CuNi Alloys

CuNi1 – CuNi44 · eleven grades · 0.03 – 10.0 mm

Copper-nickel resistance wire with a low, steady temperature coefficient, for precision resistors, shunts and marine-grade hardware.

11	0.03 – 10.0 mm	0.03 – 0.50 μΩ·m	200 – 400 °C
GRADES · CUNI1 TO CUNI44	WIRE DIAMETER	RESISTIVITY AT 20 °C	MAX. OPERATING TEMP.

PRODUCT OVERVIEW

Copper-nickel low-resistance alloys are binary alloys of copper and nickel, used wherever a circuit needs conductivity, resistance stability and corrosion resistance at the same time. Nickel lifts the resistivity only modestly and steadies it against temperature change; the copper matrix keeps the wire ductile enough to draw fine, to bend tightly and to soft-solder.

The eleven grades from CuNi1 to CuNi44 carry no aluminium or manganese additions up to CuNi14, so composition stays simple and behaviour stays consistent from coil to coil — the reason these alloys hold their place in precision resistors, shunts and marine hardware.

KEY CHARACTERISTICS

— **Low resistivity, stable with temperature.** Nickel raises resistivity only slightly while sharply reducing the temperature coefficient, so resistance stays put as the element warms — the basis of precise current control.

— **Corrosion resistance.** Chemical stability holds in humid, oxidising, acidic and salt-spray conditions, which suits harsh industrial and marine service.

— **Machinability and solderability.** The copper matrix gives good ductility and drawability plus soft-soldering performance, so fine wire, thin strip and terminal posts all form and join cleanly.

— **High-temperature stability.** The alloy resists softening and oxidation under heating and keeps its resistance, for heating elements and high-temperature connectors.

— **Simple composition.** No aluminium or manganese additions in the low-nickel grades: fewer melt variables, easier mass production, consistent performance.

SUPPLY RANGE

Form	Available
Wire	Bright, soft annealed · 0.03 – 10.0 mm
Rod	6.0 – 80.0 mm
Flat wire	Width 0.2 – 6.0 mm · thickness 0.08 – 1.0 mm
Wide strip	Width 5.0 – 100 mm · thickness 0.05 – 4.0 mm

Wire is supplied bright and soft annealed; rod, flat wire and wide strip are quoted to the same grade data.

CHEMICAL COMPOSITION

Composition (wt %)	CuNi1 NC003	CuNi2 NC005	CuNi6 NC010	CuNi8 NC012	CuNi10 NC015	CuNi14 NC020	CuNi19 NC025	CuNi23 NC030	CuNi30 NC035	CuNi34 NC040	CuNi44 NC050
Ni (%)	1	2	6	8	10	14	19	23	30	34	44
Mn (%)	-	-	-	-	-	-	0.5	0.5	1	0.5	1
Cu (%)	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.	Bal.

Ni nickel, Mn manganese, Cu copper. Values are in weight per cent; copper is the balance of every grade.

PHYSICAL AND MECHANICAL PROPERTIES

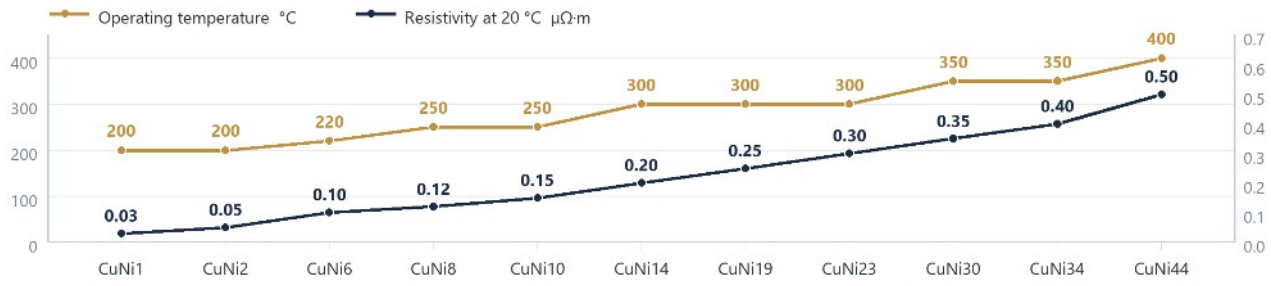
Grade NC code	Max. temp. (°C)	Melting point (°C)	Density (g/cm³)	Resistivity (μΩ·m, 20 °C)	Tensile (MPa)	EMF vs Cu (μV/°C)	Average TCR 10⁻⁶/°C, 200 – 600 °C	Elongation A/% (≤1.0 / >1.0 mm)
CuNi1 NC003	200	1085	8.9	0.03 ± 10%	≥210	-8	<100	≥18 / ≥25
CuNi2 NC005	200	1090	8.9	0.05 ± 10%	≥220	-12	<120	≥18 / ≥25
CuNi6 NC010	220	1095	8.9	0.1 ± 10%	≥250	-18	<60	≥18 / ≥25
CuNi8 NC012	250	1097	8.9	0.12 ± 10%	≥270	-22	<38	≥18 / ≥25
CuNi10 NC015	250	1100	8.9	0.15 ± 10%	≥290	-25	<50	≥20 / ≥25
CuNi14 NC020	300	1115	8.9	0.2 ± 5%	≥310	-28	<30	≥20 / ≥25
CuNi19 NC025	300	1135	8.9	0.25 ± 5%	≥340	-32	<25	≥20 / ≥25
CuNi23 NC030	300	1150	8.9	0.3 ± 5%	≥350	-34	<16	≥20 / ≥25
CuNi30 NC035	350	1170	8.9	0.35 ± 5%	≥400	-37	<10	≥20 / ≥25
CuNi34 NC040	350	1180	8.9	0.4 ± 5%	≥400	-39	0	≥20 / ≥25
CuNi44 NC050	400	1280	8.9	0.50 ± 5%	≥420	-43	<-6	≥20 / ≥25

Average TCR is the mean coefficient between 200 and 600 °C. Density is taken as 8.9 g/cm³ for every grade. Elongation A/% is a minimum, quoted for wire ≤1.0 mm and >1.0 mm. Resistivity tolerance is ±10 % up to CuNi10 and ±5 % from CuNi14 upwards.

TYPICAL APPLICATIONS

- **Low-resistance resistors.** Precise current control in power systems and signal circuits.
- **Resistance wire and heating elements.** Stable resistance under load keeps equipment safe.
- **Terminal posts and connectors.** Conductivity, strength and easy soldering in one material.
- **Precision instruments and sensors.** Low TCR and long-term stability where drift cannot be tolerated.

TEMPERATURE AND RESISTIVITY BY GRADE



Operating temperature is the maximum continuous service temperature in air; resistivity is the nominal value at 20 °C. Both series are plotted from the tables above.

NOTICE

Recommendations are given for guidance only. Suitability of the material can only be confirmed once the actual service conditions are known. Continuous technical development may lead to changes in these data without notice. Mechanical values are typical for bright, soft-annealed wire; they are not guaranteed minima except where marked ≥. Issued October 2026.

WEIGHT AND LENGTH BY DIAMETER

Dia. (mm)	Weight (g/m)	Length (m/kg)	Dia. (mm)	Weight (g/m)	Length (m/kg)
0.05	0.01748	57224.30	1.1	8.45795	118.23
0.06	0.02516	39739.10	1.2	10.06565	99.35
0.07	0.03425	29196.07	1.3	11.81316	84.65
0.08	0.04474	22353.24	1.4	13.70047	72.99
0.09	0.05662	17661.82	1.5	15.72758	63.58
0.1	0.06990	14306.07	1.6	17.89450	55.88
0.11	0.08458	11823.20	1.7	20.20121	49.50
0.12	0.10066	9934.77	1.8	22.64772	44.15
0.13	0.11813	8465.13	1.9	25.23404	39.63
0.15	0.15728	6358.26	2.0	27.96015	35.77
0.17	0.20201	4950.20	2.2	33.83178	29.56
0.19	0.25234	3962.90	2.4	40.26262	24.84
0.21	0.30826	3244.01	2.6	47.25266	21.16
0.25	0.43688	2288.97	2.8	54.80190	18.25
0.27	0.50957	1962.42	3.0	62.91034	15.90
0.29	0.58786	1701.08	3.2	71.57799	13.97
0.31	0.67174	1488.67	3.4	80.80484	12.38
0.35	0.85628	1167.84	3.6	90.59089	11.04
0.40	1.11841	894.13	3.8	100.93615	9.91
0.45	1.41548	706.47	4.0	111.84060	8.94
0.50	1.74751	572.24	4.5	141.54826	7.06
0.55	2.11449	472.93	5.0	174.75094	5.72
0.60	2.51641	397.39	5.5	211.44864	4.73
0.65	2.95329	338.61	6.0	251.64136	3.97
0.70	3.42512	291.96	6.5	295.32909	3.39
0.80	4.47362	223.53	7.0	342.51185	2.92
0.85	5.05030	198.01	7.5	393.18962	2.54
0.90	5.66193	176.62	8.0	447.36242	2.24
0.95	6.30851	158.52	8.5	505.03023	1.98
1.00	6.99004	143.06	9.0	566.19306	1.77

Weight per metre and length per kilogram use the nominal diameter and a density of 8.9 g/cm³; the same values apply to every grade in this brochure. Diameters from 0.05 to 9.0 mm are listed in two blocks, left then right.

OHM PER METRE AT 20 °C

Dia. (mm)	CuNi1 NC003	CuNi2 NC005	CuNi6 NC010	CuNi8 NC012	Dia. (mm)	CuNi1 NC003	CuNi2 NC005	CuNi6 NC010	CuNi8 NC012
0.05	15.279	25.465	50.930	61.116	1.1	0.0316	0.0526	0.1052	0.1263
0.06	10.610	17.684	35.368	42.441	1.2	0.0265	0.0442	0.0884	0.1061
0.07	7.795	12.992	25.985	31.181	1.3	0.0226	0.0377	0.0753	0.0904
0.08	5.968	9.947	19.894	23.873	1.4	0.0195	0.0325	0.0650	0.0780
0.09	4.716	7.860	15.719	18.863	1.5	0.0170	0.0283	0.0566	0.0679
0.1	3.820	6.366	12.732	15.279	1.6	0.0149	0.0249	0.0497	0.0597
0.11	3.157	5.261	10.523	12.627	1.7	0.0132	0.0220	0.0441	0.0529
0.12	2.653	4.421	8.842	10.610	1.8	0.0118	0.0196	0.0393	0.0472
0.13	2.260	3.767	7.534	9.041	1.9	0.0106	0.0176	0.0353	0.0423
0.15	1.698	2.829	5.659	6.791	2.0	0.0095	0.0159	0.0318	0.0382
0.17	1.322	2.203	4.406	5.287	2.2	0.0079	0.0132	0.0263	0.0316
0.19	1.058	1.763	3.527	4.232	2.4	0.0066	0.0111	0.0221	0.0265
0.21	0.866	1.444	2.887	3.465	2.6	0.0057	0.0094	0.0188	0.0226
0.25	0.611	1.019	2.037	2.445	2.8	0.0049	0.0081	0.0162	0.0195
0.27	0.524	0.873	1.747	2.096	3.0	0.0042	0.0071	0.0141	0.0170
0.29	0.454	0.757	1.514	1.817	3.2	0.0037	0.0062	0.0124	0.0149
0.31	0.397	0.662	1.325	1.590	3.4	0.00330	0.00551	0.01101	0.01322
0.35	0.312	0.520	1.039	1.247	3.6	0.00295	0.00491	0.00982	0.01179
0.40	0.239	0.398	0.796	0.955	3.8	0.00265	0.00441	0.00882	0.01058
0.45	0.189	0.314	0.629	0.755	4.0	0.00239	0.00398	0.00796	0.00955
0.50	0.153	0.255	0.509	0.611	4.5	0.00189	0.00314	0.00629	0.00755
0.55	0.126	0.210	0.421	0.505	5.0	0.00153	0.00255	0.00509	0.00611
0.60	0.106	0.177	0.354	0.424	5.5	0.00126	0.00210	0.00421	0.00505
0.65	0.090	0.151	0.301	0.362	6.0	0.00106	0.00177	0.00354	0.00424
0.70	0.078	0.130	0.260	0.312	6.5	0.00090	0.00151	0.00301	0.00362
0.80	0.060	0.099	0.199	0.239	7.0	0.00078	0.00130	0.00260	0.00312
0.85	0.053	0.088	0.176	0.211	7.5	0.00068	0.00113	0.00226	0.00272
0.90	0.047	0.079	0.157	0.189	8.0	0.00060	0.00099	0.00199	0.00239
0.95	0.042	0.071	0.141	0.169	8.5	0.00053	0.00088	0.00176	0.00211
1.00	0.038	0.064	0.127	0.153	9.0	0.00047	0.00079	0.00157	0.00189

Resistance per metre is worked out from the nominal section and the resistivity of each grade at 20 °C. All eleven grades are tabulated on pages 4 to 6.

OHM PER METRE AT 20 °C

Dia. (mm)	CuNi10 NC015	CuNi14 NC020	CuNi19 NC025	CuNi23 NC030	Dia. (mm)	CuNi10 NC015	CuNi14 NC020	CuNi19 NC025	CuNi23 NC030
0.05	76.394	101.859	127.324	152.789	1.1	0.1578	0.2105	0.2631	0.3157
0.06	53.052	70.736	88.419	106.103	1.2	0.1326	0.1768	0.2210	0.2653
0.07	38.977	51.969	64.961	77.954	1.3	0.1130	0.1507	0.1883	0.2260
0.08	29.842	39.789	49.736	59.683	1.4	0.0974	0.1299	0.1624	0.1949
0.09	23.579	31.438	39.298	47.157	1.5	0.0849	0.1132	0.1415	0.1698
0.1	19.099	25.465	31.831	38.197	1.6	0.0746	0.0995	0.1243	0.1492
0.11	15.784	21.045	26.307	31.568	1.7	0.0661	0.0881	0.1101	0.1322
0.12	13.263	17.684	22.105	26.526	1.8	0.0589	0.0786	0.0982	0.1179
0.13	11.301	15.068	18.835	22.602	1.9	0.0529	0.0705	0.0882	0.1058
0.15	8.488	11.318	14.147	16.977	2.0	0.0477	0.0637	0.0796	0.0955
0.17	6.609	8.811	11.014	13.217	2.2	0.0395	0.0526	0.0658	0.0789
0.19	5.290	7.054	8.817	10.581	2.4	0.0332	0.0442	0.0553	0.0663
0.21	4.331	5.774	7.218	8.662	2.6	0.0283	0.0377	0.0471	0.0565
0.25	3.056	4.074	5.093	6.112	2.8	0.0244	0.0325	0.0406	0.0487
0.27	2.620	3.493	4.366	5.240	3.0	0.0212	0.0283	0.0354	0.0424
0.29	2.271	3.028	3.785	4.542	3.2	0.0187	0.0249	0.0311	0.0373
0.31	1.987	2.650	3.312	3.975	3.4	0.01652	0.02203	0.02754	0.03304
0.35	1.559	2.079	2.598	3.118	3.6	0.01474	0.01965	0.02456	0.02947
0.40	1.194	1.592	1.989	2.387	3.8	0.01323	0.01763	0.02204	0.02645
0.45	0.943	1.258	1.572	1.886	4.0	0.01194	0.01592	0.01989	0.02387
0.50	0.764	1.019	1.273	1.528	4.5	0.00943	0.01258	0.01572	0.01886
0.55	0.631	0.842	1.052	1.263	5.0	0.00764	0.01019	0.01273	0.01528
0.60	0.531	0.707	0.884	1.061	5.5	0.00631	0.00842	0.01052	0.01263
0.65	0.452	0.603	0.753	0.904	6.0	0.00531	0.00707	0.00884	0.01061
0.70	0.390	0.520	0.650	0.780	6.5	0.00452	0.00603	0.00753	0.00904
0.80	0.298	0.398	0.497	0.597	7.0	0.00390	0.00520	0.00650	0.00780
0.85	0.264	0.352	0.441	0.529	7.5	0.00340	0.00453	0.00566	0.00679
0.90	0.236	0.314	0.393	0.472	8.0	0.00298	0.00398	0.00497	0.00597
0.95	0.212	0.282	0.353	0.423	8.5	0.00264	0.00352	0.00441	0.00529
1.00	0.191	0.255	0.318	0.382	9.0	0.00236	0.00314	0.00393	0.00472

OHM PER METRE AT 20 °C

Dia. (mm)	CuNi30 NC035	CuNi34 NC040	CuNi44 NC050	Dia. (mm)	CuNi30 NC035	CuNi34 NC040	CuNi44 NC050
0.05	178.254	203.718	254.648	1.1	0.3683	0.4209	0.5261
0.06	123.787	141.471	176.839	1.2	0.3095	0.3537	0.4421
0.07	90.946	103.938	129.923	1.3	0.2637	0.3014	0.3767
0.08	69.630	79.578	99.472	1.4	0.2274	0.2598	0.3248
0.09	55.017	62.876	78.595	1.5	0.1981	0.2264	0.2829
0.1	44.563	50.930	63.662	1.6	0.1741	0.1989	0.2487
0.11	36.829	42.091	52.613	1.7	0.1542	0.1762	0.2203
0.12	30.947	35.368	44.210	1.8	0.1375	0.1572	0.1965
0.13	26.369	30.136	37.670	1.9	0.1234	0.1411	0.1763
0.15	19.806	22.635	28.294	2.0	0.1114	0.1273	0.1592
0.17	15.420	17.623	22.028	2.2	0.0921	0.1052	0.1315
0.19	12.344	14.108	17.635	2.4	0.0774	0.0884	0.1105
0.21	10.105	11.549	14.436	2.6	0.0659	0.0753	0.0942
0.25	7.130	8.149	10.186	2.8	0.0568	0.0650	0.0812
0.27	6.113	6.986	8.733	3.0	0.0495	0.0566	0.0707
0.29	5.299	6.056	7.570	3.2	0.0435	0.0497	0.0622
0.31	4.637	5.300	6.625	3.4	0.03855	0.04406	0.05507
0.35	3.638	4.158	5.197	3.6	0.03439	0.03930	0.04912
0.40	2.785	3.183	3.979	3.8	0.03086	0.03527	0.04409
0.45	2.201	2.515	3.144	4.0	0.02785	0.03183	0.03979
0.50	1.783	2.037	2.546	4.5	0.02201	0.02515	0.03144
0.55	1.473	1.684	2.105	5.0	0.01783	0.02037	0.02546
0.60	1.238	1.415	1.768	5.5	0.01473	0.01684	0.02105
0.65	1.055	1.205	1.507	6.0	0.01238	0.01415	0.01768
0.70	0.909	1.039	1.299	6.5	0.01055	0.01205	0.01507
0.80	0.696	0.796	0.995	7.0	0.00909	0.01039	0.01299
0.85	0.617	0.705	0.881	7.5	0.00792	0.00905	0.01132
0.90	0.550	0.629	0.786	8.0	0.00696	0.00796	0.00995
0.95	0.494	0.564	0.705	8.5	0.00617	0.00705	0.00881
1.00	0.446	0.509	0.637	9.0	0.00550	0.00629	0.00786

NOTICE

Recommendations are given for guidance only. Suitability of the material can only be confirmed once the actual service conditions are known. Continuous technical development may lead to changes in these data without notice. For diameters or tempers outside the ranges above, ask for a quotation against drawing. Issued October 2026.