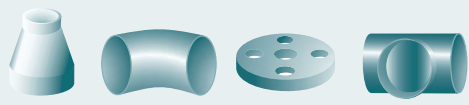


Specifications Alloys 800H/HT

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Alloys 800H and 800HT

Alloy 800H (UNS N08810) is an austenitic high-strength solid-solution nickel-iron-chromium alloy with controlled levels of carbon, aluminium, titanium, silicon and manganese and controlled content of (Al+Ti).

The analysis is similar to that of Alloy 800, but a special solution treatment (with grain sizes $\geq 90\mu\text{m}$ /ASTM No.4) gives significantly increased creep-rupture strength above 600°C (1110°F).

For services below 600°C (1110°F) the use of soft annealed Alloy 800 is suggested.

These alloys are characterised by:

- good creep-rupture properties at temperatures above 600°C (1110°F) without loss of ductility during long term use at temperatures below 700°C (1290°F), due to limitation of (Ti+Al) content to max 0.7%
- good resistance to reducing, oxidising and nitriding atmospheres and to atmospheres which alternate between reducing and oxidising conditions
- metallurgical stability in long-term application at high temperatures

Alloy 800HT (UNS N08811) is an austenitic high-strength solid-solution nickel-iron-chromium alloy with controlled levels of carbon, aluminium, titanium, silicon and manganese and increased content of (Al+Ti).

A special solution treatment (with grain sizes $\geq 90\mu\text{m}$ /ASTM No.4) gives highest creep-rupture strength above 700°C (1290°F) due to the precipitation of TiC.

Below 700°C (1290°F), gamma prime (γ') precipitates combined with a loss of ductility.

Alloy 800HT is characterised by:

- excellent creep strength at temperature above 700°C (1290°F)
- good resistance to reducing, oxidising and nitriding atmospheres and to atmospheres which alternate between reducing and oxidising conditions
- metallurgical stability in long-term application at high temperatures
- where frequent excursions to temperatures lower than 700°C (1290°F) during service cannot be excluded or parts of the material with run permanently at a regime below 700°C (1290°F) the use of Alloy 800H is recommended

Designation and Standards - Alloy 800H

Country National Standards	Material Designation	Chem. composition	Specification					
			Tube and pipe seamless	Tube and pipe welded	Sheet and plate	Rod and bar	Strip	Forgings
France AFNOR								
Germany DIN(provisional) VdTÜV	W.-Nr. 1.4958 X5NiCrAlTi3120	17459/460 412/434	17459 412/434		17460 412/434	17460 412/434	17460 412/434	17460 412/434
United Kingdom BS	NA 15 (H)		3074		3072	3076	3073	
USA ASTM	UNS N08810		B407	B163 B514/515	B409	B408	B409	B564
ASME			SB407	SB163/ 514/515	SB409	SB408	SB409	SB564
ISO	MC-FeNi32Cr21AlTi							

Designation and Standards - Alloy 800HT

Country National Standards	Material Designation	Chem. composition	Specification							
			Tube and pipe seamless	Tube and pipe welded	Sheet and plate	Rod and bar	Strip	Forgings		
France AFNOR										
Germany DIN(provisional) VdTÜV	W.-Nr. I.4959 X8NiCrAlTi32 2I	17459/460	17459			17460	17460	17460	17460	17460
United Kingdom BS										
USA ASTM ASME	UNS N08811		B407 SB407	B163 SB163	B409 SB409	B408 SB408	B409 SB409	B409 SB409	B564 SB564	B564 SB564
ISO										

Chemical Composition (%)

Alloy 800H	Ni	Cr	Fe	C	Mn	Si	Cu	P	S	Al	Ti	Al+Ti
min	30.0	19.0	bal.	0.06	0.5	0.2	-	-	-	0.20	0.20	-
max	32.0	22.0		0.08	1.0	0.6	0.5	0.015	0.010	0.40	0.50	0.7

Alloy 800HT	Ni	Cr	Fe	C	Mn	Si	Cu	P	S	Al	Ti	Al+Ti
min	30.0	19.0	bal.	0.06	0.5	0.2	-	-	-	0.30	0.30	0.85
max	32.0	22.0		0.10	1.0	0.6	0.5	0.015	0.010	0.60	0.60	1.2

Mechanical Properties

The following properties are applicable to the solution-treated condition and the indicated size ranges. Material outside these size ranges is subject to special enquiry. The values are valid for longitudinal and transverse specimens.

Sheet and strip	up to 3mm	1/8 in
Sheet and plate	up to 50mm	2 in
Tube	up to 200mm dia	8 in dia
Rod and bar, forgings	up to 250mm	10 in

Temp.		Tensile strength		0.2% Yield strength		1.0% Yield strength		Elongation A5 %	
°C	°F	N/mm ²	ksi	N/mm ²	ksi	N/mm ²	ksi	transverse	longitudinal
RT	RT	500	72.5	170	24.7	200	29.0	30	35
93	200	-	-	141	20.4	161	23.3		
100	212	<425>	-	140	20.3	160	23.2		
200	392	<400>	-	115	16.7	135	19.6		
204	400	-	-	113	16.4	133	19.3		
300	572	<390>	-	95	13.8	115	16.7		
316	600	-	-	93	13.5	113	16.4		
400	752	<380>	-	85	12.3	105	15.2		
427	800	-	-	83	12.0	103	14.9		
500	932	<360>	-	80	11.6	100	14.5		
538	1000	-	-	77	11.2	97	14.1		
593	1100	-	-	75	10.9	95	13.8		
600	1112	<300>	-	75	10.9	95	13.8		

170...according to VdTÜV no.412 and 434 and converted (N/mm² x 0.145=ksi)

141... values determined by graphs/diagrams <>informative only

Minimum short-time mechanical properties of Alloy 800H at room and elevated temperatures according to VdTÜV data sheets 412 and 434

Please Note: The figures quoted are intended for guidance only. For further information, please refer to the standards listed or contact our sales or QA Departments.

Metallurgical Structure

Alloy 800H and Alloy 800HT are austenitic, solid solution alloys containing small amounts of precipitated titanium nitride and carbide, carbonitrides and chromium carbide.

During long-term exposure of Alloy 800H to temperatures below 700°C (1290°F) γ' -phase may be formed which lowers the ductility.

Alloy 800HT precipitates γ' -phase combined with a loss of ductility.

Corrosion Resistance

The high nickel and chromium contents of Alloy 800H and Alloy 800HT ensure excellent resistance to oxidation. The alloys are also very resistant to carburisation, nitriding and oxidising sulphur-bearing atmospheres.

The protective oxide film which is formed is adherent in both static and cyclic conditions of heating and cooling, and resistance to carburisation is enhanced when a thin film of oxide is first formed on the alloy.

Resistance to hydrogen is excellent and Alloy 800H and Alloy 800HT are standard materials used in the production of hydrogen in steam / hydrocarbon reforming processes.

Applications

Due to high strength during long periods of service and resistance to carburisation and nitriding, Alloy 800H and 800HT have found many applications in steam/hydrocarbon reforming, for components such as: pigtails, headers/collectors/manifolds, transfer piping, catalyst tubes (in low-pressure processes) and quench-system piping.

Typical applications include:

- ethylene pyrolysis tubing in convection and radiant sections – resistance to carburisation and good mechanical properties
- ethylene dichloride cracking tubes – resistance to carburisation and to dry hydrogen chloride and chlorine