Meltio Mild Steel ER70-S

ER70S-6 / S 42 4 M21 3Si1 / AWS A5.18

ER70-S, also known as low alloy carbon steel or mild steel, is a highly versatile material due to its strength, ductility, and low cost. It is used in many applications, including construction, automotive and manufacturing. Its excellent weldability and machinability make it easy to work with, while its high ductility and toughness make it suitable for structural applications.

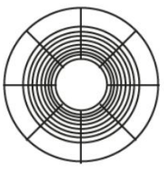
Properties	Low Cost, Easily Machined, Highly Ductile and Magnetic
Applications	Manufacturing, Tools and prototypes and Automotive industries

Wire Chemical Composition	Fe	C	Mn	Si	S	P
Weight Percent [%]	Bal.	0.07	1.45	0.85	0.02	0.01

Wire Density
7.8 g/cm³

Melting Point		
1700 - 1760 K	1425 - 1485ºC	2600 - 2700°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	1923 cm³
Spool Type	BS300
Wire Coating	Uncoated

Heat Treatment

With ER70-S it is not mandatory to perform a heat-treatment after 3D printing for general use case applications. A Normalizing heat treatment can be applied to ER70-S to improve its microstructure and mechanical properties. By eliminating unstable constituents such as acicular ferrite and bainite, a more uniform and homogeneous microstructure is achieved, leading to a better distribution of pearlite and ferrite. This results in increased ductility and toughness, as well as a reduction in the anisotropy of the material.

Normalization*

Nitrogen atmosphere Heat up to 900°C	Maintain for 2h Cooling in air to RT

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

Deposition Parameters

The following 3D printing parameters were found to provide fully 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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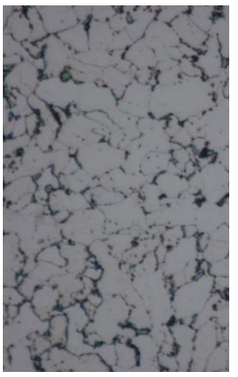
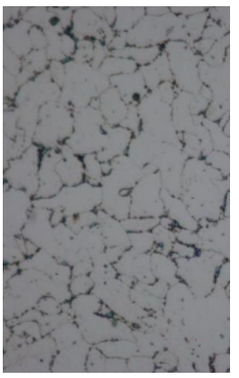
Micrography

The investigation reveals that the microstructure of the ER70-S specimens consists of a ferritic matrix intermixed with pearlite at the grain boundaries, wherein the interlayers exhibit larger grain sizes owing to the heat generated during material deposition.

As-printed XY
100x Magnification



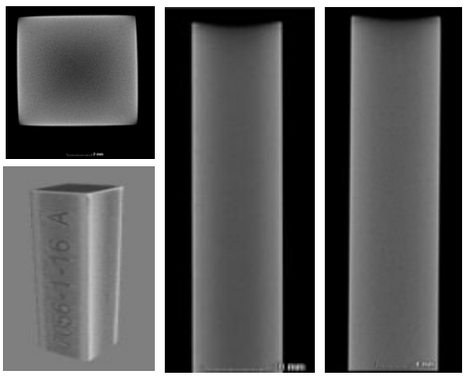
As-printed XY
1000x Magnification



As-printed XZ
1000x Magnification

Tomography

Computed Tomography Scan of 3D printed sample part in ER70-S without detectable voids or defects. Resolution of 24 µm per pixel.



3D / Top View

Left View

Front View

Relative density as 3D printed	99.19%

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. Results show low deviations and near isotropic properties in the as printed state without the application of heat-treatments.

			UNE EN ISO 6892-1	
	Cast Properties (ASTM A352)	**Wrought Properties (ASTM A36)**	**Meltio XY Properties (As printed)**	**Meltio XZ Properties (As printed)**
Ultimate Tensile strength (UTS) [MPa]	415 - 585	400 - 550	598 ± 5	525 ± 12
Yield strength [MPa]	205	250	484 ± 8	402 ± 37
Elongation [%]	24	23	71 ± 1	15 ± 9
			**Tests Carried Out in CETEMET* *i+d+i@cetemet.es*	

			UNE EN ISO 6507-1
	Cast Properties (ASTM A352)	**Wrought Properties (ASTM A36)**	**Meltio Properties (As printed)**
Hardness [HV-30]	160	127	175
			**Test Carried Out In the University of Jaen (UJA)* *info@strainanalysisuja.es*

** 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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