

Aluminium AlSi7Mg

Parameter set options

Layer thickness	Optimised for	Laser mode	Page
30 µm	Single laser per part	Continuous wave	4
60 µm	Single laser per part	Continuous wave	5

To download the latest material files, visit www.renishaw.com/softwarelicensing.

Material description

AlSi7Mg is a high strength aluminium alloy with silicon of mass fraction up to 7.5% along with small quantities of magnesium, iron, and titanium as minor elements. The presence of silicon makes the alloy both harder and stronger than pure aluminium due to the formation of Mg₂Si precipitate.

AlSi7Mg has higher strength than the commonly used AlSi10Mg alloy and is suitable for high strength, lightweight applications.

Material properties

- Low density (ideal for lightweight components)
- High specific strength (strength to mass ratio)
- High thermal conductivity
- High electrical conductivity
- Responds well to post process finishing

Applications

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

Disclaimer

The mechanical property data featured in this document were obtained from tests performed in Renishaw's laboratories and they indicate the mechanical properties that can be achieved. The data is not intended as a guaranteed minimum specification.

Glossary of terms

Term	Definition
Scan strategy	Determines the path the laser will take to melt the cross-sectional area of the parts featured in each layer of the build process.
Meander	A scan strategy that takes the form of a straight-line vector path that bounces back and forth from each side of the part border. Meander strategy is quick and ideal for parts with a small XY cross section.
Stripe	A scan strategy where the area within the part border is split into strips and a meander technique is used within each strip. Stripe is ideal for parts with a large XY cross section.

Typical wrought material properties

Material property	Wrought material value
Density	2.68 g/cm ³
Thermal conductivity	150 W/mK to 180 W/mK
Melting temperature	555 °C to 620 °C
Coefficient of thermal expansion ¹	21×10 ⁻⁶ K ⁻¹ to 24×10 ⁻⁶ K ⁻¹

¹ In the range of 20 °C to 100 °C.

Recommended composition of powder

Element	Mass (%)
Aluminium	Balance
Silicon	6.50 to 7.50
Magnesium	0.45 to 0.70
Titanium	≤ 0.20
Iron	≤ 0.19
Manganese	≤ 0.10
Oxygen	≤ 0.10
Zinc	≤ 0.07
Copper	≤ 0.05
Carbon	0.03
Nitrogen	≤ 0.01
Hydrogen	0.01
Residual elements	≤ 0.03 each, ≤ 0.10 total

Recommended powder size distribution: 20 µm to 63 µm.

The values shown in this table are representative of a general composition powder. Contact your powder supplier for more detailed information about specific powders.

Please contact Renishaw for further information about specifications or if you require support in qualifying non-Renishaw powders.

Parameter set summary

Layer thickness	Optimised for	Laser mode	Gas flow rate	Build rate	
30 µm	Single laser per part	Continuous wave	190 m ³ /h	One laser: 19.5 cm ³ /h	Four lasers: 78 cm ³ /h

Material files: AISi7Mg_500QS_B30_M_01_A (meander scan strategy)
 AISi7Mg_500QS_B30_S_01_A (stripe scan strategy)

Properties of additively manufactured components

NOTE: This parameter set is optimised for bulk density. The material properties in this table are indicative only. Further modification of the material file may be required to suit your application.

		As built	Aged ¹
Bulk density ²		≥ 99.8%	≥ 99.8%
Ultimate tensile strength ³	Horizontal (XY)	439 MPa ±2 MPa	339 MPa ±2 MPa
	Vertical (Z)	432 MPa ±5 MPa	350 MPa ±2 MPa
Yield strength ³	Horizontal (XY)	280 MPa ±1 MPa	231 MPa ±4 MPa
	Vertical (Z)	241 MPa ±2 MPa	227 MPa ±2 MPa
Elongation after fracture ³	Horizontal (XY)	15% ±1%	15% ±1%
	Vertical (Z)	9% ±3%	9% ±1%
Modulus of elasticity ³	Horizontal (XY)	72 GPa ±3 GPa	74 GPa ±8 GPa
	Vertical (Z)	64 GPa ±3 GPa	69 GPa ±3 GPa
Hardness (Vickers) ⁴	Horizontal (XY)	111 HV0.5 ±1 HV0.5	102 HV0.5 ±7 HV0.5
	Vertical (Z)	114 HV0.5 ±1 HV0.5	107 HV0.5 ±10 HV0.5
Surface roughness ⁵	Vertical (Z) (Median Ra)	25 µm ±4 µm	-
	Vertical (Z) (Median Rz)	156 µm ±19 µm	-

Mechanical test samples were created using four lasers, one laser per sample and with no downstream processing. Meander scan strategy was used for vertical samples. Stripe scan strategy was used for horizontal samples.

- ¹ Ageing method used for testing: Under argon at 15 L/min flow rate, heat at 3 °C/min to 165 °C ±10 °C, then hold temperature for 7 hours. Air cool to room temperature.
- ² Measured optically on 10 mm × 10 mm × 10 mm samples at 75× magnification.
- ³ Tested at ambient temperature to ASTM E8. Machined prior to testing. Values based on 16 samples.
- ⁴ Tested to ASTM E384-11 after polishing.
- ⁵ Tested on as-built vertical surfaces using laser interferometry. Tested to JIS B 0601 2001 (ISO 4287:1997).

Parameter set summary

Layer thickness	Optimised for	Laser mode	Gas flow rate	Build rate	
60 µm	Single laser per part	Continuous wave	190 m ³ /h	One laser: 32.4 cm ³ /h	Four lasers: 129.6 cm ³ /h

Material files: AISi7Mg_500QS_B60_M_01_A (meander scan strategy)
 AISi7Mg_500QS_B60_S_01_A (stripe scan strategy)

Properties of additively manufactured components

NOTE: This parameter set is optimised for bulk density. The material properties in this table are indicative only. Further modification of the material file may be required to suit your application.

		As built	Aged ¹
Bulk density ²		≥ 99.8%	≥ 99.8%
Ultimate tensile strength ³	Horizontal (XY)	421 MPa ±5 MPa	354 MPa ±3 MPa
	Vertical (Z)	425 MPa ±8 MPa	369 MPa ±5 MPa
Yield strength ³	Horizontal (XY)	262 MPa ±2 MPa	241 MPa ±2 MPa
	Vertical (Z)	233 MPa ±2 MPa	235 MPa ±5 MPa
Elongation after fracture ³	Horizontal (XY)	13% ±3%	12% ±1%
	Vertical (Z)	11% ±2%	7% ±1%
Modulus of elasticity ³	Horizontal (XY)	70 GPa ±5 GPa	75 GPa ±2 GPa
	Vertical (Z)	67 GPa ±2 GPa	71 GPa ±3 GPa
Hardness (Vickers) ⁴	Horizontal (XY)	111 HV0.5 ±1 HV0.5	104 HV0.5 ±4 HV0.5
	Vertical (Z)	109 HV0.5 ±3 HV0.5	106 HV0.5 ±3 HV0.5
Surface roughness ⁵	Vertical (Z) (Median Ra)	22 µm ±3 µm	-
	Vertical (Z) (Median Rz)	146 µm ±18 µm	-

Mechanical test samples were created using four lasers, one laser per sample and with no downstream processing. Meander scan strategy was used for vertical samples. Stripe scan strategy was used for horizontal samples.

- ¹ Ageing method used for testing: Under argon at 15 L/min flow rate, heat at 3 °C/min to 165 °C ±10 °C, then hold temperature for 7 hours. Air cool to room temperature.
- ² Measured optically on 10 mm × 10 mm × 10 mm samples at 75× magnification.
- ³ Tested at ambient temperature to ASTM E8. Machined prior to testing. Values based on 16 samples.
- ⁴ Tested to ASTM E384-11 after polishing.
- ⁵ Tested on as-built vertical surfaces using laser interferometry. Tested to JIS B 0601 2001 (ISO 4287:1997).

www.renishaw.com/additivemanufacturing



#renishaw



+44 (0) 1453 524524



uk@renishaw.com

© 2000–2024 Renishaw plc. All rights reserved. This document may not be copied or reproduced in whole or in part, or transferred to any other media or language by any means, without the prior written permission of Renishaw.

RENISHAW® and the probe symbol are registered trade marks of Renishaw plc. Renishaw product names, designations and the mark 'apply innovation' are trade marks of Renishaw plc or its subsidiaries. Other brand, product or company names are trade marks of their respective owners.

WHILE CONSIDERABLE EFFORT WAS MADE TO VERIFY THE ACCURACY OF THIS DOCUMENT AT PUBLICATION, ALL WARRANTIES, CONDITIONS, REPRESENTATIONS AND LIABILITY, HOWSOEVER ARISING, ARE EXCLUDED TO THE EXTENT PERMITTED BY LAW. RENISHAW RESERVES THE RIGHT TO MAKE CHANGES TO THIS DOCUMENT AND TO THE EQUIPMENT, AND/OR SOFTWARE AND THE SPECIFICATION DESCRIBED HEREIN WITHOUT OBLIGATION TO PROVIDE NOTICE OF SUCH CHANGES.

Renishaw plc. Registered in England and Wales. Company no: 1106260. Registered office: New Mills, Wotton-under-Edge, Glos, GL12 8JR, UK.

Part no.: H-5800-6831-01-A

Issued: 08.2024