Material Data Sheet

Ti Grade 2 / ASTM F67 / 3.7035[1]

General

Ti Grade 2 is a commercially pure titanium grade with excellent biocompatibility and good mechanical properties. The achievable yield strength compares to that of austenitic stainless steels. Interstitially solved elements in small quantities increase the corrosion resistance. Ti Grade 2 is widely used in many different applications that require strength, ductility, and low density, potentially surrounded by corrosive media. Ti Grade 2 can be used in continuous operation at temperatures up to 425 °C; operation at up to 540 °C is possible for a short time. Typical applications for Ti Grade 2 are orthopedic implants in medical engineering or heat exchangers in energy technology. Further possible applications can also be found in aircraft and electrochemistry.

Material Structure

SLM®-processed components made of Ti Grade 2 show a homogenous, nearly non-porous structure, with mechanical properties in the range of material specifications. In the SLM® process with Ti Grade 2, an α-structure corresponding to annealed state is formed. An additional heat treatment is, therefore, not necessary.

Chemical composition [Mass fraction in %][6]

Ti	C	Fe	H	N	O	Other each	Other total	S	Cr	Cu	Mo
Balance	0.08	0.30	0.015	0.03	0.25	0.10	0.40	/	/	/	/

Powder properties

Particle size[6]	20 – 63 µm	Particle shape[7]	Spherical
Mass density[2]	4.5 g/cm³	Thermal conductivity	22 W/(m·K)

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30 µm / 400 W[3]	As-built

Build-up rate [5]	[cm³/h]	18.14 cm³/h
Component density[4]	[%]	> 99.5 %

Tensile test[8]				M	SD
Tensile strength	R_m	[MPa]	H	701	4
			V	703	5
Offset yield strength	$R_{p0,2}$	[MPa]	H	593	12
			V	577	5
Elongation at break	A	[%]	H	24	1
			V	25	2
Reduction of area	Z	[%]	H	65	3
			V	68	2
Young's modulus	E	[GPa]	H	115	8
			V	111	3

Hardness test[9]		M	SD
Vickers hardness	HV10	225	6

Roughness measurement[10]			As-built	
			M	SD
Roughness average	Ra	[µm]	13	2
Mean roughness depth	Rz	[µm]	80	6

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The properties and mechanical characteristics apply to powder that is tested and sold by SLM Solutions, and that has been processed on SLM Solutions machines using the original SLM Solutions parameters in compliance with the applicable operating instructions (including installation conditions and maintenance). The part properties are determined based on specified procedures. More details about the procedures used by SLM Solutions are available upon request.

The specifications correspond to the most recent knowledge and experience available to us at the time of publication and do not form a sufficient basis for component design on their own. Certain properties of products or parts or the suitability of products or parts for specific applications are not guaranteed. The manufacturer of the products or parts is responsible for the qualified verification of the properties and their suitability for specific applications. The manufacturer of the products or parts is responsible for protecting any third-party proprietary rights as well as existing laws and regulations.

[1] Material according to DIN 17850, ASTM F67.

[2] Material density varies within the range of possible chemical composition variations.

[3] Material data file: Ti Grade 2_SLM_MBP3.0_30_CE2_400W_Stripes_V1.0

[4] Optical density determination at test specimens by light microscopy.

[5] Theoretical build-up rate for each laser = layer thickness x scan speed x track distance.

[6] With respect to powder material.

[7] According to DIN EN ISO 3252:2001.

[8] Tensile test according to DIN EN ISO 6892-1:2017 B (DIN 50125:2016 – D6x30); orientation: 0° and 90°; heat treatment: none; testing machine: Zwick 1484; load range: 200 kN; testing speed: 0,008 1/s; testing temperature: room temperature; test laboratory: EWIS GmbH. Test samples were turned before tensile test.

[9] Hardness testing according to DIN EN ISO 6507-1:2018.

[10] Roughness measurement according to DIN EN ISO 4288:1998; λc = 2,5 mm.

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