

## Carpenter 20Cb-3® Stainless Steel, Bar, Annealed at 1750°F (955°C) then Water Quenched

Category : Metal , Ferrous Metal , Stainless Steel , T 300 Series Stainless Steel

### Material Notes:

Data provided by Carpenter Technology Corporation. 20Cb-3® is an austenitic stainless steel possessing excellent resistance to hot sulfuric acid and many other aggressive environments which would readily attack Type 316 stainless. This alloy exhibits superior resistance to stress-corrosion cracking in boiling 20 to 40% sulfuric acid. 20Cb-3 stainless is also stabilized to limit intergranular attack, even in the sensitized condition. Corrosion tests on annealed and sensitized material conducted in the Ferric Sulfate - 50% Sulfuric Acid Test resulted in rates of 0.002 inches per month maximum. Important advantages of 20Cb-3 stainless are its excellent mechanical properties and comparative ease of fabrication. The presence of columbium in the alloy minimizes the precipitation of carbides during welding. Assemblies usually have been placed in service in the as-welded condition. This material has found wide use in all phases of the chemical and allied industries. It has been used extensively in the processing of synthetic rubber, high-octane gasoline, solvents, explosives, plastics, synthetic fibers, heavy chemicals, organic chemicals, pharmaceuticals, and agrichemicals. 20Cb-3 stainless has also been used in SO<sub>2</sub> scrubbers where acid content, such as sulfuric acid, is of more concern than high-halogen content, such as chlorides. Other applications have included use in fans, mixing tanks, agitators, distillation towers, heat exchangers, process piping, bubble caps, metal cleaning and pickling tanks, spray pickling equipment, pump shafts and rods, valve stems, bolts, nuts, washers, tie rods, continuous-line pickling equipment including racks, etc. 20Cb-3® is a registered trademark of Carpenter Technology Corporation.

Order this product through the following link:

[http://www.lookpolymers.com/polymer\\_Carpenter-20Cb-3-Stainless-Steel-Bar-Annealed-at-1750F-955C-then-Water-Quenched.php](http://www.lookpolymers.com/polymer_Carpenter-20Cb-3-Stainless-Steel-Bar-Annealed-at-1750F-955C-then-Water-Quenched.php)

| Physical Properties | Metric    | English                  | Comments |
|---------------------|-----------|--------------------------|----------|
| Density             | 8.08 g/cc | 0.292 lb/in <sup>3</sup> |          |

| Mechanical Properties      | Metric                          | English                           | Comments                              |
|----------------------------|---------------------------------|-----------------------------------|---------------------------------------|
| Tensile Strength, Ultimate | 627 MPa                         | 90900 psi                         |                                       |
| Tensile Strength, Yield    | 331 MPa<br>@Strain 0.200 %      | 48000 psi<br>@Strain 0.200 %      |                                       |
| Elongation at Break        | 45 %                            | 45 %                              | In 50 mm                              |
| Reduction of Area          | 67 %                            | 67 %                              |                                       |
| Modulus of Elasticity      | 193 GPa                         | 28000 ksi                         | In Tension                            |
| Poissons Ratio             | 0.31                            | 0.31                              |                                       |
| Fatigue Strength           | 330 MPa<br>@# of Cycles 1.00e+7 | 47900 psi<br>@# of Cycles 1.00e+7 | R.R. Moore Test, Smooth Rotating Beam |
| Shear Modulus              | 73.7 GPa                        | 10700 ksi                         | Calculated                            |

| Thermal Properties     | Metric  | English   | Comments |
|------------------------|---|---|----------|
| CTE, linear            | 14.69 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$ | 8.161 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$ |          |
|                        | @Temperature 25.0 - 100 $^\circ\text{C}$        | @Temperature 77.0 - 212 $^\circ\text{F}$          |          |
|                        | 15.91 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$ | 8.839 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$ |          |
|                        | @Temperature 25.0 - 450 $^\circ\text{C}$        | @Temperature 77.0 - 842 $^\circ\text{F}$          |          |
|                        | 17.15 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$ | 9.528 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$ |          |
|                        | @Temperature 25.0 - 900 $^\circ\text{C}$        | @Temperature 77.0 - 1650 $^\circ\text{F}$         |          |
| Specific Heat Capacity | 0.500 J/g- $^\circ\text{C}$                     | 0.120 BTU/lb- $^\circ\text{F}$                    |          |

| Component Elements Properties | Metric         | English        | Comments               |
|-------------------------------|----------------|----------------|------------------------|
| Carbon, C                     | $\leq 0.060\%$ | $\leq 0.060\%$ |                        |
| Chromium, Cr                  | 19 - 21 %      | 19 - 21 %      |                        |
| Copper, Cu                    | 3.0 - 4.0 %    | 3.0 - 4.0 %    |                        |
| Iron, Fe                      | 36 %           | 36 %           | as remainder           |
| Manganese, Mn                 | $\leq 2.0\%$   | $\leq 2.0\%$   |                        |
| Molybdenum, Mo                | 2.0 - 3.0 %    | 2.0 - 3.0 %    |                        |
| Nb + Ta                       | $\leq 1.0\%$   | $\leq 1.0\%$   |                        |
| Nickel, Ni                    | 32.5 - 35 %    | 32.5 - 35 %    |                        |
| Niobium, Nb (Columbium, Cb)   | $\leq 1.0\%$   | $\leq 1.0\%$   | min Nb = 8 x C content |
| Phosphorous, P                | $\leq 0.035\%$ | $\leq 0.035\%$ |                        |
| Silicon, Si                   | $\leq 1.0\%$   | $\leq 1.0\%$   |                        |
| Sulfur, S                     | $\leq 0.035\%$ | $\leq 0.035\%$ |                        |
| Tantalum, Ta                  | $\leq 1.0\%$   | $\leq 1.0\%$   |                        |

| Electrical Properties  | Metric           | English          | Comments |
|------------------------|------------------|------------------|----------|
| Electrical Resistivity | 0.0001082 ohm-cm | 0.0001082 ohm-cm |          |
| Magnetic Permeability  | 1.002            | 1.002            |          |

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