

Wrought copper-nickel-aluminium alloy **NB 1 - NF** alloy 2451

NB 1 - NF is an amagnetic construction material with very high strength.

The material is resistant to corrosion and sea water. The fouling by marine organisms is very low.

NB 1 has a high resistance to cavitation and erosion, is abrasion-resistant and very suitable as a bearing material in conjunction with stainless steel shafts. Corresponds to the French standard NF L 14-702, very similar to 2.1504 = NB 1.

ZOLLERN brand	NB1 - NF
EN designation	None
EN material no:	None

// National designations	
NF L	CuNi14Al2
NF L	14-702
WL	~ 2.1504

// Composition (weight by per cent in %)						
Cu	Ni	Fe	Al	Mn	Other	
Rest	13.0 – 15.0	max. 0.5	1.8 – 3.5	max. 0.5	max. 0.5	

// Strength properties at room temperature				
(minimum values)				
NF L 14-702	R _{p0.2} N/mm ²	R _m N/mm ²	A ₅ %	HB
Forgings and rods up to 50 mm thickness according to NF L 14-702	590	780	10	215
Forgings and bars over 50 mm thickness according to NF L 14-702	540	740	7	205
Rings up to 50 mm thickness ¹⁾	570	740	7	205

¹⁾ Dimensions not included in NF L 14-702

// Strength properties at elevated temperatures (reference values)						
Temperature	°C	20	200	300	400	500
0.2% limit	R _{p0.2} N/mm ²	650	590	550	500	380
Tensile strength	R _m N/mm ²	830	820	790	620	390
Elongation	A ₅ %	14	11	8	2	1

// Physical properties	
Density at 20 °C	8.5 kg/dm ³
Melting temperature/range	approx. 1120 - 1150°C
Coefficient of linear expansion from 20° to 100°C	16 x 10 ⁻⁶ °C ⁻¹
Specific heat at 20°C	0.415 J/g x °C
Thermal conductivity at 20°C	0.71 W/cm x °C
Electr. conductivity at 20°C	4 - 6 MS/m 7 - 10% IACS
Electr. resistance at 20°C	0.167 - 0.25 Ω mm ² /m
Permeability	< 1.01
Young's modulus	143 KN/mm ²

// Dynamic strength values at room temperature (reference values)	
Rotational bending fatigue strength R _{bw} at 20 x 10 ⁶ load cycles	190 N/mm ²
Notched impact energy (ISO - V/KV)	30 joules

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Areas of application

NB 1 - NF is suitable for highly stressed parts due to its high strength values even with simultaneous corrosion stress.

For example

- Valve parts such as spindles, seat rings and hydraulic parts are manufactured
- High-strength, amagnetic screws, bolts and nuts for seawater use
- Gears, bevel gears
- Slot lock wedges for generator rotors
- Cap rings for electric motors
- Inserts and cores in plastic injection moulds
- Bearings in aircraft landing gears

Machinability

NB 1 - NF is easy to machine.

The machining index is approx. 20 due to the high strength, whereby $\text{CuZn39Pb3} = 100$. Cutting and die-sinking is possible.

NB 1 - NF is not suitable for cold forming.

Carbide tools are used for turning and milling, and sharp drill bits for drilling and thread cutting are advantageous.

Relaxation annealing	300 – 450°C
Soft annealing	-
Soft soldering	suitable
Brazing	suitable, but fluoride and chloride containing fluxes are recommended
Welding	not recommended, similar additive materials of the same type are not available. Welding with non-matching filler metals such as $\text{CuAl9Ni4Fe2Mn2} = \text{CF310G}$ or $\text{S-CuNi30Fe} = \text{2.0837}$ is possible.
Surface treatment	polishing and galvanic treatments are possible

