

UniFuse™ AlSi10Mg 30µm 400W Performance

· Laser Powder Bed Fusion 3D printing

Chemical composition:

Elements	Al [wt.-%]	Si [wt.-%]	Fe [wt.-%]	Cu [wt.-%]	Mn [wt.-%]	Mg [wt.-%]	Ni [wt.-%]	Zn [wt.-%]	Pb [wt.-%]	Sn [wt.-%]	Ti [wt.-%]
Min	Bal. / Rest	9.0	0.0	0.0	0.0	0.20	0.0	0.0	0.0	0.0	0.0
Max	Bal. / Rest	11.0	0.10	0.03	0.15	0.45	0.05	0.10	0.05	0.05	0.15

Powder Properties:

Density (g/cm³)

Tap Density	2.0 ± 0.06 g/cm ³
-------------	------------------------------

Typical properties at nominal density and nominal composition:

Coupon type: ASTM E8-21

As printed mechanical properties

Material properties	Symbol	As built ¹⁾
Density [g/cm ³] ²⁾	ρ	2.67
Density [%] ²⁾	%	99.8 – 100.0
Porosity [%] ²⁾	p	0.0 – 0.2
Ultimate Tensile Strength [MPa] ^{1) 6)}	R_m xy-bar	468 ± 1
	R_m z-bar	462 ± 7
Yield Strength [MPa] ^{1) 6)}	$R_{p0.2}$ xy-bar	286 ± 2
	$R_{p0.2}$ z-bar	256 ± 3
Fracture Elongation [%] ^{1) 6)}	A xy-bar	9.8 ± 1.0
	A z-bar	5.8 ± 0.5
Surface roughness in z-direction [µm], no treatment ^{7) 9)}	R_a	3.4 ± 0.9

Stress Relief Annealed

Material properties	Symbol	Stress Relief Annealed ⁸
Density [g/cm ³] ²⁾	ρ	2.67
Density [%] ²⁾	%	99.8 – 100.0
Porosity [%] ²⁾	p	0.0 – 0.2
Ultimate Tensile Strength [MPa] ^{3) 6)}	R _{m xy-bar}	247 ± 9
	R _{m z-bar}	251 ± 8
Yield Strength [MPa] ^{3) 6)}	R _{p0.2 xy-bar}	156 ± 4
	R _{p0.2 z-bar}	148 ± 5
Fracture Elongation [%] ^{3) 6)}	A xy-bar	17.3 ± 2.0
	A z-bar	14.2 ± 1.1
Surface roughness in z-direction [μm], ^{7) 9)}	R _a	3.4 ± 0.8

HIP & T6 mechanical properties

Material properties	Symbol	HIP & T6 ⁵⁾
Density [g/cm ³] ²⁾	ρ	2.67
Density [%] ²⁾	%	99.99%+
Porosity [%] ²⁾	p	0.01
Ultimate Tensile Strength [MPa] ^{4) 6)}	R _{m xy-bar}	324 ± 2
	R _{m z-bar}	322 ± 4
Yield Strength [MPa] ^{4) 6)}	R _{p0.2 xy-bar}	250 ± 4
	R _{p0.2 z-bar}	250 ± 4
Fracture Elongation [%] ^{4) 6)}	A xy-bar	14.5 ± 0.8
	A z-bar	14.3 ± 0.8
Surface roughness in z-direction [μm], ^{7) 9)}	R _a	3.4 ± 0.8

Remarks:

- 1) Properties are given for the laser melted product printed at 30μm layer thickness. Auxiliary operations may influence the displayed properties. Auxiliary operations, e.g., heat treatments or surface modifications by coating processes, bead blasting, etc. performed at Uniformity Labs or the customer may affect mechanical and physical properties. It is recommended to communicate and discuss this item with the responsible Uniformity Labs personnel.
- 2) The indicated density limits are valid for the mean density of a component. For complex and geometrically unfavorable shapes the local segment density can deviate from these limits and therefore materials properties may be affected.
- 3) Stress Relief Annealed materials properties stated in the table above have been determined on the basis of ASTM E8/E8-M and therein cited norms on horizontal and vertical tensile bars with process surface.
- 4) As printed and HIP & T6 materials properties stated in the table above have been determined on the basis of ASTM E8-21.
- 5) Specimens were HIP and T6 according to ASTM F3318-18.
- 6) All mechanical characteristics are typical mean values valid only for the indicated nominal density level, and will vary from printer to printer.
- 7) Roughness measurement in accordance with DIN EN ISO 4287.
- 8) Annealed at 300C for 2 hours in air.
- 9) Surface roughness value is dependent on the gasflow characteristic of the machine.