

Material Data Sheet



General:

It is known that the addition of Zirconium and Niobium to Titanium alloys provides an excellent combination of corrosion resistance and biocompatibility. ZTi-Med® is a ternary titanium alloy family specifically made for additive manufacturing (AM). ZTi-Med® powder family is ZTM35E, TZ10 and TNZ14, and each powder is designed to maintain a good strength-ductility ratio. Because of their unique properties, ZTi-Med® family offers a large range of applications such as medical and luxury.

Materials structure:

ZTi-Med® processing parameters were first developed on a powder bed fusion machine (PBF). Bulk parts were firstly made and later counterparts with different complex geometries were produced. The microstructure of the as-built state of ZTi-Med® parts under electron microscopy mainly shows fine grains depending on chemical composition and post heat treatment. ZTi-Med® alloys were also processed through post heat treatments such as hot isostatic pressure (HIP) in order to obtain a full density and high fatigue resistance.



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ZTM35E^[1]

Physical and Chemical Properties				
Mass density ^[2]	~ 4.43 g/cm ³			
Layer thickness	30 µm			
Component density ^[3]	> 99.7 %			
Melting point	~1678 °C			
Particle size ^[4]		15-45 µm		
Particle shape		Spherical		

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ZTM35E^[1]

Mechanical Data at 25°C			Stress relieved	
Layer thickness 30 μm				
M: Mean SD: Standard deviation			M	SD
Tensile test ^[5]				
Compressive yield strength	R _m [MPa]	Min	980	3
		Max	1030	4
Offset yield strength	R _{p0.2} [MPa]	Min	600	12
		Max	630	9
Maximum compressive strain	A [%]	Min	50	4
		Max	58	2
Young's modulus	E [GPa]	Min	35	2
		Max	40	3
Hardness test ^[6]				
Vickers micro-hardness	HV _{0.2}	Min	235	11
		Max	258	2
Roughness measurements				
Roughness average	R _a [μm]		8	1

ZTi-Med® meting parameters are developed and enhanced at Z3DLAB facility. The physical and mechanical properties of ZTi-Med® made via additive manufacturing in addition to its powder were analyzed and tested according to ASTM and ISO standards by The French National Centre for Scientific Research (CNRS). More details about measurements procedures used by Z3DLAB are available upon request. We inform our clients that they are responsible for the qualified verification of the properties and their suitability for specific applications of parts made by their own technology.



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- [1] Property and ownership of Z3DLAB. Further details are provided upon request.
- [2] Subject to minor change within the range of possible chemical composition.
Measurements according to ASTM-B962 and ASTM B923.
- [3] Rough value, subject to minor change within the range of possible heat treatments.
Theoretical density measurements via XRD.
Density measurements via Helium Pycnometry.
99.999% density obtained after HIP post-treatment.
- [4] With respect to powder material;
- [5] Compression tests were performed according to ASTM E9; stress relief heat treatment; testing machine Zwick 10KN; testing speed 0.001 s^{-1} at room temperature
- [6] Micro-hardness testing according to ASTM E384.