HAYNES® 230® alloy for Nitric Acid Catalyst Grids & Baskets Tech Brief

Top Choice for Nitric Acid Catalyst Grids

For demanding long-term applications as catalyst grid support material in nitric acid production, HAYNES® 230® alloy represents a significant advance over the materials, such as HASTELLOY® X alloy. The increase in resistance to in-service creep distortion displayed by 230® alloy translates directly into as much as 5 times longer service interval between straightening operations. The advantage is greater the higher the operating temperature. 230® alloy is also shows less loss of ductility with long-term thermal exposure. That means when straightening does become necessary, 230® alloy will still have the required ductility.

230® alloy is currently in service in over 30 nitric acid catalyst grid support applications around the world, some for as long as five years or more. Its excellent nitriding-resistance, oxidation-resistance, and resistance to combustion environments, make it suitable for a wide variety of additional industrial applications.

Nitric acid catalyst grid support made from HAYNES® 230® alloy and plate bar. Excellent creep strength at 1700°F (925°C) makes the alloy highly suitable for this application.

Nominal Composition

Nickel:	Balance
Cobalt:	5 max.
Chromium:	22
Molybdenum:	2
Tungsten:	14
Iron:	3 max.
Silicon:	0.4
Manganese:	0.5
Carbon:	0.10
Aluminum:	0.3
Boron:	0.015 max.
Lanthanum:	0.02

Typical Tensile Properties, Plate

Test Temperature		0.2% Yield Strength		Ultimate Tensile Strength		Elongation
°F	°C	ksi	MPa	ksi	MPa	%
RT	RT	57	395	125	860	50
1000	540	40	275	103	705	53
1200	650	40	275	98	675	55
1400	760	42	275	88	605	53
1600	870	37	255	63	435	65
1800	980	21	145	35	240	83
2000	1095	11	76	20	140	83
2100	1150	7	47	13	91	106
2200	1205	4	30	9	65	109

Typical Rupture Properties, Plate

Test Temperature		Typical Rupture Properties: Stress Required to Produce Rupture in Hours Shown					
		100 h		1,000 h		10,000 h	
°F	°C	ksi	MPa	ksi	MPa	ksi	MPa
1400	760	25.0	172	17.5	121	11.9	8.2
1500	815	17.0	117	11.8	81	7.8	53
1600	870	11.5	79	7.5	52	4.9	34
1700	915	7.6	52	4.8	33	3.0	21
1800	980	4.8	33	3.0	21	1.9	13

Typical Room Temperature Physical Properties

Physical Property	British Units	Metric Units
Density	0.324 lb/in^3	8.97 g/cm^3
Electrical Resistivity	49.2 µohm-in	125 µohm-cm
Modulus of Elasticity	30.6 x 10^6 psi	211 GPA
Thermal Conductivity	62 Btu-in/ft^2-h-°F	8.9 W/m-°C
Specific Heat	0.095 Btu/lb-°F	397 J/Kg-°C

Product Description

230® alloy is a top-of-the-line high-performance, industrial heat-resistant alloy for applications demanding high strength as well as resistance to environment. It is a substantial upgrade in performance capabilities from common iron-nickel-chromium and nickel-chromium alloys, and displays the best combination of strength, stability, environment-resistance and fabricability of any commercial nickel-base alloy.

230® alloy can be utilized at temperatures as high as 2100ºF (1150ºC) for continuous service. Its resistance to oxidation, combustion environments and nitriding commends it highly for applications such as nitric acid catalyst grids, high-temperature bellows, industrial furnace fixtures and hardware, strand annealing tubes, thermo-couple protection tubes, and many more.

230® alloy is covered by ASME Section VIII, Division I, and ASME Section I, Code Case 2063-3, both up to 1650ºF (900ºC). 230 alloy is also covered by a number of ASTM and AMS specifications.

Properties Data

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