



ISO 9001:2000

# PTFE

Polytetrafluorethylen

## Halbzeuge/ Semi-finished products

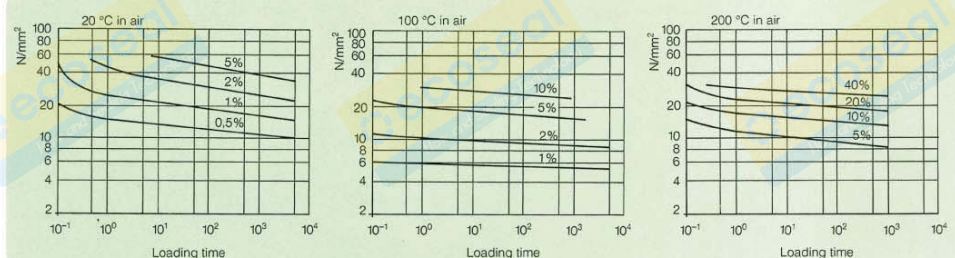
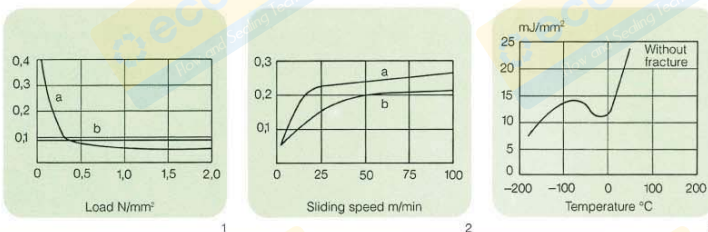
virgin  
**PTFE**

**repro**  
**flon®**

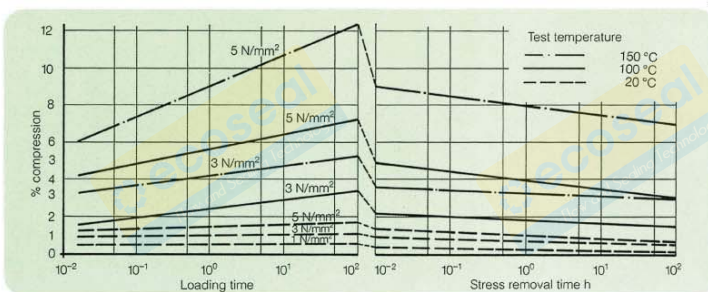


# The performance data

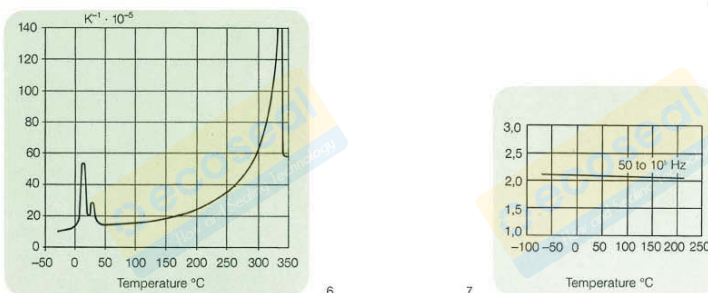
- Dynamic coefficient of friction for PTFE as a function of the load  
a unfilled  $v = 0.6$  m/min  
b 25 glass fibres  $v = 3.0$  m/min
- Dynamic coefficient of friction for PTFE as a function of the sliding speed  
a unfilled  $F = 220$  to  $340$  N  
b 25% glass fibres  $F = 180$  N



- Notched impact strength of PTFE polymers as a function of the temperature (based on DIN 53 453).
- Creep stress of PTFE-S polymers as a function of the loading time for different elongations based on DIN 53 444.
- Intermittent compression test with PTFE-S polymer. Compression and recovery as a function of time.



- Linear coefficient of expansion of PTFE as a function of the temperature.
- Relative dielectric constant of PTFE as a function of the temperature (measured in accordance with VDE 0303 at 50 Hz, 10³ Hz, 10⁴ Hz and 10⁵ Hz).



# Chemical stability of PTFE compounds

Pure PTFE displays excellent chemical stability. It is only susceptible to attack by liquid or dissolved alkaline metals, elementary fluorine, perfluoro-kerosine, chlorotrifluoride and other fluorine compounds, as well as very strong oxidizing chemicals.

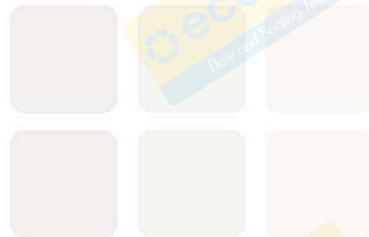
The chemical stability of PTFE compounds (i.e. PTFE with fillers) is shown in the following table which, however, is merely intended as a guideline. Trials under real service conditions must be carried out without fail in critical applications.

No warranty is given for specific product properties and their suitability for specific applications.

Chemical compound	Filler		
	Carbon / graphite	Glass fibre	Bronze
Acetaldehyde	A	A	A
Acetone	A	A	A
Aluminium sulphate	A	A	B
Formic acid	A	A	A
Ammonium chloride	A	A	C
Ammonium hydroxide	A	B	C
Aniline	A	A	C
Benzene	A	A	A
Petrol	A	A	B
Hydrogen cyanide	A	B	C
Lead acetate	A	A	C
Boric acid	A	A	A
Bromium (anhydrous)	C	B	C
Hydrogen bromide	A	B	C
Chloroacetic acid	A	A	B
Chlorobenzene	A	A	A
Chloroform	A	A	A
Chromic acid	B	B	C
Diethylether	A	A	A
Iron(III) chloride	A	A	C
Iron(III) sulphate	A	A	C
Ethylene glycol	A	A	A
Fatty acids	A	A	A
Fluorinated silicic acid	B	C	C
Hydrofluoric acid	A	C	C
Freon (liquid)	A	A	A
Tannic acid	A	A	A
Maleic acid	A	A	B
Molasses	A	A	B

A = excellent, B = good, C = unsatisfactory





Chemical compound	Filler		
	Carbon / graphite	Glass fibre	Bronze
Naphthalene	A	A	B
Sodium carbonate	A	A	A
Sodium hydroxide	A	B	A
Sodium nitrite	A	A	A
Sodium peroxide	B	A	C
Sodium silicate	A	C	A
Sodium sulphide	A	A	C
Nickel salts	A	A	A
Nitrobenzene	A	A	A
Phenol	A	B	A
Phosphoric acid	A	A	A
Phthalic acid	A	A	A
Picric acid	A	A	A
Pyridine	A	A	C
Mercury salts	A	A	C
Salicylic acid	A	A	B
Nitric acid	C	B	C
Hydrochloric acid	A	B	C
Brine solution	A	A	A
Carbon disulphide	A	A	A
Sulphuric acid	B	A	C
Hydrogen sulphide	A	C	C
Silver nitrate	A	A	C
Starch	A	A	A
Tallow	A	A	A
Trichloroethylene	A	A	B
Tartaric acid	A	A	A
Zinc chloride	A	A	C
Citric acid	A	A	A

Source: By kind permission of Messrs. DuPont de Nemours, manufacturer of TEFLON®, only from DuPont



## Overview PTFE compounds

Type	Description
<b>G25</b>	<i>Low-priced virgin with 25% glass</i>
<b>V25</b>	<i>Virgin PTFE with 25% glass</i>
<b>VKO</b>	<i>Virgin PTFE with 25% coking coal (carbon)</i>
<b>VKO (E-Kohle)</b>	<i>Virgin PTFE with 25% conductible coal (carbon)</i>
<b>15G</b>	<i>Virgin PTFE with 15% graphite</i>
<b>25G</b>	<i>Virgin PTFE with 25% graphite</i>
<b>B40</b>	<i>Virgin PTFE with 40% bronze</i>
<b>B60</b>	<i>Virgin PTFE with 60% bronze</i>
<b>E10</b>	<i>Virgin PTFE with 10% Sumikasuper (Econol)</i>
<b>E50</b>	<i>Virgin PTFE with 50% high-grade steel</i>

## Quality standards

Mikro-Technik is ISO 9001:2000 certified

virgin  
**PTFE**

Semi finished products made of virgin PTFE meet the following standards:

- ISO 13000-1 :1997 - min. Klasse 2, max. Klasse 1/ min. grade 2, max. grade 1
- ASTM D 3308-91a - Typ II, Klasse 1 for skived tape min. type II grade 1
- ASTM D 1710-96 - Typ II, Klasse 1 for PTFE basic shapes, rods and heavy-walled tubing, min. type II, grade 1
- ASTM D 3294-91a - Typ II, Klasse 1 for moulded sheet min. type II, grade 1

## Data sheet

### Physical and thermal properties

Properties	Unit	Testing Method	PTFE virgin
Density	g/cm <sup>3</sup>	DIN 53 479	2,14 – 2,20
Elongation at break	%	EN ISO 527	190 - 350
Tensile strength	N / mm <sup>2</sup>	EN ISO 527	19 - 30
Ball indentation hardness (135 N)	N / mm <sup>2</sup>	EN ISO 2039-1	25 - 30
Shore hardness D		EN ISO 868	55 - 59
Service temperatures	°C		-269 + 260
Coefficient of Linear Thermal Expansion	K <sup>-1</sup> *10 <sup>-5</sup>	DIN 52328	10 - 16

### Electrical properties

Properties	Unit	Testing Method	PTFE virgin
Dielectric constant (10 <sup>6</sup> HZ)		DIN 53 483	2,1
Dissipation factor tan δ (10 <sup>6</sup> HZ)		DIN 53 483	10 <sup>-4</sup>
Dielectric strength	KV/mm	IEC 60243-1	40 - 80
Specific volume resistance	Ω*cm	IEC 60093	10 <sup>18</sup>
Surface resistance	Ω	IEC 60093	10 <sup>17</sup>

### Typical properties of filled PTFE

Property	Method	Unit	50 s.steel	60 bronze	25 carbon	25 glass	16-20	250-280	64-72
Type of filler - % approx.			50 s.steel	60 bronze	25 carbon	25 glass	16-20	250-280	64-72
Specific gravity			3.30-3.40	3.85-3.95	2.08-2.12	2.20-2.24	3.30-3.40	3.85-3.95	2.08-2.12
Tensile strength		N/mm <sup>2</sup>	11-15	11-15	13-15	15-19	11-15	11-15	13-15
Elongation at break		%	90-120	90-120	160-180	220-260	90-120	90-120	160-180
Compressive strength 1% deformation		N/mm <sup>2</sup>	10.5	10.5	10.0	7.0	10.5	10.5	10.0
Hardness	(shore D-15 sec)		63-68	63-68	62-68	56-64	63-68	63-68	62-68
Friction coefficient dynamic			0.06	0.06	0.06	0.07	0.06	0.06	0.06
Wear factor (K)		mm <sup>3</sup> sec/Nmm	0.00041	0.00041	0.00082	0.00071	0.00041	0.00041	0.00082
PV limite - PV limit	a - at 0.05 m/sec	Nm/mm <sup>2</sup> sec	0.545	0.545	0.365	0.360	0.545	0.545	0.365
	a - at 0.05 m/sec	Nm/mm <sup>2</sup> sec	0.680	0.680	0.460	0.475	0.680	0.680	0.460
	a - at 0.05 m/sec	Nm/mm <sup>2</sup> sec	1.020	1.020	0.545	0.590	1.020	1.020	0.545
Coefficient of linear thermal expansion		°C <sup>-1</sup>	9.5x10 <sup>-5</sup>	9.5x10 <sup>-5</sup>	9.5x10 <sup>-5</sup>	10.0x10 <sup>-5</sup>	9.5x10 <sup>-5</sup>	9.5x10 <sup>-5</sup>	9.5x10 <sup>-5</sup>
Thermal conductivity		W/mK	0.74	0.74	0.64	0.43	0.74	0.74	0.64
Dielectric strength (short-time air thickness 0.5 mm)		kV/mm	-	-	-	13	-	-	-
Dielectric constant (50-10 <sup>6</sup> Hz)			-	-	-	2.5	-	-	-
Dissipation factor			-	-	-	0.003	-	-	-
Volume resistivity		Ohm/cm	-	-	10 <sup>9</sup>	10 <sup>16</sup>	-	-	10 <sup>9</sup>
Surface resistivity (2)		Ohm	-	-	10 <sup>9</sup>	10 <sup>16</sup>	-	-	10 <sup>9</sup>



## Extruded Rods

Diameter	Approx. Weight	Diameter	Approx. Weight	Diameter	Approx. Weight
[mm]	[kg/m]	[mm]	[kg/m]	[mm]	[kg/m]
4 (vir.)	0,03	28	1,44	105	20,00
5	0,04	30	1,65	110	22,00
6	0,07	32	1,85	115	24,00
7	0,09	35	2,25	120	26,00
8	0,12	38	2,67	125	28,00
9	0,15	40	2,90	130	30,00
10	0,18	45	3,72	135	32,50
11	0,23	50	4,59	140	35,00
12	0,26	55	5,55	145	38,00
13	0,31	60	6,60	150	40,00
14	0,36	65	7,75	155	44,00
15	0,41	70	8,90	160	46,50
16	0,47	75	10,30	165	48,50
18	0,59	80	11,80	170	53,00
19	0,66	85	13,20	180	57,50
20	0,73	90	14,80	190	65,00
22	0,90	95	16,60	200	71,00
25	1,13	100	18,30	205	75,00

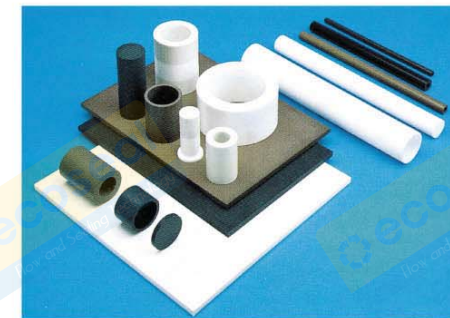
Tolerances	
Ø [mm]	[mm]
bis 5	+ 0,3
5 - 10	+ 0,4
10 - 20	+ 0,5
20 - 30	+ 1,0
30 - 50	+ 1,5
50 - 100	+ 2,0
> 100	+ 4,0

Standard Lengths 1 m & 2 m



## Moulded rods

Diameter	Approx. Weight	Max. Length	Diameter	Approx. Weight	Max. Length
[mm]	[Kg / 100 mm]	[mm]	[mm]	[Kg / 100 mm]	[mm]
200	7,40	300	515	49,00	100
210	8,10		540	53,00	
220	8,80		565	58,00	
230	9,60		590	63,00	
240	10,40		610	68,00	
250	11,30		630	73,00	
260	12,10		660	79,00	
270	13,00		710	91,00	
280	14,00		755	104,00	
290	15,00		780	112,00	
305	16,50		860	135,00	
310	17,60		910	150,00	
330	20,40		960	167,00	
360	24,00		1050	205,00	
380	26,60	1150	240,00		
400	29,40	80			
430	33,70				
460	38,40				
480	41,60				
490	43,30				
500	45,00				





## Extruded Tubes

Diameter [mm]			Approx. Weight
o.d.	x	i.d.	[kg/m]
10	x	5	0,14
12	x	6	0,20
13	x	6	0,24
14	x	6	0,29
14	x	8	0,24
15	x	8	0,30
16	x	6	0,40
16	x	8	0,35
16	x	10	0,29
17	x	6	0,45
18	x	8	0,48
19	x	10	0,48
19	x	13	0,35
20	x	6	0,66
20	x	8	0,62
20	x	10	0,55
20	x	12	0,47
20	x	15	0,35
22	x	10	0,70
22	x	12	0,63
22	x	14	0,54
25	x	8	1,03
25	x	10	0,96
25	x	14	0,79
25	x	16	0,68
25	x	19	0,56
25	x	20	0,46

Diameter [mm]			Approx. Weight
o.d.	x	i.d.	[kg/m]
27	x	12	1,07
28	x	22	0,68
30	x	10	1,47
30	x	14	1,30
30	x	18	1,10
30	x	20	0,95
30	x	25	0,60
32	x	12	1,65
32	x	14	1,52
32	x	20	1,25
32	x	22	1,05
32	x	25	0,80
35	x	10	2,00
35	x	14	1,90
35	x	16	1,77
35	x	18	1,65
35	x	20	1,55
35	x	22	1,40
35	x	25	1,15
38	x	19	2,06
38	x	22	1,75
38	x	25	1,55
40	x	10	2,70
40	x	15	2,52
40	x	20	2,25
40	x	25	1,80
40	x	30	1,40

Diameter [mm]			Approx. Weight
o.d.	x	i.d.	[kg/m]
45	x	15	3,21
45	x	20	2,90
45	x	25	2,55
45	x	30	2,10
45	x	32	2,00
45	x	35	1,60
45	x	40	1,11
50	x	12	4,50
50	x	20	3,80
50	x	25	3,50
50	x	30	3,00
50	x	35	2,45
50	x	38	2,16
50	x	40	1,80
50	x	42	1,76
50	x	45	1,10
55	x	20	4,70
55	x	30	3,90
55	x	35	3,42
55	x	40	2,80
58	x	35	4,01
58	x	45	2,45
60	x	20	5,75
60	x	30	5,00
60	x	35	4,40
60	x	40	3,70
60	x	45	3,10

Diameter [mm]			Approx. Weight
o.d.	x	i.d.	[kg/m]
60	x	50	2,20
63	x	20	7,10
63	x	45	3,65
63	x	50	3,05
65	x	35	5,50
65	x	40	4,80
65	x	48	3,50
70	x	30	7,80
70	x	40	6,10
70	x	45	5,76
70	x	50	4,60
70	x	60	2,90
75	x	50	5,80
75	x	60	4,10
75	x	65	2,85
80	x	20	10,70
80	x	40	8,80
80	x	50	7,00
80	x	60	5,50
85	x	60	7,00
85	x	70	4,80
90	x	50	10,10

Diameter [mm]			Approx. Weight
o.d.	x	i.d.	[kg/m]
90	x	60	8,20
90	x	70	6,30
90	x	75	4,80
95	x	60	10,10
95	x	75	8,00
100	x	30	16,80
100	x	50	13,80
100	x	60	12,10
100	x	70	9,90
100	x	80	7,50
100	x	90	3,50
105	x	40	17,50
105	x	70	11,50
105	x	85	7,50
110	x	85	10,50
115	x	80	13,00
115	x	90	9,60
115	x	100	6,65
120	x	60	20,00
120	x	70	17,00
120	x	100	9,00
125	x	70	19,50

Diameter [mm]			Approx. Weight
o.d.	x	i.d.	[kg/m]
125	x	85	15,20
125	x	100	11,00
130	x	60	23,50
130	x	100	12,70
135	x	80	21,00
135	x	115	10,20
140	x	100	18,00
140	x	110	14,00
140	x	120	9,60
145	x	130	8,00
150	x	80	28,50
150	x	130	12,50
160	x	100	28,80
165	x	140	16,00
175	x	130	25,50
185	x	75	52,00
200	x	80	61,00
225	x	75	81,00
340	x	150	165,00
360	x	150	200,00

Ø [mm]	Tolerances	
	(i. d.) [mm]	(o. d.) [mm]
< 20	- 0,5	+ 0,5
20 - 30	- 1,0	+ 1,0
30 - 50	- 1,5	+ 1,5
50 - 100	- 2,0	+ 2,0
> 100	- 3,0	+ 4,0

Standard Lengths: 1 m & 2 m; - 0,0 + 2 %





## Moulded Tubes

Diameter mm			Approx. Weight
o.d.	x	i.d.	[kg/100 mm]
215	x	100	6,50
215	x	145	4,40
215	x	175	2,70
225	x	100	7,30
225	x	145	5,20
225	x	185	2,90
235	x	85	8,40
235	x	145	6,00
245	x	100	8,80
245	x	195	3,80
255	x	100	9,60
255	x	195	4,60
270	x	100	11,40
270	x	210	5,40
270	x	235	3,50
280	x	100	12,40
280	x	235	4,40
290	x	100	13,30
290	x	195	8,30
290	x	265	3,90
305	x	160	12,30
305	x	235	7,00
315	x	150	13,90
315	x	225	8,80
340	x	100	18,70
340	x	215	12,40
340	x	295	5,40
360	x	225	14,00
360	x	295	7,80
390	x	195	20,00
390	x	345	6,30
410	x	295	14,40
410	x	360	6,60
440	x	325	15,60
440	x	390	7,10
485	x	390	15,00
485	x	440	7,90
505	x	390	18,40
505	x	460	8,30

Diameter mm			Approx. Weight
o.d.	x	i.d.	[kg/100 mm]
530	x	460	13,60
550	x	510	8,20
575	x	460	21,00
600	x	540	12,60
625	x	540	17,80
650	x	610	10,80
680	x	620	15,50
680	x	650	9,10
700	x	635	17,00
700	x	670	9,30
725	x	500	47,90
725	x	685	9,60
740	x	615	30,00
740	x	700	9,90
780	x	700	25,00
780	x	740	10,40
800	x	740	18,30
800	x	760	10,70
850	x	780	19,50
875	x	820	17,40
875	x	840	11,70
900	x	840	23,50
930	x	780	43,70
930	x	870	24,80
945	x	900	15,80
975	x	800	54,50
975	x	900	26,60
975	x	930	16,30
1000	x	900	35,70
1000	x	970	13,50
1040	x	880	55,80
1040	x	1000	17,40
1100	x	1060	18,60
1140	x	1020	47,80
1140	x	1000	19,00
1170	x	1120	23,40
1210	x	1060	61,80
1210	x	1130	35,80
1210	x	1150	24,20

Diameter mm			Approx. Weight
o.d.	x	i.d.	[kg/100 mm]
1250	x	1170	33,00
1270	x	1110	65,00
1270	x	1170	41,60
1320	x	1250	30,70
1370	x	1220	66,20
1370	x	1300	31,80
1410	x	1300	55,50
1410	x	1350	33,00
1460	x	1400	29,40
1520	x	1440	40,30
1560	x	1410	81,00
1560	x	1490	41,60
1610	x	1490	68,60
1610	x	1540	43,00
1660	x	1580	44,30
1750	x	1700	35,40
1850	x	1700	97,00
1850	x	1800	37,40
1950	x	1800	103,00
2050	x	1800	171,00
2050	x	1900	102,00



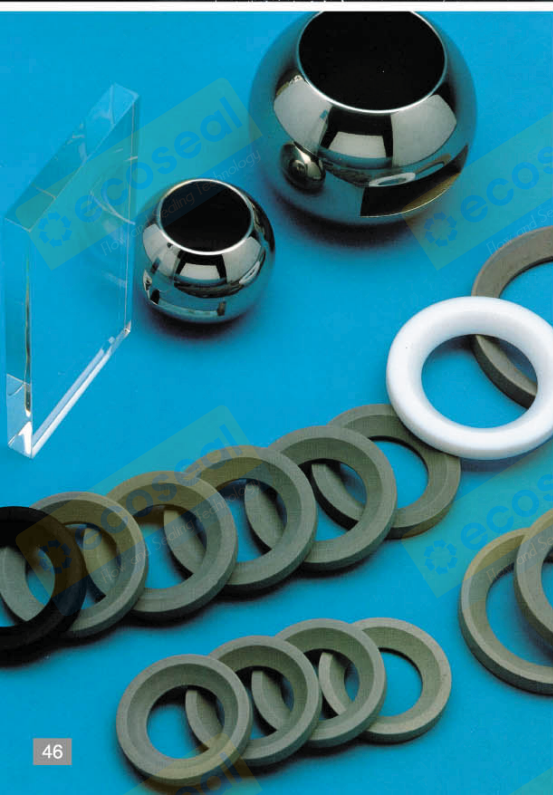
## Skived Sheets 1220 x 1220 mm 1500 x 1500 mm

Thickness		Approx. Weight	Approx. Weight	Tolerance
[mm]	[inch]	[kg/m <sup>2</sup> ]	[kg/Platte] [kg/sheet]	[mm]
0,5		1,14	1,7	+ 0,03
1,0		2,29	3,4	+ 0,05
1,5		3,44	5,1	+ 0,10
2,00	(5/64")	4,8	6,8	+ 0,20
2,38	(3/32")	5,6	8,4	+ 0,30
2,50		5,7	8,5	+ 0,30
3,00		6,8	10,2	+ 0,30
3,18	(1/8")	7,3	11,8	+ 0,35
4,00		9,1	13,6	+ 0,35
4,76	(3/16")	10,8	16,2	+ 0,40
5,00		11,7	17,4	+ 0,40
6,00		13,8	20,5	+ 0,40
6,35	(1/4")	14,5	21,6	+ 0,40

## Moulded Sheet

Sheets [mm]	600 x 600	1000 x 500	1000 x 1000	1200 x 300	1220 x 1220	1525 x 1525	2000 x 500	2000 x 1000	3000 x 1000	Tolerance [mm]
Thickness [mm]	Approx. Weight [kg]									Tolerance [mm]
6	5,5	7,5	15,0	5,5	20,5	32,0	15,0	30,0	41,5	+ 0,5
8	7,0	10,0	20,0	7,0	27,0	42,5	20,0	40,5	55,0	+ 0,6
10	9,0	12,5	25,0	9,0	34,0	53,5	25,0	50,5	69,0	+ 0,6
12	11,0	15,0	30,0	11,0	41,0	64,0	30,0	60,5	82,5	+ 0,8
15	13,5	19,0	37,5	13,5	51,0	80,0	38,0	75,5	103,0	+ 10 %
18	16,5	22,5	45,5	16,0	61,5	96,0	45,5	90,5	124,0	+ 10 %
20	18,0	25,0	50,5	18,0	68,0	106,5	50,5	101,0	137,5	+ 10 %
25	22,5	31,5	63,0	22,5	85,0	133,0	63,0	126,0	171,5	+ 10 %
30	27,0	37,5	75,5	27,0	102,0	160,0	75,5	151,0	206,0	+ 10 %
35	32,0	44,0	88,0	31,5	119,5	186,5	88,0	176,5	246,0	+ 10 %
40	36,5	50,5	100,5	36,0	136,5	213,0	101,0	201,0	275,0	+ 10 %
45	41,0	56,5	113,5	41,0	153,5	240,0	113,5	226,5	309,0	+ 10 %
50	45,5	63,0	126,0	45,5	170,5	266,5	126,0	252,0	343,5	+ 10 %
55	50,0	69,5	138,5	50,0	187,5	293,0	138,5	277,0	378,0	+ 10 %
60	54,5	75,5	151,0	54,5	204,5	319,5	151,0	302,0	412,0	+ 10 %





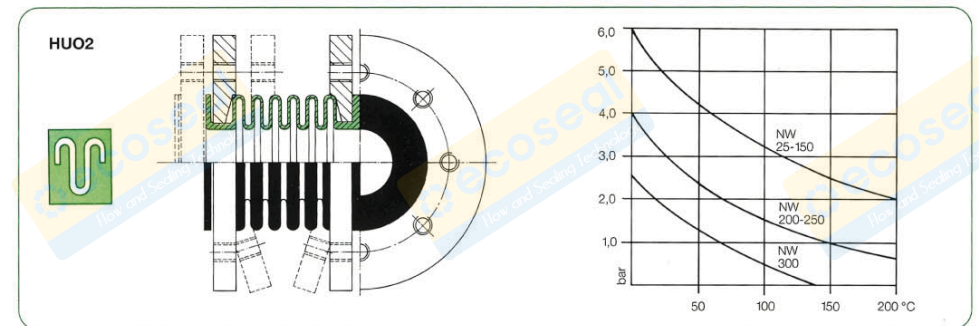
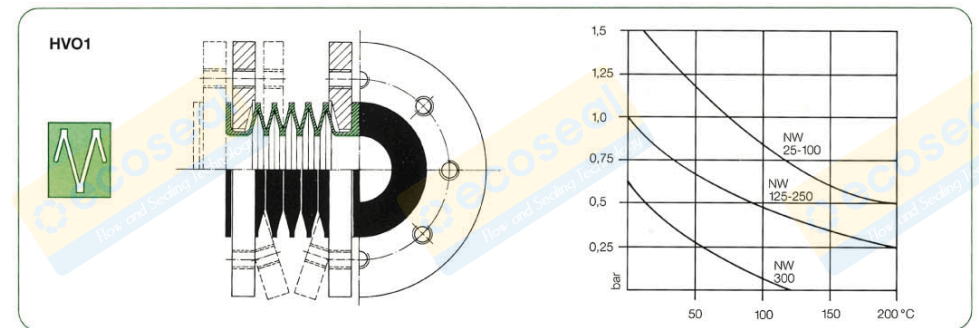
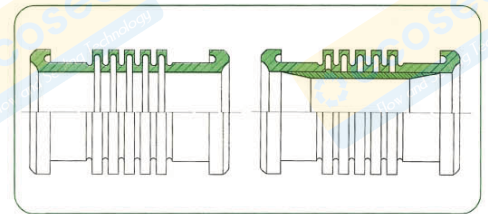
## PTFE bellows

PTFE bellows are characterized by their excellent resistance to chemicals and high thermal stability. When used as compensating elements between structural parts, they compensate for thermally induced changes in length, permit movement in axial, lateral and angular directions and eliminate the propagation of vibrations. Narrow folds ensure maximum elasticity. For this reason, sophisticated PTFE mouldings are used in order not to jeopardize the pore density that is so absolutely essential. Highly crystalline material grades ensure a positive diffusion strength, while low crystallinity PTFE ensures good elasticity, flexural strength and resilience. The compressive strength at the ends and

connections can be increased by introducing filled PTFE (with glass fibre, carbon, etc.) at the required points while producing the intermediates. A special sintering process under nitrogen gives glass-fibre-reinforced PTFE the required impermeability. PTFE bellows are produced by machining. A distinction is made between two types, depending on the geometry of the folds.

- Type HVO1 – V-shaped, folds produced without cutting. Highly flexible bellows which can be extended considerably in relation to its compressed length. Used in combination with low pressures (see diagram).

- Type HVO2 – U-shaped, folds produced by cutting. Round cut folds with high dimensional stability. Can be used at pressures up to 6 bar, depending on temperature and size. Can also be used in negative pressures by integrating a special PTFE supporting tube. Shorter compression and elongation than type HVO1.





## PFA/FEP linings

Unlike PTFE, the fluorothermo-plastics PFA and FEP are processed by means of familiar injection moulding processes.

PFA (perfluoroalkoxy) is a copolymer of tetrafluoroethylene and perfluorinated co-components. Its thermal stability, chemical stability, low surface tension and good compressive strength are largely comparable to those of PTFE.

FEP (perfluoroethylene propylene) is a semi-crystalline copolymer of tetrafluoroethylene and hexafluoropropylene and has a maximum service temperature of approx. +205 °C.

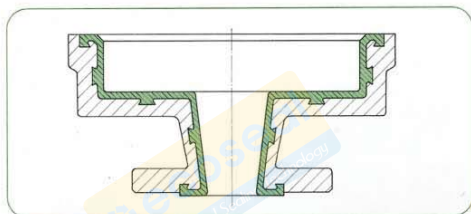
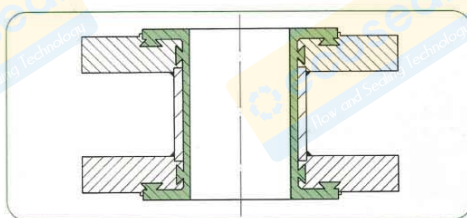
Material grades with a wide range of flow indices are available in order to meet the large variety of service requirements imposed.

Cast housings for chemical pumps, housings of ball valves, piping, engineering parts, etc. which must be safely protected against corrosion can be reliably lined or encapsulated. (A minimum wall thickness of 3 mm is required for technical reasons.)

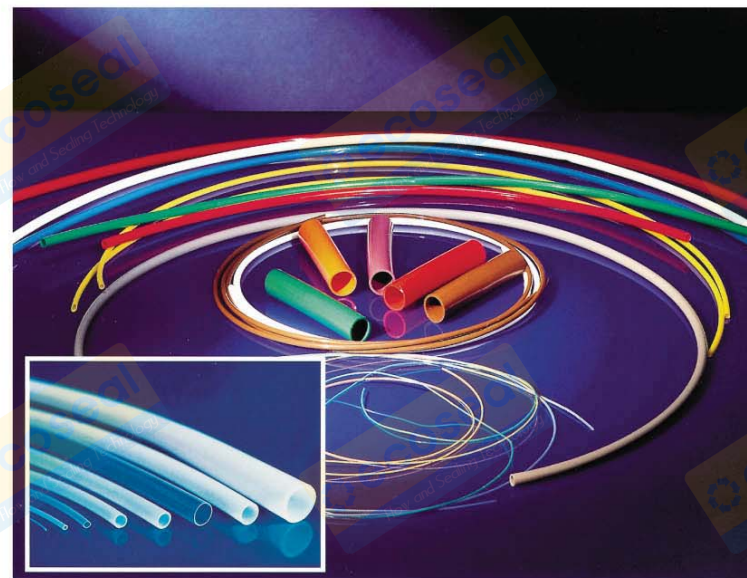
Suitable structural measures, such as all-round dovetail keys, guarantee optimum anchorage between the metallic substrate material and the non-adhesive lining material.

In this particular case, the sealing faces are additionally prevented from lifting off due to shrinkage in the flange area. Shrinkage of the lining away from the metal casing can be tolerated, depending on the wall thickness. The shrinkage induced by the material only results in a shrink-fit in the case of PFA or FEP casings on metal objects (valve discs, etc.).

Fittings are usually lined by the transfer moulding process.



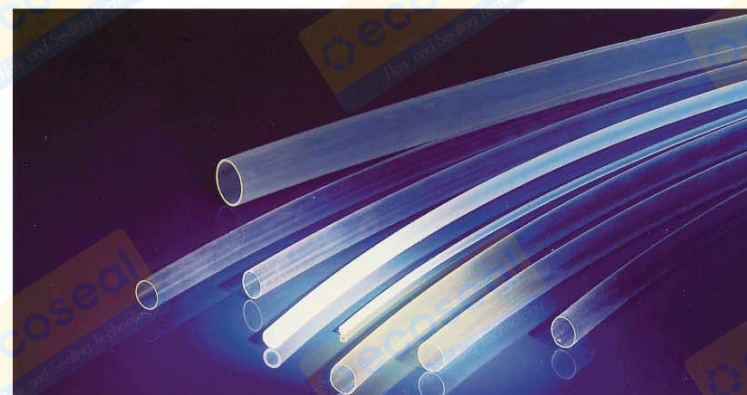
## PTFE TUBING



### Product Facts and Data at a Glance

- long-term temperature stability from -70 °C to +260 °C
- resistant to most aggressive media
- lowest friction coefficient of all fluoroplastics
- available in 10 colours from standard production
- customized manufacture
- acceptance to UL standard on request
- biocompatibility on request
- large stock available
- diameters ranging from 0.20 mm to 30.0 mm
- available also with fillers for higher abrasive resistance

## FEP TUBING



### Product Facts and Data at a Glance

- temperature stability from -70 °C to +205 °C
- low absorption of water
- large factory lengths possible
- available diameters ranging from 0.40 mm to 110 mm
- tubes available in 10 colours from standard production
- customized sizes - tooling costs not charged in most cases
- high transparency
- also available in cut-to-length sections
- very tight tolerances on request



## PFA TUBING



### Product Facts and Data at a Glance

- temperature stability from -70 °C to + 260 °C
- excellent resistance to pressure
- large factory lengths possible
- very narrow tolerances on request
- also available in cut-to-length sections
- customized sizes - tooling costs not charged in most cases

## MFA TUBING



### Product Facts and Data at a Glance

- temperature resistance from -70 °C to + 240 °C
- highest transparency of all known fluoroplastics
- extremely smooth surface
- lowest diffusion coefficients of all known fluoroplastics
- available diameters ranging from 0.40 mm to 110 mm
- customized sizes - tooling costs not charged in most cases

## Thin-wall tubing

OD (mm)	ID (mm)	Wall (mm)	Weight (mm)	OD (mm)	ID (mm)	Wall (mm)	Weight (mm)
2,00	1,00	0,50	5,09	11,00	8,00	1,50	96,65
2,50	1,50	0,50	6,78	11,00	9,00	1,00	67,82
2,50	1,70	0,40	5,70	11,00	10,00	0,50	35,61
3,00	1,00	1,00	13,56	11,10	9,50	0,80	55,89
3,00	2,00	0,50	8,48	11,50	9,50	1,00	71,22
4,00	2,00	1,00	20,35	11,95	10,35	0,80	60,50
4,00	3,00	0,50	11,87	12,00	9,00	1,50	106,82
4,50	3,50	0,50	13,56	12,00	10,00	1,00	74,61
4,60	3,20	0,70	18,52	12,00	11,00	0,50	39,00
5,00	2,00	1,50	35,61	12,10	9,50	1,30	95,22
5,00	3,00	1,00	27,13	12,35	10,35	1,00	76,98
5,00	4,00	0,50	15,26	12,50	10,50	1,00	78,00
5,20	3,20	0,50	28,49	12,95	10,35	1,30	102,72
5,60	3,20	0,70	35,81	13,00	10,00	1,50	117,00
5,80	4,00	1,50	29,91	13,00	11,00	1,00	81,39
5,90	3,90	1,00	33,23	13,00	12,00	0,50	42,39
6,00	3,00	0,50	45,78	14,00	11,00	1,50	127,17
6,00	4,00	1,00	33,91	14,00	12,00	1,00	88,17
6,00	5,00	1,20	18,65	14,00	13,00	0,50	45,78
6,34	4,00	0,90	41,03	14,40	12,00	1,20	107,43
6,50	4,50	1,00	37,30	14,50	12,70	0,90	83,02
6,50	5,00	0,75	29,25	14,90	12,50	1,20	111,50
6,50	5,50	0,50	20,35	15,00	12,00	1,50	137,34
7,00	4,00	1,50	55,95	15,00	13,00	1,00	94,95
7,00	5,00	1,00	40,69	15,00	14,00	0,50	49,17
7,00	6,00	0,50	22,04	15,10	12,70	1,20	113,13
7,40	5,00	1,20	50,46	15,50	12,70	1,40	133,88
7,85	6,35	0,75	36,12	16,00	13,00	1,50	147,52
8,00	5,00	1,50	66,13	16,00	14,00	1,00	101,74
8,00	6,00	1,00	47,48	16,00	15,00	0,50	52,56
8,00	6,50	0,75	36,88	16,40	14,00	1,20	123,71
8,00	7,00	0,50	25,43	17,00	14,00	1,50	157,69
8,35	6,35	1,00	49,85	17,00	15,00	1,00	108,52
8,75	6,35	1,20	61,45	17,00	16,00	0,50	55,95
9,00	6,00	1,50	76,30	17,40	15,00	1,20	131,85
9,00	7,00	1,00	54,26	17,80	16,00	0,90	103,16
9,00	8,00	0,50	28,83	18,00	15,00	1,50	167,86
9,51	6,35	1,58	84,98	18,00	16,00	1,00	115,30
9,52	7,00	1,26	70,59	18,00	17,00	0,50	59,35
9,60	8,00	0,80	47,75	18,40	16,00	1,20	139,99
10,00	7,00	1,50	86,48	18,80	16,00	1,40	165,22
10,00	8,00	1,00	61,04	19,00	16,00	1,50	178,04
10,00	9,00	0,50	32,22	19,00	17,00	1,00	122,08
10,40	8,00	1,20	74,88	19,40	17,00	1,20	148,13
10,50	8,50	1,00	64,43	20,00	17,00	1,50	188,21
				20,00	18,00	1,00	128,87



## PEEK TUBES



### Product Facts and Data at a Glance

- ultra-hard material
- reliable resistance to chemicals
- high resistance to pressure
- stable at temperatures up to + 228 °C
- available in various colours
- colour 'bar coding' on request
- also available with PTFE liner for improved resistance to chemicals

#### Standard Sizes

PEEK Tubing		PEEK Hoses with PTFE liner	
Inner Diameter	Outer Diameter	Inner Diameter	Outer Diameter
0,25	1/16"		
0,50	1/16"	0,30	1/16"
0,75	1/16"	0,40	1/16"
1,00	1/16"	0,50	1/16"
0,75	1/8"	0,60	1/16"
1,60	1/8"	1,60	1/8"
2,00	1/8"	3,20	1/4"
3,20	1/4"		

## PVDF TUBING

## ETFE TUBING



### Product Facts and Data at a Glance

- PVDF:**
- favourable price / performance ratio
  - favourable resistance to chemicals
  - fusibility
  - high rigidity
  - stable at temperatures between -50°C and +140°C
  - long factory lengths possible

- ETFE:**
- high material rigidity
  - long factory lengths possible
  - stable at temperatures between -50 °C and +150 °C
  - fusible material

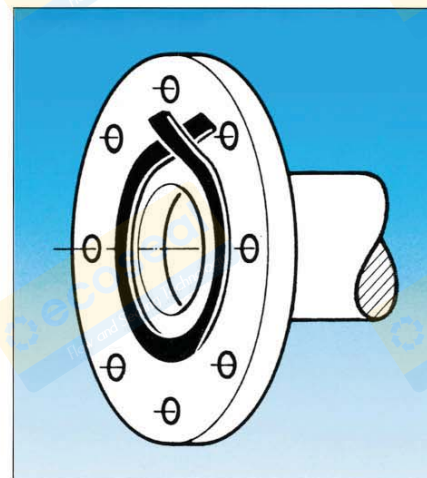
Tools for diameters of up to 110 mm and various wall thicknesses are available

## JOINT SEALING STRIP MADE OF STRETCHED PTFE



### Product Facts and Data at a Glance

- resistant to most aggressive substances
- temperature stability from -240 °C to +260 °C
- physiologically safe
- quality tests by TCB, BAM, DVGW
- available in a variety of sizes and dimensions
- easy use
- universally applicable
- long useful life
- highly reliable



Sealing Strip made of stretched PTFE • Standard Dimensions

Strip Width in mm	Strip Thickness in mm	Quantity per Coil in mm
3	1,5	25
5	2,0	25
7	2,5	25
10	3,0	15
12	4,0	15
14	5,0	10
17	6,0	10
20	7,0	5

Other forms of packaging and additional dimensions on request.

Deformation Values under Surfaces Pressure in mm

Dimensions	10 N / mm <sup>2</sup>	20 N / mm <sup>2</sup>	30 N / mm <sup>2</sup>	40 N / mm <sup>2</sup>
3 x 1,5 mm	3,6 x 0,5	3,8 x 0,4	4,2 x 0,4	4,3 x 0,3
5 x 2 mm	5,8 x 0,7	5,9 x 0,6	5,9 x 0,5	6,0 x 0,3
7 x 2,5 mm	8,7 x 1,0	8,7 x 0,8	8,8 x 0,7	8,8 x 0,6
10 x 3 mm	11,0 x 1,2	11,9 x 1,0	12,0 x 0,9	12,0 x 0,7
12 x 4 mm	14,4 x 1,7	14,4 x 1,5	14,6 x 1,2	14,7 x 1,0
14 x 5 mm	16,4 x 1,9	16,6 x 1,4	16,8 x 1,2	20,9 x 0,8
17 x 6 mm	20,0 x 2,4	20,3 x 1,6	20,3 x 1,3	20,4 x 0,9
20 x 7 mm	23,6 x 2,5	23,9 x 1,9	24,0 x 1,6	24,0 x 1,1

# FLUOROPLASTICS PHYSICAL PROPERTIES

	Properties	DIN or ASTM Standard	Unit	PTFE *	FEP *	MFA *	PFA *	ETFE *	PVDF *
general	Density	53479	g / cm <sup>3</sup>	2,14 – 2,19	2,12 – 2,17	2,12 – 2,17	2,12 – 2,17	1,71 – 1,78	1,78
	Upper temperature for continued use, no load		°C	260	205	240	260	150	140
	Combustibility			non-combustible	non-combustible	non-combustible	non-combustible	self-extinguish.	hardly inflammable
	Water absorption	53495	%	< 0,01	< 0,01	+ 0,03	+ 0,03	< 0,1	0,02
mechanical	Ultimate tensile strength at 23 °C	53455		29 – 39	19 – 25	28 – 36	27 – 32	36 – 48	
	at 150 °C		Mpa	14 – 20	4 – 6	15 – 21	15 – 21	8 – 12	
	at 250 °C			n. kn.	n. a.	6 – 8	14 – 15	n. a.	
	Yield point at 23 °C	53455	N / mm <sup>2</sup>	10	12	12	14	24	56
	Elongation at tear, at 23 °C	53455	%	200 – 500	250 – 350	300 – 360	300	200 – 500	22
	Mod. of elasticity in tension at 23 °C	53457	N / mm <sup>2</sup>	400 – 800	350 – 700	500 – 550	650	500 – 1200	
	Maximum bending stress at 23 °C	53452	Mpa	18 – 20		13	15	25 – 30	
	Mod. of elasticity in flexure	53457	N / mm <sup>2</sup>	600 – 800	660 – 680	600 – 650	650 – 700	1000 – 1500	1950
	Ball hardness 132 / 60	53456	N / mm <sup>2</sup>	25 – 30	23 – 29	n. kn.	25 – 30	34 – 40	120
	Rockwell hardness R	ASTM-D-785						45 – 55	
	Shore hardness D	53505		55 – 72	55 – 60	59	60 – 65	63 – 75	78
thermal	Friction coefficient, dynamic against steel, dry condition			0,05 – 0,2	0,3 – 0,35	0,1 – 0,2	0,2 – 0,3	0,3 – 0,5	
	Melting temperature/fusion point	ASTM 2116	°C	327	253 – 282	280 – 290	300 – 310	265 – 275	
	Dimensional stability under heat/ heat deflection temperature								
	A (18,5) Kp / cm <sup>2</sup>	53461	°C	50 – 60	51	n. kn.		71 – 74	
	B ( 4,6) Kp / cm <sup>2</sup>	ISO R 75		130 – 140	70			104	
	Coefficient of elongation		1 / K · 10 <sup>-3</sup>	10 – 16	8 – 14	12 – 20	10 – 16	8 – 12	
	Thermal conductivity at 23 °C	52612	W / K · m	0,23	0,20	0,22	0,22	0,23	
electrical	Specific heat at 23 °C		KJ / Kg · K	1,01	1,17	1,09	1,09	1,95	
	Oxygen index		%	> 95	> 95	> 95	> 95	> 30	
	Relative permittivity at 10 <sup>3</sup> Hz	53483		2,0 – 2,1	2,1	2,04 – 2,08	2,06 – 2,1	2,6	
	at 10 <sup>6</sup> Hz			2,0 – 2,1	2,1	2,04 – 2,08	2,06 – 2,1	2,6	
	Dissipation factor at 10 <sup>3</sup> Hz	53483	10 <sup>-4</sup>	0,3 – 0,5	2 – 8	< 1	0,2	6 – 8	
	at 10 <sup>6</sup> Hz			0,7 – 1,0	2 – 8	2 – 3	0,8	50	
	Volume resistivity	ICE 93 + 167	Ω · cm	10 <sup>18</sup>	10 <sup>18</sup>	10 <sup>18</sup>	10 <sup>18</sup>	10 <sup>18</sup>	> 10 <sup>16</sup>
	Surface resistivity	ICE 93 + 167	Ω	10 <sup>17</sup>	10 <sup>17</sup>	10 <sup>17</sup>	10 <sup>17</sup>	10 <sup>14</sup>	> 10 <sup>13</sup>
	Creep resistance	53480		KA 3c	KA 3c				> 600
	Arc resistance	ASTM 495	sec	> 360	> 300	> 210	> 210	> 75	
Dielectric strength	53481	KV / mm	40 – 80	50 – 80	50 – 80	50 – 80	60 – 90		

\* PTFE (Polytetrafluoroethylene),  
PVDF (Polyvinylidene fluoride),

PFA (Perfluoroalkoxy),  
n. a.: not applicable,

FEP (Perfluoroethylenepropylene),  
n. kn.: not known

ETFE (Ethylene/tetrafluoroethylene),

MFA (modified fluoroalkoxy),