

Designation	CuBe2Pb	DIN (2.1248)	EN. CW102C	UNS (ASTM) C17300	AISI -	LMSA <b>G100 G150</b>
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## Chemical composition (weight %)

Cu	Be	Pb	Co + Ni + Fe	Co + Ni
Balance	1.80 - 2.00	0.20-0.60	0.6% max.	0.2% max.

Copper plus additions equal 99.5% minimum.

In order to achieve maximum homogeneity and consistent quality, the actual tolerances on both alloy components and impurities are significantly tighter and more precisely defined than the standard composition indicated.

## 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 manufacturing range

Drawn products	Pointed and chamfered rod <sup>1), 2)</sup> Wire <sup>1)</sup>	Diameter (mm) <sup>3)</sup>	Length <sup>3)</sup>
		0.8 - 20.0 mm	Rods of 3 meters Coils and spools
		0.2 - 4.0 mm	

1) A large assortment of diameters are available from stock. Other dimensions or other product forms upon request.

2) Rods of diameter  $\geq 2.0$  and  $\leq 25.0$  mm are delivered pointed and chamfered.

3) Other dimensions are available upon request

## Mechanical properties of rods

Rods	Temper			Heat Treatment	Rp <sub>0.2</sub> (N/mm <sup>2</sup> )	Rm (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hv (N/mm <sup>2</sup> )
A <sup>1)</sup>	R410	H100	soft annealed	-	130-250	410-590	$\geq 20$	100-180
H <sup>1)</sup>	R620	H200	hard	-	510-815	620-900	$\geq 8$	190-280

After age hardening (by the customer)

AT <sup>1)</sup>	R1150	H360	soft + hardened	3h / 325°C	1000-1210	1130-1380	$\geq 3$	360-430
HT <sup>1)</sup>	R1300	H390	hard + hardened	2h / 325°C	1100-1380	1280-1550	$\geq 2$	390-470

Delivered after hardening by Lamineries Matthey SA<sup>2)</sup>

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

2) Upon request, Lamineries MATTHEY SA also delivers mill hardened rods. The requested mechanical properties can be specified individually ( $\Delta Hv$  min. 40,  $\Delta Rm$  min. 150 N/mm<sup>2</sup>).

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## Mechanical properties of wires

Wires	Temper			Heat Treatment	Rp <sub>0.2</sub> (N/mm <sup>2</sup> )	Rm (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hv (N/mm <sup>2</sup> )
A <sup>1)</sup>	R400	H090	Soft annealed	-	130-210	400-540	≥ 30	90-170
½H <sup>1)</sup>	R620	H200	¼ hard	-	510-730	620-800	≥ 3	200-250
½H <sup>1)</sup>	R750	H230	½ hard	-	620-870	750-940	≥ 2	230-300
¾H <sup>1)</sup>	R890	H270	¾ hard	-	790-1040	890-1070	≥ 2	270-340
H <sup>1)</sup>	R960	H300	hard	-	890-1110	960-1140	≥ 1	300-360
After hardening (at the customer)								
AT <sup>1)</sup>	R1100	H340	soft + hardened	3h / 325°C	990-1250	1100-1380	≥ 3	340-430
¼HT <sup>1)</sup>	R1200	H370	¼ hard + hardened	2h / 325°C	1130-1380	1200-1450	≥ 2	370-460
½HT <sup>1)</sup>	R1270	H390	½ hard + hardened	2h / 325°C	1170-1450	1270-1490	≥ 2	390-470
¾HT <sup>1)</sup>	R1310	H410	¾ hard + hardened	2h / 325°C	1200-1520	1310-1590	≥ 2	410-500
HT <sup>1)</sup>	R1340	H420	hard + hardened	2h / 325°C	1240-1520	1340-1590	≥ 1	420-500

1) 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> )	Rm (N/mm <sup>2</sup> )	A <sub>50mm</sub> (%)	Hv (N/mm <sup>2</sup> )
A	R420	H090	Soft annealed	-	> 140	> 420	≥ 35	> 90
½H	R650	H190	½ hard	-	≥ 400	650-850	≥ 2	190-300

## Physical properties

Modulus of elasticity	KN/mm <sup>2</sup>	125 - 131 (before and after hardening, respectively)
Poisson ratio		0.285
Density	kg/dm <sup>3</sup>	8.36 (before and after hardening, respectively)
Melting point / Melting range	°C	875 – 985
Linear dilatation coefficient (20-300°C)	10 <sup>-6</sup> / °C	17
Thermal conductivity at 20°C	W/m °K	11
Electrical resistivity	μΩcm	11-9, 8-6 (before and after hardening, respectively)
Electrical conductivity	MS/m	9-11, 13-16 (before and after hardening, respectively)
Electrical conductivity	% IACS	15-19, 22-28 (before and after hardening, respectively)
Magnetic properties		Non magnetic (Slightly diamagnetic)
Permeability		μ = 1.0006

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## 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.

## Dimensional tolerances (rod and wire)

	Standard Tolerances			Special 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 and ≤ 6.0mm	h8	+ 0 / - 18 µm		
	> 10.0 and ≤ 10.5mm	h8	+ 0 / - 22 µm		
	> 10.5 and ≤ 18.0mm	h9	+ 0 / - 43 µm		
	> 18.0 and ≤ 30.0mm	h9	+ 0 / - 52 µm		
	Mill-hardened, non-ground bars are available with tolerances h9 for diameters ≤ 10.5 mm and h10 for the larger diameters.				
<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 m +/- 30mm.				
<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.				