BEHIND THE SCENES WE PLAY A MAJOR ROLE

PRECISION MEASUREMENT SYSTEMS

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. In the three corporate divisions of Isabellenhütte – precision measurement technology, precision alloys and precision and power resistors – we are implementing solutions for the technological challenges of tomorrow. The decisive foundation for this is continuous research and development, which is of special significance in our company.

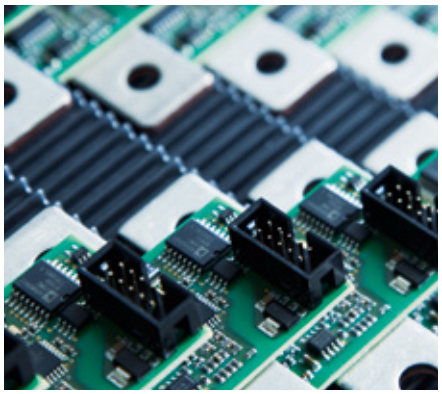
As a globally renowned specialist and technology leader, our innovative products consistently redefine the state of the art while showcasing Isabellenhütte's technical and innovative capability. Our success is driven by the continuous development of innovative products, new technologies and sophisticated 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 wet chemical processes and assembly to complex automated testing and packaging.

These diverse domains interact with each other in a unique way in order to accomplish the highest vertical range of integration possible in our added value process. The concentration of all our production steps in one location – from melting over the rolling mill, the wire drawing plant until the complete component and measuring module manufacturing – ensures a flexible and completely independent production. This way, we always guarantee the highest quality, since development, production, quality management and quality assurance lie always in our own hands.

Innovation by Tradition

Innovation as inner drive // **04**

We have a tradition of setting standards. Our ISAscale® precision measuring systems make us global leaders in determining the “right” values.



Sensors for every application and requirement

Quality standards

DIN EN ISO 9001:2008
DIN EN ISO TS 16949:2009
DIN EN ISO 14001/DIN EN ISO 50001
RoHS 2011/65/EU
Authorised Economic Operator (AEO)
AEO-F-Certificate
(Customs simplification, security and safety)
Preferred Supplier for FIA Formula 1/E

European Space Agency (ESA)

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

ilac-MRA
DAkkS Deutsche Akkreditierungsstelle D-K-19500-01-00

INNOVATION AS INNER DRIVE

The field of measurement technology pools the over 500-year tradition of technical innovations. In this field too, with comprehensive know-how, process-oriented work and exceptional performance data we set standards in the high precision measurement of current and voltage. The precision measurement systems of Isabellenhütte are combined under the brand name ISAscale®. Besides in passenger cars and trucks, ISAscale®-systems are also applied in the new electric drive technology; furthermore in renewable energy systems, industrial drive technology, railway and marine technology and power supply. In addition, we develop customer specific solutions while utilizing the latest techniques, components and processes.

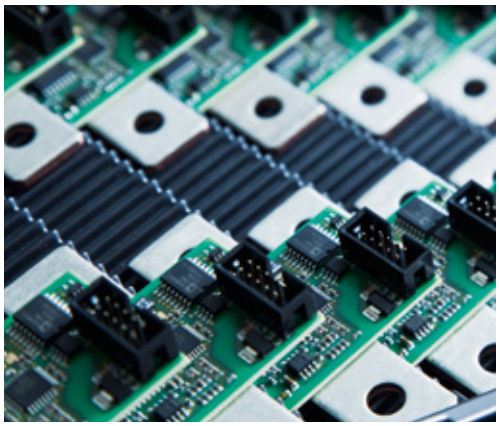
"With our modular design concept we are able to implement customer specific solutions for current, voltage and temperature measurement quickly and at low cost."

ENHANCE THE SHUNT TECHNOLOGY DEVELOPMENT

We possess decades of experience in the production of shunts and precise resistors. With ISA-WELD® and ISA-PLAN® we have developed an advanced shunt technology, which is applied in our precision measurement products in order to achieve our high standard of product quality. With those shunts and the simple formula

$$I = \frac{U}{R}$$

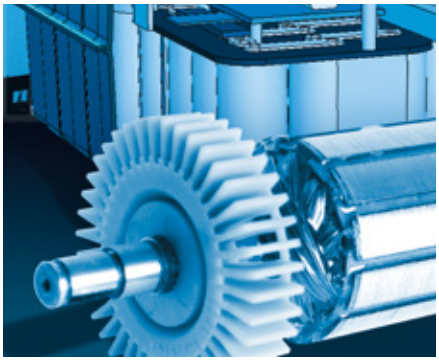
we are able to measure current the most precise way possible with state-of-the-art technology. Thus, in collaboration with a semi-conductor producer, Isabellenhütte developed an ASIC, which transfers the measured values into a data stream, that can easily be used for further processing.

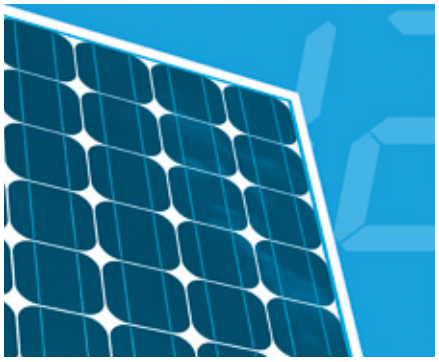


In the meantime, cooperations were initiated with various producers of semi-conductors in order to respond even better to individual customer demands.

Unifying shunt and electronics is another strong competence of Isabellenhütte. The best results are achieved when the shunt and the electronics are directly soldered together – here Isabellenhütte applies its own patented procedure.

Furthermore, we take care that the sensor is prepared for variations in temperature by calibrating the naturally low temperature drift of the shunt. With our in-house calibration laboratory we achieve high precision over the whole temperature range.





INDUSTRIAL CONVERTER TECHNOLOGY //

In modern industry railway and marine drives, the requirements on converters with respect to efficiency, reliability and comfort are increasing continuously. Here, the measurement of current plays an important role, because inaccurate measurement data reduces the efficiency of the drives and has an impact on their lifespan. Also, the concept of Total Cost of Ownership (TCO) and the growing design opportunities are gaining in importance in the development of highly precise current sensors.

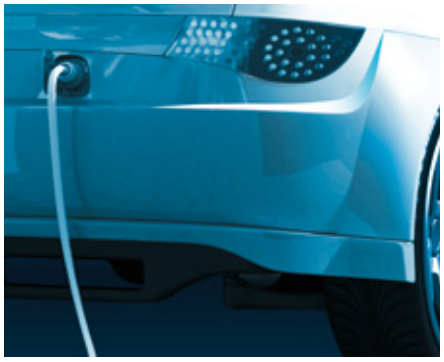
On the basis of fast and precise measuring modules we offer our customers the opportunity to integrate the current sensors directly into the required conductor bar. All our sensors for phase current measurement have digital outputs and, therefore, do not require further wiring for signal evaluation. Our dedicaded ISAscale®-products for the industrial converter industry is the IPC-MOD.

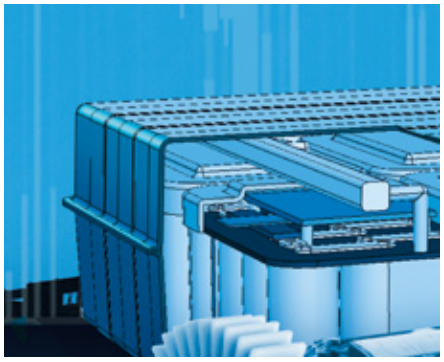
STORAGE TECHNOLOGY, SOLAR AND WIND POWER STATIONS, SMART GRID //

Storage technology is considered a trend-setting segment which, by separate use of battery storage, can assure an independent power supply and an optimal feed into the public grid. Large battery packs are already being used today to assure an uninterrupted power supply. Isabellenhütte meets these requirements with its products of the ISAscale®-IVT-MOD-series and the ICD-C.

POWER NETWORK, ENERGY DISTRIBUTION AND HIGH CURRENT TECHNOLOGY //

The increasing electrification and the rising costs of energy require an effective energy distribution with optimised knowledge of the energy flows. For the precise recording of high currents with simultaneous voltages of up to 22 kV Isabellenhütte offers various modules of the IUH- and IHI-series.





ELECTROMOBILITY STORAGE TECHNOLOGY //

There are various requirements on an energy storage device with respect to electromobility which we meet as follows:

Safety

By using the ICD-R, a redundant measuring system, we increase the safety of your energy storage device, so that it can react quickly and reliably.

Life expectancy

Inaccurate measurements imply unnecessary charge cycles. Each saved charge cycle prolongs the life of the energy storage device and thus saves costs for the end user. The ICD-R determines the state of charge very precisely within 0.1 % of the measured value.

Economic efficiency

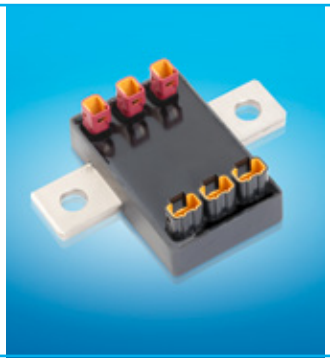
With intelligent current sensors many calculations can be made in advance. Counting of Ampère- and Watt-hours as well as storage of important measured values is done inside of the IVT-MOD-Sensor. All information can be directly retrieved with a digital output module. This enables the development department to concentrate on other important tasks which can be relevant with respect to TCO.

AUTOMOTIVE CONVERTERS AND STORAGE TECHNOLOGY //

Besides batteries and engines, the converters are crucial for the reliability of hybrid and electric cars. Because imprecise measurements lead to non-optimal control of the phases in the converter, vibrations are caused which limit travelling comfort. Other factors, which are also very important for the development of precise current sensors, are the costs with respect to TCO, reliability and the design options. On the basis of low-noise measuring modules we offer our customers the opportunity to directly integrate the required conductor bars – and this with high-speed and precision. In this field, we therefore exclusively develop customer specific products, into which shunt and electronics are seamlessly integrated into the application. Thus, we ensure a compact design with high precision.

IVT-MOD 100 A - 500 A // with isolation

IVT-MOD 1,000 A / 2,500 A // with isolation



IVT-MOD 100 A - 500 A // without isolation

IVT-MOD 1,000 A / 2,500 A // without isolation

IVT-MOD

ISASCALE® IVT-MOD – CURRENT AND VOLTAGE MEASUREMENT IN HYBRID AND ELECTRIC CARS

The measuring modules of the IVT-family are specifically conceptualised for the use in high-voltage battery management systems and thus for monitoring the status of Li-ion batteries. The basis for this is the highly precise measurement of the total current. Depending on the design of the measurement module, it is possible to record continuous currents of up to 2,500 A.

In addition to the current measurement, up to three measuring channels for high-voltage measurements can be integrated. They can be used to comprehensively monitor the total voltage of the battery stack, the intermediate circuit voltage and the relay functions. To synchronise various sensors, a trigger input is available. The modularity of the system allows a multitude of functions, which exceed simple current measurement. Among this are the redundant, programmable over-voltage detection and the temperature measurement at the conductor bar.

When high-voltage battery systems are used on the high side, the communication interface and the supply voltage of the measuring modules can be isolated galvanically. The IVT-MOD can thus be configured for individual use.

Technical Data

Measurement ranges	±100 A	±300 A	±500 A	±1,000 A	±2,500 A
Accuracy	0.1 % of the measured value				
Linearity	0.01 % of the measured value				
Resolution	3 mA	10 mA	27 mA	47 mA	186 mA
Offset	7 mA	21 mA	60 mA	100 mA	400 mA
Voltage measurement	Up to three voltage measurements simultaneously (±800 V)				
Hardware-Trigger-Input	External PIN for synchronisation				
Redundant over-voltage detection	Additional external PIN for the over-voltage signal				
Conductor bar temp. measurement	Recording of conductor bar temperature within the module				
Digital output module	CAN 2.0a with complete CAN database file (dbc)				
Temperature calibration	Constant accuracy over the complete temperature range				
Isolation	Galvanic isolation // potential-free measurement				

IPC-MOD 100 A - 500 A // with isolation

IPC-MOD 1,000 A / 2,500 A // with isolation

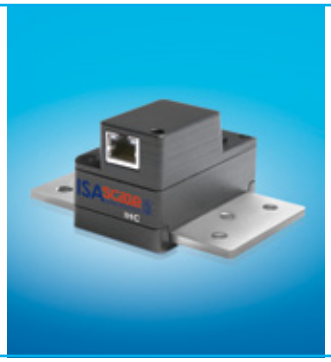
IPC-MOD

ISASCALE® IPC-MOD – MODULAR CURRENT SENSORS FOR PHASE CURRENT MEASUREMENT

Because of extremely limited linearity errors and very limited temperature coefficients during amplification as well as in offset, our modules are predestined for highly precise current measurements in modern control systems. Because of their modular construction, the current sensors of the ISAscale®-series can be delivered in various versions.

Technical Data

Measurement ranges	±100 A	±300 A	±500 A	±1,000 A	±2,500 A
Accuracy	0.2 % of the measured value				
Linearity	0.01 % of the measured value				
Resolution	7 mA	20 mA	55 mA	95 mA	380 mA
Offset	0.05 % of the measured value				
Digital output module	TTL, RS422, LVDS				
Temperature calibration	Constant accuracy over the complete temperature range				
Isolation	Galvanic isolation // potential-free measurement				



IHC // Ethernet

IHC // RS232, RS485

IHC

ISASCALE® IHC – GALVANICALLY SEPARATED CURRENT AND VOLTAGE MEASUREMENT SYSTEM FOR VARIOUS CURRENT RANGES

With their high accuracy, versatility and compact design, the modules of the ISAscale®-IHC-series present an interesting solution for precise current and voltage measurement directly on the conductor bar (1,000 A, 300 V). Thanks to complete galvanic isolation and comparatively low power loss, the IHC-system is significantly more efficient and precise – in comparison with Hall effect or compensation converters as well as conventional combinations of DIN-shunt and measurement devices/transducers.

The multitude of special functions such as direct and/or alternating current measurement, peak value and effective value measurement, Ah-meters, voltage measurement or the oscilloscope function allow the use in diverse applications.

Technical Data

Measurement ranges	±300 A	±1,000 A
Accuracy	0.1 %	0.3 %
Resolution	1 mA	3 mA
Linearity	0.01 %	
Digital output module	RS232, RS485	
Voltage measurement	250 V AC, phase to earth 500 V AC, phase to phase ±500 V DC	
Output values	AC, DC, effective and peak value, apparent and effective power	
Functions	Oscilloscope function, kWh-meter	
Temperature calibration	Constant accuracy over the complete temperature range	
Isolation	Galvanic separation // potential-free measurement	

IHI // Communication module

ICx-Family

IHI

ISASCALE® IHI – GALVANICALLY ISOLATED BRIDGE

The modules of the IHI-series are characterised by continuous current applications of up to 2.5 kA with simultaneously applied voltages of up to 22 kV. They are used in all energy distribution systems as well as in big converters in the drive technology. The IHI is a galvanically isolated bridge with modular selectable input and output interfaces. On the input side the modules of the IPC- and IVT-series can be used. The IHI rounds up the modular base strategy of the ISAscale®-series.

Technical Data

Digital output module	Ethernet
Voltage measurement	22 kV
Isolation	Galvanic separation up to 22 kV

ICx-Family

ISASCALE® ICx – COMPACT CURRENT MEASUREMENT

The ICx-series is a new family of compact current measurement sensors. Reduced to the basic function, the small sensor was developed to measure currents in excess of 100 A. The ISAscale®-series was thus enlarged by a digital current measurement sensor, which is also the most compact of its kind. Its CAN 2.0 interface allows quick and simple integration into any application. The version ICD-R – equipped with a redundant and galvanically isolated current measurement channel – is suitable for applications which require a high security level.

Technical Data

Measurement ranges	±100 A	±300 A	±500 A
Accuracy	0.1 %		
Resolution	1 mA		
Linearity	0.01 %		
Offset	±20 mA		
Digital output module	CAN 2.0 a/b		
Temperature calibration	Constant accuracy over the complete temperature range		

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PROVIDED BY

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