URANUS® S1

A 4 % Si, Austenitic stainless steel resistant to nitric acid solutions

Research carried out in about the last fifteen years in CREUSOT LOIRE INDUSTRIE laboratories shows that a strong addition of silicon to austenitic stainless steels of the 18/10 type has a favourable influence on resistance to transpassive intergranular corrosion.

This type of corrosion develops particularly in very concentrated nitric environments (> 90 %) up to boiling point, also in strongly oxydising nitric environments (oxidising ions present such as : hexavalentchronic pentalivalent vanadium - ferritic salts etc...)

Our URANUS® S1 steel grade puts in a concrete form the results of our research in this domain.

STANDARDS

EURONORM ..... X1 Cr Ni Si 18.15.4
AFNOR ..... Z1 CNS 17.15
DIN ..... W. Nr 1.4361
ASTM..... UNS S30 600

CHEMICAL ANALYSIS

Typical values (%)

C	Cr	Ni	Mo	N	Others
≤ .015	17	14.5	-	-	Si = 4
PREN = [Cr %] + 3.3 [Mo %] + 16 [N %] ≥ 17					

MECHANICAL PROPERTIES

Tensile properties - Minimum guaranteed values

℃	Rp 0.2 MPa	Rp 1.0 MPa	Rm MPa	℉	YS 0.2% KSI	YS 1.0% KSI	UTS KSI	Elongation %
20	240	260	540	*68*	35	38	78	45
100	185	210	490	*212*	27	31	71	45
200	140	175	450	*392*	21	25	65	45
300	125	155	420	*572*	18	22	61	40
400	115	150	150	*752*	17	22	58	40

PHYSICAL PROPERTIES

Density : 7700 kg/m^3

Interval Temper ℃	Thermal expansion ax10 $^{-6}$K^{-1}	℃	℉	Resistivity (μΩ cm)	Thermal conductivity (W.m^{-1}.K^{-1})	Specific heat (J.kg-1.K^{-1})	Young modulus E (GPa)	Shear modulus G (GPa)
20-100	16.5	20	68	75	15,1	500	200	77
20-300	18	200	392	-	-	520	186	71
20-500	19	400	752	-	-	540	172	65

FABRICATION

Forming

Hot forming
Forming temperature 1150/900℃ (2100/1650℉) (remov al of grease in oxidising environment necessary) in order to avoid all risks of recarburation.

Cold forming
Easy with all current methods : bending, profiling, stamping.

Heat treatment

Solution annealing at 1100/1150℃ (2010/2100℉) - c ooling in water (holding time 1 to 2 min. per mm of plate thickness oxidising environment).

Welding

Welding URANUS® S1 requires well qualified welders. It is carried out both TIG and MIG processes (recommended technique) with our welding filler metal SOUDINOX S1) and under inert gas protection.

Arc extingnishess are indispensable to avoid craters. It is also necessary to adapt speed and compatible amperage in order to limit the temperature between passes.

Heat treatment after welding is not necessary. For very severe conditions of use, it could be advisable.

However, pickling after welding is necessary and then continue immediately with a passivation treatment.

For any further information, please contact our technical assistance specialists

Cutting

All classical mechanical or thermal processes for stainless steels.

CORROSION PERFORMANCES

Pickling

This can be carried out using the following process :
nitrohydrofluoric bath HNO3 15 % (volume) HF (3 %) volume water immersion for a few hours at 20°C - 30 mins at 60°C careful rinsi ng in water.

Decontamination - Passivation

Nitric bath HNO3 25 % in volume for 30 mins at 20° C (or 10 min. at 50°C) washing in water.

Resistance to corrosion

URANUS® S1 has a chemical composition adapted to work in the transpassive zone. It resists perfectly to intergranular corrosion.

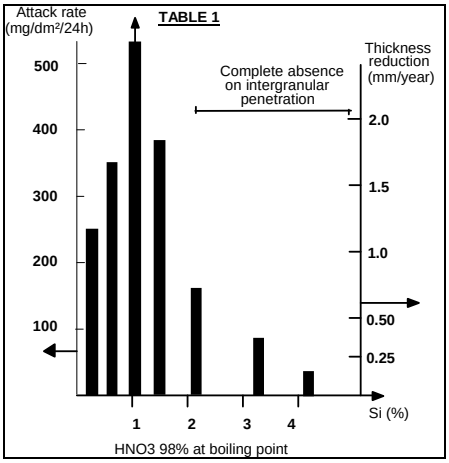
Nitric acid

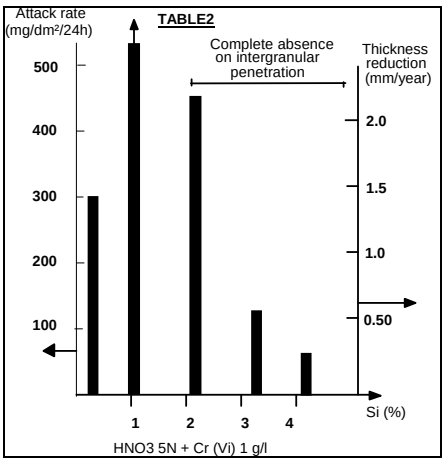
- 98 % at ambient
- 98 % boiling
- 28 % boiling + 1g/l of hexavalent chrome
- 28 % boiling + 1g/l of trivalent chrome

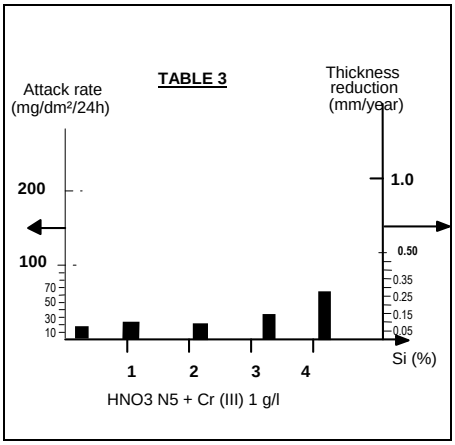
General corrosion rate

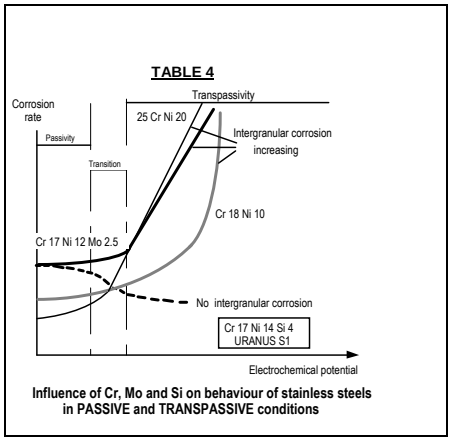
Pratically non-existent
≤ 0,20 mm/year (Table 1)
≤ 0,30 mm/year (Table 2)
≤ 0,30 mm/year (Table 3)
with no trace of intergranular corrosion

The graphs below show the influence of silicon content for a Cr 16 % Ni , the content increasing from 0,1 to 4,2 %









APPLICATIONS

Mineral chemistry	Production of concentrated HNO_3
Organic chemistry	Use of concentrated HNO_3 (nitration)
Nuclear industry	Evaporator working in nitric environment, to concentrate products of fusion
Metallurgical industry	Tanks - equipment destined for nitrogen sulphite mixtures
Chemical industry	Chrome sulphite mixtures, very oxyding solutions
Explosive industry	
Aerospatial industry	rocket tanks
Galvanotechnology	

SIZE RANGE

	Hot rolled plates	Cold rolled plates	Clad plates
Thickness	5 to 150 mm 3/16" to 6"	2 to 14 mm 5/64" to 5/8"	6 to 150 mm 1/4" to 6"
Width	Up to 3300 mm Up to 130"	Up to 2300 mm Up to 90.5"	Up to 3300 mm Up to 130"
Length	Up to 12000 mm Up to 472"	Up to 8250 mm Up to 325"	Up to 14000 mm Up to 551"

Other sizes are available on request, including 4100mm (161,4") width plates

NOTE

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.
Furthermore, 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.

Further information may be obtained from the following address.

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