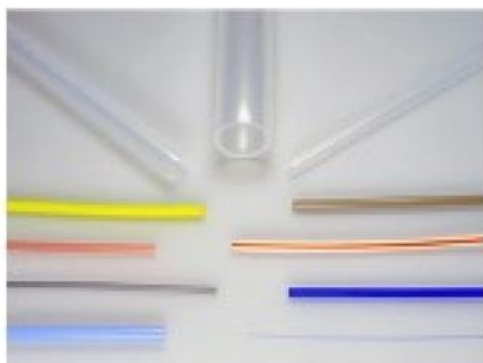




The main properties of all fluoroplastics are chemical resistance, UV resistance, low frictional resistance, high heat resistance and excellent electrical insulation. Fluoropolymer hoses and profiles are ideal for chemical, electrical, mechanical, automotive and heat exchanger applications. The main difference within fluoroplastics is that PTFE, unlike all other materials, is not a thermoplastic material. PTFE cannot be vacuum formed, conventionally extruded or injection molded.

Fluoroplastic Tubing – General Information

Applications

Industrial Grade

For industrial applications (automotive industry, electronics and electrical engineering, chemical industry, aerospace and aviation, fiber optics, environment and analysis).

Medical Grade

For applications in medical technology (manufacture of medical devices and machines) with certified polymers USP class

Properties

PTFE Polytetrafluoroethylene

The unique properties of PTFE have made it the polymer of choice for many applications. PTFE is used in many products, such as advanced medical devices and high-temperature industrial equipment, due to its low coefficient of friction for a polymer and extremely wide operating temperature range. Unrivaled chemical resistance and extreme chemical inertness have made PTFE the first choice among plastics for the chemical and analytical industries.

FEP Fluoroethylene propylene

Although FEP is similar to PTFE in its properties, it also has some significant differences. It has a slightly higher coefficient of friction, a lower continuous operating temperature and is more transparent than PTFE. FEP also offers lower gas and vapor permeability and excellent UV resistance

PFA Perfluoroalkoxy

PFA was developed to increase the continuous operating temperature of FEP resin. Melt processability allows PFA to be processed in longer continuous lengths than PTFE.

PVDF Polyvinylidene fluoride

PVDF is often referred to by one of its trade names, Kynar®. It was primarily developed for applications that required excellent chemical resistance, high purity levels and superior mechanical properties. PVDF is often used as a lining or protective barrier in chemical applications.

THV Tetrafluoroethylene Hexafluoropropylene Vinylidene Fluoride

THV offers high chemical resistance, high flexibility, low application temperatures and excellent transparency. THV can be radiation cross-linked using an e-beam and can be used in multilayer constructions. It has outstanding permeation resistance to highly aggressive media and chemicals. THV offers excellent optical clarity and transmission, especially in the UV and visible parts of the solar spectrum. THV is easier to bond to other plastics and elastomers than the other fluoroplastics.

Tolerances

Tubing with extremely tight tolerances in diameter and wall thickness can be produced.

Material properties									
Properties	Standard: Din or ASTM	Unit	PTFE*	FEP*	FEP-HT*	PFA*	ETFE*	PVDF*	ECTFE*
Density	53479	g/cm3	2,14-2,19	2,12-2,19	2,12-2,17	2,12-2,17	2,12-2,17	1,71- 1,78	1,67-1,7
Upper continuous operating temperature without load		°C	260	205	225	240	150	140	150
Flammability			incombustible	incombustible	incombustible	incombustible	self- extinguishing	flame retardant	self- extinguishing
Water absorption	53495	%	<0,01	< 0,01	< 0,03	< 0,03	< 0,1	< 0,02	< 0,1
Tear strength at 23 °C	53455	Mpa	29-39	19 -25	19 - 32	27 - 32	36 -48	38 - 50	41 - 54
Tensile strength at 150 °C		Mpa	14-20	4-6	n. b.	15-21	8-12	7,5 - 10,5	3,5 - 4,5
Residual strength at 250 °C		Mpa	n. b.	n. a.	n. b.		n. a.	n. a.	n. b.
Yield strength at 23 °C	53455	N/mm2	10	12	12	14	24	46	34
Elongation at break at 23 °C	53455	%	200-500	250-350	200-400	300-360	200-500	20-250	200-300
Tensile modulus of elasticity at 23 °C	53457	N/mm2	400-800	350-700	n. b.	500-550	500-1200	800-1800	1200-1800

Material properties									
Properties	Standard: Din or ASTM	Unit	PTFE*	FEP*	FEP-HT*	PFA*	ETFE*	PVDF*	ECTFE*
Limit bending stress at 23 °C	63452	Mpa	18-20		n. b.	15	25-30	55	50
Bending modulus of elasticity	53457	N/mm2	600-800	660 - 680	n. b.	600 - 700	1000 -1500	1200 - 1400	1600 -1800
Ball pressure hardness 132/60	53456	N/mm2	25-30	23 - 29	25 - 30	25 - 30	34 - 40	62 - 68	55 - 65
Rockwell hardness R	ASTM D725			n. b.			45-55	100-115	85-95
Shore hardness D	53505		55 - 70	55 - 60	n. b.	59	63 - 75	73 - 85	
Coefficient of friction, dynamic, against steel, dry			0,05-0,2	0,3-0,35	n. b.	0,2 - 0,3	0,3 - 0,5	0,2 - 0,4	0,6 - 0,7
Melting temperature	ASTM 2116	°C	327	250-282	265-275	300-310	265-275	165-178	240-247
Dimensional stability in heat A (18.5) kp/cm3	53461	°C	50 - 60	51	71-74	80-92	76	80 - 92	76
A (18.5) kp/cm3	ISO	°C	130 - 140	75	130-140	70	104	146 - 150	115
Lin. Coefficient of thermal expansion		1/K*10-5	10-16	8-14	8-16	10-16	8-12	8-12	4-8
Thermal conductivity at 23 °C	52612	W/K*m	0,23	0,2	n. b.	0,22	0,23	0,17	0,15
Spec. heat at 23 °C		KJ/kg*K	1,01	1,17	n. b.	1,09	1,95	1,38	n. b.
Oxygen index		%	> 95	> 95	>95	> 95	> 30	> 43	>60
Dielectric constant	53483								
at 103 Hz			2,0-2,1	0 2,10	2,00	2,06-2,10	2,60	7,80-9,00	2,60

Material properties									
Properties	Standard: Din or ASTM	Unit	PTFE*	FEP*	FEP-HT*	PFA*	ETFE*	PVDF*	ECTFE*
at 106 Hz			2,0-2,10	2,10	2,00	2,06-2,10	2,60	6,40- 7,60	2,50
Dielectric dissipation factor	53483								
at 103 Hz			0,3 - 0,5	2 - 8	n. b.	0,20	6 -8	150 -200	30
at 106 Hz			0,7 - 1,0	2 - 8	n. b.	0,8	50	1500 - 1900	90
Spec, contact resistance	ICE 93+167	Ohm x cm	1018	1018	n. b.	1018	1016	1014	1016
Surface resistance	ICE 93+167		1017	1016	1017	1017	1014	1013	1014
tracking resistance	53480		KA 3c	KA 3c	n. b.		KA1		
Arc resistance	ASTM 495	s	> 360	> 300	n. b.	> 210	> 75	> 30	> 135
Dielectric strength	53481	kV/mm	40 - 80	50 - 80	40 - 80	50 - 80	60 - 90	40 - 80	50-80

* PTFE (polytetrafluoroethylene),

* FEP (perfluoroethylene propylene),

* FEP-HT (Hyflon F),

* PFA (perfluoroalkoxy copolymer),

* ETFE (ethylene tetrafluoroethylene),

* PVDF (polyvinylidene fluoride),

* ECTFE (ethylene chlorotrifluoroethylene)

n.a.: not applicable,

n.b.: not known