

NICKLAFLOR® 1000 - Strips

UNS C72700 – Cu-Ni-Sn spinodal hardenable alloy

Features and Peculiarities

The NICKLAFLOR 1000 is a spinodal hardenable Cu-Ni-Sn alloy. It exhibits a good corrosion resistance and is totally amagnetic. The spinodal hardening occurs during the decomposition of the matrix into coherent nanometric particles of compositions et properties function of the condition before hardening and of the holding time at the hardening temperature. Hence, a broad range of properties can be achieved. The rolled strips are well indicated for deep drawing, stamping and high accuracy fine stamping with high tool lifes. The smooth surfaces can be further finished by most of the known finishing techniques, including machining with diamond tools. This alloy is also produced in bars and wires.

Uses

The strips of the NICKLAFLOR 1000 alloy are used for the production of springs for numerous industries. It is much appreciated in many branches for its properties and corrosion and wear resistances, and the long tool life in fine high precision stamping.

Standards

Material number: NICKLAFLOR 1000 (CuNi9Sn6)
UNS C72700 – This alloy is not standardized.

Chemical composition (%wt)

Ni	Sn	Mn	Pb	Zn	Fe	P	Cu
8.50	5.50	max.	max.	max.	max.	max.	balance
9.50	6.50	0.50	0.03	0.50	0.50	0.02	

Dimensions and Executions

- Strips
- Semi-products
- Finished rolled strips cut to width finale
- Straightened or as rolled
- As coils or on spools

Availability

Dimensions courantes en stock, see: [Delivery program](#)

Table 1 Mechanical properties Key data Max - min

Condition: annealed 800–810°C	Hv	Rm (MPa)	R _{0.2} (MPa)	A ₁₀₀ (%)
TB annealed and quenched +	90–125	420–450	≥ 200	≥ 30
TDX cold rolled	≥ 320	≥ 780	≥ 650	≥ 1.0
Condition: annealed 800–810°C				
TD quenched + cold rolled + hardened (aged) 350°C/3h fast cooling	290–300	740–810	≥ 510	≥ 8
TDX quenched + cold rolled + hardened (aged) 350°C/3h fast cooling	≥ 350	≥ 1050	≥ 950	≤ 1.0

Annealing

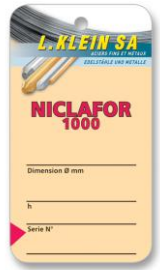
- Soft: 780-800°C/quenching >5°C/sec
- Stress relieving: up to max 250°C

Hardening - aging

- Typical solution anneal: 800°C/20-30 min/quenching >5°C/sec
- Typical aging: 350°C/3h/fast cooling

Particular uses

- Deep drawing, stamping, high precision fine stamping
- High speed machining
- Surface quality satisfying to the most stringent requirements
- Totally non-magnetic



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Figure 1
Hardness Hv
TD: cold rolled
+ TH: aging 350°C/3h

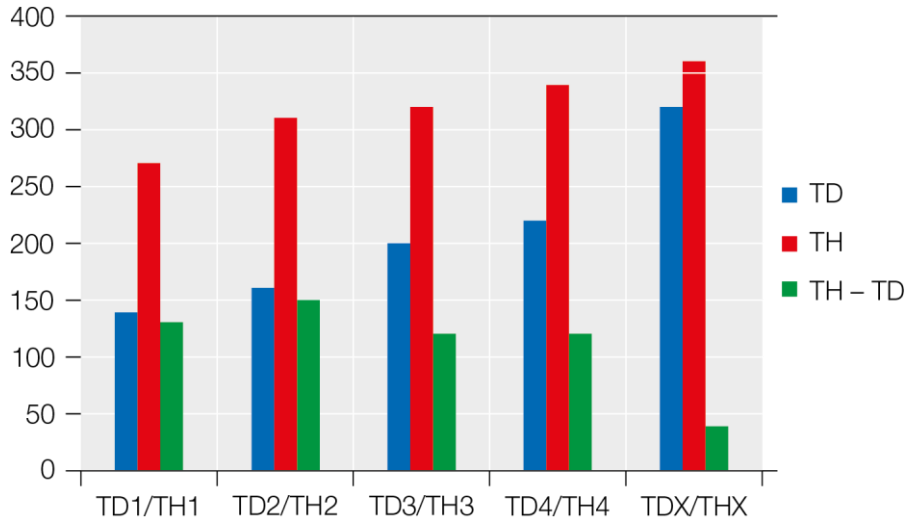


Figure 2
UTS/Rm (MPa)
TD: cold rolled
+ TH: aging 350°C/3h

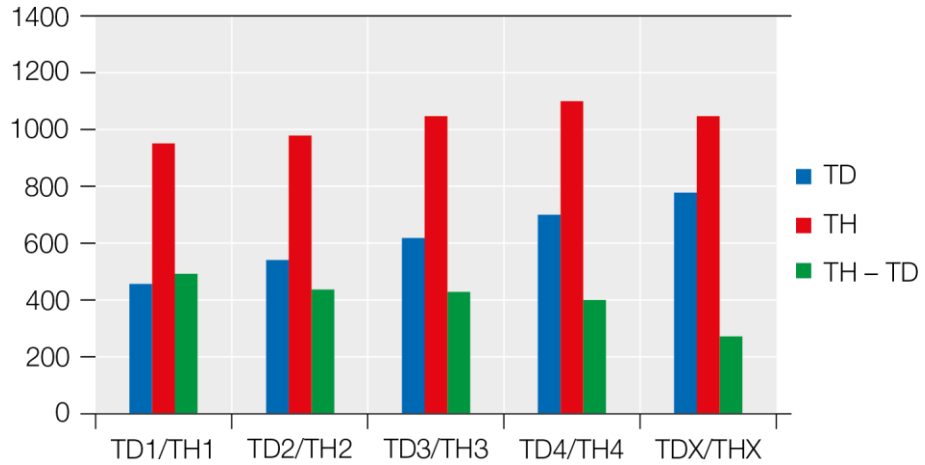
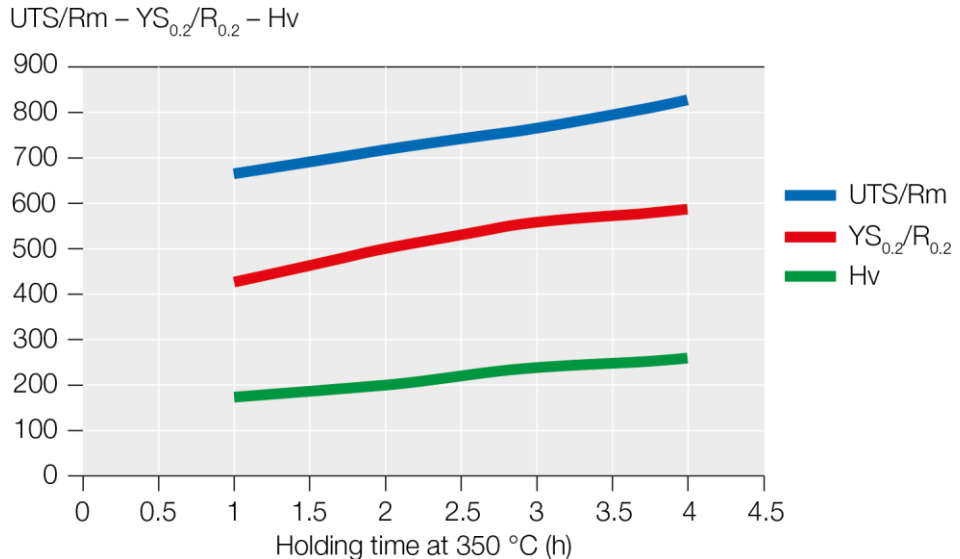
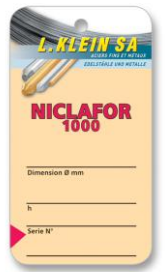


Figure 3
Aging
UTS/Rm – YS_{0.2}/R_{0.2} - Hv
Influence of the holding time





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Figure 4
Condition:
annealed & quenched
+ TD: cold rolled
+ TH: aging 350°C/3h

Influences on the
mechanical properties
and the
rigidity/elasticity in
flexion

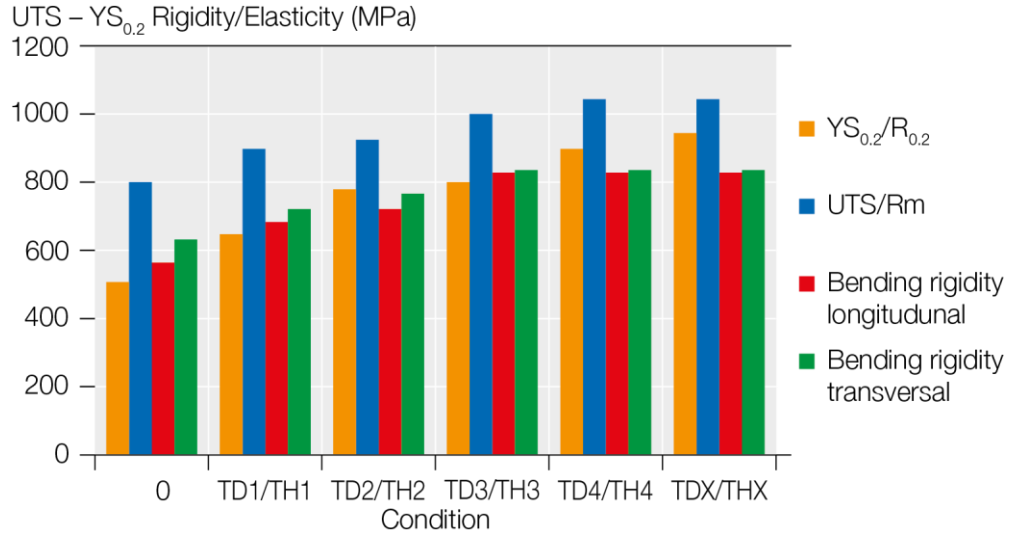
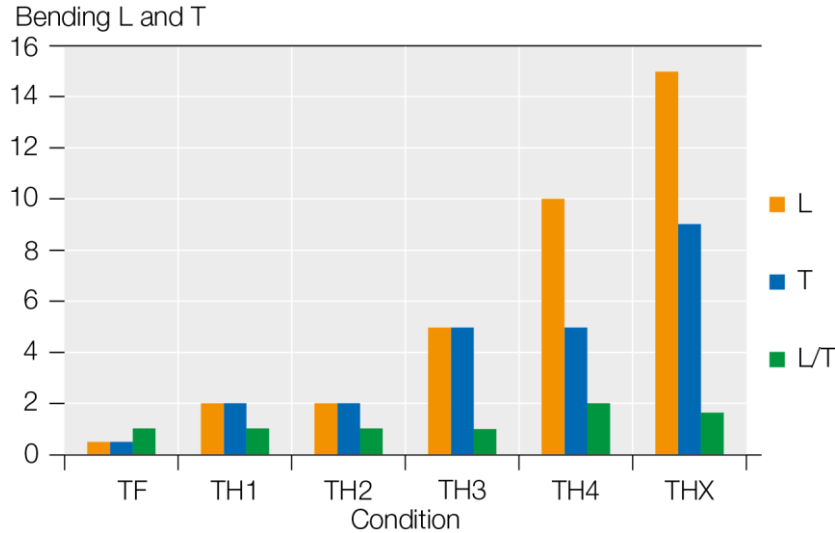


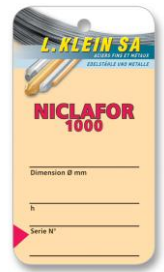
Figure 5
Condition:
annealed & quenched
+ TD: cold rolled
+ TH: aging 350°C/3h

Influence on bending



Bending

- Measurement according to: according to DIN 5011, 15.10.85
- T: Bending 90° Transverse to the rolling direction
- L: Bending 90° Parallel to the rolling direction (Longitudinal)
- Results: Ratio : bending radius/strip thickness
- Values: Minimum



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Microstructure

- The NICKLAFLOR 1000 alloy is mostly machined annealed-quenched + cold rolled.
- In the annealed and in the annealed + cold rolled condition, the NICKLAFLOR 1000 alloy is single-phase cubic face centered.
- In the temperature range of the spinodal decomposition of the matrix, it decomposes into coherent particles of the $(Cu_xNi_{1-x})_3Sn$ type. These particles are of nanometric sizes and responsible for the spinodal hardening.

Plastic deformation and forming

Warm: 780-950°C
Cold: can deformed up to ≥ 75%

Hardening Strengthening

- The NICKLAFLOR 1000 alloy can be hardened by heat treatment.
- The NICKLAFLOR 1000 alloy can be cold rolled and formed up to high deformations.

Marking

• Laser: well indicated

Welding

- Gas: feasible
- Arc: feasible but not particularly indicated
- Laser: very well indicated
- Electron beam: very well indicated
- WIG: very well indicated
- MIG: passable
- Resistance: good

Brazing Soldering

very well indicated
very well indicated

Gluing

Generally well indicated

Electro plating

- Generally well indicated. It is not current because the NICKLAFLOR 1000 alloy as a good corrosion per se.

Polishing

- Mechanical: indicated
- Electrolytic: indicated

Distortions

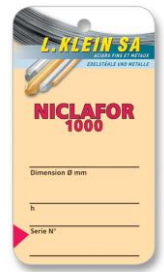
- The spinodal decomposition of the matrix is isotropic. Therefore it ensures that no dimensional distortions takes place during hardening.

Color

- The NICKLAFLOR 1000 has pinkish color.

**Table 2
Pertinent Indications**

Etat	Elasticity	Fatigue	Plasticity	Forming	Bending	Stamping
TB	—	—	*****	*****	*****	*****
TD1-TD2	*	*	***	***	***	***
TD3-TD4	**	**	**	**	**	**
TDX	**	**	*	*	*	*
TH1-2-3	**	**	*	*	—	—
TH3-4	***	***	*	*	—	—
THX	*****	*****	*	*	—	—



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Corrosion resistance

Atmosphere countryside	Resistance resistant *	Medium non-oxidizing acids	Resistance resistant
industry	resistant *	Dry gases O ₂ , Cl, Chlorinated water	resistant
marine	resistant *	Water	resistant
Humidity	resistant *	Human sweat	not resistant
Gas whir high conc. of halogen	not resistant	Cyanides	not resistant
Hydrogen disulfide and sulfides	not resistant	Halogens	not resistant
Ammoniac	not resistant	Oxidizing acids	not resistant
		Humid ammoniac	not resistant
Stress corrosion cracking	not sensitive		

* can form an adhering protection layer

Physical properties

Properties	Unit	Temperature (°C)			
		20	100	200	300
Density	g.cm ⁻³	8.9			
Young modulus E	GPa	120			
Shear modulus	GPa	50			
Electrical resistance	μΩ.cm				
– annealed & quenched		≤19.5			
– hardened		≤15			
Specific electrical conductivity	% IACS				--
- annealed & quenched		≥9			
- hardened 3h		≥12			
Coefficient of thermal expansion	m.m ⁻¹ .K ⁻¹	20–100°C	20–200°C 17.3	20–300°C	10 ⁻⁶
Thermal conductivity	W.m ⁻¹ .K ⁻¹	53.6			
bending fatigue resistance 10 ⁸ cycles	MPa	450			
Melting range		968°-1078°C			
Magnetism		amagnetic			

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