WAYKEN RAPID MANUFACTURING
Your
custom prototype manufacturing
Service Experts

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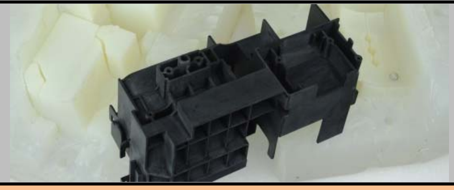
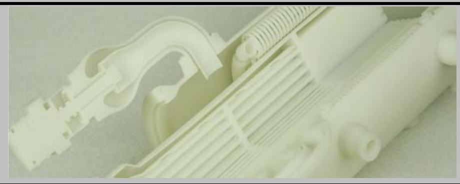
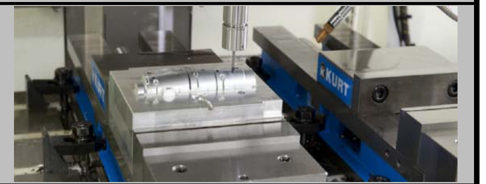
Technology selection guide 1/2	SLA	SLS	CNC MACHINING	VACUUM CASTING	RAPID INJECTION MOLDING
					
Process Comparisons – **Description**	Stereolithography is an additive fabrication process that utilizes a laser to cure thin layers in a vat of liquid UV-sensitive photopolymer. Model resolution can be modified by changing laser “spot size” and layer thickness. Smaller spot size and layer thickness increase resolution, and also increase build time and cost.SLA models can be post-processed for varying levels of finish. Include removes supports and cleans the parts, sanded and bead-blasted, making them suitable for engineering review.SLA models may also be finished and decorated to provide an accurate visual representation of the part.	The SLS process uses a laser to build parts by sintering (fusing) powdered material layer by layer from the bottom up. SLS parts can be accurate and more durable than SLA parts, but the finish is relatively poor with a grainy or sandy feel. There is reduced strength between the fused particles, so the parts will tend to be weaker than machined or molded parts made from the same resin. In addition, there are very few resins available in the powdered form that is required for SLS.	A solid block of plastic is clamped into a CNC machining and cut into a finished part. This method produces superior strength and surface finish to any additive process. It also has the complete, homogenous properties of the plastic, as opposed to the additive processes which use “plastic like” materials and are built in layers. The wide range of material choices allows parts to be made with the desired material properties, such as: tensile strength, impact resistance, heat deflection temperatures, chemical resistance and biocompatibility.	Vacuum casting is a process that is sometimes utilized for creating multiple models using a single master model as a pattern. The master model, typically built using the SLA or CNC process, is finished and textured to simulate the final product. Silicone rubber is poured over the part, and when cured, the master model is removed, leaving a core and cavity capable of producing up to 25 copies of the original. The mold is then injected with a liquid urethane thermoset resin that can be custom tinted, resulting in parts that are productionlike in appearance, and can be used for fit and function evaluation, as well as some limited testing.	When your production tooling won’t be ready for months, rapid injection molding is a great way to receive parts quickly and inexpensively. Can be use various materials and techniques to create bridge tooling for prototype testing and evaluation. Rapid Injection molds can be produced in cast steel, aluminum, P-20 or high-grade tool steel. . If you are ready to go into production, take advantage of the high-speed machining, EDM, injection molding presses, and wide selection of materials. And by offering rapid tooling and injection molding together, you get your complex and intricate parts faster and at a reduced cost.
Pros	For concept models or patterns to be used as masters for other prototyping methods, SLA can produce parts with complex geometries and excellent surface finishes as compared to other additive processes.Pricing is very competitive.	Process can make complex parts that are generally more durable and accurate than SLA parts.	Produces strong parts with good surface finish. Suitable for engineering evaluation and testing. Models can be machined out of plastic, aluminum, magnesium, or most other metals.Good tolerances yield parts suitable for fit and functional testing. Prototypes can be delivered in days like additive processes.	Allows you to make multiple copies of models very quickly, while incorporating most custom colors and textures. Wide range of mechanical properties and durometers. Flexible silicone rubber molds allow you to mold some features that can’t be molded conventionally without special tooling, keeping costs down. Molded in inserts and overmolds are possible.	Can be deliver prototypes and short-run production engineering-grade thermoplastics fast, reducing time to market. Easily manage risk before going into production by taking advantage of the flexibility to create custom injection molded parts. You can either use this tooling for initial production or as a back-up option if your production tooling is delayed or waiting for changes.
Cons	Functional testing is usually not possible on SLA parts, as they tend to be weaker than parts made of engineering resins. The UV curing aspect of the process makes parts susceptible to degradation from sunlight exposure. Despite being capable of generating complex parts, the process gives no indications as to ultimate manufacturability of the design.	The parts have a grainy or sandy texture and are typically not suitable for functional testing due to their reduced mechanical properties. While SLS can make parts with complex geometries, it gives no insight into the eventual manufacturability of the design.	Part geometries can be limited due to the nature of CNC machining. Process can be expensive because programmers and machinists are needed to create CNC toolpaths and fixturing for the parts.	Thermoset urethanes are not representative of injection molded thermoplastics. Limited functional testing. Variables in the creation and finishing of the master model, the construction of the silicone mold, and the de-molding and finishing of the castings can affect accuracy.	Tooling costs can make the process appear to be more expensive than others on first examination, but cost per finished piece is usually significantly lower than additive processes or CNC machining.

Technology selection guide 2/2		SLA	SLS	CNC MACHINING	VACUUM CASTING	PAPID TOOLING
						
General Parameters	Materials Available	UV cured photopolymer,similar to ABS. ★★	Laser cured Nylon® ★★	Many engineering grades ★★★★★	Many polyurethanes, varying hardness. ★★★★	All thermoplastics ★★★★★
	Tensile Strength	Poor ★★	Fair ★★★	Excellent ★★★★★	Good ★★★★	Excellent ★★★★★
	Minimum wall thickness	0.5mm ★★★★	0.8mm-1.2mm (depends on geometry) ★★	0.5mm-0.8mm (depends on geometry) ★★★★	0.6mm-1.0mm (depends on geometry) ★★★	0.5mm-0.8mm (depends on geometry) ★★★★★
	Max Tolerances	0.10mm-0.15mm ★★★	0.10mm-0.20mm ★★	0.05mm-0.10mm ★★★★	0.05mm-0.15mm ★★★	0.02mm-0.05mm ★★★★★
	Surface Finishing	smooth with layer lines Post-build finishing ★★	rough with grainy texture Post-build finishing ★★	smooth high accuracy Post-build finishing ★★★★	smooth high accuracy Post-build finishing ★★★★	smooth high accuracy None required ★★★★★
	Secondary Finish	Sanding, Sand Blasting, Polishing, Painting, Printing, Vacuum Plating ★★★	Sanding, Sand Blasting, Painting, Printing ★★	Sanding, Sand Blasting, Polishing, Painting, Printing, Vacuum and Chemica Plating, Anodizing, Powder Coating ★★★★★	Sanding, Sand Blasting, Polishing, Painting, Printing, Vacuum Plating ★★★★	All finishing available ★★★★★
	Typical Days to Produce	2-5 days ★★★★★	2-5 days ★★★★★	3-8 days ★★★★	5-8 days ★★★	15-35 days ★
	Replicates Volume Production	1-10 Parts ★★	1-10 Parts ★★	1-50 Parts ★★★	10-100 Parts ★★★★	100-50000 Parts ★★★★★
	Price per Part	Single Part ★★★	Single Part ★★★	Single Part ★★	Low Volume Parts ★★★★	High Volume Production ★★★★★
Applications	Concept Models	Yes	Yes	Yes	No	No
	Presentation Models	Yes	Yes	Yes	Yes	Yes
	Functional Prototypes	No	No	Yes	Yes	Yes
	Design & Engineering Verificati	Limited	Limited	Yes	Yes	Yes
	Early Market Research	No	No	Yes	Yes	Yes
	Low-Volume Production	No	No	Limited	Yes	Yes
	Assembly and Inspection Fixtur	No	No	Yes	Limited	No