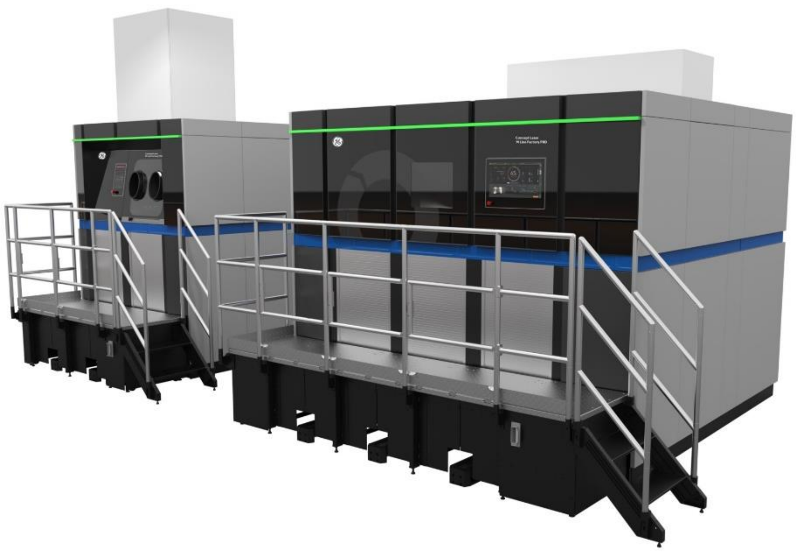
M Line Nickel 718

Parameter for GE Additive's Concept Laser M Line

Data in this material datasheet represents material built with 50 µm layer thickness and in a nitrogen atmosphere on a Concept Laser M Line machine. Values listed are typical.



Nickel 718

Nickel chromium superalloys like 718 are often used in high-stress, high-temperature aeronautical, petrochemical and auto racing environments. The excellent high temperature strength and creep resistance derive from precipitation hardening of finely dispersed precipitates. Next to that Alloy 718 is a metal that is also highly resistant to the corrosive effects of hydrochloric acid and sulfuric acid. The favorable weldability of Alloy 718 makes this alloy suitable for additive manufacturing as well. Typical applications are high-quality components designed for thermally challenging environments such as rocket engines, gas-turbine hot sections, and heat exchangers.

M Line Nickel 718

The Alloy 718 parameters for the Concept Laser M Line is developed leveraging the performance of the previous machine generations. The base parameters deliver good surface quality while maintaining a very good density. The parameter has been optimized for use of steel blade recoater. The parameter meets the minimum tensile properties specified in ASTM F3055 for additive manufactured parts in the heat treated state.

M Line Nickel 718

With corresponding approval* Nickel 718 can be used for manufacturing components for high-temperature applications.

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POWDER CHEMISTRY

Nickel 718 powder chemical composition according to ASTM B 637 UNS N07718
For additional information on Nickel 718 powder, visit www.advancedpowders.com/powders/nickel/718.

MACHINE CONFIGURATION

- M Line
- Nitrogen gas
- Steel recoater blade

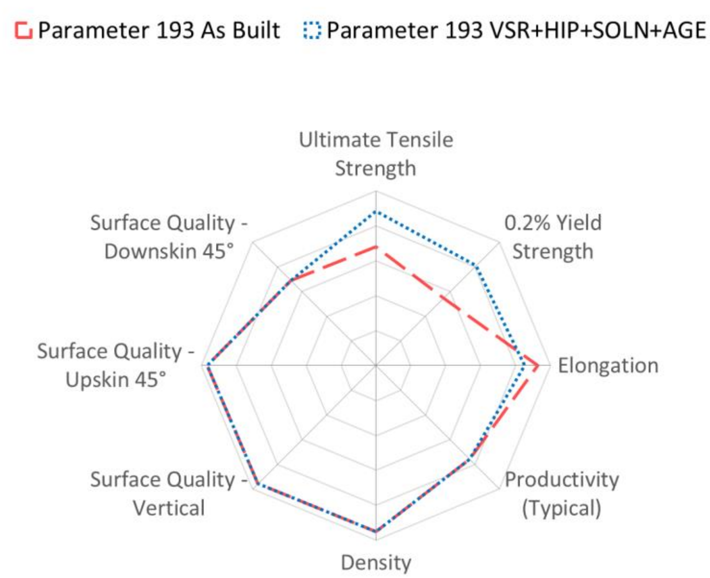
AVAILABLE PARAMETER

- **Base Parameter 193** 50 µm layer thickness, steel recoater

THERMAL STATES

1. As-Built
2. Vacuum Stress Relieve + HIP + Solution + Age (VSR+HIP+SOLN+AGE)
   VSR: 950 °C, 2 hours in argon; HIP: 1160°C, 4 hours, 100 MPa; SOLN: 980°C, 1 hour in argon; AGE: 720°C, 8 hours, furnace cooling down to 620°C; 620°C, 8 hours, cooling in air

PARAMETER COMPARISON



Spider Plot is generated by normalizing typical material data (containing both horizontal and vertical data) against a range defined for each material family. For nickel-based superalloys, the ranges are as follows: UTS: 0-1600 MPa, 0.2%YS: 0-1400 MPa, Elongation: 0-40 %, Density: 0-100 %, Productivity: 5-30 cm³/h, Surface Quality (all): 70-5 µm

TYPICAL BUILD RATE

	(cm³/h)
Typical build rate w/coating	5-66
Theoretical melting rate bulk per Laser[1]	18.7

[1]Calculated (layer thickness x scan velocity x hatch distance)

PHYSICAL DATA AT ROOM TEMPERATURE

	Surface Roughness Ra** - Overhang (µm)		
	45°	60°	75°
Upskin	7	6	6
Downskin	25	14	7

	Surface Roughness Ra** (µm)
H	--
V	8

	Relative Density (%)		Hardness (HV10)		Poisson's Ratio	
Thermal State	H	V	H	V	H	V
As-Built	99.9	99.9	289	--	--	--
VSR+HIP+SOLN	--	--	--	--	--	--

TENSILE DATA

Tensile testing done in accordance with ASTM E8 and ASTM E21

Test Temperature: RT	Modulus of Elasticity (GPa)		0.2% Yield Strength (MPa)		Ultimate Tensile Strength (MPa)		Elongation (%)		Reduction of Area (%)	
Thermal State	H	V	H	V	H	V	H	V	H	V
As-Built	188	152	775	645	1060	980	28.1	32.6	--	--
VSR+HIP+SOLN+AGE	186	183	1065	1035	1345	1305	22.1	23.9	--	--

H: HORIZONTAL (XY) orientation
V: VERTICAL (Z) orientation

* All of the figures contained herein are approximate only. The figures provided are dependent on a number of factors, including but not limited to, process and machine parameters, and the approval is brand specific and/or application specific. The information provided on this material data sheet is illustrative only and cannot be relied on as binding.
** Roughness measurements have been performed according to DIN EN ISO 4287 and DIN EN ISO 4288. In general analysis of the surface quality is strongly dependent on the methodology used and therefore deviations might be observed depending on methodology used. Vertical and horizontal sidewalls have been characterized using a tactile system, overhangs using an optical system.