Material data sheet

EOS Titanium Ti64 for EOSINT M 270 Systems (Titanium Version)

A number of different materials are available for use with EOSINT M systems, offering a broad range of e-Manufacturing applications. EOS Titanium Ti64 is a titanium alloy powder which has been optimized especially for EOSINT M 270 systems (Titanium Version). Other materials are also available for EOSINT M systems, and further materials are continuously being developed - please refer to the relevant material data sheets for details.

This document provides a brief description of the principle applications, and a table of technical data. For details of the system requirements please refer to the relevant information quote.

1 Description, application

EOS Titanium Ti64 is a pre-alloyed Ti6Al4V alloy in fine powder form. This well-known light alloy is characterized by having excellent mechanical properties and corrosion resistance combined with low specific weight and biocompatibility.

This material is ideal for many high-performance engineering applications, for example in aerospace and motor racing, and also for the production of biomedical implants. Parts built in EOS Titanium Ti64 fulfil the requirements of ASTM F1472 regarding maximum concentration of impurities.

Standard processing parameters use full melting of the entire geometry. Parts built from EOS Titanium Ti64 can be machined, spark-eroded, welded, micro shot-peened, polished and coated if required. Unexposed powder can be reused.

Applications:

- direct manufacture of functional prototypes, small series products, individualised products or spare parts
- parts requiring a combination of high mechanical properties and low specific weight, e.g. structural and engine components for aerospace and motor racing applications, etc.
- biomedical implants

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2 Technical data

General process and geometric data

Minimum recommended layer thickness	30 µm 1.2 mil
Min. wall thickness [1]	0.3 - 0.4 mm 8 - 20 mil
Surface roughness (as built)	Ra 9 - 12 µm, Rz 40 - 80 µm Ra 0.36 – 0.48, Rz 1.6 – 3.2 mil
Volume rate with standard parameters (full density) [2]	3.0 mm³/s 0.65 in³/h

[1] Mechanical stability is dependent on geometry (wall height etc.) and application

[2] Volume rate is a measure of build speed during laser exposure. The total build speed depends on the average volume rate, the recoating time (related to the number of layers) and other factors such as DMLS-Start settings.

Physical and chemical properties of parts

Material composition	Al (5.5 – 6.5 %) V (3.5 – 4.5 %) O < 2000 ppm N < 500 ppm C < 800 ppm H < 120 ppm Fe < 2500 ppm Ti Balance
Relative density with standard parameters	approx. 100 %
Density with standard parameters	4.43 g/cm³ 0.160 lb/in³

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Mechanical properties of parts

Ultimate tensile strength [3]	1150 ± 60 MPa 166 ± 9 ksi
Yield strength (Rp 0.2 %) [3]	1030 ± 70 MPa 150 ± 10 ksi
Elongation at break [3]	11 % ± 2 %
Young's modulus [3]	110 ± 7 GPa 16 ± 1 msi
Hardness [4]	approx. 400 - 430 HV (41 - 44 HRC)

[3] According to ISO 6892:1998.

[4] Vickers hardness measurement (HV) according to DIN EN ISO 6507-1. Values in parentheses are converted in accordance with DIN 50150, which is applicable to cast steels and therefore only gives an indication for laser-sintered materials. Note that depending on the measurement method used, the measured hardness value can be dependent on the surface roughness and can be lower than the real hardness. To avoid inaccurate results, hardness should be measured on a polished surface.

Thermal properties of parts

Maximum long-term operating temperature	350 °C 660 °F

The quoted values refer to the use of these materials with EOSINT M 270 systems according to current specifications (including the latest released process software PSW and any hardware specified for the relevant material) and operating instructions. All values are approximate. Unless otherwise stated, the quoted mechanical and physical properties refer to standard building parameters and test samples built in horizontal orientation. They depend on the building parameters and strategies used, which can be varied by the user according to the application. The data are based on our latest knowledge and are subject to changes without notice. They are provided as an indication and not as a guarantee of suitability for any specific application. EOS®, EOSINT®, DMLS®, DirectTool® and DirectPart® are registered trademarks of EOS GmbH.

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