

THOR44 440C | 1.4125 | X105CrMoV17 | S44004

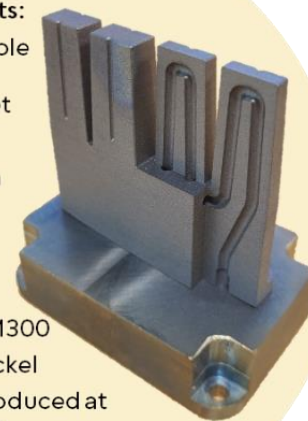
THOR44 is a high carbon martensitic stainless steel for Laser Powder Bed Fusion (LPBF). THOR44 exhibits high manufacturability and can be tailored by dedicated heat treatments to adapt final properties such as hardness and wear resistance to your application. Our Additive Manufacturing and heat treatment experts are glad to assist you with recommendations.

With an achievable hardness up to 63 HRC, THOR44 is the hardest available tool steel on the LPBF-market. Due to its exceptional wear resistance, it can be used in a variety of applications including:

- Rolling, ball and roller bearings
- Valve parts
- Gears
- Dies and injection molds

THOR44 benefits:

- Hardest available tool steel on the LPBF market
- Easy to print
- High corrosion resistance
- ~50% higher thermal conductivity compared to M300
- No cobalt & nickel
- Sustainably produced at Asgaard Metals



Due to its stainless properties further excellent applications include:

- Food processing tools
- Knife blades
- Surgical instruments

Chemical composition

<i>Element</i>	<i>Mass fraction (w. - %)</i>
Fe	Balance
C	0.95 – 1.20
Cr	16.00 – 18.00
Mo	< 0.75
Si	< 1.00
Mn	< 1.00

Typical physical properties

Density	7.80 g/cm ³
Melting range (T _{solidus} – T _{liquidus})	1285 – 1419 °C
Thermal conductivity	24.2 W/mK at 0 – 100°C
Thermal expansion	10.1 μm/m °C at 0 – 100°C

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Powder characteristics	
Particle size	25 – 63 μm

Mechanical properties of printed parts		
Properties	As-built	Heat-treatment example ¹
Rockwell hardness, ISO6508-1	48 HRC	63 HRC
Vickers hardness, ISO6507-1	479 HV	779 HV
Ultimate tensile strength, ISO6892-1	1249 MPa	-
Yield strength, ISO6892-1	924 MPa	-
Elongation at break, ISO6892-1	3,6 %	-

1: Austenization at 1065°C for 30 minutes followed by quenching + boiling nitrogen treatment for 1 minute + double tempering at 500°C for 1 hour each

Standard Heat Treatment for THOR44

AU: Austenization at 1065°C for 30 minutes followed by quenching

BN: Boiling nitrogen treatment for 1 minute

T: Double tempering for 1 hour each

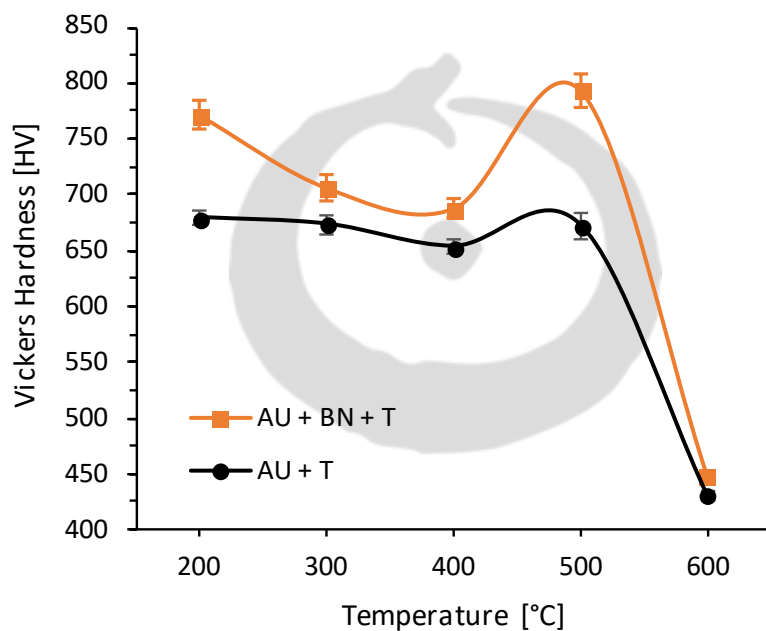


Figure 1: Tempering curves for THOR44 based on austenization (AU) at 1065°C

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As-built microstructure

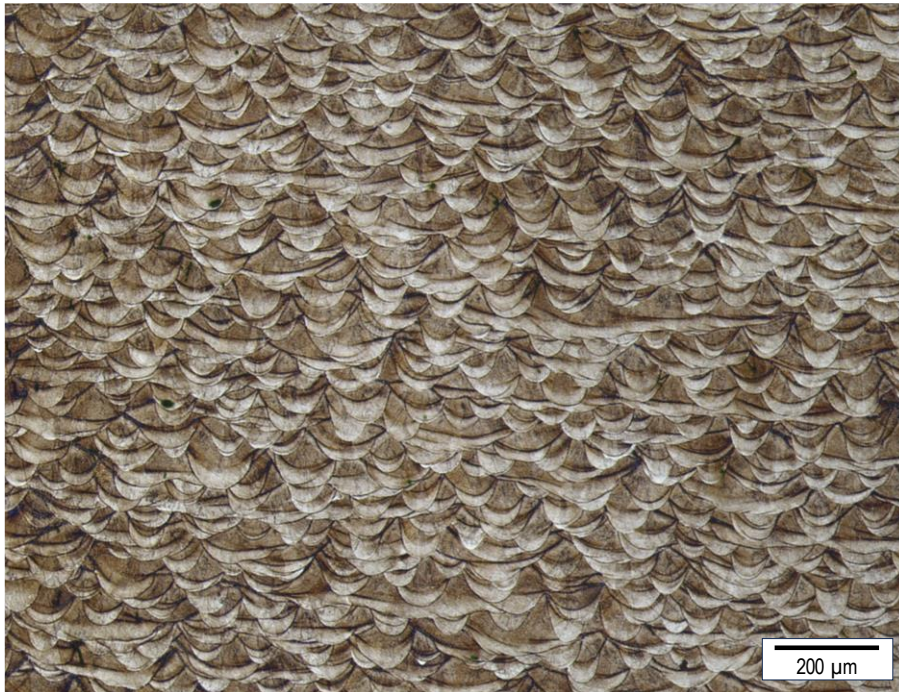


Figure 2: THOR44 as-built microstructure after etching with Kalling's no. 2

Microstructure after Standard Heat Treatment¹

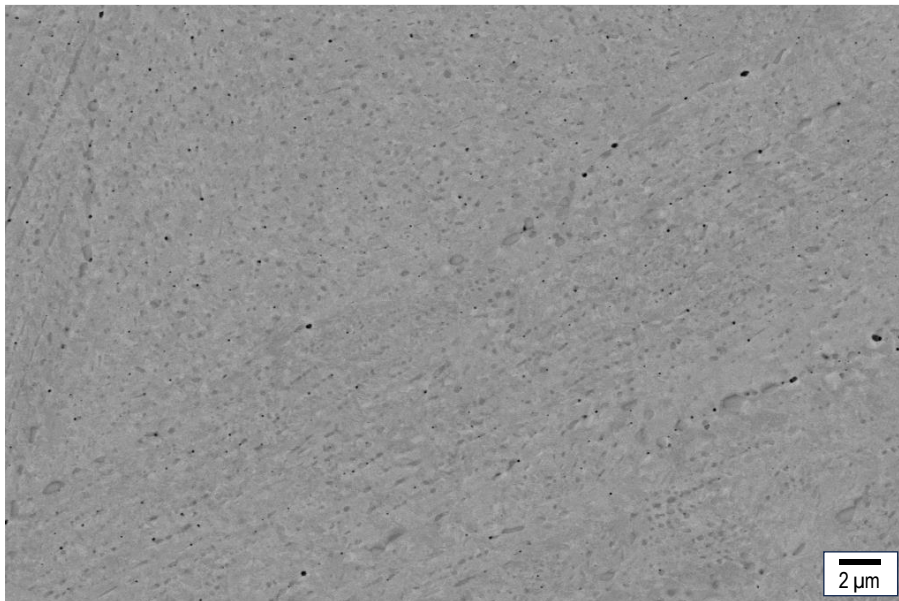


Figure 3: Image shows backscattered scanning electron microscope image (BSD-SEM) of THOR44 microstructure after Standard Heat Treatment¹. The microstructure is characterized by homogeneously and finely dispersed carbides in sub-micron sizes, which is ideal for tool steel applications.