

b.safe Materials - Physical Properties

Property	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Density	DIN 53 479	g/cm³	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-extin-guishing	self-extin-guishing	self-extin-guishing	flammable	flammable	flammable	yes	self-extin-guishing	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	
Mechanical	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Tensile strength 23 °C	DIN 53 456	N/mm²	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/mm²	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/mm²	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/mm²	18–20	15	—	25–30	50	55	45–60	40–60	breaks	—	—	
Bending E-module	DIN 53 457	N/mm²	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/mm²	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	²		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	
Thermal	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
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/cm³	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/cm³	DIN ISO R 75		130–140	—	70	104	115	146–150	85–95	165–195	76–100	—	—	
Coeff. of linear thermal expansion		1 K x 10 ⁻⁵	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
Electrical	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Dielectric constant at 10³	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 10⁴			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 10³	DIN 53 483	10 ⁻⁴	0.3–0.5	0.2	2–8	6–8	90	120–200	<4	270–2700	1–20	0.06	2	3.0
at 10⁴			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 ¹⁸	10 ¹⁸	10 ¹⁸	10 ¹⁶	10 ¹⁵	10 ¹⁴	>10 ¹⁶	10 ¹²	>10 ¹¹	10 ¹⁵	>10 ¹³	5x10 ¹⁴
Surface resistivity	DIN 53 482	Ω	10 ¹⁷	10 ¹⁷	10 ¹⁶	10 ¹⁴	10 ¹⁴	10 ¹³	>10 ¹³	10 ¹⁰	>10 ¹³	5 x 10 ¹³	>10 ¹⁵	10 ¹²
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
Gas permeability	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Nitrogen permeability		cm³/m² d/bar	0.7	—	3.8	4.7	1.5	0.06	4.3	0.5	0.27	1	—	
Oxygen permeability		cm³/m² d/bar	2.05	—	30	15.6	0.39	0.05	19	1.2	2.35	1	—	
Carbon dioxide permeability		cm³/m² d/bar	5.7	—	60	38	17	0.2	61	4	8	—	4	
Water vapor permeability		g/m²/d	0.03	—	2	0.6	9	4.5	2.1	1	14	300	—	

All information stated without gagement.

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