# IN625-RAM2™

*(High temperature strength and corrosion resistant)*

## Product

Elementum 3D's IN625-RAM2 nickel superalloy offers excellent mechanical strength and creep resistance at high temperatures, good surface stability, and corrosion and oxidation resistance, while maintaining high strength, hardness, and wear. IN625-RAM2 is targeted towards aerospace and power industry applications such as turbine blades and jet/rocket engines, industrial gas turbines, heat exchangers and nuclear components. Elementum 3D can offer the IN625-RAM2 in 40µm, 60µm and 80µm layer printing parameters.

## Properties

| | |
|---|---|
| **Material composition:** Based on IN625-RAM2 w/2 volume % RAM addition | **Thermal conductivity**[5]**:** 16.5 (W/m.k) |
| **Relative printed density**[8]**:** 8.39 g/cm$^3$ (>99.8%) ASTM B311 | **Modulus (Room Temperature)**[3]**:** 200 GPa (29.0 Msi) |
| **Infill deposition rate**[4]**:** *(Further print speed optimization possible)*<br>• 40µm layer 4.2 mm$^3$/s<br>• 60µm layer 6.5 mm$^3$/s<br>• 80µm layer 10.5 mm$^3$/s | **Hardness ASTM E18**[2]**:**<br>• AS Fabricated (29 HRC)<br>• Heat treated (26 HRC) |
| **Hall Flow ASTM B213** 17.8s +/- 2.7s | |

**Surface finish for Elementum 3D's printing layer offerings**[6]**:**

| | 40µm | 60µm | 80µm |
|---|---|---|---|
| **45° Ra Up Surface** | 8.5 | 6.2 | 10 |
| **45° Ra Down Surface** | 18.1 | 12.8 | 17 |

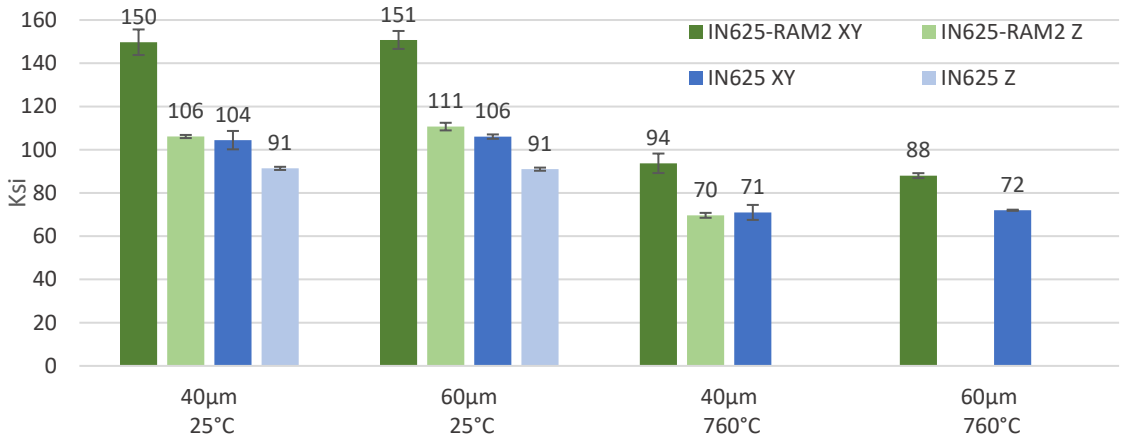


Figure 1: AS-printed IN625-RAM2 yield strength compared to AM IN625 at 25°C and 760°C for 40µm and 60µm print layers printed in the XY and Z direction.

**Mechanical Testing**[1] [7]**:**

| Temperature | | Orientation | Print Layer Height | Ultimate Tensile Strength | | Yield Strength | | Elongation |
|---|---|---|---|---|---|---|---|---|
| °C | **°F** | **XY/Z** | **µm** | **MPa** | **ksi** | **MPa** | **ksi** | **%** |
| 25 | 77 | XY | 40 | 1326 | 192 | 1030 | 150 | 23 |
| 25 | 77 | Z | 40 | 1181 | 171 | 732 | 106 | 26 |
| 760 | 1400 | XY | 40 | 839 | 122 | 647 | 94 | 49 |
| 760 | 1400 | Z | 40 | 764 | 111 | 481 | 70 | 59 |
| 870 | 1600 | XY | 40 | 310 | 45 | 239 | 35 | 67 |
| 870 | 1600 | Z | 40 | 267 | 39 | 230 | 33 | 56 |
| 980 | 1796 | XY | 40 | 164 | 24 | 117 | 17 | 53 |
| 980 | 1796 | Z | 40 | 159 | 23 | 120 | 17 | 75 |
| 25 | 77 | XY | 60 | 1351 | 196 | 1040 | 151 | 23 |
| 25 | 77 | Z | 60 | 1257 | 182 | 764 | 111 | 26 |
| 760 | 1400 | XY | 60 | 808 | 117 | 607 | 88 | 59 |

[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 E1461, [6]Surface roughness determined by stylus profilometry, [7]ASTM E21, [8]ASTM B311

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 and Product Evaluations Systems.

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