

materials for use in fine-pitch μ HELIX[®] Test Sockets and Fixtures

Materials for use in fine-pitch μ HELIX[®] Test Sockets and Fixtures

Support structures for the *AlphaTest μ HELIX[®] Test Probes* may require a material which can be machined to close tolerances and which will support *high aspect-ratio* drilling of *fine-pitch* probe guide holes. This document suggests some materials which *AlphaTest* has used for your consideration.

The petrochemical industry has developed a number of thermoplastic resins which produce rod and sheet materials with suitable mechanical manufactured by GE Plastics, E.I. DUPONT, DSM Engineered Plastic Products, Phillips 66 Company and others function well as *probe-guide* structures because of their machining characteristics, and their electrical and mechanical properties.

Table TN0019.1 includes materials which *AlphaTest Corporation* has used in test fixture products and includes typical specifications. Other materials and other manufacturers may exist which should be in this list. Please contact us with your recommendations for either materials or sources.

The trade names used here refer to resins manufactured by specific companies who have licensed other companies to extrude, cast, or mold them for resale. You should look to the specifications of the sheet or rod material you purchase for use in your structure, not the resin specifications, to predict performance.

Data in table TN0019.1 describing ULTEM[®], TECHTRON[®], PEEK, AND DELRIN[®] has been provided by DSM Engineering Plastic Products and is used with their permission and does not necessarily represent the specifications for these materials offered by other sources. Data in table TN0019.1 describing TORLON[®] and POMALOX[®] has been provided by other commercial sources. *AlphaTest Corporation* makes no warranty of the accuracy of data nor of the applicability of any of these materials. Socket and fixture designers should use this as a starting point only and do their own research and materials selection.

TABLE TN0019.1

	UNITS	ULTEM®	Techtron®	Ketron™	DELTRIN®	Torlon®	Pomalux®
	1000	PPS	PEEK 1000	Acetel	4203	SD	
MECHANICAL							
1. Specific gravity, 73°C	psi	1.28	1.35	1.31	1.41	1.40	1.33
2. Tensile strength, 73°C	psi	16,500	13,500	16,000	11,000	12,000	-
3. Tensile modulus of elasticity, 73°C	psi	475,000	500,000	500,000	450,000	600,000	-
4. Tensile elongation (at break), 73°C	%	80	15	20	30	5	-
5. Flexural Strength, 73°C	psi	20,000	21,000	25,000	13,000	600,000	8,600
6. Flexural modulus of elasticity, 73°C	psi	500,000	575,000	600,000	450,000	24,000	260,000
7. Shear strength, 73°C	psi	15,000	9,000	8,000	9,000	-	-
8. Compression strength, 10% deformation, 73°C	psi	22,000	21,500	20,000	16,000	24,000	-
9. Compression modulus of elasticity, 73°C	psi	480,000	430,000	500,000	450,000	475,000	-
10. Hardness, Rockwell scale as noted, 73°C	-	M112 (R125)	M95 (R125)	M100 (R126)	M89 (R122)	E80 (M120)	M64 (R104)
11. Hardness Durometer, Shore "D" scale, 73°C	-	D86	D85	D85	D86	-	-
12. Izod impact (notched), 73°C ft.lb/in o notch	-	0.5	0.6	1.0	1.0	2.0	-
13. Coefficient of friction (dry vs. steel) dynamic	-	0.42	0.40	0.40	0.25	-	-
14. Limiting PV (with 4:1 safety factor applied) ft.lb/in. ² min	-	1,875	-	5,500	2,700	-	-
15. Wear factor "k"	-	2,880	2.367	-	200	-	-
16. Density, lb/in ³ (gm/cm ³)	-	-	-	-	-	0.051 (1.41)	-
THERMAL							
16. Coefficient of linear thermal expansion (-40°F to 360°F)	in./in./°F	3.10x10 ⁻⁵	2.80x10 ⁻⁵	2.60x10 ⁻⁵	4.70x10 ⁻⁵	1.40x10 ⁻⁵	-
17. Heat deflection temperature 264 psi	°F	392	250	320	250	534	-
18. Tg-glass transition (amorphous)	°F	419	n/a	n/a	n/a	527	-
19. Melting point (crystalline) peak	°F	n/a	540	644	347	-	-
20. Continuous service temperature in air (max.)	°F	340	425	480	180	450/500	-
21. Thermal conductivity	BTU in./hr.ft ² °F	0.9	2.00	1.75	2.5	1.80	2.1
ELECTRICAL							
22. Dielectric strength, short term, 1/8" thick	volts/mil	830	540	480	450	580	-
23. Volume resistivity	ohm-cm	6.7x10 ¹⁷	4.5x10 ¹⁶	4.9x10 ¹⁶	1.0x10 ¹⁵	> 10 ¹⁶	-
24. Dielectric constant, 10 ⁶ Hz	-	3.15	3.00	3.30	3.7	4.2	-
25. Dissipation factor, 10 ⁶ Hz	-	0.0013	0.0013	0.0030	0.0050	0.026	-
26. Flammability @ 3.1 mm (1/8 in.) (5)	-	V-O	V-O	V-O	HB	-	-

TABLE TN0019.1 (continued)

	UNITS 1000	ULTEM® PPS	Techtron® PEEK 1000	Ketron™ Acetel	DELTRIN® 4203	Torlon®	POMALUX
CHEMICAL							
27. Water absorption immersion, 24 hours	% by wt.	0.25	0.01	0.10	0.20	0.40	0.20
28. Water absorption immersion, saturation	% by wt.	1.25	0.03	0.50	0.9	-	-
29. Acids, weak, 73°F., acetic acid, dilute hydrochloric or sulfuric acid	-	A	A	A	L	A	
30. Acids, strong, 73°F., conc. Hydrochloric or sulfuric acid	-	A	L	L	U	A	
31. Alkalies, weak, 73°F., dilute ammonia or sodium hydroxide	-	A	A	A	A	L	
32. Alkalies, strong, 73°F., strong ammonia or sodium hydroxide	-	U	A	A	U	U	
33. Hydrocarbons-Aromatic, 73°F., benzene, toluene	-	L	A	A	A	A	
34. Hydrocarbons-Aliphatic, 73°F., gasoline, hexane, grease	-	A	A	A	A	A	
35. Ketones, Esters, 73°F., acetone, methyl ethyl ketone	-	A	A	A	A	A	
36. Ethers, 73°F., diethyl ether, tetrahydrofuran	-	A	A	A	A	A	
37. Chlorinated solvents, 73°F., methylene chloride, chloroform	-	U	A	A	A	A	
38. Alcohols, 73°F., methanol, ethynol, anti-freeze	-	A	A	A	A	A	
39. Inorganic salt solutions, 73°F., sodium chloride, potassium cyanate	-	A	A	A	-	A	
40. Continuous sunlight, 73°F.	-	A	L	L	L	L	
OTHER							
41. Cost relative to other materials in this table	-	\$\$\$	\$\$\$\$	\$\$\$\$\$	\$		
42. Relative machinability (1-10, 1=easier to machine)	-	3	3	5	1		

SOURCES

U.S.A.

DSM Engineering Plastic Products
Reading, PA 19612-4235
Phone: (610) 320-6600
(800) 366-0300
Fax: (610) 320-6638

OUTSIDE USA

Belgium DSM Engineering Plastic Products
France World Headquarters
Germany Weivedlann 41, bus6
Hong Kong 1930 Zaventem
Hungary Belgium
Italy Phone: (32) 2 7255200
Japan Fax: (32) 2 7253370
Korea
South Africa
Spain
The Netherlands
United Kingdom

SELECTION CRITERIA

	1000	ULTEM® PPS	Techtron® PEEK 1000	Ketron™ Acetel	DELRIN® 4203	Torlon®	POMALUX
MACHINABLE		✓	✓	✓	✓	✓	✓
THERMAL CHARACTERISTICS FOR ENVIRONMENTAL TESTING		✓		✓	X		X
[FOR FINE PITCH PROBE-GUIDE HOLES]		✓	✓	✓	X	✓	✓
ESD CHARACTERISTIC							✓
LOW WATER ABSORPTION			✓		X		
MECHANICAL STRENGTH		✓	✓	✓	✓	✓	✓
HARDNESS							
LOW COST		X		X	✓	✓	
AVAILABLE		✓	✓	✓	✓	✓	✓

TRADE NAME AND GENERIC MATERIAL DESIGNATIONS

DELRIN®	acetal homopolymer
TORLON® 4203	polyamide-imide (PAI)
TECHTRON®	polyphenylene sulfide (PPS)
PEEK 1000	polyetherether-ketone
ULTEM® 1000	polyetherimide (PEI)
POMALUX® SD	anti-static-acetal copolymer resin

KEYWORDS (FOR SEARCH ENGINES)

DELRIN
 TORLON
 ULTEM
 TECHTRON
 ENGINEERING PLASTICS
 polyetherimide
 polyphenylene sulfide
 polyamide-imide