

Austenitic Stainless Steel

Aperam 201D_{with Manganese}

Chemical Composition

Elements (%)	C	N	Mn	Cr	Ni	Cu	S
201D	0.05	0.10	6.0	16.8	4.6	1.6	≤ 0.002

Typical values

European designation

X9CrMnNiCu17-8-5-2/1.4618⁽¹⁾

American designation

Type 201⁽²⁾

⁽¹⁾ According to prEN10088-2, Dec. 2011

⁽²⁾ With copper addition and mechanical properties of the 201-1 "rich side"

These grades comply with:

- > Aperam Stainless Europe - Safety Information Sheet for Stainless Steel.
- > European Directive 2000/53/EC on end-of-life vehicles and later modifications.
- > Standard NFA 36 711 "Stainless Steel intended for use in contact with foodstuffs, products and beverages for human and animal consumption (non-packaging steel)".

Key Features

- > A well-balanced chemical composition (low nickel and added copper), makes this grade as easy to work with as our traditional 8% nickel austenitic 304 grade
- > Low sulphur content, combined with its chromium content, guarantees that this grade has a pitting corrosion resistance close to that of 1.4301 grade, Type 304
- > A minimum nickel content of 4.5% provides a crevice corrosion resistance similar to grade 1.4310, Type 301
- > Good formability without risk of delayed cracking after deep drawing
- > Good weldability
- > Can be easily polished
- > Dimensions are identical to that of 1.4301 grade, Type 304

Applications

- > Equipment used by the chemical industry
- > Equipment for the food industry
- > Piping and tubing
- > Industrial and food storage vessels
- > Dairy equipment
- > Profiles, general metalwork, construction

Product Range

	Coils	Sheets / Blanks
Thickness (mm)	0.50 up to 13	0.50 up to 13
Width (mm)	up to 2,000	up to 2,000
Finish	1D / 2B / 2D / 2E	1D / 2B / 2D / 2E

Physical Properties

Cold rolled and annealed sheet

Density	d	kg/dm ³	4°C	7.7
Specific heat	c	J/kg.K	20°C	500
Thermal conductivity	k	W/m.K	20°C	15
Young's modulus	E	GPa	20°C	200

Mechanical Properties

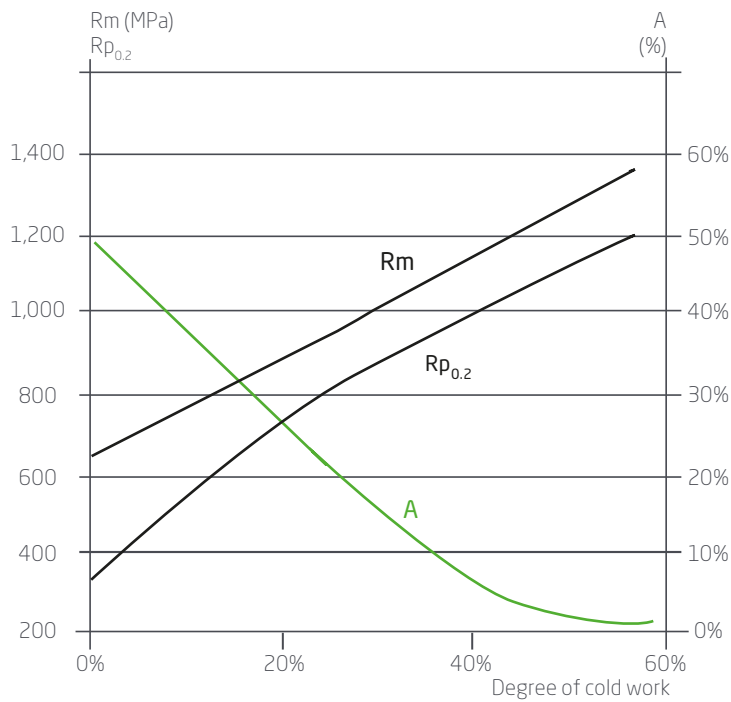
Test piece

Length = 80 mm (thickness < 3 mm)
 Length = $5.65 \sqrt{S_0}$ (thickness ≥ 3 mm)
 Cold rolled

In the annealed condition

In accordance with ISO 6892-1, part 1
 Test piece perpendicular to rolling direction

Work hardened condition (Typical values)

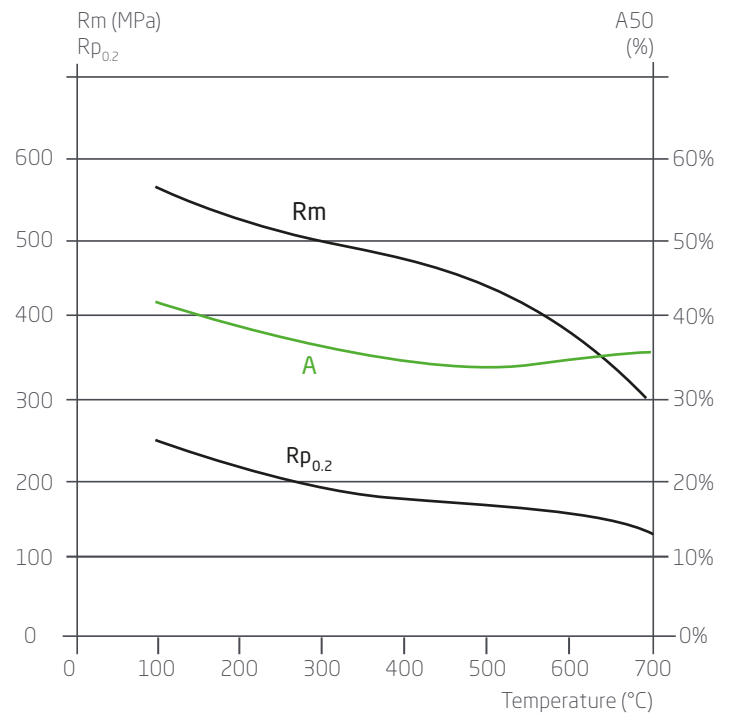


Grade	European designation	ASTM A240	Rm ⁽¹⁾ (MPa)	Rp0.2 ⁽²⁾ (MPa)	A ⁽³⁾ %	HRB
201D	1.4618	201.1	665	320	52	87

1 MPa = 1 N/mm² - Typical values

⁽¹⁾ Ultimate Tensile Strength (UTS) - ⁽²⁾ Yield Strength (YS) - ⁽³⁾ Elongation (A)

At high temperatures (Typical values)



Corrosion Resistance

Our 201D grade has good resistance to common types of corrosion and is well-suited to urban, rural and fresh water environments. In all cases, one must periodically clean the exterior surfaces to maintain the original finish.

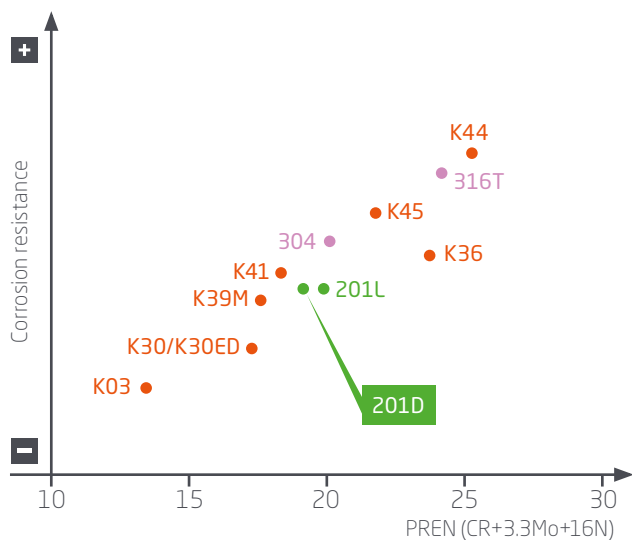
Sulphides are one of the primary causes of pitting corrosion. 201D's low sulphur content gives the grade better resistance to pitting corrosion than 1.4372 grade, Type 201 and makes it nearly equivalent to that of grade 1.4301, Type 304.

The addition of copper enhances the grade's general corrosion resistance in a reducing acidic environment such as sulphuric acid solutions (H_2SO_4).

Because 201D has a lower chromium and nickel content, it is slightly less efficient than 1.4301 grade, Type 304 in acid environments with halogens. However, if 1.4301 grade, Type 304 is used as a substitute for 201D, one must carefully consider the risk of crevice and stress corrosion.

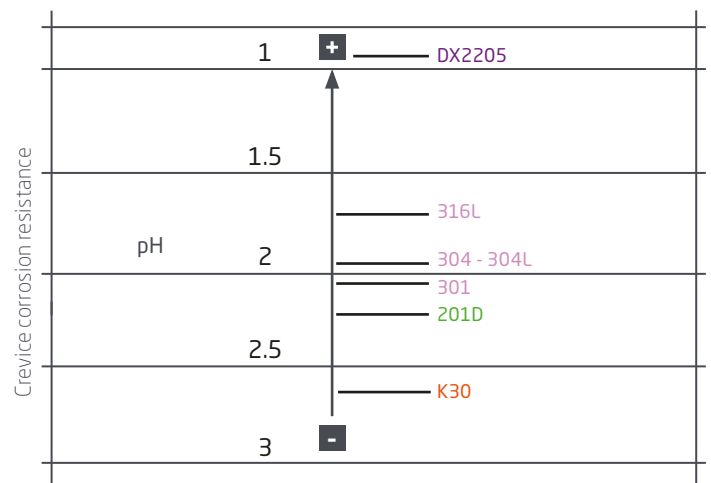
Pitting potential

Typical pitting potential values in NaCl 0.02M at 23°C and pH6 as a function of the PREN (%Cr+3.3%Mo+16%N).



Crevice corrosion

Depassivation pH in a deaerated NaCl 2M environment at 23°C



Forming

In the annealed condition, our 201D grade can be readily cold formed by processes such as bending, profiling, drawing, roll forming, spinning, etc.

For severe deep drawing, we recommend using our 304ED grade. Some forming operations can be performed more easily at higher temperatures. In such cases, subsequent pickling is necessary.

Stretching

Stretching behaviour is characterised by the dome height of the Erichsen test, whereas the limiting drawing ratio quantifies the drawing behaviour. In contrast to conventional low nickel grades, 201D grade behaves similarly to Type 304.

Bending

Good bending capacity up to 180°, with very small bending radii for thicknesses below 0.8 mm. For thicker gauges, a bending radius of at least half the thickness of the sheet is recommended.

Flow turning

Our grade 304ED grade is the most suitable option for this application.

Grades	Erichsen cup test (mm)	Limiting Drawing Ratio (LDR)	Delayed Cracking
201D	14.1	1.95-2.07	No
304L	14.0	1.95-2.06	No
201	14.1	2.00-2.05	Yes

Thickness 3 mm - EN 1.4372, Type 201

Welding

Welding process	No filler material	With filler metal			Shielding gas
	Typical thicknesses	Thicknesses	Filler material		* Hydrogen and nitrogen forbidden in all cases
			Rod	Wire	
Resistance: spot, seam	≤ 2 mm				
TIG	< 1.5 mm	> 0.5 mm	W.Nr 1.4370 ER 309L (Si) ER 316L (Si)	ER 308 L (Si) W.Nr 1.4370 ER 347 (Si)	Ar Ar + 5% H Ar + He
PLASMA	< 1.5 mm	> 0.5 mm		ER 308 L(Si) W.Nr 1.4370 ER 347 (Si)	Ar Ar + 5% H Ar + He
MIG		> 0.8 mm		ER 308 L (Si) W.Nr 1.4370 ER 347 (Si)	Ar + 2% CO ₂ Ar + 2% O ₂ Ar + 3% CO ₂ + 1% H ₂ Ar + He
SAW		> 2 mm		ER 308 L ER 347	
Electrode		Repairs	E 308 E 308 L E 347		
Laser	< 5 mm				He Under certain circumstances: Ar N

No heat treatment is needed after welding. To fully restore the metal's corrosion resistance, the welds must be mechanically or chemically descaled and passivated and decontaminated.

Our 201D grade contains the same amount of carbon as Type 304 and offers the same resistance to intergranular corrosion. It is compliant with ISO 3651-2 Method A (Moneypenny Strauss = 16% sulphuric acid/copper sulphate). If there is a risk of intergranular corrosion, a solution-based annealing treatment (1,050/1,100°C) must be carried out. However, in these cases, we recommend using a low carbon grade such as 304L or titanium stabilised grades such as 321.

Heat Treatment and Finishing

Annealing

After forming, annealing for a few minutes at 1,050 ±25°C, followed by water quenching or air cooling, will regenerate the structure (recrystallisation and dissolution of carbides) and eliminates internal stresses after the following operations:

- > Cold forming (work hardening)
 - > Welding (risk of intergranular corrosion in the weld joint).
- After annealing, pickling, followed by passivation, is necessary

Pickling

- > Nitric-Hydrofluoric acid mixture (10% HNO₃ + 2% HF) at ambient temperature or up to 60°C

- > Heat treatment and finishing Sulfuric-nitric acid mixture (10% H₂SO₄ + 0.5% HNO₃) at 60°C
- > Use descaling pastes for weld areas

Passivation

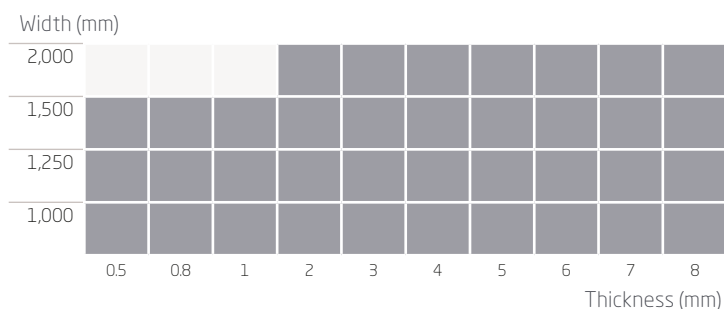
- > 20-25% HNO₃ solution at 20°C
- > Use passivating pastes for weld areas

Polishing

201D has a similar surface finish to Type 304, making it equally suitable for all kinds of polishing (grit, scotch-brite, electropolishing).

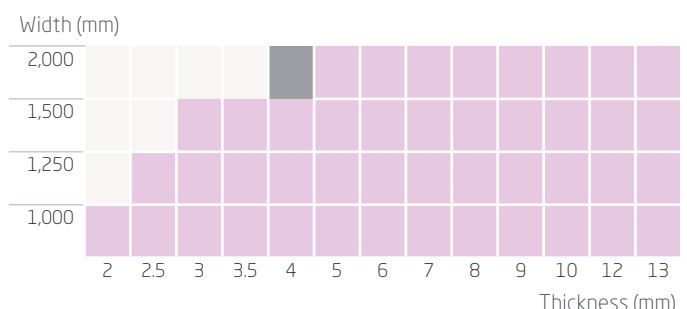
Size Range

Cold Rolled



■ 2D - 2B

Hot Rolled and HRC



■ Hot rolled HRAP - 1D ■ Cold rolled HRC - 2E



www.aperam.com
stainless@aperam.com



Aperam Stainless Europe