

## ► A2024-RAM2 (high strength and ductile aluminum)

### Product Information

Elementum 3D's 2024 Aluminum Metal-Matrix Composite (MMC) with two percent ceramic provides excellent strength, good ductility along with the wear resistance of ceramic reinforcing phases. A2024-RAM2 is suitable for many applications and is an outstanding additive material solution for structural components. It is heat treatable like wrought 2024 aluminum

### Physical and Chemical Properties

Material composition: Proprietary A2024 w/2% ceramic

Theoretical maximum density: 2.81 g/cc

Relative density: > 99.5%

Ultimate tensile strength: Approx. 72 ksi (497 MPa)<sup>1,2</sup>

Yield strength: Approx. 58 ksi (400 MPa)<sup>1,2</sup>

Elongation: ~ 10%<sup>1,2</sup>

Hardness: 82 ±2 HRB<sup>3</sup>

Modulus of elasticity: Approx. 79 GPa<sup>4</sup>

Thermal conductivity: Pending

Deposition rate: 7.8 mm<sup>3</sup>/s

Surface roughness as built:

Upskin - Ra 5.6 µm, Ra 0.22 x 10<sup>-3</sup> inch

Downskin - Pending



Piston head - as printed.



Timing wheel - glass bead blasted.

<sup>1</sup>ASTM E8, <sup>2</sup>heat treated state, <sup>3</sup>ASTM E18, <sup>4</sup>ASTM E494-15

**Elevated Temperature Testing**

Testing temperature		Ultimate tensile strength <sup>[2]</sup>		Yield strength <sup>[2]</sup>		Elongation <sup>[2]</sup>
C	F	MPa	ksi	MPa	ksi	%
23 <sup>0</sup>	73 <sup>0</sup>	497	72.0	400	58.0	10.0
100 <sup>0</sup>	212 <sup>0</sup>	481	69.7	384	55.7	13.8
150 <sup>0</sup>	302 <sup>0</sup>	437	63.3	341	49.4	16.6
200 <sup>0</sup>	392 <sup>0</sup>	385	55.8	295	42.7	18.8
250 <sup>0</sup>	482 <sup>0</sup>	174	22.7	156	22.7	27.0
300 <sup>0</sup>	572 <sup>0</sup>	114	16.6	102	14.8	39.5

All samples above were heat treated<sup>[1]</sup>

All stated values are approximate values. All details given above are our current knowledge and experience, and are dependent on the equipment, parameters and operating conditions. The data provided in this document is subject to change and only intended as general information on a material set that is continually improving and developing. The data does not provide a sufficient basis for engineering parts. All samples were produced on an EOS M290. All tensile tests were performed at third party certified test labs such as Westmoreland Mechanical Testing & Research.

Please contact us at [jacob@elementum3d.com](mailto:jacob@elementum3d.com) for additional information.

[1] 500° C for 1.5 hrs. with water quenched, then 165° C for 24h air cooled

[2] ASTM E8

[3] ASTM E494-15