1.4307

X2CrNi18-9

Chromium-nickel austenitic stainless steel with low carbon content

C max. 0.03 **Cr** 17.50 – 19.50 **Ni** 8.00 – 10.50

General comments

Due to advances in the production of stainless steels, namely reduction of the carbon content to very low levels, 1.4307 has all but replaced the titanium stabilised 1.4541 grades. 1.4307 is just as resistant to intercrystalline corrosion as the titanium grades and does not suffer from knifeline corrosion. 1.4307 also has a much better surface finish than the titanium stabilised grade and can be readily mechanically and electropolished. Due to the absence of titanium additions and the resulting hard precipitates, 1.4307 is much more machinable than 1.4541 which allows higher cutting speeds and results in longer tool life.

Relevant current and obsolete standards

EN 10088-3	1.4307	X2CrNi18-9
AISI	304L	
UNS	S30403	
BS	304S11	
AFNOR	Z3CN19-09	
SIS	2352	

Special grades for particular applications

cold heading grade	DIN EN 10263-5
improved machining grade	NIRO-CUT® 4307
drawing grades	

General properties

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

Special properties

resistant to scaling up to around 600 °C
suited for cryogenic applications
non-magnetic grade ($\mu_r \leq 1{,}3$)
improved machinability with NIRO-CUT® 4307

Physical properties

density (kg/dm³)	7.90
electrical resistivity at 20 °C (Ω mm²/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: 18.0 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
aviation and aerospace
mechanical engineering
decorative items and kitchen utensils
electronic equipment
petrochemical industry

Note: available from stock

Processing properties

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

Conditions

solution annealed and quenched

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Demand tendency

rising

Corrosion resistance (PRE = 16.5 – 20.26)

Due to the low carbon content of 1.4307, there is virtually no tendency for the formation of chromium carbides and the associated chromium depleted regions that would form around these precipitates. Resistance to intergranular corrosion is thus far superior to 1.4301. Since this grade of stainless steel is still resistant to intergranular corrosion after welding, i.e. in the sensitised condition, corrosion testing in accordance with the following corrosion testing specifications is thus sufficient to establish resistance to corrosion:
AFNOR NF 05-159 – ASTM A262-75. Practice E – DIN EN ISO 3651-2

1.4307 is resistant to corrosion in most natural waters and urban and rural atmospheres, provided that the chloride and salt contents are low. This grade of stainless steel is not resistant to sea water and as such must not be used in any sea water applications. As with 1.4301, this steel is not suited for use in swimming pools or swimming pool environments. Resistance to reducing acids is also confined to low concentrations and low temperatures.

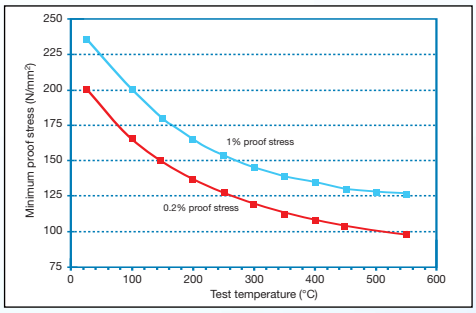
Heat treatment and mechanical properties

Optimal material properties are realised after solution annealing in the temperature range 1000 °C – 1100 °C followed by rapid cooling in air or water. During operation and fabrication, the time spent in the temperature range 450 °C – 850 °C must be minimised to avoid embrittlement. In the solution annealed condition, the following mechanical properties may be attained when testing in the longitudinal direction:

Property		Specification	Typical
yield strength (N/mm²)	$R_{p0.2}$	≥ 175	340
tensile strength (N/mm²)	R_m	450 – 680	630
tensile elongation (%)	A_5	≥ 45	51
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



Due to the slightly lower carbon content, 1.4307 displays marginally lower strengths than 1.4301 at similar temperatures.

Welding

1.4307 is weldable with or without the use of filler material. If a filler metal is required, then the use of Novonit® 4316 (AISI 308L) would be recommended. Post weld heat treatment is not necessary.

Forging

Usually heated to within the temperature range 1150 °C – 1180 °C to allow forging which takes place at temperatures between 1180 °C und 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® 4307 grade is recommended since the composition and production route followed to produce this steel compensates for the work hardening tendency of the material. The following cutting parameters are thus proposed as a guideline when using coated hard metal cutting tools.

1. Turning CNC

	Depth of cut (mm)	6	3	1
	Feed rate (mm/r)	0.5	0.4	0.2
Solution annealed R_m 520 – 650 N/mm²	Cutting speed (m/min)	140	210	260

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