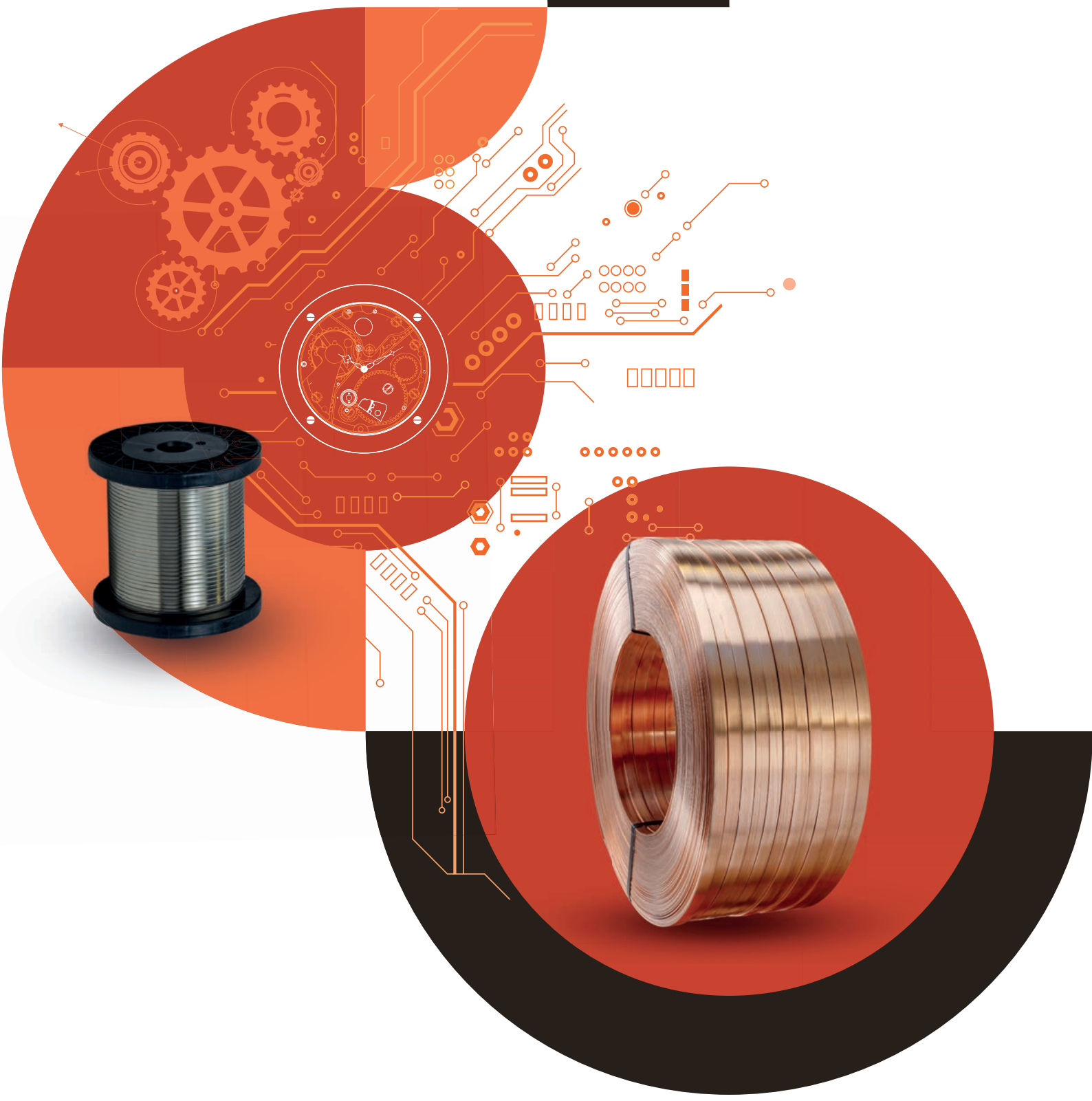
PRODUCT
CATALOG
Strips & Sheets

24

lebronze alloys



About Lebronze alloys

Lebronze alloys is a world leader in the **development** and **fully integrated production** of **high-performance copper and nickel alloys**.

Thanks to a multidisciplinary know-how, the Group provides **innovative solutions to all major industries** such as Aeronautics, Electronics, Space, Automotive, Energy, among others.

Our 6 production facilities and 750 employees manage a **unique range of metal processing technologies:** continuous and semi-continuous casting, extrusion, hot and cold rolling, drawing, open-die forging, hot stamping, closed-die forging, cold forming, machining, non-destructive testing, etc.

The Group's commitment is to find appropriate and **optimized solutions for every sector's requirements while optimizing the environmental impact of our products.**

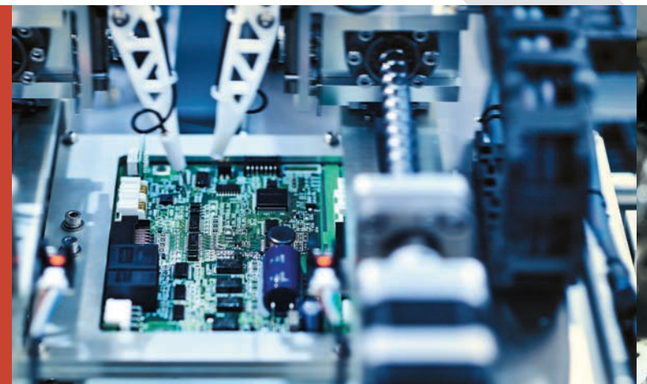
High performance copper and nickel alloys

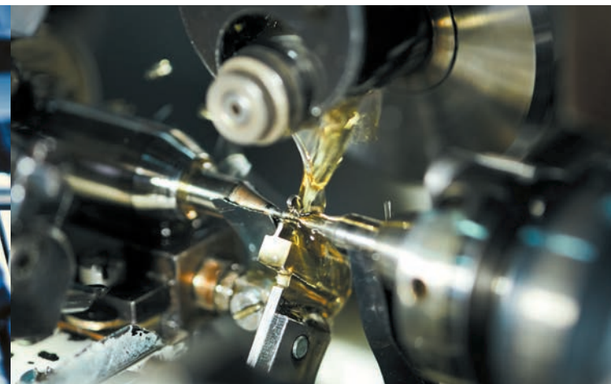
Fully integrated production process

Optimized environmental impact of our products

KEY FIGURES

- 6 production sites
- 3 service centers
- 750 employees
- 200 + alloys produced
- 288 M€ turnover





History of the Group

2006

The DUMONT family, some private investors as well as some key managers, take over "Le Bronze Industriel", a company founded in France in 1934 specializing in copper alloys production.
This change of ownerships, with Michel DUMONT as active Chairman, marked a **new period of strategic growth for the company.**

2012-2016

Period of massive external growth for the company. Several major acquisitions are made such as Inoforges, Swissmetal Lüdenscheid and CLAL. These acquisitions consolidated our metallurgical expertise through a sharing of experience.

2016

Le Bronze Industriel officially becomes Lebronze alloys. It has been 10 years since the buyout and the Group has now tripled its sales.

2020

Opening of our first service center in Europe at Aldridge (UK). This service center joins an already well-established network of distributor partners around the globe and enables us to provide a greater responsiveness to our customers' needs.

2022

Marks the end of a 2-years industrial repositioning allowing the Group to focus on high added value materials.

2023

The Group counts over 750 employees, 6 production sites and 3 service centers around the world and generates 288 M€ of sales.

Our worldwide footprint

- *Production plants*
- *Service centers*

Bornel
France
150 FTEs

Breteuil
France
100 FTEs

Suippes
France
230 FTEs

Paris
Corporate headquarters

LBA NA
USA
5 FTEs

LBA UK
England
9 FTEs

Lüdenscheid
Germany
150 FTEs

Rydzyna
Poland
40 FTEs

Dongguan
China
60 FTEs

LBA Asia
China
5 FTEs

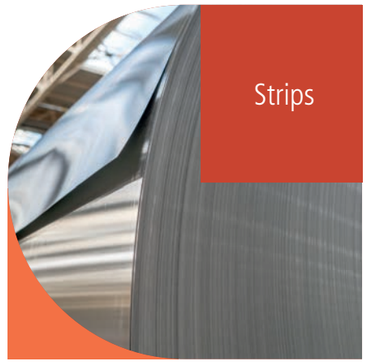
Product range at a glance

Lebronze alloys offers **more than 200 copper-based and nickel-based alloys** with unique properties which meet the most complex requirements. We supply these alloys in different forms :

Billets

Bars

Hollow bars

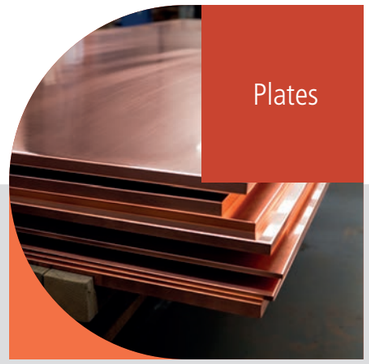

Strips

Sheets

Rods

Wires

Standard & complex profiles


Plates

Welding electrodes

Marine tubes & fitting

Machined blanks and parts

A fully integrated production process

One of the Group's major strengths relies in its **fully integrated production process,** from smelting to machining and recycling.

This particularity guarantees a traceability, optimization and strict control of the final properties of our materials so they can suit to the most stringent requirements.

Melting & Casting

- Continuous wire casting
- Continuous bar casting
- Semi-continuous casting

Hot forming

- Extrusion
- Hot rolling
- Free forging
- Hot stamping

Cold forming

- Cold rolling
- Drawing straightening
- Cold stamping
- Heat treatments

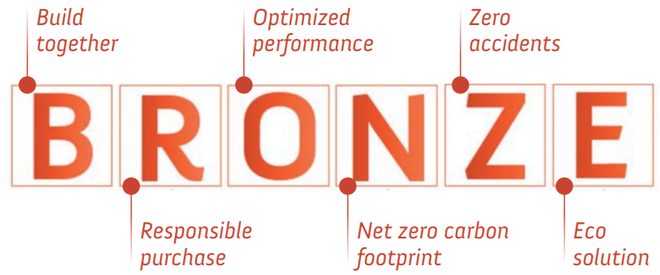
Finishing

- Machining
- Servicing
- Scrap recovery

Our sustainable development policy

To ensure the sustainability of our business, it is essential to strike the **right balance between economic performance, social impact and environmental impact.**

This balance within the Group is structured around our **6 "Bronze"** pillars. Each pillar is broken down into actions and indicators that enable us to be part of a dynamic of continuous progress and sustainability.



Build together: this pillar covers social initiatives that have a positive impact on gender, sex and age equality, as well as projects that improve the well-being of our teams at work.

Responsible purchase: purchases represent more than 50% of Group sales. It is therefore essential that we implement a responsible purchasing policy and tighten up our requirements of our suppliers.

Optimised performance: the Company's economic, industrial and environmental performance is a key factor in meeting the expectations of our relevant stakeholders.

Net zero carbon footprint: taking into account the major challenge of decarbonation, we have decided to make this a specific pillar and to build a path that meets the transformation of the Climate Act and the Paris Agreement.

Zero accidents: our processes require constant vigilance. We are taking action to anticipate and reduce the risk of accidents as far as possible.

Eco solution: by working in collaboration with our customers and bringing innovations to the market, we are contributing to a more sustainable approach by improving the life cycle of products.

Quality

Lebronze alloys develops for all its activities a formally recognized quality management system which allow to:

- guarantee the traceability of our products, from raw material to the product delivered
- certify our products properties
- control our delivery times

Our state-of-the-art quality checks equipment include:

- **Metallurgical tests** such as traction, resilience, hardness, bending and others
- **Non destructive tests** such as Magnetic Particle Inspection (MPI), ultrasonic contact testing, liquid penetrant Inspection and others
- **Metrology, geometry and surface tests** such as surface metrology, global DEA, profile projectors and others

Our certifications

All our certificates can be consulted on our website

Aerospace certifications

afaq EN/AS/JISQ 9100 Aéronautique AFNOR CERTIFICATION

Certified site: Suippes

Nadcap Administered by PRI ACCREDITED

Heat treating

UKAS MANAGEMENT SYSTEMS 9963 auva AS 9120 CERTIFIED

Certified service center: Lebronze alloys UK

General certifications

afaq ISO 9001 Qualité AFNOR CERTIFICATION

Certified sites: Bornel, Breteuil, Lüdenscheid, Suippes, Rydzyna.

afaq ISO 14001 Environnement AFNOR CERTIFICATION

Certified sites: Breteuil, Suippes, Rydzyna.

afaq ISO 50001 Énergie AFNOR CERTIFICATION

Certified sites: Lüdenscheid and Suippes.

CuMn alloys
Current sensing alloys
Precision and stability

Our Group offers a wide range of **current sensing alloys** composed of copper, manganese and nickel. These alloys are widely used for the **precision and the stability** of their electrical resistivity in various environment. Main applications are in electronics as **precision resistors** and **electric shunts** amongst others.

Our wide range of current sensing alloys makes us one of the **major actors on this market** and allows us to meet the **challenging requirements of a large portfolio of customers**.

We provide these products mainly as strips to be processed into relatively complex components.

PRODUCT PORTFOLIO

Alloy	ISO
Niclal® 28	$CuMn_6Sn_2$
Niclal® 29	$CuMn_7Sn_2$
Niclal® 37	$CuMn_{10}Ni_4$
Niclal® 38	$CuMn_{10}Ni_4$
Niclal® 42	$CuMn_{11}Ni_4$
Niclal® 43	$CuMn_{12}Ni_4$
Niclal® 43A	$CuMn_{12}Ni_2$
Niclal® 47	$CuMn_{14}Ni_2$
Niclal® 48	$CuMn_{13}Ni_4$
Constantan 45 TCR	$CuNi_{44}Mn_1Fe$
Niclal® 50*	Proprietary
Niclal® 70*	Proprietary
Niclal® 80*	Proprietary

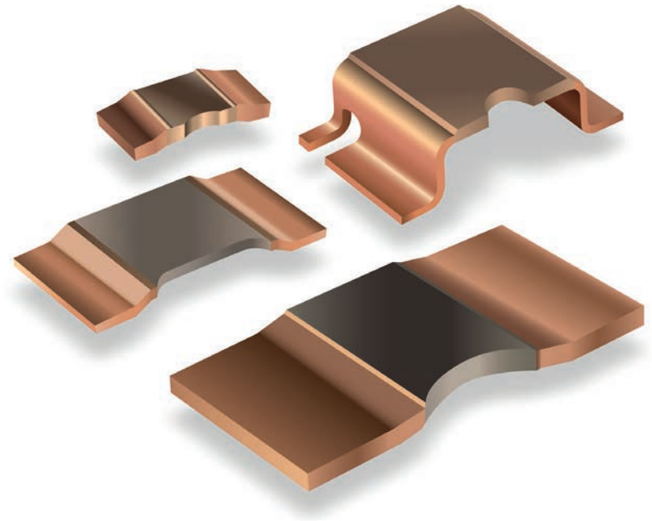
**For those alloys, technical data is on demand*

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

ELECTRICAL RESISTIVITY AT 20°C (μΩ.cm)



ESG Performance

We aim to offer our Customers products with the leading grade of environmental footprint. To achieve this, we make major investments in innovative processes aiming to optimize energy and water consumption and increasing the use of recycled raw materials. More specifically, we have developed state-of-the-art recycling know-how based on specialized purchasers for sourcing end of life materials to be processed in our Group Upcycling Workshop. Another key aspect of our ESG strategy is to offer substitutes for alloys that are not REACH and RoHS compliant.

Our CuMn current sensing alloys are :
- RoHS and REACH compliant
- Mainly produced from recycled raw materials

REACH compliant

RoHS compliant

Markets and applications

Electronics

- Precision resistors
- Electrical shunts in electricity meters
- Electrical shunts in DC ammeters

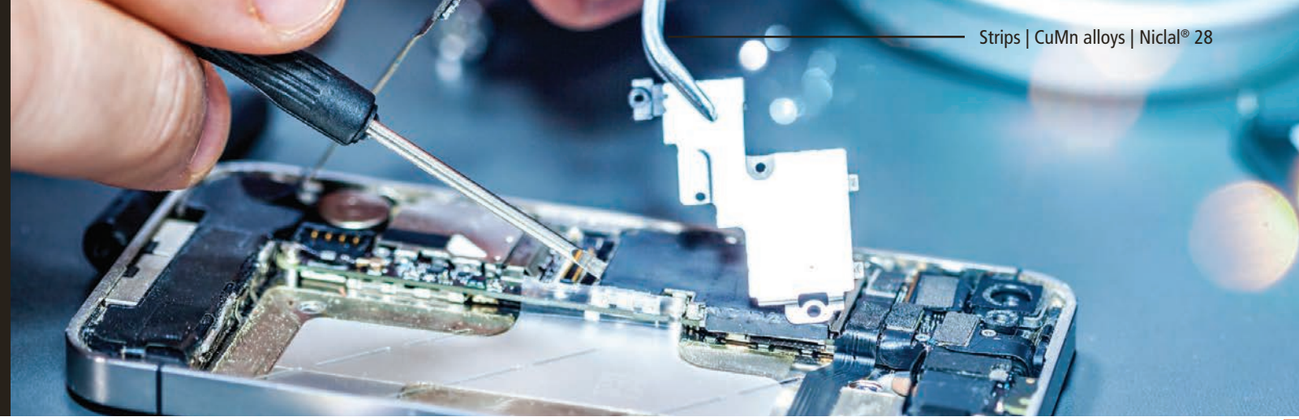
E-Mobility

- Electrical shunts for battery management

Niclal® 28
$CuMn_6Sn_2$

Cu copper | Mn manganese | Sn tin

Niclal® 28 is a Copper-Manganese-Tin ($CuMn_6Sn_2$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 28 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 28

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_6Sn_2$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Sn
Balance	6.5%	2.1%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.5 g/cm³
Thermal conductivity	34 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	860 °C
Electrical properties	
Electrical resisitivity at 20 °C	28 µΩ.cm
Temperature coefficient of electrical resistance: -between -40 and 160 °C -between 20 and 60 °C	 0 ± 25 ppm/°C 0 ± 25 ppm/°C
Thermo EMF against Copper between 15 and 25 °C	0 ± 0.6 µV/°C
Long-term stability (after 4000 hours at 100 °C)	ΔR < 0.2%

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

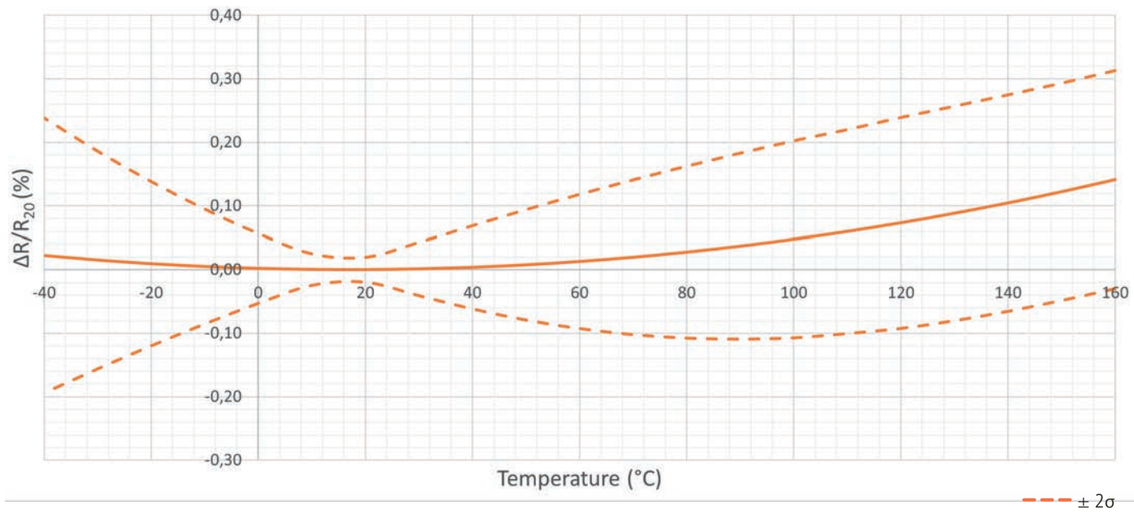
OTHER AVAILABLE FORMS

On demand

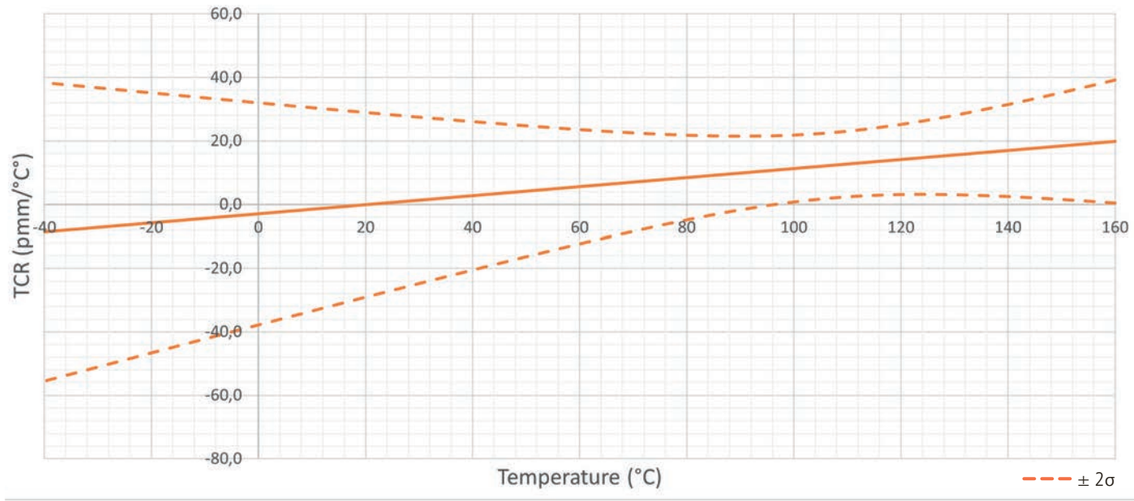
MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
OSK (skin pass)	≤ 380	≤ 450	≥ 25 %	≤ 150
¼ hard H14	≥ 500	≥ 650	≤ 5%	≤ 220

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE

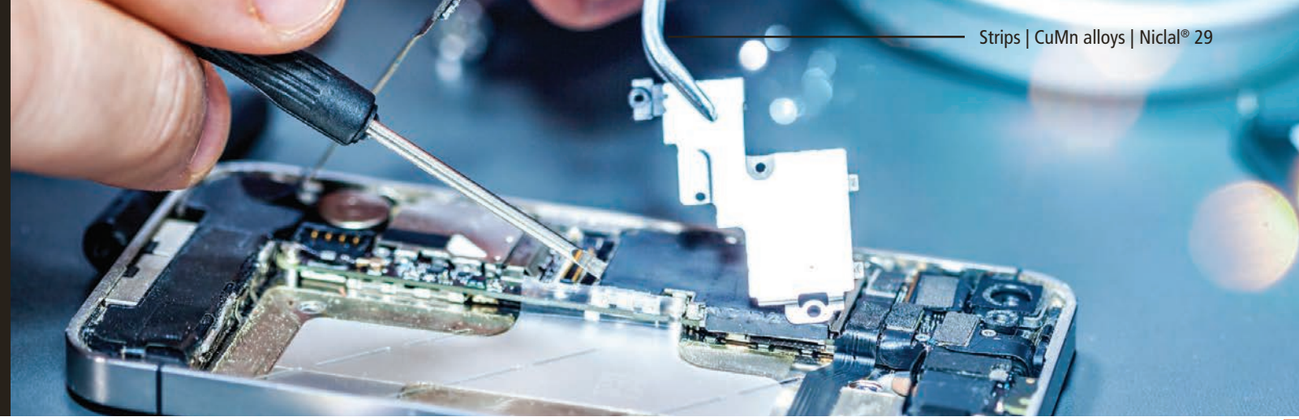


Disclaimer : Data for information only, non-contractual

Niclal® 29
$CuMn_7Sn_2$

Cu copper | Mn manganese | Sn tin

Niclal® 29 is a Copper-Manganese-Tin ($CuMn_7Sn_2$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 29 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 29

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_7Sn_2$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Sn
Balance	7%	2.3%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.5 g/cm³
Thermal conductivity	34 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	860 °C
Electrical properties	
Electrical resisitivity at 20 °C	29 µΩ.cm
Temperature coefficient of electrical resistance: -between -40 and 160 °C -between 20 and 60 °C	 0 ± 20 ppm/°C 0 ± 20 ppm/°C
Thermo EMF against Copper between 15 and 25 °C	0 ± 0.7 µV/°C
Long-term stability (after 4000 hours at 100 °C)	ΔR < 0.2%

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

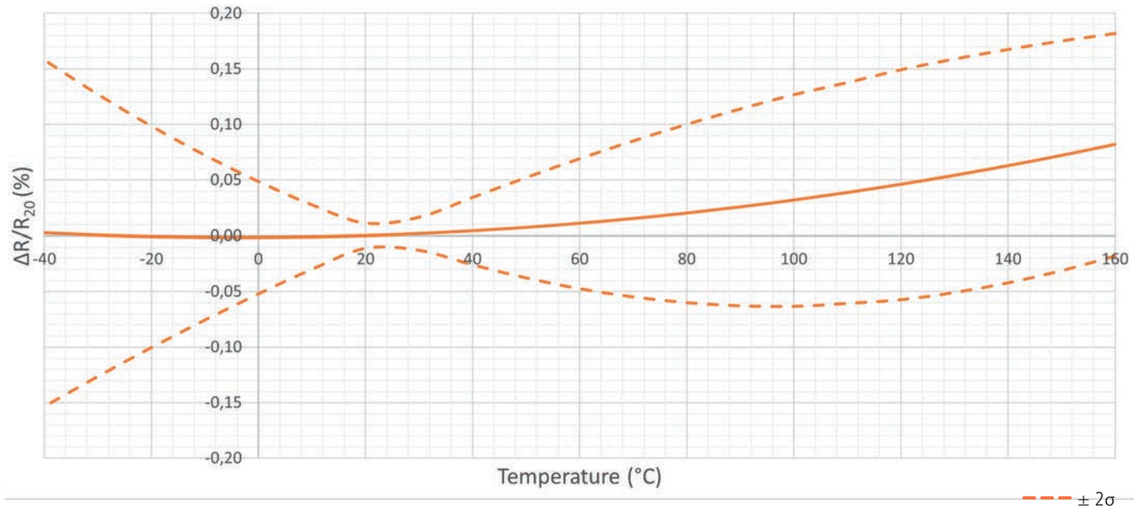
OTHER AVAILABLE FORMS

On demand

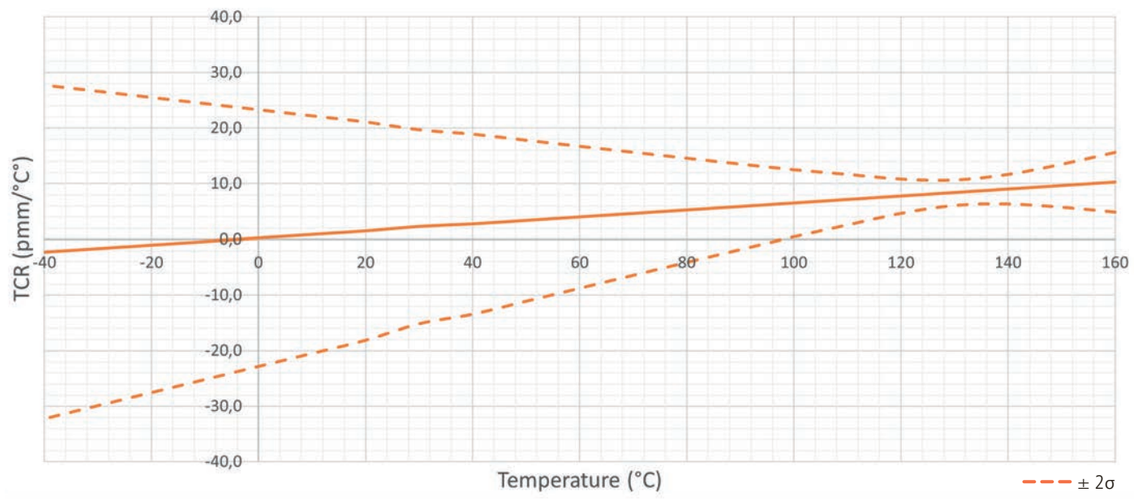
MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
Annealed	≥ 250	≤ 400	≥ 40 %	≤ 90
¼ hard H14	≥ 535	≤ 700	≤ 5%	≤ 200

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE

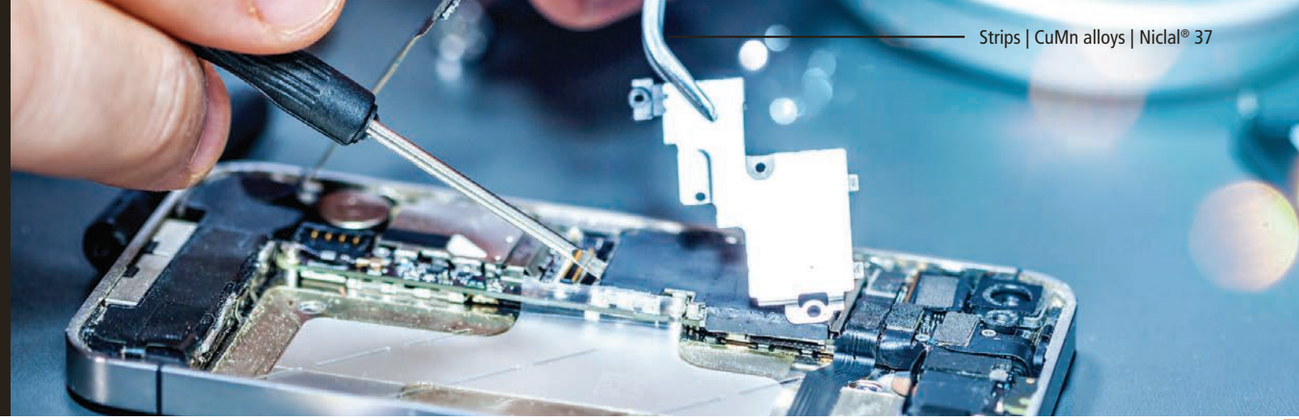


Disclaimer : Data for information only, non-contractual

Niclal® 37
$CuMn_{10}Ni_4$

Cu copper | Mn manganese | Ni nickel

Niclal® 37 is a Copper-Manganese-Nickel ($CuMn_{10}Ni_4$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 37 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 37

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{10}Ni_4$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	10%	4%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	950 °C
Electrical properties	
Electrical resisitivity at 20°C	37 µΩ.cm
Temperature coefficient of electrical resistance: -between -40 and 160 °C -between 20 and 60 °C	 0 ± 20 ppm/°C 0 ± 25 ppm/°C
Thermo EMF against Copper between 15 and 25°C	0 ± 1.7 µV/°C
Long-term stability (after 4000 hours at 100°C)	0 ± 0.1 %

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

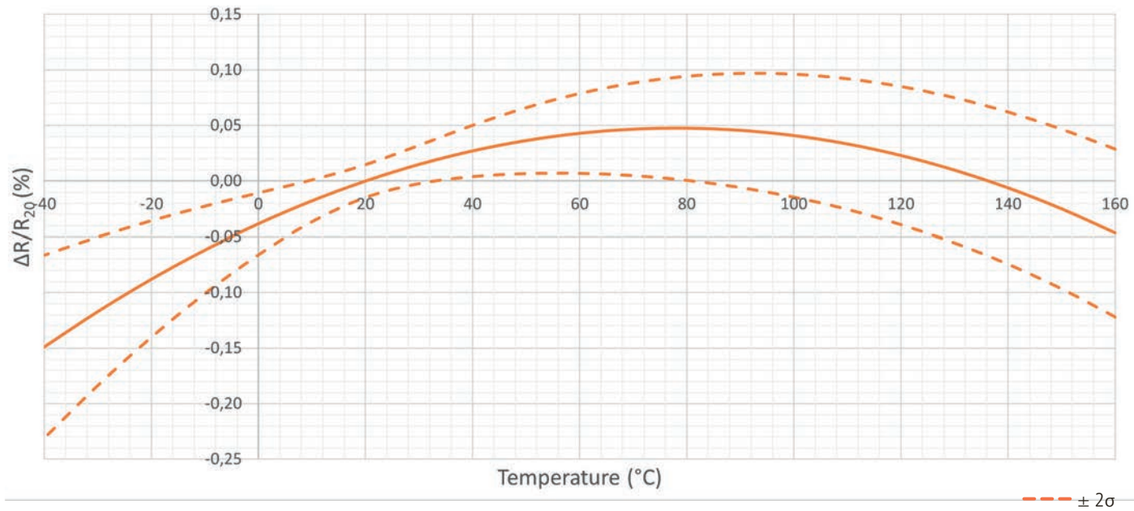
OTHER AVAILABLE FORMS

Wire

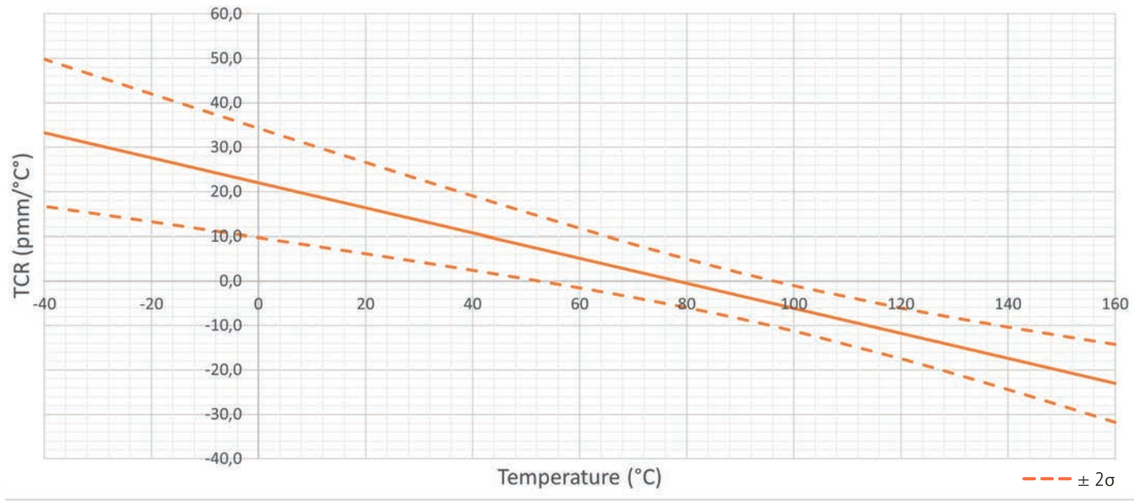
MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
Annealed	≥ 200	≤ 400	≥ 40 %	≤ 90

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE

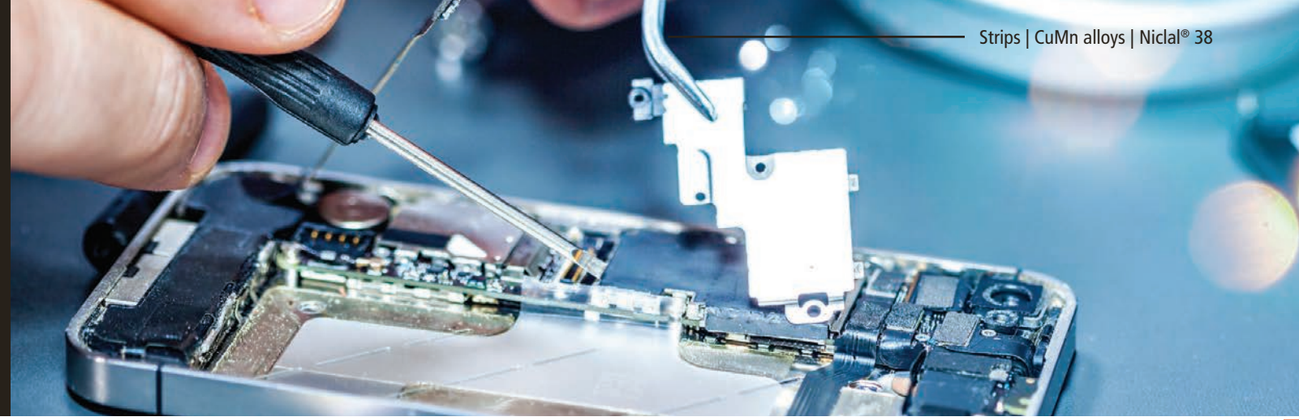


Disclaimer : Data for information only, non-contractual

Niclal® 38
$CuMn_{10}Ni_4$

Cu copper | Mn manganese | Ni nickel

Niclal® 38 is a Copper-Manganese-Nickel ($CuMn_{10}Ni_4$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 38 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 38

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{10}Ni_4$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	10%	4%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	950 °C
Electrical properties	
Electrical resisitivity at 20°C	38 µΩ.cm
Temperature coefficient of electrical resistance: -between -40 and 160 °C -between 20 and 60 °C	0 ± 15 ppm/°C 0 ± 20 ppm/°C
Thermo EMF against Copper between 15 and 25°C	0 ± 1.7 µV/°C
Long-term stability (after 4000 hours at 100°C)	0 ± 0.25%

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming

Welding

Soldering

Stamping

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

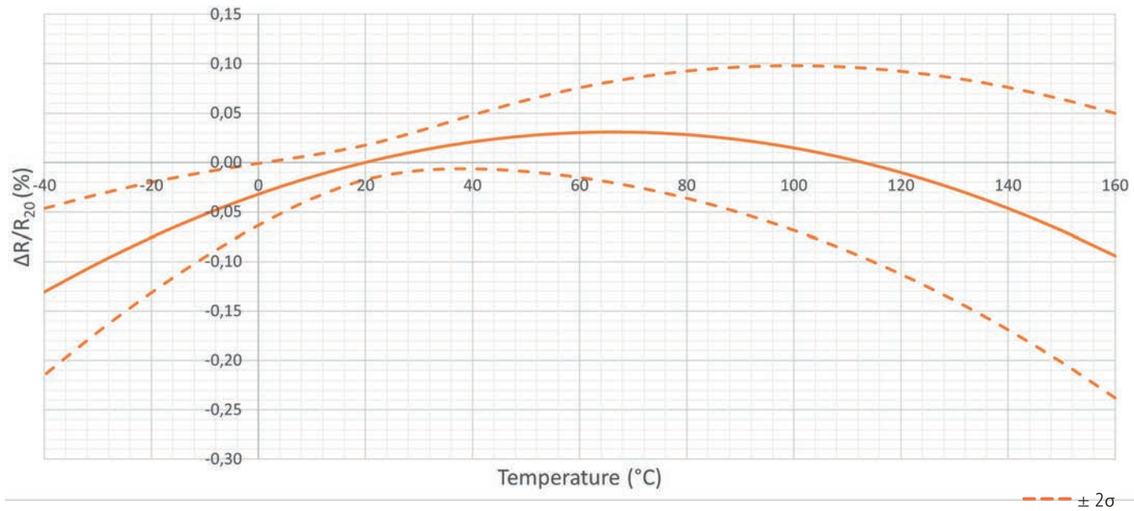
OTHER AVAILABLE FORMS

Wire

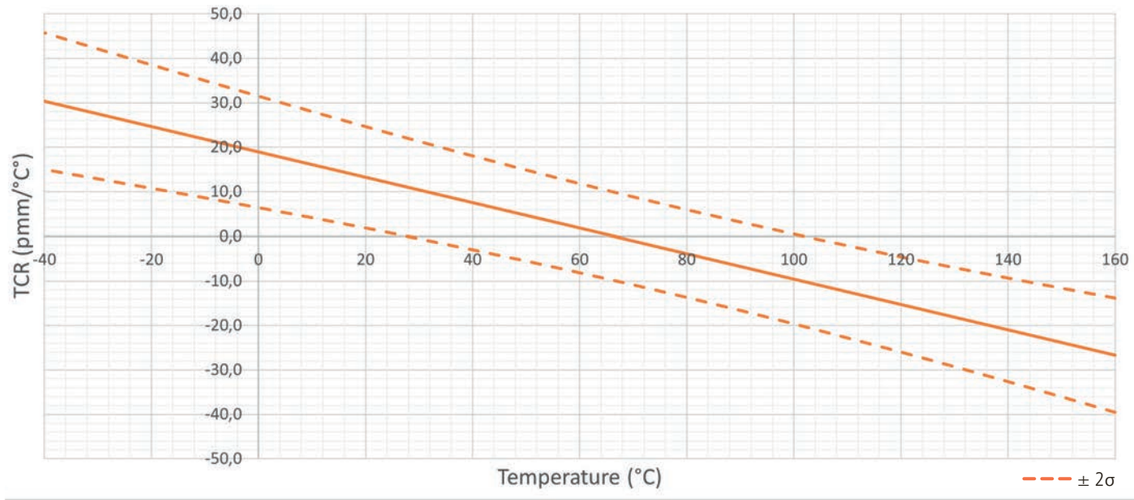
MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
Annealed	≥ 150	≤ 400	NA	≤ 110
¼ hard H11	Upon request			≤ 130
½ hard H12				≤ 160

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE



Disclaimer : Data for information only, non-contractual

Niclal® 42
$CuMn_{11}Ni_4$

29 63.546 Cu copper
25 54.938 Mn manganese
28 58.6934 Ni nickel

Niclal® 42 is a Copper-Manganese-Nickel ($CuMn_{11}Ni_4$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 42 µΩ.cm and good transformation ability (stamping, welding etc...).

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{11}Ni_4$	NA	NA

TYPICAL APPLICATIONS

Precision resistors
Electrical shunts in electricity meters
Electrical shunts in DC ammeters

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	11%	4%

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	940 °C
Electrical properties	
Electrical resisitivity at 20 °C	42 µΩ.cm

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

OTHER AVAILABLE FORMS

Wire

MECHANICAL PROPERTIES

Temper	Yield Strength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
Annealed	≤ 150	≤ 420	≥ 35 %	≤ 110
¼ hard H11	Upon request			≤ 140
½ hard H12				≤ 160
¾ hard H14	≤ 600	≤ 620	≤ 5 %	≤ 200

Disclaimer : Data for information only, non-contractual

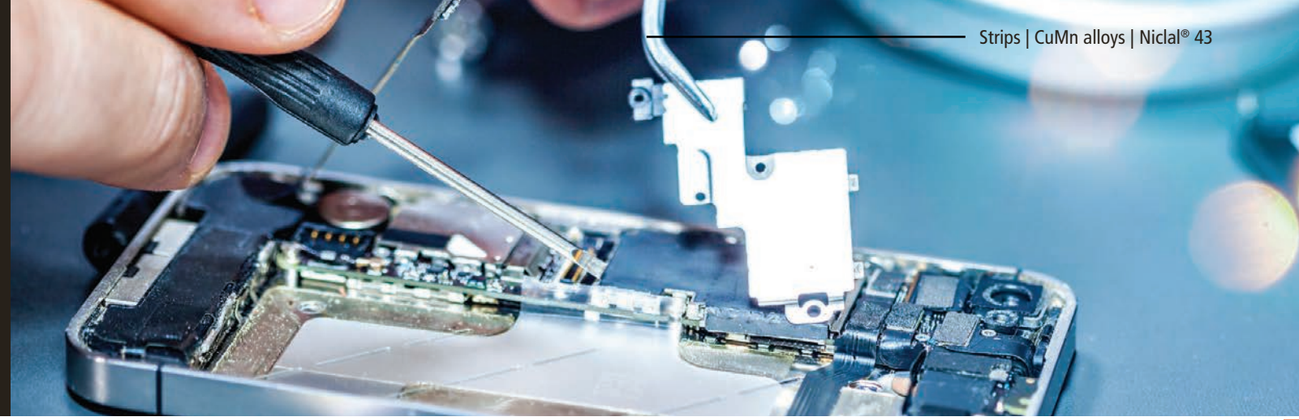
We also produce copper alloys bars and hollow bars.

To know more, visit:
www.lebronze-alloys.com

Niclal® 43
$CuMn_{12}Ni_4$

Cu copper | Mn manganese | Ni nickel

Niclal® 43 is a Copper-Manganese-Nickel ($CuMn_{12}Ni_4$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 43 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 43

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{12}Ni_4$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	12%	4%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	940 °C
Electrical properties	
Electrical resisitivity at 20 °C	43 µΩ.cm
Temperature coefficient of electrical resistance: -between -40 and 160 °C -between 20 and 60 °C	 0 ± 20 ppm/°C 0 ± 25 ppm/°C
Thermo EMF against Copper between 15 and 25 °C	0 ± 1.2 µV/°C
Long-term stability (after 4000 hours at 100 °C)	ΔR < 0,2 %

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming

Welding

Soldering

Stamping

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheet	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

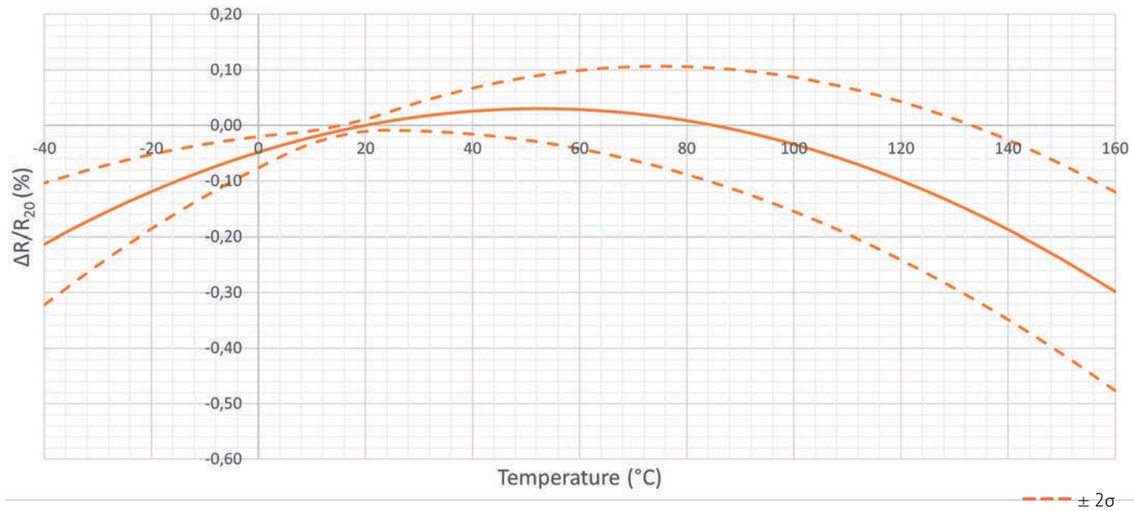
OTHER AVAILABLE FORMS

Wire

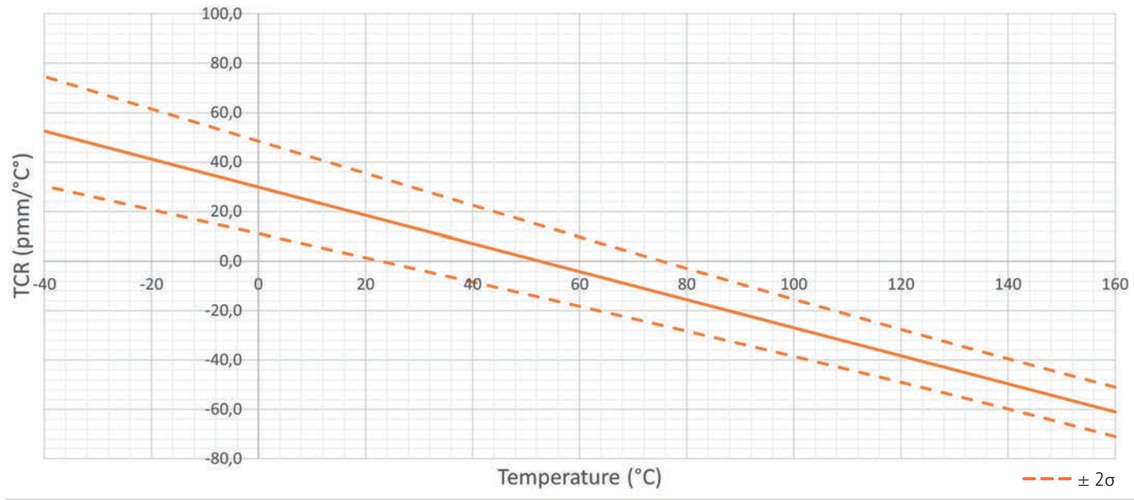
MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
OSK (skin pass)	≥ 170	≤ 440	≥ 30 %	≤ 120
¾ hard H13	≤ 600	≤ 600	≤ 5 %	≤ 200
⁴⁄₄ hard H14	≥ 570	≤ 710	≤ 5 %	≤ 210

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE

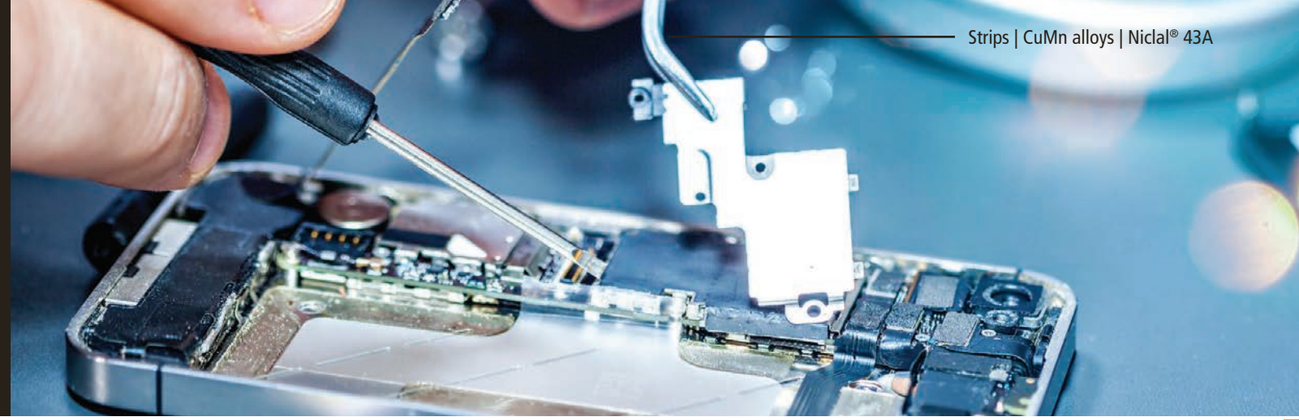


Disclaimer : Data for information only, non-contractual

Niclal® 43A
$CuMn_{12}Ni_2$

Cu copper | Mn manganese | Ni nickel

Niclal® 43A is a Copper-Manganese-Nickel ($CuMn_{12}Ni_2$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 43 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 43A

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{12}Ni_2$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	12%	2%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	940 °C
Electrical properties	
Electrical resisitivity at 20 °C	43 µΩ.cm
Temperature coefficient of electrical resistance: -between -40 and 160 °C -between 20 and 60 °C	 0 ± 15 ppm/°C 0 ± 20 ppm/°C
Thermo EMF against Copper between 15 and 25 °C	0 ± 0.3 µV/°C
Long-term stability (after 4000 hours at 100 °C)	ΔR < 0,25 %

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheet	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

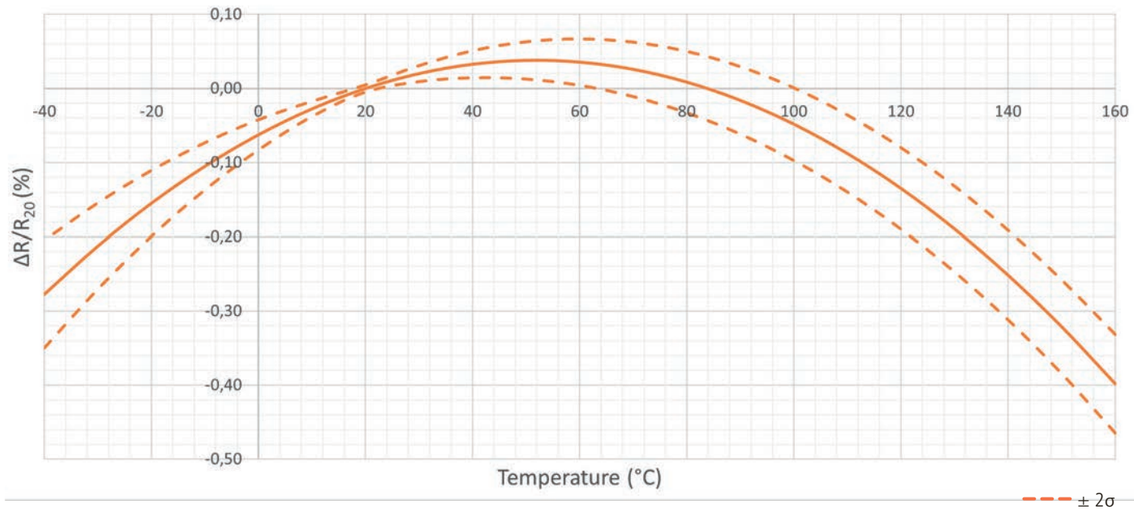
OTHER AVAILABLE FORMS

Wire

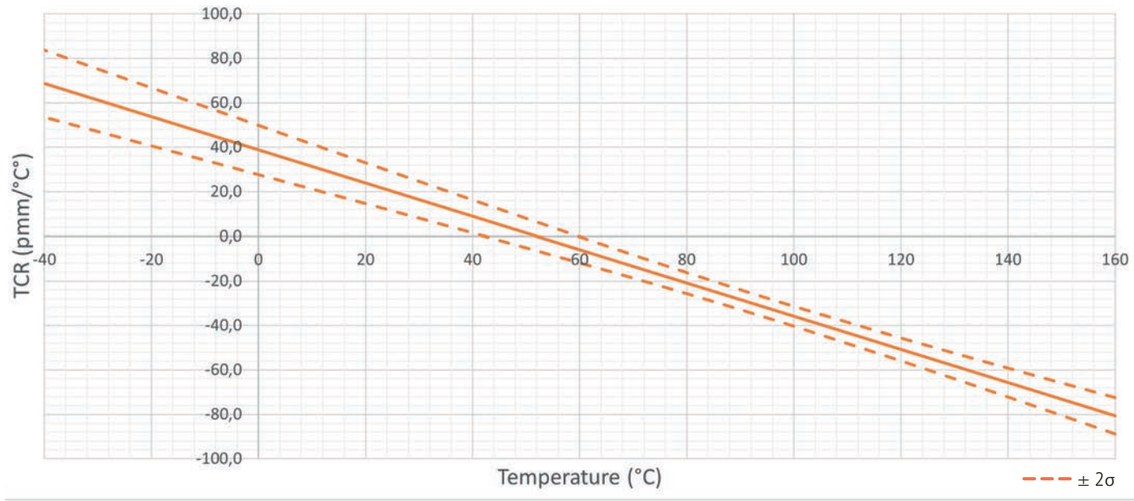
MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
OSK (skin pass)	≥ 170	≤ 440	≥ 30 %	≤ 120
¾ hard H13	≤ 600	≤ 600	≤ 5 %	≤ 200
⁴⁄₄ hard H14	≥ 570	≤ 710	≤ 5 %	≤ 210

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE

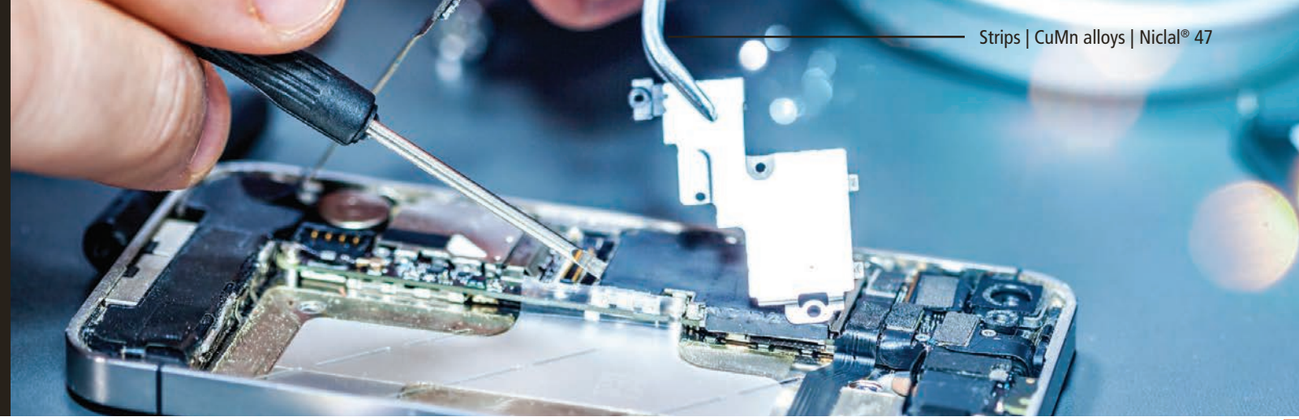


Disclaimer : Data for information only, non-contractual

Niclal® 47
$CuMn_{14}Ni_2$

Cu copper | Mn manganese | Ni nickel

Niclal® 47 is a Copper-Manganese-Nickel ($CuMn_{14}Ni_2$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 47 µΩ.cm and good transformation ability (stamping, welding etc...).



Strips | CuMn alloys | Niclal® 47

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{14}Ni_2$	NA	NA

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	14%	2%

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	930 °C
Electrical properties	
Electrical resisitivity at 20 °C	47 µΩ.cm
Temperature coefficient of electrical resistance: - between - 40 and 160 °C - between 20 and 60 °C	 0 ± 20 ppm/°C 0 ± 20 ppm/°C
Thermo EMF against Copper between 15 and 25 °C	0 ± 0.3 µV/°C
Long-term stability (after 4000 hours at 100 °C)	0 ± 0.35 %

TYPICAL APPLICATIONS

Precision resistors

Electrical shunts in electricity meters

Electrical shunts in DC ammeters

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

STANDARD CAPABILITY

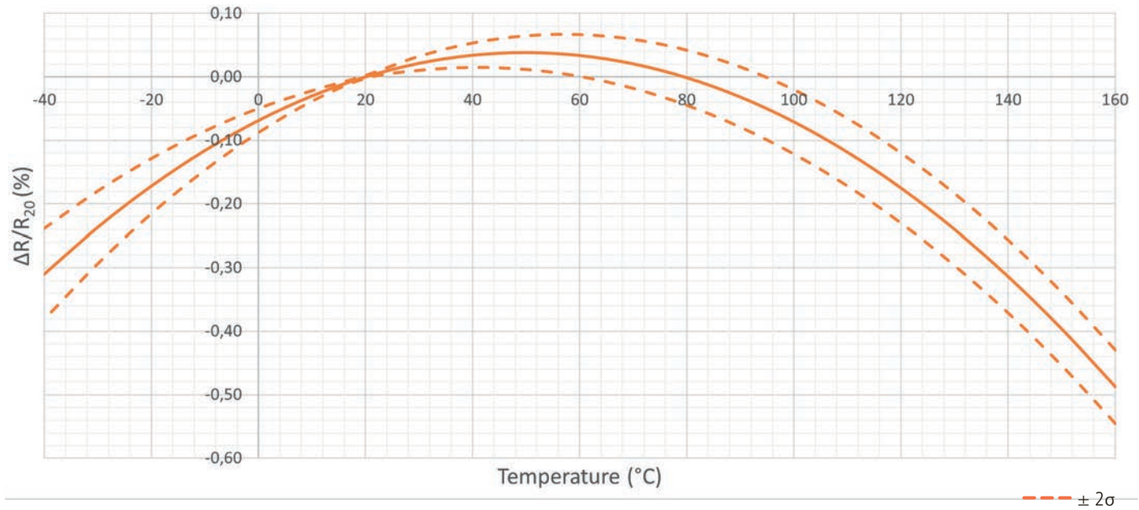
Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

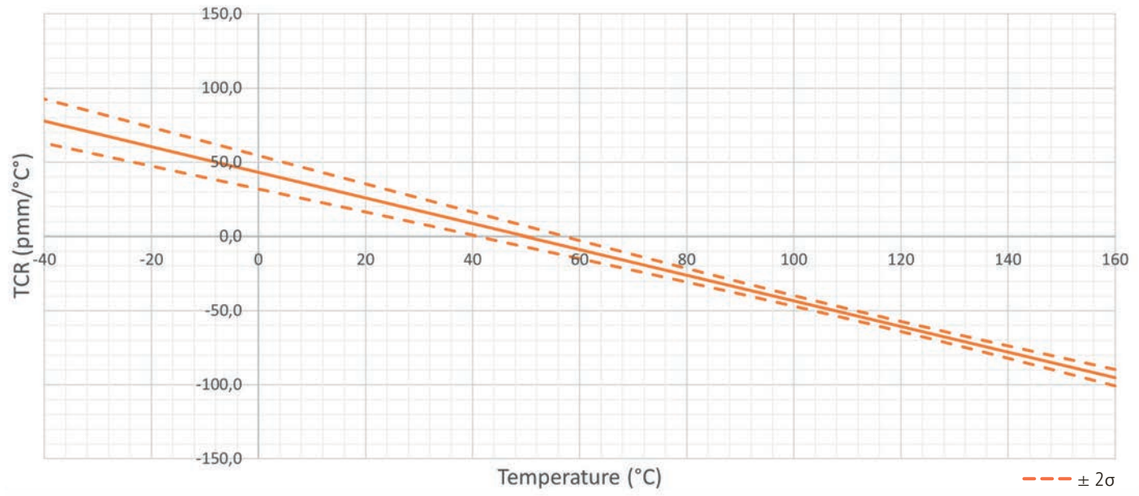
OTHER AVAILABLE FORMS

Wire

RESISTANCE CHANGE VS TEMPERATURE



TCR CHANGE VS TEMPERATURE



Disclaimer : Data for information only, non-contractual

Niclal® 48
$CuMn_{13}Ni_4$

Cu copper | Mn manganese | Ni nickel

Niclal® 48 is a Copper-Manganese-Nickel ($CuMn_{13}Ni_4$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 48 µΩ.cm and good transformation ability (stamping, welding etc...).

MATERIAL DESIGNATION

ISO	UNS	Others
$CuMn_{13}Ni_4$	NA	NA

TYPICAL APPLICATIONS

Precision resistors
Electrical shunts in electricity meters
Electrical shunts in DC ammeters

CHEMICAL COMPOSITION

Cu	Mn	Ni
Balance	13%	4%

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.8 g/cm³
Thermal conductivity	22 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	18 x 10^{-6}/°C
Melting point	930 °C
Electrical properties	
Electrical resisitivity at 20 °C	48 µΩ.cm

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

OTHER AVAILABLE FORMS

Wire

MECHANICAL PROPERTIES

Temper	Yield Stength 0.2 % (MPa)	Tensile Strength (MPa)	Elongation (%)	Hardness (HV)
¾ hard H14	≥ 610	≥ 625	≤ 3 %	≤ 200

Disclaimer : Data for information only, non-contractual

Constantan 45 TCR
$CuNi_{44}Mn_1Fe$

Cu copper | Ni nickel | Mn manganese | Fe iron

Constantan 45 TCR is a Copper-Nickel-Manganese ($CuNi_{44}Mn_1Fe$) alloy designed and produced by Lebronze alloys. It exhibits high thermal stability of electrical resistance centered around 49 µΩ.cm and good transformation ability (stamping, welding etc...).

MATERIAL DESIGNATION

ISO	UNS	Others
$CuNi_{44}Mn_1Fe$	NA	DIN 17764 n°2.0842

TYPICAL APPLICATIONS

Precision resistors
Electrical shunts in electricity meters
Electrical shunts in DC ammeters

CHEMICAL COMPOSITION

Cu	Ni	Mn	Fe
Balance	44%	1%	0.4%

COMPATIBLE DOWNSTREAM PROCESS

Cold forming
Welding
Soldering
Stamping

PHYSICAL PROPERTIES

General properties	
Density at 20 °C	8.9 g/cm³
Thermal conductivity	25 W/m.°C
Coefficient of thermal expansion from 20 to 200 °C	13.5 x 10^{-6}/°C
Electrical properties	
Electrical resisitivity at 20 °C	50 µΩ.cm
Temperature coefficient of electrical resistance between 20 and 105°C	0 ± 40 ppm/°C
Thermo EMF against Copper between 15 and 25 °C	- 40 µV/°C

STANDARD CAPABILITY

Format	Thickness	Width	Length
Strips	0.08 - 3.5 mm	3 - 380 mm	NA
Sheets	0.25 - 3.5 mm	20 - 380 mm*	500 - 3000 mm*

**Dimensions outside this range on request*

OTHER AVAILABLE FORMS

Wire

MECHANICAL PROPERTIES

Temper	Yield Strength 0.2 % (MPa)	Tensile Strength (MPa)	Hardness (HV)	Elongation (%)
Annealed	≥ 150	≤ 450	≥ 40 %	≤ 110
OSK (skin pass)	≥ 230	≤ 410	≤ 25 %	≤ 130
½ hard H12	≥ 500	≤ 560	≤ 15 %	≤ 190
¾ hard H14	≥ 620	≤ 675	≤ 5 %	≤ 210
Spring H15	Upon request		≤ 3 %	≤ 240

Disclaimer : Data for information only, non-contractual

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