Ti Cr Fe Co Ni Cu Al

X Line 2000R Steel 316L

Parameter for GE Additive's Concept Laser X Line 2000R

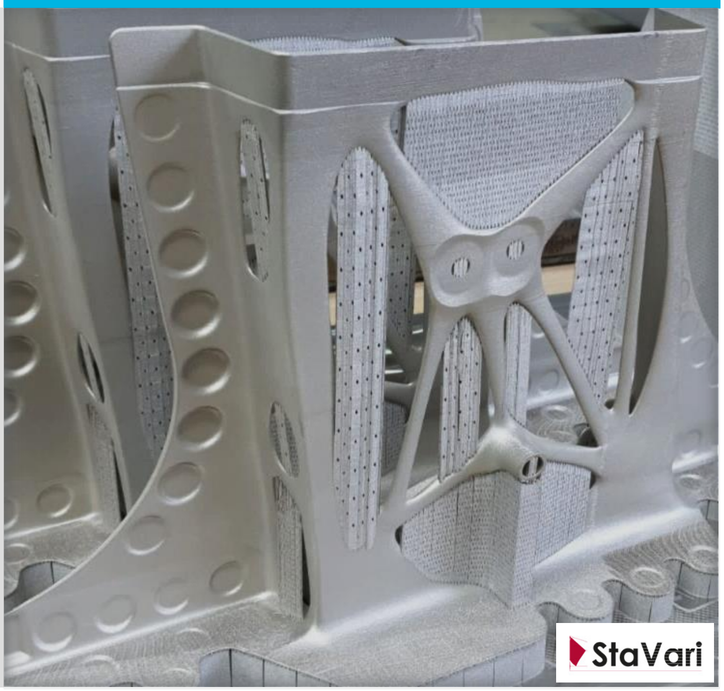
Data in this material datasheet represent material built with a 50 µm layer thickness in a nitrogen atmosphere on a X Line 2000R machine. Values listed are typical.

316L Stainless Steel

316L is a chromium-nickel-molybdenum austenitic stainless steel having a higher corrosion resistance compared to the most common stainless steel 304 without any significant disadvantages in costs. By the addition of molybdenum, this steel is in particular suitable for components within harsh chemical environments containing chlorides and other halides. Typical applications can be found across a wide range of industries like plant engineering, oil & gas industry, automotive industry, medical technology, jewelry and components for molds. Besides 316L is easily weldable, offers excellent ductility and high creep strength at elevated temperatures.

X Line 2000R Steel 316L

The 316L parameter for the Concept Laser X Line 2000R is developed leveraging the performance of the previous X Line generations. The balanced parameters deliver good surface quality while maintaining a very good density, mechanical strength and productivity.
Moreover, the parameters succeed the minimum tensile properties specified in ASTM F3184 for additive manufactured parts in the stress relieved state.



X Line 2000R Steel 316L

With corresponding approval* Steel 316L can be used for manufacturing components for acid and corrosion resistant applications in the following fields: plant engineering, automotive industry, medical technology, jewelry and components for molds.

Data in this material datasheet represent material built with 50 µm layer thickness in a nitrogen atmosphere on a X Line 2000R machine, and requires build plate heating. Values listed are typical.

POWDER CHEMISTRY

316L powder chemical composition according to ASTM F3184 - UNS S31603 / ASTM A276.

MACHINE CONFIGURATION

- Concept Laser X Line 2000R
- Nitrogen gas
- Carbon brush

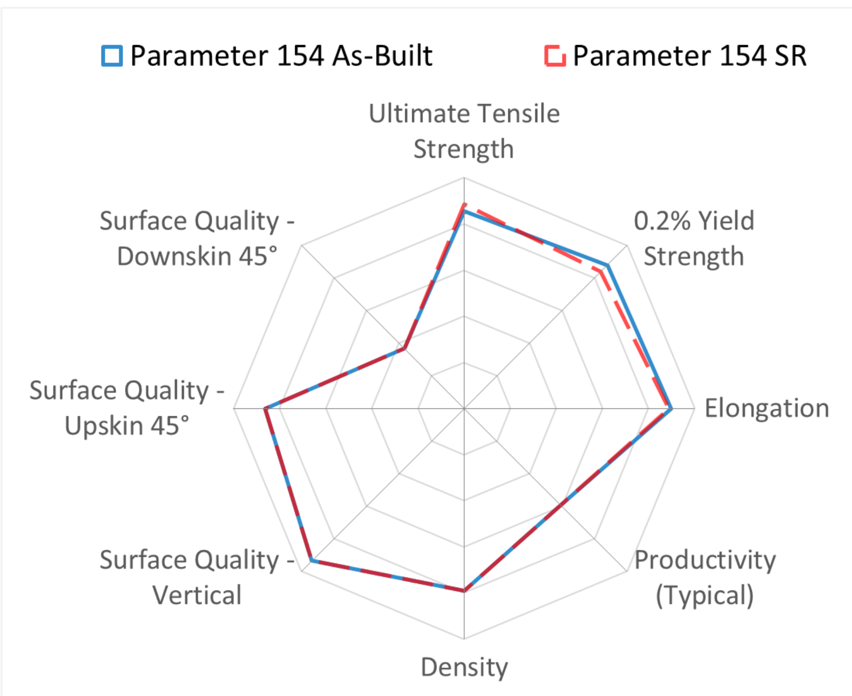
AVAILABLE PARAMETERS

- **Balanced Parameter 154** 50 µm layer thickness

THERMAL STATES

1. As-Built
2. Stress Relief (SR)
   SR: 3h to 550°C, hold 6h at 550°C

THERMAL STATE 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 **Stainless Steels**, the ranges are as follows: UTS: 0-750 MPa, 0.2%YS: 0-600 MPa, Elongation: 0-60 %, Density: 99-100 %, Productivity: 5-30 cm³/h, Surface Quality (all): 50-5 µm

TYPICAL BUILD RATE

	(cm³/h)
Typical build rate[1] w/coating	19.9
Theoretical melting rate[2] bulk per Laser	23.4

[1]Using standard Factory Acceptance Test layout and 2 lasers
[2]Calculated (layer thickness x scan velocity x hatch distance)

PHYSICAL DATA AT ROOM TEMPERATURE

	Surface Roughness Ra** - Overhang (µm) 45°	60°	75°
Upskin	12	9	8
Downskin	34	23	9

	Surface Roughness Ra** (µm)
H	21
V	8

Thermal State	Relative Density (%) H	V	Hardness (HV10) H	V	Poisson's Ratio H	V
As-Built	99.7	99.7	211	--	--	--
SR	99.7	99.7	212	--	--	--

TENSILE DATA

Tensile testing done in accordance with ASTM E8 and ASTM E21

Test Temperature: RT

Thermal State	Modulus of Elasticity (GPa) H	V	0.2% Yield Strength (MPa) H	V	Ultimate Tensile Strength (MPa) H	V	Elongation (%) H	V	Reduction of Area (%) H	V
As-Built	190	131	575	475	695	585	35.0	44.0	--	--
SR	196	168	550	455	715	610	32.5	43.0	--	--

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

*Industry specific certifications and/or approvals rely on a number of factors. Customer cannot rely on any data presented herein as binding or as a guarantee of repeatability
** 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.