

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/ Accur./diameter	Embossed and Engraved Details	Horizontal Bridges	Minimum Features						
<b>Material Extrusion</b>																			
	FDM - Fused Deposition Modeling	914x610x914 to XL-sizes	1 till 50	High	Plastic and Ceramics	1027-2772 MPa	22-81 MPa	28-235 J/m	104-230	±0.5 mm	Ø2mm	0.5 mm wide / 2 mm high	10 mm	2 mm	Rough	High	0.13-1 per hour < 2 days	\$	Materials Sheets, Stratasysredyeondemand.com/Materials_FDM_Thermoplastics.aspx, February 2015
	CFF - Continuous Fiber Fabrication	330x270x200	1 till 50	High	Composites and Metal	21000-54000 MPa	590-700 MPa	958-3117 J/m	135-180	±0.5 mm	Ø2mm	0.5 mm wide / 2 mm high	10 mm	2 mm	Rough	High	0.13-1 per hour < 2 days	\$\$\$-\$\$\$\$	https://www.conceptsinproduction.com/wp-content/uploads/2017/09/MaterialDatasheetSlick.pdf
<b>Vat Polymerisation</b>																			
	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	\$	Only one material can be printed - Higher Tensile strength with 2490 MPa (Prefers NX)
	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	\$	Prefers NX
	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	\$\$\$\$	http://wol: http://ten: https://www.3dubs.com/knowledge-base/industrial-sladij-vs-desktop-sladij
<b>Powder Bed Fusion</b>																			
	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	\$\$\$\$	Little data on the glass temp.
	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	\$\$\$\$	Glass temperature similar to SLS (2000-2500). Often stronger in the Z-direction.
	DMSL/SLM - Direct Metal Laser Sintering / Selective Laser Sintering	500x360x280	1 till 10	Very High	Metal (Aluminum)	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	\$\$\$\$\$\$	Production batch of MJF is faster due to the cooling and postprocessing work.
	EBM - Electron Beam Melting	350x350x350	1 till 10	Very High	Metal (Mainly pure: Titanium, Cobalt-chrome)	38000-105000 MPa	275-590 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	\$\$\$\$\$\$\$\$	Estimated numbers. Steels are not included as for the interior design, steel is too heavy. Often lightweight aluminum is used.
<b>Material Jetting</b>																			
	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	\$\$\$\$\$	Developed by Xjet. Volgens Chief Business Officer van hetzelfde niet veel verschillende mechanische eigenschappen vergelijkbaar met huidige mass production methods. De printmethode doet niet veel verschillen.
	NPJ - NanoParticle Jetting	500x280x200	1 till 10	Very High	Metal, Ceramics	38000-108000 MPa	275-590 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	\$\$\$\$\$\$	Polyjet Ma Material Product Data Sheets\3-D Printer Modeling Materials, 3D Systems, http://www.3dsystems.com/materials/professional, February 2015
	DOO - 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	\$\$\$\$\$	Developed for a tool for casting. Lead time faster than SLA since it does not require the burnout process. 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.
<b>Binder Jetting</b>																			
	BJ - Binder Jetting	400x250x250	1 till 100	Very High	Silica 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	\$\$\$	Impact op Glasslamp overgenomen van SLM, dit klopt dus niet
<b>Direct Energy Deposition</b>																			
	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 (FM dus).	
	EBAM - Electron Beam Additive Manufacturing	5790x1220x1220			Metal												Atar, H; Ehtemam-Haghghi, 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. [		
<b>Sheet Lamination</b>																			
	LOM - Laminated Object Manufacturing	800x550x508	1 till 10	Average	Metal	68.9-110 Gpa	89.6-210 MPa			N/A	N/A	N/A	Always Possible	N/A	Rough	Average	Fast - Dependent on the thickness of 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 of material layer < 2 days	\$\$	Strong features in the X and Y direction
																	X aantal cases die zij voorbeeld hebben, indien mogelijk meten: staal, aluminium, titanium, magnesium		

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<b>Machining</b>																			
	Milling																		
	Turning																		
	Planing																		
	WJM - Water Jet Machining	4000x2000x25	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)
	Plasma cutting																		
	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											