

Designation	CuBe2Pb	DIN	EN	UNS (ASTM)	AISI	LMSA
		2.1248	CW102C	C17300	-	G100 / G150

## Chemical composition

Cu*	Be	Co + Ni	Co + Ni + Fe	Pb
Balance	1.80 - 2.00	≤ 0.20	≤ 0.60	0.20 - 0.60

Values (Weight %). In order to achieve maximum homogeneity and consistent quality, the actual manufacturing tolerances are tighter and more precisely than the composition indicated.  
\*Copper plus additions > 99.5%

## Main technical properties and features

The Alloy M25, CuBe2Pb, offers the strength properties of Alloy 25, CuBe2, with the added benefit of being “free machining”. It achieves the highest strength and hardness available among all copper alloys after age hardening, and is consequently very widely used. Delivered in the form of rod and wire, M25 is mainly used for screw machined parts. A small addition of lead (0.2 to 0.6 %) greatly improves machinability by reducing chip length and increasing tool life. Best machinability is obtained in the cold worked temper (H or TD04), which is the most commonly used temper. M25 is generally hardened after machining. It can be locally annealed to allow crimping after ageing and is easily plated. The M25 alloy is characterized by its high fatigue strength, its excellent thermal stress relaxation and by a unique combination of mechanical resistance and conductivity.

## Typical uses

Thanks to its unique combination of high strength, electrical conductivity and low thermal stress relaxation, the alloy M25 is very frequently used for manufacturing machined male or female contacts in the electronics, aircraft and automotive industries. Another typical application is the production of turned parts for the watch industry.

## Typical manufacturing range

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

<sup>[1]</sup> A large assortment of diameters are available from stock. Other dimensions or other product forms upon request.

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

<sup>[3]</sup> Other dimensions are available upon request

## Physical properties

Modulus of elasticity	kN/mm <sup>2</sup>	125, 131 <sup>[1]</sup>
Poisson ratio		0.285
Density	g/cm <sup>3</sup>	8.25, 8.36 <sup>[1]</sup>
Melting point / Melting range	°C	875 - 985
Linear dilatation coefficient	10 <sup>-6</sup> /°C	17 from 20 to 200 °C
Thermal conductivity at 20°C	W/m °K	110
Electrical resistivity	μΩcm	11 - 9, 8 - 6 <sup>[1]</sup>
Electrical conductivity	MS/m	9 - 11, 13 - 16 <sup>[1]</sup>
Electrical conductivity	% IACS	15 - 19, 22 - 28 <sup>[1]</sup>
Magnetic properties		Nonmagnetic (Slightly diamagnetic)
Permeability		μ = 1.0006

<sup>[1]</sup> Values before and after hardening, respectively.

## Mechanical properties of rods

Rods				Temper	Heat Treatment	Rp <sub>0.2</sub> (N/mm <sup>2</sup> )	R <sub>m</sub> (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hardness HV
A <sup>[1]</sup>	TB00	R410	annealed		-	130 - 250	410 - 590	20 min.	100 - 180
H <sup>[1]</sup>	TD04	R620	hard		-	510 - 815	620 - 900	8 min.	190 - 280

After age hardening (by the customer)

AT <sup>[1]</sup>	TF00	R1150	soft + hardened	3h at 325°C	1000 - 1210	1130 - 1380	3 min.	360 - 430
HT <sup>[1]</sup>	TH04	R1300	hard + hardened	2h at 325°C	1100 - 1380	1280 - 1550	2 min.	390 - 470

After hardening by Lamineries MATTHEY <sup>[2]</sup>

HT <sup>[2]</sup>			hard + hardened	Special	750 - 1400	900 - 1500	-	270 - 450
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<sup>[1]</sup> 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.

<sup>[2]</sup> Upon request, Lamineries MATTHEY also delivers mill hardened rods. The requested mechanical properties can be specified individually ( $\Delta$ HV min. 40,  $\Delta$ R<sub>m</sub> min. 150 N/mm<sup>2</sup>).

## Mechanical properties of wires

Wires				Temper	Heat Treatment	Rp <sub>0.2</sub> (N/mm <sup>2</sup> )	R <sub>m</sub> (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hardness HV
A <sup>[1]</sup>	TB00	R400	annealed		-	130 - 210	400 - 450	30 min.	90 - 170
¼ H <sup>[1]</sup>	TD01	R620	¼ hard		-	510 - 730	620 - 800	3 min.	200 - 250
½ H <sup>[1]</sup>	TD02	R750	½ hard		-	620 - 870	750 - 940	2 min.	230 - 300
¾ H <sup>[1]</sup>	TD03	R890	¾ hard		-	790 - 1040	890 - 1070	2 min.	270 - 340
H <sup>[1]</sup>	TD04	R690	hard		-	890 - 1110	960 - 1140	1 min.	300 - 360

After age hardening (by the customer)

AT <sup>[1]</sup>	TF00		soft + hardened	3h at 325°C	990 - 1250	1100 - 1380	3 min.	340 - 430
¼ HT <sup>[1]</sup>	TH01		¼ hard + hardened	2h at 325°C	1130 - 1380	1200 - 1450	2 min.	370 - 460
½ HT <sup>[1]</sup>	TH02		½ hard + hardened	2h at 325°C	1170 - 1450	1270 - 1490	2 min.	390 - 470
¾ HT <sup>[1]</sup>	TH03		¾ hard + hardened	2h at 325°C	1200 - 1520	1310 - 1590	2 min.	410 - 500
HT <sup>[1]</sup>	TH04		hard + hardened	2h at 325°C	1240 - 1520	1340 - 1590	1 min.	420 - 500

<sup>[1]</sup> These tempers do not correspond exactly to those of the EN 12166 standard, but respect the ASTM B197M standard. Values for diameters lower than 4mm.

The following tempers respect the ASTM B197M standard and can be delivered upon request. The wire diameters available from stock have one of the following specific tempers:

Wires				Temper	Heat Treatment	Rp <sub>0.2</sub> (N/mm <sup>2</sup> )	R <sub>m</sub> (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hardness HV
A <sup>[1]</sup>	R420	H090	annealed		-	140 min.	420 min.	35 min.	90 min.
½ H <sup>[1]</sup>	R650	H190	½ hard		-	400 min.	650 - 850	2 min.	190 - 300

## Dimensional tolerances (rod and wire)

	Standard tolerances			Specific tolerances
<b>Diameter</b>	≤ 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.				
<b>Out-of-roundness</b>	Maximum equals half of the tolerance value of the diameter. Upon request rod and wire can be ordered with tighter out-of-roundness tolerances.			
<b>Length</b>	The standard length of rods is 3 meters. ±30 cm.			
<b>Chamfer</b>	Standard rods with diameters larger than 2 mm are delivered pointed and chamfered.			
<b>Straightness</b>	Straightness of the delivered rods complies with the EN 12164 standard.			

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