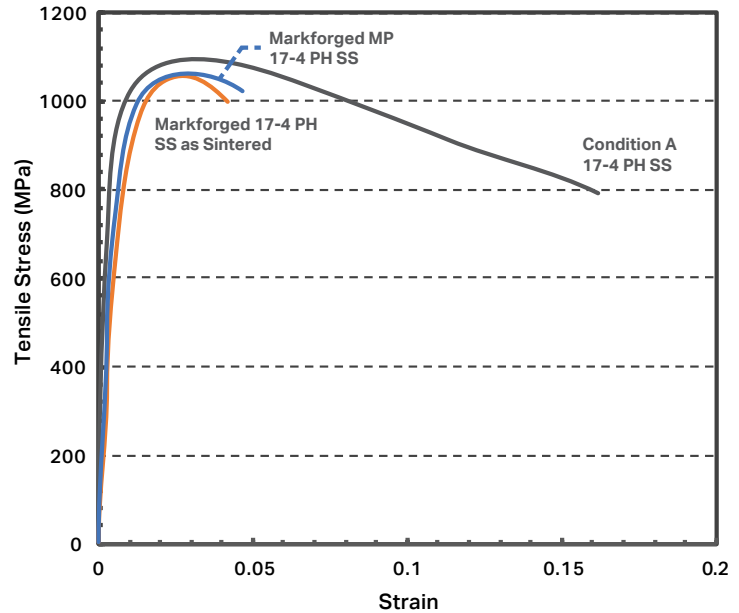


17-4 PH STAINLESS STEEL

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.