

NAS254N (UNS S32053)

High Corrosion Resistant Super Stainless Steel

NAS254N (SUS836L, UNS S32053) 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 seawater. Depending on the environment, it can be an economical alternative to Nickel alloy and pure titanium. Nippon Yakin supplies this product in plate, sheet and strip form.

Steel Grade/Standard

Nippon Yakin Grade	JIS G 4304/4305	ASTM A240	EN
NAS254N	SUS836L	UNS S32053	—

Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	N	[wt %]
Specification (SUS836L)	≤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/cm ³]	8.06
Specific heat	[J/kg · K]	457
Electrical resistivity	[μΩ · cm]	94.7
Thermal conductivity	[W/m · K]	11.9
Average coefficient of thermal expansion [10 ⁻⁶ /[°C]]	30~100°C	14.6
	30~200°C	15.2
	30~300°C	15.5
	30~400°C	15.8
Young's modulus	[MPa]	19.7 × 10 ⁴
Magnetism		None
Melting range	[°C]	1330~1390



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Mechanical Properties

Mechanical Properties at Room Temperature

	0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	[HBW]	Hardness [HRBW]	[HV]
Specification (SUS836L)	≥275	≥640	≥40	≤217	≤96	≤230
Specification (UNS S32053)	≥295	≥640	≥40	≤217	≤96	—
Example	Cold-rolled sheet 2mm ^t	385	760	46	86	—
	Hot-rolled plate 16mm ^t	336	725	56	172	—

Corrosion Resistance

NAS254N 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

Alloy	ASTM G48 Method A		ASTM G48 Method C Critical pitting corrosion temperature CPT (°C)
	22°C	50°C	
NAS255	○	×	50
NAS329J3L	○	×	50
NAS64	○	○	55
NAS254N	○	○	80

Test conditions ASTM G48 Method A (○: No pitting corrosion, ×: Pitting corrosion)

- Test solution: 6%FeCl₃
- Test temperature: 22°C, 50°C (Recommended temperature in this test)
- Test time: 72h

ASTM G48 Method C

- Test solution: 6%FeCl₃ + 1%HCl
- Test time: 72h

Crevice Corrosion Resistance

Alloy	ASTM G48 Method D	
	Critical crevice corrosion temperature CCT (°C)	
NAS255	10	
NAS329J3L	25	
NAS64	30	
NAS254N	45	

Test conditions ASTM G48 Method D

- Test solution: 6%FeCl₃ + 1%HCl
- Test time: 72h

Stress Corrosion Cracking Resistance

Alloy	MgCl ₂ concentration (boiling point (°C) are in brackets)							
	45% (155°C)	42% (143°C)	40% (138°C)	38% (134°C)	35% (126°C)	30% (115°C)	25% (110°C)	20% (108°C)
NAS255	×	×	×	×	○	○	○	○
NAS329J3L	×	×	×	×	×	×	○	○
NAS64	×	×	×	×	×	×	○	○
NAS254N	×	×	×	○	○	○	○	○

Test conditions

- Immersion in boiling MgCl₂ solution
- Test time: 300h
- U-bend test specimen is used.

○: No stress corrosion cracking

×: Stress corrosion cracking

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
NAS255	<0.01	<0.01	0.78	2.95	0.48	5.01
NAS329J3L	0.01	0.17	4.65	365.9	1456	106.4
NAS64	<0.01	0.02	1.07	191.9	1054	60.72
NAS254N	0.02	0.05	1.02	2.11	2.16	7.76

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
NAS255	<0.01	0.01	2.70	3.72
NAS329J3L	0.02	0.03	31.10	60.62
NAS64	0.01	0.01	12.94	30.51
NAS254N	0.01	0.02	0.01	9.14

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
NAS255	SUS890L	N08904	20Cr-24Ni-4.3Mo-1.5Cu
NAS329J3L	SUS329J3L	S32205	22Cr-5.3Ni-3.2Mo-0.16N
NAS64	SUS329J4L	S32506	25Cr-6.5Ni-3.3Mo-0.17N
NAS254N	SUS836L	S32053	23Cr-25Ni-5.5Mo-0.2N

Workability

The hot and cold workability of NAS254N 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

Solution annealing of NAS254N should be performed at the temperature range from 1130 to 1180°C followed by being quenched in water or rapidly cooled by other means. (Conditions provided in ASTM A480/A480M)

Pickling

A mixture of nitric acid and hydrofluoric acid is used in pickling. However, due to the high corrosion resistance of NAS254N, 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

Food manufacturing plants, Salt manufacturing plants, Pharmaceutical plants, Chemical plants, Flue gas desulfurization plants, Marine structures, Environment-related equipment, Heat exchangers, Various types of bleaching equipment.

For more information, please contact:

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