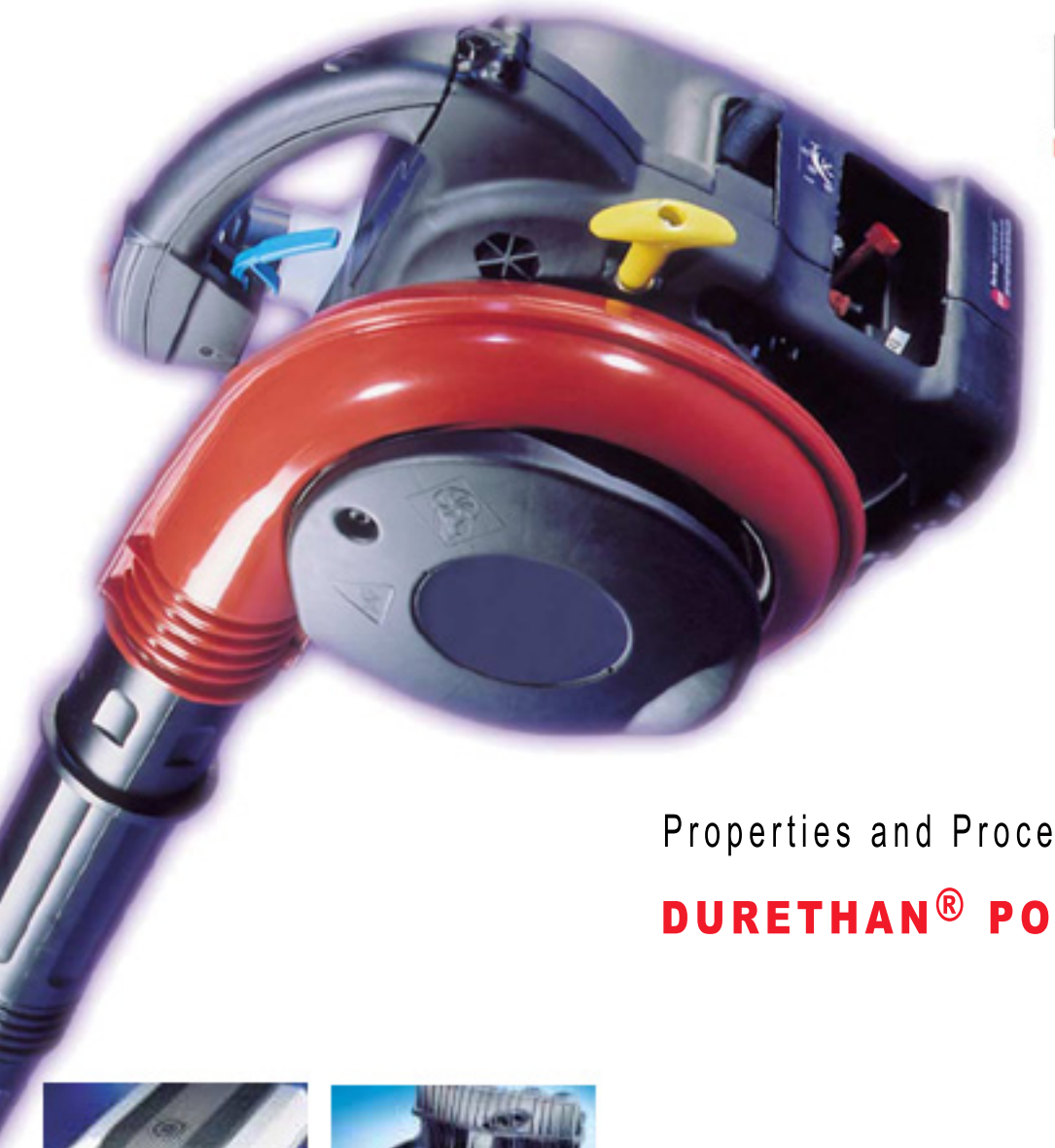
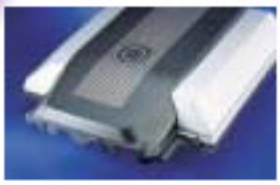
LANXESS
Energizing Chemistry



Properties and Processing Guide for

DURETHAN® POLYAMIDE 6 RESINS







Innovative Technologies Meeting a World of Needs

Introduction

Durethan polyamide resin is recognized worldwide as a high-quality engineering thermoplastic. It is used in a variety of applications that depend on properties including high strength, good impact strength even at cold temperatures, high dynamic load capacity, excellent processibility, excellent abrasion and wear resistance, chemical resistance, thermal stability, high dynamic fatigue resistance, and good electrical insulating properties. Glass-fiber-reinforced grades of Durethan resin also exhibit high heat resistance.

A number of resin grades are available for injection molding and film extrusion. This guide provides an overview of the properties of these grades. As with any product, use of a particular resin and resin grade in a given application must be tested (including field testing, etc.) in advance by the user to determine suitability. Some of the end uses for Durethan resins must comply with applicable regulations, such as those of the FDA, NSF, USDA, and CPSC. If you have any questions on the regulatory status of these products, contact your LANXESS representative or the LANXESS Regulatory Affairs Manager in Pittsburgh, Pennsylvania.

This guide also provides an overview to the methods and procedures that should be followed when working with Durethan resin. It is intended to serve only as an overview. Before molding, you must read the LANXESS Corporation publication, *A Processing Guide for Injection Molding Durethan Polyamide*. This publication is merely a summary and must not be used as a substitute for reading the complete processing guide.

Technical Support

To get material selection and/or design assistance, just write or call and let us know who you are and what your needs are. So that we can respond efficiently to your inquiry, here are some of the points of information we would like to know: physical description of your part(s) and engineering drawings, if possible; material currently being used; service requirements, such as mechanical stress and/or strain, peak and continual service temperature, types of chemicals to which the part(s) may be exposed, stiffness required to support the part itself or another item, and impact resistance and assembly techniques; applicable government or regulatory agency test standards; tolerances that must be held in the functioning environment of the part(s); and any other restrictive factors or pertinent information of which we should be aware.

In addition, we can provide processing assistance nationwide through a network of regional Field Technical Service Representatives. We can help customers optimize the quality and performance of their parts by offering the following types of assistance: on-site processing, equipment, and productivity audits; start-up and troubleshooting support; and tool design.

Upon request, LANXESS will furnish such technical advice or assistance it deems to be appropriate in reference to your use of our product, Durethan polyamide resin. It is expressly understood and agreed that, since all such technical advice or assistance is rendered without compensation and is based upon information believed to be reliable, the customer assumes and hereby expressly releases LANXESS from all liability and obligation for any advice or assistance given or results obtained. Moreover, it is your responsibility to conduct end-use testing and to otherwise determine to your own satisfaction whether LANXESS products and information are suitable for your intended uses and applications.

For assistance contact:

LANXESS Corporation
Durethan Product Management
111 RIDC Park West Drive
Pittsburgh, PA 15275-1112
Phone: 800-LANXESS

Typical Properties* for Natural Resins	Test Method ASTM	Test Method ISO	Units ASTM	Units ISO	Genera B 30 S B 31 SK ASTM DAM	ASTM COND	ISO DAM	ISO COND
GENERAL								
Specific Gravity	D 792	ISO 1183			1.14		1.14	
Density	D 792		lb/in.^{3}		0.041			
Specific Volume	D 792		in.^{3}/lb		24.3			
Mold Shrinkage:	(LANXESS)	ISO 2577						
Flow Direction			in./in.	mm/mm	0.012		0.012	
Cross-Flow Direction			in./in.	mm/mm	0.011		0.014	
Water Absorption (0.125-in. Thickness):								
24-Hour Immersion	D 570		%		1.6			
Equilibrium (73°F)	(DIN 53495)							
In Air (50% RH)		ISO 62	%	%	3.0		3.0	
In Water	D 1238	ISO 62	%	%	10		10	
MECHANICAL								
Tensile Stress at Yield	D 638	ISO 527	lb/in.^{2}	MPa	11,600	5,800	80	40
Tensile Elongation at Yield	D 638	ISO 527	%	%	4	20	4	20
Tensile Stress at Break	D 638	ISO 527	lb/in.^{2}	MPa	7,250	8,700	50	60
Tensile Elongation at Break	D 638	ISO 527	%	%	35	>200	35	>50
Tensile Modulus	D 638	ISO 527	lb/in.^{2}x10^3	MPa	464	159	3,200	1,000
Flexural Stress at 5% Strain (ISO - 3.5% Strain)	D 790	ISO 178	lb/in.^{2}	MPa	16,700	5,080	95	25
Flexural Strength	D 790	ISO 178	lb/in.^{2}	MPa				
Flexural Modulus	D 790	ISO 178	lb/in.^{2} x10^3	MPa	392	102	2,700	850
Impact Strength, Notched Izod:	D 256	ISO 180/1A						
0.125-in. Thickness, 73°F			ft·lb/in.	kJ/m^2	1.1	14.0	<10	25.0
0.125-in. Thickness, -40°F			ft·lb/in.	kJ/m^2		<10	<10	
THERMAL								
Deflection Temperature, Unannealed:	D 648	ISO 75						
0.157-in. Thickness								
264-psi (1.81-MPa) Load			°F	°C	140		55	
66-psi (0.45-MPa) Load			°F	°C	356		160	
Relative Temperature Index at 0.059-in. Thickness	(UL7468)							
Electrical			°C		105			
Mechanical with Impact			°C		65			
Mechanical without Impact			°C		75			
FLAMMABILITY†								
UL94 Flame Class:	(UL94)							
0.030-in. (0.75-mm) Thickness			Rating					
0.033-in. (0.83-mm) Thickness			Rating					
0.059-in. 1.5-mm) Thickness			Rating		V-2			
0.118-in. (3.0-mm) Thickness			Rating		V-2			
ELECTRICAL								
Volume Resistivity (Tinfoil Electrodes)	D 257	IEC 93	ohm·cm	ohm·cm	1 E+15	1 E+12	1 E+15	1 E+12
Surface Resistivity	D 257	IEC 93	ohm	ohm	1 E+13	1 E+12	1 E+14	1 E+12
Dielectric Strength:	D 149	IEC 243-1						
0.118-in. Thickness			V/mil	kV/mm	762	889	30	30
Dielectric Constant (Tinfoil Electrodes):	D 150	IEC 250						
50 Hz					3.8	20	4.0	20
51 MHz					3.4	4.6	3.4	4.2
Dissipation Factor (Tinfoil Electrodes):	D 150							
50 Hz					0.05	2.30	0.017	0.2
51 MHz					0.07	0.40	0.027	0.14
Arc Resistance: Tungsten Electrodes	D 495		s					
Comparative Tracking Index			V			600		

* These items are provided as general information only. They are approximate values and are not part of the product specifications.
** For information on using melt flow as a quality control procedure, see LANXESS processing literature.
† Flammability results are based on small-scale laboratory tests for purposes of relative comparison and are not intended to reflect the hazards presented by this or any other material under actual fire conditions.
\# Type and quantity of pigment can affect mechanical properties, especially toughness.
a Relative temperature index is reported at 0.030-in. (0.75-mm) thickness.
b Natural color.

al-Purpose					Toughened							
	High-Viscosity B 40 SK				BC 30				*High-Viscosity* BC 40 SR2			
	ASTM		ISO		ASTM		ISO		ASTM		ISO	
	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND
	1.14		1.14		1.10		1.10		1.10		1.10	
	0.041				0.040				0.040			
	24.3				25.2				25.2			
	0.012		0.01		0.013		0.011		0.015		0.012	
	0.013		0.01		0.017		0.016		0.019		0.017	
	1.6				1.5				1.5			
	3.0		3		2.7		2.7		2.7		2.7	
	10		10		9		9		9		9	
	12,300	5,800	85	40	9,400	5,800	65	40	10,200	5,800	70	40
	4	25	4	25	4	20	4	20	4	30	4	30
	8,000	8,000	55	55	10,200	8,000	70	55	10,200	5,800	50	40
	70	>200	50	>50	50	>200	>10	>50	75	>200	>20	>50
	450	145	3,200	900	406	174	2,800	1,200	406	174	2,700	1,200
	16,700	5,080	95	20	11,600	3,600	75	20	13,800	4,400	80	20
	392	102	2,800	800	319	116	2,200	800	334	116	2,400	80
	1.3	18.7	10	50	1.7	17.8	15	50	3.0	N B	18	100
	<10	<10			1.5	1.5	10	10	2.1	2.1	15	15
	140		55		149		50		158		50	
	356		130		329		135		365		130	
	105				65[a]							
	65				65[a]							
	75				65[a]							
					HB[b]							
	HB								HB[a]			
	HB											
	1 E+15	1 E+12	1 E+15	1 E+11	1 E+14	1 E+12	1 E+15	1 E+13	1 E+14	1 E+12	1 E+14	1 E+12
	1 E+13	1 E+12	1 E+14	1 E+13	1 E+12	1 E+10	1 E+15	1 E+14	1 E+12	1 E+10	1 E+12	1 E+10
	762	889	30	30	889	762	35	30	889	762	35	30
	3.8	16	40	20	3.7	13	3.7	13	3.7	14	3.7	14
	3.4	4.7	3.5	4.5	3.3	3.8	3.3	3.8	3.3	3.9	3.3	3.9
	0.05	2.80	0.012	0.2	0.04	2.25	0.01	0.16	0.04	2.65	0.012	0.2
	0.06	0.40	0.02	0.14	0.06	0.33	0.02	0.06	0.06	0.39	0.02	0.09
	600					600				600		

Notes

DAM (Dry as Molded) refers to a moisture content less than 0.2% by weight.

COND (Conditioned) refers to an equilibrium moisture content in a standard laboratory atmosphere or 73°F and 50% relative humidity.

Glass-Reinforced refers to reinforcement with glass fibers except in the case of BG 30 X, which is reinforced with glass fibers and glass beads.

Typical Properties* for Natural Resins	Test Method ASTM	Test Method ISO	Units ASTM	Units ISO	Impact-Modified BC 304 ASTM DAM	BC 304 ASTM COND	BC 304 ISO DAM	BC 304 ISO COND	KU2-23 ASTM DAM
GENERAL									
Specific Gravity	D 792	ISO 1183			1.06		1.06		1.09
Density	D 792		lb/in.^{3}		0.038				0.039
Specific Volume	D 792		in.^{3}/lb		26.1				25.4
Mold Shrinkage:	(LANXESS)	ISO 2577							
Flow Direction			in./in.	mm/mm	0.015		0.015		0.015
Cross-Flow Direction			in./in.	mm/mm	0.016		0.016		0.015
Water Absorption (0.125-in. Thickness):									
24-Hour Immersion	D 570		%		1.6				
Equilibrium (73°F)	(DIN 53495)								
In Air (50% RH)		ISO 62	%	%	2.0		2		
In Water	D 1238	ISO 62	%	%	7.5		7.5		
MECHANICAL									
Tensile Stress at Yield	D 638	ISO 527	lb/in.^{2}	MPa	6,520	5,080	45	35	7,980
Tensile Elongation at Yield	D 638	ISO 527	%	%	4	30	4	30	4
Tensile Stress at Break	D 638	ISO 527	lb/in.^{2}	MPa					
Tensile Elongation at Break	D 638	ISO 527	%	%	>200	>200	>50	>50	>200
Tensile Modulus	D 638	ISO 527	lb/in.^{2}x10^3	MPa	261	116	1,800	800	300
Flexural Stress at 5% Strain (ISO - 3.5% Strain)	D 790	ISO 178	lb/in.^{2}	MPa	8,000	4,500	55	25	8,800
Flexural Strength	D 790	ISO 178	lb/in.^{2}	MPa					
Flexural Modulus	D 790	ISO 178	lb/in.^{2} x10^3	MPa	232	109	1,600	750	290
Impact Strength, Notched Izod:	D 256	ISO 180/1A							
0.125-in. Thickness, 73°F			ft·lb/in.	kJ/m^2	12.1	17.2	70.0	100.0	6.9
0.125-in. Thickness, -40°F			ft·lb/in.	kJ/m^2	12.1	12.1	70	70	2.6
THERMAL									
Deflection Temperature, Unannealed:	D 648	ISO 75							
0.157-in. Thickness									
264-psi (1.81-MPa) Load			°F	ºC	122		50		127
66-psi (0.45-MPa) Load			°F	ºC	194		90		320
Relative Temperature Index at 0.059-in. Thickness	(UL7468)								
Electrical			ºC		65[a]				65
Mechanical with Impact			ºC		65[a]				65
Mechanical without Impact			ºC		65[a]				65
FLAMMABILITY†									
UL94 Flame Class:	(UL94)								
0.030-in. (0.75-mm) Thickness			Rating		HB				
0.033-in. (0.83-mm) Thickness			Rating						HB
0.059-in. 1.5-mm) Thickness			Rating						HB
0.118-in. (3.0-mm) Thickness			Rating						HB
ELECTRICAL									
Volume Resistivity (Tinfoil Electrodes)	D 257	IEC 93	ohm·cm	ohm·cm	1 E+15	1 E+13	1 E+15	1 E+13	1 E+15
Surface Resistivity	D 257	IEC 93	ohm	ohm	1 E+14	1 E+13	1 E+14	1 E+13	1 E+15
Dielectric Strength:	D 149	IEC 243-1							
0.118-in. Thickness			V/mil	kV/mm	914	914	36	36	762
Dielectric Constant (Tinfoil Electrodes):	D 150	IEC 250							
50 Hz					3.3	9.6	3.3	9.6	3.8
51 MHz					3.1	3.5	3.1	3.5	3.3
Dissipation Factor (Tinfoil Electrodes):	D 150								
50 Hz					0.01	0.15	0.01	0.15	
51 MHz					0.01	0.06	0.013	0.06	
Arc Resistance: Tungsten Electrodes	D 495		s						
Comparative Tracking Index			V			600			

* These items are provided as general information only. They are approximate values and are not part of the product specifications.
** For information on using melt flow as a quality control procedure, see LANXESS processing literature.
† Flammability results are based on small-scale laboratory tests for purposes of relative comparison and are not intended to reflect the hazards presented by this or any other material under actual fire conditions.
\# Type and quantity of pigment can affect mechanical properties, especially toughness.
a Relative temperature index is reported at 0.030-in. (0.75-mm) thickness.
b Natural color.

Glass-Reinforced

27	*Heat-Stabilized* BKV 15 H *15% Glass*				BKV 30 H *30% Glass*				BKV 40 H *40% Glass*				BKV 50 H *50% Glass*				*Toughened* BKV 35 Z *35% Glass*			
ISO	ASTM		ISO		ASTM		ISO		ASTM		ISO		ASTM		ISO		ASTM		ISO	
DAM	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND
1.09	1.23		1.23		1.36		1.36		1.46		1.46		1.57		1.57		1.41		1.41	
	0.044				0.049				0.053				0.057				0.051			
	22.5				20.4				19.0				17.6				19.6			
	0.003		0.003		0.003		0.002		0.003		0.003		0.003		0.002		0.003		0.003	
	0.009		0.009		0.009		0.009		0.008		0.008		0.007		0.007		0.008		0.009	
	1.3				1.0				0.85				0.80				0.90			
	2.5		2.7		2.1		2.1		1.8		1.8		1.5		1.5		1.9		1.9	
	8.5		8.5		7.0		7.0		6.0		6.0		5.0		5.0		6.5		6.5	
55																				
4																				
	18,900	10,200	135	70	26,100	14,500	180	110	29,000	17,400	195	130	30,500	21,800	220	145	26,800	16,700	185	105
>50	3	5	3	12	3	6	3	7	3	4	3	6	2	4	3	5	2	5	3	5
2,100	899	450	6,100	3,000	1,334	812	9,700	5,700	1,711	1,073	11,900	7,400	2,176	1,378	15,600	9,600	1,450	1,015	10,000	6,300
60			180	80			265	135			305	170			320	200			280	140
	29,000	17,400			40,600	26,400			47,900	29,000			50,800	31,900			43,500	26,100		
2,000	783	420	5,400	2,700	1,204	725	8,900	5,300	1,566	996	11,200	7,300	1,958	1,116	14,400	9,400	1,378	812	9,300	5,600
40.0	1.2	4.7	<10	14.0	2.2	2.8	15.0	25.0	2.0	3.6	18.0	24.0	3.1	3.7	20	25	3.0	3.6	17	25
15	1.0	1.0	<10	<10	1.9	1.9	10.0	10.0	2.5	2.5	13.0	11.0	2.5	2.5	13	14	2.2	2.2	12	12
50	392		195		392		200		392		200		392		205		392		200	
	419		215		419		215		419		215		419		215		419		210	
	65				120				120				120				130			
	65				95				95				95				95			
	65				130				140				140				130			
	HB				HB								HB				HB			
	HB				HB				HB				HB				HB			
	HB				HB				HB				HB				HB			
E+15	1 E+15	1 E+12	1 E+15	1 E+12	1 E+15	1 E+12	1 E+15	1 E+12	1 E+15	1 E+12	1 E+15	1 E+11	1 E+15	1 E+12	1 E+14	1 E+11	1 E+15	1 E+12	1 E+15	1 E+12
E+15	1 E+13	1 E+12	1 E+14	1 E+12	1 E+14	1 E+12	1 E+14	1 E+12	1 E+14	1 E+12	1 E+14	1 E+10	1 E+14	1 E+12	1 E+14	1 E+12	1 E+14	1 E+12	1 E+14	1 E+12
30	889	762	40	35	1,016	889	40	35	1,016	889	40	35	1,016	889	40	35	1,016	889	40	35
3.8	4	15	4	10	4	15	4	10	4	15	4	10	4		5	13	4	10	4	10
3.3	4	5	4	5	4	5	4	4	4	5	4	5	4	5	4	5	4	5	4	5
	0.005	0.50			0.005	0.50	0.011	0.235	0.01		0.005	0.20	0.01		0.014	0.270	0.005	0.20	0.005	0.20
	0.015	0.16			0.015	0.16	0.018	0.075	0.015	0.15	0.015	0.12	0.015	0.14	0.016	0.079	0.015	0.12	0.015	0.12
						76														
		425				400				375				375						

Notes

DAM (Dry as Molded) refers to a moisture content less than 0.2% by weight.

COND (Conditioned) refers to an equilibrium moisture content in a standard laboratory atmosphere or 73°F and 50% relative humidity.

Glass-Reinforced refers to reinforcement with glass fibers except in the case of BG 30 X, which is reinforced with glass fibers and glass beads.

Injection Molding Grades (continued)

Typical Properties* for Natural Resins	Test Method ASTM	Test Method ISO	Units ASTM	Units ISO	BKV 115 15% Glass ASTM DAM	BKV 115 15% Glass ASTM COND	BKV 115 15% Glass ISO DAM	BKV 115 15% Glass ISO COND	BKV 115 15% Glass ASTM DAM	BKV 115 15% Glass ASTM C
GENERAL										
Specific Gravity	D 792	ISO 1183			1.23		1.23		1.36	
Density	D 792		lb/in.^{3}		0.044				0.049	
Specific Volume	D 792		in.^{3}/lb		22.5				20.4	
Mold Shrinkage:	(LANXESS)	ISO 2577								
Flow Direction			in./in.	mm/mm	0.003		0.003		0.003	
Cross-Flow Direction			in./in.	mm/mm	0.009		0.009		0.009	
Water Absorption (0.125-in. Thickness):										
24-Hour Immersion	D 570		%		1.30				1.00	
Equilibrium (73°F)	(DIN 53495)									
In Air (50% RH)		ISO 62	%	%	2.3		2.5		1.8	
In Water	D 1238	ISO 62	%	%	8.5		8.5		7.0	
MECHANICAL										
Tensile Stress at Yield	D 638	ISO 527	lb/in.^{2}	MPa						
Tensile Elongation at Yield	D 638	ISO 527	%	%						
Tensile Stress at Break	D 638	ISO 527	lb/in.^{2}	MPa	18,900	9,400	120	65	23,200	14
Tensile Elongation at Break	D 638	ISO 527	%	%	7	9	4	15	4	
Tensile Modulus	D 638	ISO 527	lb/in.^{2}x10^3	MPa	827	421	5,700	2,800	1,305	
Flexural Stress at 5% Strain (ISO - 3.5% Strain)	D 790	ISO 178	lb/in.^{2}	MPa			160	65		
Flexural Strength	D 790	ISO 178	lb/in.^{2}	MPa	26,700	14,500			37,700	21
Flexural Modulus	D 790	ISO 178	lb/in.^{2} x10^3	MPa	710	362	5,000	2,250	1,160	
Impact Strength, Notched Izod:	D 256	ISO 180/1A								
0.125-in. Thickness, 73°F			ft·lb/in.	kJ/m^2	2.2	5.6	<10	15.0	3.4	
0.125-in. Thickness, -40°F			ft·lb/in.	kJ/m^2	1.2	1.2	<10	<10	2.2	
THERMAL										
Deflection Temperature, Unannealed:	D 648	ISO 75								
0.157-in. Thickness										
264-psi (1.81-MPa) Load			°F	°C	374		190		392	
66-psi (0.45-MPa) Load			°F	°C	410		205		419	
Relative Temperature Index at 0.059-in. Thickness	(UL7468)									
Electrical			°C						130	
Mechanical with Impact			°C						95	
Mechanical without Impact			°C						130	
FLAMMABILITY†										
UL94 Flame Class:	(UL94)									
0.030-in. (0.75-mm) Thickness			Rating						HB	
0.033-in. (0.83-mm) Thickness			Rating							
0.059-in. 1.5-mm) Thickness			Rating		HB#				HB	
0.118-in. (3.0-mm) Thickness			Rating						HB	
ELECTRICAL										
Volume Resistivity (Tinfoil Electrodes)	D 257	IEC 93	ohm·cm	ohm·cm	1 E+15	1 E+12	1 E+15	1 E+12	1 E+15	1
Surface Resistivity	D 257	IEC 93	ohm	ohm	1 E+13	1 E+12	1 E+14	1 E+13	1 E+14	1
Dielectric Strength:	D 149	IEC 243-1								
0.118-in. Thickness			V/mil	kV/mm	1,016		35	35	1,016	
Dielectric Constant (Tinfoil Electrodes):	D 150	IEC 250								
50 Hz							4	18	4	
51 MHz							4	5	4	
Dissipation Factor (Tinfoil Electrodes):	D 150									
50 Hz							0.008	0.215	0.005	
51 MHz							0.02	0.13	0.015	
Arc Resistance: Tungsten Electrodes	D 495		s							
Comparative Tracking Index			V			600				

* These items are provided as general information only. They are approximate values and are not part of the product specifications.

† Flammability results are based on small-scale laboratory tests for purposes of relative comparison and are not intended to reflect the hazards presented by this or any other material under actual fire conditions.

\# Type and quantity of pigment can affect mechanical properties, especially toughness.

a Relative temperature index is reported at 0.030-in. (0.75-mm) thickness.

b Natural color.

Glass-Reinforced											Mineral Filled			
Impact-Modified														
BKV 130			BKV 140				BG 30 X				BM 230 H			
30% Glass			*140% Glass*				*30% Glass-Fiber,Bead*				*30% Mineral*			
	ISO		ASTM		ISO		ASTM		ISO		ASTM		ISO	
OND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND	DAM	COND
	1.36		1.46				1.35		1.35		1.36		1.36	
			0.053				0.049				0.049			
			19.0				20.5				20.4			
	0.003		0.003		0.002		0.007		0.004		0.012		0.012	
	0.008		0.008		0.007		0.008		0.010		0.012		0.012	
			0.85				1.00				0.80			
	2.0		1.6				2.1		2.1		2.0		2	
	7.0		6.0				7.0		7		6.0		6	
4,500	160	100	26,100	17,400	185	120	18,100	9,400	1.25	65	11,600	7,300	80	50
7	4	8	3	6	4	8	4	9	4	10	10	45	10	45
725	9,200	5,100	1,595	1,015	11,500	6,500	899	507	6,400	3,200	725	232	5,000	1,600
	230	115			280	145			175	80			135	55
1,800			43,500	27,600			28,300	16,000			20,300	8,700		
682	8,000	4,600	1,479	914	10,400	6,200	798	406	5,800	2,800	667	261	4,600	1,800
4.1	17.0	27.0	4.1	4.9	20.0	30.0	1.1	2.6	<10	10	1.3	1.7	<10	10
2.2	10.0	10.0	2.6	2.6	16.0	16.0	0.9	0.9	<10	<10	0.7	0.7	10.0	<10
	200		392		200		356		180		194		90	
	210		419		210		392		200		374		190	
							120				65			
							90				65			
							125				65			
							HB				HB[b]			
			HB[#]				HB				HB[b]			
							HB				HB[b]			
E+12	1 E+15	1 E+12	1 E+15	1 E+11	1 E+15		1 E+15	1 E+12	1 E+15	1 E+12	1 E+15	1 E+11	1 E+15	1 E+11
E+12	1 E+14	1 E+13	1 E+14	1 E+10	1 E+15		1 E+16	1 E+13	1 E+15	1 E+12	1 E+14	1 E+12	1 E+14	1 E+12
889	40	40	1,016	889	40		889	889	35	30	889	889	35	35
10	4	13	4	10	4		4.5	10	4	15	5	15	5	15
5	4	5	4	5	4		4	5	4	5	4	4	4	4
0.20	0.009	0.175	0.005	0.20	0.007		0.015	0.20	0.0165	0.35				
0.12	0.019	0.09	0.015	0.12	0.02		0.02	0.06	0.0185	0.098	0.015	0.07	0.015	0.07
87				91				110						
600				575				450				575		

Notes

DAM (Dry as Molded) refers to a moisture content less than 0.2% by weight.

COND (Conditioned) refers to an equilibrium moisture content in a standard laboratory atmosphere or 73°F and 50% relative humidity.

Glass-Reinforced refers to reinforcement with glass fibers except in the case of BG 30 X, which is reinforced with glass fibers and glass beads.

Injection Molding Grades (continued)

Typical Properties* for Natural Resins	Test Method ASTM	Test Method ISO	Units ASTM	Units ISO	Mineral Filled BM 240 H 40% Mineral ASTM DAM	ASTM COND	ISO DAM	ISO COND	DAM
GENERAL									
Specific Gravity	D 792	ISO 1183			1.46		1.46		
Density	D 792		lb/in.^{3}		0.053				
Specific Volume	D 792		in.^{3}/lb		19.0				
Mold Shrinkage:	(LANXESS)	ISO 2577							
Flow Direction			in./in.	mm/mm	0.010		0.012		
Cross-Flow Direction			in./in.	mm/mm	0.010		0.013		
Water Absorption (0.125-in. Thickness):									
24-Hour Immersion	D 570		%		0.70				
Equilibrium (73°F)	(DIN 53495)								
In Air (50% RH)		ISO 62	%	%	1.8		1.8		
In Water	D 1238	ISO 62	%	%	6.0		6		
MECHANICAL									
Tensile Stress at Break	D 638	ISO 527	lb/in.^{2}	MPa	12,300	7,300	85	55	10,200
Tensile Elongation at Break	D 638	ISO 527	%	%	9	35	10	35	18
Tensile Modulus	D 638	ISO 527	lb/in.^{2}x10^3	MPa	870	290	5,800	2,000	638
Flexural Stress at 5% Strain (ISO - 3.5% Strain)	D 790	ISO 178	lb/in.^{2}	MPa			145	50	
Flexural Strength	D 790	ISO 178	lb/in.^{2}	MPa	22,500	9,400			18,900
Flexural Modulus	D 790	ISO 178	lb/in.^{2} x10^3	MPa	783	261	5,600	1,900	609
Impact Strength, Notched Izod:	D 256	ISO 180/1A							
0.125-in. Thickness, 73°F			ft·lb/in.	kJ/m^2	1.2	1.5	<10	<10	2.1
0.125-in. Thickness, -40°F			ft·lb/in.	kJ/m^2	0.7	0.7	<10	<10	0.8
THERMAL									
Deflection Temperature, Unannealed:	D 648	ISO 75							
0.157-in. Thickness									
264-psi (1.81-MPa) Load			°F	ºC	221		90		
66-psi (0.45-MPa) Load			°F	ºC	392		200		
Relative Temperature Index at 0.059-in. Thickness	(UL7468)								
Electrical			ºC		65				
Mechanical with Impact			ºC		65				
Mechanical without Impact			ºC		65				
FLAMMABILITY†									
UL94 Flame Class:	(UL94)								
0.030-in. (0.75-mm) Thickness			Rating		HB[b]				
0.059-in. 1.5-mm) Thickness			Rating		HB[b]				
0.118-in. (3.0-mm) Thickness			Rating		HB[b]				
ELECTRICAL									
Volume Resistivity (Tinfoil Electrodes)	D 257	IEC 93	ohm·cm	ohm·cm	1 E+15	1 E+11	1 E+15	1 E+11	1 E+14
Surface Resistivity	D 257	IEC 93	ohm	ohm	1 E+14	1 E+12	1 E+15	1 E+12	1 E+14
Dielectric Strength:	D 149	IEC 243-1							
0.118-in. Thickness			V/mil	kV/mm	889	889	35	38	889
Dielectric Constant (Tinfoil Electrodes):	D 150	IEC 250							
50 Hz					5	15	4	14	5
51 MHz					4	4	4	5	4
Dissipation Factor (Tinfoil Electrodes):	D 150								
50 Hz						0.025	0.011		
51 MHz					0.015	0.10	0.015		0.025
Arc Resistance: Tungsten Electrodes	D 495		s						
Comparative Tracking Index			V			575			

* These items are provided as general information only. They are approximate values and are not part of the product specifications.
† Flammability results are based on small-scale laboratory tests for purposes of relative comparison and are not intended to reflect the hazards presented by this or any other material under actual fire conditions.
\# Type and quantity of pigment can affect mechanical properties, especially toughness.
a Relative temperature index is reported at 0.030-in. (0.75-mm) thickness.
b Natural color.

				Mineral/Glass-Reinforced								Transparent			
Impact-Modified Heat-Stabilized															
BM 230 ZH *30% Mineral*				**BM 30 X** *30% Glass/Mineral*				**BM 40 X** *40% Glass/Mineral*				**T 40** *35% Glass*			
ASTM		**ISO**		**ASTM**		**ISO**		**ASTM**		**ISO**		**ASTM**		**ISO**	
	COND	**DAM**	**COND**	**DAM**	**COND**	**DAM**	**COND**	**DAM**	**COND**	**DAM**	**COND**	**DAM**	**COND**	**DAM**	**COND**
1.36		1.36		1.38		1.38		1.46		1.46		1.18		1.80	
0.049				0.050				0.053				0.043			
20.4				20.0				19.0				23.5			
0.012		0.012		0.005		0.005		0.005		0.005		0.006		0.006	
0.012		0.012		0.009		0.009		0.009		0.009		0.006		0.006	
0.70												0.5			
1.8		2.2		2.0		2.0		1.8		2		2		2	
6.0				6.0		6		6.0		6		6		6	
0	8,000	75	50	17,400	9,400	120	65	18,900	13,100	120	70	9,400	8,000	70	55
	55	15	>50	3.5	13	3	13	3	7	8	14	55	>100	25	>50
	232	4,900	1,600	972	493	6,700	3,400	1,160	798	7,700	3,700	435	478	3,000	3,300
		120	40			175	80			185	90			105	110
0	7,300			27,600	14,500			29,000	17,400			21,800	18,800		
	203	4,700	1,500	809	406	6,200	2,800	942	493	7,100	3,500	420	478	3,000	3,300
	4.3	<10	12	1.2	1.9	<10	<10	1.1	1.9	<10	13	1.5	1.1	<10	<10
	0.8	<10	<10	0.7	0.7	<10	<10	0.7	0.7	<10	<10	0.9	0.9	<10	<10
194		90		374		190		392		200		225		107	
374		190		428		220		428		220		244		118	
65				65				120				65			
65				65				95				65			
65				65				130				65			
				HB				HB				V-2[b]			
HB[b]				HB				HB				V-2[b]			
HB[b]				HB				HB				V-2[b]			
4	1 E+12	1 E+14	1 E+12	1 E+15	1 E+12	1 E+14	1 E+13					1 E+15	1 E+16	1 E+15	1 E+16
4	1 E+14	1 E+14	1 E+14	1 E+16	1 E+13	1 E+14	1 E+13					1 E+15	1 E+16	1 E+15	1 E+16
	889	35	35	889	889	40	40					635	711	25	28
	15	5	15	4.5	10	5	15	5	15	5	15			4	5
	4.5	4.0	4.5	4	5	4	4.5							4	4
				0.015	0.20									0.04	0.048
5	0.075	0.025	0.075	0.02	0.06	0.007	0.02							0.09	0.11
					110										
	600				450				500						

Notes

DAM (Dry as Molded) refers to a moisture content less than 0.2% by weight.

COND (Conditioned) refers to an equilibrium moisture content in a standard laboratory atmosphere or 73°F and 50% relative humidity.

Glass-Reinforced refers to reinforcement with glass fibers except in the case of BG 30 X, which is reinforced with glass fibers and glass beads.

Durethan® Polyamide 6 Resins

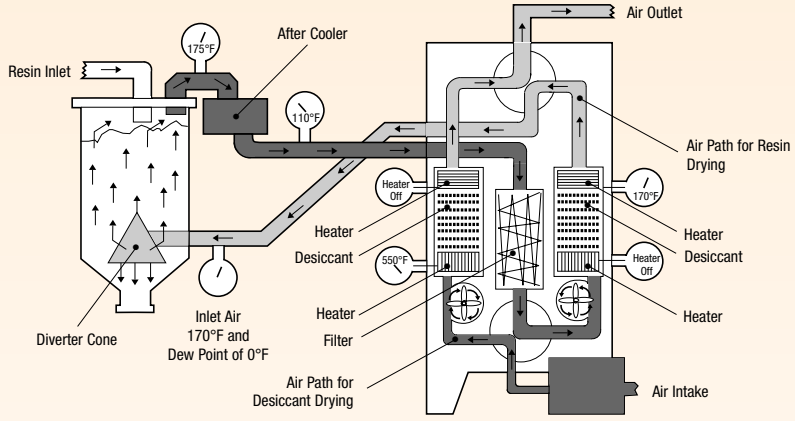
Drying Conditions

Recommended Desiccant Dehumidifying Hopper Dryer Operating Conditions

Hopper Capacity	Drying Time	Air Flow	Dew Point of Hopper Inlet Air	Hopper Inlet Air Temperature	Return Air Temperature	Moisture Content of Dried Resin
4 times molding machine throughput Running 100 lb per hour: 4 X 100 = 400 lb	Durethan resin is delivered DRY in evacuated containers and is ready for processing.*	1.0 cfm per lb of resin per hr Running 100 lb per hour for 4 hr: 100 X 1 = 100 cfm	0°F	170°-180° F (Max)	<150°F	<0.12%

*Using open containers, regrind, and/or color concentrates may require as much as 72 hours to ensure proper drying.

Desiccant Dehumidifying Hopper Dryer System Airflow



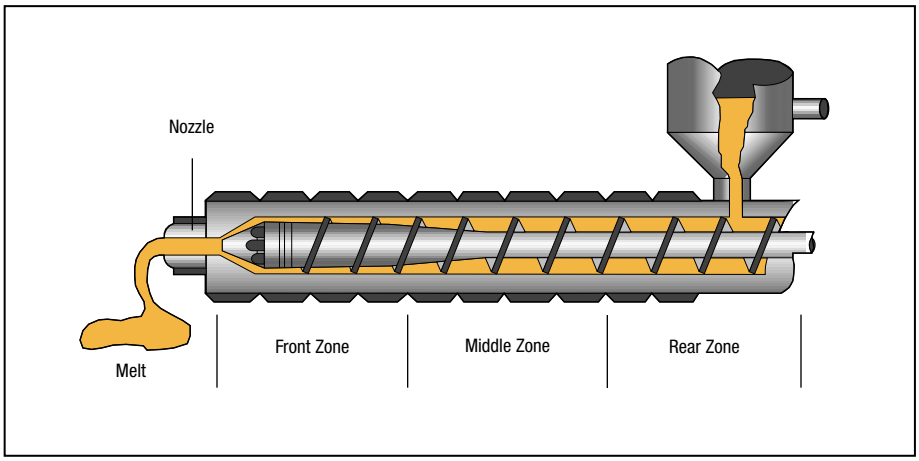
A properly maintained dryer system can give:

1. Consistent dry resin
2. Higher yields
3. Improved stream time which can yield greater profit

Troubleshooting the Dehumidifying Hopper Dryer When the Molding Material Is Not Dry

Improper Drying Condition	Drying Equipment Defect	Possible Corrective Action
Poor Dew Point Check inlet air to hopper with a dew-point meter (the only sure way to check dryness). Dew point greater than 0°F is poor.	1. Dirty filter(s). 2. Saturated desiccant. 3. Excessive return air temperatures. 4. Burned-out heater(s). 5. Contamination or worn-out desiccant. 6. Bad heater thermostat or thermocouple. 7. Malfunctioning regeneration cycle timer. 8. Air-control butterfly valves not seating. 9. Moist room air leaking into the dry process air. 10. Desiccant beds not switching.	1. Clean or replace filter(s). 2. Dry cycle machine for several complete cycles. Saturated dessicant is a common problem with machines that are not in continuous use. 3. Add after-cooler on return airline. 4. Repair or replace heater. 5. Replace dessicant. 6. Repair or replace thermostat/thermocouple. 7. Adjust or replace timer. 8. Adjust valve seating. 9. Check all hose connections and tighten as required; check all hoses for leaks and replace as needed; check filter covers for secure fit and tighten as required. 10. Check electrical connections; check switching mechanisms.
Material Residence Time in Hopper Too Short. (x hours minimum)	1. Dryer hopper too small for the amount of material being processed per hour. 2. Not keeping hopper at least 2/3 filled.	1. Use a large drying hopper. 2. Keep drying hopper filled.
Incorrect Process Air Temperature.	1. Incorrect drying temperature. 2. Dryer temperature controller malfunction. 3. Thermocouple malfunction. 4. Faulty process heating elements. 5. Supply voltage different than required heater voltage. 6. Non-insulated inlet-air hose. 7. Excessive change-over temperature.	1. Dial-in correct temperature, 170°F–180°F (Max). 2. Repair or replace controller. 3. Repair or replace thermocouple. 4. Repair or replace heating elements. 5. Check supply voltage against nameplate voltage. 6. Repair or replace inlet-air hose. 7. Insufficient reactivation air flow.
Insufficient Inlet Air Flow Good dew point but still have wet resin. (1.0 cfm x hourly throughput rate.)	1. Dirty or clogged filter(s). 2. Incorrect blower rotation. 3. Obstruction in air ducts.	1. Clean or replace filter(s). 2. Change blower rotation. (See equipment manufacturer's electrical instructions.) 3. Remove air duct obstruction.

Temperature Zones/Machine Cross Section



Temperature Settings

Grade	Zone					
	Rear	Middle	Front	Nozzle	MELT*	Mold
B30S/B31SK/B40SK	470˚-480˚F	480˚-500˚F	500˚-520˚F	520˚-535˚F	**480˚-520˚F**	175˚-250˚F
BC30/40/304/KU2-2327	490˚-500˚F	500˚-520˚F	520˚-535˚F	520˚-535˚F	**500˚-535˚F**	160˚-195˚F
BKV15H/30H/40H/50H	470˚-480˚F	480˚-510˚F	510˚-535˚F	520˚-535˚F	**500˚-535˚F**	160˚-230˚F
BKV115/130/140 BM30X/40X	470˚-480˚F	480˚-500˚F	500˚-520˚F	520˚-535˚F	**520˚-550˚F**	160˚-230˚F

*Using open containers, regrind, and/or color concentrates may require as much as 72 hours to ensure proper drying.

Note: Before molding, you must read the LANXESS publication, *A Processing Guide for Injection Molding Durethan Polyamide.* This publication is merely a summary and must not be used as a substitute for reading the complete processing guide.

Start-Up Considerations

The start-up procedure for all grades of Durethan polyamide resin is to:

- Set barrel temperature to processing conditions. After set temperature is reached, allow 1/2 hour minimum soak time before rotating the screw.
- Read the Material Safety Data Sheet and shipping container label for more information.

Shutdown Considerations

Short-Term Shutdown

For shutdowns limited to a period of 4 to 6 hours:

- Shut off the hopper feed.
- Purge the machine until it is empty, or make shots until no material remains in the machine.
- Move the screw forward.
- Lower all heat zones on the cylinder and nozzle to 300˚F.

Long-Term Shutdown

For a shutdown exceeding 6 hours or extending to several days:

- Shut off the hopper feed.
- Flush the machine with general-purpose polystyrene, and purge it until it is empty.
- Leave the screw forward in the cylinder.
- Turn off all heat zones.

Regrind

For all grades of Durethan polyamide resin, up to 10% regrind can be used with virgin material, depending on the end-use requirements of the molded part and provided that the material is kept free of contamination and is properly dried. No regrind is permissible where resin properties (e.g., impact strength) equal to virgin resin are required.

Consult the LANXESS publication, *A Processing Guide for Injection Molding Durethan Polyamide*, for details.

Health and Safety Information
Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the LANXESS products mentioned in this publication. For materials mentioned which are not LANXESS products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be followed. Before working with any of these products, you must read and become familiar with the available information on their hazards, proper use, and handling. This cannot be overemphasized. Information is available in several forms, *e.g., material safety data sheets and product labels*. Consult your LANXESS Corporation representative or contact the Product Safety and Regulatory Affairs Department at LANXESS.

Regulatory Compliance Information
Some of the end uses of the products described in this publication must comply with applicable regulations, such as the FDA, NSF, USDA, CPSC and BfR. If you have any questions on the regulatory status of these products, contact your LANXESS Corporation representative or Regulatory Affairs Manager at LANXESS.

As with any product, use of the products mentioned in this publication in a given application must be tested (including field testing, etc.) by the user in advance to determine suitability.

These items are provided as general information only. They are approximate values and are not considered part of the product specifications.

Note: The information contained in this publication is current as of June 2005. Please contact LANXESS Corporation to determine if this publication has been revised.

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