ALLOY 25
Alloy CuBe2 & Alloy M25 CuBe2 Bars and wires

STAINLESS GROUP

High performance Alloys - Medical - Aerospace - Microtechnics - Motorsport - Industry

GENERALITIES

Copper-beryllium alloys *with about 2% beryllium cover a wide range of mechanical properties, from an unaged and ductile condition to aged conditions with high strengths in the range of those of hardened steels. The M25 grade, due to a controlled addition of lead, is suitable for free cutting while retaining the same mechanical properties as alloy 25. These alloys are produced and processed by Materion in the USA.*

Stainless has a range of sizes and grades in stock to suit your processing requirements. This product can also be made to order or cut into slugs by our service centres.

APPLICATIONS

These copper alloys have very good corrosion resistance, low coefficients of friction and very high hardness for copper alloys. They are explosion-proof (no sparking), seizure-proof and can be heated up to about 250°C.

Connections: electrical contacts, relays.

Aeronautics: joint rings subject to high loads, screws, ball joint elements, hinge parts.

Other: oil research probes, connecting rod bearings, valve guides, clocks.

STANDARDS AND DESIGNATIONS

Alloy 25 – CuBe2 – UBe2
ASTM B 196 – ASTM B197 - ASTM B 251 - ASTM B 643 - NFL 14-709 - UNS C17200 - AMS 4533 - AMS 4534 - AMS 4650 - AMS 4651 - W. Nr 2.1247

Alloy M25 - CuBe2Pb
ASTM B 196 – ASTM B197 - NFL 14-709 - UNS C17300
W. Nr 2.1248

TYPICAL CHEMICAL ANALYSIS (mass %)

Alloy 25

	Beryllium	Cobalt + Nickel	Cobalt + Nickel + Iron	Lead	Copper
MIN	1.80	0.20	---	---	BALANCE
MAX	2.0	---	0.60	0.020	

Alloy M25

	Beryllium	Cobalt + Nickel	Cobalt + Nickel + Iron	Lead	Copper
MIN	1.80	0.20	---	0.20	BALANCE
MAX	2.0	---	0.60	0.60	

ALLOY 25
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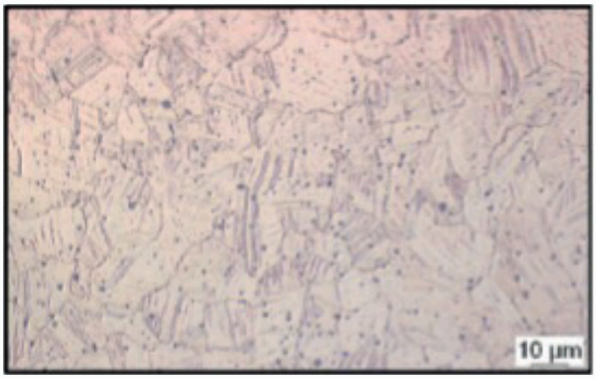
Bars and wires

METALLURGY

The M25 grade contains homogeneously distributed lead to improve the machinability of the material. The typical microstructure is shown below:



PHYSICAL PROPERTIES AT 20°C

Density.....8.3 g.cm-3.
Coefficient of thermal expansion (between 20 et 200°C).....17 x 10-6 m/m.°C
Young's modulus......131 x 10^3 MPa
Thermal conductivity.....105 $W.m^{-1}K^{-1}$
Electrical conductivity.....15 to 30% IACS depending on the state
Non-magnetic grade

MECHANICAL PROPERTIES OF THE BARS (ROUND AND FLAT)

The grade is offered in the annealed (cond A), annealed and hardened (cond H) or pretreated (AT or HT) condition with the following properties:

Condition	Conditions according to ASTM / AFNOR	Diameter or thickness (mm)	UTS (Mpa)	YS 0.2% (Mpa)	E%	Hardness
A	TB 00 / TB	0.76 - 355	410 - 590	130 - 250	20 - 75	45 - 85 HRB
H	TD 04 / TD4	0.76 - 9.5 9.5 - 25.4 25.4 - 76	620 - 900 620 - 860 620 - 830	520 - 720 520 - 720 520 - 720	8 - 30 8 - 30 8 - 20	88 - 103 HRB 88 - 102 HRB 88 - 101 HRB
AT	TF 00 / TF	0.76 - 76 76 - 355	1140 - 1380 1140 - 1380	1000 - 1210 900 - 1210	4 - 10 3 - 10	36 - 42 HRC 36 - 42 HRC
HT	TH 04 / TH4	0.76 - 9.5 9.5 - 25.4 25.4 - 76	1280 - 1550 1240 - 1520 1210 - 1480	1100 - 1380 1070 - 1340 1000 - 1310	2 - 9 2 - 9 4 - 9	39 - 45 HRC 38 - 44 HRC 37 - 44 HRC

ALLOY 25
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Bars and wires

MECHANICAL PROPERTIES OF SMALL DIAMETER BARS AND WIRES (<12.7mm)

The grade is offered in the annealed (cond A), annealed and hardened (cond H) or pretreated (AT or HT) condition with the following properties:

Condition	Conditions according to ASTM / AFNOR	Thickness (mm)	UTS (Mpa)	YS 0.2% (Mpa)	E%	HV Hardness
A	TB 00 / TB	1.3 - 12.7	410 - 590	130 - 210	30 - 75	80 - 155
	TD01 / TD1		620 - 800	510 - 730	3 - 25	180 - 265
1/4 H	TD02 / TD2		750 - 940	620 - 870	2 - 15	230 - 310
1/2 H	TD03 / TD3	1.3 - 4.8	890 - 1070	790 - 1040	2 - 8	275 - 350
3/4 H	TD04 / TD4		960 - 1140	890 - 1110	1 - 6	295 - 370
H	TF00 / TF	1.3 - 12.7	1180 - 1380	990 - 1250	> 3	330 - 420
AT	TH01 / TH1		1200 - 1490	1130 - 1380	> 2	350 - 435
1/4 HT	TH02 / TH2		1270 - 1490	1170 - 1450	> 2	370 - 440
1/2 HT	TH03 / TH3	1.3 - 2.0	1310 - 1590	1200 - 1520	> 2	375 - 460
3/4 HT	TH 04 / TH4		1340 - 1590	1240 - 1520	> 1	380 - 460

PROCESSIES

Machinability

Beryllium is a chemical element, which can present health risks when inhaled, especially in the form of fine dust. Special precautions must be taken during processing which leads to the production of dust. Grinding should be carried out under heavy watering and welding (not recommended) should be carried out under effective suction. Welding is not recommended.

Heat treatments

Products supplied in the solution treated condition (condition A) or in the solution treated then cold worked condition (conditions 1/4H, 1/2H, 3/4H, H) can be treated by ageing at 315°C +/-5°C for a minimum of 2 hours in order to obtain maximum hardness. Overaging is also possible to reduce hardness in some applications. Other grades (AT, HT, 1/2HT,...) are already aged and can be used without additional heat treatment.

CORROSION RESISTANCE

Alloys 25 and M25 are highly resistant to corrosion in marine environments. Hydrochloric and sulphuric acids can accelerate corrosion in the presence of oxidising impurities.

STANDARD SHAPE

- Round bars, wire and flats, annealed or cold worked - Hardened or ground surface.
- Other formats: Tubes - Strips (see associated data sheets)