

## URANUS® 65

310 L modified grade - C < 0.020, Si < 0.3 for nitric acid services

UR 65 is a 25 Cr 20 Ni austenitic stainless steel with sharp control of the residual elements in order to provide high corrosion resistance properties in boiling 50-65% Nitric acid solutions. The silicon content is kept under 0.3% while the carbon content is lower than 0.015%.

Molybdenum additions are also well known to reduce the behaviour of the steel in nitric acid solutions. This explains why the molybdenum content is guaranteed lower than 0.3% .

The sharp control of Carbon, Silicon and phosphorus

contents makes it possible to produce a more stable austenite microstructure, free of intermetallic or carbide precipitations.

The alloy is designed for nitric acid applications. The grade is not recommended for concentrated nitric acid purposes or highly oxydizing nitric acid solutions (with Cr VI species...)

### Standards

EURONORM 1.4335 X1 Cr Ni 25.21

ASTM 310L NAG

### Chemical analysis - Weight %

Typical values (% weight)

C	Cr	Ni	Mo	Si	Others
.015	25	20.5	≤ .3	< .3	Nb ≤ 0.25 - Mn ≤ 2.0

### Mechanical properties

Tensile properties - Minimum guaranteed values

C°	F°	Y.S. 0.2%		Y.S. 1%		UTS		EI%
		MPa	Ksi	MPa	Ksi	MPa	Ksi	
20	68	215	31	245	35	490	71	40
50	122	195	28	220	31.5	460	66	
100	212	175	25	200	28.5	430	61	35
200	392	140	20	160	23	390	56	
300	572	115	16.5	135	19	360	51	30

#### Impact value

High impact strength even at cryogenic temperatures -  
Average hardness =155 HB

## Physical properties

Density = 7900 kg/m<sup>3</sup>

Interval temperature °C	Thermal expansion $\alpha \times 10^{-6} \text{K}^{-1}$	°C	°F	Resistivity $\mu\Omega \text{ cm}$	Thermal conductivity $\text{W.m}^{-1}.\text{K}^{-1}$	Young modulus E GPa	Shear modulus G GPa
0-100	15.8	20	68	0.85	450	195	75
0-300	16.5	200	392	-	-	182	70
0-500	17.3	400	752	-	-	166	66

## Corrosion resistance

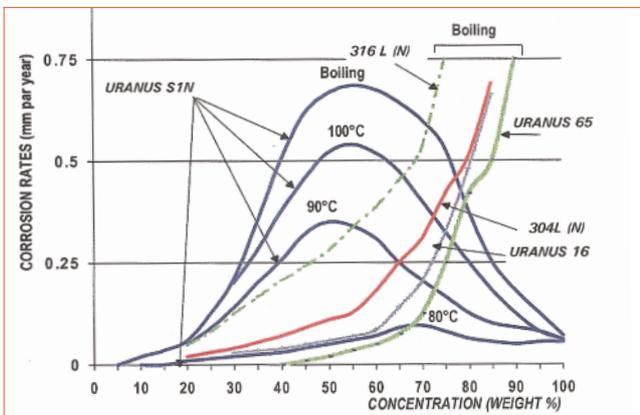
Because of its high chromium content, UR 65 has an excellent resistance in boiling nitric acid solutions of less than about 70% concentration.

In these conditions, the alloy behaves much better than 304 L grade.

Moreover, thanks to the close control of impurities such as carbon, silicon, phosphorus which are known to be deleterious to the resistance of stainless steels in nitric acid solutions in the sensitized condition, UR 65 grade performs very well in HNO<sub>3</sub> solution up to 70%.

Nitric acid solutions containing Cr<sup>VI</sup> species are much more oxydant than usual HNO<sub>3</sub> solutions. In those cases, UR 65 is normally not to be used. Please, contact us for more information.

UR 65 melts are optimised to improve corrosion resistance in nitric acid solutions, even after welding.



Corrosion rates of solution annealed stainless steels in nitric acid solutions

### ■ Huey tests

A262 Practice C - 5 x 48 hours

#### Corrosion rate (mm/year)

Without sensitization	After 1 hour at 675 °C	After 0.5 hour at 700 °C + Slow cooling (50 °C/h)
< 0.15 (6 mpy)	< 0.20 (8 mpy)	< 0.25 (10 mpy)

### ■ Pitting

UR 65 has approximately the same pitting corrosion resistance as 316L.

## Fabrication

### Heat treatment

1100/1150°C (2010/2100°F) followed by rapid cooling.

### Forming

Cold forming is easy as for all austenitic steels. Cold forming does not impair the corrosion resistance and no heat treatment is required after cold forming.

### Cutting

The preferred methods of cutting are shearing or plasma cutting.

### Machining

Similar to austenitic steels

Operation	Tool	Lubrication	Conditions					
			Blade width mm	Blade width - in	Feed - mm/t	Feed - in/t	Speed - m/min	Speed - ft/min
Parting off	High speed steel	Cutting oil	1.5	.06	.03	.0012	10-13	32.8-42.7
			3	.11	.04	.0016	11-14	36.1-45.9
			6	.23	.05	.0020	12-15	39.4-49.2
Drilling	High speed steel	Cutting oil	Drill Ø mm	Drill Ø in	Feed - mm/t	Feed - in/t	Speed - m/min	Speed - ft/min
			1.5	.06	.025	.0010	6-10	19.7-32.8
			3	.11	.06	.0024	7-11	23-26.1
			6	.23	.08	.0031	7-11	23-26.1
12	.48	.10	.0039	7-11	23-26.1			
Milling Profiling	High speed steel	Dry or Cutting oil			Feed - mm/t	Feed - in/t	Speed - m/min	Speed - ft/min
					.05-.10	.002-.0039	10-20	32.8-65.6

## Welding

The welding of fully austenitic material requires precautions against hot cracking.

- manganese addition in the filler wire,
- low heat input (< 15 KJ/cm)
- controlled welding conditions
- prevention of deformations during welding.

From the corrosion resistance point of view, GTAW/TIG welding is the preferred method and welds in contact with the corrosive solution should preferably be welded using this method.

Welding materials :

TIG - MIG            FP SOUDAGE URANUS 65  
                             SPRINT METAL SOUDINOX 65

ELECTRODE        SOUDOMETAL SOUDINOX S65  
                             UTP 6825.Lc Kb

Our welding research centre provides technical assistance for the welding of UR 65.

## Applications

UR 65 is used in all processes involving hot nitric acid up to 70 % concentration (14 N). (solutions free of Cr<sup>VI</sup> species or other very oxydizing species):

- Production of nitric acid,
- Ammonium nitrate production,
- Nuclear fuel reprocessing
- Hydrofluoric pickling.

## Size range

	Hot rolled plates	Clad plates
Thickness	5 up to 150 mm <i>3/16" to 6"</i>	6 up to 150 mm <i>1/4" to 6"</i>
Width	Up to 3300 mm <i>Up to 130"</i>	Up to 3300 mm <i>Up to 130"</i>
Length	Up to 12000 mm <i>Up to 39ft</i>	Up to 14000 mm <i>Up to 46 ft</i>

Other sizes are available on request, including 4100mm (161.4") width plate.

For any information,  
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This technical data and information represents our best knowledge at the time of printing. However, it may be subject to some slight variations due to our ongoing research programme on corrosion resistant grades.

We therefore suggest that information be verified at time of enquiry or order.

Furthemore, in service, real conditions are specific for each application. The data presented here is only for the purpose of description and may only be considered as guarantees when our company has given written formal approval.