13 Al

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

M2 Series 5 1 kW Copper CuNi2SiCr

Parameter for GE Additive's Concept Laser M2 Series 5 1 kW

Data in this material datasheet represents material built with 50 µm layer thickness and in a nitrogen atmosphere on a Concept Laser M2 Series 5 1 kW single-laser or dual-laser machine, and requires build-plate heating. Values listed are typical.

CuNi2SiCr

CuNi2SiCr is a precipitation hardened copper-based alloy with excellent thermal and electrical conductivity in particular at elevated temperatures. This alloy features a high corrosion resistance as well as robust mechanical properties. It performs best in high temperature applications like heat sinks and heat exchangers. Beside it may also be used in parts within molding systems where wear resistance is desired.

M2 Series 5 1 kW CuNi2SiCr

The novel CuNi2SiCr parameter has recently been developed for the M2 1 kW Series 5 machine. The base parameter is a 50 µm parameter that produces surface roughness less than 10 µm without bead blast or shot peening, while delivering good productivity with dual lasers. Additionally, the parameter is capable to processes complex thin wall structures. In heat treated condition the additive manufactured CuNi2SiCr has an IACS (International Annealed Copper Standard) value of 40% IACS like conventionally processed material.

M2 Series 5 1 kW Copper CuNi2SiCr

With appropriate approval* CuNi2SiCr can be used for heat transfer systems as heat exchangers and heat sinks, tooling or electrical components for automotive or for mechanical engineering.

Data in this material datasheet represents material built with 50 µm layer thickness and in a nitrogen atmosphere on a Concept Laser M2 Series 5 1 kW single-laser or dual-laser machine and requires build-plate heating. Values listed are typical.

POWDER CHEMISTRY

CuNi2SiCr powder chemical composition according to C18000 (similar to CW111C, 2.0855).

MACHINE CONFIGURATION

- Concept Laser M2 Series 5 1 kW (single-laser or dual-laser)
- Nitrogen gas
- Rubber recoater blade

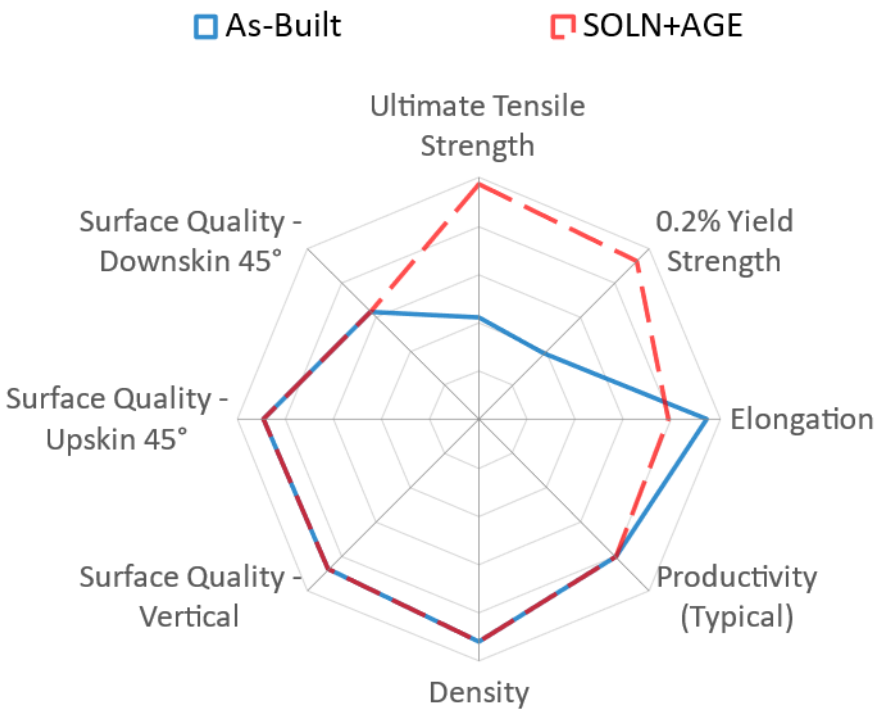
AVAILABLE PARAMETERS

- **Base 1 kW Parameter 347** — 50 µm layer thickness, rubber recoater, nitrogen gas

THERMAL STATES

1. As-Built
2. Solution Anneal + Age (SOLN+AGE)
   SOLN: 950°C, 0.5 hour in Argon, water quenching; AGE: 540°C, 1.25 hours, cooled in air

THERMAL STATE 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 copper alloys, the ranges are as follows: UTS: 0-600 MPa, 0.2%YS: 0-500 MPa, Elongation: 0-50%, Density: 0-100%, Productivity: 5-30 cm^3/hr, Surface Quality (all): 40-5 µm

TYPICAL BUILD RATE

Base 1 kW Parameter

	(cm³/h)
Typical build rate[1] w/coating	24.1
Theoretical melting rate[2] bulk per Laser	23.9

[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	8	7
Downskin	18	13	9

	Surface Roughness Ra** (µm)
H	23
V	10

	Relative Density (%)		Hardness (HV5)		Poisson's Ratio	
Thermal State	H	V	H	V	H	V
As-Built	99.9	99.9	85	--	--	--
SOLN+AGE	--	--	201	--	--	--

CONDUCTIVITY DATA (SOLN+AGE)

Conductivity testing done in accordance with ASTM E1004 and ASTM E1461

	Thermal Conductivity (W/m•K)		Electrical Conductivity (MS/m)		%IACS	
Test Temperature	H	V	H	V	H	V
22°C	264	269	23	23	40	40
50°C	277	278	--	--	--	--
85°C	277	298	--	--	--	--
115°C	287	300	--	--	--	--
150°C	289	306	--	--	--	--

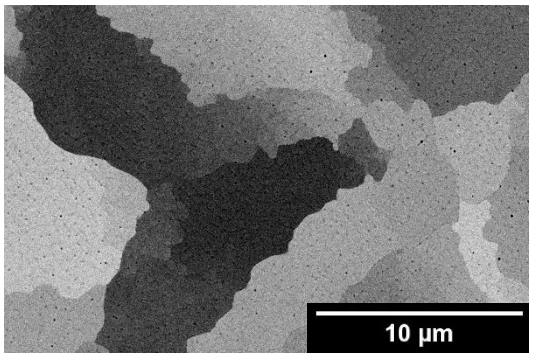
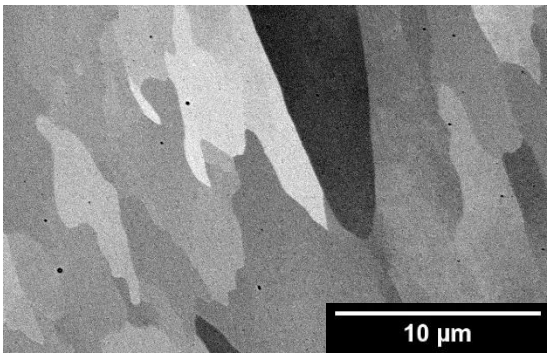
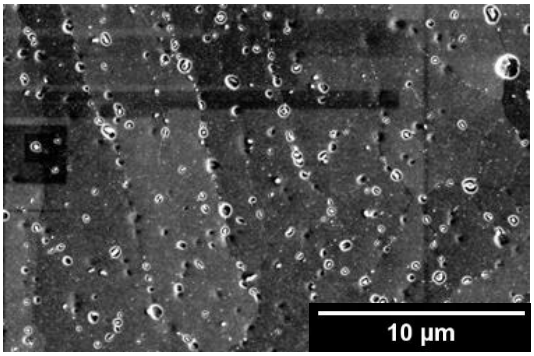
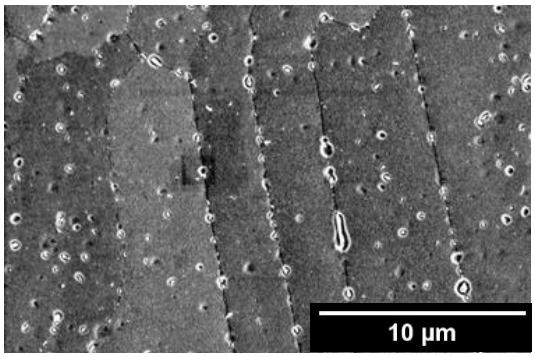
TENSILE DATA

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	109	83	200	180	275	230	38.5	42.0	85.5	90.5
SOLN+AGE	116	98	485	435	620	545	18.0	25.0	46.5	68.0

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 deviations might be caused by different measurement set up. Vertical and horizontal sidewalls have been characterized using a tactile system, overhangs using an optical system.

	Horizontal	Vertical
As-Built		
SOLN+AGE		

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