

## Carpenter MP35N\* Ni-Co-Cr-Mo Alloy, Cold Drawn 53%, Aged 565°C/4hr/AC

Category : Metal , Nonferrous Metal , Cobalt Alloy , Nickel Alloy , Superalloy

### Material Notes:

Data provided by Carpenter Technology Corporation. Carpenter MP35N alloy is a nonmagnetic, nickel-cobalt-chromium-molybdenum alloy possessing a unique combination of ultrahigh tensile strength, good ductility and toughness, and excellent corrosion resistance. In addition, this alloy displays exceptional resistance to sulfidation, high temperature oxidation, and hydrogen embrittlement. The unique properties of MP35N alloy are developed through work hardening, phase transformation and aging. If the alloy is used in the fully work hardened condition, service temperatures up to 750°F (399°C) are suggested. MP35N alloy is normally produced by vacuum induction melting (VIM), followed vacuum arc remelting (VAR). Because of its unique combination of properties, MP35N alloy has been used in a wide variety of applications. MP35N alloy has been used in fasteners, springs, nonmagnetic electrical components and instrument parts in medical, seawater, oil and gas well, and chemical and food processing environments.\*MP35N is a trademark of SPS Technologies, Inc. MP is a registered trademark of SPS Technologies, Inc.

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Physical Properties	Metric	English	Comments
Density	8.43 g/cc	0.305 lb/in <sup>3</sup>	

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	2027 MPa	294000 psi	
	1655 MPa	240000 psi	
	@Temperature 426 °C	@Temperature 799 °F	
	1689 MPa	245000 psi	
	@Temperature 371 °C	@Temperature 700 °F	
	1724 MPa	250000 psi	
	@Temperature 316 °C	@Temperature 601 °F	
	1744 MPa	252900 psi	
@Temperature 260 °C	@Temperature 500 °F		
1793 MPa	260100 psi		
@Temperature 204 °C	@Temperature 399 °F		
1834 MPa	266000 psi		
@Temperature 149 °C	@Temperature 300 °F		
Tensile Strength, Yield	1965 MPa	285000 psi	
@Strain 0.200 %	@Strain 0.200 %		

Mechanical Properties	1551 MPa Metric	225000 psi English	Comments
	@Strain 0.200 %, Temperature 426 °C	@Strain 0.200 %, Temperature 799 °F	
	<b>1586 MPa</b>	<b>230000 psi</b>	
	@Strain 0.200 %, Temperature 371 °C	@Strain 0.200 %, Temperature 700 °F	
	<b>1627 MPa</b>	<b>236000 psi</b>	
	@Strain 0.200 %, Temperature 316 °C	@Strain 0.200 %, Temperature 601 °F	
	<b>1662 MPa</b>	<b>241100 psi</b>	
	@Strain 0.200 %, Temperature 260 °C	@Strain 0.200 %, Temperature 500 °F	
	<b>1710 MPa</b>	<b>248000 psi</b>	
	@Strain 0.200 %, Temperature 204 °C	@Strain 0.200 %, Temperature 399 °F	
	<b>1758 MPa</b>	<b>255000 psi</b>	
	@Strain 0.200 %, Temperature 149 °C	@Strain 0.200 %, Temperature 300 °F	
<b>Elongation at Break</b>	<b>10 %</b>	<b>10 %</b>	
	<b>4.0 %</b>	<b>4.0 %</b>	
	@Temperature 426 °C	@Temperature 799 °F	
	<b>7.0 %</b>	<b>7.0 %</b>	
	@Temperature 371 °C	@Temperature 700 °F	
	<b>8.0 %</b>	<b>8.0 %</b>	
	@Temperature 149 °C	@Temperature 300 °F	
	<b>8.0 %</b>	<b>8.0 %</b>	
	@Temperature 316 °C	@Temperature 601 °F	
	<b>8.0 %</b>	<b>8.0 %</b>	
	@Temperature 260 °C	@Temperature 500 °F	
	<b>8.0 %</b>	<b>8.0 %</b>	
	@Temperature 204 °C	@Temperature 399 °F	
<b>Reduction of Area</b>	<b>46 %</b>	<b>46 %</b>	
	<b>8.0 %</b>	<b>8.0 %</b>	
	@Temperature 426 °C	@Temperature 799 °F	

Mechanical Properties	Metric	English	Comments
	@Temperature 371 °C	@Temperature 700 °F	
	41 %	41 %	
	@Temperature 316 °C	@Temperature 601 °F	
	43 %	43 %	
	@Temperature 260 °C	@Temperature 500 °F	
	44 %	44 %	
	@Temperature 204 °C	@Temperature 399 °F	
	45 %	45 %	
	@Temperature 149 °C	@Temperature 300 °F	
Modulus of Elasticity	234.8 GPa	34060 ksi	
Shear Modulus	80.95 GPa	11740 ksi	

Thermal Properties	Metric	English	Comments
CTE, linear	12.8 $\mu\text{m}/\text{m}\cdot\text{°C}$	7.11 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 21.0 - 93.0 °C	@Temperature 69.8 - 199 °F	
	14.8 $\mu\text{m}/\text{m}\cdot\text{°C}$	8.22 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 21.0 - 316 °C	@Temperature 69.8 - 601 °F	
	15.7 $\mu\text{m}/\text{m}\cdot\text{°C}$	8.72 $\mu\text{in}/\text{in}\cdot\text{°F}$	
	@Temperature 21.0 - 538 °C	@Temperature 69.8 - 1000 °F	
Thermal Conductivity	11.2 W/m-K	77.7 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
	17.0 W/m-K	118 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 316 °C	@Temperature 601 °F	
	23.4 W/m-K	162 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 649 °C	@Temperature 1200 °F	
Melting Point	1315 - 1440 °C	2399 - 2620 °F	
Solidus	1315 °C	2399 °F	
Liquidus	1440 °C	2620 °F	

Component Elements Properties	Metric	English	Comments
Boron, B	0.010 %	0.010 %	
Carbon, C	<= 0.025 %	<= 0.025 %	
Chromium, Cr	19 - 21 %	19 - 21 %	
Cobalt, Co	33 %	33 %	as remainder
Iron, Fe	<= 1.0 %	<= 1.0 %	
Manganese, Mn	<= 0.15 %	<= 0.15 %	
Molybdenum, Mo	9.0 - 10.5 %	9.0 - 10.5 %	
Nickel, Ni	33 - 37 %	33 - 37 %	
Phosphorous, P	<= 0.015 %	<= 0.015 %	
Silicon, Si	<= 0.15 %	<= 0.15 %	
Sulfur, S	<= 0.010 %	<= 0.010 %	
Titanium, Ti	<= 1.0 %	<= 1.0 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0001033 ohm-cm	0.0001033 ohm-cm	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
	0.0001154 ohm-cm	0.0001154 ohm-cm	
	@Temperature 538 °C	@Temperature 1000 °F	

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