HIGH-TEMPERATURE
ALLOY AT A GLANCE

HAYNES International

HAYNES® HR-160® alloy

CHEMISTRY: Weight %

Ni	Co	Fe	Cr	Mn	Si	Ti	C
37[a]	29	2	28	0.5	2.75	0.45	0.05

[a] As Balance

ALLOY DESCRIPTION:

HAYNES HR-160 alloy is a solid-solution-strengthened heat-resistant alloy with outstanding resistance to most forms of high-temperature corrosion. Its high levels of chromium and silicon provide for the formation of a highly protective surface oxide scale which resists attack from sulfur, chloride, vanadium and other salt deposits. HR-160 alloy's strength is also superior to that for typical Fe-Ni-Cr and Ni-Cr alloys. Applications include component service in the waste incineration, chemical process, pulp and paper, power, coal gasification and industrial heating industries. HR-160 alloy is readily hot or cold-formed, and it can be welded using conventional techniques.

PHYSICAL PROPERTIES:

	Temp., °F	British Units	Temp., °C	Metric Units
Density	Room	0.292 lb/in³	Room	8.08 g/cm³
Melting Range	2360-2500		1295-1370	
Thermal Conductivity	800	126 BTU-in/ft²-hr-°F	400	17.6 W/m-K
	1000	144 BTU-in/ft²-hr-°F	600	21.8 W/m-K
	1200	162 BTU-in/ft²-hr-°F	700	24.7 W/m-K
	1400	178 BTU-in/ft²-hr-°F	800	26.1 W/m-K
	1600	185 BTU-in/ft²-hr-°F	900	26.9 W/m-K
	1800	196 BTU-in/ft²-hr-°F	1000	28.7 W/m-K
Mean Coefficient of Thermal Expansion	70-800	8.1 µin/in-°F	20-500	14.8 µm/m-°C
	70-1000	8.3 µin/in-°F	20-600	15.2 µm/m-°C
	70-1200	8.6 µin/in-°F	20-700	15.7 µm/m-°C
	70-1400	8.9 µin/in-°F	20-800	16.2 µm/m-°C
	70-1600	9.2 µin/in-°F	20-900	16.7 µm/m-°C
	70-1800	9.5 µin/in-°F	20-1000	17.2 µm/m-°C
Electrical Resistivity	400	45.2 µohm-in	200	115 µohm-cm
	800	46.9 µohm-in	400	119 µohm-cm
	1000	47.8 µohm-in	600	122 µohm-cm
	1200	48.3 µohm-in	700	123 µohm-cm
	1400	48.6 µohm-in	800	124 µohm-cm
	1600	48.9 µohm-in	900	124 µohm-cm
	1800	49.3 µohm-in	1000	125 µohm-cm

HEAT TREATMENT, PLATE:

2025°F (1105°C)/15 min./WQ

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DYNAMIC MODULUS OF ELASTICITY:

Temp.,°F	10^6 psi	Temp.,°C	GPa
70	30.6	20	211
400	29.1	200	201
800	26.5	400	185
1000	25.6	600	172
1200	24.4	700	163
1400	22.9	800	155
1600	21.7	900	146
1800	19.8	1000	134

TYPICAL TENSILE PROPERTIES, PLATE:

Test Temperature		Ultimate Tensile Strength		0.2% Yield Strength		Elongation in 1.4 in (36mm)
°F	°C	Ksi	MPa	Ksi	MPa	%
ROOM	ROOM	110.0	760	44.7	310	68.1
1000	540	80.6	555	24.6	170	77.0
1200	650	74.0	510	23.5	160	69.5
1400	760	61.8	425	23.5	160	74.2
1600	870	39.1	270	23.3	160	90.2
1800	980	20.8	145	11.4	79	88.9
2000	1095	10.6	73	4.6	32	95.4
2200	1205	3.7	26	1.6	11	116.3

TYPICAL STRESS-RUPTURE STRENGTH, PLATE:

Test Temperature		Approximate Initial Stress, Ksi (MPa) to Produce Rupture in:		
°F	°C	100 Hours	1,000 Hours	10,000 Hours
1200	650	32.0 (220)	22.0 (150)	15.0 (105)
1400	760	15.0 (105)	11.0 (76)	8.4 (58)
1600	870	8.5 (59)	5.8 (40)	4.0 (28)
1800	980	4.1 (28)	2.7 (19)	1.8 (12)
2000	1095	1.8 (12)	1.5 (10)	1.2 (8.3)

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