Meltio Titanium 64

Ti-6Al-4V / ER Ti-5 / S Ti 6402c / 3.7165

Ti64 is a popular and widely used alloy due to its excellent combination of strength, low density, and corrosion resistance. It is used in a variety of industries, including aerospace, and chemical processing, due to its properties. Its high strength-to-weight ratio makes it a preferred choice for lightweight applications.

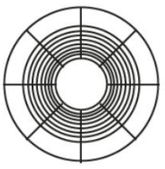
Properties	High Strength, Low Weight and Corrosion Resistance
Applications	Aerospace, Marine, Chemical industries and Automotive

Wire Chemical Composition	Ti	Al	V	Fe	C	N	H	O
Weight Percent [%]	Bal.	5.5	3.5	0.4	0.08	0.05	0.015	0.2

Wire Density
4.4 g/cm³

Melting Point		
1947 K	1674 ºC	3045 °F

Spool Specs



Meltio Materials are tightly spooled and packaged to ensure the best compatibility with Meltio systems.

Wire Diameter	1.0 mm
Weight on Spool	7.5 kg
Volume on Spool	1704 cm³
Spool Type	BS300
Wire Coating	Uncoated

Relative density as 3D printed	> 99.9%

Micrography

The observed microstructure is composed of acicular martensite embedded in the beta phase. The columnar shape of the grains extends along the manufacturing direction due to epitaxial growth of the original beta phase. In the XY section, the microstructure appears as polyhedral grains of α´ + β, with alpha phases at grain boundaries.

Gen I As-printed XY
100x Magnification

Published in Q3

Gen I HT XY
100x Magnification

Gen II As-printed XY
100x Magnification

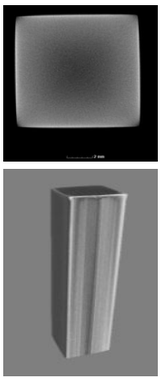
Published in Q4

Gen II HT XY
100x Magnification

*Test Carried Out In ADIMME
aidimme@aidimme.es

Tomography

Computed Tomography Scan of 3D printed sample part in Ti64 without detectable voids or defects. Resolution of 24 µm per pixel.



3D / Top View

Front View

*Test Carried Out In CATEC
info@catec.aero

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Parametrization for Verified Density Profiles

The following fully dense printing parameters were obtained, based on a printed block of 30x60x20 mm. A sample from this block of 10x10x60 mm was extracted using EDM, and was analyzed using CT Scan on an external lab. Please use the provided “Materials Handbook” to know better the printing parameters relation and their effect on part density. These printing parameters are available in our slicers Meltio Horizon and Meltio Space.

	Laser Power [W]	Laser Wavelength (nm)	Velocity [mm/s]	Argon Flow [l/min]	Layer Height [mm]	Layer Width [mm]	Wire Speed [mm/s]	Input Energy Density [J/mm3]	Deposition Rate [g/h]
IR	1100	976	7.5	20.0	1.2	1.0	9.6	122.22	143
Blue	1000	450	12.5	20.0	1.2	1.2	22.9	55.6	285

Heat Treatment

Heat treatment is recommended for Ti64 to enhance its mechanical properties. Through heat treatment, the alloy becomes stronger, more ductile, and more resistant to fatigue, making it suitable for high-stress applications. Heat treatment also eliminates residual stresses and helps to refine the microstructure of the alloy, leading to improved toughness and increased resistance to crack growth. Heat treatment of Ti64 after 3D printing is a crucial step in maximizing its performance in applications.

Annealing

Vacuum atmosphere Heat up to 920ºC	Hold for 2h Cooling to RT

Age Hardening

Vacuum atmosphere Heat up to 460ºC	Hold for 8h Cooling inside the oven to RT

**Typical Parameters for a Sample of 160x60x30 mm*

Mechanical Properties

Results show that specimens printed using Meltio’s wire-laser metal 3D printed process perform at the same level as samples made with conventional manufacturing methods. Results show low deviations and near isotropic properties after heat treatment. As printed data is not shown as it is not industrially relevant.

			UNE EN ISO 6892-1		
	Cast Properties *(ASTM F1108)*	**Wrought Properties** *(ASTM F1472)*	**Meltio XY properties** *(Age Hardened)*	**Meltio XZ properties** *(Age Hardened)*	
Ultimate Tensile strength (UTS) [MPa]	860	930	802 ± 7	788 ± 12	**IR**
			Published in Q4		**Blue**
Yield strength [MPa]	758	860	727 ± 17	693 ± 16	**IR**
			Published in Q4		**Blue**
Elongation [%]	8	10	7 ± 1	9 ± 1	**IR**
			Published in Q4		**Blue**
			**Test Carried Out In IDONIAL* info@idonial.com		

The following Mechanical Properties were obtained, based on a printed block of 160x30x70 mm using the Verified Density Parametrization, from it 16 ASTM E8M samples were extracted using EDM and were analyzed by an external laboratory.

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			UNE EN ISO 6507-1		
	Cast Properties *(ASTM F1108)*	**Wrought Properties** *(ASTM F1472)*	**Meltio** *(Age Hardened)*	**Meltio Properties** *(As printed)*	
Hardness [HV-30]	342	349	311	303	**IR**
			Published in Q4	345	**Blue**
			**Tests Carried Out in CETEMET* i+d+i@cetemet.es **Test Carried Out In CATEC* info@catec.aero		

Based on a printed block of 30x60x20 mm using Verified Density Parametrization. A sample from this block of 10x10x60 mm was extracted using EDM, and was analyzed by an external lab.

Fatigue Life

Meltio carried out a fatigue study on 3D printed specimens using two heat treatments, namely age hardening and hot isostatic pressing. The presence of residual porosity in the sample parts during the study, which has been resolved through process improvements, may explain the difference in fatigue behavior between the age-hardened and hot isostatic pressed specimens.

	ASTM E466		
	XZ properties *(Age Hardened)*	**XZ properties** *(HIP)*	
Stress Range [Mpa]	450	530	**IR**
	Published in Q1 of 2025		**Blue**
Nº of Cycles (Nf)	10^7		**IR & Blue**
Stress Ratio (R)	-1		**IR & Blue**

The following Mechanical Properties were obtained, based on a printed block of 160x30x70 mm using the Verified Density Parametrization, from it 16 ASTM E466 samples were extracted using EDM and were analyzed by an external laboratory.

Oxygen Content

Oxidation is a crucial factor that particularly affects the properties and performance of 3D printed titanium samples. Titanium has a high affinity for oxygen when exposed to air at high temperatures, which leads to embrittlement and reduced mechanical properties, such as decreased resistance to wear, fatigue, and corrosion.

	IR	**Blue**
Oxygen Content [%]	0.25 - 0.45	0.095 - 0.213
	**Test Carried Out In AIDIMME* aidimme@aidimme.es	

** Meltio's work on material characterization is carried out using the Meltio M450 and M600 and it remains under constant development. Specifications provided herein may not reflect the latest state of our research. For further information and questions please contact us via info@meltio3d.com.*

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