Meltio Stainless Steel 17-4PH

17-4PH / ER 630 / 1.4542 / UNS S17400

17-4PH is a precipitation-hardening martensitic stainless steel with excellent mechanical properties and corrosion resistance. It is a versatile material with high strength, good toughness, and good resistance to stress corrosion cracking, making it ideal for a wide range of applications in the aerospace and chemical industries.

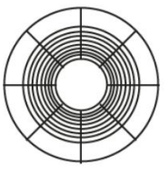
Properties	High Strength, Low Weight, Corrosion Resistance and Heat Treatable
Applications	Aerospace, Chemical Industries, Oil & Gas, Defense and Naval

Wire Chemical Composition	Fe	C	Ni	Si	Mn	Cr	Mo	Nb	Cu
Weight Percent [%]	Bal.	0.02	4.7	0.4	0.5	16.5	0.2	0.23	3.4

Wire Density
7.75 g/cm³

Melting Point		
1677 - 1713 K	1404 - 1440 °C	2559 - 2624°F

Spool Specs



Meltio Materials are tightly spooled and packaged to ensure the best compatibility with Meltio systems.

Wire Diameter	1.0 mm
Weight on Spool	15 kg
Volume on Spool	1935 cm³
Spool Type	BS300
Wire Coating	Uncoated

Heat Treatment

To achieve the best mechanical properties, 17-4PH should be heat-treated after 3D printing. The standard heat treatment process for 17-4PH involves two steps: Solution Annealing and Age Hardening. Solution annealing removes internal stresses of the metal that have been formed during 3D printing and Age Hardening will upgrade the mechanical properties. Machining may take place before or after the solution annealing depending on part tolerance requirements.

Solution Annealing

HT.1: [Condition A]	1030°C-1050°C Hold 1 hour Slow cooling

Age Hardening

HT.2: [H900]	480°C-490°C Hold 1 hour Slow Cooling to RT

**Typical Parameters for a Sample of 160x60x30 mm*

Deposition Parameters

The following 3D printing parameters were found to provide dense samples. Please use the provided “Density Profiles” and refer to the document “Printing Parameters and their effect on part density” for additional information.

Laser Power [W]	Velocity [mm/s]	Argon Flow [l/min]	Layer Height [mm]	Wire Speed [mm/s]	Energy Density [J/mm3]
1100	7.5	10	1.0	9.6	147

Meltio Material Datasheet

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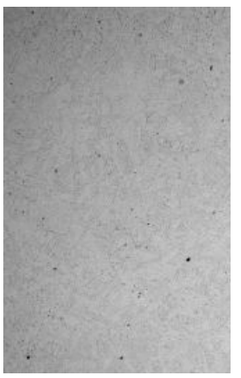
Micrography

The as printed microstructure of 17-4 PH stainless steel is heterogeneous and mostly martensitic with some retained austenite.
Solution Annealing and Age Hardening results in a significantly refined grain structure with a predominantly martensitic microstructure and equiaxed morphology.

As-printed XZ
100x Magnification

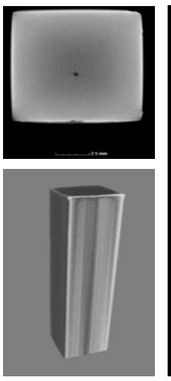
As-printed XZ
1000x Magnification



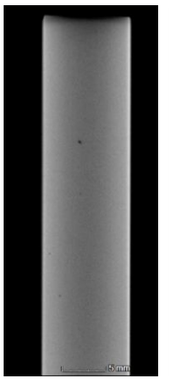
HT.1+ HT.2
1000x Magnification

Tomography

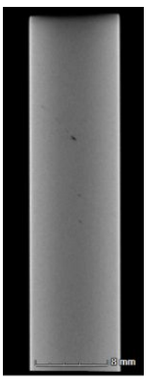
Computed Tomography Scan of 3D printed sample part in 17-4PH showing small detectable voids. Resolution of 24 µm per pixel.



3D / Top View



Left View



Front View

Relative density as 3D printed	99.90%

Mechanical Properties

Results show that specimens printed using Meltio's wire-laser metal 3D printed process perform at the same level as samples made with conventional manufacturing methods. Testing is carried out in the less favorable XZ direction to ensure the values are applicable across complete part.

		UNE EN ISO 6892-1	
	Wrought Properties (ASTM 1472)	**Meltio XZ Properties (HT.1 + HT.2)**	**Meltio XZ Properties (As Printed)**
Ultimate Tensile strength (UTS) [MPa]	1310	1391 ± 7	1017 ± 15
Yield strength [MPa]	1170	1243 ± 8	815 ± 17
Elongation [%]	10	10 ± 3	14 ± 0.1
		**Tests Carried Out In IDONIAL* info@idonial.com	

		UNE EN ISO 6507-1	
	Wrought Properties (ASTM 1472)	**Meltio Properties (HT.1 + HT.2)**	**Meltio Properties (As Printed)**
Hardness [HV-30]	388	393	258
		**Tests Carried Out In IDONIAL* info@idonial.com	

** Meltio's work on material characterization is carried out using the Meltio M450 and it remains under constant development. Specifications provided herein may not reflect the latest state of our research. For further information and questions please contact us via info@meltio3d.com.*

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