Inconel 718

Selectable Core Power & Layer Thickness

To Learn More visit
velo3d.com
info@velo3d.com

Headquarters
2710 Lakeview Court
Fremont, CA 94538

Material

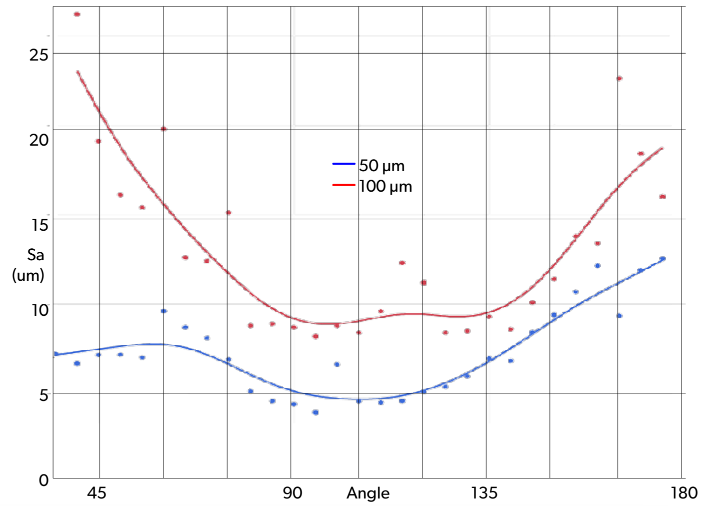
Inconel® 718 is a precipitation-hardenable nickel-based superalloy known for superb tensile strength even under extreme pressure and heat. It has rupture strength at temperatures up to 1290°F (980°C), it ideal for high temperature applications such as gas turbine and power/process industry parts. It is used for critical applications in the aerospace, defense, and petrochemical industries.

Process Capabilities

Velo3D lets you build the parts you need without compromising on design intent or quality. Flow, our print preparation software, now features user-selectable core parameter sets and different layer thicknesses that provide enhanced control over builds. This lets you optimize material properties and print speeds without sacrificing part performance. In addition, Flow provides a complete print file transferable to any Sapphire printer worldwide, enabling engineers to achieve identical geometric accuracy and material properties regardless of which printers you use.

- Available Layer Thicknesses: 50 µm, 100 µm
- Available Core Powers: 240 W, 1000 W

Surface Finish versus Angle



	Sapphire Sapphire 1MZ	Sapphire XC Sapphire XC 1MZ
Typical Volume Rate[1], cc/hour	50 µm layer: 60 100 µm layer: 98	50 µm layer: 240 100 µm layer: 392
Density, g/cc (lbs/cubic in)	8.19 (0.296)	
Relative Density, percent	99.9+	
Surface Finish[2], S_a, µm (µin)	50 µm: <15 (590) 100 µm: <20 (786)	

Mechanical Properties after Post Processing[3]

Performance @ Room Temperature				Ultimate Tensile Strength				0.2% Yield				Elongation		Modulus
Temp	Power @ Layer Thickness (W)[4]	Orientation	Sample Size	Mean KSI	Mean MPa	Mean -3σ[5] KSI	Mean -3σ[5] MPa	Mean KSI	Mean MPa	Mean -3σ[5] KSI	Mean -3σ[5] MPa	Mean %	Mean-3σ[5] %	Range
21°C 70°F	240 @50 µm	Horizontal	30	196	1350	193	1330	159	1093	156	1076	21.3	16.6	26.5-29 MSI 183-200 GPa
		Vertical	30	195	1343	192	1323	160	1103	157	1081	20.6	16.2	
	1000 @50 µm	Horizontal	24	192	1343	187	1308	159	1109	153	1070	17.83	15.3	
		Vertical	274	183	1273	177	1220	150	1037	139	960	22.9	12.0	
	1000 @100 µm	Vertical	24	179	1237	173	1191	143	989	135	930	22.1	11.3	158-179 GPa
Performance @ Elevated Temperature														
649°C 1200°F	240 @50 µm	Horizontal	7	155	1068	152	1047	131	902	117	806	24.2	12.0	
		Vertical	9	156	1077	153	1056	131	904	128	883	22.5	12.0	
	1000 @50 µm	Horizontal	9	153	1055	143	988	128	885	122	840	20.0	10.0	
		Vertical	9	150	1036	146	1008	129	889	121	836	19.1	10.0	

1. Geometry-dependent. **2.** 50 µm thickness, for angles >25° from horizontal; 100 µm thickness, for angles >45°; depends on orientation and process selected. **3.** Stress Relief at 1950°F ±25°F (1065 ±14°C) for 90 +5/-15 minutes, Hot Isostatic Pressing per ASTM F3055 CL-D at 14750 ±250 PSI (100 ±2MPa) at 2125 ±25°F (1163 ±14°C) for 180-225 minutes, Solution & Age per AMS 2774 S1750DP. **4.** Performance at power level user-selected in Flow. **5.** Data from sample sizes ≤30 for information only.

Inconel 718 - Microstructure

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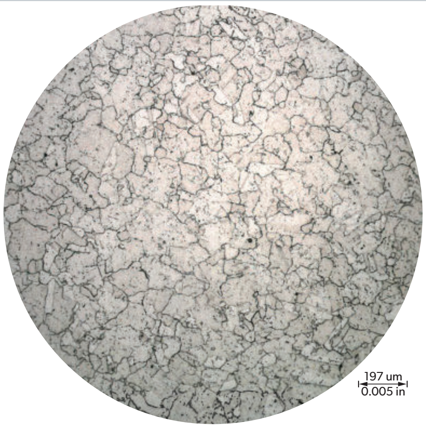
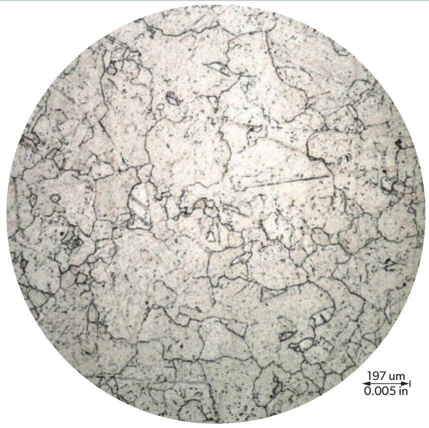
Microstructure Details

All photographs at 100X magnification. Samples were etched with HCl and H_2O_2.

50 µm Layers - Micrograph showing the typical microstructure in the horizontal plane

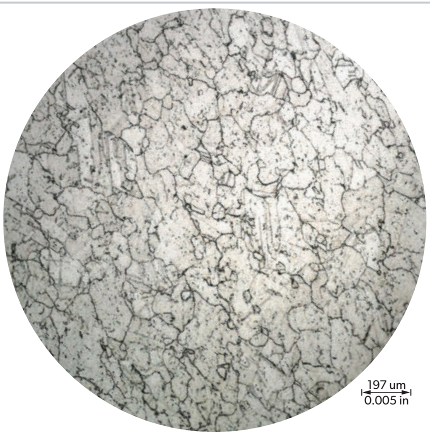


240 W core



1000 W core

50 µm Layers - Micrograph showing the typical microstructure in the vertical plane

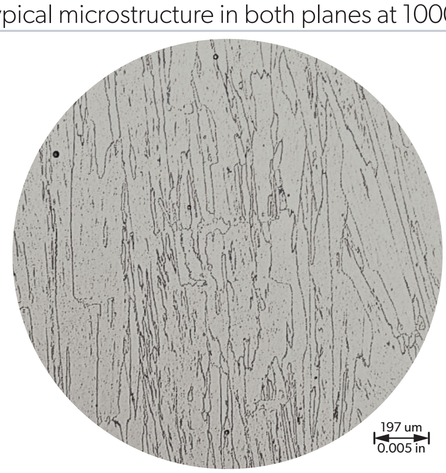


240 W core

1000 W core

100 µm Layers - Micrograph showing the typical microstructure in both planes at 1000 W

1000 W core; horizontal plane



1000 W core; vertical plane