PA Tubes

Brake tube DIN 74324, POLYAMIDE PA12

Flexible brake tube for automotive applications. In conformity with the standard DIN 74324. For demanding installations.

- Operating temperatures -40°…+93°C
- Sizes 4-16 mm
- Operating pressures according to the standard
- On special order also PA11

Pneumatics, POLYAMIDE PA11 and PA12

Flexible pressure-resistant tubes for pneumatic and hydraulic applications, as well as for grease lubrication.

- Three hardnesses
- 96 stock items, other dimensions on request
- Operating temperatures:
  PA11 and PA11P40 -40°…+93°C
  PA11F15 -20°…+65°C
  PA12 and PA12P40 -40°…+80°C
- Operating pressures 4-135 bar depending on tube dimensions and hardness

Operating pressure (bar) with safety factor 3 (three)

Quality		PA11				PA11P40 and PA12P40				PA11F15				
Tube dimensions mm		Temperature °C				Temperature °C				Temperature °C			Weight	Bending radius
outer	inner	23	40	60	80	23	40	60	80	23	40	60	g/m	min.mm
3,0	2,0	45	32	24	19	26	19	15	12	17	12	10	4,1	18
3,2	2,4	32	22	17	14	19	14	11	9	12	9	7	3,7	20
4,0	1,0	135	95	73	58	80	58	46	38	52	37	30	12,4	24
4,0	2,0	75	53	41	32	44	32	25	21	29	21	17	9,9	24
4,0	2,5	52	36	28	22	30	22	17	14	20	14	11	8,0	24
4,0	2,7	43	30	23	18	26	19	15	12	16	12	9	7,2	24
4,0	3,0	32	22	17	14	19	14	11	9	12	9	7	5,8	25
5,0	2,0	96	67	52	41	57	41	32	27	37	27	21	17,3	30
5,0	2,5	75	53	41	32	44	32	25	21	29	21	17	15,5	30
5,0	3,0	56	39	30	24	33	24	19	16	21	15	12	13,2	30
5,0	3,5	39	27	21	17	23	17	13	11	15	11	9	10,5	30
5,5	3,5	50	35	27	22	29	21	17	14	19	14	11	14,8	33
6,0	2,0	113	79	61	49	67	48	38	31	43	31	25	26,4	36
6,0	3,0	75	53	41	32	44	32	25	21	29	21	17	22,3	36
6,0	4,0	45	32	24	19	26	19	15	12	17	12	10	16,5	36
6,0	4,2	39	27	21	17	23	17	13	11	15	11	9	15,1	36
6,0	4,3	37	26	20	16	22	16	13	10	14	10	8	14,4	36
6,0	5,0	20	14	11	9	12	9	7	6	7	5	4	9,1	59
6,4	4,0	52	36	28	22	30	22	17	14	20	14	11	20,6	38
6,4	4,3	44	31	24	19	26	19	15	12	17	12	10	18,5	38
6,4	4,7	34	24	18	15	20	14	11	9	13	9	7	15,6	38
7,0	3,0	90	63	49	39	53	38	30	25	34	24	19	33,0	42
7,0	4,0	61	43	33	26	36	26	21	17	23	17	13	27,2	42
7,0	5,0	37	26	20	16	22	16	13	10	14	10	8	19,8	42
8,0	4,0	75	53	41	32	44	32	25	21	29	21	17	39,6	48
8,0	5,0	52	36	28	22	30	22	17	14	20	14	11	32,2	48
8,0	6,0	32	22	17	14	19	14	11	9	12	9	7	23,1	50
9,0	7,0	28	20	15	12	16	12	9	8	10	7	6	26,4	64
9,0	4,0	86	60	46	37	51	37	29	24	33	24	19	53,6	64
9,0	6,0	45	32	24	19	26	19	15	12	17	12	10	37,1	54
9,5	5,5	60	42	32	26	35	25	20	16	23	17	13	49,5	54
9,5	6,4	44	31	24	19	26	19	15	12	16	12	9	40,6	57
9,5	7,5	26	18	14	11	15	11	9	7	10	7	6	28,0	57
10,0	6,0	56	39	30	24	33	24	19	16	21	15	12	52,8	72
10,0	7,0	39	27	21	17	23	17	13	11	15	11	9	42,1	60
10,0	7,5	32	22	17	14	19	14	11	9	12	9	7	36,1	63
10,0	8,0	25	18	14	11	14	10	8	7	9	6	5	29,7	80
10,5	7,5	37	26	20	16	22	16	13	10	14	10	8	44,5	63
11,0	9,0	22	15	12	9	13	9	7	6	8	6	5	33,0	98
11,0	8,0	35	25	19	15	21	15	12	10	13	9	7	47,0	66
12,0	10,0	20	14	11	9	12	9	7	6	7	5	4	36,3	118
12,0	8,0	45	32	24	19	26	19	15	12	17	12	10	66,0	72
12,0	9,0	32	22	17	14	19	14	11	9	12	9	7	52,0	75
12,7	9,5	32	22	17	14	19	14	11	9	12	9	7	58,6	79
13,0	9,5	35	25	19	15	20	14	11	9	13	9	7	64,9	78
13,0	10,0	29	20	16	12	17	12	10	8	11	8	6	56,9	89
14,0	7,0	75	53	41	32	44	32	25	21	29	21	17	121,2	84
14,0	10,0	37	26	20	16	22	16	13	10	14	10	8	79,2	84
14,0	11,0	27	19	15	12	16	12	9	8	10	7	6	61,9	104
14,0	12,0	17	12	9	7	10	7	6	5	6	4	3	42,9	163
15,0	10,0	45	32	24	19	26	19	15	12	17	12	10	103,1	90
15,0	11,0	34	24	18	15	20	14	11	9	13	9	7	85,8	90
15,0	12,0	25	18	14	11	14	10	8	7	9	6	5	66,8	121
15,0	13,0	16	11	9	7	9	6	5	4	6	4	3	46,2	188
16,0	12,0	32	22	17	14	19	14	11	9	12	9	7	92,4	100
16,0	13,0	23	16	12	10	13	9	7	6	9	6	5	71,7	138
16,0	14,0	15	11	8	6	8	6	5	4	5	4	3	49,5	214
17,0	14,0	21	15	11	9	12	9	7	6	8	6	5	76,7	157
18,0	14,0	28	20	15	12	16	12	9	8	10	7	6	105,6	129
18,0	15,0	20	14	11	9	12	9	7	6	7	5	4	81,6	177
18,0	16,0	13	9	7	6	7	5	4	3	5	4	3	56,1	273
19,0	16,0	19	13	10	8	11	8	6	5	7	5	4	86,6	198
20,0	16,0	25	18	14	11	14	10	8	7	9	6	5	118,8	161
21,0	19,0	11	8	6	5	6	4	3	3	4	3	2	66,0	375
22,0	18,0	22	15	12	9	13	9	7	6	8	6	5	131,9	196
22,0	20,0	10	7	5	4	6	4	3	3	4	3	2	69,3	413
24,0	20,0	20	14	11	9	12	9	7	6	7	5	4	145,1	236
25,0	20,0	25	18	14	11	14	10	8	7	9	6	5	185,6	201
28,0	24,0	17	12	9	7	10	7	6	5	6	4	3	171,5	325
28,0	23,0	22	15	12	9	13	9	7	6	8	6	5	210,3	255

PUR C98A (Polyester-based)

- Extremely flexible, also in low temperatures
- Excellent abrasion resistance
- No plasticizers used
- Excellent elasticity - small bending radius
- Extremely wide operating temperature range

Applications:
- pneumatics
- industrial robots
- instrumentation lines

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PUR Tubes

PUR C98A

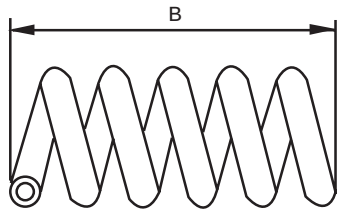
Tube dimensions mm		Operating pressure (bar) with safety factor 3 (three) Temperature °C						Weight	Bending radius
outer	inner	20	30	40	50	60	70	kg/m	min. mm
3,0	2,0	11	10	9	8	7	6	0,005	11
4,0	2,5	13	12	10	9	8	7	0,009	12
4,0	2,2	17	15	13	11	10	9	0,011	10
4,0	2,0	19	17	15	13	11	10	0,011	9
4,3	2,8	12	11	9	8	7	6	0,010	15
5,0	3,0	14	13	11	10	9	8	0,015	14
5,0	3,1	13	12	10	9	8	7	0,015	15
6,0	3,9	12	11	9	8	7	7	0,020	20
6,0	4,0	11	10	9	8	7	6	0,019	21
8,0	5,5	11	9	8	7	6	6	0,032	31
8,0	5,0	13	12	10	9	8	7	0,037	25
8,0	5,7	10	9	7	7	6	5	0,030	34
8,0	6,0	8	7	6	6	5	4	0,027	40
10,0	8,0	6	6	5	4	4	3	0,034	64
10,0	7,5	8	7	6	6	5	4	0,042	50
10,0	7,0	10	9	8	7	6	5	0,049	40
12,0	8,0	11	10	9	8	7	6	0,077	43
12,0	9,0	8	7	6	6	5	4	0,060	60
14,0	11,0	7	6	5	5	4	4	0,072	83
14,0	12,0	4	4	3	3	3	2	0,050	130
15,0	12,5	5	5	4	4	3	3	0,066	118
15,0	12,0	6	6	5	4	4	3	0,078	96
16,0	13,0	6	5	5	4	4	3	0,083	110

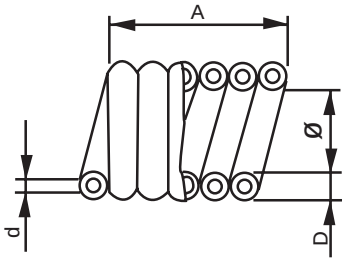
Operating temperature	-40°C…+80°C, momentarily +100°C
Operating conditions	Based on experience, we can say that high humidity, particularly in association with high temperature, will considerably shorten the service life of the tubes.
Bending radius	The minimum bending radius is a guideline only.
Tolerances	According to DIN 74324

Spirals

POLYAMIDE

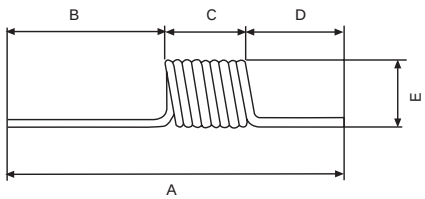
Economical solution for universal use
- Operating temperatures -40°…+93°C
- Operating pressures 4…135 bar





POLYURETHANE

Flexible solution e.g. for robotic control and pneumatic tools, as well as places where installation room is limited.
- Operating temperatures -40°…+70°C
- Operating pressure 10 bar



PA 11 spirals

Recommendation:	For horizontal fitting medium hard polyamide, for vertical fitting hard polyamide.
Ordering:	The spirals are manufactured by request.
Colours:	Standard colour is blue, other colours by request.
Sizes:	Other sizes by request. N.B. By request also with straight heads.

Tube dimensions mm		Spiral dimensions mm		
outer	inner	Work length	Inner diameter	Free length
D	d	B	Ø	A
4,0	2,0	5000	22	367
6,0	4,0	5000	60	217
8,0	6,0	5000	60	281
8,0	6,0	5000	100	177
10,0	8,0	5000	100	217
10,0	8,0	5000	127	174
12,0	10,0	5000	127	206
15,0	12,5	5000	150	217
15,0	12,5	5000	215	156
16,0	12,0	5000	215	165
25,0	19,0	5000	320	173
4,0	2,0	10000	22	735
6,0	4,0	10000	60	434
6,0	4,0	10000	100	270
8,0	6,0	10000	100	354
10,0	8,0	10000	100	434
10,0	8,0	10000	127	349
12,0	10,0	10000	127	412
15,0	12,5	10000	150	434
15,0	12,5	10000	215	311
16,0	12,0	10000	215	331
25,0	19,0	10000	320	346
4,0	2,0	15000	22	1102
6,0	4,0	15000	60	651
6,0	4,0	15000	100	405
8,0	6,0	15000	100	531
10,0	8,0	15000	100	651
10,0	8,0	15000	127	523
12,0	10,0	15000	127	618
15,0	12,5	15000	150	651
15,0	12,5	15000	215	467
16,0	12,0	15000	215	496
25,0	19,0	15000	320	519
6,0	4,0	20000	60	868
6,0	4,0	20000	100	541
8,0	6,0	20000	100	707
10,0	8,0	20000	100	868
10,0	8,0	20000	127	697
12,0	10,0	20000	127	824
15,0	12,5	20000	150	868
15,0	12,5	20000	215	623
16,0	12,0	20000	215	661
25,0	19,0	20000	320	692

PUR Spirals, hardness 90 Shore A

Ordering:	The spirals are manufactured by request
Colours:	The standard colour is blue

Hose dimensions mm		Work length	Spiral dimensions					Operating pressure
inner	outer	m	A	B	C	D	E	
d	D		mm	mm	mm	mm	mm	max. bar
5,0	8,0	2	780	500	180	100	41	10
5,0	8,0	4	1020	500	420	100	41	10
5,0	8,0	6	1250	500	650	100	41	10
5,0	8,0	8	1480	500	880	100	41	10
6,5	10,0	2	790	500	190	100	50	10
6,5	10,0	4	1030	500	430	100	50	10
6,5	10,0	6	1270	500	670	100	50	10
6,5	10,0	8	1510	500	910	100	50	10
8,0	12,0	2	780	500	180	100	64	10
8,0	12,0	4	1000	500	400	100	64	10
8,0	12,0	6	1220	500	620	100	64	10
8,0	12,0	8	1440	500	840	100	64	10
11,0	16,0	2	735	500	135	100	107	10
11,0	16,0	4	900	500	300	100	107	10
11,0	16,0	6	1070	500	470	100	107	10
11,0	16,0	8	1240	500	640	100	107	10

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LDPE Tubes

LDPE Tubes

LD-polyethylene is an inexpensive material and the tubes are made of it where the requirement is for:
- good elasticity,
- good remolding characteristics,
- moderate pressure and temperature resistance,
- high chemical resistance, especially against gases and liquids.

LDPE tubing is often used in pneumatic instrumentation and equipment due to its low price, good durability and easy installation.

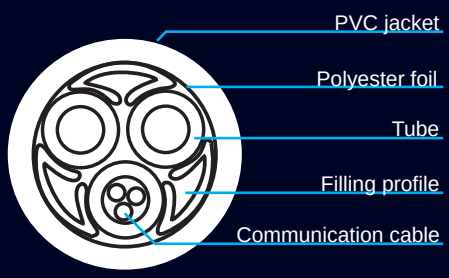
Operating pressures (bar) with safety factor 2.5 (two and a half)

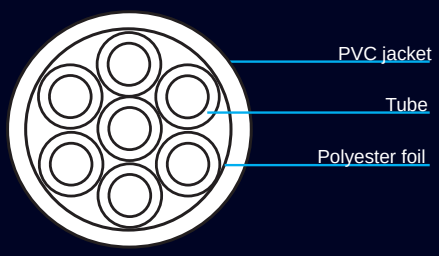
Tube dimensions mm		Temperature °C					Weight	Bending radius
outer	inner	20	30	40	50	60	g/m	min. mm
4,0	2,0	20	13	10	7	5	9,9	24
4,0	2,5	13	9	7	4	3	8,0	24
4,0	2,7	11	7	6	4	3	7,2	24
4,0	3,2	6	4	3	2	2	4,8	32
5,0	3,0	15	10	8	5	4	13,2	30
5,0	3,2	3	9	7	4	3	12,2	30
6,0	3,0	20	13	10	7	5	22,3	34
6,0	3,2	18	12	9	6	5	21,2	36
6,0	4,0	12	8	6	4	3	16,5	36
6,0	4,2	10	7	5	3	3	15,1	36
6,0	4,5	8	5	4	3	2	13,0	38
6,2	4,0	12	8	6	4	3	18,5	37
6,4	4,0	13	9	7	4	3	20,6	38
6,4	4,3	11	7	6	4	3	18,5	38
7,0	3,2	22	15	11	7	6	32,0	42
7,0	5,0	10	7	5	3	3	19,8	42
8,0	5,0	13	9	7	4	3	32,2	48
8,0	6,0	8	5	4	3	2	23,1	50
9,0	6,0	12	8	6	4	3	37,1	54
9,0	7,0	7	5	4	2	2	26,4	64
9,5	6,0	13	9	7	4	3	44,7	57
9,5	6,4	11	7	6	4	3	40,6	57
10,0	6,0	15	10	8	5	4	52,8	60
10,0	7,0	10	7	5	3	3	42,1	60
10,0	8,0	6	4	3	2	2	29,7	80
10,5	7,5	10	7	5	3	3	44,5	63
11,0	7,5	11	7	6	4	3	53,4	66
12,0	8,0	12	8	6	4	3	66,0	72
12,0	9,0	8	5	4	3	2	52,0	75
12,0	10,0	5	3	3	2	1	36,3	118
12,5	9,5	8	5	4	3	2	54,4	82
12,7	9,5	8	5	4	3	2	58,6	79
13,0	9,0	10	7	5	3	3	72,6	78
13,0	10,0	7	5	4	2	2	56,9	89
14,0	10,0	10	7	5	3	3	79,2	84
14,0	12,0	4	3	2	1	1	42,9	163
15,0	12,5	5	3	3	2	1	56,7	147
16,0	12,0	8	5	4	3	2	92,4	100
16,0	13,0	6	4	3	2	2	71,7	138
19,0	16,0	5	3	3	2	1	86,6	198
20,0	16,0	6	4	3	2	2	118,8	161
22,0	18,0	6	4	3	2	2	131,9	196

Mechanical properties	Value	Unit		Test method
	Density	922	kg/m3	ISO 1183
	Tensile strength, MD/TD	25/23	MPa	ISO 1184
	Break elongation, MD/TD	500/700	%	ISO 1184
	Tensile modulus, MD/TD	200/220	MPa	ASTM D 882-A
	Bending radius	at 20 °C		
	Tolerances	based on DIN 74324		
	Temperature range	installation operation		-30°C…+50°C -40°C…+60°C

Multi-Tube Cables for Pneumatics

We have developed a manufacturing method that gives us the possibility to make smaller or larger series based on customer's needs. The material range includes several different plastics.
- Materials PVC, PA11, PA12, PUR, LDPE
- Manufactured by request





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Multi-Tube Cables

General information	
General	Extruded PE (Polyethylene), PA (Polyamide) and PUR (Polyurethane) tubes in different combinations, with the jacket made of PVC. Other tubes and jacket materials by request.
Maximum pressure	Please see separate brochures of the different tubes.
Temperature ranges	Please see separate brochures of the different tubes.
Quality control	Continuous measurement of the tube outer diameter in two directions, measurement of the tube wall thickness in six directions. Regular measurement of the maximum pressure.
Tolerances	Based on DIN 74324.
Number of tubes	1-19 pcs, maximum number depending on individual tubes size.
Electric cables	Electric wires can be attached for electrical communication.
Jacket	PVC (Polyvinyl Chloride), black, blue or grey. Other materials by request.
Bending radius	Minimum 7x cable jacket outer diameter.
Delivery lengths	Standard length 500 m/wooden drum.
Protective foil	Polyester, standard thickness 12 µm.
EXAMPLE	O-3 PE - 6/4 MUS L-3 PE - 6/4 MUS LAL-3 PE - 6/4 MUS OAL-3PE 6/4 MUS
O	Round-shaped jacket without filling profiles (max 3 pcs).
L	Jacket without filling profiles.
LAL	Jacket with protective foil, (aluminium 12 µm + polyester 12 µm). Jacket without filling profiles.
OAL	Jacket with protective foil, (aluminium 12 µm + polyester 12 µm).
3	Number of tubes, numbering clockwise starting in the middle.
PE	Tubing material, other materials on request.
6/4	Tubing size, the tubes can be numbered or in different colours, max. 6 colours
MUS	Colour of the jacket, MUS = black, HAR = grey

			Tubes		Jacket
Cross profile	Product	Number	Material	Colour	Material
	L-1PE-6/4 MUS	1	PE (PA or PUR optional)	MUS =black	PVC (other materials by request)
	L-2PE-6/4 HAR	2	PE (PA or PUR optional)	HAR =grey	PVC (othermaterials by request)
	L-3PE-6/4 MUS	3	PE (PA or PUR optional)	MUS =black	PVC (other materials by request)
	O-2PE-6/4 MUS	2	PE (PA or PUR optional)	MUS =black	PVC (other materials by request)
	O-3PE-6/4 HAR	3	PE (PA or PUR optional)	HAR =grey	PVC (other materials by request)
	O-7PE-6/4 MUS	7	PE (PA or PUR optional)	MUS =black	PVC (other materials by request)

Jacket dimensions

Item	~Weight kg/m	~Outer dimensions mm
L-1PE-6/4	0,060	Ø 9,4
L-1PE-8/6	0,075	Ø 11,4
L-1PE-10/7	0,091	Ø 13,4
L-2PE-6/4	0,089	15,4 x 9,4
L-2PE-6,4	0,094	16,2 x 9,8
L-2PE-8/6	0,115	19,4 x 11,4
L-2PE-10/8	0,140	23,4 x 13,4
L-3PA-6/4	0,104	15,4 x 14,6
L-3PE-6/4	0,104	15,4 x 14,6
O-2PE-6,4/4,3	0,119	Ø 16,2
O-2PE-6/4	0,113	Ø 15,4

Chemical resistance of different plactics

	Chemical resistance	Type of plastic			
	1 suiteble 2 good 3 limited 4 bad 5 soluble	Polyamide PA11 and PA12	Plasticized PVC	Ester-based polyurethane PUR	Soft Polyethylene LDPE
	Chemical or substance	+20°C	+20°C	+20°C	+20°C
1	1,4-Dioxane	1	4	4	1
2	Battery acid	3	3	1	1
3	Aluminium salt, w.	1	1	2	4
4	Alumnus, w.	1	1	1	1
5	Ammonia , gas	1	1	4	1
6	Ammonia, w.	1	1	4	1
7	Ammonium acetate, w.	1	1	4	1
8	Ammonium phosphate	1	1	1	1
9	Ammonium carbonate, w.	1	1	4	1
10	Ammonium chloride, w.	1	1	1	1
11	Ammonium nitrate, w.	1	1	1	1
12	Ammonium sulphate, w.	1	1	1	1
13	Amyl alcohol, pure	1	1	2	1
14	Aniline (aminobenzene)	2	3	4	1
15	Acetone	1	5	4	1
16	Dishwashing agent, liquid	1	1	1	1
17	ASTM D 390-59, oil no.3	1	2	1	3
18	Barium salt	1	1	1	1
19	Benzene	1	3	4	1
20	Benzal	1	3	3	1
21	Benzoic acid	1	1	4	1
22	Borax, w. (sodium borate)	1	1	1	1
23	Boric acid	1	1	1	1
24	Bromine, liquid	4	4	4	4
25	Bromine vapour	4	4	4	4
26	Bromine water	4	4	4	4
27	Butane, gas	1	1	1	4
28	Butane, liquid	1	2	1	1
29	Butyl alcohol	1	3	4	4
30	Butyl acetate	1	5	4	4
31	Butyl acetate	1	4	4	2
32	Coca-Cola	1	1	1	1
33	Decalin	1	1	2	1
34	Butyl acetate (plasticizer)	1	3	3	3
35	Diesel fuel	1	2	1	2
36	Dimethyl ether	1	2	2	2
37	Dimethyl formamide	1	4	4	1
38	Ether	1	3	3	4
39	Mercury	1	3	1	1
40	Mercury salt, w.	1	3	1	1
41	Acetic acid	4	3	3	2
42	Acetic anhydrite	1	4	4	3
43	Ethyl alcohol (ethanol)	1	3	1	1
44	Ethyl acetate	1	5	4	2
45	Ethyl hexane	1	4	4	4
46	Ethyl chloride	3	4	2	4
47	Phenol	4	4	4	4
48	Hydrofluoric acid	4	4	3	3
49	Formaldehyde, w.	3	3	2	1
50	Formaline	3	2	2	1
51	Phosphoric acid	4	1	3	4
52	Phosphorus pentoxide	3	1	2	1
53	Gin	1	2	1	1
54	Glycol	1	1	2	1
55	Glycerol	1	1	1	1
56	Fruit juices	1	1	1	1
57	Hexane	1	1	2	1
58	Heptane	1	1	2	1
59	Hair shampoo	1	1	1	1
60	Silver salts, w.	1	1	1	1
61	Honey	1	1	1	1
62	Gelatine	1	1	1	1
63	Isooctane	1	1	1	4
64	Isopropanol	1	3	3	1
65	Brake fluid	1	3	4	3
66	Cocoa	1	1	1	1
67	Coffee	1	1	1	1
68	Potassium dichromate, w.	3	1	1	1

		Type of plastic			
		Polyamide PA11 and PA12	Plasticized PVC	Ester-based polyurethane PUR	Soft Polyethylene LDPE
	Chemical or substance	+20°C	+20°C	+20°C	+20°C
69	Potassium hydroxide, w.	1	2	1	1
70	Potassium iodide, w.	1	1	2	1
71	Potassium carbonate	1	1	3	1
72	Potassium chlorate, w.	2	1	2	1
73	Potassium chloride, w.	1	1	1	1
74	Potassium nitrate, w.	1	1	1	1
75	Potassium permanganate, w.	3	1	3	1
76	Potassium sulphate	1	1	1	1
77	Calcium chloride, w.	1	1	1	1
78	Calcium nitrate, w.	1	1	1	1
79	Carbamide (urea), w.	1	1	1	1
80	Fixing salt (sodium thiosulphate)	1	1	2	1
81	Chlorine, gas	4	4	4	4
82	Chlorine, liquid	4	4	4	4
83	Chlorobenzene, monochlorobenzene	3	4	3	4
84	Chlorosulphonic acid	4	4	4	4
85	Hydrochloric acid, gas	4	2	2	1
86	Chloroform	3	4	4	4
87	Coconut oil	1	1	1	2
88	Cresol	4	4	4	4
89	Cresol, w.	3	4	4	4
90	Chromic acid	4	3	4	2
91	Chrome baths, technical	4	1	3	1
92	Chrome-sulphuric acid	4	2	3	1
93	Chrome salt (bivalent or trivalent)	1	1	3	1
94	Xylene	1	4	4	4
95	Aqua regia	4	2	4	4
96	Spruce needle oil	1	3	2	2
97	Nail polish remover	1	4	4	1
98	Nail polish	1	4	4	1
99	White spirit	1	3	1	4
100	Lanolin	1	2	1	3
101	Liqueurs	1	2	1	1
102	Lemonades	1	1	1	1
103	Hartshorn oil	1	3	1	2
104	Heating oils	1	4	1	3
105	Magnesium salt, w.	1	1	1	1
106	Corn oil	1	1	2	4
107	Milk	1	1	1	1
108	Lactic acid	2	3	3	2
109	Liver oil	1	4	1	1
110	Margarines	1	1	1	3
111	Sea water	1	1	1	1
112	Methanol	1	3	2	1
113	Methylene chloride	3	4	4	4
114	Methyl ethyl ketone	1	3	4	4
115	Engine oils (Kfz German)	1	3	2	3
116	Ink	1	1	1	1
117	Formic acid	4	4	4	2
118	Pine needle oil	1	2	2	2
119	Naphthaline (petroleum)	1	2	1	4
120	Sodium carbonate, w.	1	1	1	1
121	Sodium sulphite, w.	1	1	2	1
122	Sodium phosphate, w.	1	1	2	1
123	Sodium hydroxide (caustic soda)	1	4	4	4
124	Sodium hypochlorite, w.	2	1	2	1
125	Sodium carbonate, w.	1	1	1	1
126	Sodium chlorate, w.	2	1	2	1
127	Sodium chloride, w.	1	1	1	1
128	Sodium nitrate, w.	1	1	1	1
129	Sodium nitrite, w.	2	1	1	1
130	Sodium perborate, w.	1	3	2	1
131	Sodium silicate	1	1	3	1
132	Sodium sulphate, w.	1	1	1	1
133	Sodium sulphide, w.	1	1	1	1
134	Sodium sulphite, w.	1	1	1	1
135	Sodium thiosulphate, w.	1	1	2	1
136	Liquid caustic soda, w.	1	1	2	1
137	Bovine fat	1	2	1	1
138	Clove oil	1	2	1	4
139	Nickelic salts, w.	1	1	1	1

		Type of plastic			
		Polyamide PA11 and PA12	Plasticized PVC	Ester-based polyurethane PUR	Soft Polyethylene LDPE
	Chemical or substance	+20°C	+20°C	+20°C	+20°C
140	Nitrobenzene	2	4	4	4
141	Oxalic acid	2	3	4	1
142	Octane	1	4	1	1
143	Olive oil	1	2	1	1
144	Beer	1	1	1	1
145	Ozone (less than 0.55 ppm)	1	3	1	4
146	Antifreeze agent (Kfz German)	1	1	2	1
147	Palm kernel oil	1	3	2	4
148	Paraffin	1	1	2	3
149	Paraffin oil	1	1	2	3
150	Perfume	1	4	1	1
151	Pectin	1	1	1	1
152	Linseed oil	1	3	1	1
153	Detergent	1	2	1	1
154	Petroleum	1	2	2	3
155	Petroleum ether	1	3	1	4
156	Pepper	1	1	1	1
157	Peppermint oil	1	2	1	3
158	Fuels (all motor petrols)	1	4	2	4
159	Propane, gas	1	1	2	3
160	Propane, liquid	1	1	2	4
161	Pyridine	1	4	5	1
162	Ferrous salt	1	1	2	1
163	Sulphur	1	4	1	4
164	Sulphuric dioxide	1	2	3	1
165	Sulphuric acid (max. 50%)	4	3	2	1
166	Sulphocarbide	1	4	3	4
167	Rum	1	2	1	1
168	Cooking oil, animal fat	1	2	2	3
169	Cooking oil, vegetable-based	1	2	2	4
170	Soap solution	1	1	2	1
171	Fuming sulphuric acid	4	4	4	4
172	Silicone oils	1	4	1	4
173	Mustard	1	1	1	1
174	Citric acid	1	1	2	1
175	Lemon juice	1	1	1	1
176	Soybean oil	1	2	2	4
177	Solution of sugar	1	1	1	1
178	Soda	1	1	1	1
179	Stearic acid	2	1	1	4
180	Hydrochloric acid (max. 20%)	4	2	2	1
181	Cyclohexane (hexahydrobenzene)	1	1	2	1
182	Cyclohexanol	1	5	4	1
183	Cyclohexanone	1	5	1	4
184	Tea	1	1	1	1
185	Tar (hot tar)	1	3	4	3
186	Tetrahydrofurane	1	4	4	3
187	Tetrahydronaphtalene (tetraline)	1	1	2	4
188	Tetrachlorizated carbon	1	4	3	4
189	Tin chlorid	1	1	1	1
190	Toluene	1	4	4	4
191	Trichlorthylene	2	4	4	4
192	Nitric acid (max 25%)	4	3	5	2
193	Starch, solution of starch	1	1	1	1
194	Turpentine oil	1	3	4	3
195	Bleaching solution (12% chlorine)	3	3	4	1
196	Vanilla	1	1	1	1
197	Vaseline	1	2	1	3
198	Hydrogen peroxide	2	3	2	1
199	Wine	1	1	1	1
200	Tartaric acid, w.	2	2	1	2
201	Oleinic acid	2	2	1	2

W =hydrous solution

All information given in the table is based on material supplier's recommendations. As individual operating conditions will affect the suitability of any given hose, this information shall be regarded as guidelines only. If no earlier experience with the operating conditions is available, we recommend a test run to avoid any risk. This is recommended especially when mixtures of various substances are concerned.

Food applications are always subject to separate approval.