

HAYNES® 214® alloy

HAYNES® 214® alloy (UNS N07214) is a nickel-chromium-aluminum-iron alloy, designed to provide optimum in high-temperature oxidation resistance while allowing for conventional forming and joining. Intended principally for use at temperatures of 1750°F (955°C) and above, 214® alloy forms an Al₂O₃ scale for its outstanding oxidation resistance that far exceeds virtually all conventional heat-resistant wrought alloys. At temperatures below 1750°F (955°C), 214® alloy develops an oxide scale with a mixture of chromium and aluminum oxides, which still affords oxidation resistance equal to the best nickel-base alloys. Al₂O₃ scale formed on the alloy also provides excellent resistance to carburization, nitridation, and corrosion in chlorine-bearing oxidizing environments. 214® alloy is widely used in engine and turbine applications, industrial heating, “Clean Firing” processes, chloride compound processing, automotive industry, and hospital waste incineration.

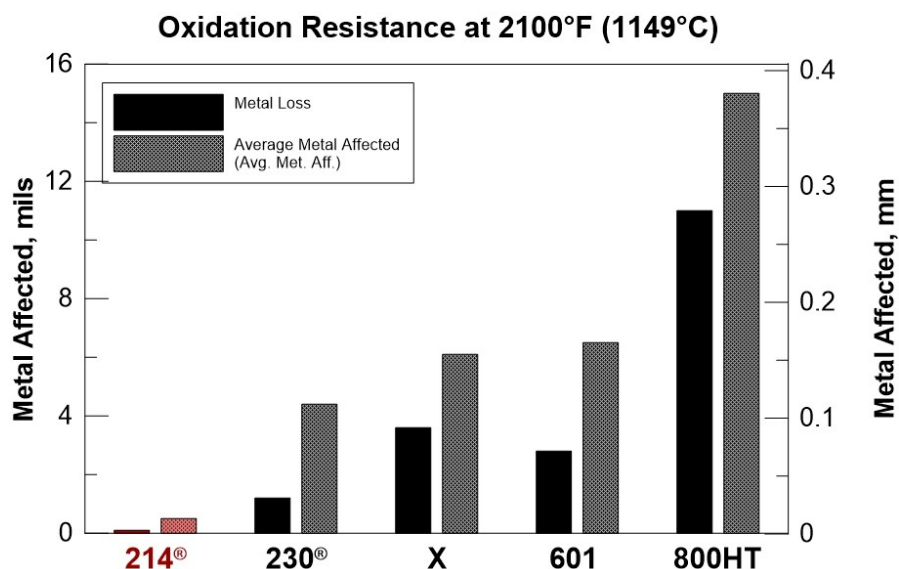
Nominal Composition (wt%):

Ni	Cr	Al	Fe	Co	Mn	Mo	Ti	W	Cb	Si	Zr	C	B	Y
75 ^a	16	4.5	3	2*	0.5*	0.5*	0.5*	0.5*	0.15*	0.2*	0.1*	0.04	0.01*	0.01

^aAs Balance

*Maximum

Oxidation Resistance:



Alloy	Comparative Oxidation Resistance in Flowing Air, mils (µm)							
	1800°F (982°C)/1008h		2000°F (1093°C)/1008h		2100°F (1149°C)/1008h		2200°F (1204°C)/1008h	
	Metal Loss	Average Metal Affected	Metal Loss	Average Metal Affected	Metal Loss	Average Metal Affected	Metal Loss	Average Metal Affected
214®	0.1 (3)	0.3 (8)	0.1 (3)	0.2 (5)	0.1 (3)	0.5 (13)	0.1 (3)	0.7 (18)
230®	0.2 (5)	1.5 (38)	0.5 (13)	3.3 (84)	1.2 (30)	4.4 (112)	4.7 (119)	8.3 (211)
X	0.2 (5)	1.5 (38)	1.3 (33)	4.4 (112)	3.6 (91)	6.1 (155)	-	-
601	0.4 (10)	1.7 (43)	1.3 (33)	3.8 (97)	2.8 (71)	6.5 (165)	4.4 (112)	7.5 (191)
800HT	0.5 (13)	4.1 (104)	7.6 (193)	11.6 (295)	11.0 (279)	15.0 (381)	-	-

Heat Treatment:

2000 - 2050°F (1093 - 1121°C), rapid air cool or faster

Typical Tensile Properties (Plate) :

Test Temperature		0.2% Yield Strength		Ultimate Tensile Strength		Elongation
°F	°C	ksi	MPa	ksi	MPa	%
RT	RT	82.2	565	138.9	960	42.8
1200	649	75.9	252	114.9	790	33.0
1400	760	73.6	505	94.4	670	23.1
1600	871	50.4	345	66.4	460	33.6
1800	982	8.4	58	16.7	115	86.4
2000	1093	4.2	29	9.0	62	88.6
2100	1149	2.1	14	6.6	46	99.4
2200	1204	1.4	10	5.0	34	91.5

Typical Stress-Rupture Properties (Plate):

Test Temperature		Approximate Initial Stress to Produce Rupture in:					
		100 hours		1,000 hours		10,000 hours	
°F	°C	ksi	MPa	ksi	MPa	ksi	MPa
1400	760	38	262	24	165	15	103
1500	816	23	159	15	103	9.0*	62*
1600	871	15	103	8.5	59	4.6	32
1700	927	7.1	49	4.2	29	2.4	17
1800	982	2.9	20	1.8	12	1.1	7.6
1900	1038	1.9	13	1.2	8.3	0.80	5.5
2000	1093	1.4	9.7	0.90	6.2	0.60	4.1

*Significant extrapolation

Physical Properties

Physical Property	Customary Units		Metric Units	
Density	RT	0.291 lb/in ³	RT	8.05 g/cm ³
Melting Range	2475-2550°F	—	1355-1400°C	—
Mean Coefficient of Thermal Expansion	70 - 1000°F	8.2 µin/in-°F	25 - 600°C	15.2 µm/m-°C
	70 - 1200°F	8.6 µin/in-°F	25 - 700°C	15.8 µm/m-°C
	70 - 1400°F	9.0 µin/in-°F	25 - 800°C	16.6 µm/m-°C
	70 - 1600°F	9.6 µin/in-°F	25 - 900°C	17.6 µm/m-°C
	70 - 1800°F	10.2 µin/in-°F	25 - 1000°C	18.6 µm/m-°C
	70 - 2000°F	11.1 µin/in-°F	25 - 1100°C	20.2 µm/m-°C

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