

HAYNES[®] HR-160[®] alloy for Severely Sulfidizing Environments Tech Brief

For Severely Sulfidizing and Other Aggressive Environments

HAYNES[®] HR-160[®] alloy has excellent resistance to sulfidation and chloride attack in both reducing and oxidizing atmospheres. The alloy also has exceptionally good resistance to oxidation, hot corrosion, carburization, metal dusting, nitridation and corrosion at corrosion attack by low melting point compounds such as those formed by phosphorus, vanadium, and other impurities. HR-160 alloy utilizes high chromium and silicon contents to form a protective oxide scale which renders the alloy resistance to various forms of high-temperature corrosion.

Current Applications

Waste Incineration

Thermocouple Protection Tubes

Gas Sampling Probes

Tube Shields

Feed Chutes Combustion

Chamber Liners & Internals

Refractory Anchors

Dampers

Others

Coal and Oil Fired Boilers & Fluidized Bed System

Burners

Coal Feed Chutes

Expansion Joints

Others

Sulfur Recovery Plants

Burners

Tube Shields in Waste Heat

Recovery Boilers

Chemical Plant

Recuperators and Heat Exchangers

Claciners

Other Application

Cement Kilns & Other High-temperature

Furnaces

Pulp and Paper Recovery Boilers

Coal Gasification

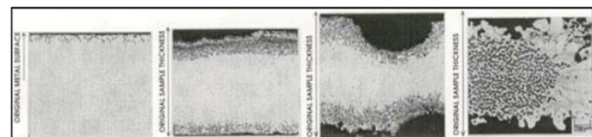
Industrial Gas Turbines

Nominal Composition

Nickel:	Balance
Cobalt:	29
Chromium:	28
Iron:	2 max.
Molybdenum:	1 max.
Silicon:	2.75
Tungsten:	1 max.
Manganese:	0.5
Titanium:	0.5
Carbon:	0.005

Sulfidation Resistance

Lab Tests at 1600°F (870°C)/215 h in Ar-5%h₂-5%CO-1%CO₂-0.15%H₂S P_{O₂}= 3 x 10⁻¹⁹ atm, P_{S₂}= 0.9 x 10⁻⁶ atm



Alloy Description

HAYNES[®] HR-160[®] alloy is a Ni-Co-Cr-Si alloy with a stable austenitic structure. The alloy is readily fabricated, and may be welded by gas-tungsten-arc (TIG) or gas-metal-arc (MIG) techniques. HR-160[®] filler metal is recommended for joining HR-160 alloy. When HR-160[®] alloy is welded to other alloys, such as stainless steels, 556[®] filler metal should be used. HAYNES[®] HR-160[®] alloy is available as plate, sheet, strip, billet, bar, wire, pipe, and tubing.

Typical Tensile Properties, Plate

Test Temperature		0.2% Yield Strength		Ultimate Tensile Strength		Elongation	Reduction of Area
°F	°C	ksi	MPa	ksi	MPa	%	%
70	20	45.6	315	111.2	765	68	73
1000	540	25.5	175	81.8	565	76	69
1200	650	25.7	175	75.8	525	70	67
1400	760	24.7	170	62.1	430	73	64
1600	870	22.41	150	38.3	265	85	84
1800	980	10.8	74	20.4	140	90	98
2000	1095	5.0	34	10.8	74	88	98
2100	1150	2.3	16	6.0	41	113	94
2200	1205	1.6	11	4.4	30	110	94