Brand Name	**SUPER PURE NICKEL**
Material Code	1)
Abbreviation	**Ni 99.98**

Perfect [1] chemical Composition (mass components) in %

Ni					
99.98					

Features and Application Notes

SUPER PURE NICKEL is especially characterized by very high temperature coefficient and low resistivity. SUPER PURE NICKEL is used for resistors with a strongly temperature dependent resistance value, also for the production of spark-plugs. SUPER PURE NICKEL is magnetic up to +357.5 °C (Curie point). The maximum working temperature in air is +700 °C.

Due to the higher relevance of the specific electric resistance and its temperature coefficient, the chemical composition is ranked subordinated. Hence, it can be considered as guide value solely.

Form of Delivery

SUPER PURE NICKEL is supplied in the form of round wires in the range 0.10 to 3.00 mm Ø in bare and enamelled condition.

Electrical Resistance in Annealed Condition

Temperature coefficient[2] of electrical resistance between	Electrical resistivity in: µΩ x cm (first line) and Ω/CMF (second line) Reference Values					
0 °C and +100 °C 10^{-6}/K	+20 °C tolerance ±10%	+100 °C	+200 °C	+300 °C	+400 °C	+500 °C
approx. + 6,600	**7**	**11**	**17**	**24**	**31**	**36**
	42	**66**	**102**	**144**	**186**	**211**

Physical Characteristics (Reference Values)

Density at +20 °C		Melting point	Specific heat at +20 °C	Thermal conductivity[3] at +20 °C	Average linear thermal expansion coefficient between +20 °C and		Thermal EMF against copper at
					+100 °C	+400 °C	+20 °C
g/cm³	**lb/cub in**	**°C**	**J/g K**	**W/m K**	**10^{-6}/K**	**10^{-6}/K**	**µV/K**
8.9	**0.32**	**1453**	**see graph 2**	**see graph 3**	**see graph 4**		**-23**

Strength Properties at +20 °C in Annealed Condition

Tensile Strength[4]		Elongation (L_0 = 100 mm) in % at nominal diameter in mm				
MPa	**psi**	0.020 bis 0.063	>0.063 bis 0.125	>0.125 bis 0.50	>0.50 bis 1.00	>1.00
>400	**>58,000**	**<10**	**≈10**	**≈15**	**≥18**	**≥20**

Notes on Treatment // SUPER PURE NICKEL is very soft as compared with the types of technically pure nickel quoted in DIN 17740; this must be taken into consideration when it is processed. As can be seen on page 2 graphs, its physical properties are heavily temperature-dependent, the latter being strongly affected if the Curie point is exceeded.

1) SUPER PURE NICKEL is not a standardized alloy.
2) These are approximate values; tolerances must separately be agreed upon.
3) As with all pure metals, the thermal conductivity strongly depends on the purity and temperature.
4) This value applies to wires of 2.0 mm diameter. For thinner wires the values will substantially increase, depending on the dimensions.

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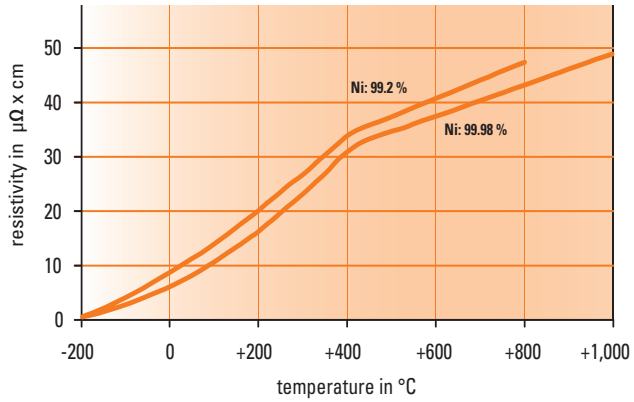
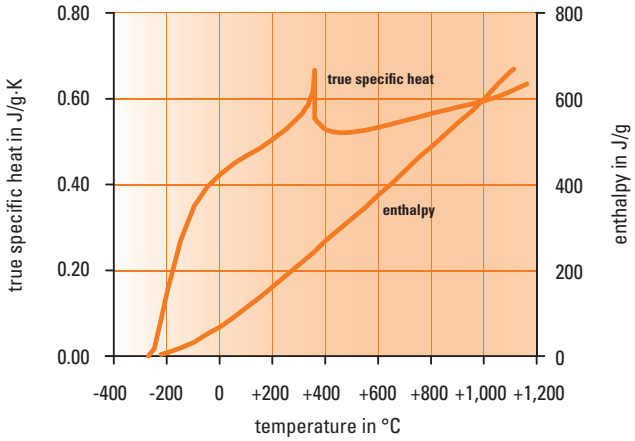
Special Remarks on the behaviour of the Electrical Resistance vs. Temperature // The variation of the resistivity of Super Pure Nickel vs. temperature in the range between -200 °C and +1,000 °C is shown in graph 1. As can be seen, the values below the Curie point are distinctly lower than could be expected on the basic of the behaviour in the paramagnetic range above the Curie Point.

Accordingly, the temperature coefficient increases from a value of 6,600 ppm/K in the range between 0 °C and +100 °C to values of about 10,000 ppm/K in the range between 0 °C and +357 °C and shows a distinct decrease at still higher temperatures. The ratio of the resistivity values for Super Pure Nickel at +1,200 °C and at +20 °C is >7.

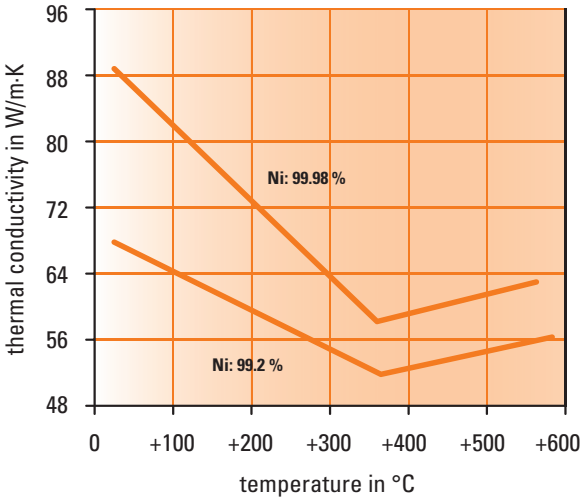


1 ppm = 10^{-6} = 0.0001%, 1,000 ppm = 1 · 10^{-3} = 0.1%.

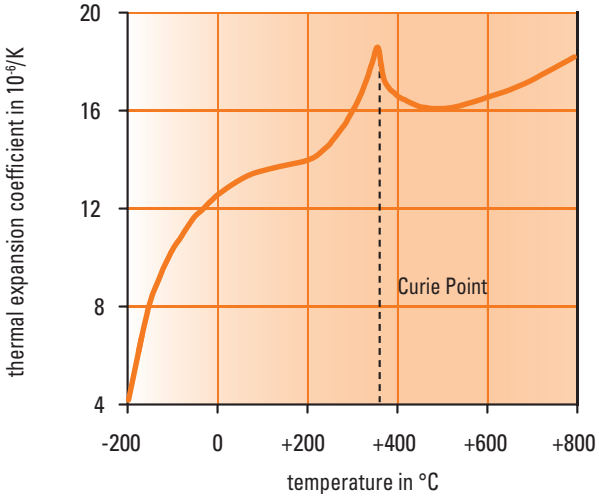
Graph 1: Resistivity of Nickel vs. Temperature



Graph 2: Specific Heat and Enthalpy of Super Pure Nickel



Graph 3: Thermal Conductivity of two Nickel Types of Different Pureness



Graph 4: Thermal Expansion Coefficient of Super Pure Nickel

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