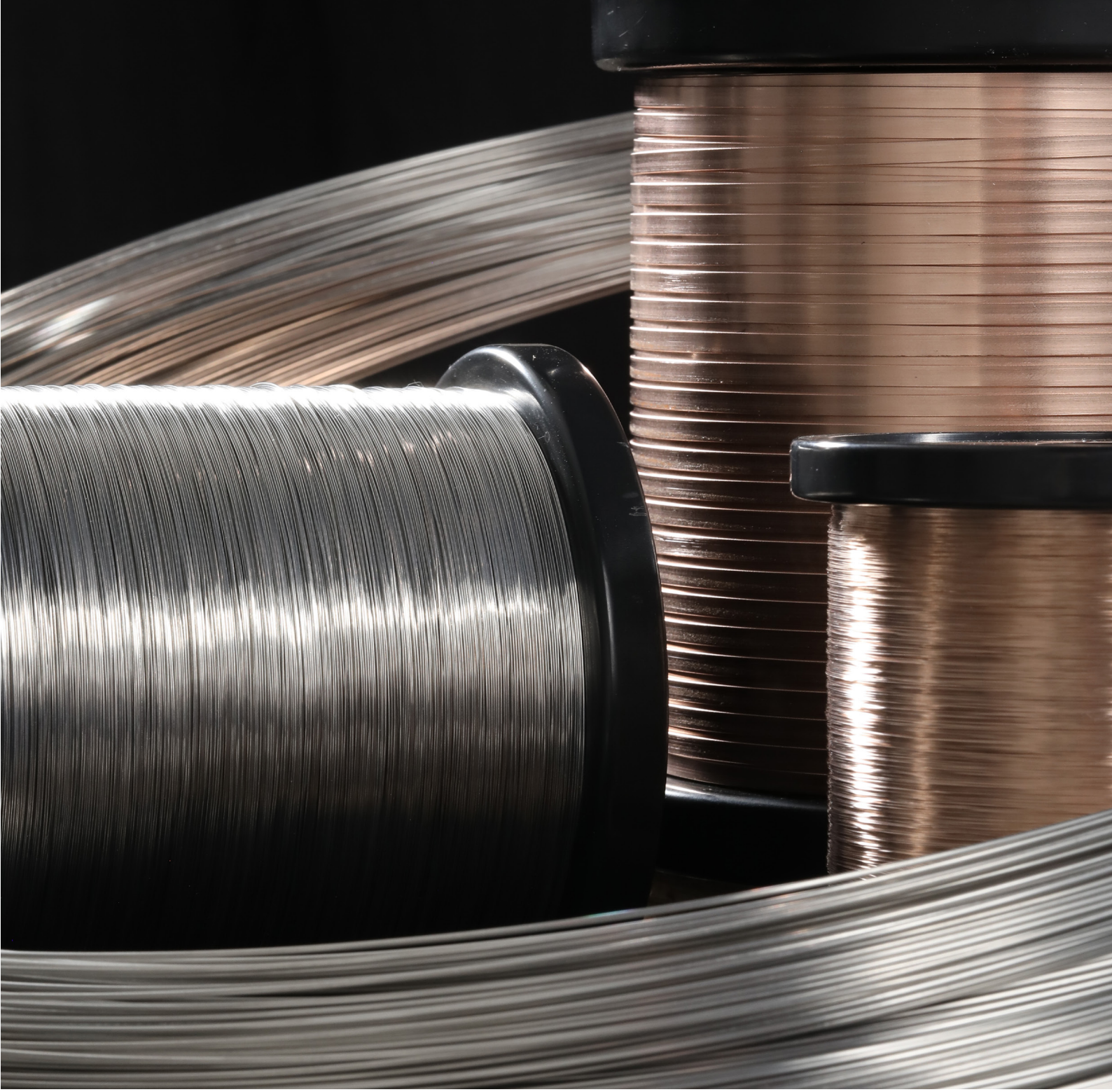

Aperam Alloys Rescal

Resistance, Corrosion & Thermocouple Alloys
Wire & Ribbons

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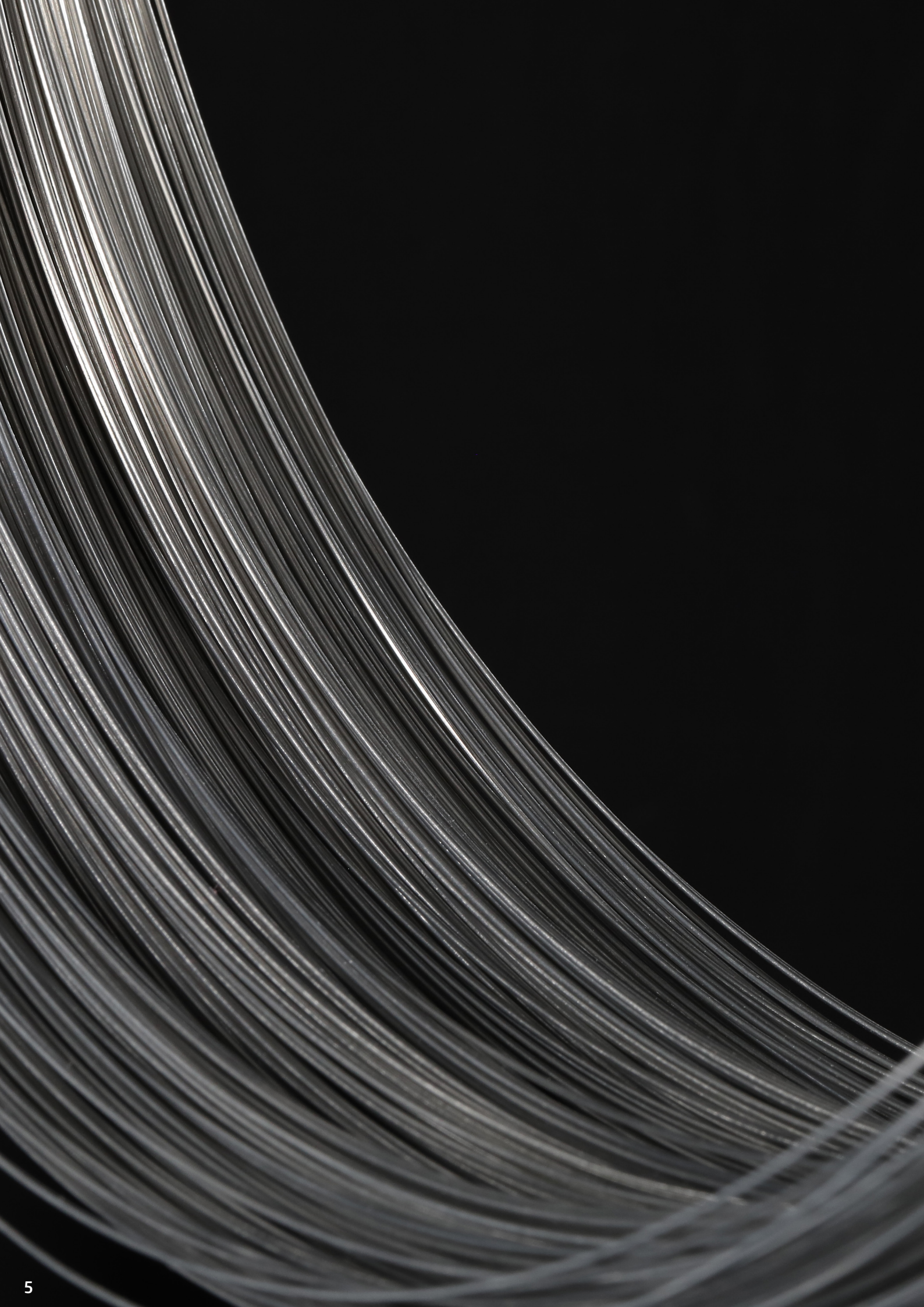


1 - company presentation


agility
ingenuity

our vision

We are a leading global stainless and specialty steel producer but we are also a young company with a fresh approach. Our vision is to become sustainably profitable, and we are prepared to constantly challenge the status quo in order to achieve this. Our goals for sustainability are rooted in our business ambitions. The business we want to be, and the qualities we draw on to make this vision a reality, are fundamental to how we engage in the topic of corporate responsibility and sustainability.

Living our values

With leadership has always come responsibility and this has never been truer than it is today. We aim to do things the right way and we support the development of new standards in our industry. Our people are innovative and collaborative. Adapting to today's business and sustainability challenges demands quick thinking and flexibility. There is no time to waste.

The Aperam Way

While our three company values of leadership, ingenuity and agility ensure high performance and profitability, it is our behavioural values that help us become a responsible and sustainable leader in our industry.

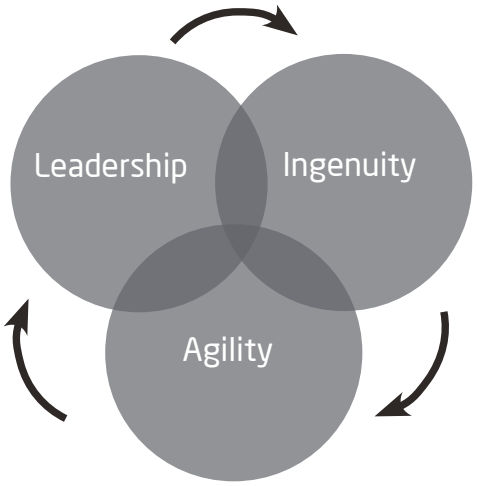
The Aperam Way is the name we give to the behaviours we want to see from our people. These include teamwork, transparency and proximity. They capture the culture we want to build for our company; one that fosters the key qualities that guide the way that we do business.

It is through the expression of these behaviours that we can manage our impacts on society and become a more sustainablebusiness.

For more information please visit our website: aperam.com/sustainability

Our values

Our three values are the means by which we will deliver our vision. They inform our every action:



Leadership

We seek to be bold and audacious in our approach, while remaining relevant to the marketplace, and to promote sustainable solutions

Ingenuity

Our people are skillful, imaginative and innovative in their work, and passionate to share their skills. This may mean developing new ideas, or seeing things with new ideas to find an appropriate solution.

Agility

We recognise the need to move quickly and adapt to changing market conditions, as well as to be flexible enough to meet specific customer requirements.

Overview

Aperam Alloys Rescal is a transformation unit specialized in the drawing and rolling of resistance and thermocouple alloys. We offer a wide range of heat resistant, nickel, corrosion resistant, controlled expansion alloys and thermocouple alloys.

We are dedicated to offer the most comprehensive and innovative range of alloy solutions in the market in order to satisfy a large variety of expectations. Our different grades of alloys are tailor-made for every type of customer. Our company is part of Aperam Group, a global player in stainless steel in Europe and Brazil. The latter is also a leading producer of high value-added specialty products including electrical steel and high nickel alloys.

Our know-how

As a member of **Aperam Alloys & Specialties Division** and a **subsidiary of Aperam Alloys Imphy**, Aperam Alloys Rescal is the specialist in the manufacturing of wires and ribbons. We are also able to deliver strips and straightened wire on request.

Our material is manufactured using the most reliable production process at our plant in Epône (France), in accordance with international standards. With an experience of more than 30 years, we are able to offer high-quality services to our customers.

Aperam Alloys Rescal mission is to provide the best service and quick response to our customers queries and needs. We aim to achieve a transparent, stable relationship thanks to excellent communication.

A perfect understanding of your needs

Aperam Alloys Rescal mission is to provide the best service and quick response to our customers queries and needs. We aim to achieve a transparent, stable relationship thanks to excellent communication and synergy.

Aperam Alloys Rescal is focused on providing high service with short delivery time, including when it comes to delivering small quantities. Our products are available directly from Aperam Alloys Rescal and through a wide network of distributors and sales offices in more than 60 countries.

Our expertise at your service

For more than a century, Aperam Alloys Imphy, parent company of Aperam Alloys Rescal, has been specialized in the design and production of nickel and cobalt alloys in every form, as well as certain specific stainless steels manufactured at the Imphy plant (France). Aperam Alloys Imphy high performance materials exceed the most demanding requirements of high technology applications, including the sector of aerospace, automotive, petrochemicals, household appliances, electronics, and renewable energies.

The Pierre Chevenard Research Center in Imphy has its own experimental means, from the development of metal casting in a laboratory to the complete characterization of the properties of use of our alloys. It also uses the resources and expertise of the Aperam group and other Research Centers as well as those of academic laboratories with whom it maintains close relationships.

Through Aperam Alloys Imphy, Aperam Alloys Rescal benefits from an integrated process from melting shop to drawn and flattened wire.

Quality management

This market requires technical know-how, quality, continuous improvement, safety and flexibility. That is the reason why we hold ISO 9001 certificate for quality management, as well as ISO 14001 and OHSAS 18001 for environment, health and safety.

Our updated Quality Certifications are available on www.aperam.com/alloys-rescal

2 - resistance heating alloys

Main Product Range - Physical and mechanical properties

Family	Nickel-Chromium Alloys						Iron-Chromium-Aluminium Alloys				
Grades	RESISTOHM® 80	RESISTOHM 70	RESISTOHM 60	RESISTOHM 40	RESISTOHM 30	RESISTOHM 20	RESITOHM® PRM	RESISTOHM 145	RESISTOHM 140	RESISTOHM Y	RESISTOHM 135
International standards											
DIN	17470	17470	17470	-	17470	17470	-	17470	17470	17470	17470
Werkstoff N°	2.4869	2.4658	2.4867	1.4864	1.4860	1.4843	-	1.4765	1.4767	-	1.4767
ASTM	B344	-	B344	B344	-	-	-	-	-	-	-
Physical properties											
Chemical composition % Al	-	-	-	-	-	-	6	6	5	5	4.5
Cr	20	30	15	18	20	20	23	23	22	22	20
Ni	80	70	57	37	30	25	-	-	-	-	-
Fe	-	-	balance	balance	balance	balance	balance	balance	balance	balance	balance
Mn	-	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	-	-	-	-	-	-	-	-
Other	Si+	Si+	Si+	Si+	Si+	Si+	-	-	-	Y	-
Resistivity (Ω mm²/m)	1.08	1.18	1.12	1.05	1.04	0.95	1.45	1.45	1.40	1.39	1.35
Temperature coefficient Ct at:											
20° C	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
100° C	1.01	1.01	1.01	1.03	1.03	1.04	1.00	1.00	1.00	1.00	1.00
200° C	1.02	1.02	1.02	1.07	1.07	1.09	1.00	1.00	1.01	1.00	1.01
300° C	1.03	1.03	1.03	1.10	1.10	1.13	1.00	1.00	1.01	1.01	1.01
400° C	1.035	1.05	1.05	1.13	1.13	1.17	1.01	1.01	1.01	1.02	1.02
500° C	1.045	1.05	1.07	1.16	1.15	1.22	1.01	1.01	1.03	1.03	1.03
600° C	1.05	1.05	1.07	1.18	1.18	1.25	1.02	1.02	1.03	1.05	1.04
700° C	1.045	1.05	1.10	1.20	1.19	1.28	1.02	1.02	1.04	1.07	1.05
800° C	1.04	1.05	1.11	1.21	1.21	1.33	1.03	1.03	1.05	1.08	1.06
900° C	1.045	1.05	1.11	1.23	1.23	1.30	1.03	1.03	1.05	1.08	1.07
1000° C	1.05	1.06	1.12	1.23	1.25	1.40	1.04	1.04	1.06	1.08	1.07
1100° C	1.06	1.06	1.13	1.24	1.27	-	1.04	1.04	1.06	1.08	1.07
1200° C	1.07	1.07	-	1.24	-	-	1.04	1.04	-	1.08	-
1300° C	-	-	-	-	-	-	1.04	1.04	-	1.08	-
Temperature coefficient (K x 10^{-6}/°C)	60	110	170	240	250	330	33	33	60	100	70
Thermal conductivity at 20°C (Wm^{-1}° C^{-1})	15	13.70	13.30	13.00	13.00	11.50	16.00	16.00	16.00	16.00	16.50
Coefficient of linear expansion (coef. 10^{-6}/°C)	17.50	17.50	17.50	18	18	10.50	15.10	15	15	15	14
Density (g/cm²)	8.35	8.16	8.20	7.95	7.90	7.80	7.10	7.10	7.15	7.10	7.25
Creeping point											
at 800°C (1472°F)	15	15	15	20	20	20	8	8	6	8	6
at 1000°C (1832°F)	4	4	4	4	4	4	1.5	1.5	1	1.5	1
Maximal operating temp. °C	1200	1250	1100	1050	1000	950	1400	1300	1280	1300	1200
° F	2192	2282	2012	1922	1832	1742	2552	2372	2336	2372	2192
Melting point ° C	1400	1380	1350	1380	1390	1000	1500	1500	1500	1490	1500
° F	2550	2510	2460	2510	2530	1832	2730	2730	2730	2710	2730
Approximate mechanical properties											
Tensile strength (daN/mm²)	76	80	70	75	75	75	75	75	75	75	75
Yield strength (daN/mm²)	33	40	35	40	35	40	55	55	55	55	55
Elongation (A% on 100 mm)	≥ 30	≥ 30	≥ 30	≥ 30	≥ 30	≥ 30	≥18	≥ 18	≥ 18	≥ 18	≥ 18
Hardness (HV)	220	220	220	220	220	220	230	230	230	210	230

For further grades, feel free to contact us or to refer to separate documentation (Heat Resistant, Corrosion, Magnetic, FeNiCo, Special NiCr / NiCrTi / NiCo Alloys).

		Copper-Nickel & FeNi Alloys										Nickel Alloys		
	RESISTOHM 125	CuNi 44	CuNi 23 Mn	CuNi 10	CuNi 6	CuNi 2	Clad 40	Phy 400	INVAR®	FeNi 70 (Hytemco)	Manganina	Nickel 200	Nickel 201	Nickel 212
	17470	17471	17471	17471	17471	17471	-	17743	17745	-	-	17740	17740	17741
	1.4725	2.0842	2.0881	2.0811	2.0807	2.0802	-	2.4360	1.3912	-	-	2.4066	2.4068	2.4110
	B603	B267	-	-	-	-	B452	-	-	-	-	B160	-	-
	3	-	-	-	-	-	1 max	-	-	-	-	-	-	-
	17	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	44	23	10	6	2	-	63	36	72	4	99.2	99	97
	balance	-	-	-	-	-	balance	2.5	balance	balance	-	0.4	0.4	0.25
	-	-	-	-	-	-	0.03-0.25	2	-	2	11	-	-	1.5-2.5
	-	balance	balance	balance	balance	balance	-	28-34	-	-	balance	0.25	0.25	0.2
	-	-	-	-	-	-	Si+ Ti+		Si Mn +	-	-	C 0.10 max. Si +	C 0.02 max	C 0.05 max
	1.25	0.49	0.30	0.15	0.10	0.05	≤ 0.04	-	0.8	0.20	-	0.096	0.085	0.109
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.01	1.002	1.02	1.03	1.05	1.11	-	-	-	1.36	-	1.48	1.40	1.36
	1.01	1.002	1.03	1.07	1.11	1.25	-	-	-	1.97	-	2.08	1.90	1.81
	1.02	1.001	1.04	1.11	1.19	1.4	-	-	-	2.65	-	2.68	2.40	2.26
	1.03	1.005	1.06	1.15	-	-	-	-	-	3.33	-	-	-	-
	1.05	1.017	-	-	-	-	-	-	-	3.93	-	-	-	-
	1.08	1.037	-	-	-	-	-	-	-	4.48	-	-	-	-
	1.09	-	-	-	-	-	-	-	-	4.98	-	-	-	-
	1.10	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.11	-	-	-	-	-	-	-	-	-	-	-	-	-
	1.11	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	110	20/60	200	450	700	1300	-	-	1350	4500	-	6170	5000	4500
	16.70	21.1	35	60	90	160	≥ 39.2	21.8	11	28.9	22	60	60	44
	14	14	15.70	16	16.20	14.40		13.90	1.50	13	18	13.30	13.30	12.90
	7.35	8.90	8.90	8.90	8.90	8.90	8.20	8.90	8.11	8.46	8.76	8.90	8.90	8.86
	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	1100	600	400	400	300	300	-	1350	-	-	-	315	315	315
	2012	1110	750	750	570	570	-	2462	-	-	-	519	519	519
	1520	1210	1100	1080	1080	1080	-	1350	1425	1425	1050	1450	1450	1440
	2760	2210	2010	1970	1970	1970	-	2462	2600	2590		2640	2640	2620
	70	50	40	35	30	30	40	50	50	60	-	50	50	50
	50	30	20	15	15	15	-	35	30	30	-	30	30	30
	≥ 18	≥ 25	≥ 25	≥ 25	≥ 25	≥ 25	≥ 10	≥ 25	≥ 25	≥ 25	-	≥ 25	≥ 25	≥ 25
	210	120	120	120	120	120	-	120	-	90	-	120	90	100

The resistivity

The resistivity of an alloy represents its specific resistance to electric current and is expressed in Ω mm^2/m. It is generally given at 20° C. This value is intrinsic to the metal and varies in function of the chemical composition of the latter. There is a variation of more or less 5% with respect to the nominal value because of possible differences between chemical analysis. For a given resistivity, the use of a low resistivity alloy has to be counterbalanced with a small section.

The temperature coefficient

With very few exceptions, the resistance of a metal will change with temperature, which must be allowed for when designing an element. As the resistance of an element is calculated at operating temperature, the resistance of the element at room temperature must be found. The variation of the resistivity is expressed by the following equation:

$\rho t = \rho_0 (1+Ct)$

Where:

ρ_0 *= resistivity at 20°C*

ρt *= resistivity at operating temperature*

Ct *= temperature coefficient expressed by* $°C^{-1}$

Austenitic or nickel-chromium alloys

The resistivity for nickel-chromium alloys in cold state are very similar but the temperature coefficient is different due to its dependence to the iron content.

As for the RESISTOHM® 80, the evolution of the resistivity is not linear but relatively stable in comparison with other alloys of this family (G N-C A). On the other hand, the change of the resistivity is more and more important in function of a higher iron content. For the case of the RESISTOHM® 30, there is a variation of about 30% of the resistivity between room temperature and 1000°C.

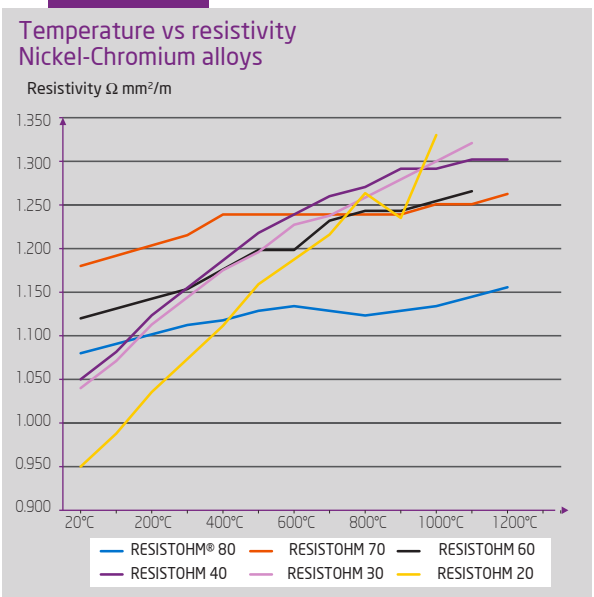
Ferritic alloys (iron-chromium-aluminium)

For ferritic alloys the variation of the resistivity is similar but does not exceed 8% (G I-C-A).

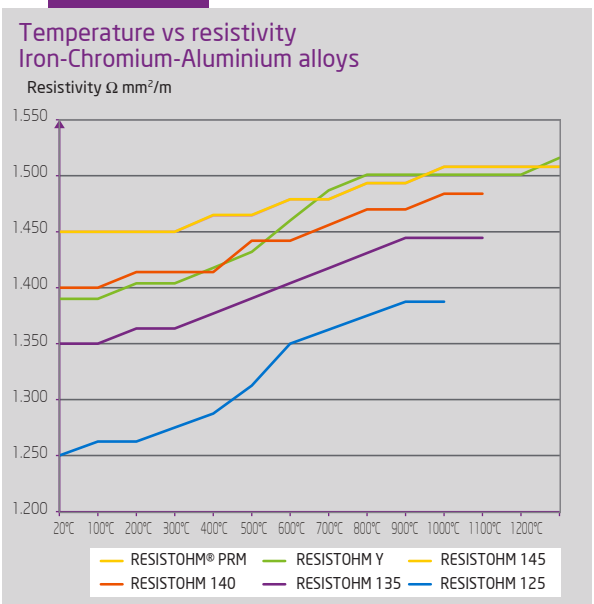
Copper-nickel alloys

The particularity of copper-nickel alloys is that they show a constant value of resisitivity versus temperature.
This characteristic makes them widely used in temperature indicators, high precision resistors or other electronic measuring devices.
This particular aspect of copper-nickel alloys allows the resistor to operate at almost exactly the same resistance regardless of temperature
(G C-N A).

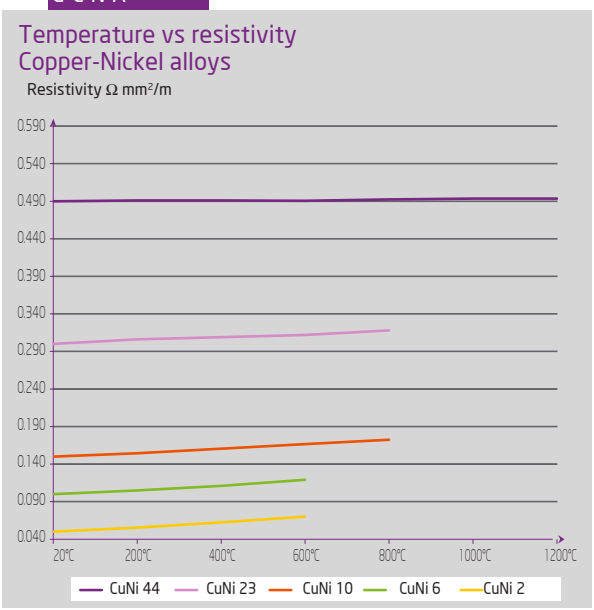
G-N-C A



G-I-C-A



G-C-N-A



The maximum operating temperature

This temperature is given as an indicative value for a straight, tight wire in air. Special attention should be paid to the design of the heating element, the cross section of the electrical conductor and the type of application, which can impact on the maximum operating temperature.

The coefficient of linear thermal expansion

Alloys expand with increasing temperatures. This dilatation can be expressed as follows:
Lt = L0 (1 +KT)
Lt: length at operating temperature T
L0: length at room temperature
K: coefficient of linear thermal expansion
T: temperature of use

The dilatation must be taken into account for certain types of heating elements. Some controlled expansion alloys, used as a pin of a thermostat, are characterized by this property.

Density

Another aspect to consider is alloys' density. There is a dependence between density and weight of a finished element. A lower density means a lower weight. Therefore, other factors must be considered when it comes to choose the right alloy.

Mechanical properties

Mechanical characteristics reveal elastic and inelastic behavior of a given alloy when force is applied on it. In general, austenitic alloys are more malleable than ferritic alloys. On the other hand, weaker mechanical properties enable a better control of the elasticity of the alloy.

Creep strength

It is an alloy's mechanical resistance in hot state. Generally austenitic alloys tend to be more resistant to creeping than ferritic alloys. Attention must be paid to this parameter during the conception of an electrical resistance which presents elevated amplitude.

Effects of atmosphere

The electrical resistance's lifetime is highly dependent on the environment in which it is used. That is the reason why it is important to pay attention to the atmosphere before choosing the alloy.

Oxidizing atmospheres

This type of atmospheres represents ideal working conditions for resistant alloys. Our nickel-chromium alloys all show a good resistance to oxidation, making them ideal heating element materials. The most adapted alloy for this type of atmospheres is RESISTOHM® 80.

Iron-chromium-aluminium alloys also have a good lifetime under normal oxidizing atmospheres. Therefore, a pre-oxidation is recommended in order to give a protective aluminium oxide film. This oxide film proves to be more adhesive on the RESISTOHM® Y thanks to the yttrium content.

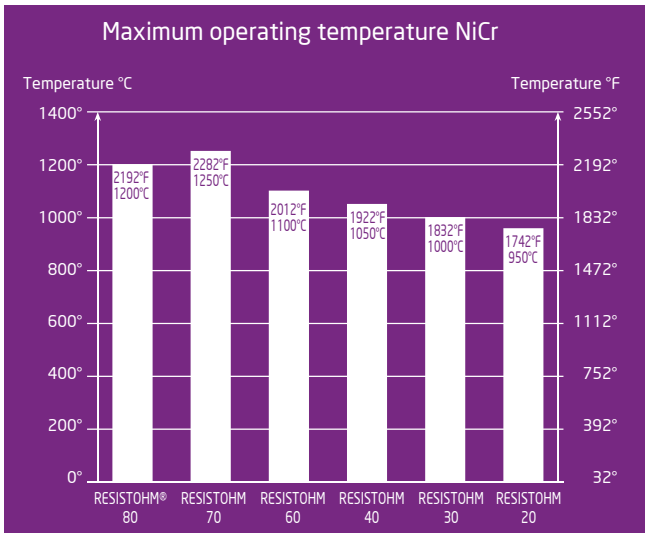
Carburizing and reducing atmospheres

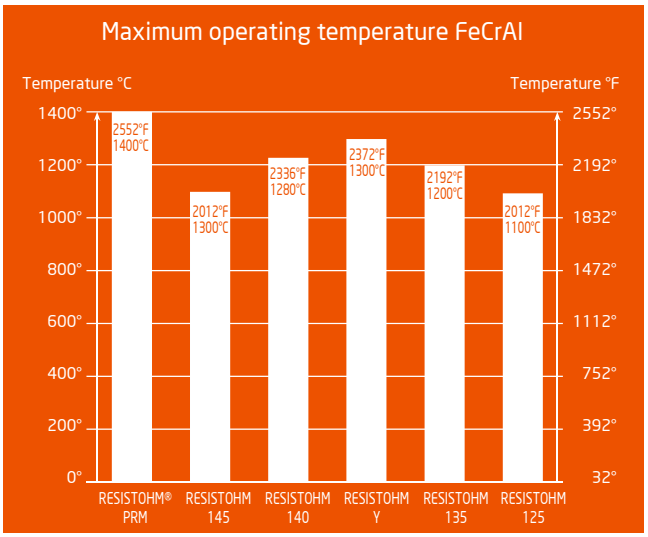
In carburizing atmospheres, a lower nickel content alloy is more suitable. Nickel alloys containing chromium are subject to a light green oxide also called «green rot» under highly carbonaceous atmospheres. Even if all our FeCrAl alloys resist to attack from carburizing atmospheres, provided a pre-oxidizing treatment, a reduction of their lifetime is to be anticipated. The yttrium content of RESISTOHM® Y is particularly interesting under those conditions.

Sulphurous atmospheres

When sulphur is present in an oxidizing atmosphere, there is a risk of embrittlement of the alloy. Nickel-chromium alloys have a considerably lower durability than ferritic alloys when sulphur is present in this atmosphere at temperatures higher than 650°C, particularly in reducing atmospheres.

Nickel-based austenitic alloys are not recommended under those conditions and iron-chromium-aluminium alloys must be prefered. The latter have a better resistance to attack from oxidizing gases containing sulphur provided pre-oxidation treatment.





Surface loading

For designing heating elements, several factors must be considered and surface loading is an important one. It determines the surface load of the element in terms of watts per square centimeter (W/cm²). It should not exceed a certain value in order not to reach temperatures that would make melt the surface of the wire or strip. The resistance heating material is heated, following the Joules law of heating by supplying current.

Heat is sent everywhere inside in the furnace through radiation and convection. Generally, the amount of power load to the heating element is described in electric energy per unit area of the heating material. This value is known as surface load. The surface load content is calculated as following:

Surface load = P/A (W/cm²), where P = power in watts and A = the surface area of heating material in square centimeters.

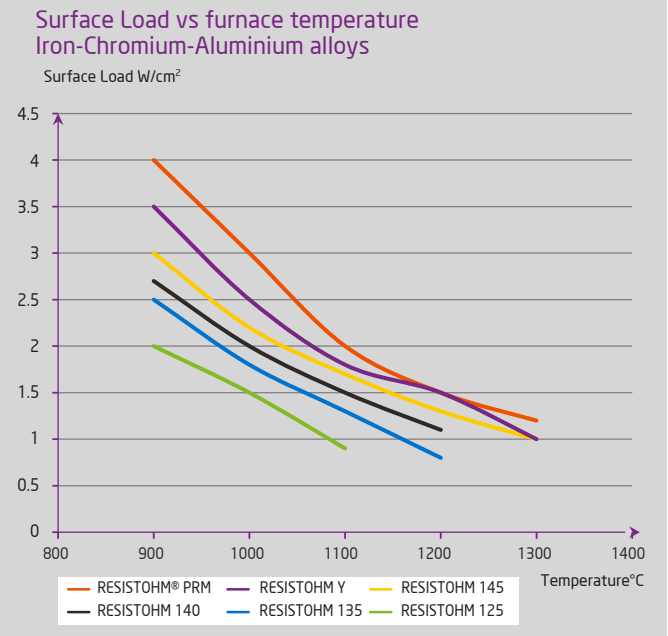
The surface load content corresponds to the heating magnitude per unit area of the heating material. It is an important and useful factor that shows the surface temperature and functional period of the heating material. So it is recommended to decrease the surface load content to reduce the surface temperature of the heating material and decrease the difference between the temperature of heating material and the furnace temperature as long as possible. The objective is to increase the service life of the heating material.

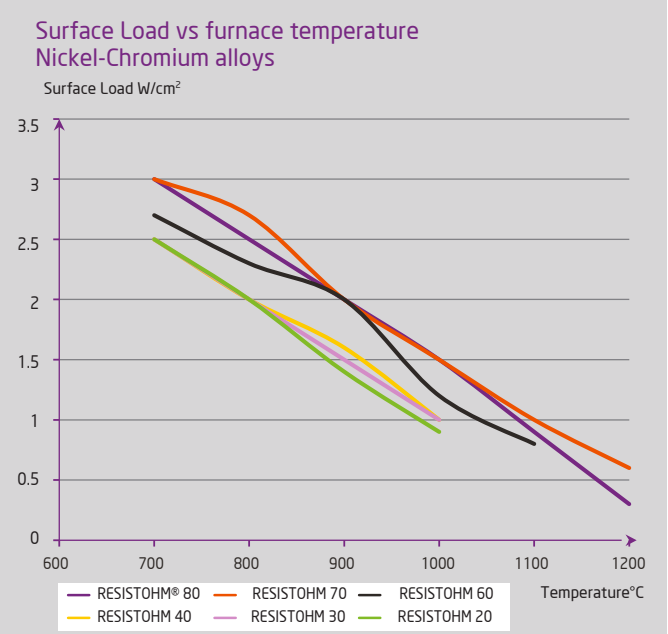
While designing the heating material, the surface load content is based on various factors such as furnace temperature, heating alloy (ferritic alloys shows better surface loading than austenitic alloys), operation conditions, furnace cycles and heating material design. There is no specific rule. The values shown are given as indicative values only in order to guide the customer.

The ideal surface load depends on a number of factors such as alloy type, cross section, heating element design, diameter and application. For that reason, it is difficult to determine exactly the permissible surface load.

Generally, higher surface loads are supported by the iron-chromium-aluminium alloys, compared to nickel-chromium alloys. The surface load is a measure of the temperature that the wire will achieve under given environmental conditions. It is not a material dependent quality, but it has to be chosen in accordance with the respective conductor material, application and atmosphere.

Comparision of surface loading for our ferritic and austenitic alloys





The following table shows advisable surface loads for industrial heating elements concerning nickel-chromium and iron-chromium-aluminium alloys. They are given as indicative values only

Alloy	Temperature in °C							
	700	800	900	1000	1100	1200	1300	1400
RESISTOHM®80	2.5-3.0	2.0-2.5	1.6-2.0	1.2-1.5	0.7-0.9	0.1-0.3	-	-
RESISTOHM 70	3.0-3.5	2.4-2.7	1.7-2.0	1.3-1.5	0.8-1.0	0.3-0.6	-	-
RESISTOHM 60	2.2-2.7	1.9-2.3	1.4-1.7	1.0-1.2	0.5-0.8	-	-	-
RESISTOHM 40	2.0-2.5	1.6-2.0	1.2-1.6	0.7-1.0	-	-	-	-
RESISTOHM 30	2.0-2.5	1.6-2.0	1.2-1.5	0.7-1.0	-	-	-	-
RESISTOHM 20	2.0-2.5	1.6-2.0	1.2-1.4	0.6-0.9	-	-	-	-
RESISTOHM PRM	-	-	3.1-4.5	2.2-2.5	1.5-2.0	1.2.-1.5	1.0-12	0.5-0.8
RESISTOHM 145	-	-	2.5-3.0	1.7-2.2	1.3-1.7	0.9-1.3	0.7-1.0	-
RESISTOHM 140	-	-	2.4-2.7	1.6-2.0	1.2-1.5	0.8-1.1	-	-
RESISTOHM Y	-	-	3.0-3.5	2.2-2.5	1.5-1.8	1.2-1.5	0.8-1.0	-
RESISTOHM 135	-	-	2.0-2.5	1.5-1.8	1.0-1.3	0.5-0.8	-	-
RESISTOHM 125	-	-	1.5-2.0	1.2-1.5	0.7-0.9	-	-	-

Element operating temperatures and surface loading
The data in the table above are given as indicative values only.

future


quality

Nickel-chromium Alloys

Nickel-chromium alloys contain nickel and chromium, with silicium, manganese, and rare-earth additions in order to confer them an excellent behaviour in hot state and to increase oxidation resistance.

The nickel-chromium alloys manufactured by Aperam Alloys Rescal are perfectly suitable for electrical-resistance heating elements. Applications include electrical resistances for appliances (tubular heaters for example) and industrial furnace elements.

Their metallurgical structure provides a good plasticity in cold condition. In addition to high specific resistance, nickel-chromium alloys have all properties that provide good performance for industrial furnace applications.

Some of the characteristics are resistance to oxidation thanks to the nickel content, relatively low embrittlement at high temperature, good ductility for forming due to lower mechanical characteristics (which contrasts with iron-chromium-aluminum alloys) and resistance to creeping.

The maximum recommended temperature of nickel-chromium alloys for furnaces applications are situated between 1050 to 1100°C (1920 to 2010°F).

RESISTOHM® 80

This nickel-chromium alloy is suitable for use up to 1200°C. It contains rare-earth in addition for increased oxidation resistance, especially under conditions of frequent switching or wide temperature fluctuation. RESISTOHM 80 is the top quality of our austenitic alloys and is the one with the highest nickel content in this range. It also has a relatively low temperature coefficient. This alloy is suitable for heating elements in domestic appliances and electric furnaces.

RESISTOHM 70

With a higher chromium content, this nickel-chromium alloy has a very good lifetime in industrial furnace applications. RESISTOHM 70 also has a higher resistivity and is for use at temperatures up to 1250°C (2280°F).

RESISTOHM 60

A nickel-chromium alloy containing 60 per cent of nickel, 15 per cent of chromium, balance Iron. It also contains rare-earth additions for a better resistance to oxidation. This alloy has a relatively high temperature coefficient. Applications include a variety of heating elements such as toaster elements or potentiometer resistances. It can be operated at temperatures up to 1100°C (2010°F).

RESISTOHM 40

This resistance alloy has a nominal composition of 37% of nickel, 18% of chromium, balance Iron, with small rare-earth additions and is used for domestic appliances and other heating elements operating at temperatures up to 1050°C (1920°F). This alloy has a high temperature coefficient.

RESISTOHM 30

The applications of this resistance alloy are similar to those of RESISTOHM 40. It has a lower nickel content and resistivity, which means that it is for use up to 1000°C (1832°F). RESISTOHM 30 is suitable for resistance element applications for lower temperatures.

RESISTOHM 20

This alloy is close to be a stainless steel but can be used for heating elements applications at low temperature or as cold connections of furnace.

RESISTOHM® 80

Resistivity 1.08 Ω mm²/m. Density 8.35 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
Ct	1.08	1.01	1.02	1.03	1.035	1.045	1.05	1.045	1.04	1.045	1.05	1.06	1.07

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	137.5796	± 5 %	130.7006	144.4586	0.0655	15256.11	2 098 930	3.141	0.0079
0.11	113.7022	± 5 %	108.0171	119.3873	0.0793	12608.36	1 433 597	3.455	0.0095
0.12	95.5414	± 5 %	90.7643	100.3185	0.0944	10594.52	1 012 215	3.769	0.0113
0.13	81.4081	± 5 %	77.3377	85.4785	0.1108	9027.29	734 894	4.084	0.0133
0.14	70.1937	± 5 %	66.6840	73.7034	0.1285	7783.73	546 369	4.398	0.0154
0.15	61.1465	± 5 %	58.0892	64.2038	0.1475	6780.49	414 603	4.712	0.0177
0.16	53.7420	± 5 %	51.0549	56.4291	0.1678	5959.42	320 271	5.026	0.0201
0.17	47.6054	± 5 %	45.2251	49.9857	0.1894	5278.93	251 306	5.340	0.0227
0.18	42.4628	± 5 %	40.3397	44.5860	0.2124	4708.68	199 944	5.654	0.0254
0.19	38.1107	± 5 %	36.2052	40.0162	0.2366	4226.07	161 058	5.968	0.0283
0.20	34.3949	± 5 %	32.6752	36.1146	0.2622	3814.03	131 183	6.282	0.0314
0.22	28.4255	± 5 %	27.0043	29.8468	0.3172	3152.09	89 600	6.911	0.0380
0.25	22.0127	± 5 %	20.9121	23.1134	0.4097	2440.98	53 733	7.853	0.0491
0.28	17.5484	± 5 %	16.6710	18.4258	0.5139	1945.93	34 148	8.795	0.0615
0.30	15.2866	± 5 %	14.5223	16.0510	0.5899	1695.12	25 913	9.423	0.0707
0.32	13.4355	± 5 %	12.7637	14.1073	0.6712	1489.85	20 017	10.052	0.0804
0.35	11.2310	± 5 %	10.6694	11.7925	0.8030	1245.40	13 987	10.994	0.0962
0.38	9.5277	± 5 %	9.0513	10.0041	0.9465	1056.52	10 066	11.936	0.1134
0.40	8.5987	± 5 %	8.1688	9.0287	1.0488	953.51	8 199	12.565	0.1256
0.42	7.7993	± 5 %	7.4093	8.1893	1.1563	864.86	6 745	13.193	0.1385
0.45	6.7941	± 5 %	6.4544	7.1338	1.3273	753.39	5 119	14.135	0.1590
0.48	5.9713	± 5 %	5.6728	6.2699	1.5102	662.16	3 954	15.078	0.1809
0.50	5.5032	± 5 %	5.2280	5.7783	1.6387	610.24	3 358	15.706	0.1963
0.55	4.5481	± 3 %	4.4116	4.6845	1.9828	504.33	2 294	17.276	0.2375
0.60	3.8217	± 3 %	3.7070	3.9363	2.3597	423.78	1 620	18.847	0.2826
0.65	3.2563	± 3 %	3.1586	3.3540	2.7694	361.09	1 176	20.418	0.3317
0.70	2.8077	± 3 %	2.7235	2.8920	3.2118	311.35	874	21.988	0.3847
0.75	2.4459	± 3 %	2.3725	2.5192	3.6870	271.22	663	23.559	0.4416
0.80	2.1497	± 3 %	2.0852	2.2142	4.1950	238.38	512	25.129	0.5024
0.85	1.9042	± 3 %	1.8471	1.9613	4.7358	211.16	402	26.700	0.5672
0.90	1.6985	± 3 %	1.6476	1.7495	5.3093	188.35	320	28.270	0.6359
0.95	1.5244	± 3 %	1.4787	1.5702	5.9157	169.04	258	29.841	0.7085
1.00	1.3758	± 3 %	1.3345	1.4171	6.5548	152.56	210	31.412	0.7850
1.10	1.1370	± 3 %	1.1029	1.1711	7.9312	126.08	143	34.553	0.9499
1.20	0.9554	± 3 %	0.9268	0.9841	9.4388	105.95	101	37.694	1.1304
1.30	0.8141	± 3 %	0.7897	0.8385	11.0775	90.27	73	40.835	1.3267
1.40	0.7019	± 3 %	0.6809	0.7230	12.8473	77.84	55	43.976	1.5386
1.50	0.6115	± 3 %	0.5931	0.6298	14.7482	67.80	41	47.117	1.7663
1.60	0.5374	± 3 %	0.5213	0.5535	16.7802	59.59	32	50.259	2.0096
1.70	0.4761	± 3 %	0.4618	0.4903	18.9432	52.79	25	53.400	2.2687
1.80	0.4246	± 3 %	0.4119	0.4374	21.2374	47.09	20	56.541	2.5434
1.90	0.3811	± 3 %	0.3697	0.3925	23.6626	42.26	16	59.682	2.8339
2.00	0.3439	± 3 %	0.3336	0.3543	26.2190	38.14	13	62.823	3.1400
2.25	0.2718	± 3 %	0.2636	0.2799	33.1834	30.14	8.19	70.676	3.9741
2.50	0.2201	± 3 %	0.2135	0.2267	40.9672	24.41	5.37	78.529	4.9063
2.80	0.1755	± 3 %	0.1702	0.1807	51.3892	19.46	3.41	87.952	6.1544
3.00	0.1529	± 3 %	0.1483	0.1575	58.9928	16.95	2.59	94.235	7.0650
3.25	0.1303	± 3 %	0.1263	0.1342	69.2345	14.44	1.88	102.088	8.2916
3.50	0.1123	± 3 %	0.1089	0.1157	80.2957	12.45	1.40	109.941	9.6163
3.80	0.0953	± 3 %	0.0924	0.0981	94.6506	10.57	1.01	119.364	11.3354
4.00	0.0860	± 3 %	0.0834	0.0886	104.8760	9.54	0.82	125.646	12.5600
4.50	0.0679	± 3 %	0.0659	0.0700	132.7337	7.534	0.51	141.352	15.8963
5.00	0.0550	± 3 %	0.0534	0.0567	163.8688	6.10	0.34	157.058	19.6250
5.50	0.0455	± 3 %	0.0441	0.0468	198.2812	5.043	0.23	172.764	23.7463
6.00	0.0382	± 3 %	0.0371	0.0394	235.9710	4.24	0.16	188.470	28.2600

RESISTOHM® 70

Resistivity 1.18 Ω mm²/m. Density 8.16 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
Ct	1.18	1.01	1.02	1.03	1.05	1.05	1.05	1.05	1.05	1.05	1.06	1.06	1.07

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	150.3185	± 5 %	142.8025	157.8344	0.0641	15611.34	2 346 673	3.141	0.0079
0.11	124.2301	± 5 %	118.0186	130.4416	0.0775	12901.93	1 602 809	3.455	0.0095
0.12	104.3878	± 5 %	99.1684	109.6072	0.0922	10841.21	1 131 690	3.769	0.0113
0.13	88.9458	± 5 %	84.4985	93.3931	0.1083	9237.48	821 635	4.084	0.0133
0.14	76.6931	± 5 %	72.8584	80.5278	0.1255	7964.97	610 858	4.398	0.0154
0.15	66.8082	± 5 %	63.4678	70.1486	0.1441	6938.37	463 540	4.712	0.0177
0.16	58.7182	± 5 %	55.7822	61.6541	0.1640	6098.18	358 074	5.026	0.0201
0.17	52.0133	± 5 %	49.4126	54.6140	0.1851	5401.85	280 968	5.340	0.0227
0.18	46.3946	± 5 %	44.0749	48.7143	0.2075	4818.31	223 544	5.654	0.0254
0.19	41.6395	± 5 %	39.5575	43.7214	0.2312	4324.47	180 069	5.968	0.0283
0.20	37.5796	± 5 %	35.7006	39.4586	0.2562	3902.84	146 667	6.282	0.0314
0.22	31.0575	± 5 %	29.5047	32.6104	0.3100	3225.48	100 176	6.911	0.0380
0.25	24.0510	± 5 %	22.8484	25.2535	0.4004	2497.81	60 075	7.853	0.0491
0.28	19.1733	± 5 %	18.2146	20.1319	0.5022	1991.24	38 179	8.795	0.0615
0.30	16.7021	± 5 %	15.8669	17.5372	0.5765	1734.59	28 971	9.423	0.0707
0.32	14.6795	± 5 %	13.9456	15.4135	0.6559	1524.54	22 380	10.052	0.0804
0.35	12.2709	± 5 %	11.6574	12.8844	0.7847	1274.40	15 638	10.994	0.0962
0.38	10.4099	± 5 %	9.8894	10.9304	0.9250	1081.12	11 254	11.936	0.1134
0.40	9.3949	± 5 %	8.9252	9.8646	1.0249	975.71	9 167	12.565	0.1256
0.42	8.5215	± 5 %	8.0954	8.9475	1.1299	885.00	7 541	13.193	0.1385
0.45	7.4231	± 5 %	7.0520	7.7943	1.2971	770.93	5 723	14.135	0.1590
0.48	6.5242	± 5 %	6.1980	6.8505	1.4759	677.58	4 421	15.078	0.1809
0.50	6.0127	± 5 %	5.7121	6.3134	1.6014	624.45	3 755	15.706	0.1963
0.55	4.9692	± 3 %	4.8201	5.1183	1.9377	516.08	2 564	17.276	0.2375
0.60	4.1755	± 3 %	4.0502	4.3008	2.3060	433.65	1 811	18.847	0.2826
0.65	3.5578	± 3 %	3.4511	3.6646	2.7064	369.50	1 315	20.418	0.3317
0.70	3.0677	± 3 %	2.9757	3.1598	3.1387	318.60	977	21.988	0.3847
0.75	2.6723	± 3 %	2.5922	2.7525	3.6032	277.53	742	23.559	0.4416
0.80	2.3487	± 3 %	2.2783	2.4192	4.0996	243.93	573	25.129	0.5024
0.85	2.0805	± 3 %	2.0181	2.1429	4.6280	216.07	450	26.700	0.5672
0.90	1.8558	± 3 %	1.8001	1.9115	5.1885	192.73	358	28.270	0.6359
0.95	1.6656	± 3 %	1.6156	1.7155	5.7811	172.98	288	29.841	0.7085
1.00	1.5032	± 3 %	1.4581	1.5483	6.4056	156.11	235	31.412	0.7850
1.10	1.2423	± 3 %	1.2050	1.2796	7.7508	129.02	160	34.553	0.9499
1.20	1.0439	± 3 %	1.0126	1.0752	9.2241	108.41	113	37.694	1.1304
1.30	0.8895	± 3 %	0.8628	0.9161	10.8255	92.37	82	40.835	1.3267
1.40	0.7669	± 3 %	0.7439	0.7899	12.5550	79.65	61	43.976	1.5386
1.50	0.6681	± 3 %	0.6480	0.6881	14.4126	69.38	46	47.117	1.7663
1.60	0.5872	± 3 %	0.5696	0.6048	16.3983	60.98	36	50.259	2.0096
1.70	0.5201	± 3 %	0.5045	0.5357	18.5122	54.02	28	53.400	2.2687
1.80	0.4639	± 3 %	0.4500	0.4779	20.7541	48.18	22	56.541	2.5434
1.90	0.4164	± 3 %	0.4039	0.4289	23.1242	43.24	18	59.682	2.8339
2.00	0.3758	± 3 %	0.3645	0.3871	25.6224	39.03	15	62.823	3.1400
2.25	0.2969	± 3 %	0.2880	0.3058	32.4284	30.84	9.16	70.676	3.9741
2.50	0.2405	± 3 %	0.2333	0.2477	40.0350	24.98	6.01	78.529	4.9063
2.80	0.1917	± 3 %	0.1860	0.1975	50.2199	19.91	3.82	87.952	6.1544
3.00	0.1670	± 3 %	0.1620	0.1720	57.6504	17.35	2.90	94.235	7.0650
3.25	0.1423	± 3 %	0.1380	0.1466	67.6592	14.78	2.10	102.088	8.2916
3.50	0.1227	± 3 %	0.1190	0.1264	78.4686	12.74	1.56	109.941	9.6163
3.80	0.1041	± 3 %	0.1010	0.1072	92.4969	10.81	1.13	119.364	11.3354
4.00	0.0939	± 3 %	0.0911	0.0968	102.4896	9.76	0.92	125.646	12.5600
4.50	0.0742	± 3 %	0.0720	0.0765	129.7134	7.709	0.57	141.352	15.8963
5.00	0.0601	± 3 %	0.0583	0.0619	160.1400	6.24	0.38	157.058	19.6250
5.50	0.0497	± 3 %	0.0482	0.0512	193.7694	5.161	0.26	172.764	23.7463
6.00	0.0418	± 3 %	0.0405	0.0430	230.6016	4.34	0.18	188.470	28.2600

RESISTOHM® 60

Resistivity 1.12 Ω mm²/m. Density 8.20 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100
Ct	1.12	1.01	1.02	1.03	1.05	1.07	1.07	1.10	1.11	1.11	1.12	1.13

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	142.6752	± 5 %	135.5414	149.8089	0.0641	15535.19	2 216 485	3.141	0.0079
0.11	117.9134	± 5 %	112.0177	123.8090	0.0775	12839.00	1 513 889	3.455	0.0095
0.12	99.0800	± 5 %	94.1260	104.0340	0.0922	10788.32	1 068 907	3.769	0.0113
0.13	84.4232	± 5 %	80.2020	88.6443	0.1083	9192.42	776 053	4.084	0.0133
0.14	72.7934	± 5 %	69.1538	76.4331	0.1255	7926.12	576 969	4.398	0.0154
0.15	63.4112	± 5 %	60.2406	66.5817	0.1441	6904.53	437 824	4.712	0.0177
0.16	55.7325	± 5 %	52.9459	58.5191	0.1640	6068.43	338 209	5.026	0.0201
0.17	49.3686	± 5 %	46.9001	51.8370	0.1851	5375.50	265 381	5.340	0.0227
0.18	44.0355	± 5 %	41.8338	46.2373	0.2075	4794.81	211 142	5.654	0.0254
0.19	39.5222	± 5 %	37.5461	41.4983	0.2312	4303.38	170 079	5.968	0.0283
0.20	35.6688	± 5 %	33.8854	37.4522	0.2562	3883.80	138 530	6.282	0.0314
0.22	29.4783	± 5 %	28.0044	30.9523	0.3100	3209.75	94 618	6.911	0.0380
0.25	22.8280	± 5 %	21.6866	23.9694	0.4004	2485.63	56 742	7.853	0.0491
0.28	18.1984	± 5 %	17.2884	19.1083	0.5022	1981.53	36 061	8.795	0.0615
0.30	15.8528	± 5 %	15.0602	16.6454	0.5765	1726.13	27 364	9.423	0.0707
0.32	13.9331	± 5 %	13.2365	14.6298	0.6559	1517.11	21 138	10.052	0.0804
0.35	11.6470	± 5 %	11.0646	12.2293	0.7847	1268.18	14 770	10.994	0.0962
0.38	9.8806	± 5 %	9.3865	10.3746	0.9250	1075.84	10 630	11.936	0.1134
0.40	8.9172	± 5 %	8.4713	9.3631	1.0249	970.95	8 658	12.565	0.1256
0.42	8.0882	± 5 %	7.6838	8.4926	1.1299	880.68	7 123	13.193	0.1385
0.45	7.0457	± 5 %	6.6934	7.3980	1.2971	767.17	5 405	14.135	0.1590
0.48	6.1925	± 5 %	5.8829	6.5021	1.4759	674.27	4 175	15.078	0.1809
0.50	5.7070	± 5 %	5.4217	5.9924	1.6014	621.41	3 546	15.706	0.1963
0.55	4.7165	± 3 %	4.5750	4.8580	1.9377	513.56	2 422	17.276	0.2375
0.60	3.9632	± 3 %	3.8443	4.0821	2.3060	431.53	1 710	18.847	0.2826
0.65	3.3769	± 3 %	3.2756	3.4782	2.7064	367.70	1 242	20.418	0.3317
0.70	2.9117	± 3 %	2.8244	2.9991	3.1387	317.04	923	21.988	0.3847
0.75	2.5364	± 3 %	2.4604	2.6125	3.6032	276.18	701	23.559	0.4416
0.80	2.2293	± 3 %	2.1624	2.2962	4.0996	242.74	541	25.129	0.5024
0.85	1.9747	± 3 %	1.9155	2.0340	4.6280	215.02	425	26.700	0.5672
0.90	1.7614	± 3 %	1.7086	1.8143	5.1885	191.79	338	28.270	0.6359
0.95	1.5809	± 3 %	1.5335	1.6283	5.7811	172.14	272	29.841	0.7085
1.00	1.4268	± 3 %	1.3839	1.4696	6.4056	155.35	222	31.412	0.7850
1.10	1.1791	± 3 %	1.1438	1.2145	7.7508	128.39	151	34.553	0.9499
1.20	0.9908	± 3 %	0.9611	1.0205	9.2241	107.88	107	37.694	1.1304
1.30	0.8442	± 3 %	0.8189	0.8696	10.8255	91.92	78	40.835	1.3267
1.40	0.7279	± 3 %	0.7061	0.7498	12.5550	79.26	58	43.976	1.5386
1.50	0.6341	± 3 %	0.6151	0.6531	14.4126	69.05	44	47.117	1.7663
1.60	0.5573	± 3 %	0.5406	0.5740	16.3983	60.68	34	50.259	2.0096
1.70	0.4937	± 3 %	0.4789	0.5085	18.5122	53.75	27	53.400	2.2687
1.80	0.4404	± 3 %	0.4271	0.4536	20.7541	47.95	21	56.541	2.5434
1.90	0.3952	± 3 %	0.3834	0.4071	23.1242	43.03	17	59.682	2.8339
2.00	0.3567	± 3 %	0.3460	0.3674	25.6224	38.84	14	62.823	3.1400
2.25	0.2818	± 3 %	0.2734	0.2903	32.4284	30.69	8.65	70.676	3.9741
2.50	0.2283	± 3 %	0.2214	0.2351	40.0350	24.86	5.67	78.529	4.9063
2.80	0.1820	± 3 %	0.1765	0.1874	50.2199	19.82	3.61	87.952	6.1544
3.00	0.1585	± 3 %	0.1538	0.1633	57.6504	17.26	2.74	94.235	7.0650
3.25	0.1351	± 3 %	0.1310	0.1391	67.6592	14.71	1.99	102.088	8.2916
3.50	0.1165	± 3 %	0.1130	0.1200	78.4686	12.68	1.48	109.941	9.6163
3.80	0.0988	± 3 %	0.0958	0.1018	92.4969	10.76	1.06	119.364	11.3354
4.00	0.0892	± 3 %	0.0865	0.0918	102.4896	9.71	0.87	125.646	12.5600
4.50	0.0705	± 3 %	0.0683	0.0726	129.7134	7.672	0.54	141.352	15.8963
5.00	0.0571	± 3 %	0.0554	0.0588	160.1400	6.21	0.35	157.058	19.6250
5.50	0.0472	± 3 %	0.0458	0.0486	193.7694	5.136	0.24	172.764	23.7463
6.00	0.0396	± 3 %	0.0384	0.0408	230.6016	4.32	0.17	188.470	28.2600

RESISTOHM® 40

Resistivity 1.05 Ω mm²/m. Density 7.95 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
Ct	1.05	1.03	1.07	1.10	1.13	1.16	1.18	1.20	1.21	1.23	1.23	1.24	1.24

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	133.7580	± 5 %	127.0701	140.4459	0.0624	16023.72	2 143 299	3.141	0.0079
0.11	110.5438	± 5 %	105.0166	116.0710	0.0755	13242.74	1 463 902	3.455	0.0095
0.12	92.8875	± 5 %	88.2431	97.5318	0.0899	11127.58	1 033 613	3.769	0.0113
0.13	79.1467	± 5 %	75.1894	83.1041	0.1055	9481.49	750 429	4.084	0.0133
0.14	68.2439	± 5 %	64.8317	71.6561	0.1223	8175.36	557 918	4.398	0.0154
0.15	59.4480	± 5 %	56.4756	62.4204	0.1404	7121.65	423 368	4.712	0.0177
0.16	52.2492	± 5 %	49.6367	54.8617	0.1598	6259.26	327 042	5.026	0.0201
0.17	46.2830	± 5 %	43.9689	48.5972	0.1804	5544.54	256 618	5.340	0.0227
0.18	41.2833	± 5 %	39.2192	43.3475	0.2022	4945.59	204 170	5.654	0.0254
0.19	37.0521	± 5 %	35.1995	38.9047	0.2253	4438.70	164 463	5.968	0.0283
0.20	33.4395	± 5 %	31.7675	35.1115	0.2496	4005.93	133 956	6.282	0.0314
0.22	27.6359	± 5 %	26.2541	29.0177	0.3021	3310.68	91 494	6.911	0.0380
0.25	21.4013	± 5 %	20.3312	22.4713	0.3900	2563.79	54 868	7.853	0.0491
0.28	17.0610	± 5 %	16.2079	17.9140	0.4893	2043.84	34 870	8.795	0.0615
0.30	14.8620	± 5 %	14.1189	15.6051	0.5617	1780.41	26 460	9.423	0.0707
0.32	13.0623	± 5 %	12.4092	13.7154	0.6391	1564.82	20 440	10.052	0.0804
0.35	10.9190	± 5 %	10.3731	11.4650	0.7645	1308.06	14 283	10.994	0.0962
0.38	9.2630	± 5 %	8.7999	9.7262	0.9012	1109.68	10 279	11.936	0.1134
0.40	8.3599	± 5 %	7.9419	8.7779	0.9985	1001.48	8 372	12.565	0.1256
0.42	7.5827	± 5 %	7.2035	7.9618	1.1009	908.37	6 888	13.193	0.1385
0.45	6.6053	± 5 %	6.2751	6.9356	1.2638	791.29	5 227	14.135	0.1590
0.48	5.8055	± 5 %	5.5152	6.0957	1.4379	695.47	4 038	15.078	0.1809
0.50	5.3503	± 5 %	5.0828	5.6178	1.5602	640.95	3 429	15.706	0.1963
0.55	4.4218	± 3 %	4.2891	4.5544	1.8878	529.71	2 342	17.276	0.2375
0.60	3.7155	± 3 %	3.6040	3.8270	2.2467	445.10	1 654	18.847	0.2826
0.65	3.1659	± 3 %	3.0709	3.2608	2.6367	379.26	1 201	20.418	0.3317
0.70	2.7298	± 3 %	2.6479	2.8116	3.0580	327.01	893	21.988	0.3847
0.75	2.3779	± 3 %	2.3066	2.4493	3.5104	284.87	677	23.559	0.4416
0.80	2.0900	± 3 %	2.0273	2.1527	3.9941	250.37	523	25.129	0.5024
0.85	1.8513	± 3 %	1.7958	1.9069	4.5089	221.78	411	26.700	0.5672
0.90	1.6513	± 3 %	1.6018	1.7009	5.0550	197.82	327	28.270	0.6359
0.95	1.4821	± 3 %	1.4376	1.5265	5.6323	177.55	263	29.841	0.7085
1.00	1.3376	± 3 %	1.2975	1.3777	6.2408	160.24	214	31.412	0.7850
1.10	1.1054	± 3 %	1.0723	1.1386	7.5513	132.43	146	34.553	0.9499
1.20	0.9289	± 3 %	0.9010	0.9567	8.9867	111.28	103	37.694	1.1304
1.30	0.7915	± 3 %	0.7677	0.8152	10.5469	94.81	75	40.835	1.3267
1.40	0.6824	± 3 %	0.6620	0.7029	12.2319	81.75	56	43.976	1.5386
1.50	0.5945	± 3 %	0.5766	0.6123	14.0417	71.22	42	47.117	1.7663
1.60	0.5225	± 3 %	0.5068	0.5382	15.9763	62.59	33	50.259	2.0096
1.70	0.4628	± 3 %	0.4489	0.4767	18.0358	55.45	26	53.400	2.2687
1.80	0.4128	± 3 %	0.4004	0.4252	20.2200	49.46	20	56.541	2.5434
1.90	0.3705	± 3 %	0.3594	0.3816	22.5291	44.39	16	59.682	2.8339
2.00	0.3344	± 3 %	0.3244	0.3444	24.9630	40.06	13	62.823	3.1400
2.25	0.2642	± 3 %	0.2563	0.2721	31.5938	31.65	8.36	70.676	3.9741
2.50	0.2140	± 3 %	0.2076	0.2204	39.0047	25.64	5.49	78.529	4.9063
2.80	0.1706	± 3 %	0.1655	0.1757	48.9275	20.44	3.49	87.952	6.1544
3.00	0.1486	± 3 %	0.1442	0.1531	56.1668	17.80	2.65	94.235	7.0650
3.25	0.1266	± 3 %	0.1228	0.1304	65.9179	15.17	1.92	102.088	8.2916
3.50	0.1092	± 3 %	0.1059	0.1125	76.4492	13.08	1.43	109.941	9.6163
3.80	0.0926	± 3 %	0.0899	0.0954	90.1164	11.10	1.03	119.364	11.3354
4.00	0.0836	± 3 %	0.0811	0.0861	99.8520	10.01	0.84	125.646	12.5600
4.50	0.0661	± 3 %	0.0641	0.0680	126.3752	7.913	0.52	141.352	15.8963
5.00	0.0535	± 3 %	0.0519	0.0551	156.0188	6.41	0.34	157.058	19.6250
5.50	0.0442	± 3 %	0.0429	0.0455	188.7827	5.30	0.23	172.764	23.7463
6.00	0.0372	± 3 %	0.0360	0.0383	224.6670	4.45	0.17	188.470	28.2600

RESISTOHM® 30

Resistivity 1.04 Ω mm²/m. Density 7.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
Ct	1.04	1.03	1.07	1.10	1.13	1.15	1.18	1.19	1.21	1.23	1.25	1.27	-

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	132.4841	± 5 %	125.8599	139.1083	0.0620	16125.13	2 136 323	3.141	0.0079
0.11	109.4910	± 5 %	104.0164	114.9655	0.0750	13326.55	1 459 137	3.455	0.0095
0.12	92.0028	± 5 %	87.4027	96.6030	0.0893	11198.01	1 030 248	3.769	0.0113
0.13	78.3929	± 5 %	74.4733	82.3126	0.1048	9541.50	747 986	4.084	0.0133
0.14	67.5939	± 5 %	64.2142	70.9736	0.1215	8227.11	556 102	4.398	0.0154
0.15	58.8818	± 5 %	55.9377	61.8259	0.1395	7166.72	421 990	4.712	0.0177
0.16	51.7516	± 5 %	49.1640	54.3392	0.1588	6298.88	325 977	5.026	0.0201
0.17	45.8422	± 5 %	43.5501	48.1344	0.1792	5579.63	255 783	5.340	0.0227
0.18	40.8901	± 5 %	38.8456	42.9347	0.2009	4976.89	203 506	5.654	0.0254
0.19	36.6992	± 5 %	34.8642	38.5341	0.2239	4466.80	163 928	5.968	0.0283
0.20	33.1210	± 5 %	31.4650	34.7771	0.2481	4031.28	133 520	6.282	0.0314
0.22	27.3727	± 5 %	26.0041	28.7414	0.3002	3331.64	91 196	6.911	0.0380
0.25	21.1975	± 5 %	20.1376	22.2573	0.3876	2580.02	54 690	7.853	0.0491
0.28	16.8985	± 5 %	16.0536	17.7434	0.4862	2056.78	34 756	8.795	0.0615
0.30	14.7205	± 5 %	13.9844	15.4565	0.5581	1791.68	26 374	9.423	0.0707
0.32	12.9379	± 5 %	12.2910	13.5848	0.6350	1574.72	20 374	10.052	0.0804
0.35	10.8150	± 5 %	10.2743	11.3558	0.7597	1316.34	14 236	10.994	0.0962
0.38	9.1748	± 5 %	8.7161	9.6335	0.8955	1116.70	10 245	11.936	0.1134
0.40	8.2803	± 5 %	7.8662	8.6943	0.9922	1007.82	8 345	12.565	0.1256
0.42	7.5104	± 5 %	7.1349	7.8860	1.0939	914.12	6 865	13.193	0.1385
0.45	6.5424	± 5 %	6.2153	6.8695	1.2558	796.30	5 210	14.135	0.1590
0.48	5.7502	± 5 %	5.4627	6.0377	1.4288	699.88	4 024	15.078	0.1809
0.50	5.2994	± 5 %	5.0344	5.5643	1.5504	645.01	3 418	15.706	0.1963
0.55	4.3796	± 3 %	4.2482	4.5110	1.8760	533.06	2 335	17.276	0.2375
0.60	3.6801	± 3 %	3.5697	3.7905	2.2325	447.92	1 648	18.847	0.2826
0.65	3.1357	± 3 %	3.0416	3.2298	2.6201	381.66	1 197	20.418	0.3317
0.70	2.7038	± 3 %	2.6226	2.7849	3.0387	329.08	890	21.988	0.3847
0.75	2.3553	± 3 %	2.2846	2.4259	3.4883	286.67	675	23.559	0.4416
0.80	2.0701	± 3 %	2.0080	2.1322	3.9690	251.96	522	25.129	0.5024
0.85	1.8337	± 3 %	1.7787	1.8887	4.4806	223.19	409	26.700	0.5672
0.90	1.6356	± 3 %	1.5865	1.6847	5.0232	199.08	326	28.270	0.6359
0.95	1.4680	± 3 %	1.4239	1.5120	5.5969	178.67	262	29.841	0.7085
1.00	1.3248	± 3 %	1.2851	1.3646	6.2015	161.25	214	31.412	0.7850
1.10	1.0949	± 3 %	1.0621	1.1278	7.5038	133.27	146	34.553	0.9499
1.20	0.9200	± 3 %	0.8924	0.9476	8.9302	111.98	103	37.694	1.1304
1.30	0.7839	± 3 %	0.7604	0.8074	10.4805	95.41	75	40.835	1.3267
1.40	0.6759	± 3 %	0.6557	0.6962	12.1549	82.27	56	43.976	1.5386
1.50	0.5888	± 3 %	0.5712	0.6065	13.9534	71.67	42	47.117	1.7663
1.60	0.5175	± 3 %	0.5020	0.5330	15.8758	62.99	33	50.259	2.0096
1.70	0.4584	± 3 %	0.4447	0.4722	17.9223	55.80	26	53.400	2.2687
1.80	0.4089	± 3 %	0.3966	0.4212	20.0929	49.77	20	56.541	2.5434
1.90	0.3670	± 3 %	0.3560	0.3780	22.3874	44.67	16	59.682	2.8339
2.00	0.3312	± 3 %	0.3213	0.3411	24.8060	40.31	13	62.823	3.1400
2.25	0.2617	± 3 %	0.2538	0.2695	31.3951	31.85	8.34	70.676	3.9741
2.50	0.2120	± 3 %	0.2056	0.2183	38.7594	25.80	5.47	78.529	4.9063
2.80	0.1690	± 3 %	0.1639	0.1741	48.6198	20.57	3.48	87.952	6.1544
3.00	0.1472	± 3 %	0.1428	0.1516	55.8135	17.92	2.64	94.235	7.0650
3.25	0.1254	± 3 %	0.1217	0.1292	65.5033	15.27	1.91	102.088	8.2916
3.50	0.1082	± 3 %	0.1049	0.1114	75.9684	13.16	1.42	109.941	9.6163
3.80	0.0917	± 3 %	0.0890	0.0945	89.5497	11.17	1.02	119.364	11.3354
4.00	0.0828	± 3 %	0.0803	0.0853	99.2240	10.078	0.83	125.646	12.5600
4.50	0.0654	± 3 %	0.0635	0.0674	125.5804	7.96	0.52	141.352	15.8963
5.00	0.0530	± 3 %	0.0514	0.0546	155.0375	6.45	0.34	157.058	19.6250
5.50	0.0438	± 3 %	0.0425	0.0451	187.5954	5.33	0.23	172.764	23.7463
6.00	0.0368	± 3 %	0.0357	0.0379	223.2540	4.48	0.16	188.470	28.2600

RESISTOHM® 20

Resistivity 0.95 Ω mm²/m. Density 7.80 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
Ct	0.95	1.04	1.09	1.13	1.17	1.22	1.25	1.28	1.33	1.30	1.40	-	-

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	121.0191	± 5 %	114.9682	127.0701	0.0612	16331.86	1 976 468	3.141	0.0079
0.11	100.0158	± 5 %	95.0150	105.0166	0.0741	13497.41	1 349 954	3.455	0.0095
0.12	84.0410	± 5 %	79.8390	88.2431	0.0882	11341.57	953 158	3.769	0.0113
0.13	71.6089	± 5 %	68.0285	75.1894	0.1035	9663.82	692 016	4.084	0.0133
0.14	61.7444	± 5 %	58.6572	64.8317	0.1200	8332.58	514 491	4.398	0.0154
0.15	53.7863	± 5 %	51.0970	56.4756	0.1378	7258.61	390 413	4.712	0.0177
0.16	47.2731	± 5 %	44.9094	49.6367	0.1567	6379.63	301 585	5.026	0.0201
0.17	41.8751	± 5 %	39.7814	43.9689	0.1770	5651.16	236 643	5.340	0.0227
0.18	37.3516	± 5 %	35.4840	39.2192	0.1984	5040.70	188 278	5.654	0.0254
0.19	33.5233	± 5 %	31.8471	35.1995	0.2210	4524.06	151 661	5.968	0.0283
0.20	30.2548	± 5 %	28.7420	31.7675	0.2449	4082.97	123 529	6.282	0.0314
0.22	25.0039	± 5 %	23.7538	26.2541	0.2964	3374.35	84 372	6.911	0.0380
0.25	19.3631	± 5 %	18.3949	20.3312	0.3827	2613.10	50 598	7.853	0.0491
0.28	15.4361	± 5 %	14.6643	16.2079	0.4800	2083.15	32 156	8.795	0.0615
0.30	13.4466	± 5 %	12.7742	14.1189	0.5511	1814.65	24 401	9.423	0.0707
0.32	11.8183	± 5 %	11.2274	12.4092	0.6270	1594.91	18 849	10.052	0.0804
0.35	9.8791	± 5 %	9.3852	10.3731	0.7501	1333.21	13 171	10.994	0.0962
0.38	8.3808	± 5 %	7.9618	8.7999	0.8842	1131.02	9 479	11.936	0.1134
0.40	7.5637	± 5 %	7.1855	7.9419	0.9797	1020.74	7 721	12.565	0.1256
0.42	6.8605	± 5 %	6.5175	7.2035	1.0801	925.84	6 352	13.193	0.1385
0.45	5.9763	± 5 %	5.6774	6.2751	1.2399	806.51	4 820	14.135	0.1590
0.48	5.2526	± 5 %	4.9899	5.5152	1.4107	708.85	3 723	15.078	0.1809
0.50	4.8408	± 5 %	4.5987	5.0828	1.5308	653.27	3 162	15.706	0.1963
0.55	4.0006	± 3 %	3.8806	4.1207	1.8522	539.90	2 160	17.276	0.2375
0.60	3.3616	± 3 %	3.2608	3.4625	2.2043	453.66	1 525	18.847	0.2826
0.65	2.8644	± 3 %	2.7784	2.9503	2.5870	386.55	1 107	20.418	0.3317
0.70	2.4698	± 3 %	2.3957	2.5439	3.0003	333.30	823	21.988	0.3847
0.75	2.1515	± 3 %	2.0869	2.2160	3.4442	290.34	625	23.559	0.4416
0.80	1.8909	± 3 %	1.8342	1.9477	3.9187	255.19	483	25.129	0.5024
0.85	1.6750	± 3 %	1.6248	1.7253	4.4239	226.05	379	26.700	0.5672
0.90	1.4941	± 3 %	1.4492	1.5389	4.9596	201.63	301	28.270	0.6359
0.95	1.3409	± 3 %	1.3007	1.3812	5.5260	180.96	243	29.841	0.7085
1.00	1.2102	± 3 %	1.1739	1.2465	6.1230	163.32	198	31.412	0.7850
1.10	1.0002	± 3 %	0.9702	1.0302	7.4088	134.97	135	34.553	0.9499
1.20	0.8404	± 3 %	0.8152	0.8656	8.8171	113.42	95	37.694	1.1304
1.30	0.7161	± 3 %	0.6946	0.7376	10.3479	96.64	69	40.835	1.3267
1.40	0.6174	± 3 %	0.5989	0.6360	12.0011	83.33	51	43.976	1.5386
1.50	0.5379	± 3 %	0.5217	0.5540	13.7768	72.59	39	47.117	1.7663
1.60	0.4727	± 3 %	0.4585	0.4869	15.6749	63.80	30	50.259	2.0096
1.70	0.4188	± 3 %	0.4062	0.4313	17.6955	56.51	24	53.400	2.2687
1.80	0.3735	± 3 %	0.3623	0.3847	19.8385	50.41	19	56.541	2.5434
1.90	0.3352	± 3 %	0.3252	0.3453	22.1040	45.24	15	59.682	2.8339
2.00	0.3025	± 3 %	0.2935	0.3116	24.4920	40.83	12	62.823	3.1400
2.25	0.2391	± 3 %	0.2319	0.2462	30.9977	32.26	7.71	70.676	3.9741
2.50	0.1936	± 3 %	0.1878	0.1994	38.2688	26.13	5.06	78.529	4.9063
2.80	0.1544	± 3 %	0.1497	0.1590	48.0043	20.83	3.22	87.952	6.1544
3.00	0.1345	± 3 %	0.1304	0.1385	55.1070	18.15	2.44	94.235	7.0650
3.25	0.1146	± 3 %	0.1111	0.1180	64.6742	15.46	1.77	102.088	8.2916
3.50	0.0988	± 3 %	0.0958	0.1018	75.0068	13.33	1.32	109.941	9.6163
3.80	0.0838	± 3 %	0.0813	0.0863	88.4161	11.31	0.95	119.364	11.3354
4.00	0.0756	± 3 %	0.0734	0.0779	97.9680	10.21	0.77	125.646	12.5600
4.50	0.0598	± 3 %	0.0580	0.0616	123.9908	8.065	0.48	141.352	15.8963
5.00	0.0484	± 3 %	0.0470	0.0499	153.0750	6.53	0.32	157.058	19.6250
5.50	0.0400	± 3 %	0.0388	0.0412	185.2208	5.399	0.22	172.764	23.7463
6.00	0.0336	± 3 %	0.0326	0.0346	220.4280	4.54	0.15	188.470	28.2600

NICKEL-CHROMIUM ALLOYS

RESISTOHM 80: Resistivity 1.08 Ω mm²/m. Density 8.35 g/cm³.
RESISTOHM 70: Resistivity 1.18 Ω mm²/m. Density 8.16 g/cm³.
RESISTOHM 60: Resistivity 1.12 Ω mm²/m. Density 8.20 g/cm³.
RESISTOHM 40: Resistivity 1.05 Ω mm²/m. Density 7.95 g/cm³.
RESISTOHM 30: Resistivity 1.04 Ω mm²/m. Density 7.90 g/cm³.
RESISTOHM 20: Resistivity 0.95 Ω mm²/m. Density 7.80 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Temperature °C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
RESISTOHM 80 Ct	1.00	1.01	1.02	1.03	1.035	1.045	1.05	1.045	1.04	1.045	1.05	1.06	1.07
RESISTOHM 70 Ct	1.00	1.01	1.02	1.03	1.05	1.05	1.05	1.05	1.05	1.05	1.06	1.06	1.07
RESISTOHM 60 Ct	1.00	1.01	1.02	1.03	1.05	1.07	1.07	1.1	1.11	1.11	1.12	1.13	-
RESISTOHM 40 Ct	1.00	1.03	1.07	1.1	1.13	1.16	1.18	1.2	1.21	1.23	1.23	1.24	1.24
RESISTOHM 30 Ct	1.00	1.03	1.07	1.1	1.13	1.15	1.18	1.19	1.21	1.23	1.25	1.27	-
RESISTOHM 20 Ct	1.00	1.04	1.09	1.13	1.17	1.22	1.25	1.28	1.33	1.30	1.40	-	-

Here are the conversion factors for NiCr alloys. Multiply the figures in the table by the conversion factor to obtain the data required for other alloys.

Alloy	Conversion Factor of Resistance	Conversion Factor of Weight g/m
RESISTOHM 80	1.00	1.00
RESISTOHM 70	1.092	0.970
RESISTOHM 60	1.037	0.980
RESISTOHM 40	0.972	0.945
RESISTOHM 30	0.963	0.939
RESISTOHM 20	0.879	0.927

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm²/m	Cross section mm²
5.0	0.10	2.3112	± 5 %	2.1956	2.4268	3.902	102.0	0.467
	0.11	2.1011	± 5 %	1.9960	2.2061	4.292	102.2	0.514
	0.12	1.9260	± 5 %	1.8297	2.0223	4.682	102.4	0.561
	0.14	1.6509	± 5 %	1.5683	1.7334	5.463	102.8	0.654
	0.15	1.5408	± 5 %	1.4638	1.6178	5.853	103.0	0.701
	0.18	1.2840	± 5 %	1.2198	1.3482	7.023	103.6	0.841
	0.19	1.2164	± 5 %	1.1556	1.2772	7.414	103.8	0.888
	0.20	1.1556	± 5 %	1.0978	1.2134	7.804	104.0	0.935
	0.22	1.0505	± 5 %	0.9980	1.1031	8.584	104.4	1.028
	0.25	0.9245	± 5 %	0.8783	0.9707	9.755	105.0	1.168
	0.30	0.7704	± 5 %	0.7319	0.8089	11.706	106.0	1.402
	0.35	0.6603	± 5 %	0.6273	0.6934	13.657	107.0	1.636
	0.40	0.5778	± 5 %	0.5489	0.6067	15.607	108.0	1.869
	0.45	0.5136	± 5 %	0.4879	0.5393	17.558	109.0	2.103
	0.50	0.4622	± 5 %	0.4391	0.4854	19.509	110.0	2.336
	0.60	0.3852	± 5 %	0.3659	0.4045	23.411	112.0	2.804
	0.70	0.3302	± 5 %	0.3137	0.3467	27.313	114.0	3.271
	0.80	0.2889	± 5 %	0.2745	0.3033	31.215	116.0	3.738
	0.90	0.2568	± 5 %	0.2440	0.2696	35.117	118.0	4.206
	1.00	0.2311	± 5 %	0.2196	0.2427	39.019	120.0	4.673
4.0	0.10	2.8890	± 5 %	2.7446	3.0335	3.121	82.0	0.374
	0.11	2.6264	± 5 %	2.4950	2.7577	3.434	82.2	0.411
	0.12	2.4075	± 5 %	2.2871	2.5279	3.746	82.4	0.449
	0.14	2.0636	± 5 %	1.9604	2.1668	4.370	82.8	0.523
	0.15	1.9260	± 5 %	1.8297	2.0223	4.682	83.0	0.561
	0.18	1.6050	± 5 %	1.5248	1.6853	5.619	83.6	0.673
	0.19	1.5205	± 5 %	1.4445	1.5966	5.931	83.8	0.710
	0.20	1.4445	± 5 %	1.3723	1.5167	6.243	84.0	0.748
	0.22	1.3132	± 5 %	1.2475	1.3788	6.867	84.4	0.822
	0.25	1.1556	± 5 %	1.0978	1.2134	7.804	85.0	0.935
	0.30	0.9630	± 5 %	0.9149	1.0112	9.364	86.0	1.121
	0.35	0.8254	± 5 %	0.7842	0.8667	10.925	87.0	1.308
	0.40	0.7223	± 5 %	0.6861	0.7584	12.486	88.0	1.495
	0.45	0.6420	± 5 %	0.6099	0.6741	14.047	89.0	1.682
	0.50	0.5778	± 5 %	0.5489	0.6067	15.607	90.0	1.869
	0.60	0.4815	± 5 %	0.4574	0.5056	18.729	92.0	2.243
	0.70	0.4127	± 5 %	0.3921	0.4334	21.850	94.0	2.617
	0.80	0.3611	± 5 %	0.3431	0.3792	24.972	96.0	2.991
	0.90	0.3210	± 5 %	0.3050	0.3371	28.093	98.0	3.364

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
4.0	1.00	0.2889	± 5 %	0.2745	0.3033	31.215	100.0	3.738
3.0	0.10	3.8520	± 5 %	3.6594	4.0446	2.341	62.0	0.280
	0.11	3.5018	± 5 %	3.3267	3.6769	2.575	62.2	0.308
	0.12	3.2100	± 5 %	3.0495	3.3705	2.809	62.4	0.336
	0.14	2.7514	± 5 %	2.6139	2.8890	3.278	62.8	0.393
	0.15	2.5680	± 5 %	2.4396	2.6964	3.512	63.0	0.421
	0.18	2.1400	± 5 %	2.0330	2.2470	4.214	63.6	0.505
	0.19	2.0274	± 5 %	1.9260	2.1287	4.448	63.8	0.533
	0.20	1.9260	± 5 %	1.8297	2.0223	4.682	64.0	0.561
	0.22	1.7509	± 5 %	1.6634	1.8385	5.150	64.4	0.617
	0.25	1.5408	± 5 %	1.4638	1.6178	5.853	65.0	0.701
	0.30	1.2840	± 5 %	1.2198	1.3482	7.023	66.0	0.841
	0.35	1.1006	± 5 %	1.0455	1.1556	8.194	67.0	0.981
	0.40	0.9630	± 5 %	0.9149	1.0112	9.364	68.0	1.121
	0.45	0.8560	± 5 %	0.8132	0.8988	10.535	69.0	1.262
	0.50	0.7704	± 5 %	0.7319	0.8089	11.706	70.0	1.402
	0.60	0.6420	± 5 %	0.6099	0.6741	14.047	72.0	1.682
	0.70	0.5503	± 5 %	0.5228	0.5778	16.388	74.0	1.963
	0.80	0.4815	± 5 %	0.4574	0.5056	18.729	76.0	2.243
	0.90	0.4280	± 5 %	0.4066	0.4494	21.070	78.0	2.523
	1.00	0.3852	± 5 %	0.3659	0.4045	23.411	80.0	2.804
2.5	0.10	4.6224	± 5 %	4.3913	4.8535	1.951	52.0	0.234
	0.11	4.2022	± 5 %	3.9921	4.4123	2.146	52.2	0.257
	0.12	3.8520	± 5 %	3.6594	4.0446	2.341	52.4	0.280
	0.14	3.3017	± 5 %	3.1366	3.4668	2.731	52.8	0.327
	0.15	3.0816	± 5 %	2.9275	3.2357	2.926	53.0	0.350
	0.18	2.5680	± 5 %	2.4396	2.6964	3.512	53.6	0.421
	0.19	2.4328	± 5 %	2.3112	2.5545	3.707	53.8	0.444
	0.20	2.3112	± 5 %	2.1956	2.4268	3.902	54.0	0.467
	0.22	2.1011	± 5 %	1.9960	2.2061	4.292	54.4	0.514
	0.25	1.8490	± 5 %	1.7565	1.9414	4.877	55.0	0.584
	0.30	1.5408	± 5 %	1.4638	1.6178	5.853	56.0	0.701
	0.35	1.3207	± 5 %	1.2547	1.3867	6.828	57.0	0.818
	0.40	1.1556	± 5 %	1.0978	1.2134	7.804	58.0	0.935
	0.45	1.0272	± 5 %	0.9758	1.0786	8.779	59.0	1.051
	0.50	0.9245	± 5 %	0.8783	0.9707	9.755	60.0	1.168
	0.60	0.7704	± 5 %	0.7319	0.8089	11.706	62.0	1.402
	0.70	0.6603	± 5 %	0.6273	0.6934	13.657	64.0	1.636
	0.80	0.5778	± 5 %	0.5489	0.6067	15.607	66.0	1.869
	0.90	0.5136	± 5 %	0.4879	0.5393	17.558	68.0	2.103
	1.00	0.4622	± 5 %	0.4391	0.4854	19.509	70.0	2.336
2.0	0.08	7.2225	± 5 %	6.8614	7.5836	1.249	41.6	0.150
	0.085	6.7976	± 5 %	6.4578	7.1375	1.327	41.7	0.159
	0.09	6.4200	± 5 %	6.0990	6.7410	1.405	41.8	0.168
	0.10	5.7780	± 5 %	5.4891	6.0669	1.561	42.0	0.187
	0.11	5.2527	± 5 %	4.9901	5.5154	1.717	42.2	0.206
	0.12	4.8150	± 5 %	4.5743	5.0558	1.873	42.4	0.224
	0.14	4.1271	± 5 %	3.9208	4.3335	2.185	42.8	0.262
	0.15	3.8520	± 5 %	3.6594	4.0446	2.341	43.0	0.280
	0.18	3.2100	± 5 %	3.0495	3.3705	2.809	43.6	0.336
	0.19	3.0411	± 5 %	2.8890	3.1931	2.965	43.8	0.355
	0.20	2.8890	± 5 %	2.7446	3.0335	3.121	44.0	0.374
	0.22	2.6264	± 5 %	2.4950	2.7577	3.434	44.4	0.411
	0.25	2.3112	± 5 %	2.1956	2.4268	3.902	45.0	0.467
	0.30	1.9260	± 5 %	1.8297	2.0223	4.682	46.0	0.561
	0.35	1.6509	± 5 %	1.5683	1.7334	5.463	47.0	0.654
	0.40	1.4445	± 5 %	1.3723	1.5167	6.243	48.0	0.748
	0.45	1.2840	± 5 %	1.2198	1.3482	7.023	49.0	0.841
	0.50	1.1556	± 5 %	1.0978	1.2134	7.804	50.0	0.935
	0.60	0.9630	± 5 %	0.9149	1.0112	9.364	52.0	1.121
	0.70	0.8254	± 5 %	0.7842	0.8667	10.925	54.0	1.308

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
2.0	0.80	0.7223	± 5 %	0.6861	0.7584	12.486	56.0	1.495
	0.90	0.6420	± 5 %	0.6099	0.6741	14.047	58.0	1.682
	1.00	0.5778	± 5 %	0.5489	0.6067	15.607	60.0	1.869
1.8	0.08	8.0250	± 5 %	7.6238	8.4263	1.124	37.6	0.135
	0.085	7.5529	± 5 %	7.1753	7.9306	1.194	37.7	0.143
	0.09	7.1333	± 5 %	6.7767	7.4900	1.264	37.8	0.151
	0.10	6.4200	± 5 %	6.0990	6.7410	1.405	38.0	0.168
	0.11	5.8364	± 5 %	5.5445	6.1282	1.545	38.2	0.185
	0.12	5.3500	± 5 %	5.0825	5.6175	1.686	38.4	0.202
	0.14	4.5857	± 5 %	4.3564	4.8150	1.967	38.8	0.236
	0.15	4.2800	± 5 %	4.0660	4.4940	2.107	39.0	0.252
	0.18	3.5667	± 5 %	3.3883	3.7450	2.528	39.6	0.303
	0.19	3.3789	± 5 %	3.2100	3.5479	2.669	39.8	0.320
	0.20	3.2100	± 5 %	3.0495	3.3705	2.809	40.0	0.336
	0.22	2.9182	± 5 %	2.7723	3.0641	3.090	40.4	0.370
	0.25	2.5680	± 5 %	2.4396	2.6964	3.512	41.0	0.421
	0.30	2.1400	± 5 %	2.0330	2.2470	4.214	42.0	0.505
	0.35	1.8343	± 5 %	1.7426	1.9260	4.916	43.0	0.589
	0.40	1.6050	± 5 %	1.5248	1.6853	5.619	44.0	0.673
	0.45	1.4267	± 5 %	1.3553	1.4980	6.321	45.0	0.757
	0.50	1.2840	± 5 %	1.2198	1.3482	7.023	46.0	0.841
	0.60	1.0700	± 5 %	1.0165	1.1235	8.428	48.0	1.009
	0.70	0.9171	± 5 %	0.8713	0.9630	9.833	50.0	1.178
	0.80	0.8025	± 5 %	0.7624	0.8426	11.237	52.0	1.346
	0.90	0.7133	± 5 %	0.6777	0.7490	12.642	54.0	1.514
	1.00	0.6420	± 5 %	0.6099	0.6741	14.047	56.0	1.682
1.5	0.075	10.2720	± 5 %	9.7584	10.7856	0.878	31.5	0.105
	0.08	9.6300	± 5 %	9.1485	10.1115	0.936	31.6	0.112
	0.085	9.0635	± 5 %	8.6104	9.5167	0.995	31.7	0.119
	0.09	8.5600	± 5 %	8.1320	8.9880	1.054	31.8	0.126
	0.10	7.7040	± 5 %	7.3188	8.0892	1.171	32.0	0.140
	0.11	7.0036	± 5 %	6.6535	7.3538	1.288	32.2	0.154
	0.12	6.4200	± 5 %	6.0990	6.7410	1.405	32.4	0.168
	0.14	5.5029	± 5 %	5.2277	5.7780	1.639	32.8	0.196
	0.15	5.1360	± 5 %	4.8792	5.3928	1.756	33.0	0.210
	0.18	4.2800	± 5 %	4.0660	4.4940	2.107	33.6	0.252
	0.19	4.0547	± 5 %	3.8520	4.2575	2.224	33.8	0.266
	0.20	3.8520	± 5 %	3.6594	4.0446	2.341	34.0	0.280
	0.22	3.5018	± 5 %	3.3267	3.6769	2.575	34.4	0.308
	0.25	3.0816	± 5 %	2.9275	3.2357	2.926	35.0	0.350
	0.30	2.5680	± 5 %	2.4396	2.6964	3.512	36.0	0.421
	0.35	2.2011	± 5 %	2.0911	2.3112	4.097	37.0	0.491
	0.40	1.9260	± 5 %	1.8297	2.0223	4.682	38.0	0.561
	0.45	1.7120	± 5 %	1.6264	1.7976	5.268	39.0	0.631
	0.50	1.5408	± 5 %	1.4638	1.6178	5.853	40.0	0.701
	0.60	1.2840	± 5 %	1.2198	1.3482	7.023	42.0	0.841
	0.70	1.1006	± 5 %	1.0455	1.1556	8.194	44.0	0.981
	0.80	0.9630	± 5 %	0.9149	1.0112	9.364	46.0	1.121
	0.90	0.8560	± 5 %	0.8132	0.8988	10.535	48.0	1.262
	1.00	0.7704	± 5 %	0.7319	0.8089	11.706	50.0	1.402
1.2	0.07	13.7571	± 5 %	13.0693	14.4450	0.656	25.4	0.079
	0.075	12.8400	± 5 %	12.1980	13.4820	0.702	25.5	0.084
	0.08	12.0375	± 5 %	11.4356	12.6394	0.749	25.6	0.090
	0.085	11.3294	± 5 %	10.7629	11.8959	0.796	25.7	0.095
	0.09	10.7000	± 5 %	10.1650	11.2350	0.843	25.8	0.101
	0.10	9.6300	± 5 %	9.1485	10.1115	0.936	26.0	0.112
	0.11	8.7545	± 5 %	8.3168	9.1923	1.030	26.2	0.123
	0.12	8.0250	± 5 %	7.6238	8.4263	1.124	26.4	0.135
	0.14	6.8786	± 5 %	6.5346	7.2225	1.311	26.8	0.157
	0.15	6.4200	± 5 %	6.0990	6.7410	1.405	27.0	0.168
	0.18	5.3500	± 5 %	5.0825	5.6175	1.686	27.6	0.202

Resistohm® 80, Resistohm 70, Resistohm 60, Resistohm 40, Resistohm 30 and Resistohm 20 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
1.2	0.19	5.0684	± 5 %	4.8150	5.3218	1.779	27.8	0.213
	0.20	4.8150	± 5 %	4.5743	5.0558	1.873	28.0	0.224
	0.22	4.3773	± 5 %	4.1584	4.5961	2.060	28.4	0.247
	0.25	3.8520	± 5 %	3.6594	4.0446	2.341	29.0	0.280
	0.30	3.2100	± 5 %	3.0495	3.3705	2.809	30.0	0.336
	0.35	2.7514	± 5 %	2.6139	2.8890	3.278	31.0	0.393
	0.40	2.4075	± 5 %	2.2871	2.5279	3.746	32.0	0.449
	0.45	2.1400	± 5 %	2.0330	2.2470	4.214	33.0	0.505
	0.50	1.9260	± 5 %	1.8297	2.0223	4.682	34.0	0.561
	0.60	1.6050	± 5 %	1.5248	1.6853	5.619	36.0	0.673
	0.70	1.3757	± 5 %	1.3069	1.4445	6.555	38.0	0.785
1.0	0.06	19.2600	± 5 %	18.2970	20.2230	0.468	21.2	0.056
	0.07	16.5086	± 5 %	15.6831	17.3340	0.546	21.4	0.065
	0.075	15.4080	± 5 %	14.6376	16.1784	0.585	21.5	0.070
	0.08	14.4450	± 5 %	13.7228	15.1673	0.624	21.6	0.075
	0.085	13.5953	± 5 %	12.9155	14.2751	0.663	21.7	0.079
	0.09	12.8400	± 5 %	12.1980	13.4820	0.702	21.8	0.084
	0.10	11.5560	± 5 %	10.9782	12.1338	0.780	22.0	0.093
	0.11	10.5055	± 5 %	9.9802	11.0307	0.858	22.2	0.103
	0.12	9.6300	± 5 %	9.1485	10.1115	0.936	22.4	0.112
	0.14	8.2543	± 5 %	7.8416	8.6670	1.093	22.8	0.131
	0.15	7.7040	± 5 %	7.3188	8.0892	1.171	23.0	0.140
	0.18	6.4200	± 5 %	6.0990	6.7410	1.405	23.6	0.168
	0.19	6.0821	± 5 %	5.7780	6.3862	1.483	23.8	0.178
	0.20	5.7780	± 5 %	5.4891	6.0669	1.561	24.0	0.187
	0.22	5.2527	± 5 %	4.9901	5.5154	1.717	24.4	0.206
	0.25	4.6224	± 5 %	4.3913	4.8535	1.951	25.0	0.234
	0.30	3.8520	± 5 %	3.6594	4.0446	2.341	26.0	0.280
	0.35	3.3017	± 5 %	3.1366	3.4668	2.731	27.0	0.327
	0.40	2.8890	± 5 %	2.7446	3.0335	3.121	28.0	0.374
	0.45	2.5680	± 5 %	2.4396	2.6964	3.512	29.0	0.421
	0.50	2.3112	± 5 %	2.1956	2.4268	3.902	30.0	0.467
	0.60	1.9260	± 5 %	1.8297	2.0223	4.682	32.0	0.561
	0.70	1.6509	± 5 %	1.5683	1.7334	5.463	34.0	0.654
0.9	0.06	21.4000	± 5 %	20.3300	22.4700	0.421	19.2	0.050
	0.07	18.3429	± 5 %	17.4257	19.2600	0.492	19.4	0.059
	0.075	17.1200	± 5 %	16.2640	17.9760	0.527	19.5	0.063
	0.08	16.0500	± 5 %	15.2475	16.8525	0.562	19.6	0.067
	0.085	15.1059	± 5 %	14.3506	15.8612	0.597	19.7	0.071
	0.09	14.2667	± 5 %	13.5533	14.9800	0.632	19.8	0.076
	0.10	12.8400	± 5 %	12.1980	13.4820	0.702	20.0	0.084
	0.11	11.6727	± 5 %	11.0891	12.2564	0.773	20.2	0.093
	0.12	10.7000	± 5 %	10.1650	11.2350	0.843	20.4	0.101
	0.14	9.1714	± 5 %	8.7129	9.6300	0.983	20.8	0.118
	0.15	8.5600	± 5 %	8.1320	8.9880	1.054	21.0	0.126
	0.18	7.1333	± 5 %	6.7767	7.4900	1.264	21.6	0.151
	0.19	6.7579	± 5 %	6.4200	7.0958	1.334	21.8	0.160
	0.20	6.4200	± 5 %	6.0990	6.7410	1.405	22.0	0.168
	0.22	5.8364	± 5 %	5.5445	6.1282	1.545	22.4	0.185
	0.25	5.1360	± 5 %	4.8792	5.3928	1.756	23.0	0.210
	0.30	4.2800	± 5 %	4.0660	4.4940	2.107	24.0	0.252
	0.35	3.6686	± 5 %	3.4851	3.8520	2.458	25.0	0.294
	0.40	3.2100	± 5 %	3.0495	3.3705	2.809	26.0	0.336
	0.45	2.8533	± 5 %	2.7107	2.9960	3.161	27.0	0.379
	0.50	2.5680	± 5 %	2.4396	2.6964	3.512	28.0	0.421
	0.60	2.1400	± 5 %	2.0330	2.2470	4.214	30.0	0.505
0.8	0.06	24.0750	± 5 %	22.8713	25.2788	0.375	17.2	0.045
	0.07	20.6357	± 5 %	19.6039	21.6675	0.437	17.4	0.052
	0.075	19.2600	± 5 %	18.2970	20.2230	0.468	17.5	0.056
	0.08	18.0563	± 5 %	17.1534	18.9591	0.499	17.6	0.060
	0.085	16.9941	± 5 %	16.1444	17.8438	0.531	17.7	0.064

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
	0.09	16.0500	± 5 %	15.2475	16.8525	0.562	17.8	0.067
	0.10	14.4450	± 5 %	13.7228	15.1673	0.624	18.0	0.075
	0.11	13.1318	± 5 %	12.4752	13.7884	0.687	18.2	0.082
	0.12	12.0375	± 5 %	11.4356	12.6394	0.749	18.4	0.090
	0.14	10.3179	± 5 %	9.8020	10.8338	0.874	18.8	0.105
	0.15	9.6300	± 5 %	9.1485	10.1115	0.936	19.0	0.112
	0.18	8.0250	± 5 %	7.6238	8.4263	1.124	19.6	0.135
	0.19	7.6026	± 5 %	7.2225	7.9828	1.186	19.8	0.142
0.8	0.20	7.2225	± 5 %	6.8614	7.5836	1.249	20.0	0.150
	0.22	6.5659	± 5 %	6.2376	6.8942	1.373	20.4	0.164
	0.25	5.7780	± 5 %	5.4891	6.0669	1.561	21.0	0.187
	0.30	4.8150	± 5 %	4.5743	5.0558	1.873	22.0	0.224
	0.35	4.1271	± 5 %	3.9208	4.3335	2.185	23.0	0.262
	0.40	3.6113	± 5 %	3.4307	3.7918	2.497	24.0	0.299
	0.45	3.2100	± 5 %	3.0495	3.3705	2.809	25.0	0.336
	0.50	2.8890	± 5 %	2.7446	3.0335	3.121	26.0	0.374
	0.60	2.4075	± 5 %	2.2871	2.5279	3.746	28.0	0.449
	0.06	27.5143	± 5 %	26.1386	28.8900	0.328	15.2	0.039
	0.07	23.5837	± 5 %	22.4045	24.7629	0.382	15.4	0.046
	0.075	22.0114	± 5 %	20.9109	23.1120	0.410	15.5	0.049
	0.08	20.6357	± 5 %	19.6039	21.6675	0.437	15.6	0.052
	0.085	19.4218	± 5 %	18.4508	20.3929	0.464	15.7	0.056
	0.09	18.3429	± 5 %	17.4257	19.2600	0.492	15.8	0.059
	0.10	16.5086	± 5 %	15.6831	17.3340	0.546	16.0	0.065
	0.11	15.0078	± 5 %	14.2574	15.7582	0.601	16.2	0.072
	0.12	13.7571	± 5 %	13.0693	14.4450	0.656	16.4	0.079
	0.14	11.7918	± 5 %	11.2022	12.3814	0.765	16.8	0.092
0.7	0.15	11.0057	± 5 %	10.4554	11.5560	0.819	17.0	0.098
	0.18	9.1714	± 5 %	8.7129	9.6300	0.983	17.6	0.118
	0.19	8.6887	± 5 %	8.2543	9.1232	1.038	17.8	0.124
	0.20	8.2543	± 5 %	7.8416	8.6670	1.093	18.0	0.131
	0.22	7.5039	± 5 %	7.1287	7.8791	1.202	18.4	0.144
	0.25	6.6034	± 5 %	6.2733	6.9336	1.366	19.0	0.164
	0.30	5.5029	± 5 %	5.2277	5.7780	1.639	20.0	0.196
	0.35	4.7167	± 5 %	4.4809	4.9526	1.912	21.0	0.229
	0.40	4.1271	± 5 %	3.9208	4.3335	2.185	22.0	0.262
	0.45	3.6686	± 5 %	3.4851	3.8520	2.458	23.0	0.294
	0.50	3.3017	± 5 %	3.1366	3.4668	2.731	24.0	0.327
	0.06	32.1000	± 5 %	30.4950	33.7050	0.281	13.2	0.034
	0.07	27.5143	± 5 %	26.1386	28.8900	0.328	13.4	0.039
	0.075	25.6800	± 5 %	24.3960	26.9640	0.351	13.5	0.042
	0.08	24.0750	± 5 %	22.8713	25.2788	0.375	13.6	0.045
	0.085	22.6588	± 5 %	21.5259	23.7918	0.398	13.7	0.048
	0.09	21.4000	± 5 %	20.3300	22.4700	0.421	13.8	0.050
	0.10	19.2600	± 5 %	18.2970	20.2230	0.468	14.0	0.056
	0.11	17.5091	± 5 %	16.6336	18.3845	0.515	14.2	0.062
	0.12	16.0500	± 5 %	15.2475	16.8525	0.562	14.4	0.067
	0.14	13.7571	± 5 %	13.0693	14.4450	0.656	14.8	0.079
0.6	0.15	12.8400	± 5 %	12.1980	13.4820	0.702	15.0	0.084
	0.18	10.7000	± 5 %	10.1650	11.2350	0.843	15.6	0.101
	0.19	10.1368	± 5 %	9.6300	10.6437	0.890	15.8	0.107
	0.20	9.6300	± 5 %	9.1485	10.1115	0.936	16.0	0.112
	0.22	8.7545	± 5 %	8.3168	9.1923	1.030	16.4	0.123
	0.25	7.7040	± 5 %	7.3188	8.0892	1.171	17.0	0.140
	0.30	6.4200	± 5 %	6.0990	6.7410	1.405	18.0	0.168
	0.35	5.5029	± 5 %	5.2277	5.7780	1.639	19.0	0.196
	0.40	4.8150	± 5 %	4.5743	5.0558	1.873	20.0	0.224
	0.45	4.2800	± 5 %	4.0660	4.4940	2.107	21.0	0.252
	0.06	38.5200	± 5 %	36.5940	40.4460	0.234	11.2	0.028
0.5	0.07	33.0171	± 5 %	31.3663	34.6680	0.273	11.4	0.033
	0.075	30.8160	± 5 %	29.2752	32.3568	0.293	11.5	0.035

Resistohm® 80, Resistohm 70, Resistohm 60, Resistohm 40, Resistohm 30 and Resistohm 20 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
0.5	0.08	28.8900	± 5 %	27.4455	30.3345	0.312	11.6	0.037
	0.085	27.1906	± 5 %	25.8311	28.5501	0.332	11.7	0.040
	0.09	25.6800	± 5 %	24.3960	26.9640	0.351	11.8	0.042
	0.10	23.1120	± 5 %	21.9564	24.2676	0.390	12.0	0.047
	0.11	21.0109	± 5 %	19.9604	22.0615	0.429	12.2	0.051
	0.12	19.2600	± 5 %	18.2970	20.2230	0.468	12.4	0.056
	0.14	16.5086	± 5 %	15.6831	17.3340	0.546	12.8	0.065
	0.15	15.4080	± 5 %	14.6376	16.1784	0.585	13.0	0.070
	0.18	12.8400	± 5 %	12.1980	13.4820	0.702	13.6	0.084
	0.19	12.1642	± 5 %	11.5560	12.7724	0.741	13.8	0.089
	0.20	11.5560	± 5 %	10.9782	12.1338	0.780	14.0	0.093
0.4	0.05	57.7800	± 5 %	54.8910	60.6690	0.156	9.0	0.019
	0.06	48.1500	± 5 %	45.7425	50.5575	0.187	9.2	0.022
	0.07	41.2714	± 5 %	39.2079	43.3350	0.219	9.4	0.026
	0.075	38.5200	± 5 %	36.5940	40.4460	0.234	9.5	0.028
	0.08	36.1125	± 5 %	34.3069	37.9181	0.250	9.6	0.030
	0.085	33.9882	± 5 %	32.2888	35.6876	0.265	9.7	0.032
	0.09	32.1000	± 5 %	30.4950	33.7050	0.281	9.8	0.034
	0.10	28.8900	± 5 %	27.4455	30.3345	0.312	10.0	0.037
	0.11	26.2636	± 5 %	24.9505	27.5768	0.343	10.2	0.041
	0.12	24.0750	± 5 %	22.8713	25.2788	0.375	10.4	0.045
	0.14	20.6357	± 5 %	19.6039	21.6675	0.437	10.8	0.052
	0.15	19.2600	± 5 %	18.2970	20.2230	0.468	11.0	0.056
	0.18	16.0500	± 5 %	15.2475	16.8525	0.562	11.6	0.067
	0.19	15.2053	± 5 %	14.4450	15.9655	0.593	11.8	0.071
	0.20	14.4450	± 5 %	13.7228	15.1673	0.624	12.0	0.075
0.3	0.05	77.0400	± 5 %	73.1880	80.8920	0.117	7.0	0.014
	0.06	64.2000	± 5 %	60.9900	67.4100	0.140	7.2	0.017
	0.07	55.0286	± 5 %	52.2771	57.7800	0.164	7.4	0.020
	0.075	51.3600	± 5 %	48.7920	53.9280	0.176	7.5	0.021
	0.08	48.1500	± 5 %	45.7425	50.5575	0.187	7.6	0.022
	0.085	45.3176	± 5 %	43.0518	47.5835	0.199	7.7	0.024
	0.09	42.8000	± 5 %	40.6600	44.9400	0.211	7.8	0.025
	0.10	38.5200	± 5 %	36.5940	40.4460	0.234	8.0	0.028
	0.11	35.0182	± 5 %	33.2673	36.7691	0.258	8.2	0.031
	0.12	32.1000	± 5 %	30.4950	33.7050	0.281	8.4	0.034
	0.14	27.5143	± 5 %	26.1386	28.8900	0.328	8.8	0.039
	0.15	25.6800	± 5 %	24.3960	26.9640	0.351	9.0	0.042
0.2	0.05	115.5600	± 5 %	109.7820	121.3380	0.078	5.0	0.009
	0.06	96.3000	± 5 %	91.4850	101.1150	0.094	5.2	0.011
	0.07	82.5429	± 5 %	78.4157	86.6700	0.109	5.4	0.013
	0.075	77.0400	± 5 %	73.1880	80.8920	0.117	5.5	0.014
	0.08	72.2250	± 5 %	68.6138	75.8363	0.125	5.6	0.015
	0.085	67.9765	± 5 %	64.5776	71.3753	0.133	5.7	0.016
	0.09	64.2000	± 5 %	60.9900	67.4100	0.140	5.8	0.017
	0.10	57.7800	± 5 %	54.8910	60.6690	0.156	6.0	0.019
	0.11	52.5273	± 5 %	49.9009	55.1536	0.172	6.2	0.021
	0.12	48.1500	± 5 %	45.7425	50.5575	0.187	6.4	0.022
	0.14	41.2714	± 5 %	39.2079	43.3350	0.219	6.8	0.026
	0.15	38.5200	± 5 %	36.5940	40.4460	0.234	7.0	0.028

technology

Iron-chromium-aluminium Alloys

Our iron-chromium-aluminium alloys contain rare-earth additions such as yttrium, zirconium, titanium, cerium and lanthanum. These chemical elements confer them an excellent resistance in hot state, limit intergranular oxidation and increase their life time.

The iron-chromium-aluminium based alloys manufactured by Aperam Alloys Rescal offer higher heat resistance, higher resistivity (until 1.45 Ω mm^2/m) and a higher surface load compared to austenitic alloys. As an example, Resistohm 145 has a maximum operating temperature of 1300°C (2372°F) compared to 1200°C (2192°F) for Resistohm 80.

FeCrAl alloys proves to be more cost-efficient than NiCr because they have a lower density, which means that a higher number of elements can be made with an equal weight. Other characteristics include resistance to sulphurous and carbonaceous atmospheres.

RESISTOHM® PRM

The RESISTOHM PRM is made of a highly pure metal. It has a higher maximimum operating temperature and longer life time than any of our FeCrAl alloys. This exceptional lifetime enables a 30 per cent higher surface loading than in the case of FeCrAl alloys.

RESISTOHM Y

This is an iron-chromium-aluminium alloy with yttrium addition, a high resistivity and a relatively low density. As other FeCrAl alloys, an aluminium oxide layer is formed in oxidising atmospheres. This oxide protects the wire from further chemical attacks and the yttrium content improves the adherence of the oxide film on the RESISTOHM Y wire.

RESISTOHM 145

An iron-chromium-aluminium alloy with a high resistivity and a maximum operating temperature up to 1300°C (2372°F). Keeping this alloy above 1000°C (1832°F) for 7-8 hours in an oxidising atmosphere with sufficient quantity of oxygen or air causes formation of a light grey aluminium oxide layer, protecting the wire from chemical attacks. It is recommended to oxidise the wire in this way in case of using it in reducing conditions. Resistohm 145 is generally supplied preoxidised for that reason.

RESISTOHM 140

It is possible to operate RESISTOHM 140 at very high temperature, up to 1280°C (2336°F). It is particularly useful for heating elements in industrial furnaces when a high surface load is required. A very good life time of the elements operating at high temperatures up to 1280°C is guaranteed when using Resistohm® 140

RESISTOHM 135

This alloy can be used as heating element up to 1200°C (2192°F) in a dry environment in order to avoid oxidation, because it is not a stainless alloy. RESISTOHM 135 lifetime proves to be excellent in sulphurous and oxidising atmospheres.

RESISTOHM 125

This alloy is close to be a stainless steel but can be used for heating elements applications at low temperature or as cold connections of furnace. It is recommended for application on heating elements operating in air like rheostat, quartz tube and other elements in which the maximum operating temperature does not exceed 1100°C (2012°F). RESISTOHM 125, as others alloys of the same grade, has a lower creep strength than NiCr alloys.

RESISTOHM® 145 and RESISTOHM PRM

Resistivity 1.45 Ω mm²/m. Density 7.10 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
Ct	1.45	1.00	1.00	1.00	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.04	1.04

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	184.7134	± 5%	175.4777	193.9491	0.0557	17942.05	3 314 136	3.141	0.0079
0.11	152.6557	± 5%	145.0229	160.2885	0.0674	14828.14	2 263 600	3.455	0.0095
0.12	128.2732	± 5%	121.8595	134.6869	0.0803	12459.75	1 598 252	3.769	0.0113
0.13	109.2979	± 5%	103.8330	114.7628	0.0942	10616.60	1 160 371	4.084	0.0133
0.14	94.2415	± 5%	89.5294	98.9536	0.1092	9154.11	862 697	4.398	0.0154
0.15	82.0948	± 5%	77.9901	86.1995	0.1254	7974.24	654 644	4.712	0.0177
0.16	72.1537	± 5%	68.5460	75.7614	0.1427	7008.61	505 697	5.026	0.0201
0.17	63.9147	± 5%	60.7190	67.1104	0.1611	6208.32	396 803	5.340	0.0227
0.18	57.0103	± 5%	54.1598	59.8608	0.1806	5537.67	315 704	5.654	0.0254
0.19	51.1671	± 5%	48.6087	53.7255	0.2012	4970.10	254 306	5.968	0.0283
0.20	46.1783	± 5%	43.8694	48.4872	0.2229	4485.51	207 134	6.282	0.0314
0.22	38.1639	± 5%	36.2557	40.0721	0.2698	3707.03	141 475	6.911	0.0380
0.25	29.5541	± 5%	28.0764	31.0318	0.3483	2870.73	84 842	7.853	0.0491
0.28	23.5604	± 5%	22.3824	24.7384	0.4370	2288.53	53 919	8.795	0.0615
0.30	20.5237	± 5%	19.4975	21.5499	0.5016	1993.56	40 915	9.423	0.0707
0.32	18.0384	± 5%	17.1365	18.9403	0.5707	1752.15	31 606	10.052	0.0804
0.35	15.0786	± 5%	14.3247	15.8325	0.6828	1464.66	22 085	10.994	0.0962
0.38	12.7918	± 5%	12.1522	13.4314	0.8048	1242.52	15 894	11.936	0.1134
0.40	11.5446	± 5%	10.9674	12.1218	0.8918	1121.38	12 946	12.565	0.1256
0.42	10.4713	± 5%	9.9477	10.9949	0.9832	1017.12	10 651	13.193	0.1385
0.45	9.1216	± 5%	8.6655	9.5777	1.1286	886.03	8 082	14.135	0.1590
0.48	8.0171	± 5%	7.6162	8.4180	1.2841	778.73	6 243	15.078	0.1809
0.50	7.3885	± 5 %	7.0191	7.7579	1.3934	717.68	5 303	15.706	0.1963
0.55	6.1062	± 3 %	5.9230	6.2894	1.6860	593.13	3 622	17.276	0.2375
0.60	5.1309	± 3 %	4.9770	5.2848	2.0065	498.39	2 557	18.847	0.2826
0.65	4.3719	± 3 %	4.2407	4.5031	2.3548	424.66	1 857	20.418	0.3317
0.70	3.7697	± 3 %	3.6566	3.8828	2.7310	366.16	1 380	21.988	0.3847
0.75	3.2838	± 3 %	3.1853	3.3823	3.1351	318.97	1 047	23.559	0.4416
0.80	2.8861	± 3 %	2.7995	2.9727	3.5670	280.34	809	25.129	0.5024
0.85	2.5566	± 3 %	2.4799	2.6333	4.0269	248.33	635	26.700	0.5672
0.90	2.2804	± 3 %	2.2120	2.3488	4.5145	221.51	505	28.270	0.6359
0.95	2.0467	± 3 %	1.9853	2.1081	5.0301	198.80	407	29.841	0.7085
1.00	1.8471	± 3 %	1.7917	1.9025	5.5735	179.42	331	31.412	0.7850
1.10	1.5266	± 3 %	1.4808	1.5724	6.7439	148.28	226	34.553	0.9499
1.20	1.2827	± 3 %	1.2442	1.3212	8.0258	124.60	160	37.694	1.1304
1.30	1.0930	± 3 %	1.0602	1.1258	9.4192	106.17	116	40.835	1.3267
1.40	0.9424	± 3 %	0.9141	0.9707	10.9241	91.54	86	43.976	1.5386
1.50	0.8209	± 3 %	0.7963	0.8455	12.5404	79.74	65	47.117	1.7663
1.60	0.7215	± 3 %	0.6999	0.7431	14.2682	70.09	51	50.259	2.0096
1.70	0.6391	± 3 %	0.6199	0.6583	16.1074	62.08	40	53.400	2.2687
1.80	0.5701	± 3 %	0.5530	0.5872	18.0581	55.38	32	56.541	2.5434
1.90	0.5117	± 3 %	0.4963	0.5271	20.1203	49.70	25	59.682	2.8339
2.00	0.4618	± 3 %	0.4479	0.4757	22.2940	44.86	21	62.823	3.1400
2.25	0.3649	± 3 %	0.3540	0.3758	28.2158	35.44	13	70.676	3.9741
2.50	0.2955	± 3 %	0.2866	0.3044	34.8344	28.71	8.48	78.529	4.9063
2.80	0.2356	± 3 %	0.2285	0.2427	43.6962	22.89	5.39	87.952	6.1544
3.00	0.2052	± 3 %	0.1990	0.2114	50.1615	19.94	4.09	94.235	7.0650
3.25	0.1749	± 3 %	0.1697	0.1801	58.8701	16.99	2.97	102.088	8.2916
3.50	0.1508	± 3 %	0.1463	0.1553	68.2754	14.65	2.21	109.941	9.6163
3.80	0.1279	± 3 %	0.1241	0.1317	80.4813	12.43	1.59	119.364	11.3354
4.00	0.1154	± 3 %	0.1119	0.1189	89.1760	11.21	1.29	125.646	12.5600
4.50	0.0912	± 3 %	0.0885	0.0939	112.8634	8.860	0.81	141.352	15.8963
5.00	0.0739	± 3 %	0.0717	0.0761	139.3375	7.18	0.53	157.058	19.6250
5.50	0.0611	± 3 %	0.0593	0.0629	168.5984	5.931	0.36	172.764	23.7463
6.00	0.0513	± 3 %	0.0498	0.0528	200.6460	4.98	0.26	188.470	28.2600

Resistivity 1.39 Ω mm²/m. Density 7.10 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
Ct	1.39	1.00	1.01	1.01	1.02	1.03	1.05	1.07	1.08	1.08	1.08	1.08	1.08	1.08

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	177.0701	± 5 %	168.2166	185.9236	0.0557	17942.05	3 176 999	3.141	0.0079
0.11	146.3389	± 5 %	139.0220	153.6558	0.0674	14828.14	2 169 933	3.455	0.0095
0.12	122.9653	± 5 %	116.8170	129.1136	0.0803	12459.75	1 532 118	3.769	0.0113
0.13	104.7752	± 5 %	99.5364	110.0140	0.0942	10616.60	1 112 356	4.084	0.0133
0.14	90.3419	± 5 %	85.8248	94.8590	0.1092	9154.11	826 999	4.398	0.0154
0.15	78.6978	± 5 %	74.7629	82.6327	0.1254	7974.24	627 555	4.712	0.0177
0.16	69.1680	± 5 %	65.7096	72.6264	0.1427	7008.61	484 772	5.026	0.0201
0.17	61.2699	± 5 %	58.2064	64.3334	0.1611	6208.32	380 383	5.340	0.0227
0.18	54.6513	± 5 %	51.9187	57.3839	0.1806	5537.67	302 641	5.654	0.0254
0.19	49.0499	± 5 %	46.5974	51.5024	0.2012	4970.10	243 783	5.968	0.0283
0.20	44.2675	± 5 %	42.0541	46.4809	0.2229	4485.51	198 562	6.282	0.0314
0.22	36.5847	± 5 %	34.7555	38.4139	0.2698	3707.03	135 621	6.911	0.0380
0.25	28.3312	± 5 %	26.9146	29.7478	0.3483	2870.73	81 331	7.853	0.0491
0.28	22.5855	± 5 %	21.4562	23.7148	0.4370	2288.53	51 687	8.795	0.0615
0.30	19.6745	± 5 %	18.6908	20.6582	0.5016	1993.56	39 222	9.423	0.0707
0.32	17.2920	± 5 %	16.4274	18.1566	0.5707	1752.15	30 298	10.052	0.0804
0.35	14.4547	± 5 %	13.7320	15.1774	0.6828	1464.66	21 171	10.994	0.0962
0.38	12.2625	± 5 %	11.6494	12.8756	0.8048	1242.52	15 236	11.936	0.1134
0.40	11.0669	± 5 %	10.5136	11.6202	0.8918	1121.38	12 410	12.565	0.1256
0.42	10.0380	± 5 %	9.5361	10.5399	0.9832	1017.12	10 210	13.193	0.1385
0.45	8.7442	± 5 %	8.3070	9.1814	1.1286	886.03	7 748	14.135	0.1590
0.48	7.6853	± 5 %	7.3010	8.0696	1.2841	778.73	5 985	15.078	0.1809
0.50	7.0828	± 5 %	6.7287	7.4369	1.3934	717.68	5 083	15.706	0.1963
0.55	5.8536	± 3 %	5.6780	6.0292	1.6860	593.13	3 472	17.276	0.2375
0.60	4.9186	± 3 %	4.7710	5.0662	2.0065	498.39	2 451	18.847	0.2826
0.65	4.1910	± 3 %	4.0653	4.3167	2.3548	424.66	1 780	20.418	0.3317
0.70	3.6137	± 3 %	3.5053	3.7221	2.7310	366.16	1 323	21.988	0.3847
0.75	3.1479	± 3 %	3.0535	3.2423	3.1351	318.97	1 004	23.559	0.4416
0.80	2.7667	± 3 %	2.6837	2.8497	3.5670	280.34	776	25.129	0.5024
0.85	2.4508	± 3 %	2.3773	2.5243	4.0269	248.33	609	26.700	0.5672
0.90	2.1861	± 3 %	2.1205	2.2517	4.5145	221.51	484	28.270	0.6359
0.95	1.9620	± 3 %	1.9031	2.0209	5.0301	198.80	390	29.841	0.7085
1.00	1.7707	± 3 %	1.7176	1.8238	5.5735	179.42	318	31.412	0.7850
1.10	1.4634	± 3 %	1.4195	1.5073	6.7439	148.28	217	34.553	0.9499
1.20	1.2297	± 3 %	1.1928	1.2666	8.0258	124.60	153	37.694	1.1304
1.30	1.0478	± 3 %	1.0164	1.0792	9.4192	106.17	111	40.835	1.3267
1.40	0.9034	± 3 %	0.8763	0.9305	10.9241	91.54	83	43.976	1.5386
1.50	0.7870	± 3 %	0.7634	0.8106	12.5404	79.74	63	47.117	1.7663
1.60	0.6917	± 3 %	0.6709	0.7125	14.2682	70.09	48	50.259	2.0096
1.70	0.6127	± 3 %	0.5943	0.6311	16.1074	62.08	38	53.400	2.2687
1.80	0.5465	± 3 %	0.5301	0.5629	18.0581	55.38	30	56.541	2.5434
1.90	0.4905	± 3 %	0.4758	0.5052	20.1203	49.70	24	59.682	2.8339
2.00	0.4427	± 3 %	0.4294	0.4560	22.2940	44.86	20	62.823	3.1400
2.25	0.3498	± 3 %	0.3393	0.3603	28.2158	35.44	12	70.676	3.9741
2.50	0.2833	± 3 %	0.2748	0.2918	34.8344	28.71	8.13	78.529	4.9063
2.80	0.2259	± 3 %	0.2191	0.2327	43.6962	22.89	5.17	87.952	6.1544
3.00	0.1967	± 3 %	0.1908	0.2026	50.1615	19.94	3.92	94.235	7.0650
3.25	0.1676	± 3 %	0.1626	0.1726	58.8701	16.99	2.85	102.088	8.2916
3.50	0.1445	± 3 %	0.1402	0.1488	68.2754	14.65	2.12	109.941	9.6163
3.80	0.1226	± 3 %	0.1189	0.1263	80.4813	12.43	1.52	119.364	11.3354
4.00	0.1107	± 3 %	0.1074	0.1140	89.1760	11.21	1.24	125.646	12.5600
4.50	0.0874	± 3 %	0.0848	0.0900	112.8634	8.860	0.77	141.352	15.8963
5.00	0.0708	± 3 %	0.0687	0.0729	139.3375	7.18	0.51	157.058	19.6250
5.50	0.0585	± 3 %	0.0567	0.0603	168.5984	5.931	0.35	172.764	23.7463
6.00	0.0492	± 3 %	0.0477	0.0507	200.6460	4.98	0.25	188.470	28.2600

RESISTOHM® 140

Resistivity 1.40 Ω mm²/m. Density 7.15 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
Ct	1.40	1.00	1.01	1.01	1.01	1.03	1.03	1.04	1.05	1.05	1.06	1.06	-	-

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	178.3439	± 5 %	169.4268	187.2611	0.056	17816.58	3 177 479	3.141	0.0079
0.11	147.3917	± 5 %	140.0221	154.7613	0.068	14724.44	2 170 261	3.455	0.0095
0.12	123.8500	± 5 %	117.6575	130.0425	0.081	12372.62	1 532 349	3.769	0.0113
0.13	105.5290	± 5 %	100.2525	110.8054	0.095	10542.35	1 112 524	4.084	0.0133
0.14	90.9918	± 5 %	86.4422	95.5414	0.110	9090.09	827 124	4.398	0.0154
0.15	79.2640	± 5 %	75.3008	83.2272	0.126	7918.48	627 650	4.712	0.0177
0.16	69.6656	± 5 %	66.1823	73.1489	0.144	6959.60	484 845	5.026	0.0201
0.17	61.7107	± 5 %	58.6252	64.7962	0.162	6164.91	380 441	5.340	0.0227
0.18	55.0444	± 5 %	52.2922	57.7967	0.182	5498.94	302 686	5.654	0.0254
0.19	49.4028	± 5 %	46.9326	51.8729	0.203	4935.34	243 819	5.968	0.0283
0.20	44.5860	± 5 %	42.3567	46.8153	0.225	4454.14	198 592	6.282	0.0314
0.22	36.8479	± 5 %	35.0055	38.6903	0.272	3681.11	135 641	6.911	0.0380
0.25	28.5350	± 5 %	27.1083	29.9618	0.351	2850.65	81 343	7.853	0.0491
0.28	22.7480	± 5 %	21.6106	23.8854	0.440	2272.52	51 695	8.795	0.0615
0.30	19.8160	± 5 %	18.8252	20.8068	0.505	1979.62	39 228	9.423	0.0707
0.32	17.4164	± 5 %	16.5456	18.2872	0.575	1739.90	30 303	10.052	0.0804
0.35	14.5587	± 5 %	13.8308	15.2866	0.688	1454.41	21 174	10.994	0.0962
0.38	12.3507	± 5 %	11.7332	12.9682	0.810	1233.84	15 239	11.936	0.1134
0.40	11.1465	± 5 %	10.5892	11.7038	0.898	1113.54	12 412	12.565	0.1256
0.42	10.1102	± 5 %	9.6047	10.6157	0.990	1010.01	10 211	13.193	0.1385
0.45	8.8071	± 5 %	8.3668	9.2475	1.137	879.83	7 749	14.135	0.1590
0.48	7.7406	± 5 %	7.3536	8.1277	1.293	773.29	5 986	15.078	0.1809
0.50	7.1338	± 5 %	6.7771	7.4905	1.403	712.66	5 084	15.706	0.1963
0.55	5.8957	± 3 %	5.7188	6.0726	1.698	588.98	3 472	17.276	0.2375
0.60	4.9540	± 3 %	4.8054	5.1026	2.021	494.90	2 452	18.847	0.2826
0.65	4.2212	± 3 %	4.0946	4.3478	2.371	421.69	1 780	20.418	0.3317
0.70	3.6397	± 3 %	3.5305	3.7489	2.750	363.60	1 323	21.988	0.3847
0.75	3.1706	± 3 %	3.0755	3.2657	3.157	316.74	1 004	23.559	0.4416
0.80	2.7866	± 3 %	2.7030	2.8702	3.592	278.38	776	25.129	0.5024
0.85	2.4684	± 3 %	2.3943	2.5425	4.055	246.60	609	26.700	0.5672
0.90	2.2018	± 3 %	2.1357	2.2679	4.546	219.96	484	28.270	0.6359
0.95	1.9761	± 3 %	1.9168	2.0354	5.066	197.41	390	29.841	0.7085
1.00	1.7834	± 3 %	1.7299	1.8369	5.613	178.17	318	31.412	0.7850
1.10	1.4739	± 3 %	1.4297	1.5181	6.791	147.24	217	34.553	0.9499
1.20	1.2385	± 3 %	1.2013	1.2757	8.082	123.73	153	37.694	1.1304
1.30	1.0553	± 3 %	1.0236	1.0870	9.486	105.42	111	40.835	1.3267
1.40	0.9099	± 3 %	0.8826	0.9372	11.001	90.90	83	43.976	1.5386
1.50	0.7926	± 3 %	0.7688	0.8164	12.629	79.18	63	47.117	1.7663
1.60	0.6967	± 3 %	0.6758	0.7176	14.369	69.60	48	50.259	2.0096
1.70	0.6171	± 3 %	0.5986	0.6356	16.221	61.65	38	53.400	2.2687
1.80	0.5504	± 3 %	0.5339	0.5669	18.185	54.99	30	56.541	2.5434
1.90	0.4940	± 3 %	0.4792	0.5088	20.262	49.35	24	59.682	2.8339
2.00	0.4459	± 3 %	0.4325	0.4593	22.451	44.54	20	62.823	3.1400
2.25	0.3523	± 3 %	0.3417	0.3629	28.415	35.19	12	70.676	3.9741
2.50	0.2854	± 3 %	0.2768	0.2940	35.080	28.51	8.13	78.529	4.9063
2.80	0.2275	± 3 %	0.2207	0.2343	44.004	22.73	5.17	87.952	6.1544
3.00	0.1982	± 3 %	0.1923	0.2041	50.515	19.80	3.92	94.235	7.0650
3.25	0.1688	± 3 %	0.1637	0.1739	59.285	16.87	2.85	102.088	8.2916
3.50	0.1456	± 3 %	0.1412	0.1500	68.756	14.54	2.12	109.941	9.6163
3.80	0.1235	± 3 %	0.1198	0.1272	81.048	12.34	1.52	119.364	11.3354
4.00	0.1115	± 3 %	0.1082	0.1148	89.804	11.14	1.24	125.646	12.5600
4.50	0.0881	± 3 %	0.0855	0.0907	113.658	8.798	0.77	141.352	15.8963
5.00	0.0713	± 3 %	0.0692	0.0734	140.319	7.13	0.51	157.058	19.6250
5.50	0.0590	± 3 %	0.0572	0.0608	169.786	5.890	0.35	172.764	23.7463
6.00	0.0495	± 3 %	0.0480	0.0510	202.059	4.95	0.25	188.470	28.2600

RESISTOHM® 135

Resistivity 1.35 Ω mm²/m. Density 7.25 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000	1100	1200
Ct	1.35	1.00	1.01	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.07	1.07	-

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	171.9745	± 5 %	163.3758	180.5732	0.0569	17570.83	3 021 736	3.141	0.0079
0.11	142.1277	± 5 %	135.0213	149.2341	0.0689	14521.35	2 063 886	3.455	0.0095
0.12	119.4268	± 5 %	113.4555	125.3981	0.0820	12201.97	1 457 241	3.769	0.0113
0.13	101.7601	± 5 %	96.6721	106.8481	0.0962	10396.94	1 057 994	4.084	0.0133
0.14	87.7421	± 5 %	83.3550	92.1292	0.1115	8964.71	786 583	4.398	0.0154
0.15	76.4331	± 5 %	72.6114	80.2548	0.1281	7809.26	596 886	4.712	0.0177
0.16	67.1775	± 5 %	63.8186	70.5364	0.1457	6863.61	461 080	5.026	0.0201
0.17	59.5068	± 5 %	56.5315	62.4821	0.1645	6079.87	361 794	5.340	0.0227
0.18	53.0786	± 5 %	50.4247	55.7325	0.1844	5423.10	287 850	5.654	0.0254
0.19	47.6384	± 5 %	45.2565	50.0203	0.2055	4867.27	231 869	5.968	0.0283
0.20	42.9936	± 5 %	40.8439	45.1433	0.2277	4392.71	188 858	6.282	0.0314
0.22	35.5319	± 5 %	33.7553	37.3085	0.2755	3630.34	128 993	6.911	0.0380
0.25	27.5159	± 5 %	26.1401	28.8917	0.3557	2811.33	77 356	7.853	0.0491
0.28	21.9355	± 5 %	20.8387	23.0323	0.4462	2241.18	49 161	8.795	0.0615
0.30	19.1083	± 5 %	18.1529	20.0637	0.5122	1952.31	37 305	9.423	0.0707
0.32	16.7944	± 5 %	15.9547	17.6341	0.5828	1715.90	28 818	10.052	0.0804
0.35	14.0387	± 5 %	13.3368	14.7406	0.6972	1434.35	20 137	10.994	0.0962
0.38	11.9096	± 5 %	11.3141	12.5051	0.8218	1216.82	14 492	11.936	0.1134
0.40	10.7484	± 5 %	10.2110	11.2858	0.9106	1098.18	11 804	12.565	0.1256
0.42	9.7491	± 5 %	9.2616	10.2366	1.0039	996.08	9 711	13.193	0.1385
0.45	8.4926	± 5 %	8.0680	8.9172	1.1525	867.70	7 369	14.135	0.1590
0.48	7.4642	± 5 %	7.0910	7.8374	1.3113	762.62	5 692	15.078	0.1809
0.50	6.8790	± 5 %	6.5294	7.2167	1.4228	702.83	4 835	15.706	0.1963
0.55	5.6851	± 3 %	5.5145	5.8557	1.7216	580.85	3 302	17.276	0.2375
0.60	4.7771	± 3 %	4.6338	4.9204	2.0489	488.08	2 332	18.847	0.2826
0.65	4.0704	± 3 %	3.9483	4.1925	2.4046	415.88	1 693	20.418	0.3317
0.70	3.5097	± 3 %	3.4044	3.6150	2.7887	358.59	1 259	21.988	0.3847
0.75	3.0573	± 3 %	2.9656	3.1490	3.2013	312.37	955	23.559	0.4416
0.80	2.6871	± 3 %	2.6065	2.7677	3.6424	274.54	738	25.129	0.5024
0.85	2.3803	± 3 %	2.3089	2.4517	4.1119	243.19	579	26.700	0.5672
0.90	2.1231	± 3 %	2.0594	2.1868	4.6099	216.92	461	28.270	0.6359
0.95	1.9055	± 3 %	1.8483	1.9627	5.1364	194.69	371	29.841	0.7085
1.00	1.7197	± 3 %	1.6681	1.7713	5.6913	175.71	302	31.412	0.7850
1.10	1.4213	± 3 %	1.3787	1.4639	6.8864	145.21	206	34.553	0.9499
1.20	1.1943	± 3 %	1.1585	1.2301	8.1954	122.02	146	37.694	1.1304
1.30	1.0176	± 3 %	0.9871	1.0481	9.6182	103.97	106	40.835	1.3267
1.40	0.8774	± 3 %	0.8511	0.9037	11.1549	89.65	79	43.976	1.5386
1.50	0.7643	± 3 %	0.7414	0.7872	12.8053	78.09	60	47.117	1.7663
1.60	0.6718	± 3 %	0.6516	0.6920	14.5696	68.64	46	50.259	2.0096
1.70	0.5951	± 3 %	0.5772	0.6130	16.4477	60.80	36	53.400	2.2687
1.80	0.5308	± 3 %	0.5149	0.5467	18.4397	54.23	29	56.541	2.5434
1.90	0.4764	± 3 %	0.4621	0.4907	20.5454	48.67	23	59.682	2.8339
2.00	0.4299	± 3 %	0.4170	0.4428	22.7650	43.93	19	62.823	3.1400
2.25	0.3397	± 3 %	0.3295	0.3499	28.8120	34.71	11.79	70.676	3.9741
2.50	0.2752	± 3 %	0.2669	0.2835	35.5703	28.11	7.74	78.529	4.9063
2.80	0.2194	± 3 %	0.2128	0.2260	44.6194	22.41	4.92	87.952	6.1544
3.00	0.1911	± 3 %	0.1854	0.1968	51.2213	19.52	3.73	94.235	7.0650
3.25	0.1628	± 3 %	0.1579	0.1677	60.1138	16.64	2.71	102.088	8.2916
3.50	0.1404	± 3 %	0.1362	0.1446	69.7178	14.34	2.01	109.941	9.6163
3.80	0.1191	± 3 %	0.1155	0.1227	82.1817	12.17	1.45	119.364	11.3354
4.00	0.1075	± 3 %	0.1043	0.1107	91.0600	10.98	1.18	125.646	12.5600
4.50	0.0849	± 3 %	0.0824	0.0874	115.2478	8.677	0.74	141.352	15.8963
5.00	0.0688	± 3 %	0.0667	0.0709	142.2813	7.03	0.48	157.058	19.6250
5.50	0.0569	± 3 %	0.0552	0.0586	172.1603	5.809	0.33	172.764	23.7463
6.00	0.0478	± 3 %	0.0464	0.0492	204.8850	4.88	0.23	188.470	28.2600

RESISTOHM® 125

Resistivity 1.25 Ω mm²/m. Density 7.35 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700	800	900	1000
Ct	1.25	1.01	1.01	1.02	1.03	1.05	1.08	1.09	1.10	1.11	1.11

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	159.2357	± 5 %	151.2739	167.1975	0.0569	17570.83	2 797 903	3.141	0.0079
0.11	131.5997	± 5 %	125.0197	138.1797	0.0689	14521.35	1 911 006	3.455	0.0095
0.12	110.5803	± 5 %	105.0513	116.1093	0.0820	12201.97	1 349 297	3.769	0.0113
0.13	94.2223	± 5 %	89.5112	98.9334	0.0962	10396.94	979 624	4.084	0.0133
0.14	81.2427	± 5 %	77.1806	85.3048	0.1115	8964.71	728 317	4.398	0.0154
0.15	70.7714	± 5 %	67.2328	74.3100	0.1281	7809.26	552 672	4.712	0.0177
0.16	62.2014	± 5 %	59.0914	65.3115	0.1457	6863.61	426 926	5.026	0.0201
0.17	55.0988	± 5 %	52.3439	57.8538	0.1645	6079.87	334 994	5.340	0.0227
0.18	49.1468	± 5 %	46.6895	51.6042	0.1844	5423.10	266 528	5.654	0.0254
0.19	44.1096	± 5 %	41.9041	46.3151	0.2055	4867.27	214 693	5.968	0.0283
0.20	39.8089	± 5 %	37.8185	41.7994	0.2277	4392.71	174 869	6.282	0.0314
0.22	32.8999	± 5 %	31.2549	34.5449	0.2755	3630.34	119 438	6.911	0.0380
0.25	25.4777	± 5 %	24.2038	26.7516	0.3557	2811.33	71 626	7.853	0.0491
0.28	20.3107	± 5 %	19.2951	21.3262	0.4462	2241.18	45 520	8.795	0.0615
0.30	17.6929	± 5 %	16.8082	18.5775	0.5122	1952.31	34 542	9.423	0.0707
0.32	15.5504	± 5 %	14.7728	16.3279	0.5828	1715.90	26 683	10.052	0.0804
0.35	12.9988	± 5 %	12.3489	13.6488	0.6972	1434.35	18 645	10.994	0.0962
0.38	11.0274	± 5 %	10.4760	11.5788	0.8218	1216.82	13 418	11.936	0.1134
0.40	9.9522	± 5 %	9.4546	10.4498	0.9106	1098.18	10 929	12.565	0.1256
0.42	9.0270	± 5 %	8.5756	9.4783	1.0039	996.08	8 992	13.193	0.1385
0.45	7.8635	± 5 %	7.4703	8.2567	1.1525	867.70	6 823	14.135	0.1590
0.48	6.9113	± 5 %	6.5657	7.2568	1.3113	762.62	5 271	15.078	0.1809
0.50	6.3694	± 5 %	6.0509	6.6879	1.4228	702.83	4 477	15.706	0.1963
0.55	5.2640	± 3 %	5.1061	5.4219	1.7216	580.85	3 058	17.276	0.2375
0.60	4.4232	± 3 %	4.2905	4.5559	2.0489	488.08	2 159	18.847	0.2826
0.65	3.7689	± 3 %	3.6558	3.8820	2.4046	415.88	1 567	20.418	0.3317
0.70	3.2497	± 3 %	3.1522	3.3472	2.7887	358.59	1 165	21.988	0.3847
0.75	2.8309	± 3 %	2.7459	2.9158	3.2013	312.37	884	23.559	0.4416
0.80	2.4881	± 3 %	2.4134	2.5627	3.6424	274.54	683	25.129	0.5024
0.85	2.2040	± 3 %	2.1378	2.2701	4.1119	243.19	536	26.700	0.5672
0.90	1.9659	± 3 %	1.9069	2.0248	4.6099	216.92	426	28.270	0.6359
0.95	1.7644	± 3 %	1.7115	1.8173	5.1364	194.69	344	29.841	0.7085
1.00	1.5924	± 3 %	1.5446	1.6401	5.6913	175.71	280	31.412	0.7850
1.10	1.3160	± 3 %	1.2765	1.3555	6.8864	145.21	191	34.553	0.9499
1.20	1.1058	± 3 %	1.0726	1.1390	8.1954	122.02	135	37.694	1.1304
1.30	0.9422	± 3 %	0.9140	0.9705	9.6182	103.97	98	40.835	1.3267
1.40	0.8124	± 3 %	0.7881	0.8368	11.1549	89.65	73	43.976	1.5386
1.50	0.7077	± 3 %	0.6865	0.7289	12.8053	78.09	55	47.117	1.7663
1.60	0.6220	± 3 %	0.6034	0.6407	14.5696	68.64	43	50.259	2.0096
1.70	0.5510	± 3 %	0.5345	0.5675	16.4477	60.80	33	53.400	2.2687
1.80	0.4915	± 3 %	0.4767	0.5062	18.4397	54.23	27	56.541	2.5434
1.90	0.4411	± 3 %	0.4279	0.4543	20.5454	48.67	21	59.682	2.8339
2.00	0.3981	± 3 %	0.3861	0.4100	22.7650	43.93	17	62.823	3.1400
2.25	0.3145	± 3 %	0.3051	0.3240	28.8120	34.71	10.92	70.676	3.9741
2.50	0.2548	± 3 %	0.2471	0.2624	35.5703	28.11	7.16	78.529	4.9063
2.80	0.2031	± 3 %	0.1970	0.2092	44.6194	22.41	4.55	87.952	6.1544
3.00	0.1769	± 3 %	0.1716	0.1822	51.2213	19.52	3.45	94.235	7.0650
3.25	0.1508	± 3 %	0.1462	0.1553	60.1138	16.64	2.51	102.088	8.2916
3.50	0.1300	± 3 %	0.1261	0.1339	69.7178	14.34	1.86	109.941	9.6163
3.80	0.1103	± 3 %	0.1070	0.1136	82.1817	12.17	1.34	119.364	11.3354
4.00	0.0995	± 3 %	0.0965	0.1025	91.0600	10.98	1.09	125.646	12.5600
4.50	0.0786	± 3 %	0.0763	0.0810	115.2478	8.677	0.68	141.352	15.8963
5.00	0.0637	± 3 %	0.0618	0.0656	142.2813	7.03	0.45	157.058	19.6250
5.50	0.0526	± 3 %	0.0511	0.0542	172.1603	5.809	0.31	172.764	23.7463
6.00	0.0442	± 3 %	0.0429	0.0456	204.8850	4.88	0.22	188.470	28.2600


250 kg

IRON-CHROMIUM-ALUMINIUM

RESISTOHM 145 and RESISTOHM PRM: Resistivity 1.45 Ω mm²/m. Density 7.10 g/cm³.
RESISTOHM 140: Resistivity 1.40 Ω mm²/m. Density 7.15 g/cm³.
RESISTOHM Y: Resistivity 1.39 Ω mm²/m. Density 7.10 g/cm³.
RESISTOHM 135: Resistivity 1.35 Ω mm²/m. Density 7.25 g/cm³.
RESISTOHM 125: Resistivity 1.25 Ω mm²/m. Density 7.35 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Temperature °C	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
RESISTOHM 145 Ct	1.00	1.00	1.00	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.04	1.04
RESISTOHM 140 Ct	1.00	1.01	1.01	1.01	1.03	1.03	1.04	1.05	1.05	1.06	1.06	-	-
RESISTOHM Y Ct	1.00	1.00	1.01	1.02	1.03	1.05	1.07	1.08	1.08	1.08	1.08	1.08	1.08
RESISTOHM 135 Ct	1.00	1.01	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.07	1.07	-	-
RESISTOHM 125 Ct	1.01	1.01	1.02	1.03	1.05	1.08	1.09	1.10	1.11	1.11	-	-	-

Here are the conversion factors for FeCrAl alloys. Multiply the figures in the table by the conversion factor to obtain the data required for other alloys.

Alloy	Conversion Factor of Resistance	Conversion Factor of Weight g/m
RESISTOHM 125	0.927	1.007
RESISTOHM 135	1.000	1.000
RESISTOHM 140	1.016	1.000
RESISTOHM Y	1.015	0.993
RESISTOHM 145	1.051	0.986

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm²/m	Cross section mm²
5.0	0.10	2.8890	± 5 %	2.7446	3.0335	3.388	102.0	0.467
	0.11	2.6264	± 5 %	2.4950	2.7577	3.727	102.2	0.514
	0.12	2.4075	± 5 %	2.2871	2.5279	4.065	102.4	0.561
	0.14	2.0636	± 5 %	1.9604	2.1668	4.743	102.8	0.654
	0.15	1.9260	± 5 %	1.8297	2.0223	5.082	103.0	0.701
	0.18	1.6050	± 5 %	1.5248	1.6853	6.098	103.6	0.841
	0.19	1.5205	± 5 %	1.4445	1.5966	6.437	103.8	0.888
	0.20	1.4445	± 5 %	1.3723	1.5167	6.776	104.0	0.935
	0.22	1.3132	± 5 %	1.2475	1.3788	7.453	104.4	1.028
	0.25	1.1556	± 5 %	1.0978	1.2134	8.470	105.0	1.168
	0.30	0.9630	± 5 %	0.9149	1.0112	10.164	106.0	1.402
	0.35	0.8254	± 5 %	0.7842	0.8667	11.857	107.0	1.636
	0.40	0.7223	± 5 %	0.6861	0.7584	13.551	108.0	1.869
	0.45	0.6420	± 5 %	0.6099	0.6741	15.245	109.0	2.103
	0.50	0.5778	± 5 %	0.5489	0.6067	16.939	110.0	2.336
	0.60	0.4815	± 5 %	0.4574	0.5056	20.327	112.0	2.804
	0.70	0.4127	± 5 %	0.3921	0.4334	23.715	114.0	3.271
	0.80	0.3611	± 5 %	0.3431	0.3792	27.103	116.0	3.738
	0.90	0.3210	± 5 %	0.3050	0.3371	30.491	118.0	4.206
	1.00	0.2889	± 5 %	0.2745	0.3033	33.879	120.0	4.673
4.0	0.10	3.6113	± 5 %	3.4307	3.7918	2.710	82.0	0.374
	0.11	3.2830	± 5 %	3.1188	3.4471	2.981	82.2	0.411
	0.12	3.0094	± 5 %	2.8589	3.1598	3.252	82.4	0.449
	0.14	2.5795	± 5 %	2.4505	2.7084	3.794	82.8	0.523
	0.15	2.4075	± 5 %	2.2871	2.5279	4.065	83.0	0.561
	0.18	2.0063	± 5 %	1.9059	2.1066	4.879	83.6	0.673
	0.19	1.9007	± 5 %	1.8056	1.9957	5.150	83.8	0.710
	0.20	1.8056	± 5 %	1.7153	1.8959	5.421	84.0	0.748
	0.22	1.6415	± 5 %	1.5594	1.7236	5.963	84.4	0.822
	0.25	1.4445	± 5 %	1.3723	1.5167	6.776	85.0	0.935
	0.30	1.2038	± 5 %	1.1436	1.2639	8.131	86.0	1.121
	0.35	1.0318	± 5 %	0.9802	1.0834	9.486	87.0	1.308
	0.40	0.9028	± 5 %	0.8577	0.9480	10.841	88.0	1.495
	0.45	0.8025	± 5 %	0.7624	0.8426	12.196	89.0	1.682
	0.50	0.7223	± 5 %	0.6861	0.7584	13.551	90.0	1.869
	0.60	0.6019	± 5 %	0.5718	0.6320	16.262	92.0	2.243
	0.70	0.5159	± 5 %	0.4901	0.5417	18.972	94.0	2.617
	0.80	0.4514	± 5 %	0.4288	0.4740	21.682	96.0	2.991
	0.90	0.4013	± 5 %	0.3812	0.4213	24.393	98.0	3.364

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
4.0	1.00	0.3611	± 5 %	0.3431	0.3792	27.103	100.0	3.738
3.0	0.10	4.8150	± 5 %	4.5743	5.0558	2.033	62.0	0.280
	0.11	4.3773	± 5 %	4.1584	4.5961	2.236	62.2	0.308
	0.12	4.0125	± 5 %	3.8119	4.2131	2.439	62.4	0.336
	0.14	3.4393	± 5 %	3.2673	3.6113	2.846	62.8	0.393
	0.15	3.2100	± 5 %	3.0495	3.3705	3.049	63.0	0.421
	0.18	2.6750	± 5 %	2.5413	2.8088	3.659	63.6	0.505
	0.19	2.5342	± 5 %	2.4075	2.6609	3.862	63.8	0.533
	0.20	2.4075	± 5 %	2.2871	2.5279	4.065	64.0	0.561
	0.22	2.1886	± 5 %	2.0792	2.2981	4.472	64.4	0.617
	0.25	1.9260	± 5 %	1.8297	2.0223	5.082	65.0	0.701
	0.30	1.6050	± 5 %	1.5248	1.6853	6.098	66.0	0.841
	0.35	1.3757	± 5 %	1.3069	1.4445	7.114	67.0	0.981
	0.40	1.2038	± 5 %	1.1436	1.2639	8.131	68.0	1.121
	0.45	1.0700	± 5 %	1.0165	1.1235	9.147	69.0	1.262
	0.50	0.9630	± 5 %	0.9149	1.0112	10.164	70.0	1.402
	0.60	0.8025	± 5 %	0.7624	0.8426	12.196	72.0	1.682
	0.70	0.6879	± 5 %	0.6535	0.7223	14.229	74.0	1.963
	0.80	0.6019	± 5 %	0.5718	0.6320	16.262	76.0	2.243
	0.90	0.5350	± 5 %	0.5083	0.5618	18.294	78.0	2.523
	1.00	0.4815	± 5 %	0.4574	0.5056	20.327	80.0	2.804
2.5	0.10	5.7780	± 5 %	5.4891	6.0669	1.694	52.0	0.234
	0.11	5.2527	± 5 %	4.9901	5.5154	1.863	52.2	0.257
	0.12	4.8150	± 5 %	4.5743	5.0558	2.033	52.4	0.280
	0.14	4.1271	± 5 %	3.9208	4.3335	2.371	52.8	0.327
	0.15	3.8520	± 5 %	3.6594	4.0446	2.541	53.0	0.350
	0.18	3.2100	± 5 %	3.0495	3.3705	3.049	53.6	0.421
	0.19	3.0411	± 5 %	2.8890	3.1931	3.218	53.8	0.444
	0.20	2.8890	± 5 %	2.7446	3.0335	3.388	54.0	0.467
	0.22	2.6264	± 5 %	2.4950	2.7577	3.727	54.4	0.514
	0.25	2.3112	± 5 %	2.1956	2.4268	4.235	55.0	0.584
	0.30	1.9260	± 5 %	1.8297	2.0223	5.082	56.0	0.701
	0.35	1.6509	± 5 %	1.5683	1.7334	5.929	57.0	0.818
	0.40	1.4445	± 5 %	1.3723	1.5167	6.776	58.0	0.935
	0.45	1.2840	± 5 %	1.2198	1.3482	7.623	59.0	1.051
	0.50	1.1556	± 5 %	1.0978	1.2134	8.470	60.0	1.168
	0.60	0.9630	± 5 %	0.9149	1.0112	10.164	62.0	1.402
	0.70	0.8254	± 5 %	0.7842	0.8667	11.857	64.0	1.636
	0.80	0.7223	± 5 %	0.6861	0.7584	13.551	66.0	1.869
	0.90	0.6420	± 5 %	0.6099	0.6741	15.245	68.0	2.103
	1.00	0.5778	± 5 %	0.5489	0.6067	16.939	70.0	2.336
2.0	0.08	9.0281	± 5 %	8.5767	9.4795	1.084	41.6	0.150
	0.085	8.4971	± 5 %	8.0722	8.9219	1.152	41.7	0.159
	0.09	8.0250	± 5 %	7.6238	8.4263	1.220	41.8	0.168
	0.10	7.2225	± 5 %	6.8614	7.5836	1.355	42.0	0.187
	0.11	6.5659	± 5 %	6.2376	6.8942	1.491	42.2	0.206
	0.12	6.0188	± 5 %	5.7178	6.3197	1.626	42.4	0.224
	0.14	5.1589	± 5 %	4.9010	5.4169	1.897	42.8	0.262
	0.15	4.8150	± 5 %	4.5743	5.0558	2.033	43.0	0.280
	0.18	4.0125	± 5 %	3.8119	4.2131	2.439	43.6	0.336
	0.19	3.8013	± 5 %	3.6113	3.9914	2.575	43.8	0.355
	0.20	3.6113	± 5 %	3.4307	3.7918	2.710	44.0	0.374
	0.22	3.2830	± 5 %	3.1188	3.4471	2.981	44.4	0.411
	0.25	2.8890	± 5 %	2.7446	3.0335	3.388	45.0	0.467
	0.30	2.4075	± 5 %	2.2871	2.5279	4.065	46.0	0.561
	0.35	2.0636	± 5 %	1.9604	2.1668	4.743	47.0	0.654
	0.40	1.8056	± 5 %	1.7153	1.8959	5.421	48.0	0.748
	0.45	1.6050	± 5 %	1.5248	1.6853	6.098	49.0	0.841
	0.50	1.4445	± 5 %	1.3723	1.5167	6.776	50.0	0.935
	0.60	1.2038	± 5 %	1.1436	1.2639	8.131	52.0	1.121
	0.70	1.0318	± 5 %	0.9802	1.0834	9.486	54.0	1.308

Resistohm® 145, Resistohm PRM, Resistohm 140, Resistohm Y, Resistohm 135 and Resistohm 125 ribbon dimensions and properties.

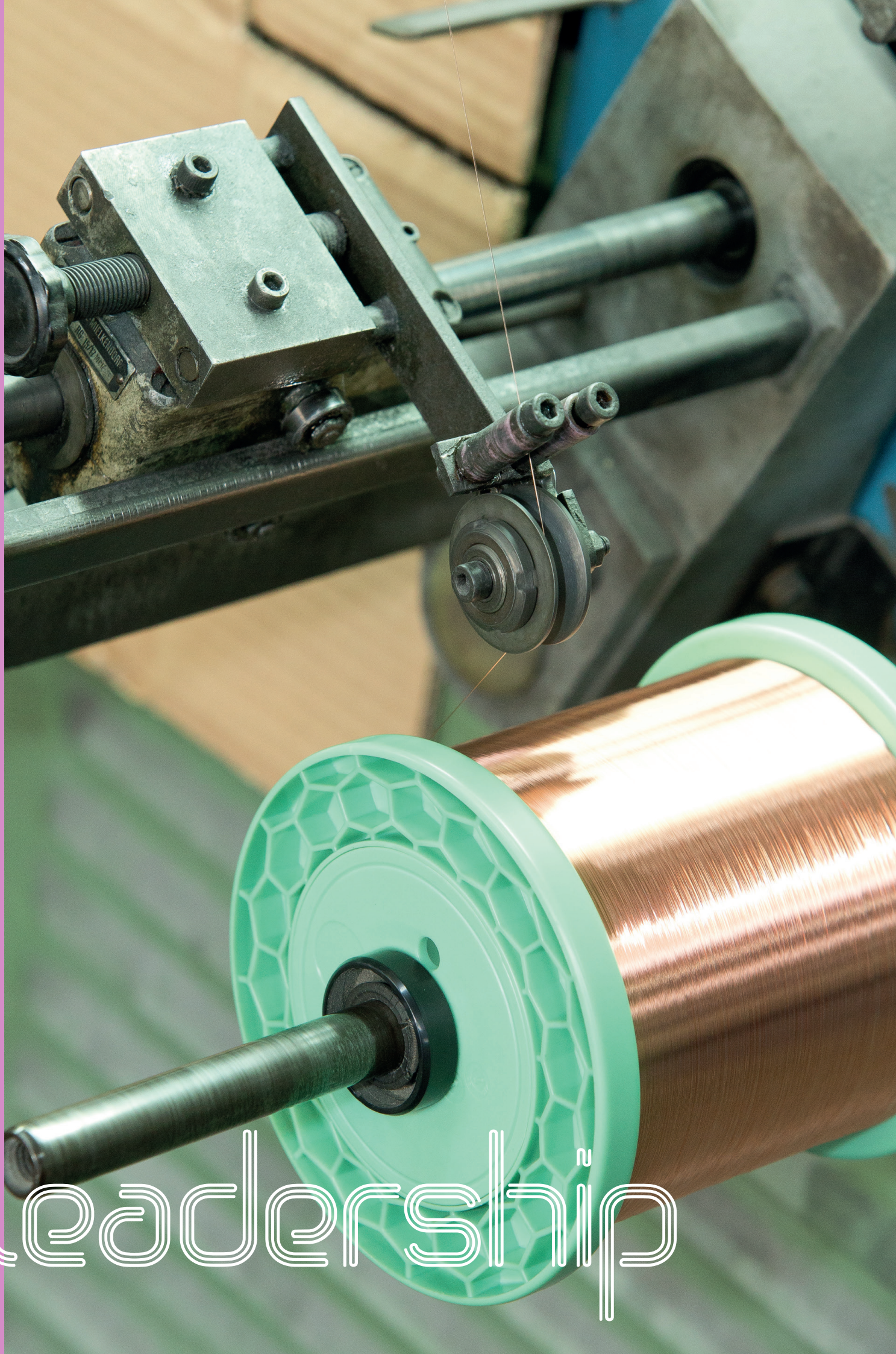
Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
2.0	0.80	0.9028	± 5 %	0.8577	0.9480	10.841	56.0	1.495
	0.90	0.8025	± 5 %	0.7624	0.8426	12.196	58.0	1.682
	1.00	0.7223	± 5 %	0.6861	0.7584	13.551	60.0	1.869
1.8	0.08	10.0313	± 5 %	9.5297	10.5328	0.976	37.6	0.135
	0.085	9.4412	± 5 %	8.9691	9.9132	1.037	37.7	0.143
	0.09	8.9167	± 5 %	8.4708	9.3625	1.098	37.8	0.151
	0.10	8.0250	± 5 %	7.6238	8.4263	1.220	38.0	0.168
	0.11	7.2955	± 5 %	6.9307	7.6602	1.342	38.2	0.185
	0.12	6.6875	± 5 %	6.3531	7.0219	1.464	38.4	0.202
	0.14	5.7321	± 5 %	5.4455	6.0188	1.707	38.8	0.236
	0.15	5.3500	± 5 %	5.0825	5.6175	1.829	39.0	0.252
	0.18	4.4583	± 5 %	4.2354	4.6813	2.195	39.6	0.303
	0.19	4.2237	± 5 %	4.0125	4.4349	2.317	39.8	0.320
	0.20	4.0125	± 5 %	3.8119	4.2131	2.439	40.0	0.336
	0.22	3.6477	± 5 %	3.4653	3.8301	2.683	40.4	0.370
	0.25	3.2100	± 5 %	3.0495	3.3705	3.049	41.0	0.421
	0.30	2.6750	± 5 %	2.5413	2.8088	3.659	42.0	0.505
	0.35	2.2929	± 5 %	2.1782	2.4075	4.269	43.0	0.589
	0.40	2.0063	± 5 %	1.9059	2.1066	4.879	44.0	0.673
	0.45	1.7833	± 5 %	1.6942	1.8725	5.488	45.0	0.757
	0.50	1.6050	± 5 %	1.5248	1.6853	6.098	46.0	0.841
	0.60	1.3375	± 5 %	1.2706	1.4044	7.318	48.0	1.009
	0.70	1.1464	± 5 %	1.0891	1.2038	8.537	50.0	1.178
	0.80	1.0031	± 5 %	0.9530	1.0533	9.757	52.0	1.346
	0.90	0.8917	± 5 %	0.8471	0.9363	10.977	54.0	1.514
	1.00	0.8025	± 5 %	0.7624	0.8426	12.196	56.0	1.682
1.5	0.075	12.8400	± 5 %	12.1980	13.4820	0.762	31.5	0.105
	0.08	12.0375	± 5 %	11.4356	12.6394	0.813	31.6	0.112
	0.085	11.3294	± 5 %	10.7629	11.8959	0.864	31.7	0.119
	0.09	10.7000	± 5 %	10.1650	11.2350	0.915	31.8	0.126
	0.10	9.6300	± 5 %	9.1485	10.1115	1.016	32.0	0.140
	0.11	8.7545	± 5 %	8.3168	9.1923	1.118	32.2	0.154
	0.12	8.0250	± 5 %	7.6238	8.4263	1.220	32.4	0.168
	0.14	6.8786	± 5 %	6.5346	7.2225	1.423	32.8	0.196
	0.15	6.4200	± 5 %	6.0990	6.7410	1.525	33.0	0.210
	0.18	5.3500	± 5 %	5.0825	5.6175	1.829	33.6	0.252
	0.19	5.0684	± 5 %	4.8150	5.3218	1.931	33.8	0.266
	0.20	4.8150	± 5 %	4.5743	5.0558	2.033	34.0	0.280
	0.22	4.3773	± 5 %	4.1584	4.5961	2.236	34.4	0.308
	0.25	3.8520	± 5 %	3.6594	4.0446	2.541	35.0	0.350
	0.30	3.2100	± 5 %	3.0495	3.3705	3.049	36.0	0.421
	0.35	2.7514	± 5 %	2.6139	2.8890	3.557	37.0	0.491
	0.40	2.4075	± 5 %	2.2871	2.5279	4.065	38.0	0.561
	0.45	2.1400	± 5 %	2.0330	2.2470	4.574	39.0	0.631
	0.50	1.9260	± 5 %	1.8297	2.0223	5.082	40.0	0.701
	0.60	1.6050	± 5 %	1.5248	1.6853	6.098	42.0	0.841
	0.70	1.3757	± 5 %	1.3069	1.4445	7.114	44.0	0.981
	0.80	1.2038	± 5 %	1.1436	1.2639	8.131	46.0	1.121
	0.90	1.0700	± 5 %	1.0165	1.1235	9.147	48.0	1.262
	1.00	0.9630	± 5 %	0.9149	1.0112	10.164	50.0	1.402
1.2	0.07	17.1964	± 5 %	16.3366	18.0563	0.569	25.4	0.079
	0.075	16.0500	± 5 %	15.2475	16.8525	0.610	25.5	0.084
	0.08	15.0469	± 5 %	14.2945	15.7992	0.650	25.6	0.090
	0.085	14.1618	± 5 %	13.4537	14.8699	0.691	25.7	0.095
	0.09	13.3750	± 5 %	12.7063	14.0438	0.732	25.8	0.101
	0.10	12.0375	± 5 %	11.4356	12.6394	0.813	26.0	0.112
	0.11	10.9432	± 5 %	10.3960	11.4903	0.894	26.2	0.123
	0.12	10.0313	± 5 %	9.5297	10.5328	0.976	26.4	0.135
	0.14	8.5982	± 5 %	8.1683	9.0281	1.138	26.8	0.157
	0.15	8.0250	± 5 %	7.6238	8.4263	1.220	27.0	0.168
	0.18	6.6875	± 5 %	6.3531	7.0219	1.464	27.6	0.202

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
1.2	0.19	6.3355	± 5 %	6.0188	6.6523	1.545	27.8	0.213
	0.20	6.0188	± 5 %	5.7178	6.3197	1.626	28.0	0.224
	0.22	5.4716	± 5 %	5.1980	5.7452	1.789	28.4	0.247
	0.25	4.8150	± 5 %	4.5743	5.0558	2.033	29.0	0.280
	0.30	4.0125	± 5 %	3.8119	4.2131	2.439	30.0	0.336
	0.35	3.4393	± 5 %	3.2673	3.6113	2.846	31.0	0.393
	0.40	3.0094	± 5 %	2.8589	3.1598	3.252	32.0	0.449
	0.45	2.6750	± 5 %	2.5413	2.8088	3.659	33.0	0.505
	0.50	2.4075	± 5 %	2.2871	2.5279	4.065	34.0	0.561
	0.60	2.0063	± 5 %	1.9059	2.1066	4.879	36.0	0.673
	0.70	1.7196	± 5 %	1.6337	1.8056	5.692	38.0	0.785
1.0	0.06	24.0750	± 5 %	22.8713	25.2788	0.407	21.2	0.056
	0.07	20.6357	± 5 %	19.6039	21.6675	0.474	21.4	0.065
	0.075	19.2600	± 5 %	18.2970	20.2230	0.508	21.5	0.070
	0.08	18.0563	± 5 %	17.1534	18.9591	0.542	21.6	0.075
	0.085	16.9941	± 5 %	16.1444	17.8438	0.576	21.7	0.079
	0.09	16.0500	± 5 %	15.2475	16.8525	0.610	21.8	0.084
	0.10	14.4450	± 5 %	13.7228	15.1673	0.678	22.0	0.093
	0.11	13.1318	± 5 %	12.4752	13.7884	0.745	22.2	0.103
	0.12	12.0375	± 5 %	11.4356	12.6394	0.813	22.4	0.112
	0.14	10.3179	± 5 %	9.8020	10.8338	0.949	22.8	0.131
	0.15	9.6300	± 5 %	9.1485	10.1115	1.016	23.0	0.140
	0.18	8.0250	± 5 %	7.6238	8.4263	1.220	23.6	0.168
	0.19	7.6026	± 5 %	7.2225	7.9828	1.287	23.8	0.178
	0.20	7.2225	± 5 %	6.8614	7.5836	1.355	24.0	0.187
	0.22	6.5659	± 5 %	6.2376	6.8942	1.491	24.4	0.206
	0.25	5.7780	± 5 %	5.4891	6.0669	1.694	25.0	0.234
	0.30	4.8150	± 5 %	4.5743	5.0558	2.033	26.0	0.280
	0.35	4.1271	± 5 %	3.9208	4.3335	2.371	27.0	0.327
	0.40	3.6113	± 5 %	3.4307	3.7918	2.710	28.0	0.374
	0.45	3.2100	± 5 %	3.0495	3.3705	3.049	29.0	0.421
	0.50	2.8890	± 5 %	2.7446	3.0335	3.388	30.0	0.467
	0.60	2.4075	± 5 %	2.2871	2.5279	4.065	32.0	0.561
	0.70	2.0636	± 5 %	1.9604	2.1668	4.743	34.0	0.654
0.9	0.06	26.7500	± 5 %	25.4125	28.0875	0.366	19.2	0.050
	0.07	22.9286	± 5 %	21.7821	24.0750	0.427	19.4	0.059
	0.075	21.4000	± 5 %	20.3300	22.4700	0.457	19.5	0.063
	0.08	20.0625	± 5 %	19.0594	21.0656	0.488	19.6	0.067
	0.085	18.8824	± 5 %	17.9382	19.8265	0.518	19.7	0.071
	0.09	17.8333	± 5 %	16.9417	18.7250	0.549	19.8	0.076
	0.10	16.0500	± 5 %	15.2475	16.8525	0.610	20.0	0.084
	0.11	14.5909	± 5 %	13.8614	15.3205	0.671	20.2	0.093
	0.12	13.3750	± 5 %	12.7063	14.0438	0.732	20.4	0.101
	0.14	11.4643	± 5 %	10.8911	12.0375	0.854	20.8	0.118
	0.15	10.7000	± 5 %	10.1650	11.2350	0.915	21.0	0.126
	0.18	8.9167	± 5 %	8.4708	9.3625	1.098	21.6	0.151
	0.19	8.4474	± 5 %	8.0250	8.8697	1.159	21.8	0.160
	0.20	8.0250	± 5 %	7.6238	8.4263	1.220	22.0	0.168
	0.22	7.2955	± 5 %	6.9307	7.6602	1.342	22.4	0.185
	0.25	6.4200	± 5 %	6.0990	6.7410	1.525	23.0	0.210
	0.30	5.3500	± 5 %	5.0825	5.6175	1.829	24.0	0.252
	0.35	4.5857	± 5 %	4.3564	4.8150	2.134	25.0	0.294
	0.40	4.0125	± 5 %	3.8119	4.2131	2.439	26.0	0.336
	0.45	3.5667	± 5 %	3.3883	3.7450	2.744	27.0	0.379
	0.50	3.2100	± 5 %	3.0495	3.3705	3.049	28.0	0.421
	0.60	2.6750	± 5 %	2.5413	2.8088	3.659	30.0	0.505
0.8	0.06	30.0938	± 5 %	28.5891	31.5984	0.325	17.2	0.045
	0.07	25.7946	± 5 %	24.5049	27.0844	0.379	17.4	0.052
	0.075	24.0750	± 5 %	22.8713	25.2788	0.407	17.5	0.056
	0.08	22.5703	± 5 %	21.4418	23.6988	0.434	17.6	0.060
	0.085	21.2426	± 5 %	20.1805	22.3048	0.461	17.7	0.064

Resistohm® 145, Resistohm PRM, Resistohm 140, Resistohm Y, Resistohm 135 and Resistohm 125 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
	0.09	20.0625	± 5 %	19.0594	21.0656	0.488	17.8	0.067
	0.10	18.0563	± 5 %	17.1534	18.9591	0.542	18.0	0.075
	0.11	16.4148	± 5 %	15.5940	17.2355	0.596	18.2	0.082
	0.12	15.0469	± 5 %	14.2945	15.7992	0.650	18.4	0.090
	0.14	12.8973	± 5 %	12.2525	13.5422	0.759	18.8	0.105
	0.15	12.0375	± 5 %	11.4356	12.6394	0.813	19.0	0.112
	0.18	10.0313	± 5 %	9.5297	10.5328	0.976	19.6	0.135
	0.19	9.5033	± 5 %	9.0281	9.9785	1.030	19.8	0.142
0.8	0.20	9.0281	± 5 %	8.5767	9.4795	1.084	20.0	0.150
	0.22	8.2074	± 5 %	7.7970	8.6178	1.193	20.4	0.164
	0.25	7.2225	± 5 %	6.8614	7.5836	1.355	21.0	0.187
	0.30	6.0188	± 5 %	5.7178	6.3197	1.626	22.0	0.224
	0.35	5.1589	± 5 %	4.9010	5.4169	1.897	23.0	0.262
	0.40	4.5141	± 5 %	4.2884	4.7398	2.168	24.0	0.299
	0.45	4.0125	± 5 %	3.8119	4.2131	2.439	25.0	0.336
	0.50	3.6113	± 5 %	3.4307	3.7918	2.710	26.0	0.374
	0.60	3.0094	± 5 %	2.8589	3.1598	3.252	28.0	0.449
	0.06	34.3929	± 5 %	32.6732	36.1125	0.285	15.2	0.039
	0.07	29.4796	± 5 %	28.0056	30.9536	0.332	15.4	0.046
	0.075	27.5143	± 5 %	26.1386	28.8900	0.356	15.5	0.049
	0.08	25.7946	± 5 %	24.5049	27.0844	0.379	15.6	0.052
	0.085	24.2773	± 5 %	23.0634	25.4912	0.403	15.7	0.056
	0.09	22.9286	± 5 %	21.7821	24.0750	0.427	15.8	0.059
	0.10	20.6357	± 5 %	19.6039	21.6675	0.474	16.0	0.065
	0.11	18.7597	± 5 %	17.8218	19.6977	0.522	16.2	0.072
	0.12	17.1964	± 5 %	16.3366	18.0563	0.569	16.4	0.079
	0.14	14.7398	± 5 %	14.0028	15.4768	0.664	16.8	0.092
0.7	0.15	13.7571	± 5 %	13.0693	14.4450	0.711	17.0	0.098
	0.18	11.4643	± 5 %	10.8911	12.0375	0.854	17.6	0.118
	0.19	10.8609	± 5 %	10.3179	11.4039	0.901	17.8	0.124
	0.20	10.3179	± 5 %	9.8020	10.8338	0.949	18.0	0.131
	0.22	9.3799	± 5 %	8.9109	9.8489	1.043	18.4	0.144
	0.25	8.2543	± 5 %	7.8416	8.6670	1.186	19.0	0.164
	0.30	6.8786	± 5 %	6.5346	7.2225	1.423	20.0	0.196
	0.35	5.8959	± 5 %	5.6011	6.1907	1.660	21.0	0.229
	0.40	5.1589	± 5 %	4.9010	5.4169	1.897	22.0	0.262
	0.45	4.5857	± 5 %	4.3564	4.8150	2.134	23.0	0.294
	0.50	4.1271	± 5 %	3.9208	4.3335	2.371	24.0	0.327
	0.06	40.1250	± 5 %	38.1188	42.1313	0.244	13.2	0.034
	0.07	34.3929	± 5 %	32.6732	36.1125	0.285	13.4	0.039
	0.075	32.1000	± 5 %	30.4950	33.7050	0.305	13.5	0.042
	0.08	30.0938	± 5 %	28.5891	31.5984	0.325	13.6	0.045
	0.085	28.3235	± 5 %	26.9074	29.7397	0.346	13.7	0.048
	0.09	26.7500	± 5 %	25.4125	28.0875	0.366	13.8	0.050
	0.10	24.0750	± 5 %	22.8713	25.2788	0.407	14.0	0.056
	0.11	21.8864	± 5 %	20.7920	22.9807	0.447	14.2	0.062
	0.12	20.0625	± 5 %	19.0594	21.0656	0.488	14.4	0.067
	0.14	17.1964	± 5 %	16.3366	18.0563	0.569	14.8	0.079
0.6	0.15	16.0500	± 5 %	15.2475	16.8525	0.610	15.0	0.084
	0.18	13.3750	± 5 %	12.7063	14.0438	0.732	15.6	0.101
	0.19	12.6711	± 5 %	12.0375	13.3046	0.772	15.8	0.107
	0.20	12.0375	± 5 %	11.4356	12.6394	0.813	16.0	0.112
	0.22	10.9432	± 5 %	10.3960	11.4903	0.894	16.4	0.123
	0.25	9.6300	± 5 %	9.1485	10.1115	1.016	17.0	0.140
	0.30	8.0250	± 5 %	7.6238	8.4263	1.220	18.0	0.168
	0.35	6.8786	± 5 %	6.5346	7.2225	1.423	19.0	0.196
	0.40	6.0188	± 5 %	5.7178	6.3197	1.626	20.0	0.224
	0.45	5.3500	± 5 %	5.0825	5.6175	1.829	21.0	0.252
	0.06	48.1500	± 5 %	45.7425	50.5575	0.203	11.2	0.028
0.5	0.07	41.2714	± 5 %	39.2079	43.3350	0.237	11.4	0.033
	0.075	38.5200	± 5 %	36.5940	40.4460	0.254	11.5	0.035

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
0.5	0.08	36.1125	± 5 %	34.3069	37.9181	0.271	11.6	0.037
	0.085	33.9882	± 5 %	32.2888	35.6876	0.288	11.7	0.040
	0.09	32.1000	± 5 %	30.4950	33.7050	0.305	11.8	0.042
	0.10	28.8900	± 5 %	27.4455	30.3345	0.339	12.0	0.047
	0.11	26.2636	± 5 %	24.9505	27.5768	0.373	12.2	0.051
	0.12	24.0750	± 5 %	22.8713	25.2788	0.407	12.4	0.056
	0.14	20.6357	± 5 %	19.6039	21.6675	0.474	12.8	0.065
	0.15	19.2600	± 5 %	18.2970	20.2230	0.508	13.0	0.070
	0.18	16.0500	± 5 %	15.2475	16.8525	0.610	13.6	0.084
	0.19	15.2053	± 5 %	14.4450	15.9655	0.644	13.8	0.089
	0.20	14.4450	± 5 %	13.7228	15.1673	0.678	14.0	0.093
0.4	0.05	72.2250	± 5 %	68.6138	75.8363	0.136	9.0	0.019
	0.06	60.1875	± 5 %	57.1781	63.1969	0.163	9.2	0.022
	0.07	51.5893	± 5 %	49.0098	54.1688	0.190	9.4	0.026
	0.075	48.1500	± 5 %	45.7425	50.5575	0.203	9.5	0.028
	0.08	45.1406	± 5 %	42.8836	47.3977	0.217	9.6	0.030
	0.085	42.4853	± 5 %	40.3610	44.6096	0.230	9.7	0.032
	0.09	40.1250	± 5 %	38.1188	42.1313	0.244	9.8	0.034
	0.10	36.1125	± 5 %	34.3069	37.9181	0.271	10.0	0.037
	0.11	32.8295	± 5 %	31.1881	34.4710	0.298	10.2	0.041
	0.12	30.0938	± 5 %	28.5891	31.5984	0.325	10.4	0.045
	0.14	25.7946	± 5 %	24.5049	27.0844	0.379	10.8	0.052
	0.15	24.0750	± 5 %	22.8713	25.2788	0.407	11.0	0.056
	0.18	20.0625	± 5 %	19.0594	21.0656	0.488	11.6	0.067
	0.19	19.0066	± 5 %	18.0563	19.9569	0.515	11.8	0.071
	0.20	18.0563	± 5 %	17.1534	18.9591	0.542	12.0	0.075
0.3	0.05	96.3000	± 5 %	91.4850	101.1150	0.102	7.0	0.014
	0.06	80.2500	± 5 %	76.2375	84.2625	0.122	7.2	0.017
	0.07	68.7857	± 5 %	65.3464	72.2250	0.142	7.4	0.020
	0.075	64.2000	± 5 %	60.9900	67.4100	0.152	7.5	0.021
	0.08	60.1875	± 5 %	57.1781	63.1969	0.163	7.6	0.022
	0.085	56.6471	± 5 %	53.8147	59.4794	0.173	7.7	0.024
	0.09	53.5000	± 5 %	50.8250	56.1750	0.183	7.8	0.025
	0.10	48.1500	± 5 %	45.7425	50.5575	0.203	8.0	0.028
	0.11	43.7727	± 5 %	41.5841	45.9614	0.224	8.2	0.031
	0.12	40.1250	± 5 %	38.1188	42.1313	0.244	8.4	0.034
	0.14	34.3929	± 5 %	32.6732	36.1125	0.285	8.8	0.039
	0.15	32.1000	± 5 %	30.4950	33.7050	0.305	9.0	0.042
0.2	0.05	144.4500	± 5 %	137.2275	151.6725	0.068	5.0	0.009
	0.06	120.3750	± 5 %	114.3563	126.3938	0.081	5.2	0.011
	0.07	103.1786	± 5 %	98.0196	108.3375	0.095	5.4	0.013
	0.075	96.3000	± 5 %	91.4850	101.1150	0.102	5.5	0.014
	0.08	90.2813	± 5 %	85.7672	94.7953	0.108	5.6	0.015
	0.085	84.9706	± 5 %	80.7221	89.2191	0.115	5.7	0.016
	0.09	80.2500	± 5 %	76.2375	84.2625	0.122	5.8	0.017
	0.10	72.2250	± 5 %	68.6138	75.8363	0.136	6.0	0.019
	0.11	65.6591	± 5 %	62.3761	68.9420	0.149	6.2	0.021
	0.12	60.1875	± 5 %	57.1781	63.1969	0.163	6.4	0.022
	0.14	51.5893	± 5 %	49.0098	54.1688	0.190	6.8	0.026
	0.15	48.1500	± 5 %	45.7425	50.5575	0.203	7.0	0.028



leadership

Copper-Nickel & Iron-Nickel Alloys

Copper-nickel alloys are highly resistant to corrosion and have a very low resistivity. These alloys are recommended for the manufacturing of low temperature electric resistances.

Highly used in the automotive industry, these alloys are not for furnace applications as they have a maximum operating temperature of 400°C (752°F).

CuNi alloys have the particularity to have a very high thermal conductivity and also a high level of formability and weldability. One of the most widely used alloys of this grade is the CuNi 44, also known as Constantan.

Iron-nickel alloys are corrosion resistant, present a particular strength and have a good conductivity. The main characteristics are their low thermal expansion and magnetic permeability. Applications include thermostats and other measuring devices.

CuNi 44

This alloy has a very low temperature coefficient, which is particularly interesting for precision measurement application. CuNi 44 offers good ductility, solderability and weldability. It is very resistant to corrosion. Applications include resistors, whose resistance must vary as little as possible with temperature change, potentiometers, volume control devices. CuNi 44 is also used as a thermocouple alloy because of the fact that it has a high thermal electromotive force against other metals.

CuNi 23 Mn - CuNi 10 - CuNi 6 - CuNi 2

These copper-nickel alloys can be used in every kind of resistance operated at low temperatures. They are resistant to corrosion and very malleable and have a lower resistivity than CuNi 44, between 0.30 and 0.05 Ω mm^2/m. The maximum operating temperature range for these alloys is bewteen 300 et 400°C (572 and 752°F). Aperam Alloys Rescal covers all the range which is of interest for our customers with these four alloys.

Phy 400

This copper-nickel alloy has a good ductility and is highly resistant to many corrosive environments such as sea water or hydrofluoric water.

Clad 40

This is a copper plated steel with a good electrical conductivity. Steel improves mechanical strength, electrical weldability of this alloy. It is particulalrly used in the manufacture of shunts.

Manganina

It is a copper-based alloy with manganese and Nickel. Manganina is used in the manufacture of resistors for its very low temperature coefficient and relative long term stability of the electrical resistance.

INVAR®

Invar® is an iron-nickel alloy with the lowest coefficient of thermal expansion in the temperature range -100°C to +230°C. It features optimised chemical compositions in order to achieve the best balance between expansion and the other properties required by the applications: mechanical properties, weldability, structural stability at cryogenic temperature, etc. Typical applications are thermostat rods, clock balance wheels, moulds for composites and filters for mobile telephone relay stations.

FeNi 70 (Hytemco)

This alloy, also known as Hytemco, is an iron-nickel alloys which has a very high temperature coefficient. Its resistivity at 300°C is 2.65 times more important than its value when cold. It is used for its high change of resistance with temperature in all applications requiring a self regulation of current.

CuNi 44

Resistivity 0.49 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600
Ct	0.49	1.002	1.002	1.001	1.005	1.007	1.007

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	62.4204	± 5 %	59.2994	65.5414	0.0699	14313.32	893 443	3.141	0.0079
0.11	51.5871	± 5 %	49.0077	54.1664	0.0845	11829.19	610 233	3.455	0.0095
0.12	43.3475	± 5 %	41.1801	45.5149	0.1006	9939.80	430 866	3.769	0.0113
0.13	36.9351	± 5 %	35.0884	38.7819	0.1181	8469.42	312 819	4.084	0.0133
0.14	31.8471	± 5 %	30.2548	33.4395	0.1369	7302.71	232 570	4.398	0.0154
0.15	27.7424	± 5 %	26.3553	29.1295	0.1572	6361.47	176 483	4.712	0.0177
0.16	24.3830	± 5 %	23.1638	25.6021	0.1789	5591.14	136 329	5.026	0.0201
0.17	21.5987	± 5 %	20.5188	22.6787	0.2019	4952.71	106 972	5.340	0.0227
0.18	19.2656	± 5 %	18.3023	20.2288	0.2264	4417.69	85 109	5.654	0.0254
0.19	17.2910	± 5 %	16.4264	18.1555	0.2522	3964.91	68 557	5.968	0.0283
0.20	15.6051	± 5 %	14.8248	16.3854	0.2795	3578.33	55 840	6.282	0.0314
0.22	12.8968	± 5 %	12.2519	13.5416	0.3381	2957.30	38 140	6.911	0.0380
0.25	9.9873	± 5 %	9.4879	10.4866	0.4367	2290.13	22 872	7.853	0.0491
0.28	7.9618	± 5 %	7.5637	8.3599	0.5477	1825.68	14 536	8.795	0.0615
0.30	6.9356	± 5 %	6.5888	7.2824	0.6288	1590.37	11 030	9.423	0.0707
0.32	6.0957	± 5 %	5.7910	6.4005	0.7154	1397.79	8 521	10.052	0.0804
0.35	5.0955	± 5 %	4.8408	5.3503	0.8558	1168.43	5 954	10.994	0.0962
0.38	4.3227	± 5 %	4.1066	4.5389	1.0089	991.23	4 285	11.936	0.1134
0.40	3.9013	± 5 %	3.7062	4.0963	1.1178	894.58	3 490	12.565	0.1256
0.42	3.5386	± 5 %	3.3616	3.7155	1.2324	811.41	2 871	13.193	0.1385
0.45	3.0825	± 5 %	2.9284	3.2366	1.4148	706.83	2 179	14.135	0.1590
0.48	2.7092	± 5 %	2.5738	2.8447	1.6097	621.24	1 683	15.078	0.1809
0.50	2.4968	± 5 %	2.3720	2.6217	1.7466	572.53	1 430	15.706	0.1963
0.55	2.0635	± 3 %	2.0016	2.1254	2.1134	473.17	976	17.276	0.2375
0.60	1.7339	± 3 %	1.6819	1.7859	2.5151	397.59	689	18.847	0.2826
0.65	1.4774	± 3 %	1.4331	1.5217	2.9518	338.78	501	20.418	0.3317
0.70	1.2739	± 3 %	1.2357	1.3121	3.4234	292.11	372	21.988	0.3847
0.75	1.1097	± 3 %	1.0764	1.1430	3.9299	254.46	282	23.559	0.4416
0.80	0.9753	± 3 %	0.9461	1.0046	4.4714	223.65	218	25.129	0.5024
0.85	0.8639	± 3 %	0.8380	0.8899	5.0477	198.11	171	26.700	0.5672
0.90	0.7706	± 3 %	0.7475	0.7937	5.6591	176.71	136	28.270	0.6359
0.95	0.6916	± 3 %	0.6709	0.7124	6.3053	158.60	110	29.841	0.7085
1.00	0.6242	± 3 %	0.6055	0.6429	6.9865	143.13	89	31.412	0.7850
1.10	0.5159	± 3 %	0.5004	0.5313	8.4537	118.29	61	34.553	0.9499
1.20	0.4335	± 3 %	0.4205	0.4465	10.0606	99.40	43	37.694	1.1304
1.30	0.3694	± 3 %	0.3583	0.3804	11.8072	84.69	31	40.835	1.3267
1.40	0.3185	± 3 %	0.3089	0.3280	13.6935	73.03	23	43.976	1.5386
1.50	0.2774	± 3 %	0.2691	0.2857	15.7196	63.61	18	47.117	1.7663
1.60	0.2438	± 3 %	0.2365	0.2511	17.8854	55.91	14	50.259	2.0096
1.70	0.2160	± 3 %	0.2095	0.2225	20.1910	49.53	11	53.400	2.2687
1.80	0.1927	± 3 %	0.1869	0.1984	22.6363	44.18	9	56.541	2.5434
1.90	0.1729	± 3 %	0.1677	0.1781	25.2213	39.65	6.86	59.682	2.8339
2.00	0.1561	± 3 %	0.1514	0.1607	27.9460	35.78	5.58	62.823	3.1400
2.25	0.1233	± 3 %	0.1196	0.1270	35.3692	28.27	3.49	70.676	3.9741
2.50	0.0999	± 3 %	0.0969	0.1029	43.6656	22.90	2.29	78.529	4.9063
2.80	0.0796	± 3 %	0.0772	0.0820	54.7742	18.26	1.45	87.952	6.1544
3.00	0.0694	± 3 %	0.0673	0.0714	62.8785	15.90	1.10	94.235	7.0650
3.25	0.0591	± 3 %	0.0573	0.0609	73.7949	13.55	0.80	102.088	8.2916
3.50	0.0510	± 3 %	0.0494	0.0525	85.5846	11.68	0.60	109.941	9.6163
3.80	0.0432	± 3 %	0.0419	0.0445	100.8851	9.91	0.43	119.364	11.3354
4.00	0.0390	± 3 %	0.0378	0.0402	111.7840	8.95	0.35	125.646	12.5600
4.50	0.0308	± 3 %	0.0299	0.0317	141.4766	7.068	0.22	141.352	15.8963
5.00	0.0250	± 3 %	0.0242	0.0257	174.6625	5.73	0.14	157.058	19.6250
5.50	0.0206	± 3 %	0.0200	0.0213	211.3416	4.732	0.10	172.764	23.7463
6.00	0.0173	± 3 %	0.0168	0.0179	251.5140	3.98	0.07	188.470	28.2600

CuNi 23 Mn

Resistivity 0.30 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400
Ct	0.30	1.02	1.03	1.04	1.06

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	38.2166	± 5 %	36.3057	40.1274	0.0699	14313.32	547 006	3.141	0.0079
0.11	31.5839	± 5 %	30.0047	33.1631	0.0845	11829.19	373 612	3.455	0.0095
0.12	26.5393	± 5 %	25.2123	27.8662	0.1006	9939.80	263 795	3.769	0.0113
0.13	22.6133	± 5 %	21.4827	23.7440	0.1181	8469.42	191 522	4.084	0.0133
0.14	19.4982	± 5 %	18.5233	20.4732	0.1369	7302.71	142 390	4.398	0.0154
0.15	16.9851	± 5 %	16.1359	17.8344	0.1572	6361.47	108 051	4.712	0.0177
0.16	14.9283	± 5 %	14.1819	15.6748	0.1789	5591.14	83 466	5.026	0.0201
0.17	13.2237	± 5 %	12.5625	13.8849	0.2019	4952.71	65 493	5.340	0.0227
0.18	11.7952	± 5 %	11.2055	12.3850	0.2264	4417.69	52 108	5.654	0.0254
0.19	10.5863	± 5 %	10.0570	11.1156	0.2522	3964.91	41 974	5.968	0.0283
0.20	9.5541	± 5 %	9.0764	10.0318	0.2795	3578.33	34 188	6.282	0.0314
0.22	7.8960	± 5 %	7.5012	8.2908	0.3381	2957.30	23 351	6.911	0.0380
0.25	6.1146	± 5 %	5.8089	6.4204	0.4367	2290.13	14 003	7.853	0.0491
0.28	4.8746	± 5 %	4.6308	5.1183	0.5477	1825.68	8 899	8.795	0.0615
0.30	4.2463	± 5 %	4.0340	4.4586	0.6288	1590.37	6 753	9.423	0.0707
0.32	3.7321	± 5 %	3.5455	3.9187	0.7154	1397.79	5 217	10.052	0.0804
0.35	3.1197	± 5 %	2.9637	3.2757	0.8558	1168.43	3 645	10.994	0.0962
0.38	2.6466	± 5 %	2.5142	2.7789	1.0089	991.23	2 623	11.936	0.1134
0.40	2.3885	± 5 %	2.2691	2.5080	1.1178	894.58	2 137	12.565	0.1256
0.42	2.1665	± 5 %	2.0581	2.2748	1.2324	811.41	1 758	13.193	0.1385
0.45	1.8872	± 5 %	1.7929	1.9816	1.4148	706.83	1 334	14.135	0.1590
0.48	1.6587	± 5 %	1.5758	1.7416	1.6097	621.24	1 030	15.078	0.1809
0.50	1.5287	± 5 %	1.4522	1.6051	1.7466	572.53	875	15.706	0.1963
0.55	1.2634	± 3 %	1.2255	1.3013	2.1134	473.17	598	17.276	0.2375
0.60	1.0616	± 3 %	1.0297	1.0934	2.5151	397.59	422	18.847	0.2826
0.65	0.9045	± 3 %	0.8774	0.9317	2.9518	338.78	306	20.418	0.3317
0.70	0.7799	± 3 %	0.7565	0.8033	3.4234	292.11	228	21.988	0.3847
0.75	0.6794	± 3 %	0.6590	0.6998	3.9299	254.46	173	23.559	0.4416
0.80	0.5971	± 3 %	0.5792	0.6150	4.4714	223.65	134	25.129	0.5024
0.85	0.5289	± 3 %	0.5131	0.5448	5.0477	198.11	105	26.700	0.5672
0.90	0.4718	± 3 %	0.4577	0.4860	5.6591	176.71	83	28.270	0.6359
0.95	0.4235	± 3 %	0.4107	0.4362	6.3053	158.60	67	29.841	0.7085
1.00	0.3822	± 3 %	0.3707	0.3936	6.9865	143.13	55	31.412	0.7850
1.10	0.3158	± 3 %	0.3064	0.3253	8.4537	118.29	37	34.553	0.9499
1.20	0.2654	± 3 %	0.2574	0.2734	10.0606	99.40	26	37.694	1.1304
1.30	0.2261	± 3 %	0.2193	0.2329	11.8072	84.69	19	40.835	1.3267
1.40	0.1950	± 3 %	0.1891	0.2008	13.6935	73.03	14	43.976	1.5386
1.50	0.1699	± 3 %	0.1648	0.1749	15.7196	63.61	11	47.117	1.7663
1.60	0.1493	± 3 %	0.1448	0.1538	17.8854	55.91	8	50.259	2.0096
1.70	0.1322	± 3 %	0.1283	0.1362	20.1910	49.53	6.55	53.400	2.2687
1.80	0.1180	± 3 %	0.1144	0.1215	22.6363	44.18	5.21	56.541	2.5434
1.90	0.1059	± 3 %	0.1027	0.1090	25.2213	39.65	4.20	59.682	2.8339
2.00	0.0955	± 3 %	0.0927	0.0984	27.9460	35.78	3.42	62.823	3.1400
2.25	0.0755	± 3 %	0.0732	0.0778	35.3692	28.27	2.13	70.676	3.9741
2.50	0.0611	± 3 %	0.0593	0.0630	43.6656	22.90	1.40	78.529	4.9063
2.80	0.0487	± 3 %	0.0473	0.0502	54.7742	18.26	0.89	87.952	6.1544
3.00	0.0425	± 3 %	0.0412	0.0437	62.8785	15.90	0.68	94.235	7.0650
3.25	0.0362	± 3 %	0.0351	0.0373	73.7949	13.55	0.49	102.088	8.2916
3.50	0.0312	± 3 %	0.0303	0.0321	85.5846	11.68	0.36	109.941	9.6163
3.80	0.0265	± 3 %	0.0257	0.0273	100.8851	9.91	0.26	119.364	11.3354
4.00	0.0239	± 3 %	0.0232	0.0246	111.7840	8.95	0.21	125.646	12.5600
4.50	0.0189	± 3 %	0.0183	0.0194	141.4766	7.068	0.13	141.352	15.8963
5.00	0.0153	± 3 %	0.0148	0.0157	174.6625	5.73	0.09	157.058	19.6250
5.50	0.0126	± 3 %	0.0123	0.0130	211.3416	4.732	0.06	172.764	23.7463
6.00	0.0106	± 3 %	0.0103	0.0109	251.5140	3.98	0.04	188.470	28.2600

CuNi 10

Resistivity 0.15 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400
Ct	0.15	1.03	1.07	1.11	1.15

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	19.1083	± 5 %	18.1529	20.0637	0.0699	14313.32	273 503	3.141	0.0079
0.11	15.7920	± 5 %	15.0024	16.5816	0.0845	11829.19	186 806	3.455	0.0095
0.12	13.2696	± 5 %	12.6062	13.9331	0.1006	9939.80	131 898	3.769	0.0113
0.13	11.3067	± 5 %	10.7413	11.8720	0.1181	8469.42	95 761	4.084	0.0133
0.14	9.7491	± 5 %	9.2617	10.2366	0.1369	7302.71	71 195	4.398	0.0154
0.15	8.4926	± 5 %	8.0679	8.9172	0.1572	6361.47	54 025	4.712	0.0177
0.16	7.4642	± 5 %	7.0910	7.8374	0.1789	5591.14	41 733	5.026	0.0201
0.17	6.6119	± 5 %	6.2813	6.9425	0.2019	4952.71	32 747	5.340	0.0227
0.18	5.8976	± 5 %	5.6027	6.1925	0.2264	4417.69	26 054	5.654	0.0254
0.19	5.2932	± 5 %	5.0285	5.5578	0.2522	3964.91	20 987	5.968	0.0283
0.20	4.7771	± 5 %	4.5382	5.0159	0.2795	3578.33	17 094	6.282	0.0314
0.22	3.9480	± 5 %	3.7506	4.1454	0.3381	2957.30	11 675	6.911	0.0380
0.25	3.0573	± 5 %	2.9045	3.2102	0.4367	2290.13	7 002	7.853	0.0491
0.28	2.4373	± 5 %	2.3154	2.5591	0.5477	1825.68	4 450	8.795	0.0615
0.30	2.1231	± 5 %	2.0170	2.2293	0.6288	1590.37	3 377	9.423	0.0707
0.32	1.8660	± 5 %	1.7727	1.9593	0.7154	1397.79	2 608	10.052	0.0804
0.35	1.5599	± 5 %	1.4819	1.6379	0.8558	1168.43	1 823	10.994	0.0962
0.38	1.3233	± 5 %	1.2571	1.3895	1.0089	991.23	1 312	11.936	0.1134
0.40	1.1943	± 5 %	1.1346	1.2540	1.1178	894.58	1 068	12.565	0.1256
0.42	1.0832	± 5 %	1.0291	1.1374	1.2324	811.41	879	13.193	0.1385
0.45	0.9436	± 5 %	0.8964	0.9908	1.4148	706.83	667	14.135	0.1590
0.48	0.8294	± 5 %	0.7879	0.8708	1.6097	621.24	515	15.078	0.1809
0.50	0.7643	± 5 %	0.7261	0.8025	1.7466	572.53	438	15.706	0.1963
0.55	0.6317	± 3 %	0.6127	0.6506	2.1134	473.17	299	17.276	0.2375
0.60	0.5308	± 3 %	0.5149	0.5467	2.5151	397.59	211	18.847	0.2826
0.65	0.4523	± 3 %	0.4387	0.4658	2.9518	338.78	153	20.418	0.3317
0.70	0.3900	± 3 %	0.3783	0.4017	3.4234	292.11	114	21.988	0.3847
0.75	0.3397	± 3 %	0.3295	0.3499	3.9299	254.46	86	23.559	0.4416
0.80	0.2986	± 3 %	0.2896	0.3075	4.4714	223.65	67	25.129	0.5024
0.85	0.2645	± 3 %	0.2565	0.2724	5.0477	198.11	52	26.700	0.5672
0.90	0.2359	± 3 %	0.2288	0.2430	5.6591	176.71	42	28.270	0.6359
0.95	0.2117	± 3 %	0.2054	0.2181	6.3053	158.60	34	29.841	0.7085
1.00	0.1911	± 3 %	0.1854	0.1968	6.9865	143.13	27	31.412	0.7850
1.10	0.1579	± 3 %	0.1532	0.1627	8.4537	118.29	19	34.553	0.9499
1.20	0.1327	± 3 %	0.1287	0.1367	10.0606	99.40	13	37.694	1.1304
1.30	0.1131	± 3 %	0.1097	0.1165	11.8072	84.69	10	40.835	1.3267
1.40	0.0975	± 3 %	0.0946	0.1004	13.6935	73.03	7.12	43.976	1.5386
1.50	0.0849	± 3 %	0.0824	0.0875	15.7196	63.61	5.40	47.117	1.7663
1.60	0.0746	± 3 %	0.0724	0.0769	17.8854	55.91	4.17	50.259	2.0096
1.70	0.0661	± 3 %	0.0641	0.0681	20.1910	49.53	3.27	53.400	2.2687
1.80	0.0590	± 3 %	0.0572	0.0607	22.6363	44.18	2.61	56.541	2.5434
1.90	0.0529	± 3 %	0.0513	0.0545	25.2213	39.65	2.10	59.682	2.8339
2.00	0.0478	± 3 %	0.0463	0.0492	27.9460	35.78	1.71	62.823	3.1400
2.25	0.0377	± 3 %	0.0366	0.0389	35.3692	28.27	1.07	70.676	3.9741
2.50	0.0306	± 3 %	0.0297	0.0315	43.6656	22.90	0.70	78.529	4.9063
2.80	0.0244	± 3 %	0.0236	0.0251	54.7742	18.26	0.44	87.952	6.1544
3.00	0.0212	± 3 %	0.0206	0.0219	62.8785	15.90	0.34	94.235	7.0650
3.25	0.0181	± 3 %	0.0175	0.0186	73.7949	13.55	0.25	102.088	8.2916
3.50	0.0156	± 3 %	0.0151	0.0161	85.5846	11.68	0.18	109.941	9.6163
3.80	0.0132	± 3 %	0.0128	0.0136	100.8851	9.91	0.13	119.364	11.3354
4.00	0.0119	± 3 %	0.0116	0.0123	111.7840	8.95	0.11	125.646	12.5600
4.50	0.0094	± 3 %	0.0092	0.0097	141.4766	7.068	0.07	141.352	15.8963
5.00	0.0076	± 3 %	0.0074	0.0079	174.6625	5.73	0.04	157.058	19.6250
5.50	0.0063	± 3 %	0.0061	0.0065	211.3416	4.732	0.03	172.764	23.7463
6.00	0.0053	± 3 %	0.0051	0.0055	251.5140	3.98	0.02	188.470	28.2600

CuNi 6

Resistivity 0.10 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300
Ct	0.10	1.05	1.11	1.19

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	12.7389	± 5 %	12.1019	13.3758	0.0699	14313.32	182 335	3.141	0.0079
0.11	10.5280	± 5 %	10.0016	11.0544	0.0845	11829.19	124 537	3.455	0.0095
0.12	8.8464	± 5 %	8.4041	9.2887	0.1006	9939.80	87 932	3.769	0.0113
0.13	7.5378	± 5 %	7.1609	7.9147	0.1181	8469.42	63 841	4.084	0.0133
0.14	6.4994	± 5 %	6.1744	6.8244	0.1369	7302.71	47 463	4.398	0.0154
0.15	5.6617	± 5 %	5.3786	5.9448	0.1572	6361.47	36 017	4.712	0.0177
0.16	4.9761	± 5 %	4.7273	5.2249	0.1789	5591.14	27 822	5.026	0.0201
0.17	4.4079	± 5 %	4.1875	4.6283	0.2019	4952.71	21 831	5.340	0.0227
0.18	3.9317	± 5 %	3.7352	4.1283	0.2264	4417.69	17 369	5.654	0.0254
0.19	3.5288	± 5 %	3.3523	3.7052	0.2522	3964.91	13 991	5.968	0.0283
0.20	3.1847	± 5 %	3.0255	3.3439	0.2795	3578.33	11 396	6.282	0.0314
0.22	2.6320	± 5 %	2.5004	2.7636	0.3381	2957.30	7 784	6.911	0.0380
0.25	2.0382	± 5 %	1.9363	2.1401	0.4367	2290.13	4 668	7.853	0.0491
0.28	1.6249	± 5 %	1.5436	1.7061	0.5477	1825.68	2 966	8.795	0.0615
0.30	1.4154	± 5 %	1.3447	1.4862	0.6288	1590.37	2 251	9.423	0.0707
0.32	1.2440	± 5 %	1.1818	1.3062	0.7154	1397.79	1 739	10.052	0.0804
0.35	1.0399	± 5 %	0.9879	1.0919	0.8558	1168.43	1 215	10.994	0.0962
0.38	0.8822	± 5 %	0.8381	0.9263	1.0089	991.23	874	11.936	0.1134
0.40	0.7962	± 5 %	0.7564	0.8360	1.1178	894.58	712	12.565	0.1256
0.42	0.7222	± 5 %	0.6860	0.7583	1.2324	811.41	586	13.193	0.1385
0.45	0.6291	± 5 %	0.5976	0.6605	1.4148	706.83	445	14.135	0.1590
0.48	0.5529	± 5 %	0.5253	0.5805	1.6097	621.24	343	15.078	0.1809
0.50	0.5096	± 5 %	0.4841	0.5350	1.7466	572.53	292	15.706	0.1963
0.55	0.4211	± 3 %	0.4085	0.4338	2.1134	473.17	199	17.276	0.2375
0.60	0.3539	± 3 %	0.3432	0.3645	2.5151	397.59	141	18.847	0.2826
0.65	0.3015	± 3 %	0.2925	0.3106	2.9518	338.78	102	20.418	0.3317
0.70	0.2600	± 3 %	0.2522	0.2678	3.4234	292.11	76	21.988	0.3847
0.75	0.2265	± 3 %	0.2197	0.2333	3.9299	254.46	58	23.559	0.4416
0.80	0.1990	± 3 %	0.1931	0.2050	4.4714	223.65	45	25.129	0.5024
0.85	0.1763	± 3 %	0.1710	0.1816	5.0477	198.11	35	26.700	0.5672
0.90	0.1573	± 3 %	0.1526	0.1620	5.6591	176.71	28	28.270	0.6359
0.95	0.1412	± 3 %	0.1369	0.1454	6.3053	158.60	22	29.841	0.7085
1.00	0.1274	± 3 %	0.1236	0.1312	6.9865	143.13	18	31.412	0.7850
1.10	0.1053	± 3 %	0.1021	0.1084	8.4537	118.29	12	34.553	0.9499
1.20	0.0885	± 3 %	0.0858	0.0911	10.0606	99.40	9	37.694	1.1304
1.30	0.0754	± 3 %	0.0731	0.0776	11.8072	84.69	6.38	40.835	1.3267
1.40	0.0650	± 3 %	0.0630	0.0669	13.6935	73.03	4.75	43.976	1.5386
1.50	0.0566	± 3 %	0.0549	0.0583	15.7196	63.61	3.60	47.117	1.7663
1.60	0.0498	± 3 %	0.0483	0.0513	17.8854	55.91	2.78	50.259	2.0096
1.70	0.0441	± 3 %	0.0428	0.0454	20.1910	49.53	2.18	53.400	2.2687
1.80	0.0393	± 3 %	0.0381	0.0405	22.6363	44.18	1.74	56.541	2.5434
1.90	0.0353	± 3 %	0.0342	0.0363	25.2213	39.65	1.40	59.682	2.8339
2.00	0.0318	± 3 %	0.0309	0.0328	27.9460	35.78	1.14	62.823	3.1400
2.25	0.0252	± 3 %	0.0244	0.0259	35.3692	28.27	0.71	70.676	3.9741
2.50	0.0204	± 3 %	0.0198	0.0210	43.6656	22.90	0.47	78.529	4.9063
2.80	0.0162	± 3 %	0.0158	0.0167	54.7742	18.26	0.30	87.952	6.1544
3.00	0.0142	± 3 %	0.0137	0.0146	62.8785	15.90	0.23	94.235	7.0650
3.25	0.0121	± 3 %	0.0117	0.0124	73.7949	13.55	0.16	102.088	8.2916
3.50	0.0104	± 3 %	0.0101	0.0107	85.5846	11.68	0.12	109.941	9.6163
3.80	0.0088	± 3 %	0.0086	0.0091	100.8851	9.91	0.09	119.364	11.3354
4.00	0.0080	± 3 %	0.0077	0.0082	111.7840	8.95	0.07	125.646	12.5600
4.50	0.0063	± 3 %	0.0061	0.0065	141.4766	7.068	0.04	141.352	15.8963
5.00	0.0051	± 3 %	0.0049	0.0052	174.6625	5.73	0.03	157.058	19.6250
5.50	0.0042	± 3 %	0.0041	0.0043	211.3416	4.732	0.02	172.764	23.7463
6.00	0.0035	± 3 %	0.0034	0.0036	251.5140	3.98	0.01	188.470	28.2600

CuNi 2

Resistivity 0.05 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300
Ct	0.05	1.11	1.25	1.40

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	6.3694	± 5 %	6.0510	6.6879	0.0699	14313.32	91 168	3.141	0.0079
0.11	5.2640	± 5 %	5.0008	5.5272	0.0845	11829.19	62 269	3.455	0.0095
0.12	4.4232	± 5 %	4.2021	4.6444	0.1006	9939.80	43 966	3.769	0.0113
0.13	3.7689	± 5 %	3.5804	3.9573	0.1181	8469.42	31 920	4.084	0.0133
0.14	3.2497	± 5 %	3.0872	3.4122	0.1369	7302.71	23 732	4.398	0.0154
0.15	2.8309	± 5 %	2.6893	2.9724	0.1572	6361.47	18 008	4.712	0.0177
0.16	2.4881	± 5 %	2.3637	2.6125	0.1789	5591.14	13 911	5.026	0.0201
0.17	2.2040	± 5 %	2.0938	2.3142	0.2019	4952.71	10 916	5.340	0.0227
0.18	1.9659	± 5 %	1.8676	2.0642	0.2264	4417.69	8 685	5.654	0.0254
0.19	1.7644	± 5 %	1.6762	1.8526	0.2522	3964.91	6 996	5.968	0.0283
0.20	1.5924	± 5 %	1.5127	1.6720	0.2795	3578.33	5 698	6.282	0.0314
0.22	1.3160	± 5 %	1.2502	1.3818	0.3381	2957.30	3 892	6.911	0.0380
0.25	1.0191	± 5 %	0.9682	1.0701	0.4367	2290.13	2 334	7.853	0.0491
0.28	0.8124	± 5 %	0.7718	0.8530	0.5477	1825.68	1 483	8.795	0.0615
0.30	0.7077	± 5 %	0.6723	0.7431	0.6288	1590.37	1 126	9.423	0.0707
0.32	0.6220	± 5 %	0.5909	0.6531	0.7154	1397.79	869	10.052	0.0804
0.35	0.5200	± 5 %	0.4940	0.5460	0.8558	1168.43	608	10.994	0.0962
0.38	0.4411	± 5 %	0.4190	0.4632	1.0089	991.23	437	11.936	0.1134
0.40	0.3981	± 5 %	0.3782	0.4180	1.1178	894.58	356	12.565	0.1256
0.42	0.3611	± 5 %	0.3430	0.3791	1.2324	811.41	293	13.193	0.1385
0.45	0.3145	± 5 %	0.2988	0.3303	1.4148	706.83	222	14.135	0.1590
0.48	0.2765	± 5 %	0.2626	0.2903	1.6097	621.24	172	15.078	0.1809
0.50	0.2548	± 5 %	0.2420	0.2675	1.7466	572.53	146	15.706	0.1963
0.55	0.2106	± 3 %	0.2042	0.2169	2.1134	473.17	100	17.276	0.2375
0.60	0.1769	± 3 %	0.1716	0.1822	2.5151	397.59	70	18.847	0.2826
0.65	0.1508	± 3 %	0.1462	0.1553	2.9518	338.78	51	20.418	0.3317
0.70	0.1300	± 3 %	0.1261	0.1339	3.4234	292.11	38	21.988	0.3847
0.75	0.1132	± 3 %	0.1098	0.1166	3.9299	254.46	29	23.559	0.4416
0.80	0.0995	± 3 %	0.0965	0.1025	4.4714	223.65	22	25.129	0.5024
0.85	0.0882	± 3 %	0.0855	0.0908	5.0477	198.11	17	26.700	0.5672
0.90	0.0786	± 3 %	0.0763	0.0810	5.6591	176.71	14	28.270	0.6359
0.95	0.0706	± 3 %	0.0685	0.0727	6.3053	158.60	11	29.841	0.7085
1.00	0.0637	± 3 %	0.0618	0.0656	6.9865	143.13	9	31.412	0.7850
1.10	0.0526	± 3 %	0.0511	0.0542	8.4537	118.29	6.23	34.553	0.9499
1.20	0.0442	± 3 %	0.0429	0.0456	10.0606	99.40	4.40	37.694	1.1304
1.30	0.0377	± 3 %	0.0366	0.0388	11.8072	84.69	3.19	40.835	1.3267
1.40	0.0325	± 3 %	0.0315	0.0335	13.6935	73.03	2.37	43.976	1.5386
1.50	0.0283	± 3 %	0.0275	0.0292	15.7196	63.61	1.80	47.117	1.7663
1.60	0.0249	± 3 %	0.0241	0.0256	17.8854	55.91	1.39	50.259	2.0096
1.70	0.0220	± 3 %	0.0214	0.0227	20.1910	49.53	1.09	53.400	2.2687
1.80	0.0197	± 3 %	0.0191	0.0202	22.6363	44.18	0.87	56.541	2.5434
1.90	0.0176	± 3 %	0.0171	0.0182	25.2213	39.65	0.70	59.682	2.8339
2.00	0.0159	± 3 %	0.0154	0.0164	27.9460	35.78	0.57	62.823	3.1400
2.25	0.0126	± 3 %	0.0122	0.0130	35.3692	28.27	0.36	70.676	3.9741
2.50	0.0102	± 3 %	0.0099	0.0105	43.6656	22.90	0.23	78.529	4.9063
2.80	0.0081	± 3 %	0.0079	0.0084	54.7742	18.26	0.15	87.952	6.1544
3.00	0.0071	± 3 %	0.0069	0.0073	62.8785	15.90	0.11	94.235	7.0650
3.25	0.0060	± 3 %	0.0058	0.0062	73.7949	13.55	0.08	102.088	8.2916
3.50	0.0052	± 3 %	0.0050	0.0054	85.5846	11.68	0.06	109.941	9.6163
3.80	0.0044	± 3 %	0.0043	0.0045	100.8851	9.91	0.04	119.364	11.3354
4.00	0.0040	± 3 %	0.0039	0.0041	111.7840	8.95	0.04	125.646	12.5600
4.50	0.0031	± 3 %	0.0031	0.0032	141.4766	7.068	0.02	141.352	15.8963
5.00	0.0025	± 3 %	0.0025	0.0026	174.6625	5.73	0.01	157.058	19.6250
5.50	0.0021	± 3 %	0.0020	0.0022	211.3416	4.732	0.01	172.764	23.7463
6.00	0.0018	± 3 %	0.0017	0.0018	251.5140	3.98	0.01	188.470	28.2600

Resistivity 0.547 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600
Ct	0.547	-	-	-	-	-	-

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	69.6815	± 5 %	66.1975	73.1656	0.0699	14313.32	997 374	3.141	0.0079
0.11	57.5880	± 5 %	54.7086	60.4674	0.0845	11829.19	681 220	3.455	0.0095
0.12	48.3900	± 5 %	45.9705	50.8094	0.1006	9939.80	480 987	3.769	0.0113
0.13	41.2317	± 5 %	39.1701	43.2933	0.1181	8469.42	349 208	4.084	0.0133
0.14	35.5518	± 5 %	33.7742	37.3294	0.1369	7302.71	259 625	4.398	0.0154
0.15	30.9696	± 5 %	29.4211	32.5180	0.1572	6361.47	197 012	4.712	0.0177
0.16	27.2193	± 5 %	25.8584	28.5803	0.1789	5591.14	152 187	5.026	0.0201
0.17	24.1113	± 5 %	22.9057	25.3168	0.2019	4952.71	119 416	5.340	0.0227
0.18	21.5066	± 5 %	20.4313	22.5820	0.2264	4417.69	95 010	5.654	0.0254
0.19	19.3024	± 5 %	18.3372	20.2675	0.2522	3964.91	76 532	5.968	0.0283
0.20	17.4204	± 5 %	16.5494	18.2914	0.2795	3578.33	62 336	6.282	0.0314
0.22	14.3970	± 5 %	13.6772	15.1169	0.3381	2957.30	42 576	6.911	0.0380
0.25	11.1490	± 5 %	10.5916	11.7065	0.4367	2290.13	25 533	7.853	0.0491
0.28	8.8880	± 5 %	8.4436	9.3323	0.5477	1825.68	16 227	8.795	0.0615
0.30	7.7424	± 5 %	7.3553	8.1295	0.6288	1590.37	12 313	9.423	0.0707
0.32	6.8048	± 5 %	6.4646	7.1451	0.7154	1397.79	9 512	10.052	0.0804
0.35	5.6883	± 5 %	5.4039	5.9727	0.8558	1168.43	6 646	10.994	0.0962
0.38	4.8256	± 5 %	4.5843	5.0669	1.0089	991.23	4 783	11.936	0.1134
0.40	4.3551	± 5 %	4.1373	4.5729	1.1178	894.58	3 896	12.565	0.1256
0.42	3.9502	± 5 %	3.7527	4.1477	1.2324	811.41	3 205	13.193	0.1385
0.45	3.4411	± 5 %	3.2690	3.6131	1.4148	706.83	2 432	14.135	0.1590
0.48	3.0244	± 5 %	2.8732	3.1756	1.6097	621.24	1 879	15.078	0.1809
0.50	2.7873	± 5 %	2.6479	2.9266	1.7466	572.53	1 596	15.706	0.1963
0.55	2.3035	± 3 %	2.2344	2.8709	2.1134	473.17	1 090	17.276	0.2375
0.60	1.9356	± 3 %	1.8775	2.3726	2.5151	397.59	770	18.847	0.2826
0.65	1.6493	± 3 %	1.5998	1.9937	2.9518	338.78	559	20.418	0.3317
0.70	1.4221	± 3 %	1.3794	1.6987	3.4234	292.11	415	21.988	0.3847
0.75	1.2388	± 3 %	1.2016	1.4647	3.9299	254.46	315	23.559	0.4416
0.80	1.0888	± 3 %	1.0561	1.2759	4.4714	223.65	243	25.129	0.5024
0.85	0.9645	± 3 %	0.9355	1.1214	5.0477	198.11	191	26.700	0.5672
0.90	0.8603	± 3 %	0.8345	0.9934	5.6591	176.71	152	28.270	0.6359
0.95	0.7721	± 3 %	0.7489	0.8861	6.3053	158.60	122	29.841	0.7085
1.00	0.6968	± 3 %	0.6759	0.7953	6.9865	143.13	100	31.412	0.7850
1.10	0.5759	± 3 %	0.5586	0.7177	8.4537	118.29	68	34.553	0.9499
1.20	0.4839	± 3 %	0.4694	0.5932	10.0606	99.40	48	37.694	1.1304
1.30	0.4123	± 3 %	0.3999	0.4984	11.8072	84.69	35	40.835	1.3267
1.40	0.3555	± 3 %	0.3449	0.4247	13.6935	73.03	26	43.976	1.5386
1.50	0.3097	± 3 %	0.3004	0.3662	15.7196	63.61	20	47.117	1.7663
1.60	0.2722	± 3 %	0.2640	0.3190	17.8854	55.91	15	50.259	2.0096
1.70	0.2411	± 3 %	0.2339	0.2804	20.1910	49.53	12	53.400	2.2687
1.80	0.2151	± 3 %	0.2086	0.2483	22.6363	44.18	9.50	56.541	2.5434
1.90	0.1930	± 3 %	0.1872	0.2215	25.2213	39.65	7.65	59.682	2.8339
2.00	0.1742	± 3 %	0.1690	0.1988	27.9460	35.78	6.23	62.823	3.1400
2.25	0.1376	± 3 %	0.1335	0.1794	35.3692	28.27	3.89	70.676	3.9741
2.50	0.1115	± 3 %	0.1081	0.1418	43.6656	22.90	2.55	78.529	4.9063
2.80	0.0889	± 3 %	0.0862	0.1148	54.7742	18.26	1.62	87.952	6.1544
3.00	0.0774	± 3 %	0.0751	0.0915	62.8785	15.90	1.23	94.235	7.0650
3.25	0.0660	± 3 %	0.0640	0.0797	73.7949	13.55	0.89	102.088	8.2916
3.50	0.0569	± 3 %	0.0552	0.0679	85.5846	11.68	0.66	109.941	9.6163
3.80	0.0483	± 3 %	0.0468	0.0586	100.8851	9.91	0.48	119.364	11.3354
4.00	0.0436	± 3 %	0.0422	0.0497	111.7840	8.946	0.39	125.646	12.5600
4.50	0.0344	± 3 %	0.0334	0.0449	141.4766	7.068	0.24	141.352	15.8963
5.00	0.0279	± 3 %	0.0270	0.0354	174.6625	5.725	0.16	157.058	19.6250
5.50	0.0230	± 3 %	0.0223	0.0287	211.3416	4.732	0.11	172.764	23.7463
6.00	0.0194	± 3 %	0.0188	0.0237	251.5140	3.976	0.08	188.470	28.2600

Resistivity 0.04 Ω mm²/m. Density 8.20 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	5,0955	± 5 %	4.8408	5.3503	0,0644	15535	79 160	3.141	0.0079
0.11	4,2112	± 5 %	4.0006	4.4218	0,0779	12839	54 067	3.455	0.0095
0.12	3,5386	± 5 %	3.3616	3.7155	0,0927	10788	38 175	3.769	0.0113
0.13	3,0151	± 5 %	2.8644	3.1659	0,1088	9192	27 716	4.084	0.0133
0.14	2,5998	± 5 %	2.4698	2.7298	0,1262	7926	20 606	4.398	0.0154
0.15	2,2647	± 5 %	2.1515	2.3779	0,1448	6905	15 637	4.712	0.0177
0.16	1,9904	± 5 %	1.8909	2.0900	0,1648	6068	12 079	5.026	0.0201
0.17	1,7632	± 5 %	1.6750	1.8513	0,1860	5375	9 478	5.340	0.0227
0.18	1,5727	± 5 %	1.4941	1.6513	0,2086	4795	7 541	5.654	0.0254
0.19	1,4115	± 5 %	1.3409	1.4821	0,2324	4303	6 074	5.968	0.0283
0.20	1,2739	± 5 %	1.2102	1.3376	0,2575	3884	4 948	6.282	0.0314
0.22	1,0528	± 5 %	1.0002	1.1054	0,3116	3210	3 379	6.911	0.0380
0.25	0,8153	± 5 %	0.7745	0.8561	0,4023	2486	2 027	7.853	0.0491
0.28	0,6499	± 5 %	0.6174	0.6824	0,5047	1982	1 288	8.795	0.0615
0.30	0,5662	± 5 %	0.5379	0.5945	0,5793	1726	977	9.423	0.0707
0.32	0,4976	± 5 %	0.4727	0.5225	0,6591	1517	755	10.052	0.0804
0.35	0,4160	± 5 %	0.3952	0.4368	0,7885	1268	528	10.994	0.0962
0.38	0,3529	± 5 %	0.3352	0.3705	0,9295	1076	380	11.936	0.1134
0.40	0,3185	± 5 %	0.3025	0.3344	1,0299	971	309	12.565	0.1256
0.42	0,2889	± 5 %	0.2744	0.3033	1,1355	881	254	13.193	0.1385
0.45	0,2516	± 5 %	0.2391	0.2642	1,3035	767	193	14.135	0.1590
0.48	0,2212	± 5 %	0.2101	0.2322	1,4831	674	149	15.078	0.1809
0.50	0,2038	± 5 %	0.1936	0.2140	1,6093	621	127	15.706	0.1963
0.55	0,1684	± 3 %	0.1634	0.1735	1,9472	514	87	17.276	0.2375
0.60	0,1415	± 3 %	0.1373	0.1458	2,3173	432	61	18.847	0.2826
0.65	0,1206	± 3 %	0.1170	0.1242	2,7196	368	44	20.418	0.3317
0.70	0,1040	± 3 %	0.1009	0.1071	3,1541	317	33	21.988	0.3847
0.75	0,0906	± 3 %	0.0879	0.0933	3,6208	276	25	23.559	0.4416
0.80	0,0796	± 3 %	0.0772	0.0820	4,1197	243	19	25.129	0.5024
0.85	0,0705	± 3 %	0.0684	0.0726	4,6507	215	15	26.700	0.5672
0.90	0,0629	± 3 %	0.0610	0.0648	5,2140	192	12	28.270	0.6359
0.95	0,0565	± 3 %	0.0548	0.0582	5,8094	172	10	29.841	0.7085
1.00	0,0510	± 3 %	0.0494	0.0525	6,4370	155	7,92	31.412	0.7850
1.10	0,0421	± 3 %	0.0408	0.0434	7,7888	128	5,41	34.553	0.9499
1.20	0,0354	± 3 %	0.0343	0.0364	9,2693	108	3,82	37.694	1.1304
1.30	0,0302	± 3 %	0.0292	0.0311	10,8785	92	2,77	40.835	1.3267
1.40	0,0260	± 3 %	0.0252	0.0268	12,6165	79	2,06	43.976	1.5386
1.50	0,0226	± 3 %	0.0220	0.0233	14,4833	69	1,56	47.117	1.7663
1.60	0,0199	± 3 %	0.0193	0.0205	16,4787	61	1,21	50.259	2.0096
1.70	0,0176	± 3 %	0.0171	0.0182	18,6029	54	0,95	53.400	2.2687
1.80	0,0157	± 3 %	0.0153	0.0162	20,8559	48	0,75	56.541	2.5434
1.90	0,0141	± 3 %	0.0137	0.0145	23,2376	43	0,61	59.682	2.8339
2.00	0,0127	± 3 %	0.0124	0.0131	25,7480	39	0,49	62.823	3.1400
2.25	0,0101	± 3 %	0.0098	0.0104	32,5873	31	0,31	70.676	3.9741
2.50	0,0082	± 3 %	0.0079	0.0084	40,2313	25	0,20	78.529	4.9063
2.80	0,0065	± 3 %	0.0063	0.0067	50,4661	20	0,13	87.952	6.1544
3.00	0,0057	± 3 %	0.0055	0.0058	57,9330	17	0,10	94.235	7.0650
3.25	0,0048	± 3 %	0.0047	0.0050	67,9908	15	0,07	102.088	8.2916
3.50	0,0042	± 3 %	0.0040	0.0043	78,8533	13	0,05	109.941	9.6163
3.80	0,0035	± 3 %	0.0034	0.0036	92,9503	11	0,04	119.364	11.3354
4.00	0,0032	± 3 %	0.0031	0.0033	102,9920	9,71	0,03	125.646	12.5600
4.50	0,0025	± 3 %	0.0024	0.0026	130,3493	7,67	0,02	141.352	15.8963
5.00	0,0020	± 3 %	0.0020	0.0021	160,9250	6,21	0,01	157.058	19.6250
5.50	0,0017	± 3 %	0.0016	0.0017	194,7193	5,14	0,01	172.764	23.7463
6.00	0,0014	± 3 %	0.0014	0.0015	231,7320	4,32	0,01	188.470	28.2600

Resistivity 0.80 Ω mm²/m. Density 8.11 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	101.9108	± 5 %	96.8153	107.0064	0.0637	15707.59	1 600 773	3.141	0.0079
0.11	84.2238	± 5 %	80.0126	88.4350	0.0770	12981.48	1 093 350	3.455	0.0095
0.12	70.7714	± 5 %	67.2328	74.3100	0.0917	10908.05	771 978	3.769	0.0113
0.13	60.3023	± 5 %	57.2872	63.3174	0.1076	9294.43	560 475	4.084	0.0133
0.14	51.9953	± 5 %	49.3956	54.5951	0.1248	8014.08	416 694	4.398	0.0154
0.15	45.2937	± 5 %	43.0290	47.5584	0.1432	6981.15	316 202	4.712	0.0177
0.16	39.8089	± 5 %	37.8185	41.7994	0.1630	6135.78	244 259	5.026	0.0201
0.17	35.2633	± 5 %	33.5001	37.0264	0.1840	5435.15	191 661	5.340	0.0227
0.18	31.4540	± 5 %	29.8813	33.0267	0.2063	4848.02	152 489	5.654	0.0254
0.19	28.2301	± 5 %	26.8186	29.6417	0.2298	4351.13	122 833	5.968	0.0283
0.20	25.4777	± 5 %	24.2038	26.7516	0.2547	3926.90	100 048	6.282	0.0314
0.22	21.0560	± 5 %	20.0032	22.1088	0.3081	3245.37	68 334	6.911	0.0380
0.25	16.3057	± 5 %	15.4904	17.1210	0.3979	2513.21	40 980	7.853	0.0491
0.28	12.9988	± 5 %	12.3489	13.6488	0.4991	2003.52	26 043	8.795	0.0615
0.30	11.3234	± 5 %	10.7573	11.8896	0.5730	1745.29	19 763	9.423	0.0707
0.32	9.9522	± 5 %	9.4546	10.4498	0.6519	1533.94	15 266	10.052	0.0804
0.35	8.3193	± 5 %	7.9033	8.7352	0.7799	1282.25	10 667	10.994	0.0962
0.38	7.0575	± 5 %	6.7047	7.4104	0.9193	1087.78	7 677	11.936	0.1134
0.40	6.3694	± 5 %	6.0510	6.6879	1.0186	981.72	6 253	12.565	0.1256
0.42	5.7773	± 5 %	5.4884	6.0661	1.1230	890.45	5 144	13.193	0.1385
0.45	5.0326	± 5 %	4.7810	5.2843	1.2892	775.68	3 904	14.135	0.1590
0.48	4.4232	± 5 %	4.2021	4.6444	1.4668	681.75	3 016	15.078	0.1809
0.50	4.0764	± 5 %	3.8726	4.2803	1.5916	628.30	2 561	15.706	0.1963
0.55	3.3690	± 3 %	3.2679	3.4700	1.9258	519.26	1 749	17.276	0.2375
0.60	2.8309	± 3 %	2.7459	2.9158	2.2919	436.32	1 235	18.847	0.2826
0.65	2.4121	± 3 %	2.3397	2.4845	2.6898	371.78	897	20.418	0.3317
0.70	2.0798	± 3 %	2.0174	2.1422	3.1195	320.56	667	21.988	0.3847
0.75	1.8117	± 3 %	1.7574	1.8661	3.5811	279.25	506	23.559	0.4416
0.80	1.5924	± 3 %	1.5446	1.6401	4.0745	245.43	391	25.129	0.5024
0.85	1.4105	± 3 %	1.3682	1.4528	4.5997	217.41	307	26.700	0.5672
0.90	1.2582	± 3 %	1.2204	1.2959	5.1567	193.92	244	28.270	0.6359
0.95	1.1292	± 3 %	1.0953	1.1631	5.7456	174.05	197	29.841	0.7085
1.00	1.0191	± 3 %	0.9885	1.0497	6.3664	157.08	160	31.412	0.7850
1.10	0.8422	± 3 %	0.8170	0.8675	7.7033	129.81	109	34.553	0.9499
1.20	0.7077	± 3 %	0.6865	0.7289	9.1675	109.08	77	37.694	1.1304
1.30	0.6030	± 3 %	0.5849	0.6211	10.7591	92.94	56	40.835	1.3267
1.40	0.5200	± 3 %	0.5044	0.5356	12.4780	80.14	42	43.976	1.5386
1.50	0.4529	± 3 %	0.4393	0.4665	14.3243	69.81	32	47.117	1.7663
1.60	0.3981	± 3 %	0.3861	0.4100	16.2979	61.36	24	50.259	2.0096
1.70	0.3526	± 3 %	0.3421	0.3632	18.3988	54.35	19	53.400	2.2687
1.80	0.3145	± 3 %	0.3051	0.3240	20.6270	48.48	15	56.541	2.5434
1.90	0.2823	± 3 %	0.2738	0.2908	22.9825	43.51	12	59.682	2.8339
2.00	0.2548	± 3 %	0.2471	0.2624	25.4654	39.27	10	62.823	3.1400
2.25	0.2013	± 3 %	0.1953	0.2073	32.2296	31.03	6.25	70.676	3.9741
2.50	0.1631	± 3 %	0.1582	0.1679	39.7897	25.13	4.10	78.529	4.9063
2.80	0.1300	± 3 %	0.1261	0.1339	49.9122	20.04	2.60	87.952	6.1544
3.00	0.1132	± 3 %	0.1098	0.1166	57.2972	17.45	1.98	94.235	7.0650
3.25	0.0965	± 3 %	0.0936	0.0994	67.2446	14.87	1.43	102.088	8.2916
3.50	0.0832	± 3 %	0.0807	0.0857	77.9878	12.82	1.07	109.941	9.6163
3.80	0.0706	± 3 %	0.0685	0.0727	91.9301	10.88	0.77	119.364	11.3354
4.00	0.0637	± 3 %	0.0618	0.0656	101.8616	9.82	0.63	125.646	12.5600
4.50	0.0503	± 3 %	0.0488	0.0518	128.9186	7.757	0.39	141.352	15.8963
5.00	0.0408	± 3 %	0.0395	0.0420	159.1588	6.28	0.26	157.058	19.6250
5.50	0.0337	± 3 %	0.0327	0.0347	192.5821	5.193	0.17	172.764	23.7463
6.00	0.0283	± 3 %	0.0275	0.0292	229.1886	4.36	0.12	188.470	28.2600

FeNi 70 (Hytemco)

Resistivity 0.20 Ω mm²/m. Density 8.46 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700
Ct	1.00	1.36	1.97	2.65	3.33	3.93	4.48	4.98

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	25.4777	± 5 %	24.2038	26.7516	0.0664	15057.75	383 637	3.141	0.0079
0.11	21.0560	± 5 %	20.0032	22.1088	0.0804	12444.42	262 029	3.455	0.0095
0.12	17.6929	± 5 %	16.8082	18.5775	0.0956	10456.77	185 010	3.769	0.0113
0.13	15.0756	± 5 %	14.3218	15.8293	0.1122	8909.91	134 322	4.084	0.0133
0.14	12.9988	± 5 %	12.3489	13.6488	0.1302	7682.52	99 864	4.398	0.0154
0.15	11.3234	± 5 %	10.7573	11.8896	0.1494	6692.33	75 780	4.712	0.0177
0.16	9.9522	± 5 %	9.4546	10.4498	0.1700	5881.93	58 538	5.026	0.0201
0.17	8.8158	± 5 %	8.3750	9.2566	0.1919	5210.29	45 933	5.340	0.0227
0.18	7.8635	± 5 %	7.4703	8.2567	0.2152	4647.45	36 545	5.654	0.0254
0.19	7.0575	± 5 %	6.7047	7.4104	0.2397	4171.12	29 438	5.968	0.0283
0.20	6.3694	± 5 %	6.0510	6.6879	0.2656	3764.44	23 977	6.282	0.0314
0.22	5.2640	± 5 %	5.0008	5.5272	0.3214	3111.10	16 377	6.911	0.0380
0.25	4.0764	± 5 %	3.8726	4.2803	0.4151	2409.24	9 821	7.853	0.0491
0.28	3.2497	± 5 %	3.0872	3.4122	0.5207	1920.63	6 241	8.795	0.0615
0.30	2.8309	± 5 %	2.6893	2.9724	0.5977	1673.08	4 736	9.423	0.0707
0.32	2.4881	± 5 %	2.3637	2.6125	0.6800	1470.48	3 659	10.052	0.0804
0.35	2.0798	± 5 %	1.9758	2.1838	0.8135	1229.20	2 557	10.994	0.0962
0.38	1.7644	± 5 %	1.6762	1.8526	0.9590	1042.78	1 840	11.936	0.1134
0.40	1.5924	± 5 %	1.5127	1.6720	1.0626	941.11	1 499	12.565	0.1256
0.42	1.4443	± 5 %	1.3721	1.5165	1.1715	853.61	1 233	13.193	0.1385
0.45	1.2582	± 5 %	1.1953	1.3211	1.3448	743.59	936	14.135	0.1590
0.48	1.1058	± 5 %	1.0505	1.1611	1.5301	653.55	723	15.078	0.1809
0.50	1.0191	± 5 %	0.9682	1.0701	1.6603	602.31	614	15.706	0.1963
0.55	0.8422	± 3 %	0.8170	0.8675	2.0089	497.78	419	17.276	0.2375
0.60	0.7077	± 3 %	0.6865	0.7289	2.3908	418.27	296	18.847	0.2826
0.65	0.6030	± 3 %	0.5849	0.6211	2.8059	356.40	215	20.418	0.3317
0.70	0.5200	± 3 %	0.5044	0.5356	3.2541	307.30	160	21.988	0.3847
0.75	0.4529	± 3 %	0.4393	0.4665	3.7356	267.69	121	23.559	0.4416
0.80	0.3981	± 3 %	0.3861	0.4100	4.2503	235.28	94	25.129	0.5024
0.85	0.3526	± 3 %	0.3421	0.3632	4.7982	208.41	73	26.700	0.5672
0.90	0.3145	± 3 %	0.3051	0.3240	5.3793	185.90	58	28.270	0.6359
0.95	0.2823	± 3 %	0.2738	0.2908	5.9936	166.84	47	29.841	0.7085
1.00	0.2548	± 3 %	0.2471	0.2624	6.6411	150.58	38	31.412	0.7850
1.10	0.2106	± 3 %	0.2042	0.2169	8.0357	124.44	26	34.553	0.9499
1.20	0.1769	± 3 %	0.1716	0.1822	9.5632	104.57	19	37.694	1.1304
1.30	0.1508	± 3 %	0.1462	0.1553	11.2235	89.10	13	40.835	1.3267
1.40	0.1300	± 3 %	0.1261	0.1339	13.0166	76.83	10	43.976	1.5386
1.50	0.1132	± 3 %	0.1098	0.1166	14.9425	66.92	7.58	47.117	1.7663
1.60	0.0995	± 3 %	0.0965	0.1025	17.0012	58.82	5.85	50.259	2.0096
1.70	0.0882	± 3 %	0.0855	0.0908	19.1928	52.10	4.59	53.400	2.2687
1.80	0.0786	± 3 %	0.0763	0.0810	21.5172	46.47	3.65	56.541	2.5434
1.90	0.0706	± 3 %	0.0685	0.0727	23.9744	41.71	2.94	59.682	2.8339
2.00	0.0637	± 3 %	0.0618	0.0656	26.5644	37.64	2.40	62.823	3.1400
2.25	0.0503	± 3 %	0.0488	0.0518	33.6206	29.74	1.50	70.676	3.9741
2.50	0.0408	± 3 %	0.0395	0.0420	41.5069	24.09	0.98	78.529	4.9063
2.80	0.0325	± 3 %	0.0315	0.0335	52.0662	19.21	0.62	87.952	6.1544
3.00	0.0283	± 3 %	0.0275	0.0292	59.7699	16.73	0.47	94.235	7.0650
3.25	0.0241	± 3 %	0.0234	0.0248	70.1466	14.26	0.34	102.088	8.2916
3.50	0.0208	± 3 %	0.0202	0.0214	81.3535	12.29	0.26	109.941	9.6163
3.80	0.0176	± 3 %	0.0171	0.0182	95.8975	10.43	0.18	119.364	11.3354
4.00	0.0159	± 3 %	0.0154	0.0164	106.2576	9.41	0.15	125.646	12.5600
4.50	0.0126	± 3 %	0.0122	0.0130	134.4823	7.436	0.09	141.352	15.8963
5.00	0.0102	± 3 %	0.0099	0.0105	166.0275	6.02	0.06	157.058	19.6250
5.50	0.0084	± 3 %	0.0082	0.0087	200.8933	4.978	0.04	172.764	23.7463
6.00	0.0071	± 3 %	0.0069	0.0073	239.0796	4.18	0.03	188.470	28.2600

Manganina

Resistivity 0.42 Ω mm²/m. Density 8.76 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Diameter mm	Resistance at 20°C Ω/m	Tolerance %	Minimum value	Maximum value	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	53.5032	± 5 %	50.8280	56.1783	0.0664	15058	805 637	3.141	0.0079
0.11	44.2175	± 5 %	42.0066	46.4284	0.0804	12444	550 261	3.455	0.0095
0.12	37.1550	± 5 %	35.2972	39.0127	0.0956	10457	388 521	3.769	0.0113
0.13	31.6587	± 5 %	30.0758	33.2416	0.1122	8910	282 076	4.084	0.0133
0.14	27.2975	± 5 %	25.9327	28.6624	0.1302	7683	209 714	4.398	0.0154
0.15	23.7792	± 5 %	22.5902	24.9682	0.1494	6692	159 138	4.712	0.0177
0.16	20.8997	± 5 %	19.8547	21.9447	0.1700	5882	122 931	5.026	0.0201
0.17	18.5132	± 5 %	17.5876	19.4389	0.1919	5210	96 459	5.340	0.0227
0.18	16.5133	± 5 %	15.6877	17.3390	0.2152	4647	76 745	5.654	0.0254
0.19	14.8208	± 5 %	14.0798	15.5619	0.2397	4171	61 819	5.968	0.0283
0.20	13.3758	± 5 %	12.7070	14.0446	0.2656	3764	50 352	6.282	0.0314
0.22	11.0544	± 5 %	10.5017	11.6071	0.3214	3111	34 391	6.911	0.0380
0.25	8.5605	± 5 %	8.1325	8.9885	0.4151	2409	20 624	7.853	0.0491
0.28	6.8244	± 5 %	6.4832	7.1656	0.5207	1921	13 107	8.795	0.0615
0.30	5.9448	± 5 %	5.6476	6.2420	0.5977	1673	9 946	9.423	0.0707
0.32	5.2249	± 5 %	4.9637	5.4862	0.6800	1470	7 683	10.052	0.0804
0.35	4.3676	± 5 %	4.1492	4.5860	0.8135	1229	5 369	10.994	0.0962
0.38	3.7052	± 5 %	3.5199	3.8905	0.9590	1043	3 864	11.936	0.1134
0.40	3.3439	± 5 %	3.1768	3.5111	1.0626	941	3 147	12.565	0.1256
0.42	3.0331	± 5 %	2.8814	3.1847	1.1715	854	2 589	13.193	0.1385
0.45	2.6421	± 5 %	2.5100	2.7742	1.3448	744	1 965	14.135	0.1590
0.48	2.3222	± 5 %	2.2061	2.4383	1.5301	654	1 518	15.078	0.1809
0.50	2.1401	± 5 %	2.0331	2.2471	1.6603	602	1 289	15.706	0.1963
0.55	1.7687	± 3 %	1.7156	1.8218	2.0089	498	880	17.276	0.2375
0.60	1.4862	± 3 %	1.4416	1.5308	2.3908	418	622	18.847	0.2826
0.65	1.2663	± 3 %	1.2284	1.3043	2.8059	356	451	20.418	0.3317
0.70	1.0919	± 3 %	1.0591	1.1247	3.2541	307	336	21.988	0.3847
0.75	0.9512	± 3 %	0.9226	0.9797	3.7356	268	255	23.559	0.4416
0.80	0.8360	± 3 %	0.8109	0.8611	4.2503	235	197	25.129	0.5024
0.85	0.7405	± 3 %	0.7183	0.7627	4.7982	208	154	26.700	0.5672
0.90	0.6605	± 3 %	0.6407	0.6803	5.3793	186	123	28.270	0.6359
0.95	0.5928	± 3 %	0.5750	0.6106	5.9936	167	99	29.841	0.7085
1.00	0.5350	± 3 %	0.5190	0.5511	6.6411	151	80.56	31.412	0.7850
1.10	0.4422	± 3 %	0.4289	0.4554	8.0357	124	55.03	34.553	0.9499
1.20	0.3715	± 3 %	0.3604	0.3827	9.5632	105	38.85	37.694	1.1304
1.30	0.3166	± 3 %	0.3071	0.3261	11.2235	89	28.21	40.835	1.3267
1.40	0.2730	± 3 %	0.2648	0.2812	13.0166	77	20.97	43.976	1.5386
1.50	0.2378	± 3 %	0.2307	0.2449	14.9425	67	15.91	47.117	1.7663
1.60	0.2090	± 3 %	0.2027	0.2153	17.0012	59	12.29	50.259	2.0096
1.70	0.1851	± 3 %	0.1796	0.1907	19.1928	52	9.65	53.400	2.2687
1.80	0.1651	± 3 %	0.1602	0.1701	21.5172	46	7.67	56.541	2.5434
1.90	0.1482	± 3 %	0.1438	0.1527	23.9744	42	6.18	59.682	2.8339
2.00	0.1338	± 3 %	0.1297	0.1378	26.5644	38	5.04	62.823	3.1400
2.25	0.1057	± 3 %	0.1025	0.1089	33.6206	30	3.14	70.676	3.9741
2.50	0.0856	± 3 %	0.0830	0.0882	41.5069	24	2.06	78.529	4.9063
2.80	0.0682	± 3 %	0.0662	0.0703	52.0662	19	1.31	87.952	6.1544
3.00	0.0594	± 3 %	0.0577	0.0612	59.7699	17	0.99	94.235	7.0650
3.25	0.0507	± 3 %	0.0491	0.0522	70.1466	14	0.72	102.088	8.2916
3.50	0.0437	± 3 %	0.0424	0.0450	81.3535	12	0.54	109.941	9.6163
3.80	0.0371	± 3 %	0.0359	0.0382	95.8975	10	0.39	119.364	11.3354
4.00	0.0334	± 3 %	0.0324	0.0344	106.2576	9.41	0.31	125.646	12.5600
4.50	0.0264	± 3 %	0.0256	0.0272	134.4823	7.44	0.20	141.352	15.8963
5.00	0.0214	± 3 %	0.0208	0.0220	166.0275	6.02	0.13	157.058	19.6250
5.50	0.0177	± 3 %	0.0172	0.0182	200.8933	4.98	0.09	172.764	23.7463
6.00	0.0149	± 3 %	0.0144	0.0153	239.0796	4.18	0.06	188.470	28.2600

CuNi 44: Resistivity 0.49 Ω mm²/m. Density 8.90 g/cm³.
CuNi 23: Resistivity 0.30 Ω mm²/m. Density 8.90 g/cm³.
CuNi 10: Resistivity 0.15 Ω mm²/m. Density 8.90 g/cm³.
CuNi 6: Resistivity 0.10 Ω mm²/m. Density 8.90 g/cm³.
CuNi 2: Resistivity 0.05 Ω mm²/m. Density 8.90 g/cm³.
Phy 400: Resistivity 0.547 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient of temperature Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Temperature °C	20	100	200	300	400	500	600
CuNi 44 Ct	1.00	1.02	1.02	1.01	1.05	1.017	1.037
CuNi 23 Ct	1.00	1.02	1.03	1.04	1.06		
CuNi 10 Ct	1.00	1.03	1.07	1.11	1.15		
CuNi 6 Ct	1.00	1.05	1.11	1.19			
CuNi 2 Ct	1.00	1.11	1.25	1.40			

Here are the conversion factors for other CuNi alloys. Multiply the figures in the table by the conversion factor to obtain the data required for other alloys.

Alloy	Conversion Factor of Resistance	Conversion Factor of Weight g/m
CuNi 44	1.00	1.00
CuNi 23	0.612	1.00
CuNi 10	0.306	1.00
CuNi 6	0.204	1.00
CuNi 2	0.102	1.00
Phy 400	1.116	0.992

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm²/m	Cross section mm²
5.0	0.10	1.0486	± 5 %	0.9962	1.1010	4.1589	102.0	0.467
	0.11	0.9533	± 5 %	0.9056	1.0009	4.5748	102.2	0.514
	0.12	0.8738	± 5 %	0.8301	0.9175	4.9907	102.4	0.561
	0.14	0.7490	± 5 %	0.7116	0.7865	5.8224	102.8	0.654
	0.15	0.6991	± 5 %	0.6641	0.7340	6.2383	103.0	0.701
	0.18	0.5826	± 5 %	0.5534	0.6117	7.4860	103.6	0.841
	0.19	0.5519	± 5 %	0.5243	0.5795	7.9019	103.8	0.888
	0.20	0.5243	± 5 %	0.4981	0.5505	8.3178	104.0	0.935
	0.22	0.4766	± 5 %	0.4528	0.5005	9.1495	104.4	1.028
	0.25	0.4194	± 5 %	0.3985	0.4404	10.3972	105.0	1.168
	0.30	0.3495	± 5 %	0.3321	0.3670	12.4766	106.0	1.402
	0.35	0.2996	± 5 %	0.2846	0.3146	14.5561	107.0	1.636
	0.40	0.2622	± 5 %	0.2490	0.2753	16.6355	108.0	1.869
	0.45	0.2330	± 5 %	0.2214	0.2447	18.7150	109.0	2.103
	0.50	0.2097	± 5 %	0.1992	0.2202	20.7944	110.0	2.336
	0.60	0.1748	± 5 %	0.1660	0.1835	24.9533	112.0	2.804
	0.70	0.1498	± 5 %	0.1423	0.1573	29.1121	114.0	3.271
	0.80	0.1311	± 5 %	0.1245	0.1376	33.2710	116.0	3.738
	0.90	0.1165	± 5 %	0.1107	0.1223	37.4299	118.0	4.206
	1.00	0.1049	± 5 %	0.0996	0.1101	41.5888	120.0	4.673
4.0	0.10	1.3108	± 5 %	1.2452	1.3763	3.327	82.0	0.374
	0.11	1.1916	± 5 %	1.1320	1.2512	3.660	82.2	0.411
	0.12	1.0923	± 5 %	1.0377	1.1469	3.993	82.4	0.449
	0.14	0.9363	± 5 %	0.8894	0.9831	4.658	82.8	0.523
	0.15	0.8738	± 5 %	0.8301	0.9175	4.991	83.0	0.561
	0.18	0.7282	± 5 %	0.6918	0.7646	5.989	83.6	0.673
	0.19	0.6899	± 5 %	0.6554	0.7244	6.321	83.8	0.71
	0.20	0.6554	± 5 %	0.6226	0.6881	6.654	84.0	0.748
	0.22	0.5958	± 5 %	0.5660	0.6256	7.320	84.4	0.822
	0.25	0.5243	± 5 %	0.4981	0.5505	8.318	85.0	0.935
	0.30	0.4369	± 5 %	0.4151	0.4588	9.981	86.0	1.121
	0.35	0.3745	± 5 %	0.3558	0.3932	11.645	87.0	1.308
	0.40	0.3277	± 5 %	0.3113	0.3441	13.308	88.0	1.495
	0.45	0.2913	± 5 %	0.2767	0.3058	14.972	89.0	1.682
	0.50	0.2622	± 5 %	0.2490	0.2753	16.636	90.0	1.869
	0.60	0.2185	± 5 %	0.2075	0.2294	19.963	92.0	2.243
	0.70	0.1873	± 5 %	0.1779	0.1966	23.290	94.0	2.617
	0.80	0.1638	± 5 %	0.1557	0.1720	26.617	96.0	2.991
	0.90	0.1456	± 5 %	0.1384	0.1529	29.944	98.0	3.364

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
4.0	1.00	0.1311	± 5 %	0.1245	0.1376	33.271	100.0	3.738
3.0	0.10	1.7477	± 5 %	1.6603	1.8351	2.495	62.0	0.280
	0.11	1.5888	± 5 %	1.5093	1.6682	2.745	62.2	0.308
	0.12	1.4564	± 5 %	1.3836	1.5292	2.994	62.4	0.336
	0.14	1.2483	± 5 %	1.1859	1.3108	3.493	62.8	0.393
	0.15	1.1651	± 5 %	1.1069	1.2234	3.743	63.0	0.421
	0.18	0.9709	± 5 %	0.9224	1.0195	4.492	63.6	0.505
	0.19	0.9198	± 5 %	0.8738	0.9658	4.741	63.8	0.533
	0.20	0.8738	± 5 %	0.8301	0.9175	4.991	64.0	0.561
	0.22	0.7944	± 5 %	0.7547	0.8341	5.490	64.4	0.617
	0.25	0.6991	± 5 %	0.6641	0.7340	6.238	65.0	0.701
	0.30	0.5826	± 5 %	0.5534	0.6117	7.486	66.0	0.841
	0.35	0.4993	± 5 %	0.4744	0.5243	8.734	67.0	0.981
	0.40	0.4369	± 5 %	0.4151	0.4588	9.981	68.0	1.121
	0.45	0.3884	± 5 %	0.3690	0.4078	11.229	69.0	1.262
	0.50	0.3495	± 5 %	0.3321	0.3670	12.477	70.0	1.402
	0.60	0.2913	± 5 %	0.2767	0.3058	14.972	72.0	1.682
	0.70	0.2497	± 5 %	0.2372	0.2622	17.467	74.0	1.963
	0.80	0.2185	± 5 %	0.2075	0.2294	19.963	76.0	2.243
	0.90	0.1942	± 5 %	0.1845	0.2039	22.458	78.0	2.523
	1.00	0.1748	± 5 %	0.1660	0.1835	24.953	80.0	2.804
2.5	0.10	2.0972	± 5 %	1.9923	2.2021	2.079	52.0	0.234
	0.11	1.9065	± 5 %	1.8112	2.0019	2.287	52.2	0.257
	0.12	1.7477	± 5 %	1.6603	1.8351	2.495	52.4	0.280
	0.14	1.4980	± 5 %	1.4231	1.5729	2.911	52.8	0.327
	0.15	1.3981	± 5 %	1.3282	1.4680	3.119	53.0	0.350
	0.18	1.1651	± 5 %	1.1069	1.2234	3.743	53.6	0.421
	0.19	1.1038	± 5 %	1.0486	1.1590	3.951	53.8	0.444
	0.20	1.0486	± 5 %	0.9962	1.1010	4.159	54.0	0.467
	0.22	0.9533	± 5 %	0.9056	1.0009	4.575	54.4	0.514
	0.25	0.8389	± 5 %	0.7969	0.8808	5.199	55.0	0.584
	0.30	0.6991	± 5 %	0.6641	0.7340	6.238	56.0	0.701
	0.35	0.5992	± 5 %	0.5692	0.6292	7.278	57.0	0.818
	0.40	0.5243	± 5 %	0.4981	0.5505	8.318	58.0	0.935
	0.45	0.4660	± 5 %	0.4427	0.4893	9.357	59.0	1.051
	0.50	0.4194	± 5 %	0.3985	0.4404	10.397	60.0	1.168
	0.60	0.3495	± 5 %	0.3321	0.3670	12.477	62.0	1.402
	0.70	0.2996	± 5 %	0.2846	0.3146	14.556	64.0	1.636
	0.80	0.2622	± 5 %	0.2490	0.2753	16.636	66.0	1.869
	0.90	0.2330	± 5 %	0.2214	0.2447	18.715	68.0	2.103
	1.00	0.2097	± 5 %	0.1992	0.2202	20.794	70.0	2.336
2.0	0.08	3.2769	± 5 %	3.1130	3.4407	1.331	41.6	0.150
	0.085	3.0841	± 5 %	2.9299	3.2383	1.414	41.7	0.159
	0.09	2.9128	± 5 %	2.7671	3.0584	1.497	41.8	0.168
	0.10	2.6215	± 5 %	2.4904	2.7526	1.664	42.0	0.187
	0.11	2.3832	± 5 %	2.2640	2.5023	1.830	42.2	0.206
	0.12	2.1846	± 5 %	2.0754	2.2938	1.996	42.4	0.224
	0.14	1.8725	± 5 %	1.7789	1.9661	2.329	42.8	0.262
	0.15	1.7477	± 5 %	1.6603	1.8351	2.495	43.0	0.280
	0.18	1.4564	± 5 %	1.3836	1.5292	2.994	43.6	0.336
	0.19	1.3797	± 5 %	1.3108	1.4487	3.161	43.8	0.355
	0.20	1.3108	± 5 %	1.2452	1.3763	3.327	44.0	0.374
	0.22	1.1916	± 5 %	1.1320	1.2512	3.660	44.4	0.411
	0.25	1.0486	± 5 %	0.9962	1.1010	4.159	45.0	0.467
	0.30	0.8738	± 5 %	0.8301	0.9175	4.991	46.0	0.561
	0.35	0.7490	± 5 %	0.7116	0.7865	5.822	47.0	0.654
	0.40	0.6554	± 5 %	0.6226	0.6881	6.654	48.0	0.748
	0.45	0.5826	± 5 %	0.5534	0.6117	7.486	49.0	0.841
	0.50	0.5243	± 5 %	0.4981	0.5505	8.318	50.0	0.935
	0.60	0.4369	± 5 %	0.4151	0.4588	9.981	52.0	1.121
	0.70	0.3745	± 5 %	0.3558	0.3932	11.645	54.0	1.308

CuNi 44, CuNi 23, CuNi 10, CuNi 6, CuNi 2 and Phy 400 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
2.0	0.80	0.3277	± 5 %	0.3113	0.3441	13.308	56.0	1.495
	0.90	0.2913	± 5 %	0.2767	0.3058	14.972	58.0	1.682
	1.00	0.2622	± 5 %	0.2490	0.2753	16.636	60.0	1.869
1.8	0.08	3.6410	± 5 %	3.4589	3.8230	1.198	37.6	0.135
	0.085	3.4268	± 5 %	3.2555	3.5981	1.273	37.7	0.143
	0.09	3.2364	± 5 %	3.0746	3.3982	1.347	37.8	0.151
	0.10	2.9128	± 5 %	2.7671	3.0584	1.497	38.0	0.168
	0.11	2.6480	± 5 %	2.5156	2.7804	1.647	38.2	0.185
	0.12	2.4273	± 5 %	2.3059	2.5487	1.797	38.4	0.202
	0.14	2.0806	± 5 %	1.9765	2.1846	2.096	38.8	0.236
	0.15	1.9419	± 5 %	1.8448	2.0389	2.246	39.0	0.252
	0.18	1.6182	± 5 %	1.5373	1.6991	2.695	39.6	0.303
	0.19	1.5330	± 5 %	1.4564	1.6097	2.845	39.8	0.320
	0.20	1.4564	± 5 %	1.3836	1.5292	2.994	40.0	0.336
	0.22	1.3240	± 5 %	1.2578	1.3902	3.294	40.4	0.370
	0.25	1.1651	± 5 %	1.1069	1.2234	3.743	41.0	0.421
	0.30	0.9709	± 5 %	0.9224	1.0195	4.492	42.0	0.505
	0.35	0.8322	± 5 %	0.7906	0.8738	5.240	43.0	0.589
	0.40	0.7282	± 5 %	0.6918	0.7646	5.989	44.0	0.673
	0.45	0.6473	± 5 %	0.6149	0.6796	6.737	45.0	0.757
	0.50	0.5826	± 5 %	0.5534	0.6117	7.486	46.0	0.841
	0.60	0.4855	± 5 %	0.4612	0.5097	8.983	48.0	1.009
	0.70	0.4161	± 5 %	0.3953	0.4369	10.480	50.0	1.178
	0.80	0.3641	± 5 %	0.3459	0.3823	11.978	52.0	1.346
	0.90	0.3236	± 5 %	0.3075	0.3398	13.475	54.0	1.514
	1.00	0.2913	± 5 %	0.2767	0.3058	14.972	56.0	1.682
1.5	0.075	4.6604	± 5 %	4.4274	4.8935	0.936	31.5	0.105
	0.08	4.3692	± 5 %	4.1507	4.5876	0.998	31.6	0.112
	0.085	4.1122	± 5 %	3.9065	4.3178	1.061	31.7	0.119
	0.09	3.8837	± 5 %	3.6895	4.0779	1.123	31.8	0.126
	0.10	3.4953	± 5 %	3.3206	3.6701	1.248	32.0	0.140
	0.11	3.1776	± 5 %	3.0187	3.3365	1.372	32.2	0.154
	0.12	2.9128	± 5 %	2.7671	3.0584	1.497	32.4	0.168
	0.14	2.4967	± 5 %	2.3718	2.6215	1.747	32.8	0.196
	0.15	2.3302	± 5 %	2.2137	2.4467	1.871	33.0	0.210
	0.18	1.9419	± 5 %	1.8448	2.0389	2.246	33.6	0.252
	0.19	1.8396	± 5 %	1.7477	1.9316	2.371	33.8	0.266
	0.20	1.7477	± 5 %	1.6603	1.8351	2.495	34.0	0.280
	0.22	1.5888	± 5 %	1.5093	1.6682	2.745	34.4	0.308
	0.25	1.3981	± 5 %	1.3282	1.4680	3.119	35.0	0.350
	0.30	1.1651	± 5 %	1.1069	1.2234	3.743	36.0	0.421
	0.35	0.9987	± 5 %	0.9487	1.0486	4.367	37.0	0.491
	0.40	0.8738	± 5 %	0.8301	0.9175	4.991	38.0	0.561
	0.45	0.7767	± 5 %	0.7379	0.8156	5.614	39.0	0.631
	0.50	0.6991	± 5 %	0.6641	0.7340	6.238	40.0	0.701
	0.60	0.5826	± 5 %	0.5534	0.6117	7.486	42.0	0.841
	0.70	0.4993	± 5 %	0.4744	0.5243	8.734	44.0	0.981
	0.80	0.4369	± 5 %	0.4151	0.4588	9.981	46.0	1.121
	0.90	0.3884	± 5 %	0.3690	0.4078	11.229	48.0	1.262
	1.00	0.3495	± 5 %	0.3321	0.3670	12.477	50.0	1.402
1.2	0.07	6.2417	± 5 %	5.9296	6.5538	0.699	25.4	0.079
	0.075	5.8256	± 5 %	5.5343	6.1168	0.749	25.5	0.084
	0.08	5.4615	± 5 %	5.1884	5.7345	0.799	25.6	0.090
	0.085	5.1402	± 5 %	4.8832	5.3972	0.848	25.7	0.095
	0.09	4.8546	± 5 %	4.6119	5.0974	0.898	25.8	0.101
	0.10	4.3692	± 5 %	4.1507	4.5876	0.998	26.0	0.112
	0.11	3.9720	± 5 %	3.7734	4.1706	1.098	26.2	0.123
	0.12	3.6410	± 5 %	3.4589	3.8230	1.198	26.4	0.135
	0.14	3.1208	± 5 %	2.9648	3.2769	1.397	26.8	0.157
	0.15	2.9128	± 5 %	2.7671	3.0584	1.497	27.0	0.168
	0.18	2.4273	± 5 %	2.3059	2.5487	1.797	27.6	0.202

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
1.2	0.19	2.2996	± 5 %	2.1846	2.4145	1.896	27.8	0.213
	0.20	2.1846	± 5 %	2.0754	2.2938	1.996	28.0	0.224
	0.22	1.9860	± 5 %	1.8867	2.0853	2.196	28.4	0.247
	0.25	1.7477	± 5 %	1.6603	1.8351	2.495	29.0	0.280
	0.30	1.4564	± 5 %	1.3836	1.5292	2.994	30.0	0.336
	0.35	1.2483	± 5 %	1.1859	1.3108	3.493	31.0	0.393
	0.40	1.0923	± 5 %	1.0377	1.1469	3.993	32.0	0.449
	0.45	0.9709	± 5 %	0.9224	1.0195	4.492	33.0	0.505
	0.50	0.8738	± 5 %	0.8301	0.9175	4.991	34.0	0.561
	0.60	0.7282	± 5 %	0.6918	0.7646	5.989	36.0	0.673
	0.70	0.6242	± 5 %	0.5930	0.6554	6.987	38.0	0.785
1.0	0.06	8.7383	± 5 %	8.3014	9.1753	0.499	21.2	0.056
	0.07	7.4900	± 5 %	7.1155	7.8645	0.582	21.4	0.065
	0.075	6.9907	± 5 %	6.6411	7.3402	0.624	21.5	0.070
	0.08	6.5538	± 5 %	6.2261	6.8814	0.665	21.6	0.075
	0.085	6.1682	± 5 %	5.8598	6.4766	0.707	21.7	0.079
	0.09	5.8256	± 5 %	5.5343	6.1168	0.749	21.8	0.084
	0.10	5.2430	± 5 %	4.9809	5.5052	0.832	22.0	0.093
	0.11	4.7664	± 5 %	4.5280	5.0047	0.915	22.2	0.103
	0.12	4.3692	± 5 %	4.1507	4.5876	0.998	22.4	0.112
	0.14	3.7450	± 5 %	3.5578	3.9323	1.164	22.8	0.131
	0.15	3.4953	± 5 %	3.3206	3.6701	1.248	23.0	0.140
	0.18	2.9128	± 5 %	2.7671	3.0584	1.497	23.6	0.168
	0.19	2.7595	± 5 %	2.6215	2.8974	1.580	23.8	0.178
	0.20	2.6215	± 5 %	2.4904	2.7526	1.664	24.0	0.187
	0.22	2.3832	± 5 %	2.2640	2.5023	1.830	24.4	0.206
	0.25	2.0972	± 5 %	1.9923	2.2021	2.079	25.0	0.234
	0.30	1.7477	± 5 %	1.6603	1.8351	2.495	26.0	0.280
	0.35	1.4980	± 5 %	1.4231	1.5729	2.911	27.0	0.327
	0.40	1.3108	± 5 %	1.2452	1.3763	3.327	28.0	0.374
	0.45	1.1651	± 5 %	1.1069	1.2234	3.743	29.0	0.421
	0.50	1.0486	± 5 %	0.9962	1.1010	4.159	30.0	0.467
	0.60	0.8738	± 5 %	0.8301	0.9175	4.991	32.0	0.561
	0.70	0.7490	± 5 %	0.7116	0.7865	5.822	34.0	0.654
0.9	0.06	9.7093	± 5 %	9.2238	10.1947	0.449	19.2	0.050
	0.07	8.3222	± 5 %	7.9061	8.7383	0.524	19.4	0.059
	0.075	7.7674	± 5 %	7.3790	8.1558	0.561	19.5	0.063
	0.08	7.2819	± 5 %	6.9178	7.6460	0.599	19.6	0.067
	0.085	6.8536	± 5 %	6.5109	7.1963	0.636	19.7	0.071
	0.09	6.4728	± 5 %	6.1492	6.7965	0.674	19.8	0.076
	0.10	5.8256	± 5 %	5.5343	6.1168	0.749	20.0	0.084
	0.11	5.2960	± 5 %	5.0312	5.5608	0.823	20.2	0.093
	0.12	4.8546	± 5 %	4.6119	5.0974	0.898	20.4	0.101
	0.14	4.1611	± 5 %	3.9531	4.3692	1.048	20.8	0.118
	0.15	3.8837	± 5 %	3.6895	4.0779	1.123	21.0	0.126
	0.18	3.2364	± 5 %	3.0746	3.3982	1.347	21.6	0.151
	0.19	3.0661	± 5 %	2.9128	3.2194	1.422	21.8	0.160
	0.20	2.9128	± 5 %	2.7671	3.0584	1.497	22.0	0.168
	0.22	2.6480	± 5 %	2.5156	2.7804	1.647	22.4	0.185
	0.25	2.3302	± 5 %	2.2137	2.4467	1.871	23.0	0.210
	0.30	1.9419	± 5 %	1.8448	2.0389	2.246	24.0	0.252
	0.35	1.6644	± 5 %	1.5812	1.7477	2.620	25.0	0.294
	0.40	1.4564	± 5 %	1.3836	1.5292	2.994	26.0	0.336
	0.45	1.2946	± 5 %	1.2298	1.3593	3.369	27.0	0.379
	0.50	1.1651	± 5 %	1.1069	1.2234	3.743	28.0	0.421
	0.60	0.9709	± 5 %	0.9224	1.0195	4.492	30.0	0.505
0.8	0.06	10.9229	± 5 %	10.3768	11.4691	0.399	17.2	0.045
	0.07	9.3625	± 5 %	8.8944	9.8306	0.466	17.4	0.052
	0.075	8.7383	± 5 %	8.3014	9.1753	0.499	17.5	0.056
	0.08	8.1922	± 5 %	7.7826	8.6018	0.532	17.6	0.060
	0.085	7.7103	± 5 %	7.3248	8.0958	0.566	17.7	0.064

CuNi 44, CuNi 23, CuNi 10, CuNi 6, CuNi 2 and Phy 400 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
	0.09	7.2819	± 5 %	6.9178	7.6460	0.599	17.8	0.067
	0.10	6.5538	± 5 %	6.2261	6.8814	0.665	18.0	0.075
	0.11	5.9580	± 5 %	5.6601	6.2559	0.732	18.2	0.082
	0.12	5.4615	± 5 %	5.1884	5.7345	0.799	18.4	0.090
	0.14	4.6813	± 5 %	4.4472	4.9153	0.932	18.8	0.105
	0.15	4.3692	± 5 %	4.1507	4.5876	0.998	19.0	0.112
	0.18	3.6410	± 5 %	3.4589	3.8230	1.198	19.6	0.135
	0.19	3.4493	± 5 %	3.2769	3.6218	1.264	19.8	0.142
0.8	0.20	3.2769	± 5 %	3.1130	3.4407	1.331	20.0	0.150
	0.22	2.9790	± 5 %	2.8300	3.1279	1.464	20.4	0.164
	0.25	2.6215	± 5 %	2.4904	2.7526	1.664	21.0	0.187
	0.30	2.1846	± 5 %	2.0754	2.2938	1.996	22.0	0.224
	0.35	1.8725	± 5 %	1.7789	1.9661	2.329	23.0	0.262
	0.40	1.6384	± 5 %	1.5565	1.7204	2.662	24.0	0.299
	0.45	1.4564	± 5 %	1.3836	1.5292	2.994	25.0	0.336
	0.50	1.3108	± 5 %	1.2452	1.3763	3.327	26.0	0.374
	0.60	1.0923	± 5 %	1.0377	1.1469	3.993	28.0	0.449
	0.06	12.4833	± 5 %	11.8592	13.1075	0.349	15.2	0.039
	0.07	10.7000	± 5 %	10.1650	11.2350	0.408	15.4	0.046
	0.075	9.9867	± 5 %	9.4873	10.4860	0.437	15.5	0.049
	0.08	9.3625	± 5 %	8.8944	9.8306	0.466	15.6	0.052
	0.085	8.8118	± 5 %	8.3712	9.2524	0.495	15.7	0.056
	0.09	8.3222	± 5 %	7.9061	8.7383	0.524	15.8	0.059
	0.10	7.4900	± 5 %	7.1155	7.8645	0.582	16.0	0.065
	0.11	6.8091	± 5 %	6.4686	7.1495	0.640	16.2	0.072
	0.12	6.2417	± 5 %	5.9296	6.5538	0.699	16.4	0.079
	0.14	5.3500	± 5 %	5.0825	5.6175	0.815	16.8	0.092
0.7	0.15	4.9933	± 5 %	4.7437	5.2430	0.873	17.0	0.098
	0.18	4.1611	± 5 %	3.9531	4.3692	1.048	17.6	0.118
	0.19	3.9421	± 5 %	3.7450	4.1392	1.106	17.8	0.124
	0.20	3.7450	± 5 %	3.5578	3.9323	1.164	18.0	0.131
	0.22	3.4045	± 5 %	3.2343	3.5748	1.281	18.4	0.144
	0.25	2.9960	± 5 %	2.8462	3.1458	1.456	19.0	0.164
	0.30	2.4967	± 5 %	2.3718	2.6215	1.747	20.0	0.196
	0.35	2.1400	± 5 %	2.0330	2.2470	2.038	21.0	0.229
	0.40	1.8725	± 5 %	1.7789	1.9661	2.329	22.0	0.262
	0.45	1.6644	± 5 %	1.5812	1.7477	2.620	23.0	0.294
	0.50	1.4980	± 5 %	1.4231	1.5729	2.911	24.0	0.327
	0.06	14.5639	± 5 %	13.8357	15.2921	0.299	13.2	0.034
	0.07	12.4833	± 5 %	11.8592	13.1075	0.349	13.4	0.039
	0.075	11.6511	± 5 %	11.0686	12.2337	0.374	13.5	0.042
	0.08	10.9229	± 5 %	10.3768	11.4691	0.399	13.6	0.045
	0.085	10.2804	± 5 %	9.7664	10.7944	0.424	13.7	0.048
	0.09	9.7093	± 5 %	9.2238	10.1947	0.449	13.8	0.050
	0.10	8.7383	± 5 %	8.3014	9.1753	0.499	14.0	0.056
	0.11	7.9439	± 5 %	7.5467	8.3411	0.549	14.2	0.062
	0.12	7.2819	± 5 %	6.9178	7.6460	0.599	14.4	0.067
	0.14	6.2417	± 5 %	5.9296	6.5538	0.699	14.8	0.079
0.6	0.15	5.8256	± 5 %	5.5343	6.1168	0.749	15.0	0.084
	0.18	4.8546	± 5 %	4.6119	5.0974	0.898	15.6	0.101
	0.19	4.5991	± 5 %	4.3692	4.8291	0.948	15.8	0.107
	0.20	4.3692	± 5 %	4.1507	4.5876	0.998	16.0	0.112
	0.22	3.9720	± 5 %	3.7734	4.1706	1.098	16.4	0.123
	0.25	3.4953	± 5 %	3.3206	3.6701	1.248	17.0	0.140
	0.30	2.9128	± 5 %	2.7671	3.0584	1.497	18.0	0.168
	0.35	2.4967	± 5 %	2.3718	2.6215	1.747	19.0	0.196
	0.40	2.1846	± 5 %	2.0754	2.2938	1.996	20.0	0.224
	0.45	1.9419	± 5 %	1.8448	2.0389	2.246	21.0	0.252
	0.06	17.4767	± 5 %	16.6028	18.3505	0.250	11.2	0.028
0.5	0.07	14.9800	± 5 %	14.2310	15.7290	0.291	11.4	0.033
	0.075	13.9813	± 5 %	13.2823	14.6804	0.312	11.5	0.035

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
0.5	0.08	13.1075	± 5 %	12.4521	13.7629	0.333	11.6	0.037
	0.085	12.3365	± 5 %	11.7196	12.9533	0.354	11.7	0.040
	0.09	11.6511	± 5 %	11.0686	12.2337	0.374	11.8	0.042
	0.10	10.4860	± 5 %	9.9617	11.0103	0.416	12.0	0.047
	0.11	9.5327	± 5 %	9.0561	10.0094	0.457	12.2	0.051
	0.12	8.7383	± 5 %	8.3014	9.1753	0.499	12.4	0.056
	0.14	7.4900	± 5 %	7.1155	7.8645	0.582	12.8	0.065
	0.15	6.9907	± 5 %	6.6411	7.3402	0.624	13.0	0.070
	0.18	5.8256	± 5 %	5.5343	6.1168	0.749	13.6	0.084
	0.19	5.5189	± 5 %	5.2430	5.7949	0.790	13.8	0.089
	0.20	5.2430	± 5 %	4.9809	5.5052	0.832	14.0	0.093
0.4	0.05	26.2150	± 5 %	24.9043	27.5258	0.166	9.0	0.019
	0.06	21.8458	± 5 %	20.7535	22.9381	0.200	9.2	0.022
	0.07	18.7250	± 5 %	17.7888	19.6613	0.233	9.4	0.026
	0.075	17.4767	± 5 %	16.6028	18.3505	0.250	9.5	0.028
	0.08	16.3844	± 5 %	15.5652	17.2036	0.266	9.6	0.030
	0.085	15.4206	± 5 %	14.6496	16.1916	0.283	9.7	0.032
	0.09	14.5639	± 5 %	13.8357	15.2921	0.299	9.8	0.034
	0.10	13.1075	± 5 %	12.4521	13.7629	0.333	10.0	0.037
	0.11	11.9159	± 5 %	11.3201	12.5117	0.366	10.2	0.041
	0.12	10.9229	± 5 %	10.3768	11.4691	0.399	10.4	0.045
	0.14	9.3625	± 5 %	8.8944	9.8306	0.466	10.8	0.052
	0.15	8.7383	± 5 %	8.3014	9.1753	0.499	11.0	0.056
	0.18	7.2819	± 5 %	6.9178	7.6460	0.599	11.6	0.067
	0.19	6.8987	± 5 %	6.5538	7.2436	0.632	11.8	0.071
	0.20	6.5538	± 5 %	6.2261	6.8814	0.665	12.0	0.075
0.3	0.05	34.9533	± 5 %	33.2057	36.7010	0.125	7.0	0.014
	0.06	29.1278	± 5 %	27.6714	30.5842	0.150	7.2	0.017
	0.07	24.9667	± 5 %	23.7183	26.2150	0.175	7.4	0.020
	0.075	23.3022	± 5 %	22.1371	24.4673	0.187	7.5	0.021
	0.08	21.8458	± 5 %	20.7535	22.9381	0.200	7.6	0.022
	0.085	20.5608	± 5 %	19.5327	21.5888	0.212	7.7	0.024
	0.09	19.4185	± 5 %	18.4476	20.3894	0.225	7.8	0.025
	0.10	17.4767	± 5 %	16.6028	18.3505	0.250	8.0	0.028
	0.11	15.8879	± 5 %	15.0935	16.6823	0.274	8.2	0.031
	0.12	14.5639	± 5 %	13.8357	15.2921	0.299	8.4	0.034
	0.14	12.4833	± 5 %	11.8592	13.1075	0.349	8.8	0.039
	0.15	11.6511	± 5 %	11.0686	12.2337	0.374	9.0	0.042
0.2	0.05	52.4300	± 5 %	49.8085	55.0515	0.083	5.0	0.009
	0.06	43.6917	± 5 %	41.5071	45.8763	0.100	5.2	0.011
	0.07	37.4500	± 5 %	35.5775	39.3225	0.116	5.4	0.013
	0.075	34.9533	± 5 %	33.2057	36.7010	0.125	5.5	0.014
	0.08	32.7688	± 5 %	31.1303	34.4072	0.133	5.6	0.015
	0.085	30.8412	± 5 %	29.2991	32.3832	0.141	5.7	0.016
	0.09	29.1278	± 5 %	27.6714	30.5842	0.150	5.8	0.017
	0.10	26.2150	± 5 %	24.9043	27.5258	0.166	6.0	0.019
	0.11	23.8318	± 5 %	22.6402	25.0234	0.183	6.2	0.021
	0.12	21.8458	± 5 %	20.7535	22.9381	0.200	6.4	0.022
	0.14	18.7250	± 5 %	17.7888	19.6613	0.233	6.8	0.026
	0.15	17.4767	± 5 %	16.6028	18.3505	0.250	7.0	0.028

INVAR® and FeNi 70 (Hytemco)

INVAR®: Resistivity 0.80 Ω mm²/m. Density 8.11 g/cm³.
FeNi 70: Resistivity 0.20 Ω mm²/m. Density 8.46 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300	400	500	600	700
INVAR® Ct								
FeNi 70 Ct	1.00	1.36	1.97	2.65	3.33	3.93	4.48	4.98

Here are the conversion factors for FeNi alloys. Multiply the figures in the table by the conversion factor to obtain the data required for other alloys.

Alloy	Conversion Factor of Resistance	Conversion Factor of Weight g/m
INVAR®	1.00	1.00
FeNi 70	0.25	1.044

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm²/m	Cross section mm²
5.0	0.10	1.7120	± 5 %	1.6264	1.7976	3.790	102.0	0.467
	0.11	1.5564	± 5 %	1.4785	1.6342	4.169	102.2	0.514
	0.12	1.4267	± 5 %	1.3553	1.4980	4.548	102.4	0.561
	0.14	1.2229	± 5 %	1.1617	1.2840	5.306	102.8	0.654
	0.15	1.1413	± 5 %	1.0843	1.1984	5.685	103.0	0.701
	0.18	0.9511	± 5 %	0.9036	0.9987	6.821	103.6	0.841
	0.19	0.9011	± 5 %	0.8560	0.9461	7.200	103.8	0.888
	0.20	0.8560	± 5 %	0.8132	0.8988	7.579	104.0	0.935
	0.22	0.7782	± 5 %	0.7393	0.8171	8.337	104.4	1.028
	0.25	0.6848	± 5 %	0.6506	0.7190	9.474	105.0	1.168
	0.30	0.5707	± 5 %	0.5421	0.5992	11.369	106.0	1.402
	0.35	0.4891	± 5 %	0.4647	0.5136	13.264	107.0	1.636
	0.40	0.4280	± 5 %	0.4066	0.4494	15.159	108.0	1.869
	0.45	0.3804	± 5 %	0.3614	0.3995	17.054	109.0	2.103
	0.50	0.3424	± 5 %	0.3253	0.3595	18.949	110.0	2.336
	0.60	0.2853	± 5 %	0.2711	0.2996	22.738	112.0	2.804
	0.70	0.2446	± 5 %	0.2323	0.2568	26.528	114.0	3.271
	0.80	0.2140	± 5 %	0.2033	0.2247	30.318	116.0	3.738
	0.90	0.1902	± 5 %	0.1807	0.1997	34.107	118.0	4.206
	1.00	0.1712	± 5 %	0.1626	0.1798	37.897	120.0	4.673
4.0	0.10	2.1400	± 5 %	2.0330	2.2470	3.032	82.0	0.374
	0.11	1.9455	± 5 %	1.8482	2.0427	3.335	82.2	0.411
	0.12	1.7833	± 5 %	1.6942	1.8725	3.638	82.4	0.449
	0.14	1.5286	± 5 %	1.4521	1.6050	4.244	82.8	0.523
	0.15	1.4267	± 5 %	1.3553	1.4980	4.548	83.0	0.561
	0.18	1.1889	± 5 %	1.1294	1.2483	5.457	83.6	0.673
	0.19	1.1263	± 5 %	1.0700	1.1826	5.760	83.8	0.710
	0.20	1.0700	± 5 %	1.0165	1.1235	6.064	84.0	0.748
	0.22	0.9727	± 5 %	0.9241	1.0214	6.670	84.4	0.822
	0.25	0.8560	± 5 %	0.8132	0.8988	7.579	85.0	0.935
	0.30	0.7133	± 5 %	0.6777	0.7490	9.095	86.0	1.121
	0.35	0.6114	± 5 %	0.5809	0.6420	10.611	87.0	1.308
	0.40	0.5350	± 5 %	0.5083	0.5618	12.127	88.0	1.495
	0.45	0.4756	± 5 %	0.4518	0.4993	13.643	89.0	1.682
	0.50	0.4280	± 5 %	0.4066	0.4494	15.159	90.0	1.869
	0.60	0.3567	± 5 %	0.3388	0.3745	18.191	92.0	2.243
	0.70	0.3057	± 5 %	0.2904	0.3210	21.222	94.0	2.617
	0.80	0.2675	± 5 %	0.2541	0.2809	24.254	96.0	2.991
	0.90	0.2378	± 5 %	0.2259	0.2497	27.286	98.0	3.364
	1.00	0.2140	± 5 %	0.2033	0.2247	30.318	100.0	3.738
3.0	0.10	2.8533	± 5 %	2.7107	2.9960	2.274	62.0	0.280
	0.11	2.5939	± 5 %	2.4642	2.7236	2.501	62.2	0.308
	0.12	2.3778	± 5 %	2.2589	2.4967	2.729	62.4	0.336
	0.14	2.0381	± 5 %	1.9362	2.1400	3.183	62.8	0.393
	0.15	1.9022	± 5 %	1.8071	1.9973	3.411	63.0	0.421
	0.18	1.5852	± 5 %	1.5059	1.6644	4.093	63.6	0.505
	0.19	1.5018	± 5 %	1.4267	1.5768	4.320	63.8	0.533

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
3.0	0.20	1.4267	± 5 %	1.3553	1.4980	4.548	64.0	0.561
	0.22	1.2970	± 5 %	1.2321	1.3618	5.002	64.4	0.617
	0.25	1.1413	± 5 %	1.0843	1.1984	5.685	65.0	0.701
	0.30	0.9511	± 5 %	0.9036	0.9987	6.821	66.0	0.841
	0.35	0.8152	± 5 %	0.7745	0.8560	7.958	67.0	0.981
	0.40	0.7133	± 5 %	0.6777	0.7490	9.095	68.0	1.121
	0.45	0.6341	± 5 %	0.6024	0.6658	10.232	69.0	1.262
	0.50	0.5707	± 5 %	0.5421	0.5992	11.369	70.0	1.402
	0.60	0.4756	± 5 %	0.4518	0.4993	13.643	72.0	1.682
	0.70	0.4076	± 5 %	0.3872	0.4280	15.917	74.0	1.963
	0.80	0.3567	± 5 %	0.3388	0.3745	18.191	76.0	2.243
	0.90	0.3170	± 5 %	0.3012	0.3329	20.464	78.0	2.523
	1.00	0.2853	± 5 %	0.2711	0.2996	22.738	80.0	2.804
2.5	0.10	3.4240	± 5 %	3.2528	3.5952	1.895	52.0	0.234
	0.11	3.1127	± 5 %	2.9571	3.2684	2.084	52.2	0.257
	0.12	2.8533	± 5 %	2.7107	2.9960	2.274	52.4	0.280
	0.14	2.4457	± 5 %	2.3234	2.5680	2.653	52.8	0.327
	0.15	2.2827	± 5 %	2.1685	2.3968	2.842	53.0	0.350
	0.18	1.9022	± 5 %	1.8071	1.9973	3.411	53.6	0.421
	0.19	1.8021	± 5 %	1.7120	1.8922	3.600	53.8	0.444
	0.20	1.7120	± 5 %	1.6264	1.7976	3.790	54.0	0.467
	0.22	1.5564	± 5 %	1.4785	1.6342	4.169	54.4	0.514
	0.25	1.3696	± 5 %	1.3011	1.4381	4.737	55.0	0.584
	0.30	1.1413	± 5 %	1.0843	1.1984	5.685	56.0	0.701
	0.35	0.9783	± 5 %	0.9294	1.0272	6.632	57.0	0.818
	0.40	0.8560	± 5 %	0.8132	0.8988	7.579	58.0	0.935
	0.45	0.7609	± 5 %	0.7228	0.7989	8.527	59.0	1.051
	0.50	0.6848	± 5 %	0.6506	0.7190	9.474	60.0	1.168
	0.60	0.5707	± 5 %	0.5421	0.5992	11.369	62.0	1.402
	0.70	0.4891	± 5 %	0.4647	0.5136	13.264	64.0	1.636
	0.80	0.4280	± 5 %	0.4066	0.4494	15.159	66.0	1.869
	0.90	0.3804	± 5 %	0.3614	0.3995	17.054	68.0	2.103
	1.00	0.3424	± 5 %	0.3253	0.3595	18.949	70.0	2.336
2.0	0.08	5.3500	± 5 %	5.0825	5.6175	1.213	41.6	0.150
	0.085	5.0353	± 5 %	4.7835	5.2871	1.289	41.7	0.159
	0.09	4.7556	± 5 %	4.5178	4.9933	1.364	41.8	0.168
	0.10	4.2800	± 5 %	4.0660	4.4940	1.516	42.0	0.187
	0.11	3.8909	± 5 %	3.6964	4.0855	1.667	42.2	0.206
	0.12	3.5667	± 5 %	3.3883	3.7450	1.819	42.4	0.224
	0.14	3.0571	± 5 %	2.9043	3.2100	2.122	42.8	0.262
	0.15	2.8533	± 5 %	2.7107	2.9960	2.274	43.0	0.280
	0.18	2.3778	± 5 %	2.2589	2.4967	2.729	43.6	0.336
	0.19	2.2526	± 5 %	2.1400	2.3653	2.880	43.8	0.355
	0.20	2.1400	± 5 %	2.0330	2.2470	3.032	44.0	0.374
	0.22	1.9455	± 5 %	1.8482	2.0427	3.335	44.4	0.411
	0.25	1.7120	± 5 %	1.6264	1.7976	3.790	45.0	0.467
	0.30	1.4267	± 5 %	1.3553	1.4980	4.548	46.0	0.561
	0.35	1.2229	± 5 %	1.1617	1.2840	5.306	47.0	0.654
	0.40	1.0700	± 5 %	1.0165	1.1235	6.064	48.0	0.748
	0.45	0.9511	± 5 %	0.9036	0.9987	6.821	49.0	0.841
	0.50	0.8560	± 5 %	0.8132	0.8988	7.579	50.0	0.935
	0.60	0.7133	± 5 %	0.6777	0.7490	9.095	52.0	1.121
	0.70	0.6114	± 5 %	0.5809	0.6420	10.611	54.0	1.308
	0.80	0.5350	± 5 %	0.5083	0.5618	12.127	56.0	1.495
	0.90	0.4756	± 5 %	0.4518	0.4993	13.643	58.0	1.682
	1.00	0.4280	± 5 %	0.4066	0.4494	15.159	60.0	1.869
1.8	0.08	5.9444	± 5 %	5.6472	6.2417	1.091	37.6	0.135
	0.085	5.5948	± 5 %	5.3150	5.8745	1.160	37.7	0.143
	0.09	5.2840	± 5 %	5.0198	5.5481	1.228	37.8	0.151
	0.10	4.7556	± 5 %	4.5178	4.9933	1.364	38.0	0.168
	0.11	4.3232	± 5 %	4.1071	4.5394	1.501	38.2	0.185

INVAR® and FeNi 70 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
1.8	0.12	3.9630	± 5 %	3.7648	4.1611	1.637	38.4	0.202
	0.14	3.3968	± 5 %	3.2270	3.5667	1.910	38.8	0.236
	0.15	3.1704	± 5 %	3.0119	3.3289	2.046	39.0	0.252
	0.18	2.6420	± 5 %	2.5099	2.7741	2.456	39.6	0.303
	0.19	2.5029	± 5 %	2.3778	2.6281	2.592	39.8	0.320
	0.20	2.3778	± 5 %	2.2589	2.4967	2.729	40.0	0.336
	0.22	2.1616	± 5 %	2.0535	2.2697	3.001	40.4	0.370
	0.25	1.9022	± 5 %	1.8071	1.9973	3.411	41.0	0.421
	0.30	1.5852	± 5 %	1.5059	1.6644	4.093	42.0	0.505
	0.35	1.3587	± 5 %	1.2908	1.4267	4.775	43.0	0.589
	0.40	1.1889	± 5 %	1.1294	1.2483	5.457	44.0	0.673
	0.45	1.0568	± 5 %	1.0040	1.1096	6.139	45.0	0.757
	0.50	0.9511	± 5 %	0.9036	0.9987	6.821	46.0	0.841
	0.60	0.7926	± 5 %	0.7530	0.8322	8.186	48.0	1.009
	0.70	0.6794	± 5 %	0.6454	0.7133	9.550	50.0	1.178
	0.80	0.5944	± 5 %	0.5647	0.6242	10.914	52.0	1.346
	0.90	0.5284	± 5 %	0.5020	0.5548	12.279	54.0	1.514
	1.00	0.4756	± 5 %	0.4518	0.4993	13.643	56.0	1.682
1.5	0.075	7.6089	± 5 %	7.2284	7.9893	0.853	31.5	0.105
	0.08	7.1333	± 5 %	6.7767	7.4900	0.910	31.6	0.112
	0.085	6.7137	± 5 %	6.3780	7.0494	0.966	31.7	0.119
	0.09	6.3407	± 5 %	6.0237	6.6578	1.023	31.8	0.126
	0.10	5.7067	± 5 %	5.4213	5.9920	1.137	32.0	0.140
	0.11	5.1879	± 5 %	4.9285	5.4473	1.251	32.2	0.154
	0.12	4.7556	± 5 %	4.5178	4.9933	1.364	32.4	0.168
	0.14	4.0762	± 5 %	3.8724	4.2800	1.592	32.8	0.196
	0.15	3.8044	± 5 %	3.6142	3.9947	1.705	33.0	0.210
	0.18	3.1704	± 5 %	3.0119	3.3289	2.046	33.6	0.252
	0.19	3.0035	± 5 %	2.8533	3.1537	2.160	33.8	0.266
	0.20	2.8533	± 5 %	2.7107	2.9960	2.274	34.0	0.280
	0.22	2.5939	± 5 %	2.4642	2.7236	2.501	34.4	0.308
	0.25	2.2827	± 5 %	2.1685	2.3968	2.842	35.0	0.350
	0.30	1.9022	± 5 %	1.8071	1.9973	3.411	36.0	0.421
	0.35	1.6305	± 5 %	1.5490	1.7120	3.979	37.0	0.491
	0.40	1.4267	± 5 %	1.3553	1.4980	4.548	38.0	0.561
	0.45	1.2681	± 5 %	1.2047	1.3316	5.116	39.0	0.631
	0.50	1.1413	± 5 %	1.0843	1.1984	5.685	40.0	0.701
	0.60	0.9511	± 5 %	0.9036	0.9987	6.821	42.0	0.841
	0.70	0.8152	± 5 %	0.7745	0.8560	7.958	44.0	0.981
	0.80	0.7133	± 5 %	0.6777	0.7490	9.095	46.0	1.121
	0.90	0.6341	± 5 %	0.6024	0.6658	10.232	48.0	1.262
	1.00	0.5707	± 5 %	0.5421	0.5992	11.369	50.0	1.402
1.2	0.07	10.1905	± 5 %	9.6810	10.7000	0.637	25.4	0.079
	0.075	9.5111	± 5 %	9.0356	9.9867	0.682	25.5	0.084
	0.08	8.9167	± 5 %	8.4708	9.3625	0.728	25.6	0.090
	0.085	8.3922	± 5 %	7.9725	8.8118	0.773	25.7	0.095
	0.09	7.9259	± 5 %	7.5296	8.3222	0.819	25.8	0.101
	0.10	7.1333	± 5 %	6.7767	7.4900	0.910	26.0	0.112
	0.11	6.4848	± 5 %	6.1606	6.8091	1.000	26.2	0.123
	0.12	5.9444	± 5 %	5.6472	6.2417	1.091	26.4	0.135
	0.14	5.0952	± 5 %	4.8405	5.3500	1.273	26.8	0.157
	0.15	4.7556	± 5 %	4.5178	4.9933	1.364	27.0	0.168
	0.18	3.9630	± 5 %	3.7648	4.1611	1.637	27.6	0.202
	0.19	3.7544	± 5 %	3.5667	3.9421	1.728	27.8	0.213
	0.20	3.5667	± 5 %	3.3883	3.7450	1.819	28.0	0.224
	0.22	3.2424	± 5 %	3.0803	3.4045	2.001	28.4	0.247
	0.25	2.8533	± 5 %	2.7107	2.9960	2.274	29.0	0.280
	0.30	2.3778	± 5 %	2.2589	2.4967	2.729	30.0	0.336
	0.35	2.0381	± 5 %	1.9362	2.1400	3.183	31.0	0.393
	0.40	1.7833	± 5 %	1.6942	1.8725	3.638	32.0	0.449
	0.45	1.5852	± 5 %	1.5059	1.6644	4.093	33.0	0.505

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
1.2	0.50	1.4267	± 5 %	1.3553	1.4980	4.548	34.0	0.561
	0.60	1.1889	± 5 %	1.1294	1.2483	5.457	36.0	0.673
	0.70	1.0190	± 5 %	0.9681	1.0700	6.367	38.0	0.785
1.0	0.06	14.2667	± 5 %	13.5533	14.9800	0.455	21.2	0.056
	0.07	12.2286	± 5 %	11.6171	12.8400	0.531	21.4	0.065
	0.075	11.4133	± 5 %	10.8427	11.9840	0.568	21.5	0.070
	0.08	10.7000	± 5 %	10.1650	11.2350	0.606	21.6	0.075
	0.085	10.0706	± 5 %	9.5671	10.5741	0.644	21.7	0.079
	0.09	9.5111	± 5 %	9.0356	9.9867	0.682	21.8	0.084
	0.10	8.5600	± 5 %	8.1320	8.9880	0.758	22.0	0.093
	0.11	7.7818	± 5 %	7.3927	8.1709	0.834	22.2	0.103
	0.12	7.1333	± 5 %	6.7767	7.4900	0.910	22.4	0.112
	0.14	6.1143	± 5 %	5.8086	6.4200	1.061	22.8	0.131
	0.15	5.7067	± 5 %	5.4213	5.9920	1.137	23.0	0.140
	0.18	4.7556	± 5 %	4.5178	4.9933	1.364	23.6	0.168
	0.19	4.5053	± 5 %	4.2800	4.7305	1.440	23.8	0.178
	0.20	4.2800	± 5 %	4.0660	4.4940	1.516	24.0	0.187
	0.22	3.8909	± 5 %	3.6964	4.0855	1.667	24.4	0.206
	0.25	3.4240	± 5 %	3.2528	3.5952	1.895	25.0	0.234
	0.30	2.8533	± 5 %	2.7107	2.9960	2.274	26.0	0.280
	0.35	2.4457	± 5 %	2.3234	2.5680	2.653	27.0	0.327
	0.40	2.1400	± 5 %	2.0330	2.2470	3.032	28.0	0.374
	0.45	1.9022	± 5 %	1.8071	1.9973	3.411	29.0	0.421
	0.50	1.7120	± 5 %	1.6264	1.7976	3.790	30.0	0.467
	0.60	1.4267	± 5 %	1.3553	1.4980	4.548	32.0	0.561
	0.70	1.2229	± 5 %	1.1617	1.2840	5.306	34.0	0.654
0.9	0.06	15.8519	± 5 %	15.0593	16.6444	0.409	19.2	0.050
	0.07	13.5873	± 5 %	12.9079	14.2667	0.478	19.4	0.059
	0.075	12.6815	± 5 %	12.0474	13.3156	0.512	19.5	0.063
	0.08	11.8889	± 5 %	11.2944	12.4833	0.546	19.6	0.067
	0.085	11.1895	± 5 %	10.6301	11.7490	0.580	19.7	0.071
	0.09	10.5679	± 5 %	10.0395	11.0963	0.614	19.8	0.076
	0.10	9.5111	± 5 %	9.0356	9.9867	0.682	20.0	0.084
	0.11	8.6465	± 5 %	8.2141	9.0788	0.750	20.2	0.093
	0.12	7.9259	± 5 %	7.5296	8.3222	0.819	20.4	0.101
	0.14	6.7937	± 5 %	6.4540	7.1333	0.955	20.8	0.118
	0.15	6.3407	± 5 %	6.0237	6.6578	1.023	21.0	0.126
	0.18	5.2840	± 5 %	5.0198	5.5481	1.228	21.6	0.151
	0.19	5.0058	± 5 %	4.7556	5.2561	1.296	21.8	0.160
	0.20	4.7556	± 5 %	4.5178	4.9933	1.364	22.0	0.168
	0.22	4.3232	± 5 %	4.1071	4.5394	1.501	22.4	0.185
	0.25	3.8044	± 5 %	3.6142	3.9947	1.705	23.0	0.210
	0.30	3.1704	± 5 %	3.0119	3.3289	2.046	24.0	0.252
	0.35	2.7175	± 5 %	2.5816	2.8533	2.388	25.0	0.294
	0.40	2.3778	± 5 %	2.2589	2.4967	2.729	26.0	0.336
	0.45	2.1136	± 5 %	2.0079	2.2193	3.070	27.0	0.379
	0.50	1.9022	± 5 %	1.8071	1.9973	3.411	28.0	0.421
	0.60	1.5852	± 5 %	1.5059	1.6644	4.093	30.0	0.505
0.8	0.06	17.8333	± 5 %	16.9417	18.7250	0.364	17.2	0.045
	0.07	15.2857	± 5 %	14.5214	16.0500	0.424	17.4	0.052
	0.075	14.2667	± 5 %	13.5533	14.9800	0.455	17.5	0.056
	0.08	13.3750	± 5 %	12.7063	14.0438	0.485	17.6	0.060
	0.085	12.5882	± 5 %	11.9588	13.2176	0.515	17.7	0.064
	0.09	11.8889	± 5 %	11.2944	12.4833	0.546	17.8	0.067
	0.10	10.7000	± 5 %	10.1650	11.2350	0.606	18.0	0.075
	0.11	9.7273	± 5 %	9.2409	10.2136	0.667	18.2	0.082
	0.12	8.9167	± 5 %	8.4708	9.3625	0.728	18.4	0.090
	0.14	7.6429	± 5 %	7.2607	8.0250	0.849	18.8	0.105
	0.15	7.1333	± 5 %	6.7767	7.4900	0.910	19.0	0.112
	0.18	5.9444	± 5 %	5.6472	6.2417	1.091	19.6	0.135
	0.19	5.6316	± 5 %	5.3500	5.9132	1.152	19.8	0.142

INVAR® and FeNi 70 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
0.8	0.20	5.3500	± 5 %	5.0825	5.6175	1.213	20.0	0.150
	0.22	4.8636	± 5 %	4.6205	5.1068	1.334	20.4	0.164
	0.25	4.2800	± 5 %	4.0660	4.4940	1.516	21.0	0.187
	0.30	3.5667	± 5 %	3.3883	3.7450	1.819	22.0	0.224
	0.35	3.0571	± 5 %	2.9043	3.2100	2.122	23.0	0.262
	0.40	2.6750	± 5 %	2.5413	2.8088	2.425	24.0	0.299
	0.45	2.3778	± 5 %	2.2589	2.4967	2.729	25.0	0.336
	0.50	2.1400	± 5 %	2.0330	2.2470	3.032	26.0	0.374
	0.60	1.7833	± 5 %	1.6942	1.8725	3.638	28.0	0.449
0.7	0.06	20.3810	± 5 %	19.3619	21.4000	0.318	15.2	0.039
	0.07	17.4694	± 5 %	16.5959	18.3429	0.371	15.4	0.046
	0.075	16.3048	± 5 %	15.4895	17.1200	0.398	15.5	0.049
	0.08	15.2857	± 5 %	14.5214	16.0500	0.424	15.6	0.052
	0.085	14.3866	± 5 %	13.6672	15.1059	0.451	15.7	0.056
	0.09	13.5873	± 5 %	12.9079	14.2667	0.478	15.8	0.059
	0.10	12.2286	± 5 %	11.6171	12.8400	0.531	16.0	0.065
	0.11	11.1169	± 5 %	10.5610	11.6727	0.584	16.2	0.072
	0.12	10.1905	± 5 %	9.6810	10.7000	0.637	16.4	0.079
	0.14	8.7347	± 5 %	8.2980	9.1714	0.743	16.8	0.092
	0.15	8.1524	± 5 %	7.7448	8.5600	0.796	17.0	0.098
	0.18	6.7937	± 5 %	6.4540	7.1333	0.955	17.6	0.118
	0.19	6.4361	± 5 %	6.1143	6.7579	1.008	17.8	0.124
	0.20	6.1143	± 5 %	5.8086	6.4200	1.061	18.0	0.131
	0.22	5.5584	± 5 %	5.2805	5.8364	1.167	18.4	0.144
	0.25	4.8914	± 5 %	4.6469	5.1360	1.326	19.0	0.164
	0.30	4.0762	± 5 %	3.8724	4.2800	1.592	20.0	0.196
	0.35	3.4939	± 5 %	3.3192	3.6686	1.857	21.0	0.229
	0.40	3.0571	± 5 %	2.9043	3.2100	2.122	22.0	0.262
	0.45	2.7175	± 5 %	2.5816	2.8533	2.388	23.0	0.294
	0.50	2.4457	± 5 %	2.3234	2.5680	2.653	24.0	0.327
0.6	0.06	23.7778	± 5 %	22.5889	24.9667	0.273	13.2	0.034
	0.07	20.3810	± 5 %	19.3619	21.4000	0.318	13.4	0.039
	0.075	19.0222	± 5 %	18.0711	19.9733	0.341	13.5	0.042
	0.08	17.8333	± 5 %	16.9417	18.7250	0.364	13.6	0.045
	0.085	16.7843	± 5 %	15.9451	17.6235	0.387	13.7	0.048
	0.09	15.8519	± 5 %	15.0593	16.6444	0.409	13.8	0.050
	0.10	14.2667	± 5 %	13.5533	14.9800	0.455	14.0	0.056
	0.11	12.9697	± 5 %	12.3212	13.6182	0.500	14.2	0.062
	0.12	11.8889	± 5 %	11.2944	12.4833	0.546	14.4	0.067
	0.14	10.1905	± 5 %	9.6810	10.7000	0.637	14.8	0.079
	0.15	9.5111	± 5 %	9.0356	9.9867	0.682	15.0	0.084
	0.18	7.9259	± 5 %	7.5296	8.3222	0.819	15.6	0.101
	0.19	7.5088	± 5 %	7.1333	7.8842	0.864	15.8	0.107
	0.20	7.1333	± 5 %	6.7767	7.4900	0.910	16.0	0.112
	0.22	6.4848	± 5 %	6.1606	6.8091	1.000	16.4	0.123
	0.25	5.7067	± 5 %	5.4213	5.9920	1.137	17.0	0.140
	0.30	4.7556	± 5 %	4.5178	4.9933	1.364	18.0	0.168
	0.35	4.0762	± 5 %	3.8724	4.2800	1.592	19.0	0.196
	0.40	3.5667	± 5 %	3.3883	3.7450	1.819	20.0	0.224
	0.45	3.1704	± 5 %	3.0119	3.3289	2.046	21.0	0.252
0.5	0.06	28.5333	± 5 %	27.1067	29.9600	0.227	11.2	0.028
	0.07	24.4571	± 5 %	23.2343	25.6800	0.265	11.4	0.033
	0.075	22.8267	± 5 %	21.6853	23.9680	0.284	11.5	0.035
	0.08	21.4000	± 5 %	20.3300	22.4700	0.303	11.6	0.037
	0.085	20.1412	± 5 %	19.1341	21.1482	0.322	11.7	0.040
	0.09	19.0222	± 5 %	18.0711	19.9733	0.341	11.8	0.042
	0.10	17.1200	± 5 %	16.2640	17.9760	0.379	12.0	0.047
	0.11	15.5636	± 5 %	14.7855	16.3418	0.417	12.2	0.051
	0.12	14.2667	± 5 %	13.5533	14.9800	0.455	12.4	0.056
	0.14	12.2286	± 5 %	11.6171	12.8400	0.531	12.8	0.065
	0.15	11.4133	± 5 %	10.8427	11.9840	0.568	13.0	0.070

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
0.5	0.18	9.5111	± 5 %	9.0356	9.9867	0.682	13.6	0.084
	0.19	9.0105	± 5 %	8.5600	9.4611	0.720	13.8	0.089
	0.20	8.5600	± 5 %	8.1320	8.9880	0.758	14.0	0.093
0.4	0.05	42.8000	± 5 %	40.6600	44.9400	0.152	9.0	0.019
	0.06	35.6667	± 5 %	33.8833	37.4500	0.182	9.2	0.022
	0.07	30.5714	± 5 %	29.0429	32.1000	0.212	9.4	0.026
	0.075	28.5333	± 5 %	27.1067	29.9600	0.227	9.5	0.028
	0.08	26.7500	± 5 %	25.4125	28.0875	0.243	9.6	0.030
	0.085	25.1765	± 5 %	23.9176	26.4353	0.258	9.7	0.032
	0.09	23.7778	± 5 %	22.5889	24.9667	0.273	9.8	0.034
	0.10	21.4000	± 5 %	20.3300	22.4700	0.303	10.0	0.037
	0.11	19.4545	± 5 %	18.4818	20.4273	0.333	10.2	0.041
	0.12	17.8333	± 5 %	16.9417	18.7250	0.364	10.4	0.045
	0.14	15.2857	± 5 %	14.5214	16.0500	0.424	10.8	0.052
	0.15	14.2667	± 5 %	13.5533	14.9800	0.455	11.0	0.056
	0.18	11.8889	± 5 %	11.2944	12.4833	0.546	11.6	0.067
	0.19	11.2632	± 5 %	10.7000	11.8263	0.576	11.8	0.071
	0.20	10.7000	± 5 %	10.1650	11.2350	0.606	12.0	0.075
0.3	0.05	57.0667	± 5 %	54.2133	59.9200	0.114	7.0	0.014
	0.06	47.5556	± 5 %	45.1778	49.9333	0.136	7.2	0.017
	0.07	40.7619	± 5 %	38.7238	42.8000	0.159	7.4	0.020
	0.075	38.0444	± 5 %	36.1422	39.9467	0.171	7.5	0.021
	0.08	35.6667	± 5 %	33.8833	37.4500	0.182	7.6	0.022
	0.085	33.5686	± 5 %	31.8902	35.2471	0.193	7.7	0.024
	0.09	31.7037	± 5 %	30.1185	33.2889	0.205	7.8	0.025
	0.10	28.5333	± 5 %	27.1067	29.9600	0.227	8.0	0.028
	0.11	25.9394	± 5 %	24.6424	27.2364	0.250	8.2	0.031
	0.12	23.7778	± 5 %	22.5889	24.9667	0.273	8.4	0.034
	0.14	20.3810	± 5 %	19.3619	21.4000	0.318	8.8	0.039
	0.15	19.0222	± 5 %	18.0711	19.9733	0.341	9.0	0.042
0.2	0.05	85.6000	± 5 %	81.3200	89.8800	0.076	5.0	0.009
	0.06	0.1667	± 5 %	0.1583	0.1750	0.091	5.2	0.011
	0.07	73.3714	± 5 %	69.7029	77.0400	0.106	5.4	0.013
	0.075	0.1556	± 5 %	0.1478	0.1633	0.114	5.5	0.014
	0.08	68.7857	± 5 %	65.3464	72.2250	0.121	5.6	0.015
	0.085	0.1464	± 5 %	0.1391	0.1537	0.129	5.7	0.016
	0.09	64.9643	± 5 %	61.7161	68.2125	0.136	5.8	0.017
	0.10	0.1318	± 5 %	0.1252	0.1384	0.152	6.0	0.019
	0.11	59.0584	± 5 %	56.1055	62.0114	0.167	6.2	0.021
	0.12	0.1208	± 5 %	0.1147	0.1268	0.182	6.4	0.022
	0.14	50.6215	± 5 %	48.0904	53.1526	0.212	6.8	0.026
	0.15	0.1127	± 5 %	0.1071	0.1184	0.227	7.0	0.028


performance

Nickel

Our pure nickel range of products have very interesting characteristics in terms of resistance to caustic alakalis, to corrosion and to reducing environment.

That is the reason why nickel is used to maintain product purity in the handling of foods and synthetic fibers. It is also operated in the chemical and electrical, aerospace and pollution control industries.

Other attribute of nickel is its low resistivity. With regard to the manufacture of industrial components, nickel is also easily soldered and very malleable, which make them very fabricable.

Typical electrical and electronic applications include lead wires, battery components, manufacturing of lamps.

Conductors made of pure nickel are suitable for applications that require a higher temperature resistance, e.g. in heating coils for spark plugs or lead wires for heating conductors. Furthermore, nickel features a relatively high temperature coefficient of resistance..

Nickel 200

This is a commercially pure nickel (99.2%) which shows very good characteristics of malleability and solderability. It shows good mechanical properties and resistance to corrosion. It is used for a variety of processing equipment, particularly to maintain product purity in handling foods or synthetic fibers. Nickel 200 is also used in the clothing of electric resistances, and can be part of the composition of cold connections.

Nickel 201

It has a similar chemical composition as Nickel 200 but with a lower Carbon content. The latter characteristic prevents embrittlement by intergranular carbon at temperatures above 315°C, enables good weldability and reduces hardness. Nickel 201 replaces Nickel 200 when very high qualities of malleability are required.

Nickel 212

Straightened with manganese addition, Nickel 212 is very close to pure nickel in terms of characteristics. It is mainly used for cold connections but also for electrical and electronic applications such as lead wires, supporting components in lamps and cathode-ray tubes and electrodes in glow-discharge lamps.

Nickel 200

Resistivity 0.096 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300
Ct	0.096	1.40	2.08	2.97

Diameter mm	Resistance at 20°C Ω/m	Tolerance	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	12.2293	on dimensions	0.0699	14313.32	175 042	3.141	0.0079
0.11	10.1069	on dimensions	0.0845	11829.19	119 556	3.455	0.0095
0.12	8.4926	on dimensions	0.1006	9939.80	84 414	3.769	0.0113
0.13	7.2363	on dimensions	0.1181	8469.42	61 287	4.084	0.0133
0.14	6.2394	on dimensions	0.1369	7302.71	45 565	4.398	0.0154
0.15	5.4352	on dimensions	0.1572	6361.47	34 576	4.712	0.0177
0.16	4.7771	on dimensions	0.1789	5591.14	26 709	5.026	0.0201
0.17	4.2316	on dimensions	0.2019	4952.71	20 958	5.340	0.0227
0.18	3.7745	on dimensions	0.2264	4417.69	16 674	5.654	0.0254
0.19	3.3876	on dimensions	0.2522	3964.91	13 432	5.968	0.0283
0.20	3.0573	on dimensions	0.2795	3578.33	10 940	6.282	0.0314
0.22	2.5267	on dimensions	0.3381	2957.30	7 472	6.911	0.0380
0.25	1.9567	on dimensions	0.4367	2290.13	4 481	7.853	0.0491
0.28	1.5599	on dimensions	0.5477	1825.68	2 848	8.795	0.0615
0.30	1.3588	on dimensions	0.6288	1590.37	2 161	9.423	0.0707
0.32	1.1943	on dimensions	0.7154	1397.79	1 669	10.052	0.0804
0.35	0.9983	on dimensions	0.8558	1168.43	1 166	10.994	0.0962
0.38	0.8469	on dimensions	1.0089	991.23	839	11.936	0.1134
0.40	0.7643	on dimensions	1.1178	894.58	684	12.565	0.1256
0.42	0.6933	on dimensions	1.2324	811.41	563	13.193	0.1385
0.45	0.6039	on dimensions	1.4148	706.83	427	14.135	0.1590
0.48	0.5308	on dimensions	1.6097	621.24	330	15.078	0.1809
0.50	0.4892	on dimensions	1.7466	572.53	280	15.706	0.1963
0.55	0.4043	on dimensions	2.1134	473.17	191	17.276	0.2375
0.60	0.3397	on dimensions	2.5151	397.59	135	18.847	0.2826
0.65	0.2895	on dimensions	2.9518	338.78	98	20.418	0.3317
0.70	0.2496	on dimensions	3.4234	292.11	73	21.988	0.3847
0.75	0.2174	on dimensions	3.9299	254.46	55	23.559	0.4416
0.80	0.1911	on dimensions	4.4714	223.65	43	25.129	0.5024
0.85	0.1693	on dimensions	5.0477	198.11	34	26.700	0.5672
0.90	0.1510	on dimensions	5.6591	176.71	27	28.270	0.6359
0.95	0.1355	on dimensions	6.3053	158.60	21	29.841	0.7085
1.00	0.1223	on dimensions	6.9865	143.13	18	31.412	0.7850
1.10	0.1011	on dimensions	8.4537	118.29	12	34.553	0.9499
1.20	0.0849	on dimensions	10.0606	99.40	8	37.694	1.1304
1.30	0.0724	on dimensions	11.8072	84.69	6.13	40.835	1.3267
1.40	0.0624	on dimensions	13.6935	73.03	4.56	43.976	1.5386
1.50	0.0544	on dimensions	15.7196	63.61	3.46	47.117	1.7663
1.60	0.0478	on dimensions	17.8854	55.91	2.67	50.259	2.0096
1.70	0.0423	on dimensions	20.1910	49.53	2.10	53.400	2.2687
1.80	0.0377	on dimensions	22.6363	44.18	1.67	56.541	2.5434
1.90	0.0339	on dimensions	25.2213	39.65	1.34	59.682	2.8339
2.00	0.0306	on dimensions	27.9460	35.78	1.09	62.823	3.1400
2.25	0.0242	on dimensions	35.3692	28.27	0.68	70.676	3.9741
2.50	0.0196	on dimensions	43.6656	22.90	0.45	78.529	4.9063
2.80	0.0156	on dimensions	54.7742	18.26	0.28	87.952	6.1544
3.00	0.0136	on dimensions	62.8785	15.90	0.22	94.235	7.0650
3.25	0.0116	on dimensions	73.7949	13.55	0.16	102.088	8.2916
3.50	0.0100	on dimensions	85.5846	11.68	0.12	109.941	9.6163
3.80	0.0085	on dimensions	100.8851	9.91	0.08	119.364	11.3354
4.00	0.0076	on dimensions	111.7840	8.95	0.07	125.646	12.5600
4.50	0.0060	on dimensions	141.4766	7.068	0.04	141.352	15.8963
5.00	0.0049	on dimensions	174.6625	5.73	0.03	157.058	19.6250
5.50	0.0040	on dimensions	211.3416	4.732	0.02	172.764	23.7463
6.00	0.0034	on dimensions	251.5140	3.98	0.01	188.470	28.2600

Nickel 201

Resistivity 0.085 Ω mm²/m. Density 8.90 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300
Ct	0.09	1.40	2.08	2.97

Diameter mm	Resistance at 20°C Ω/m	Tolerance	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	10.8280	on dimensions	0.0699	14313.32	154 985	3.141	0.0079
0.11	8.9488	on dimensions	0.0845	11829.19	105 857	3.455	0.0095
0.12	7.5195	on dimensions	0.1006	9939.80	74 742	3.769	0.0113
0.13	6.4071	on dimensions	0.1181	8469.42	54 265	4.084	0.0133
0.14	5.5245	on dimensions	0.1369	7302.71	40 344	4.398	0.0154
0.15	4.8125	on dimensions	0.1572	6361.47	30 614	4.712	0.0177
0.16	4.2297	on dimensions	0.1789	5591.14	23 649	5.026	0.0201
0.17	3.7467	on dimensions	0.2019	4952.71	18 556	5.340	0.0227
0.18	3.3420	on dimensions	0.2264	4417.69	14 764	5.654	0.0254
0.19	2.9995	on dimensions	0.2522	3964.91	11 893	5.968	0.0283
0.20	2.7070	on dimensions	0.2795	3578.33	9 687	6.282	0.0314
0.22	2.2372	on dimensions	0.3381	2957.30	6 616	6.911	0.0380
0.25	1.7325	on dimensions	0.4367	2290.13	3 968	7.853	0.0491
0.28	1.3811	on dimensions	0.5477	1825.68	2 521	8.795	0.0615
0.30	1.2031	on dimensions	0.6288	1590.37	1 913	9.423	0.0707
0.32	1.0574	on dimensions	0.7154	1397.79	1 478	10.052	0.0804
0.35	0.8839	on dimensions	0.8558	1168.43	1 033	10.994	0.0962
0.38	0.7499	on dimensions	1.0089	991.23	743	11.936	0.1134
0.40	0.6768	on dimensions	1.1178	894.58	605	12.565	0.1256
0.42	0.6138	on dimensions	1.2324	811.41	498	13.193	0.1385
0.45	0.5347	on dimensions	1.4148	706.83	378	14.135	0.1590
0.48	0.4700	on dimensions	1.6097	621.24	292	15.078	0.1809
0.50	0.4331	on dimensions	1.7466	572.53	248	15.706	0.1963
0.55	0.3580	on dimensions	2.1134	473.17	169	17.276	0.2375
0.60	0.3008	on dimensions	2.5151	397.59	120	18.847	0.2826
0.65	0.2563	on dimensions	2.9518	338.78	87	20.418	0.3317
0.70	0.2210	on dimensions	3.4234	292.11	65	21.988	0.3847
0.75	0.1925	on dimensions	3.9299	254.46	49	23.559	0.4416
0.80	0.1692	on dimensions	4.4714	223.65	38	25.129	0.5024
0.85	0.1499	on dimensions	5.0477	198.11	30	26.700	0.5672
0.90	0.1337	on dimensions	5.6591	176.71	24	28.270	0.6359
0.95	0.1200	on dimensions	6.3053	158.60	19	29.841	0.7085
1.00	0.1083	on dimensions	6.9865	143.13	15	31.412	0.7850
1.10	0.0895	on dimensions	8.4537	118.29	11	34.553	0.9499
1.20	0.0752	on dimensions	10.0606	99.40	7.47	37.694	1.1304
1.30	0.0641	on dimensions	11.8072	84.69	5.43	40.835	1.3267
1.40	0.0552	on dimensions	13.6935	73.03	4.03	43.976	1.5386
1.50	0.0481	on dimensions	15.7196	63.61	3.06	47.117	1.7663
1.60	0.0423	on dimensions	17.8854	55.91	2.36	50.259	2.0096
1.70	0.0375	on dimensions	20.1910	49.53	1.86	53.400	2.2687
1.80	0.0334	on dimensions	22.6363	44.18	1.48	56.541	2.5434
1.90	0.0300	on dimensions	25.2213	39.65	1.19	59.682	2.8339
2.00	0.0271	on dimensions	27.9460	35.78	0.97	62.823	3.1400
2.25	0.0214	on dimensions	35.3692	28.27	0.60	70.676	3.9741
2.50	0.0173	on dimensions	43.6656	22.90	0.40	78.529	4.9063
2.80	0.0138	on dimensions	54.7742	18.26	0.25	87.952	6.1544
3.00	0.0120	on dimensions	62.8785	15.90	0.19	94.235	7.0650
3.25	0.0103	on dimensions	73.7949	13.55	0.14	102.088	8.2916
3.50	0.0088	on dimensions	85.5846	11.68	0.10	109.941	9.6163
3.80	0.0075	on dimensions	100.8851	9.91	0.07	119.364	11.3354
4.00	0.0068	on dimensions	111.7840	8.95	0.06	125.646	12.5600
4.50	0.0053	on dimensions	141.4766	7.068	0.04	141.352	15.8963
5.00	0.0043	on dimensions	174.6625	5.73	0.02	157.058	19.6250
5.50	0.0036	on dimensions	211.3416	4.732	0.02	172.764	23.7463
6.00	0.0030	on dimensions	251.5140	3.98	0.01	188.470	28.2600

Nickel 212

Resistivity 0.109 Ω mm²/m. Density 8.86 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300
Ct	0.109	-	-	-

Diameter mm	Resistance at 20°C Ω/m	Tolerance	Weight per length g/m	Length per weight m/Kg	Resistance per weight Ω/Kg	Surface area cm²/m	Cross section mm²
0.10	13.8854	on dimensions	0.0696	14377.94	199 643	3.141	0.0079
0.11	11.4755	on dimensions	0.0842	11882.59	136 359	3.455	0.0095
0.12	9.6426	on dimensions	0.1002	9984.68	96 278	3.769	0.0113
0.13	8.2162	on dimensions	0.1175	8507.66	69 900	4.084	0.0133
0.14	7.0844	on dimensions	0.1363	7335.68	51 969	4.398	0.0154
0.15	6.1713	on dimensions	0.1565	6390.19	39 436	4.712	0.0177
0.16	5.4240	on dimensions	0.1781	5616.38	30 463	5.026	0.0201
0.17	4.8046	on dimensions	0.2010	4975.07	23 903	5.340	0.0227
0.18	4.2856	on dimensions	0.2253	4437.64	19 018	5.654	0.0254
0.19	3.8464	on dimensions	0.2511	3982.81	15 319	5.968	0.0283
0.20	3.4713	on dimensions	0.2782	3594.48	12 478	6.282	0.0314
0.22	2.8689	on dimensions	0.3366	2970.65	8 522	6.911	0.0380
0.25	2.2217	on dimensions	0.4347	2300.47	5 111	7.853	0.0491
0.28	1.7711	on dimensions	0.5453	1833.92	3 248	8.795	0.0615
0.30	1.5428	on dimensions	0.6260	1597.55	2 465	9.423	0.0707
0.32	1.3560	on dimensions	0.7122	1404.10	1 904	10.052	0.0804
0.35	1.1335	on dimensions	0.8520	1173.71	1 330	10.994	0.0962
0.38	0.9616	on dimensions	1.0043	995.70	957	11.936	0.1134
0.40	0.8678	on dimensions	1.1128	898.62	780	12.565	0.1256
0.42	0.7872	on dimensions	1.2269	815.08	642	13.193	0.1385
0.45	0.6857	on dimensions	1.4084	710.02	487	14.135	0.1590
0.48	0.6027	on dimensions	1.6025	624.04	376	15.078	0.1809
0.50	0.5554	on dimensions	1.7388	575.12	319	15.706	0.1963
0.55	0.4590	on dimensions	2.1039	475.30	218	17.276	0.2375
0.60	0.3857	on dimensions	2.5038	399.39	154	18.847	0.2826
0.65	0.3286	on dimensions	2.9385	340.31	112	20.418	0.3317
0.70	0.2834	on dimensions	3.4080	293.43	83	21.988	0.3847
0.75	0.2469	on dimensions	3.9122	255.61	63	23.559	0.4416
0.80	0.2170	on dimensions	4.4513	224.66	49	25.129	0.5024
0.85	0.1922	on dimensions	5.0251	199.00	38	26.700	0.5672
0.90	0.1714	on dimensions	5.6336	177.51	30	28.270	0.6359
0.95	0.1539	on dimensions	6.2770	159.31	25	29.841	0.7085
1.00	0.1389	on dimensions	6.9551	143.78	20	31.412	0.7850
1.10	0.1148	on dimensions	8.4157	118.83	14	34.553	0.9499
1.20	0.0964	on dimensions	10.0153	99.85	10	37.694	1.1304
1.30	0.0822	on dimensions	11.7541	85.08	6.99	40.835	1.3267
1.40	0.0708	on dimensions	13.6320	73.36	5.20	43.976	1.5386
1.50	0.0617	on dimensions	15.6490	63.90	3.94	47.117	1.7663
1.60	0.0542	on dimensions	17.8051	56.16	3.05	50.259	2.0096
1.70	0.0480	on dimensions	20.1002	49.75	2.39	53.400	2.2687
1.80	0.0429	on dimensions	22.5345	44.38	1.90	56.541	2.5434
1.90	0.0385	on dimensions	25.1079	39.83	1.53	59.682	2.8339
2.00	0.0347	on dimensions	27.8204	35.94	1.25	62.823	3.1400
2.25	0.0274	on dimensions	35.2102	28.40	0.78	70.676	3.9741
2.50	0.0222	on dimensions	43.4694	23.00	0.51	78.529	4.9063
2.80	0.0177	on dimensions	54.5280	18.34	0.32	87.952	6.1544
3.00	0.0154	on dimensions	62.5959	15.98	0.25	94.235	7.0650
3.25	0.0131	on dimensions	73.4632	13.61	0.18	102.088	8.2916
3.50	0.0113	on dimensions	85.2000	11.74	0.13	109.941	9.6163
3.80	0.0096	on dimensions	100.4316	9.96	0.10	119.364	11.3354
4.00	0.0087	on dimensions	111.2816	8.99	0.08	125.646	12.5600
4.50	0.0069	on dimensions	140.8408	7.100	0.05	141.352	15.8963
5.00	0.0056	on dimensions	173.8775	5.75	0.03	157.058	19.6250
5.50	0.0046	on dimensions	210.3918	4.753	0.02	172.764	23.7463
6.00	0.0039	on dimensions	250.3836	3.99	0.02	188.470	28.2600

NICKEL

Nickel 200: Resistivity 0.096 Ω mm²/m. Density 8.90 g/cm³.
Nickel 201: Resistivity 0.085 Ω mm²/m. Density 8.90 g/cm³.
Nickel 212: Resistivity 0.109 Ω mm²/m. Density 8.86 g/cm³.
To obtain the Ohmic value at operating temperature, multiply the resistance at 20 °C by the coefficient Ct.
For imperial values (SWG, B&S etc.), please refer to conversion table page 115

°C	20	100	200	300
Nickel 200 Ct	0.096	1.40	2.08	2.97
Nickel 201 Ct	0.09	1.40	2.08	2.97
Nickel 212	0.109	-	-	-

Here are the conversion factors for Nickel alloys. Multiply the figures in the table by the conversion factor to obtain the data required for other alloys.

Alloy	Conversion Factor of Resistance	Conversion Factor of Weight g/m
Nickel 200	1.00	1.00
Nickel 201	0.895	1.00
Nickel 212	1.147	0.995

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm²/m	Cross section mm²
5.0	0.10	0.1926		on dimensions		4.159	102.0	0.467
	0.11	0.1751		on dimensions		4.575	102.2	0.514
	0.12	0.1605		on dimensions		4.991	102.4	0.561
	0.14	0.1376		on dimensions		5.822	102.8	0.654
	0.15	0.1284		on dimensions		6.238	103.0	0.701
	0.18	0.1070		on dimensions		7.486	103.6	0.841
	0.19	0.1014		on dimensions		7.902	103.8	0.888
	0.20	0.0963		on dimensions		8.318	104.0	0.935
	0.22	0.0875		on dimensions		9.150	104.4	1.028
	0.25	0.0770		on dimensions		10.397	105.0	1.168
	0.30	0.0642		on dimensions		12.477	106.0	1.402
	0.35	0.0550		on dimensions		14.556	107.0	1.636
	0.40	0.0482		on dimensions		16.636	108.0	1.869
	0.45	0.0428		on dimensions		18.715	109.0	2.103
	0.50	0.0385		on dimensions		20.794	110.0	2.336
	0.60	0.0321		on dimensions		24.953	112.0	2.804
	0.70	0.0275		on dimensions		29.112	114.0	3.271
	0.80	0.0241		on dimensions		33.271	116.0	3.738
	0.90	0.0214		on dimensions		37.430	118.0	4.206
	1.00	0.0193		on dimensions		41.589	120.0	4.673
4.0	0.10	0.2408		on dimensions		3.327	82.0	0.374
	0.11	0.2189		on dimensions		3.660	82.2	0.411
	0.12	0.2006		on dimensions		3.993	82.4	0.449
	0.14	0.1720		on dimensions		4.658	82.8	0.523
	0.15	0.1605		on dimensions		4.991	83.0	0.561
	0.18	0.1338		on dimensions		5.989	83.6	0.673
	0.19	0.1267		on dimensions		6.321	83.8	0.710
	0.20	0.1204		on dimensions		6.654	84.0	0.748
	0.22	0.1094		on dimensions		7.320	84.4	0.822
	0.25	0.0963		on dimensions		8.318	85.0	0.935
	0.30	0.0803		on dimensions		9.981	86.0	1.121
	0.35	0.0688		on dimensions		11.645	87.0	1.308
	0.40	0.0602		on dimensions		13.308	88.0	1.495
	0.45	0.0535		on dimensions		14.972	89.0	1.682
	0.50	0.0482		on dimensions		16.636	90.0	1.869
	0.60	0.0401		on dimensions		19.963	92.0	2.243
	0.70	0.0344		on dimensions		23.290	94.0	2.617
	0.80	0.0301		on dimensions		26.617	96.0	2.991
	0.90	0.0268		on dimensions		29.944	98.0	3.364
	1.00	0.0241		on dimensions		33.271	100.0	3.738
3.0	0.10	0.3210		on dimensions		2.495	62.0	0.280
	0.11	0.2918		on dimensions		2.745	62.2	0.308
	0.12	0.2675		on dimensions		2.994	62.4	0.336
	0.14	0.2293		on dimensions		3.493	62.8	0.393

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Minimum value	Maximum value	Weight g/m	Surface area cm^2/m	Cross section mm^2
3.0	0.15	0.2140		on dimensions		3.743	63.0	0.421
	0.18	0.1783		on dimensions		4.492	63.6	0.505
	0.19	0.1689		on dimensions		4.741	63.8	0.533
	0.20	0.1605		on dimensions		4.991	64.0	0.561
	0.22	0.1459		on dimensions		5.490	64.4	0.617
	0.25	0.1284		on dimensions		6.238	65.0	0.701
	0.30	0.1070		on dimensions		7.486	66.0	0.841
	0.35	0.0917		on dimensions		8.734	67.0	0.981
	0.40	0.0803		on dimensions		9.981	68.0	1.121
	0.45	0.0713		on dimensions		11.229	69.0	1.262
	0.50	0.0642		on dimensions		12.477	70.0	1.402
	0.60	0.0535		on dimensions		14.972	72.0	1.682
	0.70	0.0459		on dimensions		17.467	74.0	1.963
	0.80	0.0401		on dimensions		19.963	76.0	2.243
	0.90	0.0357		on dimensions		22.458	78.0	2.523
	1.00	0.0321		on dimensions		24.953	80.0	2.804
2.5	0.10	0.3852		on dimensions		2.079	52.0	0.234
	0.11	0.3502		on dimensions		2.287	52.2	0.257
	0.12	0.3210		on dimensions		2.495	52.4	0.280
	0.14	0.2751		on dimensions		2.911	52.8	0.327
	0.15	0.2568		on dimensions		3.119	53.0	0.350
	0.18	0.2140		on dimensions		3.743	53.6	0.421
	0.19	0.2027		on dimensions		3.951	53.8	0.444
	0.20	0.1926		on dimensions		4.159	54.0	0.467
	0.22	0.1751		on dimensions		4.575	54.4	0.514
	0.25	0.1541		on dimensions		5.199	55.0	0.584
	0.30	0.1284		on dimensions		6.238	56.0	0.701
	0.35	0.1101		on dimensions		7.278	57.0	0.818
	0.40	0.0963		on dimensions		8.318	58.0	0.935
	0.45	0.0856		on dimensions		9.357	59.0	1.051
	0.50	0.0770		on dimensions		10.397	60.0	1.168
	0.60	0.0642		on dimensions		12.477	62.0	1.402
	0.70	0.0550		on dimensions		14.556	64.0	1.636
	0.80	0.0482		on dimensions		16.636	66.0	1.869
	0.90	0.0428		on dimensions		18.715	68.0	2.103
	1.00	0.0385		on dimensions		20.794	70.0	2.336
2.0	0.08	0.6019		on dimensions		1.331	41.6	0.150
	0.085	0.5665		on dimensions		1.414	41.7	0.159
	0.09	0.5350		on dimensions		1.497	41.8	0.168
	0.10	0.4815		on dimensions		1.664	42.0	0.187
	0.11	0.4377		on dimensions		1.830	42.2	0.206
	0.12	0.4013		on dimensions		1.996	42.4	0.224
	0.14	0.3439		on dimensions		2.329	42.8	0.262
	0.15	0.3210		on dimensions		2.495	43.0	0.280
	0.18	0.2675		on dimensions		2.994	43.6	0.336
	0.19	0.2534		on dimensions		3.161	43.8	0.355
	0.20	0.2408		on dimensions		3.327	44.0	0.374
	0.22	0.2189		on dimensions		3.660	44.4	0.411
	0.25	0.1926		on dimensions		4.159	45.0	0.467
	0.30	0.1605		on dimensions		4.991	46.0	0.561
	0.35	0.1376		on dimensions		5.822	47.0	0.654
	0.40	0.1204		on dimensions		6.654	48.0	0.748
	0.45	0.1070		on dimensions		7.486	49.0	0.841
	0.50	0.0963		on dimensions		8.318	50.0	0.935
	0.60	0.0803		on dimensions		9.981	52.0	1.121
	0.70	0.0688		on dimensions		11.645	54.0	1.308
	0.80	0.0602		on dimensions		13.308	56.0	1.495
	0.90	0.0535		on dimensions		14.972	58.0	1.682
	1.00	0.0482		on dimensions		16.636	60.0	1.869
1.8	0.08	0.6688		on dimensions		1.198	37.6	0.135
	0.085	0.6294		on dimensions		1.273	37.7	0.143

Nickel 200, Nickel 201 and Nickel 212 ribbon dimensions and properties.

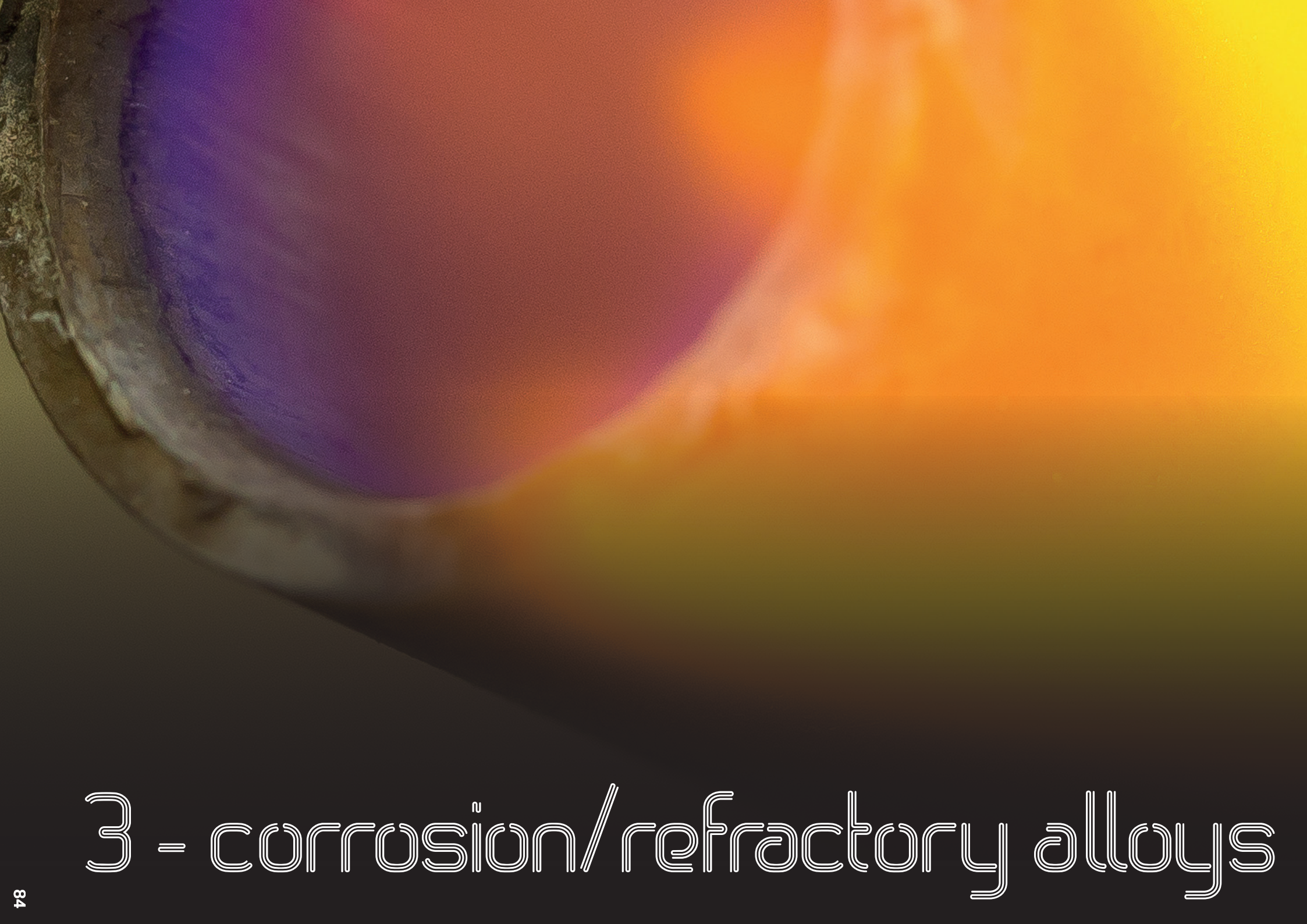
Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Weight g/m	Surface area cm^2/m	Cross section mm^2
1.8	0.09	0.5944	on dimensions	1.347	37.8	0.151
	0.10	0.5350	on dimensions	1.497	38.0	0.168
	0.11	0.4864	on dimensions	1.647	38.2	0.185
	0.12	0.4458	on dimensions	1.797	38.4	0.202
	0.14	0.3821	on dimensions	2.096	38.8	0.236
	0.15	0.3567	on dimensions	2.246	39.0	0.252
	0.18	0.2972	on dimensions	2.695	39.6	0.303
	0.19	0.2816	on dimensions	2.845	39.8	0.320
	0.20	0.2675	on dimensions	2.994	40.0	0.336
	0.22	0.2432	on dimensions	3.294	40.4	0.370
	0.25	0.2140	on dimensions	3.743	41.0	0.421
	0.30	0.1783	on dimensions	4.492	42.0	0.505
	0.35	0.1529	on dimensions	5.240	43.0	0.589
	0.40	0.1338	on dimensions	5.989	44.0	0.673
	0.45	0.1189	on dimensions	6.737	45.0	0.757
	0.50	0.1070	on dimensions	7.486	46.0	0.841
	0.60	0.0892	on dimensions	8.983	48.0	1.009
	0.70	0.0764	on dimensions	10.480	50.0	1.178
	0.80	0.0669	on dimensions	11.978	52.0	1.346
	0.90	0.0594	on dimensions	13.475	54.0	1.514
	1.00	0.0535	on dimensions	14.972	56.0	1.682
1.5	0.075	0.8560	on dimensions	0.936	31.5	0.105
	0.08	0.8025	on dimensions	0.998	31.6	0.112
	0.085	0.7553	on dimensions	1.061	31.7	0.119
	0.09	0.7133	on dimensions	1.123	31.8	0.126
	0.10	0.6420	on dimensions	1.248	32.0	0.140
	0.11	0.5836	on dimensions	1.372	32.2	0.154
	0.12	0.5350	on dimensions	1.497	32.4	0.168
	0.14	0.4586	on dimensions	1.747	32.8	0.196
	0.15	0.4280	on dimensions	1.871	33.0	0.210
	0.18	0.3567	on dimensions	2.246	33.6	0.252
	0.19	0.3379	on dimensions	2.371	33.8	0.266
	0.20	0.3210	on dimensions	2.495	34.0	0.280
	0.22	0.2918	on dimensions	2.745	34.4	0.308
	0.25	0.2568	on dimensions	3.119	35.0	0.350
	0.30	0.2140	on dimensions	3.743	36.0	0.421
	0.35	0.1834	on dimensions	4.367	37.0	0.491
	0.40	0.1605	on dimensions	4.991	38.0	0.561
	0.45	0.1427	on dimensions	5.614	39.0	0.631
	0.50	0.1284	on dimensions	6.238	40.0	0.701
	0.60	0.1070	on dimensions	7.486	42.0	0.841
	0.70	0.0917	on dimensions	8.734	44.0	0.981
	0.80	0.0803	on dimensions	9.981	46.0	1.121
	0.90	0.0713	on dimensions	11.229	48.0	1.262
	1.00	0.0642	on dimensions	12.477	50.0	1.402
1.2	0.07	1.1464	on dimensions	0.699	25.4	0.079
	0.075	1.0700	on dimensions	0.749	25.5	0.084
	0.08	1.0031	on dimensions	0.799	25.6	0.090
	0.085	0.9441	on dimensions	0.848	25.7	0.095
	0.09	0.8917	on dimensions	0.898	25.8	0.101
	0.10	0.8025	on dimensions	0.998	26.0	0.112
	0.11	0.7295	on dimensions	1.098	26.2	0.123
	0.12	0.6688	on dimensions	1.198	26.4	0.135
	0.14	0.5732	on dimensions	1.397	26.8	0.157
	0.15	0.5350	on dimensions	1.497	27.0	0.168
	0.18	0.4458	on dimensions	1.797	27.6	0.202
	0.19	0.4224	on dimensions	1.896	27.8	0.213
	0.20	0.4013	on dimensions	1.996	28.0	0.224
	0.22	0.3648	on dimensions	2.196	28.4	0.247
	0.25	0.3210	on dimensions	2.495	29.0	0.280
	0.30	0.2675	on dimensions	2.994	30.0	0.336

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Weight g/m	Surface area cm^2/m	Cross section mm^2
	0.35	0.2293	on dimensions	3.493	31.0	0.393
	0.40	0.2006	on dimensions	3.993	32.0	0.449
	0.45	0.1783	on dimensions	4.492	33.0	0.505
	0.50	0.1605	on dimensions	4.991	34.0	0.561
	0.60	0.1338	on dimensions	5.989	36.0	0.673
	0.70	0.1146	on dimensions	6.987	38.0	0.785
	0.06	1.6050	on dimensions	0.499	21.2	0.056
	0.07	1.3757	on dimensions	0.582	21.4	0.065
	0.075	1.2840	on dimensions	0.624	21.5	0.070
	0.08	1.2038	on dimensions	0.665	21.6	0.075
	0.085	1.1329	on dimensions	0.707	21.7	0.079
	0.09	1.0700	on dimensions	0.749	21.8	0.084
	0.10	0.9630	on dimensions	0.832	22.0	0.093
	0.11	0.8755	on dimensions	0.915	22.2	0.103
	0.12	0.8025	on dimensions	0.998	22.4	0.112
	0.14	0.6879	on dimensions	1.164	22.8	0.131
	0.15	0.6420	on dimensions	1.248	23.0	0.140
1.0	0.18	0.5350	on dimensions	1.497	23.6	0.168
	0.19	0.5068	on dimensions	1.580	23.8	0.178
	0.20	0.4815	on dimensions	1.664	24.0	0.187
	0.22	0.4377	on dimensions	1.830	24.4	0.206
	0.25	0.3852	on dimensions	2.079	25.0	0.234
	0.30	0.3210	on dimensions	2.495	26.0	0.280
	0.35	0.2751	on dimensions	2.911	27.0	0.327
	0.40	0.2408	on dimensions	3.327	28.0	0.374
	0.45	0.2140	on dimensions	3.743	29.0	0.421
	0.50	0.1926	on dimensions	4.159	30.0	0.467
	0.60	0.1605	on dimensions	4.991	32.0	0.561
	0.70	0.1376	on dimensions	5.822	34.0	0.654
	0.06	1.7833	on dimensions	0.449	19.2	0.050
	0.07	1.5286	on dimensions	0.524	19.4	0.059
	0.075	1.4267	on dimensions	0.561	19.5	0.063
	0.08	1.3375	on dimensions	0.599	19.6	0.067
	0.085	1.2588	on dimensions	0.636	19.7	0.071
	0.09	1.1889	on dimensions	0.674	19.8	0.076
	0.10	1.0700	on dimensions	0.749	20.0	0.084
	0.11	0.9727	on dimensions	0.823	20.2	0.093
	0.12	0.8917	on dimensions	0.898	20.4	0.101
	0.14	0.7643	on dimensions	1.048	20.8	0.118
	0.15	0.7133	on dimensions	1.123	21.0	0.126
0.9	0.18	0.5944	on dimensions	1.347	21.6	0.151
	0.19	0.5632	on dimensions	1.422	21.8	0.160
	0.20	0.5350	on dimensions	1.497	22.0	0.168
	0.22	0.4864	on dimensions	1.647	22.4	0.185
	0.25	0.4280	on dimensions	1.871	23.0	0.210
	0.30	0.3567	on dimensions	2.246	24.0	0.252
	0.35	0.3057	on dimensions	2.620	25.0	0.294
	0.40	0.2675	on dimensions	2.994	26.0	0.336
	0.45	0.2378	on dimensions	3.369	27.0	0.379
	0.50	0.2140	on dimensions	3.743	28.0	0.421
	0.60	0.1783	on dimensions	4.492	30.0	0.505
	0.06	2.0063	on dimensions	0.399	17.2	0.045
	0.07	1.7196	on dimensions	0.466	17.4	0.052
	0.075	1.6050	on dimensions	0.499	17.5	0.056
	0.08	1.5047	on dimensions	0.532	17.6	0.060
	0.085	1.4162	on dimensions	0.566	17.7	0.064
0.8	0.09	1.3375	on dimensions	0.599	17.8	0.067
	0.10	1.2038	on dimensions	0.665	18.0	0.075
	0.11	1.0943	on dimensions	0.732	18.2	0.082
	0.12	1.0031	on dimensions	0.799	18.4	0.090
	0.14	0.8598	on dimensions	0.932	18.8	0.105

Nickel 200, Nickel 201 and Nickel 212 ribbon dimensions and properties.

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Weight g/m	Surface area cm^2/m	Cross section mm^2
0.8	0.15	0.8025	on dimensions	0.998	19.0	0.112
	0.18	0.6688	on dimensions	1.198	19.6	0.135
	0.19	0.6336	on dimensions	1.264	19.8	0.142
	0.20	0.6019	on dimensions	1.331	20.0	0.150
	0.22	0.5472	on dimensions	1.464	20.4	0.164
	0.25	0.4815	on dimensions	1.664	21.0	0.187
	0.30	0.4013	on dimensions	1.996	22.0	0.224
	0.35	0.3439	on dimensions	2.329	23.0	0.262
	0.40	0.3009	on dimensions	2.662	24.0	0.299
	0.45	0.2675	on dimensions	2.994	25.0	0.336
	0.50	0.2408	on dimensions	3.327	26.0	0.374
	0.60	0.2006	on dimensions	3.993	28.0	0.449
0.7	0.06	2.2929	on dimensions	0.349	15.2	0.039
	0.07	1.9653	on dimensions	0.408	15.4	0.046
	0.075	1.8343	on dimensions	0.437	15.5	0.049
	0.08	1.7196	on dimensions	0.466	15.6	0.052
	0.085	1.6185	on dimensions	0.495	15.7	0.056
	0.09	1.5286	on dimensions	0.524	15.8	0.059
	0.10	1.3757	on dimensions	0.582	16.0	0.065
	0.11	1.2506	on dimensions	0.640	16.2	0.072
	0.12	1.1464	on dimensions	0.699	16.4	0.079
	0.14	0.9827	on dimensions	0.815	16.8	0.092
	0.15	0.9171	on dimensions	0.873	17.0	0.098
	0.18	0.7643	on dimensions	1.048	17.6	0.118
	0.19	0.7241	on dimensions	1.106	17.8	0.124
	0.20	0.6879	on dimensions	1.164	18.0	0.131
	0.22	0.6253	on dimensions	1.281	18.4	0.144
	0.25	0.5503	on dimensions	1.456	19.0	0.164
	0.30	0.4586	on dimensions	1.747	20.0	0.196
	0.35	0.3931	on dimensions	2.038	21.0	0.229
	0.40	0.3439	on dimensions	2.329	22.0	0.262
	0.45	0.3057	on dimensions	2.620	23.0	0.294
	0.50	0.2751	on dimensions	2.911	24.0	0.327
0.6	0.06	2.6750	on dimensions	0.299	13.2	0.034
	0.07	2.2929	on dimensions	0.349	13.4	0.039
	0.075	2.1400	on dimensions	0.374	13.5	0.042
	0.08	2.0063	on dimensions	0.399	13.6	0.045
	0.085	1.8882	on dimensions	0.424	13.7	0.048
	0.09	1.7833	on dimensions	0.449	13.8	0.050
	0.10	1.6050	on dimensions	0.499	14.0	0.056
	0.11	1.4591	on dimensions	0.549	14.2	0.062
	0.12	1.3375	on dimensions	0.599	14.4	0.067
	0.14	1.1464	on dimensions	0.699	14.8	0.079
	0.15	1.0700	on dimensions	0.749	15.0	0.084
	0.18	0.8917	on dimensions	0.898	15.6	0.101
	0.19	0.8447	on dimensions	0.948	15.8	0.107
	0.20	0.8025	on dimensions	0.998	16.0	0.112
	0.22	0.7295	on dimensions	1.098	16.4	0.123
	0.25	0.6420	on dimensions	1.248	17.0	0.140
	0.30	0.5350	on dimensions	1.497	18.0	0.168
	0.35	0.4586	on dimensions	1.747	19.0	0.196
	0.40	0.4013	on dimensions	1.996	20.0	0.224
	0.45	0.3567	on dimensions	2.246	21.0	0.252
0.5	0.06	3.2100	on dimensions	0.250	11.2	0.028
	0.07	2.7514	on dimensions	0.291	11.4	0.033
	0.075	2.5680	on dimensions	0.312	11.5	0.035
	0.08	2.4075	on dimensions	0.333	11.6	0.037
	0.085	2.2659	on dimensions	0.354	11.7	0.040
	0.09	2.1400	on dimensions	0.374	11.8	0.042
	0.10	1.9260	on dimensions	0.416	12.0	0.047
	0.11	1.7509	on dimensions	0.457	12.2	0.051

Width mm	Thickness mm	Resistance at 20°C Ω/m	Tolerance	Weight g/m	Surface area cm^2/m	Cross section mm^2
	0.12	1.6050	on dimensions	0.499	12.4	0.056
	0.14	1.3757	on dimensions	0.582	12.8	0.065
	0.15	1.2840	on dimensions	0.624	13.0	0.070
	0.18	1.0700	on dimensions	0.749	13.6	0.084
	0.19	1.0137	on dimensions	0.790	13.8	0.089
	0.20	0.9630	on dimensions	0.832	14.0	0.093
0.4	0.05	4.8150	on dimensions	0.166	9.0	0.019
	0.06	4.0125	on dimensions	0.200	9.2	0.022
	0.07	3.4393	on dimensions	0.233	9.4	0.026
	0.075	3.2100	on dimensions	0.250	9.5	0.028
	0.08	3.0094	on dimensions	0.266	9.6	0.030
	0.085	2.8324	on dimensions	0.283	9.7	0.032
	0.09	2.6750	on dimensions	0.299	9.8	0.034
	0.10	2.4075	on dimensions	0.333	10.0	0.037
	0.11	2.1886	on dimensions	0.366	10.2	0.041
	0.12	2.0063	on dimensions	0.399	10.4	0.045
	0.14	1.7196	on dimensions	0.466	10.8	0.052
	0.15	1.6050	on dimensions	0.499	11.0	0.056
	0.18	1.3375	on dimensions	0.599	11.6	0.067
	0.19	1.2671	on dimensions	0.632	11.8	0.071
	0.20	1.2038	on dimensions	0.665	12.0	0.075
0.3	0.05	6.4200	on dimensions	0.125	7.0	0.014
	0.06	5.3500	on dimensions	0.150	7.2	0.017
	0.07	4.5857	on dimensions	0.175	7.4	0.020
	0.075	4.2800	on dimensions	0.187	7.5	0.021
	0.08	4.0125	on dimensions	0.200	7.6	0.022
	0.085	3.7765	on dimensions	0.212	7.7	0.024
	0.09	3.5667	on dimensions	0.225	7.8	0.025
	0.10	3.2100	on dimensions	0.250	8.0	0.028
	0.11	2.9182	on dimensions	0.274	8.2	0.031
	0.12	2.6750	on dimensions	0.299	8.4	0.034
	0.14	2.2929	on dimensions	0.349	8.8	0.039
	0.15	2.1400	on dimensions	0.374	9.0	0.042
0.2	0.05	9.6300	on dimensions	0.083	5.0	0.009
	0.06	8.0250	on dimensions	0.100	5.2	0.011
	0.07	6.8786	on dimensions	0.116	5.4	0.013
	0.075	6.4200	on dimensions	0.125	5.5	0.014
	0.08	6.0188	on dimensions	0.133	5.6	0.015
	0.085	5.6647	on dimensions	0.141	5.7	0.016
	0.09	5.3500	on dimensions	0.150	5.8	0.017
	0.10	4.8150	on dimensions	0.166	6.0	0.019
	0.11	4.3773	on dimensions	0.183	6.2	0.021
	0.12	4.0125	on dimensions	0.200	6.4	0.022
	0.14	3.4393	on dimensions	0.233	6.8	0.026
	0.15	3.2100	on dimensions	0.250	7.0	0.028



3 - corrosion/refractory alloys

Corrosion/Refractory Alloys

The corrosion and refactory alloys are composed of nickel-chromium. This combination provides resistance a good corrosion and oxidation resistance, and offers a good behaviour in carburized atmosphere or other forms of high temperature deteriorations.

In most of these alloys, the valuable basic characteristics of the nickel-chromium are augmented by the addition of other elements. Some of the alloys are strengthened by the addition of aluminium and niobium (columbium). The niobium improves the mechanical properties of the alloy in a high-temperature environment, giving a better lifespan.

These alloys are mainly used in the equipment of chemical engineering, nuclear energy, muffles, furnace tubes and manufacture of conveyer belts...

NICRIMPHY 600

This Nickel Chromium alloy offers good resistance to oxidation at high temperatures, to stress corrosion cracking generated by chloride ions, to very pure water corrosion and to caustic corrosion. It is used for furnace components (conveyer belts). It is also used in the equipment of chemical engineering, in the nuclear energy and for the ignition electrodes.

NICRIMPHY 601

This Nickel Chromium alloy with addition of aluminium confers a remarkable resistance to oxidation and other forms of corrosion, carburation and high temperature sulphidation. It is used for furnace components (conveyer belts, securing rod for ceramic fibers, furnace tubes), It is also used in petrochemical industry and nuclear engineering.

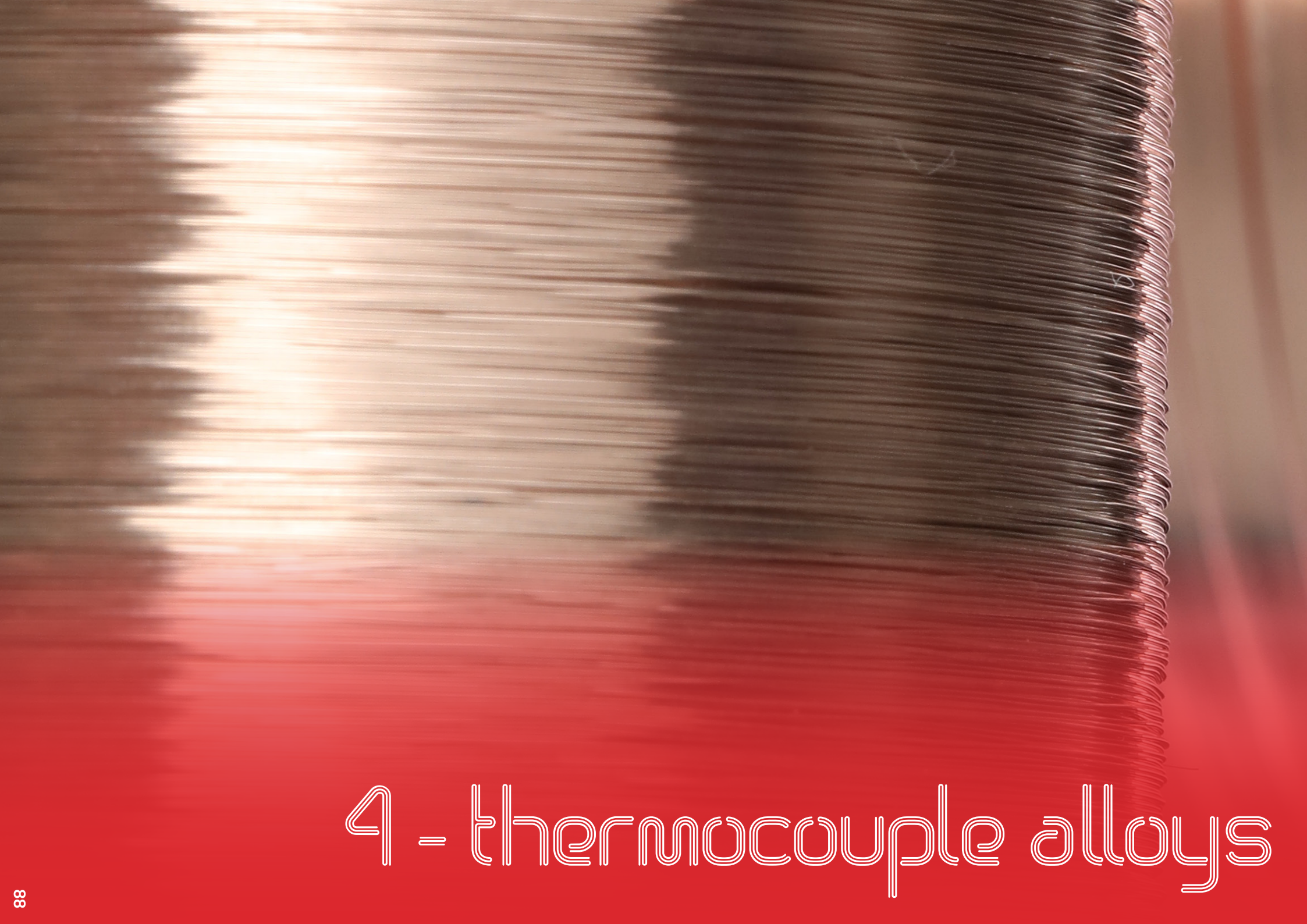
RESISTOHM 330CB

Physical and electrical characteristics of Resistohm 330CB and Resistohm 40 are similar, except that Resistohm 330CB benefits from a specific addition of Columbium (1%). This element confers to the alloy an improved hot mechanical stability, but it penalizes its life cycle for purely electrical applications. The recommended field of application for this alloy is the manufacturing of conveyer belts or other products requiring the same hot mechanical constraints.

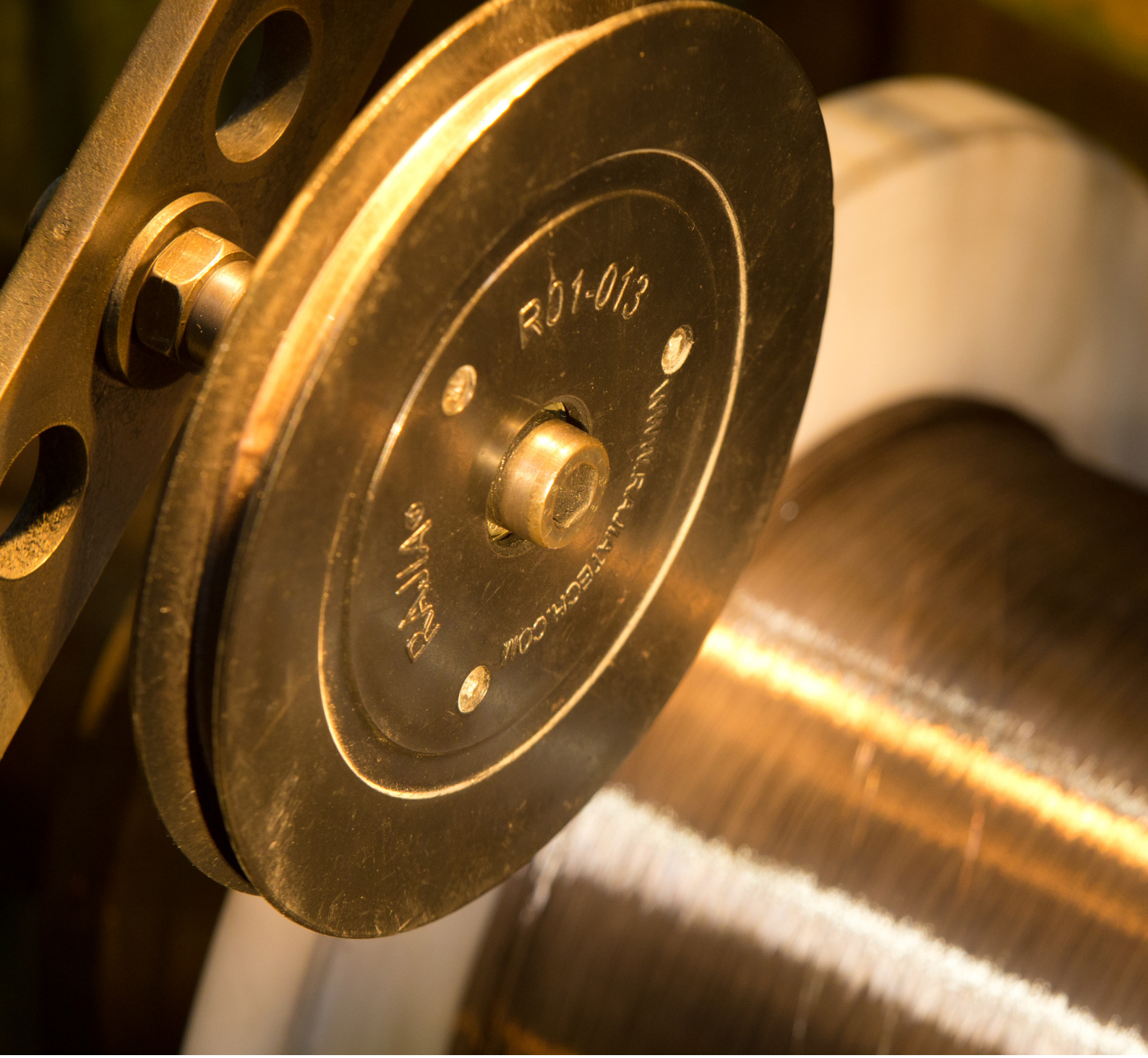
Corrosion/refractory Alloys - Physical and mechanical properties

For imperial values (SWG, B&S etc.), please refer to conversion table page 115

Grades		NiCRIMPHY 600	NiCRIMPHY 601	RESISTOHM 330CB
International standards				
	DIN	17742	17742	-
	Werkstoff N°	2.4816	2.4851	1.4887
	ASTM	B163	B166 - B168	
Physical properties				
Chemical composition %	Al	0.30 max	1.7 max	-
	Cr	14-17	21-25	20-23
	Ni	72 min	63 max	33-37 max
	Fe	6-10	18 max	balance
	Mn	1 max	1 max	2 max
	Cu	0.50 max	-	-
	Other	Ti+ Si+	Ti+ Si+	Si (1-3) CB (1.5 max)
Resistivity (Ω mm²/m)		1.03	1.19	1.05
Temperature coefficient (K x 10^{-6}/°C)		-	-	-
Thermal conductivity at 20°C ($Wm^{-1°}C^{-1}$)		14.9	11.20	13.00
Coefficient of linear expansion (coef. 10^{-6}/°C)		13.30	13.75	19.00
Density (g/cm²)		8.40	8.11	7.95
Creeping point				
at 800°C (1472°F)		25	30	20
at 1000°C (1832°F)		5	10	4
Maximal operating temperature				
	° C	1354	1360	1050
	° F	2470	2480	1922
Melting point				
	° C	1413	1400	1380
	° F	2575	2552	2516
Approximate mechanical properties				
Tensile strength (daN/mm²)		70	70	78
Yield strength (daN/mm²)		35	35	42
Elongation (A% on 100 mm)		30	30	25
Hardness (HV)		≥ 220	≥ 220	230



9 - thermocouple alloys



Our experience in the thermocouple market

As a market leader in melting, redrawing and precision flattening processes, Aperam Alloys Rescal has acquired a position as partner to resistance and furnace manufacturers worldwide.

Today, Aperam Alloys Rescal is also recognized as a superior vendor of thermocouple alloys which, in various configurations, are now in worldwide used where critical temperature measurement or control is required. Our integrated manufacturing process assures the quality into all different aspects of the production.

Aperam Alloys Rescal growth in thermocouple alloys is attributable to our ability to provide stable material and to meet exact special limit and offset requirements.

What is a thermocouple?

The principle of a thermocouple, due to Seebeck's discovery, is a circuit formed by using two dissimilar metal conductors which are joined at the junctions.

A temperature differential at each junction will produce a voltage. The resultant electromotive force (EMF) will be proportional to the temperature difference between the junctions.

Applications of a thermocouple

Thermocouple is the most adapted method for measuring temperatures, sometimes the only available method. Thermocouples are among others used for nuclear reactors, nuclear submarines, jet aero engines, industrial furnaces and other industrial heat treatment (measurement and control of temperature).

Thermocouples can be created with various combinations of alloys.

Our thermocouple alloys wire can be used to measure temperatures from – 200 °C to higher temperatures up to 1260°C.

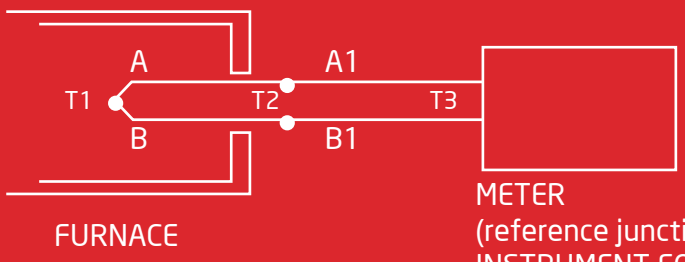
Standard of reference

The alloy conforms to the following international specifications:

- European standard IEC 584
- American standard ASTM E 230
- American standard ANSI MC 96.1

For other main specifications, please contact us.

A SIMPLE THERMOCOUPLE CIRCUIT TYPE K-KP/KN



T1 Temperature of measuring junction inside furnace
T2 Temperature of the weld between the thermocouple grade and extension grade wires
T3 Temperature of the reference junction
A Positive thermocouple leg
A1 Positive extension (compensating) leg
B Negative thermocouple leg
B1 Negative extension (compensating) leg

Choice of a thermocouple

The most commonly used thermocouples are type K, N, J, T and E thermocouples. The tables will give you further information about chemical composition, mechanical properties, advantages of each thermocouple and their application.

A thermocouple suitable to your application has to be chosen in relation to different characteristics such as atmosphere, maximum operating temperature or physical properties

Which thermocouple should be used?

Although many metals and alloys have been used in various combinations to form thermocouples, there are several combinations which have become more commonly used. These combinations fall into three general categories.

Base metal thermocouples

Base metal thermocouples such as types K, N, J, T and E are made of readily available materials, such as nickel, chromium, and copper. They are used in a variety of environments and temperatures from absolute zero up to 1250°C.

Noble metal thermocouples

Noble metal thermocouples generally include those made from mixtures of platinum, iridium, and rhodium such as types R, S, and B. Gold and silver alloy combinations are also available. Certain noble metal combinations can be used in up to 1800°C. They are not as widely used as the base metal thermocouples due to their significantly higher cost.

Refractory metal thermocouples

Refractory metal thermocouples can be used at temperatures up to about 2750°C. The most commonly used refractory alloys are made of tungsten and rhenium, although molybdenum, niobium and occasionally tantalum have also been used. In spite of a wide temperature range, refractory thermocouples are generally limited in use by the mechanical complications associated with these alloys. Their cost, and their lack of oxidation resistance can also explain their limited utilization.

The most commonly used base metal and noble metal thermocouples have been given letter designations by the American National Society Institute (ANSI). These letter designations provide a generic meaning of specific thermocouple combinations. For example, a type K thermocouple is made with nickel-chromium alloy as the positive thermo-element, and a copper-nickel alloy as the negative thermo-element. The positive thermo-element is designated as «KP» for the K type positive leg. To the same extent as the latter, the negative leg is designated as «KN».

Some general information regarding the application of the common thermocouple types may be found in table below. As indicated earlier, a thermocouple's usefulness may be expanded by protecting it from environmental or mechanical damage through the use of soft insulation, metallic sheaths or protection tubes.

Thermo-element letter designation	Environmental recommendations and limitations
KP, EP / KN	Type K thermocouple is adapted for use in oxidizing or inert atmospheres. Can be used in hydrogen or cracked ammonia atmospheres if dew point is below -42°C. Do not use unprotected in sulphurous atmospheres above 540 °C. Sulphurous atmospheres are particularly damaging as intergranular corrosion will cause severe embrittlement on the negative leg. In general, type K thermocouple is not recommended for service in vacuum at high temperatures except for short time periods because preferential vaporization of chromium will alter calibration.
NP / NN	A nickel-based thermocouple is recommended for use in oxidizing or inert atmospheres of 1000-1200°C. Thanks to a higher nickel content, Type N provides superior long-term stability and oxidation resistance over type K when used at high temperatures between 600 and 1250 °C. Reduced preferential oxidation of chromium in marginally oxidizing atmospheres. It should not be used in sulphurous atmospheres.
JP / JN	Type J is a good choice in oxidizing, reducing or inert atmospheres or in vacuum up to 750 °C. Oxidizes rapidly above 538 °C. Under its temperature, will rust in moist atmospheres as in sub-zero applications. Because of comparatively less expensive price, type J has been easily for the use in various applications.
TN, EN	This thermocouple is suitable for use in oxidizing, reducing, and inert atmospheres or in vacuum up to 400 °C. It is not recommended to use unprotected in sulphurous atmospheres above 538 °C. Because of its stability and precise EMF characteristics, Type T is widely used in laboratories. Type T is the first thermocouple for which tolerance in the sub-zero temperature range has been established.

Thermocouples behavior according to atmosphere

Couple	Oxidizing	Reducing	Remarks
K	good	not recommended*	not recommended with H2 S*
N	good	good	
J	good	good	not recommended with H2 S
T	good	good	
E	good up to 400°C	not recommended	not recommended with H2 S

* can be improved if the surface is pre-oxidized

Maximum temperatures

Ther-mocouple	Conductor +	Conductor -	Temperature range
K	Nickel Chromium 10%	Nickel Copper 2.2% - Silicium	-200/+1260°C
N	Nickel 84.4% Chromium 14.2% Silicium 1.4%	Nickel 95.6% Silicium 4.4%	-200/+1260°C
J	Iron	CuNi 44	-40/+760°C
T	Cu	CuNi 44	-200/+370°C
E	Nickel Chromium 10%	CuNi 44	-200/+870°C

The temperature limits shown above are only shown as a guide and should not be taken as absolute values nor as guarantees of satisfactory life or performance. It may be necessary to reduce the above limits to achieve adequate service.

Working temperature according to diameters

Ther-mocouple Type	Diameters					
	3.25 mm	1.63 mm	0.81 mm	0.51 mm	0.33 mm	0.25 mm
K and N	1260°C	1090°C	980°C	870°C	870°C	760°C
J	760°C	590°C	480°C	370°C	370°C	320°C
T	-	370°C	260°C	200°C	200°C	150°C
E	870°C	650°C	540°C	430°C	430°C	370°C

Different thermocouple grades and conditions

Standard grade

Full details of Aperam Alloys Rescal standard grades are given in the following pages for each type of thermocouple, which include their EMF tables. You can also refer to our delivery program in order to know our standard tolerances in class 1 and class 2. The thermocouples wires and ribbons manufactured in our plant are usually supplied in the bright annealed condition.

Special grade

We can also provide you with thermocouple alloy wire with special tolerances for your special applications. Please feel free to contact us. We will verify feasibility for each of your specification. Special melting programs can be organized.

Special request

Hardness

For specific applications (as machining of special pieces), Aperam Alloys Rescal produces thermocouples with specific mechanical characteristics (hard, ¾ hard, half hard, ¼ hard).

Oxidized surface

We can supply on demand oxidized wires, which offer a greater resistance to corrosion from H2S and CO2 atmospheres. It proves to be interesting for particular applications.

Factors affecting life of a thermocouple

The EMF output of any thermocouple will change slightly with time in service at any elevated temperature. The rate and the direction of the change are influenced by a number of metallurgical and environmental factors which fall into two categories:

- those which change the metallurgical structure of thermocouple wires during service
- those which change the chemical composition of the wires during service.

Chief among the structural factors are recovery and recrystallizing effects which can take place in cold-worked or improperly annealed wires. Such effects can produce relatively rapid changes in EMF – observable as drift from initial calibration after a few hours of operation at elevated temperatures. Factors which induce EMF drift due to their effect on the composition of thermocouple alloys include the following:

Evaporation

At high temperatures, some alloy constituents tend to evaporate more readily than others from the surface of thermocouple wires. Such "selective" evaporation can generate changes in alloy composition which will be reflected in calibration drift with time in service.

Diffusion

Diffusion of alloy elements from one junction of a thermocouple to the other adjacent wires are placed in a high thermal gradient at a high temperature. Where a substantial length of the thermocouple adjacent to the hot junction is isothermal, diffusional drift should not occur.

Oxidation

Oxidation probably occurs in most thermocouple applications. In clean, normally oxidizing atmospheres such as air, oxidation takes place at a rate dependent on the temperature and the alloy in question. The EMF generated by the thermocouple is affected by the oxide film on the wires. As the oxide film thickens with time, it forms an increasing proportion of the cross section of the wire, thus effectively altering the overall composition of the thermo-element.

In the special case of "preferential" oxidation of chromium in KP, which takes place under reducing or marginally oxidizing conditions, chromium is removed to a greater or lesser extent as a constituent of the alloy, by conversion of the chromium oxide. The remaining alloy becomes substantially diluted in the chromium component and exhibits a rapid decrease in EMF with time as the preferential oxidation progresses.

Corrosion and contamination

Some changes in wire composition can result from corrosion and contamination by extraneous elements. Impurities such as sulphur and iron plus other constituents picked up from furnace refractories, oxide scale, brazing alloys and fluxes, immersion thermocouple operations constitute potential sources of drift from initial calibration.

All furnace atmospheres containing sulphur-bearing compounds, carbonaceous gases and other corrosive materials are further sources of contamination.

Most of the phenomena which tend to alter the composition of the thermocouple alloys in service take place initially at the surface of the wires. Thus evaporation, oxidation, and the pick-up of contamination elements from the environment can be regarded as surface effects. Wires of smaller diameters have increasing ratios of surface to volume. Their overall composition is more rapidly affected by surface phenomena than the composition of larger diameter wires. For this reason, wires with larger diameter proves to have a greater EMF stability in service than finer diameter wires.

Atmosphere concerns: Premature failure

Premature thermocouple failure is due to contamination or corrosion of the wires which is caused by uncontrolled furnace atmosphere, unclean or leaking protection tubes, or some other factors related to improper installation or operation. Such premature failures are generally due to one of the effect developed below.

Selective oxidation

Selective oxidation, an oxide also called «green rot» is a greenish surface or subsurface scale developed in the nickel-chromium alloys such as thermocouple wire type KP when subjected to a marginally oxidizing environment at high temperature. The corrosive environment may arise from various sources such as leakage of a protective furnace atmosphere into a faulty protection tube, or the introduction of carbonaceous solid or liquid contaminants into a sound protection tube. However, regardless of its origin, the marginally oxidizing condition selectively removes some of the chromium tram the KP alloy wire, and can adversely affect its calibration. In extreme cases, the thermocouple output falls off sharply, causing the temperature reading to be much lower than the actual temperature measured.

Where selective oxidation has occurred, normally non magnetic KP wire becomes magnetic, often brittle, and may acquire a mottled, metallic skin. The internal structure typically shows intergranular attack. Whenever any of these adverse conditions is found in the KP wire, preferential oxidation has likely occurred, and the thermocouple calibration may have changed.

Conditions which may lead to selective oxidation of Thermocouples can often be avoided by making sure that protection tubes are clean, sound and large enough in diameter to permit free circulation of air within the tube. Bare Thermocouples exposed directly to the furnace environment may have to be placed in protection tubes. It may also be advisable to precondition new metallic protection tubes by heating for an hour at 1500 °F to burn off organic matter, such as lubricants from inside the tubes, and to pre-oxidize the protection tube surfaces.

Such procedures can help to achieve the dependable long-life service inherent in KP-KN thermocouple alloys.

Sulphur attack

Sulphur is particularly harmful to high nickel alloys. In heat-treating operations, sulphur may come from various sources such as furnace atmospheres, oil, mortar, cements, and asbestos. Sulphur attack often reveals itself in breakage of the wire, Figure 2. Thus, when normally ductile wire appears to have become brittle in service, that is, if surface cracks appear when it is bent with the fingers, it is likely that sulphur corrosion has occurred. In case of doubt, the presence of sulphur can be determined positively by performing any one of several chemical tests.

A simple test for sulphur in a suspected material is to immerse a sample of the material in a solution of 20% hydrochloric acid containing a few pieces of metallic zinc. If sulphur is present in the sample, it can be identified by the characteristic hydrogen sulphide odor of rotten eggs. Also, moistened lead acetate paper held over the top of the test solution will turn brown or black if sulphur is present in the sample. The sulphur may not be detected if the thermocouple is used or passes through a temperature of 760 °C. At this temperature, the sulphur combines with the oxygen in the air and forms a gas which typically would present an odor. The sample would no longer contain sulphur.

Where there is evidence of sulphur attack in a thermocouple, it should be replaced, and an attempt made to eliminate the source of sulphur. If elimination of the source is not feasible, then the thermocouple should be completely isolated from the contaminating material. The possibility of a leak in an existing protection tube should not be overlooked.

Test process on thermocouples

Two methods are used to proceed to verification of the EMF of our thermocouples alloys.

- Upon receipt of the raw material, our quality department verifies that the EMF values of the material comply with standard of reference by conducting comparison with a "standard" element certified by the TMS Europe Ltd laboratory in Castleton in England (laboratory of calibration tests) or with the LNE (French National Laboratory). The TMS and LNE Laboratory proceeds to calibration tests in comparison with Platinum 67 (Pt 67). The so-called platinum 67 is an alloy which has been melted in 1967 and which has the property not to oxidise and not to alter its properties over time.

Our method for calibrating the EMF is to compare the couple to be tested with a calibrated "standard" element. A couple is made of a "standard" element and the product to be tested. To obtain the EMF values of the tested wire, EMF of the "standard" element is to be added to the reading of the couple (in accordance with ASTM E207: method of thermal EMF test of single thermo element materials by comparison with a secondary standard of similar EMF-temperature properties).

The results obtained are compared with reference tables (please refer to below references tables for each type of thermocouple).

- Final control before shipment to customer, Our Quality Department controls again the EMF values of the material at finished size to enable our controllers to indicate specific values on each label and issue test certificates, corresponding to material as supplied.

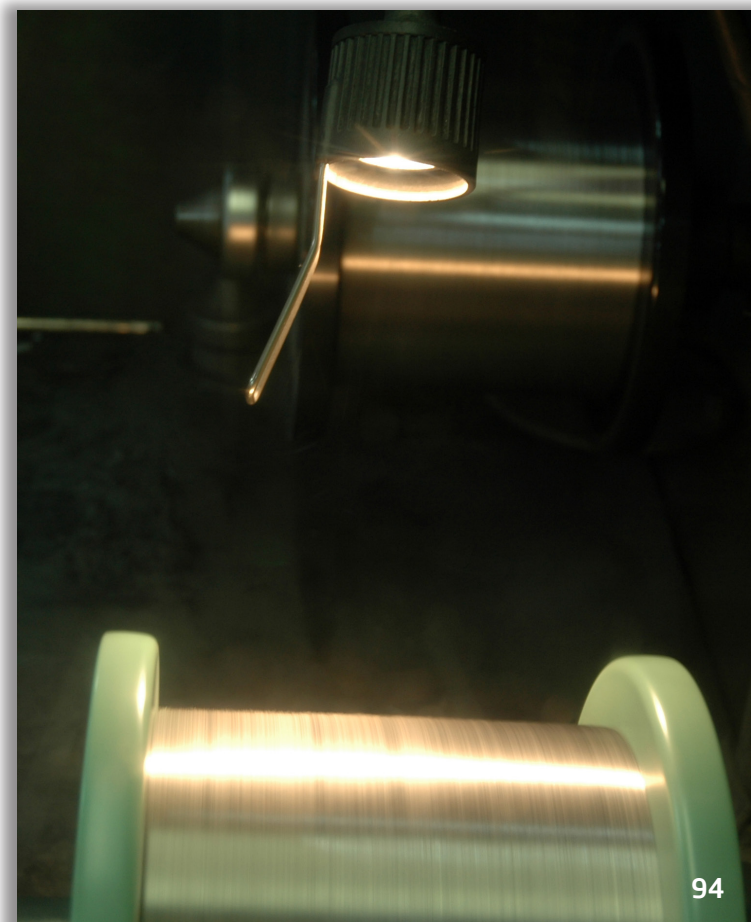
EMF tolerances

The standard and special tolerances are established for the industry by ASTM in specification E-230. The special tolerance is designed for application where temperature accuracy is more critical than other applications. All tolerances must be calculated using the Celsius temperature scale. When other temperatures are desired, convert the tolerance from °C to the desired temperature scale.

ASTM type K, N and J tolerances:

Standard tolerance: +/- 2.2 °C or 0.75% of temperature, whichever is greater.
Special tolerance: +/- 1.1 °C or 0.4% of temperature, whichever is greater.

Refer to tables for tolerances on each type. To determine the higher value, multiply the temperature by the percentage. If this number is greater than the unit given in degrees, the latter should be used. Typically, the percentage of temperature is greater above 293.3 °C.



Standard tolerance examples to determine the EMF tolerance for a thermocouple

Example at 93.3 °C

a. +/- 2.2 °C or 0.75% of temperature, whichever is greater
b. temperature x 0.75 % or (93 x 0.0075) = 0.70 °
c. 0.70 is less than 2.2 °C
d. the tolerance is +/- 2.2 °C

Example at 293.3 °C

a. temperature x 0.75% or (293.3 x 0.0075) = 2.2 °C
b. 2.2 °C is equal to 2.2°
c. he tolerance is +/- 2.2 °C

Note: at all temperatures below 293.3 °C the tolerance is +/-2.2°C, and at all temperature above 293.3 °C, the tolerance is 0.75% of the temperature.

Example at 537.8 °C

a. temperature x 0.75% or (537.8 x 0.0075) = 4.0 °C
b. 4.0 °C is greater than 2.2°
c. the tolerance is +/- 4.0 °C

The EMF tolerance (mV) is then calculated from the tolerance in degrees Fahrenheit.

Calculation of millivolt tolerances

The Seebeck coefficient is used to toggle the EMF tolerance between degrees and millivolt (mV). The Seebeck coefficient is the rate of change of thermal EMF (with temperature) at a given temperature, normally expressed as millivolt per unit of temperature (mV/°C). When the tolerance is shown in degrees, multiply the tolerance by the Seebeck coefficient to calculate the tolerance in millivolts. When the tolerance is provided in millivolts, divide the tolerance by the Seebeck coefficient to calculate the tolerance in degrees.

The Seebeck coefficient is commonly determined for a particular temperature by taking the EMF at a temperature 10°C greater than the desired temperature and the EMF at 10°C below the temperature and divide the difference by 20°C to get to a nominal Seebeck coefficient (mV/°C) at the desired temperature.

Thermocouple, extension and compensating cables product range

Thermocouple types have been established by the American Society for Testing and Materials according to their temperature versus electromotive force or EMF characteristics, in standard or special tolerances.

The tables below give more detailed information about our delivery program.

Type	Conductor (+) Chemical composition %					Conductor (-) Chemical composition %			Temp. Range °C	American Standard ASTM E230/ANSI MC 96.1			European Standard IEC 584		
	Ni	Cr	Fe	Cu	Others	Cu	Ni	Others		T°C range	Standard	Special	T°C range	Class 1	Class 2
K	90	10	-	-	Mn Si +	2.20	94	Si 2.60. others +	-200 / +1260	From 0 to 1260	+/- 2.2°C	+/-1.1°C	From - 40 to 1260	+/- 1.5 °C	+/- 2.5 °C
N	84.4	14.2	-	-	Si 1.4		95.6	Si 4.4	-200 / +1260	From 0 to 1260	+/- 2.2°C	+/-1.1°C	From - 40 to 1260	+/- 1.5 °C	+/- 2.5 °C
J	-	-	100	-	-	Bal	44	Mn+	-40 / +760	From 0 to 760	+/- 2.2°C	+/-1.1°C	From - 40 to 760	+/- 1.5 °C	+/- 2.5 °C
T	-	-	-	100	-	Bal	44	Mn+	-200 / + 370	From 0 to 370	+/- 1°C	+/-0.5°C	From - 40 to 370	+/- 0.5 °C	+/- 1 °C
E	90	10	-	-	+	Bal	44	Fe+ Mn+	-200 / +870	From 0 to 870	+/- 1.7°C	+/-1.1°C	From - 40 to 870	+/- 1.5 °C	+/- 2.5 °C

Delivery forms supplied by Aperam Alloys Rescal: wire, flat wire or strengthened wire.
If you have any special requirement regarding surface, tolerances or dimensions, feel free to contact us.

Type	Conductor (+) Chemical composition %					Conductor (-) Chemical composition %			American Standard ASTM E230/ANSI MC 96.1			European Standard IEC 584		
	Ni	Cr	Fe	Cu	Others	Cu	Ni	Others	T°C range	Standard	Special	T°C range	Class 1	Class 2
KX	90	10	-	-	Mn Si +	2.2	94	Si 2.60	From 0 to 200°C	+/- 1.1°C	+/- 2.2°C	From -25 to 200°C	+/- 1.5 °C	+/- 2.5 °C
KCA (WX)	-	-	100	-	-	Bal	43	Mn 2 - Fe 2	-	-	-	From 0 to 150°C	-	+/- 2.5 °C
KCB (VX)	-	-	-	100	-	Bal	44	-	-	-	-	From 0 to 100°C	-	+/- 2.5°C
NX	84.4	14.2	-	-	Si 1.4	-	95.6	Si 4.4	From 0 to 200°C	+/- 1.1°C	+/- 2.2°C	From - 25 to 200°C	-	+/- 2.5 °C
JX	-	-	100	-	-	Bal	44	Mn+	From 0 to 200°C	+/- 1.1°C	+/- 2.2°C	From -25 to 200°C	+/- 1.5 °C	+/- 2.5 °C
TX	-	-	-	100	-	Bal	44	Mn+	From -60 to 100°C	+/- 0.5°C	+/- 1°C	From -25 to 100°C	+/- 0.5 °C	+/- 1 °C
EX	90	10	-	-	+	Bal	44	Fe+ - Mn+	From 0 to 200°C	+/- 1°C	+/- 1.7°C	From -25 to 200°C	+/- 1.5 °C	+/- 2.5 °C

KCA and KCB, also named WX et VX, are compensating type K. For special request, feel free to contact us.


V
M06305B
Made
in
France
Hi-Fi
Stereo

Thermocouple type K

Type K is the most commonly used thermocouple for measuring high temperatures, providing the widest operating temperature range from – 200 ° to + 1260 °C. It usually works in most applications, which include industrial heat treatments, processing operations, precision laboratory and research work, and some of the most demanding applications from nuclear reactors and submarines, to jet aircraft engines. Type K is particularly appreciated due to its accuracy and reliability at high temperatures.

Chemical composition and mechanical properties

Alloy	Chemical composition			Melting point °C	Resistivity	Density g/cm³	Temp. coef. of resistance (x10-6/°C)	Linear expansion (coef. x10-6/°C)	Thermal Conductivity (W m-1 °C-1 at 20°C)
	Ni	Cr	Others						
KP (+)	90	10	-	1430	70	8.72	300	17	19.2
KN (-)	94	-	Cu 2.20 - Si 2.60- Others +	1400	29	8.60	1900	17	29.7

Resistivity: micro ohm-cm at 20°C - Temperature coefficient and linear expansion coefficient by °C from 20 up to 100°C.

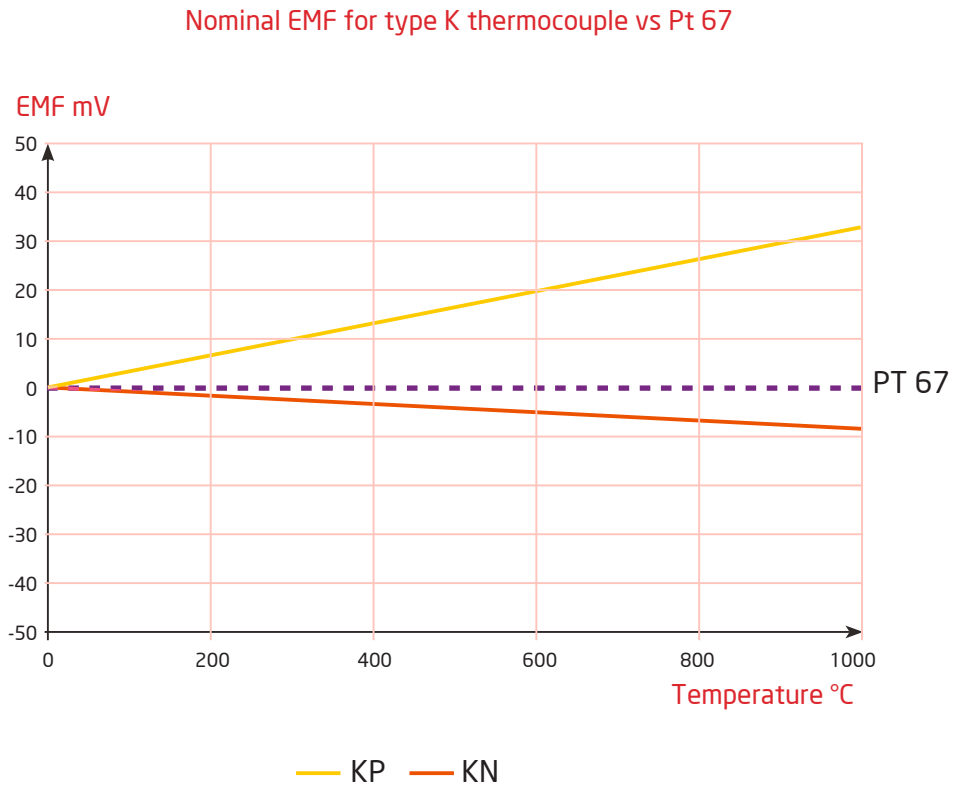
Maximum operating temperatures

Thermocouple operating conditions are very different from one to another. Precise instructions cannot be given on lifetime at various temperatures. The table shown below is to be used as a guideline to reach an acceptable lifetime. Reaction to temperature variation are faster with a smaller diameter, but to the detriment of the lifetime of the thermocouple. Please note that the data below are given as indicative values.

As per norm ASTM

Thermocouple	Dia 3.20 mm	Dia 1.60 mm	Dia 0.81 mm	Dia 0.51 mm	Dia 0.25 mm
KP - KN	1260 ° C	1090° C	980° C	870° C	760° C

KP and KN vs platinum



EMF calculation of a couple

The table below indicates the standard EMF of a couple for any given temperature, cold welding point of KP and KN being 0°C. (Example at 1000°C, EMF of a couple is 41.269 mV).

To calculate the EMF of a couple to be matched, algebraic sum of the deviations values indicated on the labels with the material must be added to the standard value indicated on the table below, for a given temperature. The result is the exact EMF value of the couple at this temperature.

Example:
KP at 1000°C deviation + 0,04
KN at 1000°C deviation - 0,06
EMF of couple at 1000°C:
41,269 +0,04 - (-0,06) = 41,369 mV

Couple KP/KN EMF reference table (mV)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0.397	0.798	1.203	1.611	2.022	2.436	2.85	3.266	3.681	4.095
100	4.095	4.508	4.919	5.327	5.733	6.137	6.539	6.939	7.338	7.737	8.137
200	8.137	8.537	8.938	0.341	9.745	10.151	10.56	10.969	11.381	11.793	12.207
300	12.207	12.623	13.039	13.456	13.874	14.292	14.712	15.132	15.552	15.974	16.395
400	16.395	16.818	17.241	17.664	18.088	18.513	18.938	19.363	19.788	20.214	20.64
500	20.64	21.066	21.493	21.919	22.346	22.772	23.198	23.624	24.05	24.476	24.902
600	24.902	25.327	25.751	26.176	26.599	27.022	27.445	27.867	28.288	28.709	29.128
700	29.128	29.547	29.965	30.383	30.799	31.214	31.629	32.042	32.455	32.866	33.277
800	33.277	33.686	34.095	34.502	34.909	35.314	35.718	36.121	36.524	36.925	37.325
900	37.325	37.724	38.122	38.519	38.915	39.31	39.703	40.096	40.488	40.879	41.269
1000	41.269	41.657	42.045	42.432	42.817	43.202	43.585	43.968	44.349	44.729	45.108
1100	45.108	45.486	45.863	46.238	46.612	46.985	47.356	47.726	48.095	48.462	48.828

Conversion tables

KP wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
8	3.251	0.085	13.8	72.4	10	3.251	0.085	13.8	72.4	4	0.0561	9.12	72.3
10	2.591	0.133	21.7	45.9	13	2.337	0.164	26.7	37.4	3.26	0.085	13.8	72.3
11	2.311	0.168	27.3	36.5	14	2.032	0.817	35.3	28.3	3	0.0998	16.2	61.6
12	2.057	0.212	24.5	28.9	15	1.829	0.269	43.6	22.9	2.5	0.144	23.3	42.8
13	1.829	0.269	43.6	22.9	16	1.626	0.34	55.2	18.1	2.05	0.213	34.7	28.8
14	1.626	0.34	55.2	18.1	18	1.219	0.605	98.2	10.2	1.8	0.277	45.1	22.2
16	1.295	0.536	87	11.5	19	1.016	0.871	141.4	7.07	1.63	0.338	54.9	18.2
20	0.813	1.359	220.9	4.52	21	0.813	1.359	220.9	4.52	1.29	0.54	87.7	11.4
24	0.311	3.442	559.1	1.78	25	0.508	3.483	565.8	1.77	0.81	1.37	222.5	4.49
28	0.32	8.778	1426	0.7	30	0.315	9.059	1471	0.679	0.5	3.595	584	1.71
32	0.203	21.81	35430	0.282	35	0.213	19.8	3218	0.311	0.3	9.987	1622	0.62
					38	0.152	38.9	6320	0.158	0.2	22.47	3650	0.27

KN wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
8	3.251	0.0351	14	71.4	10	3.251	0.0351	14	71.4	4	0.0232	9.25	108
10	2.591	0.0554	22	45.3	13	2.337	0.068	27.1	36.9	3.26	0.0351	14	71.4
11	2.311	0.0696	27.7	36.1	14	2.032	0.09	35.8	27.9	3	0.0413	16.4	60.8
12	2.057	0.0878	35	28.6	15	1.829	0.111	44.2	22.6	2.5	0.0595	23.7	42.2
13	1.829	0.111	44.2	22.6	16	1.626	0.14	56	17.8	2.05	0.0884	35.2	28.4
14	1.626	0.14	56	17.8	18	1.219	0.25	99.63	10	1.8	0.115	45.7	21.9
16	1.295	0.221	88.3	11.3	19	1.016	0.36	143.4	6.97	1.63	0.14	55.7	17.9
20	0.813	0.562	224	4.46	21	0.813	0.562	224	4.46	1.29	0.223	88.9	11.2
24	0.311	1.423	567	1.76	25	0.508	1.44	573.7	1.74	0.81	0.566	225.6	4.43
28	0.32	3.63	1446	0.691	30	0.315	3.747	1492	0.67	0.5	1.487	592	1.69
32	0.203	9.021	3592	0.278	35	0.213	8.195	3263	0.306	0.3	4.131	1645	0.6
					38	0.152	16.09	6408	0.156	0.2	9.294	3701	0.27

Any intermediate diameter non above listed can be supplied upon request.

Recommendations for use

Our type K thermocouple competitive advantages

The type K thermocouple alloy manufactured by our company is melted with copper-nickel-silicon content instead of aluminium. One interesting advantage of this thermocouple is its very high stability in use at high temperature. On special request, we can supply a non aging material.

Environmental limitations

Type K has a better resistance to oxidation than other types of thermocouple (except type N) and is particularly recommended for oxidizing or inert atmospheres (see table of behaviours in part I). It should not be used without protection in sulphurous atmospheres, in reducing atmospheres or a long time in a vacuum.

Embrittlement of the wire can be generated, which would change the metallurgical structure of the thermocouple, or spoil quality of the EMF couple by attacking the chromium. In reducing atmospheres, KP develops green oxide, also known as "green rot", which decreases the chromium content. This phenomenon damages the metallurgical structure, resulting in reduction in EMF output. In addition, KP becomes magnetic due to lower chromium content. Pre-oxidized surface can be delivered in order to increase resistance to corrosion.

Thermocouple type N

Type N thermocouple has been developed with silicon content which provides:

- Much longer life due to improved oxidation resistance of the negative NN leg
- Longer exposure to high temperature without gradual drift EMF
- Better reliability of EMF drift and short term EMF changes.

Please note that Aperam Alloys Rescal type K thermocouple has been developed with silicon content instead of aluminium content and problems listed above are considerably reduced. However type N takes also place in our product range. It provides better resistance to oxidation at elevated temperatures and good lifetime in applications where sulfur is present.

Those advantages are particularly interesting for use in aerospace, nuclear or semi-conductors industries.

Chemical composition and mechanical properties

Alloy	Chemical composition			Melting point. °C	Resistivity	Density g/cm³	Temp. coef. of resistance (x10-6/°C)	Linear expansion (coef. x10-6/°C)	Thermal Conductivity (W m-1 °C-1 at 20°C)
	Ni	Cr	Si						
NP (+)	84.4	14.2	+	1420	100	8.53	88	17	13
NN (-)	95.6	-	4.4	1420	36.5	8.58	678	17	27

Resistivity: micro ohm-cm at 20°C - Temperature Coefficient and linear expansion Coefficient by °C from 20 up to 100°C.

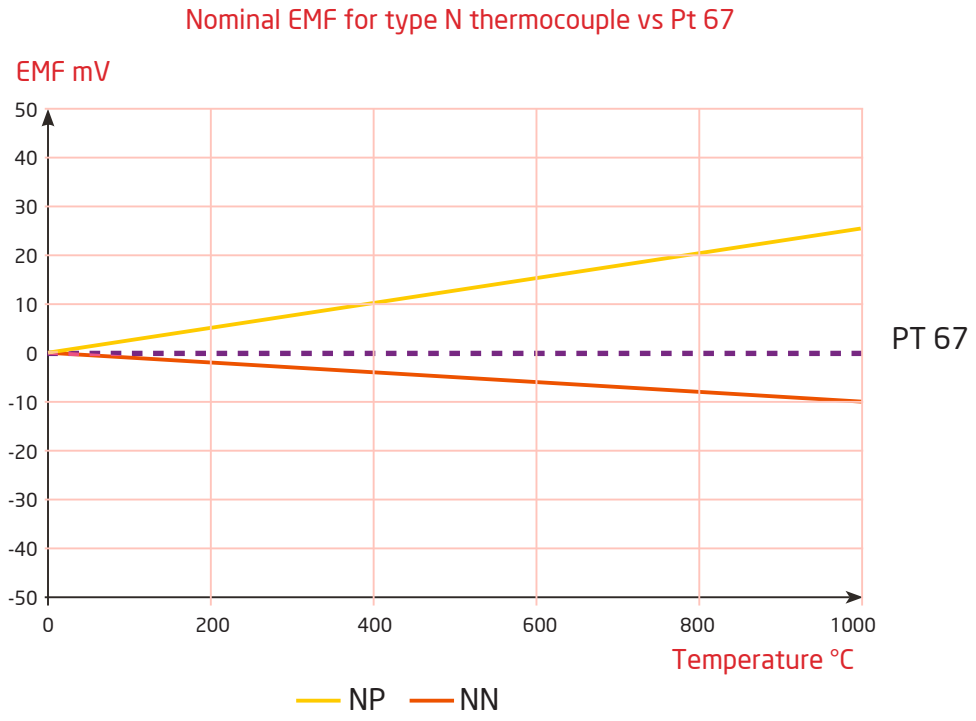
Maximum operating temperatures

Please note that the data below are given as indicative values.

As per norm ASTM

Thermocouple	Dia 3.26 mm	Dia 1.63 mm	Dia 0.81 mm	Dia 0.51 mm	Dia 0.25 mm
NP - NN	1260 °C	1090 °C	980 °C	870 °C	760 °C

NP and NN vs Platinum



Couple NP/NN EMF reference table (mV)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0.000	0.261	0.525	0.793	1.065	1.340	1.619	1.902	2.189	2.479	2.774
100	2.774	3.072	3.374	3.680	3.989	4.302	4.618	4.937	5.260	5.585	5.913
200	5.913	6.245	6.579	6.916	7.255	7.597	7.941	8.288	8.637	8.988	9.341
300	9.341	9.696	10.054	10.413	10.774	11.136	11.501	11.867	12.234	12.603	12.974
400	12.974	13.346	13.719	14.094	14.469	14.846	15.225	15.604	15.984	16.362	16.748
500	16.748	17.131	17.515	17.900	18.286	18.672	19.059	19.447	19.835	20.224	20.613
600	20.613	21.003	21.393	21.784	22.175	22.566	22.958	23.350	23.742	24.134	24.527
700	24.527	24.919	25.312	25.705	26.098	26.491	26.883	27.276	27.669	28.062	28.455
800	28.455	28.847	29.240	29.632	30.024	30.416	30.807	31.199	31.590	31.981	32.371
900	32.371	32.769	33.151	33.541	33.930	34.319	34.707	35.095	35.482	35.689	36.256
1000	36.256	36.641	37.027	37.411	37.796	38.179	38.562	38.944	39.326	39.706	40.087
1100	40.087	40.466	40.845	41.223	41.600	41.976	42.352	42.727	43.101	43.474	43.846
1200	43.846	44.218	44.588	44.958	45.326	45.694	46.060	46.426	46.789	47.152	47.513
1300	47.513										

Conversion tables

NP wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
8	3.251	0.1205	14.1	70.8	10	3.251	0.12	14.1	70.8	4	0.0795	9.35	107
10	2.591	0.189	22.3	44.9	13	2.591	0.233	27.3	36.6	3.26	0.1205	14.1	70.81
11	2.311	0.238	27.9	35.8	14	2.311	0.308	36.1	27.7	3	0.141	16.5	60.3
12	2.057	0.301	35.3	28.3	15	2.057	0.38	44.6	22.4	2.5	0.204	23.9	41.8
13	1.829	0.38	44.6	22.4	16	1.829	0.481	56.5	17.7	2.05	0.302	35.3	28.35
14	1.626	0.481	56.5	17.7	18	1.626	0.607	71.4	14	1.8	0.392	46.1	21.7
16	1.295	0.759	89	11.2	19	1.295	1.233	144.6	6.91	1.63	0.479	56.5	17.71
20	0.813	1.233	225.8	4.43	21	0.813	1.926	178.7	4.43	1.29	0.765	89	11.24
24	0.311	4.876	571	1.75	25	0.311	4.934	578.4	1.73	0.81	1.94	227.5	4.43
28	0.32	12.43	1457	0.686	30	0.32	12.83	1504	0.665	0.5	5.092	597	1.75
32	0.203	30.9	3622	0.276	35	0.203	28.06	3290	0.304	0.3	14.14	1658	0.69
										0.2	31.83	3731	0.28

NN wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
										4	0.029	9.26	108
8	3.251	0.0439	14	71.2	10	3.251	0.0439	14	71.2	3.26	0.0439	14	71.22
10	2.591	0.0692	22.1	45.2	13	2.591	0.0851	27.2	36.8	3	0.0516	16.5	60.6
11	2.311	0.087	27.8	35.9	14	2.311	0.112	36	27.8	2.5	0.0743	23.7	42.1
12	2.057	0.1098	35.1	28.5	15	2.057	0.139	44.4	22.5	2.05	0.0878	35.1	28.51
13	1.829	0.139	44.4	22.5	16	1.829	0.176	56.1	17.8	1.8	0.143	45.9	21.8
14	1.626	0.176	56.1	17.8	18	1.626	0.312	99.8	10.01	1.63	0.175	56.1	17.82
16	1.295	0.277	88.5	11.3	19	1.295	0.45	143.7	6.95	1.29	0.279	88.5	11.3
20	0.813	0.703	224.5	4.45	21	0.813	0.703	224.5	4.45	0.81	0.708	226	4.45
24	0.311	1.779	568.3	1.76	25	0.311	1.801	575	1.74	0.5	1.856	586	1.7
28	0.32	4.538	1449	0.69	30	0.32	4.683	1495	0.668	0.3	5.163	1649	0.61
32	0.203	11.27	3601	0.277	35	0.203	10.24	3271	0.305	0.2	11.62	3710	0.28

Any intermediate diameter non above listed can be supplied upon request.

Thermocouple type J

Type J Thermocouple is frequently used for its low cost and high EMF It can be used in oxidizing conditions up to 760°C. For higher temperatures, it is recommended to use large wire diameters since the iron content of the positive leg (JP) will oxidize rapidly at these temperatures

Chemical composition and mechanical properties

Alloy	Chemical composition			Melting point °C	Resistivity	Density g/cm³	Temp. coef. of resistance (x10-6/°C)	Linear expansion (coef. x10-6/°C)	Thermal Conductivity (W m-1 °C-1 at 20°C)
	Fe	Ni	Others						
JP (+)	100	-	-	1535	13	7.86	5000	11.7	66.2
JN (-)	-	44	Bal Cu -Mn+	1210	49	8.90	60	14	21.2

Maximum operating temperatures

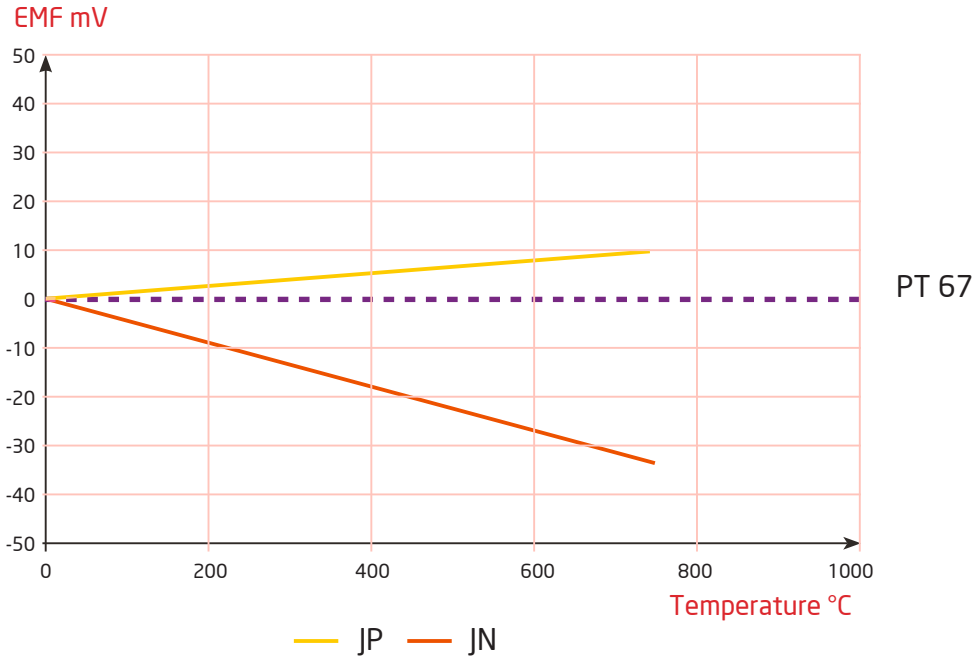
Please note that the data below are given as indicative values.

As per norm ASTM

Thermocouple	Dia 3.2 mm	Dia 1.6 mm	Dia 0.81 mm	Dia 0.51 mm	Dia 0.25 mm
JP - JN	760 °C	590 °C	480 °C	370 °C	320 °C

JP and JN vs Platinum

Nominal EMF for type J thermocouple vs Pt 67



EMF calculation of a couple

The table below indicates by direct reading the standard EMF of a couple for any given temperature. To calculate the EMF of a couple to be matched, algebraic sum of the deviations values indicated on the labels of the material must be added to the standard value indicated on the table below, for a given temperature. The result is the exact EMF value of the couple at this given temperature.

Couple JP/JN EMF reference table (mV)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0.507	1.019	1.536	2.058	2.585	3.115	3.649	4.186	4.725	5.268
100	5.268	5.812	6.359	6.907	7.547	8.008	8.56	9.113	9.667	10.222	10.777
200	10.777	11.332	11.887	12.442	12.998	13.553	14.108	14.663	15.217	15.771	16.325
300	16.325	16.879	17.432	17.984	18.537	19.089	19.64	20.192	20.743	21.295	21.846
400	21.846	22.397	22.949	23.501	24.054	24.607	25.161	25.716	26.272	26.829	27.388
500	27.388	27.949	28.511	29.075	29.642	30.21	30.782	31.356	31.933	32.513	33.096
600	33.096	33.683	34.273	34.867	35.464	36.066	36.671	37.28	37.893	38.51	39.13
700	39.13	39.754	40.382	41.013	41.647	42.283	42.922	43.563	44.207	44.852	45.498
800	45.498	46.144	46.79	47.434	48.076	48.716	49.354	49.989	50.62	51.249	51.875

Recommendations for use / general information

Type J thermocouples must not be used in sulphurous atmospheres over 500°C. In order to limit oxidation risks of pure iron at room temperature, Aperam Alloys Rescal is able to deliver copper-clad-iron or electro-copper-clad for the JP positive leg from 0.20 mm to 0.80 mm. The latter presents an excellent resistance to corrosion over time thanks to an external copper-clad up to 40-50 g/m² of wire.

Conversion tables

JP wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
										4	0.0103	10.1	98.7
8	3.251	0.0156	15.3	65.2	10	3.251	0.0156	15.3	65.2	3.26	0.0157	15,3	65,2
10	2.591	0.0246	24.1	41.4	13	2.337	0.0303	29.7	33.7	3	0.0184	18,0	55,5
11	2.311	0.031	30.4	32.9	14	2.032	0.0401	39.2	25.5	2.5	0.0265	25,9	38,6
12	2.057	0.0391	38.3	26.1	15	1.829	0.0495	48.4	20.6	2.05	0.0394	38,6	25,9
13	1.829	0.0498	48.5	20.6	16	1.626	0.0626	61.3	16.3	1.8	0.0511	50,0	20,0
14	1.626	0.0626	61.3	16.3	18	1.219	0.111	109	9.17	1.63	0.0623	60,9	16,4
16	1.295	0.0987	96.6	10.3	19	1.016	0.16	157	6.37	1.29	0.0994	97,3	10,27
20	0.813	0.25	245.1	4.08	21	0.813	0.25	245	4.08	0.81	0.252	246,9	4,05
24	0.311	0.634	620	1.61	25	0.508	0.641	627.7	1.59	0.5	0.636	648	1,54
28	0.32	1.616	1582	0.632	30	0.315	1.668	1632	0.612	0.3	1.839	1800	0,555
32	0.203	4.016	3930	0.254	35	0.213	3.648	3570	0.28	0.2	4.138	4049	0,247

JN wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
										4	0.039	8.94	111
8	3.251	0.059	13.5	73.9	10	3.251	0.059	13.5	73.9	3.26	0.059	13,5	73,9
10	2.591	0.0929	21.3	46.9	13	2.337	0.114	26.2	38.2	3	0.0693	15,9	62,9
11	2.311	0.116	26.8	37.3	14	2.032	0.151	34.6	28.8	2.5	0.0998	22,9	43,7
12	2.057	0.147	33.8	29.6	15	1.829	0.186	42.7	23.4	2.05	0.148	34,0	29,3
13	1.829	0.186	42.7	23.4	16	1.626	0.236	54.1	18.5	1.8	0.192	44,1	22,6
14	1.626	0.236	54.1	18.5	18	1.219	0.419	96.2	10.4	1.63	0.235	53,2	18,6
16	1.295	0.372	85.3	11.7	19	1.016	0.604	138.6	7.21	1.29	0.375	85,9	11,6
20	0.813	0.943	216.4	4.62	21	0.813	0.943	216.4	4.62	0.81	0.951	218,0	4,58
24	0.311	2.389	548	1.82	25	0.508	2.417	554	1.8	0.5	5.092	572	1,75
28	0.32	6.092	1397	0.715	30	0.315	6.287	1441	0.693	0.3	6.932	1589	0,629
32	0.203	15.14	3471	0.288	35	0.213	13.75	3153	0.317	0.2	15.59	3576	0,279

Any intermediate diameter non above listed can be supplied upon request.

Thermocouple type T

Type T is used in laboratory and industry in the temperature range – 185°C to + 370°C when high temperature accuracy is required (as for temperature sensors for cars). It can be used in oxidizing or reducing atmospheres and proves to be relatively stable at lower temperatures. If you need this material for treatment below 0°C, please let us know when ordering in order for us to guide you towards a special quality. Aperam Alloys Rescal only deliver negative leg (TN). The positive leg, made of pure copper is being widely available.

Chemical composition and mechanical properties

Alloy	Chemical composition			Melting point. °C	Resistivity	Density g/cm³	Temp. coef. of resistance (x10-6/°C)	Linear expansion coef. x10-6/°C)	Thermal Conductivity W m-1 °C-1 at 20°C
	Ni	Cu	Others						
TP (+)	100	-	-	1083	1.720	8.92	4000	16.60	388
TN (-)	44	Balance	Mn+	1210	49.00	8.90	60	14	21.20

Resistivity: micro ohm-cm at 20°C - Temperature coefficient by °C from 20 up to 100°.

Maximum operating temperatures

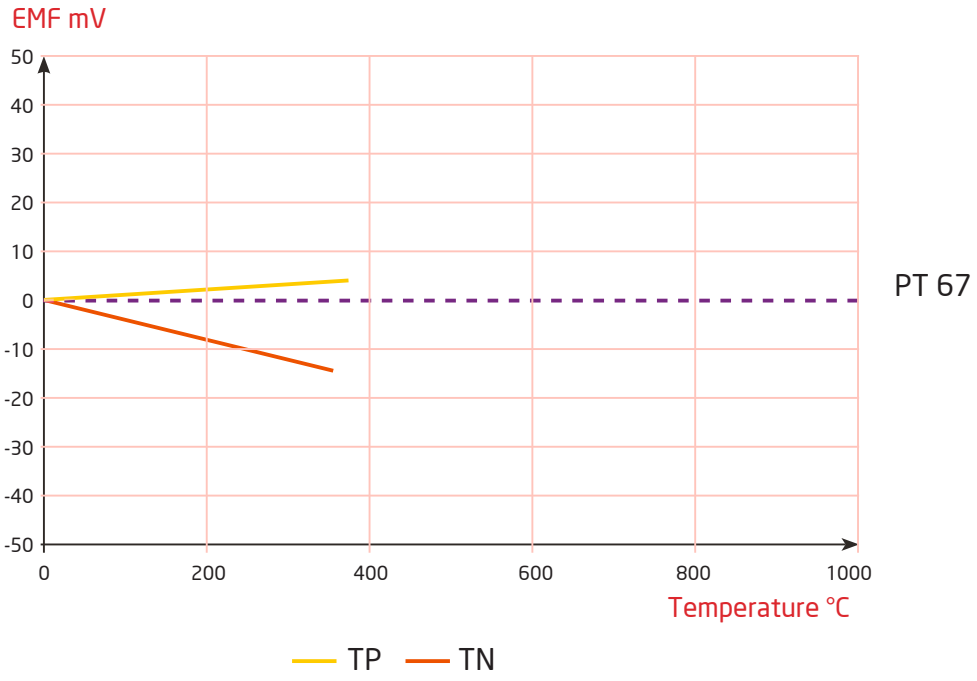
Please note that the data below are given as indicative values.

As per norm ASTM

Thermocouple	Dia 3.26 mm	Dia 1.63 mm	Dia 0.81 mm	Dia 0.51 mm	Dia 0.25 mm
TP - TN	-	360° C	260° C	200° C	150° C

TP and TN vs Platinum *

Nominal EMF for type T thermocouple vs Pt 67



** Rescal does not supply the TP leg*

Couple TP/TN EMF reference table (mV)

°C	0	10	20	30	40	50	60	70	80	90	100
-200	-5.603	-5.439	-5.261	-5.07	-4.865	-4.6481	-4.4191	-4.1771	-3.923	-3.657	-3.379
-100	-3.379	-3.089	-2.788	-2.476	-2.153	-1.819	-1.475	-1.121	-0.757	-0.383	0
0	0	0.391	0.789	1.196	1.612	2.036	2.468	2.909	3.358	3.814	4.279
100	4.279	4.75	5.228	5.714	6.206	6.704	7.209	7.72	8.235	8.76	9.288
200	9.288	9.822	10.362	10.908	11.458	12.013	12.574	13.139	13.709	14.283	14.862
300	14.8621	15.445	16.032	16.624	17.219	17.819	18.422	19.03	19.6411	20.255	20.872

Recommendations for use

It is recommended not to exceed 370°C. At this temperature, the copper (positive leg) would oxidize.

Conversion tables

TN wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
										4	0.039	8.94	111
8	3.251	0.059	13.5	73.9	10	3.251	0.059	13.5	73.9	3.26	0.059	13,5	73,9
10	2.591	0.0929	21.3	46.9	13	2.337	0.114	26.2	38.2	3	0.0693	15,9	62,9
11	2.311	0.116	26.8	37.3	14	2.032	0.151	34.6	28.8	2.5	0.0998	22,9	43,7
12	2.057	0.147	33.8	29.6	15	1.829	0.186	42.7	23.4	2.05	0.148	34,0	29,3
13	1.829	0.186	42.7	23.4	16	1.626	0.236	54.1	18.5	1.8	0.192	44,1	22,6
14	1.626	0.236	54.1	18.5	18	1.219	0.419	96.2	10.4	1.63	0.235	53,2	18,6
16	1.295	0.372	85.3	11.7	19	1.016	0.604	138.6	7.21	1.29	0.375	85,9	11,6
20	0.813	0.943	216.4	4.62	21	0.813	0.943	216.4	4.62	0.81	0.951	218,0	4,58
24	0.311	2.389	548	1.82	25	0.508	2.417	554	1.8	0.5	5.092	572	1,75
28	0.32	6.092	1397	0.715	30	0.315	6.287	1441	0.693	0.3	6.932	1589	0,629
32	0.203	15.14	3471	0.288	35	0.213	13.75	3153	0.317	0.2	15.59	3576	0,279

Any intermediate diameter non above listed can be supplied upon request.

Thermocouple type E

This thermocouple has the highest EMF output per degree of all the referenced thermocouples. This characteristic allows type E to be used in applications requiring high EMF output and superior resistance to oxidation in the operating range from 150°C to 870°C. It is sometimes used in thermal-generators (thermopiles). Arranged in series, a thermopile permits measuring accurately very small temperature differences.
Aperam Alloys Rescal has developed special thermopile application elements (see chapter "thermopile applications" below).

Chemical composition and mechanical properties

Alloy	Chemical composition			Melting point. °C	Resistivity	Density g/cm³	Temp. coef. of resistance (x10-6/°C)	Linear expansion (coef. x10-6/°C)	Thermal Conductivity (W m-1 °C-1 at 20°C)
	Ni	Cu	Others						
EP (+)	90	10	+	1430	100	8.72	300	17	19.20
EN (-)	44	-	Fe+-Bal Cu-Mn+	1210	49	8.90	60	14	21.20

Resistivity: micro ohm-cm at 20°C - Temperature coefficient by °C from 20 up to 100°.

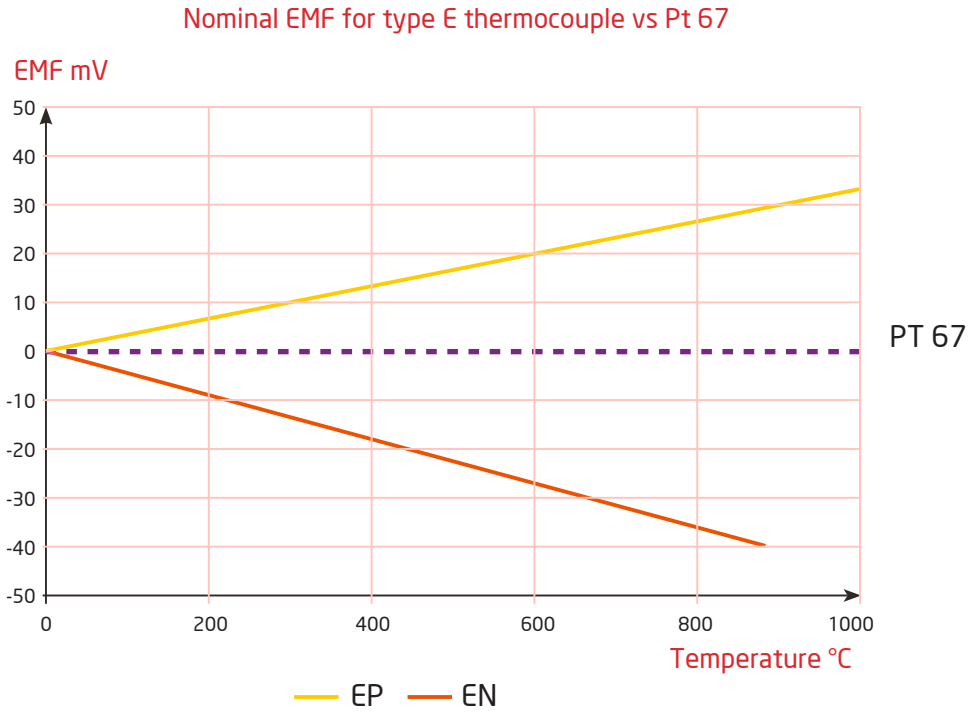
Maximum operating temperatures

Please note that the data below are given as indicative values.

As per norm ASTM

Thermocouple	Dia 3.26 mm	Dia 1.63 mm	Dia 0.81 mm	Dia 0.51 mm	Dia 0.25 mm
EP - EN	870 °C	650°C	540°C	430°C	370°C

EP and EN vs Platinum



Couple EP/EN EMF reference table (mV)

°C	0	10	20	30	40	50	60	70	80	90	100
0	0	0.591	1.192	1.801	2.42	3.048	3.685	4.33	4.985	5.648	6.319
100	6.319	6.998	7.685	8.379	9.081	9.789	10.504	11.224	11.951	12.684	13.421
200	13.421	14.164	14.9121	15.664	16.42	17.181	17.945	18.713	19.484	20.257	21.036
300	21.036	21.817	22.6001	23.386	24.174	24.964	25.757	26.552	27.348	28.146	28.946
400	28.946	29.747	30.55	31.354	32.159	32.965	33.772	34.579	35.388	36.196	37.005
500	37.005	37.815	38.624	39.434	40.244	41.053	41.862	42.671	43.479	44.286	45.093
600	45.093	45.9	46.705	47.51	48.313	49.116	49.917	50.718	51.517	52.315	53.112
700	53.112	53.908	54.703	55.497	56.289	57.08	57.87	58.659	59.446	60.232	61.017
800	61.017	61.801	62.583	63.364	64.144	64.922	65.698	66.473	67.246	68.017	68.787
900	68.787	69.554	70.319	71.083	71.844	72.603	73.36	74.115	74.869	75.621	76.373

Conversion tables

EP wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
-	-	-	-	-	-	-	-	-	-	4	0.0561	9.12	72.3
8	3.251	0.085	13.8	72.4	10	3.251	0.085	13.8	72.4	3.26	0.085	13.8	72.3
10	2.591	0.133	21.7	45.9	13	2.337	0.164	26.7	37.4	3	0.0998	16.2	61.6
11	2.311	0.168	27.3	36.5	14	2.032	0.817	35.3	28.3	2.5	0.144	23.3	42.8
12	2.057	0.212	24.5	28.9	15	1.829	0.269	43.6	22.9	2.05	0.213	34.7	28.8
13	1.829	0.269	43.6	22.9	16	1.626	0.34	55.2	18.1	1.8	0.277	45.1	22.2
14	1.626	0.34	55.2	18.1	18	1.219	0.605	98.2	10.2	1.63	0.338	54.9	18.2
16	1.295	0.536	87	11.5	19	1.016	0.871	141.4	7.07	1.29	0.54	87.7	11.4
20	0.813	1.359	220.9	4.52	21	0.813	1.359	220.9	4.52	0.81	1.37	222.5	4.49
24	0.311	3.442	559.1	1.78	25	0.508	3.483	565.8	1.77	0.5	3.595	584	1.71
28	0.32	8.778	1426	0.7	30	0.315	9.059	1471	0.679	0.3	9.987	1622	0.62
32	0.203	21.81	35430	0.282	35	0.213	19.8	3218	0.311	0.2	22.47	3650	0.27

EN wire

B&S or AWG					SWG					Metric			
B&S or AWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	SWG	Dia mm	Ohm/m	Length m / kg	Weight g / m	Diameter mm	Ohm/m	Length m / kg	Weight g / m
-	-	-	-	-	-	-	-	-	-	4	0.039	8.94	112
8	3.251	0.059	13.5	73.9	10	3.251	0.059	13.5	73.9	3.26	0.059	13.5	73.9
10	2.591	0.0929	21.3	46.9	13	2.337	0.114	26.2	38.2	3	0.0693	15.9	62.9
11	2.311	0.116	26.8	37.3	14	2.032	0.151	34.6	28.8	2.5	0.0998	22.9	43.7
12	2.057	0.147	33.8	29.6	15	1.829	0.186	42.7	23.4	2.05	0.148	34	29.3
13	1.829	0.186	42.7	23.4	16	1.626	0.236	54.1	18.5	1.8	0.193	44.1	22.6
14	1.626	0.236	54.1	18.5	18	1.219	0.419	96.2	10.4	1.63	0.235	53.2	18.6
16	1.295	0.372	85.3	11.7	19	1.016	0.604	138.6	7.21	1.29	0.375	85.9	11.6
20	0.813	0.943	216.4	4.62	21	0.813	0.943	216.4	4.62	0.81	0.951	218	4.58
24	0.311	2.389	548	2.89	25	0.508	2.417	554	1.8	0.5	5.092	572	1.75
28	0.32	6.092	1397	0.715	30	0.315	6.287	1441	0.693	0.3	6.932	1589	0.629
32	0.203	15.14	3471	0.288	35	0.213	13.75	3153	0.317	0.2	15.59	3576	0.279

Any intermediate diameter non above listed can be supplied upon request.

Thermopile applications

Aperam Alloys Rescal has developed specific heats for thermopile applications. Particularity of these alloys is to have the capacity to develop the highest EMF never developed until now by Seebeck's effect.

Alloy		Chemical analysis %			
		Ni	Cr	Cu	Others
Positive leg	REPS	90	8	-	Si+
Negative leg	RENS	44	-	55	Si+
	RENM	44	-	55	Mn+
	RENN	44	-	55	Fe+

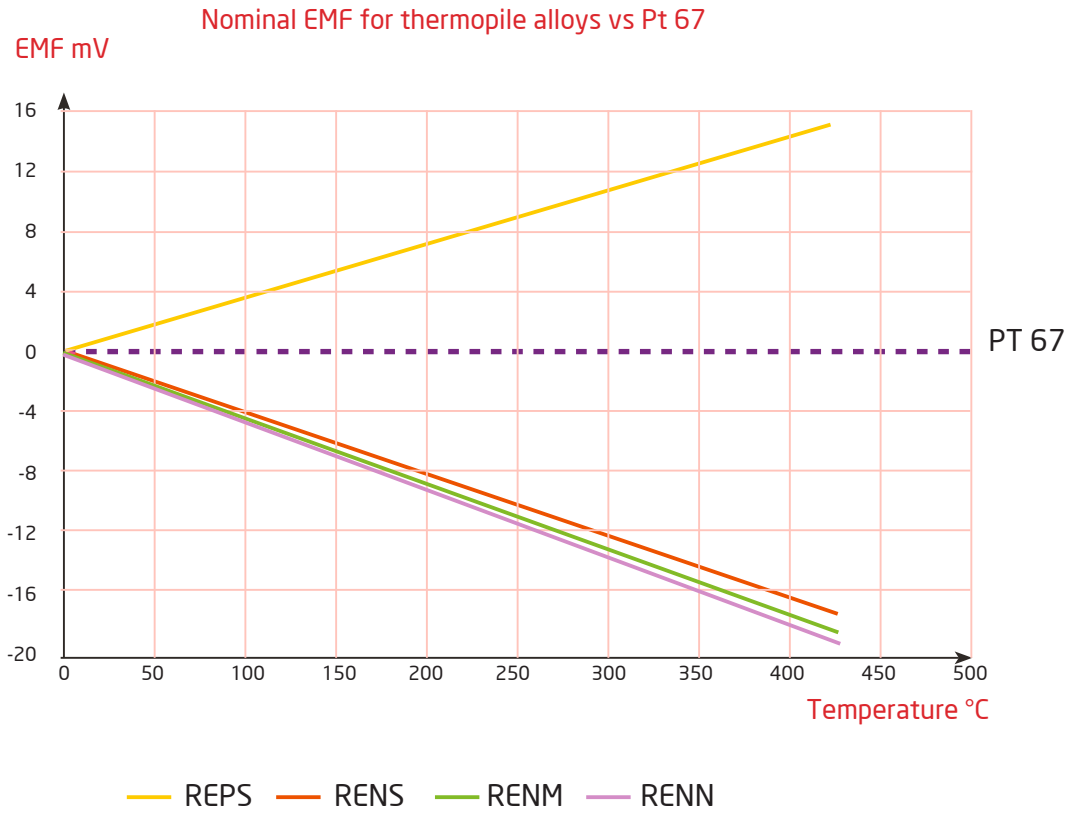
EMF developed

EMF developed by these alloys are not referenced by ASTM or other norm. Table below gives EMF values for a specific temperature.

For example, at 427 °C the EMF of each thermocouple is:

- Resistohm EPS - 14.779 mV
- Resistohm ENN- 19.602 mV
- Resistohm ENM - 18.914 mV
- Resistohm ENS - 17.526 mV

Thermopile alloys vs Platinum



Typical application

Those alloys are used when the highest EMF are required, which will, then, make easier piloting of electronic measurement devices. These systems are particularly required in equipment leading where safety is a priority (sensor for gas flame, safety valve...).

Extension and compensating cable

Using extension and compensating cables permit connecting electrically non active wire extremities of a thermoelectric couple to a temperature regulator (to the terminals converting mV in °C). If conductors of electric cables and thermocouple are made up of the same alloy, cables are called extension cables. The cable alloy can also be different from the thermocouple one but with the same thermoelectric characteristics within reduced range of temperatures (0+80/100°C). In this case, they are called compensating cables. They are marked by the letter C after the code of the thermo-element couple.

Advantages of using extension cables

The advantages offered by using Aperam Alloys Rescal extension wires are:

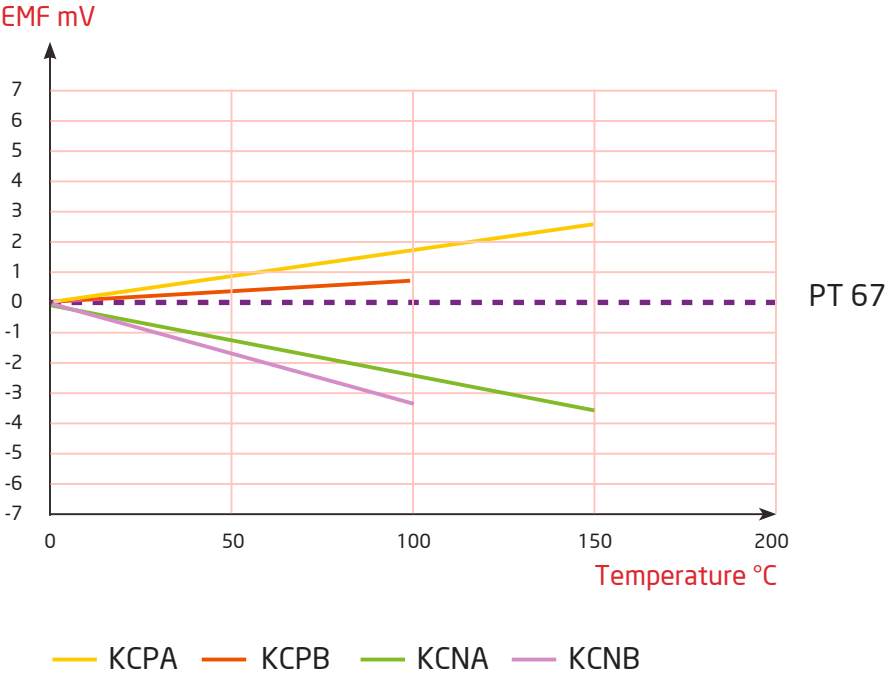
- Improvement in mechanical properties of the thermoelectric circuit: stranded wire may increase the flexibility of that portion of the circuit over solid wire.
- Cost effectiveness, thanks to the possibility to use extension wires as a subsitute for more expensive thermocouple wires within the circuit. This can only be done if the extension wires are not exposed to temperatures over 200°C.

Particularity of type K

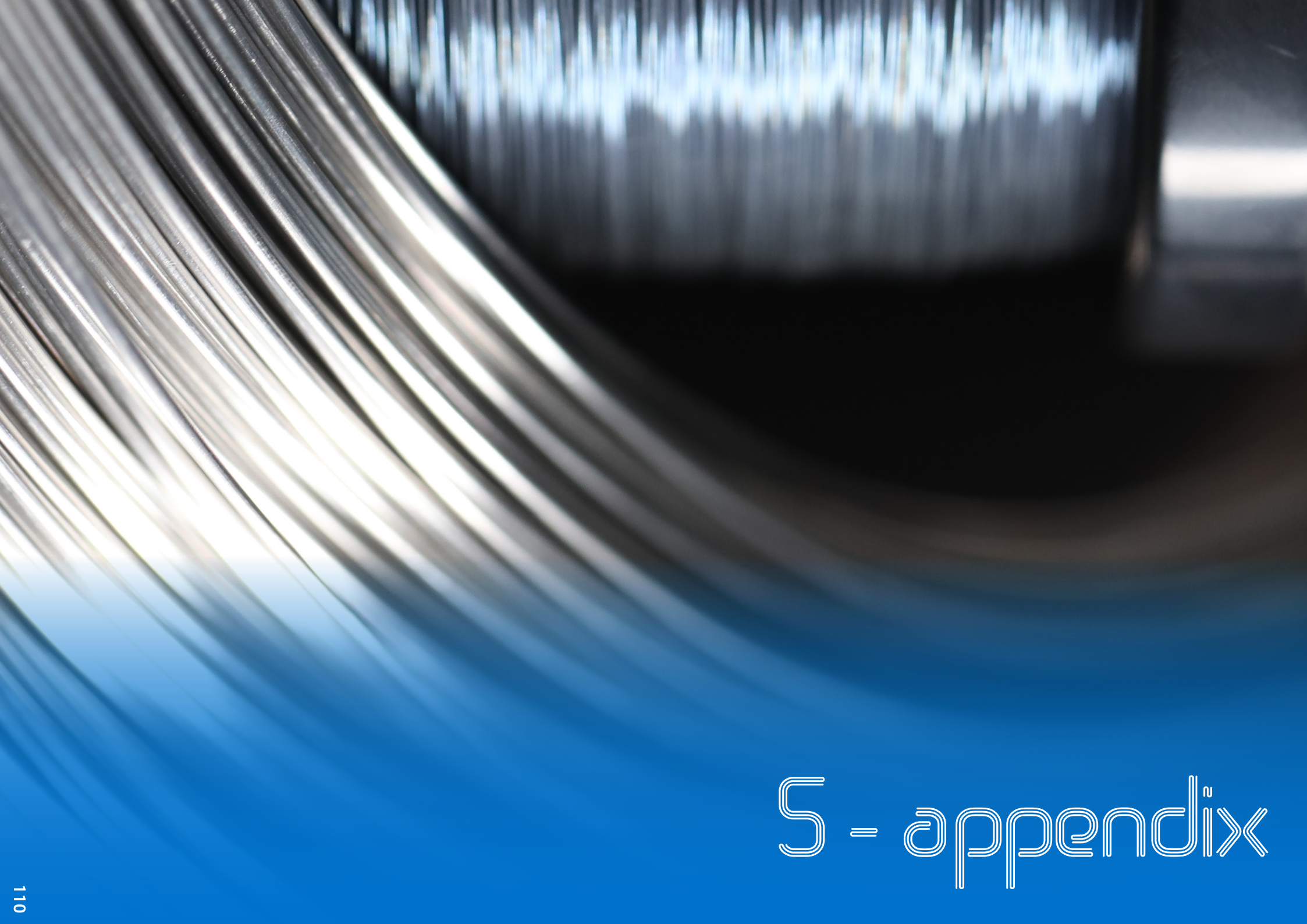
Characteristics of type K thermocouple can be realised at lower temperatures with different alloy associations: extension KPX (same association of alloys as type K), but also by association of copper and copper-nickel (compensation KCB or VX following specification) or by association of iron and CuNi 44 (compensation KCA or WC following specification). Those three associations develop the same EMF as thermocouple type K at 100 °C, that is to say 4.095 mV. Compensations as KCB or KCA can be used from 0 to 100°C and are more economical than extensions.

Thermocouple			Extension			Compensating		
Type	Polarity	Chemical composition	Type	Polarity	Chemical composition	Type	Polarity	Chemical composition
K	KP	NiCr 10	KPX	KPX	NiCr 10	KCB	KCPB	Cu
							KCNB	CuNi 44
	KN	Ni Si ++ Cu ++		KNX	Ni ++	KCA	KCPA	Iron
					Si ++			
					Cu ++		KCNA	CuNi 43

Nominal EMF for type K Thermocouple Compensating Cables vs Pt 67 *



** For extension cables EMF values: please refer to thermocouple graphics until 200°C*
(page 97 for type K, page 99 for type N, page 101 for type J, page 103 for type T, page 105 for type E)

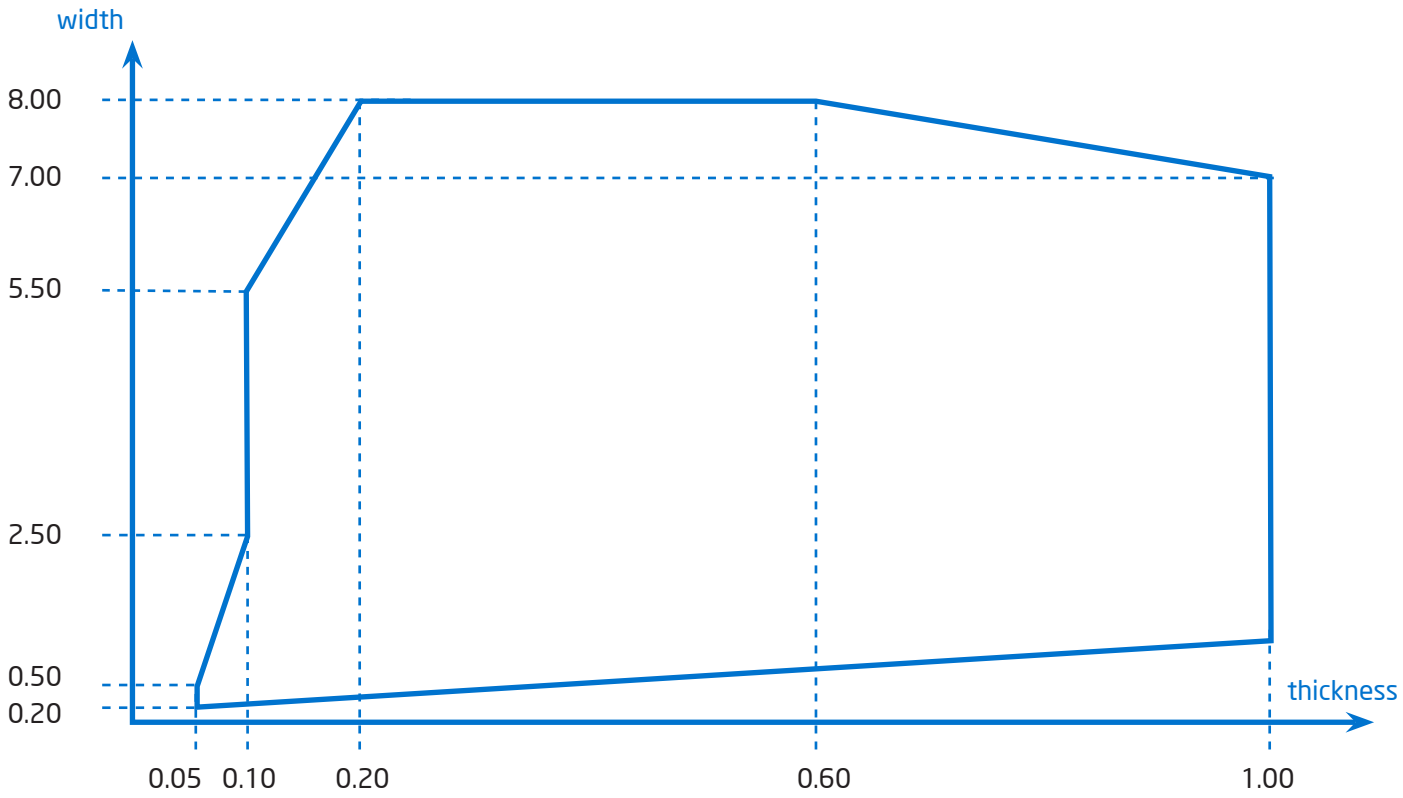


5 - appendix

Delivery Forms

Format	Sizes available	Heat treatment	
		Bright	Oxidized
Wire	- Diameter from 0.10 to 16.00 mm - Below 0.10 mm: please contact us.	•	•
Ribbon	- From 0.20 to 8.00 mm width - From 0.05 to 1.00 mm thickness	•	•
Straightened wire	- Diameter from 0.60 to 16.00 mm - Length of bars up to 4.00 m	•	•
Strip (complementary range)	- From 6.00 to 200.00 mm width - From 0.10 to 3.30 mm thickness	•	•

Capabilities of Aperam Alloys Rescal ribbon manufacturing (mm)



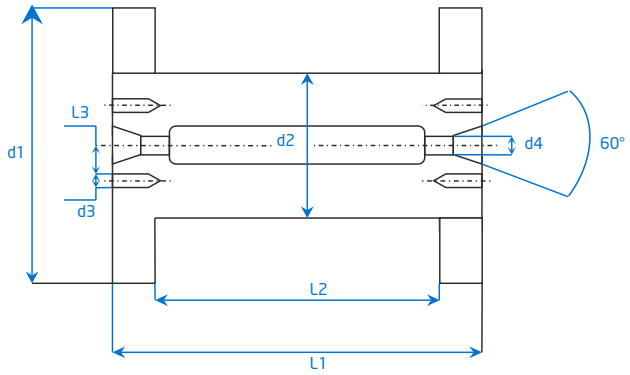
Detail of our alloys delivery forms

Alloy	Wire	Ribbon	Staightened wire	Strip (complem. range)
RESISTOHM® 80	•	•	•	•
RESISTOHM 70	•	•	•	•
RESISTOHM 60	•	•	•	•
RESISTOHM 40	•	•	•	
RESISTOHM 30	•	•	•	•
RESISTOHM 20	•	•	•	
RESISTOHM® PRM	•	•	•	
RESISTOHM Y	•	•	•	•
RESISTOHM 145	•	•	•	•
RESISTOHM 140	•	•	•	•
RESISTOHM 135	•	•	•	•
RESISTOHM 125	•	•	•	•
CuNi 44	•	•	•	•
CuNi 23 Mn	•	•	•	
CuNi 10	•	•	•	
CuNi 6	•	•	•	
CuNi 2	•	•	•	
Clad 40	•	•	•	
Phy 400	•	•	•	
INVAR®	•	•	•	
FeNi 70 (Hytemco)	•	•	•	
Manganina	•	•	•	
Nickel 200	•	•	•	
Nickel 201	•	•	•	
Nickel 212	•	•	•	
NICRIMPHY 600	•	•	•	
NICRIMPHY 601	•	•	•	
RESISTOHM 330CB	•	•	•	
THERMOCOUPLE TYPE K (KP/KN)	•	•	•	•
THERMOCOUPLE TYPE N (NP/NN)	•	•	•	
THERMOCOUPLE TYPE J (JP/JN)	•	•	•	
THERMOCOUPLE TYPE T TN)	•	•	•	
THERMOCOUPLE TYPE E (EP/EN)	•	•	•	

For further grades, feel free to contact us or to refer to separate documentation (especially for Heat Resistant, Corrosion, Magnetic, FeNiCo, Special NiCr / NiCrTi / NiCo Alloys).

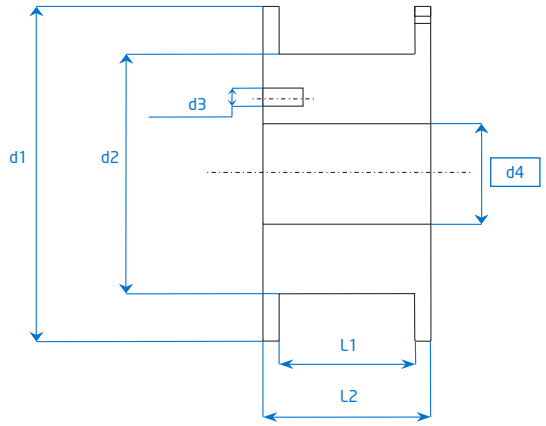
Dimensions of standard conditioning

DIN TYPE



Spool no.	d1		d2		d3		d4		L1		L2		L3		Approx. weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
DIN63	63	2.48	40	1.57			11	0.43	63	2.48	49	1.93			0.5	1.101
DIN80	80	3.15	50	1.97	7	0.28	16	0.63	80	3.15	64	2.52	20	0.79	0.7	1.541
DIN100	100	3.94	63	2.48	7	0.28	16	0.63	100	3.94	80	3.15	20	0.79	1.5	3.303
DIN125	125	4.92	80	3.15	7	0.28	16	0.63	125	4.92	100	3.94	20	0.79	3	6.606
RE125	125	4.92	60	2.36	7	0.28	16	0.63	125	4.92	100	3.94	20	0.79	4	8.808
DIN160	160	6.30	100	3.94	13	0.51	22	0.87	160	6.30	128	5.04	32	1.26	6	13.212
DIN200	200	7.87	125	4.92	13	0.51	22	0.87	200	7.87	160	6.30	32	1.26	13	28.626
DIN250	250	9.84	160	6.30	13	0.51	22	0.87	200	7.87	160	6.30	32	1.26	20	44.04
DIN250/127	250	9.84	160	6.30			127	5	200	7.87	160	6.30			20	44.04
DIN355	355	13.98	224	8.82	26	1.02	36	1.42	200	7.87	160	6.30	80	3.15	45	99.09
DIN500	500	19.69	315	12.40	26	1.02	36	1.42	250	9.84	180	7.09	80	3.15	80	176.16
GMV500	500	19.69	250	9.84			127	5	375	14.76	315	12.40			180	396.36

SD & SH TYPE



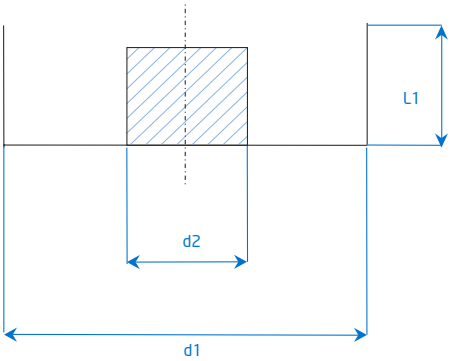
Type	d1		d2		d3		d4		L1		L2		Approx. weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	Kg	Lbs
SD300K/20	300	11.81	180	7.09	11	0.43	51.5	2.03	85	3.35	103	4.06	20	44.04
SH460K	460	18.11	319	12.56			305	12	91	3.58	105	4.13	20	44.04

COIL

Wire diameter	Internal diameter		Outside diameter	
	mm	inch	mm	inch
Ø ≤ 2.00 mm	400	15,75	500	19,68
2.00 < Ø ≤ 3.00 mm	450	17,72	550	21,65
Ø > 3.00 mm	550	21,65	650	25,59

Wire diameter	Minimum weight		Maximum weight		Tolerance	
	kg	lbs	kg	lbs	kg	lbs
1.00 ≤ Ø ≤ 2.00 mm	15	33,03	50	110,1	+/- 5	11,01
2.00 < Ø ≤ 4.00 mm	20	44,04	50	110,1	+/- 5	11,01
4.00 < Ø ≤ 6.00 mm	25	55,05	50	110,1	+/- 5	11,01

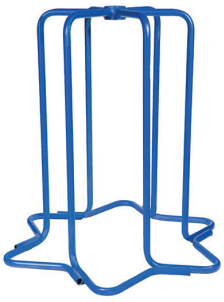
DRUM



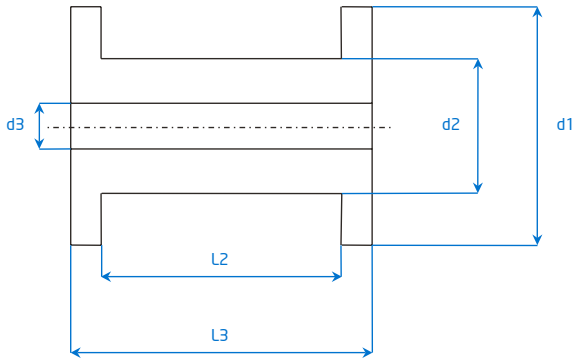
Type	d1		d2		L1		Approx. weight	
	mm	inch	mm	inch	mm	inch	Kg	lbs
F150	510	20.07	330	13	150	5.91	25	55.05
F250	510	20.07	330	13	250	9.84	50	110.1
F500	510	20.07	330	13	500	19.69	70	154.14
F800	510	20.07	330	13	800	31.50	150	330.3

CARRIER - FORMER

Standard weight	Minimum		Maximum		Internal diameter		Outside diameter	
	kg	lbs	kg	lbs	mm	inch	mm	inch
	200	440	350	770	450	17.72	850	33.46



BP & U TYPE



Type	d1		d2		d3		L1		L2		Approx. weight	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
BP60	254	10	202	7.95	32.5	1.28	184	7.24	153	6.02	35	77.07
U125	126.5	4.98	101.5	4.00	16	0.63	101	3.98	76	3.00	1	2.202
U151	152	5.98	89	3.50	16	0.63	101	3.98	89	3.50	4	8.808
U305	305	12	168	6.61	39	1.54	211	8.30	176	6.93	35	77.07

Gauge n°	B&S or A.W.G.		S.W.G.	
	inches	mm	inches	mm
4-0	0.4600	11.6840	0.400	10.160
3-0	0.4096	10.4049	0.372	9.449
2-0	0.3648	9.2658	0.348	8.839
0	0.3249	8.2515	0.324	8.230
1	0.2893	7.3481	0.300	7.620
2	0.2576	6.5437	0.276	7.010
3	0.2294	5.8273	0.252	6.401
4	0.2043	5.1894	0.232	5.893
5	0.1819	4.6213	0.212	5.385
6	0.1620	4.1154	0.192	4.877
7	0.1443	3.6649	0.176	4.470
8	0.1285	3.2636	0.160	4.064
9	0.1144	2.9064	0.144	3.658
10	0.1019	2.5882	0.128	3.251
11	0.0907	2.3048	0.116	2.946
12	0.0808	2.0525	0.104	2.642
13	0.0720	1.8278	0.092	2.337
14	0.0641	1.6277	0.080	2.032
15	0.0571	1.4495	0.072	1.829
16	0.0508	1.2908	0.064	1.626
17	0.0453	1.1495	0.056	1.422
18	0.0403	1.0237	0.048	1.219
19	0.0359	0.9116	0.040	1.016
20	0.0320	0.8118	0.036	0.914
21	0.0285	0.7229	0.032	0.813
22	0.0253	0.6438	0.028	0.711
23	0.0226	0.5733	0.024	0.610
24	0.0201	0.5106	0.022	0.559
25	0.0179	0.4547	0.020	0.5080
26	0.0159	0.4049	0.018	0.4572
27	0.0142	0.3606	0.0164	0.4166
28	0.0126	0.3211	0.0148	0.3759
29	0.0113	0.2859	0.0136	0.3454
30	0.0100	0.2546	0.0124	0.3150
31	0.0089	0.2268	0.0116	0.2946
32	0.0080	0.2019	0.0108	0.2743
33	0.0071	0.1798	0.0100	0.2540
34	0.0063	0.1601	0.0092	0.2337
35	0.0056	0.1426	0.0084	0.2134
36	0.0050	0.1270	0.0076	0.1930
37	0.0045	0.1131	0.0068	0.1727
38	0.0040	0.1007	0.006	0.1524
39	0.0035	0.0897	0.0052	0.1321
40	0.0031	0.0799	0.0048	0.1219
41	-	-	0.0044	0.1118
42	-	-	0.004	0.1016
43	-	-	0.0036	0.0914
44	-	-	0.0032	0.0813
45	-	-	0.0028	0.0711
46	-	-	0.0024	0.0610
47	-	-	0.002	0.0508
48	-	-	0.0016	0.0406
49	-	-	0.0012	0.0305
50	-	-	0.001	0.0254

Useful information and formulas

Symbol	Meaning	Unit
d	Diameter of wire or ribbon	mm
I	Electrical current	A
R	Electrical resistance	Ω
R_{20}	Resistance at 20°C	Ω/m
ρ0	Resistivity at 20°C	cm²/Ω
Ct	Temperature coefficient	-
U	Voltage	V
P	Power	W
S	Surface area	cm²/m
α	Cross sectional area	mm²
ρ	Resistivity	Ω mm²/m
w_i	Width of ribbon	mm
t	Thickness	mm
W_m	Weight per meter	g/m
γ	Density	g/cm³
T	Surface load of heating element	W/cm²

The following formulas are generally used for calculating heating elements.

General formulas

$U = I \cdot R$
$P = U \cdot I$
$P = I^2 \cdot R$

This allows the customer to calculate a heating element but will not guarantee that the element will perform as required.

Formulas used in the tables

Cross sectional area

Wire: $\alpha = \pi \cdot d^2/4$
Ribbon: $\alpha = (w_i \cdot t) / 1.07$

Resistance at 20°C of a round wire

$R_{20} = \rho/\alpha$

Resistance at 20°C of a ribbon/strip

$R_{20} = \rho/(w \cdot t) \cdot 1.07$

Surface area

Wire: $S = \pi \cdot d \cdot 10$
Ribbon: $S = 2 \cdot (w+t) \cdot 10$

Resistivity at 20°C

$\rho_0 = S/R$

Weight per meter

Wire: $W_m = \pi \cdot d^2 \times \gamma / 4$
Ribbon: $W_m = w \cdot t \cdot y / 1.07$

Design of wire element

Calculating a wire diameter and length element

Diameter and length required for a 750w/240v element, operating at 1000°C

$Rt = v^2 / w = 240^2 / 750 = 76.8$ ohms

Using a Resistohm 80 wire, the coefficient of temperature at 1000°C will be 1.12 (see Resistohm 80 table).
The total resistance of the element at 20°C will be:

$R = Rt / Ct = 76.8 / 1.12 = 68.57$ ohms

Assuming a length of wire of 10 meters, the resistance required per meter will be:

$R_{20} = R / l = 68.57 / 10 = 6.86$ ohms/m

The a wire diameter of 0.45mm has a resistance per meter of 6.79 ohms/m, which is the closest value to 6.86 ohms/m.

The actual length would be:

$l = R / R_{20} = 68.57 / 6.79 = 10.099$m

The surface loading would be:

$S = W / l \cdot d \cdot \pi \cdot 10 = 750 / 10.099 \cdot 0.45 \cdot 31.416 = 5.25$ W/cm²

Design of strip element

Calculating a strip or ribbon heating element

The method is similar to the one used for wire calculation:

Given:
Power = 600W
Tension = 220V
Hot resistance $Ct = V^2 / W = 220 / 500 = 96.8$ ohms
Operating temperature: 800°C

Using Resistohm® 80 ribbon, the temperature coefficient Ct at 800°C would be 1.04.
The total resistance element at 20°C would be:

$R = \rho 0 / Ct = 96.8 / 1.04 = 93.08$ ohms

Assuming a length of tape of 10 meters, the resistance required per meter of ribbon would be:

$R_{20} = R / l = 93.08 / 10 = 9.31$ ohms/m

From the table "Resistohm 80 – Ribbon dimensions and properties", the nearest value is for ribbon size of 1.5 x 0.085 mm which has a resistance of 9.064 ohms/m

To verify the ribbon length, the following calculation has to be done:

$L = R / \text{Ohms/m} = 93.08 / 9.064 = 10.27$ m

To calculate the surface loading value:

$T = W / 2 \cdot (w + t) \cdot 10 \cdot l = 600 / 2 \cdot (1.5+0.085) \cdot 10 \cdot 10.27 = 1.84$ W/cm²

Design calculation of heating element

Resistance / heating ribbon and wire

To be used as a heating element the ribbon or wire must res ist the flow of electricity. This resistance converts the electrical energy into heat which is related to the electrical resistivity of the metal, and is defined as the resistance of a unit length of unit cross-sectional-area. The linear resistance of a length of ribbon or wire can be calculated from its electrical resistance..

As a heating element, ribbon offers a larger surface area than wire and therefore, a greater effective heat radiation in a preferred direction, making it ideal for many domestic appliances like toasters and convector heaters, and industrial applications such as injection moulding band heaters. An important characteristic of these electrical resistance alloys is their resistance to heat and corrosion, thanks to the formation of an oxide surface layers that delay further reaction with the oxygen in air.

Electrical resistance at operating temperature

With very few exceptions the resistance of a metal will change with temperature, which must be allowed for when designing an element. As the resistance of an element is calculated at operating temperature, the resistance of the element at room temperature must be found. To obtain the element's resistance at operating temperature, divide the resistance at operating temperature by the coefficient of temperature shown in the resistance tables.

Calculating a wire diameter and length element

Calculation example based on surface load concentration

Design conditions

Electric capacity P = 10kw
Voltage U = 200 V
Current I = P / U = 10^4 / 200 = 50A
Heating element temperature: 1300°C

How to find the heating element dimensions, provided RESISTOHM® 145 is used and its surface load concentration is 0.7 W/cm^2 at 1300°C

Find the Resistivity at 20°C (cm^2/Ω) value using the following expression based on the resistance temperature coefficient:

Ct = 1.04 of RESISTOHM 145 at 1300°C.
Resistivity at 20°C (cm^2 /Ω) = I^2 · Ct / T = 50^2 · 1.04 / 0.7 = 3714 cm^2 /Ω

Find the resistivity at 20°C (cm^2/Ω) value closest to the above value in the RESISTOHM 145 round wire resistance weight table. It is 3673.208 and the wire diameter is 6.00mm.

Therefore, the values of the heating element would be as shown below:

Alloy type: RESISTOHM 145
Wire diameter: 6.00 mm
Total resistance: R= I^2 / P · Ct = 50^2/104 · 1.04 = 3.85 Ω
Length: l = R / R_{20} = 3.85 / 0.0513 = 75m
Weight: l · g/ m · 10^{-3} = 75 · 200.6460 · 10^{-3} = 15.04 kg
Current density: Id = I / S = 50 / 28.26 = 1.77A/mm^2
Surface load concentration: T = P / d · l · π · 10 = 10 000 / 75 · 6 · 31.416 = 0.71 W/cm^2.

Conversion Tables

Resistivity

From	To	Multiply by
ohm.mm²/m	Ohm.in²/in	0.00393
ohm.in²/in	Ohm.mm²/m	25399
µohm.cm²/cm	µohm.cir mil/ft	0.3937
µohm.cir mil/ft	µohm.cm²/cm	2.54

Electrical resistance

From	To	Multiply by
ohm/m	ohm/ft	0.3048
ohm/ft	ohm/m	3.2808
ohm/m	ohm/yd	0.9144
ohm/yd	ohm/m	1.0936
ohm/in	ohm/ft	12
ohm/ft	ohm/in	0.083
ohm/in	ohm/m	39.37
ohm/m	ohm/in	0.0254

Strength

From	To	Multiply by
N/mm²	psi	145
psi	N/mm²	0.0689
Kg/mm²	psi	1422
psi	Kg/mm²	0.00703
Ksi	N/mm²	6890 x 10-3
N/mm²	Ksi	0.145

Length

From	To	Multiply by
in	mm	25.4
ft	cm	30.48
yd	m	0.9144
mm	In	0.0393
cm	ft	0.0328
m	yd	1.0936

Surface area

From	To	Multiply by
cm^2	in^2	0.155
in^2	cm^2	6.452
m^2	ft^2	10.76
ft^2	m^2	0.0929

Weight

From	To	Multiply by
lb	Kg	0.454
kg	lb	2.202
gr	oz	0.03527
oz	gr	28.35
gr/m	lb/ft	0.0006717
lb/ft	gr/m	1488

Energy & power

	joule	kwh	kcal	kgm	erg
joule	1	2.77 x 10 -7	2.388 x 10 -4	0.1019	10 7
kwh	3.6 x 10 6	1	860	3.67 x 10 5	3.6 x 10 13
kcal	4.18 x 10 3	1.163 x 10 -3	1	4.269 x 10 2	4.18 x 10 10
kgm	9.806	2.724 x 10 -6	2.342 x 10 -3	1	9.806 x 10 7
erg	10-7	2.777 x 10 -14	2.388 x 10 -11	1.019 x 10 -8	1

Space

	cm3	dm3	cubic inch	cubic foot
cm3	1	0.001	0.061	-
dm3	1000	1	61.02	0.035
cubic foot	2832	28.32	1728	1
cubic inch	16.39	0.0164	1	-

Temperature conversion tables

The numbers in the central column represents the temperature to be converted. The corresponding temperature in Fahrenheit can be read on the right column and those in Celsius on the left.

Example : If 100 degrees are read in Celsius, look in the right column and convert it to 212°F; If they are read in Fahrenheit, convert it to 38°C

°C		°F
-17.8	0	32
-17.2	1	33.8
-16.7	2	35.6
-16.1	3	37.4
-15.6	4	39.2
-15.0	5	41.0
-14.4	6	42.8
-13.9	7	44.6
-13.3	8	46.4
-12.8	9	48.2
-12.2	10	50.0
-11.7	11	51.8
-11.1	12	53.6
-10.6	13	55.4
-10.0	14	57.2
-9.44	15	59.0
-8.89	16	60.8
-8.33	17	62.6
-7.78	18	64.4
-7.22	19	66.2
-6.67	20	68.0
-6.11	21	69.8
-5.56	22	71.6
-5.00	23	73.4
-4.44	24	75.2
-3.89	25	77.0
-3.33	26	78.8
-2.78	27	80.6
-2.22	28	82.4
-1.67	29	84.2
-1.11	30	86.0
-0.56	31	87.8
0	32	89.6
0.56	33	91.4
1.11	34	93.2
1.67	35	95.0
2.22	36	96.8
2.78	37	98.6
3.33	38	100.4
3.89	39	102.2
4.44	40	104.0
5.00	41	105.8
5.56	42	107.6
6.11	43	109.4
6.67	44	111.2
7.22	45	113.0
7.78	46	114.8
8.33	47	116.6
8.89	48	118.4
9.44	49	120.2
10.0	50	122.0
10.6	51	123.8
11.1	52	125.6
11.7	53	127.4
12.2	54	129.2
12.8	55	131.0

°C		°F
13.3	56	132.8
13.9	57	134.6
14.4	58	136.4
15.0	59	138.2
15.6	60	140.0
16.1	61	141.8
16.7	62	143.6
17.2	63	145.4
17.8	64	147.2
18.3	65	149.0
18.9	66	150.8
19.4	67	152.6
20.0	68	154.4
20.6	69	156.2
21.1	70	158.0
21.7	71	159.8
22.2	72	161.6
22.8	73	163.4
23.3	74	165.2
23.9	75	167.0
24.4	76	168.8
25.0	77	170.6
25.6	78	172.4
26.1	79	174.2
26.7	80	176.0
27.2	81	177.8
27.8	82	179.6
28.3	83	181.4
28.9	84	183.2
29.4	85	185.0
30.0	86	186.8
30.6	87	188.6
31.1	88	190.4
31.7	89	192.2
32.2	90	194.0
32.8	91	195.8
33.3	92	197.6
33.9	93	199.4
34.4	94	201.2
35.0	95	203.0
35.6	96	204.8
36.1	97	206.6
36.7	98	208.4
37.2	99	210.2
38	100	212
43	110	230
49	120	248
54	130	266
60	140	284
66	150	302
71	160	320
77	170	338
82	180	356
88	190	374
93	200	392
99	210	410

°C		°F
100	212	413
104	220	428
110	230	446
116	240	464
121	250	482
127	260	500
132	270	518
138	280	536
143	290	554
149	300	572
154	310	590
160	320	608
166	330	626
171	340	644
177	350	662
182	360	680
188	370	698
193	380	716
199	390	734
204	400	752
210	410	770
216	420	788
221	430	806
227	440	824
232	450	842
238	460	860
243	470	878
249	480	896
254	490	914
260	500	932
266	510	950
271	520	968
277	530	986
282	540	1004
288	550	1022
293	560	1040
299	570	1058
304	580	1076
310	590	1094
316	600	1112
321	610	1130
327	620	1148
332	630	1166
338	640	1184
343	650	1202
349	660	1220
354	670	1238
360	680	1256
366	690	1274
371	700	1292
377	710	1310
382	720	1328
388	730	1346
393	740	1364
399	750	1382
404	760	1400

°C		°F
410	770	1418
416	780	1436
421	790	1454
427	800	1472
432	810	1490
438	820	1508
443	830	1526
449	840	1544
454	850	1562
460	860	1580
468	870	1598
471	880	1616
477	890	1634
482	900	1652
488	910	1670
493	920	1688
499	930	1706
504	940	1724
510	950	1742
516	960	1760
521	970	1778
527	980	1796
532	990	1814
538	1000	1832
543	1010	1850
549	1020	1868
554	1030	1886
560	1040	1904
566	1050	1922
571	1060	1940
577	1070	1958
582	1080	1976
588	1090	1994
593	1100	2012
599	1110	2030
604	1120	2048
610	1130	2066
616	1140	2084
621	1150	2102
627	1160	2120
632	1170	2138
638	1180	2156
643	1190	2174
649	1200	2192
654	1210	2210
660	1220	2228
666	1230	2246
671	1240	2264
677	1250	2282
682	1260	2300
688	1270	2318
693	1280	2336
699	1290	2354
704	1300	2372
710	1310	2390
716	1320	2408

°C		°F
721	1330	2426
727	1340	2444
732	1350	2462
738	1360	2480
743	1370	2498
749	1380	2516
754	1390	2534
760	1400	2552
766	1410	2570
771	1420	2588
777	1430	2606
782	1440	2624
788	1450	2642
793	1460	2660
799	1470	2678
804	1480	2696
810	1490	2714
816	1500	2732
821	1510	2750
827	1520	2768
832	1530	2786
838	1540	2804
843	1550	2822
849	1560	2840
854	1570	2858
860	1580	2876
866	1590	2894
871	1600	2912
877	1610	2930
882	1620	2948
888	1630	2966
893	1640	2984
899	1650	3002
904	1660	3020
910	1670	3038
916	1680	3058
921	1690	3074
927	1700	3092
932	1710	3110
938	1720	3128
943	1730	3146
949	1740	3164
954	1750	3182
960	1760	3200
966	1770	3218
971	1780	3236
977	1790	3254
982	1800	3272
988	1810	3290
993	1820	3308
999	1830	3326
1004	1840	3344
1010	1850	3362
1016	1860	3380
1021	1870	3398
1027	1880	3416

°C		°F
1032	1890	3434
1038	1900	3452
1043	1910	3470
1049	1920	3488
1054	1930	3506
1060	1940	3524
1066	1950	3542
1071	1960	3560
1077	1970	3578
1082	1980	3596
1088	1990	3614
1093	2000	3632
1099	2010	3650
1104	2020	3668
1110	2030	3686
1116	2040	3704
1121	2050	3722
1127	2060	3740
1132	2070	3758
1138	2080	3776
1143	2090	3794
1149	2100	3812
1154	2110	3830
1160	2120	3848
1166	2130	3866
1171	2140	3884
1177	2150	3902
1182	2160	3920
1188	2170	3938
1193	2180	3956
1199	2190	3974
1204	2200	3992
1210	2210	4010
1216	2220	4028
1221	2230	4046
1227	2240	4064
1232	2250	4082
1238	2260	4100
1243	2270	4118
1249	2280	4138
1254	2290	4154
1260	2300	4172
1266	2310	4190
1271	2320	4208
1277	2330	4226
1282	2340	4244
1288	2350	4262
1293	2360	4280
1299	2370	4298
1304	2380	4316
1310	2390	4334
1316	2400	4352
1321	2410	4370
1327	2420	4388
1332	2430	4406
1338	2440	4424

°C		°F
1343	2450	4442
1349	2460	4460
1354	2470	4478
1360	2480	4496
1366	2490	4514
1371	2500	4532
1377	2510	4550
1382	2520	4568
1388	2530	4586
1393	2540	4604
1399	2550	4622
1404	2560	4640
1410	2570	4658
1416	2580	4676
1421	2590	4694
1427	2600	4712
1432	2610	4730
1438	2620	4748
1443	2630	4766
1449	2640	4784
1454	2650	4802
1460	2660	4820
1466	2670	4838
1471	2680	4856
1477	2690	4874
1482	2700	4892
1488	2710	4910
1493	2720	4928
1499	2730	4946
1504	2740	4964
1510	2750	4982
1516	2760	5000
1521	2770	5018
1527	2780	5036
1532	2790	5054
1538	2800	5072
1543	2810	5090
1549	2820	5108
1554	2830	5126
1560	2840	5144
1566	2850	5162
1571	2860	5180
1577	2870	5198
1582	2880	5216
1586	2890	5234
1593	2900	5252
1599	2910	5270
1604	2920	5288
1610	2930	5306
1616	2940	5324
1621	2950	5342
1627	2960	5360
1632	2970	5378
1638	2980	5396
1643	2990	5414
1649	3000	5432

Calculation:
°F → °C
C = 5/9 x (F-32)

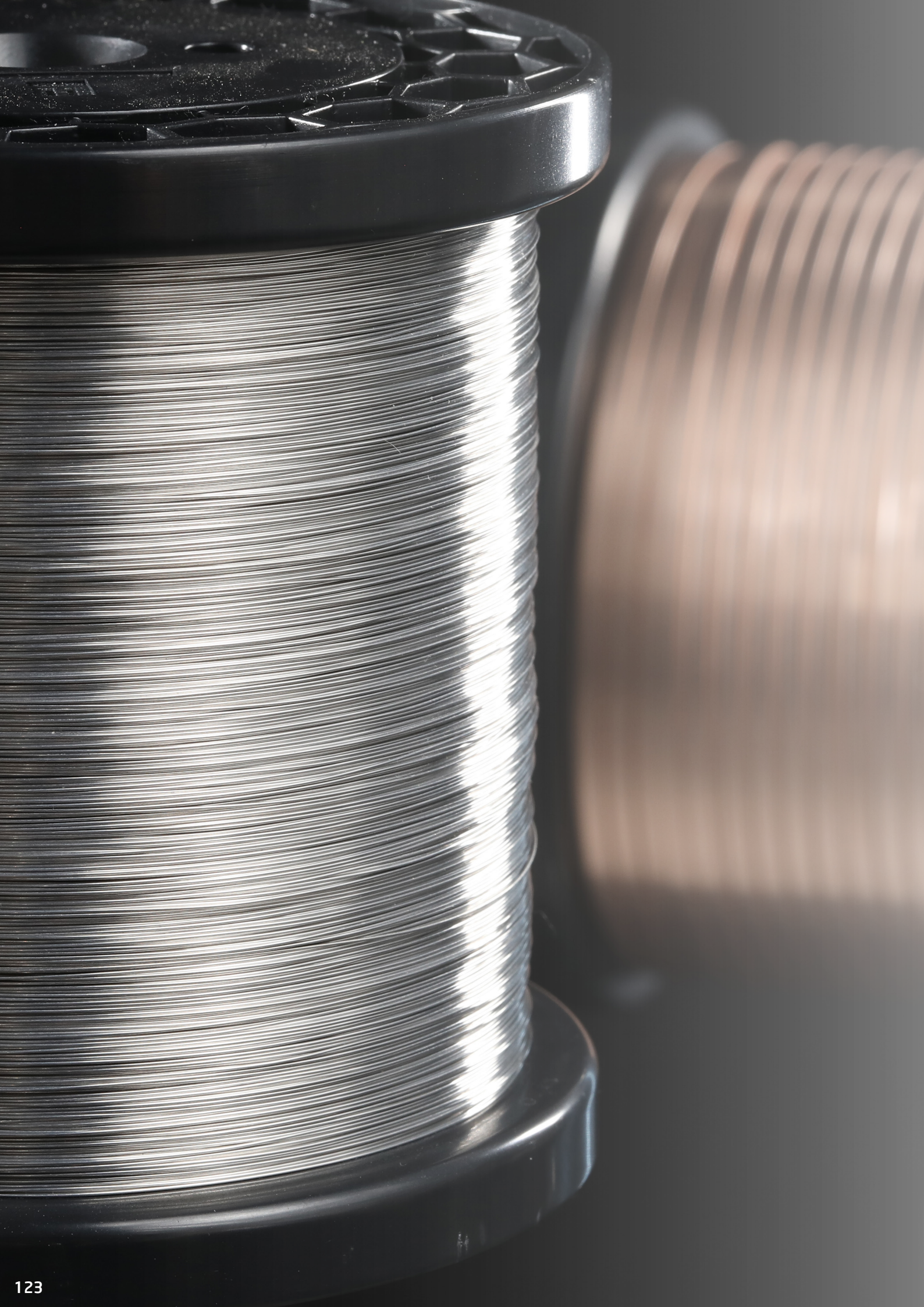
°C → °F
F = (C x 9/5) + 32

C = temperature in Celsius

F = temperature in Fahrenheit

Interpolation table

°C		°F
0.56	1	1.8
1.11	2	3.6
1.67	3	5.4
2.22	4	7.2
2.78	5	9.0
3.33	6	10.8
3.89	7	12.6
4.44	8	14.4
5.00	9	16.2
5.56	10	18.0



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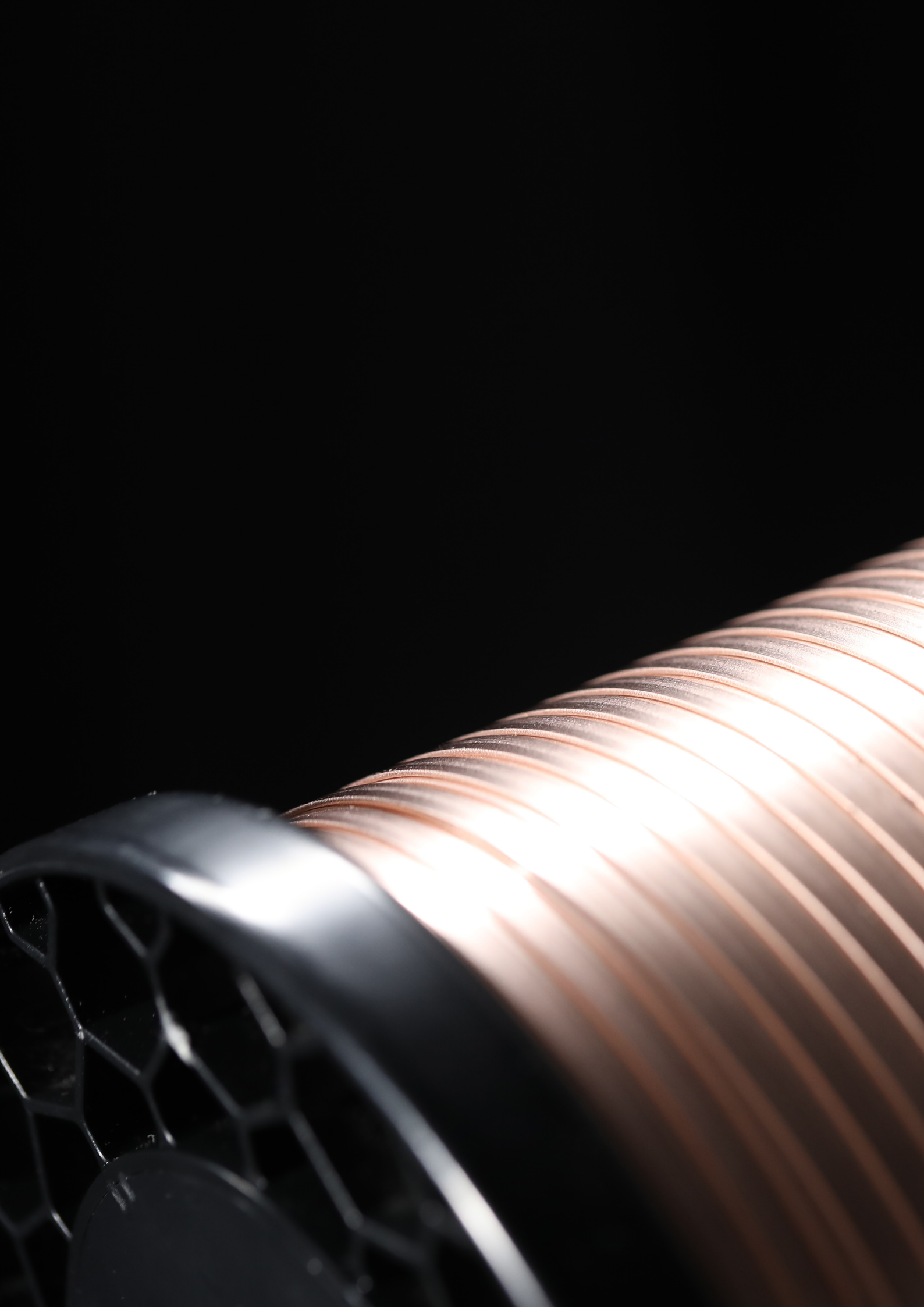
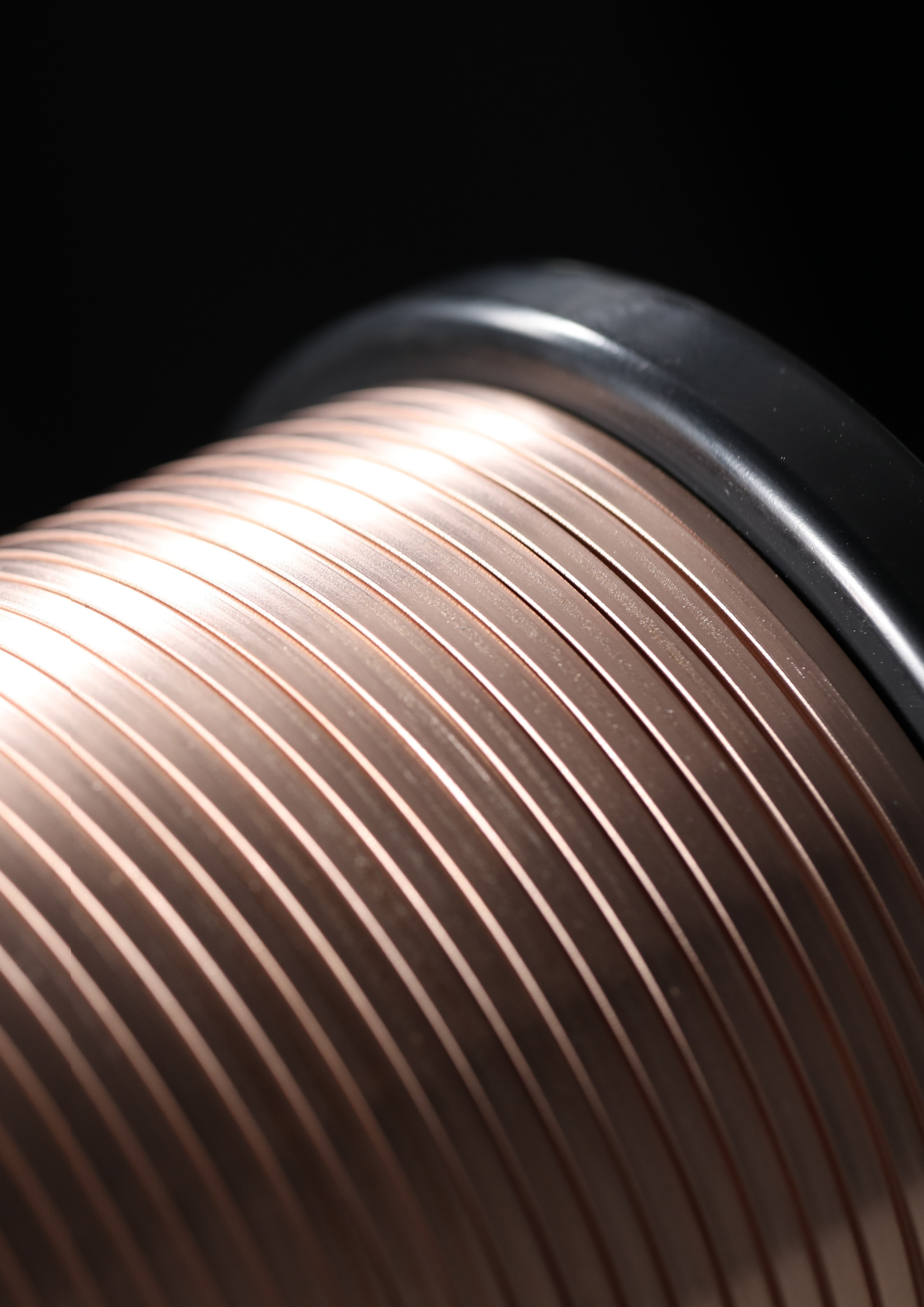
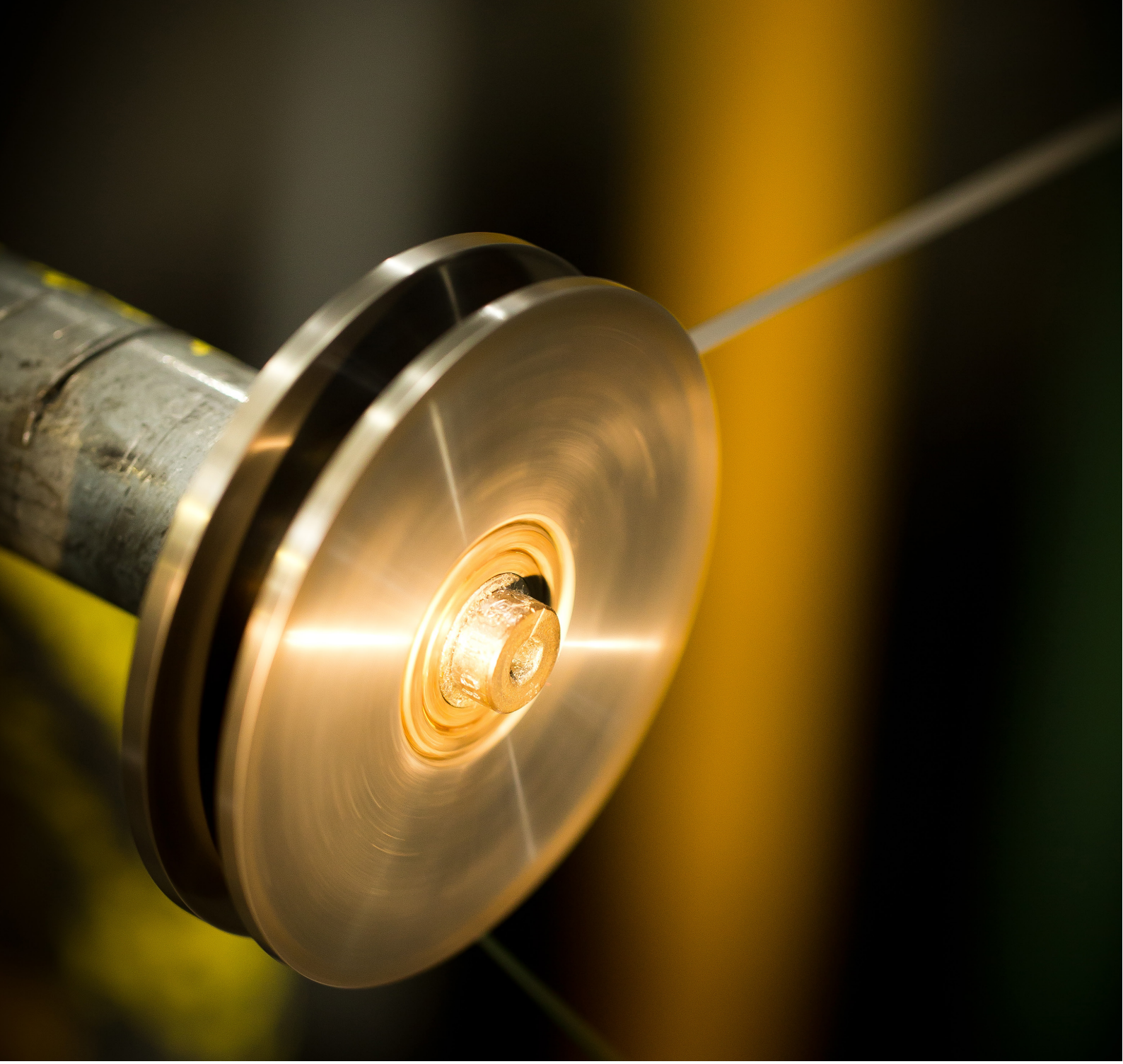
Tony Chapuis - 2018







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