

## Carpenter Pyrotough® 78 Hot Work Die Steel

Category : Metal , Ferrous Metal , Carbon Steel , Tool Steel , Hot Work Steel

### Material Notes:

Pyrotough® 78 alloy is a premium quality hot work die steel engineered to withstand the operating temperatures and pressures associated with die casting and hot extrusion operations. The patented composition of the alloy displays improved temper resistance/red-hardness and similar toughness when compared to standard AISI type H13 hot work die steel. Careful control over all stages of processing results in an alloy possessing a high degree of purity, homogeneity and microstructural integrity. Applications: mandrels for extruding copper, brass, stainless steel, and nickel-base superalloys, dies for extruding copper and brass. Information provided by Carpenter Technology Corporation. Pyrotough® is a registered trademark of Carpenter Technology Corporation.

Order this product through the following link:

[http://www.lookpolymers.com/polymer\\_Carpenter-Pyrotough-78-Hot-Work-Die-Steel.php](http://www.lookpolymers.com/polymer_Carpenter-Pyrotough-78-Hot-Work-Die-Steel.php)

Physical Properties	Metric	English	Comments
Specific Gravity	7.75 g/cc	7.75 g/cc	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell C	54	54	As hardened
	56.5	56.5	Tempered at 1000°F
Tensile Strength, Ultimate	1860 MPa	270000 psi	3 in bar
	1515 MPa @Temperature 427 °C	219700 psi @Temperature 800 °F	3 in bar
Tensile Strength, Yield	1655 MPa @Strain 0.200 %	240000 psi @Strain 0.200 %	3 in bar
	1480 MPa @Strain 0.200 %, Temperature 427 °C	215000 psi @Strain 0.200 %, Temperature 800 °F	3 in bar
Elongation at Break	9.0 %	9.0 %	Elongation in 4D, 3 in bar
	15 % @Temperature 427 °C	15 % @Temperature 800 °F	Elongation in 4D, 3 in bar
Reduction of Area	43 %	43 %	3 in bar
	59 % @Temperature 427 °C	59 % @Temperature 800 °F	3 in bar
Charpy Impact	14.9 J	11.0 ft-lb	V Notch, 3 in bar

Mechanical Properties	29.8 J Metric	22.0 ft-lb English	Comments V-Notch, Bar
	@Diameter 3.00 mm, Temperature 427 °C	@Diameter 0.118 in, Temperature 800 °F	
Abrasion	120	120	loss in mm <sup>3</sup> , Tempered at 1025°F; ASTM G65

Thermal Properties	Metric	English	Comments
CTE, linear	12.6 µm/m-°C	7.00 µin/in-°F	
	@Temperature 27.0 - 600 °C	@Temperature 80.6 - 1110 °F	
Transformation Temperature	857 °C	1570 °F	Ac <sub>1</sub>
	913 °C	1680 °F	Ac <sub>3</sub>

Component Elements Properties	Metric	English	Comments
Carbon, C	0.40 %	0.40 %	
Chromium, Cr	4.45 %	4.45 %	
Iron, Fe	90.845 - 90.85 %	90.845 - 90.85 %	As Balance
Manganese, Mn	0.45 %	0.45 %	
Molybdenum, Mo	2.05 %	2.05 %	
Silicon, Si	1.0 %	1.0 %	
Sulfur, S	<= 0.0050 %	<= 0.0050 %	
Vanadium, V	0.80 %	0.80 %	

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