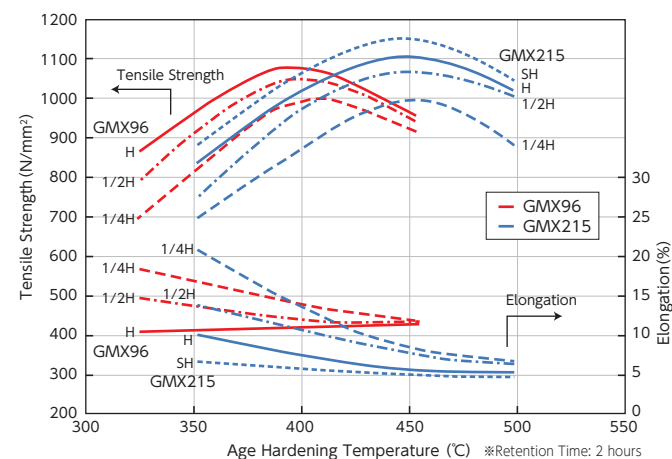
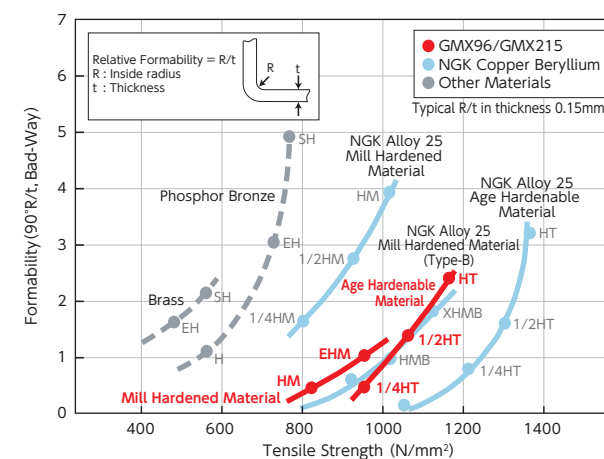


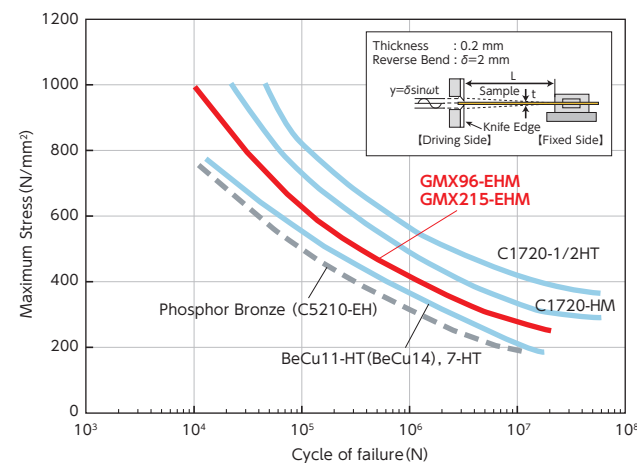
Age Hardening Properties



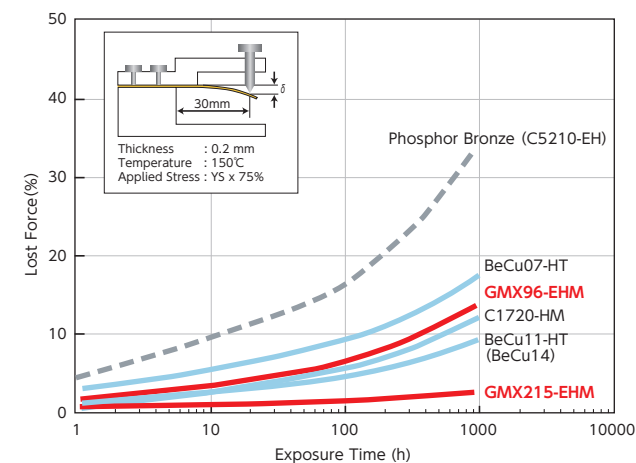
Bending Formability



Fatigue Strength



Thermal Stability



NGK Copper-Nickel-Tin Alloy GMX96 GMX215



NGK INSULATORS, LTD. New Metals Division

Asia	Tokyo	Marunouchi Bldg. 25 Fl., 2-4-1, Marunouchi, Chiyoda-ku, Tokyo 100-6325, JAPAN Tel +81-(0)3-6213-8913 Fax +81-(0)3-6213-8972 URL : http://www.ngk.co.jp/english/products/electronics/berylliumcopper/index.html (English edition) http://www.ngk.co.jp/product/metal/beryllium/index.html (Japanese edition)
	Shanghai	Room 1903A, Dawning Centre Tower A, No.500 Hongbaoshi Road, Changning District, Shanghai 201103, China Tel +86-(0)21-6208-4488 URL : http://www.ngk.co.jp/cn/ (Chinese edition)
	Shenzhen	Unit 7, Taiping Finance Tower Level 14, 6001 Yitian Road, Futian District, Shenzhen, Guangdong Province 518000, P.R.China Tel +86-(0)755-3290-0287
North America	India	803 & 804, 8th Floor, Vatika City Point, MG road, Gurgaon, Haryana, 122018, India Tel +91-(0)12-4448-8891
	USA	NGK Metals Corporation 917 U.S. Highway 11, South Sweetwater, TN 37874 USA Tel +1 (423) 337 5500 Fax +1 (877) 645 2328 Email : marketing@ngkmetals.com URL : www.ngkmetals.com
	Europe	France NGK BERYLCO France 103 quai Jean-Pierre Fougerat, CS 20017, 44220, Couëron, France Tel +33 (0)2 40 38 67 50 Fax +33 (0)2 40 38 09 95 Email : nbf@ngkbf.com URL : www.ngk-alloys.com
Europe	United-Kingdom	NGK BERYLCO UK Ltd Houston Park, Montford Street, Salford, M50 2RP, U.K. Tel +44 (0)161- 745-7162 Fax +44 (0)161- 745-7520 Email : enquiries@ngkberylco.co.uk URL : www.ngk-alloys.com
	Germany	NGK DEUTSCHE BERYLCO GmbH Westerbachstraße 32 61476 Kronberg Im Taunus Germany Tel +49 (0)6173/ 993-400 Fax +49 (0)6173/ 993-401 Email : sales@ngkdbg.de URL : www.ngk-alloys.com
	Italy	Tecnicom Via G Passeroni, 6 20135 MILANO Italy Tel +39(0)2 45506240 Fax +39(0)2 39304926 Email : tecnicom@mclink.it
	Switzerland	Notz Metall SA Brügg Rte de Berne 24 CH - 2555 Brügg Switzerland Tel +41(0)32 366 75 55 Fax +41(0)32 366 77 34 Email : info@notz.ch URL : www.notzmetall.ch
	Spain	Massague Rep. Ind. SA Calle la Ginesta, 6 Apt de Correos 47 08 830 Sant Boi de Llobregat, Spain Tel +34 93 640 0573 Fax +34 93 630 2865 Email : massaguesa@terra.es URL : www.massaguesa.com

Distributor



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NGK INSULATORS, LTD.
New Metals Division

GMX96



NGK Cu-Ni-Sn Alloy Strip High Performance **Conductive Spring** Material

Tensile Strength

GMX96 can achieve the strength of 1200 N/mm² through age hardening (Spinodal decomposition) and can withstand very high bending stress.

Bending Formability

Age hardenable material can be formed into complicated shapes and heat treatment afterwards. Mill-hardened material, which does not require heat-treatment after stamping or forming, has well-balanced performance in strength and formability.

Thermal Stability

Due to less stress relaxation at elevated temperature, GMX96 can be used in a wide range of temperature with little loss of mechanical properties.

Corrosion Resistance

GMX96 has good corrosion resistance and can be used even under severe condition.

Heat Distortion

Due to less deformation (heat distortion) after age hardening treatment, dimensional dispersion after heat treatment is small.

Electrical Conductivity

Electrical conductivity is equivalent to that of phosphor bronze.

Applications

- Connectors •Switches •Sockets •Ground terminals
- Motor Brushes •Jacks •EMI Shields •Watch Gears

Specifications

CDA No.	JIS
C72700	C7270

Chemical Composition

Unit: wt%

Alloy	Ni	Sn	Mn	Fe	Cu
GMX96	8.5-9.5	5.5-6.5	max. 0.5	max. 0.5	Bal.

Physical Properties

Alloy	Melting Point (Solidus) (°C)	Melting Point (Liquidus) (°C)	Density (g/cm ³)	Specific Heat (J/(kg·K))	Electrical Conductivity (%IACS)	Thermal Conductivity (W/m·K)	Modulus of Elasticity (kN/mm ²)
GMX96	960	1090	8.93	375	12	17.1×10 ⁻⁶	130

Mechanical Properties

Alloy	Temper	Tensile Test ⁽¹⁾		Hardness Test ⁽¹⁾		Bending Formability, R/t (90°W)		Heat Treatment (Age hardening)
		Tensile Strength (N/mm ²)	Elongation (%)	Vickers Hardness HV		0° (Good way)	90° (Bad way)	
GMX96 Age Hardenable	1/4H	510 – 620	Min. 15	145 – 220		1.0	1.0	(Before H.T.)
	1/4HT	Min. 885	Min. 5	Min. 270		–	–	375°C×2h
	1/2H	590 – 695	Min. 10	180 – 240		1.0	1.0	(Before H.T.)
	1/2HT	Min. 930	Min. 5	Min. 285		–	–	375°C×2h
	H	685 – 835	Min. 4	210 – 270		1.0	1.5	(Before H.T.)
	HT	Min. 980	Min. 2	Min. 300		–	–	375°C×2h
GMX96 Mill Hardened	HM	835 – 980 ⁽²⁾	Min. 15	Min. 250		1.5	1.5	No need
	EHM	930 – 1080 ⁽²⁾	Min. 10	Min. 280		2.5	2.5	No need
	XHM	Min. 1060	Min. 3	Min. 320		4.0	6.0	No need

(1) Values are applicable to thickness 0.1 mm and over. (2) The upper limits of tensile strength of mill hardened material are for design guidance only.
※Contact us for purchase instructions, if you need a product other than above.

GMX215



NGK Cu-Ni-Sn Alloy Strip High Performance **Heat Resistant Spring** Material

Tensile Strength

GMX215 can achieve the strength of 1200 N/mm² through age hardening (Spinodal decomposition) and can withstand very high bending stress.

Bending Formability

Age hardenable material can be formed into complicated shapes and heat treatment afterwards. Mill-hardened material, which does not require heat-treatment after stamping or forming, has well-balanced performance in strength and formability.

Thermal Stability

Due to far less stress relaxation at elevated temperature, GMX215 can be used in wider range of temperature than GMX96 with little loss of mechanical properties.

Corrosion Resistance

GMX215 has excellent corrosion resistance and can be used even under severe condition.

Heat Distortion

Due to less deformation (heat distortion) after age hardening treatment, dimensional dispersion after heat treatment is small.

Electrical Conductivity

Electrical conductivity is approximately twice that of stainless steel.

Applications

- Connectors •Switches •Sockets •Spring Washers
- Motor Brushes •Jacks •Clips •Thermostats

Specifications

CDA No.	JIS
C72950	—

Chemical Composition

Unit: wt%

Alloy	Ni	Sn	Mn	Fe	Cu
GMX215	20.0-22.0	4.5-5.7	max. 0.5	max. 0.5	Bal.

Physical Properties

Alloy	Melting Point (Solidus) (°C)	Melting Point (Liquidus) (°C)	Density (g/cm ³)	Specific Heat (J/(kg·K))	Electrical Conductivity (%IACS)	Thermal Conductivity (W/m·K)	Modulus of Elasticity (kN/mm ²)
GMX215	1040	1160	8.93	385	6	16.5×10 ⁻⁶	150

Mechanical Properties

Alloy	Temper	Tensile Test ⁽¹⁾		Hardness Test ⁽¹⁾		Bending Formability, R/t (90°W)		Heat Treatment (Age hardening)
		Tensile Strength (N/mm ²)	Elongation (%)	Vickers Hardness HV		0° (Good way)	90° (Bad way)	
GMX215 Age Hardenable	1/4H	510 – 620	Min. 10	145 – 220		1.0	1.0	(Before H.T.)
	1/4HT	Min. 885	Min. 2	Min. 270		–	–	450°C×2h
	1/2H	590 – 695	Min. 4	180 – 240		2.0	2.0	(Before H.T.)
	1/2HT	Min. 930	Min. 2	Min. 285		–	–	450°C×2h
	H	685 – 835	Min. 2	210 – 270		3.0	3.0	(Before H.T.)
	HT	Min. 980	–	Min. 300		–	–	450°C×2h
	SH	825 – 950	–	250 – 310		–	–	(Before H.T.)
	SHT	Min. 1080	–	Min. 330		–	–	450°C×2h
GMX215 Mill Hardened	HM	835 – 980 ⁽²⁾	Min. 3	Min. 250		3.0	5.0	No need
	EHM	960 – 1110 ⁽²⁾	Min. 3	Min. 280		–	–	No need
	XHM	Min. 1060	Min. 3	Min. 320		–	–	No need

(1) Values are applicable to thickness 0.1 mm and over. (2) The upper limits of tensile strength of mill hardened material are for design guidance only.
※Contact us for purchase instructions, if you need a product other than above.

Tolerances (GMX96/GMX215)

Thickness Tolerance

Specified thickness (mm)		Tolerance (mm)
Over	Up to and including	
from 0.08	0.1	±0.005
0.1	0.15	±0.006
0.15	0.2	±0.008
0.2	0.25	±0.010
0.25	0.4	±0.015

Width Tolerance

Specified width (mm)		Tolerance (mm)		
Specified thickness (mm)		Strip cut to length		Strip in coils
from	Up to and including	max. 200	max. 100	Over 100 up to and including 200
0.08	0.4	+2 –0	±0.1	±0.2

Length Tolerance

Specified length (mm)		Tolerance (mm)
Specified thickness (mm)	Up to and including	
from	Up to and including	max. 1200
0.08	0.40	+8 –0

Camber Tolerance

Specified width (mm)		Maximum value (mm)
Over	Up to and including	
from 4	13	4
13	50	3
50	100	2
100	200	1

