

Meltio Stainless Steel 17 - 4PH

Material Group: Stainless Steels

A martensitic precipitation hardened stainless steel capable of achieving high hardness while offering excellent corrosion resistance. It is widely employed in the oil & gas, aerospace, energy, and defense industries. Typical applications include pump impellers, pipes, and valves.

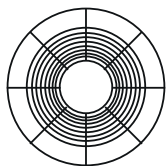
Nomenclature Standards

AWS A 5.9 _____	ER630
EN ISO 14343-A _____	630
Material N° _____	1.4542

Chemical Composition

C	Ni	Si	Mn	Cr	Mo	Nb	Cu
0.02	4.7	0.40	0.5	16.5	0.2	0.23	3.40

Spool Specs



Diameter	1 mm
Weight	15 kg
Volume	1935 cm ³
Density	7.75 g/cm ³
Spool Type	BS300

Applications



Aerospace industries



Tools and prototypes

Mechanical Properties

Results show Meltio's wire LMD 3D printed specimens to perform at the same level as conventional manufacturing methods, with low deviations and near isotropic properties between vertical (XZ) print orientations.

		Tensile Strength (MPa)	Yield Strength (MPa)	Elongation (%)	Hardness (HV-30)
Wrought Properties		1310	1170	10	388
Meltio as Built	XZ	1007	815	14,29	258
Meltio Post Temper Heat - Treatment	XZ	1391	1243	10	393

Heat Treatment

HT.1-Hardening

Heat treatment to reach condition A
 - Heat up to 1030°C-1050°C in 1h
 - Forced air flow cooling

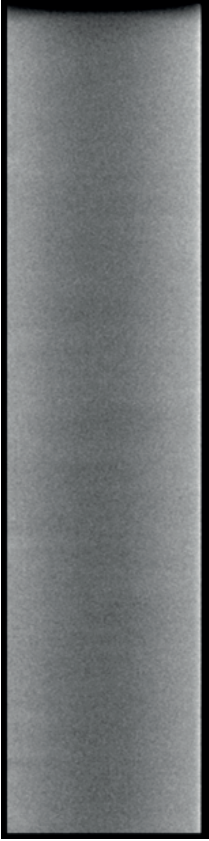
HT.2-Precipitation

Precipitation Heat Treatment H900
 -Heat up to 480°C-490°C in 1h
 -Air cooled

Printing Parameters Used

Print Speed	Deposition Width	Layer Height	Laser Power
450 mm/min	1 mm	0.8 mm	1100 W

Tomography

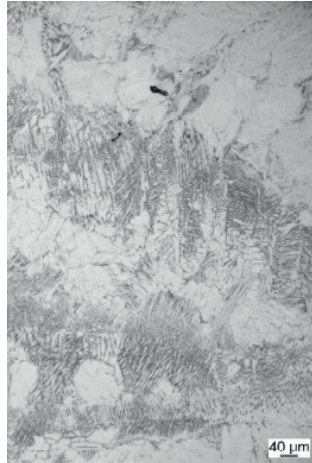


Metallography

The microstructure in "As Build" state for 17-4ph is composed mostly of martensite with a little content of helded austenite. It has a very heterogeneous grain size with zones of fine grains with equiaxial and columnar morphology close to the solidification start points and thicker grain size in the closer zones of the end of solidification point of the melt pool. After the heat treatment is possible to appreciate refined grain size in comparison with the original material with an equiaxial grain morphology, the microstructure is mostly martensitic.

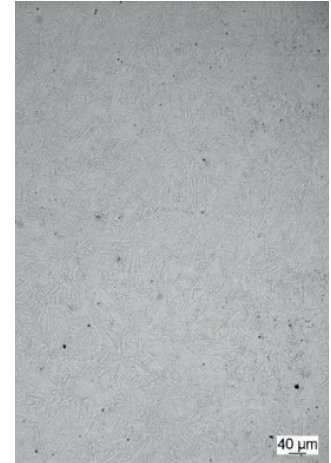
Before Heat Treatment

Micrography after etching done at x500 of the 17-4ph at as build state in the XZ plane.



After Heat Treatment

Micrography after etching done at x500 of the 17-4ph after heat treatment in the XZ plane.



Shielding gas: Argon > 99.996% purity.

Machine Used: Meltio M450

Laser System: 6x200W Fiber coupled diode lasers. 976nm wavelength.

* Data represent typical reference values from Worught (ASTM A36) and Cast (ASTM A352) material classification compared to Meltio (M450) horizontal (XY) and vertical (XZ) specimens extracted from 3D printed walls and tensile tested according to UNE EN ISO 6892-1

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