Material data sheet

SCHMELZMETALL *goes* ADDITIVE

additively manufactured components made of

HOVADUR® CNCS

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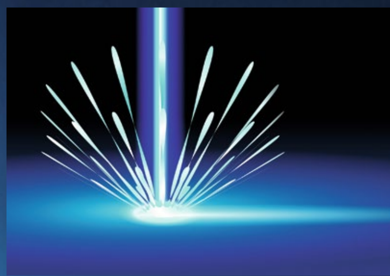

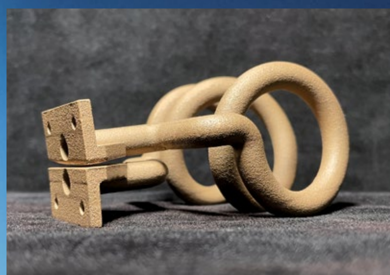

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SCHMELZMETALL

Material data sheet
of additively manufactured components made of
HOVADUR® CNCS

1. Material Description

HOVADUR® CNCS 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, HOVADUR® CNCS is used when the use of alloys with beryllium as an alloying element is not opportune.

2. Designations

Material designation SCHMELZMETALL:	**Hovadur® CNCS**
Material designation, EN standards	similar to CuNi2Si / CuNi3Si
Material number, EN standards	similar to CW111C / CW112C
Material number, former DIN standards	similar 2.0855 / 2.0857
Material number, UNS system (ASTM)	C18000

3. Powder Material Used

Powder designation:	HOVADUR® CNCS
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

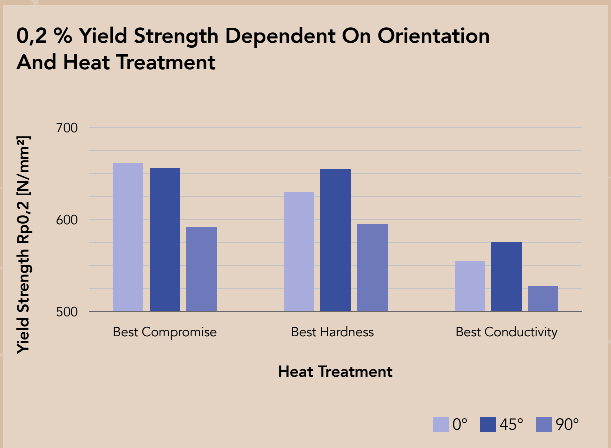
4. Post-Processing Performed

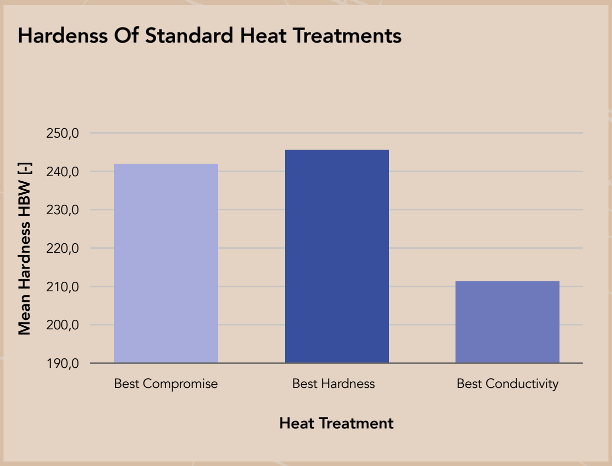
Separation process:	Sawing
Thermal post-treatment:	Solution annealing and precipitation hardening
Specimen preparation:	
Tensile specimen (θ = 0°; θ = 45°; θ = 90°)	Turning to B10 x 50 (DIN 50125)
Density cube	Milling off the edge layer by 0,5 mm
Hardness and conductivity samples	Grinding of the test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

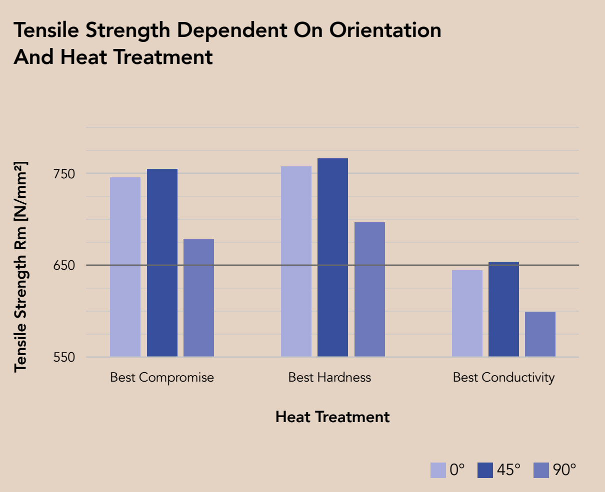
5. Heat Treatment Options

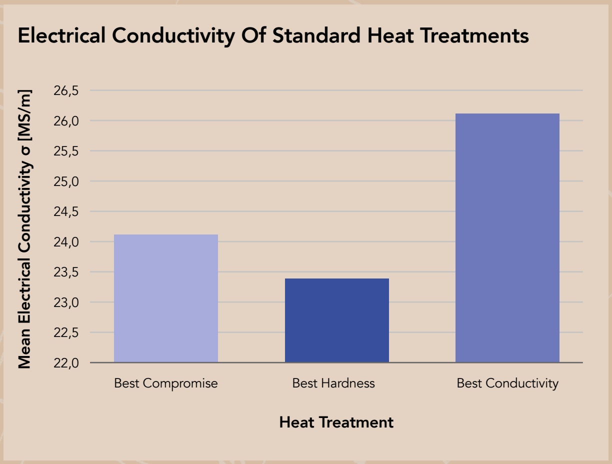
WB 1 = Heat Treatment „Best Compromise“
WB 2 = Heat Treatment „Best Hardness“
WB 3 = Heat Treatment „Best Electrical Conductivity“

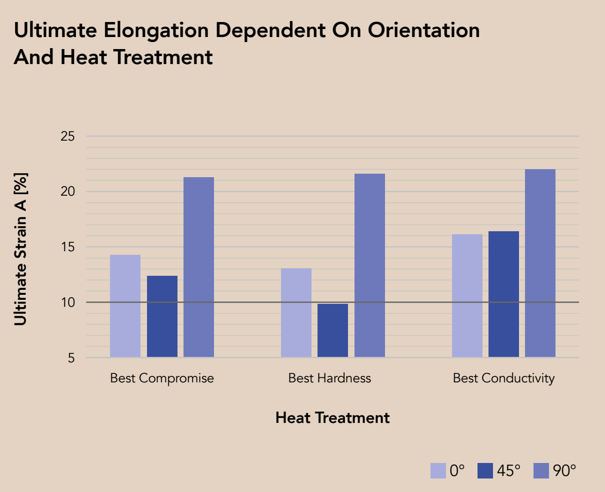
Due to the only minor differences in terms of adjustable material properties, the standard „Best Compromise“ heat treatment is recommended.











6. Material Properties

6.1 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

6.2 Properties At 20°C, Heat Treated

Modulus of elasticity:	E	=	140 000	MPa
Coefficient of expansion ($\bar{x}_{(20°C-300°C)}$):	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