

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.

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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 wt⁰%

[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/ cm ³
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

Legal notes

The quoted values refer to the use of this material with above specified EOS DMLS system, 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.

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