COLIBRIUM ADDITIVE
a GE Aerospace company

13 Al

22 Ti | 24 Cr | 26 Fe | 27 Co | 28 Ni | 29 Cu

L-PBF Ti-6Al-2Sn-4Zr-2Mo

Parameters for Colibrium Additive's M2 Series 5

Titanium Ti-6Al-2Sn-4Zr-2Mo

Titanium alloy Ti-6Al-2Sn-4Zr-2Mo is a near-alpha alloy and combines high mechanical strength, weldability, high temperature stability and creep resistance up to temperatures of 550 °C (versus approximately 400°C for Ti-6Al-4V). Ti-6Al-2Sn-4Zr-2Mo is used to manufacture lightweight production parts where high temperature stability is critical. Examples from the aerospace industry include turbine components, afterburner structures and various applications in the hot zone of the airframe.

M2 Series 5 Ti-6Al-2Sn-4Zr-2Mo

Introducing the first Ti-6Al-2Sn-4Zr-2Mo parameter for the Colibrium Additive M2 Series 5. The surface parameter has been developed for the 400 W machine and has a layer thickness of 30 µm, enabling surface roughness of less than 10 µm without bead blast or shot peening. The microstructure exhibits an extremely low level of porosity and is free of cracks. Additionally, the parameter has outstanding tensile properties exceeding the limits for conventionally processed Ti-6Al-2Sn-4Zr-2Mo according to AMS4919 in stress relieved state.

M2 Series 5 Ti-6Al-2Sn-4Zr-2Mo

Machine Configuration

M2 Series 5

Single- or dual-laser architecture

Argon gas

Platform heating: 200°C

Powder Chemistry

Ti-6Al-2Sn-4Zr-2Mo powder chemical composition according to AMS4919 and AMS7014

Particle size: 15-45 µm

For more information, visit: AP&C

Thermal States

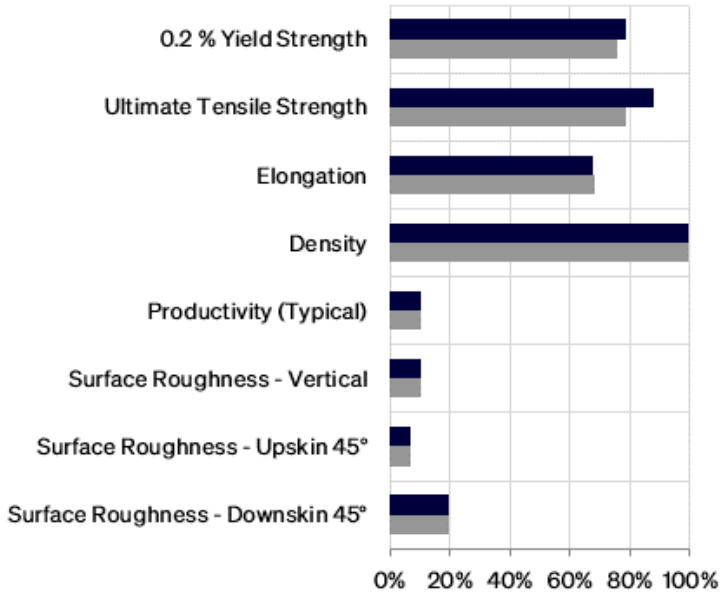
As-Built (AB)

Stress Relief (SR)

900°C for 1 hour in argon; furnace cooling

Parameter Availability and Thermal State Comparison

- Surface Parameter 184 AB
  400 W, 30 µm layer thickness, steel recoater
- Surface Parameter 184 SR
  400 W, 30 µm layer thickness, steel recoater



Bar plot is generated by normalizing typical material data (containing both horizontal and vertical data) against a range defined for each material family. For titanium-based alloys, the ranges are as follows: 0.2%YS: 0-1250 MPa, UTS: 0-1350 MPa, Elongation: 0-20 %, Density: 99-100 %, Productivity: 5-70 cm^3/h, Surface Quality (all): 5-40 µm. 0 % in the bar plot indicates the lower range value, 100 % indicates the upper range value.

Surface Parameter 184 - 400 W / 30 µm

Typical Build Rate

	(cm^3/h)
Typical build rate with coating[1]	11.6
Theoretical melting rate bulk per laser[2]	13.0

[1] Using standard Factory Acceptance Test layout and 2 lasers
[2] Calculated (layer thickness × scan velocity × hatch distance)

Tensile Performance at Room Temperature

Thermal State	Modulus of Elasticity (GPa)		0.2% Yield Strength (MPa)		Ultimate Tensile Strength (MPa)	
	H	V	H	V	H	V
As-Built	111	104	1025	940	1245	1120
SR	121	117	985	910	1065	1060

Thermal State	Elongation (%)	
	H	V
As-Built	8.5	18.0
SR	12.0	15.0

Physical Properties at Room Temperature

Parameter 184

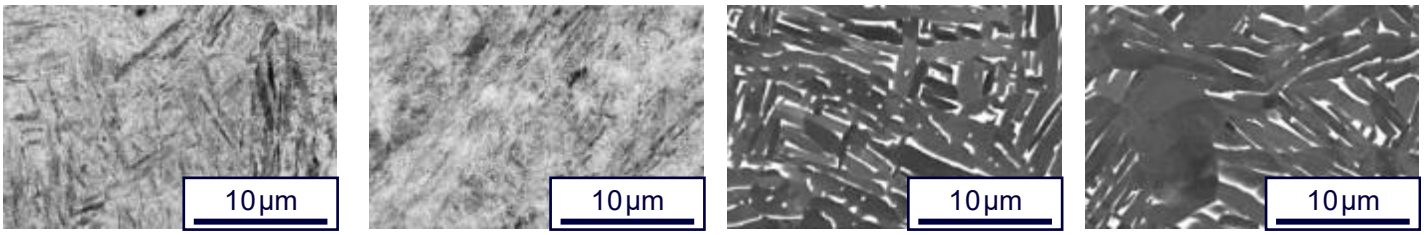
	Overhang Surface Roughness, Ra (µm)		
	45°	60°	75°
Upskin	8	7	7
Downskin	12	8	6

Surface Roughness, Ra (µm)	
H	6
V	9

Thermal State	Relative Density (%)		Hardness (HV10)
	H	V	H
As-Built	99.9	99.9	360
SR	99.9	99.9	349

Microstructure

As-Built		SR	
H	V	H	V



Scanning electron microscope images in As-Built and Stress Relief condition as defined previously.

Data Sheet Nomenclature and Notation

H: Horizontal, perpendicular to build direction.
V: Vertical, parallel to build direction.
Other angles are measured from horizontal.

Roughness measurements have been performed according to DIN EN ISO 4287 and DIN EN ISO 4288. In general analysis of the surface quality is strongly dependent on the methodology used and therefore deviations might be observed depending on methodology used. Vertical and horizontal sidewalls have been characterized using a tactile system, overhangs using an optical system.

Tensile evaluations were performed according to ASTM E8 or E21, depending on test temperature.