

Powder Material

Aluminum (AlSi10Mg) is widely applied in the automotive and aerospace sector, due to its comparably high mechanical strength at very low specific density. Also, Aluminum does not show any corrosion. Generally, for Additive Manufacturing (AM) by means of Laser Powder Bed Fusion (LPBF) AlSi10Mg, originally developed for casting processes is used due to its low melt viscosity and possibility for further hardening by means of heat treatment. A further characteristic of this material is a very high heat- and electrical conductivity, rendering this material class a perfect candidate for cooling applications or within the electrical industry.

Physical Properties

Particle Size	25 µm – 63 µm
Density	2.68 g/cm³
Thermal conductivity	221 W/mK
Melting range	570 °C – 590 °C
Thermal expansion	23.8 x 10 ⁻⁶ K ⁻¹

Chemical Composition

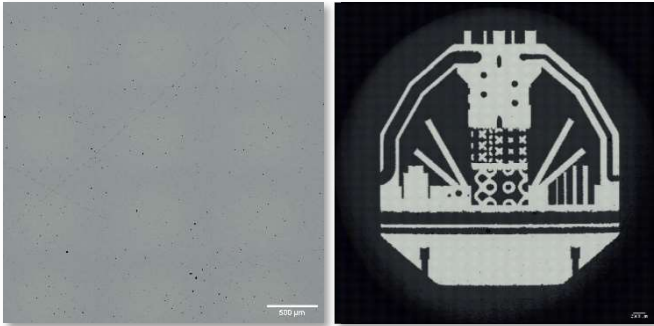
Al	Balance	Cu	< 0.005 %
Si	10.2 %	Pb	< 0.005 %
Mg	0.31 %	Sn	< 0.005 %
Fe	0.12 %	Ti	< 0.005 %
Mn	0.006 %		
Zn	< 0.005 %		

LPBF Process

Layer Thickness	50 µm
Laser Power Classification	400 W
Preheating Temperature	220 °C
Theoretical Build-up Rate	36.5 cm³/h

Density

Relative Density > 99.5 %



Dimensional Accuracy

	As Built	Sand Blasted
Tolerance	± 180 µm or 1 %*	± 90 µm or 1 %*

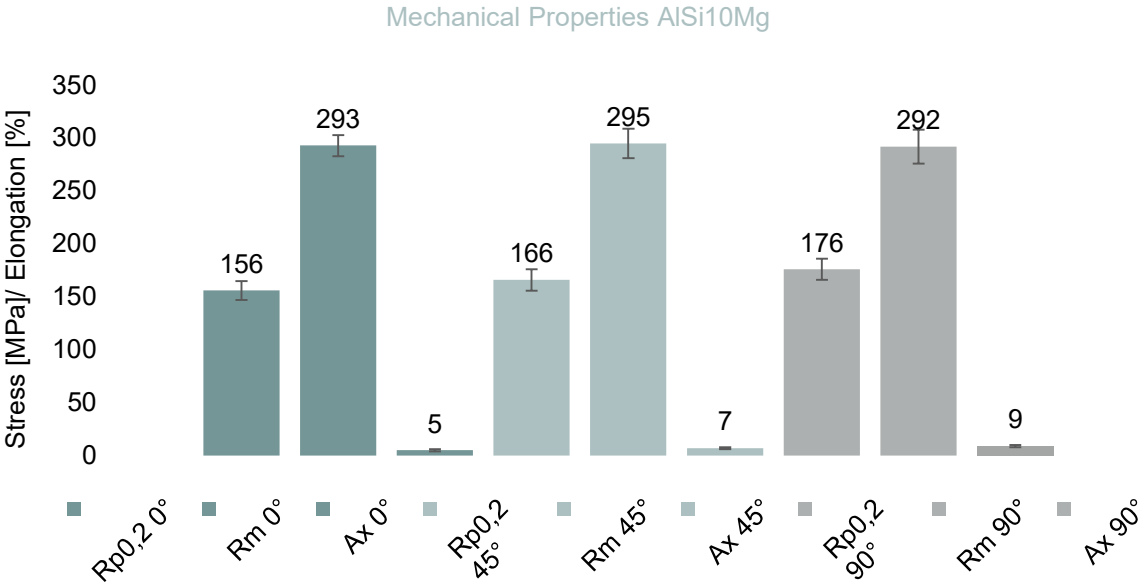
Minimum Wall Thickness (Vector) 220 µm

* Whichever is greater. Evaluated on test artifact sample (see <https://aconity3d.com/job-shop>) and dependent on geometrical feature and size.

Mechanical Properties – As built

According to DIN EN ISO 6892-1

Orientation	Young's Modulus [GPa]	Yield Strength R _{p0,2} [MPa]	Tensile Strength R _m [MPa]	Elongation at Break A _x [%]
0° (vertical)	78 ± 14	156 ± 10	293 ± 16	5 ± 1
45°	74 ± 5	166 ± 10	295 ± 14	7 ± 1
90° (horizontal)	74 ± 9	176 ± 9	292 ± 10	9 ± 1

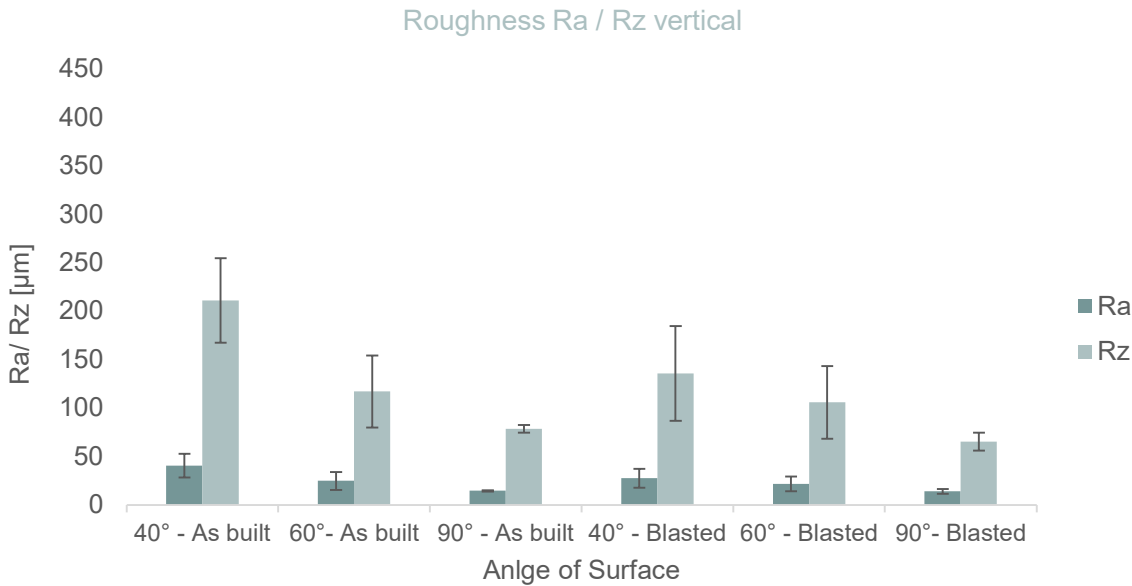


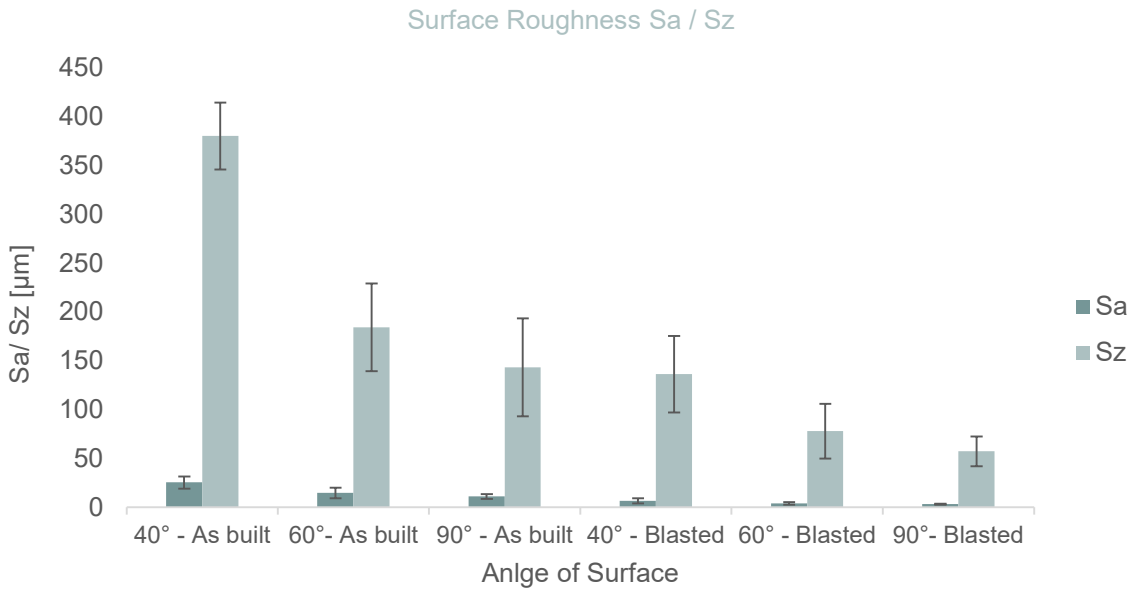
Mechanical Properties – Heat Treated¹

Orientation	Yield Strength R _{p0,2} [MPa]	Tensile Strength R _m [MPa]	Elongation at Break A _x [%]
0° (vertical)	207 ²	345 ²	4 ²

Surface Roughness

Condition	As Built			Sand Blasted		
Orientation relative to platform	40°	60°	90°	40°	60°	90°
Ra vertical[μm]	41 ± 12	25 ± 9	15 ± 1	28 ± 10	23 ± 9	14 ± 3
Ra horizontal [μm]	32 ± 16	16 ± 7	11 ± 1	37 ± 8	31 ± 16	13 ± 2
Rz vertical [μm]	211 ± 44	117 ± 37	79 ± 4	136 ± 49	106 ± 37	65 ± 9
Rz horizontal [μm]	232 ± 125	149 ± 55	111 ± 49	174 ± 31	125 ± 60	61 ± 7
Sa [μm]	26 ± 6	15 ± 5	11 ± 2	7 ± 3	4 ± 1	3 ± 1
Sz [μm]	381 ± 34	184 ± 45	163 ± 22	136 ± 39	78 ± 28	57 ± 15





All values are related to the standard process of Aconity3D and are subject to natural volatilities depending on applied powder material, process parameters and surrounding conditions. Changes in laser spot size and other process conditions might have an influence on the values.

¹ Classification SR2, according to ASTM F3318 – 18
² Minimum specifications according to ASTM F3318 – 18