Material data sheet

EOS Aluminium AlSi10Mg_200C

All information in this data sheet refers to the alloy EOS Aluminium AlSi10Mg_200C. This alloy is formed when the powder EOS Aluminium AlSi10Mg is processes at a building platform temperature of 200 °C.

This document provides information and data for parts built using EOS Aluminium AlSi10Mg powder (EOS art.-no. 9011-0024) on the following system specifications:

- EOSINT M 280/400W
  with PSW 3.6 and EOS Parameterset AlSi10Mg_200C

Description

AlSi10Mg is a typical casting alloy with good casting properties and is typically used for cast parts with thin walls and complex geometry. It offers good strength, hardness and dynamic properties and is therefore also used for parts subject to high loads. Parts in EOS Aluminium AlSi10Mg are ideal for applications which require a combination of good thermal properties and low weight. They can be machined, spark-eroded, welded, micro shot-peened, polished and coated if required.

Processing of aluminium powder EOS Aluminium AlSi10Mg at elevated building platform temperature of 200 °C minimises internal stresses, which are characteristic for DMLS parts. The laser-sintering process is characterized by extremely rapid melting and re-solidification. This produces a metallurgy and corresponding mechanical properties in the as-built condition which is similar to T6 heat-treated cast parts. Due to the layerwise building method, the parts have a certain anisotropy.

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.

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Technical data

General process and geometrical data

Exposure type	Default_DirectPart	Default_DirectPart_Surface
Smallest wall thickness [1]	typ.0.4 mm typ. 0.016 inch	typ. 1 mm typ. 0.039 inch
Surface roughness, as built, cleaned [2]	R_a typ. 8 µm, R_z typ. 40 µm R_a typ. 0.32 x 10^{-3} inch R_z typ. 1.57 x 10^{-3} inch	R_a typ. 4 µm, R_z typ. 20 µm R_a typ. 0.16 x 10^{-3} inch R_z typ. 0.79 x 10^{-3} inch
- after micro shot-peening	R_a typ. 9 µm, R_z typ. 60 µm R_a typ. 0.35 x 10^{-3} inch R_z typ. 2.36 x 10^{-3} inch	R_a typ. 5 µm, R_z typ. 28 µm R_a typ. 0.19 x 10^{-3} inch R_z typ. 1.1 x 10^{-3} inch [4]
Volume rate [3]	7.4 mm^3/s (26.6 cm^3/h) 1.6 in^3/h	

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

[2] 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.

[3] 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.

[4] It is recommended to use IEPCONORM-A and IEPCONORM-C with max. pressure of 3 bar.

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Physical and chemical properties of the parts

Material composition	Al (balance) Si (9.0 – 11.0 wt-%) Fe (≤ 0.55 wt-%) Cu (≤ 0.05 wt-%) Mn (≤ 0.45 wt-%) Mg (0.2 - 0.45 wt-%) Ni (≤ 0.05 wt-%) Zn (≤ 0.10 wt-%) Pb (≤ 0.05 wt-%) Sn (≤. 0.05 wt-%) Ti (≤ 0.15 wt-%)
Relative density	approx. 100 %
Density	2.67 g/cm³ 0.096 lb/in³

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Mechanical properties of the parts

	As built
Tensile strength [5]	
- in horizontal direction (XY)	typ. 360 MPa typ. 52.2 ksi
- in vertical direction (Z)	typ. 390 MPa typ. 56.6 ksi
Yield strength (Rp 0.2 %) [5]	
- in horizontal direction (XY)	typ. 220 MPa typ. 31.9 ksi
- in vertical direction (Z)	typ. 210 MPa typ. 30.5 ksi
Modulus of elasticity	
- in horizontal direction (XY)	typ. 70 GPa typ. 10.2 Msi
- in vertical direction (Z)	typ. 70 GPa typ. 10.2 Msi
Elongation at break [5]	
- in horizontal direction (XY)	typ. 8 %
- in vertical direction (Z)	typ. 6 %

[5] Tensile testing according to ISO 6892-1:2009 (B) Annex D, proportional test pieces, diameter of the neck area 5 mm (0.2 inch), original gauge length 25 mm (1 inch).

Abbreviations

approx.	approximately
wt	weight

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Notes

The data are valid for the combinations of powder material, machine and parameter sets referred to on page 1, when used in accordance with the relevant Operating Instructions (including Installation Requirements and Maintenance), Parameter Sheet and Product Description for AlSi10Mg_200C. Furthermore they are only valid for use of the start parameters originally delivered from EOS. Changes of the process parameters may influence part properties. Part properties are measured using defined test procedures. Further details of the test procedures used by EOS are available on request.

The data correspond to our knowledge and experience at the time of publication. They do not on their own provide a sufficient basis for designing parts. Neither do they provide any agreement or guarantee about the specific properties of a part or the suitability of a part for a specific application. The producer or the purchaser of a part is responsible for checking the properties and the suitability of a part for a particular application. This also applies regarding any rights of protection as well as laws and regulations. The data are subject to change without notice as part of EOS' continuous development and improvement processes.

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