

Brand Name	ISA® 13	
Material Code	2.1356	
Abbreviation	CuMn3	
Chemical Composition (mass components) in % Average values of alloy components		
Cu	Mn	
Rem.	3	

Form of Delivery

ISA® 13 is supplied in the form of round wires in the range 8.0 to 0.05 mm Ø in bare or enamelled condition, also with rayon or silk covering. To a limited extent flat

wires, stranded wires, ribbons and sheets are also manufactured.

Properties 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 "electrical-welding-fittings".

Electrical Resistance in Annealed Condition

Temperature coefficient of electrical resistance between 20 °C and 105 °C 10 ⁻⁶ /K	Electrical resistivity in: μΩ x cm (first line) and Ω /CMF (second line) Reference Values					
	20 °C tolerance ± 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 °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/cm ³	lb/cub in				100 °C 10 ⁻⁶ /K	400 °C 10 ⁻⁶ /K	
8.8	0.32	1050	0.39	84	15.5	18	+1

Strength Properties at 20 °C in Annealed Condition

Tensile Strength ¹⁾		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
290	42050	≈ 8	≈ 15	≈ 20	≥ 20	≥ 25

1) This value applies to wires of 2 mm diameter. For thinner wires the minimum values will substantially increase, depending on the dimensions.

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.

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
0.05	0.001963	1.73	63.7	± 8 %	58.6	68.8
0.056	0.002463	2.17	50.8		46.7	54.8
0.06	0.002827	2.49	44.2		40.7	47.7
0.063	0.003117	2.74	40.1		36.9	43.3
0.07	0.003848	3.39	32.5		29.9	35.1
0.071	0.003959	3.48	31.6		29.1	34.1
0.08	0.005027	4.42	24.9		22.9	26.9
0.09	0.006362	5.60	19.6		18.1	21.2
0.10	0.007854	6.91	15.9	14.6	17.2	
0.11	0.009503	8.36	13.2	± 7 %	12.2	14.1
0.112	0.009852	8.67	12.7		11.8	13.6
0.12	0.01131	9.95	11.1		10.3	11.8
0.125	0.01227	10.8	10.2		9.47	10.9
0.13	0.01327	11.7	9.42		8.76	10.1
0.14	0.01539	13.5	8.12		7.55	8.69
0.15	0.01767	15.6	7.07		6.58	7.57
0.16	0.02011	17.7	6.22		5.78	6.65
0.18	0.02545	22.4	4.91	4.57	5.26	
0.20	0.03142	27.6	3.98	± 6 %	3.74	4.22
0.22	0.03801	33.5	3.29		3.09	3.49
0.224	0.03941	34.7	3.17		2.98	3.36
0.25	0.04909	43.2	2.55		2.39	2.70
0.28	0.06158	54.2	2.03		1.91	2.15
0.30	0.07069	62.2	1.77	1.66	1.87	
0.315	0.07793	68.6	1.60	± 5 %	1.52	1.68
0.35	0.09621	84.7	1.30		1.23	1.36
0.355	0.09898	87.1	1.26		1.20	1.33
0.40	0.1257	111	0.995		0.945	1.04
0.45	0.1590	140	0.786		0.747	0.825
0.50	0.1963	173	0.637	0.605	0.668	
0.55	0.2376	209	0.526	± 4 %	0.505	0.547
0.56	0.2463	217	0.508		0.487	0.528
0.60	0.2827	249	0.442		0.424	0.460
0.63	0.3117	274	0.401		0.385	0.417
0.65	0.3318	292	0.377		0.362	0.392
0.70	0.3848	339	0.325		0.312	0.338
0.71	0.3959	348	0.316		0.303	0.328
0.80	0.5027	442	0.249		0.239	0.259
0.90	0.6362	560	0.196		0.189	0.204
1.0	0.7854	691	0.159		0.153	0.166
1.12	0.9852	867	0.127		0.122	0.132
1.2	1.131	995	0.111		0.106	0.115
1.25	1.227	1080	0.102		0.0978	0.106
1.4	1.539	1355	0.0812		0.0780	0.0844
1.5	1.767	1555	0.0707		0.0679	0.0736
1.6	2.011	1769	0.0622		0.0597	0.0647
1.8	2.545	2239	0.0491		0.0472	0.0511
2.0	3.142	2765	0.0398		0.0382	0.0414
2.2	3.801	3345	0.0329		0.0316	0.0342
2.24	3.941	3468	0.0317		0.0305	0.0330
2.5	4.909	4320	0.0255	0.0244	0.0265	
2.8	6.158	5419	0.0203	0.0195	0.0211	
3.0	7.069	6220	0.0177	0.0170	0.0184	
3.15	7.793	6858	0.0160	0.0154	0.0167	
3.2	8.042	7077	0.0155	0.0149	0.0162	
3.5	9.621	8467	0.0130	0.0125	0.0135	
3.55	9.898	8710	0.0126	0.0121	0.0131	
4.0	12.57	11058	0.00995	0.00955	0.0103	
4.5	15.90	13996	0.00786	0.00755	0.00817	
5.0	19.63	17279	0.00637	0.00611	0.00662	
5.5	23.76	20907	0.00526	0.00505	0.00547	
5.6	24.63	21675	0.00508	0.00487	0.00528	
6.0	28.27	24881	0.00442	0.00424	0.00460	
6.3	31.17	27432	0.00401	0.00385	0.00417	
8.0	50.27	44234	0.00249	0.00239	0.00259	