

# Meltio Stainless Steel 316L

ER316LSI / G 19 12 3 L Si / 1.4430

SS316L is an austenitic steel with excellent durability, low reactivity and adequate elevated temperature properties. The alloy has a low carbon content which makes it particularly recommended when there is a risk of intergranular corrosion. Thus, parts manufactured with SS316L are an excellent choice in corrosion prone applications.

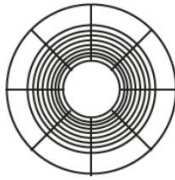
<b>Properties</b>	Corrosion Resistance, Machinable and Polishable
<b>Applications</b>	Machinery, Chemical and Food Industry and Naval

Wire Chemical Composition	Fe	C	Si	Mn	Cr	Ni	Mo
<b>Weight Percent [%]</b>	Bal.	0.02	0.9	1.7	18.5	12.0	2.7

Wire Density
8.0 g/cm <sup>3</sup>

Melting Point		
1671 K	1398 °C	2548 °F

## Spool Specs



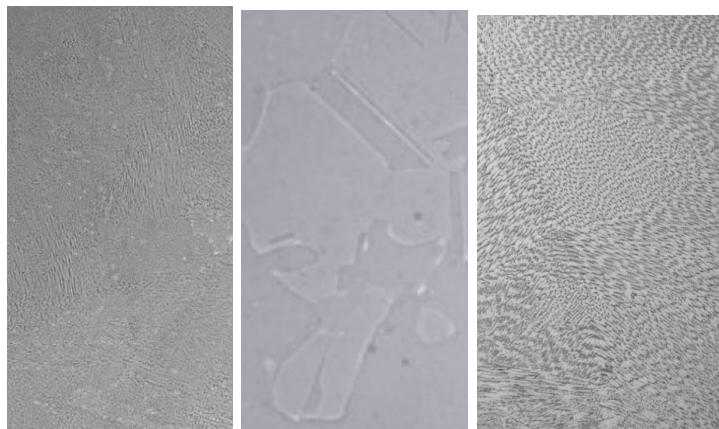
Meltio Materials are tightly spooled and packaged to ensure the best compatibility with Meltio systems.

<b>Wire Diameter</b>	1.0 mm
<b>Weight on Spool</b>	15 kg
<b>Volume on Spool</b>	1875 cm <sup>3</sup>
<b>Spool Type</b>	BS300
<b>Wire Coating</b>	Uncoated

Relative density as 3D printed	> 99.7%
--------------------------------	---------

## Micrography

The as-built SS316L samples show a microstructure with both cellular and columnar dendritic solidification mode. In as printed condition we find around 5.6% ferritic structures which are reduced to 0.2 % after heat-treatment of re-austenization.



Gen I. As-printed XY  
100x Magnification

Gen I. HT XY  
100x Magnification

Gen II. As-printed XY  
100x Magnification

Gen II. HT XY  
100x Magnification

Published  
in Q4

## Tomography

CT Scan of 3D printed sample part in SS316L without detectable voids or defects. Resolution of 24 µm per pixel.



3D / Top View

Front View

\*Test Carried Out In IDONIAL  
[info@idonial.com](mailto:info@idonial.com)

\*Test Carried Out In CATEC  
[info@catec.aero](mailto:info@catec.aero)

# Meltio Stainless Steel 316L

ER316LSI / G 19 12 3 L Si / 1.4430

## Parametrization for Verified Density Profiles

The following fully dense printing parameters were obtained, based on a printed block of 30x60x20 mm. A sample from this block of 10x10x60 mm was extracted using EDM, and was analyzed using CT Scan on an external lab. Please use the provided “Materials Handbook” to know better the printing parameters relation and their effect on part density. These printing parameters are available in our slicers Meltio Horizon and Meltio Space.

	Laser Power [W]	Laser Wavelength (nm)	Velocity [mm/s]	Argon Flow [l/min]	Layer Height [mm]	Layer Width [mm]	Wire Speed [mm/s]	Input Energy Density [J/mm <sup>3</sup> ]	Deposition Rate [g/h]
<b>IR</b>	1100	976	7.5	10.0	1.0	1.0	9.6	146.6	196
<b>Blue</b>	1000	450	10.0	10.0	1.2	1.0	15.3	83.3	346

## Heat Treatment

With SS316L it is not mandatory to perform a heat-treatment after 3D printing for general use case applications. As-built Meltio SS316L parts show a mainly austenitic structure with some small ferrite content. This Ferrite content may be adjusted via re-austenization to fit the requirements of a specific application. Applying the heat-treatment a 99.8% austenitic structure structure can be achieved. SS316L may also be stress relieved between 450°C and 500°C without affecting its microstructure.

### Re-austenization\*

Protective atmosphere	1050°C	Maintain for 2h	Cooling to RT
-----------------------	--------	-----------------	---------------

\*Typical Parameters for a cylinder sample of 4 mm diameter and 10 mm long extracted by EDM from a printed block of 160x30x70mm.

## 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 even in the as-printed state without the application of heat-treatments.

	Cast Properties (ASTM A403)	Wrought Properties (ASTM A351)	UNE EN ISO 6892-1				
			Meltio XY properties (H.T.)	Meltio XZ properties (H.T.)	Meltio XY properties (As printed)	Meltio XZ properties (As printed)	
Ultimate Tensile strength (UTS) [MPa]	515	550	556 ± 8	547 ± 8	643 ± 6	655 ± 11	IR
			Published in Q4				Blue
Yield strength [MPa]	208	260	215 ± 3	253 ± 17	429 ± 16	347 ± 28	IR
			Published in Q4				Blue
Elongation [%]	40	35	65 ± 1	62 ± 2	38 ± 2	41 ± 4	IR
			Published in Q4				Blue
*Test Carried Out In IDONIAL <a href="mailto:info@idonial.com">info@idonial.com</a>							

The following Mechanical Properties were obtained, based on a printed block of 160x30x70 mm using the Verified Density Parametrization, from it 16 ASTM E8M samples were extracted using EDM and were analyzed by an external laboratory.

# Meltio Stainless Steel 316L

ER316LSI / G 19 12 3 L Si / 1.4430

		UNE EN ISO 6507-1			
	Cast Properties (ASTM A403)	Wrought Properties (ASTM A351)	Meltio Properties (H.T)	Meltio Properties (As printed)	
Hardness [HV-30]	215	225	192	198	IR
			Published in Q4	173	Blue
<p>*Gen I Test Carried Out In IDONIAL  <a href="mailto:info@idonial.com">info@idonial.com</a>            *Gen II Test Carried Out in CETEMET  <a href="mailto:i+d+i@cetemet.es">i+d+i@cetemet.es</a></p>					

Based on a printed block of 30x60x20 mm using Verified Density Parametrization. A sample from this block of 10x10x60 mm was extracted using EDM, and was analyzed by an external lab.

## Fatigue Life

The results demonstrate that specimens printed using Meltio’s wire-laser metal 3D printing process can withstand high fatigue cycles, performing at the same level as samples produced using conventional manufacturing methods. The results also indicate that specimens exhibit good fatigue behaviour even in the as-printed state, without the application of heat treatments.

		ASTM E466		
	XZ properties (As printed)	XZ properties (H.T.)		
Stress Range [Mpa]	220	190		IR
	Published in Q1 of 2025			Blue
N° of Cycles (Nf)	5x10 <sup>6</sup>			IR & Blue
Stress Ratio (R)	-1			IR & Blue
<p>*Test Carried Out In IDONIAL  <a href="mailto:info@idonial.com">info@idonial.com</a></p>				

The following Mechanical Properties were obtained, based on a printed block of 160x30x70 mm using the Verified Density Parametrization, from it 16 ASTM E466 samples were extracted using EDM and were analyzed by an external laboratory.

\* Meltio’s work on material characterization is carried out using the Meltio M450 and M600 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](mailto:info@meltio3d.com).

\*\* Any technical information or assistance provided herein is given and accepted at your own risk and neither Meltio nor its affiliates make any guarantees relating to it or because of it. Neither Meltio nor its affiliates shall be responsible for the use of this information, or any product, method or apparatus mentioned and you must make your own determination for its suitability and completeness for you application. Specifications are subject to change without notice.