Brand Name	**ISA-ZIN**
Material Code	**2.0881**
Abbreviation	**CuNi23Mn**

Chemical Composition (mass components) in %.
Average values of alloy components

Cu	**Ni**	**Mn**			
Rem.	23	1.5			

Features and Application Notes

ISA-ZIN is especially noted for high resistance to oxidation and chemical corrosion, as well as a relatively low resistivity. It is used for resistors of any type and for heating cords, cables and heating mats. Ribbons for instance are used for heating of bimetals. The maximum working temperature in air is +500 °C.

Form of Delivery

ISA-ZIN is supplied in the form of round wires in the range 0.04 to 8.00 mm Ø in bare or enamelled condition flat wires, stranded wires, ribbons and sheets.

Notes on Treatment // ISA-ZIN 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	Electrical resistivity in: µΩ x cm (first line) and Ω/CMF (second line) Reference Values					
+20 °C and +105 °C 10^{-6}/K	+20 °C tolerance ±5 %	+100 °C	+200 °C	+300 °C	+400 °C	+500 °C
approx. +180	**30**	**30.4**	**31**	**31.5**	**32.1**	**32.6**
	180	**183**	**186**	**189**	**193**	**196**

Physical Characteristics (Reference Values)

Density at +20 °C		Melting point	Specific heat at +20 °C	Thermal conductivity 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**
8.90	**0.32**	**+1,150**	**0.37**	**33.00**	**16.00**	**17.50**	**-30.00**

Mechanical Properties at +20 °C in Annealed Condition

Tensile Strength[1]		Elongation (L_0 = 100 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
350	**50,750**	**≈ 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) This value applies to wires of 2.0 mm diameter. For thinner wires the minimum values will substantially increase, depending on the dimensions.

Nominal Diameter	Cross Section	Weight per 1.000 m	DC Resistance Referred to Length at +20 °C Ω/m			
mm	mm²	g	Nominal Value	Tolerance	Minimum Value	Maximum Value
0.040	0.001257	11.20	239		220	258
0.045	0.001590	14.20	189		174	204
0.050	0.001963	17.50	153		141	165
0.056	0.002463	21.90	122		112	132
0.060	0.002827	25.20	106		97.6	115
0.063	0.003117	27.70	96.2	±8 %	88.5	104
0.070	0.003848	34.30	78.0		71.7	84.2
0.071	0.003959	35.20	75.8		69.7	81.8
0.080	0.005027	44.70	59.7		54.9	64.5
0.090	0.006362	56.60	47.2		43.4	50.9
0.100	0.007854	69.90	38.2		35.1	41.3
0.110	0.009503	84.60	31.6		29.4	33.8
0.112	0.009852	87.70	30.5		28.3	32.6
0.120	0.01131	100.70	26.5		24.7	28.4
0.125	0.01227	109.00	24.4		22.7	26.2
0.130	0.01327	118.00	22.6	±7 %	21.0	24.2
0.140	0.01539	137.00	19.5		18.1	20.9
0.150	0.01767	157.00	17.0		15.8	18.2
0.160	0.02011	179.00	14.9		13.9	16.0
0.180	0.02545	226.00	11.8		11.0	12.6
0.200	0.03142	280.00	9.55		8.98	10.1
0.220	0.03801	338.00	7.89		7.42	8.37
0.224	0.03941	351.00	7.61	±6 %	7.16	8.07
0.250	0.04909	437.00	6.11		5.74	6.48
0.280	0.06158	548.00	4.87		4.58	5.16
0.300	0.07069	629.00	4.24		3.99	4.50
0.315	0.07793	694.00	3.85		3.66	4.04
0.350	0.09621	856.00	3.12		2.96	3.27
0.355	0.09898	881.00	3.03	±5 %	2.88	3.18
0.400	0.1257	1,120.00	2.39		2.27	2.51
0.450	0.1590	1,420.00	1.89		1.79	1.98
0.500	0.1963	1,750.00	1.53		1.45	1.60

Nominal Diameter	Cross Section	Weight per 1.000 m	DC Resistance Referred to Length at +20 °C Ω/m			
mm	mm²	g	Nominal Value	Tolerance	Minimum Value	Maximum Value
0.55	0.2376	2,110.00	1.26		1.21	1.31
0.56	0.2463	2,190.00	1.22		1.17	1.27
0.60	0.2827	2,520.00	1.06		1.02	1.10
0.63	0.3117	2,770.00	0.962		0.924	1.00
0.65	0.3318	2,950.00	0.904		0.868	0.940
0.70	0.3848	3,430.00	0.780		0.748	0.811
0.71	0.3959	3,520.00	0.758		0.727	0.788
0.80	0.5027	4,470.00	0.597		0.573	0.621
0.90	0.6362	5,660.00	0.472		0.453	0.490
1.00	0.7854	6,990.00	0.382		0.367	0.397
1.12	0.9852	8,770.00	0.305		0.292	0.317
1.20	1.131	10,070.00	0.265		0.255	0.276
1.25	1.227	10,920.00	0.244		0.235	0.254
1.40	1.539	13,700.00	0.195		0.187	0.203
1.50	1.767	15,730.00	0.170		0.163	0.177
1.60	2.011	17,900.00	0.149		0.143	0.155
1.80	2.545	22,650.00	0.118		0.113	0.123
2.00	3.142	27,960.00	0.0955	±4 %	0.0917	0.0993
2.20	3.801	33,830.00	0.0789		0.0758	0.0821
2.24	3.941	35,070.00	0.0761		0.0731	0.0792
2.50	4.909	43,690.00	0.0611		0.0587	0.0636
2.80	6.158	54,800.00	0.0487		0.0468	0.0507
3.00	7.069	62,910.00	0.0424		0.0407	0.0441
3.15	7.793	69,360.00	0.0385		0.0370	0.0400
3.20	8.042	71,580.00	0.0373		0.0358	0.0388
3.50	9.621	85,630.00	0.0312		0.0299	0.0324
3.55	9.898	88,090.00	0.0303		0.0291	0.0315
4.00	12.57	111,840.00	0.0239		0.0229	0.0248
4.50	15.90	141,550.00	0.0189		0.0181	0.0196
5.00	19.63	174,750.00	0.0153		0.0147	0.0159
5.50	23.76	211,450.00	0.0126		0.0121	0.0131
5.60	24.63	219.210.00	0.0122		0.0117	0.0127
6.00	28.27	251,640.00	0.0106		0.0102	0.0110
6.30	31.17	277,440.00	0.00962		0.00924	0.0100
8.00	50.27	447,360.00	0.00597		0.00573	0.00621