

AM production type	Sub type	min. Build size (mm)	Typical Production Volume	Possibilities for shape complexity	Material	Mechanical Properties				Precision					Surface Finish	Reproducibility	Lead Time		Price	Source:
						Range Young's Modulus	Range Tensile Strength	Range Impact strength Notched (ability to absorb energy)	Max. Service temperature or Glass-Transition Temperature (Celsius)	Tolerances/ Accuracy	Holes (minimum diameter)	Embossed and Engraved Details	Horizontal Bridges	Minimum Features			Production rate (Units)	Total Lead Time		
Material Extrusion																				
	FDM - Fused Deposition Modeling	914x610x914 to XL-sizes	1 till 50	High	Plastic and Composites and Metal	1027-2772 MPa 21000-54000 MPa	22-81 MPa 590-700 MPa	28-235 J/m	104-230	±0.5 mm	Ø2mm	0.6 mm wide / 2 mm high 0.6 mm wide / 2 mm high	10 mm	2 mm	Rough	High	0.13-1 per hour	< 2 days	\$	Materials Sheets, Stratasysredeyendemand.com/Materials_FDM_Thermoplastics.aspx, February 2015
	CFF - Continuous Fiber Fabrication	330x270x200	1 till 50	High						±0.5 mm	Ø2mm	0.6 mm wide / 2 mm high	10 mm	2 mm	Rough	High	0.13-1 per hour	< 2 days	\$5-\$55	https://www.conceptsinproduction.com/wp-content/uploads/2017/09/MaterialDatasheetSick.pdf
Vat Polymerisation																				
	SLA - Stereolithography	2100x700x800	1 till 50	Very High	Plastic	910-11700 MPa	20-2490 MPa	9-66 J/m	41-111	±0.01 mm	Ø0.5mm	0.4 mm wide / 0.4 mm high	Not Possible	0.075 mm	Smooth	Good	0.04-12 per hour	< 3 days	\$5	Only one material can be printed - Higher Tensile strength with 2490 Mpa (Somos hexis) Prefactory Family of Envisiontec - Desktop Faster than SLA but less precise. Industrial DUP is better than SLA
	DLP - Digital Light Processing	800x400x225	1 till 10	Very High	Plastic	2400-4890 MPa	5-78.1 MPa	4-105 J/m	37-160	±0.01 mm	Ø0.5mm	0.4 mm wide / 0.4 mm high	Not Possible	0.001 mm	Very smooth	Good	0.04-12 per hour	< 3 days	\$5	http://wohhttp://tenchhttps://www.3dhubs.com/knowledge-base/industrial-sladdp-vs-desktop-sladdp
	CLIP - Continuous Liquid Interface Production	1630x945x590	1 till 100	Very High	Plastic	750-4010 MPa	3.2-105 MPa	21-45 J/m	9-231	±0.01 mm	Ø0.5mm	0.4 mm wide / 0.4 mm high	Not Possible	NA	Very smooth	High	0.0004-12 per hour	< 2 days	\$55	https://3dhttps://www.3dbeginners.com/carbon-m1-review/
Powder Bed Fusion																				
	SLS - Selective Laser Sintering	750x750x550	1 till 100	Very High	Plastic and Composites	9.2-8928 MPa	2.3-90 MPa	10-282 J/m	32-105	±0.3 mm	Ø1.5mm	1 mm wide / 1 mm high	Always Possible	0.7 mm	Average	High	0.1-400 per hour	< 7 days	\$55	Little data on the glass temp. Glass temperature similar to SLS technique. Often stronger in the Z-direction. Production batch of MJF is faster due to the cooling and postprocessing workflow. Estimated numbers. Steels are not included as for the interior design, steel is too heavy. Often lightweight aluminum is used. Mechanical props van Ti en Al. Only made bij Arcam. Do not reveal their mechanical properties. Reasons: High densities can not be fulfilled compared to SLM. See paper.
	MJF - Multi Jet Fusion	3700x3700x2500	1 till 100	Very High	Plastic	1700-2500 MPa	48-52 MPa	52-56 J/m	32-105	±0.2 mm	Ø1.0mm	1 mm wide / 1 mm high	Always Possible	0.5 mm	Smooth	High	0.01-400 per hour	< 4 days	\$55	https://eos.materialdatacenter.com/eo/standard/main/ds
	DM/LS/SLM - Direct Metal Laser Sintering / Selective Laser Sintering	500x360x280	1 till 10	Very High	Metal (Aluminium)	38000-108000 MPa	184-409 MPa	100-235 J/m	200-590	±0.1 mm	Ø5 mm	0.1 mm wide / 0.1 mm high	2 mm	0.6 mm	Smooth	High	0.08-1 per hour	< 5 days	\$55555	https://wwwhttp://www8.hp.com/h20195/v2/GetPDF.aspx/4AA7-1533ENA.pdf
	EBM - Electron Beam Melting	350x350x350	1 till 10	Very High	Metal (Mainly pure: Titanium, Cobalt- chrome)	38000-105000 Mpa	375-590 MPa	171-187.6 J/m	200-590	±0.1 mm	Ø5 mm	0.1 mm wide / 0.1 mm high	2 mm	0.6 mm	Average	High	0.04-7 per hour	< 4 days	\$55555	https://wwhttps://wwhttps://wwhttps://iopscience.iop.org/article/10.1088/1757-899X/115/1/012002/pdf
Material Jetting																				
	MJ - Material Jetting	1000x800x500	1 till 10	Very High	Plastic	1000-3500 MPa	0.8-80 MPa	14-80 J/m	47-65	±0.05 mm	Ø0.5mm	0.5 mm wide / 0.5 mm high	Always Possible	0.5 mm	Very Smooth	High	1-5 per hour	< 3 days	\$555	Developed by Xjet. Volgens Chief Business Officer van het bedrijf, zijn de mechanische properties vergelijkbaar met huidige mass production methods. Dure print methode door nano omhulsel. Mainly used for as a tool for casting. Lead time faster than SLA since it does not require the burnout procedures. Mainly used for jewelry. Mechanical properties are low as it is used as a casting method for metals. Therefore the mechanical properties of metals are used. Making of a casting product compared to SM takes a week instead of 7 weeks.
	NPJ - NanoParticle Jetting	500x280x200	1 till 10	Very High	Metal, Ceramics	38000-108000 MPa	375-590 MPa	171-187.6 J/m	200-590	±0.05 mm	Ø0.5mm	0.5 mm wide / 0.5 mm high	Always Possible	0.5 mm	Very Smooth	High	1-5 per hour	<3 days	\$55555	Polyjet Ma Material P Product Data Sheets), 3-D Printer Modeling Materials, 3D Systems, http://www.3dsystems.com/materials/professional, February 2015
	DOD - Drop On Demand	558x495x419	1 till 10	Very High	Wax	38000-108000 MPa	184-409 MPa	100-235 J/m	200-590	±0.05 mm	Ø0.25mm	0.25 mm wide / 0.25 mm high	Always Possible	0.25 mm	Average	High	1-5 per hour	< 6 days	\$555	https://wwhttps://www.solidescape.com/high-precision-investment-casting-wax-3d-printer/
	BJ - Binder Jetting	400x250x250	1 till 100	Very High	Sillica Sand, Metal (Mainly Steel)	147-200 GPa	406-682 MPa	100-235 J/m	200-590	±0.2 mm	Ø1.5mm	0.5 mm wide / 0.5 mm high	Always Possible	2 mm	Average	Good	1-500 per hour	< 5 days	\$55	Impact en Glasstemp overgenomen van SLM, dit klopt dus niet
Direct Energy Deposition																				
	LENS - Laser Engineering Net Shape	4000x1000x1000	1 till 10	High	Metal	70-74 Gpa	190-222 Mpa	171-187.6 J/m	200-590	layer 0.25 mm					Smooth	High	0.04-25 per hour	< 5 days		Material properties are similar or better than wrought products (PM dus).
	EBAM - Electron Beam Additive Manufacturing	5790x1220x1220			Metal											High				Attar, H.; Ehemann-Haghighi, S.; Kent, D.; Wu, X.; Dargusch, M.S. Comparative study of commercially pure titanium produced by laser engineered net shaping, selective laser melting and casting processes. Mater. Sci. Eng. A 2017, 705, 385–393. [
Sheet Lamination																				
	LDM - Laminated Object Manufacturing	800x550x508	1 till 10	Average	Metal			N/A	N/A	N/A	N/A	N/A	Always Possible	N/A	Rough	Average	Fast - Dependent on thickness material layer	< 2 days	\$	Product Data Sheets, Fabrisonic, http://www.fabrisonic.com/materials.html, February 2015
	SLCOM - Selective Lamination Composite Object Manufacturing	762x610x610	1 till 10	Average	Composites	N/A	N/A	N/A	-125-435	±0.1 mm	Ø5 mm	0.1 mm wide / 0.1 mm high	N/A	0.6 mm	Average	Average	Fast - Dependent on thickness material layer	< 2 days	\$5	Strong features in the X and Y direction

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Machining																				
	Milling Turning Planing																			
Cutting																				
	WJM - Water Jet Machining	4000x2000x15	1-1000000	Low	Plastics, thin composites, paper, leather, metal	70-74 Gpa	190-222 Mpa	171-187.6 J/m	200-590	±0.05 mm	Ø0.3 mm	0.3 mm wide / 0.3 mm high	Not Possible	0.3 mm	Very Smooth	Very High	Fast	< 2 days		Low equipment and tooling costs Material highest werd aluminium gebruikt (6082)
	Plasmacutting Lasercutting photochemical																			

FM production type	Sub type	min. Build size (mm)	Typical Production Volume	Possibilities for shape complexity	Material	Mechanical Properties				Precision					Surface Finish	Reproducibility	Lead Time		Price	Source:
						Range Young's Modulus	Range Tensile Strength	Range Impact strength Notched (ability to absorb energy)	Max. Service temperature or Glass-Transition Temperature (Celsius)	Tolerances/ Accuracy	Holes (minimum diameter)	Embossed and Engraved Details	Horizontal Bridges	Minimum Features			Production rate (Units)	Total Lead Time		
Forming																				
	Thermofforming																			
Casting																				
	Injection molding	500x500x500	1000 - 1000000	Average	Plastics	3-49400 MPa	7-350 MPa	0.4-550 J/m	32-427	±0.1 mm	Ø0.1 mm	0.5 mm wide / 0.5 mm high	Always Possible	1 mm	Very Smooth	Very High	60-3000 per hour	> 14 days	\$555	Injection molding has build sizes with sizes a big as a trains caboose. However, molding big parts is often expensive.
	die casting low pressure die casting investment casting sandcasting																			https://www.creativemechanisms.com/blog/everything-you-need-to-know-about-injection-molding