Meltio Stainless Steel 308L

ER308LSI / G 19 9 L Si / 1.4316

SS308L is an austenitic chromium-nickel steel with low carbon content, making it suitable for applications requiring reduced carbide precipitation. It supports service temperatures ranging from -196°C to 350°C. Due to its silicon addition, it offers improved fluidity, resulting in flatter and more uniform surfaces.

General Properties

Wire Diameter	Weight on Spool	Spool Type	Wire Coating	Melting Point	Wire Density	Recom. Build plate	Drive Wheels	Inertization[2]
1.0 mm	15 kg	BS300	Uncoated	1390 ºC	7.9 g/cm³	304 Steel	1.0 V-Groove	Local

Chemical Composition

Fe	C	Si	Mn	Cr	Ni
Bal.	0.02	0.9	1.7	20.0	10.0

Tested Print Profiles

Laser	Profile name	Laser Power [W]	Energy Density [J/mm3]	Deposition Rate [g/h]	Volume rate [cc/h]	Relative Density [%]	Max Pore/Defect [µm]
450 nm	**Rev 7 2024-12-13**	1000	98.03	290	36.72	99.98	27/ 65
	Rev23 2025-06-24	1400	83.33	478	60.48	-	-

* Printing profiles available in our official Slicers: **Meltio Horizon** for standalone Printers and **Meltio Space** for Laser Integration Kits.
** Profiles developed for the 1.4Kw blue head will be available for Meltio Space for laser integration kits.

Structural Properties

ASTM E8/E8M *UNE EN ISO 6892-1* *UNE EN ISO 6507-1*	Wire	Blue Laser			
		Heat Treatment		As Printed	
		XY	XZ	XY	XZ
Ultimate Tensile strength [MPa]	580	557.09±11	580.46±51	653.7±9	605.9±10.2
Yield strength [MPa]	440	273.8±25.8	291.3±22.7	432.5±30	416.3±23.3
Elongation [%]	35	41.42±6.2	50.8±5.3	35.8±4.7	27.1±6.7
Hardness [HV-10]	-	-	-	-	213

Reference Standards

	Casting (ASTM A743)	Wrought *(ASTM A473)*
Ultimate Tensile strength [MPa]	485	515
Yield strength [MPa]	195	205
Elongation [%]	35	40
Hardness [HV-30]	-	-

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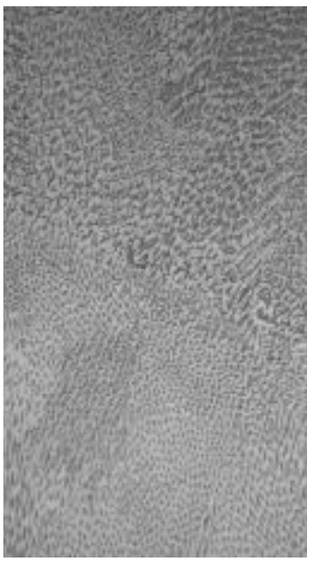
Internal Structure [1]

Micrography

The microstructure of SS308L stainless steel exhibits solidification dendrites with varying orientations, characteristic of directional solidification typically observed in welding and additive manufacturing processes. The matrix is predominantly austenitic (γ), with a secondary fraction of delta ferrite (δ). This ferrite forms as the primary phase during solidification and partially transforms into austenite upon further cooling, starting from the dendrite cores, which are less enriched in alloying elements. The interdendritic regions, enriched in elements such as chromium and molybdenum, promote the retention of delta ferrite at room temperature, where it appears with characteristic vermicular and lath-like morphologies.

Blue Laser



As-printed XZ
100x Magnification

HT
100x Magnification

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1.Internal Structure

Hardness

Based on a printed block of 250x250x30 mm using Verified Density Parametrization. A sample from this block of 30x30x60 mm was extracted using EDM. from it UNE-EN ISO 6507-1 and was analyzed by an external laboratory. (*IDONIAL* info@idonial.com).

Relative Density

Characterizing materials for its Blue Laser technology using 300x400x60 mm 304L steel build plates. Relative density and pore size are evaluated through micrography following NASA-STD-6030 “Additive Manufacturing Requirements for Spaceflight Systems,” based on a 250x250x30 mm printed specimen. The results comply with NASA-STD-6030, showing an overall porosity fraction below 0.25% by volume and were analyzed by an external laboratory. (*IDONIAL* info@idonial.com , *CETEMET* i+d+i@cetemet.es , AIMEN comunicacion@aimen.es)

Tensile Tests

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. Testing is carried out in the less favorable XZ direction to ensure the values are applicable across complete part.

Mechanical Properties were obtained, based on a printed block of 95x155x55 mm using the **Rev 7 2024-12-13** profile for the Blue laser, from it 16 ASTM E8M samples were extracted using EDM and were analyzed by an external laboratory. (*IDONIAL* info@idonial.com)

Micrography

The micrography were obtained from a 10x10x60 mm printed block using the Verified Density Profile for IR laser and **Rev 21 2024-12-13** profile for the Blue laser. The metallographic analysis followed ASTM E3-11:2017 standards, ensuring proper preparation and examination of the microstructure and were analyzed by an external laboratory. (*IDONIAL* info@idonial.com)

Heat Treatment

With SS308L it is not mandatory to perform a heat-treatment after 3D printing for general use case applications. As-built Meltio SS308L 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. SS308L 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 ASTM E8M cylinder sample of 4 mm diameter and 10 mm long extracted by EDM from a printed block for Tensile Tests

2.Inertization

Inertization of Meltio M600 machinery can be performed in two ways: localised inertisation or full chamber inertization. Both options are designed to ensure a controlled environment during the 3D printing process and prevent oxygen contamination of reactive materials.

Localised Inertization:
In this mode, the shielding gas is supplied locally through the shield nozzle located in the deposition head, with a flow rate of approximately 15 L/min. This method is suitable for most applications where oxygen control in the work area is necessary without requiring a completely isolated environment.

Full Chamber Inertization:
For more demanding applications, it is possible to perform a full chamber inertization. In this case, the chamber must be preconditioned before the printing process is started, reaching an oxygen concentration of 50 ppm. It is essential to control the oxygen concentration in the chamber, as reactive materials can absorb oxygen even when the part is hot, not only when it is in the melt pool.

The choice of inertisation method depends on the properties of the material to be used and the specific requirements of the printing process, ensuring the highest quality and integrity of the manufactured parts.