



# ADDITIVELY MANUFACTURED COMPONENTS MADE OF **AMPCOLOY<sup>®</sup> 83**

**PRINT YOUR IDEAS**



# Material data sheet

## ADDITIVELY MANUFACTURED COMPONENTS MADE OUT OF AMPCOLOY® 83

### 1. MATERIAL DESCRIPTION

AMPCOLOY® 83 is a thermally hardenable copper alloy. When hardened, the material exhibits exceptionally high hardness and strength combined with attractive electrical and thermal conductivity values.

### 2. DESIGNATIONS

Material designation:	AMPCOLOY® 83
Material designation, EN standards:	Similar to CuBe2
Material number, EN standards:	Similar to CW101C
Material number, former DIN standards:	Similar to 2.1247 (CuBe2)
Material number, UNS system (ASTM):	Similar to C17200

### 3. POWDER MATERIAL USED

Powder designation:	AMPCOLOY® 83
Batch purity/use condition:	2A (used powder of one batch)
Particle size, distribution in $\mu\text{m}$ :	$d_{10}= 15-21$ ; $d_{50}= 27-33$ ; $d_{90}= 44-50$ ;
Measurement according to:	EN ISO 13320

### 4. POST-PROCESSING PERFORMED

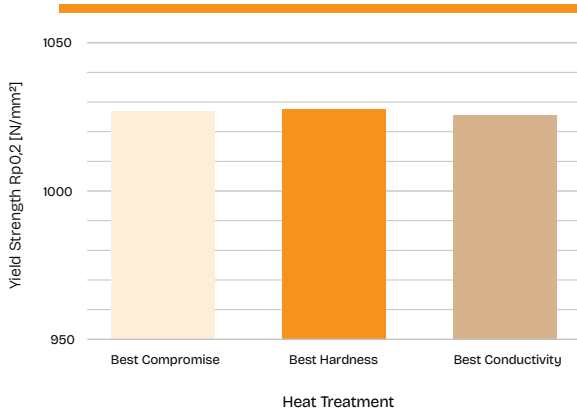
Separation process:	Sawing
Thermal post-treatment:	Solution annealing and precipitation hardening
Specimen preparation:	
Tensile specimen ( $\theta = 0^\circ, \theta = 45^\circ, \theta = 90^\circ$ ):	Turning to B6 x 30 (DIN 50125)
Density cube:	Milling off the edge layer by 0,5mm
Hardness and conductivity samples:	Grinding of the test surface

## 5. HEAT TREATMENT OPTIONS

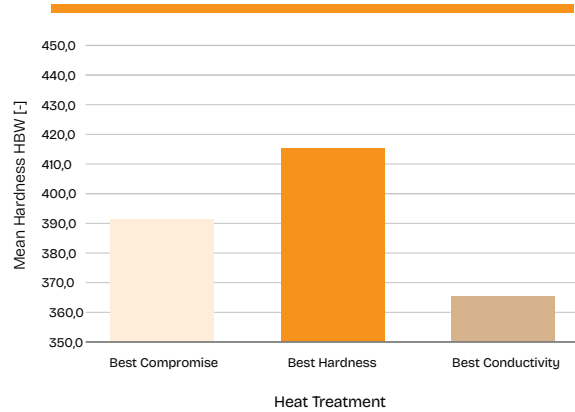
WB 1 = Heat treatment	Best compromise
WB 2 = Heat treatment	Best hardness
WB 3 = Heat treatment	Best electrical conductivity

Due to the only minor differences in terms of adjustable material properties, the standard “Best compromise” heat treatment is recommended.

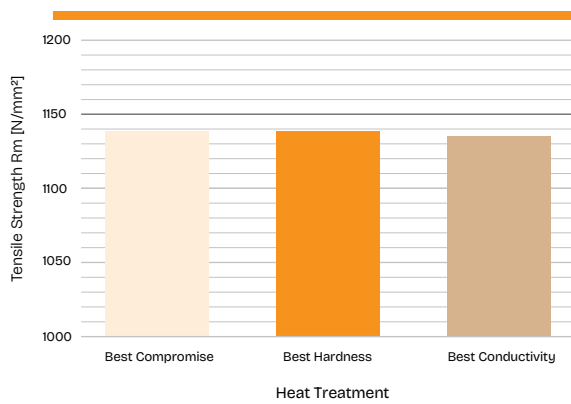
### 0,2 % Yield Strength Dependent On Heat Treatment



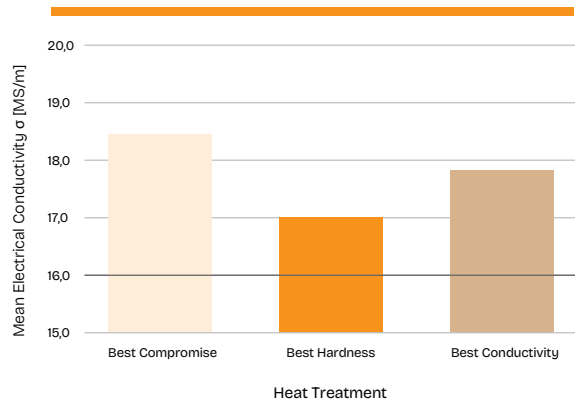
### Hardness Dependent On Heat Treatment



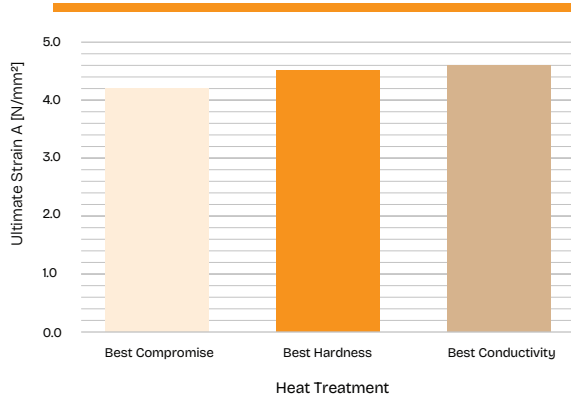
### Tensile Strength Dependent On Heat Treatment



### Electrical Conductivity Dependent On Heat Treatment



### Ultimate Elongation Dependent On Heat Treatment



## 6. MATERIAL PROPERTIES

### Chemical composition (percent by weight)

Cu	Be	Co	Ni	Co + Ni	Fe	Si	Others
Residual	1,8 – 2,0	0,0 – 0,3	0,0 – 0,3	0,2 – 0,5	≤ 0,1	≤ 0,1	≤ 0,5

### Properties At 20°C, Heat Treated

Modulus of elasticity:	E	135 000 MPa
Coefficient of expansion ( $\alpha_{(20^{\circ}\text{C} - 300^{\circ}\text{C})}$ ):	$\alpha$	$17,0 \cdot 10^{-6} \cdot \text{K}^{-1}$
Softening temperature:	$T_{\text{Soft}}$	300 °C
Melting interval:	$T_{\text{Melt}}$	870 - 970 °C
Thermal conductivity:	$\lambda$	160 W/m·K
Specific weight, 8.85 g/cm <sup>3</sup>	$\rho_{\text{ar}}$	≥ 99,5%

The results of the test series regarding the dependence on build direction and heat treatment are not yet fully available.

Criteria	Orientation/ Reference *	Coding **	WB 1		WB 2		WB 3		
			$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S	
0,2% Yield Strength, MPa	$R_{p0,2}$	$\theta = 0^{\circ}$	-	-	-	-	-	-	
		$\theta = 45^{\circ}$	-	-	-	-	-	-	
		$\theta = 90^{\circ}$	1_1_5	1026	35	1027	6	1025	8
Tensile Strength, MPa	$R_m$	$\theta = 0^{\circ}$	-	-	-	-	-	-	
		$\theta = 45^{\circ}$	-	-	-	-	-	-	
		$\theta = 90^{\circ}$	1_1_5	1138	28	1138	22	1135	6
Elongation $A_{50}$ %	$A_{50}$	$\theta = 0^{\circ}$	-	-	-	-	-	-	
		$\theta = 45^{\circ}$	-	-	-	-	-	-	
		$\theta = 90^{\circ}$	1_1_5	4,2	2	4,5	2	4,6	2
Hardness Brinell	HBW	2	1_1_3	393	0	415	0	366	6
Electr. Conductivity, MS/m ***	$\sigma$	2	1_1_3	18,4	0,1	17,1	0	19,6	0
Therm. Conductivity, W/(m K)****	$\lambda$	2	1_1_3	132,6	0,6	122,6	0,3	140,8	0,3
Spec. Weight, % (Archimedes)	$\rho_{\text{ar}}$	8,30 g/cm <sup>3</sup>	1_2_5	$\bar{x} \geq 99,50 \%$					

\* Reference: 1 = measuring direction in buildup direction, 2 = measuring direction at right angles to buildup direction

\*\* Coding: x\_y\_z; x = number of used machines, y = number of build jobs per machine, z = number of samples for a distinct property

\*\*\* Measured with Fischer Sigmascopie SMP10 @ 60 kHz

\*\*\*\* Calculated from electrical conductivity

For any further information – Contact us.

#### HEADQUARTERS

#### AMPCO METAL S.A.

SWITZERLAND  
Route de Chésalles 48  
P.O. Box 45  
1723 Marly  
T/ +41 26 439 9300  
E/ info@ampcometal.com

#### AMPCO ADDITIVE MANUFACTURING

T/ +49 8376 974290  
M/ +49 173 8657273  
E/ additive@ampcometal.com

