

## Copper Nickel Tin Alloy

ToughMet® 3 is a wrought copper-nickel-tin alloy which is similar to beryllium copper alloys.

The fundamental difference is that ToughMet® 3 has reduced conductivity when compared to its beryllium copper counterparts. However, it is comparable in performance to beryllium copper alloys but without containing beryllium at all.

The alloy is non-magnetic and thermally strengthened using a heat treatment process called spinodal decomposition. Improvements in this heat treatment process have resulted in an end product aged to a much higher strength level. The alloy offers numerous performance benefits with a combination of high toughness and high strength, which is resistant to dynamic impact loading. The product also provides galling and high bearing resistance and is suitable for use in both saltwater and sour service environments. Its high strength and low coefficient of friction make it well suited for use as a bushing and bearing material. The alloy also out-performs many nickel and copper alloys in corrosive environments.

Traditionally, used in bushings and bearings, particularly in aircraft, ToughMet® 3 has also become popular in oil and gas applications due to its performance in sour service.

### Machinability

The product benefits from excellent machinability and can be used to produce intricate parts. The material can be machined at extremely high speeds with carbide tooling although generous amounts of coolant should be applied. In general, ToughMet 3 machines very well, especially with a chip breaker to control cutting resistance.

### About Smiths High Performance

Smiths High Performance is a leading stockholder and supplier of high-performance engineering materials to the global motorsport sector. We are supply partners in a range of specialist motorsport markets including Formula 1, Formula E, NASCAR, MOTO GP, WEC & WRC.

Further technical data available on the reverse of this Datasheet



### Motorsport Applications

- Automotive powertrains
- Valve retainer springs
- Gearbox thrust washers
- Engine and generator bearings
- Racing valve guides and seats
- Camshaft bearings
- Brake calliper bushings
- Steering bushings

### Product Availability

Bar, plate and wire

## Chemical Composition (%)

Nickel	15.0	Tin	8.0	Copper	Balance
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## Physical Properties

Elastic Modulus	Poisson's Ratio	Electrical Conductivity	Thermal Conductivity	Coefficient of Thermal Expansion	Density	Magnetic Permeability
24 x 10 <sup>6</sup> psi 144 kN/mm <sup>2</sup>	0.33	<7% IACS <4 MS/m	22 Btu/ft/hr/°F 38 W/m/°C	9.1 x 10 <sup>-6</sup> in/in/°F 16.4 x 10 <sup>-6</sup> m/m/°C	0.325 lb/in <sup>3</sup> 9.00 g/cm <sup>3</sup>	<1.001

## Mechanical Properties (minimum)

Temper	Diameter		0.2% Offset Strength		Ultimate Tensile Strength		Elongation	Hardness	Avg CVN Impact Toughness		
	inch	mm	ksi	N/mm <sup>2</sup>	ksi	N/mm <sup>2</sup>	% in 4D	HRC	ft-lbs	J	
ROD	TS 95	0.75 - 3.25	19 - 82	95	655	106	730	18	93 HRB	30*	40*
		3.26 - 6.00	83 - 152.4	95	655	105	725	18	93 HRB	30*	40*
	TS 120U	0.75 - 1.59	19 - 40.9	110	755	120	825	15	24	15	20
		1.6 - 3.25	41 - 82	110	755	120	825	15	24	12	16
	TS 130	3.26 - 6.00	83 - 152.4	110	755	120	825	15	22	11**	14**
		0.75 - 6.00	19 - 152.4	130	895	140	965	10	24		
WIRE	TS 160U	0.25	<6.35	150	1035	160	1100	5	32		
		0.26 - 0.4	6.35 - 1.0	150	1035	160	1100	7	32		
	TS 160U	0.41 - 0.75	10.1 - 19	150	1035	165	1140	7	36		
		0.76 - 1.6	19.1 - 41	150	1035	165	1140	5	34		
	TS 160U	1.61 - 3.25	41.1 - 82	150	1035	160	1105	3	34		
		3.26 - 6.00	83 - 152.4	148	1020	160	1100	3	32		
TUBE	TS 105	1.50 - 3.05 (OD)	38 - 77 (OD)	105	725	120	830	15	22		
		<0.4 wall <10 wall									
	1.50 - 3.05 (OD)	38 - 77 (OD)	105	725	120	830	16	22	14***	19***	
TS 150	1.3 - 3.00 (OD)	33 - 76 (OD)	150	1035	158	1090	5	36			

\*no single value less than 24 ft-lbs (32 J) \*\*no single value less than 10 ft-lbs (13.5 J) \*\*\*no single value less than 12 ft-lbs(16 J); (10mm width x 10mm thickness) CVN specimens only

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[www.smithshp.com](http://www.smithshp.com)

[info@smithshp.com](mailto:info@smithshp.com)



Unit 3, Juno Place  
Stratton Business Park  
Biggleswade SG18 8XP  
Tel: +44 (0)1767 604 708



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