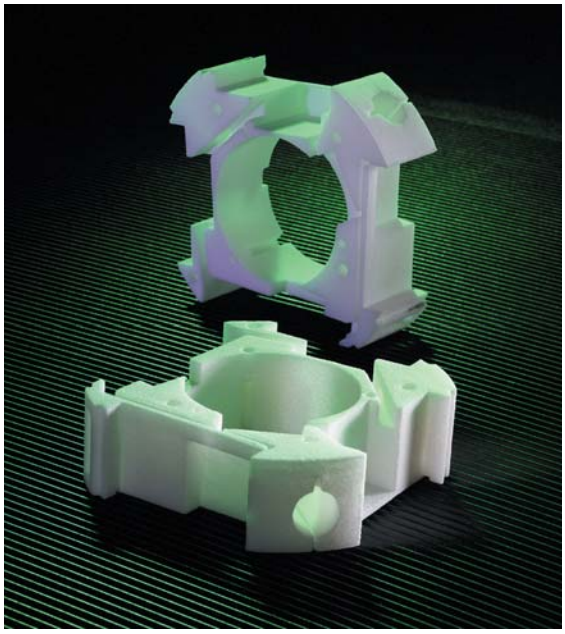
DuraForm® PA & GF plastic

for use with all SLS® systems



Automatically produce durable, high-quality thermoplastic parts for functional use and testing with DuraForm material and an SLS system — from 3D Systems

APPLICATIONS

- Complex production or prototype plastic parts
- Form, fit or functional prototypes
- Applications where stiffness is required
- Heat and chemical resistance testing
- Snap-fit assemblies
- Durable patterns for sandcasting & silicone tooling
- USP Level VI certified for brief in-vivo exposure
- Parts requiring machining, welding, or joining with glue

BENEFITS

Outstanding functional performance
DuraForm PA and DuraForm GF plastics are used with SLS systems to produce rugged thermoplastic parts that withstand aggressive functional use in both rapid manufacturing and prototyping applications. In addition to rugged durability, DuraForm PA and GF materials also produce high quality, complex parts with excellent surface finish and feature detail.

DuraForm PA material is also USP Level VI certified for brief *in-vivo* exposure; it can be used for modeling and testing surgical devices, and can be sterilized with an autoclave.

Choose DuraForm GF material for adverse testing conditions.
DuraForm GF material's increased stiffness, heat resistance, and mechanical integrity make it a perfect material for extreme testing conditions. As an example, a connector with snap fits, hinges and locking cams produced with DuraForm GF recently withstood temperatures up to 100°C and an electrical charge of 460 Amps (twice the amperage withstood by the final production part).

Eliminate tooling and enjoy the many benefits of rapid manufacturing
Companies worldwide are realizing the benefits of rapid manufacturing, and producing economical batch-quantities of DuraForm PA plastic parts with their SLS systems for a variety of production applications. Producing batch-quantities of plastic parts on an SLS system is an economical, fast, and beneficial manufacturing method - and eliminates tooling time and cost, reduces inventory holding costs, and reduces or eliminates labor for assembly operations compared to previous traditional manufacturing methods. With tool-less manufacturing, design changes can be incorporated up to the last minute — without the normal penalty for associated tooling.

DuraForm PA and **Duraform GF** plastic

For use with all SLS systems

TECHNICAL DATA

Powder Properties

PROPERTIES	CONDITION	UNITS	TEST METHOD	PA	GF
Density	Tap	g/cm^3	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		ASTM D792	0.97	1.40
Moisture Absorption	23 °C	%	ASTM D570	0.41	0.30

Thermal Properties

PROPERTIES	CONDITION	UNITS	TEST METHOD	PA	GF
Melting Point:	T_m	°C	DSC	184	185
DTUL	0.45 MPa	°C	ASTM D648	177	175
DTUL	1.82 MPa	°C	ASTM D648	86	110

Mechanical Properties

PROPERTIES	CONDITION	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 Unnotched Izod	J/m J/m	ASTM D256 ASTM D256	214 428	96 101

Surface Finish

PROPERTIES	CONDITION	UNITS	TEST METHOD	PA	GF
Facing	As Processed (R_a) After Polishing (R_a)	µm µm		8.5 0.13	6.2 1.0

Chemical Resistance

PROPERTIES	CONDITION	UNITS	TEST METHOD	PA	GF
	Alkalines, hydrocarbons, fuels and solvents				

Electrical Properties

PROPERTIES	CONDITION	UNITS	TEST METHOD	PA	GF
Volume Resistivity	22°C, 50% RH, 500V	ohm x cm	ASTM D257-93	$3.1x10^{14}$	$2.0Ex10^{14}$
Surface Resistivity	22°C, 50% RH, 500V	ohm x cm	ASTM D257-93	$3.0x10^{14}$	$2.3Ex10^{14}$
Dielectric Constant	22°C, 50% RH, 500V		D150-95	2.9	3.7
Dielectric Strength		v/mm	D149-95a	$1.6x10^4$	$1.5Ex10^4$
Comparative Tracking Index		V	D5288-92	585, TI-Cu and/or IEC Standard	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 SLS system. Expected shelf life of this material is at least twelve months, when stored in dry conditions at ambient temperatures.

3D SYSTEMS

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PN 70455 Issue Date - 25 Mar 05