

# Core 301LN/4318

EN 1.4318, ASTM TYPE 301LN / UNS S30153

## General characteristics

Core 301LN/4318 is a low-carbon, nitrogen alloyed alternative to Core 301/4310 with elevated strength, making it particularly suitable for lightweight construction. Temper rolled Core 301LN/4318 is used for applications that require increased hardness and strength.

Core 301LN/4318 is an austenitic CrNi stainless steel with high nitrogen and relatively low nickel content. Due to its high nitrogen content, Core 301LN/4318 has increased mechanical strength and shows a high degree of work hardening on mechanical deformation. As nitrogen-alloying improves corrosion properties, this product offers similar corrosion resistance to austenitic CrNi standard grades in many corrosive environments.

Core 301LN/4318 is used in applications where corrosion resistance and a combination of high mechanical strength and good formability are needed. Due to its tendency to work hardening, Core 301LN/4318 can absorb an increased amount of energy during deformation. It can be delivered in the temper rolled condition with different strength levels.

## Typical applications

- Automotive applications, especially vehicle chassis
- Railroad cars

# 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	0.40-6.35	30-1530	0.40-6.35	35-1530
2BB	Bright-pickled	0.50-3.50	30-1500	0.50-3.50	600-1500
2C	Cold rolled, heat treated	0.80-6.00	30-1530		
2D	Cold rolled, heat treated, pickled	0.50-6.00	30-1500	0.50-6.00	600-1500
2E	Cold rolled, heat treated, mech. desc. pickled	0.50-6.00	30-1500	0.50-6.00	600-1500
2G	Ground	0.50-4.00	30-1530	0.50-3.00	600-1500
2H	Work hardened	0.05-6.00	3-1530	0.50-6.00	35-1530
2J	Brushed or dull polished	0.50-3.00	30-1500	0.50-3.00	600-1500
2K	Satin finish	0.80-4.00	35-1530		
2M	Patterned	0.50-3.00	30-1500	0.50-3.00	600-1500
2R	Cold rolled, bright annealed	0.05-3.50	3-1250	0.40-3.50	350-1250

## Continuous hot rolled products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
1C	Hot rolled, heat treated, not descaled	2.00-10.00	50-1550		
1D	Hot rolled, heat treated, pickled	3.00-8.20	50-1530	3.00-8.20	50-1530
1G	Ground	2.00-3.00	750-1350	2.00-3.00	750-1350
1M	Patterned	2.00-3.00	750-1350	2.00-3.00	750-1350
1U	Black hot rolled	2.00-10.00	50-1550		

# 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
<b>Typical</b>	<b>0.02</b>		<b>17.7</b>	<b>6.5</b>		<b>0.14</b>	
ASTM A240	≤0.03	≤2.00	16.0-18.0	6.0-8.0		0.07-0.20	
ASTM A666	≤0.03	≤2.00	16.0-18.0	6.0-8.0		0.07-0.20	
EN 10028-7	≤0.030	≤2.00	16.50-18.50	6.00-8.00		0.10-0.20	
EN 10088-2	≤0.030	≤2.0	16.5-18.5	6.0-8.0		0.10-0.20	
EN 10088-4	≤0.030	≤2.0	16.5-18.5	6.0-8.0		0.10-0.20	
IS 6911	≤0.03	≤2.00	16.0-18.0	6.0-8.0	≤0.70	0.07-0.20	

# Corrosion resistance

Core 301LN/4318 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 sufficiently diluted mineral acids depending on the temperature of the solution. Core 301LN/4318 may suffer from uniform corrosion in mineral acids and hot strong alkaline solutions.

Due to its high carbon content, Core 301LN/4318 is easily sensitized for intergranular corrosion during heat treatment or welding.

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, or crevice geometry, if applicable. Due to its relatively high nitrogen content, the resistance of Core 301LN/4318 against pitting and crevice corrosion is nearly on the same level as the basic austenitic CrNi Core 304/4301 and Core 304L/4307. The presence of corrosion inhibiting or accelerating compounds like e.g. transition metal ions or organic compounds may influence the corrosion behavior of Core 301LN/4318.

Core 301LN/4318 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.

Core 301LN/4318 can be used for indoor and outdoor applications in rural areas and urban environments where chloride contamination is low. The best material performance is typically reached with the help of adequate design, correct post-weld treatment, and regular cleaning during use (if applicable).

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

Pitting corrosion resistance		Crevice corrosion resistance
PRE	CPT	CCT
20	<10	<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

# Mechanical properties

The mechanical properties of the available products in soft annealed condition at room temperature are given in the table below. Moderate strengths can be reached at elevated temperatures (~550 °C / 1022 °F). Temperatures for excessive scaling are close to 850 °C/1562 °F. This product, along with other austenitic corrosion resistant stainless steels, exhibits very high ductility and high elongation to fracture. It is not susceptible to brittle fracture in the solution annealed condition.

Cold rolled coil and sheet	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical (thickness 1 mm)</b>	<b>360</b>	<b>400</b>	<b>750</b>	<b>55</b>				
ASTM A240	≥ 240		≥ 550			≤ 100HRB	≤ 241	
EN 10028-7	≥ 350	≥ 380	650 - 850	≥ 40				
EN 10088-2	≥ 350	≥ 380	650 - 850	≥ 40				
EN 10088-4	≥ 350	≥ 380	650 - 850	≥ 40				
IS 6911	≥ 240		≥ 550			≤ 100HRB	≤ 241	

Hot rolled coil and sheet	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical (thickness 4 mm)</b>	<b>350</b>	<b>400</b>	<b>740</b>	<b>47</b>			<b>90</b>	
ASTM A240	≥ 240		≥ 550					
EN 10028-7	≥ 350	≥ 380	650 - 850	≥ 40				
EN 10088-2	≥ 350	≥ 380	650 - 850	≥ 40				
EN 10088-4	≥ 350	≥ 380	650 - 850	≥ 40				
IS 6911	≥ 240		≥ 550			≤ 100HRB	≤ 241	

Hot rolled quarto plate	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical (thickness 15 mm)</b>	<b>345</b>	<b>380</b>	<b>750</b>	<b>45</b>				
ASTM A240	≥ 240		≥ 550					
EN 10028-7	≥ 330	≥ 370	650 - 850	≥ 40				
EN 10088-2	≥ 330	≥ 370	630 - 830	≥ 40				
EN 10088-4	≥ 330	≥ 370	630 - 830					
IS 6911	≥ 240		≥ 550			≤ 100HRB	≤ 241	

<sup>1)</sup>Elongation according to EN standard:

A<sub>80</sub> for thickness below 3 mm.

A for thickness = 3 mm.

Elongation according to ASTM standard A<sub>2</sub> or A<sub>50</sub>.

# Physical properties

The physical properties of the available products are given in the table below

Austenitic crystal structure, non-magnetic as soft annealed. Becomes easily magnetic when deformed.

Density	Modulus of elasticity	Thermal exp. at 100 °C	Thermal conductivity	Thermal capacity	Electrical resistance	Magnetizable
kg/dm <sup>3</sup>	GPa	10 <sup>-6</sup> /°C	W/m°C	J/kg°C	μΩm	
7.9	200	16.0	15	500	0.73	No

# Fabrication

## Forming and machining

Work hardening is pronounced due to high work hardening rate and formation of martensite in the range of larger deformations. Formability is good, thus forces needed and the elastic return is bigger compared with carbon steels and even when compared with Core 304/4301. Because of high ductility and work hardening it is recommended to use sharp cutting tools and an effective cooling and adequate feed of tool when machined.

## Welding

Core 301LN/4318 has good weldability and is suitable for the full range of conventional welding methods (like MMA, MIG, MAG, TIG, SAW, LBW or RSW), except gas welding. Core 301LN/4318 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 (such as strength, corrosion resistance) are equivalent to those of the parent metal, matching or slightly over-alloyed fillers should preferably be used. The recommended welding metal is 19 9 L. Shielding gases should be Ar/He based or contain up to 3% nitrogen to minimize nitrogen drop.

Core 301LN/4318 in the cold stretched condition can be welded in the same way as material in the annealed condition. As the additional strength obtained by temper rolling is lost within the weldment, the strength, including fatigue strength, is also reduced. The use of high heat input may also reduce the strength in the heat-affected zone (HAZ). Since the strength is reduced in the weld area, the location of the welds must be carefully considered at the design stage and the welds must be placed, if possible, in less stressed areas.

Post-weld heat treatment is generally not required. In special cases with high risks 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
ASTM A240/A240M	TYPE 301LN / UNS S30153
ASTM A666	TYPE 301LN / UNS S30153
EN 10028-7, PED 2014/68/EU	1.4318
EN 10088-2	1.4318
EN 10088-4	1.4318
IS 6911, AMENDMENT NO. 2	ISS 301LN

## Contacts & Enquiries

Contact your nearest sales office

[www.outokumpu.com/contacts](http://www.outokumpu.com/contacts)

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