

AlSi10Mg-0403 powder for additive manufacturing

Process specification

| | |
|--------------------------------------|------------------------|
| Powder description | Aluminium alloy powder |
| Layer thickness | 25 µm |
| Laser power | 400 W |
| Additive manufacturing system | AM250 |

Material description

AlSi10Mg-0403 alloy comprises aluminium alloyed with silicon of mass fraction up to 10%, small quantities of magnesium and iron, along with other minor elements. The presence of silicon makes the alloy both harder and stronger than pure aluminium due to the formation of Mg₂Si precipitate.

Due to the natural formation of an oxide layer on the surface of the aluminium alloy, the material has high corrosion resistance which can be further improved by chemically anodising.

Material properties

- Low density (good for light weight components)
- High specific strength (strength to mass ratio)
- High thermal conductivity
- Very high electrical conductivity
- Responds well to post process finishing

Applications

- Automotive
- Aerospace and defence
- Electronics cooling
- Consumer goods

Generic data - wrought material

| | |
|--|------------------------|
| Density | 2.68 g/cm ³ |
| Thermal conductivity | 130 W/mK to 190 W/mK |
| Melting range | 570 °C to 590 °C |
| Coefficient of thermal expansion (see note 1) | 20 µm/mK to 21 µm/mK |

Note 1 In the range of 20 °C to 100 °C.

Note 2 Stress relieved at 300 °C ±10 °C for 2 hr, air cooled.

Note 3 Tested at ambient temperature by Nadcap and UKAS accredited independent laboratory. Test ASTM E8. Machined before testing.

Note 4 Tested to ASTM E384-11, after polishing.

Note 5 Tested to JIS B 0601-2001 (ISO 97). As built after bead blasting.

Composition of powder

| Element | Mass (%) |
|-----------|---------------|
| Aluminium | Balance |
| Silicon | 9.00 to 11.00 |
| Magnesium | 0.25 to 0.45 |
| Iron | < 0.25 |
| Nitrogen | < 0.20 |
| Oxygen | < 0.20 |
| Titanium | < 0.15 |
| Zinc | < 0.10 |
| Manganese | < 0.10 |
| Nickel | < 0.05 |
| Copper | < 0.05 |
| Lead | < 0.02 |
| Tin | < 0.02 |

Mechanical properties of additively manufactured components

| | As Built | Stress relieved (see note 2) |
|---|--------------------|------------------------------|
| Tensile strength (UTS) (See note 3) | | |
| Horizontal direction (XY) | 442 MPa ±6 MPa | 334 MPa ±1 MPa |
| Vertical direction (Z) | 417 MPa ±27 MPa | 339 MPa ±6 MPa |
| Yield strength (see note 3) | | |
| Horizontal direction (XY) | 264 MPa ±2 MPa | 211 MPa ±2 MPa |
| Vertical direction (Z) | 206 MPa ±6 MPa | 174 MPa ±4 MPa |
| Elongation at break (see note 3) | | |
| Horizontal direction (XY) | 9% ±1% | 9% ±2% |
| Vertical direction (Z) | 6% ±2% | 4% ±1% |
| Modulus of elasticity (see note 3) | | |
| Horizontal direction (XY) | 71 GPa ±5 GPa | 71 GPa ±2 GPa |
| Vertical direction (Z) | 68 GPa ±2 GPa | 66 GPa ±3 GPa |
| Hardness (Vickers) (see note 4) | | |
| Horizontal direction (XY) | 119 HV0.5 ±5 HV0.5 | 103 HV0.5 ±5 HV0.5 |
| Vertical direction (Z) | 123 HV0.5 ±2 HV0.5 | 98 HV0.5 ±5 HV0.5 |
| Surface roughness (R_a) (See note 5) | | |
| Horizontal direction (XY) | | 5 µm to 9 µm |
| Vertical direction (Z) | | 7 µm to 9 µm |

For worldwide contact details, please visit www.renishaw.com/contact

