

# Materials - Physical Properties

Property	Standard	Unit	PTFE <sup>1</sup>	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA <sup>3</sup>	PPS	PEEK
Density	DIN 53 479	g/cm <sup>3</sup>	2.14-2.19	2.12-2.17	2.12-2.17	1.71-1.78	1.67-1.70	1.75-1.78	0.904-0.907	1.10-1.15	1.04-1.05	1.19	1.65	1.32
Service temperature without loading		°C	250-260	250-260	200-205	150-180	150-180	150-170	90-100	80-100	55-70	80	250	260
Inflammability			non-flammable	non-flammable	non-flammable	self-extinguishing	self-extinguishing	self-extinguishing	flammable	flammable	flammable	yes	self-extinguishing	V-0
Water absorption	DIN 53 495	%	<0.01	0.03	<0.01	<0.1	<0.1	0.03	<0.05	9-10	<0.3	—	0.02	0.5
Transparency			opaque	milky opaque	milky opaque	milky opaque	milky opaque	opaque	milky opaque	milky opaque	transparent	transparent	black	
Radioresistance		MGy	0.006	0.040	0.010	0.030	0.010	0.100	0.020	0.040	10	0.050	—	
Food suitability			Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	
<b>Mechanical</b>	<b>Standard</b>	<b>Unit</b>	<b>PTFE<sup>1</sup></b>	<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>ECTFE</b>	<b>PVDF</b>	<b>PP</b>	<b>PA</b>	<b>PS</b>	<b>PMMA<sup>3</sup></b>	<b>PPS</b>	<b>PEEK</b>
Tensile strength 23 °C	DIN 53 456	N/mm <sup>2</sup>	29-39	27-32	19-25	36-48	41-54	38-50	25-40	40-60	35-60	72	195	
at 70 °C			—	—	—	—	—	—	18-28	18-28	28-38	35	150	
at 150 °C			14-20	15-21	4-6	8-12	3.5-4.5	7.5-10.5	—	—	—	—	70	
Limit of elasticity 23 °C	DIN 53 455	N/mm <sup>2</sup>	10	14	12	24	34	46	25-40	40-80	32-57	—	—	97
Elongation a. tear 23 °C	DIN 53 455	%	200-500	300	250-350	200-500	200-300	20-250	400-800	40-280	2-4	—	1.9	50
Tension E-module 23 °C	DIN 53 457	N/mm <sup>2</sup>	400-800	650	350-700	500-1200	1200-1800	800-1800	1100-2100	1600-2000	2900-3500	3300	14700	3600
Limit of bending stress at 23 °C	DIN 53 452	N/mm <sup>2</sup>	18-20	15	—	25-30	50	55	45-60	40-60	breaks	—	—	
Bending E-module	DIN 53 457	N/mm <sup>2</sup>	600-800	650-700	660-680	1000-1500	1700	1200-1400	800-1500	1000-1600	3000-3400	—	—	
Ball hardness 132/60	DIN 53 456	N/mm <sup>2</sup>	25-30	25-30	23-29	34-40	55-65	62-68	58-80	50-80	110-160	—	—	200
Rockwell hardness R	ASIM d-785		—	—	—	45-55	85-95	100-115	—	90-100	—	—	100	99
Shore hardness D	DIN 53 505		55-72	60-65	55-60	63-75	70-80	73-85	70-75	—	—	—	—	
Coefficient of friction dyn. against steel, dry	<sup>2</sup>		0.05-0.2	0.2-0.3	0.3-0.35	0.3-0.5	0.65	0.2-0.4	0.3-0.5	0.3-0.35	—	0.5	0.4	
<b>Thermal</b>	<b>Standard</b>	<b>Unit</b>	<b>PTFE<sup>1</sup></b>	<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>ECTFE</b>	<b>PVDF</b>	<b>PP</b>	<b>PA</b>	<b>PS</b>	<b>PMMA<sup>3</sup></b>	<b>PPS</b>	<b>PEEK</b>
Melting temperature	ASTM 2116	°C	327	300-310	253-282	265-275	240-247	165-178	158-167	215-221	—	—	285	335
Dimensional stability u. heat A (18,5)Kp/cm <sup>3</sup>	DIN 53 461	°C	50-60	—	51	71-74	76	80-92	55-60	55-80	70-88	105	—	152
heat B (4,6) Kp/cm <sup>3</sup>	DIN ISO R 75		130-140	—	70	104	115	146-150	85-95	165-195	76-100	—	—	
Coeff. of linear thermal expansion		1K x 10 <sup>-5</sup>	10-16	10-16	8-14	8-12	4-8	8-12	15-18	6-12	6-8	7	2.6-4.8	
Thermal conductivity at 23 °C	DIN 52612	W/K x m	0.23	0.22	0.20	0.23	0.15	0.17	0.22	0.21-0.23	0.15-0.16	0.19	0.20	0.25
Specific heat at 23 °C		Kj /Kg x K	1.01	1.09	1.17	1.95	—	1.38	1.68	1.5-2.1	1.18-1.34	—	—	2.16
Oxygen value		%	>95	>95	>95	30	60	43	<30	<30	<30	1.47	56	35
<b>Electrical</b>	<b>Standard</b>	<b>Unit</b>	<b>PTFE<sup>1</sup></b>	<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>ECTFE</b>	<b>PVDF</b>	<b>PP</b>	<b>PA</b>	<b>PS</b>	<b>PMMA<sup>3</sup></b>	<b>PPS</b>	<b>PEEK</b>
Dielectric constant at 10 <sup>3</sup>	DIN 53 483		2.0-2.1	2.06-2.1	2.1	2.6	2.6	7.8-9.0	2.26-2.4	4-12	2.4-2.74	3.6	4.0	3.2
at 10 <sup>4</sup>			2.0-2.1	2.06-2.1	2.06-2.1	2.6	2.5	6.4-7.6	2.25	3.5-9	2.5	2.7	4.1	3.2
Dielectric loss factor at 10 <sup>3</sup>	DIN 53 483	10 <sup>-4</sup>	0.3-0.5	0.2	2-8	6-8	90	120-200	<4	270-2700	1-20	0.06	2	3.0
at 10 <sup>4</sup>			0.7-1.0	0.8	2-8	50	90	1500-1900	<5	300-3300	1-14	0.02	20	
Volume resistivity	DIN 53 482	Ω x cm	10 <sup>18</sup>	10 <sup>18</sup>	10 <sup>18</sup>	10 <sup>14</sup>	10 <sup>15</sup>	10 <sup>14</sup>	>10 <sup>16</sup>	10 <sup>12</sup>	>10 <sup>11</sup>	10 <sup>15</sup>	>10 <sup>13</sup>	5x10 <sup>14</sup>
Surface resistivity	DIN 53 482	Ω	10 <sup>17</sup>	10 <sup>17</sup>	10 <sup>14</sup>	10 <sup>14</sup>	10 <sup>14</sup>	10 <sup>13</sup>	>10 <sup>13</sup>	10 <sup>18</sup>	>10 <sup>13</sup>	5 x 10 <sup>13</sup>	>10 <sup>15</sup>	10 <sup>12</sup>
Creep resistance	DIN 53 480		KA3c	—	KA3c	—	—	KA1	KA3c	KA3a-b	KA2-1	600	—	KC 150
Arc resistance	ASTM 495	sec	>360	—	>300	>75	135	>30	—	—	—	—	—	
Dielectric strength	DIN 53 481	KV/mm	40-80	50-80	50-80	60-90	50-80	40-80	60-90	30-80	60-90	30	25-28	25
<b>Gas permeability</b>	<b>Standard</b>	<b>Unit</b>	<b>PTFE<sup>1</sup></b>	<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>ECTFE</b>	<b>PVDF</b>	<b>PP</b>	<b>PA</b>	<b>PS</b>	<b>PMMA<sup>3</sup></b>	<b>PPS</b>	<b>PEEK</b>
Nitrogen permeability		cm <sup>3</sup> /m <sup>2</sup> d/bar	0.7	—	3.8	4.7	1.5	0.06	4.3	0.5	0.27	1	—	
Oxygen permeability		cm <sup>3</sup> /m <sup>2</sup> d/bar	2.05	—	30	15.6	0.39	0.05	19	1.2	2.35	1	—	
Carbon dioxide permeability		cm <sup>3</sup> /m <sup>2</sup> d/bar	5.7	—	60	38	17	0.2	61	4	8	—	4	
Water vapor permeability		g/m <sup>2</sup> /d	0.03	—	2	0.6	9	4.5	2.1	1	14	300	—	

<sup>1</sup> Not extrudable thermoplastic » <sup>2</sup> Not a standardised test. Friction coefficient is subject to different effects and can therefore only be used as a guide.  
<sup>3</sup> Tested partially by methods other than those stated; upon request additional physical characteristics available based on the actual test methods used.

All information stated without engagement.