

NAS625 (UNS N06625)

NAS Corrosion-Resistant and Heat-Resistant Nickel Alloy

NAS625 (NCF625, UNS N06625) is a nickel-chromium-molybdenum alloy with an additional of niobium. Matrix stiffening provided by molybdenum and niobium results in high strength. The alloy resists a wide range of severe corrosion environments. It also offers resistance to high temperatures. Uses include parts in chemical and garbage incinerator plants. Nippon Yakin supplies this product in plate, sheet, and strip forms.

Grade/Standard

NAS	JIS G4902	ASTM B443	EN
NAS625	NCF625	UNS N06625	—

Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	Al	Ti	Fe	Co	Nb+Ta
Specification (NCF625)	≤0.10	≤0.50	≤0.50	≤0.015	≤0.015	≥58.00	20.00~23.00	8.00~10.00	≤0.40	≤0.40	≤5.00	—	3.15~4.15
Specification (UNS N06625)	≤0.10	≤0.50	≤0.50	≤0.015	≤0.015	≥58.0	20.0~23.0	8.0~10.0	≤0.40	≤0.40	≤5.0	≤1.0	3.15~4.15

Physical Properties

Density	[g/cm ³]	8.44
Specific heat	[J/kg · K]	419
Electrical resistivity	[μΩ · cm]	129
Thermal conductivity	[W/m · K]	10.2
Average coefficient of thermal expansion	[10 ⁻⁶ /°C]	20~200°C: 12.8 20~300°C: 13.1 20~400°C: 13.6
Young's modulus	[MPa]	20.7 × 10 ⁴
Magnetism		None
Melting range	[°C]	1290~1350

Mechanical Properties

Mechanical Properties at Room Temperature

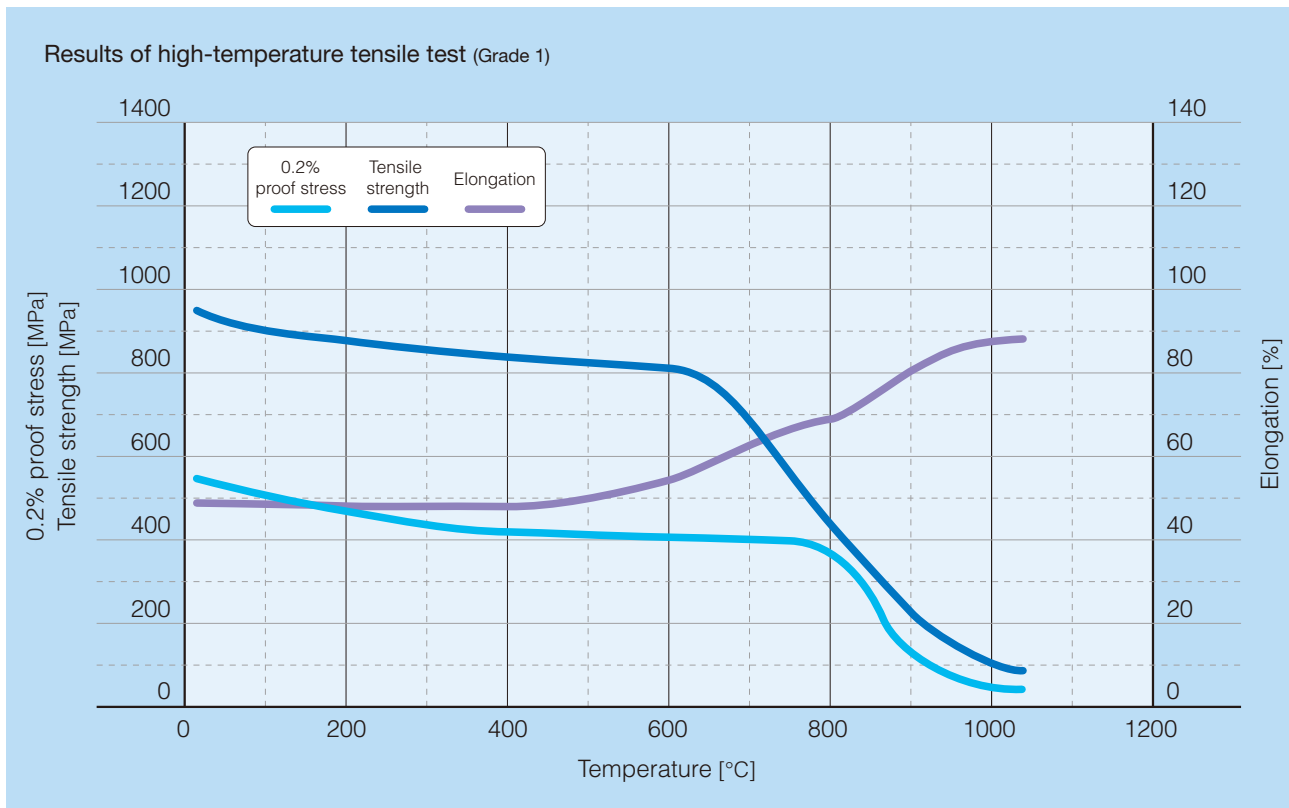
Grade 1 (annealed)

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness
Specification	>0.5mm ^t , ≤3.0mm ^t	≥415	≥830	≥30	—
NCF625 (annealing)	>3.0mm ^t , ≤70mm ^t	≥380	≥760	≥30	—
Specification	Cold-rolled sheet, strip	≥414	≥827	≥30	—
UNS N06625 Grade 1 (annealed)	Hot-rolled plate (≤70mm ^t)	≥379	≥758	≥30	—
	Cold-rolled sheet (≤9.5mm ^t)	≥379	≥758	≥30	—
Example	Hot-rolled plate 10mm ^t	421	837	54	HBW 212
	Cold-rolled sheet 3.2mm ^t	536	936	46	HRBW 98

Grade 2 (solution annealed)

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness
Specification	>0.5mm ^t , ≤70mm ^t	≥275	≥690	≥30	—
Specification	UNS N06625 Grade 2 (solution annealed)	≥276	≥690	≥30	—
Example	Hot-rolled plate 11mm ^t	407	826	62	HBW 201
	Cold-rolled sheet 2.5mm ^t	392	832	57	Hv 197

High Temperatures Strength



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
NAS825	○	×	30
NAS625*	○	○	> 103

*Grade 1

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

• Test solution: 6%FeCl₃

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

• 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)
NAS185N	40
NAS825	10
NAS625*	40

*Grade 1

Test conditions ASTM G48 Method D

• Test solution: 6%FeCl₃ + 1%HCl

• Test time: 72h

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
NAS825	0.01	0.03	0.30	0.21	0.23	0.73
NAS625*	<0.01	0.01	0.02	0.61	1.07	2.81

*Grade 1

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
NAS185N	SUS312L	S31254	20Cr-18Ni-6Mo-0.8Cu-0.2N
NAS825	NCF825	N08825	40Ni-23Cr-3Mo-2Cu-0.7Ti
NAS625	NCF625	N06625	62Ni-22Cr-9Mo-3.7Nb-0.2Ti-0.2Al

Workability

Because the high-temperature strength of NAS625 is extremely higher than that of Type304, care is required when hot working. The cold workability of NAS625 is basically the same as that of standard austenitic stainless steels such as Type 304, Type316, etc. However, the fact that this is a high strength material must be considered in cold 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. Susceptibility of NAS625 to solidification cracking is higher than that of Type304.

Heat Treatment

Annealing of NAS625 is normally performed at 871°C and higher followed by being quenched in water or rapidly cooled by other means.

Solution annealing of NAS625 is normally performed at 1093°C and higher 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 Type304, alkali immersion before acid pickling, and if possible, shot blasting are extremely effective.

Applications

Chemical plants, nuclear power, seawater applications, jet engine parts, aircraft material, heat treatment furnace material, evaporators

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