

LS, or Laser Sintering, defined: Laser Sintering is a process that uses a laser beam to selectively melt a heated nylon powder. It's done layer by layer in .005" (.120mm) increments; with a laser build line width of .026" (.66mm). The un-sintered powder acts as the support structure for the sintered part. LS is very similar to SLS (selective laser sintering), which is a registered trademark of 3D Systems. ProtoGenic uses the new EOS P-390, which has a 12.6" x 12.6" x 24" build envelope, and uses white PrimePart material. The EOS machine was designed from the ground up to be a direct manufacturing system.

LS vs. SLA: Sintered parts are considerably more durable than SLA's, and they'll also maintain their material properties long after they're built. Stereolithography parts, or SLA's, will absorb moisture over time, which causes them to expand and become more brittle. SLA's are more dimensionally accurate, and they are the best prototypes for high quality cosmetics, making them excellent candidates for RTV mold master patterns. SLA's can also be polished clear. Sintered parts will have a rougher surface finish than SLA's, but the mechanical properties make them excellent candidates for direct manufacturing.

Direct Manufacturing, defined: Direct manufacturing means making end use parts directly from 3D CAD data without the need for costly, time-consuming tooling. With LS, the Engineer has almost complete design freedom. Complexity does not add time or cost when you don't have to build tools, and you can tweak your design between every run of parts without any penalty. Ideal applications for direct manufacturing are complex geometries, fairly low volume, or non-cosmetic parts, where absolute dimensional accuracy isn't critical to function. Examples include cable routing, wiring harnesses, internal chassis, clips, and connectors, to name a few.

Accuracy of laser sintering: Laser sintering is not as accurate as Stereolithography. The beam diameter in the sintering machine is about .023", almost twice the diameter as what's in our SLA machines. With every build, our techs do their best to predict material shrink, and are continually working towards improving accuracy, a process that will continue and remain at the forefront of every build setup (the same holds true for SLA's, by the way). That said, in the X and Y axis expect your parts to be +/- .005" for all features less than 2", and +/- .003" per inch for all features larger than 2". For Z, expect your parts to be within .010" of nominal in the first inch of Z, with +/- .003"/inch, for each inch thereafter. Holes typically build .010" under nominal, but can be post-drilled as specified by you. For direct manufacturing, we can also make adjustments to run parameters on subsequent runs, based on the dimensional feedback of prior runs, to improve the dimensional accuracy of your sintered parts over time.

Cosmetics of sintered parts: Your sintered parts will be cleaned and bead blasted only, or painted black upon request. You can paint your sintered models, but paints don't typically stick to Nylon very well, so the paint may rub off with direct contact. You can also dye your sintered parts using a fabric dye. If you're looking for a show-quality prototype for your photo shoot or trade show booth however, a better solution is a set of SLA's with a paint ready finish, or cast urethanes.

Material Specifications: The material is white in color, called Fine Polyamide PrimePart, aka Nylon 12 powder.

Material Properties	Density of sintered part	ASTM D792	.95 g/cm ³
	Moisture Absorption @ 73° F	ASTM D570	0.41%
	Hardness	DIN 53505	75 Shore D
Mechanical Properties	Tensile Modulus	ASTM D638	1693 Mpa, 245,565 PSI
	Tensile Strength	ASTM D638	45 Mpa, 6527 PSI
	Elongation at break	ASTM D638	15%
	Flexural Modulus	ASTM D790	1300 Mpa, 188,549 PSI
	Izod – Impact Strength	ASTM 256	4.1 ft-lb/in.
	Izod – Notched Impact	ASTM 256	2.0 ft-lb/in.
Thermal Properties	Melting Point	DSC	363°F (184°C)
	HDT (Deflection Temp under Load) @ 66psi	ASTM D648	350°F (177°C)
	HDT (Deflection Temp under Load) @ 264psi	ASTM D648	187°F (86°C)
Sintering Parameters	Layer thickness		.005" (.120mm)
	Build Envelope (largest part size)		12.6" x 12.6" x 24.4" (320mm x 320mm x 620mm)
	Minimum feature size		.030" (.750mm)