# **NAS254NM** (UNS N08367) High Corrosion Resistant Super Stainless Steel

NAS254NM (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.

Nippon Yakin Grade			JIS			ASTM A240/B688			EN		
NAS254NM			-			UNS N08367			_		
Chemical Composition									[wt %]		
	С	Si	Mn	Р	S	Ni	Cr	Мо	Cu	N	
Specification*	≦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**

Steel Grade/Standard

Density	[g/cm <sup>3</sup> ]		8.06
Specific heat	[J/kg · K]		451
Electrical resistivity	$[\mu\Omega\cdot cm]$		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 at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HRBW]	
Specification* (UNS N08367)		Sheet and strip	≧310	≧690	≧30	≦100
		Plate	≧310	≧655	≧30	≦241 (HBW)
Example	Hot-ro	olled plate 6.0mm <sup>t</sup>	422	770	49	207 (HBW)

\*ASTM A240

# **Corrosion Resistance**

Because NAS254NM contains high concentrations of chromium and molybdenum and also contains nitrogen, it offers excellent pitting corrosion resistance and crevice corrosion resistance in chloride environments. NAS254NM demonstrates excellent corrosion resistance under corrosion environments where it had been difficult to maintain corrosion resistance with conventional duplex stainless steels.

• Test solution: 6%FeCl<sub>3</sub> + 1%HCl

#### Pitting Corrosion Resistance

Alloy		ASTM G48	B Method A	ASTM G48 Method C		
		22°C	50°C	Critical pitting corrosion temperature CPT (°C)		
NAS255		0	×	50		
NAS329J3L		0	×	50		
NAS64		0	0	55		
NAS254NM		0	0	70		
Test conditions	ASTM G48 Met	hod A (O: No pitting cor	rosion, ×: Pitting corrosi	on) ASTM G48 Method C		

Test conditions ASTM G48 Method A (O: 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

• Test time: 72h

# **Crevice Corrosion Resistance**

Allow	ASTM G48 Method D
AllOy	Critical crevice corrosion temperature CCT (°C)
NAS255	10
NAS329J3L	25
NAS64	30
NAS254NM	45

Test conditions ASTM G48 Method D

• Test solution: 6%FeCl<sub>3</sub> + 1%HCl

• Test time: 72h

# Acid Resistance

Allow	Corrosion rate in sulfuric acid at 80°C (mm/y)						
AllOy	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	
NAS254NM	< 0.01	0.03	0.79	2.58	1.82	7.66	

Test time: 24h

Allov	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		
NAS254NM	0.01	0.02	0.01	8.08		

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
NAS254NM	_	N08367	21Cr-24Ni-6Mo-0.2N



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.

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.

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.

Solution annealing of NAS254NM 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)

A mixture of nitric acid and hydrofluoric acid is used in pickling. However, due to the high corrosion resistance of NAS254NM, 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

Chemical plants, Flue gas desulfurization plants, Heat exchangers.

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