

NAS 800H/800T (UNS N08810/N08811)

NAS Heat-Resistant Nickel Alloy

NAS 800H (NCF 800H, UNS N08810)/NAS 800T (UNS N08811) are nickel-iron-chromium alloys that provide high strength and excellent resistance to oxidation and carburization at high temperatures. High creep strength is attained through control over crystal grains—via high temperature heat treatment, together with fine control over carbon, titanium, and aluminum content. Nippon Yakin provides this product in plate, sheet, and strip forms.

Grade/Standards

NAS	JIS G4902	ASTM B409	EN 10095
NAS 800H	NCF 800H	UNS N08810	1.4876
NAS 800T	—	UNS N08811	—

Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Cu	Al	Ti	Al+Ti	Fe
Specification (NCF 800H)	0.05~0.10	≦1.00	≦1.50	≦0.030	≦0.015	30.00~35.00	19.00~23.00	≦0.75	0.15~0.60	0.15~0.60	—	Bal.
Specification (UNS N08810)	0.05~0.10	≦1.0	≦1.5	—	≦0.015	30.0~35.0	19.0~23.0	≦0.75	0.15~0.60	0.15~0.60	—	≧39.5
Specification (UNS N08811)	0.06~0.10	≦1.0	≦1.5	—	≦0.015	30.0~35.0	19.0~23.0	≦0.75	0.15~0.60	0.15~0.60	0.85~1.20	≧39.5
Specification (EN 1.4876)	≦0.12	≦1.00	≦2.00	≦0.030	≦0.015	30.00~34.00	19.00~23.00	—	0.15~0.60	0.15~0.60	—	—

Physical Properties

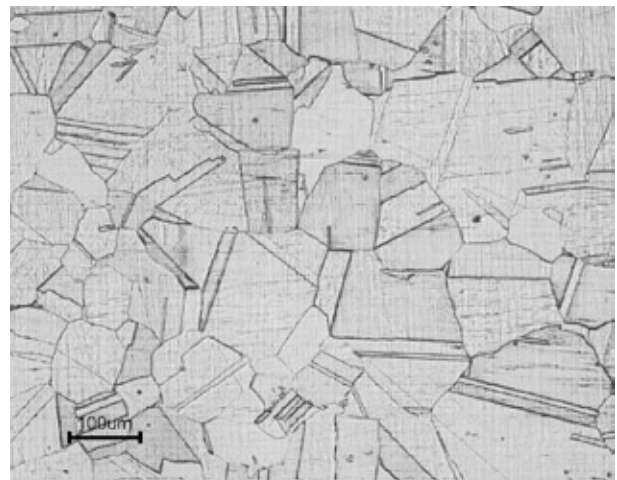
Density	[g/cm ³]	8.03
Specific heat	[J/kg · K]	460
Electrical resistivity	[μΩ · cm]	99.0
Thermal conductivity	[W/m · K]	12.6
Average coefficient of thermal expansion [10 ⁻⁶ /°C]	25~200°C	15.9
	25~400°C	16.8
	25~600°C	17.3
	25~800°C	18.1
Young's modulus	[MPa]	19.7 × 10 ⁴
Curie point	[°C]	-115
Magnetism		None
Melting range	[°C]	1357~1385

Properties at High Temperatures

	Thermal conductivity [W/m · K]	Average coefficient of thermal expansion [10 ⁻⁶ /°C]	Young's modulus [10 ⁴ MPa]
Room temperature	12.6	—	19.7
100°C	14.1	14.6	19.3
200°C	16.1	15.9	18.7
300°C	17.8	16.4	18.0
400°C	19.3	16.8	17.3
500°C	20.6	17.0	16.7
600°C	23.2	17.3	15.9
700°C	24.4	17.7	15.2
800°C	25.1	18.1	14.5
900°C	25.9	18.3	13.8
1000°C	26.7	18.6	13.1

Microstructure

	Heat Treatment	Crystal grain size
Specification (NCF 800H)	1100~1170°C	No.5 or coarser
Specification (UNS N08810)	≧1121°C	No.5 or coarser
Specification (UNS N08811)	≧1149°C	No.5 or coarser



Typical microstructure of NAS 800T
Grain size number = 3

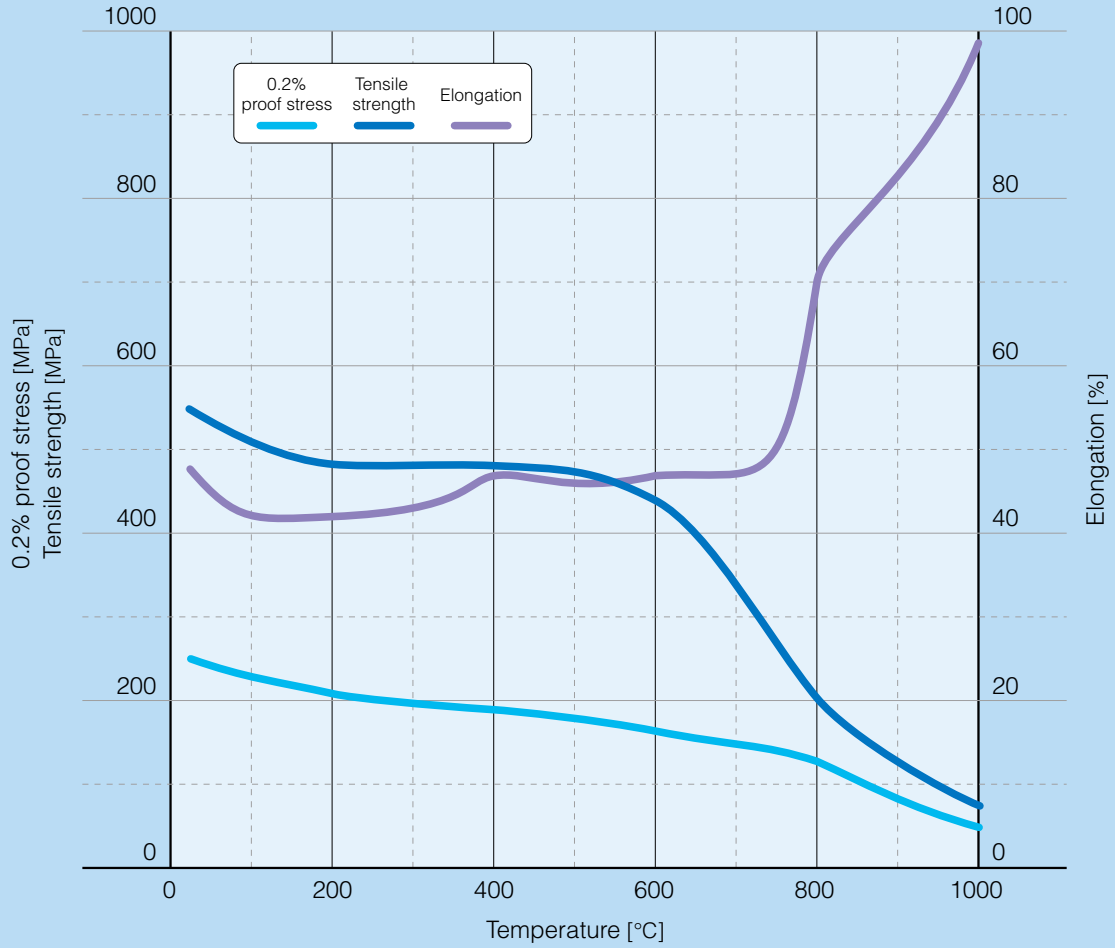
Mechanical Properties

Mechanical Properties at Room Temperature

	0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness	
				[Hv]	[HB]
Specification (NCF 800H)	≧ 175	≧ 450	≧ 30	≦ 171	≦ 167
Specification (UNS N08810)	≧ 170	≧ 450	≧ 30	—	—
Specification (UNS N08811)	≧ 170	≧ 450	≧ 30	—	—
Specification (EN 1.4876)	≧ 170	450~680	≧ 30	—	≦ 192

High Temperature Strength

Results of high-temperature tensile test



Creep Properties

Heat treatment	Temperature [°C]	Creep rupture strength [MPa]			Creep strength [MPa]	
		100hr	1000hr	10000hr	1%/10000hr	1%/100000hr
Solution treatment 1150°C	650	228	169	110	109	76
	704	162	110	73	54	39
	760	99	66	45	31	24
	816	64	42	25	22	16

Workability

Whether for hot working or cold working, NAS 800H/800T offer workability similar to austenitic stainless steels. For hot working, temperatures should be between 1000 and 1230°C, although light work may be done at temperatures as low as 850°C. To prevent cracks, we recommend avoiding the temperature range between 650 and 800°C. Although cold workability is similar to austenitic stainless steels, work hardening tends to be slightly lower.

Weldability

As with standard austenitic stainless steels, NAS 800H/800T may be welded using techniques such as TIG, MIG, and shield metal arc welding. AWS ERNiCr-3/AWS ENiCrFe-2 welding rods are often used.

Heat Treatment

NAS 800H/800T exhibit an austenite structure similar to austenitic stainless steels, and appropriate heat treatment procedures and requirements are similar. Typical heat treatments are as follows:

Solution treatment: 1100~1170°C; rapid cooling

For applications requiring creep rupture strength in high-temperature environments, the following ASTM B409 heat treatment may be used:

Solution treatment:

1121°C minimum (UNS N08810)

1149°C minimum (UNS N08811)

Properties at High Temperatures

Because of its high nickel and chromium content, NAS 800H/800T resist oxidation and carburization at high temperatures. NAS 800H/800T are superior to Type 310S and approach NAS 600 in resistance to oxidation. Offering superior high-temperature strength nearly equal to NAS 600, NAS 800H/800T are widely used in applications requiring heat resistance, as they do not become brittle due to sigma phase precipitation during use. While NAS 800 is generally used at temperatures below 600°C, NAS 800H/800T are recommended for applications requiring superior creep properties at higher temperatures.

Corrosion Resistance

NAS 800H/800T offer superior corrosion resistance in oxidizing corrosive environments such as nitric acid or nitric acid-sulfuric acid. Likewise, they perform well in sodium salt and other molten salt environments, with stress corrosion cracking resistance surpassing standard austenitic stainless steels.

Applications

NAS 800H/800T are widely used in chemical plants, heat treatment furnaces and other high-temperature environments.

For more information, please contact:

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