



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.

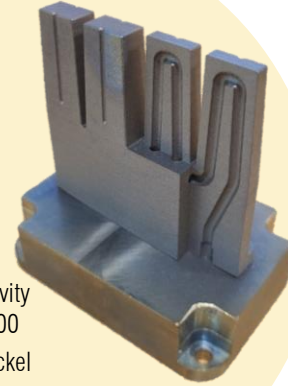
With an achievable hardness up to 65 HRC, **THOR44** is the hardest available tool steel on the LPBF-market. Due to its exceptional wear resistance, it can be used in a variety of applications including:

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

Due to its stainless properties further excellent applications include:

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 and nickel
- Sustainably produced at Nordic Metals



- Food processing tools
- Knife blades
- Surgical instruments

CHEMICAL COMPOSITION	
ELEMENT	MASS FRACTION (W.-%)
Fe	Balance
C	0.95 – 1.20
Cr	16.00 – 18.00
Mo	< 0.75
Si	< 1.00
Mn	< 1.00
P	< 0.04
O	< 0.05
S	< 0.03

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

POWDER CHARACTERISTICS	
Particle size	20 – 53 µm



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MECHANICAL PROPERTIES OF PRINTED PARTS		
PROPERTIES	AS-BUILT	HEAT-TREATED
Rockwell hardness, ISO6508-1	48 HRC	32 – 65 HRC
Vickers hardness, ISO6507-1	HV _{0.1} = 479 ± 30	322 ± 9 ≤ HV _{0.1} ≤ 826 ± 48

LASER POWDER BED FUSION		
QUALIFIED PROCESS PARAMETERS	EXAMPLE 1	EXAMPLE 2
Layer thickness	20 µm	50 µm
Spot size	70 µm	100 µm
Preheating	-	150°C
Hatch distance	80 µm	110 µm
Laser power	160 W	280 W
Scanning speed	750 mm/s	1000 mm/s
Volumetric Energy Density	133.7 J/mm ³	50.9 J/mm ³
Build rate	4.32 cm ³ /h	19.8 cm ³ /h
Archimedes density, ISO3369	99.73 ± 0.04 %	> 99.5%

HEAT TREATMENT
<ul style="list-style-type: none"> Heat treatment instructions upon request

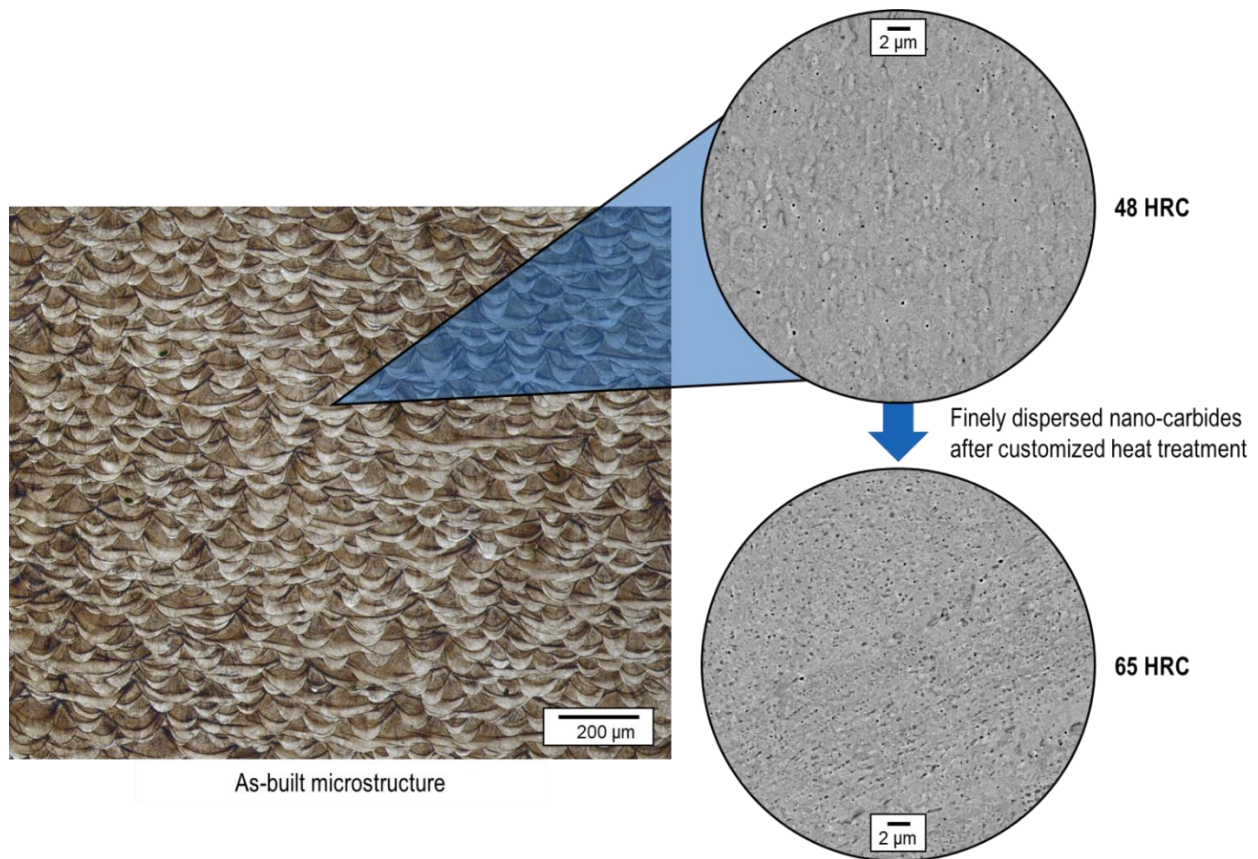


Figure 1: Left: As-built crack-free microstructure of THOR44 after Laser Powder Bed Fusion. Top right: High-magnification SEM image of microstructure after printing. Bottom right: Homogenously distributed nano-sized carbides after customized heat treatment resulting in exceptional strength.