NAS825 (UNS N08825) High Corrosion Resistant Nickel Alloy

NAS825 (NCF825, UNS N08825) is a high-Ni nickel alloy with high corrosion resistance, and possesses extremely high corrosion resistance against oxidizing and non-oxidizing acids. Nippon Yakin supplies this product in plate, sheet and strip form.

Steel Grade/Standard

Nippon Yakin Grade	JIS G 4902	ASTM B424	DIN 17750
NAS825	NCF825	UNS N08825	2.4858

Chemical Composition

												[wt %]
	С	Si	Mn	Р	S	Ni	Cr	Fe	Мо	Cu	Al	Ti
Specification (NCF825)	≦0.05	≦0.50	≦1.00	≦0.030	≦0.015	38.00~ 46.00	19.50~ 23.50	Bal.	2.50~ 3.50	1.50~ 3.00	≦0.20	0.60~ 1.20
Specification (UNS N08825)	≦0.05	≦0.5	≦1.0	_	≦0.03	38.0~ 46.0	19.5~ 23.5	≧22.0	2.5~ 3.5	1.5~ 3.0	≦0.2	0.6~ 1.2

Physical Properties

Density	[g/cm ³]		8.14
Specific heat	[J/kg · K]	20°C	444
Electrical resistivity	[μΩ · cm]		112
Thermal conductivity	[W/m · K]		10.9
Average coefficient of thermal expansion	[10 ⁻⁶ /°C]	20~100°C	13.4
		20~200°C	14.1
		20~500°C	15.1
		20~900°C	16.9
Young's modulus	[MPa]		19.7×10^{4}
Magnetism			None
Melting range	[°C]		1370~1400

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Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HBW]
Sp	ecification (NCF825)	≧235	≧580	≧30	≦207
Sp	ecification (UNS N08825)	≧241	≧586	≧30	-
Ŭ	Cold-rolled sheet 1.0mm ^t	262	612	47	-
amp	Hot-rolled plate 8.0mm ^t	253	615	54	144
ble	Hot-rolled plate 33.5mm ^t	255	616	48	137

High Temperature Strength



Corrosion Resistance

Because NAS825 has high contents of chromium, molybdenum, and copper, it provides excellent general (overall) corrosion resistance against oxidizing and non-oxidizing acids. Corrosion resistance against sulfuric acid is particularly good. Due to its high contents of chromium, molybdenum, and nickel, pitting corrosion resistance, crevice corrosion resistance, and stress corrosion cracking (SCC) resistance under chloride environments are also excellent in comparison with Type 316L. Because the carbon content of NAS825 is held to an extremely low level, sensitization during welding is minimal, and this is also an alloy with low grain boundary corrosion sensitivity.

Pitting Corrosion Resistance

ASTM G48	B Method A	ASTM G48 Method C
22°C	50°C	Critical pitting corrosion temperature CPT (°C)
×	×	15
0	×	50
0	0	80
0	×	30
	ASTM G48 22°C × O O O	ASTM G48 Method A22°C50°C××○×○○○○○×

Test conditions

• Test solution: 6%FeCl₃

• Test temperature: 22°C, 50°C (Recommended temperature in this test)

ASTM G48 Method A (O: No pitting corrosion, ×: Pitting corrosion)

• 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)				
SUS316L	<-10				
NAS329J3L	25				
NAS254N	45				
NAS825	10				

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)					
	42% (143°C)	35% (126°C)	25% (110°C)	20% (108°C)		
SUS316L	×	×	×	0		
NAS329J3L	×	×	0	0		
NAS254N	×	0	0	0		
NAS825	×	0	0	0		

Test conditions $\hfill \bullet$ Immersion in boiling MgCl_2 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%	
SUS316L	1.67	4.69	71.91	764.9	704.5	33.74	
NAS329J3L	0.01	0.17	4.65	365.9	1456	106.4	
NAS254N	0.02	0.05	1.02	2.11	2.16	7.76	
NAS825	0.01	0.03	0.30	0.21	0.23	0.73	

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)					
	0.1%	1%	2%	3%		
SUS316L	0.02	2.73	6.75	14.88		
NAS329J3L	0.02	0.03	31.10	60.62		
NAS254N	0.01	0.02	0.01	9.14		
NAS825	0.01	0.02	2.26	3.14		
				T 0.41		

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
SUS316L	SUS316L	S31603	17Cr-12Ni-2Mo
NAS329J3L	SUS329J3L	S32205	22Cr-5.3Ni-3.2Mo-0.16N
NAS254N	SUS836L	S32053	23Cr-25Ni-5.5Mo-0.2N
NAS825	NCF825	N08825	40Ni-23Cr-3Mo-2Cu-0.7Ti



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 URL: https://www.nyk.co.jp/en/

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