



ASM Aerospace Specification Metals Inc.



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

**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.

Custom 455® is a registered trademark of Carpenter Technology Corporation.

Physical Properties	Metric	English	Comments
Density	<u>7.76 g/cc</u>	0.28 lb/in <sup>3</sup>	

### Mechanical Properties

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	<u>1413 MPa</u>	205000 psi	
Tensile Strength, Ultimate at Elevated Temperature	<u>1062 MPa</u>	154000 psi	427°C
Tensile Strength, Ultimate at Elevated Temperature	<u>1200 MPa</u>	174000 psi	316°C
Tensile Strength, Ultimate at Elevated Temperature	<u>1517 MPa</u>	220000 psi	-73°C
Tensile Strength, Ultimate at Elevated Temperature	<u>1758 MPa</u>	255000 psi	-184°C
Tensile Strength, Ultimate at Elevated Temperature	<u>814 MPa</u>	118000 psi	538°C
Tensile Strength, Yield	<u>1345 MPa</u>	195000 psi	0.2% Offset
Tensile Strength, Yield at Elevated Temperature	<u>1020 MPa</u>	148000 psi	0.2% Offset; 427°C
Tensile Strength, Yield at Elevated Temperature	<u>138 MPa</u>	20000 psi	0.2% Offset; 316°C
Tensile Strength, Yield at Elevated Temperature	<u>738 MPa</u>	107000 psi	0.2% Offset; 538°C
Elongation at Break	<u>14 %</u>	14 %	In 4D
Elongation at Break at Elevated Temperature	<u>13 %</u>	13 %	-184°C
Elongation at Break at Elevated Temperature	<u>13 %</u>	13 %	-73°C
Elongation at Break at Elevated Temperature	<u>14 %</u>	14 %	In 4D; 316°C
Elongation at Break at Elevated Temperature	<u>15 %</u>	15 %	In 4D; 427°C
Elongation at Break at Elevated Temperature	<u>20 %</u>	20 %	In 4D; 538°C
Reduction of Area	<u>45 %</u>	45 %	-184°C
Reduction of Area	<u>50 %</u>	50 %	-73°C
Reduction of Area	<u>55 %</u>	55 %	
Reduction of Area	<u>60 %</u>	60 %	316°C
Reduction of Area	<u>65 %</u>	65 %	427°C
Reduction of Area	<u>75 %</u>	75 %	538°C
Modulus of Elasticity	<u>200 GPa</u>	29000 ksi	
Notched Tensile Strength	<u>1517 MPa</u>	220000 psi	-184°C
Notched Tensile Strength	<u>2000 MPa</u>	290000 psi	
Notched Tensile Strength	<u>2068 MPa</u>	300000 psi	-73°C
Poisson's Ratio	0.3	0.3	
Charpy Impact	<u>16 J</u>	11.8 ft-lb	V-notch; -73°C
Charpy Impact	<u>30 J</u>	22.1 ft-lb	V-notch
Charpy Impact	<u>5 J</u>	3.69 ft-lb	V-notch; -184°C

Fatigue Strength	<a href="#">630 MPa</a>	91400 psi	R.R. Moore Test, Smooth Rotating Beam, 1E+7 Cycles
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Shear Modulus	<a href="#">76.9 GPa</a>	11200 ksi	Calculated
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### Electrical Properties

Electrical Resistivity	<a href="#">7.58e-005 ohm-cm</a>	7.58e-005 ohm-cm	Condition H950 at Room Temp.
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### Thermal Properties

CTE, linear 20°C	<a href="#">10.6 μm/m-°C</a>	5.89 μin/in-°F	22-93°C
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CTE, linear 250°C	<a href="#">11.2 μm/m-°C</a>	6.22 μin/in-°F	22-260°C
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CTE, linear 500°C	<a href="#">12 μm/m-°C</a>	6.67 μin/in-°F	22-482°C
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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.