

PLASTIC

INJECTION MOLDING

page 5

- Rapid tooling
- Production tooling
- Multi-cavity and family molds
- Insert molding
- Over-molding

CAST URETHANE

page 10

ADDITIVE MANUFACTURING

page 14

- Carbon Digital Light Synthesis (DLS)
- HP Multi Jet Fusion – 4200 (MJF)
- HP Multi Jet Fusion – 580 (MJF, Color)
- Stratasys Fused Deposition Modeling (FDM)
- Formlabs Stereolithography (SLA)

METAL

CNC MACHINING

page 2

- 3-axis milling
- 5-axis milling
- Turning

ADDITIONAL PROCESSES

POST-PROCESSING

- Anodizing
- Powder coating
- Painting
- Inserts
- Bead blasting
- Brushing
- Polishing
- Screen printing
- Engraving
- Heat treating
- Passivating
- Plating
- Ultrasonic welding
- *Inquire for additional options*

QUALITY

CERTIFICATIONS

- ISO9001:2015
- AS9100D
- AIAG

INSPECTION CAPABILITIES

- Supplier audits
- Inspection reports
- Functional inspections with gages
- Custom sampling
- CMM
- PPAP
- T1 samples & first articles (incl. AS9102)



CNC MACHINING

CNC MACHINING

General process information

	3-AXIS MILLING	5-AXIS MILLING	TURNING
MAX. PART SIZE	<ul style="list-style-type: none">• 2000 x 1200 x 500 mm• 78.7 x 47.2 x 19.6 in	<ul style="list-style-type: none">• 2000 x 1200 x 500 mm• 78.7 x 47.2 x 19.6 in	<ul style="list-style-type: none">• Ø 350 x 600 mm• Ø 13.8 x 23.6 in
MIN. FEATURE SIZE	<ul style="list-style-type: none">• Ø 0.50 mm• Ø 0.019 in	<ul style="list-style-type: none">• Ø 0.50 mm• Ø 0.019 in	<ul style="list-style-type: none">• Ø 0.50 mm• Ø 0.019 in
BEST ACHIEVABLE TOLERANCE	<ul style="list-style-type: none">• +/- 0.01 mm• +/- 0.0004 in	<ul style="list-style-type: none">• +/- 0.005 mm• +/- 0.0002 in	<ul style="list-style-type: none">• +/- 0.01 mm• +/- 0.0004 in
LEAD TIME	<ul style="list-style-type: none">• As low as 8 days for less than 50 parts	<ul style="list-style-type: none">• As low as 10 days for less than 50 parts	<ul style="list-style-type: none">• As low as 8 days for less than 50 parts

CNC MACHINING

Materials

PLASTIC

- ABS
- Nylon 6
- Acetal (Delrin)
- Polycarbonate
- PVC
- HDPE
- PTFE (Teflon)
- PEEK
- G-10
- Nylon 30%GF
- UHMW

ALUMINUM

- 5083
- 6061
- 6061 - T6
- 6082
- 7075

STAINLESS STEEL

- 303
- 304
- 316
- 2205 Duplex
- 17-4
- 420

OTHER STEEL

- Mild steel
- Alloy steel
- Tool steel

OTHER METAL

- Brass
- Copper
- Titanium
- *Inquire for additional options*

Finishing / post-processing options

- | | | | |
|--------------------------|-----------------|-------------------|-----------------|
| • As machined (standard) | • Bead blasting | • Polishing | • Heat treating |
| • Anodizing | • Brushing | • Screen printing | • Passivating |
| • Powder coating | • Painting | • Engraving | • Plating |

INJECTION MOLDING

A collection of various black plastic injection-molded parts scattered on a light surface. The parts include a large curved bracket, several small cylindrical and conical pieces, a ring-shaped component, and various other small mechanical parts. The text "INJECTION MOLDING" is overlaid in white on the left side of the image.

INJECTION MOLDING

General process information

MAX. PART SIZE	<ul style="list-style-type: none">• 2000 x 1500 x 800 mm• 78.7 x 59.0 x 31.5 in
MIN. PART SIZE	<ul style="list-style-type: none">• 5 x 5 x 5 mm• 0.2 x 0.2 x 0.2 in
BEST ACHIEVABLE TOLERANCE	<ul style="list-style-type: none">• +/- 0.05 mm• +/- 0.002 in
LEAD TIME	<ul style="list-style-type: none">• As low as 2 weeks for T1 samples• After T1 sample approval, lead time for < 10,000 parts is as low as 1 week
TOOL VALIDATION	<ul style="list-style-type: none">• Standard process is to produce a small set of T1 samples for approval before initiating full production
MAX. PRESS SIZE	<ul style="list-style-type: none">• 1400T
MIN. ORDER SIZE	<ul style="list-style-type: none">• 100 parts and \$5000
SET-UP FEE	<ul style="list-style-type: none">• \$500 per mold per order (applies to sample runs after initial T1 samples or engineering changes)

INJECTION MOLDING

Tooling

RAPID TOOLING

- Molds with aluminum cavity and core with a shot life of 5,000-10,000 shots
- Typically machined in 2 weeks

PRODUCTION TOOLING

- P20 steel tool with shot life up to 1M shots
- Ability to integrate side-pulls or cam-actions
- Typically machined in 3 weeks

MULTI-CAVITY OR FAMILY MOLDS

- Multiple identical cavities or family of parts machined into a single tool
- Allows for more parts to be produced per shot, minimizing unit costs

INSERT MOLDING

- Inserts are placed into the mold and molding occurs around them to extend tool life for critical features
- Allows for inserts such as helicoils to be molded in your design

OVER-MOLDING

- Premade parts are placed into the mold and molded over
- Allows for multi-material injection molding

INJECTION MOLDING

Materials

MOST COMMON MATERIALS

- Acrylonitrile Butadiene Styrene (ABS)
- Polyethylene (PE)
- Polypropylene (PP)
- Polycarbonate (PC)

OTHER SUPPORTED MATERIALS

- Nylon (PA 6)
- Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS)
- Polyurethane (PU)
- Polymethyl Methacrylate (PMMA/Acrylic)
- High Density Polyethylene (HDPE)
- Low Density Polyethylene (LDPE)
- Polystyrene (PS)
- Polyvinyl chloride (PVC)
- PEEK
- POM (Acetal/Delrin)
- Polyethylene Terephthalate (PET)
- Thermoplastic Elastomer (TPE)
- *Inquire for additional options*

ADDITIVES AND FIBER

- UV absorbers
- Flame retardants
- Plasticizers
- Colorants
- Carbon fibers
- Glass fibers

INJECTION MOLDING

Additional information

COLORS

- Pantone color matching
- RAL color matching
- Physical sample color matching

FINISHING / POST-PROCESSING OPTIONS

- We can produce to any SPI standard (glossy, matte, rough, very rough)
- Pad printing
- Inserts (e.g. heat stake inserts)
- Mold-tech textures also available
- Ultrasonic welding
- Silk screening
- Painting
- Light assembly
- Protective packaging / film



CAST URETHANE

CAST URETHANE

General process information

MAX. PART SIZE	<ul style="list-style-type: none">• 914.4 x 914.4 x 1828.8 mm• 36.0 x 36.0 x 72.0 in• Note: Ability to break parts up into multiple segments to create an even larger assembly
MIN. FEATURE SIZE	<ul style="list-style-type: none">• 0.635 mm for features• 0.025 in for features• 1.016 mm wall thickness• 0.040 in wall thickness
BEST ACHIEVABLE TOLERANCE	<ul style="list-style-type: none">• 0.005 in (0.127 mm) for first inch, 0.003 in (0.0762 mm) per lineal inch after the first one
LEAD TIME	<ul style="list-style-type: none">• As low as 7 days for first articles (FA)• After FA approval, as low as 2 weeks for remaining parts

CAST URETHANE

Shore D materials

STANDARD

- ABS-like (80D)
- PE-like (65D)
- PC-like (84D)
- PP-like (70D)

HIGH PERFORMANCE

- Nylon-Derlin like (84D)
- ABS-High Impact (78D)
- High Impact FR (UL-94V0) (85D)
- Hi Temp (84D)
- 12 Sec burn (78D)

FDA

- ABS-like (80A)
- ABS-High Strength (85A)
- Hi Impact Class VI (85D)

CLEAR

- Optical Clear (80D, water clear)
- PC-like (84D, haze/pale yellow)

Finishing / post-processing options

PART FINISHES

- Smooth
- Satin
- Glossy / polish
- Custom finishing available

MOLD TEXTURES

- Mold-tech soft textures: MT-11010, MT-11020, MT-11030, MT-11040, MT-11050, MT-11060, MT-11070
- Mold-tech rough textures: MT-11080, MT-11090, MT-11100, MT-11110, MT-11120, MT-11130, MT-11140, MT-11150, MT-11160

CAST URETHANE

Shore A materials

ELASTOMERS

- Standard elastomers (15A-94A, “F” series)
- High performance elastomers (15A-90A, “M” series)

CLEAR ELASTOMERS

- Clear elastomer (45A, water clear)
- Clear elastomer (65A, water clear)
- Clear elastomer (70A, water clear)
- Clear elastomer (90A, water clear)

SILICONES

- 15A
- 25A
- 35A
- 40A
- 42A
- 50A
- 53A
- 60A
- 75A

MEDICAL SILICONES

- 38A

Finishing / post-processing options

PART FINISHES

- Smooth
- Satin
- Glossy / polish
- Custom finishing available

MOLD TEXTURES

- Mold-tech soft textures: MT-11010, MT-11020, MT-11030, MT-11040, MT-11050, MT-11060, MT-11070
- Mold-tech rough textures: MT-11080, MT-11090, MT-11100, MT-11110, MT-11120, MT-11130, MT-11140, MT-11150, MT-11160



CARBON[®] DIGITAL LIGHT SYNTHESIS[™]

CARBON[®] DIGITAL LIGHT SYNTHESIS[™] (DLS)

General process information

DESCRIPTION	Carbon's Digital Light Synthesis (DLS) is a resin-based polymer additive manufacturing process. Light is projected in a series of layered patterns as the build platform rises, selectively solidifying the UV-curable resin to achieve a semi-solid part. After build, some of the resins will also require a secondary thermal cure to complete the process. The DLS process produces isotropic material properties.
BENEFITS OF DLS	<ul style="list-style-type: none">• Production grade parts off the printer (closest 3D printing technique to injection molding quality)• Isotropic material properties• Foam replacement opportunities with elastomers and lattices
MAX. PART SIZE	<ul style="list-style-type: none">• 189 x 118 x 326 mm• 7.4 x 4.6 x 12.8 in
MIN. FEATURE SIZE	Material dependent, typically: <ul style="list-style-type: none">• ~0.25 - 0.5 mm• ~0.01 - 0.02 in
BEST ACHIEVABLE TOLERANCE	Material dependent, typically: <ul style="list-style-type: none">• +/- 0.25 mm• +/- 0.01 in
LEAD TIME	<ul style="list-style-type: none">• As low as 3 business days

CARBON[®] DIGITAL LIGHT SYNTHESIS[™] (DLS)

Polyurethane materials

MATERIAL	COLOR	DUROMETER	DESCRIPTION
Elastomeric Polyurethane – EPU 40	Black	68A	• Highly elastic, tear resistant, and resilient • Perfect for cushioning, impact absorption, vibration isolation, gaskets, and seals
Elastomeric Polyurethane – EPU 41	Linen Green	71A	
Rigid Polyurethane – RPU 130	Black	100D	• Versatile, tough, and rigid • Comparable to an unfilled thermoplastic like nylon or polypropylene
Rigid Polyurethane – RPU 70	Black	80D	
Multi-purpose Polyurethane – MPU 100	White	74D	• Biocompatible, sterilizable, and durable • Medical-grade • Perfect for medical products and devices, consumer health care products, and drug contact applications

Finishing / post-processing options

- Painting
- Heat staked inserts
- Hydrographics
- Bead blasting
- Press-fit inserts
- Laser surface decorating / etching
- Smoothing
- Digital texturing

CARBON® DIGITAL LIGHT SYNTHESIS™ (DLS)

Additional materials

MATERIAL	COLOR	DUROMETER	DESCRIPTION
Epoxy – EPX 82	Black	88D	<ul style="list-style-type: none">• Temperature resistant, strong, and tough• Comparable to lightly glass-filled thermoplastics• Perfect for connectors, brackets, and housings
Silicone – SIL 30	Light grey	35A	<ul style="list-style-type: none">• Soft touch, biocompatible, and tear resistant• Perfect for comfortable skin contact products such as headphones, wristbands, and attachment wearables
Cyanate Ester – CE 221	Orange	92D	<ul style="list-style-type: none">• Highly temperature resistant and stiff• Comparable to glass-filled nylon• Perfect for applications that need long term thermal stability such as under-the-hood components, electronics assemblies, etc.
Whipmix	Translucent	80D	<ul style="list-style-type: none">• Material for surgical guides• Primarily used for dental and orthodontic applications
Urethane Methacrylate – UMA 90	Full RGB	86D	<ul style="list-style-type: none">• Manufacturing jigs, fixtures, and general-purpose prototypes• Like conventional SLA resins

Finishing / post-processing options

- Painting
- Heat staked inserts
- Hydrographics
- Bead blasting
- Press-fit inserts
- Laser surface decorating / etching
- Smoothing
- Digital texturing

HP MULTI JET FUSION (MJF)



HP MULTI JET FUSION (MJF) - 4200

General process information

DESCRIPTION	<p>MJF – 4200 is a powder bed fusion process that utilizes precision printheads to selectively apply fusing and detailing agent to a layer of powder. Parts are fused by heating lamps that apply thermal energy directly to each layer before a recoating roller re-applies an 80micron layer of powder to the top of the build. The process repeats layer-by-layer for the duration of the build then parts are ready for thermal processing. After cooling, parts are excavated from the powder bed and bead-blasted to achieve an optimal surface finish.</p>			
BENEFITS OF HP MJF 4200	<ul style="list-style-type: none"> • Produces fine features and complex parts • More consistent isotropic mechanical properties in the Z build direction when compared to other additive processes • Does not require supports (self-supporting) allowing more design freedom 			
MAX. PART SIZE	<ul style="list-style-type: none"> • 375 x 375 x 280 mm • 14.8 x 14.8 x 11.0 in 			
MIN. FEATURE SIZE	<ul style="list-style-type: none"> • 0.5 mm • 0.02 in 			
BEST ACHIEVABLE TOLERANCE	<p>Features in X-Y Dimension (0-100mm feature size)</p> <ul style="list-style-type: none"> • +/- 0.3 mm • +/- 0.012 in 	<p>Features in X-Y Dimension (>100mm feature size)</p> <ul style="list-style-type: none"> • +/- 0.3% of feature size 	<p>Features in Z Dimension (0-100mm feature size)</p> <ul style="list-style-type: none"> • +/- 0.4 mm • +/- 0.016 in 	<p>Features in Z Dimension (>100mm feature size)</p> <ul style="list-style-type: none"> • +/- 0.4% of feature size
LEAD TIME	<ul style="list-style-type: none"> • As low as 4 business days for Nylon PA 12 • As low as 5 business days for 40% Glass Bead Filled Nylon PA 12 			

HP MULTI JET FUSION (MJF) - 4200

Materials

MATERIAL	COLOR	DUROMETER	DESCRIPTION
Nylon PA 12	Gray	80D	<ul style="list-style-type: none">• Fine detail and high dimensional accuracy• Produce strong quality parts• Provides excellent chemical resistance to oils, greases, aliphatic hydrocarbons, and alkalies• Product complex parts and lattice structures• Ideal for complex assemblies, housings, enclosures and connectors• Biocompatibility – Meets USP Class I-IV and US FDA guidance for intact Skin Surface Devices• Certifications – UL 94, UL 746A
40% Glass Bead Filled Nylon PA 12	Gray	82D	<ul style="list-style-type: none">• Product stiff, functional parts• Provides dimensional stability along with repeatability• Ideal for applications requiring high stiffness like enclosures and housings, fixtures and tooling• Certifications – UL 94, UL 746A

Finishing / post-processing options

- Painting
- Black dying
- Bead blasting
- Heat staked inserts
- Press-fit inserts
- Digital texturing
- Smoothing
- Laser surface decorating / etching

HP MULTI JET FUSION (MJF) - 580

General process information

DESCRIPTION	<p>The HP Jet Fusion 580 Color Printer is a first-generation, full color, polymer 3D printer. The 580 uses the same basic Multi Jet Fusion technology as the 4200/5200 printer models, but now with the added capability of printing in color. The 580 is part of a “500/300 series” of printers that includes a purely black-and-white printing solution; the 580 is the most advanced product in the series because of its ability to print colors. It receives Cyan, Magenta, Yellow, and Black colored agents (CMYK).</p>				
BENEFITS OF HP MJF 580	<ul style="list-style-type: none">• Produces full-spectrum color parts with a voxel-control system• Produces accurate, functional parts with intricate detail				
MAX. PART SIZE	<ul style="list-style-type: none">• 332 x 190 x 248 mm• 13.1 x 7.5 x 9.8 in				
MIN. FEATURE SIZE	<ul style="list-style-type: none">• 0.5 mm• 0.02 in				
BEST ACHIEVABLE TOLERANCE	<table><thead><tr><th>Features in X-Y dimension</th><th>Features in Z dimension</th></tr></thead><tbody><tr><td><ul style="list-style-type: none">• +/- 0.4 mm• +/- 0.016 in</td><td><ul style="list-style-type: none">• +/- 0.8 mm• +/- 0.031 in</td></tr></tbody></table>	Features in X-Y dimension	Features in Z dimension	<ul style="list-style-type: none">• +/- 0.4 mm• +/- 0.016 in	<ul style="list-style-type: none">• +/- 0.8 mm• +/- 0.031 in
Features in X-Y dimension	Features in Z dimension				
<ul style="list-style-type: none">• +/- 0.4 mm• +/- 0.016 in	<ul style="list-style-type: none">• +/- 0.8 mm• +/- 0.031 in				
LEAD TIME	<ul style="list-style-type: none">• As low as 4 business days with a color file provided• As low as 5 business days without a color file provided				

HP MULTI JET FUSION (MJF) - 580

Materials

MATERIAL	COLOR	DUROMETER	DESCRIPTION
CB Nylon PA 12	All CMYK values are accepted, but system is not capable of a perfect color-match. Part geometry, orientation, and nesting position all affect the color uniformity and repeatability	80D	<ul style="list-style-type: none">• Produces strong, functional complex parts• Provides excellent chemical resistance to oils, greases, aliphatic hydrocarbons, and alkalies• Ideal for color and white parts like jigs, fixtures, labeling, presentation models, functional prototypes

Color demonstration samples



Finishing / post-processing options

- Heat staked inserts
- Press-fit inserts
- Bead blasting



STRATASYS FUSED DEPOSITION MODELING (FDM)

STRATASYS FUSED DEPOSITION MODELING (FDM)

General process information

DESCRIPTION	The most common additive method on the market. This process uses a roll of plastic filament which is melted down and deposited layer-by-layer until a 3-dimensional part is created
BENEFITS OF FDM	<ul style="list-style-type: none">• Engineering-grade materials• Industry certifications• Large build volume
MAX. PART SIZE	<ul style="list-style-type: none">• 914 x 610 x 914 mm• 36.0 x 24.0 x 36.0 in
MIN. FEATURE SIZE	<ul style="list-style-type: none">• 0.4 mm• 0.016 in
BEST ACHIEVABLE TOLERANCE	<ul style="list-style-type: none">• +/- 0.0035 in (+/- 0.089 mm) or +/- 0.0015 (+/- 0.038 mm) in per inch, whichever is greater
LEAD TIME	<ul style="list-style-type: none">• As low as 3 business days

STRATASYS FUSED DEPOSITION MODELING (FDM)

Materials (Page 1)

MATERIAL NAME	COLOR	THICKNESS
Ultem 1010	Tan	0.010", 0.013", 0.020"
Ultem 9085	Black, Tan	0.010", 0.013"
PC-10	White	0.007", 0.010", 0.013"
PC-ISO	White, Translucent	0.007", 0.010", 0.013"
PC-ABS	Black	0.005", 0.007", 0.010", 0.013"
ASA	Black, Dark Grey, White, Ivory, Light Grey, Red, Orange, Yellow, Green, Dark Blue	0.005", 0.007", 0.010", 0.013", 0.020"

Finishing / post-processing options

- Painting
- Vapor smoothing
- Epoxy impregnation
- Bead blasting
- Heat staked inserts
- Sanding
- Press-fit inserts

STRATASYS FUSED DEPOSITION MODELING (FDM)

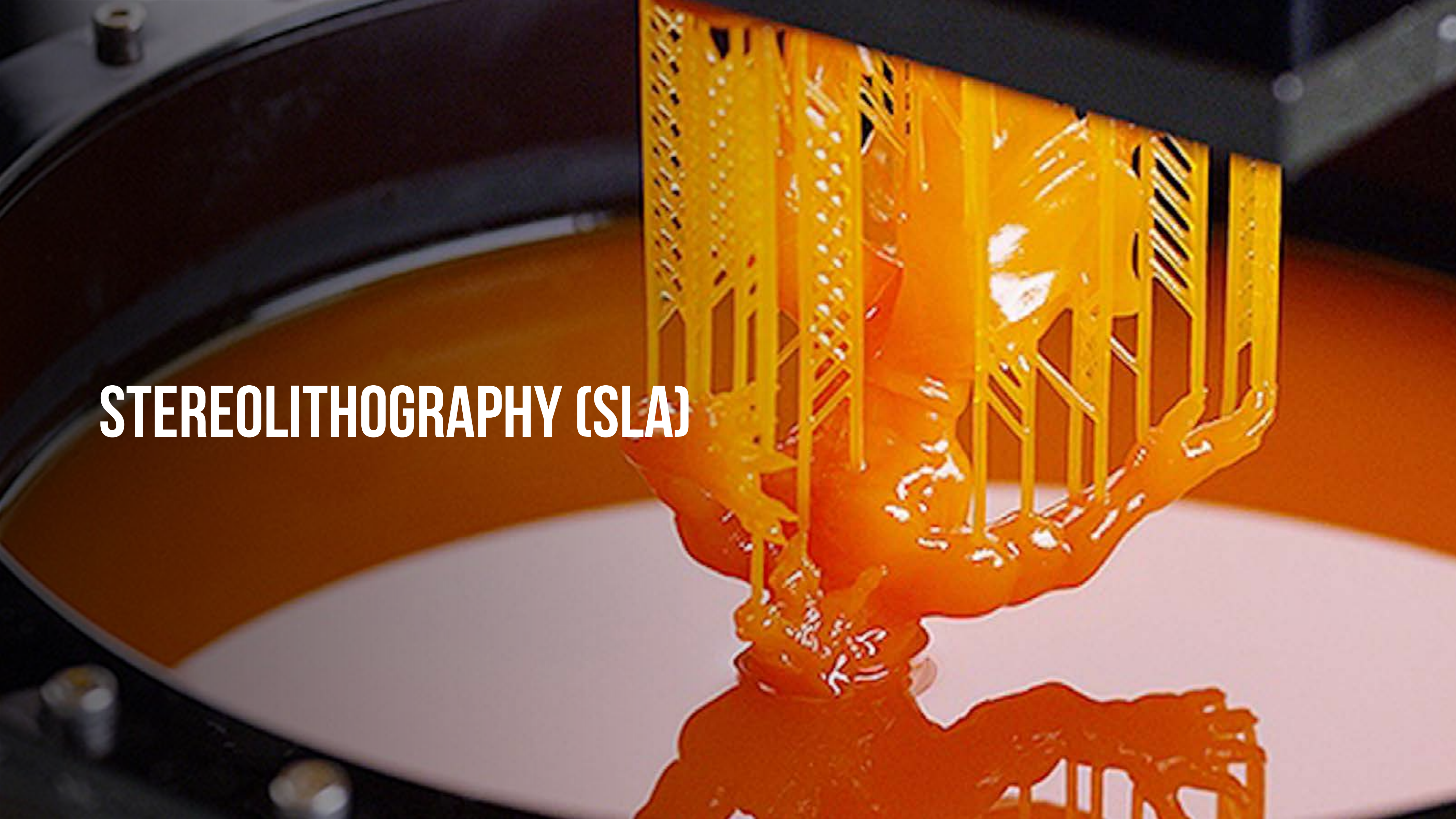
Materials (Page 2)

MATERIAL NAME	COLOR	THICKNESS
ABS-ESD7	Black, White, Gray, Ivory, Red, Blue	0.005", 0.007", 0.010", 0.013"
ABS-M30i	Black, White, Gray, Ivory, Red, Blue	0.005", 0.007", 0.010", 0.013"
ABS-M30	Black, White, Gray, Ivory, Red, Blue	0.005", 0.007", 0.010", 0.013"
PPSF	Tan	0.010"
ST-130	Natural	0.013"
Nylon 6	Black	0.010", 0.013"
Nylon 12	Black	0.007", 0.010", 0.013"
Nylon 12CF	Black	0.010"
Antero 800NA	Tan, Natural	0.010"

Finishing / post-processing options

- Painting
- Vapor smoothing
- Epoxy impregnation
- Bead blasting
- Heat staked inserts
- Sanding
- Press-fit inserts

STEREOLITHOGRAPHY (SLA)



STEREOLITHOGRAPHY (SLA)

General process information

DESCRIPTION	SLA is a type of photopolymerization capable of producing parts with an excellent surface finish and small feature resolution. While SLA is not typically suitable for high-performance applications, its intricate and accurate detailing make it a popular option for prototypes. Our factory houses Formlabs Form 3 SLA printers.
BUILD VOLUME	• 145 x 145 x 185 mm
MAX. PART SIZE	• 75mm x 75mm x 75mm x 75mm
MIN. FEATURE SIZE	The minimum feature size is different for each resin, but we are able to achieve complex and aggressive geometry.
LEAD TIME	Get your prototypes in as little as seven days. Production or high volume runs will be examined on a case by case basis, but the standard lead time is four days.

STEREOLITHOGRAPHY (SLA)

Materials

MATERIAL	COLOR	HARDNESS	DESCRIPTION
Surgical guide	Clear orange	67D	• Biocompatible
Clear	Clear	82D	
Rigid	White	92D	• Strong and brittle • Meant for more industrial applications
Tough 2000	Gray matte	81D	• Engineering resin • For mechanical and industrial applications
Elastic	Clear	50A	• Elastomeric
Flexible	Black	80-85A	• Flexible • Stronger mechanical properties than Elastic

Finishing / post-processing options

- Sanding
- Polishing
- Metal coating
- Paint

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