

Brand Name	<b>ZERANIN® 30<sup>1)</sup></b>				
Material Code	2)				
Abbreviation	<b>CuMn7Sn</b>				
Chemical Composition (mass components) in %. Average values of alloy components					
<b>Cu</b> Rem.	<b>Mn</b> 7	<b>Sn</b> 2.3			



### Features and Application Notes

ZERANIN® 30 is well known for its low temperature coefficient between +20 and +60 °C with a very flat parabolic shape of the R(T)-curve, high long-term stability of the electrical resistance, low thermal EMF versus copper and good workability. In addition, the very low temperature coefficient applies to a relatively wide temperature range. This alloy is mainly used for precision resistors. The maximum working temperature in air is +140 °C. However, higher thermal loads in a non-oxidizing atmosphere are possible. Exceeding the maximum working temperature in air may result in a resistance drift generated by oxidizing processes. Thus, the long-term stability could be affected negatively. As a result, the resistivity as well as the temperature coefficient of the electric resistance may change slightly.

### Form of Delivery

ZERANIN® 30 is supplied in the form of round wires in the range of 0.02 to 8.00 mm Ø in bare or enamelled condition and/or with silk covering. Special versions can be supplied as well as flat wires and ribbons.

### Electrical Resistance in Annealed Condition

Temperature coefficient <sup>3)</sup> of electrical resistance between	Electrical resistivity in: $\mu\Omega \times \text{cm}$ (first line) and $\Omega/\text{CMF}$ (second line) Reference Values					
	+20 °C tolerance $\pm 5\%$	+100 °C	+200 °C	+300 °C	+400 °C	+500 °C
+20 °C and +60 °C $10^{-6}/\text{K}$						
<b>Stand: <math>\pm 10</math></b>	<b>29</b>	<b>29</b>				
<b>Special: <math>\pm 3</math></b>	<b>174</b>	<b>174</b>				

### 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 +20 °C
$\text{g}/\text{cm}^3$	$\text{lb}/\text{cub in}$				+100 °C	+400 °C	
<b>8.50</b>	<b>0.31</b>	<b>+1,000</b>	<b>0.39</b>	<b>34.00</b>	<b>18.00</b>	<b>19.50</b>	<b>-1.00</b>

### Strength Properties at +20 °C in Annealed Condition

Tensile Strength <sup>4)</sup>	Elongation ( $L_0 = 100 \text{ mm}$ ) % at nominal diameter in mm					
<b>MPa</b>	<b>psi</b>	0.020 to 0.063	> 0.063 to 0.125	> 0.125 to 0.50	> 0.50 to 1.00	> 1.00
<b>370</b>	<b>35,650</b>	$\approx 12$	$\approx 18$	$\approx 20$	$\geq 20$	$\geq 25$

**Notes on Treatment** // ZERANIN® 30 can be worked very easily. The alloy can be soft soldered; in air however, it develops a thin oxide film which must be removed before working. With an appropriate flux ZERANIN® 30 is also suitable for dip-tinning. ZERANIN® 30 can also be brazed and welded.

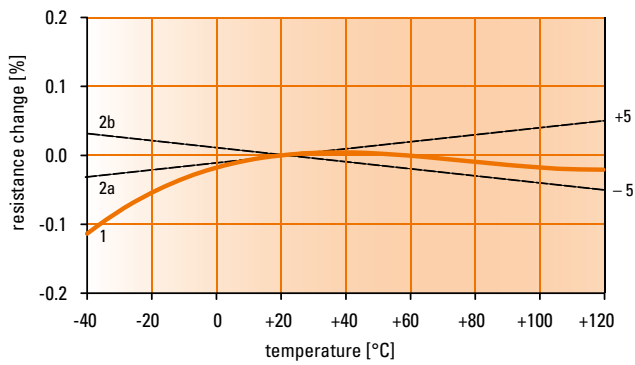
**Special Remarks on the Temperature Coefficient** // The variations of the electrical resistance versus temperature in the range between -40 and +120 °C, referred to +20 °C, is shown in graph 1. Curve 1 is the ideal curve which can be approximated. The two straight lines 2a and 2b represent the  $\text{TC} = \pm 5 \text{ ppm}/\text{K}$ .

1) ZERANIN® 30 is a registered trademark of Isabellenhütte Heusler GmbH & Co. KG.

2) This alloy is not standardized.

3) On request, the temperature coefficient can be lowered still further.

4) This value applies to wires of 2.0 mm diameter. For thinner wires, the minimum values will substantially increase, depending on the dimensions.



Graph 1: Electrical resistance depending on the temperature (range -40 °C to +120 °C)

Nominal Diameter mm	Cross Section mm <sup>2</sup>	Weight per 1.000 m g	DC Resistance Referred to Length at +20 °C Ω/m			
			Nominal Value	Tolerance	Minimum Value	Maximum Value
0.040	0.001257	10.07	231	±8 %	212	249
0.045	0.001590	13.50	182		168	197
0.050	0.001963	16.70	148		136	160
0.056	0.002463	20.90	118		108	127
0.060	0.002827	24.00	103		94	111
0.063	0.003117	26.50	93		86	101
0.070	0.003848	32.70	75		69	81
0.071	0.003959	33.70	73		67	79
0.080	0.005027	42.70	57.7		53.1	62.3
0.090	0.006362	54.10	45.6		41.9	49.2
0.100	0.007854	66.80	36.9	34.0	39.9	
0.110	0.009503	80.80	30.5	28.4	32.7	
0.112	0.009852	83.70	29.4	27.4	31.5	
0.120	0.01131	96.10	25.6	23.8	27.4	
0.125	0.01227	104.00	23.6	22.0	25.3	
0.130	0.01327	113.00	21.8	±7 %	20.3	23.4
0.140	0.01539	131.00	18.8	17.5	20.2	
0.150	0.01767	150.00	16.4	15.3	17.6	
0.160	0.02011	171.00	14.4	13.4	15.4	
0.180	0.02545	216.00	11.4	10.6	12.2	
0.200	0.03142	267.00	9.2	8.70	9.80	
0.220	0.03801	323.00	7.6	7.20	8.10	
0.224	0.03941	335.00	7.4	±6 %	6.90	7.80
0.250	0.04909	417.00	5.91	5.55	6.26	
0.280	0.06158	523.00	4.71	4.43	4.99	
0.300	0.07069	601.00	4.10	3.86	4.35	
0.315	0.07793	662.00	3.72	3.54	3.91	
0.350	0.09621	818.00	3.01	2.86	3.16	
0.355	0.09898	841.00	2.93	±5 %	2.78	3.08
0.400	0.1257	1,070.00	2.31	2.19	2.42	
0.450	0.1590	1,350.00	1.82	1.73	1.91	
0.500	0.1963	1,670.00	1.48	1.40	1.55	

Nominal Diameter mm	Cross Section mm <sup>2</sup>	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	2,020.00	1.22		1.17	1.27
0.560	0.2463	2,090.00	1.18		1.13	1.22
0.600	0.2827	2,400.00	1.03		0.980	1.07
0.630	0.3117	2,650.00	0.93		0.890	0.970
0.650	0.3318	2,820.00	0.87		0.840	0.910
0.700	0.3848	3,270.00	0.75		0.720	0.780
0.710	0.3959	3,370.00	0.73		0.700	0.760
0.800	0.5027	4,270.00	0.577		0.554	0.600
0.900	0.6362	5,410.00	0.456		0.438	0.474
1.000	0.7854	6,680.00	0.369		0.354	0.384
1.120	0.9852	8,370.00	0.294		0.283	0.306
1.200	1.131	9,610.00	0.256		0.246	0.267
1.250	1.227	10,430.00	0.236		0.227	0.246
1.400	1.539	13,090.00	0.188		0.181	0.196
1.500	1.767	15,020.00	0.164		0.158	0.171
1.600	2.011	17,090.00	0.144		0.138	0.150
1.800	2.545	21,630.00	0.114		0.109	0.119
2.000	3.142	26,700.00	0.092	±4 %	0.0890	0.0960
2.200	3.801	32,310.00	0.076		0.0730	0.0790
2.240	3.941	33,500.00	0.074		0.0710	0.0770
2.500	4.909	41,720.00	0.0591		0.0567	0.0614
2.800	6.158	52,340.00	0.0471		0.0452	0.0490
3.000	7.069	60,080.00	0.0410		0.0394	0.0427
3.150	7.793	66,240.00	0.0372		0.0357	0.0387
3.200	8.042	68,360.00	0.0361		0.0346	0.0375
3.500	9.621	81,780.00	0.0301		0.0289	0.0313
3.550	9.898	84,130.00	0.0293		0.0281	0.0305
4.000	12.57	106,810.00	0.0231		0.0222	0.0240
4.500	15.90	135,190.00	0.0182		0.0175	0.0190
5.000	19.63	166,900.00	0.0148		0.0142	0.0154
5.500	23.76	201,950.00	0.0122		0.0117	0.0127
5.600	24.63	209,360.00	0.0118		0.0113	0.0122
6.000	28.27	240,330.00	0.0103		0.00980	0.0107
6.300	31.17	264,970.00	0.0093		0.00890	0.00970
8.000	50.27	427,260.00	0.00577		0.00554	0.00600