EOS NickelAlloy IN718

EOS NickelAlloy IN718 is a heat and corrosion resistant nickel alloy powder intended for processing on EOS DMLS systems.

This document provides information and data for parts built using EOS NickelAlloy powder (EOS art.-no. 9011-0020) on the following specifications:

- – EOS DMLS system: M400 SF

- – EOSYSTEM: EOSPRINT v.1.2/HCS v.2.2.40

- – EOS Parameter set IN718_040_FlexM400_1.11

Description

Parts built from EOS NickelAlloy IN718 have chemical composition corresponding to UNS N07718, AMS 5662, AMS 5664, W.Nr 2.4668, DIN NiCr19Fe19NbMo3. This kind of precipitation-hardening nickel-chromium alloy is characterized by having good tensile, fatigue, creep and rupture strength at temperatures up to 700 °C (1290 °F).

This material is ideal for many high temperature applications such as gas turbine parts, instrumentation parts, power and process industry parts etc. It also has excellent potential for cryogenic applications.

Parts built from EOS NickelAlloy IN718 can be easily post-hardened by precipitation-hardening heat treatments. In both as-built and age-hardened states the parts can be machined, spark eroded, welded, micro shot-peened, polished and coated if required. Due to the layerwise building method, the parts have a certain anisotropy.

Technical Data

Powder properties

Material composition

Element	Min	Max
Ni	50	55
Cr	17.0	21.0
Nb	4.75	5.5
Mo	2.8	3.3
Ti	0.65	1.15
Al	0.20	0.80
Co	–	1.0
Cu	–	0.3
C	–	0.08
Si, Mn	–	0.35
P, S	–	0.015
B	–	0.006
Fe	–	Balance

Max. particle size

Particles > 63µm [1]	max. 0.3 wt.-%

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

General process data

Layer thickness	40 µm
Volume rate [2]	4.2 mm³/s (15.2 cm³/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.

Physical and chemical properties of parts

Part density [3]	min. 8.15 g/cm3
Surface roughness after shot peening [4]	Ra < 6.5 µm; Rz < 50.0 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	Heat treated [7]
Ultimate tensile strength, Rm	1040 MPa	1470 MPa
Yield strength, Rp0.2	710 MPa	1200 MPa
Elongation at break A	26 %	15 %

[5]   The numbers are average values and are determined from samples with horizontal and vertical orientation.
[6]   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).
[7]   Heat treatment procedure conform to Aerospace Material Specification AMS 2774D and AMS 5662:
1. Solution Anneal at 954 °C (1750 °F) for 1 hour per 25mm (0.98 inch) of thickness, air (/argon) cool.
2. Ageing treatment; hold at 718 °C (1325 °F) 8 hours, furnace cool to 621 °C (1150 °F) and hold at 621 °C (1150 °F) for total precipitation time of 18 hours., air (/argon) cool.

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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