



Data sheet

General description. Subject to changes or deviations

Copper Nickel Silicon Alloys - Luvata NK101, NK103 and NK203

Alloy description

CuNiSi alloys offer high temperature endurance to basic copper properties. Strongest CuNiSi version is CuNiSiCr, which has similar properties to beryllium containing copper alloys. Luvata CuNiSiCr is beryllium free alloy for medium high electrical and thermal conductivity, and it can replace harmful beryllium copper alloys. Intermediate strength is obtained with CuNiSiCrZr alloy.

Mechanical and electrical properties are obtained through thermomechanical treatment which typically consist of following steps: solution annealing followed by rapid quenching to water bath, optional cold working, aging at 400-500 °C and possible machining to final dimensions. The final metallographic structure of CuNiSi consists off finely dispersed Ni_2Si . When Cr or Zr is added also they precipitate as silicides. Adding chromium or zirconium to basic CuNiSi material is possible and that way strength can be added. Aging treatment is essential to obtain high mechanical properties and sufficient electrical conductivity.

All CuNiSi alloys are also available in solution treated state. In that state these alloys can be bent, straightened, or otherwise formed. After aging treatment only machining operations should be made. Instructions for all necessary heat treatments are available from us.

Typical applications:

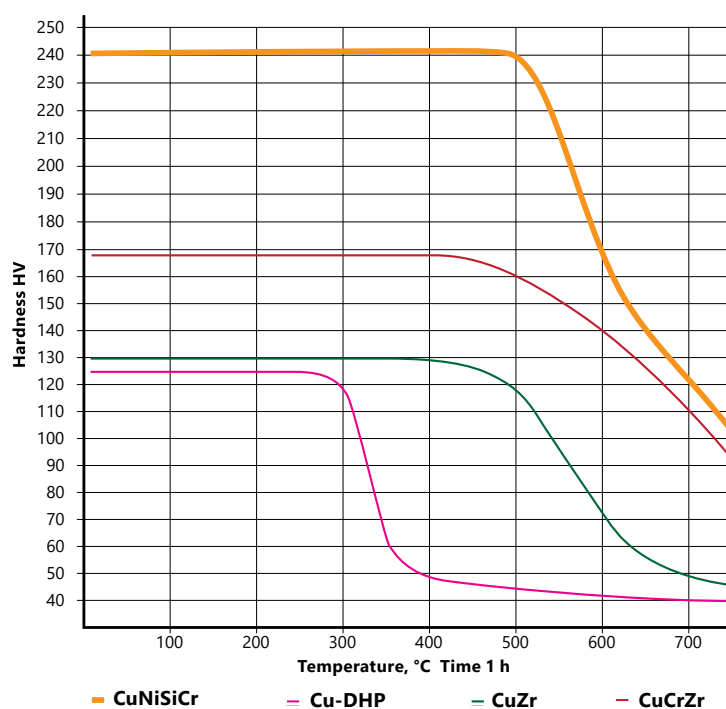
- Spot welding adaptor shanks
- Generator rotor wedge profiles
- Casting dies for non-ferrous metals
- Other applications where high strength material properties are needed.

Product / Shapes:

Extruded and drawn round rods and solid profiles. Various shapes as forgings or machined components.

Softening behaviour – resistance against softening:

Room temperature hardness is presented in the following figure as a function of annealing temperature. Material at hard or aged temper.



Chemical composition and corresponding standards:

Luvata Pori Oy alloy	Composition	EN - CEN/TS 13388:2008	ASTM / USA
NK101 CuNiSi	Ni 1,6 - 2,5 Si 0,4 - 0,8	CW111C	CDA 70260
NK103 CuNiSiCrZr	Ni 1,6 - 2,5 Si 0,5 - 0,8 Cr 0,05 - 0,15 Zr 0,15 - 0,25		
NK203 CuNiSiCr	Ni 1,8 - 3,0 Si 0,4 - 0,8 Cr 0,1 - 0,8	CW111C	CDA 18000

Physical Properties:

Density kg/dm ³	Coefficient of linear expansion 1/K	Specific heat J/(kg x K)	Melting temperature °C
8,8-8,9	0.0000175	380	1020-1060

Mechanical properties – typical values:

	NK101	NK103	NK203
Hardness HV	130-240	180-220	220-250
Tensile strength	420-780	590-750	650-800
0,2% yield strength	380-620	>520	600-750
Elongation	9-16%	>5	9-15%

Electrical and thermal properties – typical values:

Electrical conductivity	vol	% IACS	38-51
	mass	% IACS	38-51
	MS/m		>22
Electrical resistivity	vol	Ω mm ₂ /m	0,033-0,044
	mass	Ω g/m ₂	0,033-0,044
Thermal conductivity (20 °C)	W / Km		220

Joining and machining:

Machinability rating (free cutting brass = 100)	Soldering	Brazing	TIG	MIG	EBW
20	Good	Good	NOT recommended	NOT recommended	NOT recommended

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