

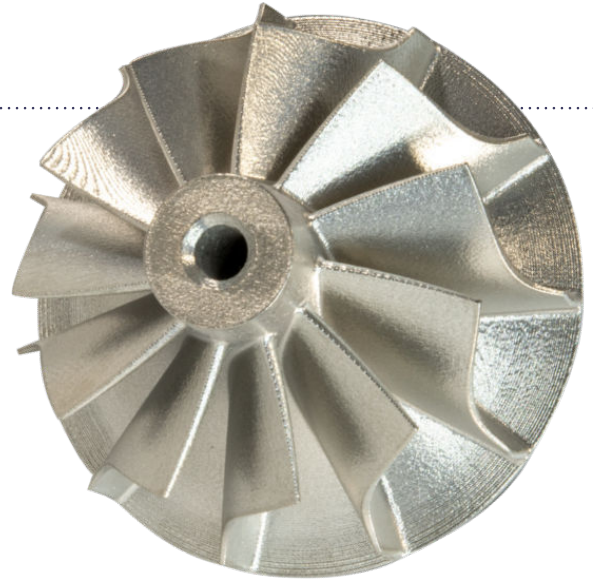
Inconel 718

The alloy chemical composition complies with UNS N07718 and ASTM F3055

General Material and Process Specification

Inconel 718 is a Ni-Cr based superalloy with columbium (Cb/Nb) and molybdenum as major alloying elements. It is a high-strength and corrosive-resistant precipitation-hardening alloy with exceptional tensile, fatigue and creep-rupture properties at elevated temperatures. This material is widely used in aerospace, oil and gas, and automotive industries. Common applications include jet engine components, gas turbine parts, aerospace fasteners and rocket motors.

This data sheet specifies the expected mechanical properties and characteristics of this alloy when manufactured on a FormUp 350 system. All data is based on parts built with AddUp standard 40 µm layer thickness parameters, using standard fine spherical Inconel 718 powder.



Physical Properties	Results
Density (%) ¹	Typical 99.9
Theoretical density (g/cm ³) ²	8.2

¹ Relative density measured using optical microscopy
² Values based on literature

Surface Roughness Ra ^{3,4,5}	As-built	Bead blasted ⁵
Vertical surface	2 to 5	1 to 3

³ Depends on orientation and testing method
⁴ Tested using optical profilometer, cutoff wavelength λc=2.5 mm
⁵ Surface treatment performed with glass blasting medium at 5 bar

Mechanical Properties ⁶	Test Method	Thermal State			
		As-built	Stress relieved ⁷	Heat treated ^{8,9}	Heat treated ^{8,10}
Tensile strength (MPa)	ASTM E8				
Horizontal direction (XY)		1117±12	1339±13	1392±6	1120±10
Vertical direction (Z)		1004±12	1208±13	1362±5	1101±8
Yield strength (MPa)	ASTM E8				
Horizontal direction (XY)		852±27	1138±19	1145±11	954±18
Vertical direction (Z)		692±27	982±18	1121±9	923±10
Elongation at failure (%)	ASTM E8				
Horizontal direction (XY)		28±2	25±2	19±1	13±2
Vertical direction (Z)		32±2	26±2	21±1	19±2
Reduction of area (%)	ASTM E8				
Horizontal direction (XY)		39±4	26±7	30±4	17±1
Vertical direction (Z)		49±4	32±5	36±2	21±2

Mechanical Properties ⁶ (cont.)	Test Method	Thermal State			
		As-built	Stress relieved ⁷	Heat treated ^{8,9}	Heat treated ^{8,10}
Modulus of Elasticity (GPa)	ASTM E8				
Horizontal direction (XY)		208±18	225±6	205±6	166±25
Vertical direction (Z)		146±18	175±6	195±8	164±8
Rockwell hardness (HRC)	ASTM E18				
Horizontal direction (XY)		28±1	39±1	45±1	-
Vertical direction (Z)		28±1	38±1	44±1	-
Impact strength (J)	ASTM E23				
Horizontal direction (XY)		77±3	42±1	27±4	-
Vertical direction (Z)		75±2	39±2	26±1	-

⁶ Tested at ambient temperature to ASTM E8. Machined before testing. Values based on a sample size of a minimum 27 across the build plate

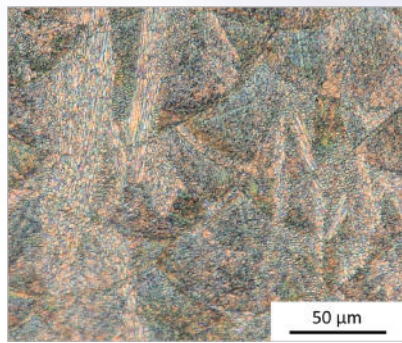
⁷ Specimens were stress-relieved at 650°C for 2 hours

⁸ Specimens were heat treated: Step 1- solution annealed at 1095°C in a vacuum for 2 hours, Step 2- aged at 720°C for 8 hours, furnace cool to 620°C and held for 8 hours then argon cool to ambient temperature

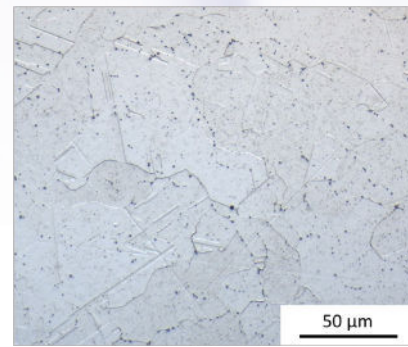
⁹ Tested at ambient temperature

¹⁰ Tested at elevated temperature

Microstructures



As-built



Heat treated

Generic Data¹¹

Thermal and Electrical Properties

	Results
Thermal conductivity (W/mK)	11.4
Electrical Resistivity (Ωm) [x10⁻⁶]	1.25
Melting Range (°C)	1260-1336
Coefficient of thermal expansion (µm/m °C)	13

¹¹ Based on the literature data

Chemical Composition¹²

Element	Ni	Cr	Cb(Nb)	Mo	Ti	Co	Al	Mn	Si	Cu	Fe	Other, total
Weight (%)	50.0-55.0	17.0-21.0	4.75-5.50	2.80-	0.65-1.15	≤1.00	0.20-	≤0.35	≤0.35	≤0.30	Balance	≤ 0.13

¹² Based on the manufacturer material datasheet

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