NAS 254N (UNS S32053)

NAS High Corrosion Resistant Super Stainless Steel

NAS 254N (SUS 836L, UNS S32053, ASME Code Case 2445-2) is a high corrosion resistance austenitic stainless steel with a high nickel, high chromium, high molybdenum alloy design, and provides excellent corrosion resistance in severe corrosion environments such as high temperature seawater. Depending on the environment, this stainless steel offers high economy combined with corrosion resistance comparable to that of Nickel alloy and pure titanium. Nippon Yakin supplies this product in plate, sheet and strip form.

Steel Grade/Standard

NAS	JIS G4304/4305	ASTM A240	EN
NAS 254N	SUS 836L	UNS S32053	—

Chemical Composition

[wt %]

	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification (SUS 836L)	≦0.030	≦1.00	≦2.00	≦0.045	≦0.030	24.00~ 26.00	19.00~ 24.00	5.00~ 7.00	≦0.25
Specification (UNS S32053)	≦0.030	≦1.00	≦1.00	≦0.030	≦0.010	24.0~ 26.0	22.0~ 24.0	5.0~ 6.0	0.17~ 0.22

Physical Properties

Density	[g/cm³]		8.06
Specific heat	[J/kg · K]		460
Electrical resistivity	[μΩ · cm]		93.1
Thermal conductivity	[W/m · K]		10.9
Average coefficient of thermal expansion	[10^{-6}/°C]	30~200°C	14.9
		30~300°C	15.5
		30~400°C	16.0
Young's modulus	[MPa]		18.8 × 10^4
Magnetism			None
Melting range	[°C]		1330~1390

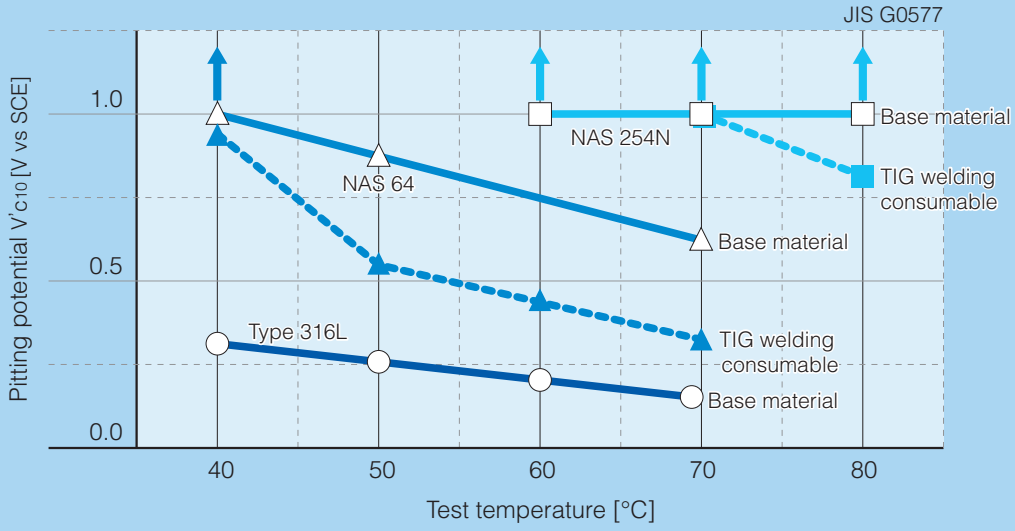
NIPPON YAKIN KOGYO CO., LTD.

Corrosion Resistance

NAS 254N is a high Cr, high Mo stainless steel which provides excellent pitting corrosion resistance and crevice corrosion resistance in high Cl environments. As a high Ni steel, it also offers excellent stress corrosion cracking resistance.

Pitting Corrosion Resistance

Temperature dependency of pitting potential (in 3.5%NaCl, Ar degassing)



SCC Resistance

Test method: U-bending test piece, 2mmt, #400 finish

Conditions		Occurrence of SCC
$MgCl_2$	30% Boil, 300hr	**No SCC**
	35% Boil, 300hr	**No SCC**
	42% Boil, 300hr	**SCC**
20%NaCl + 1%$Na_2Cr_2O_7 \cdot 2H_2O$, 300hr Temp.105°C		**No SCC**

Atmospheric Corrosion Resistance

Atmospheric exposure test data (exposure period: 2 years)

Alloy	PRE	Inland environment (Hirakata)	Urban residential environment (Tokyo)	Coastal clean environment (Sotobo, Chiba)	Coastal industrial environment (Kawasaki)	Marine environment (splash conditions)
Type 304	18	○	△	×	×	×
Type 316	24	○	○	×	×	×
NAS 64	38	○	○	○	○	△
NAS 254N	44	○	○	○	○	○

* PRE (Pitting Resistance Evaluation) = %Cr+3.3×%Mo+16×%N

○ : Without corrosion
△ : With corrosion, maximum pit depth ≦ 15μm
× : With corrosion, maximum pit depth > 15μm

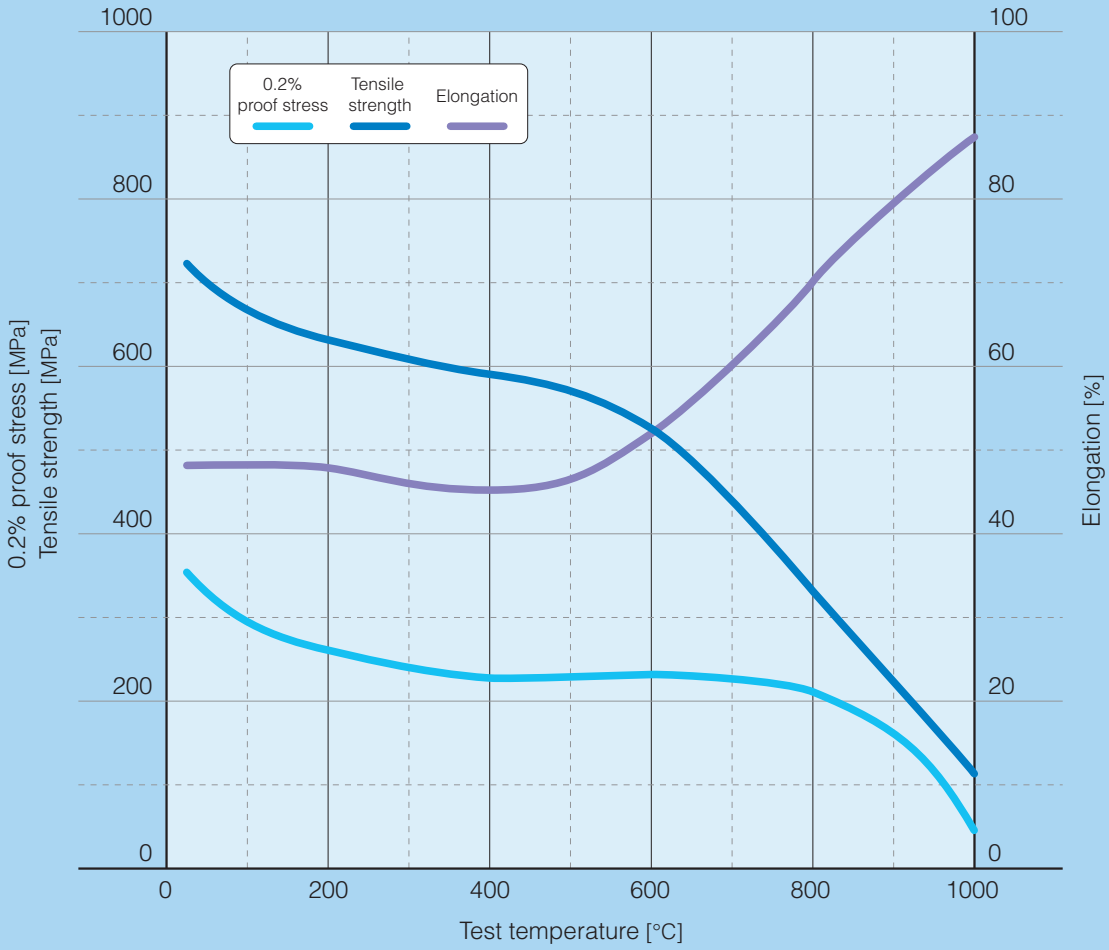
Mechanical Properties

Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [Hv]	Hardness [HB]
Specification (SUS 836L)		≧275	≧640	≧40	≦230	≦217
Specification (UNS S32053)		≧295	≧640	≧40	—	≦217
Example	Cold-rolled sheet 2mm^{t}	354	722	48	185	166
	Hot-rolled plate 6mm^{t}	377	744	49	—	176
	Hot-rolled plate 16mm^{t}	381	747	52	—	174

High Temperature Strength

Results of high temperature tensile test



Workability

The hot and cold workability of NAS 254N is basically the same as that of standard austenitic stainless steels such as Type 304, Type 316, etc. However, the fact that this is a high strength material must be considered in both cold and hot working.

Weldability

Various welding methods are applicable in the same manner as with the standard austenitic stainless steels, including shielded metal arc welding, TIG welding, and plasma welding. Alloy 276 welding consumable should be used.

Machinability

As a feature of high Ni stainless steels, although machining is difficult in comparison with the standard austenitic stainless steels, it is easier than with Ni-based alloys. A ultrahard tool should be used in machining if at all possible. It is also advisable to use a slower feed rate and deeper cutting depth.

Heat Treatment

Because NAS 254N is an austenitic stainless steel, heat treatment is equivalent to that with the standard austenitic stainless steels. The following heat treatment conditions are normally used:

Solution heat treatment: 1125~1175°C; Water cooling

Stress relief heat treatment: 450~550°C; Air cooling

Pickling

A mixture of nitric acid and hydrofluoric acid is used in pickling. However, due to the high corrosion resistance of NAS 254N, scale is somewhat difficult to remove in comparison with Type 304. Therefore, the material should be immersed in an alkaline solution before pickling, or if possible, shot blasting is extremely effective.

Applications

- Seawater environments: Marine structures, seawater desalination systems, heat exchangers using seawater, condenser tubes, etc.
- Chemical plants: PC manufacturing plants, bis-phenol A manufacturing plants, carbon black manufacturing plants, etc.
- Pulp and paper plants: Various types of bleaching systems, scrubbers, etc.
- Medical and pharmaceutical product plants: Centrifugal separators, reaction tanks, etc.
- Food product plants: Soy sauce fermentation tanks, salty mirin tanks, dressing manufacturing equipment, etc.
- Pollution prevention systems: Thermal power plant flue gas desulfurization plants, etc.

For more information, please contact:
Nippon Yakin Kogyo Co., Ltd.
Material Solutions Sales Department
San-Ei Bldg., 5-8, 1-chome Kyobashi, Chuo-ku, Tokyo 104-8365 Japan
TEL: +81-3-3273-4649 FAX: +81-3-3273-4642
E-Mail: inquiry@nyk.co.jp
URL: http://www.nyk.co.jp/en/

2011.6.9