

## Summary of Typical Properties of PLAVIS Polyimide

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Property	Condition	ASTM Method	Unit	PLAVIS-N			PLAVIS-G15			PLAVIS-G40		
				DF	ISO <sup>1)</sup>	CM <sup>2)</sup>	DF	ISO	CM	DF	ISO	CM
<b>Mechanical</b>												
Tensile Strength, Ultimate	23°C	D-1708	kgf/cm <sup>2</sup> (MPa)	810 (79.4)	900 (88.3)	900 (88.3)	650 (63.7)	680 (66.7)	680 (66.7)	550 (53.9)	580 (56.9)	580 (56.9)
	260°C			400 (39.2)	420 (41.2)	420 (41.2)	330 (32.4)	350 (34.3)	350 (34.3)	270 (26.5)	280 (27.5)	280 (27.5)
Elongation, Ultimate	23°C	D-1708	%	8.5	7.5	8.0	5.5	4.5	5.0	3.5	2.5	3.0
	260°C			7.5	6.0	6.0	4.5	3.0	3.0	2.5	2.0	2.0
Poisson's Ratio	23°C	D-638	-		0.44	0.37						
Flexural Strength, Ultimate	23°C	D-790	kgf/cm <sup>2</sup> (MPa)	860 (84.3)	1,150 (112.8)	1,150 (112.8)	850 (83.4)	1,100 (107.9)		650 (63.7)	900 (88.3)	
	260°C			470 (46.1)	600 (58.8)	600 (58.8)	500 (49.0)	650 (63.7)		400 (39.2)	450 (44.1)	
Flexural Modulus of Elasticity	23°C	D-790	kgf/cm <sup>2</sup> (MPa)	26,000 (2,550)	31,000 (3,040)	31,000 (3,040)	32,500 (3,187)	39,000 (3,825)		49,500 (4,854)	49,500 (4,854)	
	260°C			14,500 (1,422)	17,000 (1,667)	17,000 (1,667)	18,000 (1,765)	26,000 (2,550)		28,000 (2,746)	28,000 (2,746)	
Compressive Strength	23°C	D-695	kgf/cm <sup>2</sup> (MPa)									
	@ 1% Strain			250 (24.5)	250 (24.5)	250 (24.5)	230 (22.6)	300 (29.4)		250 (24.5)	350 (34.3)	
	@ 10% Strain			1,150 (112.8)	1,300 (127.5)	1,300 (127.5)	1,080 (105.9)	1,400 (137.3)		950 (93.2)	1,100 (107.9)	
	@ 50% Strain											
Compressive Modulus	23°C	D-695	kgf/cm <sup>2</sup> (MPa)	24,500 (2,403)	24,000 (2,354)	24,000 (2,354)	23,500 (2,304)	30,000 (2,942)		27,000 (2,648)	34,000 (3,334)	
Impact Strength Izod, notched	23°C	D-256	kgcm/cm	6.0	6.0	5.0	5.0	5.0				
			J/m	58.8	58.8	49.0	49.0	49.0				
<b>WEAR &amp; FRICTION</b>												
Wear Rate			m/s x 10 <sup>-10</sup>	64.0	27.0	27.0	3.1	2.4	2.4			
Friction Coefficient <sup>3)</sup> PV=10kg/cm <sup>2</sup> .m/sec (0.98MPa.m/sec)				0.34	0.32	0.32	0.26	0.23	0.23	0.18	0.16	0.16
<b>THERMAL</b>												
Coefficient of Linear Expansion	23~260°C	D-696	µm/m/°C	50	50	55			45	25		25
Thermal conductivity	25°C		W/m·°C			0.36	0.45					
	40°C					0.37						
Specific Heat			J/kg·°C			1,042						
			kcal/kg·°C			0.249						
Thermal Decomposition Temperature (on-set point, rate 10°C/min, in air)			°C			565	569			557		
Thermal 50% weight reduction Time (on-set point, rate 10°C/min, in air)			min			154	164			231		
<b>ELECTRICAL</b>												
Dielectric Constant	23°C, @10 <sup>3</sup> Hz	D-150		2.7	2.7	3.0						
	23°C, @10 <sup>4</sup> Hz			2.7	2.8	3.0						
	23°C, @10 <sup>5</sup> Hz			2.7	2.7	3.0						
	23°C, @10 <sup>6</sup> Hz			2.8	3.0	3.1						
Dielectric Strength		D-149	kV/mm			21.9						
Dissipation Factor	23°C, @10 <sup>3</sup> Hz	D-150	(10 <sup>-3</sup> )	0.9	0.7	1.8						
	23°C, @10 <sup>4</sup> Hz			2.0	2.0	2.7						
	23°C, @10 <sup>5</sup> Hz			3.0	2.8	4.6						
	23°C, @10 <sup>6</sup> Hz			0.7	0.2	8.8						
Volume Resistivity	23°C	D-257	Ω·m	≥ 1E14	≥ 1E14	≥ 1E14	1E12-13	1E12-13	1E12-13			
Surface Resistivity	23°C	D-257	Ω/□	≥ 1E14	≥ 1E14	≥ 1E14	1E12-13	1E12-13	1E12-13			
<b>OTHER PROPERTIES</b>												
Water Absorption	50%RH(avg)	D-570	%	0.9-1.1	0.9-1.1	0.9-1.1						
	24hrs 23°C			0.37	0.23	0.21			0.20		0.20	
	48hrs 50°C					0.50						
Specific Gravity		D-792	g/cm <sup>3</sup>	1.33	1.38	1.43	1.41	1.49	1.49	1.56	1.62	1.64
Hardness		D-785	Rockwell"M"	65-90	85-100	90-105	65-85			65-80		

1) ISO : Isostatically Molded

2) CM : Compression Molded

3) Steady state, unlubricated in air

Property	Condition	ASTM Method	Unit	PLAVIS-MS		PLAVIS-C		PLAVIS-ESD		PLAVIS-S	PLAVIS-SG		PLAVIS-HM		
				DF	CM	DF	CM	DF	CM	CM	DF	CM	CM		
<b>Mechanical</b>															
Tensile Strength, Ultimate	23°C	D-1708	kgf/cm <sup>2</sup> (MPa)	600 (58.8)	650 (63.7)	800 (78.4)	850 (83.3)	800 (78.4)	850 (83.3)	1,670 (164)	903 (88.6)	1,070 (105.0)	1,370 (135)		
	260°C					370 (36.2)	400 (39.2)	370 (36.2)	400 (39.2)	650 (64.0)	342 (33.5)	214 (21.0)	560 (55)		
Elongation, Ultimate	23°C	D-1708	%	4.5	4.0	8.0	7.0	8.0	7.0	8.0	2.5	2.6	4.0		
	260°C						7.0	6.0	7.0	6.0	40.0	4.3	4.3	16.0	
Poisson's Ratio	23°C	D-638	-						0.41	0.31			0.31		
Flexural Strength, Ultimate	23°C	D-790	kgf/cm <sup>2</sup> (MPa)	780 (76.5)	800 (78.5)		1,100 (107.9)		1,100 (107.9)	1,800 (176.0)		1,466 (143.8)	2,040 (200.0)		
	260°C					400 (39.2)	450 (44.1)				1,220 (119.6)		928 (91.0)		
Flexural Modulus of Elasticity	23°C	D-790	kgf/cm <sup>2</sup> (MPa)	33,500 (3,285)	34,000 (3,334)		35,000 (3,432)		35,000 (3,432)	54,620 (5,356)		160,000 (15,690)	70,400 (6,900)		
	260°C					18,500 (1,814)	19,000 (1,863)				35,282 (3,460)		95,850 (9,400)		
Compressive Strength	23°C	D-695	kgf/cm <sup>2</sup> (MPa)												
	@ 1% Strain						250 (24.5)		250 (24.5)					270 (26.5)	
	@ 10% Strain					1,300 (127.5)	1,300 (127.5)		1,500 (147.1)		1,500 (147.1)	2,141 (210.0)			2,400 (235.0)
	@ 50% Strain								3,500 (343.2)		3,500 (343.2)				
Compressive Modulus	23°C	D-695	kgf/cm <sup>2</sup> (MPa)	25,000 (2,452)	25,000 (2,452)		25,000 (2,452)		25,000 (2,452)	82,190 (8,060)					
Impact Strength Izod, notched	23°C	D-256	kgcm/cm				5.0		5.0	11.7					
			J/m				49.0		49.0	114.7					
<b>WEAR &amp; FRICTION</b>															
Wear Rate			m/s x 10 <sup>-10</sup>		2.8					11.0	8.3	30.0	2.8		
Friction Coefficient <sup>3)</sup> PV=10kg/cm <sup>2</sup> .m/sec (0.98MPa.m/sec)					0.24		0.32		0.32	0.34	0.47	0.39	0.18		
<b>THERMAL</b>															
Coefficient of Linear Expansion	23~260°C	D-696	µm/m/°C	50			45		45	50	47	57	30		
Thermal conductivity	25°C		W/m·°C				0.37		0.37	0.30	1.50	1.71	0.35		
	40°C						0.38		0.38	0.31	1.50	1.71			
Specific Heat			J/kg·°C							938	880	964	1020		
			kcal/kg·°C							0.224	0.210	0.230	0.244		
Thermal Decomposition Temperature (on-set point, rate 10°C/min, in air)			°C				545		550	567		567			
Thermal 50% weight reduction Time (on-set point, rate 10°C/min, in air)			min				145		155	242			276		
<b>ELECTRICAL</b>															
Dielectric Constant	23°C, @10 <sup>3</sup> Hz	D-150								3.0			3.7		
	23°C, @10 <sup>4</sup> Hz									2.9			3.7		
	23°C, @10 <sup>5</sup> Hz										2.9			3.7	
	23°C, @10 <sup>6</sup> Hz										3.1			3.7	
Dielectric Strength		D-149	kV/mm												
Dissipation Factor	23°C, @10 <sup>3</sup> Hz	D-150	(10 <sup>-3</sup> )							2.4					
	23°C, @10 <sup>4</sup> Hz									1.7			4.5		
	23°C, @10 <sup>5</sup> Hz										1.5			5.8	
	23°C, @10 <sup>6</sup> Hz										0.9			6.7	
Volume Resistivity	23°C	D-257	Ω·m							≥ 1E14	1E7-8	1E7-8	≥ 1E14		
Surface Resistivity	23°C	D-257	Ω/□				1E0-3	1E0-3	1E6-9	1E6-9	≥ 1E14	1E5-6	1E5-6	≥ 1E14	
<b>OTHER PROPERTIES</b>															
Water Absorption	50%RH(avg)	D-570	%												
	24hrs 23°C				0.20		0.20		0.20	0.03	0.08	0.07	0.03		
	48hrs 50°C									0.20					
Specific Gravity		D-792	g/cm <sup>3</sup>	1.55	1.58	1.36	1.44	1.36	1.44	1.45	1.68	1.80	1.47		
Hardness		D-785	Rockwell"M"		70-90	65-95	90-105	65-95	90-105	100-120	80-85	100-105	115		

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