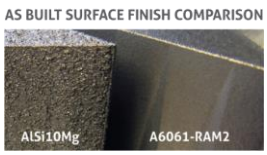
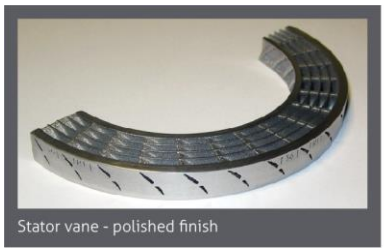
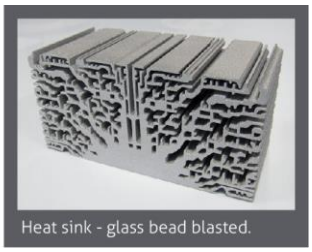



# A6061-RAM2 (Highly Versatile and Cost Effective)

## Product Information

Elementum 3D's A6061-RAM2 is a general-purpose AM aluminum alloy that features a good combination of ductility, strength, thermal conductivity, and corrosion resistance. A6061-RAM2 solves the printability and weldability problems faced by AA6061 to deliver printed properties in line with wrought AA6061 along with excellent as-printed surface finish. Print speed is a major factor in printed part cost and A6061-RAM2 has a real part deposition rate approximately 50% higher than AlSi10Mg on an EOS M290 to deliver highly economical production.*


Stator vane - polished finish


Heat sink - glass bead blasted.

## Physical and Chemical Properties

Material composition: Proprietary A6061 w/2% ceramic (E3D-T6 Condition)

Theoretical maximum density: 2.74 g/cm³

Printed relative density: > 99.7%

Ultimate tensile strength[1]: 48 ± 3.0 ksi (331 MPa)

Yield strength[1]: 43 ± 2.0 ksi (297 MPa)

Elongation[1]: 12 ± 1.5 %

Hardness[2]: 60 ± 2.0 HRB

Modulus of elasticity[3]: 11.0 ± 0.10 Msi (76 GPa)

Deposition rate[4]: 2.3 $in^3$/hr (10.4 $mm^3$/s)

Wear volume loss[5]: 5.1x$10^{-3}$ $in^3$ (84 $mm^3$) (Note: Lower volume loss is better)

**Comparison:** [6]17-4 Stainless Steel 300$mm^3$, [7]A380 Cast Aluminum 304 $mm^3$

Thermal conductivity[8]: 162±3 W/m·K (measured in z)

Coefficient of Thermal Expansion (CTE) [9]: 22.4ppm/



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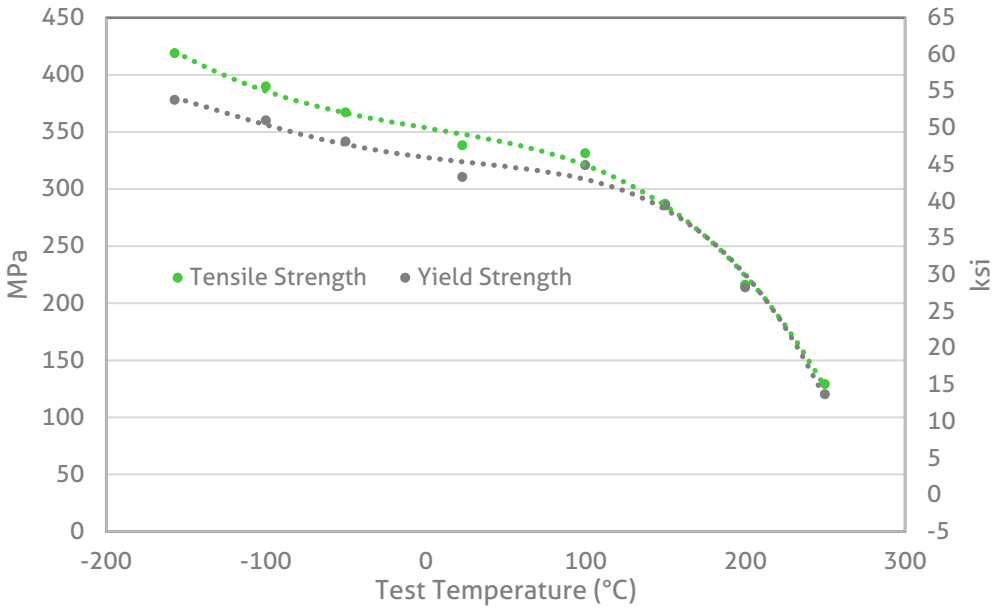
Surface roughness as built[10]:

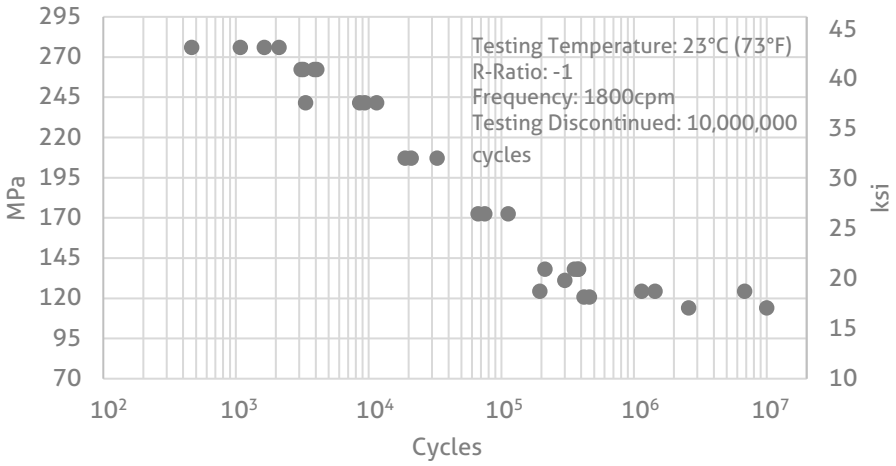
| Angle | Upskin | | Downskin | |
|---|---|---|---|---|
| Deg. ° | Ra µm | Ra µin | Ra µm | Ra µin |
| 0 (top) | 2.55±0.71 | 100.2±27.99 | NA | NA |
| 45 | 6.12±1.06 | 240.96±41.80 | 9.19±1.67 | 361.97±65.66 |
| 50 | 5.19±0.82 | 204.49±32.33 | 8.38±2.30 | 330.00±90.65 |
| 55 | 6.16±1.52 | 242.35±59.70 | 7.80±1.56 | 307.11±62.42 |
| 90 (vertical) | 5.11±0.76 | 201.21±29.87 | NA | NA |

Elevated temperature tensile[11]:

| Test temperature | | Ultimate tensile strength | | Yield strength | | Elongation |
|---|---|---|---|---|---|---|
| °C | °F | MPa | ksi | MPa | ksi | % |
| -157 | -251 | 419±11 | 60.7±2 | 378±11 | 54.8±2 | 15.1±1 |
| -100 | -148 | 390±11 | 56.5±2 | 360±12 | 52.2±2 | 13.0±1 |
| -50 | -58 | 367±17 | 53.2±3 | 342±17 | 49.5±3 | 13.1±1 |
| **23** | **73** | **338±20** | **49.0±3** | **311±14** | **45.0±2** | **12.9±2** |
| 100 | 212 | 331±5 | 48.0±1 | 320±7 | 46.5±1 | 14.5±1 |
| 150 | 302 | 287±6 | 41.6±1 | 286±5 | 41.4±0.7 | 18.4±3 |
| 200 | 392 | 215±9 | 31.3±1 | 214±8 | 31.0±1 | 22.0±4 |
| 250 | 482 | 129±15 | 18.7±2 | 120±6 | 17.4±1 | 29.6±5 |



Fatigue[12]:




All stated values are from heat treated samples.
[1]ASTM E8, [2]ASTM E18, [3]ASTM E494-15, [4]Deposition rate calculation is for comparison purposes on an EOS M290 and does not include recoating time, laser migration time, contour exposures, etc., [5]ASTM G65, Procedure E, [6]Suthar et al. (2015). Comparative evaluation of abrasive wear resistance of various stainless steel grades. GE- International Journal of Engineering Research, 3(7), [7]Lall and Williamson. Wear Resistance and Mechanical Properties of Selected PM Aluminum Alloys and Composites, Metal Powder Products Company, [8]ISO/DIS 22007-2.2 (Transient Plane Source, TPS), [9] ASTM E228, [10]Surface roughness determined by stylus profilometry, [11] ASTM E21, [12]ASTM E466.

*Print speed comparison is based on simulation of various real parts for our standard A6061-RAM2 parameter set A6061-RAM2_40um_M290_v0.70 and standard AlSi10Mg parameter set AlSi10Mg_FlexM291 2.01. The theoretical laser exposure rate of the A6061-RAM2 standard M290 parameter set is 2x the rate of the standard M290 Alsi10Mg set which results in approximately 50% higher print rate for real parts after accounting for recoater time, thin walled geometries, etc..

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 sales@elementum3d.com for additional information.