ISABELLENHÜTTE

# ISAOHM®

| Brand Name | ISAOHM® 1) |
|---|---|
| Material Code | 2.4872 |
| Abbreviation | NiCr20AlSi |

Chemical Composition (mass components) in %
Average values of alloy components

| Ni | Cr | Al | Si | Mn | Fe |
|---|---|---|---|---|---|
| Rem. | 20 | 3.5 | 1 | 0.5 | 0.5 |

## Form of Delivery

ISAOHM® is supplied in the form of round wire in the dimension 0.6 to 0.01 mm Ø in bare, oxidized (non-insulating oxide film) or enamelled condition.

To a limited extent flat wires and stranded wires are also manufactured.

## Properties and Application Notes

ISAOHM® is especially characterized by its high resistivity, the low temperature coefficient, the low thermal EMF versus Copper, the high tensile strength and the high resistance to oxidation and chemical corrosion. The alloy is non-magnetic. ISAOHM® is suitable for high-value resistors and potentiometers for example for the automotive and consumer electronics industries as well as for testing and automatic control equipment. ISAOHM® is also used for heating cords and cables. When used as materiel for high precision resistors the maximum working temperature in air is 250 °C. The maximum working temperature in air is 250 °C; at higher temperatures the resistivity and temperature coefficient may be affected irreversibly. For others applications, for heating cords for instance, it can be used at higher temperatures, especially in non-oxidating atmosphere.

## Electrical Resistance in Annealed Condition

| Temperature coefficient of electrical resistance between | Electrical resistivity[2] in: µΩ x cm (first line) and Ω/CMF (second line) Reference Values | | | | | |
|---|---|---|---|---|---|---|
| 20 °C and 105 °C | 20 °C | 100 °C | 200 °C | 300 °C | 400 °C | 500 °C |
| $10^{-6}$/K | tolerance ±5 % | | | | | |
| **Stand.: -50 to +50** | **132** | **132** | **132** | **-** | **-** | **-** |
| **Special: ±3, ±10** | **794** | **794** | **794** | **-** | **-** | **-** |

## 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 |
|---|---|---|---|---|---|---|---|
| | | | | | 100 °C | 400 °C | |
| g/cm³ | lb/cub in | °C | J/g K | W/m K | $10^{-6}$/K | $10^{-6}$/K | µV/K |
| **8.0** | **0.29** | **1400** | **0.46** | **14** | **14** | **15** | **+1** |

## Strength Properties at 20 °C in Annealed Condition

| Tensile Strength[3] | | 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 |
| **1000** | **145000** | **≈ 8** | **≈ 15** | **≈ 20** | **≥ 20** | **-** |

*1) ISAOHM® is a registered registered trademark of Isabellenhütte Heusler GmbH & Co. KG.*
*2) The resistivity of nickel-chromium alloys can be modified by special heat treatment (see Technical Information).*
*3) This value applies to wires of 0.6 mm Ø. For thinner wires the minimum values will substantially increase, depending on the dimension.*

## Notes on Treatment

ISAOHM® can easily be welded and brazed. Under certain conditions soldering is possible (see *Technical Information*).

## Special Remarks on the Temperature Coefficient (TC)

**(for further technical details please see *Technical Information*)**

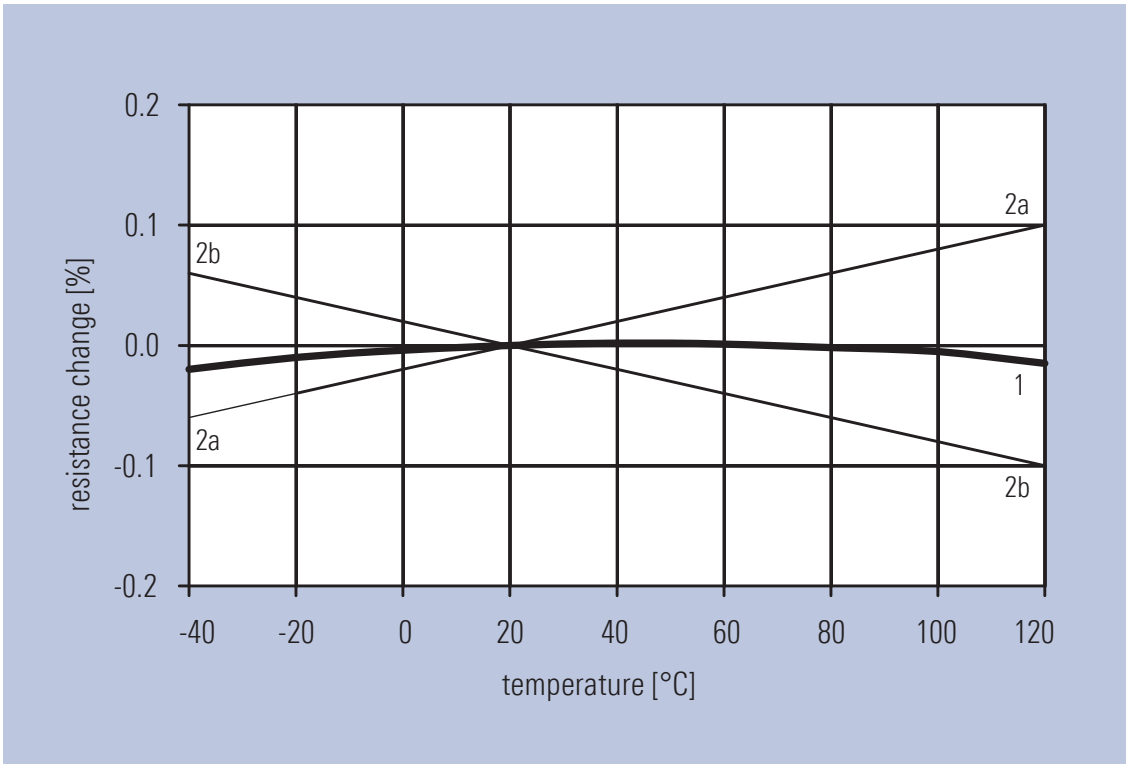
The temperature dependence of ISAOHM® in the range between -40 and 120 °C, referred to 20 °C, is shown in graph 1, page 10.
Curve 1 represents the typical R(T)-curve. Due to the very flat behaviour between 20 and 60 °C TC-values as low as 1 ppm/K can be produced.
The straight lines 2a and 2b apply to a TC = ±10 ppm/K. Wires with a temperature coefficient in this range meet the requirements of DIN 46463 and can be used as precision resistance wires.

# ISAOHM®

| Nominal Diameter d mm | Cross Section mm² | Weight per 100 m g | DC Resistance Referred to Length at 20 °C Ω / m | | | |
|---|---|---|---|---|---|---|
| | | | Nominal Value | Tolerance | Minimum Value | Maximum Value |
| 0.01 | 0.00007854 | 0.0628 | 16807 | ± 10 % | 15126 | 18487 |
| 0.011 | 0.00009503 | 0.0760 | 13890 | | 12501 | 15279 |
| 0.013 | 0.0001327 | 0.106 | 9945 | | 8950 | 10939 |
| 0.014 | 0.0001539 | 0.123 | 8575 | | 7717 | 9432 |
| 0.016 | 0.0002011 | 0.161 | 6565 | | 5909 | 7222 |
| 0.018 | 0.0002545 | 0.204 | 5187 | | 4669 | 5706 |
| 0.02 | 0.0003142 | 0.251 | 4202 | ± 8 % | 3866 | 4538 |
| 0.022 | 0.0003801 | 0.304 | 3473 | | 3195 | 3750 |
| 0.025 | 0.0004909 | 0.393 | 2689 | | 2474 | 2904 |
| 0.028 | 0.0006158 | 0.493 | 2144 | | 1972 | 2315 |
| 0.03 | 0.0007069 | 0.565 | 1867 | | 1718 | 2017 |
| 0.032 | 0.0008042 | 0.643 | 1641 | | 1510 | 1773 |
| 0.036 | 0.001018 | 0.814 | 1297 | | 1193 | 1401 |
| 0.04 | 0.001257 | 1.01 | 1050 | | 966 | 1135 |
| 0.045 | 0.001590 | 1.27 | 830 | | 764 | 896 |
| 0.05 | 0.001963 | 1.57 | 672 | | 619 | 726 |
| 0.056 | 0.002463 | 1.97 | 536 | | 493 | 579 |
| 0.06 | 0.002827 | 2.26 | 467 | | 430 | 504 |
| 0.063 | 0.003117 | 2.49 | 424 | | 390 | 457 |
| 0.07 | 0.003848 | 3.08 | 343 | | 316 | 370 |
| 0.071 | 0.003959 | 3.17 | 333 | | 307 | 360 |
| 0.08 | 0.005027 | 4.02 | 263 | | 242 | 284 |
| 0.09 | 0.006362 | 5.09 | 208 | | 191 | 224 |
| 0.10 | 0.007854 | 6.28 | 168 | | 155 | 182 |
| 0.11 | 0.009503 | 7.60 | 139 | ± 5 % | 132 | 146 |
| 0.112 | 0.009852 | 7.88 | 134 | | 127 | 141 |
| 0.12 | 0.01131 | 9.05 | 117 | | 111 | 123 |
| 0.125 | 0.01227 | 9.82 | 108 | | 102 | 113 |
| 0.13 | 0.01327 | 10.6 | 99.4 | | 94.5 | 104 |
| 0.14 | 0.01539 | 12.3 | 85.7 | | 81.5 | 90.0 |
| 0.15 | 0.01767 | 14.1 | 74.7 | | 71.0 | 78.4 |
| 0.16 | 0.02011 | 16.1 | 65.7 | | 62.4 | 68.9 |
| 0.18 | 0.02545 | 20.4 | 51.9 | | 49.3 | 54.5 |
| 0.20 | 0.03142 | 25.1 | 42.0 | | 39.9 | 44.1 |
| 0.22 | 0.03801 | 30.4 | 34.7 | | 33.0 | 36.5 |
| 0.224 | 0.03941 | 31.5 | 33.5 | | 31.8 | 35.2 |
| 0.25 | 0.04909 | 39.3 | 26.9 | | 25.5 | 28.2 |
| 0.28 | 0.06158 | 49.3 | 21.4 | | 20.4 | 22.5 |
| 0.30 | 0.07069 | 56.5 | 18.7 | | 17.7 | 19.6 |
| 0.315 | 0.07793 | 62.3 | 16.9 | | 16.1 | 17.8 |
| 0.35 | 0.09621 | 77.0 | 13.7 | | 13.0 | 14.4 |
| 0.355 | 0.09898 | 79.2 | 13.3 | | 12.7 | 14.0 |
| 0.40 | 0.1257 | 101 | 10.5 | | 9.98 | 11.0 |
| 0.45 | 0.1590 | 127 | 8.30 | | 7.88 | 8.71 |
| 0.50 | 0.1963 | 157 | 6.72 | | 6.39 | 7.06 |
| 0.55 | 0.2376 | 190 | 5.56 | | 5.28 | 5.83 |
| 0.56 | 0.2463 | 197 | 5.36 | | 5.09 | 5.63 |
| 0.60 | 0.2827 | 226 | 4.67 | | 4.44 | 4.90 |
| 0.63 | 0.3117 | 249 | 4.23 | | 4.02 | 4.45 |
| 0.65 | 0.3318 | 266 | 3.98 | | 3.78 | 4.18 |
| 0.70 | 0.3848 | 308 | 3.43 | | 3.26 | 3.60 |
| 0.71 | 0.3959 | 317 | 3.33 | | 3.17 | 3.50 |

# ISAOHM®

*Graph 1*
*Electrical Resistance vs. Temperature*




*Graph 2*
*Electrical Resistance vs. Temperature*