

UGINOX

18-12D

Non-magnetic, high drawability
austenitic stainless steel

European designation ⁽¹⁾
X4CrNi18-12
1.4303
American designation ⁽²⁾
AISI 305

(1) According to NF EN 10088-2
(2) According to ASTM A 240

This grade is in accordance with:

- UGINE & ALZ Material Safety Data Sheet n°1: stainless steels (European Directive 2001/58/EC).
- European Commission Directive 2000/53/EC for end-of-life vehicles, and to Annex II dated 27 June 2002.
- NFA 36 711 Standard «Stainless steel intended for use in contact with foodstuffs, products and beverages for human and animal consumption» (non packaging steel).

Chemical composition

Mean values

Elements (%)	C	Si	Mn	Cr	Ni
UGINOX 18-12D	0.03	0.40	1.30	18.30	12

General characteristics

UGINOX 18-12D is an austenitic stainless steel; its high nickel content ensures excellent formability (better than UGINOX 18-9D) and makes it possible to dispense with inter-stage annealing in the event of multi-pass drawing operations.

UGINOX 18-12D remains non-magnetic after forming and exhibits good resistance to atmospheric corrosion and corrosion by organic substances.

UGINOX 18-12D exhibits excellent weldability and does not require post-weld heat treatment, particularly in thin gauges.

Typical applications

- Electronic components, non-magnetic cable or hose clamps, battery and pen casings
- Drawn and extra-deep-drawn components
- Decorative and automotive components

Product range

Forms: sheets, blanks, strips

Thickness (mm)	Maximum width (mm)	Minimum width in strip form (mm)	Minimum and maximum length in sheet and blanks (mm)
	2B / 2D		
$0.40 \leq e < 0.80$	1250	100	275 - 4500
$0.80 \leq e \leq 1.50$	1250	100	275 - 6000

Physical properties (cold rolled sheet - annealed)

Density	d	–	20 °C	7.90
Melting temperature		°C		1425
Specific heat	c	J/kg.K	20 °C	500
Thermal conductivity	k	W/m.K	20 °C	15
Mean coefficient of Thermal expansion	α	$10^{-6}/K$	20 - 100 °C 20 - 500 °C	16.5 18.0
Electric resistivity	ρ	$\Omega \cdot \text{mm}^2/\text{m}$	20 °C	0.75
Magnetic permeability	μ	at 0.8 kA/m DC or top AC	20 °C	1.002* 1.008**
Young's modulus	E	Mpa. 10^3	20 °C 500 °C	200 165

* 0% cold processing

** after 50% cold processing

Tensile properties

Annealed condition

According to NF EN 10002-1 (July 2001), specimen perpendicular to the rolling direction

Specimen

Lo = 80 mm (thickness < 3 mm)

Lo = 5,65 $\sqrt{S_0}$ (thickness \geq 3 mm)

1 MPa = 1 N/mm²

Condition	R _m ⁽¹⁾ (MPa)	Rp _{0,2} ⁽²⁾ (MPa)	A ⁽³⁾ (%)
Annealed	580	250	55

* mean values

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

At high temperature

Temperatures	100	150	200	250	300	350	400	450	500	550
Rp _{0,2} (MPa)	155	142	127	118	110	104	98	95	92	90

Corrosion resistance

UGINOX 18-12D exhibits corrosion resistance comparable to that of grades UGINOX 18-9D and UGINOX 18-9DDQ

Generalised corrosion: UGINOX 18-12D provides good corrosion resistance in respect of many oxidising and moderately reducing environments. This grade can be used in contact with foodstuffs and drinking water.

Intergranular corrosion: The grade's low carbon content greatly reduces the risk of intergranular corrosion, especially in the case of fine gauge material.

Stress corrosion: Due to its good cold formability, which induces few residual stresses, UGINOX 18-12D is generally not susceptible to this type of corrosion.

Pitting corrosion: UGINOX 18-12D is not susceptible to pitting corrosion in environments containing less than 100 ppm of chloride ions.

Forming

UGINOX 18-12D possesses excellent cold-formability, principally by multi-pass drawing for which it is not necessary to perform inter-stage annealing.

The grade's high nickel content greatly reduces work-hardening through cold forming.

The absence of strain-induced martensite enables the material to remain non-magnetic after forming operations.

r	n	Erichsen deflection* (mm)	LDR** (mm)
1	0.45	13	2.10

* 0.8 mm thick sheet

** Limiting Drawing Ratio - 0.8 mm thick sheet

Flow turning

Without lubrication, **UGINOX 18-12D** performs better than UGINOX 18-9D and enables production of a taller cone at a higher speed of rotation (750 rpm).

Welding

UGINOX 18-12D is easily welded by all usual processes.

Post-weld heat treatment is not necessary irrespective of the thickness; however, in the case of very heavy gauges, 308L type filler metal may be recommended.

As this grade contains virtually no solidification-induced ferrite, it is slightly more prone to hot cracking than AISI 304 type grades (in the case of very heavy gauges).

Generally, welding is performed under inert gas: for the most severe applications, the weld zones can be cleaned with a mixture of acids (see pickling) and then rinsed thoroughly.

Heat treatment and finishing

Annealing

Annealing temperature 1050/1080°C.

Cooling: water or forced air.

Pickling

Nitric-hydrofluoric acid mixture (10% HNO₃ + 2% HF), at RT or 60°C.

Sulphuric-nitric acid mixture (10% H₂SO₄ + 0,5% HNO₃) at 60°C.

Descaling pastes for weld zones.

Passivation

20-25 % HNO₃ solution at 20°C.

Passivating pastes for weld zones.

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