

Wrought copper-nickel-silicon alloy **NSB 5** alloy 1111

NSB 5 is a precipitation-hardenable, low-alloy material with high strength, medium electrical and thermal conductivity. The material is insensitive to stress corrosion cracking and to atmospheric corrosion and complies with the BS 3B 25 and D.T.D 498 standards. The composition lies between the EN materials CW111C CuNi2Si and CW112C CuNi3Si.

ZOLLERN brand	NSB 5
EN designation	≈ CuNi2Si
EN material no:	≈ CW111C

BS 3B 25
D.T.D 498

// National designations / ISO

DIN	≈ CuNi2Si
DIN	≈ 2.0855
ISO	≈ CuNi2Si
USA	≈ C64700
GB	BS 3B 25 D.T.D 498
F	≈ U - N3S

≈ (substantial coherence)

// Composition (weight by per cent in %)

Cu	Ni	Si	Al	Fe	Other
Rest	2.0 – 3.5	0.4 – 0.8	max. 0.02	max. 0.10	max. 0.3

// Strength properties at room temperature

(minimum values)					
	[1] BS 3B 25 [2] D.T.D 498	R _{p0.2} N/mm ²	R _m N/mm ²	A ₅ %	HB
[1] Forgings and bars		430	580	12	159-207
[2] Forgings and bars R _{p0.1} => 417 N/mm ²		-	587	15	-

// Physical properties

Density at 20 °C	8.8 kg/dm ³
Melting temperature/range	1040 – 1060°C
Coefficient of linear expansion	
from 20° to 200°C	16 x 10 ⁻⁶ °C ⁻¹
from 20° to 300°C	16 x 10 ⁻⁶ °C ⁻¹
Specific heat at 20°C	0.381 J/g x °C
Thermal conductivity at 20°C	1.51 W/cm x °C
Electr. conductivity at 20°C	20 - 28 MS/m 34 - 48 % IACS
Electr. resistance at 20°C	0.0357 - 0.0500 Ω mm ² /m
Temperature coefficient of the electrical resistance (0 - 100°C)	0.0020 °C ⁻¹
Permeability	< 1.01
Young's modulus	130 KN/mm ²

// Dynamic strength values at room temperature (reference values)

Rotational bending fatigue strength R _{bw} at 20 x10 ⁶ load cycles, 30% cold-formed	180 N/mm ²
Notched impact energy (ISO - V/KV)	50 joules

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Areas of application

Due to the favourable combination of properties, NSB 5 is suitable for

- many areas of technology, also with seawater contact. The material is used among other things for
- bearings in aircrafts
- as well as for amagnetic screws,
- amagnetic sealing rings,
- amagnetic bolts,
- amagnetic flanges
- amagnetic shafts.

Machinability

NSB 5 has good hot forming properties and can also be cold-formed well in the solution-annealed condition. NSB5 behaves better than pure copper during machining. Flow chips do not form as long. The cutting index is approx. 30 where CuZn39Pb3 = 100.

Relaxation annealing

250 – 400°C

Soft annealing

soft, solution annealed condition is achieved by annealing 800 - 900°C with subsequent water quenching

Soft soldering

after solution annealing at over 450°C with subsequent air cooling

Soft soldering

good

Brazing

not recommended due to softening

Welding

not recommended because of softening, preheating is necessary for large parts. A filler material of the same type is not available

Surface treatment

polishing and chemical structuring is possible, as well as galvanic coatings

