

Supra 316LN/4429

EN 1.4429, ASTM UNS S31653

General characteristics

Supra 316LN/4429 is an austenitic stainless steel, that belongs to the standard CrNiMo stainless steel family. Supra 316LN/4429 has low carbon content for improved resistance against intergranular corrosion after welding, increased nitrogen content for improved mechanical strength and increased molybdenum content for slightly improved corrosion resistance.

Due to their molybdenum content, the austenitic CrNiMo standard grades can be used in applications that demand increased corrosion resistance. Their well-balanced material properties make them suitable for the fabrication of many products. Because of its more stable austenitic structure, Supra 316LN/4429 has a lower magnetic permeability than the austenitic CrNiMo standard grades.

Typical applications

- Pulp & paper industry
- Chemical industry
- Medical applications
- Textile finishing
- Pharmaceutical industry
- Low temperature equipment
- Applications with high magnetic fields

Products & dimensions

Cold rolled products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
2B	Cold rolled, heat treated, pickled, skin passed	0.40-3.20	36-1540	0.40-3.20	400-1500
2D	Cold rolled, heat treated, pickled	0.40-4.76	36-1540	0.40-4.76	400-1500

Quarto plate products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
1D	Hot rolled, heat treated, pickled			5.00-50.00	400-3200

Chemical composition

The typical chemical composition for this grade is given in the table below, together with composition limits given for the product according to different standards. The required standard will be fully met as specified on the order.

The chemical composition is given as % by mass.

	C	Mn	Cr	Ni	Mo	N	Other
Typical	0.02		17.3	12.5	2.6	0.14	
EN 10028-7	≤0.030	≤2.00	16.5-18.5	11.0-14.0	2.50-3.00	0.12-0.22	
EN 10088-2	≤0.030	≤2.0	16.5-18.5	11.0-14.0	2.5-3.0	0.12-0.22	
EN 10088-3	≤0.030	≤2.00	16.5-18.5	11.0-14.0	2.50-3.00	0.12-0.22	
EN 10088-4	≤0.030	≤2.0	16.5-18.5	11.0-14.0	2.5-3.0	0.12-0.22	

Corrosion resistance

Supra 316LN/4429 has excellent corrosion resistance in solutions of many halogen-free organic and inorganic compounds over a wide temperature and concentration range. It can withstand many organic and diluted mineral acids depending on the temperature and concentration of the solution. Supra 316LN/4429 may suffer from uniform corrosion in strong mineral acids and hot strong alkaline solutions.

In aqueous solutions containing halogenides, e.g. chlorides or bromides, pitting and crevice corrosion may occur depending on halogenide concentration, temperature, pH-value, concentration of oxidizing compounds, and crevice geometry, if applicable. Due to its high nitrogen and increased molybdenum contents, the resistance of Supra 316LN/4429 against pitting and crevice corrosion is slightly increased compared to the basic austenitic CrNiMo grades 4401 and 4404. The presence of corrosion-inhibiting or accelerating compounds like transition metal ions or organic compounds may influence the corrosion behavior of Supra 316LN/4429.

Supra 316LN/4429 is prone to chloride-induced stress corrosion cracking at temperatures over about 50 °C depending on the applied stress and the chloride concentration in the environment. Prior cold deformation of the structure under load increases the risk of stress corrosion cracking.

Pitting corrosion resistance		Crevice corrosion resistance
PRE	CPT	CCT
28		<0

Pitting Resistance Equivalent (PRE) is calculated using the following formula: $PRE = \%Cr + 3.3 \times \%Mo + 16 \times \%N$

Corrosion Pitting Temperature (CPT) as measured in the Avesta Cell (ASTM G 150), in a 1M NaCl solution (35,000 ppm or mg/l chloride ions).

Critical Crevice Corrosion Temperature (CCT) is obtained by laboratory tests according to ASTM G 48 Method F

For more information on corrosion resistance, please refer to the Outokumpu Corrosion Handbook or contact our corrosion experts.

Mechanical properties

The mechanical properties of the available products are given in the table below.

Cold rolled coil and sheet	R _{p0.2} MPa	R _{p1.0} MPa	R _m MPa	Elongation ¹⁾ %	Impact strength J	Rockwell	HB	HV
Typical (thickness 1 mm)								

Hot rolled coil and sheet	R _{p0.2} MPa	R _{p1.0} MPa	R _m MPa	Elongation ¹⁾ %	Impact strength J	Rockwell	HB	HV
Typical (thickness 4 mm)								

Hot rolled quarto plate	R _{p0.2} MPa	R _{p1.0} MPa	R _m MPa	Elongation ¹⁾ %	Impact strength J	Rockwell	HB	HV
Typical (thickness 15 mm)	330	390	670	45				
EN 10028-7	≥ 280	≥ 320	580 - 780	≥ 40				
EN 10088-2	≥ 280	≥ 320	580 - 780	≥ 40				
EN 10088-4	≥ 280	≥ 320	580 - 780	≥ 40				

Wire rod	R _{p0.2} MPa	R _{p1.0} MPa	R _m MPa	Elongation ¹⁾ %	Impact strength J	Rockwell	HB	HV
Typical	300	340	600	45				

¹⁾Elongation according to EN standard:

A₈₀ for thickness below 3 mm.

A for thickness = 3 mm.

Elongation according to ASTM standard A₂^{*} or A₅₀.

Physical properties

Physical properties according to EN 10088 are shown below.

Density	Modulus of elasticity	Thermal exp. at 100 °C	Thermal conductivity	Thermal capacity	Electrical resistance	Magnetizable
kg/dm ³	GPa	10 ⁻⁶ /°C	W/m°C	J/kg°C	μΩm	
8.0	200	16.0	15	500	0.75	No

Fabrication

Hot forming

Hot forming can be carried out in the 850–1150 °C range. For maximum corrosion resistance, forgings should be annealed at 1070 °C and rapidly cooled in air or water after hot forming operations.

Cold forming

Supra 316LN/4429 can be readily formed and fabricated by the full range of cold forming operations. They can be used in heading, drawing, and bending. Any cold forming operations will increase the strength and hardness of the material

Machining

Better machinability performance is given by Outokumpu Prodec products, which have been modified for improved machinability. Prodec is available as hot rolled plate and bar in Prodec 304L/4307, Prodec 316L/4404, Prodec 303/4305 and as bar in Prodec 17-4PH.

Welding

Supra 316LN/4429 has excellent weldability and is suited to a full range of conventional welding methods (like MMA, MIG, MAG, TIG, SAW, LBW, or RSW), except gas welding. Supra 316LN/4429 has about 50% higher thermal expansion and lower heat conductivity compared to carbon steels. This means that larger deformation and higher shrinkage stresses may result from welding.

In thin sections, autogenous welding may be used. To ensure that the weld metal properties (e.g. strength, corrosion resistance) are equivalent to those of the parent metal, matching or slightly over-alloyed fillers should preferably be used. The recommended filler metal is 19 12 3L.

Generally, post-weld heat treatment is not required. In special cases where there is high risk of stress corrosion cracking or fatigue, stress relief treatment may be considered.

In order to fully restore the corrosion resistance of the weld seam, the weld discoloration should be removed by pickling and passivation.

More detailed information concerning welding procedures can be obtained from the Outokumpu Welding Handbook, available from our sales offices.

Standards & approvals

The most commonly used international product standards are given in the table below.

Standard	Designation
EN 10028-7, PED 2014/68/EU	1.4429
EN 10088-2	1.4429
EN 10088-3	1.4429
EN 10088-4	1.4429

Contacts & Enquiries

Contact your nearest sales office

www.outokumpu.com/contacts

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