RADATA SHEET RA800H/AT alloy

FEATURES

- High design stresses for ASME Section VIII applications to 1650°F (899°C)
- Seamless pipe and tube 5" O.D. and under to 1800°F (982°C), Section VIII
- Useful oxidation resistance through 1900°F (1038°C)
- Resistant to chloride ion stress corrosion cracking

APPLICATIONS

- Ethylene furnace quench boilers
- Reformer outlet pigtails and manifolds
- Heat exchangers
- Pressure vessels

Chemical Composition Range, %

Nickel	30.0 - 35.0
Chromium	19.0 - 23.0
Manganese	1.5 max
Silicon	1.0 max
Sulfer	0.015 max
Copper	0.75 max
Carbon	0.06 - 0.10
Aluminum	0.15 - 0.60
Titanium	0.15 - 0.60
Aluminum + Titanium	0.85 - 1.20
Iron	39.5 min

Specifications

UNS N08811
N08810

ASME	ASTM
SB-409 Plate, sheet and strip	B 409
SB-408 Rod and bar	B 408
SB-407 Seamless pipe and tube	B 407

Code Cases 1325, 1949, 1987 and 1983

For external pressure design use Fig. NFN-9 of Section II Part D. RA800H/AT is P No. 45 in ASME Section IX.

Performance Profile

RA800H/AT is an austenitic heat resistant alloy meant for high temperature structural applications. The strength of RA800H/AT is achieved by controlled levels of carbon, aluminum and titanium along with a 2100°F (1149°C) minimum anneal to achieve grain size ASTM 5 or coarser.

Welding

RA800H/AT is commonly joined by RA 82 (ERNiCr-3) bare wire for applications under 1450°F (788°C). RA330-04 (N08334) bare wire and RA330-04-15 (W88334) covered electrodes offer a close match of thermal expansion coefficients. For applications 1600°F (871°C) and higher RA333 (N06333) bare wire and RA333-07-16 covered electrodes offer greater strength.

To avoid possible stress relaxation grain boundary cracking of N08811 in applications above 1000°F (538°C) the welded fabrication may be heated 1650°F (899°C) for about one hour per inch (25mm) of thickness, 30 minutes minimum, air cooled.

Mechanical Properties

Minimum Room Temperature Properties

Tensile Strength psi (N/mm2)	0.2% Yield Strength psi (N/mm2)	Elongation in 2" or 4D %
65,000 (448)	25,000 (172)	30

Typical Creep-Rupture Strengths stress, psi, for rupture in

Temp. °F	Temp. °C	10,000 hour psi	10,000 hour N/mm²	100,000 hour psi	100,000 hour N/mm²
1200	649	17,500	121	13,000	89.6
1300	704	11,000	75.8	8,000	55.2
1400	760	7,300	50.3	5,300	36.5
1500	816	5,200	35.8	3,700	25.5
1600	871	3,500	24.1	1,200	17.2
1700	927	1,900	13.1	1,200	8.27
1800	982	1,200	8.27	800	5.5

RA800H/AT Design Stresses ASME Case 1987-2, Section I and Section VIII, Div. 1

Metal Temperature °F	Metal Temperature °C	Stress[b] psi	Stress[b] N/mm²
1100	593	12,900	88.9
1150	621	10,400	71.7
1200	649	8,300	57.2
1250	677	6,700	46.2
1300	704	5,400	37.2
1350	732	4,300	29.6
1400	760	3,400	23.4
1450	788	2,700	18.6
1500	816	2,200	15.2
1550	843	1,700[a]	11.7
1600	871	1,400[a]	9.65
1650	899	1,100[a]	7.58

[a]Section VIII, Div. 1 only

[b]U.S. Customary units govern

Physical Properties

Density, 0.287 lb/in³
7944 Kg/m³
Melting range
2475-2525°F
1357-1385°C

Temp. °F	Temp. °C	Coefficient[c] of Thermal Expansion inch/inch °F x 10^{-6}	Coefficient[c] of Thermal Expansion m/m °C x 10^{-6}
70	21	–	–
100	38	–	–
200	93	7.9	14.2
400	204	8.8	15.8
600	316	9.0	16.2
800	427	9.2	16.6
1000	538	9.4	16.9
1200	649	9.6	17.3
1400	760	9.9	17.8
1600	871	10.2	18.4
1800	982	–	–

[c]From 70°F (21°C) to listed temp.

Thermal Conductivity Btu • ft/ft² hr • F	Thermal Conductivity w/mK	Dynamic Modulus[d] of Elasticity psi x 10^6	Dynamic Modulus[d] of Elasticity MN/mm²
6.67	11.5	28.5	197
6.92	12.0	–	–
7.42	12.8	27.82	191.8
8.58	14.8	26.81	184.8
9.58	16.6	25.71	177.3
10.6	18.3	24.64	169.9
11.6	20.1	23.52	162.2
12.7	22.0	22.37	154.2
13.8	23.9	21.06	145.2
15.1	26.1	19.2	132.4
17.8	30.8	–	–

[d]Above 1100°F (593°C), time dependent parameters are used for design purposes.

Properties listed in this bulletin are typical of the alloy but should not be considered as guaranteed maximums or minimums. Materials must be tested under actual service to determine suitability for a particular application.