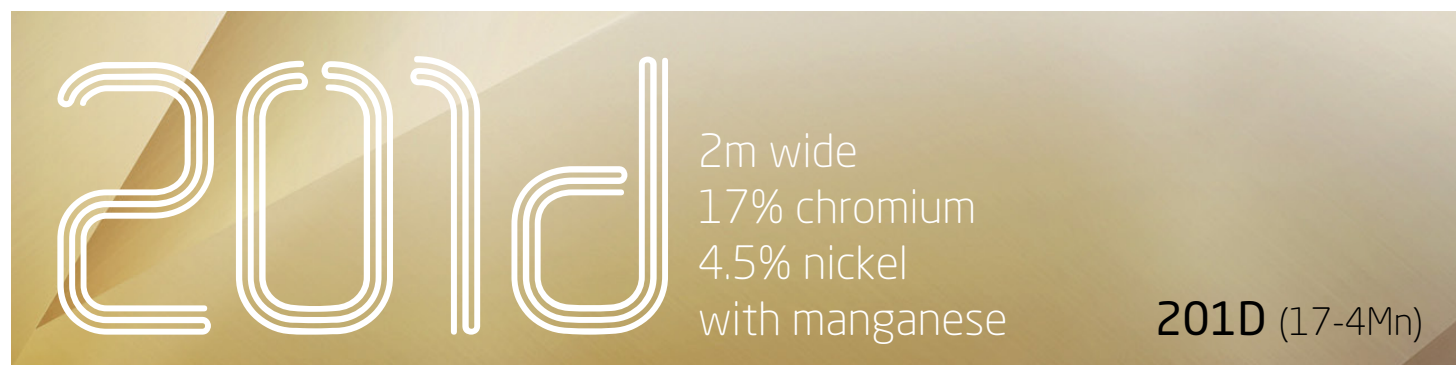


## Austenitic stainless steel offer grade 201D



### Chemical composition

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

Typical values

European designation	American designation
X9CrMnNiCu17-8-5-2/1.4618 <sup>(1)</sup>	Type 201 <sup>(2)</sup>

<sup>(1)</sup> according to prEN10088-2, dec. 2011

<sup>(2)</sup> With copper addition and mechanical properties of the 201-1 « rich side ».

This grade complies with:

- > Stainless Europe Material Safety Data Sheet n°1 (European Directive 2001/58/EC).
- > 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).»

### General characteristics

The principal features of our grade 201D (17-4Mn) are :

- > A well-balanced chemical composition (low nickel combined with copper addition), making the grade as easy to work with as our traditional 8% nickel austenitic grade 304 (18-9E).
- > A very low sulphur content combined with the chromium content, guaranteeing pitting corrosion resistance close to that of grade 1.4301, Type 304.
- > A minimum nickel content of 4.5 % which provides crevice corrosion resistance similar to grade 1. 4310, Type 301.
- > Good formability without risk of delayed cracking after deep drawing.
- > Good weldability.
- > Good polishing ability.
- > A dimensional offer identical to the grade 1. 4301, Type 304.

### Applications

- > Chemical industry equipment
- > Food industry equipment
- > Piping and tubing
- > Industrial and food storage vessels
- > Dairy equipment
- > Profiles, general metalwork, construction

In general, all applications where austenitic grade 1.4301, Type 304 is being used, with the advantage of lower cost due to the low nickel content.

### Product range

**Forms:** Sheets, blanks, coils, narrow strips, tubes

**Thicknesses :** from 1.0 up to 13 mm (consult us for thicknesses < 1 mm).

**Width :** up to 2000 mm according to thickness

**Finishes :** cold rolled, hot rolled, patterned (tear plate), according to thickness.

### Physical Properties

Cold rolled and annealed sheet.

Density	d	kg/dm <sup>3</sup>	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	MPa.10 <sup>3</sup>	20 °C	200

## Mechanical properties

### Annealed condition

According ISO 6892-1, part 1,  
Test piece perpendicular to rolling direction:  
Length = 80 mm (thickness < 3 mm)  
Length =  $5.65 \sqrt{S_0}$  (thickness  $\geq 3$  mm).

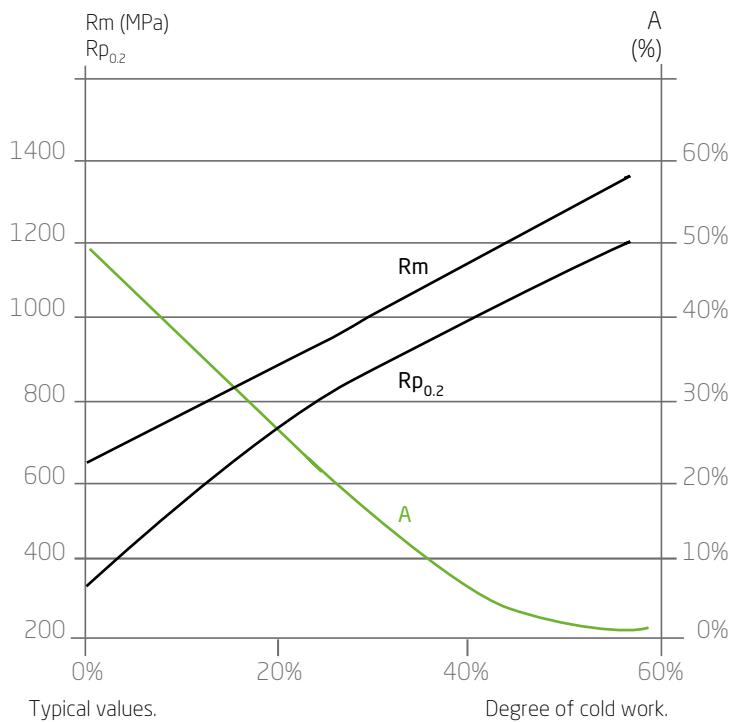
Condition	R <sub>m</sub> <sup>(1)</sup> (MPa)	R <sub>p0.2</sub> <sup>(2)</sup> (MPa)	A <sup>(3)</sup> (%)	HRB
Cold-rolled*	665	320	52	87

1 MPa = 1 N/mm<sup>2</sup>.

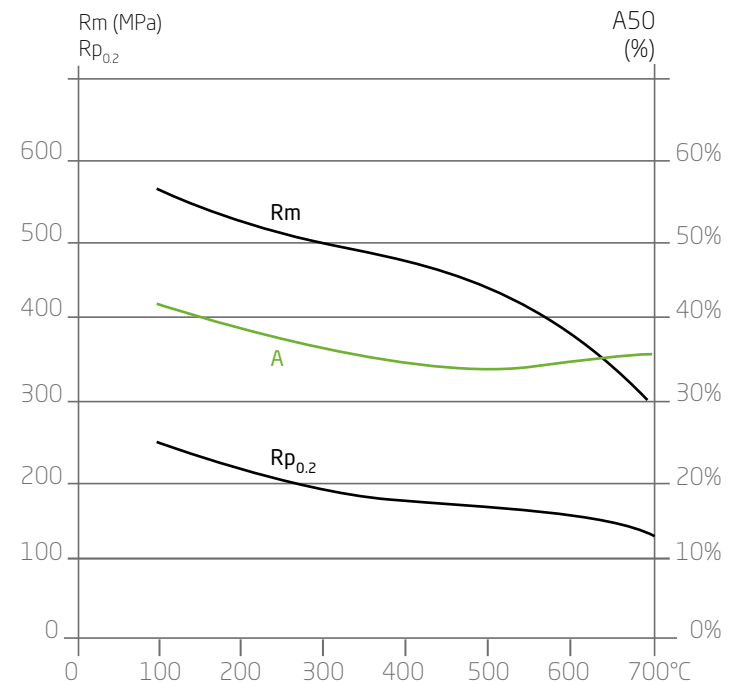
\*Typical values

<sup>(1)</sup> Ultimate Tensile Strength (UTS) <sup>(2)</sup> Yield Strength (YS) <sup>(3)</sup> Elongation (A).

### Work hardened condition



### At elevated temperatures



## Corrosion resistance

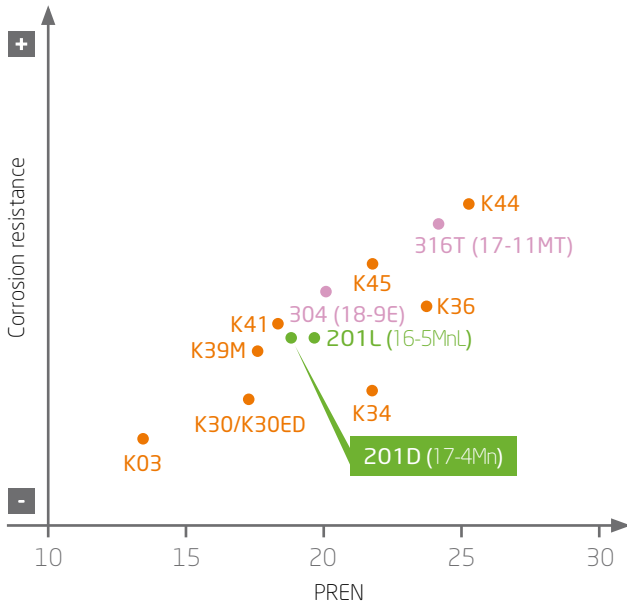
Our grade 201D (17-4Mn) has good resistance to common types of corrosion and is well suited to urban as well as rural atmospheres and fresh water. In all cases, periodic cleaning of exterior surfaces is necessary to maintain the original finish.

Sulphides are preferential sites for the initiation of pitting corrosion. The very low sulphur content of 201D (17-4Mn) improves the pitting corrosion resistance in comparison with grade 1.4372, Type 201 and makes it nearly equivalent to that of grade 1.4301, Type 304.

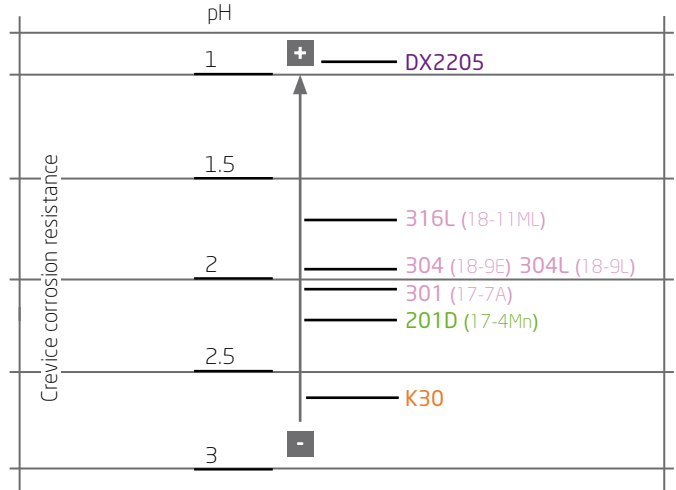
The addition of copper enhances general corrosion resistance in a reducing acidic environment such as sulphuric acid solutions (H<sub>2</sub>SO<sub>4</sub>).

Due to the fact that the chromium and nickel content is lower, 201D (17-4Mn) is slightly less efficient than grade 1.4301, Type 304 in acid environments with halogens. In case of grade 1.4301, Type 304 substitution, the risk of crevice and stress corrosion must be considered carefully.

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).



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



## Forming

In the annealed condition, our grade 201D (17-4Mn) can be readily cold formed by processes such as bending, profiling, drawing, roll forming, spinning etc.

For severe deep drawing, our grade 304ED (18-9DDQ - 1.4301) is recommended. Some forming operations can be performed more easily at higher temperature. In that case, 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 the conventional low nickel grades such as 201D (17-4Mn -1.4372) behaves similarly to 1.4301, Type 304.

## Bending

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

## Flow turning

Our grade 304ED (18-9DDQ - 1.4301) is the most suitable for this application.

Grades	Erichsen cup test mm	Limiting Drawing Ration (LDR)	Delayed Cracking
201D (17-4Mn)	14.1	1.95-2.07	No
304L (18-9L)	14.0	1.95-2.05	No
201 (16-4Mn)	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		
			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)	Argon Argon + 5 % Hydrogen Argon + Helium
PLASMA	< 1.5 mm	> 0.5 mm		ER 308 L(Si) W.Nr 1.4370 ER 347 (Si)	Argon Argon + 5 % Hydrogen Argon + Helium
MIG		> 0.8 mm		ER 308 L (Si) W.Nr 1.4370 ER 347 (Si)	Argon + 2 % CO <sub>2</sub> Argon + 2 % O <sub>2</sub> Argon + 3 % CO <sub>2</sub> + 1 % H <sub>2</sub> Argon + Helium
S.A.W.		> 2 mm		ER 308 L ER 347	
Electrode		Repairs	E 308 E 308 L E 347		
Laser	< 5 mm				Helium Under certain circumstances: Argon Nitrogen

No heat treatment is necessary after welding. In order to fully restore the corrosion resistance of the metal, the welds must be mechanically or chemically descaled, then passivated and decontaminated.

Our grade 201D (17-4Mn) contains the same amount of carbon as 1.4301, Type 304 and has 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 annealing treatment (1050/1100°C) must be carried out. However, in this case a low carbon grade such as 304L (18-9L -1.4307) or titanium stabilised grades such as 321 (18-10T -1.4541) are recommended.

## Heat treatment and finishing

### Annealing

- After forming, annealing for a few minutes at 1050 +/-25°C, followed by water quenching or air cooling, regenerates 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% HNO<sub>3</sub> + 2% HF) at ambient temperature or up to 60°C. Heat treatment and finishing Sulfuric-nitric acid mixture (10% H<sub>2</sub>SO<sub>4</sub> + 0,5% HNO<sub>3</sub>) at 60°C. Descaling pastes for weld areas.

### Passivation

20-25% HNO<sub>3</sub> solution at 20°C. Passivating pastes for weld areas.

### Polishing

201D (17-4Mn) has a similar surface finish to 1.4301, Type 304 making it equally suitable for all kinds of polishing (grit, scotch-brite, electropolishing).

## Size range

