Carpenter Custom 455® Stainless Steel, Condition H1000 (Age Hardened 538°C (1000°F))

Category : Metal , Ferrous Metal , Stainless Steel , T 400 Series Stainless Steel

Material Notes:

Data provided by Carpenter Technology Corporation.Recognizing the need for high-strength alloys with good corrosion resistance to atmospheric environments, the Carpenter Research Laboratory developed Custom 455® stainless, a martensitic age-hardenable stainless steel. This alloy is relatively soft and formable in the annealed condition. A single-step aging treatment develops exceptionally high yield strength with good ductility and toughness. This stainless can be machined in the annealed condition, and welded in much the same manner as other precipitation hardenable stainless steels. Because of its low work-hardening rate, it can be extensively cold formed. The dimensional change during hardening is only about -0.001 in/in, which permits close-tolerance finish machining in the annealed state. Custom 455 stainless represents a significant advancement in the area of precipitation hardening stainless steels. It should be considered where simplicity of heat treatment, ease of fabrication, high strength and corrosion resistance are required in combination.Because of the unique combination of high strength and corrosion resistance of Custom 455 stainless there are few other alloys available for consideration. Carpenter PH13-8 Mo can be considered where good transverse toughness and ductility are necessary in large sections.Custom 455® is a registered trademark of Carpenter Technology Corporation.

Order this product through the following link:
http://www.lookpolymers.com/polymer_Carpenter-Custom-455-Stainless-Steel-Condition-H1000-Age-Hardened-538C-1000F.php

Physical Properties	Metric	English	Comments
Density	7.76 g/cc	0.280 lb/in³	

Mechanical Properties	Metric	English	Comments
Hardness, Brinell	411	411	Estimated from Rockwell C for 3000 kg load, 10 mm ball Brinell measurement.
Hardness, Knoop	450	450	Estimated from Rockwell C
Hardness, Rockwell C	44	44	
Hardness, Vickers	430	430	Estimated from Rockwell C
Tensile Strength, Ultimate	1413 MPa	204900 psi	
	814 MPa @Temperature 538 °C	118000 psi @Temperature 1000 °F	
	1062 MPa @Temperature 427 °C	154000 psi @Temperature 801 °F	
	1200 MPa @Temperature 316 °C	174000 psi @Temperature 601 °F	

Mechanical Properties	Metric	English	Comments
	1517 MPa @Temperature -73.0 °C	220000 psi @Temperature -99.4 °F	
	1758 MPa @Temperature -184 °C	255000 psi @Temperature -299 °F	
Tensile Strength, Yield	1345 MPa @Strain 0.200 %	195100 psi @Strain 0.200 %	
	138 MPa @Strain 0.200 %, Temperature 316 °C	20000 psi @Strain 0.200 %, Temperature 601 °F	
	738 MPa @Strain 0.200 %, Temperature 538 °C	107000 psi @Strain 0.200 %, Temperature 1000 °F	
	1020 MPa @Strain 0.200 %, Temperature 427 °C	148000 psi @Strain 0.200 %, Temperature 801 °F	
Elongation at Break	14 %	14 %	In 4D
	13 % @Temperature -73.0 °C	13 % @Temperature -99.4 °F	
	13 % @Temperature -184 °C	13 % @Temperature -299 °F	
	14 % @Temperature 316 °C	14 % @Temperature 601 °F	In 4D
	15 % @Temperature 427 °C	15 % @Temperature 801 °F	In 4D
	20 % @Temperature 538 °C	20 % @Temperature 1000 °F	In 4D
Reduction of Area	55 %	55 %	
	45 % @Temperature -184 °C	45 % @Temperature -299 °F	
	50 % @Temperature -73.0 °C	50 % @Temperature -99.4 °F	
	60 %	60 %	

Mechanical Properties	Metric	English	Comments
	@Temperature 316 °C 65 %	@Temperature 601 °F 65 %	
	@Temperature 427 °C	@Temperature 801 °F	
	75 % @Temperature 538 °C	75 % @Temperature 1000 °F	
Modulus of Elasticity	200 GPa	29000 ksi	
Notched Tensile Strength	1517 MPa @Temperature -184 °C	220000 psi @Temperature -299 °F	
	2000 MPa @Temperature 23.0 °C	290000 psi @Temperature 73.4 °F	
	2070 MPa @Temperature -73.0 °C	300000 psi @Temperature -99.4 °F	
Poissons Ratio	0.30	0.30	
Fatigue Strength	630 MPa @# of Cycles 1.00e+7	91400 psi @# of Cycles 1.00e+7	R.R. Moore Test, Smooth Rotating Beam
Shear Modulus	76.9 GPa	11200 ksi	Calculated
Charpy Impact	30.0 J	22.1 ft-lb	V-notch
	5.00 J @Temperature -184 °C	3.69 ft-lb @Temperature -299 °F	V-notch
	16.0 J @Temperature -73.0 °C	11.8 ft-lb @Temperature -99.4 °F	V-notch

Thermal Properties	Metric	English	Comments
CTE, linear	10.6 µm/m-°C @Temperature 22.0 - 93.0 °C	5.89 µin/in-°F @Temperature 71.6 - 199 °F	
	11.2 µm/m-°C @Temperature 22.0 - 260 °C	6.22 µin/in-°F @Temperature 71.6 - 500 °F	
	12.0 µm/m-°C @Temperature 22.0 - 482 °C	6.67 µin/in-°F @Temperature 71.6 - 900 °F	

Component Elements Properties	Metric	English	Comments
Carbon, C	<= 0.050 %	<= 0.050 %	
Chromium, Cr	11 - 12.5 %	11 - 12.5 %	
Copper, Cu	1.5 - 2.5 %	1.5 - 2.5 %	
Iron, Fe	75 %	75 %	as remainder
Manganese, Mn	<= 0.50 %	<= 0.50 %	
Molybdenum, Mo	<= 0.50 %	<= 0.50 %	
Nb + Ta	0.10 - 0.50 %	0.10 - 0.50 %	
Nickel, Ni	7.5 - 9.5 %	7.5 - 9.5 %	
Niobium, Nb (Columbium, Cb)	<= 0.50 %	<= 0.50 %	
Phosphorous, P	<= 0.040 %	<= 0.040 %	
Silicon, Si	<= 0.50 %	<= 0.50 %	
Sulfur, S	<= 0.030 %	<= 0.030 %	
Tantalum, Ta	<= 0.50 %	<= 0.50 %	
Titanium, Ti	0.80 - 1.4 %	0.80 - 1.4 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0000758 ohm-cm @Temperature 23.0 °C	0.0000758 ohm-cm @Temperature 73.4 °F	

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