

NASNW276 (UNS N10276)

High Corrosion Resistant Nickel Alloy

NASNW276 is a Ni-Cr-Mo alloy with excellent corrosion resistance in both oxidizing and reducing atmospheres. In this alloy, carbide precipitation in the heat affected zone (HAZ) is suppressed and corrosion resistance is improved by reducing the contents of C and Si. Based on these features, NASNW276 is widely used in materials under severe environments such as chemical plants. Nippon Yakin supplies this product in plate, sheet and strip forms.

Grade/Standard

Nippon Yakin Grade	JIS G 4902	ASTM B575	DIN 17744/17750
NASNW276	NW0276	UNS N10276	2.4819

Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	Fe	Co	W	V
Specification (NW0276)	≤0.010	≤0.08	≤1.00	≤0.040	≤0.030	Bal.	14.50~16.50	15.00~17.00	4.00~7.00	≤2.50	3.00~4.50	≤0.35
Specification (UNS N10276)	≤0.010	≤0.08	≤1.0	≤0.04	≤0.03	Bal.	14.5~16.5	15.0~17.0	4.0~7.0	≤2.5	3.0~4.5	≤0.35

Physical Properties

Density	[g/cm ³]	8.90
Specific heat	[J/kg · K]	400
Electrical resistivity	[μΩ · cm]	130.0
Thermal conductivity	[W/m · K]	9.9
Average coefficient of thermal expansion [10 ⁻⁶ /°C]	20~100°C	12.1
	20~200°C	12.7
	20~300°C	13.0
	20~400°C	13.3
	20~500°C	13.5
Young's modulus	[MPa]	21.1 × 10 ⁴
Magnetism		None
Melting range	[°C]	1325~1369

Mechanical Properties

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HRBW]
Specification (NW0276)		≥275	≥690	≥40	—
Specification (UNS N10276)		≥283	≥690	≥40	—
Example	Hot-rolled plate 14mm ^t	372	763	71	83
	Cold-rolled sheet 2mm ^t	366	785	61	86

Corrosion Resistance

Pitting Corrosion Resistance

Alloy	ASTM G48 Method A		ASTM G48 Method C
	22°C	50°C	Critical pitting corrosion temperature CPT (°C)
NAS185N	○	○	70
NAS254N	○	○	80
NASNW276	○	○	>103

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

- Test solution: 6%FeCl₃
- Test temperature: 22°C, 50°C (Recommended temperature in this test)
- Test time: 72h
- Test solution: 6%FeCl₃ + 1%HCl
- Test time: 72h

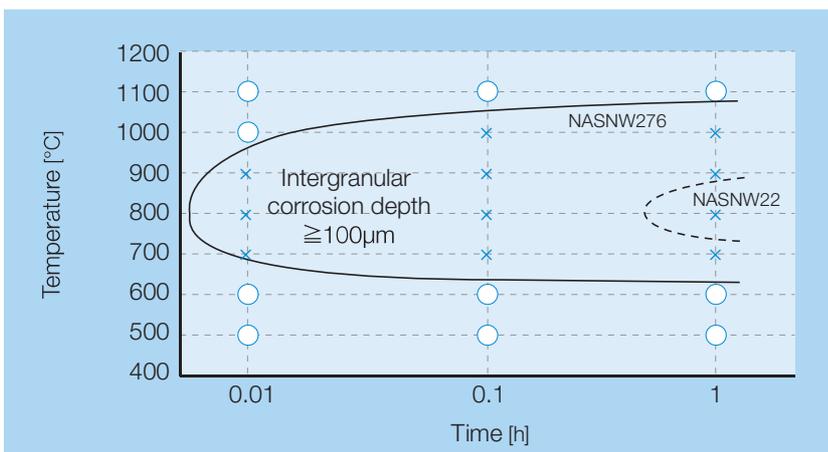
Crevice Corrosion Resistance

Alloy	ASTM G48 Method D
	Critical crevice corrosion temperature CCT (°C)
NAS185N	40
NAS254N	45
NASNW276	103

Test conditions ASTM G48 Method D

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

Intergranular Corrosion Resistance



Test conditions: ASTM G28 Method A
 Test time 24h,
 boiling 50%H₂SO₄ - Fe₂(SO₄)₃ solution

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)
NAS185N	x	x	x	x	○	○	○	○
NAS254N	x	x	x	○	○	○	○	○
NASNW276	○	○	○	○	○	○	○	○

- Test conditions
- Immersion in boiling MgCl₂ solution
 - Test time: 300h
 - U-bend test specimen is used.
- : No stress corrosion cracking
x: Stress corrosion cracking

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
NAS185N	0.02	0.04	1.32	2.89	3.20	4.78
NAS254N	0.02	0.05	1.02	2.11	2.16	7.76
NASNW276	0.01	0.02	0.03	0.05	0.08	0.03

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
NAS185N	0.01	0.02	4.20	7.21
NAS254N	0.01	0.02	0.01	9.14
NASNW276	<0.01	0.03	0.01	0.23

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
NAS185N	SUS312L	S31254	20Cr-18Ni-6Mo-0.8Cu-0.2N
NAS254N	SUS836L	S32053	23Cr-25Ni-5.5Mo-0.2N
NASNW276	NW0276	N10276	59Ni-15Cr-16Mo-4W-5Fe

Workability

Because the high-temperature strength of NASNW276 is extremely higher than that of Type 304, care is required when hot working. The cold workability of NASNW276 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 cold working.

Weldability

In welding, it is possible to apply ordinary welding methods in the same manner as with stainless steels. Matching composition welding consumables should be used. Post-weld heat treatment is not required.

Heat Treatment

Solution annealing of NASNW276 is normally performed at the temperature range from 1150 to 1170°C followed by being quenched in water or rapidly cooled by other means.

Pickling

A mixture of nitric acid and fluoric acid is used in pickling. However, because descaling is somewhat difficult in comparison with Type 304, alkali immersion before acid pickling, and if possible, shot blasting are extremely effective.

Applications

Chemical plants, Flue gas desulfurization plants, Oil and gas extraction, Heat exchangers.

For more information, please contact:

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