LAMINERIES MATTHEY
NOTZ group advanced metal solutions

ToughMet® 3

Rod and wires

		DIN	EN	UNS (ASTM)	AISI	LMSA
Designation	**CuNi15Sn8**	-	-	C72900	-	**G505 / G506**

Chemical composition

Cu	Ni	Sn	Pb
Balance	14.50 - 15.50	7.50 - 8.50	≤ 0.02

Values (Weight %). In order to achieve maximum homogeneity and consistent quality, the actual manufacturing tolerances are tighter and more precise than the composition indicated.

Main technical properties and features

ToughMet® 3 is a copper-nickel-tin alloy with a very high mechanical strength and good corrosion resistance. The high mechanical strength reaches its maximum after a spinodal decomposition heat treatment. Following spinodal decomposition, the manufactured parts can reach mechanical strengths of over 1300 N/mm^2. ToughMet® 3 also has very good fatigue strength and excellent resistance to thermal relaxation. ToughMet® 3 presents an excellent corrosion resistance in marine environments. It meets the requirements of NACE MR0175/ISO 15156. The alloy has excellent resistance to pitting and is not susceptible to hydrogen embrittlement. The geometrical stability of the parts during the spinodal decomposition heat treatment is exceptional. It is heat resistant up to 300 °C depending on the temper. This alloy also has excellent tribological properties: self-lubricating, excellent galling resistance, and excellent wear resistance under severe load conditions.

ToughMet® 3 is a beryllium and lead-free alloy and therefore complies with REACH and RoHs regulations.

Typical uses

Thanks to its unique combination of high strength, electrical conductivity and low thermal stress relaxation, this alloy can be used in spring contacts, diaphragms, electric and electronic contacts and connectors, switches, relays, bearings, resistance welding electrodes, various parts for the watch industry such as wheels, watch hands, balances, levers, etc.

Typical manufacturing range

		Diameter (mm) [3]	Length (mm) [3]
Drawn products	Pointed and chamfered rod [1]	0.8 - 25.4	rods 3 meters
	Wire [1]	0.2 - 4.0	coils and spools

[1] A large assortment of diameters is available from stock. Other dimensions or other product forms upon request.

[2] Rods of diameter ≥ 2.0 and ≤ 25.0 mm are delivered pointed and chamfered.

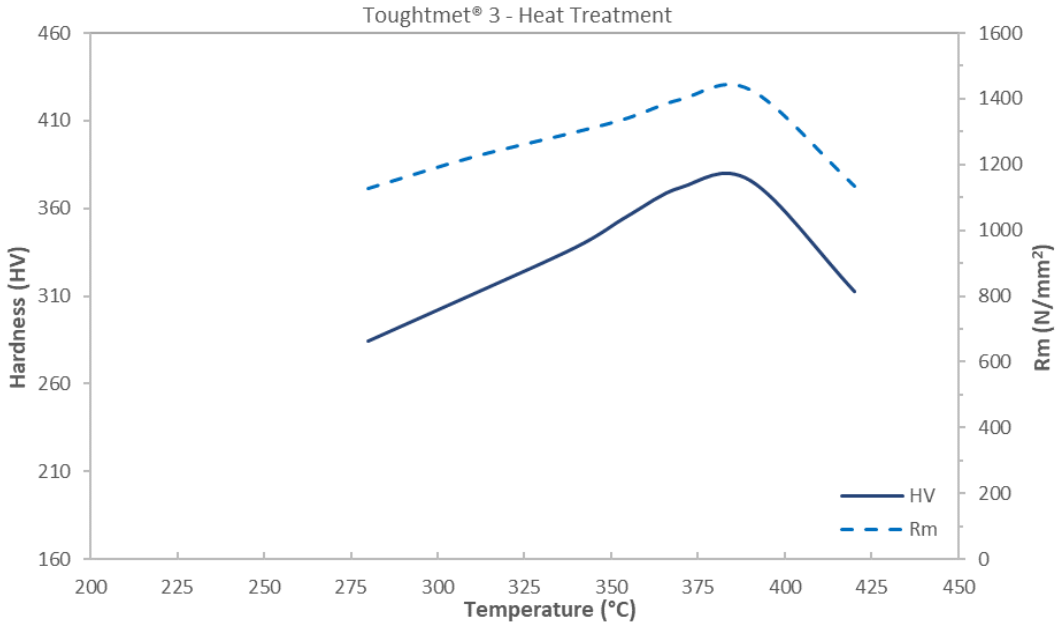
[3] Other dimensions are available upon request

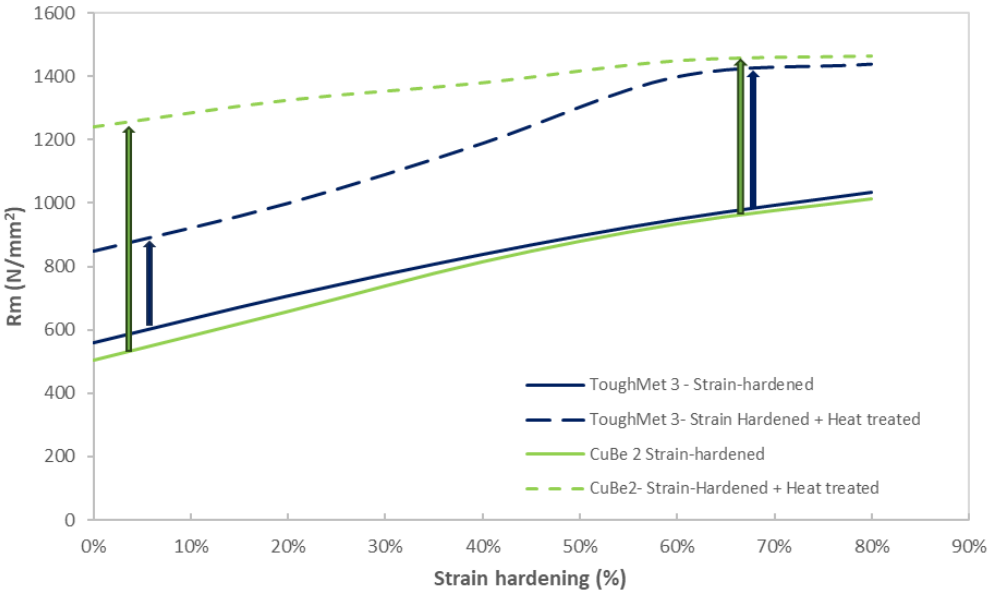
Physical properties

Modulus of elasticity	kN/mm^2	144
Poisson ratio		0.33
Density	g/cm^3	9.00
Melting point / Melting range	°C	1115
Linear dilatation coefficient	10^{-6}·/ °C	16.4
Thermal conductivity at 20°C	W/m °K	38.0
Electrical resistivity	μΩcm	16.7 - 25.0
Electrical conductivity	MS/m	4.0
Electrical conductivity	% IACS	7.0
Magnetic properties		< 1.0001

Heat Treatment

ToughMet® 3 can be heat-treated by spinodal decomposition. To obtain maximum mechanical properties, the bars can be heat-treated between 370 - 390ºC for around 3 hours in a nitrogen or cracked ammonia atmosphere. ToughMet® 3 can achieve mechanical properties above 1300 N/mm², but unlike CuBe2, a combination of spinodal decomposition treatment and a high strain-hardening rate is required.





Mechanical properties of rods

Rods and wires	Temper			Heat Treatment	$Rp_{0.2}$ (N/mm^2)	R_m (N/mm^2)	A_{50mm} (%)	Hardness HV
A [1]	TB00	R410	annealed	-	-	410 - 620	20 min.	100 - 180
H [1]	TD04	R760	hard	-	-	760 - 960	1 min.	190 - 280
After spinodal decomposition (by the customer)								
AT [1]	TS00	R1150	soft + hardened	2.5h at 370 °C	-	900 - 1100	-	280 - 340
HT [1]	TS04	R1300	hard + hardened	2.5h at 370 °C	-	1030 - 1230	-	320 - 380
After hardening by Lamineries MATTEY [2]								
TM [2]			hard + hardened	special	-	900 - 1300	-	280 - 390

[1] These tempers do not correspond exactly to those of the EN 12164 standard, but respect the ASTM B196M standard. The given mechanical properties are valid for diameters lower than 25.0 mm. These tempers are comparable to the alloy CuBe(M25).

[2] Upon request, Lamineries MATTHEY SA also delivers mill hardened rods. The requested mechanical properties can be specified individually.

Dimensional tolerances (rod and wire)

	Standard tolerances			Specific tolerances
Diameter	≤ 3.0mm	h8	+ 0 / - 14 µm	Upon request, rod and wire can be delivered with tighter tolerances (h5, h6, h7) by means of additional drawing and/or grinding processes.
	> 3.0 et ≤ 6.0mm	h8	+ 0 / - 18 µm	
	> 10.0 et ≤ 10.5mm	h8	+ 0 / - 22 µm	
	> 10.5 et ≤ 18.0mm	h9	+ 0 / - 43 µm	
	> 18.0 et ≤ 30.0mm	h9	+ 0 / - 52 µm	
	Mill-hardened, non-ground bars are available with tolerances h9.			
Out-of-roundness	Maximum equals half of the tolerance value of the diameter. Upon request rod and wire can be ordered with tighter out-of-roundness tolerances.			
Length	The standard length of rods is 3 meters ± 30 mm.			
Chamfer	Standard rods with diameters larger than 2 mm are delivered pointed and chamfered.			
Straightness	Straightness of the delivered rods complies with the EN 12164 standard.			

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