# Carpenter 20Cb-3® Stainless Steel

**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 SO2 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.php

| Physical Properties | Metric | English | Comments |
|---|---|---|---|
| Density | 8.08 g/cc | 0.292 lb/in³ | |

| Mechanical Properties | Metric | English | Comments |
|---|---|---|---|
| Tensile Strength, Ultimate | 627 MPa | 90900 psi | |
| | 200 MPa<br>@Temperature 871 °C | 29000 psi<br>@Temperature 1600 °F | |
| | 310 MPa<br>@Temperature 760 °C | 45000 psi<br>@Temperature 1400 °F | |
| | 531 MPa<br>@Temperature 538 °C | 77000 psi<br>@Temperature 1000 °F | |
| | 545 MPa<br>@Temperature 427 °C | 79000 psi<br>@Temperature 801 °F | |
| | 552 MPa<br>@Temperature 316 °C | 80100 psi<br>@Temperature 601 °F | |
| | 572 MPa | 83000 psi | |

| Mechanical Properties | Metric | English | Comments |
|---|---|---|---|
| | @Temperature 204 °C | @Temperature 399 °F | |
| | 593 MPa<br>@Temperature 93.0 °C | 86000 psi<br>@Temperature 199 °F | |
| | 731 MPa<br>@Temperature -73.0 °C | 106000 psi<br>@Temperature -99.4 °F | Transverse |
| | 752 MPa<br>@Temperature -73.0 °C | 109000 psi<br>@Temperature -99.4 °F | Longitudinal |
| | 800 MPa<br>@Temperature -129 °C | 116000 psi<br>@Temperature -200 °F | Transverse |
| | 827 MPa<br>@Temperature -129 °C | 120000 psi<br>@Temperature -200 °F | Longitudinal |
| | 1034 MPa<br>@Temperature -196 °C | 150000 psi<br>@Temperature -321 °F | Transverse |
| | 1062 MPa<br>@Temperature -196 °C | 154000 psi<br>@Temperature -321 °F | Longitudinal |
| | 1124 MPa<br>@Temperature -253 °C | 163000 psi<br>@Temperature -423 °F | Longitudinal |
| | 1241 MPa<br>@Temperature -253 °C | 180000 psi<br>@Temperature -423 °F | Transverse |
| Tensile Strength, Yield | 310 MPa<br>@Strain 0.200 % | 45000 psi<br>@Strain 0.200 % | |
| | 131 MPa<br>@Strain 0.200 %, Temperature 871 °C | 19000 psi<br>@Strain 0.200 %, Temperature 1600 °F | |
| | 179 MPa<br>@Strain 0.200 %, Temperature 760 °C | 26000 psi<br>@Strain 0.200 %, Temperature 1400 °F | |
| | 193 MPa<br>@Strain 0.200 %, Temperature 538 °C | 28000 psi<br>@Strain 0.200 %, Temperature 1000 °F | |
| | 207 MPa<br>@Strain 0.200 %, Temperature 427 °C | 30000 psi<br>@Strain 0.200 %, Temperature 801 °F | |

| Mechanical Properties | Metric | English | Comments |
|---|---|---|---|
| | @Strain 0.200 %, Temperature 316 °C | @Strain 0.200 %, Temperature 601 °F | |
| | 241 MPa<br>@Strain 0.200 %, Temperature 204 °C | 35000 psi<br>@Strain 0.200 %, Temperature 399 °F | |
| | 276 MPa<br>@Strain 0.200 %, Temperature 93.0 °C | 40000 psi<br>@Strain 0.200 %, Temperature 199 °F | |
| | 407 MPa<br>@Strain 0.200 %, Temperature -73.0 °C | 59000 psi<br>@Strain 0.200 %, Temperature -99.4 °F | Transverse |
| | 434 MPa<br>@Strain 0.200 %, Temperature -73.0 °C | 62900 psi<br>@Strain 0.200 %, Temperature -99.4 °F | Longitudinal |
| | 462 MPa<br>@Strain 0.200 %, Temperature -129 °C | 67000 psi<br>@Strain 0.200 %, Temperature -200 °F | Transverse |
| | 490 MPa<br>@Strain 0.200 %, Temperature -129 °C | 71100 psi<br>@Strain 0.200 %, Temperature -200 °F | Longitudinal |
| | 552 MPa<br>@Strain 0.200 %, Temperature -196 °C | 80100 psi<br>@Strain 0.200 %, Temperature -321 °F | Transverse |
| | 600 MPa<br>@Strain 0.200 %, Temperature -196 °C | 87000 psi<br>@Strain 0.200 %, Temperature -321 °F | Longitudinal |
| | 683 MPa<br>@Strain 0.200 %, Temperature -253 °C | 99100 psi<br>@Strain 0.200 %, Temperature -423 °F | Transverse |
| | 724 MPa<br>@Strain 0.200 %, Temperature -253 °C | 105000 psi<br>@Strain 0.200 %, Temperature -423 °F | Longitudinal |
| Elongation at Break | 45 % | 45 % | In 50 mm |
| | 30 %<br>@Temperature -253 °C | 30 %<br>@Temperature -423 °F | In 50 mm, Longitudinal |
| | 36 % | 36 % | |

| Mechanical Properties | Metric | English | Comments |
|---|---|---|---|
| | @Temperature -129 °C | @Temperature -200 °F | In 50 mm, Longitudinal |
| | 36 %<br>@Temperature -73.0 °C | 36 %<br>@Temperature -99.4 °F | In 50 mm, Longitudinal |
| | 37 %<br>@Temperature -73.0 °C | 37 %<br>@Temperature -99.4 °F | In 50 mm, Transverse to rolling direction |
| | 38 %<br>@Temperature 538 °C | 38 %<br>@Temperature 1000 °F | In 50 mm |
| | 40 %<br>@Temperature -129 °C | 40 %<br>@Temperature -200 °F | In 50 mm, Transverse to rolling direction |
| | 40 %<br>@Temperature 427 °C | 40 %<br>@Temperature 801 °F | In 50 mm |
| | 42 %<br>@Temperature 316 °C | 42 %<br>@Temperature 601 °F | In 50 mm |
| | 44 %<br>@Temperature 204 °C | 44 %<br>@Temperature 399 °F | In 50 mm |
| | 46 %<br>@Temperature 93.0 °C | 46 %<br>@Temperature 199 °F | In 50 mm |
| | 52 %<br>@Temperature 760 °C | 52 %<br>@Temperature 1400 °F | In 50 mm |
| | 54 %<br>@Temperature -253 °C | 54 %<br>@Temperature -423 °F | In 50 mm, Transverse to rolling direction |
| | 64 %<br>@Temperature -196 °C | 64 %<br>@Temperature -321 °F | In 50 mm, Longitudinal |
| | 64 %<br>@Temperature -196 °C | 64 %<br>@Temperature -321 °F | In 50 mm, Transverse to rolling direction |
| | 75 %<br>@Temperature 871 °C | 75 %<br>@Temperature 1600 °F | In 50 mm |
| Reduction of Area | 67 % | 67 % | |
| | 57 %<br>@Temperature 538 °C | 57 %<br>@Temperature 1000 °F | |

| Mechanical Properties | Metric | English | Comments |
|---|---|---|---|
| | 60 % | 60 % | |
| | @Temperature 427 °C | @Temperature 801 °F | |
| | 65 % | 65 % | |
| | @Temperature 316 °C | @Temperature 601 °F | |
| | 67 % | 67 % | |
| | @Temperature 204 °C | @Temperature 399 °F | |
| | 68 % | 68 % | |
| | @Temperature 93.0 °C | @Temperature 199 °F | |
| | 75 % | 75 % | |
| | @Temperature 760 °C | @Temperature 1400 °F | |
| | 75 % | 75 % | |
| | @Temperature 871 °C | @Temperature 1600 °F | |
| Tensile Modulus | 193 GPa | 28000 ksi | |
| | @Temperature 23.0 °C | @Temperature 73.4 °F | |
| Poissons Ratio | 0.31 | 0.31 | |
| | @Temperature 23.0 °C | @Temperature 73.4 °F | |
| Shear Modulus | 73.7 GPa | 10700 ksi | |
| | @Temperature 23.0 °C | @Temperature 73.4 °F | |

| Thermal Properties | Metric | English | Comments |
|---|---|---|---|
| CTE, linear | 14.69 µm/m-°C | 8.161 µin/in-°F | |
| | @Temperature 25.0 - 100 °C | @Temperature 77.0 - 212 °F | |
| | 15.91 µm/m-°C | 8.839 µin/in-°F | |
| | @Temperature 25.0 - 450 °C | @Temperature 77.0 - 842 °F | |
| | 17.15 µm/m-°C | 9.528 µin/in-°F | |
| | @Temperature 25.0 - 900 °C | @Temperature 77.0 - 1650 °F | |
| Specific Heat Capacity | 0.500 J/g-°C | 0.120 BTU/lb-°F | |

| Component Elements Properties | Metric | English | Comments |
|---|---|---|---|
| Carbon, C | <= 0.060 % | <= 0.060 % | |

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

| Electrical Properties | Metric | English | Comments |
|---|---|---|---|
| Electrical Resistivity | 0.0001082 ohm-cm | 0.0001082 ohm-cm | |

## Contact Songhan Plastic Technology Co.,Ltd.

**Website : www.lookpolymers.com**
**Email : sales@lookpolymers.com**
**Tel : +86 021-51131842**
**Mobile : +86 13061808058**
**Skype : lookpolymers**
**Address : United North Road 215,Fengxian District, Shanghai City,China**