



| | | | |
|--|-----------|---------|--|
| Brand Name | ISOTAN®1) | | |
| Material Code | 2.0842 | | |
| Abbreviation | CuNi44 | | |
| Chemical Composition (mass components) in % Average values of alloy components | | | |
| Cu Rem. | Ni 44 | Mn 1 | |

Form of Delivery

ISOTAN[®] is supplied in the form of round wire in the dimension 8.0 to 0.02 mm diam. in bare, oxide-insulated or enamelled condition, also with rayon or silk covering. The range also includes flat wires, sheets, panels and foils.

Features and Application Notes

ISOTAN[®] is notable for its low temperature coefficient and good scale and corrosion resistance. The alloy is non-magnetic. It is suitable for electrical resistors of any kind, potentiometers, heating cables and heating wires as well as for spectacle rim profiles in the optical industry. Due to its high thermo EMF against copper, ISOTAN[®] is also used for thermocouples and compensation cables (see www.thermo-alloys.com). The maximum working temperature in air is 600°C.

Electrical Resistance (Reference Values)

| Temperature coefficient ⁽²⁾ of electrical resistance between 20 °C and 105 °C 10⁻⁶/K | Electrical resistivity in: $\mu\Omega \times \text{cm}$ (first line) & CMF (second line) Reference Values | | | | | |
|--|--|------------|------------|------------|------------|------------|
| | 20°C | 100°C | 200°C | 300°C | 400°C | 500°C |
| | Perm. Dev.: $\pm 5\%$ | | | | | |
| -80 to +40 | 49 | 49 | 49 | 49 | 49 | 49 |
| | 295 | 295 | 295 | 295 | 295 | 295 |

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 |
|-------------------------|------------------|---------------|-----------------------|------------------------------|---|-----------------------------------|------------------------------------|
| g/cm³ | lb/cub in | °C | J/g K | W/m K | 100°C 10⁻⁶/K | 400°C 10⁻⁶/K | $\mu\text{V/K}$ |
| 8.9 | 0.32 | 1280 | 0.41 | 23 | 13.5 | 15 | -40 |

Strength Properties at 20 °C in annealed Condition

| Tensile Strength ⁽³⁾ | | Elongation (L ₀ =100mm) % at nominal diameter in mm | | | | |
|---------------------------------|-------------------|--|----------------|--------------|------------|------------|
| MPa | lb / sq in | 0.02 to 0.063 | 0.063 to 0.125 | 0.125 to 0.5 | 0.5 to 1 | over 1 |
| 420 | 60900 | ≈12 | ≈18 | ≈20 | ≥20 | ≥25 |

1) ISOTAN[®] is a trademark of Isabellenhütte Heusler GmbH & Co KG.

2) The temperature coefficient can be adjusted on request to values between $\pm 10 \cdot 10^{-6}/\text{K}$.

3) This value applies to wires of 0.6mm diam. For thinner wires the minimum values will substantially increase, depending on the dimension.

Notes on Treatment

ISOTAN[®] can be worked easily. It can be soldered and brazed without difficulty. All known welding methods are applicable.

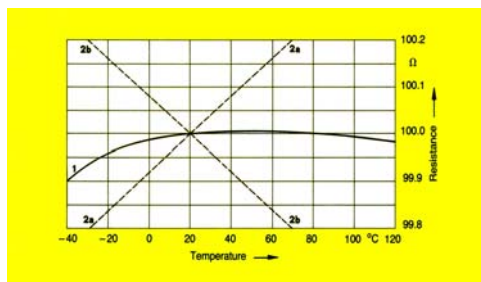
Special remarks on the temperature coefficient

The variation of electrical resistance vs. temperature in the range between -40 and +120°C, referred to 20°C, is shown in Graph 1.

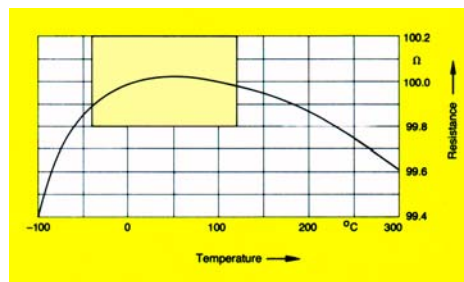
Curve 1 represents the ideal curve which can be approximated. Here the resistance changes by appr. $\pm 0.015\%$, i.e. appr. $\pm 150 \text{ ppm}^*$ in the temperature range from 20 to 120°C; this corresponds to a temperature coefficient of 0.5 ppm/K between 20 and 60°C.

The straight lines 2a and 2b apply to a temperature coefficient $\alpha = \pm 40 \cdot 10^{-6}/\text{K}$. If not otherwise agreed, normally wires with a temperature coefficient within this range are supplied. It should be noted here that DIN 17471 permits a temperature coefficient $\alpha = -80$ to $+40 \cdot 10^{-6}/\text{K}$ in the temperature range from 20 to 105°C. The possible resistance variations in the range from -100 to +300°C are shown in Graph 2. Graph 1 is an enlarged view of the cut-out.

Graph 1:
electrical
resistance vs.
temperature



* 1ppm = $1 \cdot 10^{-6} = 0.0001\%$, 1000 ppm = $1 \cdot 10^{-3} = 0.1\%$.



Graph 2

For further technical detail please have a look at the additional PDF "Technical Information"

www.thermo-alloys.com and www.resistance-alloys.com are a service of www.isabellenhuetten.de
for any further questions please contact thermo@isabellenhuetten.de



| Nominal Diameter d mm | Cross Section mm² | Cross Section square inch | Weight per 100 m g | DC Resistance Referred to Length at 20 °C Ω/m | | | |
|-----------------------------|----------------------|------------------------------|--------------------------|--|-----------|---------------|---------------|
| | | | | Nominal Value | Tolerance | Minimum Value | Maximum Value |
| 0,02 | 0,0003142 | 0,0000019 | 0,280 | 1560 | ± 10 % | 1404 | 1716 |
| 0,022 | 0,0003801 | 0,0000023 | 0,338 | 1289 | | 1160 | 1418 |
| 0,025 | 0,0004909 | 0,0000029 | 0,437 | 998 | | 898 | 1098 |
| 0,028 | 0,0006158 | 0,0000037 | 0,548 | 796 | | 716 | 875 |
| 0,03 | 0,0007069 | 0,0000042 | 0,629 | 693 | ± 8 % | 638 | 749 |
| 0,032 | 0,0008042 | 0,0000048 | 0,716 | 609 | | 561 | 658 |
| 0,036 | 0,001018 | 0,000006 | 0,906 | 481 | | 443 | 520 |
| 0,04 | 0,001257 | 0,000008 | 1,12 | 390 | | 359 | 421 |
| 0,045 | 0,001590 | 0,000010 | 1,42 | 308 | | 283 | 333 |
| 0,05 | 0,001963 | 0,000012 | 1,75 | 250 | | 230 | 270 |
| 0,056 | 0,002463 | 0,000015 | 2,19 | 199 | | 183 | 215 |
| 0,06 | 0,002827 | 0,000017 | 2,52 | 173 | | 159 | 187 |
| 0,063 | 0,003117 | 0,000019 | 2,77 | 157 | | 145 | 170 |
| 0,07 | 0,003848 | 0,000023 | 3,43 | 127 | | 117 | 138 |
| 0,071 | 0,003959 | 0,000024 | 3,52 | 124 | | 114 | 134 |
| 0,08 | 0,005027 | 0,000030 | 4,47 | 97,5 | | 89,7 | 105 |
| 0,09 | 0,006362 | 0,000038 | 5,66 | 77,0 | ± 7 % | 70,9 | 83,2 |
| 0,1 | 0,007854 | 0,000047 | 6,99 | 62,4 | | 57,4 | 67,4 |
| 0,11 | 0,009503 | 0,000057 | 8,46 | 51,6 | | 48,0 | 55,2 |
| 0,112 | 0,009852 | 0,000059 | 8,77 | 49,7 | | 46,3 | 53,2 |
| 0,12 | 0,011310 | 0,000068 | 10,1 | 43,3 | | 40,3 | 46,4 |
| 0,125 | 0,012272 | 0,000074 | 10,9 | 39,9 | | 37,1 | 42,7 |
| 0,13 | 0,013273 | 0,000080 | 11,8 | 36,9 | | 34,3 | 39,5 |
| 0,14 | 0,015394 | 0,000092 | 13,7 | 31,8 | | 29,6 | 34,1 |
| 0,15 | 0,017671 | 0,000106 | 15,7 | 27,7 | | 25,8 | 29,7 |
| 0,16 | 0,020106 | 0,000121 | 17,9 | 24,4 | | 22,7 | 26,1 |
| 0,18 | 0,025447 | 0,000153 | 22,6 | 19,3 | ± 6 % | 17,9 | 20,6 |
| 0,2 | 0,031416 | 0,000188 | 28,0 | 15,6 | | 14,7 | 16,5 |
| 0,22 | 0,038013 | 0,000228 | 33,8 | 12,9 | | 12,1 | 13,7 |
| 0,224 | 0,039408 | 0,000236 | 35,1 | 12,4 | | 11,7 | 13,2 |
| 0,25 | 0,049087 | 0,000295 | 43,7 | 9,98 | | 9,38 | 10,6 |
| 0,28 | 0,061575 | 0,000369 | 54,8 | 7,96 | | 7,48 | 8,44 |
| 0,3 | 0,070686 | 0,000424 | 62,9 | 6,93 | ± 5 % | 6,52 | 7,35 |
| 0,315 | 0,077931 | 0,000468 | 69,4 | 6,29 | | 5,97 | 6,60 |
| 0,35 | 0,096211 | 0,000577 | 85,6 | 5,09 | | 4,84 | 5,35 |
| 0,355 | 0,098980 | 0,000594 | 88,1 | 4,95 | | 4,70 | 5,20 |
| 0,4 | 0,1257 | 0,0008 | 112 | 3,90 | | 3,70 | 4,09 |
| 0,45 | 0,1590 | 0,0010 | 142 | 3,08 | | 2,93 | 3,23 |
| 0,5 | 0,1963 | 0,0012 | 175 | 2,50 | ± 4 % | 2,37 | 2,62 |
| 0,55 | 0,2376 | 0,0014 | 211 | 2,06 | | 1,98 | 2,14 |
| 0,56 | 0,2463 | 0,0015 | 219 | 1,99 | | 1,91 | 2,07 |
| 0,6 | 0,2827 | 0,0017 | 252 | 1,73 | | 1,66 | 1,80 |
| 0,63 | 0,3117 | 0,0019 | 277 | 1,57 | | 1,51 | 1,63 |
| 0,65 | 0,3318 | 0,0020 | 295 | 1,48 | | 1,42 | 1,54 |
| 0,7 | 0,3848 | 0,0023 | 343 | 1,27 | | 1,22 | 1,32 |
| 0,71 | 0,3959 | 0,0024 | 352 | 1,24 | | 1,19 | 1,29 |
| 0,8 | 0,5027 | 0,0030 | 447 | 0,975 | | 0,936 | 1,014 |
| 0,9 | 0,6362 | 0,0038 | 566 | 0,770 | | 0,739 | 0,801 |
| 1,0 | 0,7854 | 0,0047 | 699 | 0,624 | | 0,599 | 0,649 |
| 1,12 | 0,9852 | 0,0059 | 877 | 0,497 | | 0,477 | 0,517 |
| 1,2 | 1,131 | 0,007 | 1007 | 0,433 | | 0,416 | 0,451 |
| 1,25 | 1,227 | 0,007 | 1092 | 0,399 | | 0,383 | 0,415 |
| 1,4 | 1,539 | 0,009 | 1370 | 0,318 | | 0,306 | 0,331 |
| 1,5 | 1,767 | 0,011 | 1573 | 0,277 | | 0,266 | 0,288 |
| 1,6 | 2,011 | 0,012 | 1789 | 0,244 | | 0,234 | 0,253 |
| 1,8 | 2,545 | 0,015 | 2265 | 0,193 | | 0,185 | 0,200 |
| 2,0 | 3,142 | 0,019 | 2796 | 0,156 | | 0,150 | 0,162 |
| 2,2 | 3,801 | 0,023 | 3383 | 0,129 | | 0,124 | 0,134 |
| 2,24 | 3,941 | 0,024 | 3507 | 0,124 | | 0,119 | 0,129 |
| 2,5 | 4,909 | 0,029 | 4369 | 0,0998 | | 0,0958 | 0,1038 |
| 2,8 | 6,158 | 0,037 | 5480 | 0,0796 | | 0,0764 | 0,0828 |
| 3,0 | 7,069 | 0,042 | 6291 | 0,0693 | | 0,0665 | 0,0721 |
| 3,15 | 7,793 | 0,047 | 6936 | 0,0629 | | 0,0604 | 0,0654 |
| 3,2 | 8,042 | 0,048 | 7158 | 0,0609 | | 0,0585 | 0,0634 |
| 3,5 | 9,621 | 0,058 | 8563 | 0,0509 | | 0,0489 | 0,0530 |
| 3,55 | 9,898 | 0,059 | 8809 | 0,0495 | | 0,0475 | 0,0515 |
| 4,0 | 12,57 | 0,08 | 11184 | 0,0390 | | 0,0374 | 0,0406 |
| 4,5 | 15,90 | 0,10 | 14155 | 0,0308 | | 0,0296 | 0,0320 |
| 5,0 | 19,63 | 0,12 | 17475 | 0,0250 | | 0,0240 | 0,0260 |
| 5,5 | 23,76 | 0,14 | 21145 | 0,0206 | | 0,0198 | 0,0214 |
| 5,6 | 24,63 | 0,15 | 21921 | 0,0199 | | 0,0191 | 0,0207 |
| 6,0 | 28,27 | 0,17 | 25164 | 0,0173 | | 0,0166 | 0,0180 |
| 6,3 | 31,17 | 0,19 | 27743 | 0,0157 | | 0,0151 | 0,0163 |
| 8,0 | 50,27 | 0,30 | 44736 | 0,00975 | | 0,00936 | 0,0101 |