

1.4301

X5CrNi18-10

Chromium-nickel austenitic stainless steel

C max. 0.07 Cr 18.00 – 19.50 Ni 8.00 – 10.50

General comments

1.4301 is the standard for the austenitic grades of stainless steel due to its good corrosion resistance, ease of formability and fabrication coupled with its aesthetic appearance in the polished, ground and brushed conditions.

Since 1.4301 is not resistant to intergranular corrosion in the welded condition, 1.4307 should rather be specified if welding of larger sections is required and no solution annealing treatment after welding can be performed. Surface condition plays an important role in the corrosion resistance of this steel with polished surfaces exhibiting far superior corrosion resistance compared with rougher surfaces on the same material.

Relevant current and obsolete standards

EN 10088-3	1.4301	X5CrNi18-10
AISI	304	
UNS	S30400	
BS	304S15 / 304S31	
JIS	SUS304	
AFNOR	Z7CN18-09	
DIN 17440	1.4301	
SIS	2333	

Special grades for particular applications

cold heading grade	DIN EN 10263-5
improved machining grade	NIRO-CUT® 4301
fine wire drawing grade	
drawing grade	

General properties

corrosion resistance	good
mechanical properties	average
forgeability	good
weldability	excellent
machinability	average

Special properties

resistant to scaling up to around 700 °C
suited for cryogenic applications
non-magnetic grade ($\mu_r \leq 1,3$) improved machinability with NIRO-CUT® 1.4301

Physical properties

density (kg/dm ³)	7.90
electrical resistivity at 20 °C (Ω mm ² /m)	0.73
magnetizability	slight
thermal conductivity at 20 °C (W/m K)	15
specific heat capacity at 20 °C (J/kg K)	500
thermal expansion (K ⁻¹)	20 – 100 °C: 16.0 x 10 ⁻⁶ 20 – 200 °C: 16.5 x 10 ⁻⁶ 20 – 300 °C: 17.0 x 10 ⁻⁶ 20 – 400 °C: 17.5 x 10 ⁻⁶ 20 – 500 °C: 18.0 x 10 ⁻⁶

Typical applications

automotive industry
building and construction industry
chemical industry
food and beverage industry
decorative items and kitchen utensils
electronic equipment
petrochemical industry

Note: available from stock
supplied in accordance with the Z- 30.3-6 building regulation
dimensional limits can be agreed on
can be used in accordance with Pressure Equipment Directive

Processing properties

automated machining	yes
machinable	yes
hammer and die forging	yes
cold forming	yes
cold heading	yes
suited to polishing	yes

1.4301

X5CrNi18-10

C max. 0.07 Cr 18.00 – 19.50 Ni 8.00 – 10.50

Conditions solution annealed

Demand tendency constant

Corrosion resistance
(PRE = 17.5 – 21.36)

Due to the moderate carbon content of 1.4301, this grade of stainless steel is prone to sensitisation. The formation of chromium carbides and the associated chromium depleted regions that form around these precipitates make this grade of steel susceptible to intergranular corrosion. Although no danger of intergranular corrosion exists in the supplied (solution annealed) condition, intergranular corrosion may occur after welding or high temperature processing. 1.4301 is resistant to corrosion in most environments provided the chloride and salt concentrations are low. 1.4301 is not recommended for applications where it comes into contact with sea water, nor is it recommended for use in swimming pools.

Heat treatment and mechanical properties

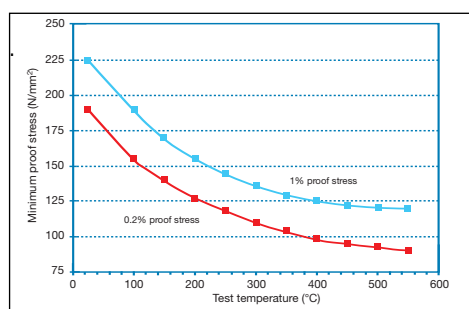
Optimal material properties are realised after solution annealing in the temperature range 1000 °C – 1100 °C followed by rapid cooling in air or water. Since this grade of steel is susceptible to precipitation of chromium carbides, care must be taken to limit the time spent in the temperature range 450 °C to 850 °C, both during fabrication and service.

In the solution annealed condition, the following mechanical properties may be attained when testing in the longitudinal direction:

Property		Specification	Typical
yield strength (N/mm ²)	R _{p0.2}	≥ 190	360
tensile strength (N/mm ²)	R _m	500 – 700	660
tensile elongation (%)	A ₅	≥ 45	50
hardness	HB	≤ 215	195
impact energy (J) 25 °C	ISO-V	≥ 100	225

The mechanical properties (d ≥ 160 mm) have to be agreed on for thicker dimensions, or the delivered product is based on the values given.

Elevated temperature properties



Minimum tensile properties at various temperatures, shown in the diagram, are specified in the EN 10088-3.

Welding 1.4301 is weldable with or without the use of filler material. If the use of a filler metal is required, then the use of Novonit® 4316 (AISI 308L) would be recommended. Maximum interpass temperature 200 °C. Post weld heat treatment is not necessary.

Forging 1.4301 is usually heated to within the range 1150 °C – 1180 °C to allow forging to take place at temperatures between 1180 °C and 950 °C. Forging is followed by air cooling, or water quenching when no danger of distortion exists.

Machining For applications which require machining, the NIRO-CUT® 4301 grade is recommended since the composition and production route followed to produce this grade compensates for the work hardening tendency of the material. The following cutting parameters are thus proposed as a guideline when machining NIRO-CUT® 4301 using coated hard metal cutting tools.

	Depth of cut (mm)	6	3	1
	Feed rate (mm/r)	0.5	0.4	0.2
Solution annealed R_m 550 – 650 N/mm²	Cutting speed (m/min)	120	150	200