



dB
Skolan *SAFE*[®]

ISSUED 07/2019



- **MINERAL-FILLED POLYPROPYLENE**
- **USABLE IN ALL BUILDING CONSTRUCTION AREAS**
- **EXCELLENT MECHANICAL AND ACOUSTIC PROPERTIES**
- **WALL VIBRATIONS**
- **AIR COLUMN RESONANCE**
- **ABILITY TO EFFECTIVELY DROWN NOISE**
- **ABILITY TO STOP NOISE PROPAGATION**
- **WALL-THICKNESS – PLACIDITY**
- **20 dB (A) VALUE ACCORDING TO DIN 4109**
- **HIGH-DENSITY MATERIAL**
- **DURABLE AND STURDY STRUCTURE**
- **THERMAL RESISTANCE LONG 90 °C, SHORT 95 °C**
- **HIGH AND LONG-LASTING QUALITY**
- **MEETS ECONOMIC AND ENVIRONMENTAL CRITERIA**
- **UPWARD REAL ESTATE REVALUATION**
- **LIVING STANDARD ENHANCEMENT**

Trust your ears

The unique Skolan SAFE® system of silent sewer pipes and fittings is a quality product made of Polypropylene containing a high amount of mineral filler. This material gives Skolan SAFE® sewer pipes and fittings excellent mechanical and acoustic qualities that significantly lower noise intensity penetrating to the outside through the pipe wall. Skolan SAFE® is thus predetermined for use in all areas of building construction (residential houses and apartment buildings, industrial, cultural and sports facility buildings, hospitals, hotels, etc.).

Noise origin in sewer piping

Running fluid inside sewer piping can reach a relatively high speed. Air column resonance inside piping and wall vibration occurrence take place as a result of fluid impact on the pipe wall, especially in places like bends, branches and vertical collecting pipes. The air column resonance effect is successfully used in organs and all other wind instruments. The noise created by air column resonance has a tendency to penetrate the pipe wall and to be transmitted to the building structure. The noise created by pipe wall vibration alone has a similar propensity.

Skolan SAFE® can reduce noise

The unique Skolan SAFE® system of silent sewer pipes and fittings is able to effectively absorb noise right at the point of its origin – inside the pipes and more so, can prevent its transmission through the pipe wall. This happens thanks to the special molecular structure and high density of the used material, the composition of which is patented. The used polymer containing a high molecular weight mineral filler was subjected to many tests.

Don't give noise a chance - teach water to whisper

Due to the quietness - thanks to thick-walled Skolan SAFE® sewer pipes and fittings, it is possible to achieve noise values approaching the noise perception threshold. When tested, dramatically lower data were reached than required by DIN 4109 - standard regulating noise conditions on noise protected premises. Measured data of 20 dB (A) were even lower than the 25 dB (A) requirement of the stricter German VDI 4100 guideline.

Strength and endurance

Thick-walled Skolan SAFE® pipes and fittings have a resistant and sturdy structure. They are supplied in DN 58 – 200 with thick walls with material density 1.6g.cm³. The high-quality material, processing, surface finishing and quality package guarantee success even under extreme conditions for the most demanding customer.

Quality assurance

Manufacturing company laboratory tests and constant in-process control is a consistent and high quality guarantee. All organizational and production processes take place in compliance with TQM and meet the EN ISO 9001 requirements.

Standard of Living

In connection with the growing demands on internal environmental hygiene, where protection against noise clearly belongs, there are products designed and manufactured to meet strict environmental and economic criteria. Due to its qualities, Skolan SAFE® meets the requirements and using it in construction or reconstruction explicitly leads to living standard enhancement and thereby to upward real estate revaluation.



Skolan SAFE®

Silent Waste Pipes and shaped Pieces

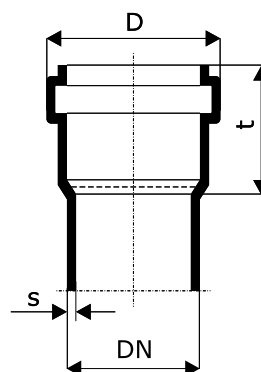
Description

Mineral filled Polypropylene sewer pipes and fittings with the ability to lower noise intensity manufactured in compliance with ČSN EN 1451- 1.

Field of application

Due to its excellent mechanical and acoustic properties, this system is predetermined for use in all areas of building construction.

DN(OD)	d _i	s [mm]	D [mm]	t [mm]	kg / m
58	58	4,0	76	55	1,40
78	78	4,5	97	61	1,75
90	90	4,5	110	64	1,97
110	110	5,3	132	76	3,55
135	135	5,3	158	61	4,40
160	160	5,3	185	64	5,15
200	200	6,2	233	123	6,58



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.

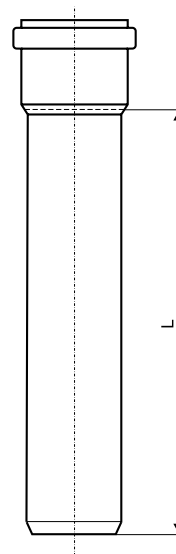
In the event of use other than that as recommended by us, potential risks must be taken into consideration.

Typographic errors reserved.



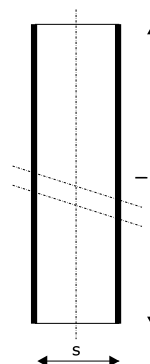
SKEM – Pipe with Socket

EAN CODE	EAN	DN	L (mm)	PACKING	PALLETE
4052836320001	332000	58	150	4	660
4052836320100	332010	58	250	4	440
4052836320209	332020	58	500	4	220
4052836320407	332040	58	1000	1	114
4052836320605	332060	58	2000	1	114
4052836320704	332070	58	3000	1	114
4052836330000	333000	78	150	4	360
4052836330109	333010	78	250	4	240
4052836330208	333020	78	500	4	152
4052836330406	333040	78	1000	1	70
4052836330604	333060	78	2000	1	70
4052836330703	333070	78	3000	1	70
4052836340009	334000	90	150	4	192
4052836340108	334010	90	250	4	128
4052836340207	334020	90	500	4	96
4052836340405	334040	90	1000	1	60
4052836340603	334060	90	2000	1	60
4052836340702	334070	90	3000	1	60
4052836350008	335000	110	150	4	180
4052836350107	335010	110	250	4	120
4052836350206	335020	110	500	2	78
4052836350404	335040	110	1000	1	40
4052836350602	335060	110	2000	1	40
4052836350701	335070	110	3000	1	40
4052836360007	336000	135	150	1	120
4052836360205	336020	135	500	1	48
4052836360403	336040	135	1000	1	24
4052836360601	336060	135	2000	1	24
4052836360700	336070	135	3000	1	24
4052836370006	337000	160	150	1	84
4052836370105	337010	160	250	1	48
4052836370204	337020	160	500	1	35
4052836370402	337040	160	1000	1	21
4052836370600	337060	160	2000	1	21
4052836370709	337070	160	3000	1	21
4052836380005	338000	200	150	1	45
4052836380104	338010	200	250	1	30
4052836380203	338020	200	500	1	20
4052836380401	338040	200	1000	1	15
4052836380609	338060	200	2000	1	15
4052836380707	338070	200	3000	1	15



SKGL – Pipe without Socket

EAN CODE	EAN	DN	s (mm)	l (mm)	PACKING	PALLETE
4052836320803	332080	58	4,0	3000	1	114
4052836330802	333080	78	4,5	3000	1	70
4052836340658	334065	90	4,5	2000	1	60
4052836340801	334080	90	4,5	3000	1	60
4052836350800	335080	110	5,3	3000	1	40
4052836360809	336080	135	5,3	3000	1	24
4052836370808	337080	160	5,3	3000	1	21
4052836380807	338080	200	6,2	3000	1	15

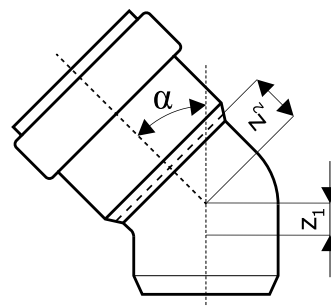


SKB - Bend 15°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	PACKING	PALLETE
4052836321008	332100	58	9	8	4	576
4052836331007	333100	78	7	10	4	384
4052836341006	334100	90	6	12,5	2	320
4052836351005	335100	110	9	15	4	192
4052836361004	336100	135	29	16	2	180
4052836371003	337100	160	13	19	2	96
4052836381002	338100	200	15	31	1	40

SKB – Bend 30°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	PACKING	PALLETE
4052836321107	332110	58	10	16	4	576
4052836331106	333110	78	12	17	4	384
4052836341105	334110	90	13	18,5	2	320
4052836351104	335110	110	17	19	4	192
4052836361103	336110	135	38	45	2	160
4052836371102	337110	160	24	30	2	84
4052836381101	338110	200	29	46	1	38



SKB – Bend 45°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	PACKING	PALLETE
4052836321206	332120	58	14	17	4	576
4052836331205	333120	78	18	21	4	320
4052836341204	334120	90	20	25,5	4	256
4052836351203	335120	110	25	28	4	192
4052836361202	336120	135	50	34	4	140
4052836371201	337120	160	36	42	4	60
4052836381200	338120	200	46	57	1	38



SKB – Bend 67°

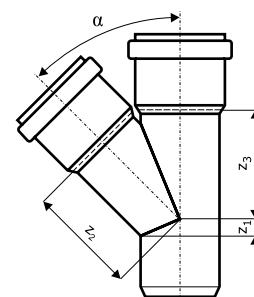
EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	PACKING	PALLETE
4052836321305	332130	58	23	21	4	480
4052836331304	333130	78	28	31	4	500
4052836351302	335130	110	40	44	4	192

SKB – Bend 87°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	PACKING	PALLETE
4052836321404	332140	58	32	32	4	480
4052836331403	333140	78	40	42	2	320
4052836341402	334140	90	46	49,4	2	256
4052836351401	335140	110	57	58	2	128
4052836361400	336140	135	96	102	2	96
4052836371409	337140	160	83	89	2	60

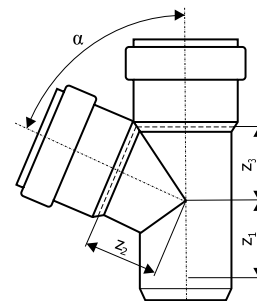
SKEA - Branch Pipe 45°

EAN CODE	EAN	DN	Z ₁ (mm)	Z ₂ (mm)	Z ₃ (mm)	PACKING	PALLETE
405283632005	332200	58/58	13	74	74	2	384
4052836332103	333210	78/58	3	83	79	2	192
4052836332004	333200	78/78	18	99	99	4	160
4052836342201	334220	90/58	3	97	84	2	216
4052836342102	334210	90/78	12	105	103	2	216
4052836342003	334200	90/90	20	110	110	2	144
4052836352200	335220	110/58	13	110	97	4	128
4052836352101	335210	110/78	6	122	115	4	96
4052836352002	335200	110/110	25	136	136	4	96
4052836362100	336210	135/110	31	155	152	2	70
4052836362001	336200	135/135	49	169	169	2	56
4052836372109	337210	160/110	2	168	159	2	46
4052836372000	337200	160/160	36	194	194	2	28
4052836382108	338210	200/160	19	221	218	1	20
4052836382009	338200	200/200	46	244	244	1	14



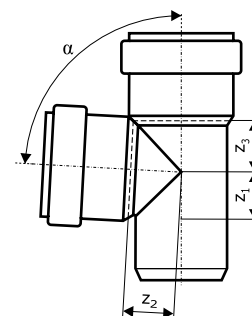
SKEA - Branch Pipe 67°

EAN CODE	EAN	DN	Z ₁ (mm)	Z ₂ (mm)	Z ₃ (mm)	PACKING	PALLETE
4052836332002	332300	58/58	22	45	45	2	500
4052836333100	333310	78/58	18	54	46	2	340
4052836333001	333300	78/78	19	61	60	2	280
4052836333207	335320	110/58	21	75	52	4	180
4052836353108	335310	110/78	22	81	67	2	140
4052836353009	335300	110/110	40	84	84	4	120



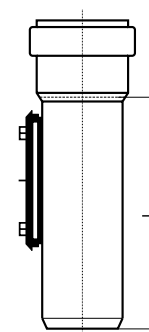
SKEA - Branch Pipe 87°

EAN CODE	EAN	DN	Z ₁ (mm)	Z ₂ (mm)	Z ₃ (mm)	PACKING	PALLETE
4052836324009	332400	58/58	33	32	32	4	500
4052836334107	333410	78/58	32	42	28	2	256
4052836334008	333400	78/78	41	43	43	4	288
4052836344205	334420	90/58	32	48	31	2	198
4052836344106	334410	90/78	43	49	40	2	240
4052836344007	334400	90/90	56	70	51	2	112
4052836354204	335420	110/58	31	61	27	4	160
4052836354105	335410	110/78	40	61	27	2	112
4052836354006	335400	110/110	57	58	58	4	96
4052836364104	336410	135/110	78	73	59	2	40
4052836364005	336400	135/135	90	72	72	2	40
4052836374103	337410	160/110	55	68	85	2	46
4052836374004	337400	160/160	81	91	91	2	32



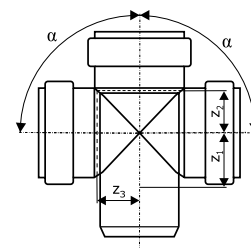
SKRE - Purging Fitting (rectangular Cover)

EAN CODE	EAN	DN	L (mm)	PACKING	PALLETE
4052836326003	332600	58	151	4	480
4052836336002	333600	78	208	4	320
4052836346001	334600	90	208	4	240
4052836356000	335600	110	298	4	96
4052836366009	336600	135	316	2	40
4052836376008	337600	160	345	1	40
4052836386007	338600	200	380	1	20



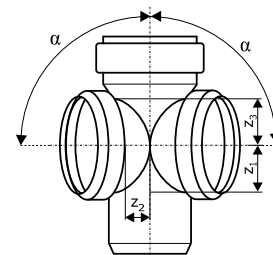
SKDA - double Branch Pipe 87°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	z_3 (mm)	PACKING	PALLETE
4052836349002	334900	90/90/90	46	51	51	4	80
4052836359001	335900	110/110/110	78	58	58	4	80



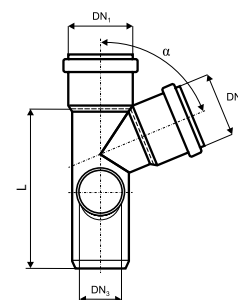
SKED - Corner Branch Pipe 87°

EAN CODE	EAN	DN	z_1 (mm)	z_2 (mm)	z_3 (mm)	PACKING	PALLETE
4052836349101	334910	90/90/90	78	58	58	1	72
4052836359100	335910	110/110/110	78	58	58	1	72



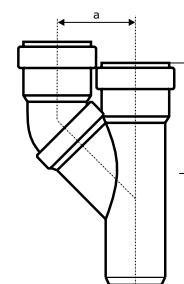
SKEP – Corner Branch for pre-fabricated Buildings 67°/87°

EAN CODE	EAN		DN1	DN2	DN3	DEGREE	L (mm)	PACKING	PALLETE
4025075373701	37370	levá	110	75	110	67°	295	1	10
4025075373756	37375	pravá	110	75	110	87°	295	1	10
4025075373800	37380	levá	110	110	75	67°	295	1	10
4025075373855	37385	pravá	110	110	75	87°	295	1	10



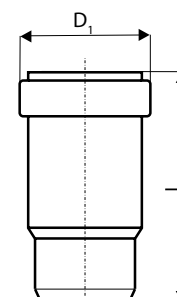
SKPA -parallel Branch Pipe

EAN CODE	EAN	DN	z_1 (mm)	a (mm)	l (mm)	PACKING	PALLETE
4052836359209	335920	110/110/110	199,5	129	320	2	90



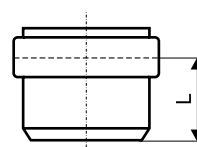
SKL – extended individual Socket (extension Piece)

EAN CODE	EAN	DN	D_1 (mm)	l (mm)	PACKING	PALLETE
4052836359308	335930	110	110	210	4	200



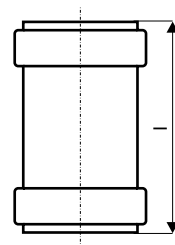
SKM – Socket Stopper

EAN CODE	EAN	DN	L (mm)	PACKING	PALLETE
4052836326201	332620	58	49	4	1700
4052836336200	333620	78	52	4	1100
4052836336200	333620	90	36	4	720
4052836356208	335620	110	57	4	448
4052836366207	336620	135	60	2	400
4052836376206	337620	160	49	2	256
4052836386205	338620	200	84	2	160



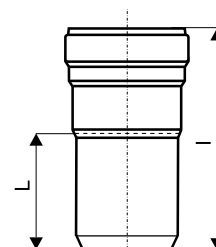
SKU - Sleeve

EAN CODE	EAN	DN	I (mm)	PACKING	PALLETE
4052836325006	332500	58	105	4	1100
4052836335005	333500	78	107	4	640
4052836345004	334500	90	98	4	320
4052836355003	335500	110	122	4	300
4052836365002	336500	135	124	4	180
4052836375001	337500	160	129	4	96
4025075385000	338500	200	239	1	54



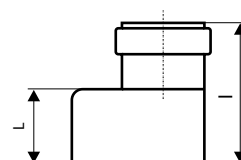
SKUHT - Reducer Skolan/HT

EAN CODE	EAN	DN	L (mm)	I (mm)	PACKING	PALLETE
4052836328304	332830	58	59	52	4	2200
4052836338303	333830	78	59	112	4	800
4052836338204	336820	135	64	255	4	200



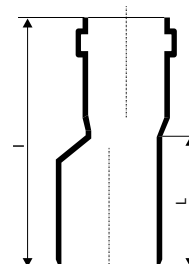
SKRHT - Reduction Skolan/HT

EAN CODE	EAN	DN	I (mm)	L (mm)	PACKING	PALLETE
4052836327505	332750	58/40	89	60	4	1000
4052836337504	333750	78/50	110	76	4	1140



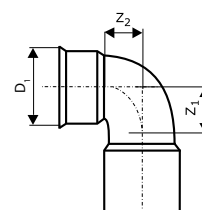
SKR - Reduction abaxial

EAN CODE	EAN	DN	I (mm)	L (mm)	PACKING	PALLETE
4052836337108	333710	78/58	102	60	4	1000
4052836347206	334720	90/58	84	65	4	1000
4052836347107	334710	90/78	105	60	4	800
4052836357205	335720	110/58	104	61	4	800
4052836357106	335710	110/78	104	62	4	800
4052836367105	336710	135/110	133	90	4	240
4052836377104	337710	160/110	195	100	4	240
4052836377005	337700	160/135	190	100	1	120
4052836387103	338710	200/160	272	143	1	60



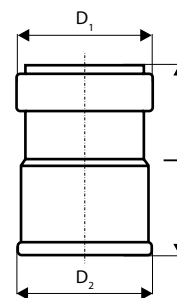
SKSW - Siphon Bend 87°

EAN CODE	EAN	DN	D ₁ (mm)	z ₁ (mm)	z ₂ (mm)	PACKING	PALLETE
4052836359407	335940	58/40	58	30,5	25	4	1220



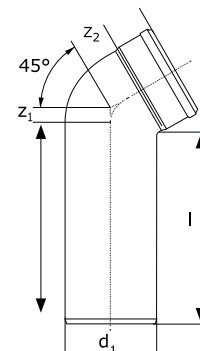
SKAM - individual Socket

EAN CODE	EAN	DN	D ₁ (mm)	D ₂ (mm)	l (mm)	PACKING	PALLETE
4052836328106	332810	58	72	75	117	4	576
4052836338105	333810	78	84	96	119	4	384
4052836348104	334810	90	110	1110	120	2	224
4052836358103	335810	110	116	132	124	4	288
4052836368102	336810	135	141	161	145	4	160
4052836378101	337810	160	166	181	147	2	120
4052836388100	338810	200	235	225	228	1	45



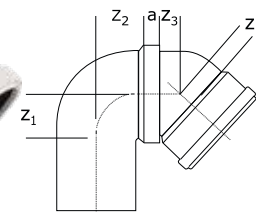
SKB - Extended Bend 45°

EAN CODE	EAN	DN	t (mm)	l (mm)	D ₁ (mm)	z ₁ (mm)	z ₂ (mm)	PACKING
4052836359605	335960	110	57	250	110	24	28	1



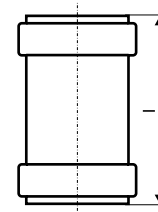
SKB - Return air Bend 135°

EAN CODE	EAN	DN	z ₁ (mm)	z ₂ (mm)	z ₁ (mm)	z ₂ (mm)	a (mm)	PACKING
4052836359506	335950	110/100/100	78	58	44	44	19,5	1



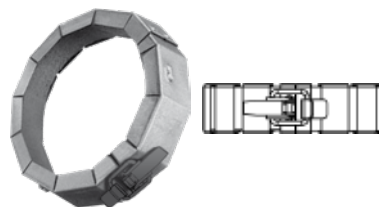
SKMM - double-Socket Sleeve

EAN KÓD	EAN	DN	l (mm)	BALENÍ	PALETA
4052836081551	332510	58	105	4	1100
4052836081582	333510	78	107	4	384
4052836081612	334510	90	98	-	648
4052836081636	335510	110	125	4	224
4052836081667	336510	135	123	4	180
4052836081698	337510	160	129	2	96
4052836081728	338510	200	239	-	50



SK – Pull-out Protection

EAN CODE	EAN	DN	PACKING
4052836815057	881505	58	50
4052836815156	881515	78	30
4052836815200	881520	90	30
4052836815309	881530	110	20
4052836815453	881545	135	9
4052836815507	881550	160	10



SK – Throttle lock sleeve Skolan

EAN CODE	EAN	DN	PACKING
4052836390103	839010	58	1
4052836390202	839020	78	1
4052836390301	839030	90	1
4052836390400	839040	110	1
4052836390509	839050	135	1
4052836390608	839060	160	1



SK – Washer for SKAM

EAN CODE	EAN	DN	PACKING
4052836814401	881440	58	1
4052836814500	881450	78	1
4052836814708	881470	110	1
4052836814807	881480	135	1
4052836814906	881490	160	1



SK - Spare O-ring

EAN CODE	EAN	DN	PACKING
4052836806007	880600	58	1
4052836806106	880610	78	1
4052836806304	880630	110	1
4052836806403	880640	135	1
4052836806502	880650	160	1
4052836806601	880660	200	1



Transition cuff Skolan Safe 58/HT 50

EAN CODE	EAN	DN SK	DN HT	PACKING
4052836086754	910833	58	50	20

* new - replacement for SKUHT DN58 fitting



SK NBR - Gasket (Oil and Fat resistant)

EAN CODE	EAN	DN	PACKING
4052836807007	880700	58	1
4052836807106	880710	78	1
4052836802408	880240	90	1
4052836807304	880730	110	1
4052836807403	880740	135	1
4052836807502	880750	160	1
4052836807601	880760	200	1



SK - 3-fold ring

EAN CODE	EAN	DN	PACKING
4052836806055	880605	58	1
4052836014054	880615	78	1
4052836003768	880047	90	1
4052836014191	880635	110	1
4052836014238	880645	135	1



SK NBR - 3-fold ring (oil-resistant)

EAN CODE	EAN	DN	PACKING
4052836014252	880705	58	1
4052836014276	880715	78	1
4052836004109	880247	90	1
4052836014290	880735	110	1
4052836014313	880745	135	1



Mounting screws and nuts for installation sleeve

EAN CODE	EAN	TITLE	PACKING	PALLETE
4025075400506	40050	50 mm screw combi	100	-
4025075400704	40070	70 mm screw combi	100	-
4025075401008	40100	100 mm screw combi	100	-
4025075410000	41000	1 m eyebolt	100	-
4025075400308	40030	24 mm coupling nut	50	-



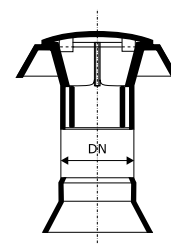
Mounting Lubricant

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	



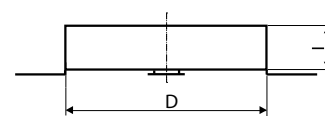
OSMA – ventilation Cap

EAN CODE	EAN	DN	PACKING
4025075801006	80100	75	1
4025075800702	80070	110	1



SKBM - Fire Block

EAN CODE	EAN	DN	D (mm)	l (mm)	PACKING
4025075392054	39205	58	50	60	1
4025075392108	39210	78	75-78	60	1
4025075393153	39215	110	110	60	1
4025075393105	39310	135	125	60	1
4025075394102	39410	160	160	60	1



SKBM - Fire Block Pacifyre

EAN CODE	EAN	DN	PACKING
4025075392207	39220	110	1



Installation manual HT, ULTRA dB a Skolan SAFE®

1. SCOPE OF VALIDITY

- a) This manual describes the handling, storage and installation of pipelines designated for draining media in connection, waste, ventilation and rainwater pipelines made of HT-System PLUS® pipes and shaped pieces which are made in compliance with the ČSN EN 1451-1 standard as well as with the requirements of the Act No. 22/1997 Coll. „Technical requirements on products“. The Declaration of Conformity was issued in compliance with Act No. NV 178/1997 Coll. as amended in Act No. NV 81/97 Coll.
- b) This Manual is intended only for installations from genuine pipes and shaped pieces, as well as genuine sealing elements and mounting lubricants.

2. TRANSPORT, HANDLING, STORAGE

Free pipes must rest on the cargo bed along all their full length throughout transport. Dragging the pipes along the ground or the cargo bed is not recommended. We recommend proceeding with extreme caution in low ambient temperatures (particularly in temperatures below 0°C). Use textile belts to move the pipes with a crane.

The HT System Plus®, Skolan SAFE® a Ultra dB System pipes and shaped pieces, including sealing elements, may be stored in open areas. Maximum storage time in open areas, however, is limited to two years. For longer periods, it will be necessary to protect the products from UV radiation. The following conditions apply to storage:

- a) The pipes must be stored in such a manner as to protect them from any deformation.
- b) The pipe faucets must be stored as to protect them from any horizontal and/or vertical deformation.
- c) The maximum pile height for pipes not stored in PALLETES must not exceed 1.5 meters.

3. CONNECTING THE PIPES

The HT System Plus®, Skolan SAFE® a Ultra dB System pipes and shaped pieces are connected by means of socket faucets with a tight connection to even pipe ends provided by means of lipped O-rings. The glueing of pipes or shaped pieces is not recommended. Single pipes and shaped pieces are always fitted with a faucet and an O-ring at one end. Other pipes with no faucets can be connected via sleeves, double faucet sleeves, and individual faucets. The pipes can be cut either with a special pipe cutter, or with a slant-cut hand-saw with fine teeth (see Figure 1). The cut must be lead at a right angle to the pipe axis. The cut must be cleaned and bevelled. The bevel can be created with a special cutter (the bevel will be created during cutting) or with a fine rasp or wood file. The dimensions are given in Figure 2 and in the following table.

Figure 1 Pipe cutting with a hand-saw

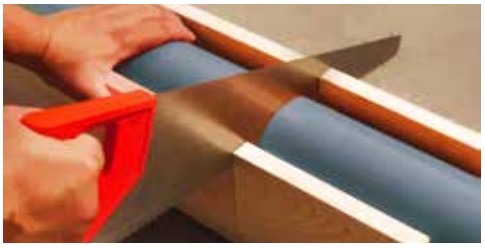
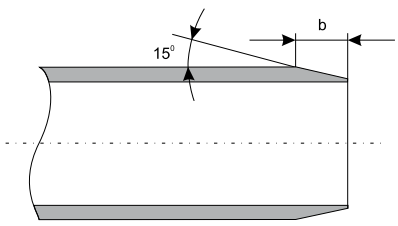


Figure 2 Bevel of pipe cut subsequently



BEVEL DIMENSIONS								
DN	32	40	50	75	110	125	160	200
b[mm]	3,5	3,5	3,5	3,5	4,5	5,0	6,0	6,5

4. CONNECTING PIPES AND SHAPED PIECES

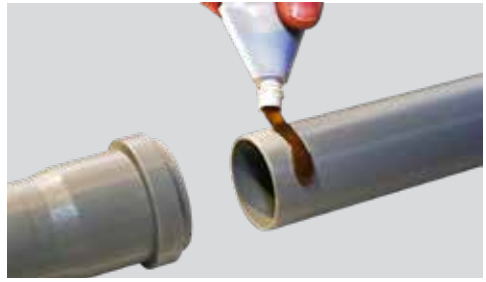
- a) Clean the faucet and flat end of the pipe.



- b) Check the condition of sealing elements.



- c) On the flat end of the bevel evenly spread the original mounting lubricant (usage of petroleum-based greases and oils is not recommended). Prior to fitting the O-ring, the surface must be dry and free from lubricant residue.



- d) Insert the flat end of the pipe into the faucet completely. Mark the faucet rim on the flat end with a pencil or marker and move this mark out backwards by ca 10mm. This will allow for pipe expansion. Considering that the pipes with faucets are max. 2,000 mm long, the above mentioned value should be sufficient. In case of longer pipes

(e.g. 5000mm without faucet) it will be necessary to insert an extension bend – extended faucet (HTL, SKL). Flat ends of the fittings are to be inserted in the faucet completely.



5. PIPELINE ANCHORING

Anchoring of the pipeline to the building structure stabilises the pipeline position, transmits forces and loads into the structure and prevents the pipeline from unwanted bending and from transmitting vibrations and noise into the building structure. OSMA recommends anchoring the HT System Plus®, Skolan SAFE® a Ultra dB System pipes with steel holders with rubber lining (decrease transmission of noise on the structure), which are included in the catalogue. The holders must correspond to the outer diameter of the piping. The use of steel hooks or flexible PVC tapes is not recommended.

FIXED HOLDERS (FH)

Holders located along the entire pipeline length are divided into fixed and loose units. Fixed holders (FH) must always be located under the pipe faucet (HTEM, SKEM) or closely under the separate faucet in case of a straight pipe (HTGL) with a faucet socket (HTAM). Fixing at a subsequent connection with sleeve (HTU, SKU) or connection (HTMM) is included in paragraph 11. Fixed holders must always be used with shaped pieces and groups of shaped pieces.

LOOSE HOLDERS (LH)

Loose holders are a supplement to fixed holders in the pipeline anchoring system. Loose holders are fitted with slip rubber sleeves and distance washers and are always a few hundredths of a millimeter greater than the pipe outer diameter (they are not tight, i. e. allowing for pipe expansion).

RECOMMENDED HOLDER SPACING VALUES		
DN	horizontal [m]	vertical [m]
32	0,50	1,2
40	0,50	1,2
50	0,50	1,5
58	0,50	1,5
78	0,80	2,0
75	0,80	2,0
100	1,10	2,0
110	1,10	2,0
125	1,25	2,0
135	1,35	2,0
160	1,60	2,0
200	2,00	2,0

6. INSTALLING PIPELINES IN WALLS

Penetrations and grooves in walls must provide for tension-free pipeline installation and pipeline movement during structure subsidence, as well as for pipeline protection from mechanical damage. No pipeline connections may be placed in penetrations. It is possible to plaster the pipeline immediately after it has been packed in cardboard, felt stripes, mineral wool or plaster carrier, such as e. g. meshwork. At such places where the waste pipeline should be lead along with hot-water pipes, it is necessary to insulate these pipes. At the same time, all directives concerning skin-wall installations as well as standards applicable to construction of waste pipelines inside buildings have to be fully respected. Horizontal pipelines, such as connection pipes leading from multiple furnishing objects, must

rest on brickwork along its entire length. Nevertheless, enough space must be provided for pipeline expansion at the same time.

7. PIPING PENETRATION THROUGH CEILINGS

Piping penetration through ceilings must be water and sound-proof. In the event the area needs to be made resistant to the spread of fire, it is possible to use fire-proof sleeves; these sleeves are placed on the ceiling side with greater fire risk. The sleeves are fastened to the structure with steel dowels. The sleeves must never be installed directly into the penetration hole. Fire-proof sleeves are included in the catalogue. In the event an installation certification or regular checks of fire-proof sleeves by an authorised company are needed, please refer to the contact information on the reverse side of the catalogue cover.

8. PIPELINE INSTALLATION IN CONCRETE

The HT System Plus®, Skolan SAFE® a Ultra dB System waste pipes and shaped pieces may be directly encased in concrete, taking the length of thermal expansion into account. The pipeline must be properly fixed and secured against any possible displacement (floating) during concrete placing. At the same time, the connections must be secured with adhesive tape, so that no cement laitance can penetrate into the sealing elements, and any pipeline openings must be closed, if possible with stoppers (HTM, SKM).

9. CONNECTING PIPES MADE OF OTHER MATERIALS

- The HT-System PLUS® pipeline may be connected to already present PVC-pipeline directly through the faucet or using a sleeve (HTU), double-faucet sleeve (HTMM), or separate faucet (HTAM). Connections between flat ends of Polypropylene pipes and PVC waste pipeline faucets must be equipped with O-rings!! Skolan SAFE® pipes connections with existing glued PVC pipe is not recommended.
- The HT-System PLUS® pipeline can be directly connected to the horizontal KG System (PP)® sewerage as both systems are fully compatible.
- Connection to a cast-iron system – see Figures 3 and 4.

- connections Skolan SAFE® with horizontal KG-System (PVC)® can be performed at DN 110 and 200 directly to DN 135 is part of the Reducer (SKUKG).

Figure 3 Connection to the cast-iron pipe flat end



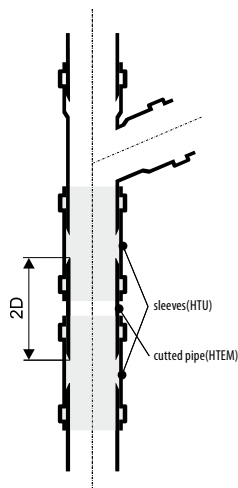
Figure 4 Connection to the cast-iron pipe faucet



10. SUBSEQUENT INSERTION OF BRANCH

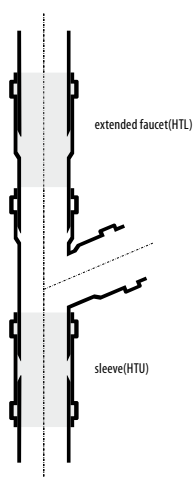
a) Procedure using two sleeves and a piece of cut pipe (see Figure 5): First, cut the existing pipeline in twice the length of the Branch Pipe to be inserted. Fit the Branch Pipe on one end and the sleeve on the other. Then close the remaining gap with the cut pipe and the sleeve. Finally, use the sleeves to close the connections.

Figure 5 Subsequent insertion of branch (using two HTU, SKU sleeves)



b) Procedure using a sleeve and an extended faucet (see Figure 6): Cut the existing pipeline in the length corresponding to the shaped piece length + the extended faucet (HTL, SKL) length. Fit the extended faucet completely on one end and the sleeve (HTU) on the other. Insert the flat end of the extended faucet to the inserted Branch Pipe and tighten the Branch Pipe flat end with the sleeve to fix the inserted Branch Pipe.

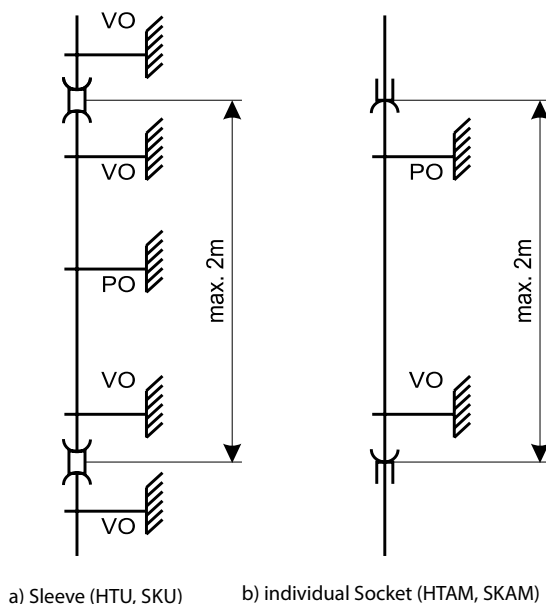
Figure 6 Subsequent insertion of branch (using an HTU, SKU sleeve and an extended HTL, SKL faucet)



11. PRINCIPLES FOR WORK WITH PIPES WITHOUT FAUCETS (HTGL) AND PIPE CUT-OFFS

Pipes with no faucets can be connected using sleeves (HTU), double faucet sleeves (HTMM, SKGL), and individual faucets (HTAM, SKAM). Nevertheless, it is always necessary to respect thermal linear expansion of the materials; this means that extended faucets (HTL, SKL) must be used with pipes of lengths exceeding 2 m. The anchoring of vertical pipelines is shown in Figure 7. The anchoring of horizontal pipelines is described in paragraph 5.

Figure 7 Anchoring of pipeline connected subsequently



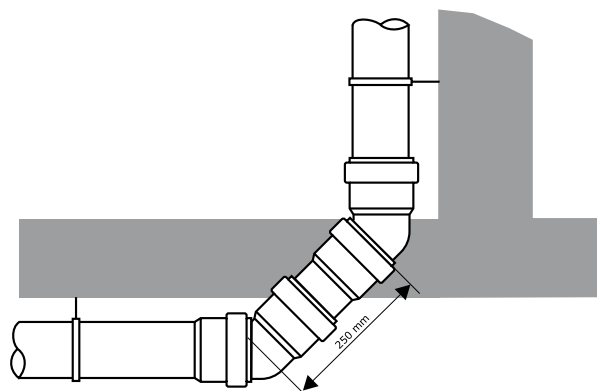
12. MEASURES AGAINST NOISE LEADING AND TRANSMISSION

According to DIN 4109 the noise emissions from pipelines installed in noise-protected areas should not exceed 35 dB(A). Therefore, the piping must not be installed uncovered in such areas. The piping can be installed in wall channels or on the other side of the wall only if its surface density is equal to 220 kg/m². Further noise emission reduction can be reached by using holders with rubber bushings and by anchoring the piping in plastic dowels in walls. For further information, please refer to DIN 1986, Part 1, and DIN 4109, Annex 2 – silencing zone (see Figure 8). Should these solutions not be enough, we recommend using the Skolan SAFE®, „silent waste system“.

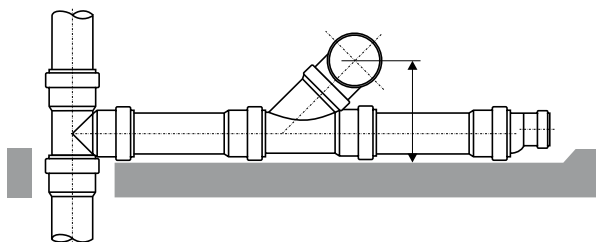
13. MEASURES TO REDUCE THE MANAGEMENT AND TRANSFER OF NOISE

According to DIN 4109 should not noise emissions from the built pipeline in areas protected from noise exceed 35 dB (A). In these areas it is not permissible to install pipes uncovered. A channel in the wall or on the other side of the pipe walls can be placed only takes place if a basis weight of 220 kg / m². Further reduction of noise emissions can be achieved by use of clamps with rubber lining and anchored to the anchors in the wall. For more information, refer to DIN 1986, Part 1 and DIN 4109, Annex 2 - silencing zone (see Figure 8).

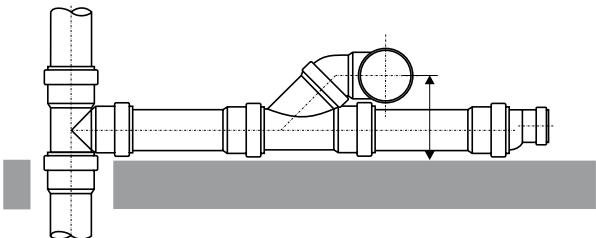
Figure 8 Silencing zone – transition from vertical to horizontal piping



Skolan SAFE® - use standard fittings, installation height 260 mm



Skolan SAFE® - USE parallel branch (SKPA), installation height 195 mm



14. FIRE PRECAUTIONS

Fire protection of buildings, especially high-rise buildings, is based on division of these buildings into fire sectors. In the event of fire, these sectors must be perfectly separated from each other, so no fire or combustion gases can penetrate other areas. The HT System Plus®, Skolan SAFE® a Ultra dB System is classified as B2 according to DIN 4102 - materials with normal inflammability. The following measures are necessary to prevent any fire or smoke from penetrating other fire sectors:

- In case the collection piping penetrates a ceiling separating two different fire sectors, the piping must be fitted with a fire-proof sleeve (HTBM, SKBM) containing a filling that will seal the piping penetration hole at 130 °C completely, so no air or fire can pass through this hole. Thus, the sleeve will prevent any fire or smoke from penetrating the hole.
- In case the collection piping is lead through an installation shaft being a separate fire sector, all branches must be fitted with fire-proof sleeves (HTBM, SKBM).

Installation of fire block SKBM:

- Open the cuff so that it can be put on the pipe.
- Place the cuff on the tube so that the metal sleeve to be outside.
- Insert the clip into the notches and bend - the cuff tightly.
- 4th cuff into the hole in the wall, mineral wool and wrap or fix it to the wall with the supplied mounting hardware.

In addition to these general rules, national fire regulations, standards and directives must be observed. .

15. INTERNAL SEWERAGE SYSTEM TESTS

Internal sewerage system tests are carried out in compliance with the ČSN 75 6760 standard and consist of three parts:

- technical inspection;
- collection piping water-tightness test;
- collection, connection and ventilation piping gas tightness test.

If the sewerage system has not been tested, the piping to be tested must be left accessible and clean (visible connections). All openings in the piping must be sealed during the collection piping water tightness test, which is carried out with water free of mechanical impurities at overpressures of minimum 3 kPa and maximum 50 kPa. The water tightness test lasts one hour and is passed if water leaks related to 10 m² of the internal piping surface does not exceed the volume of 0.5 l/hour.

The water tightness test is carried out after furnishing objects have

been fitted and brazes have been filled with water. At the same time, the waste piping is temporarily sealed in cleaning shaped pieces installed at the lowest places. The ventilation piping remains temporarily open until testing gas starts leaking. The testing gas must be sanitary and non-combusting, though foul-smelling or coloured. The cleaning shaped piece located in the lowest position is fitted with a testing cap and micropressure gauge. With the ventilation piping sealed, the piping is then filled with the testing gas under the overpressure of 0.4 kPa through the inlet valve. The test is passed if no gas can be smelled or seen in the entire building after 0.5 hour. A written record is made of the test results.

16. STANDARDS AND REGULATIONS

The following ČSN EN and DIN standards also apply to the installation of the HT System Plus®, Skolan SAFE® a Ultra dB System piping:

ČSN ENV 13801
Plastic piping system for sewerage (for low and high temperatures) inside buildings – Thermoplastic materials – Installation recommendations.
ČSN EN 12056-1
Sewerage system inside buildings – Gravity systems Part 1: General and functional requirements.
ČSN EN 12056-2
Sewerage system inside buildings – Gravity systems Part 2: Draining of sewerage water – Designing and calculation.
ČSN EN 12056-3
Sewerage systems inside buildings – Gravity systems Part 3: Draining of rainwater from roofs – Designing and calculation.
ČSN EN 12056-4
Sewerage systems inside buildings – Gravity systems Part 4: Sewerage water pumping plants – Designing and calculation.
ČSN EN 12056-5
Sewerage systems inside buildings – Gravity systems Part 5: Installation and testing, instructions for operation, maintenance and use.
ČSN EN 1451-1
Plastic piping waste systems (for low and high temperatures) inside buildings – Polypropylene (PP) Part 1: Requirements on pipes, shaped pieces and system.
ČSN EN 681
Elastomeric sealants – Requirements on materials for sealing of connections of pipes designated for water supply and waste systems – Part 1: Vulcanised rubber
ČSN EN 743
Plastic distribution and protective piping systems – Pipes made of thermoplastic materials – Determination of linear shrinkage
DIN 4102
Fire resistance of construction materials and parts.
DIN 4109
Noise protection in structural engineering.

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		+	+	
acetaldehyde	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 acetate	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	+	+	
triethylamine 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	-	-
chlorobenzene	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	-	
muratic 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-dihydroxybutanedioic 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 pentoxide	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.	+	+	
ferrous 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		+	+	
Lysof*		+	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 – dihexylphthalate		+		
softening agent – dinonyl-adipate		+		
softening agent – dioctyl-adipate		+		
softening agent – dioctyl-phthalate		+		
softening agent – tricresyl phosphate		+		
softening agent – trioctyl phosphate		+		
Pharmaceuticals and cosmetics				
Aspirin*		+		
Quinine		+		

COMPOUND	Concentration [%]	Temperature [°C]		
		20	40	60
iodine tincture		+		
bornyl chloride		+		
finger nail polish		+		
menthol		+		
soap and soapflakes		+		
soap solution	sat.	+	+	+
soap solution	10	+	+	+
finger nail 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 chlorine)	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 acetate	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 sugar), sol. aq.	sat.	+	+	°
glycerine, sol. aq.	all	+	+	+
glycocol, 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 phosphorus	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 alum, sol. aq.	dil.	+	+	°
chrome alum, sol. aq.	sat.	+	+	+
chromium-sulphur cleaning mixture	50/15/35	+	+	°
metallic iodine and in alkaline 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	+	+	
silicic 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, sol. aq.	90	+	°	-
lactacid, 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.	+	+	+
picric acid	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-dihydroxybutanedioic acid, sol. aq.	up to 10	+	+	°
2,3-dihydroxybutanedioic 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	niz.	+		
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 CS ₂	200 mg/l		°	
spinner acids with CS ₂	100 mg/l	+	+	
spinner acids with CS ₂	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 solution
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

