



## Material data sheet

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### EOS NickelAlloy IN625

EOS NickelAlloy IN625 is a heat and corrosion resistant nickel alloy powder which has been optimized especially for processing on EOSINT M systems.

This document provides information and data for parts built using EOS NickelAlloy IN625 powder (EOS art.-no. 9011-0022) on the following system specifications:

- EOS DMLS™ system: EOS M290
- HSS recoating blade (2200-4073)
- Argon atmosphere
- Grid nozzle (2200-5501)
- IPCM M sieving module with 63µm mesh recommended (9044-0032)
- Software: EOSYSTEM v.2.5 or newer
- EOS Parameter set IN625 Performance 2.0

### Description

Parts built from EOS NickelAlloy IN625 have chemical composition corresponding to UNS N06625, AMS 5666F, AMS 5599G, W.Nr 2.4856, DIN NiCr22Mo9Nb. This type of alloy is characterized by having high tensile, creep and rupture strength. Conventionally cast or wrought components in this type of nickel alloy have typically excellent fatigue and thermal-fatigue properties combined with good oxidation resistance. EOS NickelAlloy IN625 is expected to have good corrosion resistance in various corrosive environments. Especially sea-water applications require high pitting and crevice corrosion resistance, stress-corrosion resistance against chloride-ions, high tensile and corrosion-fatigue strength. However, corrosion resistance has not been verified yet and therefore it is recommended to conduct relevant corrosion tests and studies prior to use in specific corrosive environment.

Parts built from EOS NickelAlloy IN625 can be heat treated and material properties can be varied within specified range. Parts can be machined, spark-eroded, welded, micro shot-peened, polished and coated in both as-built and in heat-treated conditions. Due to the layerwise building method, the parts have certain anisotropy.



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### Quality Assurance

The quality of the EOS NickelAlloy IN625 powder lots is ensured by the Quality Assurance procedures. The procedures include sampling (ASTM B215), PSD analysis (ISO 13320), chemical analyses (ASTM E2371, ASTM E1409, ASTM E1941, ASTM E1447), and mechanical testing (ISO 6892-1).

The results of the quality assurance tests are given in the lot specific Mill Test Certificates (MTC) according to EN 10204 type 3.1.

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### Technical Data

#### Powder properties

Material composition [wt.%]	Element	Min	Max
	Cr	20.00	23.00
	Mo	8.00	10.00
	Nb	3.15	4.15
	Fe	-	5.00
	Ti	-	0.40
	Al	-	0.40
	Co	-	1.00
	Si	-	0.50
	Mn	-	0.50
	C	-	0.10
	Ta	-	0.05
	P	-	0.015
	S	-	0.015
	Ni	58.00	bal.

#### Particle size

d50 [1]	35 ± 6 µm
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[1] Particle size distribution analysis according to ISO 13320



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### General process data

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Layer thickness	40 $\mu\text{m}$
Volume rate [2]	4.2 $\text{mm}^3/\text{s}$ (15.2 $\text{cm}^3/\text{h}$ )

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[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 properties of parts

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Part density [3]	8.4 $\text{g}/\text{cm}^3$
Surface roughness after shot peening [4]	typ. $R_a$ 1-5 $\mu\text{m}$ ; $R_z$ 3-10 $\mu\text{m}$
Hardness as built [5]	typ. 27 HRC

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

[4] 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.

[5] Hardness measurement according to standard EN ISO 6508-1:2005

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### Tensile data at room temperature [6,7]

	As built [9]	Heat treated [8,9]
Ultimate tensile strength, R <sub>m</sub>		
- in horizontal direction (XY)	Mean 980 MPa StDev. 5 MPa	Mean 1000 MPa StDev. 10 MPa
- in vertical direction (Z)	Mean 870 MPa StDev. 10 MPa	Mean 890 MPa StDev. 10 MPa
Yield strength, R <sub>p0.2%</sub>		
- in horizontal direction (XY)	Mean 720 MPa StDev. 5 MPa	Mean 680 MPa StDev. 5 MPa
- in vertical direction (Z)	Mean 630 MPa StDev. 5 MPa	Mean 640 MPa StDev. 5 MPa
Elongation at break, A		
- in horizontal direction (XY)	Mean 33 % StDev. 2 %	Mean 34 % StDev. 2 %
- in vertical direction (Z)	Mean 48 % StDev. 2 %	Mean 49 % StDev. 2 %

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

[7] Tensile testing according to ISO 6892-1 B10, proportional test pieces, diameter of the neck area 5 mm (0.2 inch), original gauge length 20 mm (0,79 inch).

[8] Heat treatment procedure: anneal at 870 °C (1600 °F) for 1 hour, rapid cooling.

[9] The values are subject to variations depending on samples orientation on a building platform.



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### Abbreviations

min. minimum

max. maximum

wt. weight

typ. typical

StDev. standard deviation

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 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.

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