Material data sheet

EOS Titanium Ti64ELI

EOS Titanium Ti64ELI is a titanium alloy powder intended for processing on EOS DMLS™ machines. This document provides information and data for parts built using EOS Titanium Ti64ELI powder (EOS art.-no. 9011-0040) on the following system setup:

- EOS DMLS™ machine: EOSINT M 290 400W
- EOSPRINT v. 1.3
- EOS parameter set: Ti64ELI_PerformanceM291 1.10

Description

Parts built in EOS Titanium Ti64ELI have a chemical composition and mechanical properties corresponding to ASTM F136. Ti64ELI is well-known light alloy, characterized by having excellent mechanical properties and corrosion resistance combined with low specific weight and biocompatibility. This material is ideal for many high-performance applications.
Parts built with EOS Titanium Ti64ELI powder can be machined, shot-peened and polished in as-built and heat treated states. Due to the layerwise building method, the parts have a certain anisotropy.

Quality Assurance

The quality of the EOS Titanium Ti64ELI 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
	Al	5.50	6.50
	V	3.50	4.50
	O	-	0.110
	N	-	0.040
	C	-	0.080
	H	-	0.012
	Fe	-	0.250
	Y	-	0.005
	Other elements, each	-	0.10
	Other elements, total	-	0.40
	Ti	bal.	

Max. particle size	
d50 [1]	39 ± 3 µm

[1] Particle size distribution analysis according to DIN ISO 13320.

General process data

Layer thickness	30 µm
Volume rate [2]	5 mm³/s (18 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.

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Physical and chemical properties of parts

Part density [3]	4.41 g/ cm³
Min. wall thickness [4]	0.3-0.4 mm
Surface roughness after shot peening [5]	R_a 5-9 µm; R_z 20-50 µm

[3] Weighing in air and water according to ISO 3369.
[4] Mechanical stability is dependent on geometry (wall height etc.) and application.
[5] 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 [6]

	As built	Heat treated [7]
Ultimate tensile strength, R_m	1290 ± 80 MPa	1070 ± 80 MPa
Yield strength, $R_{p0.2}$	1150 ± 80 MPa	1010 ± 80 MPa
Elongation at break, A	8 ± 4 %	14 ± 4 %

[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] Specimens were heat treated at 800 °C for 2 hours in argon inert atmosphere.

Hardness [8]

	Hardness as built	Heat treated
Vickers hardness (HV)	typ. 320 ± 15 HV5	n.a.

[8] Hardness measurement according to standard EN ISO 6507-1:2005 with load 5kgf (HV5).

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Abbreviations

typ.	typical
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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