

# NAS 354N (UNS N08354)

## NAS High Corrosion Resistant Super Stainless Steel

NAS 354N (UNS N08354, ASME Code Case 2585-1) is a super austenitic stainless steel with excellent corrosion resistance in various environments. The high chromium, molybdenum and nitrogen contents provide high resistance to crevice and pitting corrosion in oxidizing chloride environments while the high nickel content enhances resistance to stress corrosion cracking. The corrosion resistance of NAS 354N exceeds the conventional 6 Mo super austenitic stainless steels because of containing 7.5% Mo. Nippon Yakin supplies this product in plate, sheet and strip form.

### Steel Grade/Standard

NAS	JIS	ASTM B625	EN
NAS 354N	—	UNS N08354	—

### Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	N
Specification (UNS N08354)	≤0.030	≤1.00	≤1.00	≤0.030	≤0.010	34.0~36.0	22.0~24.0	7.0~8.0	0.17~0.24

### Physical Properties

Density	[g/cm <sup>3</sup> ]	8.16
Specific heat	[J/kg · K]	454
Electrical resistivity	[μΩ · cm]	105.6
Thermal conductivity	[W/m · K]	11.3
Average coefficient of thermal expansion [10 <sup>-6</sup> /°C]	30~100°C	14.0
	30~200°C	14.4
	30~300°C	14.7
	30~400°C	15.1
Young's modulus	[MPa]	19.4 × 10 <sup>4</sup>
Magnetism		None
Melting range	[°C]	1362~1391

## Mechanical Properties

### Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness	
					[Hv]	[HRB]
Specification (UNS N08354)		≥295	≥640	≥40	—	—
Example	Cold-rolled sheet 2mm <sup>t</sup>	393	795	52	188	89

## Corrosion Resistance

NAS 354N 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
	22°C	50°C	Critical pitting corrosion temperature CPT (°C)
NAS 329J3L	○	×	50
NAS 64	○	○	55
NAS 185N	○	○	70
NAS 254N	○	○	80
NAS 354N	○	○	103

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

- Test solution: 6%FeCl<sub>3</sub>
- Test temperature: 22°C, 50°C (Recommended temperature in this test)
- Test time: 72h

ASTM G48 Method C

- Test solution: 6%FeCl<sub>3</sub> + 1%HCl
- Test time: 72h

### Crevice Corrosion Resistance

Alloy	ASTM G48 Method D
	Critical crevice corrosion temperature CCT (°C)
NAS 329J3L	25
NAS 64	30
NAS 185N	40
NAS 254N	45
NAS 354N	60

Test conditions ASTM G48 Method D

- Test solution: 6%FeCl<sub>3</sub> + 1%HCl
- Test time: 72h

## Stress Corrosion Cracking Resistance

Alloy	MgCl <sub>2</sub> 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)
NAS 329J3L	×	×	×	×	×	×	○	○
NAS 64	×	×	×	×	×	×	○	○
NAS 185N	×	×	×	×	○	○	○	○
NAS 254N	×	×	×	○	○	○	○	○
NAS 354N	×	○	○	○	○	○	○	○

Test conditions

- Immersion in boiling MgCl<sub>2</sub> 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%
NAS 329J3L	0.01	0.17	4.65	365.9	1456	106.4
NAS 64	<0.01	0.02	1.07	191.9	1054	60.72
NAS 185N	0.02	0.04	1.32	2.89	3.20	4.78
NAS 254N	0.02	0.05	1.02	2.11	2.16	7.76
NAS 354N	0.01	0.03	0.03	2.06	3.02	4.99

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
NAS 329J3L	0.02	0.03	31.10	60.62
NAS 64	0.01	0.01	12.94	30.51
NAS 185N	0.01	0.02	4.20	7.21
NAS 254N	0.01	0.02	0.01	9.14
NAS 354N	0.02	0.03	0.02	7.35

Test time: 24h

(Reference)

Nippon Yakin	JIS	UNS No.	Chemical composition
NAS 329J3L	SUS 329J3L	S32205	22Cr-5.3Ni-3.2Mo-0.16N
NAS 64	SUS 329J4L	S32506	25Cr-6.5Ni-3.3Mo-0.17N
NAS 185N	SUS 312L	S31254	20Cr-18Ni-6Mo-0.8Cu-0.2N
NAS 254N	SUS 836L	S32053	23Cr-25Ni-5.5Mo-0.2N
NAS 354N	—	N08354	23Cr-35Ni-7.5Mo-0.2N

**Workability**

The hot and cold workability of NAS 354N 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 NAS 354N is normally performed at the temperature range from 1125 to 1175°C followed by being quenched in water or rapidly cooled by other means.

**Pickling**

A mixture of nitric acid and hydrofluoric acid is used in pickling. However, due to the high corrosion resistance of NAS 354N, 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, heat exchangers using seawater etc.
- Food product plants: Dressing manufacturing equipment, etc.
- Incinerator: Waste gasification plant

**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.jp  
 URL: <http://www.nyk.co.jp/en/>

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