Material data sheet - FlexLine

EOS StainlessSteel 316L

EOS StainlessSteel 316L is a stainless steel powder intended for processing on EOS DMLS™ machines.

- EOS DMLS™ EOS M100 system
  - HSS blade (300006274)
  - Argon atmosphere
  - IPCM extra sieving module with 63 µm mesh
  - Hand sieve with 63 µm mesh (300013590) recommended
- EOSYSTEM
  - EOSPRINT v 1.6 or higher
  - Software: HCS 1.8 or higher
- EOS Parameter set: 316L_020_FlexM100_200

Description

EOS StainlessSteel 316L is a corrosion resistant iron based alloy which has been optimized for processing on EOS DMLS systems. EOS StainlessSteel 316L have chemical composition corresponding to ASTM F138 "Standard Specification for Wrought 18Cr-14Ni-2.5Mo Stainless Steel Bar and Wire for Surgical Implants (UNS S31673)". This kind of stainless steel is characterized having a good corrosion resistance and evidence that there are no leachable substances in cytotoxic concentrations.
This material is ideal in

- Lifestyle/Consumer, e.g. watches, other jewellery, spectacle frames, decorations
- Automotive/Industrial, e.g. non-corroding common material, food and chemical plants
- Aerospace/Turbine industry
- Entry-level material for Laser Sintering Technology, e.g. mounting parts, heat exchangers, functional elements in electronic housing and accessories

Parts built from EOS StainlessSteel 316L can be machined, shot-peened and polished in as-built or stress relieved (AMS2759) states if required. Solution annealing is not necessary because the mechanical properties of as-built state are showing desired values (ASTM A403). Parts are not ideal in temperature range 427°C - 816°C where precipitation of chromium carbides occurs. Due to layer-wise building method, the parts have a certain anisotropy which could be seen from mechanical properties.

EOS GmbH Electro Optical Systems
Robert-Stirling-Ring 1
D-82152 Krailling / München
Telephone: +49 (0)89 / 893 36-0
Telefax: +49 (0)89 / 893 36-285
Internet: www.eos.info

Technical Data

Powder properties

The chemical composition of the powder (wt-%):

Material composition	Element	Min	Max
	Fe	Balance	
	Cr	17.00	19.00
	Ni	13.00	15.00
	Mo	2.25	3.00
	C		0.030
	Mn		2.00
	Cu		0.50
	P		0.025
	S		0.010
	Si		0.75
	N		0.10

Max. particle size	
≥ 63µm [1]	Max. 1,0 wt%

[1] analysis according to ASTM B214.

General process data

Layer thickness	20 µm
Volume rate [2]	1,16 mm³/s (4,17 cm³/h) 0,25 in³/h

[2] The volume rate is a measure of build speed during laser exposure of the skin area. The total build speed depends on this volume rate and many other factors such as exposure parameters of contours, supports, up and downskin, recoating time, Home-In or LPM settings.

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Physical and chemical properties of parts*

Part density [3]	min. 7,98 g/ cm³
Surface roughness after shot peening [4]	R_a < 12 µm; R_z < 62 µm

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

[4] Measurement according to ISO 4287. The numbers were measured at the horizontal (up-facing) and all vertical surfaces of test cubes. Due to the layerwise building the roughness strongly depends on the orientation of the surface, for example sloping and curved surfaces exhibit a stair-step effect.

Tensile data at room temperature* [5, 6]

	As built	
	Horizontal	**Vertical**
Ultimate tensile strength, R_m	650 MPa	590 MPa
Yield strength, $R_{p0.2}$	535 MPa	490 MPa
Elongation at break, A	35 %	45 %

[5] The numbers are average values of vertical and horizontal orientation.

[6] Tensile testing according to ISO 6892 & ASTM E8M, proportional test pieces, diameter of the neck area 4 mm, original gauge length 4D (16 mm). Tensile test parameters: Stress rate 10MPa/s in elastic range, strain speed in plastic region 0,375 1/min. Results are derived from the validation data made with EOS M100 system and two powder LOTs

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Abbreviations

min. minimum
max. maximum
wt. weight

*Part properties are provided for information purposes only and EOS makes no representation or warranty, and disclaims any liability, with respect to actual part properties achieved. Part properties are dependent on a variety of influencing factors and therefore, actual part properties achieved by the user may deviate from the information stated herein. This document does not on its own represent a sufficient basis for any part design, neither does it provide any agreement or guarantee about the specific properties of a material or part or the suitability of a material or a part for a specific application.

This powder has not been developed, tested or certified as a medical device according to Directive 93/42/EEC (MDD) or Regulation (EU) 2017/745 (MDR) and is not intended to be used as a medical device, in particular for the purposes specified in Art. 2 No. 1 MDR. Insofar as you intend to use the powder as raw material for the manufacture of pharmaceutical products or medical devices (e.g. as raw material which as a material must meet the requirements of Annex 1, Chapter II MDR), the responsibility and liability for all analyses, tests, evaluations, procedures, risk assessments, conformity assessments, approval and certification procedures as well as for all other official and regulatory measures required for this purpose shall lie solely with you both with regard to the pharmaceutical product and/or medical device manufactured by you and with regard to the properties, suitability, testing, evaluation, risk assessment, other requirements for use of the powder as raw material.
This also applies to applications with food contact. In this respect, the limitations of liability pursuant to our General Terms and Conditions and the system sales or material contracts shall apply.

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