BEHIND THE SCENES WE PLAY A MAJOR ROLE

MEASUREMENT SYSTEMS

ISABELLENHÜTTE
Innovation by Tradition
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 wet chemical processes and assembly to complex automated testing and packaging during final inspection.

Innovation by Tradition
Driven to innovate // 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

Industrial converter technology // 05
Storage technology, solar and wind power installations // 06
Automotive storage technology // 08
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Energy distribution and high-current engineering // 11

Quality standards

DIN EN ISO 9001:2008
DIN EN ISO TS 16949:2009
IECQ-CECC (IEC Quality Assessment System for Electronic Components)
RoHS 2002/95/EC
Authorised Economic Operator (AEO)
AEO-F certificate (Customs simplifications/security and safety)
Preferred supplier for FIA Formula 1

European Space Agency (ESA)
Deutscher Kalibrierdienst (DKD)
INTRODUCTION TO PRECISION MEASUREMENT

DRIVEN TO INNOVATE

As the newest Isabellenhütte division, Precision Measurement is committed to continuing our 500-year tradition of technical innovation. Guided by our extensive expertise, this division sets exceptional performance standards for high-precision current, voltage and temperature measurement. Isabellenhütte’s precision measurement systems are marketed under the ISAscale® brand. In addition to applications in modern cars and trucks, ISAscale® systems are used in the emerging field of electric drive technology. They are also deployed in renewable energy generating systems, industrial power engineering, railway and marine technology, and energy supply systems.
INNOVATION IN MINIATURE

SENSORS FOR INDUSTRIAL CONVERTER TECHNOLOGY

The demands placed on converters in modern industrial, railway and marine drive systems in terms of efficiency, reliability and convenience are increasing all the time. Current measurement plays a significant role in these systems, since inaccurate measurement data reduces the efficiency of drive systems and shortens their service life. The total cost of ownership (TCO) and available design options are also becoming increasingly important in the development of high-precision current sensors.

We make it possible for our customers to integrate current sensor technology directly into the required bus bars, quickly and precisely, using fast, high-precision measurement modules. All our phase current measurement sensors feature digital outputs and thus require no additional signal processing circuitry. This enables direct, low-cost, low-error signal processing using microcontrollers or FPGAs.

**ISAscale® IPC**

**IPC series**
- Operating range: up to 1000 A continuous current*
- Resolution: up to 16 bits, depending on the oversampling ratio
- DC isolation voltage: up to 1400 V (IEC 60747-5-2)
- Interface: SPI, CAN, 1-bit data stream
- Separate input for triggering
- Bus bar temperature: up to 105 °C
- Optional non-isolated power supply

* Depending on resistance value

**ISAscale® IPC – galvanically isolated current sensors for phase current measurement**

Our modules boast extremely low linearity error and very low temperature coefficients for both gain and offset, making them perfect for high-precision current measurement in modern control systems.

The modular design of the ISAscale® series allows a wide variety of current sensor variants with regard to communication, evaluation and control.
EMBRACING THE FUTURE

SENSORS FOR STORAGE TECHNOLOGY, SOLAR AND WIND POWER INSTALLATIONS

Precision current measurement is of the utmost importance in the renewable energy sector. Regardless of how they are harnessed, renewable energy sources almost always need to be converted into electric power. This can be illustrated by examining three different sets of requirements.

Inverters for solar applications
With their high base precision and compact sensor design on both the DC side and AC side of the inverters, Isabellenhütte modules are ideally suited for solar inverter applications. The ISD multiple module provides a highly cost-effective way to collect the individual string currents on the DC side.

Legal requirements for fault current ratings and the maximum allowed DC feed-in current necessitate substantially higher current measurement accuracy on the AC side. Isabellenhütte developed the ISA four-phase current sensor specifically for this purpose in order to fulfil all legal requirements in a single module.

ISD series
n-channel solar module for DC string current
Current range: up to 100 A
Measurement frequency: 500 Hz
Interface: RS 485
Potential combination

Performance characteristics

ISA series
4-channel measurement sensor, synchronous acquisition
Current range: ±50 A to ±300 A
Resolution: 16-bit
Measurement frequency: 8 kHz
Interface: serial, SPI
Converters for wind, steam and water power systems
Modern converter technology primarily requires fast and precise measured value acquisition modules to enable accurate converter control. Our IPC phase current modules meet this need (see page 5).

Storage technologies, especially battery banks
Storage technology is widely regarded as a key future segment, allowing independent power supply through the use of additional battery banks and optimising feed-in into the public grid. Large battery blocks are already being deployed to ensure an uninterrupted power supply. Isabellenhütte is meeting these requirements with its ISAscale® IVT product series.

Performance characteristics

**IVT series**
Operating range up to 5 kA peak and 1000 A continuous current*
Accuracy: up to 0.2% (initial)
Resolution: up to 2 mA*
Up to 3 voltage channels for high voltages up to 586 V
Redundant overcurrent detection
Trigger input
DC isolation voltage (IVT): up to 846 V (IEC 60747-5-2)
Interfaces: CAN, SPI
Bus bar temperature: up to 105°C
Automotive-qualified

*Depending on resistance value
EFFICIENCY AS A CORE COMPETENCE

SENSORS IN AUTOMOTIVE BATTERIES

Energy efficiency is set to play a decisive role in the years ahead, particularly in the modern mobility sector. Electrically assisted hybrids, fuel cell vehicles and fully electric vehicles will be the mobility solution of the future.

This will require efficient use of energy, plus safe and reliable systems, but the decisive factor will be monitoring the available energy flowing in the battery through precision measurement of voltage and current.

With our experience in precision measurement applications, we are ideally positioned to fulfil these requirements. We are also an internationally recognised specialist and leader when it comes to other important aspects such as free-forming options during implementation and the weight of the individual components.

We provide both standardised and customer-specific solutions to meet these challenges. Our primary goal is always to find the best solution for our customers in terms of TCO and functionality.

Our IPC and IVT series form the basis for all our precision measurement development work. With an operating range up to 10 kA peak and up to 4 kA continuous current, reliable and precise voltage measurement up to 600 V, isolation voltages up to 5 kV and temperatures up to 125 °C, they meet even the most stringent requirements.
ISAscale® IVT – current and voltage measurement in hybrid and electric vehicles

The IVT family of measurement modules has been designed especially for use in high-voltage battery management systems and thus for monitoring the status of Li-ion batteries.

High-precision total current measurement is central to this functionality. Depending on measurement module design, it is possible to detect continuous currents up to 1000 A. In addition to performing current measurement, up to three switchable high-voltage measurement channels can be integrated for measuring total battery stack voltage and performing comprehensive monitoring of the intermediate circuit voltage and relay functions. A trigger input is available for synchronising multiple sensors.

The modularity of these systems allows for a variety of functions above and beyond simple current measurement. These include redundant, programmable overcurrent detection and bus bar temperature measurement. When used on the high side of high-voltage battery systems, the communications interface and the measurement module supply can be galvanically isolated. The systems can be configured for individual applications.

Their unique performance characteristics make them an obvious choice for applications such as hybrid and electric vehicles, Li-ion-based industrial energy storage systems, charging stations and fuel cell monitoring.

In addition to applications in HV traction batteries, four-cell Li-ion starter battery applications in particular will become increasingly important. The ISAscale® IB4 sensor’s precision measurement capability allows Isabellenhütte to provide complete battery management module solutions that are perfect for direct application in cell blocks of this type.

We can customise our products to meet customers’ specific automotive needs, thereby also optimising the cost structure.
PRECISION DOWN TO THE LAST DETAIL

SENSORS IN AUTOMOTIVE CONVERTER AND CHARGING SYSTEMS

The reliability of hybrid and electric vehicles depends not only on batteries and motors, but also on the converters. Inaccurate measurement can cause suboptimal converter phase triggering, resulting in vibration and greatly reduced driving comfort.

When developing precision current sensors, the costs in terms of TCO, reliability and design options are also crucial. We make it possible for our customers to integrate current sensor technology directly into the required bus bars, quickly and precisely, using fast, high-precision, low-noise measurement modules. Our IPC series sensors, which have been specially optimised for the requirements of the automobile industry, are used here.

IPC series
- Operating range up to 1000 A continuous current*
- Resolution: up to 16 bits, depending on oversampling
- DC isolation voltage: up to 1400 V (IEC 60747-5-2)
- Interface: SPI, CAN, 1-bit data stream
- Separate input for triggering
- Bus bar temperature: up to 105 °C
- Automotive-qualified

* Depending on resistance value

Performance characteristics

E-KERS in Formula 1 – our fastest reference

Formula 1 represents the pinnacle of motor sport. As a preferred supplier to the FIA (Fédération Internationale de l’Automobile), we meet the extremely rigorous requirements in this arena.

We supply all Formula 1 teams that use E-KERS.

Charging technology is currently one of the most important challenges around electric mobility. Isabellenhütte is engaged in developing extremely precise modules for on-board metering and determining power flow in stationary charging devices in order to provide our clients with optimal solutions.
IN THE MIDDLE OF THE CURRENT

SENSORS FOR ENERGY DISTRIBUTION AND HIGH-CURRENT ENGINEERING

Increasing electrification and rising energy costs call for effective energy distribution with optimised information about energy flows. Isabellenhütte offers a range of modules in the IHC and IOC series for detecting high currents with simultaneous voltages up to 12.5 kV.

ISAscale® IHC – galvanically isolated current and voltage measurement system for various current ranges

With their high level of accuracy, enormous versatility and compact design, ISAscale® IHC series modules provide an attractive solution for performing precision current and voltage measurement directly on the bus bar (1000 A, 300 V). Thanks to complete galvanic isolation and comparatively negligible power loss, the IHC system is significantly more efficient and accurate than Hall-effect or closed-loop transducers, or conventional combinations of DIN shunts and measurement devices/transducers.

ISAscale® IHI – galvanically isolated high-current measurement modules for medium-voltage applications

With a number of specialised functions such as DC and/or AC current measurement, peak value measurement, effective value measurement, Ah meter, voltage measurement and the oscilloscope function, these modules are suitable for a wide range of applications.

ISAscale® IHI – galvanically isolated high-current measurement modules for medium-voltage applications

The IHI series modules excel in continuous current applications up to 4 kA with simultaneous voltages of up to 12.5 kV. They can be deployed in all types of power distribution systems as well as in large converters used in motive power engineering. The IHI is a galvanically isolated bridge with modularly selectable input and output interfaces. The IPC and IVT series modules can be used for input applications. The IHI thus rounds out the modular strategy of the ISAscale® family at the top end.

IHC/IHI series

Operating range between 300 A and 1000 A continuous current
Accuracy: 0.1% ± 100 mA or 0.3% ± 300 mA of the measured value*
Current measurement resolution: 0.015 A or 0.004 A*
DC isolation voltage: up to 891 V (IEC 60747-5-2)
Interface: RS232, RS485 (isolated)
Current output parameters: DC component, effective value of AC component, effective AC/DC value, peak value, time integral, oscilloscope function
Voltage output parameters: DC component, effective value of AC component, effective AC/DC value, peak value, oscilloscope function
Power: apparent power, effective power, effective power time integral (kWh meter)
Bus bar temperature −40 °C to 85 °C
* Depending on measurement range