GE Additive

13 Al

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

M2 Series 5 remanium® star CL

Parameter for GE Additive's Concept Laser M2 Series 5

Data in this material datasheet represents material built with a 25 µm and 50 µm layer thickness and in a nitrogen atmosphere on a Concept Laser M2 Series 5 single laser or dual laser machine. Values listed are typical.

remanium® star CL

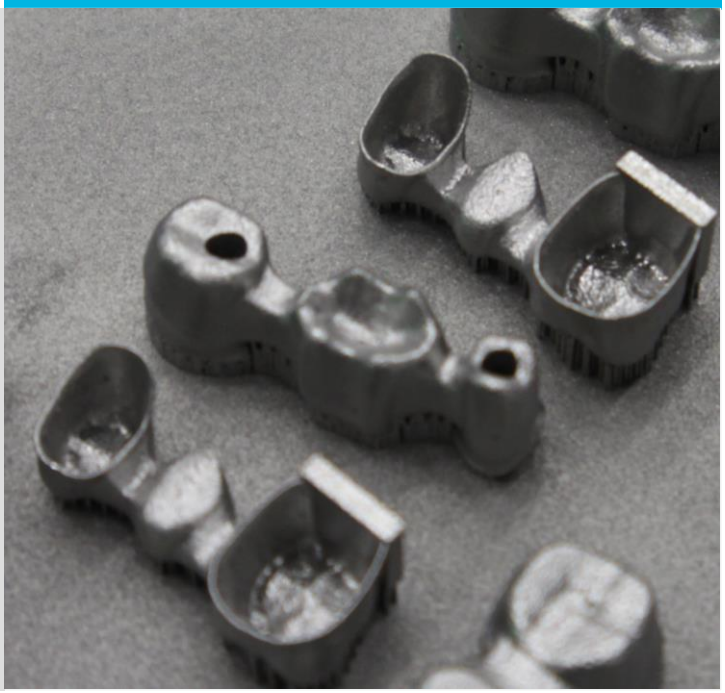
CoCrW alloy according to DIN EN ISO 22674 type 5/ DIN EN ISO 9693.

Due to its proven biocompatibility and long history in the medical industry, it is an established material used for medical/ dental applications.

remanium® star CL is particularly suitable for the manufacture of fixed and removable prosthestic restoration, appliances and metal-ceramic frameworks.

M2 Series 5 remanium® star CL

Parameter sets in two different layer thicknesses were developed for the Concept Laser M2 Series 5. The Productivity parameter is a 50 µm layer thickness parameter that results in fast printing while still maintaining good surface finish. The Surface Parameter is a 25 µm layer thickness parameter that results in excellent surface finish while still maintaining good productivity. Both parameters have outstanding tensile properties in heat treated state and meet the DIN EN ISO 22674 type 5/ DIN EN ISO 9693 requirements.



M2 Series 5 remanium® star CL

With appropriate approval* remanium® star CL can be used for dental restorations.

Data in this material datasheet represents material built 25 and 50µm layer thickness and in a nitrogen atmosphere on a Concept Laser M2 Series 5 single laser or dual laser machine. Values listed are typical.

POWDER CHEMISTRY

CoCrW alloy powder chemical composition according to remanium ® star CL.
Produced by Dentaurum distributed by GE Additive.

MACHINE CONFIGURATION

- Concept Laser M2 Series 5 (Single Laser or Dual Laser)
- Nitrogen gas
- Rubber

AVAILABLE PARAMETER

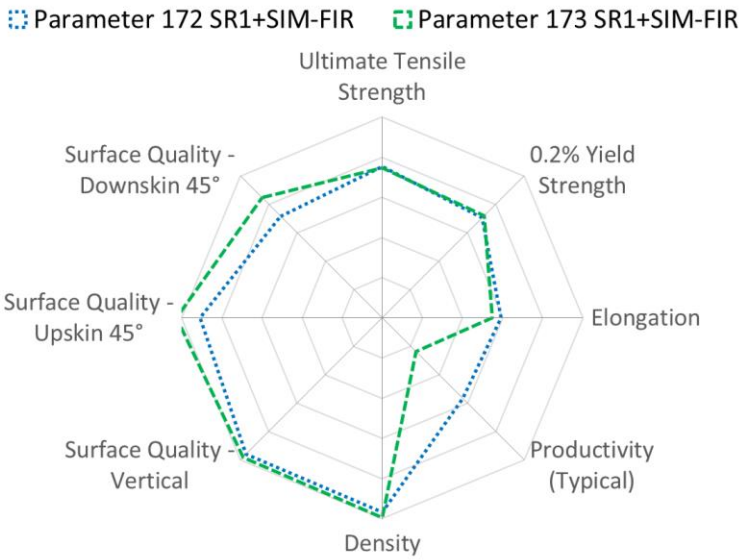
- **Productivity Parameter 172** 50 µm layer thickness, rubber recoater
- **Surface Parameter 173** 25 µm layer thickness, rubber recoater

THERMAL STATES

1. As-Built
2. Stress Relief + Simulated Firing (SR1 + SIM-FIR)

SR1: 1150°C, 1 hour in argon, furnace cooling; SIM-FIR: 950°C, ¼ h in argon, air cooling

PARAMETER COMPARISON



Spider Plot is generated by normalizing typical material data (containing both horizontal and vertical data) against a range defined for each material family. For **Cobalt Alloys**, the ranges are as follows: UTS: 0-1400 MPa, 0.2%YS: 0-900 MPa, Elongation: 0-60%, Density: 99-100%, Productivity: 5-30 cm³/hr, Surface Quality (all): 40-5 µm

TYPICAL BUILD RATE

	(cm³/h)
Typical build rate[1] w/coating	17.1
Theoretical melting rate[2] bulk per Laser	16.2

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

PHYSICAL DATA AT ROOM TEMPERATURE

	Surface Roughness Ra** – Overhang (µm)		
	45°	60°	75°
Upskin	9	6	5
Downskin	15	8	6

	Surface Roughness Ra** (µm)
H	7
V	7

Thermal State	Relative Density (%)		Hardness (HV10)	Melting range (°C)	Coefficient of Thermal Expansion CTE 25-500 °C (10^{-6}/K)
	H	V	H		
As-Built	99.9	99.9	368	1320-1420	14.4
SR1 + SIM-FIR	99.9	99.9	349	--	14.4

TENSILE DATA

Tensile testing done in accordance with ASTM E8 and ASTM E21

Test Temperature: RT

Thermal State	Modulus of Elasticity (GPa)		0.2% Yield Strength (MPa)		Ultimate Tensile Strength (MPa)		Elongation (%)		Reduction of Area (%)	
	H	V	H	V	H	V	H	V	H	V
As-Built	214	186	915	775	1235	1150	15.0	24.0	--	--
SR1 + SIM-FIR	248	241	635	625	1055	1050	9.5	12.5	--	--

H: HORIZONTAL (XY) orientation
V: VERTICAL (Z) orientation

* All of the figures contained herein are approximate only. The figures provided are dependent on a number of factors, including but not limited to, process and machine parameters, and the approval is brand specific and/or application specific. The information provided on this material data sheet is illustrative only and cannot be relied on as binding.
** 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.

TYPICAL BUILD RATE

	(cm³/h)
Typical build rate[1] w/coating	7.2
Theoretical melting rate[2] bulk per Laser	6.3

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

PHYSICAL DATA AT ROOM TEMPERATURE

	Surface Roughness Ra** – Overhang (µm)				Surface Roughness Ra** (µm)
	45°	60°	75°		
Upskin	5	4	3	H	5
Downskin	11	7	4	V	6

	Relative Density (%)		Hardness (HV10)	Melting range (°C)	Coefficient of Thermal Expansion CTE 25-500 °C (10^{-6}/K)
Thermal State	H	V	H		
As-Built	99.9	99.9	384	1320-1420	14.4
SR1 + SIM-FIR	99.9	99.9	355	--	14.4

TENSILE DATA

Tensile testing done in accordance with ASTM E8 and ASTM E21

Test Temperature: RT

	Modulus of Elasticity (GPa)		0.2% Yield Strength (MPa)		Ultimate Tensile Strength (MPa)		Elongation (%)		Reduction of Area (%)	
Thermal State	H	V	H	V	H	V	H	V	H	V
As-Built	236	181	980	800	1310	1070	13.5	29.5	--	--
SR1 + SIM-FIR	245	241	655	630	1070	1015	9.5	9.0	--	--

H: HORIZONTAL (XY) orientation
V: VERTICAL (Z) orientation

* All of the figures contained herein are approximate only. The figures provided are dependent on a number of factors, including but not limited to, process and machine parameters, and the approval is brand specific and/or application specific. The information provided on this material data sheet is illustrative only and cannot be relied on as binding.
** 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.