

17-4 PH Stainless Steel

17-4 PH is a martensitic precipitation-hardening stainless steel used for DMLS parts that need high strength with good corrosion resistance. Chemistry aligns with ASTM A564 (UNS S17400). Parts are typically solution annealed and aged to reach production hardness and mechanical targets.

ASTM A564

Chemistry per UNS S17400

7.79 g/cm³

Mean part density (M 290, 40 µm)

42 HRC

Typical H900 hardness (min ~40 HRC)

About this alloy

17-4 PH bridges the gap between corrosion-resistant austenitic stainless grades and very hard tool steels. In additive workflows, print orientation and heat treatment condition both influence final performance, so they are called out separately in the data tables.

Typical applications

Engineering hardware, aerospace and defense components, high-strength shafts and fasteners, and selected medical and surgical instrument hardware where corrosion resistance and high strength are both required.

Powder chemical composition (wt.-%)

ELEMENT	MIN.	MAX.
Cr	15.0	17.5
Ni	3.0	5.0
Cu	3.0	5.0
Si	—	1.0
Mn	—	1.0
C	—	0.07
P	—	0.04
S	—	0.03
Nb + Ta	0.15	0.45
Fe	Balance	Balance

Process and physical data (M 290, 40 µm)

PROPERTY	TYPICAL VALUE	NOTE
Build rate	~3.32 mm ³ /s	EOS published value
Min. wall thickness	~0.4 mm	Geometry dependent
Inert gas	Argon	Preferred process gas
Particle size distribution	~15–65 µm	D50: 36–44 µm
Average porosity after HT	0.030%	Measured average
Typical shrinkage after HT	~0.2%	Use for compensation planning

Mechanical properties, as built (ISO 6892 / ASTM E8M)

ORIENTATION	YIELD RP0.2 [MPa]	TENSILE RM [MPa]	ELONGATION A [%]	HARDNESS [HRC]
Horizontal	861	886	19.9	23.9
Vertical	861	924	20.1	—

Mechanical properties, vacuum H900

ORIENTATION	YIELD RP0.2 [MPa]	TENSILE RM [MPa]	ELONGATION A [%]	HARDNESS [HRC]
Horizontal	1235	1336	14.0	42.1
Vertical	1251	1343	13.5	42.1

Mechanical properties, atmospheric HT (argon preferred)

ORIENTATION	YIELD RP0.2 [MPa]	TENSILE RM [MPa]	ELONGATION A [%]
Horizontal	1236	1340	13.5
Vertical	1243	1346	12.6

Mechanical properties, newer 40/80 µm HT set

ORIENTATION	YIELD RP0.2 [MPa]	TENSILE RM [MPa]	ELONGATION A [%]
Horizontal	~1240	~1360	13–14
Vertical	~1240	~1360	13–14

Aging condition hardness guide

CONDITION	AGING CYCLE	TYPICAL HARDNESS [HRC]
H900	480 °C for 1 h	42
H925	495 °C for 4 h	38
H1025	550 °C for 4 h	36
H1075	580 °C for 4 h	34
H1100	595 °C for 4 h	32
H1150	620 °C for 4 h	28

Coefficient of thermal expansion after atmospheric HT

TEMPERATURE RANGE	CTE [$\times 10^{-6}/K$]
25–100 °C	10.4
25–200 °C	11.0
25–300 °C	11.4
25–400 °C	11.8
25–500 °C	12.0

Heat treatment steps

STEP	CONDITION
Solution anneal	1040 °C $\pm$ 15 °C for 30 min, then air cool below 32 °C
Vacuum H900 age	480 °C for 1 h, then air cool
Atmospheric variant	460 °C for 1 h (argon preferred in EOS notes)

Source and notes

Values are drawn from the EOS IndustryLine 17-4PH material data sheet, status 07/2022 ([OEM source](#)). EOS notes the powder is not developed or certified as a medical device under MDR. Results vary with system parameters, build layout, test geometry, and post-processing; they are not a guarantee of properties on your specific part.

Full page: <https://www.evologymfg.com/manufacturing-capabilities/dmls-direct-metal-laser-sintering/17-4-stainless-steel>