OSMA®

Polypropylene® KG 2000

release 213

ISO 9001

Leading system features

- **MODERN ADVANCED SYSTEM**
- **DURABILITY UNDER SEVERE CONDITIONS**
- **HIGH STRENGTH AND TOUGHNESS**
- **ABRASION RESISTANCE**
- **STRENGTH CLASS SN 10**
- **WATERTIGHTNESS – 0.5 bar**
- **GAS TIGHTNESS – 0.5 bar**
- **PERFECT CONNECTION TIGHTNESS**
- **MULTI-BLADE SEALING ELEMENT**
- **CHEMICAL RESISTANCE PH 2 – PH 12**
- **THERMAL RESISTANCE LONG 90°C, SHORT 95°C**
- **HIGH NOTCH TOUGHNESS**
- **LOW SURFACE ROUGHNESS**
- **100 % RECYCLABLE**
- **IN HARMONY WITH NATURE**

Sewer System for Severe Conditions

KG 2000 SN10/SN16 Polypropylene® is a modern advanced system of sewer pipes and fittings to be used mostly in exposed places and in sewerage construction under demanding conditions, where the laying depth is down to 8 meters. At the same time, it complies with all future standards and environment protection requirements.

Material – PP

KG 2000 SN 10 Polypropylene® sewer pipes and fittings are made of Polypropylene (PP). They have characteristic smooth and homo-geneous walls with high radial stiffness, which predetermines them to be used in places with greater vertical pressure like highway sur-facing, at extreme depths or in areas with high underground water level.

Radial Stiffness

Due to the increased depth homogeneous walls of KG 2000 Polypropylene® tubes and tube fittings, the radial stiffness equals SN 10. The system is therefore used for footing constructions in metro-politan areas or city centers.

Sealing Properties

The KG 2000 Polypropylene® sewer system is:
waterproof – at over and under-pressure 0.5 bar
gas proof – at over and under-pressure 0.5 bar
Leakage test according to DIN EN 1610 with air and water from 0.05 bar to 0.5 bar and vacuum. (System test 3.0 bar MPA Darmstadt).

New Sealing Element

The connection tightness of the system during both overpressure and under-pressure is ensured by a multi-blade sealing element, which has a tension blade – preventing impurities getting between the gasket and the pipe wall, a restriction blade - fixing the position of the inserted pipe, a wiping blade - removing the rest of impurities from the inserted end of pipe, and a main blade - ensuring long--term sealing of the connection.

Chemical Resistance

The KG 2000 SN10/SN16 Polypropylene® sewer system is resistant accor-ding to DIN 8078 to acid wastewater with pH 2 up to alkaline water with pH 12.

Thermal Resistance

Due to the great toughness of the material – Polypropylene, the whole system including the sealing elements is resistant to long--term temperatures up to 90 °C.

Mechanical Resistance

The high notch toughness and low surface roughness (0.001mm) have great significance for the hydraulic properties of the KG 2000 SN10/SN16 Polypropylene® sewer system. Generally, the lower the sur-face roughness, the higher the flow volume; the pipe walls suffer no corrosion or erosion attacks and thus the possibility of deposit formation is almost eliminated.

Environmental Compatibility

The KG 2000 Polypropylene® sewer system is inert to under-ground and soil water. Every component is fully recyclable or com-bustible, which gives rise to water and carbon dioxide.

KG 2000 Polypropylene®

Heavy - duty Sewerage

Description

Sewer pipes and fittings made of polypropylene are able to withstand boiling water and the effects of light, and are produced according to ČSN EN 14758-1.

Field of application

Due to the production technology, the system is to be used in places with greater vertical pressure like highway surfacing, at extreme depths or in areas with high underground water level, etc.

With respect to DIN EN 476, polypropylene has excellent thermal properties. It can also be used under extreme conditions.

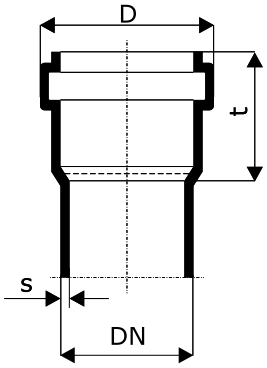
- High chemical resistance pH2 – pH 12 (acid/alkaline)
  – resistant to bioorganic sulphuric acid corrosion
  » see chapter Chemical resistance
- High abrasion resistance of PP – long lasting and safe in operation
- Excellent impact resistance and extremely tough
  – does not tend to crack or spread cracks
  – robust under mechanical stress (e. g. high-pressure flushing)

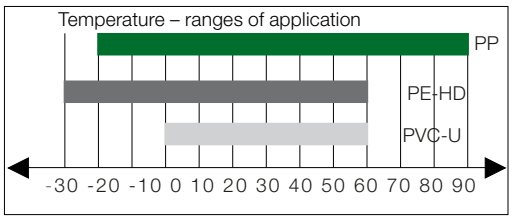
KG 2000 Polypropylen SN10

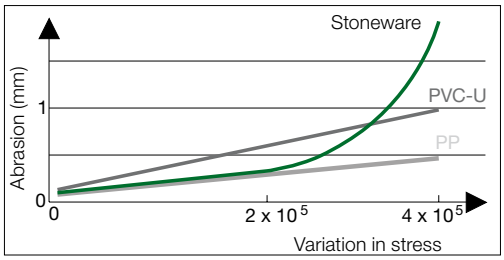
DN	s [mm]	D [mm]	t [mm]
110	3,4	128	72
125	3,9	146	80
160	4,9	187	95
200	6,2	236	123
250	7,7	287	133
315	9,7	359	155
400	12,3	450	180
500	15,3	565	205

KG 2000 Polypropylen SN16

DN	s [mm]	D [mm]	t [mm]
110	4,2	128	90
125	4,8	146	100
160	6,2	187	115
200	7,7	236	140
250	9,6	287	170
315	12,1	359	190
400	15,3	450	280
500	19,1	565	325







THE SYMBOLS AND ABBREVIATIONS USED IN THE CATALOG	
D	maximum outer diameter
DN	nominal dimension
s	Pipe wall thickness
t	faucet depth (insertion length of free faucet)

As the materials are mostly supplied by multiple manufacturers, the weight and dimension parameters must be understood as for information purposes only.

Our technical consultancy services are based on both experience and calculations. Since we do not know and cannot influence the conditions of use of the products we offer, all information must be regarded as recommendations.

In the event of use other than that as recommended by us, potential risks must be taken into consideration.

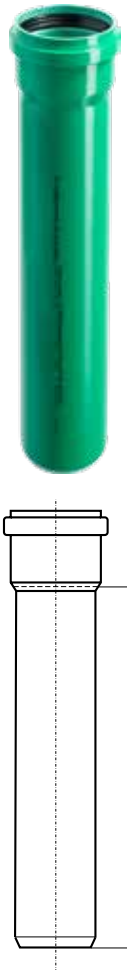
Typographic errors reserved.

100% RECYCLABLE

CIRCULAR STIFFNESS SN4 - SN10

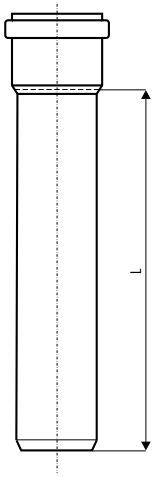
PPKGEM - Pipe with Socket SN10

EAN CODE	EAN	DN	L (mm)	PALLETE
4052836703200	770320	110	500	80
4052836703408	770340	110	1000	80
4052836703606	770360	110	2000	80
4052836703705	770370	110	3000	80
4052836703804	770380	110	5000	80
4052836704207	770420	125	500	60
4052836704405	770440	125	1000	54
4052836704603	770460	125	2000	54
4052836704702	770470	125	3000	54
4052836704801	770480	125	5000	54
4052836705204	770520	160	500	35
4052836705402	770540	160	1000	35
4052836705600	770560	160	2000	35
4052836705709	770570	160	3000	35
4052836705808	770580	160	5000	35
4052836706201	770620	200	500	20
4052836706409	770640	200	1000	25
4052836706607	770660	200	2000	25
4052836706706	770670	200	3000	25
4052836706805	770680	200	5000	25
4052836707406	770740	250	1000	16
4052836707703	770770	250	3000	16
4052836707901	770790	250	6000	16
4052836708403	770840	315	1000	9
4052836708700	770870	315	3000	9
4052836708908	770890	315	6000	9
4052836709400	770940	400	1000	4
4052836709707	770970	400	3000	4
4052836709905	770990	400	6000	4
4052836710406	771040	500	1000	4
4052836710703	771070	500	3000	4
4052836710901	771090	500	6000	4



PPKGEM - Pipe with Socket SN 16

EAN CODE	EAN	DN	L (mm)	PALLETE
405283803407	780340	110	1000	80
405283803704	780370	110	3000	80
405283803902	780390	110	6000	80
405283804404	780440	125	1000	54
405283804701	780470	125	3000	54
405283804909	780490	125	6000	54
405283805401	780540	160	1000	35
405283805708	780570	160	3000	35
405283805906	780590	160	6000	35
405283805906	780640	200	1000	25
405283806705	780670	200	3000	25
405283806903	780690	200	6000	25
405283807405	780740	250	1000	16
405283807702	780770	250	3000	16
405283807900	780790	250	6000	16
405283808402	780840	315	1000	9
405283808709	780870	315	3000	9
405283808907	780890	315	6000	9
405283809409	780940	400	1000	4
405283809706	780970	400	3000	4
405283809904	780990	400	6000	4
405283810405	781040	500	1000	4
405283810702	781070	500	3000	4
405283810900	781090	500	6000	4

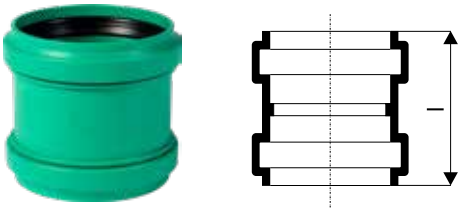


PPKGM - Socket Stopper

EAN CODE	EAN	DN	l (mm)	PACKING	PALLETE
4052836773203	777320	110	55	4	700
4052836774200	777420	125	55	4	580
4052836775207	777520	160	70	4	260
4052836776204	777620	200	85	2	160
4052836777201	777720	250	88	1	96
4052836778208	777820	315	98	1	60
4052836779205	777920	400	116	1	32
405283611804	771180	500	149	1	12

PPKGMM - double-Socket Sleeve

EAN CODE	EAN	DN	l (mm)	PACKING	PALLETE
4052836773005	777300	110	139	4	280
4052836774002	777400	125	155	4	200
4052836775009	777500	160	185	4	96
4052836776006	777600	200	239	1	54
4052836777003	777700	250	275	1	30
4052836778000	777800	315	315	1	15
4052836779007	777900	400	345	1	8
405283611705	771170	500	407	1	4

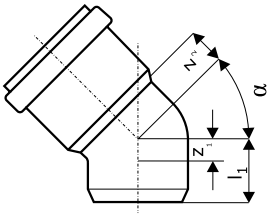


PPKGB - Bend 15°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	l_1 (mm)	PACKING	PALLETE
4052836713001	771300	110	9	15	87	4	260
4052836714008	771400	125	10	16	93	4	144
4052836715005	771500	160	13	19	120	4	72
4052836716002	771600	200	15	31	158	1	40
4052836717009	771700	250	23	44	163	1	24
4052836718006	771800	315	28	56	188	1	12
4052836719003	771900	400	29	67	220	1	6
405283611002	771100	500	67	183	263	1	2

PPKGB - Bend 30°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	l_1 (mm)	PACKING	PALLETE
4052836713100	771310	110	17	23	95	4	240
4052836714107	771410	125	19	28	102	4	144
4052836715104	771510	160	24	34	125	4	72
4052836716101	771610	200	29	46	162	1	38
405283611101	771110	500	101	217	297	1	2



PPKGB - Bend 45°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	l_1 (mm)	PACKING	PALLETE
4052836713209	771320	110	26	29	94	4	200
4052836714206	771420	125	29	36	112	4	144
4052836715203	771520	160	37	45	144	4	60
4052836716200	771620	200	46	57	189	1	38
4052836717207	771720	250	59	77	199	1	20
4052836718204	771820	315	73	98	233	1	10
4052836719201	771920	400	92	120	283	1	5
405283611200	771200	500	138	254	334	1	2

PPKGB - Bend 67°

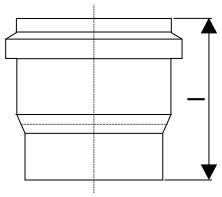
EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	l_1 (mm)	PACKING	PALLETE
4052836713308	771330	110	41	47	119	4	180
4052836714305	771430	125	44	54	127	4	120
4052836715302	771530	160	56	69	161	2	60

PPKGB - Bend 87°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	l_1 (mm)	PACKING	PALLETE
4052836713506	771350	110	59	65	137	4	160
4052836714503	771450	125	66	72	145	4	108
4052836715500	771550	160	84	91	180	2	60

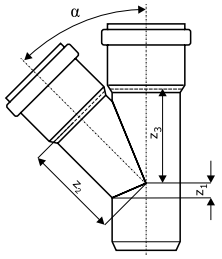
PPKGBA - connections to Concrete

EAN CODE	EAN	DN	l_1 (mm)	PACKING	PALLETE
4052836775702	877570	160	165	1	90
4052836776709	877670	200	197	1	40



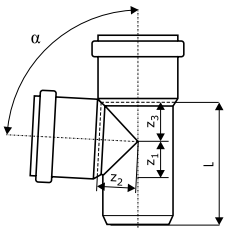
PPKGEA - Branch Pipe 45°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	z_3 (mm)	L (mm)	PACKING	PALLETE
4052836723307	772330	110/110	26	134	134	228	4	96
4052836723406	772340	125/110	81	91	91	240	2	76
4052836724403	772440	125/125	29	152	152	255	2	64
4052836723505	772350	160/110	2	168	162	250	2	46
4052836724502	772450	160/125	10	179	175	260	2	40
4052836725509	772550	160/160	37	195	195	320	2	28
4052836725608	772560	200/160	19	221	218	-	1	20
4052836726605	772660	200/200	46	244	244	-	1	15
4052836727602	772760	250/160	57	258	311	-	1	10
4052836727701	772770	250/250	57	311	311	-	1	8
4052836728500	772850	315/160	40	301	250	-	1	7
4052836728609	772860	315/200	72	325	393	-	1	4
4052836728807	772880	315/315	72	393	393	-	1	4
4052836729408	772940	400/160	82	394	526	-	1	3
4052836729606	772960	400/200	55	417	555	-	1	2
4052836729705	772970	400/315	55	417	555	-	1	1
4052836729903	772990	400/400	78	683	683	-	1	1
4052836711304	771130	500/160	78	683	683	-	1	1
4052836711502	771150	500/315	140	490	530	-	1	1



PPKGEA - Branch Pipe 87°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	z_3 (mm)	L (mm)	PACKING	PALLETE
4052836743305	774330	110/110	59	64	64	197	4	120
4052836743503	774350	160/110	15	141	140	227	2	46
4052836745507	774550	160/160	81	91	91	279	2	32



PPKG - spare O-ring

EAN CODE	EAN	DN	PACKING
4052836804006	880400	110	20
4052836804105	880410	125	18
4052836804204	880420	160	21
4052836804303	880430	200	10
4052836804402	880440	250	1
4052836804501	880450	315	1
4052836804600	880460	400	1

PPKG NBR – Oil O-ring

EAN CODE	EAN	DN	PACKING
4052836805003	880500	110	20
4052836805102	880510	125	27
4052836805201	880520	160	10
4052836805300	880530	200	10
4052836805409	880540	250	1
4052836805508	880550	315	1
4052836805607	880560	400	1

HT – GA Cuff

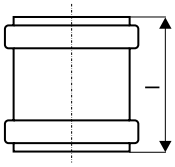
EAN CODE	EAN	DN	PACKING
4052836810250	881025	110	16
4052836810304	881030	125	15
4052836810403	881040	160	14
4052836810502	881050	200	10

Mounting Lubricant

EAN CODE	EAN	AMOUNT gr	PACKING	PALLETE
4052836818003	881800	150	50	1750
4052836818102	881810	250	50	1500
4052836818201	881820	500	24	720
4052836818300	881830	1000	12	

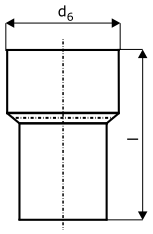
PPKGU – Sleeve

EAN CODE	EAN	DN	l (mm)	PACKING	PALLETE
4052836783004	778300	110	139	4	280
4052836784001	778400	125	155	4	200
4052836785008	778500	160	185	4	96
4052836786005	778600	200	239	1	54
4052836787002	778700	250	275	1	30
4052836788009	778800	315	315	1	15
4052836789006	778900	400	345	1	8
405283611606	771160	500	394	1	4



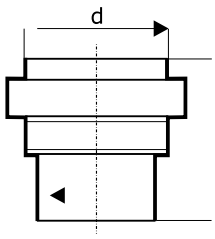
PPKGUG – Reducer Cast-iron/KG 2000

EAN CODE	EAN	DN	d_6 (mm)	l (mm)	PACKING	PALLETE
4052836783202	778320	110	125	151	1	420



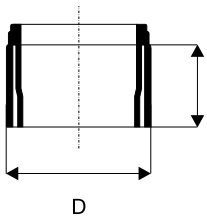
PPKGUS – Reducer Stoneware/KG 2000

EAN CODE	EAN	DN	d (mm)	l (mm)	PACKING	PALLETE
4052836773807	777380	110	138	151	1	288
4052836775801	777580	160	194	207	1	100



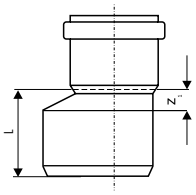
PPKGUSM – Reducer KG 2000/Stoneware

EAN CODE	EAN	DN	D (mm)	l (mm)	PACKING	PALLETE
4052836773906	777390	110	132	91	5	420
4052836775900	777590	160	187	98	1	180



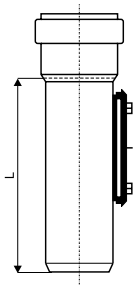
PPKGR – abaxial Reduction Pipe, long

EAN CODE	EAN	DN	z_1 (mm)	L (mm)	PACKING	PALLETE
4052836753403	775340	125/110	16	99	4	240
4052836753502	775350	160/110	34	135	4	192
4052836754509	775450	160/125	28	129	4	104
4052836755605	775560	200/160	32	175	1	60
4052836756701	775670	250/200	49	181	1	40
4052836757807	775780	315/250	63	215	1	25
4052836758804	775880	400/315	91	271	1	10
405283658809	771190	500/400	162	312	1	4



PPKGRE - Purging Fitting (rectangular Cover)

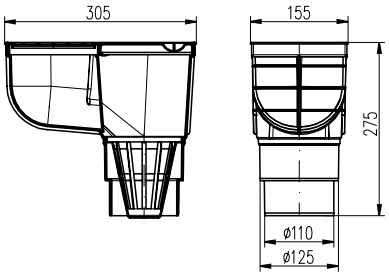
EAN CODE	EAN	DN	L (mm)	PACKING	PALLETE
4052836783103	778310	110	308	2	80
4052836784100	778410	125	313	2	70
4052836785107	778510	160	380	1	40
4052836786104	778610	200	410	1	20



KV 110/125 ST – Bottom Street Drain

EAN CODE	EAN	TITLE	Flow l/ min	PACKING	PALLETE
4025075801105	80110	KVS 110/125 ST	390	4	80

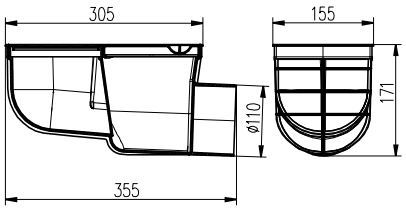
The product is designed for draining storm water (surface) water to exterior sewage lines, allowing for rain pipe installations. It includes a dry antiodour flap, which blocks the odour spreading from the sewage pipeline. The eccentric cover in the STANDARD model allows for cutouts as needed, with diameters 75, 80, 90, 100, 110 or 125 mm. Made of UVstabilized polypropylene.
Loading capacity K3 – 300 kg, resistance to 90 °C, standard EN 1253 – 1.



KV 110 B ST – Side Street Drain

EAN CODE	EAN	TITLE	Flow l/ min	PACKING	PALLETE
4025075801204	80120	KVS 110 ST	375	4	120

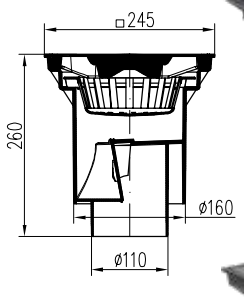
The product is designed for draining storm water (surface) water to exterior sewage lines, allowing for rain pipe installations. It includes a dry antiodour flap, which blocks the odour spreading from the sewage pipeline. The street drain KV 110 B is used for the lowest depth within the sewage system.
The eccentric cover in the STANDARD model allows for cutouts as needed, with diameters 75, 80, 90, 100, 110 or 125 mm. Made of UVstabilised polypropylene.
Loading capacity K3 – 300 kg, resistance to 90 °C, standard EN 1253 – 1.

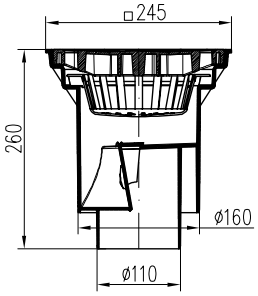


KVS 160 S – Bottom Street Drain

EAN CODE	EAN	TITLE	Type of Grid	Flow l/ min	PACKING	PALLETE
4025075801303	80130	KVS 160 S-Li*	Cast-iron	355	1	48
4025075801402	80140	KVS 160 S-P*	plast	355	1	48

Bottom street drain D 160 are made in four different models all with dry flap. Product 328 with a robus cast iron grid, 328z with a robus cast iron grid and with two stainless steel screws A2, 6,3 x 38 mm to lock the grid. Product 328 P with plastic grid and 328 Pz with plastic grid and with two stainless steel screws A2, 6,3 x 38 mm to lock the grid.
These products are designed for exterior installations for pipeline D 110 or D 160mm. They are made of UVstabilized polypropylene, grid is from cast iron DIN1691, loading capacity complaint to EN124, B 125 (12.500kg) and plastic grid if made of PP complaint to EN 12532L15 (1.500kg) with thermal resistance 90°C.
* can be ordered with grid secured by stainless steel screws





1. SCOPE OF VALIDITY

These instructions comprise rules based on experience in pipeline assembly in different parts of the world. As they are quite general, they are to be considered a recommendation only, which is not binding.

The instructions describe the transport, storage and assembly process of the KG 2000 SN 10 Polypropylene® sewer system. This involves excavation work, pipeline installation, packing of piping, backfill, repairs and maintenance. Special consideration must be given to work in frozen ground or places with high level of underground water. They also specify the material's transport, handling and storage. The instructions include the average conditions of pipe laying. In special cases, it is necessary to contact a specialized design office consultant or one of the OSMA company technical advisors.

2. TECHNICAL TERMS

These instructions are just a recommended procedure. They are in no case a manual for design. Before commencing the sewer pipe design work, it is necessary for the designer to ascertain the soil and excavation type, to calculate the height of the covering fill and to consult everything with the contractor. However, leaving out this step, it is still possible to set some guidelines to be able to determine whether KG 2000 SN 10 Polypropylene® can be used under specific conditions and to recommend maximum possible deformations. When observing the requirements specified in these instructions, pipeline operation free from defects can be ensured for at least 100 years.

The KG 2000 SN 10 Polypropylene® sewer system can be used for all applications in normal soil conditions, ordinary excavations, and backfill and compaction methods. In case of pipes and pipe fittings with radial stiffness SN 8, the medium pipe deformation, measured during the 1st - 3rd month after installation, must not exceed 5% of the external diameter with the maximum lower than 8 %. Maximum deformation 2 years after installation must not exceed 10 % of the pipeline external diameter.

3. TRANSPORT, HANDLING AND STORAGE

The pipes and pipe fittings must be transported in suitable vehicles with a clean laying area with no protruding bolts or nails. During transport, the pipes must be laid along the whole length and the laying area to avoid unwanted deflections. This does not hold for original factory packing in bundles. In such case, it is only necessary not to exceed the maximum height of the transported bundle, which is 3 meters.

KG 2000 SN 10 Polypropylene® pipes and fittings are very tough in spite of their low weight, which makes their handling significantly easier. To avoid any damage, just observe the following points:

a) When transporting using a crane, always use textile straps.

b) Handling tools should always be made of a material softer than plastic – the best is wood.

c) When unloading, never just drop it - when transporting „pipe in pipe" it is always necessary to first take out the internal pipes.

KG 2000 SN 10 Polypropylene® pipes and pipe fittings can be stored in open-air areas, which must be flat, maximum for 3 years. Pipes and pipe fittings must be laid in such a way that no deflection can occur. To avoid deformation of the bells, they must be laid loose. When bundling loose pipes, the height of the bundle must not exceed 2 meters. Bundles in original packing can be heaped up to 4 high.

4. SYMBOLS AND ABBREVIATIONS

The following table specifies the symbols and abbreviations used in Paragraph no. 5.

b_1	Width of excavation trench at the top of pipeline
b_2	The minimum width of excavation trench
D	Maximum external pipe diameter
h	The depth of the top of pipeline below the original surface
h_b	Bedding layer depth
h_c	Pack depth
h_{pc}	Depth of non-compacted soil above the top of pipeline
h_t	Total covering depth above the top of pipeline
s	Pipeline wall thickness

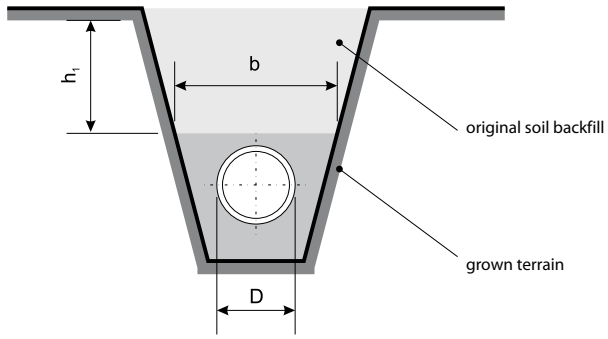
5. CONSTRUCTION - EXCAVATION

The packing and backfill materials' properties, excavation trench width at the top of the pipeline, the greatest pipe diameter or the width/total covering depth ratio influence the maximum laying depth of the pipeline. In addition to the packing of piping, backfill and compaction, the shape of the excavation has a significant role; therefore, it is important for the contractor to use some of the following excavation shapes.

NARROW EXCAVATION TRENCH

The most suitable excavation, in which the top of the pipeline is loaded by the relatively lowest force (see Figure 1).

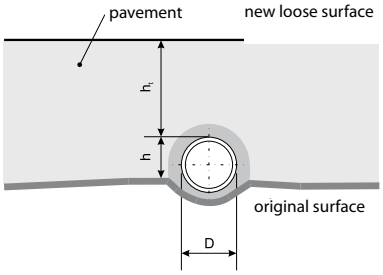
Figure 1 Narrow Excavation Trench



EMBANKMENT- POSITIVE PROJECTION

In this excavation type, the top of the pipeline is above the original ground. Due to terrain settling, the forces acting on the top of the pipeline are the greatest (see Figure 2).

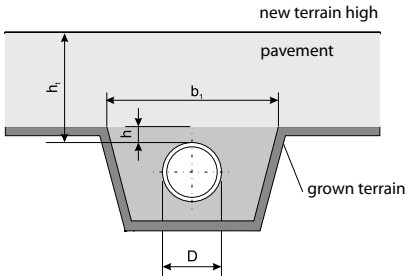
Figure 2 Embankment - Positive Projection



EMBANKMENT- NEGATIVE PROJECTION

In this excavation type, the deformation forces are slightly lower than in the positive projection (see Figure 3).

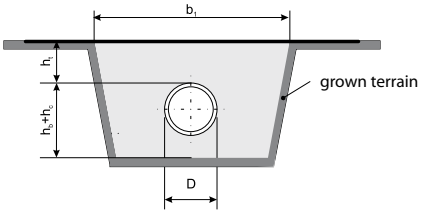
Figure 3 Embankment - Negative Projection



WIDE EXCAVATION PIT

Huge amounts of backfill, along with lower excavation wall friction compared to the narrow excavation, form deformation forces acting on the top of the pipeline which are greater than in a narrow excavation trench but lower than in the negative projection (see Figure 4).

Figure 4 Wide Excavation Pit



OTHER EXCAVATION TYPES

The four mentioned types can be adopted with greater or lesser accuracy.

EXCAVATING PROCESS

The excavation should be open shortly before laying the pipeline and backfilled immediately afterwards, preferably within one day. In case of frosty weather, it is necessary to prevent bedding layer freezing. The bottom width of the excavation must provide enough space for the workmen - must be at least DN+0.4m.The minimum covering depth above the top of the pipeline should be 1 m below the road, and 0.7 m below open terrain. This rule does not apply for horizontal sewers under building structures. The excavation must allow for the formation of the necessary bedding. For bedding adjustment, manual work is necessary (smoothing, levelling cavities) and attentive site supervision.

6. CONSTRUCTION - BED AND PACK

MATERIAL OF THE BEDDING AND THE PACKING OF PIPING

For the bedding and packing of piping, the excavated material can be used if it complies with the requirements in the following paragraph. If not, different material must be used or considered on the site.

The excavated material is suitable for the bedding and packing if it is composed of particles corresponding to the grey area depicted on the nomogram (see Figure 5). The largest particles must not exceed one-tenth of the laid pipe's DN and/or 60 mm.

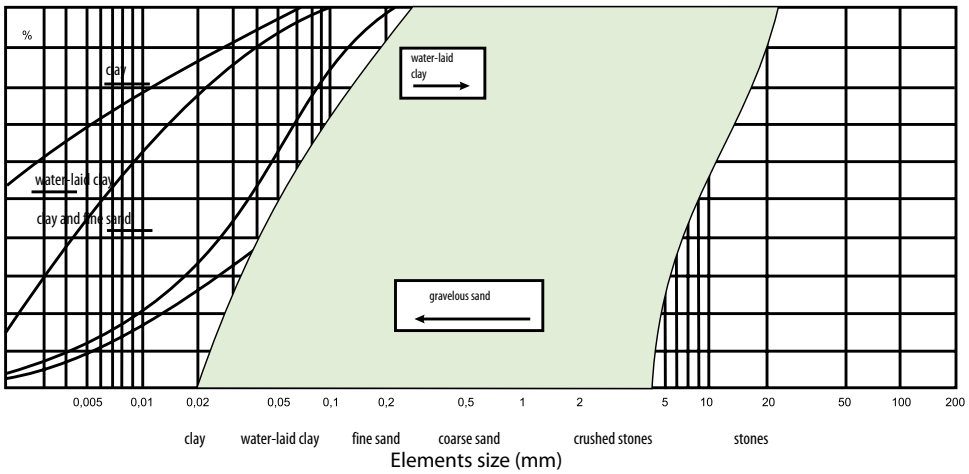
In case the excavated material cannot be used, it is appropriate to choose gravel or crushed stone (5 - 16 mm), which can be well compacted. It is also possible to use partly graded sand or gravel sand with the largest grains equal to one-tenth of the laid pipe's DN or 60 mm.

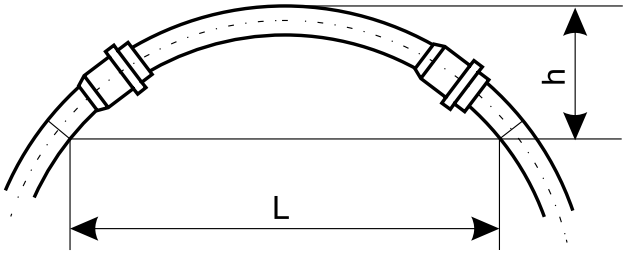
In the following cases it is necessary to form a bedding with minimum thickness hb = 100 mm.

a) narrow trench and negative projection - bedding along the whole width of the trench

b) other excavations - minimum width 2xDN on both sides.

Figure 5 Nomogram of the Excavated Material Applicability for the Backfill





PIPE INSTALLATION

Before laying the pipeline, each pipe must be checked for defects in the bell-mouth, gasket and compromised integrity. Then, it is necessary to lay the pipeline in such a way that there are no bumps at the bell-mouth connections. Larger diameter bell-mouths can be slightly sunk. Each pipe must be aligned according to its slope and direction. It is necessary to constantly keep it straight in the required slope. Exceptionally, pipeline with DN 110 – 200 can be carried out according to Figure 6. However, the values given in the following two tables must not be exceeded.

VALUES hmax FOR INDIVIDUAL NOMINAL DIAMETERS AND SEGMENTS (l)				
l / DN	110	125	160	200
8 m	0,24	0,21	0,17	0,13
12 m	0,54	0,48	0,38	0,30
16 m	0,97	0,85	0,67	0,53

Minimum radius of bending (R)				
DN	110	125	160	200
R	33	38	47	61

Figure 6 Pipe Laying of Strained Pipeline

7. CONSTRUCTION - PACK, BACKFILL, COMPACTION

After the pipeline is laid, connected and tested as required, we can proceed to its packing and backfilling. The material specified in paragraph no. 6 is placed in layers around the pipeline and manually compacted (best by stamping down by foot). Packing and compaction must be carried out always on both sides of the pipeline simultaneously (see Figure 7, layer l1) and the formation of cavities below the pipeline must be prevented. The space between the pipeline and the excavation wall must be evenly compacted. The next layer (see Figure 7, layer l2) should reach the top of the pipeline. This is carried out by gradual filling and compaction of thin layers of the prescribed material until the needed height is reached. It is good to leave the upper edge of the pipeline exposed. The third layer (Figure 7, layer l3) should reach 0.3 m above the upper edge of the pipeline and should be compacted on both sides of the pipeline with a rammer. Never compact it directly above the pipeline!!! Until this layer is completed it is not allowed to fill the excavation with a different material than a suitable graded one. As the arrows on Figure 7, layers l4 and l5 depict, for the following layers the excavated material can be used and compacted along the whole width of the excavation to Proctor's density. Frozen soil is not recommended for the backfill. In places with higher underground water level, the packing of piping, backfill and compaction must be carried out more rapidly to avoid the pipeline floating up. The excavation stiffening (formwork) is gradually removed in the process of packing, backfilling and compaction.

8. CONSTRUCTION - CONCRETE ENCASEMENT

KG 2000 SN 10 Polypropylene® pipes and fittings can be immediately encased in concrete. However, the following conditions must be fulfilled:

a) The gap between the bell-mouth and the pipe must be protected against cement milk in-leak preferably by means of adhesive tape.

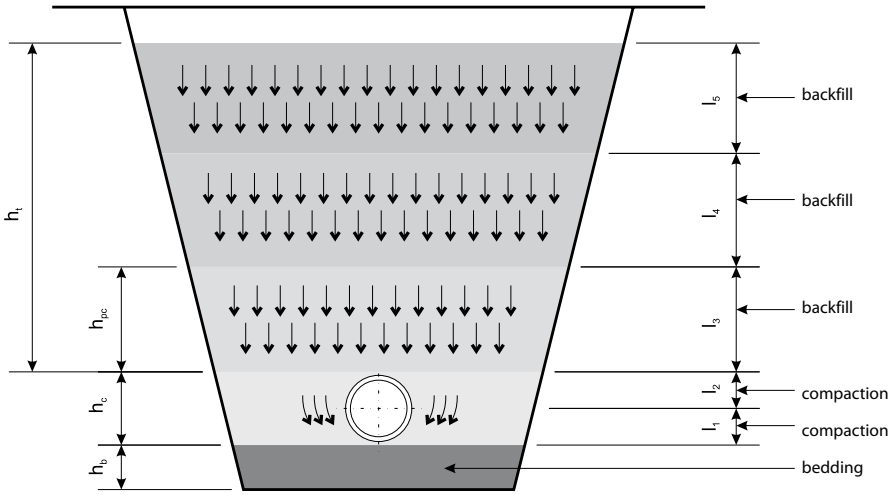
b) Pipeline must be fixed against uplift (floating up). Anchorage should be such that there will be no undesirable deflections.

c) During the assembly, thermal linear expansion must be taken into account, i.e. the bell-mouth connections are to be wrapped and left loose

9. CONNECTING THE PIPES

KG 2000 SN 10 Polypropylene® pipes and fittings can be connected by bell-mouth pieces which are tightly connected to the straight pipe ends by reed gasket rings. Gluing pipes and fittings is not recommended. Individual

Figure 7 Backfill and compaction



pipes and fittings always have a bell-mouth with a gasket ring at one end. Pipes with no bell-mouth can be connected by means of sleeves, double bell-mouth connectors or separate bell-mouths.

Examples of pipeline connections in and out of excavations are shown in Figures 8 and 9.

Figure 8 Example of Pipeline Connection in an Excavation

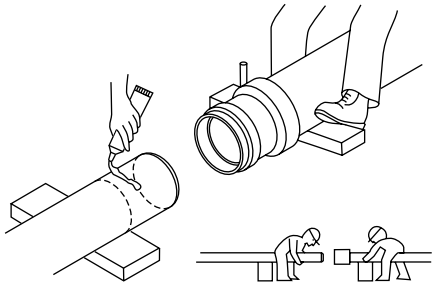
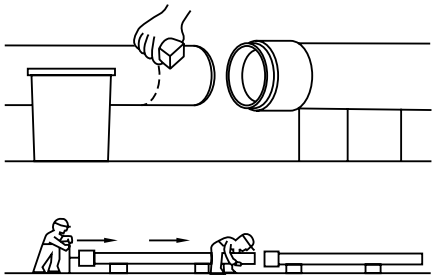


Figure 9 Example of Pipeline Connection outside an Excavation

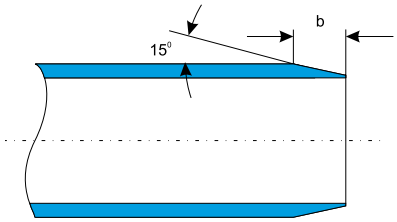


In some cases, the pipes and fittings must be shortened. This is carried out by a special plastic pipe cutter, which also forms the required scarf. If no cutter is available, a saw with fine teeth can be used which is led by two cuts in a trough (see Figure 10).

Figure 10 Shortening a Pipe with a Saw

After deburring the cut, scarf is formed by a rasping file according to the following figure and table.

Figure 11 Scarf of the Shortened Pipe



SCARF PROPORTIONS						
DN	110	125	160	200	250	315
b [mm]	6	6	7	9	9	12

10. CONNECTING PIPES AND SHAPED PIECES

a) Clean the straight end and the pipe bell-mouth.
b) Check the gasket ring that there are no defects and it is correctly placed.

c) Spread the assembly lubricant, which is part of the system, over the straight end of the pipe.

d) Insert the straight end of the pipe into the bell-mouth to the stop. Then, mark the edge of the bell-mouth on the

straight end of the pipe. (Use a marker or a pencil). After that, pull the straight end out of the bell-mouth by 3mm per each 1m of the construction length of the given pipe, minimum total is 10 mm.

11. TIGHTNESS TEST

The tightness test takes place always after completing a part or the whole pipeline - before the backfill and compaction. Two methods can be used:
a) Wet - using a water column,
b) Dry – using compressed air.

TIGHTNESS WET TEST

Both pipeline ends will be connected by a pipe bend to a pipe which at the upper end goes 0.3 m above the pipeline and at the lower end 0.75m. The system is then filled with water and left for 1 hour to level off. After the levelling period, water is added to the system to reach the 0.3 m mark and for a given time it is constantly added from the graduated bottle. The recorded added volume

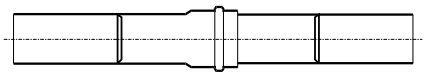
is compared to the recommended value. The recommended maximum water loss at overpressure 0.003 MPa (0.03 bar) during 24 hours cannot exceed 3 liters/1 km of pipeline with DN 25 mm. It is essential to seal visible leakages.

TIGHTNESS DRY TEST
All the pipeline ends must be properly sealed.
A „U"-tube with water and manual air pump are connected to one of the ends. The system is then pressurized to 100 mm water column difference in the U-tube. After brief stabilization, the column is then again renewed to 100 mm. During the following given time interval, the drop cannot be less than 25 mm. If the drop exceeds 75 mm, the wet test must be carried out.

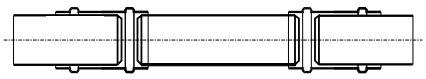
12. PIPELINE REPAIRS

In the case of the KG 2000 SN 10 Polypropylene® sewer system, post-repairs are relatively easy. For pipe repairs, sleeves (PPKGU) are most often used. First, the defective place must be identified. Then, the damaged part is cut out and a replacement pipeline part is put in its place by means of two sleeves (see Figure 12).
Figure 12 Defective Pipeline Repair by Means of Sleeves

1. a) cutting the spare part
   b) creating a bevel
   c) cutting out the damaged part



2. inserting the spare pipe part and sliding the sleeve



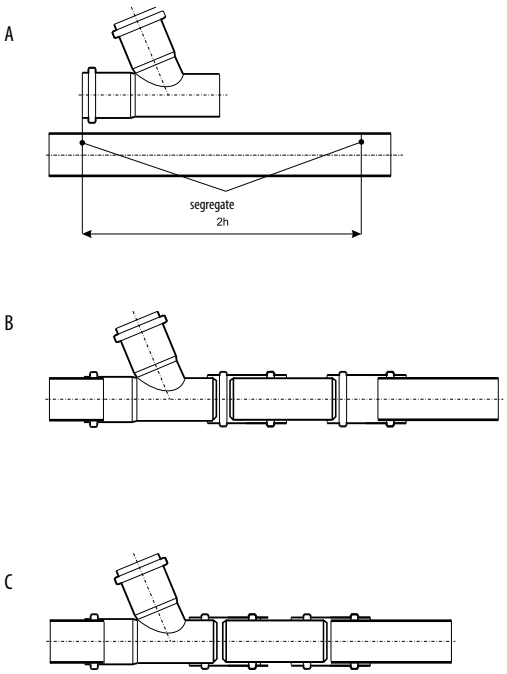
3. closing the pipeline with sleeves

13. SUBSEQUENT INSERTION OF BRANCH

fixing by means of two sleeves
(existing pipeline cannot be deflected)

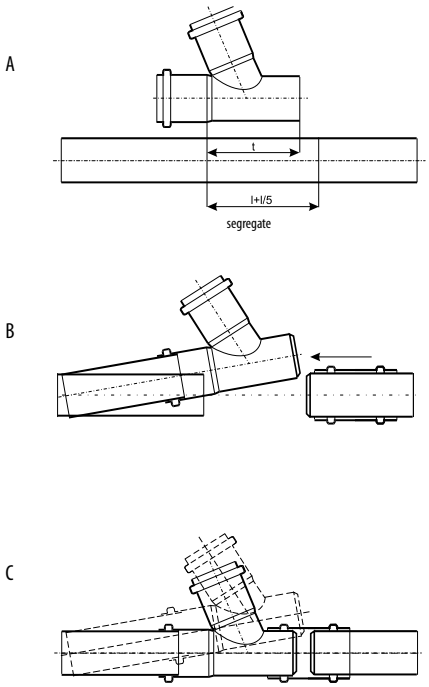
In the case of an additional branch installation, a long enough segment is cut out of the pipeline (fitting length + 2h) – see Figure 13A. Pipeline ends will be treated according to paragraph no. 9. The branch (PPKGEA) is then mounted on such a prepared end, and the sleeves (PPKGU) together with an inserted pipe piece are mounted on the other end. – see Figure 13B. The whole pipeline is then closed by moving the sleeves (see Figure 13C).

Figure 13 Additional Installation – procedure I
installation by means of one sleeve
(existing pipeline cannot be deflected)



Part of the pipeline with a length corresponding to the branch length (l + l/5) is cut out - see Figure 14A. Pipeline ends will be cleaned according to paragraph no. 9. The sleeve (PPKGU) is mounted on one end; the other end is carefully deflected and the branch (PPKGEA) is mounted on it. – see Figure 14B. The part of the pipeline with the mounted branch is moved back to its original position and the pipeline is closed by moving the sleeve (see Figure 14C).

Figure 14 Additional Installation – procedure II



Polypropylene chemical stability

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
acetone	100	+	SDgr	
gaseous ammonia	100	+	+	
ammonium, hydrous sol.	concd. soln.	+	+	
ammonium, hydrous sol.	10	+	+	
amyl alcohol, pure		+	+	
acetanhydride	100	+		
benzenamine	100	+		+*
benzaldehyde	100	+		
benzaldehyde, sol. aq.	sat.	+		
benzine	(see "Technical liquids")			
benzole	100	-*	-	
liquid bromide	100	-		
bromide fumes	high	-	-	
bromide fumes	dil.	SDgr	-	
bromide water	sat.	-	-	
liquid butane	100	+		
butane gas	100	+	+	
butyl acetane	100	+	SDgr	
cyclohexane	100	+		
cyclohexanol	100	+	+	
cyclohexanone	100	+	-	
dibutylphthalate	(see "Technical liquids")			
diethyl ether	100	SDgr		
potassium dichromate, sol. aq.	sat.	+	+	+
dimethylformamide	100	+		
1.4-dioxan	100	+	SDgr	-
ammonium nitrate, hydrous	all	+	+	+
potassium nitrate, sol. aq.	sat.	+	+	
sodium nitrate, sol. aq.	sat.	+	+	
calcium nitrate, sol. aq.	sat.	+	+	+
ethyl acetate	100	SDgr	SDgr	
ethyl alcohol	100	+		
ethyl alcohol, sol. aq.	96	+	+	
ethyl alcohol, sol. aq.	50	+	+	
ethyl alcohol, sol. aq.	10	+	+	
ethyl-benzene	100	SDgr	-	
ethylene chloride	100	SDgr	-*	
2-ethoxyethanol	100	+		
ethyl chloride	100	-		
ethyl ether see "diethyl ether"				
phenol	sat.	+	+	
formaldehyde, sol. aq.	40	+	+	
formaldehyde, sol. aq.	30	+	+	
formaldehyde, sol. aq.	10	+	+	
triammonium phosphate, hydrous	all	+	+	+
sodium phosphate, sol. aq.	sat.	+	+	+
glycerine	100	+	+	
glycerine, sol. aq.	high	+	-	-
glycerine, sol. aq.	dil.	+	-	-
glycol	100	+	+	
glycol, sol. aq.	high	+	+	
glycol, sol. aq.	dil.	+	+	+
heptane	100	+	SDgr	
hexane	100	+	SDgr	
aluminium salts	all	+	+	+
hydrogen sulphite sodium, sol. aq.	sat.	+	+	
sodium bicarbonate, sol. aq.	sat.	+	+	+
potassium hydroxide	50	+	+	
potassium hydroxide	25	+	+	
potassium hydroxide	10	+	+	

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
sodium hydroxide	100	+	+	
liquid chlorine	100	-		
chlorine gas, anhydrous	100	-	-	-
chlorine gas, humid	10	SDgr	-	-
chlorbenzene	100			
sodium chlorate, sol. aq.	5	+		
ammonium chloride, sol. aq.	all	+	+	+
tin dichloride	sat.	+	+	
potassium chloride, aq.	sat.	+	+	+
sodium chloride, sol. aq.	sat.	+	+	+
calcium chloride, hydrous	sat.	+	+	+
sodium perchlorate, sol. aq.	5	+	+	
potassium hypochlorite, sol. aq.	sat.	+	+	
sodium hypochlorite, sol. aq.	25	+	+	
chloroform	100	-*	-	
chlorine water	sat.	SDgr	-	
muriatic acid gas	high	+	+	
iso-octane	100	+	SDgr	
isopropyl alcohol	100	+	+	
potassium iodide, hydrous	sat.	+	+	
hydroxytoluene	100	+	SDgr	
hydroxytoluene, sol. aq.	sat.	+	SDgr	
benzenecarboxylic acid	100	+	+	
benzenecarboxylic acid, sol. aq.	sat.	+	+	+
boracic acid	100	+	+	
boracic acid, hydrous	sat.	+	+	
citric acid, sol. aq.	sat.	+	+	+
nitric acid	50	SDgr	-	
nitric acid	25	+	+	
nitric acid	10	+	+	
fluorohydric acid	40	+	+	
orthophosphoric acid	sat.	+	SDgr	
orthophosphoric acid	50	+	+	
orthophosphoric acid	10	+	+	+
hydrochloric acid	sat.	+	+	
chlorosulphonic acid	100	-	-	
chromic acid	sat.	+	-	
chromic acid	20	+	SDgr	
butanedioic acid, sol. aq.	sat.	+	+	
lactacid, sol. aq.	90	+	+	
lactacid, sol. aq.	50	+	+	
lactacid, sol. aq.	10	+	+	+
methanoic acid	98	+	SDgr	
methanoic acid	90	+		
methanoic acid	50	+	+	
methanoic acid	10	+	+	+
glacial acetic acid	100	+	SDgr	-
acetic acid, sol. aq.	50	+	+	
acetic acid, sol. aq.	10	+	+	+
oleic acid	100	+		
sulphuric acid	96	+	SDgr	
sulphuric acid	50	+	+	
sulphuric acid	25	+	+	
sulphuric acid	10	+	+	+
stearic acid	100	+		
ethanedioic acid, sol. aq.	sat.	+	+	+
2,3-dihydroxybutandioic acid, sol. aq.	sat.	+	+	
permanganate of potassium, sol. aq.	sat.	+	+*	
methanol	100	+	+	
methanol, sol. aq.	50	+	+	

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
methane ethyl ketone	100	+	SDgr	
methyl chloride	100	SDgr		
mineral oils	(see "Technical liquids")			
urea, sol. aq.	sat.	+	+	
naphthalene	100	+		
naphthalene	100	-*	-	-
soda lime	50	+	+	
soda lime	25	+	+	
soda lime	10	+	+	+
n-butanol	100	+	+	
nitrobenzene	100	+*	SDgr	
ammonium acetate, sol. aq.	all	+	+	+
octane see "iso-octane"				
diphosphorus pentaoxide	100	+		
sulphur dioxide	dil.	+	+	
ozone < 0,5 ppm		+*	-*	
hydrogen dioxide, sol. aq.	90			
hydrogen dioxide, sol. aq.	30	+	SDgr	
hydrogen dioxide, sol. aq.	10	+	+	
hydrogen dioxide, sol. aq.	3	+	+	+
potassium persulphate, sol. aq.	sat.	+		
propane, liquid	100	+		
propane gas	100	+	+	
pyridine	100	+	SDgr	
mercury	100	+	+	
sulphur	100	+	+	+
ammonium sulphate, sol. aq.	all	+	+	+
potassium sulphate, sol. aq.	sat.	+	+	+
sulphate of strontium, sol. aq.	sat.	+	+	+
carbon sulphide	100	SDgr		
hydrogen sulphide	dil.	+	+	
sodium sulphite, sol. aq.	sat.	+	+	
barium salts	all	+	+	+
magnesium salts, sol. aq.	sat.	+	+	+
chromium salts 2+, 3+	sat.	+	+	
copper salts	sat.	+	+	+
nickel salts	sat.	+	+	
mercury salts, sol. aq.	sat.	+	+	
argent salts	sat.	+	+	
zinc salts, sol. aq.	sat.	+	+	
ferrum salts, sol. aq.	sat.	+	+	+
sodium sulphide, sol. aq.	sat.	+	+	
trisodium tetraborate, sol. aq.	sat.	+	+	+
tetrahydrofuran	100	SDgr	-	
tetrahydro-naphthalene	100	SDgr	-	
tetrachloroethane	100	SDgr	-	
tetrachloromethane	100	SDgr	-	
thiophene	100	SDgr	-	
sodium thiosulphate, sol. aq.	sat.	+	+	
toluene	100	SDgr	-	
chloral	100	SDgr	-*	
ammonium carbonate, sol. aq.	all	+	+	+
potassium carbonate (potash)	sat.	+	+	
carbonate of soda (soda)	sat.	+	+	
carbonate of soda (soda)	10	+	+	+
water	100	+	+	+
xylene	100	SDgr	-	
Technical liquids				
accumulator acid		+	+	
asphalt		+	SDgr	
petrol, pure		+	SDgr	
unleaded petrol		+	SDgr	

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
leaded petrol		+	SDgr	
super petrol		+*	SDgr	
bleaching liquor (12,5 % Cl)		SDgr	SDgr	
sodium tetraborate, sol. aq.	sat.	+	+	
pine oil		+	+*	
brake fluid		+	+	
tar		+	SDgr	
Formalin®		+	+	
photographic developer	usual	+	+	
Fridex®		+	+	
calcium hypochlorite		+	+	
chromium tanning bath		+	+	
chromium-sulphur mixture		-	-	
alumen, sat.		+	+	
shoe polish		+	SDgr	
Kresolum saponatum®		+		
anti-moth marbles		+		
Lanolin®		+	SDgr	
LITEX®		+	+	
flax-seed oil		+	+	
Lysol®		+	SDgr	
mineral oils (w/o aromates)		+	SDgr	-
engine oils		+	SDgr	-
diesel fuel		+	SDgr	
synthetic degreasers	c. u.	+	+	+
two-cycle engine oil		SDgr	SDgr	
typewriter oil		+	+*	
transformer oil		+	SDgr	
fuming sulphuric acid	all	-	-	
paraffin	100	+	+	-
paraffin oil	100	+	SDgr	-
pectose, sat.		+	+	
pectrol-ether	100	+	SDgr	
furniture polish		+	SDgr	-
laundry agents high		+	+	
Sagrotan®		+	SDgr	
kitchenware detergent		+	+	+
silicone oil		+	+*	
spruce oil		+	+*	
soda	(see "carbonate of soda")			
Solvina		+	+	
turpentine		SDgr	-	
fuel oil		+	SDgr	
graphite		+	+	
fixative bath	10	+	+	
salt water		+	+	+
aqueous glass		+	+	
floor polish		+	SDgr	
softening agent – dibutylphthalate		+	SDgr	
softening agent – dibutyl sebacate		+		
softening agent – dihexylphtalate		+		
softening agent – dinonyl-adipate		+		
softening agent – dioctyl-adipate		+		
softening agent – dioctyl-phtalate		+		
softening agent – tricresyl phosphate		+		
softening agent – trioctyl phosphate		+		
Pharmaceuticals and cosmetics				
Aspirin®		+		
Quinine		+		

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
iodine tincture		+		
bornyl chloride		+		
fingernail polish		+		
menthol		+		
soap and soapflakes		+		
soap solution	sat.	+	+	+
soap solution	10	+	+	+
fingernail polish remover		+	SDgr	
perfumes		+		
hair shampoo		+	+	
paraffin jelly		+	SDgr	
toothpaste		+	+	
Food and eatables				
potato salad		+		
Coca-Cola®		+		
dry sugar		+	+	+
sugar solution		+	+	+*
tea tree leaves		+	+	
tea – drink		+	+	+*
lemon pulp and peel		+		
apple pulp		+	+	+*
orange pulp and peel		+		
essential oils		+	SDgr	
gin	40	+		
mustard		+		
cocoa – drink		+	+	+
cocoa – powder		+		
coffee (beans and ground coffee)		+		
coffee – drink		+	+	+
ketchup		+	+	
cognac		+		
spices		+		
fish in vinegar		+	+	+*
pickled cabbage		+	+	+*
liqueur	all	+		
lemonade		+		
beef tallow		+	+	
mayonnaise		+		
margarine		+	+	
jam		+	+	+*
butter		+	+	
honey		+	+	
milk products		+	+	+*
milk		+	+	+*
flour		+		
vinegar	c. u.	+	+	
lemon oil		+		
coconut oil		+	+*	
peppermint oil		+		
olive oil		+	+	
palm oil		+	SDgr	
orange oil		+		
vegetable oil		+	SDgr	
soya bean oil		+	SDgr	
corn-germ oil		+	SDgr	
peanut oil		+	+*	-*
animal oil		+	SDgr	
fruit salad		+		
baked goods		+	+	+*
beer		+		
butter milk		+		
pudding		+	+	+*

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
rum	40	+	+	
fish oil		+		
lard		+	SDgr	
salami		+	+	
beet syrup	all	+	+	+*
herrings		+		
carbonated water		+		
salt brine		+	+	+
common salt	(see "sodium chloride")			
cheese		+		
fecula – sol. aq.	all	+	+	
whipped cream		+		
pineapple juice		+	+	
lemon juice		+	+	
grapefruit juice		+	+	
apple juice		+	+	
fruit juice		+	+	
orange juice		+	+	
tomato sauce		+	+	
roast-food sauce		+	+	+*
lemon essence		+		
bitter almond essence		+		
vinegar essence	c. u.	+	+	
rum essence		+		
vanilla essence		+	+	
cottage cheese		+		
eggs (raw and cooked)		+	+	+*
wine		+	+	
whisky	40	+		
vegetables		+	+	+*
gelatine		+	+	+*

Legend :	
+	resistance
+*	partial resistance
SDgr	conditional resistance
-*	low resistance
-	instability
no classification	not tested
all	all concentrations
concd. soln.	concentrated solution
low conc.	low concentration
c. u.	commonly used concentration
usual	usual, commercial concentration
dil.	diluted solution
sol. aq.	aqueous solution
sat.	cold-saturated solution
hot sat.	hot-saturated solution
m. a.	minute amounts

Chemical stability of unplasticized polyvinyl chloride

COMPOUND	Concentration [%]	Temp. [°C]		
		20	40	60
acetaldehyde	100			
acetaldehyde	40	°	°	
acetaldehyde+ acetic acid	90/40	°		
acetanhydride	100	-		
acetone	m. a.	-		
acetone	100	-		
allyl alcohol	96	°		
liquid ammonia	100	°	°	
gaseous ammonia	100	+	+	+
pure phenylamine	100	-		
phenylamine hydrochloride, hydrous	sat.	°		
anon	100	-		
inorganic fertilizers	up to 10	+	+	°
inorganic fertilizers	sat.	+	+	+
antiformin hydrous	2	+		
Asfluid I, liquid		-		
benzaldehyde, sol. aq.	0.1	-	-	-
benzine	100	+	+	+
benzine-benzole mixture	80/20	-	-	-
sodium benzoate, sol. aq.	up to 10	+	+	
sodium benzoate, sol. aq.	up to 36			°
benzole	100	-	-	-
bleach liquid (12.5 % active clorine)	c. u.	+	+	°
sodium tetraborate, sol. aq.	dil.	+	+	°
sodium tetraborate, sol. aq.	sat.			°
potassium borate, sol. aq.	1	+	+	°
liquid bromide	100	-		
gaseous bromide	low conc.	°		
potassium bromate, sol. aq.	dil.	+	+	°
potassium bromate, sol. aq.	dil.	+	+	°
potassium bromate, sol. aq.	sat.	+	+	+
bromide water	sat.	°	°	
butadiene	100	+	+	+
butane gas	50	+		
succinaldehyde	up to 10	+	°	-
butanol	up to 100	+	+	°
butine-diol	100		°	
butyl acetane	100	-		
butylphenol	100	°		
cellulose, sol. aq.	sat.	+	°	
cycannone	c. u.	+	+	+
cyclohexanol	100	-	-	-
cyklohexanone	100	-	-	-
tanning cellulose extracts	usual			
tanning herbal extracts	usual	+		
ammonia liquor	sat.	+	+	°
densodrine	c. u.	+	+	+
dextrine, sol. aq.	sat.	+		
dextrine, sol. aq.	18			°
potassium dichromate, sol. aq.	40	+		
ammonium nitrate, hydrous	dil.	+	+	°
ammonium nitrate, hydrous	sat.	+	+	+
potassium nitrate, sol. aq.	sat.	+	+	+
potassium nitrate, sol. aq.	dil.	+	+	°
silver nitrate, sol. aq.	up to 8	+	+	°
calcium nitrate, sol. aq.	50	+	+	+
paraffine emulsions	c. u.	+	+	
acetic ester	100	-		
ethyl-acrylate	100	-		
ethyl alcohol (inoculum)	c. u.	+	+	°
ethyl alcohol and acetic acid (fermentation mixture)	c. u.	+	°	
denaturated ethyl alcohol (2 % of toluene)	96	+	°	°
ethyl alcohol, sol. aq.	96	+	+	°
ethylene chloride	100	-		
ethylene oxide, liquid	100	-		
ethyl ether	100	-		
phenol water	up to 90	°	°	-
phenol water	1	+		

COMPOUND	Concentration [%]	Temp. [°C]		
		20	40	60
phenylhydrazine	100	-		
phenylhydrazine-hydrochloride, sol. aq.	sat.	°		
ferri-cyanide and ferro-cyanide				
potassium sol. aq.	dil.	+	+	°
potassium sol. aq.	sat.	+	+	+
ammonium fluoride, hydrous	up to 20	+		°
copper difluoride, hydrous	2	+	+	+
nitrogen fluoride, sol. aq.	up to 20	+		°
formaldehyde, sol. aq.	dil.	+	+	°
formaldehyde, sol. aq.	40	+	+	+
phosphane	100	+		
gaseous carbonyl dichloride	100	+		°
liquid carbonyl dichloride	100	-		
photoemulsion	all	+	+	
fixative	c. u.	+	+	
developing agent	c. u.	+	+	
FRIGEN®	100	+		
fructose (grape suger), sol. aq.	sat.	+	+	°
glycerine, sol. aq.	all	+	+	+
glycocoll, sol. aq.	10	+	+	+
glycol, sol. aq.	c. u.	+	+	+
hexane-triol	c. u.	+	+	+
beef tallow, sulphonate emulsion	c. u.	+		
hydrogen sulphite sodium, sol. aq.	dil.	+	+	°
hydrogen sulphite sodium, sol. aq.	sat.	+	+	+
hydroxylamine sulphate, sol. aq.	up to 12	+	+	
chlophene	c. u.	°		-
chlorine gas, anhydrous	100	°	°	-
chlorine gas, hydrous	0.5	+		
chlorine gas, hydrous	1	°		
chlorine gas, hydrous	5	°		
chlorine gas, hydrous	97	°		
liquified chlorine		-		
chloramine, sol. aq.	dil.	+	-	-
sodium chlorate, sol. aq.	up to 10	+	+	°
sodium chlorate, sol. aq.	sat.	+	+	+
ammonium chloride, hydrous	dil.	+		°
ammonium chloride, hydrous	sat.	+	+	+
antimonous chloride, hydrous	90	+	+	+
tin bichloride, hydrous	sat.	+	+	°
tin bichloride, hydrous	dil.	+	+	°
potassium chloride, sol. aq.	sat.	+	+	+
potassium chloride, sol. aq.	dil.	+	+	°
trichloride phosphorous	100	-		
aluminium trichloride, hydrous	dil.	+	+	°
aluminium trichloride, hydrous	sat.	+	+	+
magnesium chloride, hydrous	dil.	+	+	°
magnesium chloride, hydrous	sat.	+	+	+
copper chloride, hydrous	sat.	+	+	
sodium chloride	(see Common salt)			
calcium chloride, hydrous	dil.	+	+	°
calcium chloride, hydrous	sat.	+	+	+
chloride zinc, hydrous	sat.	+	+	+
chloride zinc, hydrous	dil.	+	+	°
ferric chloride	up to 10	+	+	°
ferric chloride	sat.	+	+	+
potassium perchlorate, sol. aq	1	+	+	°
sodium hypochlorite, sol. aq.	dil.	+		
chlorine water	sat.	°	°	
chlorine hydride, hydrous		+	+	
hydrogen chloride, anhydrous		+	+	+
potassium chromate, sol. aq.	40	+	+	+
chrome alume, sol. aq.	dil.	+	+	°
chrome alume, sol. aq.	sat.	+	+	+
chromium-sulphur cleaning mixture	50/15/35	+	+	°
metallic iodine and in alcaline solution		-		
hydrous alumen	dil.	+	+	°

COMPOUND	Concentration [%]	Temp. [°C]		
		20	40	60
hydrous alumen	sat.	+	+	+
carbolineum, fruit origin	c. u.	+		
acacia	c. u.	+		
hydroxytoluene, sol. aq.	up to 90	°	°	
crotonaldehyde	100	-		
colour agents	c. u.	+	+	+
potassium cyanide, sol. aq.	up to 10	+	+	°
adipinic acid	sat.	+	+	°
antraquinone-sulphone acid				
aqueous suspension		+		
arsenic acid, sol. aq.	dil.	+	+	°
arsenic acid, sol. aq.	80	+	+	°
benzenecarboxylic acid	all	+	+	°
boracic acid, sol. aq.	sat.	+	+	°
bromhydric acid, sol. aq.	48	+	+	+
bromhydric acid, sol. aq.	up to 10	+	+	°
oxychlorine acid, sol. aq.	up to 10	+	+	°
oxychlorine acid, sol. aq.	sat.	+	+	+
hypochlorous acid, sol. aq.	10	+	+	°
hypochlorous acid, sol. aq.	20	+	+	°
hypochlorous acid, sol. aq	1	+	+	°
chlorosulphonic acid	100	°		
chromic acid, sol. aq.	up to 50	+	+	°
citric acid, sol. aq.	sat.	+	+	+
citric acid, sol. aq.	up to 10	+	+	°
diethylene-glycol acid	30	+	+	°
diethylene-glycol acid	sat.	+		
nitric acid, sol. aq.	up to 50	+	+	°
nitric acid, sol. aq.	98	-		
fluorosilicic acid, sol. aq.	up to 32	+	+	+
orthophosphoric acid, sol. aq.	up to 30	+	+	°
orthophosphoric acid, sol. aq.	above 30	+	+	+
glycollic acid, sol. aq.	37	+		
2-hydroxybutanedioic acid, sol. aq.	1	+	+	
silicilic acid, sol. aq.	all	+	+	+
(Z)-butenedioic acid, sol. aq.	sat.	+	+	°
(Z)-butenedioic acid, sol. aq.	35	+	+	
butanoic acid, concd. sol.		-		
butanoic acid, sol. aq.	20	+	-	-
methanesulfone acid	100	+	+	°
methanesulfone acid, sol. aq.	up to 50	+	°	
lactacid acid, sol. aq.	90	+	°	-
lactacid acid, sol. aq.	up to 10	+	+	°
monochloroacetic acid, sol. aq.	85	+		
monochloroacetic acid, sol. aq.	100	+	+	°
methanoic acid, hydrous	100	+	°	-
methanoic acid, hydrous	up to 50	+	+	°
methanoic acid, hydrous	50	+		°
acetic acid, sol. aq.	do 25	+	+	°
glacial acetic acid	100	°	-	
acetic acid, sol. aq.	25-60	+	+	+
acetic acid, sol. aq	80	+	°	
cruce acetic acid	95		°	
(Z)-9-octadecenoic acid	c. u.	+	+	+
picrite acite	1	+		
sulphurous acid (at 8 bar)	sat.	+		
sulphuric acid, sol. aq.	do 40	+	+	°
sulphuric acid, sol. aq.	40-80	+	+	+
sulphuric acid, sol. aq.	96	+	°	
sulphuric acid, sol. aq.	80-90			
chlorhydric acid, sol. aq.	do 30	+	+	°
chlorhydric acid, sol. aq.	concd.	+	+	+
stearic acid	100	+	+	+
ethanedioic acid, sol. aq.	sat.	+	+	+
ethanedioic acid, sol. aq.	dil.	+	+	+
carbonic acid, sol. aq. (up to 8 bar)	sat.	+		
2,3-dihydroxybutandioic acid, sol. aq.	up to 10	+	+	°
2,3-dihydroxybutandioic acid, sol. aq.	sat.	+	+	+
oxygen	all.	+	+	+
spirits		+		
liqueurs		+		

COMPOUND	Concentration [%]	Temp. [°C]		
		20	40	60
caustic potash lye, sol. aq.	up to 40	+	+	°
caustic potash lye, sol. aq.	50-60	+	+	+
sodium lye, sol. aq.	up to 40	+	+	°
sodium lye, sol. aq.	50-60	+	+	+
aqua regia		°		
tallow	100	+	+	+
permanganate of potassium, sol. aq.	6	+	+	+
permanganate of potassium, sol. aq.	up to 18	+	+	
fatty acids	100	+	+	+
palm oil fatty acids	100	+	+	+
molasses	c. u.	+	+	°
molasses mixture	c. u.	+	+	+
Mersol D	c. u.	+	+	°
methanol, sol. aq.	32	°		
methanol	100	+	+	°
chloromethane	100	-		
methylene-chloride	100	+	+	°
mineral oils		+	+	+
beer wort	c. u.	+	+	
milk		+	+	+
urine		+	+	°
urea, sol. aq.	up to 10	+	+	°
urea, sol. aq.	33	+	+	+
Mowilith D	c. u.	+		
NEKAL BX ® aq.	dil.	+	+	°
nicotine, sol. aq.	c. u.	+		
nicotinic preparates, sol. aq.	c. u.	+		
nitroglycerine	dil.	°		
nitroglycol	dil.	-		
oxides of nitrogen	concd. soln.	°		
wine vinegar	c. u.	+	+	+
acetate lead, sol. aq.	sat.	+	+	+
acetate lead, sol. aq.	dil.	+	+	°
acetate lead, sol. aq.	hot sat.	+	+	
mists containing sulphuric acid (hydrous)	all	+	+	+
mists containing sulphur trioxide	all	°		
mists containing carbon dioxide	all	+	+	+
mists containing hydrogen fluoride	all	+	+	+
mists containing sulphur dioxide	low concd.	+	+	+
mists containing carbon monoxide	all	+	+	+
mists containing nitrogene oxides	all	+	+	
mists containing fuming sulphuric acid	low conc.	+	+	+
mists containing chlorine hydride	all	+	+	+
mists containing oxides of nitrogen	all	+	+	+
flax-seed oil	100	+	+	
oils and fats		+	+	+
fuming sulphuric acid	10	-		
fruit juice	c. u.	+	+	+
fruit drinks	c. u.	+	+	+
diphosphorous pentaoxide	100	+		
sulphur dioxide, anhydrous	all	+	+	+
sulphur dioxide, hydrous	50	+	+	
sulphur dioxide, liquid	100	°		
sulphur dioxide, hydrous	all	+	+	°
carbon monoxide	100	+	+	+
carbon dioxide, anhydrous	100	+	+	+
carbon dioxide, hydrous	all	+	+	°
nitrogen oxides, hydrous and anhydrous	dil.			°
nitrogen oxides, hydrous	concd soln.	-		
ozone	100	+	+	+
ozone	10	+		
paraffin alcohols	100	+	+	+
sulphuric acid fumes	higher	°		
sulphuric acid fumes	níz.	+		
hydrogen dioxide, sol. aq.	up to 30	+		
hydrogen dioxide, sol. aq	up to 20	+	+	
potassium peroxydisulphate	sat.	+	+	°
potassium peroxydisulphate	dil.	+	+	°
beer		+	+	+

COMPOUND	Concentration [%]	Temp. [°C]		
		20	40	60
potash, sol. aq.	sat.	+	+	
propane gas		+		
propane, liquid	100	+		
propargyl alcohol, sol. aq.	7	+	+	+
plant protective agents	(see carbolineum and nicotinic preparates)			
pyridine	all	-		
mercury		+	+	+
carbon sulphide	100	°		
hydrogen sulphide, anhydrous	100	+	+	+
ethyl alcohol, sol. aq.	sat.	+	+	°
ammonium sulphate, hydrous	sat.	+	+	+
ammonium sulphate, hydrous	dil.	+	+	°
magnesium sulphate, sol. aq.	sat.	+	+	+
magnesium sulphate, sol. aq.	dil.	+	+	°
cupric sulphate, sol. aq.	sat.	+	+	+
cupric sulphate, sol. aq.	dil.	+	+	°
nickel sulphate, sol. aq.	dil.	+	+	°
nickel sulphate, sol. aq.	sat.	+	+	+
sodium sulphate, sol. aq.	dil.	+	+	°
sodium sulphate, sol. aq.	sat.	+	+	+
zinc sulphate, sol. aq.	sat.	+	+	+
zinc sulphate, sol. aq.	dil.	+	+	°
mixed acids (nitric/sulphuric/water)	50/50/0	°	-	
mixed acids (nitric/sulphuric/water)	10/20/70	+	+	
mixed acids (nitric/sulphuric/water)	10/87/3	°		
mixed acids (nitric/sulphuric/water)	50/31/19	+		
mixed acids (nitric/sulphuric/water)	48/49/3	+	°	
soda solution	sat.	+	+	+
soda solution	dil.	+	+	°
sodium bisulphide, sol. aq. with carbon dioxide	sat.	+	+	+
spinner acids with CS2	200 mg/l		°	
spinner acids with CS2	100 mg/l	+	+	
spinner acids with CS2	700 mg/l		-	
spinning viscose bath liquors		+	+	+
common salt, sol. aq.	dil.	+	+	°
common salt, sol. aq.	sat.	+	+	+
lighting gas w/o benzene		+		
fecula, sol. aq.	c. u.	+	+	+
tetrachlormethane	100	°	-	
tetraethyl lead	100	+		
thionyl chloride	concd.	-		
toluene	100	-		
trichlorethylene	100	-		
trietanolamine	100	-		
trimethylpropane, sol. aq.	c. u.		°	
trimethylpropane, sol. aq.	up to 10	+	+	°
potassium carbonate (sol. aq.)	(see potash)			
sodium carbonate	(see soda)			
wine spirits of all kinds		+		
wine spirit		+	+	
vinyl acetate	100	-		
white and red wine		+	+	+
salt water		+	+	°
water in general		+	+	°
carbonated water		+	°	°
distilled water		+	+	
soap water	concd.	+		°
drinking water		+	+	
spring water		+	+	
condensed water		+	+	
waste water (also acetic w/o organic solvents)		+	+	
waste water with minute amounts of phenols and butanol				
hydrogen	100	+	+	+
higher fatty alcohols	100	+	+	+
xylol	100	-		
gelatine, sol. aq.	all	+	+	

Legend :	
+	resistant
+*	partially resistant
°	conditionally resistant
-*	low resistance
-	instability
no classification	not tested
all	all concentrations
concd.	concentrated colution
low	low concentration
c. u.	commonly used concentration
usual	usual, commercial concentration
dil.	diluted solution
sol. aq.	aqueous solution
sat.	cold-saturated solution
hot sat.	hot-saturated solution
m. a.	minute amounts


OSMA
HT System Plus
ISO 9001
OSMA
Skolan SAFE dB
ISO 9001
OSMA
UdB System Ultra dB
ISO 9001
OSMA
KG System PVC
ISO 9001
OSMA
Polypropylene KG 2000
ISO 9001
OSMA
Magnacor Dualcore
ISO 9001
OSMA
RV System OSMA
ISO 9001