AMPCO®

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ADDITIVELY MANUFACTURED COMPONENTS MADE OF AMPCOLOY® 940

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Excellence in Engineered **Alloys**

Material data sheet

ADDITIVELY MANUFACTURED COMPONENTS MADE OUT OF AMPCOLOY®940

1. MATERIAL DESCRIPTION

AMPCOLOY® 940 is a thermally precipitation hardenable copper-nickel-silicon alloy with chromium addition. The material has a high electrical and thermal conductivity with high hardness and strength, combined with good corrosion and abrasion resistance.

In many applications, AMPCOLOY® 940 is used when the use of alloys with beryllium as an alloying element is not opportune.

2. DESIGNATIONS

Material designation:	AMPCOLOY® 940
Material designation, EN standards:	Nearest to CuNi2Si/CuNi3Si
Material number, EN standards:	Nearest to CW111C/CW112C
Material number, former DIN standards:	Nearest to 2.0855/2.0857
Material number, UNS system (ASTM):	Nearest to C18000

3. POWDER MATERIAL USED

Powder designation:	AMPCOLOY® 940
Batch purity/use condition:	2A (used powder of one batch)
Particle size, distribution in µm:	d_{10}= 20-30; d_{50}= 35-45; d_{90}= 50-60;
Measurement according to:	EN ISO 13320

4. POST-PROCESSING PERFORMED

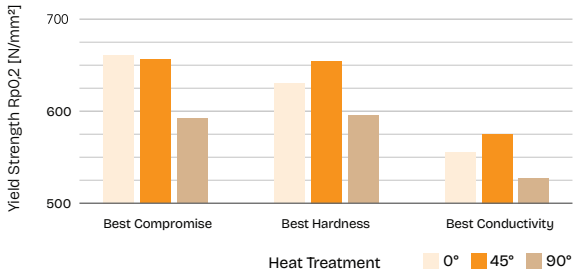
Separation process:	Sawing
Thermal post-treatment:	Solution annealing and precipitation hardening
Specimen preparation:	
Tensile specimen (θ = 0°, θ =45°, θ =90°):	Turning to B10 x 50 (DIN 50125)
Density cube:	Milling off the edge layer by 0,5mm
Hardness and conductivity samples:	Grinding of the test surface

5. HEAT TREATMENT OPTIONS

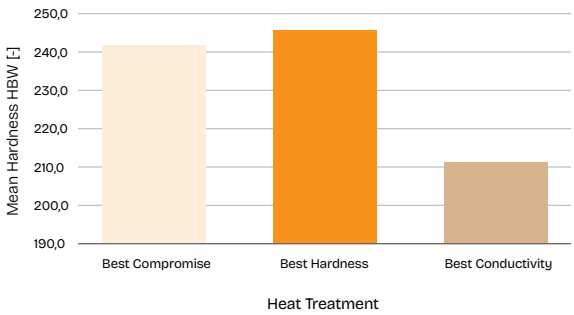
WB 1 = Heat treatment	Best compromise
WB 2 = Heat treatment	Best hardness
WB 3 = Heat treatment	Best electrical conductivity

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

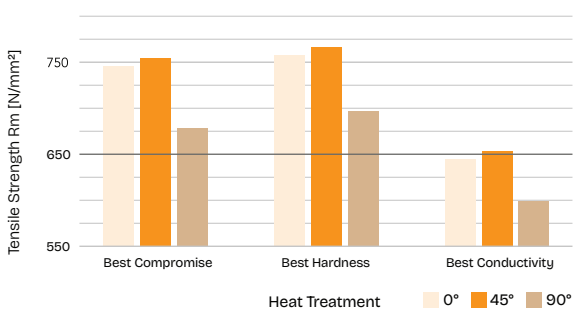
0,2 % Yield Strength Dependent On Orientation And Heat Treatment



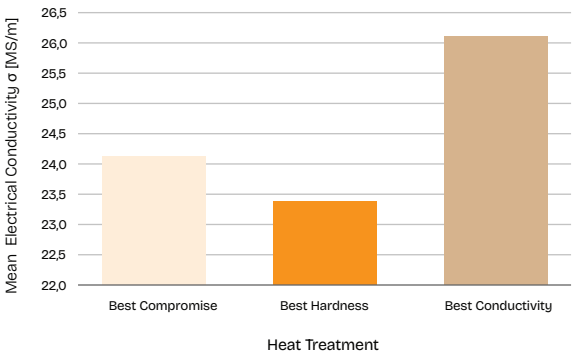
Hardness Of Standard Heat Treatments



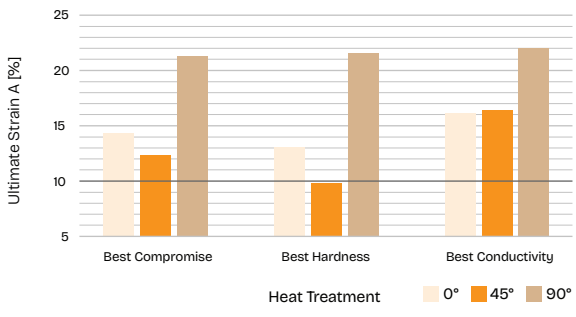
Tensile Strength Dependent On Orientation And Heat Treatment



Electrical Conductivity Of Standard Heat Treatments



Ultimate Elongation Dependent On Orientation And Heat Treatment



6. MATERIAL PROPERTIES

Chemical composition (percent by weight)

Cu	Ni	Si	Cr	Fe	Mn	Pb	Others
Residual	2,0 – 3,0	0,5 – 0,8	0,2 - 0,5	≤ 0,15	≤ 0,1	≤ 0,02	≤ 0,1

Properties At 20°C, Heat Treated

Modulus of elasticity:	E	140 000 MPa
Coefficient of expansion ($x_{(20°C - 300°C)}$):	α	$16{,}2 \cdot 10^{-6} \cdot K^{-1}$
Softening temperature:	T_{Soft}	480 °C
Melting interval:	T_{Melt}	1060 - 1085 °C

Criteria		Orientation/ Reference *	Coding **	WB 1		WB 2		WB 3	
				$\bar{x}$	S	$\bar{x}$	S	$\bar{x}$	S
0,2% Yield Strength, MPa	$R_{p0,2}$	θ = 0°	1_1_3	661	6	630	3	556	5
		θ = 45°	1_1_3	657	3	655	6	574	9
		θ = 90°	1_1_3	592	3	594	1	528	8
Tensile Strength, MPa	R_m	θ = 0°	1_1_3	747	2	760	3	645	5
		θ = 45°	1_1_3	755	1	767	4	655	7
		θ = 90°	1_1_3	679	5	695	1	601	6
Elongation A_{50} %	A_{50}	θ = 0°	1_1_3	14	1	13	1	16	1
		θ = 45°	1_1_3	12	1	10	1	16	2
		θ = 90°	1_1_3	21	1	22	1	22	1
Hardness Brinell	HBW	2	1_1_3	242	3	246	3	211	4
Electr. Conductivity, MS/m ***	σ	2	1_1_3	24	0	23	0	26	0
Therm. Conductivity, W/(m K)****	λ	2	1_1_3	175	0	169	0	189	1
Spec. Weight, % (Archimedes)	ρ_{ar}	8,84 g/cm³	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 Sigmascope SMP10 @ 60 kHz
**** Calculated from electrical conductivity

For any further information – Contact us.

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