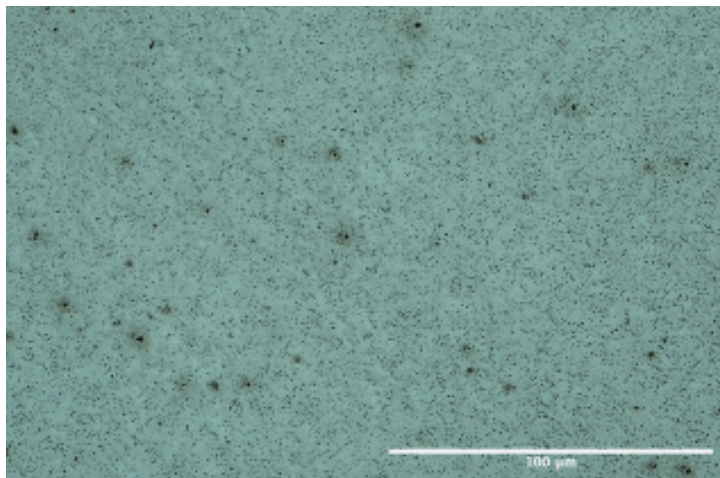
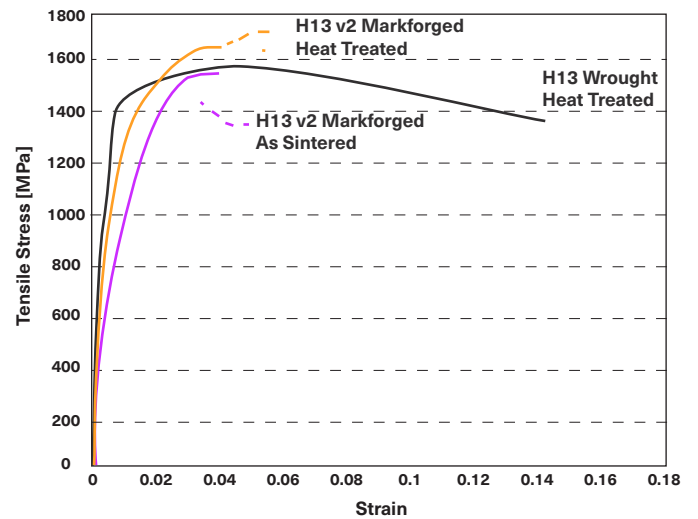


H13_{v2}

TOOL STEEL

Harder than 17-4 PH Stainless Steel and capable of maintaining material properties at high temperatures, H13 tool steel is an extremely versatile material to work with. Markforged H13 can be heat treated to 45 HRC with a UTS of 1500 MPa, and is used by Markforged customers for tool bodies, brazing fixtures, and other parts where hardness or heat resistance are required.



● **Markforged H13 v2 As-Sintered**
 H13 Tool Steel v2 printed on the Metal X, washed in the Wash-1, and sintered in the Sinter-1. As-Sintered microstructure is pictured at left.

● **Markforged H13 v2 Heat-Treated**
 H13 Tool Steel v2 printed with the Metal X system, air quenched at 1010°C, and double tempered at 600°C

● **Wrought H13 Heat-Treated**
 Wrought H13 tool steel standard from *ASM Specialty Handbook* - air quenched at 1010°C and double tempered at 600°C.

Physical Properties	Test	Markforged As-Sintered	Markforged Heat Treated	Wrought Heat Treated*	Composition	Weight%
Ultimate tensile strength [MPa]	ASTM E8	1540	1680	1580	Chromium	4.7-5.5
0.2% Yield strength [MPa]	ASTM E8	860	1250	1360	Molybdenum	1.3-1.7
Elongation at Break [%]	ASTM E8	4	4.7	14	Silicon	0.8-1.2
Hardness [HRC]	ASTM E18	40	45	46	Vanadium	0.8-1.2
Relative Density [%]	ASTM B923	94.5	94.5	100	Carbon	0.3-0.45
					Manganese	0.2-0.5
					Phosphorous	0.03 max
					Sulfur	0.03 max
					Iron	bal

These representative data were tested, measured, or calculated using standard methods and are subject to change without notice. Markforged makes no warranties of any kind, express or implied, including, but not limited to, the warranties of merchantability, fitness for a particular use, or warranty against patent infringement; and assumes no liability in connection with the use of this information. The data listed here should not be used to establish design, quality control, or specification limits, and are not intended to substitute for your own testing to determine suitability for your particular application. Nothing in this sheet is to be construed as a license to operate under or a recommendation to infringe upon any intellectual property right.