Industeel

ArcelorMittal

UR™ 65

UR™ 65: A 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...)

PROPERTIES

STANDARDS

> EURONORM: EN 1.4335 X1 Cr Ni 25-21

> ASTM: 310L NAG

CHEMICAL ANALYSIS - WEIGHT %

Typical values

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

PHYSICAL PROPERTIES

Density: 7.9 kg/dm³

Interval temperature (°C)	Thermal expansion ($\alpha x10^{-6} K^{-1}$)	T °C (°F)	Resistivity (µΩ.cm)	Thermal conductivity ($W.m^{-1}.K^{-1}$)	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

MECHANICAL PROPERTIES

Tensile properties - Minimum guaranteed values

°C	°F	Y.S. 0.2%		Y.S. 1%		UTS		Elongation
		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

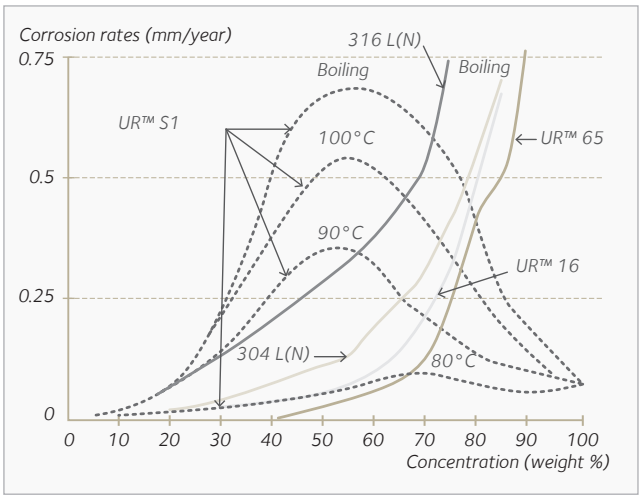
Impact value

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

IN SERVICE CONDITIONS

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_3 solution up to 70%. Nitric acid solutions containing CrVI species are much more oxydant than usual HNO_3 solutions. In those cases, UR™ 65 is normaly 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.



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.

Corrosion rates of solution annealed stainless steels in nitric acid solutions

DELIVERY CONDITIONS

SIZE RANGE

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

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

PLATE PROCESSING

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 prefered methods of cutting are shearing or plasma cutting.

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

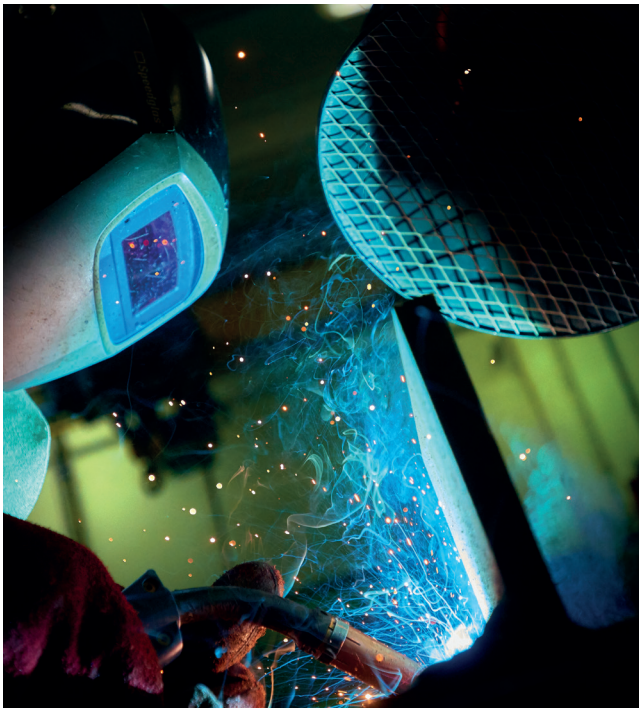
> prevention of deformations during welding

From the corrosion resistance point of view, GTAW/TIG welding is the prefered 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.



MACHINING

Similar to austenitic steels

Operation	Tool	Lubrication	CONDITIONS		
			Blade width mm (inch)	Feed mm/t (inch/t)	Speed m/min (feet/min)
Parting off	High speed steel	Cutting oil	1.5 (0.06)	0.03 (0.0012)	10 - 13 (32.8 - 42.7)
			3 (0.11)	0.04 (0.0016)	11 - 14 (36.1 - 45.9)
			6 (0.23)	0.05 (0.0020)	12 - 15 (39.4 - 49.2)
			Drill Ø mm (inch)	Feed mm/t (inch/t)	Speed m/min (feet/min)
Drilling	High speed steel	Cutting oil	1.5 (0.06)	0.025 (0.0010)	6 - 10 (19.7 - 32.8)
			3 (0.11)	0.06 (0.0024)	7 - 11 (23 - 26.1)
			6 (0.23)	0.08 (0.0031)	7 - 11 (23 - 26.1)
			12 (0.48)	0.10 (0.0039)	7 - 11 (23 - 26.1)
				Feed mm/t (inch/t)	Speed m/min (feet/min)
Milling profiling	High speed steel	Cutting oil		0.05 - 0.10 (0.002 - 0.0039)	10 - 20 (32.8 - 65.6)

APPLICATIONS

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

> Production of nitric acid

> Ammonium nitrate production

> Nuclear fuel reprocessing

> Hydrofluoric pickling

YOUR CONTACTS

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