North American Stainless

Flat Products Stainless Steel Grade Sheet

201 (S20100)
201LN (S20153)
EN 1.4372

Introduction:

SS201 is a lower-cost alternative to the conventional Cr-Ni austenitic stainless steels, such as SS304. About half of the nickel content of SS304 is replaced with alloy additions of manganese and nitrogen. This results in a higher strength than SS304. Copper is added to compensate for the increased work-hardening rate. SS201 thus has relatively lower ductility and formability compared to 304/301 SS. It also has excellent low-temperature properties. SS201 has good welding characteristics. Post-weld annealing is not required for the low-carbon grade to restore the excellent performance of this grade in a wide range of mildly corrosive conditions.

SS201 has good formability and corrosion resistance and this makes it suitable for applications such as hollowware, catering equipment, kitchen consumer equipment and abattoir equipment, including items requiring moderate drawing. The good strength ensures suitability in applications such as strapping, clamps and cable racking. The excellent low-temperature properties make it suitable for cryogenic vessels.

Product Range:

Product is available in Cold Rolled, Continuous Mill Plate and Plate Mill Plate form up to 60" wide in various thicknesses.

For inquiry about minimum quantity, specific thickness and tolerances contact inside sales at NAS.

Certification:

ASTM A240, A480, A666, ASME SA240, SA480, SA666, ASTM A262

Chemical Composition:

UNS	ASTM	Carbon	Manganese	Phosphorous	Sulfur	Silicon	Chromium	Nickel	Nitrogen	Copper
S20100	201	0.15max	5.5-7.5	0.06max	0.03 max	1 max	16-18	3.5-5.5	0.25 max	
S20153	201LN	0.03max	6.4-7.5	0.045 max	0.03 max	0.75 max	16-18	4.0-5.0	0.01-0.25	1 max

Mechanical Properties:

	Tensile strength min	Yield Strength min	Elongation min	Hardness max
201	75 ksi	38 ksi	40%	95HRB
201LN	95ksi	45 ksi	45%	100 HRB

Note: Enhance properties available upon request.

PROPERTIES AT ELEVATED TEMPERATURE:

MAXIMUM RECOMMENDED SERVICE TEMPERATURE
(In oxidising conditions)

Operating Conditions	Temperature (°C)
Type	CS201
Continuous	780
Intermittent	750

PROPERTIES AT SUB-ZERO TEMPERATURES

The properties quoted below are typical of annealed CS201.

Temperature (°C)	20	0	-10	-50	-100	-140	-196
Tensile Strength (MPa)	660	740	780	920	1100	1240	1420
0.2% Proof Stress (MPa)	320	340	360	400	460	500	560
% Elongation	58	56	54	48	42	36	30
Impact Energy (J)	250	230	220	200	160	130	100

PHYSICAL CHARACTERISTIC:

Density	7 800kg/m³
Modulus of Elasticity in Tension	200GPa
Poisson's Ratio	0.32
Specific Heat Capacity	460J/kg K
Thermal Conductivity: @ 100°C	24.2W/mK
@ 500°C	30.6W/mK
Electrical Resistivity	740ηým
Mean Co-efficient of Thermal Expansion: 0 – 100°C	16.2µm/mK
0 – 300°C	17.2µm/mK
0 – 500°C	18.6µm/mK
0 – 700°C	19.4µm/mK
Melting Range	1 400–1 450°C
Relative Permeability	1.02
(Note: this grade is non-magnetic becoming slightly magnetic after cold working)	

THERMAL PROCESSING & FABRICATION

ANNEALING

Annealing is achieved by heating to above 1900°F for 90 minutes per 25mm thickness followed by water or air quenching. The best corrosion resistance is achieved when the final annealing temperature is above 1950°C. Controlled atmospheres are recommended in order to avoid excessive oxidation of the surface.

STRESS RELIEVING

SS201LN can be stress relieved at 400°C to 500°C for 90 minutes with little danger of sensitization. If stress relieving is carried out above 450°C for regular higher carbon 201 SS, then there is a serious threat of grain boundary sensitization occurring with a concomitant loss in corrosion resistance.

HOT WORKING

SS201 can be readily forged, upset and hot headed. Uniform heating of the steel in the range of 1150°C to 1250°C is required. The finishing temperature should not be below 900°C. Upsetting operations and forgings require a finishing temperature between 930°C and 980°C. Forgings should be air cooled. All hot-working operations should be followed by annealing, pickling and passivation to restore the mechanical properties and corrosion resistance.

COLD WORKING

SS201 has moderate toughness and ductility, can be readily drawn, stamped, headed and upset without difficulty. SS201 work hardens easily compared to other austenitic stainless steel such as 304, 301, hence severe cold-forming operations should be followed by annealing.

WELDING

SS201 has good welding characteristics and is suited to all standard welding methods. Type 308L filler wire can be used. Nitrogen-containing shielding gases are recommended. The weld discoloration should be removed by pickling and passivation to restore maximum corrosion resistance.

CORROSION RESISTANCE

UNIFORM CORROSION

SS201 has good general corrosion resistance in a wide variety of corrosive media, including foodstuffs, sterilising solutions, most organic chemicals and dyes and a wide variety of inorganic chemicals.

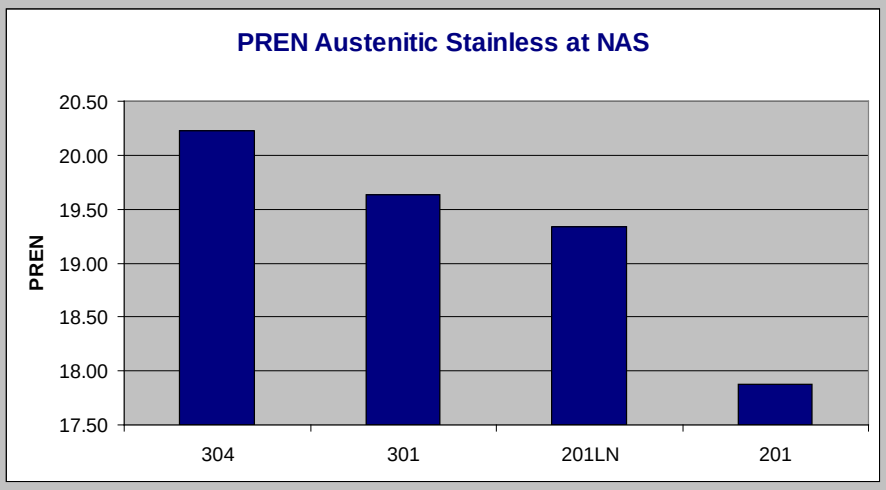
PITTING CORROSION

Pitting resistance is important, mainly in applications involving contact with chloride solutions, particularly in the presence of oxidizing media. These conditions may be conducive to localized penetration of the passive surface film on the steel; and a single deep pit may well be more damaging than a much greater number of relatively shallow

pits. Where pitting corrosion is anticipated, steels containing molybdenum (such as 316L) should be considered. The pitting resistance of SS201 lies between that of SS430 and SS304.

Pitting resistance equivalent numbers (PREN) are a theoretical way of comparing the pitting corrosion resistance of various types of stainless steels, based on their chemical compositions. The PREN (or PRE) numbers are useful for ranking and comparing the different grades, but cannot be used to predict whether a particular grade will be suitable for a given application, where pitting corrosion may be a hazard.

Typical PREN on NAS grades and comparison are shown below.



The resistance to pitting and crevice corrosion in oxidizing chloride environments was evaluated using ASTM G48 methods A and B. Samples of alloy types 304, 301, 201, and 430 were exposed for a period of 72 hours at 22^{o}C in oxidizing chloride acid. The results are summarized in Table 2.

		Type 304	Type 301	Type 201	Type 430
ASTM G48 A Pitting Test	Mass Loss	.0063 g/cm^2	.0105 g/cm^2	.0098 g/cm^2	.0280 g/cm^2
ASTM G48 B Crevice Test	Mass Loss	.0067 g/cm^2	.0086 g/cm^2	.0130 g/cm^2	.0265 g/cm^2

Table 2. Results of ASTM G48 A and B Pitting and Crevice Corrosion Tests

OXIDATION

SS201 has good oxidation resistance at temperatures up to 780°C. Continuous use of SS201 in the 450°C to 850°C temperature range is not recommended due to carbide and nitride precipitation.

ATMOSPHERIC CORROSION

The atmospheric corrosion resistance of CS201 in urban and rural areas is very good. SS201 is not recommended for marine or severely polluted industrial environments.

INTERGRANULAR CORROSION

Sensitization may occur when the heat- affected zone of welds in SS201 is cooled through the sensitizing temperature range of between 450°C and 850°C. At these temperatures, a compositional change may occur at the grain boundaries. If a sensitized material is then subjected to a corrosive environment, intergranular attack may be experienced. This corrosion takes place preferentially in the heat-affected zone away from the weld.

STRESS CORROSION CRACKING

Stress corrosion cracking (SCC) can occur in austenitic stainless steels when they are stressed in tension in chloride environments at temperatures in excess of about 60°C. The stress may be applied, as in a pressure system, or it may be residual arising from cold working operations or welding. Additionally, the chloride ion concentration need not be very high initially, if locations exist in which concentrations of salt can accumulate. Assessment of these parameters and accurate prediction of the probability of SCC occurring in service is therefore difficult. Where there is a likelihood of SCC occurring, a beneficial increase in life can be easily obtained by a reduction in operating stress and temperature. Alternatively, specially designed alloys, such as duplex stainless steels, will have to be used where SCC is likely to occur.

Technical Service: For more information, email
qualitycontrol@northamericanstainless.com
For new product development requirements, contact sales@northamericanstainless.com

DISCLAIMER

indirect, particularly consequential damages, including but not limited to damages for loss of profits.