# Carpenter Custom 455® Stainless Steel, Condition H900 (Age Hardened 482°C)

**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 | 7.76 g/cc | 0.28 lb/in³ | |

**Mechanical Properties**

| | | | |
|---|---|---|---|
| Hardness, Brinell | 472 | 472 | Estimated from Rockwell C for Brinell test with 3000 kg load, 10 mm ball. |
| Hardness, Knoop | 519 | 519 | Estimated from Rockwell C |
| Hardness, Rockwell C | 49 | 49 | |
| Hardness, Vickers | 496 | 496 | Estimated from Rockwell C |
| Tensile Strength, Ultimate | 1689 MPa | 245000 psi | |
| Tensile Strength, Ultimate at Elevated Temperature | 1241 MPa | 180000 psi | 427°C |
| Tensile Strength, Ultimate at Elevated Temperature | 1345 MPa | 195000 psi | 371°C |
| Tensile Strength, Ultimate at Elevated Temperature | 1407 MPa | 204000 psi | 316°C |
| Tensile Strength, Ultimate at Elevated Temperature | 1476 MPa | 214000 psi | 260°C |
| Tensile Strength, Yield | 1634 MPa | 237000 psi | 0.2% Offset |
| Tensile Strength, Yield at Elevated Temperature | 1145 MPa | 166000 psi | 0.2% Offset; 427°C |
| Tensile Strength, Yield at Elevated Temperature | 1241 MPa | 180000 psi | 0.2% Offset; 371°C |
| Tensile Strength, Yield at Elevated Temperature | 1296 MPa | 188000 psi | 0.2% Offset; 316°C |
| Tensile Strength, Yield at Elevated Temperature | 1372 MPa | 199000 psi | 0.2% Offset; 260°C |
| Elongation at Break | 11 % | 11 % | In 4D |
| Elongation at Break at Elevated Temperature | 10 % | 10 % | In 4D; 260°C |
| Elongation at Break at Elevated Temperature | 12 % | 12 % | In 4D; 371°C |
| Elongation at Break at Elevated Temperature | 14 % | 14 % | In 4D; 427°C |
| Reduction of Area | 48 % | 48 % | |
| Reduction of Area | 49 % | 49 % | 260°C |
| Reduction of Area | 50 % | 50 % | 316°C |
| Reduction of Area | 52 % | 52 % | 371°C |
| Reduction of Area | 56 % | 56 % | 427°C |
| Modulus of Elasticity | 200 GPa | 29000 ksi | |
| Poisson's Ratio | 0.3 | 0.3 | Room Temperature |
| Charpy Impact | 12 J | 8.85 ft-lb | 25 mm bar |
| Fatigue Strength | 772 MPa | 112000 psi | R.R. Moore Test, Smooth Rotating Beam, 1E+7 Cycles |
| Shear Modulus | 76.9 GPa | 11200 ksi | Calculated; Room Temp. |

**Electrical Properties**

| | | | |
|---|---|---|---|
| Electrical Resistivity | 7.58e-005 ohm-cm | 7.58e-005 ohm-cm | Condition H950 at Room Temp. |

**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 |

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.