

H13 tool steel (1.2344)

Parameter set options

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

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Material description

H13 tool steel (DIN/W Nr. 1.2344) is a highly heat resistant steel that offers great thermal fatigue properties. It comprises of primarily iron alloyed with Chromium, along with other minor elements.

It's great toughness and resistance to wear and impact lend itself to be used in a wide variety of tooling applications for industries such as automotive and construction.

Material properties

- Excellent high temperature performance
- Great toughness
- Excellent workability & machineability
- Corrosion resistance

Applications

- Tooling
- Automotive
- Aerospace
- Medical & dental
- Construction

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	7.80 g/cm ³
Thermal conductivity	28.6 W/mK
Melting temperature	1 427 °C
Coefficient of thermal expansion ¹	10.4×10 ⁻⁶ K ⁻¹

¹ In the range of 20 °C to 100 °C.

Recommended composition of powder

Element	Mass (%)
Iron	Balance
Chromium	4.8 to 5.5
Molybdenum	1.1 to 1.8
Silicon	0.8 to 1.2
Vanadium	0.8 to 1.2
Carbon	0.3 to 0.5
Manganese	0.2 to 0.5
Nickel	≤0.3
Copper	≤0.3
Oxygen	≤0.1
Nitrogen	≤0.1
Phosphorus	≤0.03
Sulphur	≤0.02

Recommended powder size distribution: 15 µm to 45 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 m³/h	One laser: 9.07 cm³/h	Four lasers: 36.3 cm³/h

Material files: H13_500QS_B30_M_01_A (meander scan strategy)
H13_500QS_B30_S_01_A (stripe scan strategy)

Properties of additively manufactured components

		Annealed ¹
Bulk density ²		≥99.9%
Ultimate tensile strength ³	Horizontal (XY)	1 773 MPa ±13 MPa
	Vertical (Z)	1 764 MPa ±23 MPa
Yield strength ³	Horizontal (XY)	1 506 MPa ±18 MPa
	Vertical (Z)	1 489 MPa ±31 MPa
Elongation after fracture ³	Horizontal (XY)	14.5% ±2.1%
	Vertical (Z)	12.5% ±1.9%
Modulus of elasticity ³	Horizontal (XY)	201 GPa ±8 GPa
	Vertical (Z)	198 GPa ±11 GPa
Surface roughness ⁴	Vertical (Z) (Median Ra)	6.5 µm ±1.6 µm

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

- ¹ Annealing method used for testing: Under vacuum, heat at 10°C/min to 1 020 °C ± 10 °C, then hold temperature for 30 minutes. Air cool to room temperature. Then under vacuum Temper at 560 °C ± 10 °C for 2 hours.
- 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 on as-built vertical surfaces using laser interferometry. Tested to JIS B 0601-2001 (ISO 4287:1997).

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