DIRECT METAL LASER SINTERING

Stainless Steel 316L

Marine-Grade Austenitic Stainless Steel



Stainless Steel 316L is a high-performance marine-grade austenitic stainless steel with enhanced molybdenum content for superior corrosion resistance. Offering exceptional ductility, toughness, and strength, it delivers reliable performance in demanding chemical, marine, food processing, and industrial environments where corrosion resistance is critical.

SURFACE FINISHES



Standard Finish Natural

Supports are carefully removed and parts are shot peened to a uniform matte surface, which also helps relieve residual stresses. Critical features may receive light machining for tighter tolerances.



Machining & Polishing Enhanced

Precision machining and polishing enhance surface quality for critical applications, achieving tighter tolerances and a smooth, high-gloss metallic finish.



Performance Paint Premium

An automotive-grade coating that enhances aesthetics and durability. Each part is hand-finished with professional-grade equipment for exceptional adhesion, in matte to semi-gloss with custom colour matching.

BUILD VOLUME	LEAD TIME	LAYER HEIGHT	TOLERANCE
250 × 250 × 325 mm	From 4 business days	0.02-0.08 mm	±0.3% (min ±0.3 mm)

MECHANICAL PROPERTIES

Stainless Steel 316L delivers dependable strength with exceptional ductility, giving teams a proven DMLS baseline for chemical processing equipment, valves and precision mechanical assemblies. Its balanced mechanical profile handles demanding load conditions while preventing brittleness in critical applications, and its high elongation lets parts deform rather than crack under overload.

The values are for parts as built, with no heat treatment. The horizontal and vertical rows show the modest anisotropy of laser-melted stainless steel, so plan the load direction of critical features in parts that need precise geometry and tight tolerances.

PROPERTY	VALUE	TEST STANDARD
Tensile Strength (Horizontal)	**630 MPa**	EN ISO 6892-1
Tensile Strength (Vertical)	**580 MPa**	EN ISO 6892-1
Yield Strength Rp0.2 (Horizontal)	**530 MPa**	EN ISO 6892-1
Yield Strength Rp0.2 (Vertical)	**490 MPa**	EN ISO 6892-1
Elongation at Break (Horizontal)	**41 %**	EN ISO 6892-1
Elongation at Break (Vertical)	**49 %**	EN ISO 6892-1
Young's Modulus (Horizontal)	**185 GPa**	ISO 6892 / ASTM E8M (EOS MDS 2014, 20 µm set)
Young's Modulus (Vertical)	**180 GPa**	ISO 6892 / ASTM E8M (EOS MDS 2014, 20 µm set)
Hardness (Rockwell B)	**89 HRB**	EN ISO 6508-1 (EOS MDS 2014, 20 µm set)

THERMAL PROPERTIES

Stainless Steel 316L suits chemical processing and food equipment that is heated, washed down and cooled. Its relatively high thermal expansion, which rises with temperature, matters where 316L mates with other metals or polymers.

Avoid long-term service in the carbide-precipitation range EOS lists, where carbides can form at the grain boundaries and reduce corrosion resistance. The melting range, conductivity, specific heat and oxidation limit support heat-transfer and high-temperature design.

PROPERTY	VALUE	TEST STANDARD
Coefficient of Thermal Expansion (25–100 °C)	**15.72 ×10^{-6}/K**	ASTM E228 (EOS Premium MDS, 20 µm set)
Coefficient of Thermal Expansion (25–400 °C)	**17.70 ×10^{-6}/K**	ASTM E228 (EOS Premium MDS, 20 µm set)
Carbide Precipitation Range (avoid in long-term service)	**427–816 °C**	EOS MDS 2014
Melting Range	**1371–1399 °C**	Wrought 316L reference (AK Steel)
Thermal Conductivity (100 °C)	**16.2 W/m·K**	Wrought 316L reference (AK Steel)
Specific Heat Capacity (0–100 °C)	**500 J/kg·K**	Wrought 316L reference (AK Steel)
Oxidation Resistance in Air (intermittent service)	**870 °C**	Wrought 316L reference (Macsteel)

PHYSICAL PROPERTIES

Near-full density keeps critical features in tolerance and downstream finishing predictable, and the defect percentage shows how little porosity remains in the printed metal.

Surface roughness is given as built and after shot peening. Machining and polishing take sealing faces and cosmetic surfaces finer still, and 316L can be polished to a mirror finish for aesthetic applications.

PROPERTY	VALUE	TEST STANDARD
Part Density	**≥ 7.97 g/cm³**	EN ISO 3369
Average Defect Percentage	**0.015 %**	EOS method
Surface Roughness Ra (as built, vertical faces)	**13 ± 5 µm**	EOS MDS 2014, 20 µm set
Surface Roughness Ra (shot peened, vertical faces)	**5 ± 2 µm**	EOS MDS 2014, 20 µm set

ELECTRICAL PROPERTIES

Stainless Steel 316L conducts electricity, so parts can be grounded, but its resistivity is far higher than aluminum or copper, so it suits grounded housings, shielding features and fixtures rather than current-carrying parts.

The permeability row is for annealed wrought 316L, which is essentially non-magnetic, a useful property for instrument hardware near sensors.

PROPERTY	VALUE	TEST STANDARD
Electrical Resistivity (20 °C)	**7.4×10^{-7} Ω·m**	Wrought 316L reference (AK Steel)
Electrical Conductivity (20 °C)	**1.35 MS/m**	Calculated from resistivity
Magnetic Permeability (annealed, 200 Oe)	**≤ 1.02 µr**	Wrought 316L reference (AK Steel)

CHEMICAL PROPERTIES

EOS publishes no chemical table for printed 316L, so the ratings come from wrought 316L corrosion data for the same alloy. It resists marine atmospheres, chloride waters, phosphoric and acetic acids, caustic cleaning solutions, organic solvents and food and dairy fluids, while hydrochloric acid and boiling strong caustic attack it, and permanent seawater immersion is not recommended.

Chemical ratings are screening guidance; confirm them with application-specific testing before production release.

CHEMICAL	RATING
Marine Atmosphere	**Excellent**
Chloride Waters (up to ~2,000 ppm)	**Good**
Seawater Immersion	**Poor**
Phosphoric Acid	**Excellent**
Acetic Acid	**Excellent**
Formic Acid	**Good**
Dilute Sulfuric Acid (<5%, up to 49 °C)	**Good**
Hydrochloric Acid	**Poor**
Nitric Acid	**Good**
Caustic Cleaning Solutions	**Good**
Sodium Hydroxide 50%, Boiling	**Poor**

Organic Cleaning Solvents	**Excellent**
Petroleum Products	**Good**
Food and Dairy Process Fluids	**Good**

COMPLIANCE

EOS states that the powder chemistry corresponds to ASTM F138 (UNS S31673), and its safety data sheet confirms the powder contains no REACH Annex XIV substances. EOS's datasheet for the alloy states that as-built tensile properties show the values of ASTM A403, a wrought fittings standard, so solution annealing is not necessary, and EOS lists heat treatment to AMS 2759 as optional.

Each status comes from EOS documents for the powder, so teams can start industrial qualification from supplier data. EOS does not develop or certify the powder as a medical device or for food contact, so the part owner validates those uses.

STANDARD	STATUS
ASTM F138 (UNS S31673) chemistry Powder chemistry corresponds to the ASTM F138 surgical-implant bar standard; EOS sells it as StainlessSteel 316L-4441	EOS MDS
REACH Regulation (EC) 1907/2006 Powder contains no Annex XIV substances; its nickel content falls under Annex XVII restrictions	EOS SDS

MANUFACTURING

Heat treatment	**Stress relief and solution annealing**