

HAYNES[®] NS-163[®] alloy

HAYNES[®] NS-163[®] alloy is a wrought cobalt-based alloy for use in sheet and wire forms.

Principal Features

HAYNES[®] NS-163[®] alloy is a Co – 28Cr – 21Fe – 8Ni – 1.3Ti – 1Nb alloy produced as wrought sheet, strip and wire material with high creep strength and relatively low density. Its properties bridge the gap between the capabilities of current solid-solution strengthened alloys and the oxide-dispersion strengthened (ODS) mechanical alloys. HAYNES[®] NS-163[®] alloy exhibits good oxidation resistance up to 1800°F (982°C), but is capable of being coated for exceptional oxidation resistance at even higher temperatures.

The high level of creep strength in HAYNES[®] NS-163[®] alloy is achieved via a unique high-temperature Nitride Dispersion Strengthening (NDS) treatment performed after forming, welding and fabrication is complete. Unlike other materials of comparable performance, produced by powder metallurgy, HAYNES[®] NS-163[®] alloy is conventionally melted (VIM + ESR) and processed (via hot and cold rolling) in the same manner as the solid solution strengthened materials and can be conventionally formed, fabricated and welded into nearly any conceivable shape currently produced in other superalloys.

Nominal Composition

Weight %

Cobalt:	Balance
Nickel:	8
Iron:	21
Chromium:	28
Manganese:	0.5 max.
Silicon:	0.5 max.
Columbium:	1
Aluminum:	0.5 max.
Titanium:	1.3
Carbon:	0.1
Boron:	0.015 max.

Heat Treatment

Solution Heat Treatment:

Typical Solution Annealing Temperature: 2100 to 2150°F (1150 to 1177°C) in dry hydrogen.

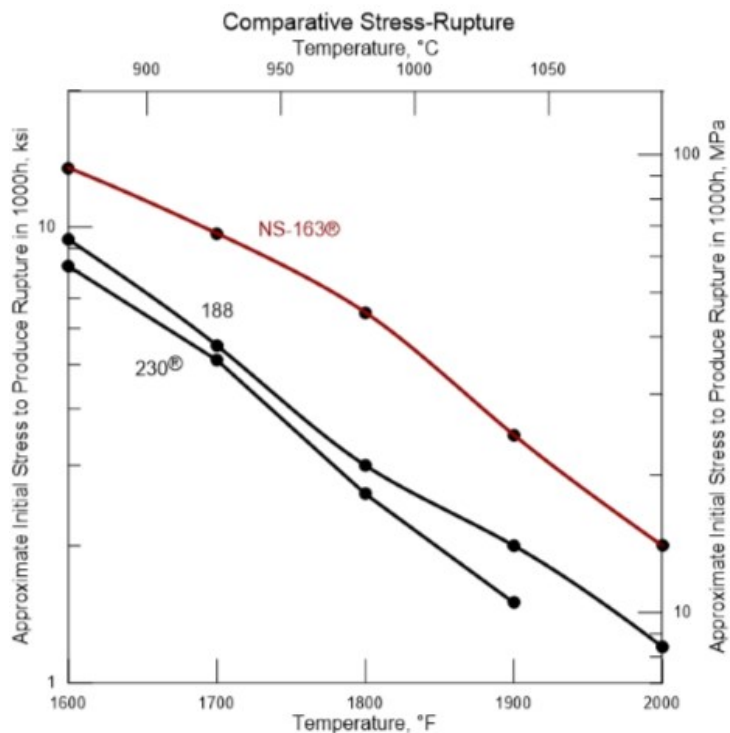
NDS (Nitride Dispersion Strengthening) Treatment:

NDS treatments have been developed for this alloy. Please contact Haynes International for more detailed information.

Material Properties (Nitrided)

Density	0.287 lb/in ³	7.95 g/cm ³
Melting Range	2523 - 2586°F	1382 - 1419°C

Stress-Rupture



Physical Properties (Nitrided)

Temperature	Specific Heat	Thermal Conductivity	Dynamic Modulus of Elasticity	Electrical Resistivity	Mean Coefficient of Thermal Expansion
(°F)	(BTU/lb-°F)	(BTU-in/ft ² -hr-°F)	(10 ⁶ psi)	(μohm-in)	(μin/in-°F)
800	0.133	138	31.5	39.5	8.8
1000	0.137	156	27.5	40.9	9
1200	0.146	173	26	42.2	9.3
1400	0.155	190	24.5	43.2	9.6
1600	0.159	203	23.1	44.3	9.8
1800	0.162	212	21.5	45.3	10.1
Temperature	Specific Heat	Thermal Conductivity	Dynamic Modulus of Elasticity	Electrical Resistivity	Mean Coefficient of Thermal Expansion
(°C)	(J/kg-°C)	(W/m-°C)	(GPa)	(μohm-cm)	(μm/m-°C)
400	553	19.6	201	99	15.7
500	566	21.1	193	103	16.1
600	584	22.7	184	106	16.5
700	638	26.1	175	108	17
800	654	27.6	165	111	17.4
900	668	28.7	156	113	17.8
1000	681	29.5	146	115	18.1

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