

# Meltio Nickel 718

ERNiFeCr-2 / S Ni 7718 / 2.4667

Nickel 718 is a highly versatile and corrosion-resistant alloy with exceptional mechanical properties at both high and low temperatures. Its ability to withstand harsh environments and high-stress applications has made it a popular choice across a range of industries, including aerospace, energy, and marine. Being Nickel 718 a difficult alloy to work using conventional methods, 3D Printing facilitates its usage for a broader range of applications.

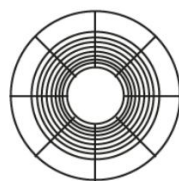
<b>Properties</b>	High Strength, Age-hardenable, High temperature and Corrosion Resistance
<b>Applications</b>	Aerospace, Energy / Oil and Gas and Chemical and Automotive

Wire Chemical Composition	Ni	C	Si	Mn	Cr	Fe	Ti	Mo	Ni+Ta	Al
<b>Weight Percent [%]</b>	Bal.	0.05	0.2	0.2	19.0	20.0	0.9	3.0	5.2	0.5

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

Melting Point		
1644 - 1700 K	1371 - 1427 °C	2500 - 2600 °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>	1829 cm <sup>3</sup>
<b>Spool Type</b>	BS300
<b>Wire Coating</b>	Uncoated

## Heat Treatment

To achieve the best mechanical properties Nickel 718 should be heat-treated after 3D printing. The standard heat treatment process for Nickel 718 involves two steps: Solution Annealing and Age Hardening. Solution annealing removes internal stresses that have been formed during 3D printing. Machining may take place before or after the solution annealing. Once the component has been age hardened its machinability is compromised.

### Solution Annealing

Protective atmosphere Heat up to 1100°C	Hold for 1h Rapid Cooling in water to RT
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### Age Hardening

Protective atmosphere Heat up to 760°C in 2h Hold at 760°C during 8h	Cool down to 650°C in 1h50' Hold at 650°C during 8h Cooling in oven to RT
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*\*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.

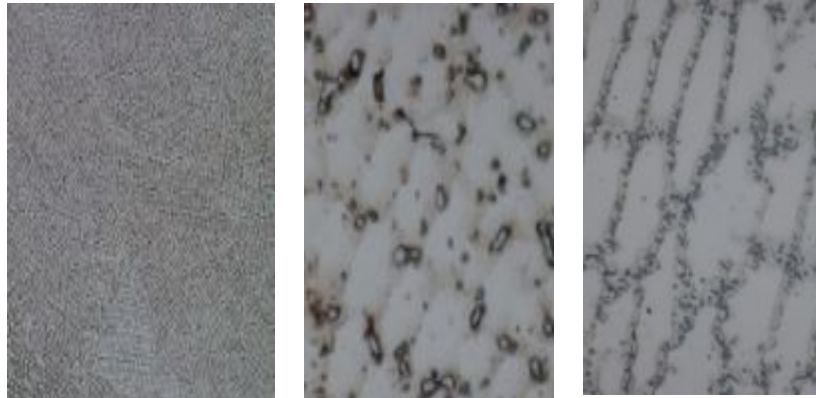
Laser Power [W]	Velocity [mm/s]	Argon Flow [l/min]	Layer Height [mm]	Wire Speed [mm/s]	Energy Density [J/mm <sup>3</sup> ]
1100	7.5	10	1.0	9.6	147

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## Micrography

In the as-printed state of Nickel 718, delta-phase dendrites have been observed within the gamma nickel matrix. Under higher magnification, the presence of intermetallic phases and gamma prime has been noted.



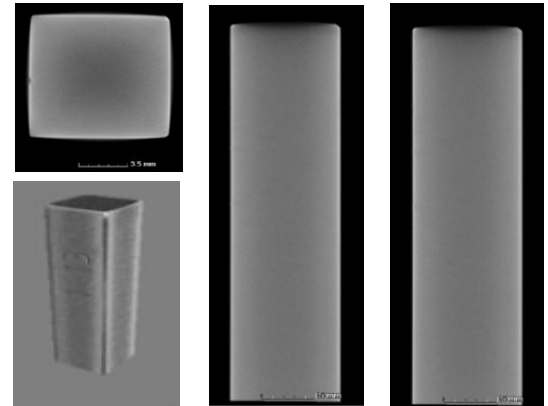
As-printed XY  
100x Magnification

As-printed XY  
1000x Magnification

As-printed XZ  
1000x Magnification

## Tomography

Computed Tomography Scan of 3D printed sample part in Inconel 718 without detectable voids or defects. Resolution of 24 μm per pixel.



3D / Top  
View

Left View

Front View

Relative density as 3D printed	99.84%
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## Mechanical Properties

Results show that specimens printed using Meltio’s wire-laser metal 3D printed perform at the same level as samples made with conventional manufacturing methods. As-printed testing is carried out in the less favorable XZ direction to ensure the values are applicable across complete part.

	UNE EN ISO 6892-1						
	Cast Properties (AMS 5383)	Wrought Properties (AMS 5662)	Meltio XY properties (S.A. + A.H.)	Meltio XZ properties (S.A. + A.H.)	Meltio XY properties (S.A.)	Meltio XZ properties (S.A.)	Meltio XZ Properties (As printed)
Ultimate Tensile strength (UTS) [MPa]	802	1241	1256 ± 11	1208 ± 49	1016 ± 28	925 ± 86	833 ± 50
Yield strength [MPa]	758	1034	1025 ± 7	980 ± 2	660 ± 10	631 ± 10	537 ± 32
Elongation [%]	5	10	11 ± 1	10 ± 5	18 ± 6	15 ± 2	25 ± 3
*Test Carried Out In CETEMET <a href="mailto:i+d+i@cetemet.es">i+d+i@cetemet.es</a>							

	UNE EN ISO 6507-1				
	Cast Properties (AMS 5383)	Wrought Properties (AMS 5662)	Meltio Properties (S.A. + A.H.)	Meltio Properties (S.A.)	Meltio Properties (As printed)
Hardness [HV-30]	342	350	332	285	245
*Tests Carried Out in CETEMET <a href="mailto:i+d+i@cetemet.es">i+d+i@cetemet.es</a>					

\* 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](mailto:info@meltio3d.com).

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