

YOUR GLOBAL ENGINEERING RESINS SOURCE

POLYLAC[®]

A B S

PROPERTIES AND PROCESSING GUIDE

EXPERIENCE
THE
WINDWARD WAY



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POLYLAC® GENERAL PURPOSE ABS

PROPERTY	METHOD	UNIT	PA-757	PA-727	PA-717C	PA-746Y	PA-747	PA-709
PHYSICAL								
Melt Flow Index								
200°C x 5 kg (cond. G)	ASTM D1238	g/10 min	1.8	1.7	1.4	1.8	1.1	0.6
230°C x 3.8 kg (cond. I)	ASTM D1238	g/10 min	6.8	7.0	5.4	4.5	3.7	1.8
220°C x 10 kg	ISO 1133	g/10 min	22	18	15	14.5	12	6.0
Specific Gravity	ASTM D792	————	1.05	1.04	1.04	1.04	1.03	1.03
Mold Shrinkage (Flow, 1/8 in)	ASTM D955	in/in x10 ⁻³	3-7	3-7	3-7	3-8	3-7	3-7
MECHANICAL @ 73°F								
Izod Impact Strength (Notched) 1/8"	ASTM D256	ft•lb/in (J/m)	3.7 (198)	4.8 (256)	5.2 (278)	6.6 (353)	7.5 (400)	8.4 (448)
Izod Impact Strength (Notched) 1/4"	ASTM D256	ft•lb/in (J/m)	3.3 (176)	4.2 (224)	4.6 (246)	5.4 (288)	6.6 (352)	7.4 (395)
Tensile Strength at Yield	ASTM D638	psi	6,800	6,900	6,400	6,850	5,500	5,700
		MPa	47	47	44	47	38	39
Tensile Modulus (6mm/min)	ASTM D638	psi	425,000	410,000	400,000	367,000	355,000	365,000
		MPa	2,930	2,827	2,758	2,530	2,448	2,517
Elongation at Break	ASTM D638	%	20	20	25	30	30	40
Flexural Modulus	ASTM D790	psi	380,000	380,000	350,000	317,000	310,000	320,000
		MPa	2,620	2,620	2,413	2,186	2,137	2,206
Flexural Strength at Yield	ASTM D790	psi	11,200	11,000	10,200	10,100	8,800	9,100
		MPa	77	76	70	70	61	63
Hardness (Rockwell, R-Scale)	ASTM D785	————	116	110	115	109	108	102
THERMAL								
Heat Deflection Temp (1/4" Test Specimens) ASTM D648								
264 psi (1.82 MPa) Unannealed		°F (°C)	190 (88)	190 (88)	189 (87)	181 (83)	187 (86)	190 (88)
264 psi (1.82 MPa) Annealed ☆		°F (°C)	210 (99)	210 (99)	208 (98)	213 (101)	206 (97)	208 (98)
66 psi (0.46 MPa) Unannealed		°F (°C)	208 (98)	208 (98)	207 (97)	201 (94)	205 (96)	208 (98)
Vicat Softening Temp. (1 kg, 50°C/hr)	ASTM D1525	°F (°C)	221 (105)	221 (105)	219 (104)	221 (105)	217 (103)	221 (105)
Coefficient of Thermal Expansion	ASTM D696	in/in/°F x10 ⁻⁵	5.2	5.6	6.2	5.5	6.2	6.2
		mm/mm/°C x10 ⁻⁵	9.3	10.1	11.2	9.9	11.1	11.1
ELECTRICAL @ 73°F								
Volume Resistivity	ASTM D257	ohm-cm	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁶	>10 ¹⁵	>10 ¹⁵
FLAME CLASS RATING*								
UL94HB (Min. Tested Thickness)	UL94	in (mm)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)
UL94 V-0 (Min. Tested Thickness)	UL94	in (mm)	————	————	————	————	————	————

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☆ Annealing Condition: Vicat Softening Temp. - 15°C for 8 hr.

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POLYLAC® ABS • PRODUCT DESCRIPTIONS

General Purpose

PA-757
PA-717C
PA-727
PA-747
PA-709
PA-746Y

High Rigidity, Medium Impact
Medium/High Impact
Electroplating Grade
High Impact
Super High Impact
Improved Chemical Resistance, High Impact

POLYLAC® HIGH FLOW ABS

PROPERTY	METHOD	UNIT	PA-756H	PA-756	PA-756S	PA-716	PA-746H	PA-746
PHYSICAL								
Melt Flow Index								
200°C x 5 kg (cond.G)	ASTM D1238	g/10 min	8.5	4.5	7.0	3.5	4.8	3.0
230°C x 3.8 kg (cond. I)	ASTM D1238	g/10 min	23	14	22	13	13	8.5
220°C x 10 kg	ISO 1133	g/10 min	75	50	70	38	52	34
Specific Gravity	ASTM D792	————	1.05	1.05	1.05	1.04	1.03	1.03
Mold Shrinkage (Flow, 1/8 in)	ASTM D955	in/in x10 ⁻³	3-7	3-7	3-7	3-5	3-7	3-7
MECHANICAL @ 73°F								
Izod Impact Strength (Notched) 1/8"	ASTM D256	ft•lb/in (J/m)	1.9 (101)	3.2 (171)	3.7 (198)	4.5 (240)	5.6 (299)	6.0 (320)
Izod Impact Strength (Notched) 1/4"	ASTM D256	ft•lb/in (J/m)	1.5 (80)	2.8 (149)	3.3 (176)	4.0 (214)	4.6 (246)	4.8 (256)
Tensile Strength at Yield	ASTM D638	psi	5,700	6,500	5,200	6,240	5,000	5,800
		MPa	39	45	36	43	34	40
Tensile Modulus (6mm/min)	ASTM D638	psi	415,000	405,000	375,000	384,000	370,000	360,000
		MPa	2,861	2,792	2,586	2,648	2,551	2,482
Elongation at Break	ASTM D638	%	10	20	46	25	30	30
Flexural Modulus	ASTM D790	psi	320,000	370,000	300,000	340,000	280,000	310,000
		MPa	2,206	2,551	2,068	2,344	1,931	2,137
Flexural Strength at Yield	ASTM D790	psi	9,100	10,800	8,200	9,920	8,000	9,200
		MPa	63	74	57	68	55	63
Hardness (Rockwell, R-Scale)	ASTM D785	————	115	115	113	112	105	108
THERMAL								
Heat Deflection Temp (1/4" Test Specimens)	ASTM D648							
264 psi (1.82 MPa) Unannealed		°F (°C)	190 (88)	192 (89)	190 (88)	190 (88)	187 (86)	189 (87)
264 psi (1.82 MPa) Annealed ☆		°F (°C)	210 (99)	210 (99)	208 (98)	210 (99)	205 (96)	207 (97)
66 psi (0.46 MPa) Unannealed		°F (°C)	208 (98)	210 (99)	208 (98)	203 (95)	205 (96)	207 (97)
Vicat Softening Temp. (1 kg, 50°C/hr)	ASTM D1525	°F (°C)	221 (105)	221 (105)	221 (105)	221 (105)	219 (104)	221 (105)
Coefficient of Thermal Expansion	ASTM D696	in/in/°F x 10 ⁻⁵	4.3	5.4	5.1	5.3	6.1	6.4
(-40° → 80°C Annealed)		mm/mm/°C x 10 ⁻⁵	7.8	9.8	9.1	9.6	11.0	11.6
ELECTRICAL @ 73°F								
Volume Resistivity	ASTM D257	ohm-cm	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁶	>10 ¹⁵	>10 ¹⁵
FLAME CLASS RATING*								
UL94HB (Min. Tested Thickness)	UL94	in (mm)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)	0.063 (1.61)	0.062 (1.57)
UL94 V-0 (Min. Tested Thickness)	UL94	in (mm)	————	————	————	————	————	————

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POLYLAC® ABS • PRODUCT DESCRIPTIONS

High	PA-756	High Rigidity, High Flow
Flow	PA-756H	Super High Flow
	PA-716	Medium Impact, High Flow
	PA-756S	Medium Impact, Super High Flow
	PA-746	High Impact, High Flow
	PA-746H	High Impact, Super High Flow



POLYLAC® EXTRUSION GRADE ABS

PROPERTY	METHOD	UNIT	PA-747S	PA-747R	PA-709S	PA-709B
PHYSICAL						
Melt Flow Index						
200°C x 5 kg (cond.G)	ASTM D1238	g/10 min	0.7	0.3	0.4	-----
230°C x 3.8 kg (cond. I)	ASTM D1238	g/10 min	1.9	0.8	0.8	0.3
220°C x 10 kg	ISO 1133	g/10 min	7.5	2.5	4.5	3.3
Specific Gravity	ASTM D792	-----	1.03	1.04	1.03	1.03
Mold Shrinkage (Flow, 1/8 in)	ASTM D955	in/in x10 ⁻³	3-7	3-7	3-7	3-7
MECHANICAL @ 73°F						
Izod Impact Strength (Notched) 1/8"	ASTM D256	ft•lb/in (J/m)	7.5 (400)	7.7 (411)	8.1 (432)	9.0 (480)
Izod Impact Strength (Notched) 1/4"	ASTM D256	ft•lb/in (J/m)	6.5 (347)	6.5 (347)	7.2 (384)	7.0 (374)
Tensile Strength at Yield	ASTM D638	psi	5,500	6,500	5,000	4,500
		MPa	38	45	34	31
Tensile Modulus (6mm/min)	ASTM D638	psi	365,000	355,000	335,000	310,000
		MPa	2,517	2,448	2,310	2,137
Elongation at Break	ASTM D638	%	40	40	40	46
Flexural Modulus	ASTM D790	psi	300,000	350,000	280,000	300,000
		MPa	2,068	2,413	1,931	2,068
Flexural Strength at Yield	ASTM D790	psi	8,800	10,300	8,000	8,600
		MPa	61	71	55	59
Hardness (Rockwell, R-Scale)	ASTM D785	-----	102	110	100	90
THERMAL						
Heat Deflection Temp (1/4" Test Specimens)	ASTM D648					
264 psi (1.82 MPa) Unannealed		°F (°C)	189 (87)	190 (88)	187 (86)	180 (82)
264 psi (1.82 MPa) Annealed ☆		°F (°C)	207 (97)	208 (98)	205 (96)	208 (98)
66 psi (0.46 MPa) Unannealed		°F (°C)	207 (97)	208 (98)	205 (96)	198 (92)
Vicat Softening Temp. (1 kg, 50°C/hr)	ASTM D1525	°F (°C)	217 (103)	221 (105)	223 (106)	219 (104)
Coefficient of Thermal Expansion	ASTM D696	in/in/°F x 10 ⁻⁵	6.4	6.2	6.6	-----
(-40° → 80°C Annealed)		mm/mm/°C x 10 ⁻⁵	11.6	11.1	11.9	-----
ELECTRICAL @ 73°F						
Volume Resistivity	ASTM D257	ohm-cm	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵
FLAME CLASS RATING*						
UL94HB (min. Tested Thickness)	UL94	in (mm)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)	-----
UL94 V-0 (min. Tested Thickness)	UL94	in (mm)	-----	-----	-----	-----

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POLYLAC® ABS • PRODUCT DESCRIPTIONS

Extrusion	PA-747R	High Impact, Compression Moldable
	PA-747S	High Impact, Thermoformable
	PA-709B	Super High Impact, Blow Moldable
	PA-709S	Super High Impact

POLYLAC® FLAME RETARDANT ABS

PROPERTY	METHOD	UNIT	PA-764	PA-765	PA-765A	PA-765B
PHYSICAL						
Melt Flow Index						
200°C x 5 kg (cond.G)	ASTM D1238	g/10 min	3.2	5.2	4.8	4.3
230°C x 3.8 kg (cond. I)	ASTM D1238	g/10 min	9.6	13	11	10
220°C x 10 kg	ISO 1133	g/10 min	35	60	55	48
Specific Gravity	ASTM D792	————	1.19	1.20	1.17	1.16
Mold Shrinkage (Flow, 1/8 in)	ASTM D955	in/in x10 ⁻³	3-7	3-7	3-7	3-7
MECHANICAL @ 73°F						
Izod Impact Strength (Notched) 1/8"	ASTM D256	ft•lb/in (J/m)	2.6 (139)	3.7 (198)	3.8 (203)	4.4 (235)
Izod Impact Strength (Notched) 1/4"	ASTM D256	ft•lb/in (J/m)	2.2 (117)	2.9 (155)	3.1 (165)	3.7 (198)
Tensile Strength at Yield	ASTM D638	psi	5,300	5,500	5,700	5,700
		MPa	37	38	39	39
Tensile Modulus (6mm/min)	ASTM D638	psi	360,000	360,000	350,000	360,000
		MPa	2,482	2,482	2,413	2,482
Elongation at Break	ASTM D638	%	15	15	15	25
Flexural Modulus	ASTM D790	psi	280,000	300,000	320,000	340,000
		MPa	1,931	2,068	2,206	2,344
Flexural Strength at Yield	ASTM D790	psi	8,400	8,800	9,100	9,200
		MPa	58	61	63	63
Hardness (Rockwell, R-Scale)	ASTM D785	————	96	100	104	102
THERMAL						
Heat Deflection Temp (1/4" Test Specimens)	ASTM D648					
264 psi (1.82 MPa) Unannealed		°F (°C)	174 (79)	163 (73)	169 (76)	174 (79)
264 psi (1.82 MPa) Annealed ☆		°F (°C)	198 (92)	181 (83)	185 (85)	187 (86)
66 psi (0.46 MPa) Unannealed		°F (°C)	192 (89)	181 (83)	187 (86)	192 (89)
Vicat Softening Temp. (1 kg, 50°C/hr)	ASTM D1525	°F (°C)	207 (97)	194 (90)	198 (92)	203 (95)
Coefficient of Thermal Expansion	ASTM D696	in/in/°F x 10 ⁻⁵	6.7	7.2	6.9	6.5
(-40° → 80°C Annealed)		mm/mm/°C x 10 ⁻⁵	12.0	12.9	12.4	11.7
ELECTRICAL @ 73°F						
Volume Resistivity	ASTM D257	ohm-cm	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵
FLAME CLASS RATING*						
UL94HB (min. Tested Thickness)	UL94	in	————	————	————	————
		(mm)	0.062	0.062	0.083	0.100
UL94 V-0 (min. Tested Thickness)	UL94	in (mm)	(1.57)	(1.57)	(2.12)	(2.54)

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POLYLAC® ABS • PRODUCT DESCRIPTIONS

Flame Retardant	PA-765	V-0 @ 0.06", Medium Impact, High Flow
	PA-765A	V-0 @ 0.08", Medium Impact, High Flow
	PA-765B	V-0 @ 0.10", Medium Impact, High Flow
	PA-764	V-0 @ 0.06", High Heat, Weather Resistant

POLYLAC[®] HIGH HEAT ABS

PROPERTY	METHOD	UNIT	PA-777E	PA-777D	PA-777B
PHYSICAL					
Melt Flow Index					
200°C x 5 kg (cond.G)	ASTM D1238	g/10 min	-----	-----	-----
230°C x 3.8 kg (cond. I)	ASTM D1238	g/10 min	1.5	2.4	2.5
220°C x 10 kg	ISO 1133	g/10 min	5.0	6.0	6.7
Specific Gravity	ASTM D792	-----	1.07	1.06	1.03
Mold Shrinkage (Flow, 1/8 in)	ASTM D955	in/in x10 ⁻³	3-7	3-7	3-7
MECHANICAL @ 73°F					
Izod Impact Strength (Notched) 1/8"	ASTM D256	ft•lb/in (J/m)	2.2 (117)	3.2 (171)	4.3 (230)
Izod Impact Strength (Notched) 1/4"	ASTM D256	ft•lb/in (J/m)	2.0 (107)	2.6 (139)	3.7 (198)
Tensile Strength at Yield	ASTM D638	psi	6,200	6,200	6,100
		MPa	43	43	42
Tensile Modulus (6mm/min)	ASTM D638	psi	400,000	390,000	390,000
		MPa	2,758	2,689	2,689
Elongation at Break	ASTM D638	%	10	15	15
Flexural Modulus	ASTM D790	psi	350,000	350,000	340,000
		MPa	2,413	2,413	2,344
Flexural Strength at Yield	ASTM D790	psi	10,600	10,600	9,900
		MPa	73	73	68
Hardness (Rockwell, R-Scale)	ASTM D785	-----	115	115	112
THERMAL					
Heat Deflection Temp (1/4" Test Specimens)	ASTM D648				
264 psi (1.82 MPa) Unannealed		°F (°C)	228 (109)	221 (105)	206 (97)
264 psi (1.82 MPa) Annealed ☆		°F (°C)	248 (120)	239 (115)	225 (107)
66 psi (0.46 MPa) Unannealed		°F (°C)	246 (119)	239 (115)	225 (107)
Vicat Softening Temp. (1 kg, 50°C/hr)	ASTM D1525	°F (°C)	264 (129)	257 (125)	239 (115)
Coefficient of Thermal Expansion	ASTM D696	in/in/°F x 10 ⁻⁵	6.7	6.4	5.7
(-40° → 80°C Annealed)		mm/mm/°C x 10 ⁻⁵	12.0	11.5	10.3
ELECTRICAL @ 73°F					
Volume Resistivity	ASTM D257	ohm-cm	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵
FLAME CLASS RATING*					
UL94HB (Min. Tested Thickness)	UL94	in (mm)	0.062 (1.57)	0.062 (1.57)	0.062 (1.57)
UL94 V-0 (Min. Tested Thickness)	UL94	in (mm)	-----	-----	-----

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ABS • PRODUCT DESCRIPTIONS

Heat Resistant	PA-777B PA-777D PA-777E	High Heat, High Impact Super High Heat, Medium Impact Super High Heat
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TYPICAL ABS PROCESSING CONDITIONS

DRYING

ABS should be dried prior to melt processing. Polylac® ABS resins exhibit an equilibrium moisture content of 0.3% to 0.4% at 73°F and 50% relative humidity. This moisture content increases to between 0.6% and 0.8% at 90% relative humidity. Although the proper amount of drying depends on the relative humidity, the ratio of regrind to virgin resin and the storage period of the resin, it is recommended that Polylac® ABS resins be dried at 175-185°F (80-85°C) for 3 hours. A moisture level of 0.1% should be reached before injection molding the resin.

INJECTION MOLDING

The following molding conditions are recommended starting points for Polylac® ABS resins. Some modifications may be required depending on the specific molding equipment and part configuration.

PARAMETER	PA-757, 717C 747, 709, 716 756H, 756, 756S 746H, 746, 746Y	PA-727*	PA-764* PA-765A PA-765	PA-765B	PA-777E PA-777D PA-777B
Rear Temp (°F)	355-390	375-410	330-350	350-365	380-420
Center Temp (°F)	390-430	410-430	335-355	355-375	420-455
Center Temp (°F)	390-430	430-445	345-365	365-385	420-455
Front Temp (°F)	420-455	430-480	355-375	375-390	445-480
Nozzle Temp (°F)	410-445	430-470	345-365	365-385	425-470
Melt Temp Max (°F)	465	495	395	430	490
Mold Temp (°F)	120-140	140-175	105-160	105-160	120-140
Filling Speed	Slow-Med	Very Slow	Slow-Med	Slow-Med	Slow-Med
Filling Pressure (psi)*	850-1000	700-1000	710-850	710-850	850-1000
Holding Pressure (psi)*	710-850	550-850	570-710	570-710	710-850
Back Pressure (psi)*	70-140	70-140	70-140	70-140	70-140
Screw Speed (RPM)	50-90	50-90	50-90	50-90	50-90
Shot to Cylinder Size (%)	40-80	40-80	40-80	40-80	40-80

* Max. melt temperature for PA-764 is 430°F. (*) Note: Pressures given are in the hydraulic circuit.

*Molding conditions for PA-727, electroplating grade ABS are as listed above. Regrind levels should not exceed 15% with this grade. To obtain high quality parts, a low residual stress process is necessary. Moisture content of the resin should be less than 0.02% prior to molding. Avoid mold release agents. If necessary water soluble release agents are recommended.

EXTRUSION

Polylac® ABS Extrusion grade resins should be dried to a moisture content of 0.02% or less prior to processing. Control of the outer stock temperature is important in successfully finishing a product. Typical temperatures of outer stock range from 160°F to 175°F after passing through a water bath. The bath temperature profile will greatly affect the dimensional stability and appearance of the part, and if not set up properly could be detrimental to the ultimate mechanical strength of the product. Extruders with one-stage or two-stage force venting are recommended for the extrusion of sheets or profiles. Compression ratios should be between 2.5/1 and 3.0/1 for a single stage screw and between 1.5/1 and 2.0/1 for a two stage screw. L/D ratios of 20/1 and 36/1 are typical.

PROCESS PARAMETER	SETTING	PROCESS PARAMETER	SETTING
Drying Temperature (°F)	185	Outer Die Zone (°F)	435-475
Drying Time (hrs)	3	Mid Die Zone (°F)	430-465
Zone 1 (°F)	375-410	Center Die Zone (°F)	420-455
Zone 2 (°F)	375-410	Mid Die Zone (°F)	430-465
Zone 3 (°F)	390-430	Outer Die Zone (°F)	435-475
Zone 4 (°F)	390-430	Die Lip Thickness (mm)	3.2-4.0
Zone 5 (°F)	390-430	Nip Roll Top (°F)	185-195
Zone 6 (°F)	430-465	Nip Roll Middle (°F)	175-185
Zone 7 (°F)	430-465	Nip Roll Bottom (°F)	165-175
Adapter (°F)	430-465	Screen Pack Mesh (2 Layers)	#60-80

Extrusion parameters were found by extruding 3.2mm thick sheets at a haul off speed of 1368 mm/min and an output rate of 210 Kg/hr. A polishing roll in a up stack wrap arrangement was used as well as a single screw extruder with a 100 mm diameter screw, a L/D ratio of 35/1, and a compression ratio of 3/1.

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