SALOMON'S METALEN B.V.

301 301L 301LN

Grade 301 is a high work-hardening rate austenitic stainless steel. It can be supplied with a tensile strength of up to over 1300 MPa in strip and wire forms, to produce tempers in the range of 1/16 Hard to Full Hard. The controlled analysis of Grade 301 enables it to retain suffient icductility in conditions up to 1/2 Hard conditions to be roll or brake formed into aircraft, architectural and particularly rail car structural components. However, 3/4 to Full Hard tempers should be used whenever high wear resistance and spring features are required in components of simple form designs. Grade 301L with low carbon is preferred for improved ductility or if heavy sections are to be welded, and another variant 301LN has a higher nitrogen content to compensate for the lower carbon. ASTM A666 covers all three variants, and some are also included in Japanese specification JIS G4305 and Euronorm EN 10088-2.

Corrosion Resistance

Corrosion resistance is similar to that of 304. Good resistance in applications involving external exposure to mildly corrosive conditions at ambient temperatures.

Heat Resistance

Good oxidation resistance in intermittent service to 840°C and in continuous service to 900°C, although not usually chosen for this environment. Exposure to temperatures above about 400°C will result in progressive removal of work hardening effects; at approximately 800°C the strength will be similar to an annealed 301. In creep applications a work hardened grade 301 can even reduce to lower strength than an annealed 301.

Heat Treatment

- **Solution Treatment (Annealing)**

Heat to 1010-1120°C and cool rapidly. Use low side of range for intermediate annealing. This grade cannot be hardened by thermal treatment.

- **Cold Working**

Grade 301 and its low carbon variants are used where a high strength stainless steel is required. The grades work harden at the very high rate of approximately 14MPa/%Ra (14MPa increase in tensile strength for each 1% reduction of area of cold work), resulting in high achievable strengths from cold rolling and from roll forming. The strain-hardened austenite is at least partially transformed to martensite by this work. Despite the high strengths achieved there is still enough residual ductility to enable significant cold deformation. Although non-magnetic in the annealed condition, when cold worked the grades become strongly attracted to a magnet.

Welding

Good characteristics suited to all standard methods. Welds in Grade 301 must be annealed for maximum corrosion resistance; this is not necessary in 301L or 301LN. Welding and post weld annealing will both remove high strength induced by prior cold rolling. Spot welding is commonly used to assemble cold rolled 301 components. The very small heat affected zone associated with this rapid welding technique results in little reduction of overall component strength.

Typical Applications

Rail car structural components - often roll formed, brake pressed or stretch formed to profiles but also used flat. Airframe sections. Highway trailer components. Automotive wheel covers, wiper blade holders and clips. Toaster springs, stove element clips. Screen frames.

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Specified Properties

The properties for Grade 301 are specified for flat rolled product (plate, sheet and coil) in ASTM A666. Similar but not identical mechanical properties are specified in EN 10088.2 and JIS G4305 and in proprietary specifications.

Composition Specification (%)

Grade		C	Mn	Si	P	S	Cr	Mo	Ni	N
301	min.	-	-	-	-	-	16.0	-	6.0	-
	max.	0.15	2.0	1.0	0.045	0.030	18.0		8.0	0.10
301L	min.	-	-	-	-	-	16.0	-	6.0	-
	max.	0.03	2.0	1.0	0.045	0.030	18.0		8.0	0.20
301LN	min.	-	-	-	-	-	16.5	-	6.0	0.07
	max.	0.03	2.0	1.0	0.045	0.015	18.5		8.0	0.20

Mechanical Property Specification (Grade 301 – other values for 301L and 301LN)

Grade 301 Temper ASTM A666	Tensile Strength (MPa) min.	Yield Strength 0.2% Proof (MPa) min.	Elongation (% in 50mm) (thick.>0.76mm) min.	Bend Test (1.27 - 4.76mm thick)		Hardness Rockwell C (Note 2)
				Bend Angle (°)	Factor (Note 1)	
Annealed	515	205	40	180	1	
1/16 Hard	620	310	40	180	1	
1/8 Hard	690	380	40	180	1	
1/4 Hard	860	515	25	90	2	25 – 32
1/2 Hard	1035	760	18	90	2	32 – 37
3/4 Hard	1205	930	12	90	3	37 – 41
Full Hard	1275	965	9	90	5	41+

Notes 1. Bend test is around a diameter of the Bend Factor multiplied by the steel thickness.
2. Hardness values are typical industry standard – there are no specified limits.

Physical Properties (Grades 301, 301L and 301LN - typical values in the annealed condition)

Grade	Density (kg/m³)	Elastic Modulus (GPa)	Mean Coefficient of Thermal Expansion			Thermal Conductivity		Specific Heat	Electrical Resistivity
			0-100°C (µm/m/°C)	0-315°C (µm/m/°C)	0-538°C (µm/m/°C)	at 100°C (W/m.K)	at 500°C (W/m.K)	0-100°C (J/kg.K)	(nΩ.m)
All	7900	193	17.0	17.2	18.2	16.3	21.5	500	720

Grade Specification Comparison

Grade	UNS No	Euronorm		Swedish SS	Japanese JIS
		No	Name		
301	S30100	1.4319	X5CrNi17-7	-	SUS 301
301L	S30103	-	-	-	SUS301L
301LN	S30153	1.4318	X2CrNiN18-7	-	-

These comparisons are approximate only. The list is intended as a comparison of functionally similar materials **not** as a schedule of contractual equivalents. If exact equivalents are needed original specifications must be consulted. Different comparisons apply to grades 301L and 301LN.

Possible Alternative Grades

Grade	Why it might be chosen instead of 301 / 301L / 301LN
304	Better availability, lower cost; the lower work hardening rate of 304 is acceptable.
316	Higher corrosion resistance needed; the lower work hardening rate of 316 is acceptable