



# STAINLESS

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

## ALLOY 25

Alloy CuBe2  
& Alloy M25 CuBe2  
Bars and wires

### 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

#### AlloyM25 - CuBe2Pb

ASTM B 196 - ASTM B197 - NFL 14-709 - UNS C17300 - W. Nr 2.1248

### TYPICAL CHEMICAL ANALYSIS (mass %)

#### Alloy 25

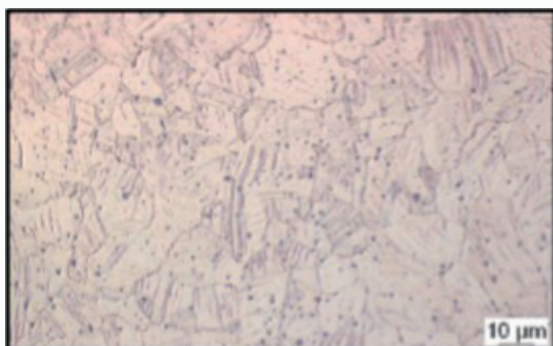
|     | Beryllium | Cobalt + Nickel | Cobalt + Nickel + Iron | Lead  | Copper  |
|-----|-----------|-----------------|------------------------|-------|---------|
| MIN | 1.80      | 0.20            | ---                    | ---   | BALANCE |
| MAX | 2.0       | ---             | 0.60               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

## 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

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

## 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                 | 620 - 900   | 520 - 720     | 8 - 30  | 88 - 103 HRB |
|           |                                      | 9.5 - 25.4                 | 620 - 860   | 520 - 720     | 8 - 30  | 88 - 102 HRB |
|           |                                      | 25.4 - 76                  | 620 - 830   | 520 - 720     | 8 - 20  | 88 - 101 HRB |
| AT        | TF 00 / TF                           | 0.76 - 76                  | 1140 - 1380 | 1000 - 1210   | 4 - 10  | 36 - 42 HRC  |
|           |                                      | 76 - 355                   | 1140 - 1380 | 900 - 1210    | 3 - 10  | 36 - 42 HRC  |
| HT        | TH 04 / TH4                          | 0.76 - 9.5                 | 1280 - 1550 | 1100 - 1380   | 2 - 9   | 39 - 45 HRC  |
|           |                                      | 9.5 - 25.4                 | 1240 - 1520 | 1070 - 1340   | 2 - 9   | 38 - 44 HRC  |
|           |                                      | 25.4 - 76                  | 1210 - 1480 | 1000 - 1310   | 4 - 9   | 37 - 44 HRC  |

The information, data and photos presented in this document are given in good faith and for information purposes only. If you need more precise data, our technical department is at your disposal. Click on the link : [t.turpin@stainless.eu](mailto:t.turpin@stainless.eu)

## MECHANICAL PROPERTIES OF THE BARS

The grade is offered as standard in the solution-hardened or solution-hardened and work-hardened condition. The grade is always aged at 700°C/16h after machining. Typical mechanical properties are:

| 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)

The information, data and photos presented in this document are given in good faith and for information purposes only. If you need more precise data, our technical department is at your disposal. Click on the link : [t.turpin@stainless.eu](mailto:t.turpin@stainless.eu)