

# DURAForm PA AND GF

MATERIALS FOR SLS® SYSTEMS

Technology:	Selective Laser Sintering, SLS
Material Class:	Powder, Thermoplastic

## Create durable, high-quality, fully functional parts with your SLS® system

DuraForm polyamide (PA) and DuraForm glass-filled (GF), next-generation nylon materials, were developed specifically for creating rugged engineering thermoplastic parts that withstand aggressive functional testing.

**Shorten product testing and development cycles.** DuraForm materials trim days, even weeks off your product development times by letting you create high-quality, fully-testable parts in the SLS system, directly from CAD files — no tooling required.

**Choose DuraForm PA material for detailed parts and medical applications.** DuraForm PA material is ideal for parts with superior surface quality, fine details, and functional features such as living hinges and snap fit connections. As an example, a DuraForm material connector with snap fits, hinges and locking cams recently withstood temperatures up to 100°C and an electrical load of 460 Amps (twice the ampage withstood by the final production part). Plus DuraForm PA material is USP Level VI certified for brief *in-vivo* exposure; it can be used for modelling and testing surgical devices, and can be sterilised with an autoclave.

### Use DuraForm GF material for adverse testing conditions.

DuraForm GF material's increased stiffness, heat resistance, and mechanical integrity (relative to PA) make it a perfect material for extreme testing conditions. As an example, manifolds built from DuraForm GF are regularly used on test engines at temperatures up to 135°C for extended periods of time.



Manifold built from DuraForm GF with selector shaft mounted on cylinder head  
Courtesy of RPM

### Use DuraForm materials for:

- Form, fit/snap-fit, and functional testing
- *In vivo* testing
- Durable patterns for sandcasting
- Production parts

### Benefits

- Durable parts without tooling
- Excellent heat and chemical resistance
- Machinable, weldable, readily-joined — mechanically or with adhesives
- High surface quality
- High feature definition and detail
- Excellent durability and stability
- USP Level VI certified; sterilised in an autoclave (PA only)



# DuraForm PA & GF Materials Typical Properties for the SLS systems



Powder Properties	UNITS	TEST METHOD	PA	GF
Density Tap	g/cm <sup>3</sup>	ASTM D4164	0.59	0.84
Particle Size Average (1)	μm	Laser Diffraction	58	48
Particle Size Range (1) 90%	μm	Laser Diffraction	25-92	10-96
Specific Gravity 20°C	g/cm <sup>3</sup>	ASTM D792	0.97	1.40
Moisture Absorption 23°C	%	ASTM D570	0.41	0.30
Thermal Properties	UNITS	TEST METHOD	PA	GF
Melting Point: T <sub>m</sub>	°C	DSC	184	185
HDT, 0.45 MPa	°C	ASTM D648	177	175
HDT, 1.82 MPa	°C	ASTM D648	86	110
Mechanical Properties	UNITS	TEST METHOD	PA	GF
Tensile Strength	MPa	ASTM D638	44	38.1
Tensile Modulus	MPa	ASTM D638	1600	5910
Tensile Elongation at Break	%	ASTM D638	9	2
Flexural Modulus	MPa	ASTM D790	1285	3300
Impact Strength Notched Izod	J/m	ASTM D256	214	96
Unnotched Izod	J/m	ASTM D256	428	101
Surface Finish	UNITS	PA	GF	
Upper Facing As Processed, Ra	μm	8.5	6.2	
After Finishing, Ra	μm	0.13	1.0	
Chemical Resistance	Alkalines, hydrocarbons, fuels & solvents			
Electrical Properties	UNITS	TEST METHOD	PA	GF
Volume Resistivity 22°C, 50% RH, 500V	ohm x cm	ASTM D257-93	3.1 x 10 <sup>14</sup>	2.0 x 10 <sup>14</sup>
Surface Resistivity 22°C, 50% RH, 500V	ohm x cm	ASTM D257-93	3.1 x 10 <sup>14</sup>	2.3 x 10 <sup>14</sup>
Dielectric Constant 22°C, 50% RH, 5V 1000Hz		D150-95	2.9	3.7
Dielectric Strength 22°C, 50% RH, in air, 5V V/sec	v/mm	D149-95a	1.6 x 10 <sup>4</sup>	1.5 x 10 <sup>4</sup>
Comparative Tracking Index	V	D5288-92 and/or IEC Standard 112	585, TI-Cu TBD <1mm depth	

(1) Results are based upon volume distribution of particles.

Data was generated from the testing of parts produced with the DuraForm materials under typical processing conditions. (New materials processed at 4 watts laser power, 165mm/sec scan speed, 0.1 mm scan spacing, 0.1 mm layer thickness on a Sinterstation® 2500 system. Expected shelf life of this material is at least twelve months, when stored in dry conditions at ambient temperatures. Warranty/Disclaimer: The performance characteristics of these products may vary according to product application, operating conditions, material combined with, or with end use. 3D Systems makes no warranties of any type, express or implied, including, but not limited to, the warranties of merchantability or fitness for a particular use.

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