Material data sheet (preliminary)

EOS Aluminium AlSi10Mg

Several materials with a wide range of applications for e-manufacturing are available for the EOSINT M-systems. EOS Aluminium AlSi10Mg is an aluminium alloy in fine powder form that has been specially optimised for EOSINT M 270-systems (Titanium-Version). Other materials are also available for EOSINT M-systems and new materials are developed continuously. The related material data sheets contain information on these materials.

This document provides a short description of the main applications as well as a table of technical data. See the related information provided for the system requirements.

Description, application

EOS Aluminium AlSi10Mg is a master alloy aluminium- powder. AlSi10Mg is a typical casting alloy with good casting properties and is used for cast parts with thin walls and complex geometry. The alloy combination silicon/magnesium results in a significant increase in the strength and hardness. It also features good dynamic properties and is therefore used for parts subject to high loads.

Standard building parameters completely melt the powder in the entire part. Parts made of EOS Aluminium AlSi10Mg can be machined, wire eroded and electrical discharge machined, welded, micro-blasted, polished and coated. Unexposed powder can be re-used.

Typical applications:

- Direct manufacture of functional prototypes, small production runs, user-specific products or spare parts
- Parts that require a combination of good thermal properties with low weight, e. g. for motorsport applications

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Technical data

General process and geometrical data

Recommended minimum layer thickness	30 µm 1.2 mil
Smallest wall thickness [1]	0.3 - 0.4 mm 11.8 – 15.8 mil
Surface roughness, as built	Ra - µm, Rz - µm Ra – , Rz – mil
Volume rate with standard parameters (full density) [2]	4.8 mm³/s 1.1 in³/h

[1] Mechanical stability dependent on the geometry (wall height etc.) and application

[2] 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.

Physical and chemical properties of the parts

Material composition	Si (9.0 – 11.0 %) Fe max. 0.55 % Cu max. 0.05 % Mn max. 0.45 % Mg (0.2 – 0.45 %) Ni max. 0.05 % Zn max. 0.10 % Pb max. 0.05 % Sn max. 0.05 % Ti max. 0.15 % Al rest
Relative density with standard parameters	approx. 100 %
Density with standard parameters	2.68 g/cm³ 0.97 lb/in³

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Mechanical properties of the parts [3]

	As built	Heat treated T6 [5]
Tensile strength		
- in horizontal direction (XY)	± MPa	± MPa
- in vertical direction (Z)	340 ± 40 MPa	315 ±20 MPa
Yield point (Rp 0.2 %)		
- in horizontal direction (XY)	250 ±15 MPa	260 ±15 MPa
- in vertical direction (Z)	± MPa	± MPa
Elongation at tear		
- in horizontal direction (XY)	% ± %	% ± %
- in vertical direction (Z)	1.5 % ± 0.5 %	1.2 ± 0.5 %
Hardness [4]	120 ± 5 HBW	112 ± 5 HBW
Fatigue strength [6]		
- in vertical direction (Z)	97 ±7 MPa	93 ±3 MPa

[3] Mechanical strength tested as per ISO 6892:1998(E) annex C, proportional specimens, specimen diameter 5mm, initial measured length 25mm, specimens manufactured with 30µm layers.

[4] Hardness test in accordance with Brinell (HBW 2.5/62.5) as per DIN EN ISO 6506-1.

[5] Heat treatment T6: solution annealing xH/530°C, quenching in water bath, elevated temperature age hardening Yh/160°C

[6] Fatigue test with test frequency of 50Hz, R=-1, measurement stopped on reaching 5 million cycles without fracture

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Thermal properties of the parts

Max. continuous operating temperature	No data

The information relates to the usage of materials with the EOSINT M 270-systems in accordance with the actual specification (including the latest release of the process software PSW and, if necessary, hardware specified for the related material) and as per the operating instructions. All values stated are approximate. If not otherwise stated, the mechanical and physical properties refer to standard parameters and specimen parts built in the horizontal direction. They are dependent on the building parameters and building strategies used and can be varied by the operator to suit the application. The information corresponds to the latest findings. The information is not intended to assure specific properties of the product or suitability for a specific application. EOS®, EOSINT®, DMLS®, DirectTool® and DirectPart® are registered trademarks of EOS GmbH.

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