EOS StainlessSteel 17-4PH

EOS StainlessSteel 17-4PH is an iron based metal powder intended for processing on EOS DMLS systems.

This document provides information and data for parts built using EOS StainlessSteel 17-4PH powder (EOS art.-no. 9011-0038) on the following specifications:

- EOS DMLS system M280 400W & M290
- PSW v3.7 and EOSYSTEM: EOSPRINT v.1.3/HCS v.2.2.23.3
- EOS Parameter set: 17-4PH_Flex 1.00

Description

The parts built from EOS StainlessSteel 17-4PH have chemical composition corresponding to ASTM F899 – 12b "Standard Specification for Wrought Stainless Steels for Surgical Instruments". This material is intended to be used in

- Surgical Instruments
- Endoscopy

Parts built from EOS StainlessSteel 17-4PH can be machined, shot-peened and polished in as-built or heat treated states. Solution annealing together with ageing treatment are necessary in order to achieve proper hardness and mechanical properties (ASTM A564 – 13). Due to the layer-wise building method, the parts have a certain anisotropy which can be eased by solution annealing.

Quality Assurance

The quality of the delivered EOS StainlessSteel 17-4PH powder lots is ensured by the Quality Assurance procedures. The procedures include sampling (ISO 3954 & ISO 2859-1) and material analyses. The powder quality is verified by sieve (ASTM B214) and chemistry analyses.

The results of the quality assurance tests are given in the lot specific Mill Test Certificates (MTC).

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Technical Data

Powder properties

The chemical composition of the powder is in compliance with standard ASTM F899 – 12b.

Material composition – (same composition with the built parts)

Element	Min	Max
Chromium	15.00	17.50
Nickel	3.00	5.00
Copper	3.00	5.00
Silicon	-	1.00
Manganese	-	1.00
Phosphorus	-	0.040
Sulfur	-	0.030
Carbon	-	0.07
Nb + Ta	0.15	0.45

Max. particle size

Particles > 63 µm [1, 2]	max. 1.0 wt-%

[1] Sieve analysis according to DIN ISO 4497 or ASTM B214.

[2] General particle size is +63µm – 16µm. The sieving shall be done with 75µm mesh sieve.

General process data

Layer thickness	20 µm
Volume rate [3]	2.0 mm³/s (7.2 cm³/h) 0.44 in³/h

[3] 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

The chemical composition of parts is in compliance with standard ASTM F899 – 12b. The material composition is same as in powder properties.

Part density [4]	7,77 g/cm³
Surface roughness after shot peening [5]	Ra 7.5 µm; Rz 40 µm

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

[5] Measurement according to ISO 4287. The numbers were measured at the vertical surfaces of test parts. 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 [6, 7]

	As built	Heat treated [8]
Ultimate tensile strength, Rm	770 MPa	1310 MPa
Yield strength, Rp0.2	720 MPa	1200 MPa
Elongation at break A	21 %	12,5 %

[6] The numbers are average values and are determined from samples with horizontal and vertical orientation.

[7] Tensile test samples machined according to ISO6892 / ASTM A564M – 13 (4D), proportional test pieces, Diameter of the neck area 5.0 mm, gauge length 4D = 4 x diameter (20.0mm).

[8] Heat treatment according to ASTM A564M (UNS S17400 – Type 630): Solution Annealing + Ageing treatment (H900)

Hardness [9]

	Heat treated [8], [10]
Hardness HRC	41

[9] Hardness is measured according to standard EN ISO 6508-1:2005 with scale C (HRC).

[10] Average value determined

Abbreviations

min. minimum

max. maximum

wt. weight

The quoted values refer to the use of this material with above specified EOS DMLS system, either PSW version or 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 and. 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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