

## Special Metals INCONEL® alloy 693

Category : Metal , Nonferrous Metal , Nickel Alloy , Superalloy

### Material Notes:

INCONEL alloy 693 is a new alloy from Special Metals which offers resistance to high temperature corrosion mechanisms not previously available from a nickel-based alloy. Of particular interest to the designer is the alloy's resistance to metal dusting. INCONEL® alloy 693 offers the best resistance to metal dusting in chemical and petrochemical processing environments of any conventional alloy currently manufactured. Like its predecessor, INCONEL alloy 690, the alloy's high chromium content gives it excellent resistance to oxidation and sulfidation. Applications Petrochemical: Syntheses gas production Waste to Energy and Biomass Incinerators Thermal Processing Burner Nozzles High-Temperature Fuel Cell Reformers Information Provided by Special Metals Corporation

Order this product through the following link:

[http://www.lookpolymers.com/polymer\\_Special-Metals-INCONEL-alloy-693.php](http://www.lookpolymers.com/polymer_Special-Metals-INCONEL-alloy-693.php)

Physical Properties	Metric	English	Comments
Density	7.77 g/cc	0.281 lb/in <sup>3</sup>	

Mechanical Properties	Metric	English	Comments
Tensile Strength at Break	882.6 MPa	128000 psi	Hot-rolled and annealed plate
	937.7 MPa	136000 psi	Cold-drawn and annealed tubing
Tensile Strength, Yield	489.5 MPa	71000 psi	Hot-rolled and annealed plate
	@Strain 0.200 %	@Strain 0.200 %	
	530.9 MPa	77000 psi	Cold-drawn and annealed tubing
	@Strain 0.200 %	@Strain 0.200 %	
Elongation at Break	42 %	42 %	Cold-drawn and annealed tubing
	45 %	45 %	Hot-rolled and annealed plate
Rupture Strength	22.1 MPa	3200 psi	
	@Temperature 871 Â°C, Time 3.60e+7 sec	@Temperature 1600 Â°F, Time 10000 hour	
	38.6 MPa	5600 psi	
	@Temperature 871 Â°C, Time 3.60e+6 sec	@Temperature 1600 Â°F, Time 1000 hour	
	68.9 MPa	10000 psi	
	@Temperature 871 Â°C, Time 360000 sec	@Temperature 1600 Â°F, Time 100 hour	

Mechanical Properties	159 MPa Metric	23000 psi English	Comments
	@Temperature 649 Â°C, Time 3.60e+7 sec	@Temperature 1200 Â°F, Time 10000 hour	
	228 MPa	33000 psi	
	@Temperature 649 Â°C, Time 3.60e+6 sec	@Temperature 1200 Â°F, Time 1000 hour	
	310 MPa	45000 psi	
	@Temperature 649 Â°C, Time 360000 sec	@Temperature 1200 Â°F, Time 100 hour	
Modulus of Elasticity	137 GPa	19900 ksi	
	@Temperature 800 Â°C	@Temperature 1470 Â°F	
	165 GPa	23900 ksi	
	@Temperature 500 Â°C	@Temperature 932 Â°F	
	194 GPa	28100 ksi	
	@Temperature 100 Â°C	@Temperature 212 Â°F	
	196 GPa	28400 ksi	
	@Temperature 21.0 Â°C	@Temperature 69.8 Â°F	
Charpy Impact, Notched	26.3 J/cmÂ²	125 ft-lb/inÂ²	
	@Temperature 704 Â°C, Time 3.60e+6 sec	@Temperature 1300 Â°F, Time 1000 hour	
	27.5 J/cmÂ²	131 ft-lb/inÂ²	
	@Temperature 649 Â°C, Time 3.60e+6 sec	@Temperature 1200 Â°F, Time 1000 hour	
	39.0 J/cmÂ²	186 ft-lb/inÂ²	
	@Temperature 760 Â°C, Time 3.60e+6 sec	@Temperature 1400 Â°F, Time 1000 hour	
	68.6 J/cmÂ²	326 ft-lb/inÂ²	
	@Temperature 593 Â°C, Time 3.60e+6 sec	@Temperature 1100 Â°F, Time 1000 hour	

Thermal Properties	Metric	English	Comments
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Thermal Properties	Metric	English	Comments
	@Temperature 100 °C	@Temperature 212 °F	
	14.8 μm/m-°C	8.22 μin/in-°F	
	@Temperature 500 °C	@Temperature 932 °F	
	17.01 μm/m-°C	9.450 μin/in-°F	
	@Temperature 900 °C	@Temperature 1650 °F	
Specific Heat Capacity	0.455 J/g-°C	0.109 BTU/lb-°F	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
	0.484 J/g-°C	0.116 BTU/lb-°F	
	@Temperature 100 °C	@Temperature 212 °F	
	0.560 J/g-°C	0.134 BTU/lb-°F	
	@Temperature 500 °C	@Temperature 932 °F	
	0.642 J/g-°C	0.153 BTU/lb-°F	
	@Temperature 900 °C	@Temperature 1650 °F	
Thermal Conductivity	9.10 W/m-K	63.2 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
	10.7 W/m-K	74.3 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 100 °C	@Temperature 212 °F	
	17.8 W/m-K	124 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 500 °C	@Temperature 932 °F	
	23.6 W/m-K	164 BTU-in/hr-ft <sup>2</sup> -°F	
	@Temperature 900 °C	@Temperature 1650 °F	
Melting Point	1317 - 1367 °C	2403 - 2493 °F	
Solidus	1317 °C	2403 °F	
Liquidus	1367 °C	2493 °F	

Component Elements Properties	Metric	English	Comments
Aluminum, Al	2.5 - 4.0 %	2.5 - 4.0 %	

Carbon C Component Elements Properties	$\leq 0.15\%$ Metric	$\leq 0.15\%$ English	Comments
Chromium, Cr	27 - 31 %	27 - 31 %	
Copper, Cu	$\leq 0.50\%$	$\leq 0.50\%$	
Iron, Fe	2.5 - 6.0 %	2.5 - 6.0 %	
Manganese, Mn	$\leq 1.0\%$	$\leq 1.0\%$	
Nickel, Ni	53.34 - 67.5 %	53.34 - 67.5 %	as remainder
Niobium, Nb (Columbium, Cb)	0.50 - 2.5 %	0.50 - 2.5 %	
Silicon, Si	$\leq 0.50\%$	$\leq 0.50\%$	
Sulfur, S	$\leq 0.010\%$	$\leq 0.010\%$	
Titanium, Ti	$\leq 1.0\%$	$\leq 1.0\%$	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.0001168 ohm-cm	0.0001168 ohm-cm	

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