UGINOX

18-9L 18-9LA

18-10L

Very low carbon austenitic stainless steels

UGINOX 18-9L	UGINOX 18-9LA	UGINOX 18-10L
European designation (1)	European designation (1)	European designation (1)
X2CrNi18-9	X2CrNi18-9	X2CrNi19-11
1.4307	1.4307	1.4306
American designation (2)	American designation (2)	American designation (2)
AISI 304 L	AISI 304 L	AISI 304 L

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

These grades are 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.
- PED (Pressure Equipment Directive) according to EN 10028-7 and AD2000W2 according to VD TÜV W494.
- Lloyd's Register of Shipping.
- 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 (weight %)

Elements	C	Si	Mn	Cr	Ni
UGINOX 18-9L	0.025	0.50	1.20	18.20	8.10
UGINOX 18-9LA	0.025	0.50	1.20	18.20	9.10
UGINOX 18-10L	0.025	0.60	1.50	18.50	10.20

General characteristics

The principal features of **UGINOX 18-9L**, **UGINOX 18-9LA** and **UGINOX 18-10L** are:
- good general resistance to corrosion
- very good resistance to intergranular corrosion
- aptitude for cryogenic applications characteristics
- excellent weldability
- very good drawability.

Typical applications

- Chemical engineering equipment
- Food industry equipment
- Aptitude for cryogenic applications characteristics
- Piping and tubes
- Welded structures

Product range

Forms: sheets, blanks, coils, strips, circles
Thicknesses: 0.4 to 14 mm
Width: according to thickness, consult us
Finish: cold rolled or hot rolled, depending on the thickness

Physical properties (cold rolled sheet - annealed)

Density	d	–	4 °C	7.90
Melting temperature (solidus)		°C		1420
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 -200 °C 20 -400 °C	16.0 16.5 17.5
Electric resistivity	ρ	Ω.mm²/m	20 °C	0.73
Magnetic permeability	H	at 0.8 kA/m	20 °C	1.01
Young's modulus	E	Mpa.10^3	20 °C	200

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 √ So (thickness ≥ 3 mm)

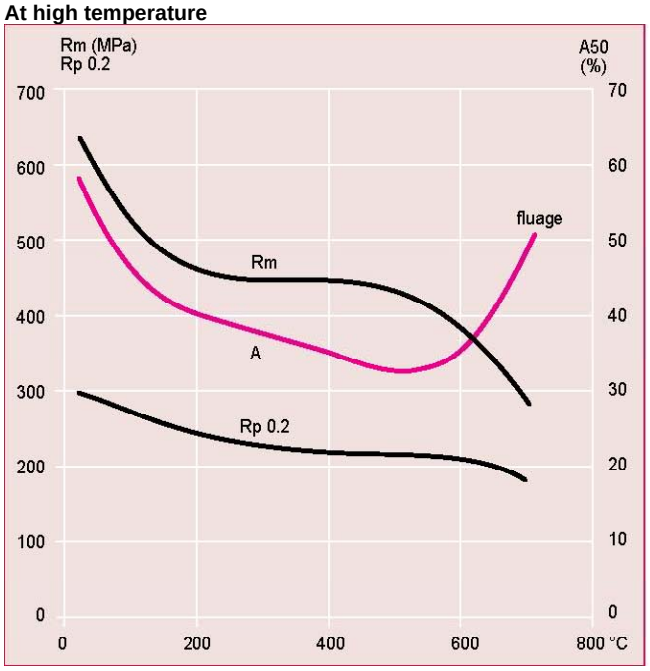
1 MPa = 1 N/mm²

	UGINOX 18-9L			UGINOX 18-9LA			UGINOX 18-10L		
	R_m (1) (MPa)	$Rp_{0,2}$ (2) (MPa)	A (3) (%)	R_m (1) (MPa)	$Rp_{0,2}$ (2) (MPa)	A (3) (%)	R_m (1) (MPa)	$Rp_{0,2}$ (2) (MPa)	A (3) (%)
Annealed*	620	310	50	610	300	50	600	300	50

* mean values

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

At high temperature



Typical values

Corrosion resistance

UGINOX 18-9L, **UGINOX 18-9LA** and **UGINOX 18-10L** have good general resistance to wet corrosion and are especially recommended where there is a risk of intergranular corrosion.
In particular, they meet the requirements of the standard tests defined by EN ISO 3651-2 (sensitizing treatments T1 and T2).
They show excellent behavior in urban and rural atmospheres.

Welding

No heat treatment is necessary after welding.
The welds must be mechanically or chemically descaled, then passivated.

Welding process	No filler metal	With filler metal			Shielding gas*
	Typical thicknesses	Thickness	Filler metal		*Hydrogen and nitrogen forbidden in all cases
			Rod	Wire	
Resistance Spot Seam	 ≤ 2 mm ≤ 2 mm				
TIG	< 1.5 mm	> 0.5 mm	ER 308 L (Si)	ER 308 L (Si)	Argon Argon + 5% hydrogen Argon + helium
PLASMA	< 1.5 mm	> 0.5 mm		ER 308 L (Si)	Argon Argon + 5% hydrogen Argon + helium
MIG		> 0.8 mm		ER 308 L (Si)	Argon + 2% CO_2 Argon + 2% O_2 Argon + 2% CO_2 + 1% H_2 Argon+ 2% CO_2 + helium
S.A.W		> 2 mm		ER 308 L	
Electrode		Repairs	ER 308 L		
Laser	< 5 mm				Helium. In certain conditions: argon, nitrogen

Forming

In the annealed condition, **UGINOX 18-9L**, **UGINOX 18-9LA** and **UGINOX 18-10 L** can be readily cold formed by all standard processes (bending, contour forming, drawing, etc.).

Grade	European designation	AISI	Erichsen deflection (expansion test)*	LDR (drawing test)**
UGINOX 18-9L	1.4307	304 L	11.5 mm	2.00-2.05 mm
UGINOX 18-9LA	1.4307	304 L	11.5 mm	2.00-2.05 mm
UGINOX 18-10L	1.4306	304 L	11.5 mm	2.00-2.05 mm

* on 0.8 mm thick sheet ** Limiting Drawing Ratio

Heat treatment and finishing

Annealing
Water quench or air cool from 1050°C ± 25°C.
After annealing, pickling and passivation is necessary.

Polishing
No particular difficulties.

Pickling
Nitric-hydrofluoric acid mixture
(10% HNO_3 + 2% HF), at RT or 60°C.
Sulphuric-nitric acid mixture
(10% H_2SO_4 + 0,5% HNO_3) at 60°C.
Descaling pastes for weld zones.

Passivation
20-25 % HNO_3 solution at 20°C.
Passivating pastes for weld zones.

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