

# UGINOX

## 18-9L 18-9LA

## 18-10L

Very low carbon  
austenitic stainless steels

UGINOX 18-9L	UGINOX 18-9LA	UGINOX 18-10L
European designation <sup>(1)</sup>	European designation <sup>(1)</sup>	European designation <sup>(1)</sup>
X2CrNi18-9	X2CrNi18-9	X2CrNi19-11
1.4307	1.4307	1.4306
American designation <sup>(2)</sup>	American designation <sup>(2)</sup>	American designation <sup>(2)</sup>
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 the annexe 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	$\alpha$	$10^{-6}/K$	20 -100 °C 20 -200 °C 20 -400 °C	16.0 16.5 17.5
Electric resistivity	$\rho$	$\Omega \cdot mm^2/m$	20 °C	0.73
Magnetic permeability	H	at 0.8 kA/m	20 °C	1.01
Young's modulus	E	$Mpa \cdot 10^3$	20 °C	200

## Tensile properties

### Annealed condition

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

### Specimen

$L_0 = 80$  mm (thickness < 3 mm)  
 $L_0 = 5,65 \sqrt{S_0}$  (thickness  $\geq 3$  mm)

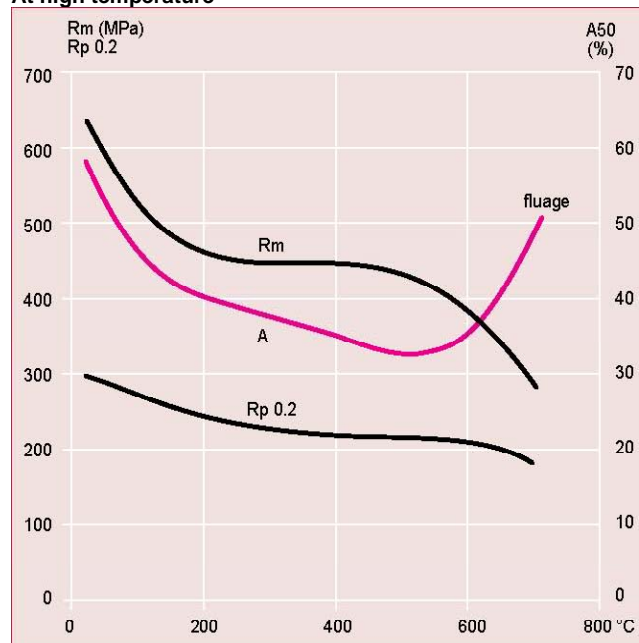
1 MPa = 1 N/mm<sup>2</sup>

	UGINOX 18-9L			UGINOX 18-9LA			UGINOX 18-10L		
	$R_m^{(1)}$ (MPa)	$R_{p0.2}^{(2)}$ (MPa)	$A^{(3)}$ (%)	$R_m^{(1)}$ (MPa)	$R_{p0.2}^{(2)}$ (MPa)	$A^{(3)}$ (%)	$R_m^{(1)}$ (MPa)	$R_{p0.2}^{(2)}$ (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 (EI)

### 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		
			Rod	Wire	
Resistance Spot Seam	≤ 2 mm ≤ 2 mm				*Hydrogen and nitrogen forbidden in all cases
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 <sub>2</sub> Argon + 2% O <sub>2</sub> Argon + 2% CO <sub>2</sub> + 1% H <sub>2</sub> Argon + 2% CO <sub>2</sub> + 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<sub>3</sub> + 2% HF), at RT or 60°C.  
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 zones.

### Passivation

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

### Head office:

UGINE & ALZ  
5 rue Luigi CHERUBINI  
93210 LA PLAINE SAINT-DENIS CEDEX  
www.ugine-alz.com

### Sales information:

Tel: (33) 1 71 92 00 00  
Technical information:  
Tel: (33) 1 71 92 06 52  
Fax: (33) 1 71 92 07 97