



LaserForm[®] 17-4PH (A)

LaserForm 17-4PH (A) fine-tuned for use with ProX[®] DMP 320 metal printer producing industrial parts with good corrosion resistance, high mechanical strength combined with excellent ductility. Mechanical properties of LaserForm 17-4PH (A) can be varied upon different heat treatments.

LaserForm 17-4PH (A) is formulated and fine-tuned specifically for 3D Systems DMP 320 metal 3D printers to deliver high part quality and consistent properties. The print parameter database that 3D Systems provides together with the material has been extensively developed, tested and optimized in 3D Systems' part production facilities that holds the unique expertise of printing 500,000 challenging metal production parts in a broad choice of materials year over year. And for your 24/7 production 3D Systems' thorough Supplier Quality Management System guarantees consistent, monitored material quality for reliable results.

Material Description

LaserForm 17-4PH (A) is known for its outstanding combination of excellent corrosion resistance and high strength with good toughness. These good mechanical properties and corrosion resistance are maintained at temperatures up to 316°C (600°F). With these characteristics, LaserForm 17-4PH (A) is ideal for surgical instruments (sterilizable), aerospace, chemical, petrochemical and general metalworking applications.

Classification

The chemical composition of LaserForm 17-4PH (A) corresponds to a stainless steel 17-4 PH alloy according to ASTM F899, A564, A693 and UNS S17400 specifications. and is indicated in the table below in wt%.

Mechanical Properties^{1,2,3}

MEASUREMENT	CONDITION	METRIC			U.S.		
		AS-BUILT	H900	H1150	AS-BUILT	H900	H1150
Ultimate strength (MPa ksi)	ASTM E8M						
Horizontal direction ⁴ - XY Vertical direction ⁵ - Z		NA 1100 ± 90	1450 ± 10 1380 ± 20	1180 ± 10 1080 ± 50	NA 160 ± 13	210 ± 2 200 ± 3	170 ± 2 155 ± 8
Yield strength Rp0.2% (MPa ksi)	ASTM E8M						
Horizontal direction ⁴ - XY Vertical direction ⁵ - Z		NA 830 ± 110	1280 ± 30 1260 ± 100	1130 ± 20 1020 ± 170	NA 120 ± 16	185 ± 5 180 ± 15	165 ± 3 145 ± 25
Elongation at break (%)	ASTM E8M						
Horizontal direction ⁴ - XY Vertical direction ⁵ - Z		NA 19 ± 4	11 ± 1 12 ± 2	12 ± 1 16 ± 4	NA 19 ± 4	11 ± 1 12 ± 2	12 ± 1 16 ± 4
Hardness, Rockwell C	ASTM E18	32 ± 4	40 ± 2	35 ± 3	32 ± 4	40 ± 2	35 ± 3
Impact toughness ⁶ (J ft-lb)	ASTM E23	71 ± 20	7 ± 2	11 ± 5	52 ± 15	5 ± 2	8 ± 4

Thermal Properties⁷

MEASUREMENT	CONDITION	METRIC	U.S.
Thermal conductivity (W/(m.K) Btu/(h.ft ² .°F))	at 100°C / 212 °F	18.3	10.6
CTE - Coefficient of thermal expansion (µm/ (m.°C) µ inch/(inch. °F))	at 0°C	11.6	6.4
Melting range (°C °F)		1400 - 1450	2550 - 2640

¹ Parts manufactured with standard parameters on a ProX DMP 320, Config B

² Values based on average and double standard deviation

³ H900 and H1150 indicate heat treatments targeting resp. H900 and H1150 conditions

⁴ Tested on ASTM E8M specimen with rectangular cross sections

⁵ Tested on ASTM E8M specimen with circular cross sections type 4

⁶ Tested with Charpy V-notch impact test specimens type A at room temperature

⁷ Values based on literature

NA = Not available



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Magnetic Properties¹

MEASUREMENT	METRIC	U.S.
Relative magnetic permeability	100	100

Physical Properties

MEASUREMENT	METRIC	U.S.
Density		
Relative, based on pixel count ² (%)	>99.9	>99.9
Absolute theoretical ¹ (g/cm ³ lb/in ³)	7.75	0.28

Surface Quality²

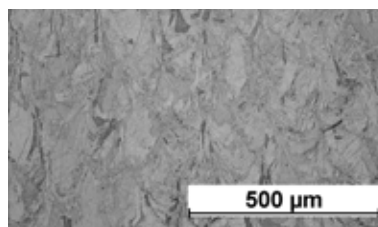
MEASUREMENT	METRIC		U.S.	
	AS BUILT	SAND BLASTED	AS BUILT	SAND BLASTED
Surface Roughness R _a				
Horizontal direction (XY) (µm µin)	5 - 7	4 - 7	195 - 275	155 - 275
Vertical direction (Z) (µm µin)	6 - 8	4 - 8	236 - 315	155 - 315

Chemical Composition

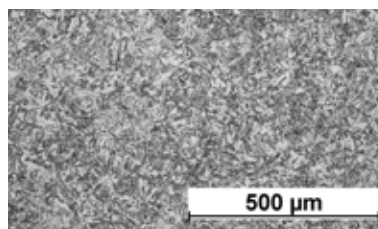
ELEMENT	% OF WEIGHT
Fe	Bal.
C	<0.07
Mn	<1.00
P	<0.040
S	<0.030
Si	<1.00
Cr	15.00-17.50
Ni	3.00-5.00
Cu	3.00-5.00
Nb+Ta	0.15-0.45

¹ Values based on literature

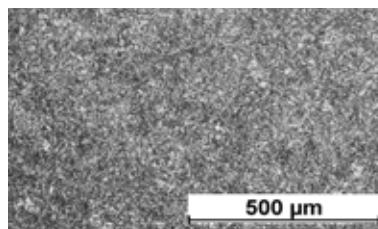
² Parts manufactured with standard parameters on a ProX DMP 320, Config B



Microstructure as built



Microstructure after H900



Microstructure after H1150



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