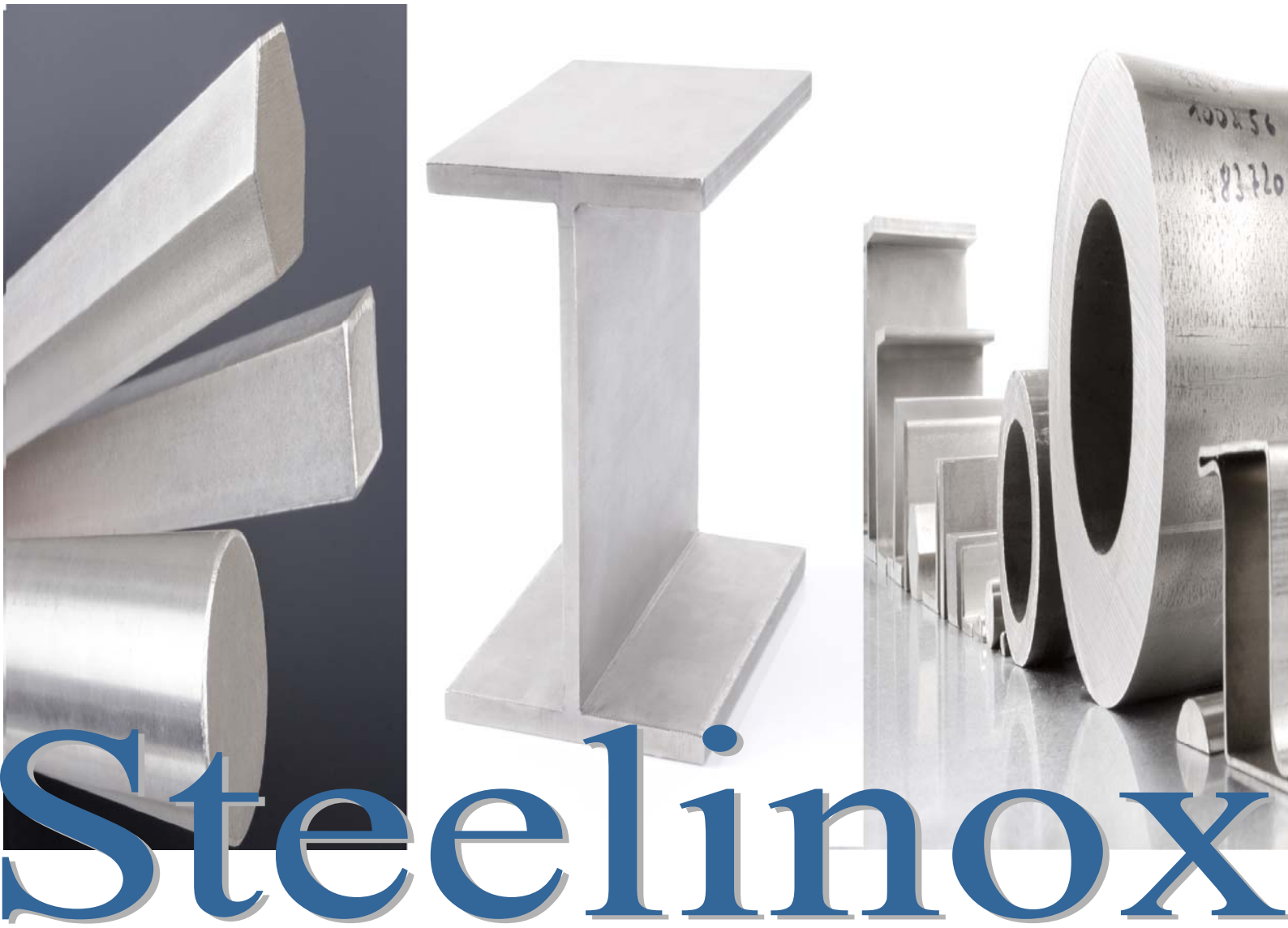
Chemical resistance of Stainless steel



Steelinox

Einsteinstraat 9
NL 3281 NJ Numansdorp

Tel. +31 186 651004
Fax. +31 186 651952

www.steelinox.nl
info@steelinox.nl

General corrosion

Stainless steels are defined as being characterized by particularly high resistance to chemical attack by aqueous media. In general, they contain at least 12% by weight of chrome and a maximum of 1.2% carbon. The reason for their high resistance to corrosion is a passive layer that forms on the surface. This consists of a metal oxide or hydroxide layer rich in chrome, only a few Ångstrom units thick, separating the actual metal from the attacking medium. After sufficient time has passed, the passive layer of a stainless steel exhibits a constant composition and remains in a state of equilibrium with the surrounding medium. Once formed, such a layer cannot therefore be transferred to another medium. Following any mechanical damage of the surface, a new layer can generally be expected to form spontaneously at that point. If in some medium a satisfactory passive layer cannot form, or if an existing layer is locally damaged or completely destroyed, corrosion can occur. The decisive element responsible for the formation of a passive layer is chrome. A chrome content above the quoted value of some 12% inhibits rusting under normal atmospheric conditions. Further increases in the chrome content and, according to the application, the addition of molybdenum and other alloys permit corrosion resistance to be extended to much more aggressive media. Only those alloy contents dissolved in the metal are effective in achieving passivation. The highest resistance to corrosion is thus given with a segregation-free matrix whose chrome or molybdenum contents are not reduced by precipitations of the formation of non-metallic phases. The right heat treatment for achieving an ideal structure is described in the particular material sheets. Stainless steels may suffer general corrosion or various types of localised corrosion. Resistance to general corrosion is usually classified as follows:

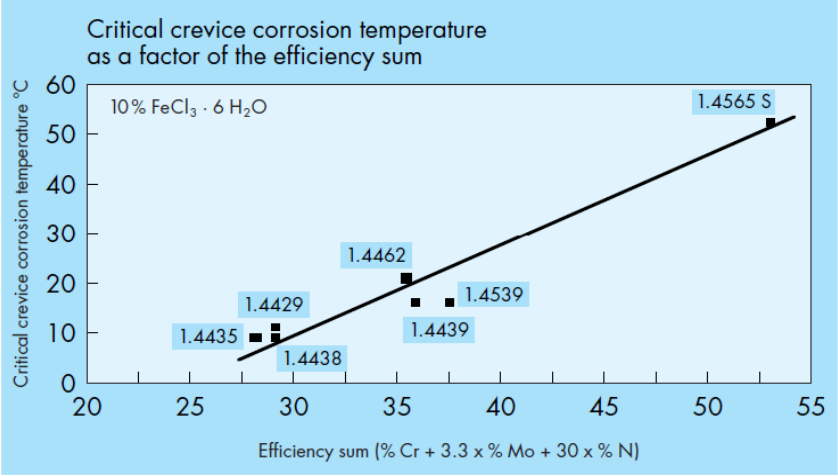
0 = resistant to general corrosion (mass loss rate <0.1 g/h · m² corresponding to a corrosion rate < 0.11 mm thickness reduction/year)
1 = slight susceptibility to general corrosion, suitable for some applications (0.1 – 1.0 g/h · m² corresponding to 0.11 – 1.10 mm thickness reduction/year)
2 = low resistance to general corrosion, unsuitable for virtually all applications (1.0 – 10.0 g/h · m² corresponding to 1.1 – 11.0 mm thickness reduction/year)
3 = no resistance to general corrosion (>10.0 g/h · m² corresponding to > 11.0 mm thickness reduction/year)
The following warning is provided for the major forms of localised corrosion
L = risk of pitting, crevice corrosion or stress-corrosion cracking, even in resistance class 0

General corrosion is to be expected primarily in acids and strong alkaline solutions. Pitting, crevice corrosion or stress-corrosion cracking are most frequently caused by chloride ions but they may also be induced by the rarer halides bromide and iodide, while stress-corrosion cracking can also occur in the presence of other species.

Pitting and crevice corrosion

Pitting corrosion is initiated by interaction between halide ions and the passive film, the latter being locally punctured. Hollows the size of pin pricks are formed and grow into pit sites which can vary greatly in severity. The risk of pitting increases with:

- Increasing concentrations of halide ions
- Increasing temperature
- An increase in the electrochemical potential of the steel in the relevant electrolyte, caused for example by the effects of an oxidising agent.



Crevice corrosion arises in crevices where fluid exchange with the surrounding environment is limited. Crevices of this nature are design or production related and occur e.g. on flanges, tube steels, beneath seals or even under scale/deposits. The corrosion mechanism is largely the as for pitting, although crevice geometry and the type of materials forming the crevice exert an additional influence. Since crevice attack occurs under less serious corrosion conditions than pitting, attempts should be made to design out crevices in components to be used in chloride-bearing media.

Assuming a homogeneous distribution of alloying elements, a rough guide to the pitting and crevice corrosion resistance of stainless steel is the efficiency sum (W) of % Cr + 3.3 x % Mo + 30 x % N. The influence of nitrogen as an alloying element is, however, more complex than expressed by this equation. The high efficiency expressed in the factor of 30 will only apply in full in the case of high-alloy steels with increased molybdenum contents.

A material's inherent resistance to pitting and crevice corrosion can only be fully achieved if the surface quality of the material is pristine, i.e. bright metallic. It is therefore important to remove any heat tinting or scale left after welding, iron particles or rust from other sources, grinding residue etc.

Stress-corrosion cracking

Stainless steels in media containing specific components – in particular chloride ions – and subjected at the same time to tensile stresses may suffer corrosion attack and cracking, even if the steel displays adequate resistance to the medium when not under mechanical load. This phenomenon is known as stress corrosion cracking and is not caused exclusively by service stresses; the blame frequently lies with internal stresses applied during processing, e.g. welding, grinding or cold forming. As with pitting and crevice corrosion, the risk of chloride-induced stress-corrosion cracking becomes greater as the temperature and chloride concentration increase. There are, however, other material-related variables. For example, austenitic steel grades 18/10-CrNi and 17/12/2-CrNiMo are at particular risk of chloride-induced stress-corrosion cracking when temperatures exceed 50 ºC. Resistance can be distinctly enhanced by increasing the molybdenum and in particular the nickel content of the material. In comparison, ferritic and austenitic-ferritic stainless steels are relatively insensitive to corrosion of this type.

How to use the table

Even though the figures provided in the following have been calculated in laboratory test using pickled specimens with the best possible microstructure – annealed, tempered or quenched – the provide a basic guide to applicability. It must however be emphasised that under practical conditions agents rarely occur in such pure form, and that even slight additions, e.g. of oxidising or reducing materials, can weaken or intensify corrosive attack. Deposits, such as those occasionally found on the walls above the bath surface or at other points, and condensation in the steam chamber of an enclosed apparatus can under certain circumstances greatly modify the conditions for corrosive attack. Exact knowledge of corrosive conditions is thus vital in selecting the right grade of steel. The best (and sometimes only) way of gaining information on the resistance of a material in the corrosive medium in question is to carry out tests on a specimen under actual service conditions, taking into consideration not only the composition and concentration of the corrosive medium but also the temperature, the pH value and other variables. We would be pleased to provide specimens of the relevant materials for test purposes.

Classification of Steelgrades by group

Gr.1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
1.4000				1.4401			
1.4002			1.4301	1.4404			
1.4003			1.4303	1.4429			
1.4006			1.4306	1.4435			
1.4021	1.4016		1.4307	1.4436			
1.4028	1.4120		1.4310	1.4438			
1.4031	1.4305		1.4311	1.4439			
1.4034	1.4509		1.4315	1.4462			
1.4313	1.4510	1.4113	1.4318	1.4501			
1.4512	1.4511	1.4521	1.4541	1.4561			
1.4589	1.4520	1.4568	1.4550	1.4571	1.4465	1.4539	1.4565 S

Table of steel grades

Material-Nr.	Abbreviation as per EN 10088-2	DIN EN/SEW	AISI	ASTM	UNS
1.4000	X6Cr13	10088-2	410S		S41008
1.4002	X6CrAl13	10088-2	405		
1.4003	X2CrNi12	10088-2			S40977
1.4006	X12Cr13	10088-2	410	A 182 F 6 a	S41000
1.4016	X6Cr17	10088-2	430		S43000
1.4021	X20Cr13	10088-2	420		S43000
1.4028	X30Cr13	10088-2	420		S42000
1.4031	X39Cr13	10088-2			
1.4034	X46Cr13	10088-2	420		S42000
1.4113	X6CrMo17-1	10088-2	434		
1.4120	X20CrMo13	SEW 400			
1.4301	X5CrNi18-10	10088-2	304	A182 F 304	S30400
1.4303	X4CrNi18-12	10088-2	305		
1.4305	X8CrNiS 18-9	10088-2	303		S30300
1.4306	X2CrNi 19-11	10088-2	304L		S30403
1.4307	X2CrNi 18-9	10088-2	304L	A182 F 304L	
1.4310	X10CrNi18-8	10088-2	301		
1.4311	X2CrNiN 18-10	10088-2	304 LN		
1.4313	X3CrNiMo 13-4	10088-2			S41500
1.4315	X5CrNiN 19-9	SEW 400	304 N		
1.4318	X2CrNiN 18-7	10088-2	301 LN		
1.4401	X5CrNiMo 17-12-2	10088-2	316	A182 F 316	S31600
1.4404	X2CrNiMo 17-12-2	10088-2	316 L	A182 F 316L	S31603
1.4429	X2CrNiMoN 17-13-3	10088-2	316 LN		
1.4435	X2CrNiMo 18-14-3	10088-2	316 L		S31603
1.4436	X3CrNiMo 17-13-3	10088-2	316		
1.4438	X2CrNiMo 18-15-4	10088-2	317 L		
1.4439	X2CrNiMoN 17-13-5	10088-2			S31726
1.4462	X2CrNiMoN 22-5-3	10088-2		A182 F51	S31803
1.4465	X1CrNiMoN 25-25-2	SEW 400			
1.4501	X2NiCrMoCuWN 25-7-4	10088-2		A182 F55	S32760
1.4509	X2CrTiNb 18	10088-2			S43940
1.4510	X3CrTi 17	10088-2	439		
1.4511	X3CrNb 17	10088-2			
1.4512	X2CrTi 12	10088-2	409		
1.4520	X2CrTi 17	10088-2			
1.4521	X2CrMoTi 18-2	10088-2	444		
1.4539	X1NiCrMoCu 25-20-5	10088-2			N08904
1.4541	X6CrNiTi 18-10	10088-2	321	A182 F321	S32100
1.4550	X6CrNiNb 18-10	10088-2	347	A182 F347	S34700
1.4561	X1CrNiMoTi 18-13-2	SEW 400	316 Ti		
1.4565	X2CrNiMnMoNbN 25-18-5-4	SEW 400			S34565
1.4568	X7CrNiAl 17-7	10088-2	631		
1.4571	X6CrNiMoTi 17-12-2	10088-2	316 Ti		S31635
1.4589	X5CrNiMoTi 15-2	SEL 94			S42035

Corrosive agent	Formula	Condition	Concentration
Acetic acid	CH_3COOH		10%
Acetic acid	CH_3COOH		10%
Acetic acid	CH_3COOH		50%
Acetic acid	CH_3COOH		50%
Acetic acid with hydrogen peroxide	$CH_3COOH + H_2O_2$		10% and 50%
Acetic acid with hydrogen peroxide	$CH_3COOH + H_2O_2$		10% and 50%
Acetic acid with hydrogen peroxide	$CH_3COOH + H_2O_2$		10% and 50%
Acetic anhydride	$(CH_3CO)_2O$		
Acetic anhydride	$(CH_3CO)_2O$		
Acetochchloride	CH_3COCl		
Activin	see p-toluene sulfonchloramide sodium		
Alcohol	see methyl and ethyl alcohol		
Alum	see potassium aluminium sulphate		
Aluminium	Al	molten	
Aluminium acetate	$Al(CH_3COO)_3$	cold saturated	
Aluminium acetate	$Al(CH_3COO)_3$	cold and hot saturated	
Aluminium ammonium sulphate	$Al(NH_4)(SO_4)_2 \cdot 12H_2O$		all concentrations
Aluminium ammonium sulphate	$Al(NH_4)(SO_4)_2 \cdot 12H_2O$	cold and hot saturated	
Aluminium chloride	$AlCl_3 \cdot 6H_2O$		5%
Aluminium chloride	$AlCl_3 \cdot 6H_2O$		25%
Aluminium nitrate	$Al(NO_3)_3 \cdot 9H_2O$		
Aluminium sulphate	$Al_2(SO_4)_3 \cdot 18H_2O$		10%
Aluminium sulphate	$Al_2(SO_4)_3 \cdot 18H_2O$		10%
Aluminium sulphate	$Al_2(SO_4)_3 \cdot 18H_2O$	cold saturated	
Aluminium sulphate	$Al_2(SO_4)_3 \cdot 18H_2O$	cold and hot saturated	
Ammonia	NH_3		
Ammonium alum	see aluminium ammonium sulphate		
Ammonium bicarbonate	NH_4HCO_3		all concentrations
Ammonium bifluoride	NH_4HF_2	cold saturated	
Ammonium carbonate	$(NH_4)_2CO_3 \cdot H_2O$	cold saturated	
Ammonium carbonate	$(NH_4)_2CO_3 \cdot H_2O$	hot saturated	
Ammonium chloride (sal ammoniac)	NH_4Cl		10%
Ammonium chloride (sal ammoniac)	NH_4Cl		25%
Ammonium chloride (sal ammoniac)	NH_4Cl		50%
Ammonium chloride (sal ammoniac)	NH_4Cl	cold saturated	
Ammonium chloride (sal ammoniac)	NH_4Cl	cold and hot saturated	
Ammonium chloride (sal ammoniac)	NH_4Cl	cold saturated with copper and zinc chlorides	
Ammonium hexachlorostannate (pink salt)	$(NH_4)_2(SnCl_6)$	cold saturated	
Ammonium hexachlorostannate (pink salt)	$(NH_4)_2(SnCl_6)$		
Ammonium hydroxide	NH_4OH		all concentrations
Ammonium nitrate	$NH_4NO_3 \cdot 9H_2O$	cold saturated	
Ammonium nitrate	$NH_4NO_3 \cdot 9H_2O$	cold and hot saturated	
Ammonium oxalate	$(NH_4)_2C_2O_4 \cdot H_2O$	cold saturated	
Ammonium oxalate	$(NH_4)_2C_2O_4 \cdot H_2O$	cold and hot saturated	
Ammonium perchlorate	NH_4ClO_4		10%
Ammonium perchlorate	NH_4ClO_4		
Ammonium sulphate	$(NH_4)_2SO_4$	cold saturated	
Ammonium sulphate	$(NH_4)_2SO_4$	cold saturated	
Ammonium sulphate	$(NH_4)_2SO_4$		with 5% sulphuric acid
Ammonium sulphite	$(NH_4)_2SO_3 \cdot H_2O$	cold saturated	
Ammonium sulphite	$(NH_4)_2SO_3 \cdot H_2O$	cold and hot saturated	

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
20 ºC		0	0	0	0	0	0	0
boiling	2	2	0	0	0	0	0	0
20 ºC	2	1	0	0	0	0	0	0
boiling	3	2	1	1	0	0	0	0
20 ºC	1	0	0	0	0	0	0	0
50 ºC	2	0	0	0	0	0	0	0
90 ºC	3	1	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	2	1	0	0	0	0	0	0
boiling	2 L	1 L	1 L	1 L	0 L	0 L	0 L	0
750 ºC	3	3	3	3	3	3	3	3
20 ºC		0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC			0	0	0	0	0	0
boiling				3	2	0	0	0
50 ºC				2 L	1 L	0 L	0 L	
20 ºC				3 L	2 L	2 L	0 L	
20 ºC	0	0	0	0	0	0	0	0
20 ºC	2	1	0	0	0	0	0	0
boiling	3	2	2	1	0	0	0	0
20 ºC	2	2	2	1	0	0	0	0
boiling	3	3	3	2	1	0	0	0
50 ºC	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20 ºC	3	3	2	2	1	1	1	1
20 ºC	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
boiling	1 L	0 L	0 L	0 L	0 L	0 L	0 L	0 L
boiling	2 L	2 L	2 L	1 L	1 L			
boiling				2 L	1 L	1 L	1 L	
20 ºC		0 L	0 L	0 L	0 L	0 L	0 L	0
boiling				2 L	1 L	1 L	1 L	
boiling	3 L	3 L	3 L	3 L	3 L			
20 ºC	2 L	2 L	1 L	1 L	0 L			
60 ºC	3 L	3 L	3 L	3 L	3 L			
20ºC and boiling	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
20 ºC	1	1	0	0	0	0	0	0
boiling	2	2	1	0	0	0	0	0
20 ºC		0	0	0	0	0	0	0
boiling	2	2	1	0	0	0	0	0
20 ºC	1	1	0	0	0	0	0	0
boiling	2	2	1	1	0	0	0	0
100 ºC	3	3	1	1	1	0	0	0
20 ºC		0	0	0	0	0	0	0
boiling	2	2	1	0	0	0	0	0

Corrosive agent	Formula	Condition	Concentration
Aniline	$C_6H_5NH_2$		
Aniline hydrochloride	$C_6H_5NH_2HCl$		5%
Antichlor	see sodium thiosulphate, sodium perborate		
Antimony	Sb	molten	
Antimony chloride	$SbCl_3$		
Aqua regia	$HCl + HNO_3$		
Aqueous ammonia	see ammonium hydroxide		
Arsenic acid	$H_3AsO_4 \cdot 1/2H_2O$		all concentrations
Aspirin	see acetosalicylic acid		
Atmosphere			
Barium chloride	$BaCl_2$	fused	
Barium chloride	$BaCl_2 \cdot 2H_2O$	cold saturated	
Barium chloride	$BaCl_2 \cdot 2H_2O$	cold and hot saturated	
Barium hydroxide	$Ba(OH)_2$	cold saturated	
Barium hydroxide	$Ba(OH)_2$	cold and hot saturated	
Barium nitrate	$Ba(NO_3)_2$		all concentrations
Beer			
Benzoic acid	C_6H_5COOH		all concentrations
Benzole	C_6H_6		
Bleach liquor	see sodium hypochlorite		
Bleach solution	see chlorinated lime		
Bleaching lye	see sodium hypochlorite		
Blood			
Bonder's solution	see iron phosphate		
Borax	see sodium tetraborate		
Boric acid	H_3BO_3		all concentrations
Boric acid	H_3BO_3		all concentrations
Brandy			
Bromine	Br_2		
Bromine water			0,03%
Bromine water			0,3%
Bromine water			1%
Buttermilk			
Butyric acid	C_3H_7COOH		100%
Butyric acid	C_3H_7COOH		100%
Cadmium	Cd		
Calcium bisulphite (sulphite lye)	$CaH_2(SO_3)_2$	cold saturated	
Calcium bisulphite (sulphite lye)	$CaH_2(SO_3)_2$	cold and hot saturated	
Calcium bisulphite (sulphite lye)	$CaH_2(SO_3)_2$	20 bar	
Calcium chloride	$CaCl_2 \cdot 6H_2O$	cold saturated	
Calcium chloride	$CaCl_2 \cdot 6H_2O$	cold saturated	
Calcium hydroxide (slaked lime)	$Ca(OH)_2$		
Calcium hydroxide (slaked lime)	$Ca(OH)_2$		
Calcium hypochloriste	$Ca(OCl)_2 \cdot 4H_2O$	cold saturated	
Calcium sulphate	$CaSO_4$	saturated	
Calcium sulphite	$CaSO_3$	cold saturated	
Camphor	$C_{10}H_{16}O$		
Carbolic acid	see phenol		
Carbon dioxide (carbonid acid)	CO_2	dry	
Carbon dioxide (carbonid acid)	CO_2	moist	
Carbon disulphide	CS_2		
Carbon tetrachloride	CCl_4	anhydrous	
Carbon tetrachloride	CCl_4	anhydrous	
Carnallite	$KClMgCl_2 \cdot 6H_2O$	cold saturated	
Carnallite	$KClMgCl_2 \cdot 6H_2O$	cold and hot saturated	
Caustic potash solution	see potassium hydroxide		

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
20 °C	0	0	0	0	0	0	0	0
20 °C	3 L	3 L	3 L	3 L	3 L	2 L		
650 °C	3	3	3	3	3	3	3	3
20 °C	3 L	3 L	3 L	3 L	3 L	3 L		
20 °C	3	3	3	3	3	2	2	2
20 °C	0	0	0	0	0	0	0	0
	1	1	0	0	0	0	0	0
fused	3	3	3	3	3	3		
20 °C	1 L	0 L	0 L	0 L	0 L	0 L	0 L	0 L
boiling	2 L	2 L	1 L	1 L	0 L	0 L	0 L	0 L
20 °C	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 °C and 70 °C				0	0	0	0	0
20°C and boiling		0	0	0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
				0 L	0	0	0	0
20 °C		0	0	0	0	0	0	0
boiling	1	1	0	0	0	0	0	0
20°C and boiling				0	0	0	0	0
20°C and boiling	3 L	3 L	3 L	3 L	3 L	3 L	3 L	
20 °C				0 L	0 L			
20 °C				1 L	1 L			
20 °C				3 L	3 L			
20 °C	1	0	0	0	0	0	0	0
20 °C		0	0	0	0	0	0	0
boiling	2	2		1	0	0	0	0
molten				2	2			
20 °C	2	2	0	0	0	0	0	0
boiling	3	3	2	2	0	0	0	0
200 °C	3	3	3	3	0	0	0	0
20 °C				0 L	0 L	0 L	0 L	0 L
boiling				1 L	1 L	0 L	0 L	0 L
20 °C	0	0	0	0	0	0	0	0
boiling				0	0	0	0	0
up to 40 °C				2 L	1 L	0 L	0 L	
20 °C				0	0	0	0	0
20 °C				0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
hot	0	0	0	0	0	0	0	0
hot	1	1	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 °C	2 L	3 L				0 L	0 L	0 L
boiling	3 L	3 L	1 L	1 L	1 L	0 L	0 L	0 L

Corrosive agent	Formula	Condition	Concentration
Caustic soda solution	see sodium hydroxide		
Cheese			
Chloramine-T	see p-toluene sodium sulfonchloramide		
Chloric acid	$HClO_3$		concentrated
Chlorinated lime	$[3CaCl(OCl) \cdot Ca(OH)_2] \cdot 5H_2O$	dry	
Chlorinated lime	$[3CaCl(OCl) \cdot Ca(OH)_2] \cdot 5H_2O$	moist	
Chlorinated lime (bleach solution)	$[3CaCl(OCl) \cdot Ca(OH)_2] \cdot 5H_2O$		2,5 g Cl/l
Chlorine (damp gas)	Cl_2		
Chlorine (damp gas)	Cl_2		
Chlorine (dry gas)	Cl_2		
Chlorine water	cold water saturated with chlorine		
Chloroacetic acid	see mono-and trichloracetic acid		
Chlorobenzene	C_6H_5Cl	dry	
Chlorobenzene	C_6H_5Cl	dry	
Chloroform	$CHCl_3$	anhydrous	
Chlorosulphonic acid	HSO_3Cl		10%
Chlorosulphonic acid	HSO_3Cl		100%
Chocolate			
Chorme alum	see potassium chrome sulphate		
Chrome sulphate	$Cr_2(SO_4)_3 \cdot 18H_2O$	saturated	
Chromic acid	CrO_3		10% pure, free of SO_3
Chromic acid	CrO_3		10% pure, free of SO_3
Chromic acid	CrO_3		50% pure, free of SO_3
Chromic acid	CrO_3		50% pure, free of SO_3
Chromic acid	CrO_3		50% tech., containing SO_3
Chromic acid	CrO_3		50% tech., containing SO_3
Cider			
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		1%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		1%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		10%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		10%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		25%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		25%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		50%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$		50%
Citric acid	$HOC(CH_2COOH)_2COOH \cdot H_2O$	3 bar	5%
Coffee			
Copper acetate	$(CH_3COO)_2Cu \cdot H_2O$	cold saturated	
Copper acetate	$(CH_3COO)_2Cu \cdot H_2O$	cold and hot saturated	
Copper carbonate	$CuCO_3Cu(OH)_2$		all concentrations
Copper chloride	$CuCl_2 \cdot 2H_2O$	cold saturated	
Copper cyanide	$Cu(CN)_2$	hot saturated	
Copper nitrade	$Cu(NO_3)_2 \cdot 3H_2O$		50%
Copper sulphate	$CuSO_4 \cdot 5H_2O$		all concentrations
Copper sulphate (blue vitriol + 3%H_2SO_4)	$CuSO_4 \cdot 5H_2O$		
Copper sulphate (blue vitriol + 3%H_2SO_4)	$CuSO_4 \cdot 5H_2O$		
Creosote			
Creosote			
Cresol	$CH_3C_6H_4(OH)_2$		
Crude oil			
Developer	see photographic developer		
Dichloroethane	CH_2ClCH_2Cl	anhydrous	
Dichloroethylene	$CHClCHCl$	anhydrous	
Disulphur dichloride	S_2Cl_2	anhydrous	
Disulphur dichloride	S_2Cl_2	anhydrous	

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
20 °C				0	0	0	0	0
20 °C				3 L	3 L	1 L		
20 °C				0	0	0	0	0
20 °C	3 L	3 L	2 L	1 L	1 L	0 L	0 L	
20 °C	3 L	3 L	2 L	1 L	0 L	0 L	0 L	
20 °C	3 L	3 L	3 L	3 L	3 L			
100 °C	3 L	3 L	3 L	3 L	3 L			
20 °C	0	0	0	0	0	0	0	0
20 °C	3 L	3 L	3 L	1 L	1 L	0 L	0 L	
20 °C	2	1	0	0	0	0	0	0
boiling	3	2	2	0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
20 °C	3 L	3 L	3 L	3 L	3 L			
20 °C	3 L	3 L		0 L	0 L			
20 °C	0	0	0	0	0	0	0	0
20 °C		0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	3	3		1	1	0		
20 °C	3	3	2	1	1	0		
boiling	3	3	3	2	2	2	2	
20 °C	3	3	2	1	1			
boiling	3	3	3	3	3	2	2	
20 °C				0	0	0	0	0
20 °C	1	0	0	0	0	0	0	0
kochend	2	1	0	0	0	0	0	0
20 °C	2	1	0	0	0	0	0	0
kochend	3	2	0	0	0	0	0	0
20 °C	2	1	0	0	0	0	0	0
kochend	3	3	2	2	0	0	0	0
20 °C	2	1	0	0	0	0	0	0
kochend	3	3	2	2	1	0	0	0
140 °C	2	1	1	1	0	0	0	0
20°C and boiling				0	0	0	0	0
20 °C		0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
20 °C	3 L	3 L	3 L	3 L	3 L	2 L	2 L	0 L
boiling	3	2	0	0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	2	2	2	0	0	0	0	0
20 °C	1	1	0	0	0	0	0	0
boiling	2	1	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
20 °C				0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 °C	1	1	0	0	0	0	0	0
boiling	2	2	2	0	0			

Corrosive agent	Formula	Condition	Concentration
Dripping			
Dye bath (alkaline or neutral)			
Dye bath (organic acid)			
Dye bath (organic acid)			
Dye bath (strong sulphuric acid or organic + strong sulphuric acid) (H_2SO_4 more than 1%)			
Dye bath (strong sulphuric acid or organic + strong sulphuric acid) (H_2SO_4 more than 1%)			
Dye bath (strong sulphuric acid or organic + strong sulphuric acid) (H_2SO_4 less than 1%)			
Dye bath (strong sulphuric acid or organic + strong sulphuric acid) (H_2SO_4 less than 1%)			
Epsom salts	see magnesium sulphate		
Ethyl chloride	C_2H_5Cl	anhydrous	
Ethyl ether	$(C_2H_5)_2O$		
Ethyl glycol	CH_2OHCH_2OH		
Ethylalcohol (spirit)	C_2H_5OH		all concentrations
Ethylene chloride	see dichloroethane		
Fatty acid (oleic acid) + traces of H_2SO_4	$C_{17}H_{33}COOH$		
Fatty acid (oleic acid)	$C_{17}H_{33}COOH$	30 bar	technical
Fatty acid (oleic acid)	$C_{17}H_{33}COOH$	30 bar	technical
Fatty acid (oleic acid)	$C_{17}H_{33}COOH$	30 bar	technical
Fatty acid (oleic acid)	$C_{17}H_{33}COOH$	30 bar	technical
Ferric chloride	$FeCl_3$		30%
Ferric chloride	$FeCl_3$		50%
Ferric nitrate	$Fe(NO_3)_3 \cdot 9H_2O$		all concentrations
Ferric sulphate	$Fe_2(SO_4)_3$		10%
Ferric sulphate	$Fe_2(SO_4)_3$		10%
Ferrous sulphate	$FeSO_4 \cdot 7H_2O$		all concentrations
Fixing salt	see photographic fixing bath		
Fluosilicic acid	H_2SiF_6	vapours	
Formaldehyde (formalin = methyl aldehyde)	HCHO		40%
Formic acid	HCOOH		10%
Formic acid	HCOOH		10%
Formic acid	HCOOH		10%
Formic acid	HCOOH		50%
Formic acid	HCOOH		50%
Formic acid	HCOOH		50%
Formic acid	HCOOH		80%
Formic acid	HCOOH		80%
Formic acid	HCOOH		100%
Formic acid	HCOOH		100%
Fruit juices and fruit acids			
Fruit pulp (containing SO_2)			
Gallic acid	$C_6H_2(OH)_3COOH$	saturated	
Gallic acid	$C_6H_2(OH)_3COOH$	hot saturated	
Glacial acetic acid			100%
Glacial acetic acid			100%
Glauber's salt	see sodium sulphate		
Glue (also acid)			
Glycerine	$C_3H_5(OH)_3$	concentrated	
Hydrazine sulphate	$(NH_2)_2 \cdot H_2SO_4$		10%
Hydrochloric acid	gas, see hydrogen chloride gas		
Hydrochloric acid	HCl		0,50%
Hydrochloric acid	HCl		0,50%
Hydrocyanic acid	HCN		
Hydrofluoric acid	HF		40%
Hydrogen chloride gas	HCl		

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
20 °C	0	0	0	0	0	0	0	0
20°C and boiling			0	0	0	0	0	0
20 °C			0	0	0	0	0	0
boiling			1	0	0	0	0	0
20 °C			1	1	0	0	0	0
boiling			1	1	1	0	0	0
20 °C			0	0	0	0	0	0
boiling			1	1	0	0	0	0
boiling	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 °C	2	1	0	0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
hot			3	2	1	0	0	0
150 °C	0	0	0	0	0	0	0	0
180 °C	2	2	1	1	0	0	0	0
235 °C	3	2	2	1	0	0	0	0
300 °C	3	3	2	2	0	0	0	0
20 °C	3 L	3 L	3 L	3 L	2 L	1 L	1 L	0
50 °C	3 L	3 L	3 L	3 L	3 L			
20 °C		0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	1	1	0	0	0	0	0	0
20 °C		0	0	0	0	0	0	0
100 °C	3	2	1	1	1	1	1	1
20°C and boiling		0	0	0	0	0	0	0
20 °C	2	1	0	0	0	0	0	0
70 °C	3	2	1	1	0	0	0	0
boiling	3	3	2	2	1	0	0	0
20 °C	2	2	0	0	0	0	0	0
70 °C	3	2	1	2	1	0	0	0
boiling	3	3	3	3	1	1	1	1
20 °C	2	2	0	0	0	0	0	0
boiling	3	3	2	2	1	1	1	1
20 °C	1	1	0	0	0	0	0	0
boiling	3	3	2	2	1	0	0	0
20°C and boiling				0	0	0	0	0
		1		0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 °C	1	0	0	0	0	0	0	0
boiling	3	2	2	1	1	0	0	0
boiling	0	0	0	0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
boiling			0	0	0	0	0	0
20 °C	3 L	2 L	2 L	1 L	1 L	0 L	0 L	0
boiling	3 L	3 L	3 L	3 L	3 L	1 L	1 L	1 L
20 °C		0	0	0	0	0	0	0
20 °C	3	3	3	3	3			
20 °C	3 L	2 L		1 L	1 L			

Corrosive agent	Formula	Condition	Concentration
Hydrogen chloride gas	HCl		
Hydrogen chloride gas	HCl		
Hydrogen chloride gas	HCl		
Hydrogen fluoride	HF	dry gaseous	
Hydrogen peroxide	H_2O_2		
Hydrogen sulphide	H_2S	dry	< 4%
Hydrogen sulphide	H_2S		< 4%
Hydrogen sulphide	H_2S		< 4%
Hydrogen sulphide	H_2S	moist	< 4%
Hydroxylamine sulphate	$(NH_2OH)_2 \cdot H_2SO_4$		10%
Industrial air	see atmosphere		
Ink	see iron gallate ink		
Iodine	J_2	dry	
Iodine	J_2	moist	
Iodoform	CHI_3	vapour	
Iron gallate ink			
Iron phosphate			
Lactic acid	$CH_3CH(OH)COOH$		2%
Lactic acid	$CH_3CH(OH)COOH$		2%
Lactic acid	$CH_3CH(OH)COOH$		10%
Lactic acid	$CH_3CH(OH)COOH$		10%
Lactic acid	$CH_3CH(OH)COOH$		80%
Lactic acid	$CH_3CH(OH)COOH$		80%
Lactic acid	$CH_3CH(OH)COOH$		concentrated
Lactic acid	$CH_3CH(OH)COOH$		concentrated
Lead	Pb		molten
Lead acetate (suger of lead)	$Pb(CH_3COO)_2 \cdot 3H_2O$		all concentrations
Lead acetate (suger of lead)	$Pb(CH_3COO)_2 \cdot 3H_2O$		all concentrations
Lead nitrate	$Pb(NO_3)_2$		
Lemon juice			
Linseed oil (+3% H_2SO_4)			
Linseed oil (+3% H_2SO_4)			
Liqueurs			
Lubricating oil	see oil		
Lysoform			
Lysol			
Magnesium carbonate	$MgCO_3$		all concentrations
Magnesium chloride	$MgCl_2 \cdot 6H_2O$		10%
Magnesium chloride	$MgCl_2 \cdot 6H_2O$		30%
Magnesium sulphate (Epsom salts)	$MgSO_4 \cdot 7H_2O$	cold saturated	
Magnesium sulphate (Epsom salts)	$MgSO_4 \cdot 7H_2O$	cold and hot saturated	
Maleic acid	$(CHCOOH)_2$		50%
Malic acid	$COOHCH_2CHOHCOOH$		up to 50%
Malic acid	$COOHCH_2CHOHCOOH$		up to 50%
Malic acid	$COOHCH_2CHOHCOOH$		up to 50%
Manganese chloride	$MnCl_2 \cdot 4H_2O$		10%
Manganese chloride	$MnCl_2 \cdot 4H_2O$		50%
Manganese sulphate	$MgSO_4 \cdot 7H_2O$		
Meat			
Mercuric acetate	$Hg(CH_3COO)_2$	cold saturated	
Mercuric acetate	$Hg(CH_3COO)_2$	hot saturated	
Mercuric chloride	$HgCl_2$ (Sublimate)		0,10%
Mercuric chloride	$HgCl_2$ (Sublimate)		0,10%
Mercuric chloride	$HgCl_2$ (Sublimate)		0,70%
Mercuric chloride	$HgCl_2$ (Sublimate)		0,70%

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
50 ºC	3 L	2 L	1 L	1 L	1 L			
100 ºC	3 L	3 L	2 L	2 L	1 L			
400 ºC	3	3	3	3	3			
100 ºC	3	3	1	1	1			
20 ºC	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
100 ºC	0	0	0	0	0	0	0	0
< 400 ºC	2	2	1	0	0	0	0	0
200 ºC	3	3	1	0	0	0	0	0
20ºC and boiling			0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20 ºC	2 L	2 L	1 L	1 L	0 L	0 L	0 L	0 L
20 ºC and 60 ºC	0	0	0	0	0	0	0	0
20 ºC	1 L	0 L	0 L	0 L	0	0	0	0
98 ºC	1	0	0	0	0	0	0	0
20 ºC	1	0	0	0	0	0	0	0
boiling		1	0	0	0	0	0	0
20 ºC	1	1	0	0	0	0	0	0
boiling	3	3	2	1	0	0	0	0
20 ºC	1	1	0	0	0	0	0	0
boiling	3	2	2	2	1	1	1	1
20 ºC	1	1	0	0	0	0	0	0
boiling	3	2	2	2	1	1	1	1
600 ºC				1				
20 ºC		0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
20 ºC	1	0	0	0	0	0	0	0
20 ºC				0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
200 ºC			1	0	0	0	0	0
	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20 ºC	2 L	1 L	0 L	0 L	0 L	0 L	0 L	0
20 ºC	2 L	1 L	0 L	0 L	0 L	0 L	0 L	0 L
20 ºC	2	1	0	0	0	0	0	0
boiling				0	0	0	0	0
100 ºC	2	1	1	0	0	0	0	0
20 ºC	1	0	0	0	0	0	0	0
60 ºC	2	2	1	0	0	0	0	0
100 ºC	3	3	2	1	0	0	0	0
boiling				0 L	0 L	0 L	0 L	0 L
boiling				0 L	0 L	0 L	0 L	0 L
20 ºC	2	1	0	0	0	0	0	0
		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC	2 L	1 L	0 L	0 L	0 L	0	0	0
boiling	3 L	2 L	1 L	1 L	0 L	0 L	0 L	0
20 ºC	2 L	2 L	1 L	1 L	1 L	0	0	0
boiling	3 L	3 L	2 L	2 L	2 L	1 L	0 L	0 L

Corrosive agent	Formula	Condition	Concentration
Mercurous nitrate	$(HgNO_3)_2 \cdot 2H_2O$		all concentrations
Mercury	Hg		
Mercury cyanide	$Hg(CN)_2$		all concentrations
Methyl alcohol	CH_3OH		all concentrations
Methyl aldehyde	see formaldehyde		
Methyl chloride	CH_3Cl	anhydrous	
Methylene chloride	CH_2Cl_2	anhydrous	
Milk		fresh	
Milk		sour	
Milk of lime	see calcium hydroxide		
Mixed acids (nitrating acids)			2% H_2SO_4 + 1% HNO_3
Mixed acids (nitrating acids)			15% H_2SO_4 + 5% HNO_3
Mixed acids (nitrating acids)			20% H_2SO_4 + 15% HNO_3
Mixed acids (nitrating acids)			20% H_2SO_4 + 15% HNO_3
Mixed acids (nitrating acids)			30% H_2SO_4 + 5% HNO_3
Mixed acids (nitrating acids)			30% H_2SO_4 + 5% HNO_3
Mixed acids (nitrating acids)			50% H_2SO_4 + 50% HNO_3
Mixed acids (nitrating acids)			50% H_2SO_4 + 50% HNO_3
Mixed acids (nitrating acids)			50% H_2SO_4 + 50% HNO_3
Mixed acids (nitrating acids)			70% H_2SO_4 + 10% HNO_3
Mixed acids (nitrating acids)			70% H_2SO_4 + 10% HNO_3
Mixed acids (nitrating acids)			70% H_2SO_4 + 10% HNO_3
Mixed acids (nitrating acids)			75% H_2SO_4 + 25% HNO_3
Mixed acids (nitrating acids)			75% H_2SO_4 + 25% HNO_3
Mixed acids (nitrating acids)			75% H_2SO_4 + 25% HNO_3
Monochloracetic acid	$CH_2ClCOOH$		50%
Mustard			
Nickel chloride	$NiCl_2 \cdot 6H_2O$	cold saturated	
Nickel nitrate	$Ni(NO_3)_2 \cdot 6H_2O$	cold saturated	
Nickel sulphate	$NiSO_4 \cdot 7H_2O$	cold saturated	
Nitrating acid	see mixed acids		
Nitric acid	HNO_3		7%
Nitric acid	HNO_3		7%
Nitric acid	HNO_3		10%
Nitric acid	HNO_3		10%
Nitric acid	HNO_3		25%
Nitric acid	HNO_3		25%
Nitric acid	HNO_3		37%
Nitric acid	HNO_3		37%
Nitric acid	HNO_3		50%
Nitric acid	HNO_3		50%
Nitric acid	HNO_3		66%
Nitric acid	HNO_3		66%
Nitric acid	HNO_3		99% (high concentration)
Nitric acid	HNO_3		99% (high concentration)
Nitrosylsulphuric acid 60ºBé with 4 - 5% nitro content			
Nitrosylsulphuric acid 60ºBé with 4 - 5% nitro content			
Nitrous acid	HNO_2		concentrated
Novocain			
Oil (lubricating oil)			
Oil (vegetable oil)			
Oleic acid	see fatty acids		
Oxalic acid	$(COOH)_2 \cdot 2H_2O$		5%
Oxalic acid	$(COOH)_2 \cdot 2H_2O$		5%
Oxalic acid	$(COOH)_2 \cdot 2H_2O$		10%

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
boiling	0	0	0	0	0	0	0	0
20 ºC and 50ºC	0	0	0	0	0	0	0	0
20 ºC	2	2		0	0	0	0	0
20 ºC and 65 ºC	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
up to 70 ºC		0	0	0	0	0	0	0
up to 70 ºC		1	0	0	0	0	0	0
boiling	3	3	2	2	0	0	0	0
134 ºC	3	3	2	1	1			
50 ºC	3	3	1	0	0	0	0	0
80 ºC	3	3	2	1	0	0	0	0
90 ºC	3	3	1	0	0	0	0	0
110 ºC	3	3	2	1	0	0	0	0
50 ºC	3	2	1	0	0	0	0	0
90 ºC	3	3	2	1	1			
120 ºC	3	3	3	2	2			
50 ºC	3	3	1	0	0	0	0	0
90 ºC	3	3	3	1	0	0	0	0
168 ºC	3	3	3	3	3			
50 ºC	3	2	1	1	0	0	0	0
90 ºC	3	3	1	1	1			
157 ºC	3	3	3	3	3			
20 ºC	3 L	3 L	2 L	1 L	1 L	0 L	0 L	
20 ºC	2 L	0 L	0 L	0 L	0 L	0	0	0
20 ºC				1 L	1 L	0 L	0 L	0
20 ºC	0	0	0	0	0	0	0	0
20ºC and boiling				0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	1	1	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	2	1	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	2	1	1	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	2	1	1	1	1	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	3	2	2	1	1	1	1	1
20 ºC	2	1	1	1	2	1	1	1
boiling	3	3	3	2	2			
20 ºC	0	0	0	0	0	0	0	0
75 ºC					1	1		
20 ºC			0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
20 ºC	1	1	0	0	0	0	0	0
boiling		3	3	1	1	0	0	0
20 ºC		1	2	1	0	0	0	0

Corrosive agent	Formula	Condition	Concentration
Oxalic acid	$(COOH)_2 \cdot 2H_2O$		10%
Oxalic acid	$(COOH)_2 \cdot 2H_2O$		25%
Oxalic acid	$(COOH)_2 \cdot 2H_2O$		50%
P-toluene sulfonchloramide sodium (chloramin T)	$CH_3C_6H_4SO_2NClNa \cdot 3H_2O$	cold saturated	
P-toluene sulfonchloramide sodium (chloramin T)	$CH_3C_6H_4SO_2NClNa \cdot 3H_2O$		cold and hot concentrated
Paraffin			
Persil			
Petrol			all concentrations
Petroleum			
Petroleum ether			
Phenol (carbolic acid)	C_6H_5OH		pure
Phenol (carbolic acid)	C_6H_5OH		with 10% H_2O
Phenol (carbolic acid)	C_6H_5OH		raw 90% Phenol
Phosphate detergents			
Phosphoric acid	H_3PO_4 chem. pure		1%
Phosphoric acid	H_3PO_4 chem. pure		1%
Phosphoric acid	H_3PO_4 chem. pure		10%
Phosphoric acid	H_3PO_4 chem. pure		10%
Phosphoric acid	H_3PO_4 chem. pure		45%
Phosphoric acid	H_3PO_4 chem. pure		45%
Phosphoric acid	H_3PO_4 chem. pure		60%
Phosphoric acid	H_3PO_4 chem. pure		60%
Phosphoric acid	H_3PO_4 chem. pure		70%
Phosphoric acid	H_3PO_4 chem. pure		70%
Phosphoric acid	H_3PO_4 chem. pure		80%
Phosphoric acid	H_3PO_4 chem. pure		80%
Phosphoric acid	H_3PO_4 chem. pure		concentrated
Phosphoric acid	H_3PO_4 chem. pure		concentrated
Phosphoric acid anhydride (phosphorus pentoxide, dry or moist)	P_2O_5		
Photographic developer (Agfa -glycine developer)			
Photographic fixing bath			
Pickling liquid			
Picric acid	$C_6H_2(NO_2)_3OH$		
Pink salt	see ammonium hexachlorostannate		
Potash	see potassium carbonate		
Potassium acetate	CH_3COOK	molten	
Potassium aluminium sulphate (alum)	$KAl(SO_4)_2 \cdot 12H_2O$		10%
Potassium aluminium sulphate (alum)	$KAl(SO_4)_2 \cdot 12H_2O$		10%
Potassium aluminium sulphate (alum)	$KAl(SO_4)_2 \cdot 12H_2O$	cold saturated	
Potassium aluminium sulphate (alum)	$KAl(SO_4)_2 \cdot 12H_2O$	cold and hot saturated	
Potassium bifluoride	KHF_2	cold saturated	
Potassium bisulphate	$KHSO_4$		2%
Potassium bisulphate	$KHSO_4$		5%
Potassium bisulphate	$KHSO_4$		5%
Potassium bisulphate	$KHSO_4$		15%
Potassium bitartrate (tartar)	$KHC_4H_4O_6$	cold saturated	
Potassium bitartrate (tartar)	$KHC_4H_4O_6$	cold and hot saturated	
Potassium bromide	KBr	cold saturated	
Potassium carbonate (potash)	K_2CO_3	cold saturated	
Potassium carbonate (potash)	K_2CO_3	cold and hot saturated	
Potassium chlorate	$KClO_3$	hot saturated	
Potassium chloride	KCl	cold saturated	

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
boiling			3	2	2	1	1	1
boiling			3	2	2	1	1	1
boiling			3	2	2	1	1	1
20 ºC				1 L	0 L	0 L	0 L	0
boiling				1 L	0 L	0 L	0 L	0 L
20 ºC and molten	0	0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
boiling	2	1	1	1	0	0	0	0
boiling	3	1	1	1	0	0	0	0
boiling	3	3	1	1	0	0	0	0
95 ºC	0	0	0	0	0	0	0	0
20 ºC		0	0	0	0	0	0	0
boiling	1	1	0	0	0	0	0	0
20 ºC	2	1	0	0	0	0	0	0
boiling	2	2	0	0	0	0	0	0
20 ºC	2	2	1	0	0	0	0	0
boiling	3	2	2	2	1	0	0	0
20 ºC	2	2	1	0	0	0	0	0
boiling	3	3	2	2	1	0	0	0
20 ºC	2	2	1	0	0	0	0	0
boiling	3	3	2	2	2	1	1	1
20 ºC	2	2	1	1	0	0	0	0
boiling	3	3	3	3	2			
20 ºC	2	2	1	1	0	0	0	0
boiling	3	3	3	3	3			
20 ºC			1	1	0	0	0	0
20 ºC	1	0	0	0	0	0	0	0
20 ºC	3 L	3 L	3 L	0 L	0 L			
20 ºC	1 L	0 L	0 L	0 L	0 L	0 L	0 L	0 L
20 ºC		0	0	0	0	0	0	0
				0	0	0	0	0
20 ºC	1	0	0	0	0	0	0	0
boiling	2	2	1	1	0	0	0	0
20 ºC	2	2	1	0	0	0	0	0
boiling	3	3	3	1	0	0	0	0
20 ºC	3	2	2	2	1	1	1	1
90 ºC				3	2	0	0	0
20 ºC			1	1	0	0	0	0
90 ºC				3	2	0	0	
90 ºC				3	2	1	1	
cold				0	0	0	0	0
boiling			2	2	1	0	0	0
20 ºC		0 L	0 L	0 L	0 L	0 L	0 L	0 L
20 ºC	0	0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC	1 L	0 L	0 L	0 L	0 L	0 L	0 L	0 L

Corrosive agent	Formula	Condition	Concentration
Potassium chloride	KCl	cold and hot saturated	
Potassium chrome sulphate (chrome alum)	$KCr(SO_4)_2 \cdot 12H_2O$	cold saturated	
Potassium chrome sulphate (chrome alum)	$KCr(SO_4)_2 \cdot 12H_2O$	cold and hot saturated	
Potassium cyanate	KOCN		
Potassium cyanide	KCN		5%
Potassium dichromate	$K_2Cr_2O_7$		25%
Potassium dichromate	$K_2Cr_2O_7$		25%
Potassium ferricyanide	$K_3[Fe(CN)_6]$	cold saturated	
Potassium ferricyanide	$K_3[Fe(CN)_6]$	hot saturated	
Potassium ferrocyanide			
Potassium hydroxide (caustic potash solution)	KOH		20%
Potassium hydroxide (caustic potash solution)	KOH		20%
Potassium hydroxide (caustic potash solution)	KOH		50%
Potassium hydroxide (caustic potash solution)	KOH		50%
Potassium hydroxide (caustic potash solution)	KOH	hot saturated	
Potassium hydroxide (caustic potash)	KOH	fused	
Potassium hypochlorite	KClO		approx. 15% free chlorine
Potassium hypochlorite	KClO		
Potassium iodide	KI	cold saturated	
Potassium nitrate (saltpetre)	KNO_3		25%
Potassium nitrate (saltpetre)	KNO_3		25%
Potassium nitrate (saltpetre)	KNO_3		50%
Potassium nitrate (saltpetre)	KNO_3		50%
Potassium nitrate (saltpetre)	KNO_3	molten	
Potassium oxalate	$K_2C_2O_4 \cdot H_2O$		all concentrations
Potassium oxalate	$K_2C_2O_4 \cdot H_2O$		all concentrations
Potassium permanganate	$KMnO_4$		all concentrations
Potassium permanganate	$KMnO_4$		all concentrations
Potassium sulphate	K_2SO_4	cold and hot saturated	
Precipitation bath	see spinning bath		
Prussic acid	see hydrocyanic acid		
Pulp	see fruit pulp		
Pyrogallic acid (pyrogallol)	$C_6H_3(OH)_3$		all concentrations
Quinine sulphate			
Sal ammoniac	see ammonium chloride		
Salicylic acid	HOC_6H_4COOH		all concentrations
Salt of hartshorn	$NH_4HCO_3 + (NH_4)_2CO_3$	cold saturated	
Salt/acid mixtures	10% H_2SO_4 + 10% copper sulphate		
Salt/acid mixtures	10% H_2SO_4 + 2% ferrous sulphate		
Saltpetre	see potassium nitrate / sodium nitrate		
Sauerkraut liquor			
Schweinfurt green	$Cu(CH_3COO)_2 \cdot 3Cu(AsO_2)_2$		
Seawater			
Seawater			
Silver bromide	AgBr	saturated	
Silver chloride	AgCl	saturated	
Silver nitrate	$AgNO_3$		10%
Silver nitrate	$AgNO_3$	fused	
Slaked lime	see calcium hydroxide		
Soap			
Soda	see sodium carbonate		
Sodium acetate	$CH_3COONa \cdot 3H_2O$	saturated	
Sodium bicarbonate	$NaHCO_3$		all concentrations
Sodium bisulphate	$NaHSO_4 \cdot H_2O$		10%
Sodium bisulphite	$NaHSO_3$		50%
Sodium bromide	NaBr		20%
Sodium carbonate (soda)	$Na_2CO_3 \cdot 10H_2O$		10%

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
boiling	3 L	1 L	0 L	0 L	0 L	0 L	0 L	0 L
20 ºC	2	2	1	0	0	0	0	0
boiling	3	3	3	3	3	1	1	
20 ºC	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	3	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	
20 ºC	0	0	0	0	0	0	0	0
boiling	2	1	1	0	0	0	0	0
boiling	2	1	1	0	0	0	0	0
360 ºC	3	3	3	3	3			
20 ºC				2 L	1 L	0 L	0 L	
150 ºC				2 L	1 L	0 L	0 L	0 L
20 ºC	2 L	1 L	0 L	0	0 L	0 L	0 L	
20 ºC	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
550 ºC	3	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	3	2	2	1	0	0	0	0
20ºC and boiling		0	0	0	0	0	0	0
20 ºC		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20 ºC		0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
boiling	2	1	1	0	0	0	0	0
boiling	3	2	2	1	1	0	0	0
20 ºC				2 L	1 L	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20 ºC		0 L	0 L	0 L	0 L	0 L	0 L	0
boiling				2 L	1 L	0 L	0 L	0 L
20 ºC		0 L	0 L	0 L	0 L			
20 ºC		1 L		1 L	1 L	0 L	0 L	0
boiling	0	0	0	0	0	0	0	0
250 ºC	3	2	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling			1	1	0	0	0	0
boiling			1	0	0	0	0	0
80 ºC						0 L	0 L	
boiling	0	0	0	0	0	0	0	0

Corrosive agent	Formula	Condition	Concentration
Sodium carbonate (soda)	$Na_2CO_3 \cdot 10H_2O$	fused	
Sodium carbonate (soda)	$Na_2CO_3 \cdot 10H_2O$	fused	
Sodium chlorate	$NaClO_3$		30%
Sodium chloride (table salt)	NaCl	cold saturated	
Sodium chloride (table salt)	NaCl	hot saturated	
Sodium chlorite	$NaClO_2$		5%
Sodium chlorite	$NaClO_2$		5%
Sodium fluoride	NaF		5%
Sodium hydrogen phosphate	$Na_2HPO_4 \cdot 12H_2O$		
Sodium hydroxide (caustic soda solution)	Na(OH)		25%
Sodium hydroxide (caustic soda solution)	Na(OH)		25%
Sodium hydroxide (caustic soda solution)	Na(OH)		50%
Sodium hydroxide (caustic soda)	Na(OH)	fused	
Sodium hypochlorite (bleaching liquor)	NaClO		5%
Sodium hypochlorite (bleaching liquor)	NaClO		5%
Sodium nitrate (Chile saltpetre)	$NaNO_3$		
Sodium nitrate (Chile saltpetre)	$NaNO_3$	fused	
Sodium nitrite	$NaNO_2$	hot saturated	
Sodium perborate	$NaBO_3 \cdot 4H_2O$	cold saturated	
Sodium perchlorate	$NaClO_4 \cdot 4H_2O$		10%
Sodium peroxide (sodium superoxide)	Na_2O_2		10%
Sodium peroxide (sodium superoxide)	Na_2O_2		10%
Sodium peroxide (sodium superoxide)	Na_2O_2		10% stabilised with sodium silicate
Sodium phosphate sec.	$Na_2HPO_4 \cdot 12H_2O$	cold saturated	
Sodium phosphate tert.	$Na_3PO_4 \cdot 12H_2O$	cold saturated	
Sodium salicylate	HOC_6H_4COONa	cold saturated	
Sodium silicate	Na_2SiO_3		
Sodium sulphate (Glauber's salt)	$Na_2SO_4 \cdot 10H_2O$	cold saturated	
Sodium sulphate (Glauber's salt)	$Na_2SO_4 \cdot 10H_2O$	cold saturated	
Sodium sulphide	$Na_2S \cdot 9H_2O$		25%
Sodium sulphide	$Na_2S \cdot 9H_2O$		sat. Solution
Sodium sulphite	$Na_2SO_3 \cdot 7H_2O$		50%
Sodium tetraborate (borax)	$Na_2B_4O_7 \cdot 10H_2O$	saturated	
Sodium tetraborate (borax)	$Na_2B_4O_7 \cdot 10H_2O$	molten	
Sodium thiosulphate (anti-chlorine)	$Na_2S_2O_3 \cdot 5H_2O$		25%
Soft soap			
Spinning bath (viscose bath)			up to 10% H_2SO_4
Spinning bath (viscose bath)			over 10% H_2SO_4
Spirit	see ethyl alcohol		
Stannic chloride	$SnCl_4$	cold saturated	
Stannic chloride	$SnCl_4$	cold and hot saturated	
Stannous chloride	$SnCl_2 \cdot 2H_2O$	hot saturated	
Stannous chloride	$SnCl_2 \cdot 2H_2O$	hot saturated	
Steam			
Stearic acid	$C_{17}H_{35}COOH$		
Stearic acid	$C_{17}H_{35}COOH$		
Sublimate	see mercuric chloride		
Sugar of lead	see lead acetate		
Sugar solution			
Sulphite liquor	see calcium bisulphite		
Sulphur chloride	see disulphur dichloride		
Sulphur dioxide	see sulphurous acid (gas)		
Sulphur, dry		molten	
Sulphur, dry		boiling	
Sulphur, wet			

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
100 ºC	0	0	0	0	0	0	0	0
900 ºC	3	3	3	3	3			
20ºC and boiling				0	0	0	0	0
20 ºC	1 L	0 L	0 L	0 L	0 L	0 L	0 L	0
100 ºC	3 L	2 L	1 L	1 L	1 L	0 L	0 L	0 L
20 ºC				2 L	2 L	1 L	0 L	
boiling				3	2	2 L	1 L	1 L
20 ºC					0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
boiling	2	2	2	1	1	0	0	0
boiling	3	2	2	1	1	0	0	0
320 ºC	3	3	3	3	3	3	2	2
20 ºC	3 L	2 L	2 L	1 L	1 L	0 L	0 L	
boiling	3 L	3 L	2 L	1 L	1 L	1 L	1 L	1 L
20ºC and boiling	0	0	0	0	0	0	0	0
360 ºC	0	0	0	0	0	0	0	0
boiling		0	0	0	0	0	0	0
20 ºC		0	0	0	0	0	0	0
boiling	2	2	1	0	0	0	0	0
20 ºC	2	1	0	0	0	0	0	0
boiling	3	2	0	0	0	0	0	0
up to 80 ºC	3	2	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
20 ºC		0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
boiling		2	1	0	0	0	0	0
100 ºC				1	1			
boiling	2	2	1	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
	3	3	3	3	3	2	2	2
20ºC and boiling		0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
70 ºC	3	3	2	2	1	0	0	0
70 ºC	3	3	3	3	3	1	1	1
20 ºC	3 L	3 L	3 L	3 L	2 L			
boiling	3 L	3 L	3 L	3 L	3 L			
50 ºC	3 L	2 L	2 L	1 L	0 L			
boiling	3 L	3 L	3 L	3 L	3 L			
400 ºC	0	0	0	0	0	0	0	0
20 ºC	0	0	0	0	0	0	0	0
130 ºC			0	0	0	0	0	0
20ºC and boiling	0	0	0	0	0	0	0	0
130 ºC	0	0	0	0	0	0	0	0
445 ºC	3	3	3	2	2			
20 ºC		1		1	0	0	0	0

Corrosive agent	Formula	Condition	Concentration
Sulphuric acid	H_2SO_4		1%
Sulphuric acid	H_2SO_4		1%
Sulphuric acid	H_2SO_4		1%
Sulphuric acid	H_2SO_4		2,50%
Sulphuric acid	H_2SO_4		2,50%
Sulphuric acid	H_2SO_4		2,50%
Sulphuric acid	H_2SO_4		5%
Sulphuric acid	H_2SO_4		5%
Sulphuric acid	H_2SO_4		5%
Sulphuric acid	H_2SO_4		7,50%
Sulphuric acid	H_2SO_4		7,50%
Sulphuric acid	H_2SO_4		7,50%
Sulphuric acid	H_2SO_4		10%
Sulphuric acid	H_2SO_4		10%
Sulphuric acid	H_2SO_4		10%
Sulphuric acid	H_2SO_4		20%
Sulphuric acid	H_2SO_4		20%
Sulphuric acid	H_2SO_4		20%
Sulphuric acid	H_2SO_4		40%
Sulphuric acid	H_2SO_4		40%
Sulphuric acid	H_2SO_4		40%
Sulphuric acid	H_2SO_4		60%
Sulphuric acid	H_2SO_4		60%
Sulphuric acid	H_2SO_4		60%
Sulphuric acid	H_2SO_4		80%
Sulphuric acid	H_2SO_4		80%
Sulphuric acid	H_2SO_4		80%
Sulphuric acid	H_2SO_4		98% (concentrated)
Sulphuric acid	H_2SO_4		98% (concentrated)
Sulphuric acid	H_2SO_4		98% (concentrated)
Sulphuric acid	H_2SO_4		98% (concentrated)
Sulphuric acid	fuming (11% free SO_3)		
Sulphuric acid	fuming (11% free SO_3)		
Sulphuric acid	fuming (60% free SO_3)		
Sulphuric acid	fuming (60% free SO_3)		
Sulphurous acid	H_2SO_3	saturated	
Sulphurous acid	H_2SO_3	4 bar	
Sulphurous acid	H_2SO_3	5 - 8 bar	
Sulphurous acid	H_2SO_3	10 - 20 bar	
Sulphurous acid, gas (SO_2)	moist, free of SO_3		
Sulphurous acid, gas (SO_2)	moist, free of SO_3		
Sulphurous acid, gas (SO_2)	moist, free of SO_3		
Sulphurous acid, gas (SO_2)	moist, free of SO_3		
Super phosphate	$Ca(H_2PO_4)_2 + CaSO_4 + 3\% H_2SO_4$		
Tannic acid (tannin)			5%
Tannic acid (tannin)			5%
Tannic acid (tannin)			10%
Tannic acid (tannin)			10%
Tannic acid (tannin)			50%
Tannic acid (tannin)			50%
Tannin	see tannic acid		
Tar, pure			
Tartar	see potassium bitratrate		
Tartaric acid	$COOH(CHOH)_2COOH$		10%

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
20 °C	3	3	2	1	0	0	0	0
70 °C	3	3	2	1	0	0	0	0
boiling	3	3	3	1	1	0	0	0
20 °C	3	3	3	1	0	0	0	0
70 °C	3	3	3	1	0	0	0	0
boiling	3	3	3	2	2	0	0	0
20 °C	3	3	3	1	0	0	0	0
70 °C	3	3	3	1	1	0	0	0
boiling	3	3	3	3	2	1	1	1
20 °C	3	3	3	1	0	0	0	0
70 °C	3	3	3	1	1	0	0	0
boiling	3	3	3	2	2	1	1	1
20 °C	3	3	3	2	1	0	0	0
70 °C	3	3	3	2	2	0	0	0
boiling	3	3	3	3	2	1	1	1
20 °C	3	3	3	1	1	0	0	0
70 °C	3	3	3	2	2	1	1	1
boiling	3	3	3	3	3	2	2	2
20 °C	3	3	3	1	1	0	0	
70 °C	3	3	3	2	2	2	1	2
boiling	3	3	3	3	3	2	2	2
20 °C	3	3	3	3	2	0	0	
70 °C	3	3	3	3	3		1	
boiling	3	3	3	3	3			
20 °C	3	3	3	1	1	1	1	1
70 °C	3	3	3	3	2	2	2	2
boiling	3	3	3	3	3	2	2	2
20 °C		0	0	0	0	0	0	0
70 °C	2	2	2	2	2	1	1	1
150 °C	3	3	3	2	2			
boiling	3	3	3	3	3			
20 °C		0	0	0	0	0	0	0
100 °C	3	3	3	1	0	0	0	0
20 °C		0	0	0	0	0	0	0
80 °C	3	3	3	0	0	0	0	0
20 °C	3	2	0	0	0	0	0	0
135 °C	3	2	0	1	0	0	0	0
160 °C	3	3	1	2	1			
180 - 200 °C	3	3	2	2	1			
up to 100 °C	3	2	0	0	0	0	0	0
up to 300 °C	3	3	1	1	0	0	0	0
up to 500 °C	3	3	3	1	1			
900 °C	3	3	3	3	2			
20 °C				0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	1	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	1	1	1	0	0	0	0	0
20 °C and hot	0	0	0	0	0	0	0	0
20 °C	1	0	0	0	0	0	0	0

Corrosive agent	Formula	Condition	Concentration
Tartaric acid	$COOH(CHOH)_2COOH$		10%
Tartaric acid	$COOH(CHOH)_2COOH$		50%
Tartaric acid	$COOH(CHOH)_2COOH$		50%
Thioglycolic acid	$HSCH_2COOH$		
Tin	Sn	molten	
Tin	Sn	molten	
Tin	Sn	molten	
Tincture of iodine			
Toluene	$C_6H_5CH_3$		
Tricholoracetic acid	CCl_3COOH		80%
Trichloroethylene	C_2HCl_3	anhydrous	
Trisodium phosphate	see sodium phosphate tert.		
Turpentine			
Urea	$CO(NH_2)_2$		
Urine			
Varnish (copal varnish)			
Vaseline			
Vaseline			
Vegetables			
Vinegar (wine vinegar)			
Vinegar (wine vinegar)			
Washing powder			
Water (tap water)			
Water [pit water (acid water)]			
Water glass			
Water glass			
Wine (white and red wines)			
Wine (white and red wines)			
Wine vinegar	see vinegar		
Xylene	$C_6H_4(CH_3)_2$		
Zinc	Zn	molten	
Zinc chloride	$ZnCl_2$	cold and hot saturated	
Zinc chloride	$ZnCl_2$	cold saturated	
Zinc chloride	$ZnCl_2$	cold and hot saturated	
Zinc sulphate	$ZnSO_4 \cdot 7H_2O$	cold saturated	
Zinc sulphate	$ZnSO_4 \cdot 7H_2O$	hot saturated	
Zinc cyanide	$Zn(CN)_2$ moistened with water		

Temperature	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	1.4465	1.4539	1.4565 S
boiling	2	2	0	0	0	0	0	0
20 °C	2	1	0	0	0	0	0	0
boiling	3	2	2	2	1	0	0	0
20°C and boiling					1	0	0	0
200 °C	2	2	0	0	0	0	0	0
400 °C	3	3	1	1	1			
600 °C	3	3	3	3	3			
20 °C	2 L	2 L	1 L	1 L	1 L	0 L	0 L	0 L
20°C and boiling	0	0	0	0	0	0	0	0
20 °C				2 L	1 L	0 L	0 L	
boiling	0	0	0	0	0	0	0	0
20 °C and hot	0	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
20 °C			0 L	0 L	0 L	0	0	0
	0	0	0	0	0	0	0	0
20 °C	0	0	0	0	0	0	0	0
hot	0	0	0	0	0	0	0	0
boiling				0	0	0	0	0
20 °C		0	0	0	0	0	0	0
boiling	2	1	0	0	0	0	0	0
	0	0	0	0				
20 °C	0 L	0 L	0 L	0	0	0	0	0
20 °C	1 L	1 L	0 L	0 L	0 L	0	0	0
20 °C	0	0	0	0	0	0	0	0
boiling	0	0	0	0	0	0	0	0
20 °C				0	0	0	0	0
hot				0	0	0	0	0
20°C and boiling	0	0	0	0	0	0	0	0
500 °C	3	3	3	3	3			
20 °C	1 L	1 L	1 L	0 L	0 L	0 L	0 L	0
45 °C				2 L	1 L	0 L	0 L	0 L
boiling	3 L	3 L	3 L	3 L	2 L	1 L	1 L	1 L
20°C and boiling				0	0	0	0	0
boiling	2	2	0	0	0	0	0	0
20 °C	1	1	0	0	0	0	0	0