

Resistance Wire for Low Temp Heating or Resistors Nickel-Copper Alloy - A30

$$i^2/\Omega = \frac{I^2 C_t}{p}$$

I = Current
 C_t = Temperature factor
 p = Surface load W/in²

Common Names: Alloy 30, CuNi 30, 30 Alloy, MWS-30, Cuprothal® 30, HAI-30, Cu-Ni 2, Alloy 230, Nickel Alloy 30

Uses: Alloy exhibits low resistivity and high temperature coefficient of resistance. Typical applications include voltage regulators, timing devices, temperature sensitive resistors, temperature compensating devices, motor control, heating wires and cables, precision and vitreous resistors, potentiometers, and low temperature heating applications.

Composition

| Ni | Cr | Fe | Al | Si | Mn | Cu | C | Ti | Mo | W |
|----|------------|------------|------------|------------|------------|-----|------------|------------|------------|------------|
| 2% | None/Trace | None/Trace | None/Trace | None/Trace | None/Trace | 98% | None/Trace | None/Trace | None/Trace | None/Trace |

Technical Data

| | | | |
|----------------------------------|--------------|--|----------------|
| Resistivity (Ω/cm ²) | 30 | Resistivity (Ω/sqmf) | 24 |
| Resistivity (μΩ/cm) | 4.99 | Nom. Temp. Coeff. of Resistance (TCR) | 0.00130 |
| Std. Res. Tol. <.020" | 5% | Std. Res. Tol. >.020" | 3% |
| Thermal EMF vs. Cu | -0.014 | Specific Heat (20°C) | 0.092 cal/g |
| Density (g/cm ³) | 8.89 | Density (lb/in ³) | 0.321 |
| Thermal Conductivity | 1.16 W/cm/°C | Coeff. of Linear Expansion (X 10 ⁻⁶) | 16.40 in/in/°C |
| Approx. Melting Point | 1190°C | Max. Continuous Operating Temp. | 300°C |
| UTS – Hard (KPSI) | 60 | YTS Tensile – Hard (KPSI) | |
| UTS – Stress Relieved (KPSI) | | YTS Tensile – Stress Relieved (KPSI) | |
| UTS – Annealed (KPSI) | 30 | YTS Tensile – Annealed (KPSI) | |
| Magnetic Attraction | None | Emissivity – fully oxidized | |
| Designations/Specifications | ASTM = B267 | Forms Available | Wire, Ribbon |

Temperature Factor – To obtain resistance at working temperature multiply by the factor C_t , in the following table:

| °C | 100 | 200 | 300 | 400 |
|-----------|------|------|------|------|
| A30 C_t | 1.00 | 1.11 | 1.25 | 1.40 |

Alloy Data

| Diameter mm | Resistance at 20° C Ω/m | Resistance at 20° C Ω/kg | Weight kg/1000 m | Surface area cm ² /m | cm ² /Ω at 20°C |
|-------------|-------------------------|--------------------------|------------------|---------------------------------|----------------------------|
| 10.4049 | 0.0006 | 0.0008 | 755.5052 | 326.8804 | 557305.2014 |
| 9.2658 | 0.0007 | 0.0012 | 599.1420 | 291.0952 | 393578.6775 |
| 8.2515 | 0.0009 | 0.0020 | 475.1405 | 259.2276 | 277952.1436 |
| 7.3481 | 0.0012 | 0.0031 | 376.8030 | 230.8486 | 196294.6637 |
| 6.5437 | 0.0015 | 0.0050 | 298.8180 | 205.5765 | 138626.7237 |
| 5.8273 | 0.0019 | 0.0079 | 236.9731 | 183.0710 | 97900.6161 |
| 5.1894 | 0.0024 | 0.0125 | 187.9279 | 163.0293 | 69139.1268 |
| 4.6213 | 0.0030 | 0.0200 | 149.0334 | 145.1817 | 48827.2602 |
| 4.1154 | 0.0037 | 0.0317 | 118.1887 | 129.2880 | 34482.6649 |
| 3.6648 | 0.0047 | 0.0504 | 93.7278 | 115.1342 | 24352.2609 |
| 3.2636 | 0.0060 | 0.0802 | 74.3294 | 102.5299 | 17197.9924 |
| 2.9063 | 0.0075 | 0.1275 | 58.9458 | 91.3054 | 12145.5229 |
| 2.5882 | 0.0095 | 0.2028 | 46.7461 | 81.3098 | 8577.3807 |
| 2.3048 | 0.0120 | 0.3224 | 37.0713 | 72.4084 | 6057.4962 |
| 2.0525 | 0.0151 | 0.5127 | 29.3988 | 64.4815 | 4277.9097 |
| 1.8278 | 0.0190 | 0.8152 | 23.3143 | 57.4224 | 3021.1346 |
| 1.7249 | 0.0213 | 1.0280 | 20.7620 | 54.1881 | 2538.8633 |
| 1.6277 | 0.0240 | 1.2963 | 18.4890 | 51.1361 | 2133.5781 |
| 1.5360 | 0.0269 | 1.6346 | 16.4650 | 48.2559 | 1792.9896 |
| 1.4495 | 0.0302 | 2.0612 | 14.6625 | 45.5380 | 1506.7702 |
| 1.3679 | 0.0339 | 2.5991 | 13.0573 | 42.9731 | 1266.2406 |
| 1.2908 | 0.0381 | 3.2774 | 11.6278 | 40.5527 | 1064.1074 |
| 1.2181 | 0.0428 | 4.1328 | 10.3549 | 38.2686 | 894.2413 |
| 1.1495 | 0.0481 | 5.2114 | 9.2213 | 36.1132 | 751.4913 |
| 1.0848 | 0.0540 | 6.5714 | 8.2118 | 34.0792 | 631.5288 |

| Diameter mm | Resistance at 20° C Ω/m | Resistance at 20° C Ω/kg | Weight kg/1000 m | Surface area cm ² /m | cm ² /Ω at 20°C |
|----------------|----------------------------|-----------------------------|---------------------|------------------------------------|-------------------------------|
| 1.0237 | 0.0606 | 8.2864 | 7.3128 | 32.1597 | 530.7163 |
| 0.9660 | 0.0680 | 10.4490 | 6.5122 | 30.3483 | 445.9967 |
| 0.9116 | 0.0764 | 13.1759 | 5.7993 | 28.6390 | 374.8011 |
| 0.8603 | 0.0858 | 16.6146 | 5.1644 | 27.0260 | 314.9707 |
| 0.8118 | 0.0964 | 20.9506 | 4.5991 | 25.5038 | 264.6911 |
| 0.7661 | 0.1082 | 26.4183 | 4.0956 | 24.0673 | 222.4378 |
| 0.7229 | 0.1215 | 33.3129 | 3.6472 | 22.7117 | 186.9295 |
| 0.6822 | 0.1364 | 42.0068 | 3.2479 | 21.4325 | 157.0895 |
| 0.6438 | 0.1532 | 52.9697 | 2.8924 | 20.2254 | 132.0129 |
| 0.6075 | 0.1720 | 66.7936 | 2.5757 | 19.0862 | 110.9393 |
| 0.5733 | 0.1932 | 84.2253 | 2.2937 | 18.0112 | 93.2298 |
| 0.5410 | 0.2169 | 106.2063 | 2.0426 | 16.9967 | 78.3473 |
| 0.5106 | 0.2436 | 133.9239 | 1.8190 | 16.0394 | 65.8405 |
| 0.4818 | 0.2736 | 168.8752 | 1.6199 | 15.1360 | 55.3302 |
| 0.4547 | 0.3072 | 212.9480 | 1.4425 | 14.2835 | 46.4977 |
| 0.4291 | 0.3450 | 268.5228 | 1.2846 | 13.4790 | 39.0752 |
| 0.4049 | 0.3874 | 338.6015 | 1.1440 | 12.7198 | 32.8375 |
| 0.3821 | 0.4350 | 426.9692 | 1.0188 | 12.0034 | 27.5956 |
| 0.3606 | 0.4884 | 538.3990 | 0.9072 | 11.3273 | 23.1904 |
| 0.3403 | 0.5485 | 678.9096 | 0.8079 | 10.6893 | 19.4885 |
| 0.3211 | 0.6159 | 856.0905 | 0.7195 | 10.0873 | 16.3775 |
| 0.2859 | 0.7767 | 1361.2411 | 0.5706 | 8.9830 | 11.5661 |
| 0.2546 | 0.9794 | 2164.4643 | 0.4525 | 7.9996 | 8.1682 |
| 0.2268 | 1.2350 | 3441.6428 | 0.3588 | 7.1238 | 5.7685 |
| 0.2019 | 1.5572 | 5472.4421 | 0.2846 | 6.3439 | 4.0738 |
| 0.1798 | 1.9637 | 8701.5487 | 0.2257 | 5.6494 | 2.8770 |
| 0.1601 | 2.4761 | 13836.0441 | 0.1790 | 5.0310 | 2.0318 |
| 0.1426 | 3.1223 | 22000.2348 | 0.1419 | 4.4802 | 1.4349 |
| 0.1270 | 3.9372 | 34981.8437 | 0.1125 | 3.9897 | 1.0133 |
| 0.1131 | 4.9647 | 55623.4694 | 0.0893 | 3.5529 | 0.7156 |
| 0.1007 | 6.2604 | 88445.0339 | 0.0708 | 3.1640 | 0.5054 |
| 0.0897 | 7.8943 | 140633.5151 | 0.0561 | 2.8176 | 0.3569 |
| 0.0799 | 9.9545 | 223616.6882 | 0.0445 | 2.5092 | 0.2521 |
| 0.0711 | 12.5524 | 355565.4794 | 0.0353 | 2.2345 | 0.1780 |
| 0.0633 | 15.8283 | 565372.8762 | 0.0280 | 1.9898 | 0.1257 |
| 0.0564 | 19.9591 | 898980.6594 | 0.0222 | 1.7720 | 0.0888 |
| 0.0502 | 25.1680 | 1429439.3310 | 0.0176 | 1.5780 | 0.0627 |
| 0.0447 | 31.7364 | 2272904.0717 | 0.0140 | 1.4053 | 0.0443 |
| 0.0398 | 40.0189 | 3614069.3817 | 0.0111 | 1.2514 | 0.0313 |
| 0.0355 | 50.4629 | 5746611.8603 | 0.0088 | 1.1144 | 0.0221 |
| 0.0316 | 63.6327 | 9137496.9279 | 0.0070 | 0.9924 | 0.0156 |
| 0.0281 | 80.2394 | 14529230.8125 | 0.0055 | 0.8838 | 0.0110 |
| 0.0251 | 101.1802 | 23102448.0410 | 0.0044 | 0.7870 | 0.0078 |

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