

NICKEL SILVER NM2

Free machining nickel silver alloy with Pb addition

Particularities This free machining nickel silver NM2 alloy contains 2.4-3.0% Pb. It has an excellent machinability. It can easily be warm extruded to produce shaped bars or warm form forged. However, its cold forming ability is somewhat restricted. High strengths can be reproducibly achieved. It has a gray silver color with a yellow touch.

Uses Numerous applications such as: ball pen points, eye glass industry, watch industry, lock pins, mode accessories, etc.

Standards	Material number	CW400J
EN	CuNi7Zn39Pb3Mn2	
DIN	CuNi7Zn39Mn5Pb3 (former DIN 2.0771)	
UNS	no number	
ASTM	no standard	
NF	no standard	
SNV	no standard	

Chemical composition (%wt)	Cu	Ni	Pb	Mn	Zn
	48.5	6.9	2.4	2.1	balance
	49.7	7.6	3.0	2.8	

Dimensions and Tolerances		
• Wires for Escomatic machines		$\varnothing \leq 3h9 \text{ mm}$
• Round cold drawn wires		$\varnothing \leq 5h9 \text{ mm}$
• Round cold drawn, ground wires		$\varnothing \leq 5h6 \text{ mm}$
Other tolerances on request		

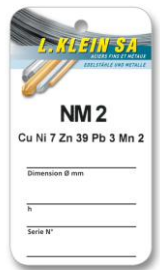
Executions and delivery conditions		
• Round straightened bars		Length 3 m +50/0
- Bar ends		pointed and chamfered
- Straightness		0.5 mm/m
• Wires for Escomatic machines		Rings
Other executions on request		

Availability Standard dimensions on stock, see [Sale program](#)

Mechanical properties		Wires and bars 0.5 – 5 mm				
Designation	Condition	UTS/Rm (MPa)	R _{0.2%} (MPa)	A (%)	Hv hardness DPHN	
soft	annealed	490	240	38	110	
½ hard	20% cold reduction	600	500	12	175	
hard	40% cold reduction	780	700	3	225	

Cutting conditions	Machinability index:		95 (CuZn39Pb3 =100)
	Tool life:		90 (CuZn39Pb3 =100)
Short, needlelike chips:		95 (CuZn39Pb3 =100)	
• Cutting speed:		V _c ≈ 60 - 120 m/min.	
• Cooling lubrication fluid, i.e.:		INOX or ORTHO NFX	
• This alloy can still be more efficiently machined in the ½ hard (UTS/Rm = 600 MPa) condition than in the soft one (UTS/Rm = 490 MPa).			

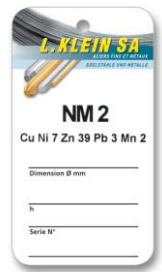
The optimal cutting conditions depend on the machine tool, the cutting tools, the chip dimensions (cutting depth and feed), the cutting speed, the lubricant-cooling fluid, as well as the tolerances and surface roughness to be produced.



NICKEL SILVER NM2

Free machining nickel silver alloy with Pb addition

Microstructure	<ul style="list-style-type: none"> • The Pb addition amounts to approximately 1.5%_{vol.}. It is not miscible into this alloy, where it is present as fine particles evenly distributed into the microstructure. • The Pb addition improves massively its machinability. • The Pb addition enhances a fine grain recrystallization.
Forming	<p>Warm: 700 – 800 °C, can easily be formed</p> <p>Cold: cannot be easily formed</p> <ul style="list-style-type: none"> • Cold reduction before annealing is limited to approximately 40% reduction.
Welding	<p>Gas-shielded welding: moderately appropriate</p> <p>Resistance welding: well appropriate</p> <ul style="list-style-type: none"> • The Pb addition may render welding more difficult. • Under given circumstances, welding may lead to a Zn loss by evaporation. This local Zn depletion can affect the corrosion resistance.
Brazing & Soldering	<ul style="list-style-type: none"> • The Pb addition may render brazing & soldering more difficult. <p>Hard soldering, brazing: very well adapted</p> <p>Soft soldering: less adapted</p>
Glueing	Very well adapted
Heat treatments	<p>Soft anneal, recrystallization: 600 – 700°C/1-3h</p> <p>Thermal stress relieving: 300 – 400°C/1-3h</p> <ul style="list-style-type: none"> • A thermal stress relieving heat treatment may reduce or (negatively) influence the mechanical properties.
Polishing	<p>Mechanical: well adapted</p> <p>Chemical: moderately adapted</p> <p>Electrolytic: less adapted</p>
Laser marking	<p>Relatively difficult</p> <ul style="list-style-type: none"> • The Pb addition can make the laser marking somewhat more difficult. Appropriate precautions might be necessary.
Surface treatments	Electroplating: well adapted
Corrosion resistance	This free machining nickel silver NM2 alloy has a better corrosion resistance than brass, such as Klein's Brass 58A (CuZn39Pb3).
Stress corrosion cracking	This free machining nickel silver NM2 alloy is less sensitive and prone to stress corrosion cracking.



NICKEL SILVER NM2

Free machining nickel silver alloy with Pb addition

Corrosion resistance	Atmospheres and Industrial atmospheres	Resistant	Medium	Passable	Insufficient
	Agrar atmospheres	•			
	Marine atmosphere	•			
	Fresh water	•			
	Sea water	•	•		
	High humidity and temperature		•		
	Vinegar			•	
	Humid atmospheres containing chlorides				•

- Galvanic corrosion**
- Copper based alloys have a high standard corrosion potential. For this reason there exist a risk of galvanic corrosion in contact with other metals having a smaller potential not forming a protective passive oxide layer (passivation layer), such as for example non stainless steels containing less than 13%Cr.

Physical properties	Properties	Unit	Temperature (°C)			
			20	200	300	400
	Density	g cm ⁻³	8.40			
	Elastic Young modulus E	GPa	115			
	Electrical resistance	Ω mm ² m ⁻¹				
	Electrical conductivity	MS/m	4			
	Electrical conductivity	%IACS	7			
	Thermal expansion	m m ⁻¹ K ⁻¹	20–100°C 19	20–200°C	20–300°C 19.5	20–400°C
	Thermal conductivity	W m ⁻¹ K ⁻¹	20°C 33			
	Specific heat	J kg ⁻¹ K ⁻¹	20°C 420		100 - 300°C 0.398	
	Magnetism	non magnetic				
	Melting range	910-925°C				

Disclaimer: The information and data of this informative "Data sheet" are indicative only. They are not use instructions. The users must define and endorse them in each case.