Material
Data Sheet

# EOS Titanium Ti64

Low Weight, High Strength & Excellent Corrosion Resistance

# EOS Titanium Ti64

EOS Titanium Ti64 is a Ti6Al4V alloy, which is well-known for having excellent mechanical properties: low density with high strength and excellent corrosion resistance. The alloy has low weight compared to superalloys and steels and higher fatigue resistance compared to other lightweight alloys.

**Main Characteristics:**

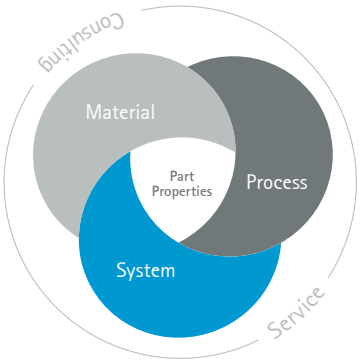
- Low weight combined with high strength
- Excellent corrosion resistance
- Parts can be machined, shot-peened and polished in as-built and heat treated states
- Chemical and part properties corresponding to Ti6Al4V, ISO5832-3, ASTM F1472, ASTM F2924 and ASTM F3302

**Typical Applications:**

- Medical components
- Aerospace components
- Automotive components
- Other industrial applications where low weight in combination with high strength are required

**The EOS Quality Triangle**

EOS uses an approach that is unique in the AM industry, taking each of the three central technical elements of the production process into account: the system, the material and the process – together simply described as the Quality Triangle. EOS focuses on delivering reproducible part properties for the customer.




All of the data stated in this material data sheet is produced according to EOS Quality Management System and international standards.

## Powder Properties

Parts built in EOS Titanium Ti64 have a chemical composition corresponding to Ti6Al4V, ISO5832-3, ASTM F1472, ASTM F2924, and ASTM F3302

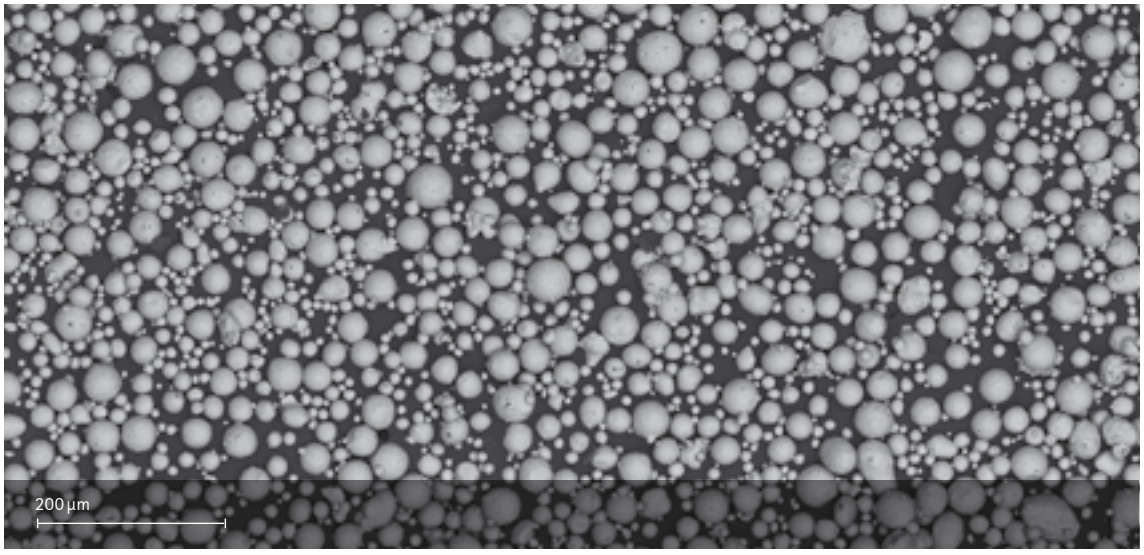
**Powder chemical composition (wt.-%)**

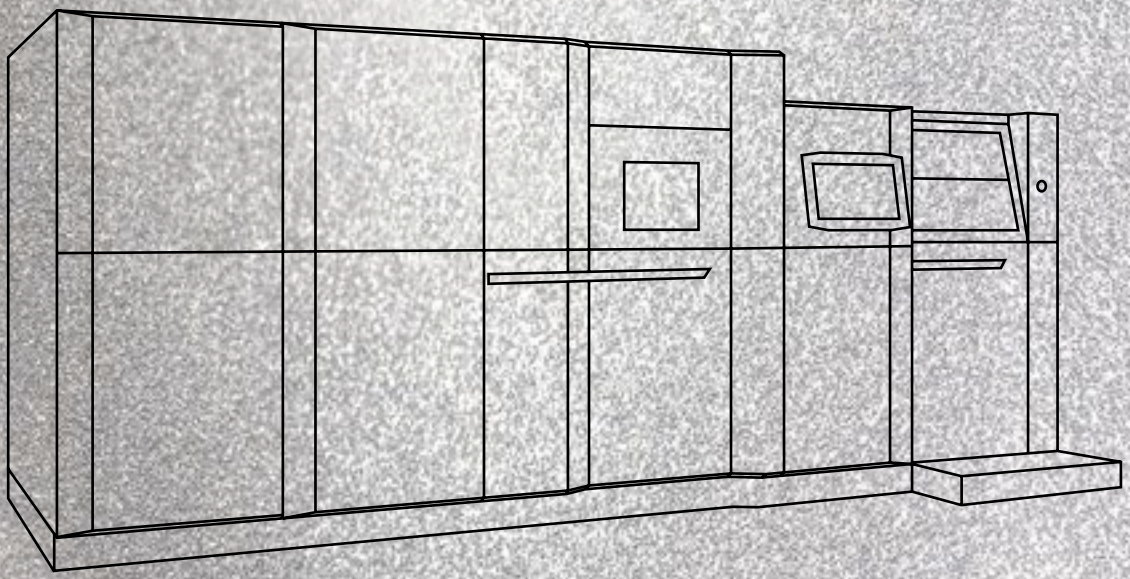
| Element | Min. | Max. |
|---|---|---|
| Ti | Balance | |
| Al | 5.50 | 6.75 |
| V | 3.50 | 4.50 |
| O | - | 0.20 |
| N | - | 0.05 |
| C | - | 0.08 |
| H | - | 0.015 |
| Fe | - | 0.30 |
| Y | - | 0.005 |
| Other elements, each | - | 0.10 |
| Other elements, total | - | 0.40 |

**Powder particle size**

| | |
|---|---|
| Generic particle size distribution | 15 - 53 µm |

*SEM picture of EOS Titanium Ti64 powder.*





# EOS Titanium Ti64
# **for EOS M 300-4 | 60 µm**

Process Information
Heat Treatment
Physical Part Properties
Mechanical Properties
Additional Data

# EOS Titanium Ti64 for EOS M 300-4 I 60 µm

**Main Characteristics:**

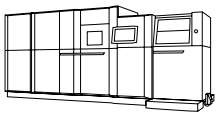
- → Highest quality across the entire build plate by using advanced exposure strategies
- → Optimized downskin parameters for highest surface quality
- → Low angle buildability by maintaining optimal surfaces
- → Reliable support parameters for very low angles

## Process Information

| **System set-up** | EOS M 300-4 |
|---|---|
| EOS ParameterSet | Ti64 60µm M300-4 |
| EOSPAR name | Ti64_060_CoreM304 |
| Software requirements | EOSPRINT 2.13 or newer<br>EOSYSTEM 2.17 or newer |
| Powder part no. | 9011-0014<br>9011-0039 |
| Recoater blade | EOS HSS blade, double-sided recoating |
| Inert gas | Argon |
| Sieve | 63 µm |

| **Additional information** | |
|---|---|
| Layer thickness | 60 µm |
| Volume rate | up to 4 x 9.00 $mm^3/s$ |
| Recommended exposure strategy | Swimlanes |

## Chemical and Physical Properties of Parts[1]



The chemical composition of parts is in compliance with standards ISO5832-3, ASTM F1472, ASTM F2924, and ASTM F3302. Composition complies with EOS Titanium Ti64 powder.

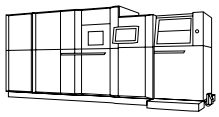

*Heat treated microstructure. Etched according to ASTM E407 modified recipe #190.*

The areal defect percentage was determined from cross-cuts of the built parts using optical microscope fitted with a camera and analysis software. The analysis was carried out for a sample area of 15 x 15 mm. The defects were detected and analyzed with an image capture/analysis software with an automatic histogram based filtering procedure on monochrome images. The density of the built specimen was measured according to ISO3369.

| Defects | Result | Number of samples |
|---|---|---|
| Average defect percentage | 0.01 % | 54 |
| **Density, ISO3369** | **Result** | **Number of samples** |
| Average density | ≥ 4.4 g/cm³ | 10 |

## Heat Treatment

**Heat Treatment Description:**
120 min (± 30 min) at 800 °C (± 10 °C) measured from the part in vacuum ($1.3 \times 10^{-3}$-$1.3 \times 10^{-5}$ mbar) followed by cooling under vacuum.



# EOS Titanium Ti64 for EOS M300-4 I 60 µm

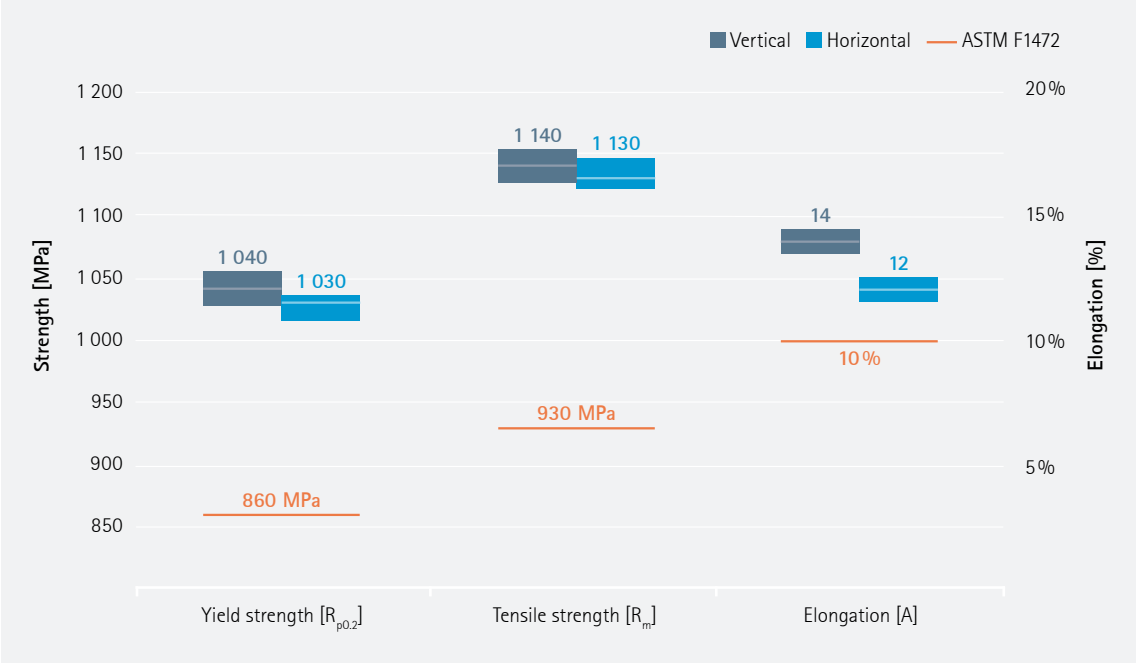
## Mechanical Properties

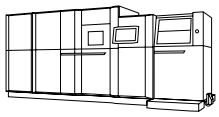
| Mechanical properties ISO6892-1<br>Heat treated and Swimlane strategy | Yield strength $R_{p0.2}$ [MPa] | Tensile strength $R_m$ [MPa] | Elongation at break A [%] | Number of samples |
|---|---|---|---|---|
| Vertical | 1 040 | 1 140 | 14 | 80 |
| Horizontal | 1 030 | 1 130 | 12 | 32 |

The values shown are average values and dependent on the build platform temperature, the thermal load of the job layout as well as the position on the build plate.

| Hardness as per ISO 6507<br>Heat treated and Swimlane strategy | |
|---|---|
| Hardness, HV | 349 HV 5 |
| Number of samples | 16 |

| Defects | Result | Number of samples |
|---|---|---|
| Average defect percentage | 0.01 % | 54 |





# EOS Titanium Ti64 for EOS M300-4 I 60 µm

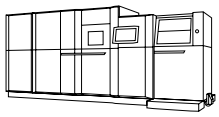
## Mechanical Properties

**Mechanical properties ISO6892-1**
**as manufactured and Swimlane strategy**

| | Yield strength $R_{p0.2}$ [MPa] | Tensile strength $R_m$ [MPa] | Elongation at break A [%] | Number of samples |
|---|---|---|---|---|
| Vertical | 1 180 | 1 280 | 9 | 118 |
| Horizontal | 1 170 | 1 320 | 5 | 47 |

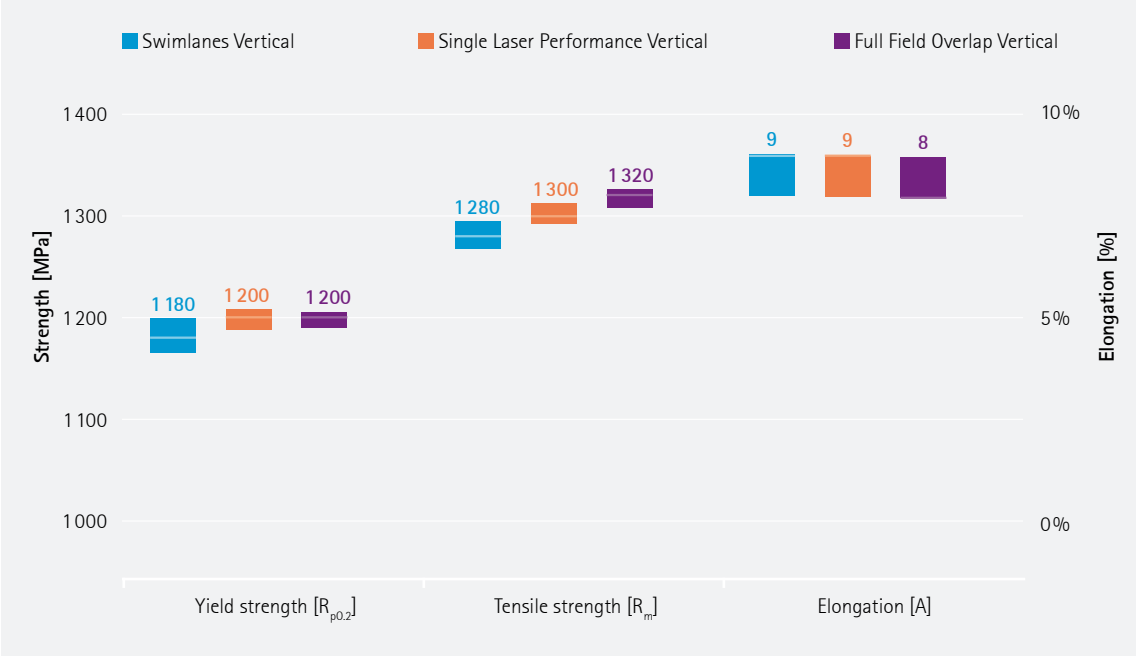
**Hardness as per ISO 6507**
**as manufactured and Swimlane strategy**

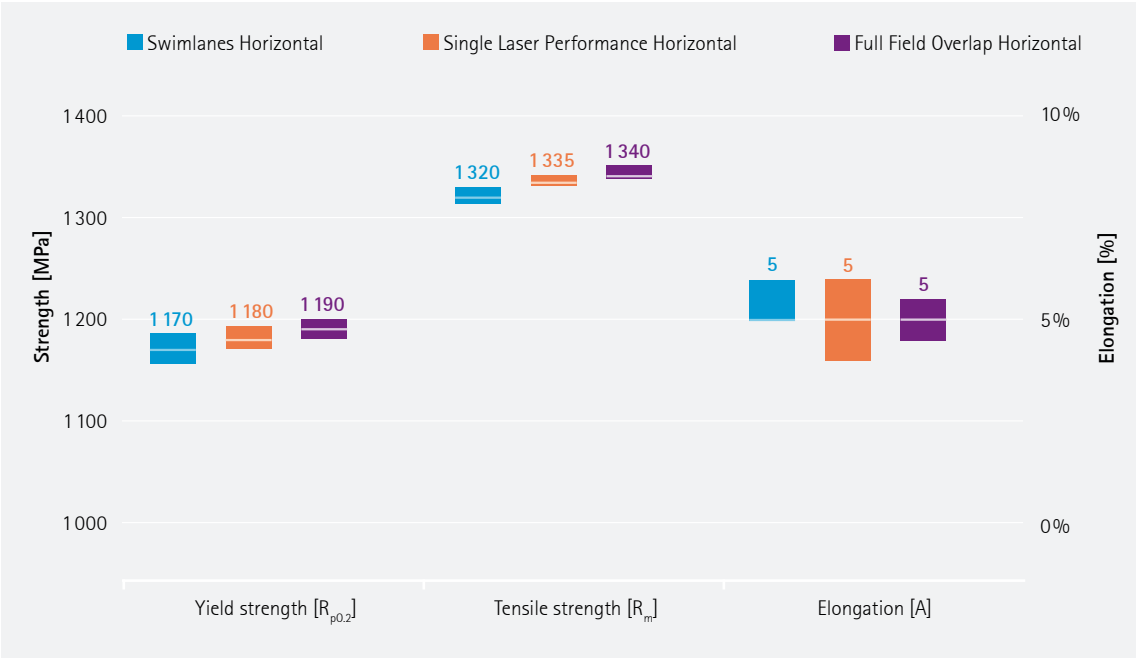
| | |
|---|---|
| Hardness, HV | 375 HV 5 |
| Number of samples | 16 |



## EOS Titanium Ti64 for EOS M300-4 I 60 µm

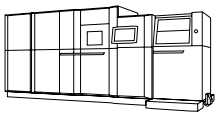
### Mechanical Properties for Different Exposure Strategies



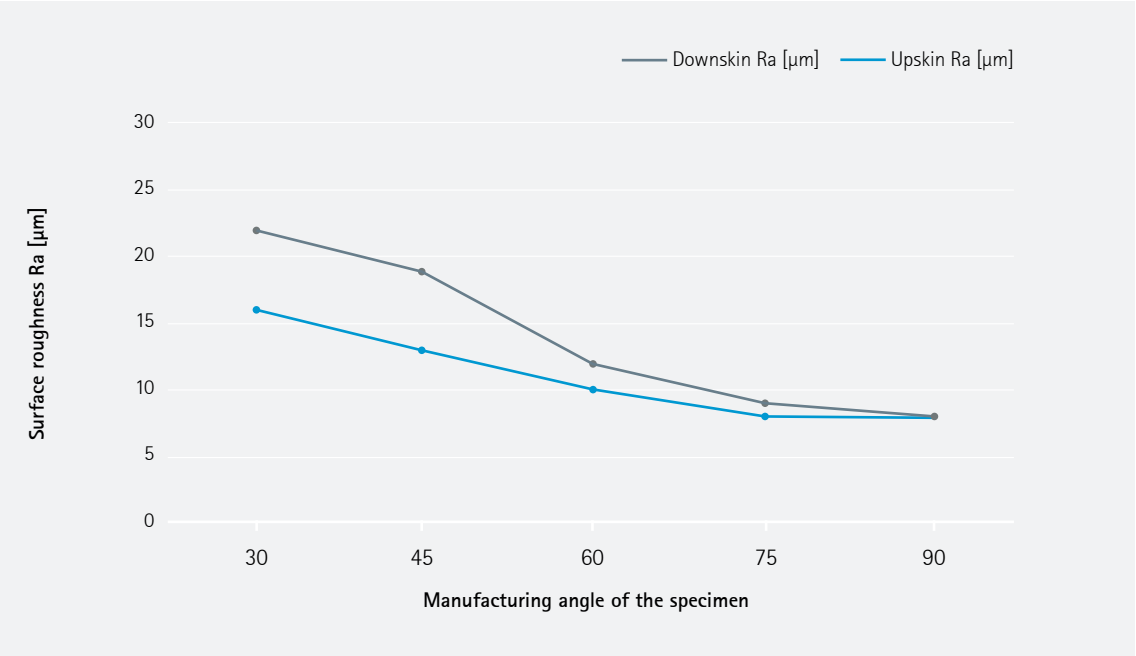




| Defects as manufactured | Result | Number of samples |
|---|---|---|
| Swimlanes | 0.01 % | 54 |
| Single Laser Performance | 0.01 % | 32 |
| Full Field Overlap | 0.01 % | 24 |

## Additional Data[1]



### Surface Roughness as Manufactured




*The surface quality was characterized by optical measurement method according to internal procedure. The 90 degree angle corresponds to vertical surface.*

[1] Part properties are provided for information purposes only and EOS makes no representation or warranty, and disclaims any liability, with respect to actual part properties achieved. Part properties are dependent on a variety of influencing factors and therefore, actual part properties achieved by the user may deviate from the information stated herein.
This document does not on its own represent a sufficient basis for any part design, neither does it provide any agreement or guarantee about the specific properties of a material or part or the suitability of a material or a part for a specific application.

This powder has not been developed, tested or certified as a medical device according to Directive 93/42/EEC (MDD) or Regulation (EU) 2017/745 (MDR) and is not intended to be used as a medical device, in particular for the purposes specified in Art. 2 No. 1 MDR. Insofar as you intend to use the powder as raw material for the manufacture of pharmaceutical products or medical devices (e.g. as raw material which as a material must meet the requirements of Annex 1, Chapter II MDR), the responsibility and liability for all analyses, tests, evaluations, procedures, risk assessments, conformity assessments, approval and certification procedures as well as for all other official and regulatory measures required for this purpose shall lie solely with you both with regard to the pharmaceutical product and/or medical device manufactured by you and with regard to the properties, suitability, testing, evaluation, risk assessment, other requirements for use of the powder as raw material. This also applies to applications with food contact. In this respect, the limitations of liability pursuant to our General Terms and Conditions and the system sales or material contracts shall apply.

Status 10/2023



Cover: This image shows a possible application.

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