

Haynes R-41 alloy, 1.27 mm thick sheet, solution heat treated at 1079°C, water quenched, 30 minutes at 1066°C, aged 16 hours at 760°C (1400°F), air cooled

Category : Metal , Nonferrous Metal , Nickel Alloy , Superalloy

Material Notes:

Vacuum melted, exceptionally high strength at temperature between 649-982°C. Precipitation-hardening type, strength developed by various solutioning and aging heat treatments. Applications include afterburner parts and nozzle diaphragm partitions in current gas turbine engines. Formed with success on drop-hammers, expanding mandrels and stretch formers. Data provided by the manufacturer, Haynes International, Inc.

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http://www.lookpolymers.com/polymer_Haynes-R-41-alloy-127-mm-thick-sheet-solution-heat-treated-at-1079C-water-quenched-30-minutes-at-1066C-aged-16-hours-at-760C-1400F-air-cooled.php

Physical Properties	Metric	English	Comments
Density	8.25 g/cc	0.298 lb/in ³	

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	1285 MPa	186400 psi	
	75.0 MPa	10900 psi	
	@Temperature 1093 °C	@Temperature 1999 °F	
	274 MPa	39700 psi	
	@Temperature 982 °C	@Temperature 1800 °F	
	702 MPa	102000 psi	
	@Temperature 871 °C	@Temperature 1600 °F	
	996 MPa	144000 psi	
	@Temperature 760 °C	@Temperature 1400 °F	
	1128 MPa	163600 psi	
@Temperature 649 °C	@Temperature 1200 °F		
1136 MPa	164800 psi		
@Temperature 538 °C	@Temperature 1000 °F		
Tensile Strength, Yield	1024 MPa	148500 psi	

Mechanical Properties	@Strain 0.200 % Metric	@Strain 0.200 % English	Comments
	38.0 MPa	5510 psi	
	@Strain 0.200 %, Temperature 1093 Å°C	@Strain 0.200 %, Temperature 1999 Å°F	
	169 MPa	24500 psi	
	@Strain 0.200 %, Temperature 982 Å°C	@Strain 0.200 %, Temperature 1800 Å°F	
	538 MPa	78000 psi	
	@Strain 0.200 %, Temperature 871 Å°C	@Strain 0.200 %, Temperature 1600 Å°F	
	825 MPa	120000 psi	
	@Strain 0.200 %, Temperature 760 Å°C	@Strain 0.200 %, Temperature 1400 Å°F	
	890 MPa	129000 psi	
	@Strain 0.200 %, Temperature 649 Å°C	@Strain 0.200 %, Temperature 1200 Å°F	
	927 MPa	134000 psi	
	@Strain 0.200 %, Temperature 538 Å°C	@Strain 0.200 %, Temperature 1000 Å°F	
Elongation at Break	14 %	14 %	in 50.8 mm
	5.0 %	5.0 %	in 50.8 mm
	@Temperature 871 Å°C	@Temperature 1600 Å°F	
	6.0 %	6.0 %	in 50.8 mm
	@Temperature 760 Å°C	@Temperature 1400 Å°F	
	8.0 %	8.0 %	in 50.8 mm
	@Temperature 649 Å°C	@Temperature 1200 Å°F	
	14 %	14 %	in 50.8 mm
	@Temperature 538 Å°C	@Temperature 1000 Å°F	
	15 %	15 %	in 50.8 mm
	@Temperature 982 Å°C	@Temperature 1800 Å°F	
	47 %	47 %	in 50.8 mm
	@Temperature 1093 Å°C	@Temperature 1999 Å°F	

Mechanical Properties	Metric	English	Comments
Modulus of Elasticity	112 GPa	16200 ksi	
	@Temperature 982 Â°C	@Temperature 1800 Â°F	
	120 GPa	17400 ksi	
	@Temperature 871 Â°C	@Temperature 1600 Â°F	
	133 GPa	19300 ksi	
	@Temperature 760 Â°C	@Temperature 1400 Â°F	
	162 GPa	23500 ksi	
	@Temperature 649 Â°C	@Temperature 1200 Â°F	
	165 GPa	23900 ksi	
	@Temperature 538 Â°C	@Temperature 1000 Â°F	
Poissons Ratio	0.31	0.31	27Â°C (80Â°F)
	0.31	0.31	
	@Temperature 149 Â°C	@Temperature 300 Â°F	
	0.32	0.32	
	@Temperature 482 Â°C	@Temperature 900 Â°F	
	0.32	0.32	
	@Temperature 371 Â°C	@Temperature 700 Â°F	
	0.32	0.32	
	@Temperature 260 Â°C	@Temperature 500 Â°F	
	0.33	0.33	
	@Temperature 760 Â°C	@Temperature 1400 Â°F	
	0.33	0.33	
	@Temperature 677 Â°C	@Temperature 1250 Â°F	
	0.33	0.33	
	@Temperature 649 Â°C	@Temperature 1200 Â°F	
		0.34	

Mechanical Properties	Metric	English	Comments
	0.34 @Temperature 843 Â°C	@Temperature 1550 Â°F	
	0.35 @Temperature 927 Â°C	0.35 @Temperature 1700 Â°F	
Shear Modulus	83.0 GPa	12000 ksi	27Â°C
	55.0 GPa @Temperature 927 Â°C	7980 ksi @Temperature 1700 Â°F	
	61.0 GPa @Temperature 843 Â°C	8850 ksi @Temperature 1550 Â°F	
	64.0 GPa @Temperature 760 Â°C	9280 ksi @Temperature 1400 Â°F	
	67.0 GPa @Temperature 677 Â°C	9720 ksi @Temperature 1250 Â°F	
	69.0 GPa @Temperature 593 Â°C	10000 ksi @Temperature 1100 Â°F	
	72.0 GPa @Temperature 482 Â°C	10400 ksi @Temperature 900 Â°F	
	75.0 GPa @Temperature 371 Â°C	10900 ksi @Temperature 700 Â°F	
	77.0 GPa @Temperature 260 Â°C	11200 ksi @Temperature 500 Â°F	
	81.0 GPa @Temperature 149 Â°C	11700 ksi @Temperature 300 Â°F	

Thermal Properties	Metric	English	Comments
CTE, linear	13.5 Âµm/m-Â°C @Temperature 21.0 - 538 Â°C	7.50 Âµin/in-Â°F @Temperature 69.8 - 1000 Â°F	
	14.0 Âµm/m-Â°C	7.78 Âµin/in-Â°F	

Thermal Properties	Metric @Temperature 21.0 - 64.5 Â°C	English @Temperature 69.8 - 120.0 Â°F	Comments
	14.8 Âµm/m-Â°C	8.22 Âµin/in-Â°F	
	@Temperature 21.0 - 760 Â°C	@Temperature 69.8 - 1400 Â°F	
	15.2 Âµm/m-Â°C	8.44 Âµin/in-Â°F	
	@Temperature 21.0 - 871 Â°C	@Temperature 69.8 - 1600 Â°F	
	16.3 Âµm/m-Â°C	9.06 Âµin/in-Â°F	
	@Temperature 21.0 - 927 Â°C	@Temperature 69.8 - 1700 Â°F	
	16.8 Âµm/m-Â°C	9.33 Âµin/in-Â°F	
	@Temperature 21.0 - 982 Â°C	@Temperature 69.8 - 1800 Â°F	
Specific Heat Capacity	0.452 J/g-Â°C	0.108 BTU/lb-Â°F	
	@Temperature 21.0 Â°C	@Temperature 69.8 Â°F	
Thermal Conductivity	11.5 W/m-K	79.8 BTU-in/hr-ftÂ²- Â°F	
	@Temperature 149 Â°C	@Temperature 300 Â°F	
	12.5 W/m-K	86.8 BTU-in/hr-ftÂ²- Â°F	
	@Temperature 204 Â°C	@Temperature 399 Â°F	
	13.6 W/m-K	94.4 BTU-in/hr-ftÂ²- Â°F	
	@Temperature 260 Â°C	@Temperature 500 Â°F	
	14.7 W/m-K	102 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 316 Â°C	@Temperature 601 Â°F	
	16.8 W/m-K	117 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 427 Â°C	@Temperature 801 Â°F	
	18.8 W/m-K	130 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 538 Â°C	@Temperature 1000 Â°F	
	20.0 W/m-K	139 BTU-in/hr-ftÂ²-Â°F	
	@Temperature 593 Â°C	@Temperature 1100 Â°F	
	21.0 W/m-K	146 BTU-in/hr-ftÂ²-Â°F	

Thermal Properties	Metric	English	Comments
	22.0 W/m-K @Temperature 644 Â°C	153 BTU-in/hr-ftÂ²-Â°F @Temperature 1190 Â°F	
	23.1 W/m-K @Temperature 704 Â°C	160 BTU-in/hr-ftÂ²-Â°F @Temperature 1300 Â°F	
	24.1 W/m-K @Temperature 760 Â°C	167 BTU-in/hr-ftÂ²-Â°F @Temperature 1400 Â°F	
	25.1 W/m-K @Temperature 816 Â°C	174 BTU-in/hr-ftÂ²-Â°F @Temperature 1500 Â°F	
	25.1 W/m-K @Temperature 871 Â°C	174 BTU-in/hr-ftÂ²-Â°F @Temperature 1600 Â°F	
Melting Point	1310 - 1345 Â°C	2390 - 2453 Â°F	
Solidus	1310 Â°C	2390 Â°F	
Liquidus	1335 Â°C	2435 Â°F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	1.4 - 1.6 %	1.4 - 1.6 %	

Electrical Properties	Metric	English	Comments
Magnetic Permeability	<= 1.002 @Temperature 21.0 Â°C	<= 1.002 @Temperature 69.8 Â°F	200 Oersted

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