



Brand Name	ISA® 13¹⁾				
Material Code	2.1356				
Abbreviation	CuMn3				
Chemical Composition (mass components) in %. Average values of alloy components					
Cu Rem.	Mn 3				

Features and Application Notes

ISA® 13 is known for low resistivity and a relatively low temperature coefficient, as well as its relatively high corrosion resistance. It is used for low-value resistors and for heating wires and mats in heating cords and in heating cables. The maximum working temperature in air is +200 °C. ISA® 13 can also be used as welding wire, e. g. for building-up welding in copper-plated steel-tanks, as well as for tube-weldings.

Form of Delivery

ISA® 13 is supplied in the form of round wires in the range 0.05 to 8.00 mm Ø in bare or enamelled condition, flat wires, stranded wires and ribbons.

Electrical Resistance in Annealed Condition

Temperature coefficient of electrical resistance between

Electrical resistivity in: $\mu\Omega \times \text{cm}$ (first line) and Ω/CMF (second line)
Reference Values

+20 °C and +105 °C
 $10^{-6}/\text{K}$

+20 °C
tolerance $\pm 10\%$

+100 °C

+200 °C

+300 °C

+400 °C

+500 °C

+280 to +380

12.5

12.9

13.3

75

75

80

Physical Characteristics (Reference Values)

Density at +20 °C

Melting point

Specific heat
at +20 °C

Wärmeleitfähigkeit bei +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

$\mu\text{V}/\text{K}$

8.80

0.32

+1,050

0.39

84.00

15.50

18.00

+1.00

Mechanical Properties at +20 °C in Annealed Condition

Tensile Strength²⁾

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

290

42,050

≈ 8

≈ 15

≈ 20

≥ 20

≥ 25

Notes on Treatment // ISA® 13 can be worked easily. This alloy can be soldered and brazed without difficulty. All known welding methods can be used.

1) ISA® 13 is a registered trademark of Isabellenhütte Heusler GmbH & Co. KG.

2) 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			
mm	mm ²	g	Nominal Value	Tolerance	Minimum Value	Maximum Value
0.050	0.001963	17.30	63.7	±8 %	58.6	68.8
0.056	0.002463	21.70	50.8		46.7	54.8
0.060	0.002827	24.90	44.2		40.7	47.7
0.063	0.003117	27.40	40.1		36.9	43.3
0.070	0.003848	33.90	32.5		29.9	35.1
0.071	0.003959	34.80	31.6		29.1	34.1
0.080	0.005027	44.20	24.9		22.9	26.9
0.090	0.006362	56.00	19.6		18.1	21.2
0.100	0.007854	69.10	15.9		14.6	17.2
0.110	0.009503	83.60	13.2		12.2	14.1
0.112	0.009852	86.70	12.7	11.8	13.6	
0.120	0.01131	99.50	11.1	10.3	11.8	
0.125	0.01227	108.00	10.2	9.47	10.9	
0.130	0.01327	117.00	9.42	±7 %	8.76	10.1
0.140	0.01539	135.00	8.12	7.55	8.69	
0.150	0.01767	156.00	7.07	6.58	7.57	
0.160	0.02011	177.00	6.22	5.78	6.65	
0.180	0.02545	224.00	4.91	4.57	5.26	
0.200	0.03142	276.00	3.98	3.74	4.22	
0.220	0.03801	335.00	3.29	3.09	3.49	
0.224	0.03941	347.00	3.17	±6 %	2.98	3.36
0.250	0.04909	432.00	2.55	2.39	2.70	
0.280	0.06158	542.00	2.03	1.91	2.15	
0.300	0.07069	622.00	1.77	1.66	1.87	
0.315	0.07793	686.00	1.60	1.52	1.68	
0.350	0.09621	847.00	1.30	1.23	1.36	
0.355	0.09898	871.00	1.26	±5 %	1.20	1.33
0.400	0.1257	1,110.00	0.995	0.945	1.04	
0.450	0.1590	1,400.00	0.786	0.747	0.825	
0.500	0.1963	1,730.00	0.637	0.605	0.668	

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	2,090.00	0.526		0.505	0.547
0.560	0.2463	2,170.00	0.508		0.487	0.528
0.600	0.2827	2,490.00	0.442		0.424	0.460
0.630	0.3117	2,740.00	0.401		0.385	0.417
0.650	0.3318	2,920.00	0.377		0.362	0.392
0.700	0.3848	3,390.00	0.325		0.312	0.338
0.710	0.3959	3,480.00	0.316		0.303	0.328
0.800	0.5027	4,420.00	0.249		0.239	0.259
0.900	0.6362	5,600.00	0.196		0.189	0.204
1.000	0.7854	6,910.00	0.159		0.153	0.166
1.120	0.9852	8,670.00	0.127		0.122	0.132
1.200	1.131	9,950.00	0.111		0.106	0.115
1.250	1.227	10,800.00	0.102		0.0978	0.106
1.400	1.539	13,550.00	0.0812		0.0780	0.0844
1.500	1.767	15,550.00	0.0707		0.0679	0.0736
1.600	2.011	17,690.00	0.0622		0.0597	0.0647
1.800	2.545	22,390.00	0.0491		0.0472	0.0511
2.000	3.142	27,650.00	0.0398	±4 %	0.0382	0.0414
2.200	3.801	33,450.00	0.0329		0.0316	0.0342
2.240	3.941	34,680.00	0.0317		0.0305	0.0330
2.500	4.909	43,200.00	0.0255		0.0244	0.0265
2.800	6.158	54,190.00	0.0203		0.0195	0.0211
3.000	7.069	62,200.00	0.0177		0.0170	0.0184
3.150	7.793	68,580.00	0.0160		0.0154	0.0167
3.200	8.042	70,770.00	0.0155		0.0149	0.0162
3.500	9.621	84,670.00	0.0130		0.0125	0.0135
3.550	9.898	87,100.00	0.0126		0.0121	0.0131
4.000	12.57	110,580.00	0.00995		0.00955	0.0103
4.500	15.90	139,960.00	0.00786		0.00755	0.00817
5.000	19.63	172,790.00	0.00637		0.00611	0.00662
5.500	23.76	209,070.00	0.00526		0.00505	0.00547
5.600	24.63	216,750.00	0.00508		0.00487	0.00528
6.000	28.27	248,810.00	0.00442		0.00424	0.00460
6.300	31.17	274,320.00	0.00401		0.00385	0.00417
8.000	50.27	442,340.00	0.00249		0.00239	0.00259