

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



Features 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®, NOVENTIN® or ZERANIN®. Due to its high thermal EMF against copper, ISOTAN® is also used for thermocouples and compensation cables (see separate brochure or www.thermoalloys.com). For resistance and heating applications, the maximum working temperature in air is +600 °C.

Form of Delivery

ISOTAN® is supplied in the form of round wire in the dimension 0.02 to 8.00 mm Ø in bare, oxide-insulated or enamelled condition. The range also includes flat wires (see Technical Information), stranded wires, ribbon sheets and foils.

Notes on Treatment

ISOTAN® is easy to process. Copper-nickel alloys can be soft and hard soldered as well as welded by the known processes. On request we supply material tested according to DIN EN 60068-2-20.

Electrical Resistance in Annealed Condition

Temperature coefficient of electrical resistance between +20 °C and +105 °C ppm/K	Electrical resistivity in: $\mu\Omega \times \text{cm}$ (first line) and Ω/CMF (second line) Reference Values					
	+20 °C tolerance $\pm 10\%$	+100 °C	+200 °C	+300 °C	+400 °C	+500 °C
-80 to +40	49	49	49	49	49	49
Special: ± 10	295	295	294	294	294	296

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 $\mu\text{V/K}$
g/cm ³	lb/cub in				+100 °C	+400 °C	
8.90	0.32	+1,280	0.41	23.00	13.50	15.00	-40.00

Mechanical Properties at +20 °C in Annealed Condition

Tensile Strength ²⁾		Elongation ($L_0 = 100 \text{ mm}$) % at nominal diameter in mm				
MPa	psi	0.020 to 0.063	> 0.063 to 0.125	> 0.125 to 0.50	> 0.50 to 1.00	> 1.00
420	60,900	≈ 12	≈ 18	≈ 20	≥ 20	≥ 25

The specifications of the electrical and physical properties generally reference the following standards:

DIN 17 471	Resistance Alloys – Properties
ASTM B267	Standard specification for wires for the production of wirewound resistors
DIN 17 470	Heating conductor alloys – Technical delivery conditions for round and flat wires
ASTM B344	Standard specification for drawn/rolled nickel-chromium and nickel-chromium-iron wires for electric heating elements

Properties and requirements depend on the material condition (formed, annealed ...) as well as the design (bare, insulated ...) and may deviate from the specified values.

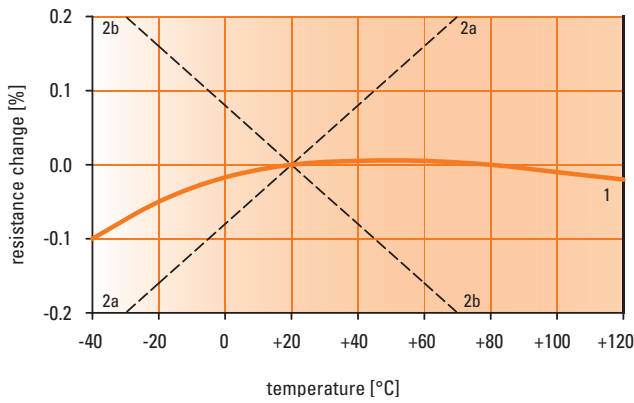
1) ISOTAN® is a registered trademark of Isabellenhütte Heusler GmbH & Co KG, also known as Konstantan®³⁾.

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

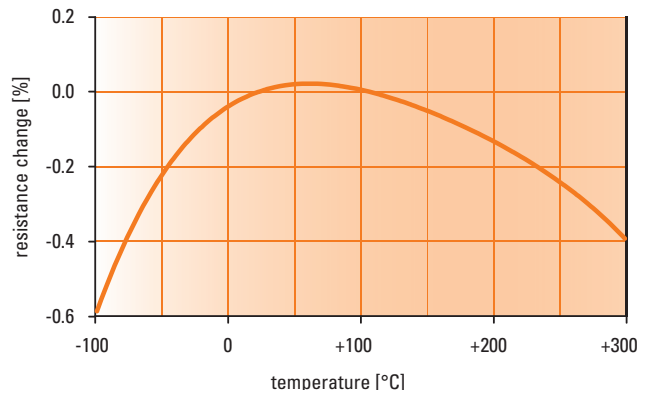
3) Konstantan® is a registered trademark of KRUPP VDM GmbH.

Nominal Diameter	Cross Section	Weight per 1.000 m	DC Resistance Referred to Length at +20 °C				
mm	mm ²	g	Nominal Value	Tolerance	Minimum Value	Maximum Value	
0.020	0.0003142	2.80	1,560	±10 %	1,404	1,716	
0.022	0.0003801	3.38	1,289		1,160	1,418	
0.025	0.0004909	4.37	998		898	1,098	
0.028	0.0006158	5.48	796		716	875	
0.030	0.0007069	6.29	693		638	749	
0.032	0.0008042	7.16	609		561	658	
0.036	0.001018	9.06	481		443	520	
0.040	0.001257	11.20	390		359	421	
0.045	0.001590	14.20	308		283	333	
0.050	0.001963	17.50	250		230	270	
0.056	0.002463	21.90	199	±8 %	183	215	
0.060	0.002827	25.20	173		159	187	
0.063	0.003117	27.70	157		145	170	
0.070	0.003848	34.30	127		117	138	
0.071	0.003959	35.20	124		114	134	
0.080	0.005027	44.70	97.5		89.7	105	
0.090	0.006362	56.60	77.0		70.9	83.2	
0.100	0.007854	69.90	62.4		57.4	67.4	
0.110	0.009503	84.60	51.6		48.0	55.2	
0.112	0.009852	87.70	49.7		46.3	53.2	
0.120	0.011310	101.00	43.3	40.3	46.4		
0.125	0.012272	109.00	39.9	37.1	42.7		
0.130	0.013273	118.00	36.9	±7 %	34.3	39.5	
0.140	0.015394	137.00	31.8		29.6	34.1	
0.150	0.017671	157.00	27.7		25.8	29.7	
0.160	0.020106	179.00	24.4		22.7	26.1	
0.180	0.025447	226.00	19.3		17.9	20.6	
0.200	0.031416	280.00	15.6		14.7	16.5	
0.220	0.038013	338.00	12.9		12.1	13.7	
0.224	0.039408	351.00	12.4		11.7	13.2	
0.250	0.049087	437.00	9.98		±6 %	9.38	10.6
0.280	0.061575	548.00	7.96			7.48	8.44
0.300	0.070686	629.00	6.93	6.52		7.35	
0.315	0.077931	694.00	6.29	5.97		6.60	
0.350	0.096211	856.00	5.09	4.84		5.35	
0.355	0.098980	881.00	4.95	4.70		5.20	
0.400	0.1257	1,120.00	3.90	±5 %		3.70	4.09
0.450	0.1590	1,420.00	3.08			2.93	3.23
0.500	0.1963	1,750.00	2.50			2.37	2.62

Nominal Diameter mm	Cross Section mm ²	Weight per 1.000 m g	DC Resistance Referred to Length at +20 °C Ω/m			
			Nominal Value	Tolerance	Minimum Value	Maximum Value
0.550	0.2376	2,110.00	2.06		1.98	2.14
0.560	0.2463	2,190.00	1.99		1.91	2.07
0.600	0.2827	2,520.00	1.73		1.66	1.80
0.630	0.3117	2,770.00	1.57		1.51	1.63
0.650	0.3318	2,950.00	1.48		1.42	1.54
0.700	0.3848	3,430.00	1.27		1.22	1.32
0.710	0.3959	3,520.00	1.24		1.19	1.29
0.800	0.5027	4,470.00	0.975		0.936	1.014
0.900	0.6362	5,660.00	0.770		0.739	0.801
1.000	0.7854	6,990.00	0.624		0.599	0.649
1.120	0.9852	8,770.00	0.497		0.477	0.517
1.200	1.131	10,070.00	0.433		0.416	0.451
1.250	1.227	10,920.00	0.399		0.383	0.415
1.400	1.539	13,700.00	0.318		0.306	0.331
1.500	1.767	15,730.00	0.277		0.266	0.288
1.600	2.011	17,900.00	0.244		0.234	0.253
1.800	2.545	22,650.00	0.193		0.185	0.200
2.000	3.142	27,960.00	0.156	±4 %	0.150	0.162
2.200	3.801	33,830.00	0.129		0.124	0.134
2.240	3.941	35,070.00	0.124		0.119	0.129
2.500	4.909	43,690.00	0.0998		0.0958	0.1038
2.800	6.158	54,800.00	0.0796		0.0764	0.0828
3.000	7.069	62,910.00	0.0693		0.0665	0.0721
3.150	7.793	69,360.00	0.0629		0.0604	0.0654
3.200	8.042	71,580.00	0.0609		0.0585	0.0634
3.500	9.621	85,630.00	0.0509		0.0489	0.0530
3.550	9.898	88,090.00	0.0495		0.0475	0.0515
4.000	12.57	111,840.00	0.0390		0.0374	0.0406
4.500	15.90	141,550.00	0.0308		0.0296	0.0320
5.000	19.63	174,750.00	0.0250		0.0240	0.0260
5.500	23.76	211,450.00	0.0206		0.0198	0.0214
5.600	24.63	219,210.00	0.0199		0.0191	0.0207
6.000	28.27	251,640.00	0.0173		0.0166	0.0180
6.300	31.17	277,440.00	0.0157		0.0151	0.0163
8.00 0	50.27	447,360.00	0.00975		0.00936	0.0101



Graph 1: Electrical resistance vs. temperature (range -40 °C to +120 °C)



Graph 2: Electrical resistance vs. temperature (range -100 °C to +300 °C)

Special remarks on the temperature coefficient (TCR)

(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 4. Curve 1 represents the ideal curve which can be approximated. Due to the even linear behaviour the TCR between +20 and +60°C is close to 2 ppm/K. The straight lines 2a and 2b apply to a TCR = ±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.

