Material data sheet - FlexLine

EOS Aluminium AlSi10Mg

EOS Aluminium AlSi10Mg is an aluminium metal alloy powder intended for processing on EOS DMLS™ systems.

This document provides information and data for parts built using

-EOS Powder: EOS Aluminium AlSi10Mg (EOS art.-no. 9011-0024)

-EOS Laser Sintering Machine: EOS M 290 (EOS art.-no. K1225-0005)

- HSS Recoater Blade (EOS art.-no. 2200-4073)
- DirectBase AL30 building platform (EOS art.-no. 2200-4819)
- 90 µm mesh for powder sieving recommended (EOS art.-no. 200000493 for IPCM M extra Sieving Module or EOS art.-no. 200001087 for IPCM M pro)
- Argon atmosphere
- EOSYSTEM V2.6, V2.7, V2.8 or newer

-EOS Software:

- EOSPRINT: V1.6 (EOS art.-no. 7501-4031) or newer plus RP Tools V6.2 (EOS art.-no. 7012-0215)

-EOS Process:

- ParameterSet: AlSi10Mg Flex 2.0 (EOS art.-no. 7202-0261)
- ParameterEditor: AlSi10Mg ParameterEditor (EOS art.-no. 7500-3097)
- Name of the Default Job: AlSi10Mg_030_FlexM291_200.eosjob

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Description

The alloy AlSi10Mg is characterised by good strength and hardness, as well as high dynamic load bearing capacity, and it therefore also used for parts subjected to high loads. It is typically used for cast parts with thin walls and complex geometry. Parts made of EOS Aluminium AlSi10Mg are ideal for applications that require a combination of good thermal properties and low weight. They can be machined, wire eroded and electrical discharge machined, welded, micro-blasted, polished and coated. Laser sintering process is extremely fast melting and re-solidification.

Due to building in layers the parts have anisotropic properties. Suitable heat treatment can be used for further improvement of part properties and reduction of anisotropy. Conventionally cast components in this type of aluminium alloy are often heat treated to improve the mechanical properties, for example using the T6 cycle of solution annealing, quenching and age hardening.

Quality Assurance

The quality of the EOS Aluminium AlSi10Mg powder lots is ensured by the Quality Assurance procedures. The procedures include sampling (ASTM B215), sieve analysis (ASTM B214), PSD analysis (ISO 13320), powder density determination (ASTM B212) and chemical analyses (ASTM E1479). The results of the quality assurance tests are given in the lot specific Mill Test Certificates (MTC) according to EN 10204 type 3.1.

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Technical Data

Powder properties

The chemical composition of the powder is in compliance with standard DIN EN 1706 (EN AC–43000).

Material composition [1]			
	Al	Balance	
	Si	9.0	11.0
	Fe	---	0.55
	Cu	---	0.05
	Mn	---	0.45
	Mg	0.25	0.45
	Ni	---	0.05
	Zn	---	0.10
	Pb	---	0.05
	Sn	---	0.05
	Ti	---	0.15

Particle size	
> 90 µm [1]	< 0.5 wt.%

[1] Siebanalyse, gemäß ASTM B214.

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Physical properties of parts

Part density, typical [2]	2.67 g/cm³
Surface roughness, typical [3]	
as manufactured	R_a 9 - 20 µm; R_z 70 - 120 µm R_a 0.4– 0.8 x 10^{-3} in R_z 2.7 – 4.7 x 10^{-3} in
after microblasting	R_a 6 - 15 µm; R_z 50 - 100 µm R_a 0.2 – 0.6 x 10^{-3} in R_z 2.0 – 3.9 x 10^{-3} in
Volume rate [4]	5.1 mm³/s (18.36 cm³/h) 1.1 in³/h

[2] Weighing in air and water according to ISO 3369.

[3] Due to the layerwise building, the surface structure depends strongly on the orientation of the surface, for example sloping and curved surfaces exhibit a stair-step effect. The values also depend on the measurement method used. The values quoted here given an indication of what can be expected for horizontal (up-facing) or vertical surfaces.

[4] The volume rate is a measure of the building speed during laser exposure. The overall building speed is dependent on the average volume rate, the time required for coating (depends on the number of layers) and other factors, e.g. DMLS settings.

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Tensile data at room temperature [5, 6,]

As-manufactured

	Horizontal	Vertical
Ultimate tensile strength, Rm	460 ± 20 MPa (67 ± 3 ksi)	470 ± 20 MPa (68 ± 3 ksi)
Yield strength, Rp0.2	270 ± 20 MPa (39 ± 3 ksi)	230 ± 20 MPa (32 ± 3 ksi)
Elongation at break, A	10 ± 2 %	6 ± 2 %

Heat treated [7]

	Horizontal	Vertical
Ultimate tensile strength, Rm	340 MPa (49 ksi)	350 MPa (51 ksi)
Yield strength, Rp0.2	220 MPa (32 ksi)	225 MPa (33 ksi)
Elongation at break, A	12 %	9 %

[5] The numbers are typical values and are determined from samples with horizontal and vertical orientation.

[6] Tensile testing according to ISO 6892-1 B10, proportional test pieces, diameter of the neck area 5 mm (0.2 inch), original gauge length 25 mm (1 inch).

[7] Stress relieve: anneal for 90 minutes at 270 °C (518 °F). Oven type & configuration may have impact on the mechanical properties: longer holding time and higher temperature can lead to decreased strength and increased elongation properties and vice versa. Values given in above table were obtained by inserting parts to preheated oven; annealing time calculation started when part temperature reached 6 °C below target temperature; maximum overheating was < 5 °C.

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Abbreviations

min. minimum

max. maximum

wt. weight

The quoted values refer to the use of this material with above specified EOS DMLS system, PSW version / EOSYSTEM software version, parameter set and operation in compliance with parameter sheet and operating instructions. All measured values are average numbers. Part properties are measured with specified measurement methods using defined test geometries and procedures. Further details of the test procedures used by EOS are available on request. Any deviation from these standard settings may affect the measured properties.

The data correspond to EOS knowledge and experience at the time of publication and they are subject to change without notice as part of EOS' continuous development and improvement processes. EOS does not warrant any properties or fitness for a specific purpose, unless explicitly agreed upon. This also applies regarding any rights of protection as well as laws and regulations.

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