

FROM HIDDEN DEPTHS COMES UNEXPECTED POWER



PRECISION ALLOYS



ISABELLENHÜTTE

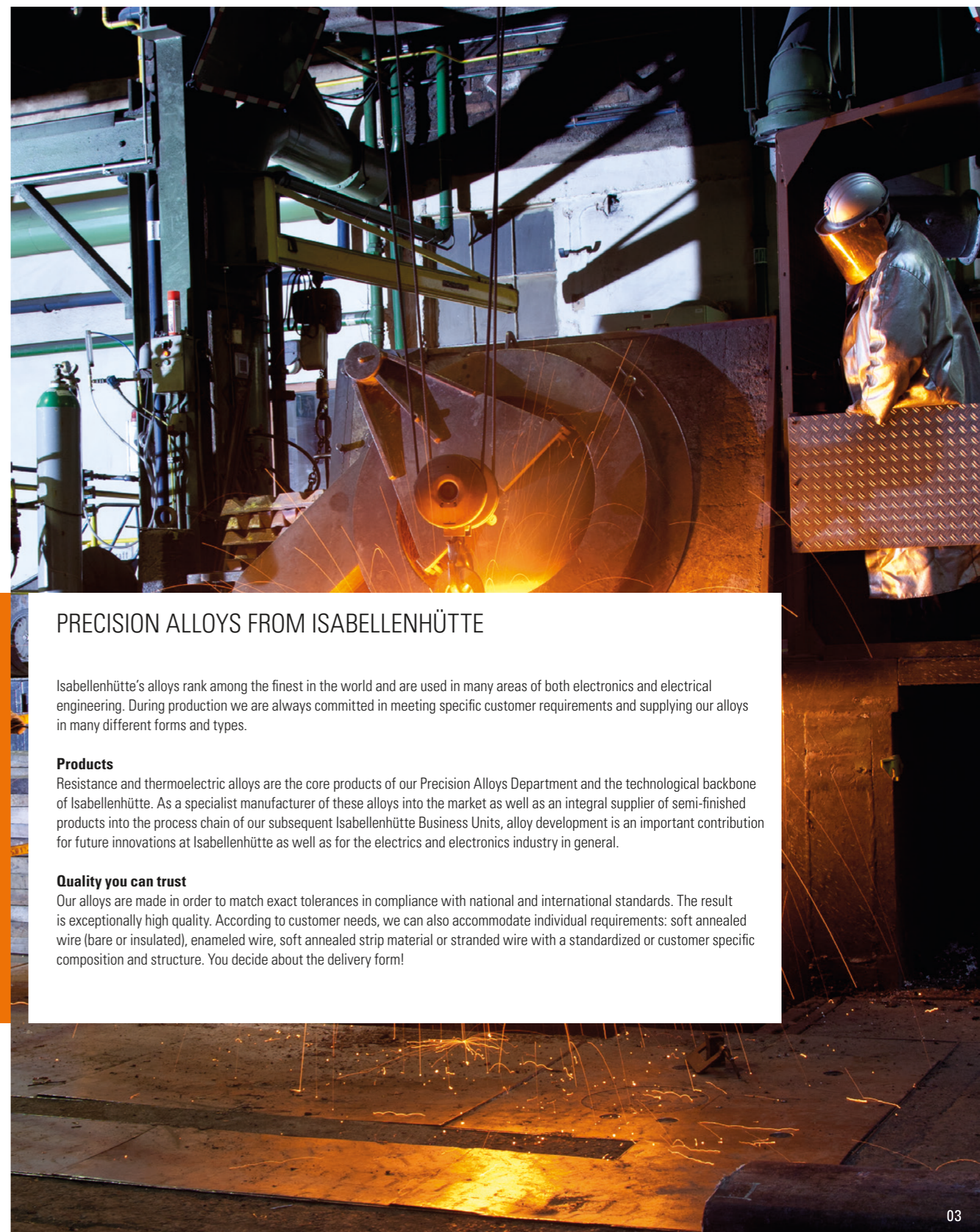
Innovation by Tradition

ISABELLENHÜTTE HEUSLER GMBH & CO. KG

Our company is one of the world's leading manufacturers of electrical resistance and thermoelectric alloys for temperature measurement and a well known manufacturer of passive components for the automotive, electrical and electronics industries. Precision measurement systems from Isabellenhütte set the industry benchmark for current, voltage and temperature measurement in cars and trucks, hybrid and electric vehicles, as well as in industrial and renewable energy generating systems.

As a globally renowned specialist and technology leader, our innovative products consistently redefine the state of the art while showcasing Isabellenhütte's technical and innovative capabilities. Our success is driven by the continuous development of innovative products, new technologies and sophisticated manufacturing processes. In addition, we concentrate on a wide range of production steps and proprietary technologies in-house. This ranges from the production of alloys as well as forming and separating to coating and standing for both standard and customer-specific requirements.

Innovation by Tradition



**Typical applications:**

|                         |                                |
|-------------------------|--------------------------------|
| Compensation leads      | Circuit breakers               |
| Strain gauges           | Signal lines                   |
| Level sensors           | Seat heaters                   |
| Floor heating systems   | Plug connectors                |
| Coiled filaments        | Tank container heating systems |
| Hard solders            | Thermocouples                  |
| Heating cables          | Thermoelectric leads           |
| Heated hoses            | Airfoil de-icers               |
| Mineral-insulated wires | Resistors                      |
| Quick cups              | Resistance thermometers        |
| Rail heating systems    | Ignition and lighting systems  |

All of our alloys are made from pure nonferrous materials, e.g. Cu, Ni, Mn, Si, Cr, Al, Sn and Co.

PRECISION ALLOYS FROM ISABELLENHÜTTE

Isabellenhütte's alloys rank among the finest in the world and are used in many areas of both electronics and electrical engineering. During production we are always committed in meeting specific customer requirements and supplying our alloys in many different forms and types.

**Products**

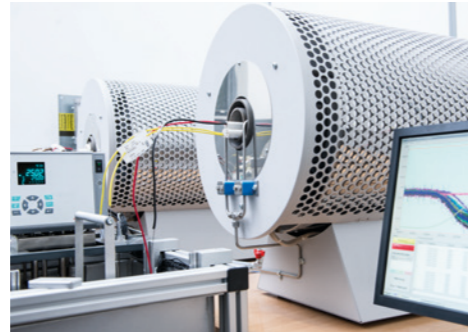
Resistance and thermoelectric alloys are the core products of our Precision Alloys Department and the technological backbone of Isabellenhütte. As a specialist manufacturer of these alloys into the market as well as an integral supplier of semi-finished products into the process chain of our subsequent Isabellenhütte Business Units, alloy development is an important contribution for future innovations at Isabellenhütte as well as for the electrics and electronics industry in general.

**Quality you can trust**

Our alloys are made in order to match exact tolerances in compliance with national and international standards. The result is exceptionally high quality. According to customer needs, we can also accommodate individual requirements: soft annealed wire (bare or insulated), enameled wire, soft annealed strip material or stranded wire with a standardized or customer specific composition and structure. You decide about the delivery form!



Alloy development



Temperature measurement



Current measurement



Signal and current transmission



Joining technology



Heat generation

## ALLOY DEVELOPMENT //



OUR PILOT PLANT ENABLES THE PRODUCTION OF SMALL QUANTITIES

We have been manufacturing innovative electronic non-ferrous copper/nickel based alloys for decades. Besides copper/nickel alloys, we are also able to melt customer specific alloys and alloy compositions in our pilot plant (sample furnace). Sample quantities and batch weights between 100 g and 20 kg are possible.

We are your experienced partner for the production of even the smallest quantities for development processes, feasibility and proof of concept studies, prototype production or special applications and offer the following services:

- Melting of sample batches of up to 20 kg in atmosphere or vacuum
- Casting geometry, generally as ingot or bar
- Further mechanical hot or cold processing to wire, strip material or flat wire
- Wafering (sliced or polished and separated chips)
- Heat treatment up to 1,100 °C in air, vacuum or inert atmosphere

Analytics Facilities

- Characterization of material features (electrical, mechanical and microstructural)
- Extensive laboratory analytical equipment, e.g.:
  - SEM-EDX
  - ICP-OES and RFA elemental analysis
  - Oxygen, Nitrogen and Hydrogen elemental analysis
  - X-ray analysis

## TEMPERATURE MEASUREMENT //



OPTIMISATION OF PRECISE TEMPERATURE MEASUREMENT

Thermocouples, which are mainly used in the industry and medical engineering, use the so-called Seebeck effect. Two different electrical conductors (legs) are connected to a circuit. If the junctions of the two different conductors have two different temperature levels, a thermoelectric voltage is generated. This voltage can be converted for temperature measurement purposes.

Our broad range of thermoelectric alloys comprises the types K, J, T, E, L and U. Furthermore, we produce alloys for compensation leads for the types B, C, D, R and S.

Type K is the thermocouple which is most frequently used. For this type we recommend our **ISATHERM® PLUS** as the positive leg and our **ISATHERM® MINUS** as the negative leg. Beside this Type N (Nicrosil-Nisil) becomes more and more significant. Since the standards and requirements of the industry are becoming more and more complex, we are optimising the common types up to one half or one third of class 1 (according to IEC 60584).

Thermoelectric alloys at a glance:

- Alloys for thermocouples, thermoelectric leads and compensation leads
- Temperature range from -40°C to +1,200°C
- Compliance with all common international standards
- With respect to precision, tolerance values that account for one third of class 1 in the IEC 60584 tolerance classes and a half of Special Tolerance in ASTM 230 are also permitted
- Special requirements with regard to thermoelectric voltage and dimensional tolerances or special thermoelectric voltages, e.g. for mineral-insulated wires, can also be fulfilled

## CURRENT MEASUREMENT //



BEST POSSIBLE RESISTANCE MATERIALS

Sustained stability is extremely important for a sensor. That is why resistance materials have to be corrosion-proof and have to experience metallurgical changes in structure and state.

Our alloys **MANGANIN®**, **ZERANIN®**, **ISA OHM®** and **NOVENTIN®** are homogenous solid-solution alloys and meet these requirements optimally because they are annealed and stabilised in the primary thermodynamic state. These alloys guarantee stability values in the ppm range per annum.

**MANGANIN®**

- Copper-manganese-nickel alloy
- Medium specific resistance
- Very low TCR and low thermoelectric EMF

**ZERANIN®**

- Copper-manganese-tin alloy
- Low-ohmic alternative to **MANGANIN®**
- Improved TCR compared to **MANGANIN®**

**ISA OHM®**

- Nickel, chrome and additives from aluminium, silicon, manganese and iron
- High specific resistance
- Low TCR

**NOVENTIN®**

- Copper-manganese-nickel alloys
- Closes the gap of the specific resistance between **MANGANIN®** and **ISA OHM®**
- TCR ±10 ppm/K

## SIGNAL AND CURRENT

### TRANSMISSION //



ISA-CON® WIRES FOR HIGH ELECTRICAL CONDUCTIVITY

Copper is frequently used as an electrical conductor. It has a number of disadvantages, including low tensile strength, low mechanical hardness and limited bending strength. Therefore, materials of a higher quality are required for the optimisation of conductor cross sections. The materials we use for **ISA-CON®** wires are characterised by the absorption of very high strain loads without any plastic deformation, as well as by high alternating loads at current-conducting contacts. Particularly noteworthy also is the high electrical conductivity, together with mechanically optimised features.

**ISA-CON®**

- Electrical conductivity of up to 90% IACS
- Mechanical strength of up to 1,400 MPa
- The characteristics of the materials remain even during a long use and in high temperatures

## JOINING TECHNOLOGY //



ISA-BRAZE® – THE HIGH TEMPERATURE SOLDER FOR ALL COMMON MATERIALS

During soldering a metallic workpiece is combined with a melted metal (solder). There is a difference between soft soldering and brazing. During soft soldering, the liquidus temperature is below +450°C; during brazing, it is above. If the temperature rises to more than +900°C, it is called high-temperature soldering, the flux-free soldering under the exclusion of air.

**ISA-BRAZE®** is a brazing alloy which is ideally suitable for the use as a high temperature solder. With this alloy, all common materials, particularly hard metals, can be soldered.

**ISA-BRAZE®**

- No additional fluxes necessary
- Superb surface quality
- No adjustment work necessary

## HEAT GENERATION //



HEAT CONDUCTOR ALLOYS

For a long time, heat losses of an electrical conductor supplied with current have been used for electrical trace heating – in the industry as well as in the automotive sector.

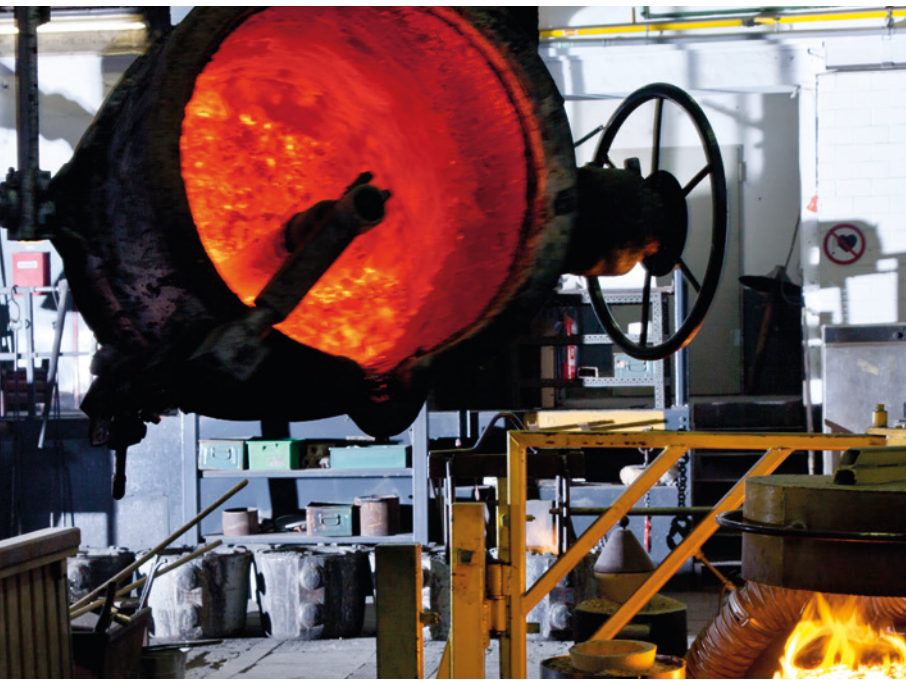
For this purpose we have developed heat conductor alloys, consisting of copper-based alloys or nickel-based alloys, depending on the temperature range. Both can be easily processed and are corrosion-proof.

Our alloys are characterised by narrow tolerances and the very good long-term stability of the electrical features, as well as by their conductivity and the temperature coefficient of the specific electrical resistance. The highest application temperature in air of our alloys is +1,200°C. Our broad portfolio offers the optimum solution for each heat generation application.



CONTACT

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**Quality standards**

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DIN EN ISO 9001:2015

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IATF 16949:2016

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DIN EN ISO 14001/

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DIN EN ISO 50001

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RoHS 2011/65/EU

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REACH 1907/2006

.....  
Authorised Economic Operator  
(AEO)

.....  
AEO-F certificate

.....  
(Customs simplification,  
security and safety)

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European Space Agency (ESA)



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Calibration Laboratory Accredited  
by DIN EN ISO/IEC 17025:2005



**ISABELLENHÜTTE**

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