TECHNICAL DATA SHEET

ALLOY 800H/HT®

UNS N08810 & N08811 / W.Nr. 1.4958 & 1.4959

Description

Alloy 800H/800HT® are two individual solid solution strengthened, iron-nickel-chromium alloys. They are typically offered as one, dual certified alloy, meeting the chemical composition requirements of both alloys. The principle difference between alloys 800H and 800HT® is the restricted aluminum and titanium content in 800HT®, which results in higher creep and stress rupture properties. Both alloy 800H and 800HT® are generally considered to be superior to the base alloy 800 (UNS N08800) because of greater creep and stress rupture properties and a more restrictive C wt% range. Alloy 800H limits the C wt% from just 0.1% max in base alloy 800 to a 0.5% to 0.1% range. Alloy 800HT® further controls this by limiting the C wt% to 0.6% to 0.1%. There are also limitations on the grain size for alloy 800 H/HT® that are not in place for alloy 800.

Industries and Applications

Alloy 800H/800HT® is frequently used in applications that involve long-term exposure to elevated temperatures where resistance to oxidation, carburization and other types of elevated temperature corrosion is required. Heat treatment and power generation are two common industries where alloy 800 H/HT® is used. Typical applications include superheater and reheater tubing, headers, pigtails, outlet manifolds and sheathing for heating elements. Pressure vessels and vessel components constructed from 800H and 800HT® are approved under the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Resistance to Corrosion

The high nickel and chromium contents in alloy 800H/800HT® results in excellent resistance to oxidation, carburization and sulfidation. The high nickel content also increases the resistance to nitriding, although resistance could be lower than other alloys containing a higher percentage of nickel, such as alloy 600. Alloy 800H/800HT® has excellent resistance to nitric acid at concentrations up to 70% largely due to the chromium content. The alloy has good resistance to organic media like formic, acetic and propionic acids.

Fabrication and Heat Treatment

Hot-working temperatures should be between 1600°F and 2200°F with heavy forming to be performed at temperatures above 1850°F. No forming should be performed between 1200°F and 1600°F and preheating of tools and dies to 500°F is suggested to avoid chill. Cooling after hot working should be as quick as possible, avoiding extensive time at temperatures between 1000°F and 1400°F. Cold working should be performed on material in the annealed condition. Depending on the amount of strain induced by cold work during fabrication, an additional stress relieving or annealing heat treatment may be necessary. Because excessive grain growth can negatively affect mechanical properties, care must be taken in selecting an annealing temperature and time at temperature for the process. If material is to be deformed more than 20% and a final anneal is desired, fine-grain material should be considered for the starting stock.

Stress relief is performed between 1000°F and 1600°F and should be at temperature for 1 hour per inch of material or for a minimum of 1½ hours at 1600°F, whichever is greater. Recrystallization anneal is achieved at temperatures between 2100°F and 2200°F.

Chemical Composition (%)

(Fe) Iron	39.5 min
(Ni) Nickel	30.0 to 35.0
(Cr) Chromium	19.0 to 23.0
(Mn) Manganese	1.5 max
(Si) Silicon	1.0 max
(Cu) Copper	0.75 max
(Al) Aluminum	0.15 to 0.60
(Ti) Titanium	0.15 to 0.60
(C) Carbon	0.06 to 0.10
(P) Phosphorus	0.045 max
(S) Sulfur	0.015 max
Other	Al + Ti = 0.85 to 1.20

Mechanical Properties

Product Form	Tensile (min. ksi)	0.2% Yield (min. ksi)	Elong. (min. %)
Bar	65	25	30
Seamless Pipe & Tube	65	25	30

All properties in this table are for material in the solution annealed condition (hot worked and cold worked) and are from the governing ASTM specification.

Physical Properties[1]

Density @ Room Temp.	0.287 lb/in.³
Melting Temperature	2475°F to 2525°F
Specific Heat @ 70°F	0.11 Btu/lb•°F
Permeability @ 70°F for Annealed Material	1.014 (200 Oersted)
Curie Temperature	-175°F
Elastic Modulus @ 75°F (Tension)	28.50 X 10³ ksi
Elastic Modulus @ 1600°F (Tension)	19.20 X 10³ ksi
Electrical Resistivity @ 70°F	595 Ω•circ mil/ft
Electrical Resistivity @ 1800°F	776 Ω•circ mil/ft

1. The compositional range of Alloy 800H falls within the range of 800HT®, therefore there is no significant difference in physical properties.

The information contained in this technical data sheet is intended to be used as a guide and may be revised at any time without prior notice. The information is believed to be reliable and accurate, however Corrosion Materials does not make any warranty or assume any legal liability with respect to the accuracy, completeness or usefulness of the information.

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Aqueous Corrosion Data

Media	Common Name	Test Duration (days)	Corrosion Rate (mpy)
10% $C_2H_4O_2$	Acetic Acid	7	0.01 / no pitting
5% $Al_2(SO_4)_3 \cdot 18H_2O$	Aluminum Sulfate	7	0.01 / no pitting
5% NH_4Cl	Ammonium Chloride	42	0.02 / pitting after 42 days
10% NH_4OH	Ammonium Hydroxide	7	0.01 / no pitting
5% $(NH_4)_2 SO_4$	Ammonium Sulfate	7	nil / no pitting
10% $BaCl_2$	Barium Chloride	42	0.03 / pitting after 42 days
5% $CaCl_2$	Calcium Chloride	42	0.01 / pitting after 42 days
5% H_2CrO_4	Chromic Acid	7	1.6 / no pitting
10% $C_6H_8O_7$	Citric Acid	7	nil / no pitting
10% $CuSO_4$	Copper Sulfate	7	nil / no pitting
5% $FeCl_3$	Ferric Chloride	42	420 / pitting after 7 days
10% $C_3H_6O_3$	Lactic Acid	7	0.04 / no pitting
CH_3OH	Methanol	7	Nil / no pitting
10% $C_2H_2O_4$	Oxalic Acid	7	11.0 / no pitting
5% $C_6N_6FeK_3$	Potassium Ferricyanide	7	0.04 / no pitting
5% $NaHSO_3$	Sodium Bisulfite	7	0.03 / no pitting
20% Na_2CO_3	Sodium Carbonate	7	nil / no pitting
NaCl	Sodium Chloride	42	0.34 / pitting after 7 days
5% NaOCl	Sodium Hypochlorite	42	8.0 / pitting after 7 days
5% Na_2SO_4	Sodium Sulfate	7	nil / no pitting
10% $C_4H_6O6_6$	Tataric Acid	7	0.02 / no pitting
10% $ZnCl_2$	Zinc Chloride	42	0.01 / pitting after 42 days

Typical High Temperature Mechanical Properties

Temp. (°F)	Tensile (ksi)	0.2% Yield (ksi)	Hardness (HRB)
800	67.5	18.8	-
1000	62.7	13.0	90
1200	54.8	13.5	84
1400	34.2	13.1	74

Grain size requirements per ASTM standards

Annealed N08810/N08811

Average grain size of ASTM No 5 or coarser

Applicable Specifications*

Form	ASTM	ASME
Bar[1]	B408, B564[1]	SB408, SB564[1]
Seamless Pipe[2]	B407	SB407
Welded Pipe[3]	B514	SB514

[1]Applies to pipe ≥3.500". Size tolerance on this material is +0.125"/-0.000".
[2]ASTM grain size 5 or courser per ASTM E112.
[3]X-Ray per ASME Section VIII, Division 1, #UW-51 for pipe ≥6.000".
**EN10204-3.1 applies to all product forms.*

800HT® is a registered trademark of Special Metals Corporation, a PCC Company.

Please contact Corrosion Materials for a complete list of items available from our extensive inventory, as well as our value-added processing services.

We supply a complete range of items in many alloys, including C-276, 22, B-2, B-3®, 200/201, 400, 405, K-500, 625, 600, 800H/HT®, 20, F255, 6B, Titanium Gr. 2 and Titanium Gr. 5.

Our machine shop, welding shop and processing departments are equipped with state-of-the-art manufacturing equipment allowing Corrosion Materials the ability to provide the service you desire along with the economic and technical advantages you need and deserve.

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