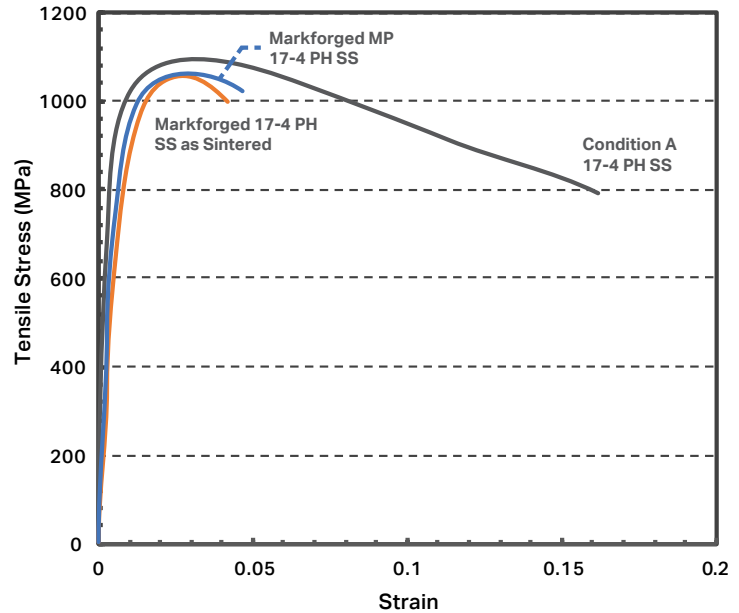


# 17-4 PH STAINLESS STEEL

**PRELIMINARY DATA:** The values stated in this sheet are preliminary — our materials team is working to constantly improve material properties to drive strength up and cost down. We will share updated testing data as we continue to push the boundaries of additive manufacturing.

COMPOSITION	Amount
Chromium	15-17.5%
Nickel	3-5%
Copper	3-5%
Silicon	1% max
Manganese	1% max
Niobium	0.15-0.45%
Carbon	0.07% max
Phosphorous	0.04% max
Sulfur	0.03% max
Iron	bal



**● Markforged**

17-4 PH SS printed on the Metal X, washed in the Wash-1, and sintered in the Sinter-1.

**● Markforged Mass Production**

17-4 PH SS Printed on the Metal X and sent to a production MIM facility for washing and sintering.

**● Wrought**

Condition A Wrought 17-4 PH SS purchased from McMaster Carr.

MECHANICAL PROPERTIES	Standard	Markforged	MF MP	Wrought
Ultimate Tensile Strength	ASTM E8	1050 MPa	1050 MPa	1090 MPa
0.2% Yield Strength	ASTM E8	750 MPa	800 MPa	900 MPa
Elongation at Break	ASTM E8	4-6%	4-6%	16%
Tensile Modulus	ASTM E8	125 GPa	135 GPa	175 GPa
Hardness	ASTM E18	35 HRC	35 HRC	35 HRC
Corrosion	ASTM F1089	Pass	Pass	Pass
Relative Density	—	≥ 96%	98%	100%

**DESIGN CONSTRAINTS**

	Dimension
Minimum Part Dimensions	3 mm x 3 mm x 1.6 mm
Minimum Part Width	3 mm (0.118")
Minimum Emboss/Engrave Width	1.8 mm / 0.33 mm
Minimum Post/Hole Diameter	3.5 mm / 1 mm
Maximum Unsupported Overhang	45°
Minimum Thread Size	M3 (1/8")

Composition data were provided by an accredited 3rd party test facility. Mechanical Properties and Design Constraints were tested and verified internally by Markforged. Data is preliminary and will be updated with 3rd party data.

Part and material performance will vary based on build orientation and infill. "As sintered" parts are in the solution annealed condition (condition a). For most applications, mechanical properties can be optimized with heat treatment. Some parts may require redesign for printing and sintering.

Material data is preliminary and subject to change without notice.