

Technology	3D Printing	CNC Machining	Urethane Casting	Sheet Metal	Rapid Injection Molding	Prototype Extrusions
Overview	3D printer extrudes, cures, or fuses raw material in a layer-by-layer fashion.	Computer-controlled cutting tool selectively removes material from blank workpiece.	Liquid urethane is poured into a silicone mold which has been made from a pattern.	Blank sheets of metal are bent or cut into new shapes using heavy machinery.	Molten plastic is injected into a low-cost aluminum mold and cooled until it solidifies.	Material is forced through a metal die, producing a prototype with a continuous profile.
Advantages	<ul style="list-style-type: none"> <li>• Low up-front cost</li> <li>• Cheap for one-off prototypes</li> <li>• Suit for complex geometry</li> </ul>	<ul style="list-style-type: none"> <li>• High precision</li> <li>• Near production quality</li> </ul>	Cheaper than injection molding for lower volume	<ul style="list-style-type: none"> <li>• Easy to make XL parts</li> <li>• Range of forming processes</li> </ul>	<ul style="list-style-type: none"> <li>• Near production quality</li> <li>• Detailed parts</li> <li>• Fast delivery</li> </ul>	<ul style="list-style-type: none"> <li>• Fast</li> <li>• Can cut multiple units from one extrusion</li> </ul>
Limitations	Limited resolution and surface quality	<ul style="list-style-type: none"> <li>• Slow when higher volumes required</li> <li>• Raw material waste</li> </ul>	Can't test real materials for final products	Only suitable for thin-walled metal prototypes	Aluminum tooling still relatively expensive	Limited geometries
Materials	Many plastics (FDM, SLA) and metals (powder bed)	Many plastic and metals	Urethanes	Many metals	Many thermopolymers and some thermosets	Aluminum and some plastics (PP, PE, nylon, etc.)
Example prototypes	<ul style="list-style-type: none"> <li>• Plastic electronics housings</li> <li>• Titanium aerospace parts</li> </ul>	<ul style="list-style-type: none"> <li>• Custom functional automotive prototypes</li> <li>• Prototype molds</li> </ul>	<ul style="list-style-type: none"> <li>• Colorful display prototypes</li> <li>• Containers</li> </ul>	<ul style="list-style-type: none"> <li>• Prototype brackets and chassis</li> <li>• Enclosures and panels</li> </ul>	<ul style="list-style-type: none"> <li>• Prototypes of small consumer goods</li> <li>• Silicone prototypes</li> </ul>	<ul style="list-style-type: none"> <li>• Simple bars and tubes</li> <li>• Construction parts</li> </ul>

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