Carpenter Custom 455® Stainless Steel, Annealed, 25 mm Bar

Subcategory: Ferrous Metal; Metal; Stainless Steel; T 400 Series Stainless Steel

Key Words: UNS S45500; Carpenter Technology Corporation, Carpenter Steel Division; Cartech

Component	Wt. %	Component	Wt. %	Component	Wt. %
C	Max 0.05	Mo	Max 0.5	S	Max 0.03
Cr	11 - 12.5	Nb	Max 0.5	Si	Max 0.5
Cu	1.5 - 2.5	Nb + Ta	0.1 - 0.5	Ta	Max 0.5
Fe	75	Ni	7.5 - 9.5	Ti	0.8 - 1.4
Mn	Max 0.5	P	Max 0.04		

Material Notes:

Iron content calculated as remainder. 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.

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Physical Properties	Metric	English	Comments
Density	7.76 g/cc	0.28 lb/in³	

Mechanical Properties

Hardness, Brinell	297	297	Estimated from Rockwell C for Brinell test with 3000 kg load, 10 mm ball.
Hardness, Knoop	322	322	Estimated from Rockwell C
Hardness, Rockwell C	31	31	
Hardness, Vickers	311	311	Estimated from Rockwell C
Tensile Strength, Ultimate	1000 MPa	145000 psi	
Tensile Strength, Yield	713 MPa	103000 psi	0.2% Offset
Elongation at Break	14 %	14 %	In 4D
Reduction of Area	60 %	60 %	
Modulus of Elasticity	200 GPa	29000 ksi	
Poisson's Ratio	0.3	0.3	Room Temperature
Charpy Impact	95 J	70.1 ft-lb	V-notch
Shear Modulus	76.9 GPa	11200 ksi	Calculated; Room Temp.

Electrical Properties

Electrical Resistivity	9.06e-005 ohm-cm	9.06e-005 ohm-cm	

Thermal Properties

CTE, linear 20°C	10.6 µm/m-°C	5.89 µin/in-°F	22-93ºC
CTE, linear 250°C	11.2 µm/m-°C	6.22 µin/in-°F	22-260ºC
CTE, linear 500°C	12 µm/m-°C	6.67 µin/in-°F	22-482ºC
Thermal Conductivity	18 - 24.7 W/m-K	125 - 171 BTU-in/hr-ft²-°F	at 100ºC. 21.3 W/m-K at 300ºC. 24.7 W/m-K at 500ºC

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error.