

# NAS 254NM (UNS N08367)

## NAS High Corrosion Resistant Super Stainless Steel

NAS 254NM (UNS N08367 equivalent) is a high corrosion resistant stainless steel with high contents of chromium and molybdenum, and provides excellent corrosion resistance under severe environments such as high temperature seawater and flue gas desulfurization plants. Depending on the environment, it is a highly economical stainless steel 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	ASTM A240/B688	EN
NAS 254NM	—	UNS N08367	—

### Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N
Specification* (UNS N08367)	≤0.030	≤1.00	≤2.00	≤0.040	≤0.030	23.5~ 25.5	20.0~ 22.0	6.0~ 7.0	≤0.75	0.18~ 0.25

\*ASTM A240

### Physical Properties

Density	[g/cm <sup>3</sup> ]	8.06
Specific heat	[J/kg · K]	451
Electrical resistivity	[μΩ · cm]	94.4
Thermal conductivity	[W/m · K] 20°C	11.9
Average coefficient of thermal expansion [10 <sup>-6</sup> /°C]	20~100°C	14.8
	20~200°C	15.3
	20~300°C	15.6
	20~400°C	15.9
Young's modulus	[MPa]	19.8 × 10 <sup>4</sup>
Magnetism		None
Melting range	[°C]	1360~1394

Mechanical Properties

Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HRB]
Specification* (UNS N08367)	Sheet and strip	≥310	≥690	≥30	≤100
	Plate	≥310	≥655	≥30	≤241 (HB)
Example	Hot-rolled plate 6.0mm <sup>t</sup>	422	770	49	207 (HB)

\*ASTM A240

Corrosion Resistance

Because NAS 254NM contains high concentrations of chromium and molybdenum and also contains nitrogen, it offers excellent pitting corrosion resistance and crevice corrosion resistance in chloride environments. NAS 254NM demonstrates excellent corrosion resistance under corrosion environments where it had been difficult to maintain corrosion resistance with conventional duplex stainless steels.

Pitting Corrosion Resistance

Alloy	ASTM G48 Method A		ASTM G48 Method C
	22°C	50°C	Critical pitting corrosion temperature CPT (°C)
NAS 255	○	×	50
NAS 329J3L	○	×	50
NAS 64	○	○	55
NAS 254NM	○	○	70

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 255	10
NAS 329J3L	25
NAS 64	30
NAS 254NM	45

Test conditions ASTM G48 Method D  
 • Test solution: 6%FeCl<sub>3</sub> + 1%HCl  
 • Test time: 72h

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
NAS 255	<0.01	<0.01	0.78	2.95	0.48	5.01
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 254NM	<0.01	0.03	0.79	2.58	1.82	7.66

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
NAS 255	<0.01	0.01	2.70	3.72
NAS 329J3L	0.02	0.03	31.10	60.62
NAS 64	0.01	0.01	12.94	30.51
NAS 254NM	0.01	0.02	0.01	8.08

Test time: 24h

(Reference)

Nippon Yakin	JIS	UNS No.	Chemical composition
NAS 255	SUS 890L	N08904	20Cr-24Ni-4.3Mo-1.5Cu
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 254NM	—	N08367	21Cr-24Ni-6Mo-0.2N

### Workability

Cold and hot workability are approximately equal to those of Type 304, 316, and other standard austenitic stainless steels. However, care is necessary for both cold and hot worked materials because they have high strength.

### Weldability

Possible welding methods include shielded metal arc welding, TIG welding, and plasma welding, in the same manner as with standard austenitic stainless steels. As welding consumables, Alloy 276 should be used. Preheating and post-welding heat treatment are not necessary.

### Machinability

As a distinctive feature of high Ni stainless steels, machinability is difficult in comparison with the austenitic stainless steels, but is easier than with Ni-based alloys. Use of a superhard tool whenever possible, together with a slow feed speed and large cut depth, is advised.

### Heat Treatment

Solution annealing of NAS 254NM should be performed at 1105°C and higher 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 NAS 254NM, 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: Seawater desalination equipment, heat exchangers using seawater, condenser tubes, etc.
- High concentration chloride ion environments: Flue gas desulfurization systems, pulp and papermaking industries, various types of bleaching equipment, etc.
- High concentration salt-containing environments: Resin manufacturing equipment, chemical reactors and piping, etc.

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