

# BUILT FOR AEROSPACE TECHNOLOGY



RESISTORS FOR AEROSPACE APPLICATIONS



**ISABELLENHÜTTE**

Innovation by Tradition

## ISABELLENHÜTTE IS ALWAYS ON BOARD

In renowned European aerospace projects, the quality of Isabellenhütte is trusted in:

### Galileo

Since December 28, 2005, the navigation systems of the GIO VE-A satellites have been equipped with measuring resistors from Isabellenhütte. Until today, almost 30 satellites have been used successfully in outer space.

### Solar Panel

The battery management systems of various satellites have been equipped with Isabellenhütte resistors.

### Jules Verne

The precision and reliability of Isabellenhütte's products have also been trusted in for the equipment of the ATV (Automated Transfer Vehicle), the European equivalent of the Space Shuttle.

### JUICE – JUpiter ICy moons Explorer

Is the first large-class mission in ESA's Cosmic Vision 2015-2025 programme.

### Board Electronics

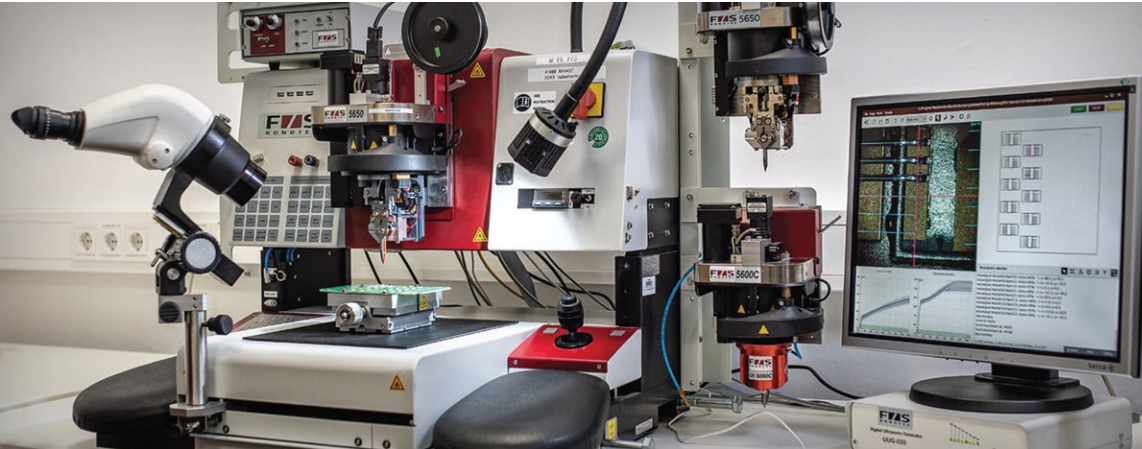
Voltage regulator in satellites.

### Power Supplies

Used in DC/DC converters for the decentralized energy distribution in satellites and helicopters.



## WORKING FOR THE AEROSPACE INDUSTRY FOR MORE THAN TWENTY YEARS



Whenever highest reliability, precision and longevity are required, there is no way around the low-ohmic precision and power resistors from Isabellenhütte. It is not without reason that we have been supplying measuring resistors to the aerospace industry for more than twenty years. We always meet the toughest quality standards and consider our customers' individual requirements (ESCC 4001). In addition, the SnPb-tinned contacts avoid the forming of whisker and thus short circuits in many applications.

### **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 capability. Our success is driven by the continuous development of innovative products, new technologies and sophisticated manufacturing processes. In addition, we concentrate a wide range of production steps and proprietary technologies in-house. Our expertise extends from alloy production and forming through etching and assembly to complex automated testing and packaging.

Innovation by Tradition

## AVAILABLE STANDARD VALUES

### SMP // size 2010

SMP-R010-0.5-PW
SMP-R010-1.0-PW
SMP-R015-1.0-PW
SMP-R018-1.0-PW
SMP-R020-0.5-PW
SMP-R020-1.0-PW
SMP-R025-0.5-PW
SMP-R025-1.0-PW
SMP-R027-0.5-PW
SMP-R027-1.0-PW
SMP-R033-0.5-PW
SMP-R033-1.0-PW
SMP-R039-1.0-PW
SMP-R047-0.5-PW
SMP-R047-1.0-PW
SMP-R050-0.5-PW
SMP-R050-1.0-PW
SMP-R056-0.5-PW
SMP-R056-1.0-PW
SMP-R082-1.0-PW
SMP-R100-0.5-PW
SMP-R100-1.0-PW
SMP-R180-1.0-PW
SMP-R200-0.5-PW
SMP-R200-1.0-PW
SMP-R220-0.5-PW
SMP-R220-1.0-PW
SMP-R330-0.5-PW
SMP-R330-1.0-PW
SMP-R390-0.5-PW
SMP-R390-1.0-PW
SMP-R470-0.5-PW
SMP-R470-1.0-PW
SMP-R500-0.5-PW
SMP-R560-1.0-PW
SMP-R820-1.0-PW
SMP-1R00-0.5-PW
SMP-1R00-1.0-PW

### SMS // size 2512

SMS-R005-1.0-PW
SMS-R008-0.5-PW
SMS-R010-0.5-PW
SMS-R010-1.0-PW
SMS-R015-0.5-PW
SMS-R015-1.0-PW
SMS-R020-1.0-PW
SMS-R022-1.0-PW
SMS-R027-0.5-PW
SMS-R027-1.0-PW
SMS-R033-0.5-PW
SMS-R033-1.0-PW
SMS-R040-1.0-PW
SMS-R047-1.0-PW
SMS-R050-0.5-PW
SMS-R050-1.0-PW
SMS-R056-1.0-PW
SMS-R068-0.5-PW
SMS-R068-1.0-PW
SMS-R082-0.5-PW
SMS-R100-0.5-PW
SMS-R100-1.0-PW
SMS-R120-1.0-PW
SMS-R150-0.5-PW
SMS-R150-1.0-PW
SMS-R180-0.5-PW
SMS-R180-1.0-PW
SMS-R200-1.0-PW
SMS-R220-0.5-PW
SMS-R220-1.0-PW
SMS-R330-0.5-PW
SMS-R330-1.0-PW
SMS-R390-1.0-PW
SMS-R470-1.0-PW
SMS-R500-1.0-PW
SMS-R560-1.0-PW
SMS-R680-0.5-PW
SMS-R680-1.0-PW
SMS-1R00-0.5-PW
SMS-1R00-1.0-PW

### SMT // size 2817

SMT-R004-1.0-PW	SMT-R330-1.0-PW
SMT-R005-0.5-PW	SMT-R390-1.0-PW
SMT-R005-1.0-PW	SMT-R470-0.5-PW
SMT-R008-0.5-PW	SMT-R470-1.0-PW
SMT-R010-0.5-PW	SMT-R500-0.5-PW
SMT-R010-1.0-PW	SMT-R560-1.0-PW
SMT-R015-0.5-PW	SMT-R680-0.5-PW
SMT-R015-1.0-PW	SMT-R680-1.0-PW
SMT-R018-0.5-PW	SMT-R820-1.0-PW
SMT-R020-0.5-PW	SMT-1R00-0.5-PW
SMT-R020-1.0-PW	SMT-1R00-1.0-PW
SMT-R022-0.5-PW	SMT-2R00-0.5-PW
SMT-R022-1.0-PW	SMT-2R00-1.0-PW
SMT-R025-1.0-PW	
SMT-R027-0.5-PW	
SMT-R030-0.5-PW	
SMT-R033-1.0-PW	
SMT-R039-0.5-PW	
SMT-R039-1.0-PW	
SMT-R040-1.0-PW	
SMT-R047-0.5-PW	
SMT-R047-1.0-PW	
SMT-R050-0.5-PW	
SMT-R050-1.0-PW	
SMT-R056-0.5-PW	
SMT-R060-0.5-PW	
SMT-R068-1.0-PW	
SMT-R082-0.5-PW	
SMT-R100-0.5-PW	
SMT-R100-1.0-PW	
SMT-R120-1.0-PW	
SMT-R150-1.0-PW	
SMT-R180-0.5-PW	
SMT-R180-1.0-PW	
SMT-R200-0.5-PW	
SMT-R220-0.5-PW	
SMT-R220-1.0-PW	
SMT-R270-0.5-PW	
SMT-R270-1.0-PW	
SMT-R330-0.5-PW	



You can find further resistance values under:  
[www.isabellenuetteusa.com/aerospace/](http://www.isabellenuetteusa.com/aerospace/)

**SMV // size 4723**

SMV-R0033-1.0-PW	SMV-R022-0.5-PW	SMV-R068-0.5-PW	SMV-R220-1.0-PW
SMV-R0039-1.0-PW	SMV-R022-1.0-PW	SMV-R068-1.0-PW	SMV-R270-1.0-PW
SMV-R005-1.0-PW	SMV-R027-0.5-PW	SMV-R082-0.5-PW	SMV-R330-0.5-PW
SMV-R0068-1.0-PW	SMV-R033-0.5-PW	SMV-R100-0.5-PW	SMV-R330-1.0-PW
SMV-R010-0.5-PW	SMV-R033-1.0-PW	SMV-R100-1.0-PW	SMV-R470-0.5-PW
SMV-R010-1.0-PW	SMV-R039-0.5-PW	SMV-R120-1.0-PW	SMV-R470-1.0-PW
SMV-R015-0.5-PW	SMV-R039-1.0-PW	SMV-R150-0.5-PW	SMV-R560-0.5-PW
SMV-R015-1.0-PW	SMV-R047-0.5-PW	SMV-R150-1.0-PW	SMV-R680-0.5-PW
SMV-R018-0.5-PW	SMV-R047-1.0-PW	SMV-R180-0.5-PW	SMV-R680-1.0-PW
SMV-R018-1.0-PW	SMV-R050-1.0-PW	SMV-R180-1.0-PW	SMV-1R00-0.5-PW
SMV-R020-0.5-PW	SMV-R056-0.5-PW	SMV-R200-1.0-PW	SMV-1R00-1.0-PW
SMV-R020-1.0-PW	SMV-R056-1.0-PW	SMV-R220-0.5-PW	

**PRECISION AND POWER RESISTORS**

Modern precision resistors for current measurement have to meet many requirements, such as a small temperature coefficient, a low thermal EMF, high long-term stability, low inductance and a high load capacity. Due to the fact that these properties are influenced by the resistance material as well as by type, we differentiate between two manufacturing technologies: ISA-PLAN® and ISA-WELD®. Whether standard modules or heavily loadable power resistors – our products meet the highest requirements.

**ISA-PLAN® AND ISA-WELD® TECHNOLOGY**

Both technologies are ideally suitable for the manufacturing of precision resistors in the value range of 2.2 mOhm to 2 Ohm. The planar structure permits a simple realization of the 4-terminal connection technology, enabling the generation of temperature coefficients of 10 ppm/K, even with values below 10 mOhm, with a large reproducibility. Due to its low inductance structures, these components are ideally suitable for the use in clocked power electronics.

**ISA-PLAN®**

ISA-PLAN® resistors are manufactured of MANGANIN®, NOVENTIN® and ZERANIN® material, using etching technology. The material is electrically insulated and mounted on a metal substrate with good thermal conductivity. The shunts are predestined for precision applications due to their extremely low thermal EMF and their very high long-term stability. As a result, the heat conduction into the substrate, together with its high thermal capacity, provides excellent pulse and continuous power rating.

**ISA-WELD®**

ISA-WELD® resistors are stamped from solid electron-beam welded composite material consisting of copper in combination with one of our resistance alloys, e. g. MANGANIN® or ZERANIN®. The resistors can be adapted by means of stamping and bending to suit almost any shape and application. Further benefits are given by the comparably low input resistance of the copper terminals, their high thermal conductivity respectively their heat storage capacity and the resulting current density and heat dissipation within the shunt. ISA-WELD® shunts are particularly suitable for extremely low-ohmic values (in the range of 0.5 to 5 mOhm). They are available as SMD or busbar assembly.

**QUALIFICATIONS**

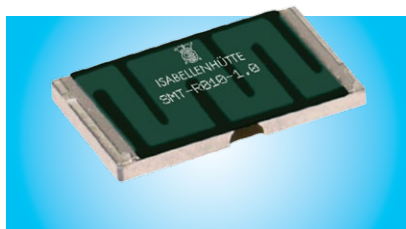
- ESCC 4001/027 and ESCC 4001/028 for aerospace applications
- Customer-specific qualification

**QUALITY**

- SnPb tinning of the contacts
- Certified according IATF 16949 / ISO 9001
- 100 % control
- Clearly retraceable due to gapless documentation
- Date code labeling

**SERVICE**

- Application-oriented support
- Simulation of your conditions of use
- Component optimization for critical applications
- SMD test board for first trials
- Comprehensive documentations
- Standard values can be supplied with SnPb-tinned contacts



# ISABELLENHÜTTE. A NAME YOU SHOULD REMEMBER.

Isabellenhütte has a 500-year history. Seems impossible, right? But it's true. There are records that take us back to 1482. The company became Isabellenhütte in 1728 and has been owned since 1827 by the Heusler family. This exceptional history makes Isabellenhütte one of the oldest family-run industrial companies in the world. But at the same time, we're one of the most modern – by always keeping ahead of customer needs. What began over 500 years ago with the smelting of copper has developed into a high-tech provider of international importance.

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## QUALITY STANDARDS

DIN EN ISO 9001:2015

IATF 16949:2016

DIN EN ISO 14001/

DIN EN ISO 50001/

DIN EN ISO 45001

REACH / RoHS 2011/65/EU

AEO-F-certificate

Calibration Laboratory Accredited

DIN EN ISO/IEC 17025:2005



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