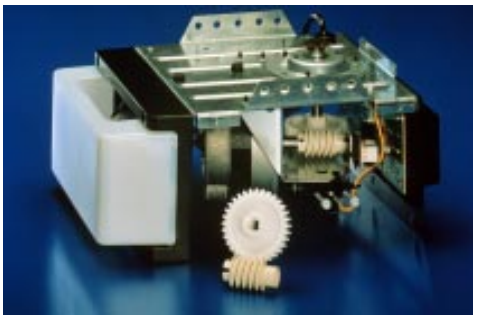
Product and Properties Guide

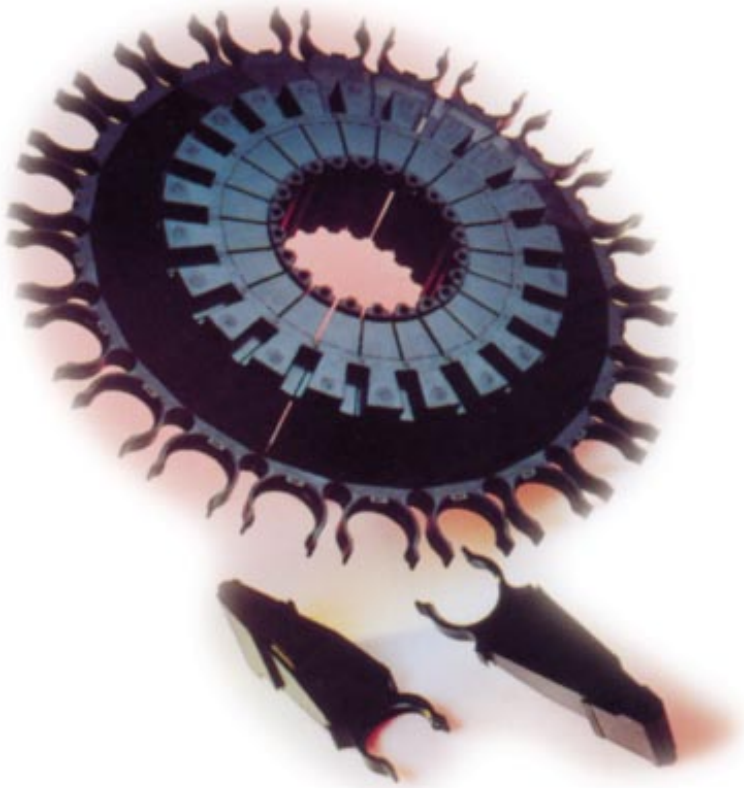
DuPont Engineering Polymers



Delrin® acetal resin

Delrin® P performance acetal resin

Delrin® “ELEVEN Series” acetal resin



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General Description

Delrin®, the world's first acetal resin, is a highly versatile engineering polymer. It offers an excellent balance of desirable properties that bridges the gap between metals and ordinary plastics. Since its introduction in 1960, it has been widely used around the world in many applications, such as in the automotive, appliance, construction, hardware, electronic, and consumer goods industries. Delrin® has gained widespread recognition for its reliability and performance in thousands of engineering components. Delrin® is the DuPont registered trademark for its brand of acetal resin also commonly referred to as polyoxymethylene (POM).

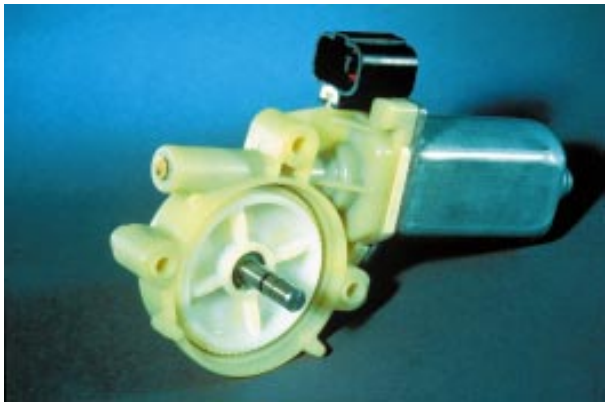

Figure 1. Windowlift motors installed in Ford Taurus and Mercury Sable automobiles use gears made of Delrin® 100. Courtesy of UTA Motor Systems.

Properties and Characteristics

The chemical composition, regular molecular-structure and high degree of crystallinity result in a unique combination of outstanding characteristics of Delrin® acetal resins not found in metals or most other plastics:

- High mechanical strength and rigidity
- Toughness and high resistance to repeated impacts
- Long-term fatigue endurance
- Excellent resistance to moisture, gasoline, solvents, and many other neutral chemicals
- Excellent dimensional stability
- Good resilience and resistance to creep
- Natural lubricity
- Wide end-use temperature range
- Good electrical insulating characteristics

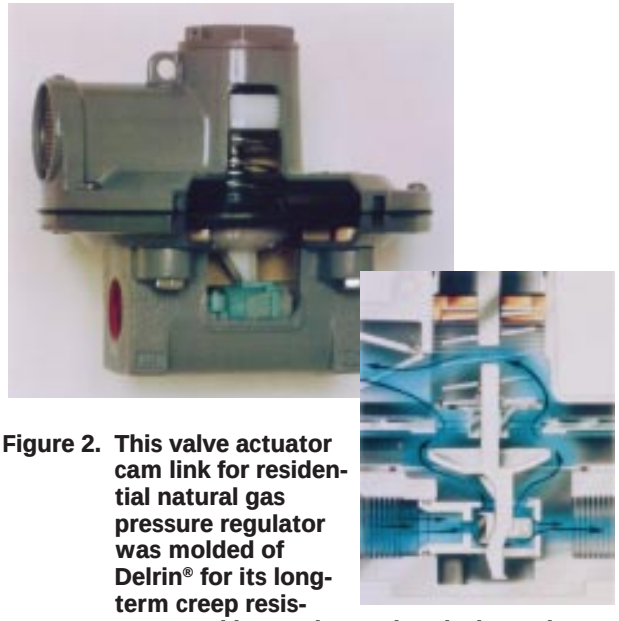

Figure 2. This valve actuator cam link for residential natural gas pressure regulator was molded of Delrin® for its long-term creep resistance and immunity to chemical attack. Courtesy of Fisher Control International, Inc.

Compositions

General purpose grades of Delrin® are available in several basic melt flow series: 100, 500, 900, and 1700. These differ primarily in melt viscosity with 100 being the most viscous and 1700 the most fluid. The most appropriate grade for a given application will depend largely upon fill requirements and end-use properties.

The original Classic grades introduced by DuPont in 1960 continue to be an important part of the Delrin® product line. Delrin® 100, 500 and 900 are known around the world for their outstanding mechanical properties.

In 1992, DuPont introduced a major upgrade to the Delrin® product line known as the "P" products. These revolutionary new formulations provide significant benefits to the molding community, while retaining the superior physical characteristics that Delrin® has always been noted for.

Major benefits include excellent thermal stability, wider processing windows, low mold and screw deposit, minimal mold corrosion, and outstanding regrind stability. The "P" products are offered throughout the range of melt viscosities: Delrin® 100P, 500P, 900P and 1700P.

The newest major addition to the Delrin® product family is the "ELEVEN Series," introduced in 1996. The new Delrin® "ELEVEN Series" essentially combines the outstanding mechanical properties of the classic grades with the excellent thermal stability of the Delrin® P grades. In addition, the Delrin® "ELEVEN Series" is modified to provide enhanced crystallization: faster cycle times, lower mold shrinkage, less warpage, reduced voids, and greater mold dimensional stability. The more crystalline nature results in even greater stiffness and strength, as well as more stability and less permeation in prolonged immersion in many chemicals, including water, fuels, and oils. The "ELEVEN Series" is also offered in a range of melt viscosities: Delrin® 111P, 511P and 911P.

Figure 3. Excellent surface appearance and superior impact behavior were benefits gained from molding this safety belt housing from a UV-stabilized grade of Delrin®. Courtesy of KKF Karl Fells GmbH & Co.

A wide range of specialty grades of Delrin® acetal resin are available to meet specific customer needs for demanding applications:

- Toughened and super tough resins
- UV-stabilized grades
- Low friction and low wear grades
- Glass-filled and glass-reinforced grades
- Extrusion resins

A complete listing of general purpose Delrin® and Delrin® specialty products can be found in **Table 1**.

Colors

A number of standard colors are available at a minimum order quantity of 25 kg (55.1 lb). Fully compounded custom colors are available for most of the Delrin® products at a minimum order quantity of 1000 kg (2,200 lb). All standard and custom colors of Delrin® acetal resin are free of heavy metals.

Compared with masterbatch coloring, fully compounded resin colors give the best possible overall offering due to careful pigment selection.

Accurate metering and uniform pigment dispersion during the production process guarantee consistent color quality and optimal physical properties of the molded part, thus avoiding color variations and part failures which may occur with the use of masterbatches.

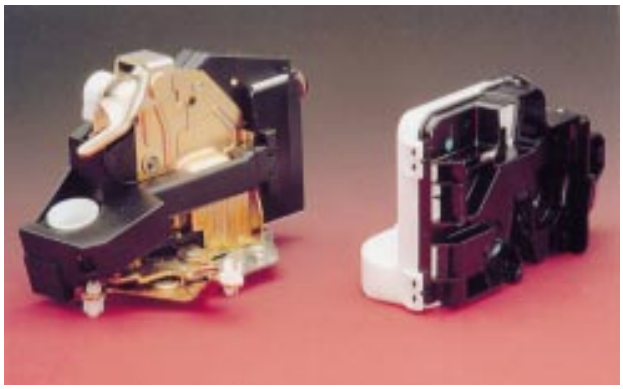

Figure 4. Cost reduction due to one-piece molding, lower weight, no rush and design versatility are some advantages for molding these door lock housings of Delrin® 100. Courtesy of Mercedes-Benz.

As a consequence of their enhanced stability, Delrin® P and the Delrin® "ELEVEN Series" have better colorability and allow for the use of a wider range of pigments. Colored resins may show slightly different properties compared with natural resins, especially for crystallinity and shrinkage. In some cases, such effects can be minimized by appropriate pigment selection.

Processing

The most commonly used method for processing Delrin® is injection molding. The surface finish of correctly molded parts of Delrin® replicate the surface finish and shape of the mold. Standard extrusion equipment can be used to extrude the resin into rods, slabs, sheeting, and small diameter tubing. Parts or stock shapes can be machined or stamped.

Consult the Delrin® Molding Guide for detailed recommendations on optimum molding.

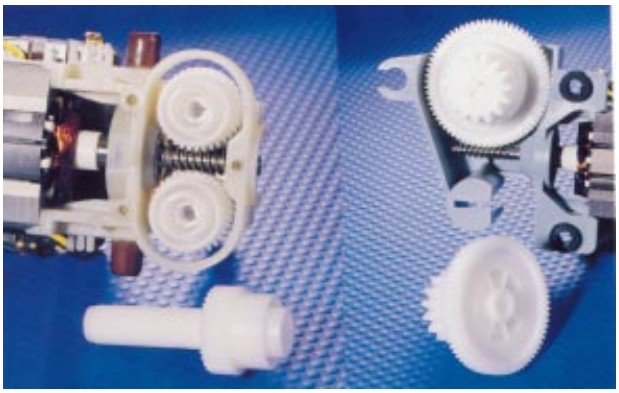

Figure 5. Gears for hand mixers and bread slicer motors molded of Delrin® 100 for reliability under harsh conditions and heavy load. Courtesy of Elektrogeräte Suhl A.G.

Applications

Automotive

- Fuel system components (gas caps, floats, pump housings, senders)
- Heavy load-bearing gears (window lifts, windshield wipers)
- Fasteners
- Window/door hardware
- Safety system components (buckles, seatbelt hardware, spools, guidetracks, clock springs)
- Loudspeaker grilles
- Control switches
- Interior trim
- Steering components
- Pillar loops

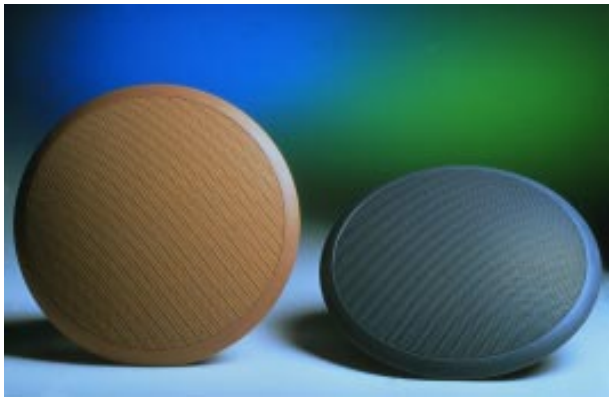

Figure 6. Sound system speaker grilles for a Jeep Cherokee made of Delrin® 1727UV. Courtesy of Chrysler Corporation.

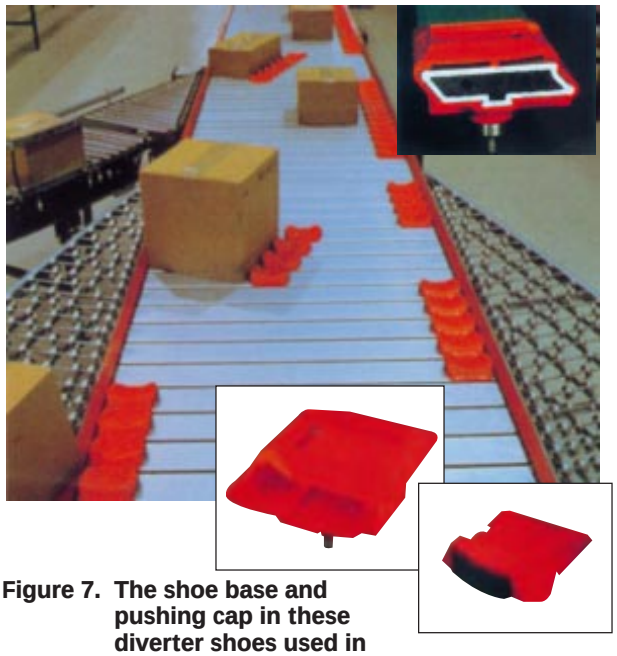

Figure 7. The shoe base and pushing cap in these diverter shoes used in high speed package sorting are molded from Delrin® 500. Courtesy of Rapistan Demag Corporation.

Industrial Equipment

- Wear surfaces: bushings, bearings, cams, pulleys
- Gas meters
- Gears: spur, cluster, helical, bevel, worm
- Conveyors: flat top conveyor chain, wear strips, conveyor links
- Pump impellers: submersible, gear, centrifugal, proportioning, reinforced diaphragms, jet well
- Fan and blower blades
- Pumps and beverage valves
- Farm machinery
- Irrigation sprinkler components
- Shower heads
- Hose couplings
- Water meter components

Figure 8. The spray system in this garden sprinkler was molded of Delrin® acetal resin for superior wear, UV stability, and the best properties for snap-fitting the sprinkler head. Courtesy of PLASTECH.

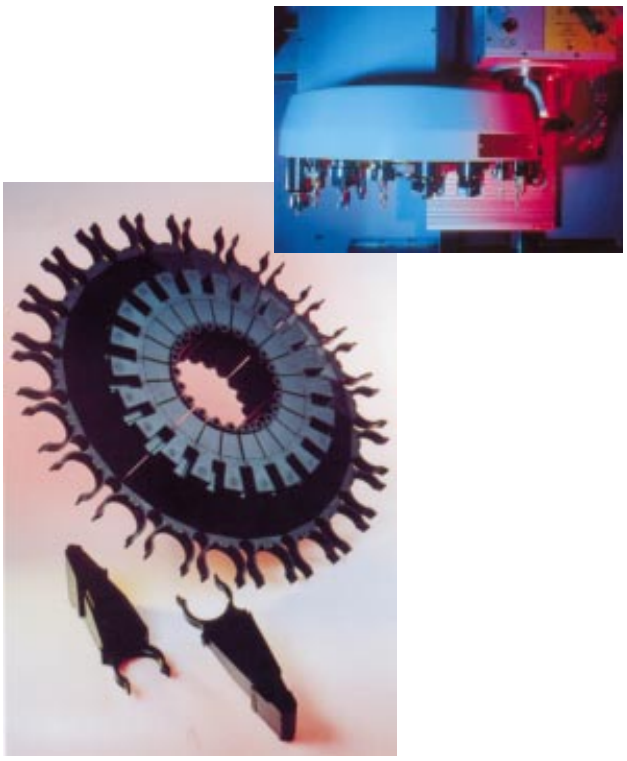

Figure 9. This tool changer carousel is comprised of 22 identical components made from Delrin® 100 acetal resin for the best balance of stiffness and strength coupled with flex fatigue resistance needed for the spring fingers of the tool gripper. Courtesy of Bridgeport Machines Ltd.

Figure 10. Six parts injection molded from Delrin® play key roles in water-saving spa™ 2001 Shower heads with adjustable spray and massaging action. Courtesy of Energy Technology Laboratories.

Consumer Goods and Appliances

- Lighter bodies
- Pen components
- Zippers
- Clips, fasteners, buckles
- Window and drapery hardware
- Chair coasters, rollers
- Appliance components (gears, knobs)
- Garden chemical sprayers
- Household water softeners
- Soap dispensers
- Paint mixing paddles, canisters
- Scrubbing discs on power rug cleaners
- Hot air: heater blowers, clothes dryers, automotive light sockets, 35 mm slide projector parts
- Garage door opener components
- Ski bindings and straps
- Knife handles
- Gears (toys)
- Roller-skate brake supports
- Salt water: marine fittings, fishing reels
- Faucet aerators
- Lawn sprinklers
- Garden hose nozzles
- Ballcocks
- Toilet flush valves
- Faucet valve cartridges

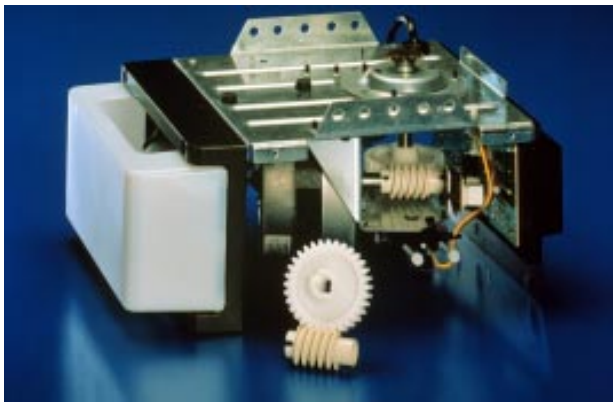

Figure 11. This ceiling-mounted garage door opener uses a worm gear molded from Delrin® 100, which provides the mechanical strength and excellent compatibility for low friction and wear. Courtesy of the Chamberlain Group.

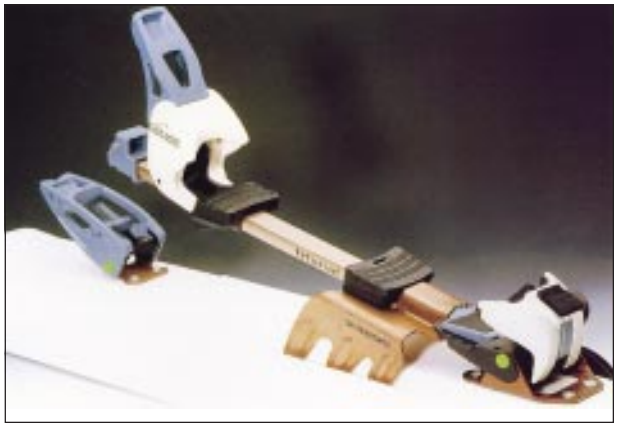

Figure 12. This touring binding utilizes a UV-stabilized grade of Delrin® and Delrin® 500AF for the impact resistance at low temperature, Good UV stability and long-life cycle. Courtesy of Fritschi A.G.

Electrical and Office Automation

- Gears: spur, cluster, helical, bevel, worm
- Laser printer gear trains
- Video tape drives
- Switches
- Coil forms
- Telephone terminal strips
- Relay components, buttons, and knobs
- Audio and video tape cartridge platforms and wear parts
- Electromechanical counter frames

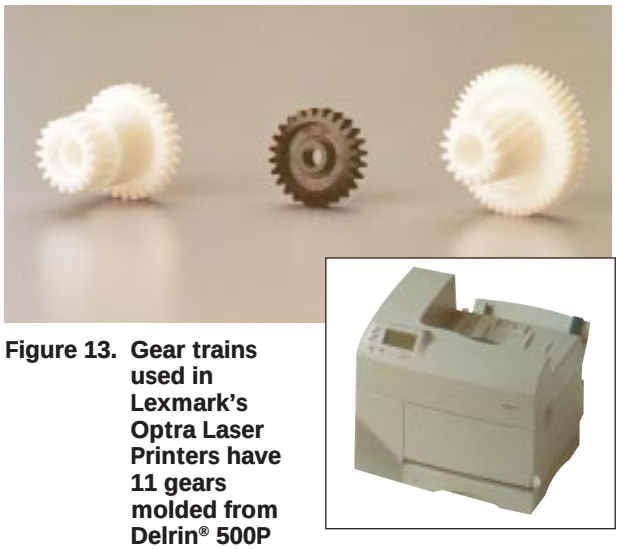

Figure 13. Gear trains used in Lexmark's Optra Laser Printers have 11 gears molded from Delrin® 500P and Delrin® CL.

Figure 14. These components for pressure regulators in solenoid valves and electromagnetic devices were molded of Delrin® acetal resin. Courtesy of Honeywell Lucifer SA.

Table 1
General Purpose and Specialty Grades of Delrin®

Delrin® Grade	Process	Characteristics	Typical Applications
COMPOSITIONS OF GENERAL PURPOSE GRADES			
100	Injection molding, extrusion	High-viscosity resin, best combination of stiffness and toughness, very good creep resistance	High performance engineering parts, e.g., gears, seatbelt restraint systems, fasteners, conveyors
100P	Injection molding, extrusion	Same as Delrin® 100, best molding thermal stability for deposit-free molding in demanding processing conditions	Same as Delrin® 100
111P	Injection molding, extrusion	Same as Delrin® 100P, but modified for enhanced crystallization and more precise molding	Same as Delrin® 100, plus fuel system components
500	Injection molding	Medium viscosity resin. Optimum combination of flow and physical properties	General mechanical parts, automotive fuel systems, snap-fits, fasteners, gears
500P	Injection molding	Same as Delrin® 500, best molding thermal stability for deposit-free molding in demanding processing conditions	Same as Delrin® 500
511P	Injection molding	Same as Delrin® 500P, but modified for enhanced crystallization, and more precise molding	Same as Delrin® 500, plus fuel system components
900	Injection molding	Low-viscosity resin	Multicavity molds and parts with thin sections difficult to fill
900P	Injection molding	Low-viscosity, fast molding, best molding thermal stability for deposit-free molding in demanding processing conditions	Same as Delrin® 900
911P	Injection molding	Same as Delrin® 900P, but modified for enhanced crystallization and more precise molding	Same as Delrin® 900, plus fuel system components
1700P	Injection molding	Very low viscosity, fast molding resin, best molding thermal stability for deposit-free molding in demanding situations	Parts with complex shapes, thin walls, long flow paths, or multicavity tools.
COMPOSITIONS OF SPECIALTY GRADES			
TOUGHENED GRADES			
100ST	Injection molding, extrusion	Super tough, high-viscosity resin, outstanding resistance against repetitive impact, even at very low temperature	Fasteners, lock systems
500MT	Injection molding	Moderately toughened resin, with higher level of toughener than Delrin® 500T; improved thermal stability in processing	Fasteners, gears
500T	Injection molding	Toughened medium viscosity resin, optimizing flow properties and impact performance	Fasteners, gears

(continued)

Table 1 (continued)
General Purpose and Specialty Grades of Delrin®

Delrin® Grade	Process	Characteristics	Typical Applications
LOW FRICTION AND WEAR GRADES			
500AL	Injection molding	Advanced lubricant system, very good low-friction and low-wear properties	Gears, drive trains, sliding devices
500CL	Injection molding	Chemically lubricated Delrin® 500, very good low-friction and low-wear properties	Gears, drive trains, sliding devices
100AF	Injection molding, extrusion	Delrin® 100 with 20% Teflon® PTFE* fibers, outstanding friction and wear properties	Specialty friction and wear applications, conveyor systems
500AF	Injection molding	Delrin® 500 with 20% Teflon® PTFE fibers, outstanding friction and wear properties	Specialty friction and wear applications, conveyor systems
520MP	Injection molding	Delrin® 500P with 20% Teflon® PTFE micropowder, with low-wear and low-friction properties	Specialty friction and wear applications
510MP	Injection molding	Delrin® 500P with 10% Teflon® PTFE micropowder, with low-wear and low-friction properties	Specialty friction and wear applications
500TL	Injection molding	Delrin® 500 with 1.5% Teflon® powder, low friction and wear properties	Specialty friction and wear applications, conveyor systems
900SP	Injection molding	Delrin® 900P with special polymer additive for low wear/low friction against itself and other plastics	Gears, drive trains, sliding devices
100KM	Injection molding	Delrin® 100P modified with Kevlar® aramid resin for abrasive wear reduction	Specialty friction and wear applications
HIGHER STIFFNESS			
570NC	Injection molding	20% glass-filled medium-viscosity resin	General engineering parts for high stiffness
577BK	Injection molding	Delrin® 570 with carbon black for improved weathering	General engineering parts
510GR	Injection molding	10% glass-reinforced resin	Parts requiring high stiffness and strength
525GR	Injection molding	25% glass-reinforced resin	Parts requiring very high stiffness and strength

*Teflon® is a registered trademark of DuPont for its brand of fluoropolymer resin. Only DuPont makes Teflon®.

(continued)

Table 1 (continued)
General Purpose and Specialty Grades of Delrin®

Delrin® Grade	Process	Characteristics	Typical Applications
UV STABILIZED GRADES			
127UV	Injection molding	Delrin® 100P with UV stabilizer system	Automotive interior parts with maximum UV performance requirements, ski bindings, seatbelt restraint parts
527UV	Injection molding	Delrin® 500P with UV stabilizer system	Automotive interior parts with maximum UV performance requirements, interior trim, seatbelt restraint parts
927UV	Injection molding	Delrin® 900P with UV stabilizer system	Automotive interior parts; loudspeaker grilles
1727UV	Injection molding	Delrin® 1700P with UV stabilizer system	Automotive interior parts; loudspeaker grilles
EXTRUSION GRADES			
Delrin® II 150E	Extrusion	High-viscosity extrusion resin	Extruded rods and slabs for machining, tubes and sheets
Delrin® II 150SA	Extrusion	High-viscosity extrusion resin	Extruded rods and slabs for machining, tubes and sheets
Delrin® II 550SA	Extrusion	Medium-viscosity extrusion resin	Extruded rods and slabs for machining, tubes and sheets
CONCENTRATES			
500SC	Injection molding	20% silicone concentrate in Delrin® for let-down to 1 or 2% silicone	Conveyors, moving parts, gears

Proven Performance in Actual Use

Standard Delrin® and Delrin® P have similar properties and may be interchangeable in many instances. Within a given viscosity or melt flow range of resins, the standard grades have similar properties, and in many cases, may be interchangeable, although there are some subtle differences.

The ASTM property values in **Tables 2** and **3** have been updated to reflect results on currently manufactured resin, as well as data obtained with revision to some of the test methods themselves. ISO physical property data is given in **Tables 4** and **5**. The suitability of a material for a given application depends not on a single property but on a combination of properties. While the data shown here are useful for comparing and selecting materials, experienced designers and end users should make a final choice after part performance has been demonstrated by their end-use testing.
For more detailed design information and data, consult the Delrin® Design Guide and your DuPont representative.

Product Form and Packaging

Delrin® acetal resin is supplied as spherical pellets, approximately 2.5 mm (0.1 in) in diameter or cylindrical pellets, 3 mm (0.125 in) in diameter by 2.3 mm (0.09 in) in length. They are packaged in 1000 kg (2,200 lb) net weight bulk corrugated boxes and 25 kg (55.1 lb) moisture-protected, tear-resistant polyethylene bags.

Figure 15. Delrin®100 gives a superior combination of stiffness and toughness as well as excellent dimensional stability in this motor and gearbox for automotive air conditioning control. Courtesy of Mikron A.G.

Table 2
General Purpose Grades of Delrin®—ASTM Data

Property	ASTM	Units	Toughest			Medium Flow			High Flow			Ultra Flow
			Delrin® D100	Delrin® D100P	Delrin® D111P	Delrin® D500	Delrin® D500P	Delrin® D511P	Delrin® D900	Delrin® D900P	Delrin® D911P	Delrin® D1700P
STRENGTH												
Tensile Stress at Yield 5 mm (0.2 in)/min	D638	MPa (kpsi)										
–40°C (–40°F)			—	NY	NY	—	93 (13)	98 (14)	—	94 (14)	97 (14)	88 (13)
23°C (73°F)			69 (10)	67 (10)	72 (10)	69 (10)	68 (10)	72 (10)	69 (10)	69 (10)	73 (11)	71 (10)
70°C (158°F)			45 (6)	44 (6)	49 (7)	49 (7)	45 (6)	50 (7)	48 (7)	47 (7)	—	48 (7)
100°C (212°F)			36 (5)	29 (4)	33 (5)	—	28 (4)	32 (5)	—	33 (5)	34 (5)	28 (4)
Tensile Strength 5 mm (0.2 in)/min	D638	MPa (kpsi)										
–40°C (–40°F)			—	91 (13)	96 (14)	—	93 (13)	99 (14)	—	94 (14)	97 (14)	—
23°C (73°F)			69 (10)	66 (9)	69 (10)	69 (10)	68 (10)	72 (10)	69 (10)	69 (10)	73 (11)	71 (10)
70°C (158°F)			—	—	—	—	—	—	48 (7)	47 (7)	—	48 (7)
100°C (212°F)			—	—	—	—	—	—	—	—	—	—
Elongation at Yield 5 mm (0.2 in)/min	D638	%										
–40°C (–40°F)			—	NY	NY	—	13	11	—	9	9	8
23°C (73°F)			25	23	21	14	15	11	11	11	10	8
70°C (158°F)			13	13	11	10	12	9	10	10	—	9
100°C (212°F)			9	11	9	—	9	8	—	9	8	8
Elongation at Break 5 mm (0.2 in)/min	D638	%										
–40°C (–40°F)			—	40	50	—	22	20	—	18	17	10
23°C (73°F)			75	80	73	45	40	33	30	25	20	15
70°C (158°F)			>100	>100	>100	>100	>100	>100	>100	>100	—	28
100°C (212°F)			>100	>100	>100	>100	>100	>100	>100	>100	>100	—
Shear Strength	D732	MPa (kpsi)	66 (9)	62 (9)	68 (10)	66 (10)	62 (9)	66 (10)	66 (10)	66 (10)	—	67 (10)
Flexural Yield Stress at 5%	D790	MPa (kpsi)	99 (14)	94 (14)	92 (13)	97 (14)	99 (14)	105 (15)	97 (14)	105 (15)	104 (15)	110 (16)
STIFFNESS												
Tensile Modulus 5 mm (0.2 in)/min	D638	MPa (kpsi)										
–40°C (–40°F)			—	3310 (480)	—	—	4030 (584)	4100 (595)	—	3930 (570)	—	3620 (525)
23°C (73°F)			3120 (452)	2940 (426)	3000 (497)	3300 (479)	3250 (471)	3380 (490)	3410 (495)	3480 (508)	3300 (479)	3560 (516)
70°C (158°F)			1370 (199)	1360 (197)	1660 (241)	1680 (244)	1470 (213)	1760 (255)	1700 (246)	1590 (231)	—	1780 (258)
100°C (212°F)			—	760 (110)	—	—	1020 (148)	1150 (167)	—	930 (135)	—	930 (135)
Flexural Modulus 1.3 mm (0.05 in)/min	D790	MPa (kpsi)										
–40°C (–40°F)			3410 (495)	3430 (497)	3500 (508)	3770 (547)	3700 (536)	3900 (566)	3900 (566)	3800 (551)	3970 (576)	3900 (566)
23°C (73°F)			2890 (419)	2790 (405)	2970 (431)	3110 (451)	3100 (450)	3300 (479)	3240 (470)	3240 (470)	3380 (490)	3380 (490)
70°C (158°F)			1400 (203)	1280 (186)	1440 (209)	1450 (210)	1380 (200)	1540 (223)	1500 (217)	1380 (200)	1600 (232)	1500 (217)
100°C (212°F)			900 (130)	780 (113)	870 (126)	930 (135)	900 (130)	1080 (157)	950 (138)	900 (130)	980 (142)	900 (130)

NY = No Yield

NB = No Break

(continued)

Table 2 (continued)
General Purpose Grades of Delrin®—ASTM Data

Property	ASTM	Units	Toughest			Medium Flow			High Flow			Ulra Flow
			Delrin® D100	Delrin® D100P	Delrin® D111P	Delrin® D500	Delrin® D500P	Delrin® D511P	Delrin® D900	Delrin® D900P	Delrin® D911P	Delrin® D1700P
Compressive Stress at 10% Deflection 1.3 mm (0.05 in)/min	D695	MPa (kpsi)	—	96 (13)	104 (15)	—	107 (15)	—	—	108 (15)	115 (17)	—
TOUGHNESS												
Tensile Impact Strength Long Specimen	D1822	kJ/m² (ft·lbf/in²)	—	570 (271)	560 (266)	—	490 (233)	500 (237)	—	440 (209)	410 (195)	—
Izod Impact Strength	D256	J/m (ft·lbf/in)										
–40°C (–40°F)			96 (1.8)	107 (2)	84 (1.6)	64 (1.2)	58 (1.1)	68 (1.3)	53 (1)	57 (1.1)	56 (1)	—
23°C (73°F)			120 (2.2)	120 (2.2)	96 (1.8)	76 (1.4)	75 (1.4)	73 (1.4)	70 (1.3)	69 (1.3)	59 (1.1)	59 (1.1)
Izod Impact (Unnotched) 23°C (73°F)	D4812	J/m (ft·lbf/in)	NB	NB	NB	NB	NB	NB	—	1630	2110	—
THERMAL												
Deflection Temperature Under Load Not annealed	D648	°C (°F)										
0.5 MPa (66 psi)			168 (334)	163 (325)	169 (336)	165 (329)	167 (333)	169 (336)	168 (334)	163 (325)	170 (338)	165 (329)
1.8 MPa (262 psi)			108 (226)	95 (203)	110 (230)	112 (234)	102 (216)	114 (237)	117 (243)	105 (221)	122 (252)	103 (217)
Deflection Temperature Under Load Annealed	D648	°C (°F)										
0.5 MPa (66 psi)			170 (338)	167 (332)	—	169 (336)	169 (336)	—	167 (333)	167 (333)	—	163 (325)
1.8 MPa (262 psi)			123 (253)	122 (252)	—	132 (270)	125 (257)	—	128 (262)	127 (261)	—	128 (262)
Melting Point (DSC)	D3418	°C (°F)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)
CLTE , Flow Direction 23 to 55°C (73 to 131°F)	E831	10^{-4}/K	1.22	1.2	1.21	1.1	1.13	1.2	1.06	1.26	1.16	1.04
CLTE , Trans Direction 23 to 55°C (73 to 131°F)	E831	10^{-4}/K	1.17	1.12	1.17	1.13	1.09	1.17	1.03	1.23	1.17	1.05
Thermal Conductivity	—	W/m·K (Btu·in/ hr·ft²·°F)	0.33 (2.29)	0.29 (2.01)	0.3 (2.08)	0.33 (2.29)	0.29 (2.01)	0.31 (2.15)	0.32 (2.22)	0.28 (1.94)	0.31 (2.15)	0.36 (2.50)

NY = No Yield
NB = No Break

(continued)

Table 2 (continued)
General Purpose Grades of Delrin®—ASTM Data

Property	ASTM	Units	Toughest			Medium Flow			High Flow			Ulra Flow
			Delrin® D100	Delrin® D100P	Delrin® D111P	Delrin® D500	Delrin® D500P	Delrin® D511P	Delrin® D900	Delrin® D900P	Delrin® D911P	Delrin® D1700P
ELECTRICAL												
Surface Resistivity	D257	ohm	5E+15	2E+14	6E+14	5E+15	2E+14	3E+14	5E+15	5E+14	6E+15	6E+14
Volume Resistivity	D257	ohm·cm	1E+15	4E+14	8E+14	1E+15	1E+14	7E+14	1E+15	2E+14	5E+14	1E+14
Dielectric Constant, 1 MHz	D150	—	3.6	3.7	3.7	3.6	3.7	3.7	3.6	3.6	3.6	3.7
Dissipation Factor, 1 MHz	D150	10^{-4}	50	50	50	50	60	50	50	60	50	50
Electric Strength 3.2 mm (0.12 in)	D149	kV/mm	16.5	16.9	18	16.5	17.3	18	16.5	17.3	18	17
FLAMMABILITY												
UL94 Rating at Min. Thickness	UL94	—	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
UL94 Min. Thickness Tested	UL94	mm (in)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)
MISCELLANEOUS												
Melt Flow Rate, 1.05 kg at 190°C	D1238	g/10 min	1	1	1	7	7	7	11	11	11	17
Melt Flow Rate, 2.16 kg at 190°C	D1238	g/10 min	2.2	2.2	2.2	14	15	14	25	25	25	37
Specific Gravity	D792	—	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Density		g/cm^3	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Rockwell Hardness	D785	—	M94 R120	M86 R119	M90 R120	M92 R120	M88 R121	M94 R123	— —	M87 R120	M91 R121	M87 R120
Water Absorption 23°C (73°F) Equilibrium, 50% RH Immersion, 24 hr Saturation (Equilibrium)	D570	%	 0.22 0.27 0.9	 0.28 0.4 1.4	 — 0.3 —	 0.22 0.31 0.9	 0.28 0.41 1.4	 — 0.3 —	 0.22 0.25 0.9	 0.28 0.43 1.4	 0.2 0.28 0.97	 0.28 0.4 1.4
Mold Shrinkage, 3.2 mm (0.12 in) thickness Flow Direction Transverse Direction	—	%	 1.8–2.1 1.8–2.1	 1.8–2.1 1.7–2.0	 1.8–2.1 1.7–2.0	 1.7–2.0 1.8–2.1	 1.8–2.1 1.8–2.1	 1.5–1.8 1.6–1.9	 1.7–2.0 1.7–2.0	 1.6–1.9 1.7–2.0	 1.4–1.7 1.5–1.8	 1.4–1.7 1.5–1.8
PROCESSING GUIDELINES												
Melt Temperature Range	—	°C (°F)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)
Mold Temperature Range	—	°C (°F)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)
Processing Moisture Content, max.	—	%	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

NY = No Yield
NB = No Break

Table 3
Specialty Grades of Delrin®—ASTM Data

Property	ASTM	Units	Extrusion Resins		UV Stabilized		Glass-Filled/ Glass-Reinforced			Chemically Lubricated with Teflon® PTFE Fibers and Filler*	
			Delrin® D150E, SA	Delrin® D550SA	Delrin® D127UV	Delrin® D527UV	Delrin® D570	Delrin® D577	Delrin® D525GR	Delrin® D500AL	Delrin® D500CL
STRENGTH											
Tensile Stress at Yield	D638	MPa (kpsi)									
5 mm (0.2 in)/min											
–40°C (–40°F)			—	—	97 (14)	96 (14)	81 (12)	—	NY	87 (13)	84 (12)
23°C (73°F)			69 (10)	69 (10)	67 (9)	67 (10)	58 (8)	57 (8)	NY	66 (10)	65 (9)
70°C (158°F)			—	—	49 (7)	40 (6)	—	—	113 (16)	—	—
100°C (212°F)			—	—	34 (5)	33 (5)	28 (4)	—	89 (13)	28 (4)	27 (4)
Tensile Strength	D638	MPa (kpsi)									
5 mm (0.2 in)/min											
–40°C (–40°F)			—	—	—	—	82 (12)	—	210 (30)	87 (13)	84 (12)
23°C (73°F)			—	—	—	—	58 (8)	58 (8)	151 (22)	66 (10)	65 (9)
70°C (158°F)			—	—	—	—	—	—	113 (16)	—	—
100°C (212°F)			—	—	—	—	28 (4)	—	89 (13)	—	—
Elongation at Yield	D638	%									
5 mm (0.2 in)/min											
–40°C (–40°F)			—	—	31	16	3	—	NY	14	9
23°C (73°F)			20	—	26	13	5	5	NY	10	14
70°C (158°F)			—	—	—	—	—	—	4	—	—
100°C (212°F)			—	—	11	9	6	—	5	8	11
Elongation at Break	D638	%									
5 mm (0.2 in)/min											
–40°C (–40°F)			—	—	40	—	—	—	3	18	12
23°C (73°F)			84	40	75	45	12	10	3.2	30	40
70°C (158°F)			—	—	—	—	—	—	5	—	—
100°C (212°F)			—	—	>100	>100	—	—	6	—	—
Shear Strength	D732	MPa (kpsi)	—	—	—	—	59 (9)	—	—	—	—
Flexural Yield Stress at 5%	D790	MPa (kpsi)	—	—	—	—	101 (15)	—	230 (33)	88 (13)	90 (13)
STIFFNESS											
Tensile Modulus	D638	MPa (kpsi)									
5 mm (0.2 in)/min											
–40°C (–40°F)			—	—	—	—	7340 (1065)	—	—	—	—
23°C (73°F)			3100 (450)	3100 (450)	2910 (422)	3230 (468)	5920 (859)	5700 (827)	9000 (1305)	3170 (460)	3250 (471)
70°C (158°F)			—	—	—	—	—	—	—	—	—
100°C (212°F)			—	—	—	—	2280 (331)	—	—	—	—
Flexural Modulus	D790	MPa (kpsi)									
1.3 mm (0.05 in)/min											
–40°C (–40°F)			—	—	3710 (538)	4000 (331)	5450 (790)	—	8720 (1265)	3660 (531)	4260 (618)
23°C (73°F)			2900 (421)	2950 (428)	2800 (406)	3050 (442)	5000 (725)	4800 (696)	8000 (1160)	2970 (431)	3000 (935)
70°C (158°F)			—	—	1270 (184)	1320 (191)	—	—	5200 (754)	1440 (209)	—
100°C (212°F)			—	—	840 (122)	850 (123)	1650 (239)	—	4500 (653)	830 (120)	830 (120)

(continued)

NY = No Yield

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Table 3
Specialty Grades of Delrin®—ASTM Data

Property	ASTM	Units	Chemically Lubricated with Teflon® PTFE Fibers and Filler*					Impact Modified		
			Delrin® D100AF	Delrin® D500AF	Delrin® D520MP	Delrin® D510MP	Delrin® D500TL	Delrin® D100ST	Delrin® D500MT	Delrin® D500T
STRENGTH										
Tensile Stress at Yield	D638	MPa (kpsi)								
5 mm (0.2 in)/min										
–40°C (–40°F)			NY	NY	76 (11)	86 (12)	92 (13)	69 (10)	70 (10)	85 (12)
23°C (73°F)			NY	NY	54 (8)	61 (9)	67 (10)	45* (6)	44* (6)	53* (8)
70°C (158°F)			—	—	—	—	—	—	28 (4)	36 (5)
100°C (212°F)			23 (3)	23 (3)	26 (4)	27 (4)	28 (4)	19 (3)	22 (3)	29 (4)
Tensile Strength	D638	MPa (kpsi)								
5 mm (0.2 in)/min										
–40°C (–40°F)			—	65 (9)	71 (10)	79 (11)	92 (13)	69 (10)	71 (10)	85 (12)
23°C (73°F)			53 (8)	50 (7)	54 (8)	61 (9)	67 (10)	45 (6))	44 (6)	53 (8)
70°C (158°F)			—	—	—	—	—	—	—	—
100°C (212°F)			—	—	—	—	—	—	—	—
Elongation at Yield	D638	%								
5 mm (0.2 in)/min										
–40°C (–40°F)			NY	NY	7	8	—	47	15	11
23°C (73°F)			NY	NY	12	10	12	35	21	15
70°C (158°F)			—	—	—	—	—	—	19	14
100°C (212°F)			8	7	8	9	—	28	13	12
Elongation at Break	D638	%								
5 mm (0.2 in)/min										
–40°C (–40°F)			—	9	12	11	—	94	50	30
23°C (73°F)			19	11	14	13	25	>150	80	75
70°C (158°F)			—	—	—	—	—	>100	>100	>100
100°C (212°F)			>100	>100	—	—	—	>100	>100	>100
Shear Strength	D732	MPa (kpsi)	54 (8)	55 (8)	51 (7)	58 (8)	—	40 (6)	44 (6)	45 (6)
Flexural Yield Stress at 5%	D790	MPa (kpsi)	75 (11)	75 (11)	101 (15)	93 (13)	—	36 (5)	49 (7)	69 (10)
STIFFNESS										
Tensile Modulus	D638	MPa (kpsi)								
5 mm (0.2 in)/min										
–40°C (–40°F)			—	—	—	—	—	2370 (344)	2650 (384)	3290 (477)
23°C (73°F)			2750 (399)	2910 (422)	3130 (454)	3030 (439)	3100 (458)	1300 (188)	1800 (261)	2400 (348)
70°C (158°F)			—	—	—	—	—	—	1000 (145)	1300 (188)
100°C (212°F)			—	—	—	—	—	460 (667)	—	—
Flexural Modulus	D790	MPa (kpsi)								
1.3 mm (0.05 in)/min										
–40°C (–40°F)			—	3440 (499)	3780 (548)	3760 (545)	3780 (450)	1960 (284)	2100 (305)	2960 (429)
23°C (73°F)			2510 (364)	2710 (393)	3100 (450)	3160 (458)	3080 (447)	1130 (164)	1400 (203)	2250 (326)
70°C (158°F)			—	—	1340 (194)	—	—	—	600 (870)	800 (116)
100°C (212°F)			—	730 (106)	1010 (146)	970 (141)	1010 (146)	240 (35)	340 (493)	500 (725)

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*Impact modified grades are tested at 50 mm/min, all others at 5 mm/min.

(continued)

Table 3 (continued)
Specialty Grades of Delrin®—ASTM Data

Property	ASTM	Units	Extrusion Resins		UV Stabilized		Glass-Filled/ Glass-Reinforced			Chemically Lubricated with Teflon® PTFE Fibers and Filler*	
			Delrin® D150E, SA	Delrin® D550SA	Delrin® D127UV	Delrin® D527UV	Delrin® D570	Delrin® D577	Delrin® D525GR	Delrin® D500AL	Delrin® D500CL
STIFFNESS (continued)											
Compressive Stress at 10% Deflection 1.3 mm (0.05 in)/min	D695	MPa (kpsi)	—	—	76 (11)	83 (12)	106 (15)	—	230 (33)	105 (15)	—
TOUGHNESS											
Tensile Impact Strength Long Specimen	D1822	kJ/m^2 ($ft{\cdot}lbf/in^2$)	—	—	—	—	—	—	—	520 (247)	—
Izod Impact Strength	D256	J/m (ft·lbf/in)									
–40°C (–40°F)			—	—	—	—	20 (0.4)	—	99 (1.9)	53 (1)	71 (1.3)
23°C (73°F)			130 (2.4)	80 (1.5)	120 (2.2)	80 (1.5)	34 (0.6)	31 (0.6)	96 (1.8)	58 (1.1)	70 (1.3)
Izod Impact (Unnotched) 23°C (73°F)	D4812	J/m (ft·lbf/in)	—	—	2310 (43.2) NB	1870 (35)	600 (11.2)	—	1100 (20.6)	2350 (44)	2610 (48.9)
THERMAL											
Deflection Temperature Under Load Not annealed	D648	°C (°F)									
0.5 MPa (66 psi)			—	—	167 (327)	168 (334)	169 (336)	169 (336)	177 (350)	169 (336)	166 (330)
1.8 MPa (262 psi)			—	—	106 (222)	104 (219)	144 (291)	—	173 (343)	108 (226)	105 (221)
Deflection Temperature Under Load Annealed	D648	°C (°F)									
0.5 MPa (66 psi)			169 (336)	168 (334)	—	167 (327)	168 (334)	168 (334)	—	—	—
1.8 MPa (262 psi)			125 (257)	129 (264)	—	115 (239)	142 (287)	147 (296)	—	—	116 (240)
Melting Point (DSC)	D3418	°C (°F)	178	178	178	178	178	178	178	178	178
CLTE , Flow Direction 23 to 55°C	E831	10^{-5}/K	—	—	1.27	1.21	0.61	—	0.29	1.18	1.12
CLTE , Trans Direction 23 to 55°C	E831	10^{-5}/K	—	—	1.22	1.2	0.86	—	0.83	1.16	1.14
Thermal Conductivity	E1530	W/m·K (Btu·in/ $hr{\cdot}ft^2{\cdot}F$)	—	—	—	—	—	—	0.34 (2.36)	0.3 (2.08)	0.29 (2.01)

NY = No Yield

NB = No Break

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(continued)

Table 3 (continued)
Specialty Grades of Delrin®—ASTM Data

Property	ASTM	Units	Chemically Lubricated with Teflon® PTFE Fibers and Filler*					Impact Modified		
			Delrin® D100AF	Delrin® D500AF	Delrin® D520MP	Delrin® D510MP	Delrin® D500TL	Delrin® D100ST	Delrin® D500MT	Delrin® D500T
STIFFNESS (continued)										
Compressive Stress at 10% Deflection 1.3 mm (0.05 in)/min	D695	MPa) (kpsi)	80 (11)	90 (13)	95 (14)	105 (15)	—	—	78 (11)	—
TOUGHNESS										
Tensile Impact Strength Long Specimen	D1822	kJ/m^2 (ft·lbf/in^2)	105 (50)	88 (42)	43 (20)	59 (28)	—	12490 (5943)	810 (385)	730 (347)
Izod Impact Strength –40°C (–40°F)	D256	J/m (ft·lbf/in)	—	—	30 (0.6)	35 (0.7)	—	169 (3.2)	76 (1.4)	88 (1.6)
23°C (73°F)			50 (0.9)	31 (0.6)	32 (0.6)	27 (0.5)	59 (1.1)	840 (15.7)	149 (2.8)	128 (2.4)
Izod Impact (Unnotched) 23°C (73°F)	D4812	J/m (ft·lbf/in)	700 (13.1)	490 (9.2)	720 (13.5)	950 (17.8)	—	NB	NB	NB
THERMAL										
Deflection Temperature Under Load Not annealed	D648	°C (°F)								
0.5 MPa (66 psi)			164 (327)	163 (325)	166 (331)	167 (333)	166 (331)	124 (255)	130 (266)	157 (315)
1.8 MPa (262 psi)			96 (205)	95 (203)	102 (216)	108 (276)	100 (212)	61 (142)	70 (158)	79 (174)
Deflection Temperature Under Load Annealed	D648	°C (°F)								
0.5 MPa (66 psi)			—	166 (331)	—	—	—	113 (235)	—	160 (320)
1.8 MPa (262 psi)			111 (232)	114 (237)	—	—	—	62 (144)	—	85 (185)
Melting Point (DSC)	D3418	°C (°F)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)	178 (352)
CLTE , Flow Direction 23 to 55°C	E831	10^{-5}/K	1.14	1.04	0.99	1.02	0.98	1.26	1.3	1.26
CLTE , Trans Direction 23 to 55°C	E831	10^{-5}/K	1.1	0.92	0.97	0.99	1.1	1.23	1.2	1.18
Thermal Conductivity	E1530	W/m·K (Btu·in/ hr·ft^2·F)	—	0.37 (2.56)	0.32 (2.22)	0.32 (2.22)	0.31 (2.15)	—	0.24 (1.66)	0.26 (1.80)

(continued)

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NB = No Break

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Table 3 (continued)
Specialty Grades of Delrin®—ASTM Data

Property	ASTM	Units	Extrusion Resins		UV Stabilized		Glass-Filled/ Glass-Reinforced			Chemically Lubricated with Teflon® PTFE Fibers and Filler*	
			Delrin® D150E, SA	Delrin® D550SA	Delrin® D127UV	Delrin® D527UV	Delrin® D570	Delrin® D577	Delrin® D525GR	Delrin® D500AL	Delrin® D500CL
ELECTRICAL											
Surface Resistivity	D257	ohm	—	—	1E+15	6E+14	2E+15	—	2E+15	4E+15	6E+15
Volume Resistivity	D257	ohm·cm	—	—	1E+14	1E+14	8E+14	—	4E+13	7E+14	4E+15
Dielectric Constant, 1 MHz	D150	—	—	—	3.3	3.4	3.8	—	3.8	3.6	3.6
Dissipation Factor, 1 MHz	D150	10^{-4}	—	—	—	—	63	—	76	60	70
Electric Strength, 2.3 mm (0.09 in)	D149	kV/mm	—	—	—	—	17.8	—	17.3	17.7	17.3
FLAMMABILITY											
UL94 Rating at Min. Thickness	UL94	—	HB	—	HB	HB	HB	HB	HB	HB	HB
UL94 Min. Thickness Tested	UL94	mm (in)	1.47 (0.05)	—	0.84 (0.03)	0.84 (0.03)	1.47 (0.05)	1.47 (0.05)	0.75 (0.03)	0.75 (0.03)	0.75 (0.03)
MISCELLANEOUS											
Melt Flow Rate, 1.05 kg at 190°C (2.3 lb at 374°F)	D1238	g/10 min	1	7	1	7	4	4	5	6	7
Melt Flow Rate, 2.16 kg at 190°C (4.8 lb at 374°F)	D1238	g/10 min	—	—	—	—	—	—	—	—	—
Specific Gravity	D792	—	1.42	1.42	1.42	1.42	1.56	1.56	1.6	1.39	1.42
Density		g/cm^3	1.42	1.42	1.42	1.42	1.56	1.56	1.6	1.39	1.42
Rockwell Hardness	D785	—	— —	— —	M86 R120	M86 R120	— —	— —	M98 R122	M87 R119	M89 R120
Water Absorption, 23°C (73°F)	D570	%									
Equilibrium, 50% RH			—	—	—	—	0.2	—	—	—	0.24
Immersion, 24 hr			—	—	—	—	0.25	—	0.3	—	0.27
Saturation (Equilibrium)			—	—	—	—	1.0	—	—	—	1.0
Mold Shrinkage, 3.2 mm (0.12 in) thickness	—	%									
Flow Direction			—	—	1.8–2.1	1.9–2.2	0.8–1.1	—	0.3–0.6	1.7–2.0	1.7–2.0
Transverse Direction			—	—	1.8–2.1	1.9–2.2	1.0–1.3	—	1.0–1.3	1.7–2.0	1.8–2.1
PROCESSING GUIDELINES											
Melt Temperature Range		°C (°F)	—	—	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)
Mold Temperature Range		°C (°F)	—	—	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)
Processing Moisture Content, max		%	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2

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NB = No Break

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Table 3 (continued)
Specialty Grades of Delrin®—ASTM Data

Property	ASTM	Units	Chemically Lubricated with Teflon® PTFE Fibers and Filler*					Impact Modified		
			Delrin® D100AF	Delrin® D500AF	Delrin® D520MP	Delrin® D510MP	Delrin® D500TL	Delrin® D100ST	Delrin® D500MT	Delrin® D500T
ELECTRICAL										
Surface Resistivity	D257	ohm	—	—	1E+16	6E+15	7E+16	2E+14	3E+14	1E+15
Volume Resistivity	D257	ohm·cm	—	—	3E+14	3E+14	2E+15	3E+14	3E+14	1E+15
Dielectric Constant, 1 MHz	D150	—	—	—	3.4	3.5	3.6	4.2	4.2	3.9
Dissipation Factor, 1 MHz	D150	10^{-4}	—	—	50	50	60	270	250	160
Electric Strength, 2.3 mm (0.09 in)	D149	kV/mm	—	—	18	17.3	16.5	20	15.5	15.5
FLAMMABILITY										
UL94 Rating at Min. Thickness	UL94	—	94	94	94	—	—	94	—	94
UL94 Min. Thickness Tested	UL94	mm (in)	1.47 (0.05)	1.47 (0.05)	1.5 (0.06)	—	—	1.5 (0.06)	—	0.75 (0.03)
MISCELLANEOUS										
Melt Flow Rate, 1.05 kg at 190°C (2.3 lb at 374°F)	D1238	g/10 min	0.5	2	4	5	6	0.8	4	5.5
Melt Flow Rate, 2.16 kg at 190°C (4.8 lb at 374°F)	D1238	g/10 min	—	—	—	—	—	2	—	12
Specific Gravity	D792	—	1.53	1.53	1.54	1.48	1.43	1.34	1.35	1.39
Density		g/cm^3	1.53	1.53	1.54	1.48	1.43	1.34	1.35	1.39
Rockwell Hardness	D785		M79 R118	M78 R118	M78 R119	M87 R121	— —	— —	M98 R122	M87 R119
Water Absorption, 23°C (73°F)	D570	%								
Equilibrium, 50% RH			0.18	0.18	—	—	0.11	0.35	—	0.27
Immersion, 24 hr		0.23	0.2	—	—	0.19	0.44	0.62	0.41	
Saturation (Equilibrium)			0.72	0.72	—	—	0.86	0.85	1.85	0.86
Mold Shrinkage, 3.2 mm (0.12 in) thickness	—	%								
Flow Direction			—	1.8–2.0	1.8–2.1	1.7–2.0	1.7–2.0	0.9–1.2	1.1–1.4	1.3–1.6
Transverse Direction			—	1.5–1.7	1.4–1.7	1.7–2.0	1.7–2.0	1.0–1.3	1.2–1.5	1.3–1.6
PROCESSING GUIDELINES										
Melt Temperature Range		°C (°F)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	210–220 (410–428)	200–210 (392–410)	200–210 (392–410)	200–210 (392–410)
Mold Temperature Range		°C (°F)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	80–100 (176–212)	40–60 (104–140)	40–60 (104–140)	40–60 (104–140)
Processing Moisture Content, Max.		%	0.2	0.2	0.2	0.2	0.2	0.05	0.05	0.05

NY = No Yield

NB = No Break

*Teflon® is a registered trademark of DuPont for its brand of fluoropolymer resin. Only DuPont makes Teflon®.

Table 4
General Purpose Grades of Delrin®—ISO Data

Property	ISO Method	Units	Toughest			Medium Flow			High Flow			Ultra Flow
			Delrin® D100	Delrin® D100P	Delrin® D111P	Delrin® D500	Delrin® D500P	Delrin® D511P	Delrin® D900	Delrin® D900P	Delrin® D911P	Delrin® D1700P
MECHANICAL PROPERTIES												
Tested at 50 mm/min												
Yield Stress	527-1/2	MPa	71	70	72	72	71	73	72	71	74	72
Yield Strain	527-1/2	%	25	22	20	15	14	12	13	12	9	8
Stress at Break	527-1/2	MPa	64	63	72	69	67	69	71	70	70	71
Nominal Strain at Break	527-1/2	%	45	45	40	30	30	25	19	25	20	16
Strain at Break	527-1/2	%	70	65	60	45	40	41	22	27	30	15
Tested at 1 mm/min												
Tensile Modulus	527-1/2	MPa	3100	3000	3200	3200	3200	3400	3400	3200	3400	3400
Temperature Dependence												
Yield Stress (5 mm/min)	11403	MPa										
–40°C			99	94	100	98	97	100	100	99	100	99
0°C			80	77	80	80	78	82	78	81	83	82
23°C			68	66	70	68	67	72	69	70	71	70
60°C			56	56	57	56	55	56	55	55	58	—
80°C			40	37	41	40	38	42	39	41	42	41
100°C			30	29	31	32	28	34	31	30	34	31
120°C			23	21	25	23	22	24	24	23	23	24
Yield Strain (5 mm/min)	11403	%										
–40°C			21	—	22	15	17	10	13	7.8	7.6	7.6
0°C			—	39	28	14	15	11	14	9.5	8.8	8
23°C			23	24	20	14	14	10	13	9	9.5	8
60°C			19	19	16	14	14	10	13	9	—	—
80°C			12	13	12	10	11	9.3	9.2	9	9.2	8
100°C			12	10	9.9	9	10	7.8	8.9	9	7.2	8
120°C			11	12	9	9	9.7	8.8	8.3	8.9	8	8
Tensile Modulus (1 mm/min)	11403	MPa										
–40°C			4030	4040	4200	4150	4300	4300	4320	4420	4300	4600
0°C			2940	—	3320	3250	3500	—	—	3640	3750	3570
23°C			3100	3000	3200	3200	3200	3400	3400	3200	3400	3400
60°C			1700	1600	1920	1900	1900	2000	—	—	2000	2000
80°C			1400	—	1420	1440	1410	1700	1600	1700	1610	1800
100°C			1060	870	1120	1090	910	—	1090	1120	1430	1600
120°C			600	540	790	640	690	770	580	630	720	670
Flexural Modulus	178	MPa	2700	2600	2900	3000	2900	3100	3000	3000	3200	3200
Notched Izod Impact	180/1A											
–40°C		kJ/m^2	14	12	11	9	9	8	8	7	7	6
23°C		kJ/m^2	14	14	11	9	9	8	8	7	7	6
Notched Charpy Impact	179/1eA											
–40°C		kJ/m^2	11	11	9	8	7	8	8	7	8	5
–30°C		kJ/m^2	10	10	8	8	8	7	7	6	6	5
23°C		kJ/m^2	15	15	12	9	9	8	7	7	8	6
Unnotched Charpy Impact	179/1eU											
–30°C		kJ/m^2	NB	350	250	300	300	260	250	200	180	140
23°C		kJ/m^2	NB	NB	NB	340	300	260	260	200	180	150
THERMAL PROPERTIES												
Deflection Temperature												
0.45 MPa	75	°C	165	160	165	165	160	165	164	165	165	165
1.80 MPa	75	°C	100	95	105	100	95	110	99	95	110	105
Melting Temperature	3146	°C	178	178	178	178	178	178	178	178	178	178
FLOW PROPERTIES												
Melt mass flow rate, 190°C, 2.16 kg	1133	g/10 min	2.3	2.4	2.3	14	15	14	24	24	25	37
Melt volume flow rate, 190°C, 2.16 kg	1133	cm^3/10 min	1.9	1.9	1.9	12	13	13	20	21	21	32
OTHER												
Density	1183	g/cm^3	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42

Table 5
Specialty Grades of Delrin®—ISO Data

Property	ISO	Units	UV Stabilized				Low Wear/Low Friction				
			Delrin® D127UV	Delrin® D527UV	Delrin® D927UV	Delrin® D1727UV	Delrin® D500AF	Delrin® D520MP	Delrin® D500TL	Delrin® D500CL	Delrin® D500AL
MECHANICAL PROPERTIES											
Tested at 50 mm/min											
Yield Stress	527-1/2	MPa	70	70	71	73	50	54	71	70	63
Yield Strain	527-1/2	%	23	15	14	9	12	16	14	14	11
Stress at Break	527-1/2	MPa	62	68	—	—	50	53	71	66	63
Nominal Strain at Break	527-1/2	%	45	30	18	10	14	13	20	23	24
Strain at Break	527-1/2	%	65	40	—	—	10	16	—	45	—
Tested at 1 mm/min											
Tensile Modulus	527-1/2	MPa	3000	3200	—	3600	2900	2800	3300	3100	3100
Temperature Dependence											
Yield Stress (5 mm/min)	11403	MPa									
–40°C			97	99			69	74	98	98	92
0°C			79	78			NY	58	77	80	74
23°C			66	68			NY	51	68	66	64
60°C			—	50			—	38	—	—	—
80°C			37	38			29	31	38	39	36
100°C			29	30			22	23	31	30	29
120°C			22	22			16	18	24	22	22
Yield Strain (5 mm/min)	11403	%									
–40°C			—	10			—	10	13	17	7
0°C			—	12			NY	14	13	19	9
23°C			30	12			NY	12	12	13	10
60°C			—	11			—	—	—	—	—
80°C			14	10			10	8.6	9.2	11	10
100°C			13	10			9.3	7.8	8.1	10	8.5
120°C			13	10			8.5	6.8	8.1	10	7.5
Tensile Modulus (1 mm/min)	11403	MPa									
–40°C			3700	3700			4000	3300	4100	4000	3800
0°C			3300	3200			—	3000	3500	3500	3300
23°C			3000	3200	—	3600	2900	2800	3300	3100	3100
60°C			—	1630			—	1800	—	—	—
80°C			1300	1270			1700	1100	1560	1350	1440
100°C			930	1200			1020	820	1120	1140	1320
120°C			530	750			590	8000	730	540	8000
Flexural Modulus	178	MPa	2600	3000	—	—	2600	2700	3000	2800	2800
Notched Izod Impact	180/1A										
–40°C		kJ/m^2	11	8	—	—	—	—	6	9	7
23°C		kJ/m^2	13	8	—	—	3	4	6	9	7
Notched Charpy Impact	179/1eA										
–40°C		kJ/m^2	10	—	—	—	—	—	8	7	5
–30°C		kJ/m^2	10	8	—	—	3	—	—	7	—
23°C		kJ/m^2	15	9	8	6	3	4	5	8	7
Unnotched Charpy Impact	179/1eU										
–30°C		kJ/m^2	350	260	—	—	35	—	—	290	170
23°C		kJ/m^2	400	270	—	—	40	72	160	350	200
Thermal Properties											
Deflection Temperature											
0.45 MPa	75	°C	165	165	—	163	165	163	165	160	166
1.80 MPa	75	°C	95	95	—	96	100	94	104	90	102
Melting Temperature	3146	°C	178	178	178	178	178	178	178	178	178
Flow Properties											
Melt mass flow rate, 190°C, 2.16 kg	1133	g/10 min	2.4	15	25	37	—	—	14	15	14
Melt volume flow rate, 190°C, 2.16 kg	1133	cm^3/10 min	1.9	13	21	32	—	—	—	12	12
Other											
Density	1183	g/cm^3	1.42	1.42	1.42	1.42	1.53	1.54	1.43	1.41	1.39

Table 5 (continued)
Specialty Grades of Delrin®—ISO Data

Property	ISO	Units	Impact Modified			Glass Grades		
			Delrin® D100ST	Delrin® D500MT	Delrin® D500T	Delrin® D570	Delrin® D510GR	Delrin® D525GR
MECHANICAL PROPERTIES								
Tested at 50 mm/min								
Yield Stress	527-1/2	MPa	43	43	58	NY	NY*	NY*
Yield Strain	527-1/2	%	30	22	16	NY	NY*	NY*
Stress at Break	527-1/2	MPa	38	40	52	59	95*	140*
Nominal Strain at Break	527-1/2	%	>50	42	30	—	—	—
Strain at Break	527-1/2	%	>100	—	55	12	4.3*	3*
Tested at 1 mm/min								
Tensile Modulus	527-1/2	MPa	1400	1600	2500	6000	5500	9500
Temperature Dependence								
Yield Stress (5 mm/min)	11403	MPa						
–40°C			69	74	83	71	NY	NY
0°C			—	54	63	62	NY	NY
23°C			38	43	52	55	95*	138*
60°C			32	—	44	—	—	—
80°C			20	24	29	33	62	95
100°C			13	18	23	24	54	83
120°C			12	17	22	18	41	63
Yield Strain (5 mm/min)	11403	%						
–40°C			33	24	31	—	NY	NY
0°C			—	44	32	9	NY	NY
23°C			33	21	16	9	NY	NY
60°C			24	24	—	—	4.8	2.4
80°C			23	23	13	8	4.8	4.4
100°C			23	23	14	8	4.8	4.3
120°C			19	19	13	8	5.7	6.1
Tensile Modulus (1 mm/min)	11403	MPa						
–40°C			2200	2350	3540	6000	5700	9900
0°C			1370	1800	2900	—	—	—
23°C			1400	1800	2500	6000	5500	9500
60°C			600	—	1300	—	3270	6750
80°C			430	690	770	2600	3450	5560
100°C			290	610	530	1850	2950	5270
120°C			100	240	440	1080	1470	3660
Flexural Modulus	178	MPa	1050	1500	2100	5000	4800	8000
Notched Izod Impact	180/1A							
–40°C		kJ/m^2	20	9	8	4	5	8
23°C		kJ/m^2	90	18	14	6	5	9
Notched Charpy Impact	179/1eA							
–40°C		kJ/m^2	11	—	10	3		8
–30°C		kJ/m^2	20	10	12	3	5	8
23°C		kJ/m^2	100	20	15	4	5	8
Unnotched Charpy Impact	179/1eU							
–30°C		kJ/m^2	NB	NB	340	50	60	66
23°C		kJ/m^2	NB	NB	NB	54	48	55
Thermal Properties								
Deflection Temperature								
0.45 MPa	75	°C	100	127	155	165	174	176
1.80 MPa	75	°C	60	66	80	130	164	172
Melting Temperature	3146	°C	178	178	178	178	178	178
Flow Properties								
Melt mass flow rate, 190°C, 2.16 kg	1133	g/10 min	2	9	12	—	15	12
Melt volume flow rate, 190°C, 2.16 kg	1133	cm^3/10 min	1.7	8	10	—	12	8
Other								
Density	1183	g/cm^3	1.33	1.35	1.39	1.56	1.49	1.58

*Tested at 5 mm/min

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