

Properties and Application Notes

Brand Name	ISOTAN® 1)		
Material Code	2.0842		
Abbreviation	CuNi44		
Chemical Composition (mass components) in % Average values of alloy components			
Cu	Ni	Mn	
Rem.	44	1	

Form of Delivery

ISOTAN® is supplied in the form of round wire in the dimension 8.0 to 0.02 mm Ø in bare, oxide-insulated or enamelled condition, also with rayon or silk covering.

The range also includes flat wires (see Technical Information), stranded wires, sheets and foils.

Properties and Application Notes

ISOTAN® is notable for its low temperature coefficient and high resistance to oxidation and chemical corrosion. The alloy is non-magnetic. It is suitable for electrical resistors, potentiometers, heating wires, heating cables and mats. Ribbons are used for heating of bimetals. Because of its high EMF against copper it is not suitable for electrical precision resistors, therefore we recommend MANGANIN® or ZERANIN®. Due to its high thermal EMF against copper, ISOTAN® is also used for thermocouples and compensation cables (see separate brochure or www.thermo-alloys.com). For resistance and heating applications, the maximum working temperature in air is 600 °C.

Electrical Resistance in Annealed Condition

Temperature coefficient of electrical resistance between 20 °C and 105 °C ppm/K	Electrical resistivity in: µΩ x cm (first line) and Ω/CMF (second line) Reference Values					
	20 °C tolerance ±5 %	100 °C	200 °C	300 °C	400 °C	500 °C
Stand.: -80 to +40	49	49	49	49	49	49
Special: ± 10	295	295	295	295	295	295

Physical Characteristics (Reference Values)

Density at 20 °C		Melting Point °C	Specific heat at 20 °C J/g K	Thermal conductivity at 20 °C W/m K	Average linear thermal expansion coefficient between 20 °C and		Thermal EMF against copper at 20 °C µV/K
g/cm³	lb/cub in				100 °C 10 ⁻⁶ /K	400 °C 10 ⁻⁶ /K	
8.9	0.32	1280	0.41	23	13.5	15	-40

Strength Properties at 20 °C in Annealed Condition

Tensile Strength ²⁾		Elongation (L ₀ = 100 mm) % at nominal diameter in mm				
MPa	psi	0.02 to 0.063	>0.063 to 0.125	> 0.125 to 0.5	> 0.5 to 1	> 1
420	60900	≈ 12	≈ 18	≈ 20	≥ 20	≥ 25

1) ISOTAN® is a registered trademark of Isabellenhütte Heusler GmbH & Co. KG.

2) This value applies to wires of 0.6 mm diam. For thinner wires the minimum values will substantially increase, depending on the dimension.

Notes on Treatment

ISOTAN® can be worked easily. It can be soldered and brazed without difficulty. All known welding methods are applicable.

Special remarks on the temperature coefficient (TC) (see Technical Information)

The variation of electrical resistance vs. temperature in the range between -40 and +120 °C, referred to 20 °C, is shown in graph 1, page 20.

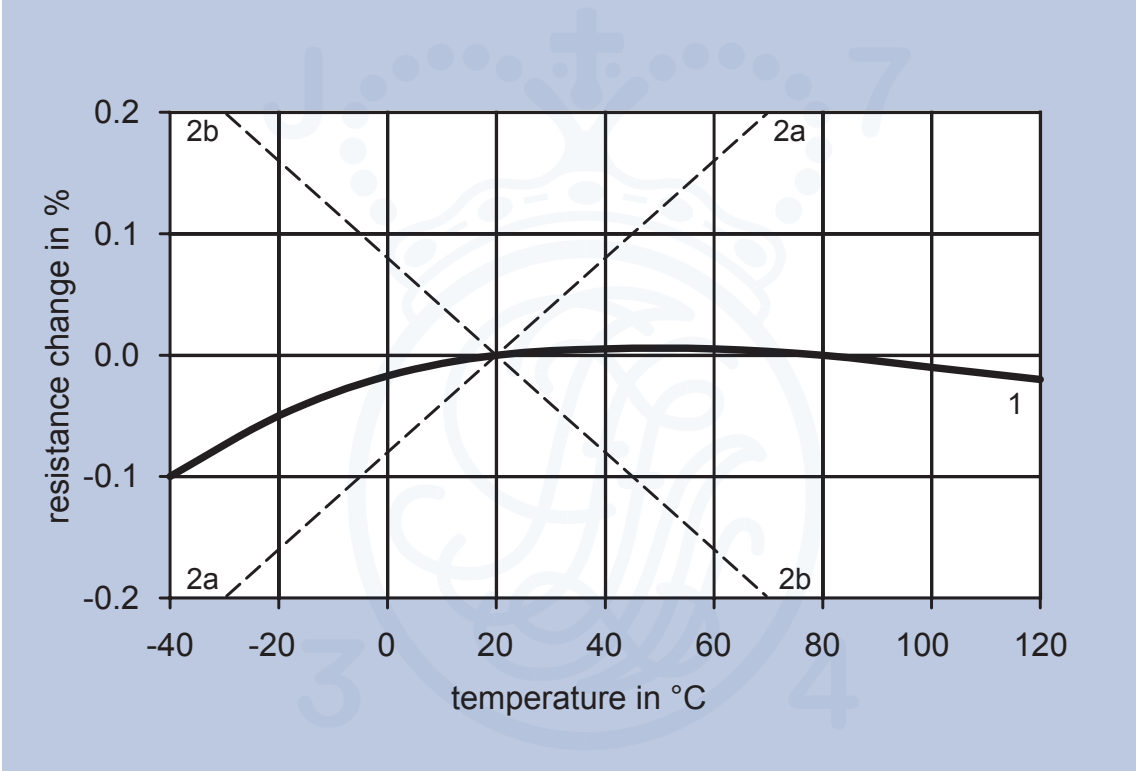
Curve 1 represents the ideal curve which can be approximated. Due to the even linear behaviour the TC between 20 and 60 °C is close to 2 ppm/K.

The straight lines 2a and 2b apply to a TC = ± 40 ppm/K. If not otherwise agreed, normally wires with a temperature coefficient within this range are supplied. It should be noted here that DIN 17471 permits a TC = -80 to +40 ppm/K in the temperature range from 20 to 105 °C.

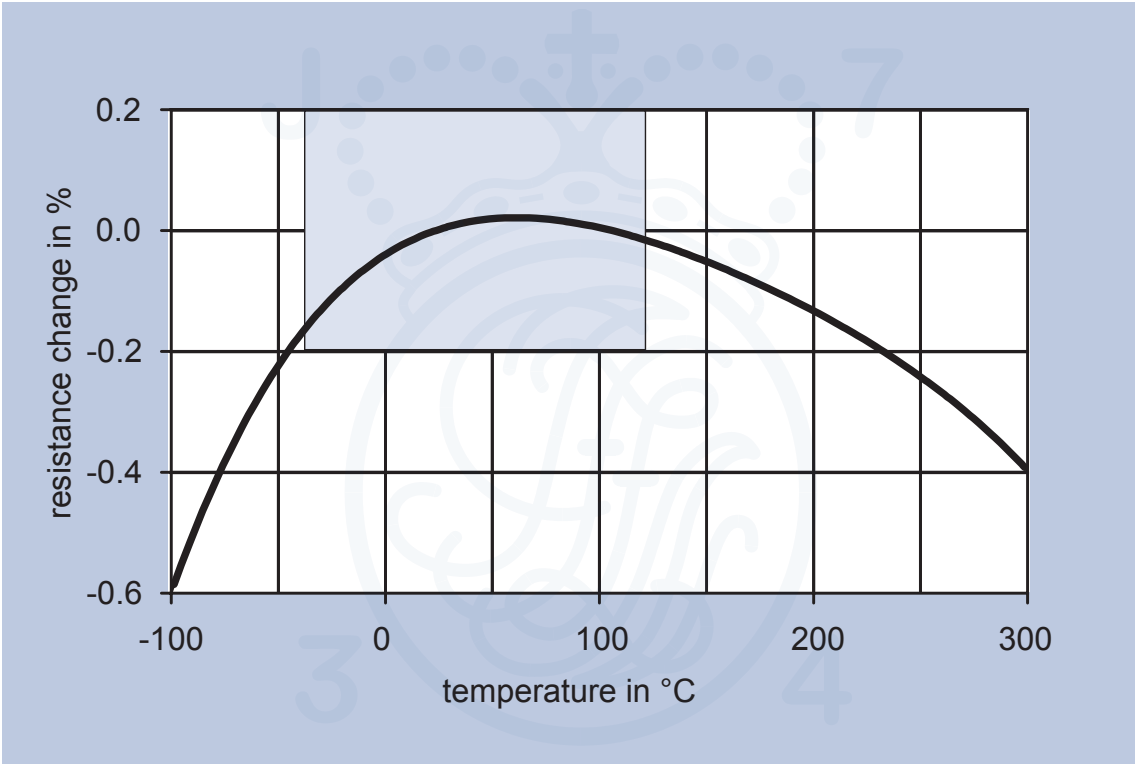
The possible resistance variations in the range from -100 to +300 °C are shown in graph 2. Graph 1 is an enlarged view of the cut-out.

Nominal Diameter d mm	Cross Section mm ²	Weight per 100 m g	DC Resistance Referred to Length at 20 °C Ω / m			
			Nominal Value	Tolerance	Minimum Value	Maximum Value
0.02	0.0003142	0.280	1560	± 10 %	1404	1716
0.022	0.0003801	0.338	1289		1160	1418
0.025	0.0004909	0.437	998		898	1098
0.028	0.0006158	0.548	796		716	875
0.03	0.0007069	0.629	693	± 8 %	638	749
0.032	0.0008042	0.716	609		561	658
0.036	0.001018	0.906	481		443	520
0.04	0.001257	1.12	390		359	421
0.045	0.001590	1.42	308		283	333
0.05	0.001963	1.75	250		230	270
0.056	0.002463	2.19	199		183	215
0.06	0.002827	2.52	173		159	187
0.063	0.003117	2.77	157		145	170
0.07	0.003848	3.43	127		117	138
0.071	0.003959	3.52	124		114	134
0.08	0.005027	4.47	97.5		89.7	105
0.09	0.006362	5.66	77.0		70.9	83.2
0.10	0.007854	6.99	62.4		57.4	67.4
0.11	0.009503	8.46	51.6	48.0	55.2	
0.112	0.009852	8.77	49.7	46.3	53.2	
0.12	0.011310	10.1	43.3	40.3	46.4	
0.125	0.012272	10.9	39.9	37.1	42.7	
0.13	0.013273	11.8	36.9	34.3	39.5	
0.14	0.015394	13.7	31.8	29.6	34.1	
0.15	0.017671	15.7	27.7	25.8	29.7	
0.16	0.020106	17.9	24.4	22.7	26.1	
0.18	0.025447	22.6	19.3	17.9	20.6	
0.20	0.031416	28.0	15.6	14.7	16.5	
0.22	0.038013	33.8	12.9	12.1	13.7	
0.224	0.039408	35.1	12.4	11.7	13.2	
0.25	0.049087	43.7	9.98	9.38	10.6	
0.28	0.061575	54.8	7.96	7.48	8.44	
0.30	0.070686	62.9	6.93	6.52	7.35	
0.315	0.077931	69.4	6.29	5.97	6.60	
0.35	0.096211	85.6	5.09	4.84	5.35	
0.355	0.098980	88.1	4.95	4.70	5.20	
0.40	0.1257	112	3.90	3.70	4.09	
0.45	0.1590	142	3.08	2.93	3.23	
0.50	0.1963	175	2.50	2.37	2.62	
0.55	0.2376	211	2.06	1.98	2.14	
0.56	0.2463	219	1.99	1.91	2.07	
0.60	0.2827	252	1.73	1.66	1.80	
0.63	0.3117	277	1.57	1.51	1.63	
0.65	0.3318	295	1.48	1.42	1.54	
0.70	0.3848	343	1.27	1.22	1.32	
0.71	0.3959	352	1.24	1.19	1.29	
0.80	0.5027	447	0.975	0.936	1.014	
0.90	0.6362	566	0.770	0.739	0.801	
1.0	0.7854	699	0.624	0.599	0.649	
1.12	0.9852	877	0.497	0.477	0.517	
1.2	1.131	1007	0.433	0.416	0.451	
1.25	1.227	1092	0.399	0.383	0.415	
1.4	1.539	1370	0.318	0.306	0.331	
1.5	1.767	1573	0.277	0.266	0.288	
1.6	2.011	1790	0.244	0.234	0.253	
1.8	2.545	2265	0.193	0.185	0.200	
2.0	3.142	2796	0.156	0.150	0.162	
2.2	3.801	3383	0.129	0.124	0.134	
2.24	3.941	3507	0.124	0.119	0.129	
2.5	4.909	4369	0.0998	0.0958	0.1038	
2.8	6.158	5480	0.0796	0.0764	0.0828	
3.0	7.069	6291	0.0693	0.0665	0.0721	
3.15	7.793	6936	0.0629	0.0604	0.0654	
3.2	8.042	7158	0.0609	0.0585	0.0634	
3.5	9.621	8563	0.0509	0.0489	0.0530	
3.55	9.898	8809	0.0495	0.0475	0.0515	
4.0	12.57	11184	0.0390	0.0374	0.0406	
4.5	15.90	14155	0.0308	0.0296	0.0320	
5.0	19.63	17475	0.0250	0.0240	0.0260	
5.5	23.76	21145	0.0206	0.0198	0.0214	
5.6	24.63	21921	0.0199	0.0191	0.0207	
6.0	28.27	25164	0.0173	0.0166	0.0180	
6.3	31.17	27744	0.0157	0.0151	0.0163	
8.0	50.27	44736	0.00975	0.00936	0.0101	

Graph 1:
Electrical resistance vs.
temperature



Graph 2:
Electrical resistance vs.
temperature



* 1 ppm = $1 \cdot 10^{-6}$ = 0.0001 %, 1000 ppm = $1 \cdot 10^{-3}$ = 0.1 %.