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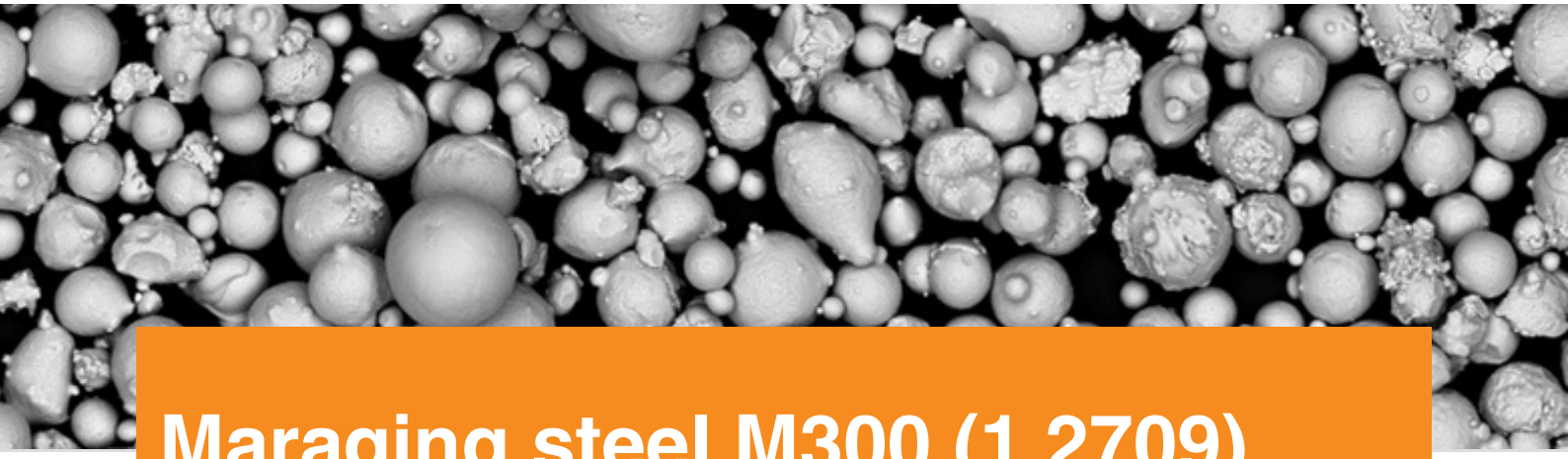

Maraging steel M300 (1.2709)

Parameter set options

Layer thickness	Optimised for	Page number
50 µm	Single laser per part	3

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

Material description

Maraging steels form a class of iron alloys. This group of materials has a martensitic crystal structure and is strengthened via aging at approximately 500 °C (900 °F), hence the name 'maraging'. These ultra-low carbon alloys have very high strength and hardness properties derived from precipitation of intermetallic compounds rather than carbon content. Nickel is the main alloying element, with cobalt, molybdenum, and titanium as secondary intermetallic alloying metals.

Material properties

- High strength
- High hardness
- High fatigue strength
- Good machinability

Applications

- Tooling inserts
- Moulds and dies
- High strength components

Generic material data

Typical wrought material properties

Material property	Wrought material value
Density	8.1 g/cm^3
Thermal conductivity	14 W/mK at 20 °C, 21 W/mK at 600 °C, 29 W/mK at 1 300 °C
Melting temperature	1 413 °C
Coefficient of thermal expansion	10×10^{-6} K^{-1}

Recommended composition of powder

Element	Mass (%)
Iron	Balance
Nickel	17.00 to 19.00
Cobalt	8.00 to 10.00
Molybdenum	4.50 to 5.20
Titanium	0.60 to 0.80
Chomium	≤ 0.50
Aluminium	≤ 0.15
Manganese	≤ 0.10
Silicon	≤ 0.10
Niobium	≤ 0.05
Tanatalum	≤ 0.05
Vanadium	≤ 0.05
Tungsten	≤ 0.05
Carbon	≤ 0.03
Oxygen	≤ 0.03
Nitrogen	≤ 0.02
Boron	≤ 0.01
Phosporus	≤ 0.01
Sulfur	≤ 0.01
Residual elements	≤ 0.10 total

Recommended powder size distribution: 15 µm to 45 µm.

The values shown in this table are representative of a general composition powder. Renishaw powders are supplied to a tighter specification to minimise batch-to-batch variations. Results quoted in this data sheet are from samples produced using Renishaw's tighter specification powder. To purchase powder from Renishaw, visit the online store at **www.renishaw.com/shop.**

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	
50 µm	Single laser per part	Modulated	190 m^3/h	One laser: 13.5 cm^3/h	Four lasers: 54 cm^3/h

Material files: MarStM300_500QS_A50_M_##_# (meander scan strategy)
MarStM300_500QS_A50_S_##_# (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		Age hardened [1]	
	Mean	Standard deviation	Mean	Standard deviation
Bulk density [2]	≥ 99.8%	-	-	-
Ultimate tensile strength [3]				
Vertical direction (Z)	979 MPa	7 MPa	1 916 MPa	16 MPa
Yield strength [3]				
Vertical direction (Z)	822 MPa	7 MPa	1 854 MPa	16 MPa
Elongation after fracture [3]				
Vertical direction (Z)	14%	1%	8%	1%
Modulus of elasticity [3]				
Vertical direction (Z)	140 GPa	8 GPa	171 GPa	6 GPa

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 and stripe scan strategy for horizontal samples. The mechanical property data 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.

1 Age hardening method used for testing: Under argon at 15 L/min flow rate, heat at 3 °C/min to 490 °C ±10 °C, then hold temperature for 6 hours. Air cool to room temperature.

2 Measured optically on a 10 mm × 10 mm × 10 mm sample at 75× magnification.

3 Tested at ambient temperature to ASTM E8. Machined prior to testing. Values based on 16 samples.

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