LaserForm® AlSi10Mg (A)

AlSi10Mg fine-tuned for use with ProX® DMP 320 metal printer producing industrial parts with a combination of good mechanical properties and good thermal conductivity.

LaserForm AlSi10Mg (A) is formulated and fine-tuned specifically for 3D Systems DMP 320 metal 3D Printers to deliver high part quality and consistent part properties. The print parameter database that 3D Systems provides together with the material has been extensively developed, tested and optimized in 3D Systems' part production facilities that hold the unique expertise of printing 500,000 challenging metal production parts in various materials year over year. And for your 24/7 production 3D Systems' thorough Supplier Quality Management System guarantees consistent, monitored material quality for reliable results.

Material Description

AlSi10Mg combines silicon and magnesium as alloying elements, which results in a significant increase in strength and hardness compared to other aluminum alloys. Due to the very rapid melting and solidification during Direct Metal Printing, LaserForm AlSi10Mg (A) in as-printed condition shows fine microstructure and high strengths.

In the aerospace and automotive industry, LaserForm AlSi10Mg (A) is used for its light weight. Both innovative approaches to mold design and specific heat exchanger applications make use of the high thermal conductivity of this alloy.

Mechanical Properties[1,2]

MEASUREMENT	CONDITION	METRIC		U.S.	
		AS-BUILT	AFTER STRESS RELIEF	AS-BUILT	AFTER STRESS RELIEF
Young's modulus (GPa | ksi)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		NA 62 ± 15	67 ± 15 67 ± 15	NA 9000 ± 2200	9700 ± 2200 9700 ± 2200
Ultimate strength (MPa | ksi)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		NA 420 ± 60	240 ± 10 260 ± 10	NA 61 ± 9	35 ± 2 38 ± 2
Yield strength Rp0.2% (MPa | ksi)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		NA 230 ± 40	160 ± 10 160 ± 30	NA 33 ± 6	23 ± 2 23 ± 5
Elongation at break (%)	ASTM E8M				
Horizontal direction - XY Vertical direction - Z		NA 5 ± 3	22 ± 2 13 ± 8	NA 5 ± 3	22 ± 2 13 ± 8
Hardness, Rockwell B (HRB)	ASTM E18	56 ± 6	27 ± 4	56 ± 6	27 ± 4
Impact toughness[3] (J | ft-lb)	ASTM E23	6 ± 1	18 ± 2	4 ± 1	13 ± 2

Thermal Properties[4]

MEASUREMENT	CONDITION	METRIC	U.S.
Thermal conductivity (W/(m.K) | Btu/(h.ft².°F))	at 25 °C/ 77 °F	113	65
CTE - Coefficient of thermal expansion (µm/(m.°C) | µ inch/(inch . °F))	in the range of 20 to 100 °C	20.9	11.6
Melting range (°C | °F)		557 - 596	543 - 613

[1] Parts manufactured with standard parameters on a ProX DMP 320, Config B
[2] Values based on average and double standard deviation
[3] Tested with Charpy V-notch impact test specimens type A at room temperature
[4] Values based on literature
NA = Not available

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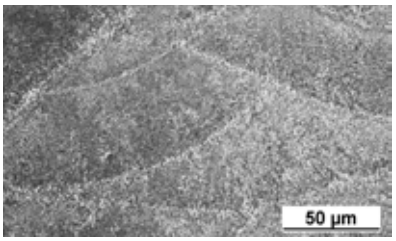
Physical Properties

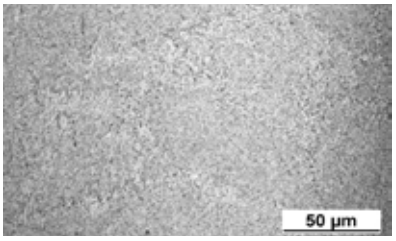
MEASUREMENT	METRIC	U.S.
Density		
Relative, based on pixel count[1] (%)	>99.9	>99.9
Absolute theoretical[2] (g/cm^3 | lb/in^3)	2.68	0.097



Microstructure as built

Surface Quality[3]

MEASUREMENT	SAND BLASTED METRIC	SAND BLASTED U.S.
Surface Roughness R_a		
Vertical direction (Z) (µm;µin)	7 - 10	275 - 390



Microstructure after stress release

Chemical Composition

The chemical composition of LaserForm AlSi10Mg (A) conforms to the requirements EN AC 43100, and is indicated in the table below in wt%.

ELEMENT	% OF WEIGHT
Al	Balance
Si	9.00-11.00
Mg	0.20-0.45
Fe	≤0.55
Cu	≤0.10
Mn	≤0.35
Ni	≤0.05
Zn	≤0.10
Pb	≤0.05
Sn	≤0.05
Ti	≤0.15

[1] Parts manufactured with standard parameters on a ProX DMP 320, Config B
[2] Values based on literature

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