selected for each application.

The Chemical Resistance List in this section serves as a useful guide in this respect. The list is periodically revised to include the latest findings. It contains all the plastics and elastomers in the GF product range which can come into direct contact with the media. The information is based on experiments, immersion and, when available, on data from tests which include temperature and pressure as stress factors. The results achieved in immersion experiments cannot be applied without reservation to pipes under stress, i.e. internal pressure, as the factor stress corrosion cracking is often not taken into consideration. In certain cases it can be of advantage to test the suitability under the planned working conditions. The tests referred to have been carried out partly by GF and partly by the Internal Standardisation Organisation (ISO) or national standards organisations.

Pure chemicals were used for the tests. If a mixture of chemicals is to be conveyed in practice, this may affect the chemical resistance of the plastic. It is possible in special cases to carry out appropriate tests with the specific mixture. Suitable test equipment is available at GF for this purpose, which we regard as part of our service to the customer. We are always willing to give individual advice at any time. In this connection it is worth mentioning that GF already possesses information concerning the behaviour towards plastics of a number of chemicals or mixtures of chemicals which are not yet included in this list.

Instructions for the use of the chemical resistance list
General
Following the assertions outlined in the introduction the attached list should be regarded as a valuable tool for finding the most suitable material for a given application. Note: The list has been compiled based on ideal and mostly simplified conditions of laboratory testing; real life and field applications are subjected to working conditions that might be defined by more complex factors. Consequently any statement quoted in our chemical resistance list should be regarded as a guiding value.

In particular, we would like to emphasize that such a list - by nature - cannot supply the following information:

- All relevant details of the respective experiment that has been the source for a given set of data
- Possible influence of dynamic effects
- Long-term effects
- Possible influence due to the method of processing, the thermal history as well as the exact formulation of the respective samples
- Behaviour of mixtures of different media or effects based on discontinuous service
- (Detailed) characterisation of the corrosion phenomenon / deterioration observed
- Derivation of the max. applicable service pressure
- Consideration of all chemicals

Contacting your GF representative
Thus, if it comes to material decisions and there is a need for selecting the proper polymer (grade), please do not hesitate to contact GF; based on decades of practical experience with polymer piping systems applied in industry and chemical engineering, GF has acquired an outstanding knowledge in: .

- Practical field testing, case studies
- Theoretical background (corrosion science, polymer formulations, possible influences of processing, etc.)
- Relevant literature

Apart from that, GF is a very active member in a global network for all aspects of corrosion regarding polymers; all this enables us to support the individual enquiries of our customers efficiently.

However, we cannot exclude situations where the stock of available data will not completely answer a customer’s enquiry. In such cases, a simple laboratory test installation under field test conditions is strongly recommended.

The data are provided as is and there is no warranty or representation, neither express nor implied, that they are free from errors. We shall not be liable for any damages of any kind that may result from the use of this data.

Classification

The customary classifications:

- resistant
- conditionally resistant and
- not recommended

are depicted by the signs: **+**, **0** and **-**, which allow simple presentation and application. These classifications are defined as:

Resistant: +

Within the acceptable limits of pressure and temperature the material is unaffected or only insignificantly affected.

Conditionally resistant: 0

The medium can attack the material or cause swelling. Restrictions must be made as regards pressure and/or temperature, taking the expected service life into account. The service life of the installation can be noticeably shortened. Further consultations with GF are recommended in any case.

Not recommended: -

The material cannot be used with the medium at all, or only under special conditions.

Solvent cement joints with Tangit/Dytex

Solvent cement joints on ABS, PVC-U or PVC-C made with Tangit cement are generally as resistant as the material of the piping system itself.

The use of Dytex solvent cement is recommended for cement jointing of PVC-U or PVC-C in connection with the following acids:

Medium	Up to % concentration
Sulphuric acid	≥ 70 % H_2SO_4
Chromic-sulphuric acid mixture	≥ 70 % H_2SO_4 + 5 % $K_2Cr_2O_7$ / $Na_2Cr_2O_1$
Chromic acid	≤ 10 % CrO_3
Hydrochloric acid	≥ 25 % HCl
Nitric acid	≥ 20 % HNO_3
Sodium hypochlorite (potassium hypochlorite)	≥ 6 % NaOCl
Hydrogen peroxide	≥ 5 % H_2O_2
Hydrofluoric acid	≥ 0% HF

For all the media mentioned above in lower concentrations, Tangit solvent cement should be used.

Due to the effects of these acids on the pipe material, we recommend using pipes with a pressure rating PN 16. For the expected life time and compressive strength, please contact your GF representative.

Attention! Usually the allowable pressure must be decreased by one pressure rating (thus PN16 to PN10).

When using Dytex in PVC-C piping construction with the above mentioned acids, the pressure and temperature requirements for PVC-U must be adhered to.

Because Dytex is not gap-filling, a special cement jointing procedure is required and is described in the chapter on jointing technology.

Fusion joints

In the case of PE, PP and PVDF (SYGEF®) heat fusion joints have practically the same chemical resistance as the respective material. In conjunction with media which could cause stress cracking, the fused joints can be subjected to an increased risk due to residual stress from the jointing process. In such cases a professionally executed welding is absolutely necessary. The sensitivity against tension fracture formation can be reduced substantially by a thermal retreatment (tempering).

Sealing materials

Depending upon the working conditions and the stress involved, the life span of the sealing materials can differ from that of the pipeline material. Seals in PTFE, which is not included in this list, are resistant to all the chemicals listed. The greater permeability of PTFE should, however, be considered. Under certain working conditions, for example when conveying highly aggressive media such as hydrochloric acid, this material characteristic must be taken into account.

General summary and limits of applications

The following table includes all the materials contained in the GF product range, and their abbreviations. The summary gives preliminary information regarding the general behaviour of the materials and the temperature limits.

Abbreviation	Material	Remarks	Maximum permissible temperature	
			Constant	Short term
PTFE	Polytetrafluoro-ethylene (e.g. Teflon®)	Resistant to all chemicals in this list	250 °C	300 °C
NBR	Nitrile Rubber	Good resistance to oil and petrol. Unsuitable for oxidising media	90 °C	120 °C
EPDM	Ehtylene Propylene Rubber	Good resistance to ozone and weather. Especially suitable for aggressive chemicals. Unsuitable for oils and fats	90 °C	120 °C
CR	Chloroprene Rubber (e.g. Neoprene®)	Chemical resistance very similar to that of PVC-U and between that of Nitrile and Butyl Rubber	80 °C	110 °C
FPM FFKM	Fluorine Rubber (e.g. Viton®, Kalrez®)	Has best chemical resistance to solvents of all elastomers	150 °C	200 °C
CSM	Chlorine sulphonyl Polyethylene (e.g. Hypalon®)	Chemical resistance similar to that of EPDM	100 °C	140 °C

Compressible media

When defining allowable operating conditions, special care is required in choosing chemically resistant piping and sealing materials when transporting compressible operating media (gases) or solutions of gases in fluids which have low boiling points (high vapour pressures) through plastic piping systems.

Suitable materials for compressible media are those that under standard conditions and at low temperatures do not tend toward brittle fractures owing to their ductility. Such materials include polyethylene (PE) and acrylonitrile-butadiene-styrene (ABS). All other raw materials such as polypropylene (PP-H), polyvinyl chloride (PVC-U/-C) or polyvinyliden fluoride (PVDF) are to be limited to ≤ 0.1 bar with respect to the operating pressure of gases. Higher pressures are possible if secondary containment piping systems are used (for environmental protection, brittle effects, gas shocks, intoxication)

For low boiling point fluids, such as liquid gas or solutions of gases in liquids, for example, hydrochloric acid, the associated vapour pressure of the media has to be taken into account. Furthermore, outgassing (due to changes in the media composition) or vaporisation (due to an inadmissible, high pressure increase) are to be prevented by relevant limitation of the operating temperature or by preventing the vapour pressure from exceeding the operational pressure. It is important to point out that, in such cases of leakage, the sudden escape of large gas or vapour volumes is to be considered a dangerous condition.

Relatively high flow velocities must be assumed when transporting humid gases (aerosols) or following pressure drops in plastic piping systems carrying fluids having high vapour pressures. These can cause the development of high levels of electrostatic charge. Such a condition exhibits an additional source of danger if flammable media or mixtures which can explode when mixed with air are involved.

Note: This document contains no notice of guarantees, rather serves only to provide technical information. We refer to our General Sales Terms. Subject to change without notice.

List of chemical resistance

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Acetaldehyde	CH_3-CHO		40 %, aqueous solution	20 40 60 80 100 120 140	O - 	- 	- 	+ + O 	+ O O O - 	- 	+ O O O 	+ + O - 	- 	+ + O - 	+ + O O
Acetaldehyde	CH_3-CHO	21	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ O 	O - 	- 	+ O - 	O - 	- 	- 	O -
Acetic acid	CH_3COOH		50 %, aqueous	20 40 60 80 100 120 140	+ + O 	+ 	- 	+ + + 	+ + + 	+ + + O O 	+ O 	O 	- 	O 	O
Acetic acid	CH_3COOH	118	technically pure, glacial	20 40 60 80 100 120 140	O - 	- 	- 	+ + O 	+ + O - 	+ O - 	+ O 	- 	- 	O 	O
Acetic acid anhydride	$(CH_3\text{-}CO)_2O$	139	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ O 	+ O 	- 	O 	- 	- 	- 	+
Acetic acid ethylester	$CH_3COOC_2H_5$	77		20 40 60 80 100 120 140	- 	- 	- 	+ 	+ 	+ 	+ 	O 	O 	O 	O
Acetic acid isobutyl ester	$(CH_2)_2\text{-}CH\text{-}(CH_2)_2\text{-}CO_2H$	117	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ 	+ 	+ 	+ 	- 	- 	- 	+
Acetone	$CH_3\text{-}CO\text{-}CH_3$		up to 10 %, aqueous	20 40 60 80 100 120 140	- 	- 	O 	+ + + 	+ + + 	O O O 	+ + + 	O O - 	- 	+ O - 	O O O
Acetone	$CH_3\text{-}CO\text{-}CH_3$	56	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ + + 	+ + + 	- 	+ + + 	- 	- 	- 	O O O

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Acetonitrile	CH_3CN	82	100 %	20 40 60 80 100 120 140	- 	- 	- 	O 	O 	- 	O 	- 	O 	O 	O
Acetophenone	CH_3-CO-C_6H_5	202	100 %	20 40 60 80 100 120 140	- 	- 	- 	O 	O 	- 	+ 	- 	- 	- 	+
Acrylic acid methyl ester	CH_2=CHCOOCH_3	80	technically pure	20 40 60 80 100 120 140	- 	- 	- 	O 	- 	O 	O 				
Acrylicethyl	CH_2=COOC_2H_5	100	technically pure	20 40 60 80 100 120 140	- 	- 	- 	O 	- 	O 	O 	- 	- 	O 	O
Acrylonitrile	CH_2=CH-CN	77	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ + + 	+ O 	- 	+ + O 	O O - 	- 	+ + + 	O O -
Adipic acid	HOOC-$(CH_2)_4$-COOH	Fp., 153	saturated, aqueous	20 40 60 80 100 120 140	+ + - 	+ + + + 	- 	+ + + 	+ + + + 	+ + + + 	+ + + 	+ + + 	+ + + 	+ + + 	+ + +
Allyl alcohol	H_2C=CH-CH_2-OH	97	96 %	20 40 60 80 100 120 140	O - 	O 	- 	+ + + 	+ + O 	 	+ + O - 	O - 	+ + + + 	O - 	+ + + -
Aluminium salts, aqueous, inorganic	$AlCl_3$, $Al(NO_3)_3$, $Al(OH)_3$, $Al(SO_4)_3$		saturated	20 40 60 80 100 120 140	 	+ + + 	 	 	 	+ + + + 	 	 	 	 	
Ammonia	NH_3	-33	gaseous, technically pure	20 40 60 80 100 120 140	+ + + 	- 	- 	+ + + 	+ + + 	+ + + + - 	+ 	+ O 	+ 	+ 	+

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Ammonium acetate	CH_3COONH_4		aqueous, all	20 40 60 80 100 120 140	+ + O	+ + +	O	+ + +	+ + + +	+ + + + +	+ + + O	+ + +	+ O	+ + O	+ +
Ammonium persulphate	$(NH_4)_2S_2O_8$			20 40 60 80 100 120 140	+ + O	+ O O O		+	O	+ + + + +	+	+	O	+	+
Amonium salts, aqueous, inorganic			saturated	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + +	+ + + + +	+ + +	+ + + +	+ + +	+ + +	+ + +
Amyl acetate	$CH_3(CH_2)_4$-$COOCH_3$	141	technically pure	20 40 60 80 100 120 140	-	-	-	+ + +	O O -	+ O O	O	-	-	-	-
Amyl alcohol	$CH_3(CH_2)_3$-CH_2-OH	137	technically pure	20 40 60 80 100 120 140	+ + O	-	-	+ + +	+ + + +	+ + + + O	+ + +	O	+ + +	+ + +	O
Aniline	$C_6H_5NH_2$	182	technically pure	20 40 60 80 100 120 140	-	-	-	+ O	+ + O	+ O -	+ + +	O O O	-	-	-
Antimony trichloride	$SbCl_3$		90 %, aqueous	20 40 60 80 100 120 140	+ +	+ + +	-	+ + +	+ + +	+ + +	+	+	-	+	+
Aqua regia	HNO_3+HCl		mixing ratio	20 40 60 80 100 120 140	+ O	+	-	-	-	O	-	O	-	-	O
Arsenic acid	H_3AsO_4		80 %, aqueous	20 40 60 80 100 120 140	+ + O	+ + + +	+ + +	+ + +	+ + + +	+ + + + + +	+ + + +	+ + + + +	+ + + + O	+ + + +	+ + + +

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Barium salts, aqueous, inorganic			saturated	20 40 60 80 100 120 140	+ + +	+ + + +	+	+ + +	+ + + +	+ + + + +	+ + +	+ + + + +	+ +	+	+	
Beer			usual commercial	20 40 60 80 100 120 140	+	+	+	+	+	+		+	+	+	+	
Benzaldehyde	C_6H_5-CHO	180	saturated, aqueous	20 40 60 80 100 120 140	-	-	-	+ + O	+ O	+ O -	+ + O	+ + +	O	-	-	
Benzene	C_6H_6	80	technically pure	20 40 60 80 100 120 140	-	-	-	O O	O -	+ O -	-	+	O	-	-	
Benzene sulfonic acid	$C_6H_5SO_3H$		technically pure	20 40 60 80 100 120 140	+	+		+ + O	+ + O	+ + + + +	+ + O	+ +				
Benzine (Gasoline)	C_5H_{12} to $C_{12}H_{26}$	80-130	free of lead and aromatic compounds	20 40 60 80 100 120 140	+ +	+ +	-	+ +	O	+ +	-	+ +	+ +	-	O -	
Benzoic acid	C_6H_5-COOH	Fp., 122	aqueous, all	20 40 60 80 100 120 140	+ + O	+ + + O	+ +	+ + +	+ + + + +	+ + + + +	+ +	+ + + + O	+	+	+	
Benzyl alcohol	C_6H_5-CH_2-OH	206	technically pure	20 40 60 80 100 120 140	O	-	-	+ + O	+ + O	+ + O -	+ + O	+	-	+ + +	O	
Beryllium salts, aqueous, inorganic				20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + + +	+ + +	+ + + +	+	+	+	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Borax	$Na_2B_4O_7$		aqueous, all	20 40 60 80 100 120 140	+ + O	+ + + +	+ +	+ + +	+ + + + +	+ + + + +	+ + +	+ + + +	+ + +	+ + +	+ + O
Boric acid	H_3BO_3		all, aqueous	20 40 60 80 100 120 140	+ + O	+ + + +	+ + +	+ + +	+ + + + +	+ + + + + +	+ + +	+ + + +	+ + +	+ + +	+ + +
Brine, containing chlorine	$NaCl\text{-}Cl_2$		depressurised with GFK-reinforcing up to 95 °C	20 40 60 80 100 120 140	+ + +	+ + + +	-	+	O	+ + O	O	+	O	O	O
Bromine water	$Br\text{-}H_2O$		saturated, aqueous	20 40 60 80 100 120 140	+	O	-	-	-	+	-	+	-	-	-
Butadiene	$H_2C=CH\text{-}CH=CH_2$	-4	technically pure	20 40 60 80 100 120 140	+	+	-	O	O	+	-	+	O	-	-
Butane	C_4H_{10}	0	technically pure	20 40 60 80 100 120 140	+	+	+	+	+	+	-	+	O	O	O
Butanediol	$HO\text{-}(CH_2)_4\text{-}OH$	230	aqueous, 10 %	20 40 60 80 100 120 140	+ O	+ +	-	+ + +	+ + +		+ + +	+ + +	+ + +	O -	+ + +
Butanol	C_4H_9OH	117	technically pure	20 40 60 80 100 120 140	+ + O	-	-	+ + +	+ + O -	+ + + + O	+ + +	+ O -	+ + +	+ + O	+ + +
Butyl acetate	$CH_3COO(CH)_3CH_2CH_2CH_3$	126	technically pure	20 40 60 80 100 120 140	-	-	-	+	O	+ O -	+ -	O -	-	O -	O -

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Butyl phenol, p-tertiary	$(CH_3)_3C\text{-}C_6H_4\text{-}OH$	237	technically pure	20 40 60 80 100 120 140	O - 	O - 	-	O 	+ 	+ + + + 	- 	O 	- 	- 	- 	
Butylene glycol	$HO\text{-}CH_2\text{-}CH{=}CH\text{-}CH_2\text{-}OH$	235	technically pure	20 40 60 80 100 120 140	+ + O 	+ + + 		+ + + 	+ + + 	+ + + + 	+ + + 	+ + O 	- 	+ + + 	O - 	
Butylene liquid	C_4H_8	51	technically pure	20 40 60 80 100 120 140	+ 			- 	- 	+ 	O 	+ 	+ 	+ 	O 	
Butyric acid	$CH_3\text{-}CH_2\text{-}CH_2\text{-}COOH$	163	technically pure	20 40 60 80 100 120 140	+ 	+ 	-	+ 	+ 	+ 	O 	O 	- 	O 	O 	
Cadmium salts, aqueous, inorganic			≤ saturated acid	20 40 60 80 100 120 140	+ + + 	+ + + + 		+ + + 	+ + + 	 	+ + + 	+ + + + 	 	 	 	
Caesium salts, aqueous, inorganic			≤ Saturated acid	20 40 60 80 100 120 140	+ + + 	+ + + + 		+ + + 	+ + + + 	+ + + + + 	+ + + 	+ + + + 	+ 	+ 	+ 	
Calcium acetate	$(CH_5COO)_2Ca$		saturated	20 40 60 80 100 120 140	+ + + 	+ + + 		+ + + 	+ + + 	+ + + 	+ + + 	+ + + + 	+ 	+ 	+ 	
Calcium hydroxid	$Ca(OH)_2$	100	saturated, aqueous	20 40 60 80 100 120 140	+ + + 	O 		+ + + 	+ + + + 	O - 	+ + + + 	+ + + + + 	+ + O 	+ + + 	+ + + + + 	
Calcium lactate	$(CH_3COO)_2Ca$		saturated	20 40 60 80 100 120 140	+ + 	+ + 		+ + + 	+ + + + 	+ + + + + 	+ + + 	+ + + + 	+ 	+ 	+ 	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Calcium salts, aqueous, inorganic			≤ Saturated acid	20 40 60 80 100 120 140	+ + +	+ + + +	+ +	+ + +	+ + + +	+ + + + +	+ + +	+ + + +	+	+	+
Carbon dioxide	CO_2		technically pure, anhydrous	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + + +	+ + + +	+ + + +	+ + +	+ + +	+ + + +
Carbon tetrachloride	CCl_4	77	technically pure	20 40 60 80 100 120 140	-	-	-	-	-	+	-	+	-	-	-
Carbonic acid	H_2CO_3			20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + +	+ + + +	+ + +	+	+	+
Caro's acid	H_2SO_5			20 40 60 80 100 120 140	+	O				-		+			
Caustic potash solution (potassium hydroxide)	KOH	131	50 %, aqueous	20 40 60 80 100 120 140	+ + O	O		+ + +	+ + O	-	+ + + O	-	O -	O	+ O O -
Caustic soda solution	NaOH		50 %, aqueous	20 40 60 80 100 120 140	+ + +	O -		+ + +	+ + O	-	+ + +	-	O	-	+
Chloric acid	$HClO_3$		10 %, aqueous	20 40 60 80 100 120 140	+ + O	+ + +	-	+ +	-	+ +	+ + +	+ + +	-	-	+ + +
Chloric acid	$HClO_3$		20 %, aqueous	20 40 60 80 100 120 140	+ + O	+ + +	-	O	-	+	O O	+ + +	-	-	+ +

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Chlorine	Cl_2		moist, 97 %, gaseous	20 40 60 80 100 120 140	- 	+ + + + 	- 	- 	- 	- 	- 	+ 	- 	- 	O 	
Chlorine	Cl_2		liquid, technically pure, as double pipe system	20 40 60 80 100 120 140	- 	- 	- 	- 	- 	+ 	- 	O 	- 	- 	- 	
Chlorine	Cl_2		anhydrous, technically pure, as double pipe system	20 40 60 80 100 120 140	- 	- 	- 	O O - 	- 	+ + + + O 	O 	+ 	- 	- 	O 	
Chlorine water	Cl_2-H_2O		saturated	20 40 60 80 100 120 140	+ + O 	+ + O - 	O 	O O 	O 	O 	O 	+ 	- 	O 	- 	
Chloroacetic acid, mono	$ClCH_2COOH$		50 %, aqueous	20 40 60 80 100 120 140	+ + 	- 	- 	+ + O 	+ + O 	+ O - 	O 	- 	- 	- 	O 	
Chloroacetic acid, mono	$ClCH_2COOH$	188	technically pure	20 40 60 80 100 120 140	+ + O 	- 	- 	+ + O 	+ + O 	+ O 	O 	- 	- 	- 	O 	
Chlorobenzene	C_6H_5Cl	132	technically pure	20 40 60 80 100 120 140	- 	- 	- 	O 	O 	+ + O - 	- 	- 	- 	- 	O 	
Chloroethanol	$ClCH_2$-CH_2OH	129	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ + + 	+ + + 	+ O O - 	O 	- 	- 	- 	O 	
Chlorosulphonic acid	$ClSO_3H$	158	technically pure	20 40 60 80 100 120 140	O 	- 	- 	- 	- 	O - 	- 	- 	- 	- 	- 	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Chromic acid	CrO_3 H_2O		all, aqueous	20 40 60 80 100 120 140	O O	O	-	O	O	+ + + + O O		+ + O	-	-	O O O
Chromic acid + sulphuric acid + water	CrO_3 H_2SO_4 H_2O		50 g 15 g 35 g	20 40 60 80 100 120 140	+ + O	+ + O	-	-	-	+ + O	O O	+ +	-	-	O O
Chromium (II) - salts, aqueous, inorganic			≤ Saturated acid	20 40 60 80 100 120 140	+ + +					+ + + + +					
Compressed air, containing oil				20 40 60 80 100 120 140	-	-	-	+ +	O	+ + +	-	+	+	+	+
Copper salts, aqueous inorganic			≤ Saturated acid	20 40 60 80 100 120 140	+ + O	+ + + +	+ + +	+ + +	+ + + +	+ + + + +	+ +	+ + + +	+ + O	+ + +	+ + O
Cresol	HO-C_6H_4-CH_3		cold saturated, aqueous	20 40 60 80 100 120 140	O	-	-	+ + O	+ O	+ O O O	O	+ +	O O	-	O
Crotonic aldehyde	CH_3-CH=CH-CHO	102	technically pure	20 40 60 80 100 120 140	-	-	-	+	+	+ O -	+	+	+	+	+
Cyclohexane	C_6H_{12}	81	technically pure	20 40 60 80 100 120 140	-	-	-	+ + +	+	+ + + +	-	+	+	-	-
Cyclohexanol	$C_6H_{12}O$	161	technically pure	20 40 60 80 100 120 140	+ + +	+ + + O	-	+ + +	+ + O	+ + O O -	-	+	O	+	+

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Cyclohexanone	$C_6H_{10}O$	155	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ O O 	+ O O 	+ O - 	O 	- 	- 	- 	-
Dextrine	$(C_6H_{10}O_5)n$		usual commercial	20 40 60 80 100 120 140	+ + + 	+ + + + 	+ + + 	+ + + 	+ 	+ + + + + + +	+ + + 	+ + + 	+ + + 	+ + + 	+ + +
Di isobutyl ketone	$[(CH_3)_2CHCH_2]_2CO$	124	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ O 	+ O 	+ O 	O O 	- 	- 	- 	-
Dibrombenzene	$C_6H_5Br_2$		≤ Saturated acid	20 40 60 80 100 120 140	- 	- 	- 	O 	O 	+ 	O 	+ 	- 	- 	-
Dibuthyl ether	$C_4H_9OC_4H_9$	142	technically pure	20 40 60 80 100 120 140	- 	- 	- 	O 	O 	+ 	- 	+ 	+ 	- 	O
Dibutyl phthalate	$C_6H_4(COOC_4H_9)_2$	340	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ O O 	+ O O 	+ + O 	O 	O 	- 	- 	-
Dichloroacetic acid	$Cl_2CHCOOH$		50 %, aqueous	20 40 60 80 100 120 140	+ + O 	- 	- 	+ + O 	+ + O 	+ O 	+ + + 	O O - 	- 	+ 	O
Dichloroacetic acid	$Cl_2CHCOOH$	194	technically pure	20 40 60 80 100 120 140	+ + O 	- 	- 	+ + O 	+ + O 	+ O 	+ + + 	O - 	- 	- 	O -
Dichloroacetic acid methyl ester	$Cl_2CHCOOCH_3$	143	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ + + 	+ + + 	O 	+ + O 	- 	- 	- 	+ + O

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Dichlorobenzene	$C_6H_4Cl_2$	180	technically pure	20 40 60 80 100 120 140	- 	- 	- 	O 	O 	+ 	O 	+ 	O 	O 	O 	
Dichloroethylene	ClCH=CHCl	60	technically pure	20 40 60 80 100 120 140	- 	- 	- 	- 	- 	+ + 	- 	O 	- 	- 	- 	
Diesel oil				20 40 60 80 100 120 140	+ + 	+ + 	- 	+ 	O 	+ + 	- 	+ + 	+ + 	O 	O - 	
Diethyl ether	H_5C_2-O-C_2H_5	35		20 40 60 80 100 120 140	- 	- 	- 	- 	- 	- 	- 	- 	- 	- 	- 	
Diethylamine	$(C_2H_5)_2NH$	56	technically pure	20 40 60 80 100 120 140	 	- 	- 	+ 	+ 	+ O - 	O 	- 	- 	- 	- 	
Dimethyl formamide	$(CH_3)_2CHNO$	153	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ + O 	+ + + 	- 	O 	- 	O 	+ 	+ 	
Dimethylamine	$(CH_3)_2NH$	7	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ 	- 	- 	O 	- 	- 	- 	- 	
Dioxane	$C_4H_8O_2$	101	technically pure	20 40 60 80 100 120 140	- 	- 	- 	+ + + 	O O O - 	- 	O 	- 	O 	- 	- 	
Ethanolamine	C_2H_7NO			20 40 60 80 100 120 140	- 	- 	- 	+ 	+ 	O 	+ 	O 	O 	O 	O 	

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Ethyl alcohol (Ethnause)	CH_3-CH_2-OH	78	technically pure, 96 %	20 40 60 80 100 120 140	+ + O	O	-	+ + +	+ + + +	+ O -	+ + +	+ O O	O	+	+	
Ethyl benzene	C_6H_5-CH_2CH_3	136	technically pure	20 40 60 80 100 120 140	-	-	-	O	O	O	-	+	-	-	-	
Ethyl chloride (G)	C_2H_5Cl	12	technically pure	20 40 60 80 100 120 140	-	-	-	O	O	O	-	O	-	-	-	
Ethyl ether	CH_3CH_2-O-CH_2CH_3	35	technically pure	20 40 60 80 100 120 140	-	-	-	+	O	+	-	-	-	-	-	
Ethylene diamine	H_2N-CH_2-CH_2-NH_2	117	technically pure	20 40 60 80 100 120 140	O	-	-	+ + +	+ + +	O O -	+	O O -	+ O -	+ O -	O O -	
Ethylene glycol	HO-CH_2-CH_2-OH	198	< 50 %	20 40 60 80 100 120 140	+ + +	O	O O	+ + +	+ + + +	+ + + + + +	+ + + +	+ + + O	+ + O	+ + O	+ + + O	
Ethylene glycol	HO-CH_2-CH_2-OH	198	technically pure	20 40 60 80 100 120 140	+ + +	O	-	+ + +	+ + + +	+ + + + + +	+ + + +	+ + + O	+ + O	+ + O	+ + + O	
Ethylenediamine-tetraacetic acid (EDTA)	$C_{10}H_{16}N_2O_8$			20 40 60 80 100 120 140				+	+	+	+					
Fluorine	F_2		technically pure	20 40 60 80 100 120 140	-	-	-	-	-	-	-	-	-	-	-	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Fluorosilicic acid	H_2SiF_6		32 %, aqueous	20 40 60 80 100 120 140	+ + +	+ + O		+ + +	+ + +	+ + + + +	+	O	O -	O -	+ O -
Formaldehyde	HCHO		40 %, aqueous	20 40 60 80 100 120 140	+ +	+ +		+ + +	+ +	+ + + +	+ + +	+ + +	+ + O	+ + O	+ + O
Formamide	$HCONH_2$	210	technically pure	20 40 60 80 100 120 140	-	-	-	+ + +	+ + +		+	O	+	+	
Formic acid	HCOOH		≤ 25 %	20 40 60 80 100 120 140	+ + +	+ + +		+ + +	+ + + +	+ + + +	+ + +				
Formic acid	HCOOH		up to 50 %, aqueous	20 40 60 80 100 120 140	+ + O	-	O	+ + +	+ + O	+ + + + +	+ + O	+ + O -	-	+ + O	+ + + O
Formic acid	HCOOH	101	technically pure	20 40 60 80 100 120 140	+ O -	-	-	+ + +	+ O -	+ + + + +	+ + O O	+	-	+ O -	+ + + O
Frigen 12 (Freon 12)	CCl_2F_2	-30	technically pure	20 40 60 80 100 120 140	+	-	-	-	-	O	O	O	O	+	O
Fuel oil				20 40 60 80 100 120 140	+ +	+ +	-	+	O -	+ +	-	+ +	+ +	O	O -
Furfuryl alcohol	$C_5H_6O_2$	171	technically pure	20 40 60 80 100 120 140	-	-	-	+ + +	+ O	+ + O -	O	-	-	O	O

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Gelatin			all, aqueous	20	+	+	+	+	+	+	+	+	+	+	+	
				40	+	+	+	+	+	+	+	+	+	+	+	
				60		+	+	+	+	+						
				80						+						
				100												
				120												
				140												
Glucose	$C_6H_{12}O_6$	Fp., 148	all, aqueous	20	+	+		+	+	+	+	+	+	+	+	
				40	+	+		+	+	+	+	+	+	+	+	
				60	O	+		+	+	+	+	+	+	+	+	
				80		+			+	+	+	+	+	+	+	
				100						+		+				
				120												
				140												
Glycerol	$HO\text{-}CH_2\text{-}CH(OH)\text{-}CH_2OH$	290	technically pure	20	+	+		+	+	+	+	+	+	+	+	
				40	+	+		+	+	+	O	+	+	+	+	
				60	+	+		+	+	+	O	O	+	+	+	
				80		+			+	+		-	O	+	+	
				100					+	+				O	O	
				120						+						
				140												
Glycin	$NH_2\text{-}CH_2\text{-}COOH$	Fp., 233	10 %, aqueous	20	+	+	+	+	+	+		+	+	+	+	
				40	+	+	+	+	+	+		+	O	+	O	
				60		+				+						
				80						+						
				100												
				120												
				140												
Glycolic acid	$HO\text{-}CH_2\text{-}COOH$	Fp., 80	37 %, aqueous	20	+	-		+	+	+		+	+	+	+	
				40				+		+						
				60				+		+						
				80						+						
				100						+						
				120												
				140												
Heptane	C_7H_{16}	98	technically pure	20	+	+	-	+	O	+	-	+	+	-	O	
				40	+	+		+		+		+	+		-	
				60												
				80												
				100												
				120												
				140												
Hexane	C_6H_{14}	69	technically pure	20	+	+	-	+	O	+	-	+	+	-	O	
				40	+	+		+		+		+	+		-	
				60												
				80												
				100												
				120												
				140												
Hydrazine hydrate	$H_2N\text{-}NH_2\text{-}H_2O$	113	aqueous	20	+	-	-	+	+	-	+	O	-	-	+	
				40				+	+							
				60				+	+							
				80												
				100												
				120												
				140												
Hydrochloric acid	HCl		up to 30 %, aqueous	20	+	+		+	+	+	+	+	-	-	+	
				40	+	+		+	O	+	+	+			O	
				60	+	+		+	O	+	O	O			-	
				80		+			-	+						
				100						+						
				120												
				140												

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Hydrochloric acid	HCl		38 %, aqueous	20 40 60 80 100 120 140	+ + +	+ + + O	-	+ +	O	+ + + + + +	+ O	+ +	-	-	+
Hydrocyanic acid	HCN	26	technically pure	20 40 60 80 100 120 140	+ + O	+ + +	-	+ + +	+ + +	+ + + +	+ O	+ O	O -	O -	+ O
Hydrofluoric acid	HF		40 %	20 40 60 80 100 120 140	+ O O	-	-	+ + O	+ + +	+ + + + +	-	+ + O	-	-	+ + O
Hydrogen	H_2	-25 3	technically pure	20 40 60 80 100 120 140	+ + +	+ + + +	+ + +	+ + +	+ + + + -	+ + + + +	+ + + +	+ + + + +	+ + + + +	+ + + +	+ + + +
Hydrogen chloride	HCl	-85	technically pure, gaseous	20 40 60 80 100 120 140	+ + O	+ + + O	-	+ + +	+ + +	+ + + + +	+ + +	+ + + +	O -	O -	O O -
Hydrogen peroxide	H_2O_2	105	30 %, aqueous	20 40 60 80 100 120 140	+	+	-	+	+	O	O	+	-	-	+
Hydrogen peroxide	H_2O_2	139	90 %, aqueous	20 40 60 80 100 120 140	+	-	-	O			-	O	-	-	O
Hydrogen sulphide	H_2S		saturated, aqueous	20 40 60 80 100 120 140	+ + O	+ + +		+ + +	+ + +	+ + + + +	+ -	+ + + O	- -	+ -	+ + O -
Hydrogen sulphide	H_2S		technically pure	20 40 60 80 100 120 140	+ + +	+ + +		+ + O	+ + +	+ + + + +	+ -	+ + O -	+ O -	O -	+ O O -

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Hydroquinone	$C_6H_4(OH)_2$		30 %	20	+	+		+	+		+					
				40	+	+		+	+							
				60				+	+							
				80					+							
				100												
				120												
				140												
Iodine-potassium iodide solution (Lugol's solution)	I-KI			20	+	-	-	+	+	+	+	+		O	O	
				40												
				60												
				80												
				100												
				120												
				140												
Iron salts, aqueous, inorganic			≤ Saturated acid	20	+	+	+	+	+	+	+	+	+	+	+	
				40	+	+		+	+	+	+	+				
				60	+	+		+	+	+	+	+				
				80		+			+	+	+	+				
				100						+		+				
				120												
				140												
Isooctane	$(CH_3)_3$-C-CH_2-CH-$(CH_3)_2$	99	technically pure	20	+	+	-	+	+	+		+	+	+	O	
				40												
				60												
				80												
				100												
				120												
				140												
Isopropyl alcohol (ESC)	$(CH_3)_2$-CH-OH	82	technically pure	20	+	-		+	+	+	+	+	+	+	+	
				40	+			+	+	+	+					
				60	O			O	O	+						
				80						O						
				100												
				120												
				140												
Isopropyl ether	$(CH_3)_2$-CH-O-CH-$(CH_3)_2$	68	technically pure	20	-	-	-	O	O	+	O	-	-	-	-	
				40												
				60												
				80												
				100												
				120												
				140												
Lactic acid	$CH_3CHOHCOOH$		10 %, aqueous	20	+	+	+	+	+	+	+	+	-	-	O	
				40	O	+	O	+	+	+	+	O			O	
				60	-	+	-	+	+	O	O	O			O	
				80		+			+	O	-	O				
				100						-						
				120												
				140												
Lead acetate	$Pb(CH_3COO)_2$		aqueous, saturated	20	+	+	+	+	+	+	+	+	+	+	+	
				40	+	+	+	+	+	+	+	+	+	+	+	
				60	+	+	+	+	+	+	+	+	+	+	+	
				80		+				+						
				100						+						
				120												
				140												
Lead salts, aqueous, inorganic			≤ Saturated acid	20	+	+		+	+	+	+	+	+	+	+	
				40	+	+		+	+	+	+	+				
				60	+	+		+	+	+	+	+				
				80		+				+						
				100						+						
				120												
				140												

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Linseed oil			technically pure	20	+			+	+	+	+	+	+	O	+
				40	+			+	+	+	+	+	+	-	O
				60	O			+	+	+	+	+	+		-
				80					+	+					
				100					+	+					
				120						+					
				140											
Lithium salts, aqueous, inorganic			≤ Saturated acid	20	+	+		+	+	+	+	+		+	+
				40	+	+		+	+	+	+	+			
				60	+	+		+	+	+	+	+			
				80		+			+	+		+			
				100						+					
				120											
				140											
Magnesium salts, aqueous, inorganic			≤ Saturated acid	20	+	+		+	+	+	+	+	+	+	+
				40	+	+		+	+	+	+	+	+	+	+
				60	O	+		+	+	+	+	+	+	+	+
				80		+			+	+	+	+			+
				100					+	+		+			
				120						+					
				140											
Maleic acid	$(CH\text{-}COOH)_2$	Fp., 131	cold saturated, aqueous	20	+	+		+	+	+	+	+	-	-	-
				40	+	+		+	+	+	+	+			
				60	O			+	+	+	+	+			
				80						+		-			
				100						+					
				120						+					
				140											
Mercury	Hg	357	pure	20	+	+	+	+	+	+	+	+	+	+	+
				40	+			+	+	+	+	+	+	+	+
				60	+			+	+	+	+	+	+	+	+
				80						+		+			
				100						+					
				120						+					
				140											
Mercury salts			≤ saturated	20	+	+		+	+	+	+	+	O	O	O
				40	+	+		+	+	+	+	+	O	O	O
				60	O	+		+	+	+	+	+	-	-	-
				80					+	+		+			
				100						+					
				120											
				140											
Methane (natural gas)	CH_4	-161	technically pure	20	+	+	+	+	+	+		+	+	-	-
				40											
				60											
				80											
				100											
				120											
				140											
Methanol	CH_3OH	65	all	20	+	-	-	+	+	+	+	O	+	+	+
				40	+			+	+	O	+	O	+	+	+
				60	O			+	+	-	+	O	+	O	+
				80											
				100											
				120											
				140											
Methyl acetate	CH_3COOCH_3	56	technically pure	20	-	-	-	+	+	+	+	-	-	-	-
				40											
				60											
				80											
				100											
				120											
				140											

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Methyl amine	CH_3NH_2	-6	32 %, aqueous	20	O	-	-	+	+	-	+	-	-	+	+	
				40						-						
				60												
				80												
				100												
				120												
				140												
Methyl bromide	CH_3Br	4	technically pure	20	-	-	-	O	-	+	-	O	-	-	O	
				40						+						
				60						+						
				80												
				100												
				120												
				140												
Methyl ethyl ketone	$CH_3COC_2H_5$	80	technically pure	20	-	-	-	+	+	-	+	-	-	-	-	
				40												
				60												
				80												
				100												
				120												
				140												
Methyl isobutyl ketone	$C_6H_{12}O$	116		20	-	-	-	+	+	-	+	-	-	-	-	
				40												
				60												
				80												
				100												
				120												
				140												
Methyl methacrylate	$C_5H_8O_2$			20	-	-	-	+	+	+	+	-	-	-	-	
				40												
				60												
				80												
				100												
				120												
				140												
Methyl phenyl ketone (Acetophenon)	C_8H_8O	202		20	-	-	-	+	+	-	+	-	-	-	-	
				40												
				60												
				80												
				100												
				120												
				140												
Milk				20	+	+	+	+	+	+		+	+	+	+	
				40	+	+	+	+	+	+						
				60	+	+	+	+	+	+						
				80		+			+	+						
				100					+	+						
				120						+						
				140												
Mineral water				20	+	+	+	+	+	+	+	+	+	+	+	
				40	+	+	+	+	+	+	+	+	+	+	+	
				60	+	+	+	+	+	+	+	+	+	+	+	
				80		+			+	+	+	+	+		+	
				100					+	+	+	+			+	
				120						+		+				
				140												
Mixed acids				20	O	O	-	O	-	+	-	+	-	-	+	
- nitric	15 % HNO_3		3 parts	40						+		O			O	
- hydrofluoric	15 % HF		1 part	60						+						
- sulphuric	18 % H_2SO_4		2 parts	80												
				100												
				120												
				140												

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Mixed acids - sulphuric - nitric - water	H_2SO_4 HNO_3 H_2O		10 % 20 % 70 %	20 40 60 80 100 120 140	+ + +	+ + +	-	+	-	+ + + +	-	+ + +	-	O	+ O
Mixed acids - sulphuric - nitric - water	H_2SO_4 HNO_3 H_2O		50 % 33 % 17 %	20 40 60 80 100 120 140	+ O	+	-	-	-	+	-	+	-	-	O
Mixed acids - sulphuric - nitric - water	H_2SO_4 HNO_3 H_2O		50 % 31 % 19 %	20 40 60 80 100 120 140	+	O	-	-	-	+ +	-	+ +	-	O	O
Mixed acids - sulphuric - nitric - water	H_2SO_4 HNO_3 H_2O		10 % 87 % 43 %	20 40 60 80 100 120 140	-	-	-	-	-	O	-	-	-	-	-
Mixed acids - sulphuric - nitric - water	H_2SO_4 HNO_3 H_2O		48 % 49 % 43 %	20 40 60 80 100 120 140	+ O -	+	-	-	-	+ + +	-	+ + +	-	-	-
Mixed acids - sulphuric - phosphoric - phosphoric	H_2SO_4 H_3PO_4 H_2O		30 % 60 % 10 %	20 40 60 80 100 120 140	+ +	+ + +	-	+ + +	+ + +	+ + + +	+ + +	+ + +	-	+ O	+ O
N,N- Dimethylaniline	$C_6H_5N(CH_3)_2$	194	technically pure	20 40 60 80 100 120 140	-	-	-	+	+		+				
N- Methylpyrrolidon	C_5H_9NO	204		20 40 60 80 100 120 140	-	-	-	+	+	O	+	O			
Naphthalene	$C_{10}H_8$	218	technically pure	20 40 60 80 100 120 140	-	-		+	+	+	-	+	+	-	O

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Nickel salts, aqueous, inorganic			≤ Saturated acid	20 40 60 80 100 120 140	+ + O	+ + +		+ + +	+ + +	+ + + + +	+ + +	+ + + +	+ + +	+ + +	+ + +	
Nitrating acid	H_2SO_4 HNO_3 H_2O		65 % 20 % 15 %	20 40 60 80 100 120 140	+ O	O		-	-	+	-	+	-	-	-	
Nitric acid	HNO_3		6.3 %, aqueous	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + O	+ + + + +	+ O	+ + + O	-	-	+ O -	
Nitric acid	HNO_3		≤ 25 %	20 40 60 80 100 120 140	+ + +	+ + +	-	+ + O	+ O	+ + + + +	+	+ +				
Nitric acid	HNO_3		65 %, aqueous	20 40 60 80 100 120 140	O O -	+ +	-	O -	-	+ + + O -	-	+ O -	-	-	O -	
Nitric acid	HNO_3		85 %	20 40 60 80 100 120 140	-	-	-	-	-	+ +	-	+	-	-	-	
Nitric acid	HNO_3		100 %	20 40 60 80 100 120 140	-	-	-	-	-	-	-	-	-	-	-	
Nitrobenzene	C_6H_5-NO_2	209	technically pure	20 40 60 80 100 120 140	-	-	-	+	+	+	O	+	-	-	-	
Nitrotoluene (o-, m-, p-)	$C_7H_7NO_2$	222 - 238	technically pure	20 40 60 80 100 120 140	-	-	-	+ O	O -	+ + O -	-	O -	O -	-	-	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Nitrous acid	HNO_2			20 40 60 80 100 120 140	+ +	+ +	-	+	-	+ + +	+	+			
Nitrous gases (Nitric oxide)	NOx		diluted, moist, anhydrous	20 40 60 80 100 120 140	+	+	-	O	O	+	O	+	O	+	+
Oleic acid	$C_{17}H_{33}COOH$		technically pure	20 40 60 80 100 120 140	+ + +	O	-	+ + O	+ + O	+ + + + + +	-	+ O -	O -	-	-
Oleum	$H_2SO_4+SO_3$		10 % SO3	20 40 60 80 100 120 140	-	-	-	-	-	-	-	-	-	-	-
Olive oil				20 40 60 80 100 120 140	+ + +	-	-	+ + O	+ + + +	+ + + +	-	+ + + +	+ + +	+ + +	+ + O -
Oxygen	O_2		technically pure	20 40 60 80 100 120 140	+ + +	+ + +		+ + O	+ + O	+ + + + O O	+ + +	+ + + + + +	+	+ + + +	+ + + + +
Ozone	O_3		up to 2 %, in air	20 40 60 80 100 120 140	+	O	-	O	O	O	O	+	-	O	+
Ozone	O_3		cold saturated, aqueous	20 40 60 80 100 120 140	+	O	-	O	O	O	-	+	-	O	+
Palm oil, palm nut oil				20 40 60 80 100 120 140	+	O		+	+	+	-	+	+	+	O

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Paraffin emulsions			usual commercial, aqueous	20 40 60 80 100 120 140	+ 	+ 	 	+ 	+ 	+ 	- 	+ 	+ 	+ 	+ 	
Paraffin oil				20 40 60 80 100 120 140	+ 	+ 	O 	+ 	+ 	+ 	- 	+ 	+ 	+ 	O 	
Perchlorid acid	$HClO_4$		10 %, aqueous	20 40 60 80 100 120 140	+ 	+ 	 	+ 	+ 	+ 	+ 	+ 	- 	- 	+ 	
Perchlorid acid	$HClO_4$		70 %, aqueous	20 40 60 80 100 120 140	+ 	- 	- 	 	- 	O 	- 	+ 	- 	- 	+ 	
Perchloro-ethylene (Tetrachlorethylene)	$Cl_2C=CCl_2$	121	technically pure	20 40 60 80 100 120 140	- 	- 	 	O 	O 	+ + + O - 	- 	+ + + 	O - 	- 	- 	
Phenol	C_6H_5-OH	182	up to 10 %, aqueous	20 40 60 80 100 120 140	+ O 	O O 	- 	+ + O 	+ + + 	+ + + + + 	+ + O 	+ + + O 	- 	- 	- 	
Phenol	C_6H_5-OH		up to 90 %, aqueous	20 40 60 80 100 120 140	O 	- 	- 	+ + O 	+ + + 	+ + O 	- 	+ O - 	- 	- O 	- 	
Phosgene	$COCl_2$		gaseous, technically pure	20 40 60 80 100 120 140	+ O O 	- 	- 	O 	O 	+ + 	+ 	+ + O 	+ + + 	+ O - 	+ O 	
Phosgene	$COCl_2$	8	liquid, technically pure	20 40 60 80 100 120 140	- 	- 	- 	- 	- 	- 	- 	+ 	O 	+ 	+ 	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Phosphoric acid	H_3PO_4		85 %, aqueous	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + + + +	+ + O	+ + + + O	-	+ + O	+ O -
Phosphoric acid	H_3PO_4		up to 95 %	20 40 60 80 100 120 140	+ +	+ + +	-	+ +	+ +	+ + + +	O	+ + O	-	-	-
Phosphorous chlorides: - ..trichloride - ..pentachloride - ..oxichloride	PCl_3 PCl_5 $POCl_3$	175 162 105	technically pure	20 40 60 80 100 120 140	-	-	-	-	-	-		-	-	-	-
Photographic developer			usual commercial	20 40 60 80 100 120 140	+ + O	+ + + O	+ + O	+ + O	+ +	+ + +	+ +	+ +	O O	+ +	+ +
Photographic emulsions				20 40 60 80 100 120 140	+ +	+ + O	+ +	+ +	+ +	+ + +	+ +	+ +	O	+ +	+ +
Photographic fixer			usual commercial	20 40 60 80 100 120 140	+ + O	+ + +	+ + O	+ +	+ +	+ + +	+ +	+ +	+ +	+ +	+ +
Phthalic acid	$C_6H_5(COOH)_2$	Fp., 208	saturated, aqueous	20 40 60 80 100 120 140	+ O -	-	-	+ + +	+ + +	+ + + + +	+ O	-	-	+ + O	+ +
Potassicim hydroxide	KOH		50 %	20 40 60 80 100 120 140	+ + +	O		+ + +	+ + O	-	+ + +	-	O	O	+
Potassium aluminium salts (alum), aqueous, inorganic	$KAl(SO_4)_2$		≤ Saturated acid	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + + +	+ + + +		-	+	+

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Potassium persulphate (Potassium Peroxidsulfate)	$K_2S_2O_8$		all, aqueous	20 40 60 80 100 120 140	+ + O	+ + +		+ + +	+ + +	+ + + +	+ +	+ + + +	-	+	+	
Potassium-hypochlorite	KOCl			20 40 60 80 100 120 140	+ O	O		O	O	O	+	O	O	O	O	
Propane	$H_3C\text{-}CH_2\text{-}CH_3$		technically pure, gaseous	20 40 60 80 100 120 140	+	+		O	+	+		+	O	O	O	
Propane	$H_3C\text{-}CH_2\text{-}CH_3$	-42	technically pure, liquid	20 40 60 80 100 120 140	+	-		+	+	+		+	O	O	O	
Propanol, n- and iso-	C_3H_7OH	97 bzw . 82	technically pure	20 40 60 80 100 120 140	+ O O	-		+ + O	+ + O	+ + + O	+ + O	+	+	+	+	
Propionic acid	CH_3CH_2COOH	141	50 %, aqueous	20 40 60 80 100 120 140	+ + O	O	-	+ + +	+ + +	+ + +	+ +	O	-	O -	O -	
Propionic acid	$H_3C\text{-}CH_2\text{-}COOH$	141	technically pure	20 40 60 80 100 120 140	+ O	O	-	+ O O	+ O O	+ + +	+ O	+ + + O	-	-	-	
Propylene glycol	$C_3H_8O_2$		< 50 %	20 40 60 80 100 120 140	+ + +	-		+ + +	+ + +	+ + +	+ +	+ + O	+ O -	+ +	+ + +	
Propylene glycol	$C_3H_8O_2$	188	technically pure	20 40 60 80 100 120 140	+ + +	+	+	+ + +	+ + + +	+ + + + +	+ + +	+ + + O	+ + O	+ + O	+ + + O	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Pyridine	C_5H_5N	115	technically pure	20	-	-	-	+	O	+	O	-	-	-	-
				40				O	O	-					
				60				O	O						
				80											
				100											
				120											
				140											
Salicylic acid	$C_6H_4(OH)COOH$		saturated	20	+	+		+	+	+	+	+	+	+	+
				40	+			+	+	+	+				
				60	+			+	+	+	+				
				80						+					
				100											
				120											
				140											
Sea water				20	+	+	+	+	+	+	+	+	+	+	+
				40	+	+	+	+	+	+	+	+	+	+	+
				60	O	+	+	+	+	+	+	+	+	+	+
				80					+	+	+	+	+	O	O
				100					+	+	+	+	O	-	-
				120											
				140											
Silicic acid	$Si(OH)_4$			20	+	+		+	+		+	+	-	+	+
				40	+	+		+	+		+				
				60	+	+		+	+		+				
				80					+						
				100											
				120											
				140											
Silicone oil				20	+	+	+	+	+	+	+	+	+	+	+
				40	O	+		+	+	+	+	+	+	+	+
				60	-			+	+	+	+	+	+	O	
				80					+	+					
				100						+					
				120											
				140											
Silver salts, aqueous, inorganic			≤ Saturated acid	20	+	+	+	+	+	+	+	+	+	+	+
				40	+	+		+	+	+	+	+	+	+	+
				60	+	+		+	+	+	+	+	+	+	+
				80		+			+	+		+			
				100						+					
				120											
				140											
Sodium chlorite	$NaClO_2$		diluted, aqueous	20	+	O		O	O	O	O	+	-	O	+
				40											
				60											
				80											
				100											
				120											
				140											
Sodium hypochlorite	NaOCl		12.5 % active chlorine, aqueous	20	+	O	-	O	O	O	+	O	-	-	+
				40	+			O	O		+				
				60											
				80											
				100											
				120											
				140											
Sodium persulphate	$Na_2S_2O_8$		cold saturated, aqueous	20	+	+		+	+	+	+	+	-	+	+
				40	+	+		+	+	+	+	+			
				60	O	+		+	+	+		+			
				80						+		+			
				100											
				120											
				140											

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Sodium salts, aqueous, inorganic			≤ Saturated acid	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + + +	+ + +	+ + + +	+	+	+	
Stannous chloride	$SnCl_2$		cold saturated, aqueous	20 40 60 80 100 120 140	+ O O	+ + O	+ +	+ + +	+ + + +	+ + + + +	+ O -	+ + +	+ + O	+ + +	+ + +	
Starch solution	$(C_6H_{10}O_5)n$		all, aqueous	20 40 60 80 100 120 140	+ + +	+ + + +	+ +	+ + +	+ + +	+ + + + +	+ + +	+ + +	+ + +	+ + +	+ + +	
Styrene	H_5C_6-CH=CH_2	145		20 40 60 80 100 120 140	-	-	-			+		+				
Succinic acid	HOOC-CH_2-CH_2-COOH	Fp., 185	aqueous, all	20 40 60 80 100 120 140	+ + +	+ + +	+	+ + +	+ + +	+ + +	+ + +	+ + + +	+ + +	+ + +	+ + +	
Sulfurous acid	H_2SO_3		saturated, aqueous	20 40 60 80 100 120 140	+ + O	+ +		+ + +	+ + +	+ + + + +	+ -	+ + O -	-	-	O O -	
Sulfuryl chloride	SO_2Cl_2	69	technically pure	20 40 60 80 100 120 140	-	-	-	-	-	O		+	-	O	+	
Sulphur dioxide	SO_2		technically pure, liquid	20 40 60 80 100 120 140	-	-	-	-	-	-	-	O	-	-	O	
Sulphur dioxide	SO_2		all, moist	20 40 60 80 100 120 140	+ + O	+ +	-	+ + +	+ + +	+ + + + +	+ O -	+ O -	-	-	O -	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Sulphuric acid	H_2SO_4	195	up to 80 %, aqueous	20 40 60 80 100 120 140	+ + +	+ + + +	-	+ + O	+ + O	+ + + + + O	O O -	+ + O -	-	-	+ O -
Sulphuric acid	H_2SO_4		96 %, aqueous	20 40 60 80 100 120 140	+ + O	+ + +	-	-	-	-	-	+ + +	-	-	-
Sulphuric acid	H_2SO_4	340	98 %	20 40 60 80 100 120 140	+ O	+ + O	-	-	-	-	-	O	-	-	-
Tannic acid			all, aqueous	20 40 60 80 100 120 140	+	+ + +		+ + +	+ + +			+	+	+	+
Tetrachlorethylene see Perchloroethylene	$Cl_2C\text{-}CCl_2$	121		20 40 60 80 100 120 140	-	-	-	-	-	+	-	+			
Tetrachloroethane	$Cl_2CH\text{-}CHCl_2$	146	technically pure	20 40 60 80 100 120 140	-	-	-	O	O	+ + O	-	O	-	-	-
Tetraethylene lead	$(C_2H_5)_4Pb$		technically pure	20 40 60 80 100 120 140	+	+	-	+	+	+	O	+	+	O	+
Tetrahydrofurane	C_4H_8O	66	technically pure	20 40 60 80 100 120 140	-	-	-	O	O	-	O	-	-	-	-
Tin salts, aqueous, inorganic			≤ saturated acid	20 40 60 80 100 120 140	+ + +	+ + + +		+ + +	+ + + +	+ + + + +	+ + +	+ + + +	+	+	+

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Toluene	C_6H_5-CH_3	111	technically pure	20 40 60 80 100 120 140	-	-	-	O	O	+ 	-	+	-	-	-	
Trichloro-methane	$CHCl_3$	61	100 %	20 40 60 80 100 120 140						+ 		+				
Trichloroacetic acid	Cl_3-C-COOH		50 %, aqueous	20 40 60 80 100 120 140	+ O 	-	-	+ + + 	+ + O 	+ + O - 	O	-	-	-	-	
Trichloroacetic acid	Cl_3-C-COOH	196	technically pure	20 40 60 80 100 120 140	O	-	-	+ O - 	+ + O 	O 	O	-	-	-	-	
Trichloroethane	Cl_3-C-CH_3	74	technically pure	20 40 60 80 100 120 140	-	-	-	O	O	+ + 	-	+	-	-	-	
Trichloroethylene	Cl_2C=CHCl	87	technically pure	20 40 60 80 100 120 140	-	-	-	-	O	+ 	-	+	-	-	-	
Triethylamine	$N(CH_2$-$CH_3)_3$	89	technically pure	20 40 60 80 100 120 140	-	-	-	+	+	O - 	-	-	-	-	-	
Trifluoro acetic acid	F_3C-COOH		up to 50 %	20 40 60 80 100 120 140	-	-	-	+	+	+ O 	O	-	-	-	-	
Turpentine oil			technically pure	20 40 60 80 100 120 140	+ O 	-	-	O O 	-	+	-	+ + + 	O	-	-	

Aggressive media					Chemical resistance										
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM
Urea	$H_2N\text{-}CO\text{-}NH_2$	Fp., 133	up to 30 %, aqueous	20	+	+	+	+	+	+	+	+	+	+	+
				40	+	+	+	+	+	+	+	+	+	+	+
				60	O	+		+	+	+	+	+	+	+	+
				80		O				+					
				100						O					
				120											
				140											
Urine				20	+	+		+	+	+	+	+	+	+	+
				40	+	+		+	+	+	+	+	+	+	+
				60	O	+		+	+	+	+	+	+	+	+
				80						+					
				100						+					
				120											
				140											
Vinyl acetate	$CH_2=CHOOCCH_3$	73	technically pure	20	-	-	-	+	+	+	+	-	-	-	-
				40				+		-					
				60					O						
				80											
				100											
				120											
				140											
Vinyl chloride	$CH_2=CHCl$	-14	technically pure	20	-	-	-	-	-	+	-	+	-	-	
				40						+					
				60											
				80											
				100											
				120											
				140											
Waste gases containing - Alkaline				20	+	+		+	+	O	+	+	+	+	+
				40	+	+		+	+	O	+	+	+	+	+
				60	+	+		+	+	-	+	+	+	+	O
				80		+			+		+	O			-
				100								-			
				120											
				140											
Waste gases containing - Hydrochloric acid			all	20	+	+		+	+	+	+	+	O	+	+
				40	+	+		+	+	+	+	+	-	+	+
				60	+	+		+	O	+	+	+		+	+
				80		+				+	O	+			+
				100						+		+			
				120						+					
				140											
Waste gases containing - Hydrogen fluoride			traces	20	+	+		+	+	+	O	+	+	+	+
				40	+	+		+	+	+	O	+	O	+	+
				60	+	+		+	+	+	O	+	-	O	+
				80		+				+		+			
				100						+					
				120											
				140											
Waste gases containing - Nitrous gases			traces	20	+	+		+	O	+	+	+	O	+	+
				40	+	+		O	O	+	O	+	-	+	+
				60	+	+		O	O	+	O	+		O	+
				80		+				+	O	+			O
				100						+		O			
				120											
				140											
Waste gases containing - Sulphur dioxide			traces	20	O	O		+	+	+	+	+	O	+	+
				40	+	+		+	+	+	+	+	-	+	+
				60							+	+			
				80							+	+			
				100								+			
				120											
				140											

Aggressive media					Chemical resistance											
Medium	Formula	Boiling point °C	Concentration	Temperature °C	PVC-U	PVC-C	ABS	PE	PP-H	PVDF	EPDM	FPM	NBR	CR	CSM	
Water, drinking, chlorinated			≤ 0.1 ppm Cl2	20	+	+	+	+	+	+	+	+	+	+	+	
				40	+	+	+	+	+	+	+	+	+	+	+	
				60	+	+	+	+	+	+	O	+	+	+	+	
				80					+	+		+	O		+	
				100					+	+		+				
				120						+						
				140						+						
Water - distilled - deionised	H_2O	100		20	+	+	+	+	+	+	+	+	+	+	+	
				40	+	+	+	+	+	+	+	+	+	+	+	
				60	+	+	+	+	+	+	O	+	+	+	+	
				80		+			+	+	-	+	+		+	
				100					+	+		+	+			
				120						+		+				
				140						+						
Xylene	$C_6H_4(CH_3)_2$	138 - 144	technically pure	20	-	-	-	-	-	+	-	+	-	-	-	
				40						+		O				
				60						O		-				
				80						-						
				100												
				120												
				140												
Zinc salts, aqueous, inorganic			≤ Saturated acid	20	+	+	+	+	+	+	+	+				
				40	+	+		+	+	+	+	+				
				60	+	+		+	+	+	+	+				
				80		+			+	+		+				
				100						+						
				120												
				140												

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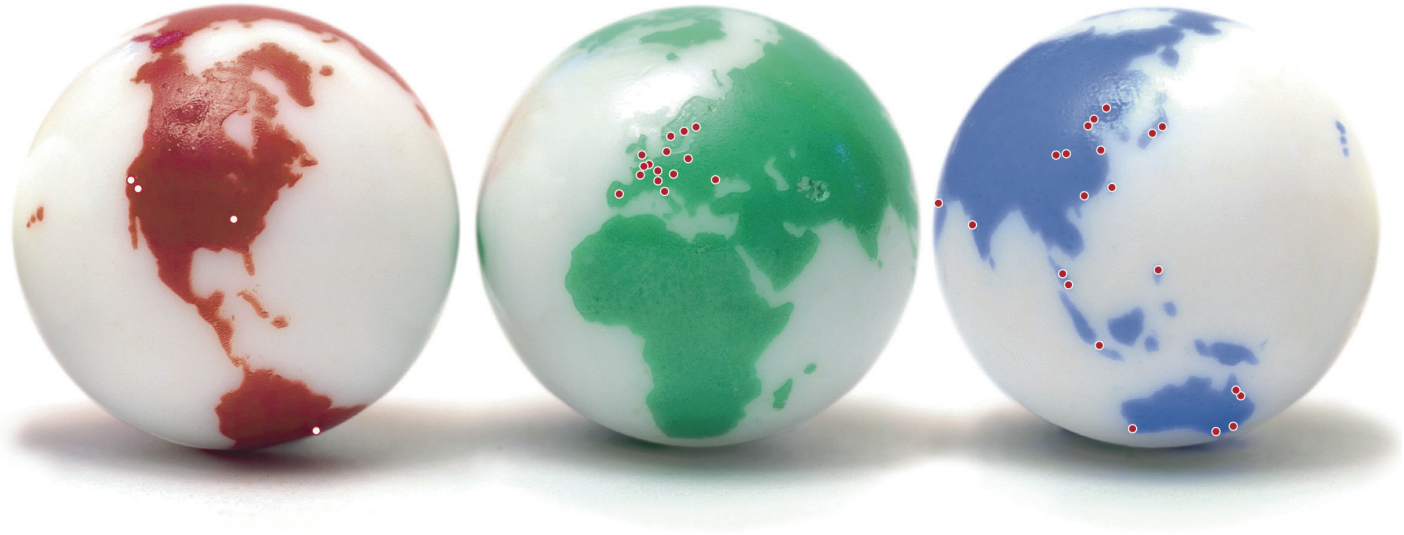

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GMST 5947/4 (06.06)

Printed in Germany

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