MELTIO

Material Datasheet Meltio Tool Steel H11

Material Group: Tool Steels

A chromium-based steel alloy, it's one of the most commonly used tool steels, thanks to its outstanding impact toughness. H11 is widely used for hot tooling applications, in the manufacturing of dies, and in aerospace applications.

Nomenclature Standards

EN ISO 14343 - A	S Fe3
Material Nº	1.2606

Spool Specs



Chemical Composition

с	Si	Mn	Cr	Мо	v	w
0.35	1.1	0.4	5.5	1.2	0.25	1.3

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		1990	1650	9	558
Meltio as Built	xz	1771	1170	3	561
Meltio Post Temper Heat - Treatment	xz	2086	1735	12	558

Heat Treatment

Printing Parameters Used

HT.1 Annealing -Heat up to 820°C hold for 4h	Print Speed	Deposition Width	Layer Height	Laser Power
-Slow cooldown in oven	300 mm/min	1 mm	1 mm	1100 W
LIT 2 Hordoning				

HT.2 Hardening

- Heat up to 1025°C for 1h

- Forced air cooling

HT.3 Tempering First tempering -Heat up to 550°C for 1h

-Air cooling

Second tempering

-Heat up to 550°C for 1h

-Air cooling



Tomography



Metallography

The microstructure in "As Build " state for H11 is composed mostly of tempered martensite, fresh martensite and helded austenite. The morphology of the grains vary in dependance on the orientation of the paths, it's possilbe to identify columnar grains that follow the direction of the solidification front of the meltpool. After the heat treatment the presence of austenite has been reduced drastically, leaving all the martensite tempered. The grain size has been refined during the process showing an equiaxial morphology.

Before Heat Treatment

Micrography after etching done at x500 of the H11 at as build state in the XZ plane.



After Heat Treatment

Micrography after etching done at x500 of the H11 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 tyical 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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