M2 Series 5 Aluminum A205

Parameters for GE Additive's Concept Laser M2 Series 5

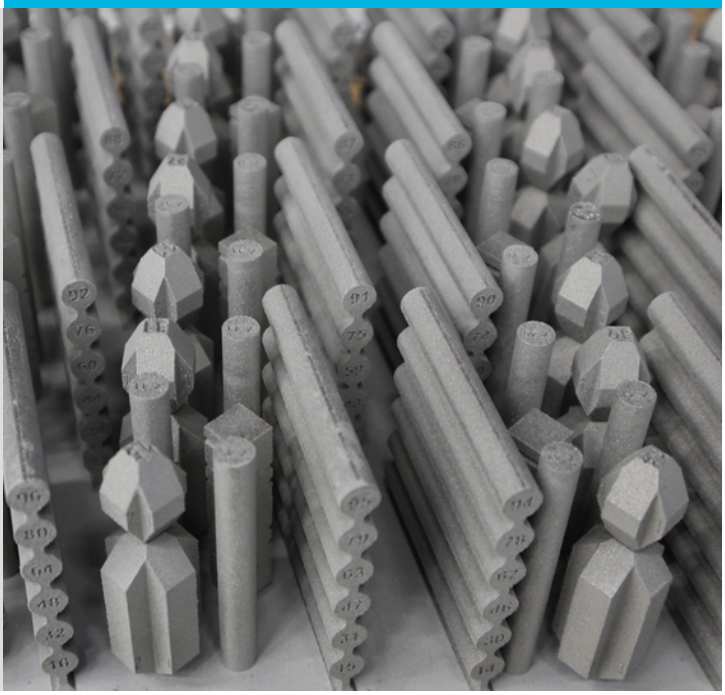
Data in this material datasheet represent material built with a 40µm layer thickness and in a nitrogen atmosphere on a Concept Laser M2 Series 5 single-laser or dual-laser machine. Values listed are typical.

High-strength aluminum alloy A205

A205 is a lightweight aluminum alloy derived from the aerospace-approved A20X™ alloy. Due to a unique solidification mechanism, this material exhibits a highly refined microstructure leading to exceptional high strength, exceeding e.g. the yield strength of AlSi10Mg by more than 150 MPa (+60%) in the T7 or T6 state, respectively. Additionally, A205 demonstrates excellent thermal stability, stress corrosion resistance, and comparatively superior fatigue properties to other AlSi-based additively manufactured alloys. These superior properties – achieved through high cooling rates to create a high-density, crack-free, and finely scaled cellular microstructure – make A205 an excellent choice for additively manufactured applications.

M2 Series 5 A205

The novel A205 parameter has recently been developed for the M2 Series 5 machine. The base parameter is a 40 µm parameter that produces surface roughness less than 10 µm without bead blasting or shot peening, while delivering good productivity with dual lasers. The high density of the parts leads to extraordinary elongation, superior to castings of the same alloy (AMS4471) and reaching the same strength level. The base parameter can be used with either a rubber or steel recoater blade, depending on application needs.



All data and figures contained herein are approximate only. All information provided is 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.

M2 Series 5 A205

With appropriate approval*, A205 can be used for lightweight components in aerospace and industrial applications.

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POWDER CHEMISTRY

Aluminum A205 powder chemical composition according to AMS 4471.

MACHINE CONFIGURATION

- M2 Series 5 (Single Laser or Dual Laser)
- Nitrogen gas
- Stainless steel or rubber recoater blade

AVAILABLE PARAMETERS

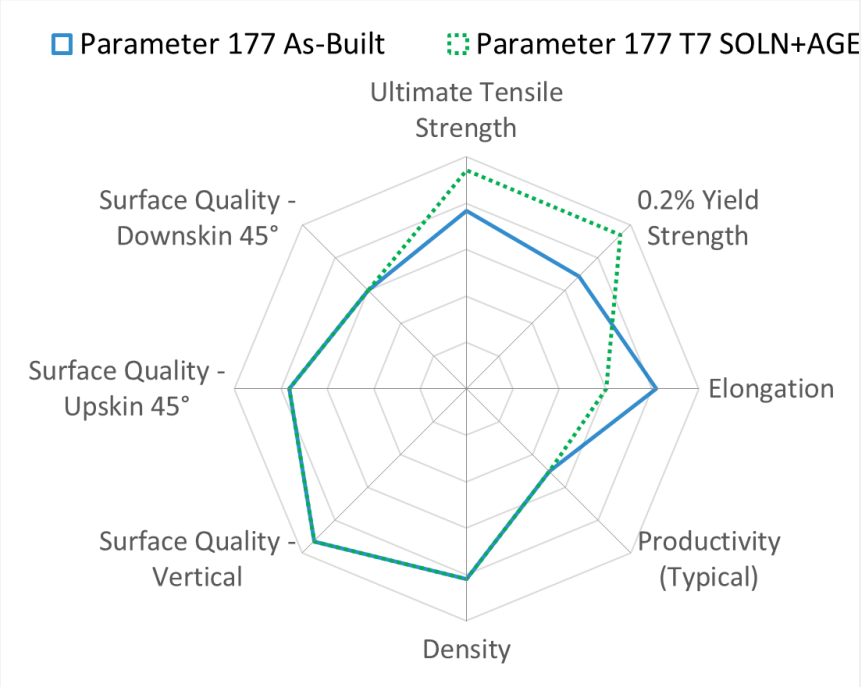
- **Balanced Parameter 177** – 40 µm layer thickness, rubber recoater
- **Balanced Parameter 179** – 40 µm layer thickness, steel recoater

THERMAL STATES

1. As-built
2. T7 solution + age (T7 SOLN + AGE)

Please contact GE Additive for more details regarding the heat treatment.

HEAT TREAT COMPARISON



Spider plot is generated by normalizing typical material data (containing both horizontal and vertical) against a range defined for each material family. For **aluminum alloys,** the ranges are as follows: UTS: 0-500 MPa, 0.2%YS: 0-425 MPa, Density: 99-100%, Elongation: 0-20%, Productivity: 5-30 cm³/hr, Surface Quality (all): 5-40 µm.

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TYPICAL BUILD RATE

	(cm³/h)
Typical build rate[1] w/coating	17.6
Theoretical melting rate[2] bulk per Laser	25.2

[1]Measured by using standard Factory Acceptance Test(FAT) layout
[2]Calculated (layer thickness x scan velocity x hatch distance)

PHYSICAL DATA AT ROOM TEMPERATURE[3]

		Surface Roughness Ra** - Overhang (µm)		
		45°	60°	75°
Upskin	Mean	14.0	11.5	9.5
	St.Dev.	1.1	0.9	0.9
Downskin	Mean	19.3	12.0	7.3
	St.Dev.	2.1	1.1	0.6

		Surface Roughness Ra** (µm)
H	Mean	19.5
	St.Dev.	1.9
V	Mean	7.7
	St.Dev.	1.0

Thermal State		Density (%)		Hardness (HV5)		Poisson's Ratio	
		H	V	H	V	H	V
As-Built	Mean	99.87	99.86	106.9	--	--	--
	St.Dev.	0.06	0.06	1.3			
T7 SOLN + AGE	Mean	99.87	99.86	--	--	--	--

[3] The physical data at room temperature have been generated using one (1) powder lot and one (1) Series 5 machine and three (3) FAT builds and minimum 24 tests per angle or orientation in the as-built state.

TENSILE DATA[4]

Tensile testing done in accordance with ASTM E8 and ASTM E21

Temperature: RT

Thermal State		Modulus of Elasticity (GPa)		0.2% YS (MPa)		UTS (MPa)		Elongation (%)	
		H	V	H	V	H	V	H	V
As-Built	Mean	75	75	319	277	388	388	17.7	14.3
	St.Dev.	2	5	10	7	3	3	1.5	1.5
T7 SOLN + AGE	Mean	74	75	395	400	465	470	9.0	6.6

[4] The tensile data at room temperature have been generated using one (1) powder lot and one (1) Series 5 machine and five (5) FAT builds and minimum 36 tests per orientation in the as-built state.

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

*Industry-specific certifications and/or approvals rely on a number of factors. Customer cannot rely on any data presented herein as binding or as a guarantee of repeatability.
** 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.

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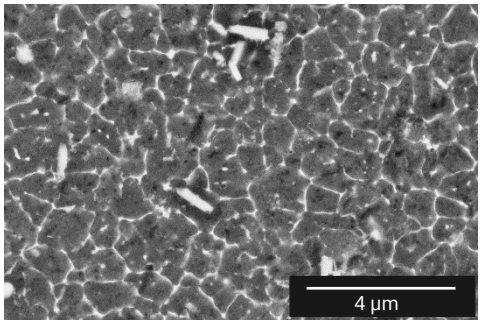
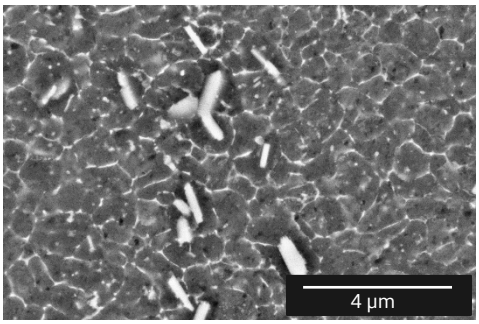
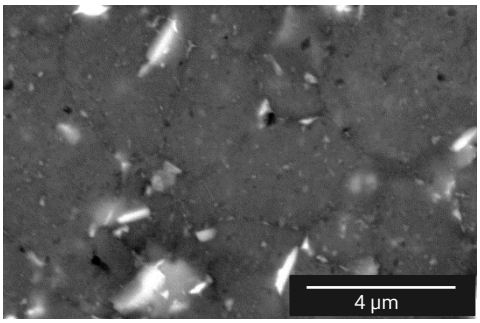
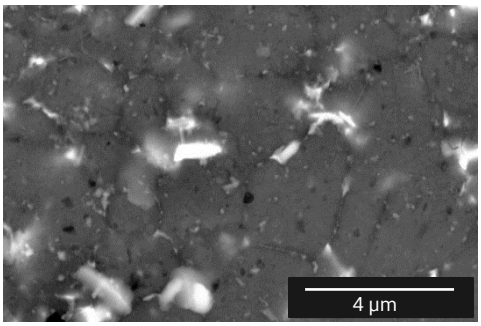
	Horizontal	Vertical
As-Built		
T7 SOLN + AGE		

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