

MONITOR

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Use in induction furnaces and hardening installations:

Insulation monitoring
in installations with low insulation levels

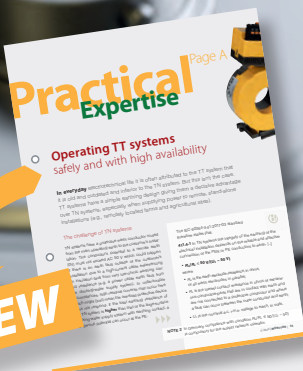
CC613 charge controllers:

Safer charging
with the new generation



Updating instead of purchasing new

When signs of the times
become problems



Additional page **"Practical Expertise"** at the back of the booklet for collection!
Operating TT systems safely and with high availability

BENDER Group

editorial

EDITORIAL

Dear Readers,

This year, Bender will once again be appearing at important trade fairs such as the leading international Light + Building fair in Frankfurt, which will be focusing on topics such as “Connecting, Pioneering, Fascinating”. Another one is Hannover Messe, Germany’s most important industrial fair, concentrating on digitalisation, individualisation and climate protection. And not to forget Indonesia as partner country of Hannover Messe. These topics will be of future importance both to Bender and to the market.

The process of internationalisation is continuing. Digitalisation and all its facets such as networking or data analytics are picking up speed – and Bender is no exception. With our networked operating theatres, we offer tomorrow’s solutions today, and make hospitals fit for the future.

The trade fair topics reflect our forward-looking, visionary perspective on the subject. Establishing our regional headquarters in Singapore, further developing our visualisation systems and focusing on predictive maintenance. With the corresponding measurement technology, we enable our clients to take far-sighted and also sustainable action with no need to forgo electrical safety and availability.

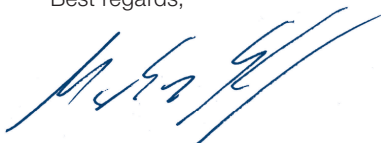
Our innovative products also enable us to carry out pioneering work in the progressive field of electromobility, both in vehicles and for the necessary charging infrastructure. We are proud of the industrialisation of the insulation monitoring developed for Formula 1 and used in the EQ series models from Mercedes.

With our insight into the future, we support customers in the transformation towards CO₂ neutral production of tomorrow. Electrically safe and available. We help them replace old systems or bring them up to date in terms of safety, standardisation and performance using both proven and new technology.

Our systems also provide visualisations of customer-specific facilities, enabling us to improve predictive maintenance planning and analysis. Our products can also be used with modern IT-based cloud computing services to suit customers’ applications.

Read about Bender’s fascinating technology in this magazine and be part of the Bender story. Use our media and join us on our journey into the future.

Best regards,



Markus Schyboll
CEO



SUBSCRIPTION

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IMPRINT

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When signs of the times become problems

Updating instead of purchasing new

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For future-proof technology

Following a boom in production in recent years, many machines and installations in manufacturing companies have now become outdated. ...



Research data in real time

Short measuring intervals for submersible robots

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ROVs (Remotely Operated Vehicles)

are used in marine research for under water exploration. The high-tech devices need to withstand immense pressures and perform their work reliably even at depths of several 1,000 metres ...



Zillmer Elektrotechnik

Hamburg's partner for industry and commerce

Page 50

Zillmer Elektrotechnik GmbH,

based in the south of Hamburg, was founded in 1918 by Otto Karl Zillmer. Since 2004, the company has been part of the Hamburg-based nationwide Handwerksgruppe Mecklenburg (HPM) ...

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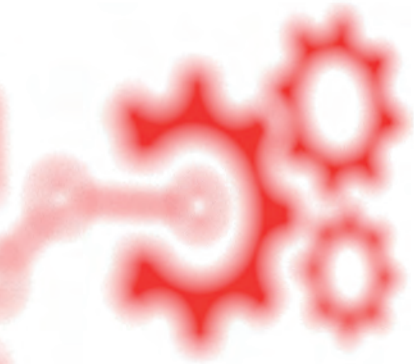
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FEATURE



UPGRADE





When signs of the times become problems

Updating instead of purchasing new – for future-proof technology

Following a boom in production in recent years, many machines and installations in manufacturing companies have now become outdated. As a result, their productivity and operational reliability have decreased, product quality has declined and they no longer meet the latest norms and standards. They also consume excessive energy and are only partially suited to Industry 4.0. If replacement parts also become unavailable, there is a risk of complete failure. Companies are therefore faced with the decision either to purchase new or to retrofit.

Making production technology future-proof

Machinery and installations are the technical heart of a manufacturing company. Their condition and the options they provide are decisive for business success and profitability. Many of the machines and installations being used today are however 40 or more years old. Mechanically they have changed little over this period and continue to function relatively smoothly.

But increasing digitalisation has brought fundamental changes to production in the form of connected processes, Industry 4.0 applications and smart factories. These are giving companies new opportunities to increase their efficiency and profitability while also improving product quality, optimising planning and raising operational reliability.





FEATURE



This is where older systems often lack the necessary components and have little or no connectivity to exploit new opportunities. But there are retrofit options which will enable companies to get their production technology up to the latest, future-proof standards without having to invest in a new plant. Retrofitting will also increase operational security and improve the safety of personnel.

Bosch recently used a pedal-driven, 130-year-old lathe to demonstrate that almost any machine can be integrated into digital processes. Although the machine's mechanics remained the same, sensors and a gateway were incorporated that could meet all the needs of digital workflows.

New or retrofit?

One major reason for the current backlog in digitalising many of the existing machines and installations has been the boom in production of recent years. Full use of production capacity often left little time to plan and implement digitalisation measures. In order not to slow down production, it has often not been possible to shut down the machines even for a short time.

The slight slowdown in the economy is now freeing up capacity and can therefore have a positive impact on digitalisation. Companies wanting to reposition themselves for the future can re-deploy personnel to plan and implement digitalisation projects.

Production technology that is planned from scratch and equipped for future needs is the dream of many production managers. But large-scale projects on city outskirts, such as the new Tesla plant in Brandenburg, are unfortunately the exception. Particularly medium-sized companies generally have heterogeneous machinery and installations that have evolved over many years. They have varying levels of automation, but no standard connectivity.

Implementing integrated digital processes is therefore difficult but such processes are becoming increasingly important for long-term competitiveness. Consequently, there is pressure to innovate and a major demand for simple solutions to digitalise productions and processes and make them fit for Industry 4.0.

Companies may be reluctant to invest in new purchases because of Brexit, punitive tariffs and economically uncertain times. But there are retrofit options that can bring their production technology up to date. Such options are available to the automotive industry and its suppliers as well as to semiconductor manufacturers and many other manufacturing sectors. Retrofits are in no way short-term solutions, but also take future technological developments into account and so provide future-proof solutions for the long term.

Small solution with big benefits

On the question of new purchase or retrofit, many arguments can be made for retrofitting which vary depending on company requirements, e.g. partial automation to increase productivity or targeted measures to raise operational reliability and save energy. Sustainability is also a major argument for retrofitting.



"**New components can deliver plenty of data** such as speed, temperature and **power consumption** and therefore generally represent a good entry point into **digitalisation**."

Instead of scrapping existing installations and replacing them with new ones, retrofitting preserves the basic substance of machines and continues to use their core parts, such as the mechanics. This doesn't only make ecological sense. Dismantling old installations and building new ones can take weeks or months depending on their size, and therefore result in a major loss in production. Well-planned retrofitting, on the other hand, is usually achieved much faster with less downtime.

Even when retrofitting involves complete dismantling of a machine, time and money is still saved because existing foundations and connections can still be used.

The familiarisation that operators and technicians have gained of machines over the years also represent a further advantage of retrofitting. Costly training necessary for a new system is avoided and production can be resumed quickly and often smoothly. What also cannot be ignored are the lengthy approval procedures and acceptances generally necessary for new installations but not needed for retrofitting. This can be an important factor especially when acceptance of a new system is uncertain.

Gradual digitalisation of production

Anyone planning the retrofitting of a machine or installation should first clearly define their goals and weigh up all the options. Does it involve renewing an old installation to prevent production coming to a standstill? Does overall equipment efficiency (OEE) need to be increased through automation measures? Or do production and processes require smart networking and conversion to meet Industry 4.0 needs?

Any further steps should be taken according to a plan of action. Basic retrofitting involves overhauling the mechanical components and replacing outdated drives and controls with new ones. The new components are then much more energy-efficient and function with greater precision and reliability. This is usually only the first step. New components can deliver plenty of data such as speed, temperature and power consumption and therefore generally represent a good entry point into digitalisation. By using an appropriate gateway, such data is then easy to transmit to control systems and be evaluated. Additional sensors are easy to integrate as and when required.





FEATURE

▶▶▶ Future-proof process optimisation

The data from the new components can be used to gain reliable information about the current condition of components – the foundations for intelligent condition monitoring. The data feeds into primary systems and undergoes evaluation by the relevant software. Reliable information can then be obtained about the risk of failure of individual components. Predictive maintenance enables maintenance and repair tasks to be performed before damage can occur. Such tasks can be scheduled to take place at weekends or at night when the machine would anyway be non-productive. Predictive maintenance therefore reduces and prevents machine downtimes.

Companies also benefit organisationally from improved production and process planning. Consistent and systematic retrofitting will enable the entire electrotechnical infrastructure of production to be monitored as well as that of individual machines. Retrofitting can be used, for example, to renew a production hall's entire power supply – from distributors to each individual drive – and to equip production with output capacities for future developments.

Secure power supplies becoming increasingly important

Power supplies are also important in planning and implementing retrofits. The sensitivity of state-of-the-art controls and sensors place significantly higher demands on power quality. Outdated power supply systems are unable to deliver the required power quality and will need to be renewed or expanded. New installations need to be equipped with smart systems enabling future requirements to be met without the need for further modifications.

Examples of such smart solutions are earthed systems with residual current monitoring and power quality monitoring. These provide information on power quality and residual currents caused by insulation deterioration which can lead to damage. Residual current monitoring can also detect and localise wiring faults in electrical installations. Wiring faults are a frequent cause of stray currents and reduce power quality. The monitoring systems use software to help to promptly detect problems and enable countermeasures to be quickly initiated. This secures production and protects machines, equipment and personnel from damage.

Digitalisation bottlenecks in operating theatres

It's not only manufacturing companies who are in major need of modernisation. Hospitals, especially operating theatres, are often still working with outdated technology. This includes older types of power supplies which need to be gradually replaced. Operating theatres are one of the most sensitive areas. Patient health is directly dependent on their trouble-free operation and they are of key economic importance for hospitals. Unplanned faults are just as hazardous and undesirable as extended downtimes for renovation. This is another area where the benefits of retrofitting can be applied.

Perfect timing and precision work

Operating theatre modernisation can be smoothly integrated into hospital procedures, e.g. by being scheduled to take place at weekends, at night or at other times when operations are not required. Typical modernisation measures include the renewal of redundant supply lines and the conversion or upgrading of control cabinets by installing devices for insulation fault location. Modernisation also includes the control technology required by operating theatres and the associated display, operating and alarm indicator panels for managing ventilation, lighting and other operating-theatre equipment. Many new types of advanced alarm indicator and operator panels have become available in recent years, increasing the pressure on hospitals to take action. The new panels need to be integrated in such a way that they fit precisely into existing connection layouts and don't require any additional structural work so that costs can be minimised and risks of contamination prevented.



Planning is the key to success

For technology upgrades to be successful is primarily a question of precise planning – especially for operating theatres. The better the preparation and the more precise-fitting the new components are, the less work is required and the faster the project can be completed with minimal downtimes. Ideally, operating theatres should very quickly be ready for use again after thorough cleaning and disinfection.

Optimal planning enables easy replacement of alarm indicator and operator panels within a day or overnight. Replacing a complete control cabinet also requires careful planning. The cabinet's components need to be laid out so that all incoming and outgoing connecting wires, which usually do not require replacement, can be re-connected in the same way as before. In rare cases, in hospitals complete floors are gutted and reinstalled electro-technically.

This enables an operating theatre to be fully updated to state-of-the-art technical standards. Timing is obviously critical here, requiring precision planning and coordination of all the different trades and professions involved.





TITELTHEMA

▶▶▶ Secure digitalisation of operating theatres

When carrying out building work in existing operating theatres, experienced partners are needed who are familiar with all the necessary standards, e.g. DIN VDE 0100-710 (Germany), HD 60364-7-710 (Europe) and IEC 60364-7-710 (worldwide). This means that even without a complete reconstruction, an operating theatre can be made future-proof for many years to come.

The new operating theatre combines high operational reliability and maximum patient protection with new functionalities and innovative operating convenience. The upgrades increasingly include many options for remote maintenance which can help to significantly reduce service and travel costs. Service technicians can work online to detect and locate problems enabling them to bring along all the required replacement parts at the next servicing appointment. The high cost of operating-theatre downtimes is making monitoring, control and predictive maintenance increasingly important.

Increase operational reliability and efficiency

Retrofit measures of course also cost money and are not always the best and most economical option to increase efficiency, improve safety and optimise processes. But retrofitting is gaining in importance in parallel with the increasing cost and modernisation pressures in manufacturing companies, hospitals and many other areas.

Condition monitoring and predictive maintenance offer excellent opportunities to enhance operational reliability. Reliable power supplies that give the power quality needed are also essential. ■

*Marco Michels
txtconcept, Gießen*



Bender is Hesse Champion 2019 in the "Innovation" category

Innovation and Growth Prize awarded by the Federal State of Hesse

Since 1999, businesses in Hesse have been awarded annually for outstanding achievements in the categories of World Market Leader, Generator of Jobs and Innovation. Winners are selected by a high-ranking jury of representatives from business, politics and the media. On 5 November 2019, the winners of the 2019 "Hesse Champions" were announced at a gala event during the Hesse Business Day held in the Wiesbaden Kurhaus. Bender is one of two winners in the "Innovation" category.



The company was chosen for one of its electrical safety products, the innovative CC612 charge controller. It is the technological heart of charging stations for developing future-proof electromobility infrastructure. The CC612 charge controller is at the core of the German government's plans to expand electromobility infrastructure which is to include around 50,000 charging stations by 2022. Electric cars will then be able to recharge safely at practically any power outlet. "An innovative idea with major benefits for consumers which paves the way for switching to the mobility of the future", was the verdict at the award ceremony.

Bender was Hesse Champion already in 2004 in the "Generator of Jobs" category and in 2011 in the "World Market Leader" category. The company is therefore particularly pleased with this year's "Innovation" award.

Winfried Möll, Chief Operating Officer, and Mario Lehr, Head of the eMobility Solutions business unit, accepted the coveted prize. A major factor behind the success of the charge controller has been the cooperation with Bender's Berlin partner ebee Smart Technologies GmbH.

Ten Hesse-based companies out of a total of 49 applicants reached the finals of the "2019 Hesse Champions" competition as announced by the Hessian Ministry of Economics, Energy, Transport and Housing (HMWEVW), the Federation of Hessian Business Associations (VhU) and the SME investment company MBG H in Wiesbaden. The awards were presented before more than 1,000 invited guests by the Minister-President of Hesse Volker Bouffier, the Minister of Economics for Hesse Tarek Al-Wazir and VhU President Wolf Matthias Mang.

Other Hesse Champions were: Faubel & Co. Nachfolger GmbH from Melsungen also in the Innovation category; Hexagon Manufacturing Intelligence from Wetzlar in the World Market Leader category; and Emma – The Sleep Company (Bettzeit GmbH) from Frankfurt – in the Generator of Jobs Motor category. The products from the winners – secure charging systems for e-cars, smart labelling for clinical studies, online mattress dispatch and the world's most accurate measuring machine – demonstrate how companies from Hesse are meeting the challenges of digitalisation and the future. ■

More information at: www.hessen-champions.de



NEWSWORTHY



"Award-winning" once again - Bender is the

"Company of the Year 2019"

Every year, the Chamber of Industry and Commerce (CIC) of Giessen-Friedberg awards the title of "Company of the Year"

to successful companies in the Chamber's district. Awards in various categories are given to individuals and companies who have contributed to a strong economic future in the region.

Five experts from economic and scientific backgrounds use best practice examples to assess the drive and spirit of successful entrepreneurs. Dr Thomas Schäfer, Minister of Finance in Hesse, took over as sponsor of this award in 2019.

Bender officially received this accolade at the CIC annual reception in mid-January. District President Dr Christoph Ulrich praised the company in his speech, calling it a "hidden champion" that prefers to work unnoticed, but acts as a driving force for the domestic economy with its products and services and is among the best in the world.



Bender GmbH & Co. KG from Grünberg accepts the award for "Company of the Year 2019" in the industry category: (l. to r.): Staff representative Frank Mehling, Managing Director Winfried Möll, shareholder Sabine Bender-Suhr, Managing Director Markus Schyboll and District President Dr. Christoph Ullrich.

The award "Company of the Year 2019" is the latest in a series of awards Bender has received in the last two years. In October 2019, the company not only won the title of "Hesse Champion" but was also a finalist in the "eMove Awards" in Munich. All of these accolades recognise the company's outstanding performance in the development of products and services for the future of electric mobility. ■

*Andrea Gossel
Marketing/Communications*



The year before, Bender was already on the radar of various awards, particularly in the field of training.

The importance of permanently monitoring electrical power installations

How monitoring increases availability

The availability and reliability of power supplies

in industrial and purpose-built environments, such as Data centres, hospitals and banks are critical factors not only for the protection of individuals and systems but also for cost efficiency and productivity.

Unexpected interruptions and malfunctions leading to a shutdown

can prove very costly. These can be averted by continuously monitoring the quality of the electrical power supply.





NEWSWORTHY

▶▶▶ **The repercussions resulting from unplanned interruptions are almost always damaging and, needless to say, costly. With proper foresight, planning and investment, however, unplanned interruptions can be avoided so that the plant can operate at the highest possible availability, efficiency and safety. Therefore, electrical systems must be installed in accordance with national and international regulations and standards. In the majority of cases, this means protection by automatic shutdown.**

What exactly is meant by the term availability? HD 60364-5-53, subclause 530.3.7, defines the term **continuity of service** as the “quality of an installation which is expressed by the extent to which the operation of an electrical system approaches the ideal state of freedom from interruption, or which the operation of electrical system minimizes supply interruption thanks to co-ordination of electrical devices”. IEC 60364-1:2005, clause 36 says that “an **assessment** shall be made for each circuit of any need for continuity of service considered necessary during the intended life of the installation.”

Among the characteristics that should be considered in the assessment for continuity of service is:

- the selection of the system earthing
- the use of monitoring devices

The choice of the network type, i.e. IT, TN or TT sets the stage for the selection of monitoring and protection devices. The correct selection leads to the desired results, such as increased availability and a reduced risk of fires and explosions. This also increases the service life of the electrical equipment and facilitates preventive maintenance.

Monitoring during operation

During the operation of an electrical system, there are several ways to monitor the insulation resistance depending on the type of system used and these are described in IEC 60364-5-53, clause 537.

TN/TT systems

In the case of earthed systems, i.e. TN/TT systems, the insulation resistance is determined indirectly via the magnitude of the fault current. However, when a shutdown is a problem for operations and availability has priority, then very often residual current monitors (RCM) are used. The job of an RCM is to monitor an electrical installation or circuit for the occurrence of a residual (or difference) current (Figure 1) and to indicate by an alarm if this exceeds a specified value.

The RCM should be configured so that an alarm message (e.g. acoustic, visual or via e-mail to a continuously manned control centre, for example) occurs before the standard-compliant automatic switch-off.

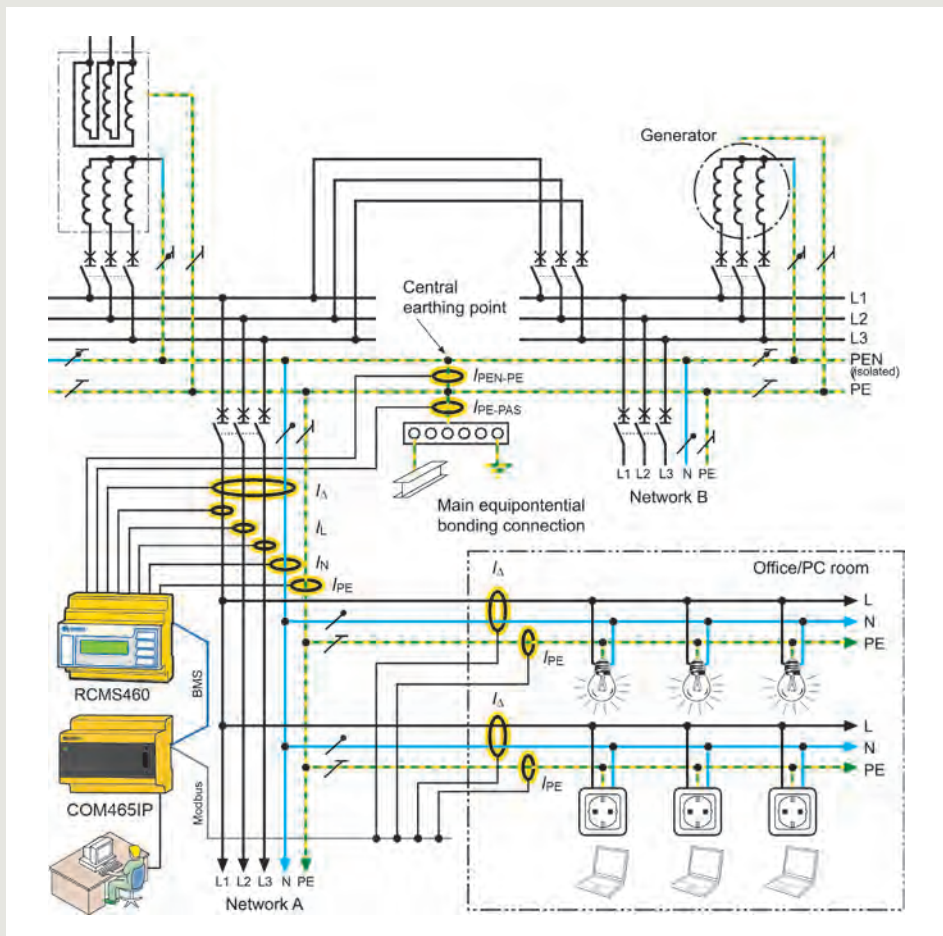


Figure 1: Power supply monitoring for multiple single circuits

IT systems

In the case of unearthed systems, i.e. IT systems in which the active conductors are insulated from earth, the insulation resistance between the active conductors and earth is continuously monitored using an insulation monitoring device (IMD). If the value measured is below a specific resistance, then an alarm is triggered. In accordance with IEC 60364-4-41, a shut-down is not necessary on the occurrence of a first fault such that operation can continue uninterrupted. This aspect is of crucial importance in safety-related

areas, e.g. in hospitals, industrial plants or electric mobility. As the IT system supplied is in operation, the IMD measures the total insulation resistance of the system, including all loads switched on that are electrically connected to the IT system.

An RCM is distinguished from an IMD in that it is passive in its monitoring function while an IMD is active in its monitoring and measuring functions.





▶▶▶ Offline monitoring

For loads, such as fire extinguishing pumps, valve drives, lift motors or emergency generators that are disconnected for a period of time, moisture or other effects can cause insulation faults in the supply cable or in the load itself and these faults may go unnoticed. The protective device then trips on switching on, or motor fires may occur, for example. Ultimately, operation is no longer possible and this in turn can lead to a situation with fatal consequences. To prevent this situation arising, offline monitoring, as described in IEC 60364-5-53, subclause 537.4 is used as part of the preventive maintenance; while the loads are disconnected, an IMD monitors the insulation resistance between all active conductors and earth (PE). If an insulation fault is detected, the operator receives a visual or audible message before a possibly critical operating state arises. If the equipment is disconnected from the installation during the off-line insulation measuring process, the insulation levels to be measured are generally very high. Offline IMDs can also be used in TN

and TT systems if the system is disconnected on all poles. However, the IMD must be automatically deactivated whenever the system is switched on.

Monitoring protects against the risk of fire

Poor insulation caused by mechanical damage to device cables, or poor device and lighting insulation due to constant heating can lead to insulation faults, which in turn are among the most frequent causes of fire. Low insulation resistance due to moisture and dirt also represents an increased fire hazard. Permanent monitoring is considered one of the most effective ways of countering the fire hazard in an electrical installation. For this purpose, monitoring devices or systems can be installed in addition to the existing protective devices. This is supported in **IEC 60364-5-53, subclauses 532.2.3.3 and 532.2.3.4**, which states that both IMDs and RCMs can be used in preventing the risk of fires in IT systems in electrical installations.

Periodic verification and testing

Electrical installations and equipment must be checked at regular intervals to ensure they are safe for people to use, they are in correct working order and any possible defects can be easily and quickly identified, reported and rectified. According to IEC 60364-6, 6.5.1.2, “periodic verification shall be carried out without dismantling, or with partial dismantling, as required, supplemented by appropriate tests and measurements....” However,

this subclause also states that “where a circuit is permanently monitored by an RCM in accordance with IEC 62020 or an IMD in accordance with IEC 61557-8, it is not necessary to measure the insulation resistance if the functioning of the IMD or RCM is correct.”

This brings with it many advantages including:

- Costly and time intensive insulation measurements can be omitted
- Sensitive components do not need to be disconnected
- An electrician is not needed in the event partial dismantling and reassembly is required
- Possible damage caused by incorrect reconnection can be avoided. ■

*Dr. Catherine Körbächer, Standards & Innovation
Dipl.-Ing. Holger Potdevin, Standards & Innovation*

Summary

Permanent monitoring maintains the required high insulation resistance of the system by ensuring that a deterioration in insulation is immediately visible and reported. The main advantages of monitoring devices in an installation are higher economic efficiency, optimized maintenance, higher operational/plant safety and higher fire safety.

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HD 60364-5-53:2015-11

Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment - Switchgear and controlgear

IEC 60364-1:2005

Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions

IEC 62020:1998 + A1:2003

Electrical accessories – Residual current monitors for household and similar uses (RCMs)

IEC 60364-4-44:2007-08

Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances

IEC 60364-4-41:2017-03

Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock

IEC 61557-8:2014-12

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems

IEC 61557-9:2014-12

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment for insulation fault location in IT systems

IEC 60364-6:2016-04

Low voltage electrical installations – Part 6: Verification



NEWSWORTHY

Optimum assistance for medical staff thanks to Bender technology

The connected operating theatre

Media reports abound on the current intensifying skills shortage in the care sector. As a result of this health-care crisis, hospitals are no longer able to provide the minimum levels of nursing staff required. The current problem: There is a shortage of trained staff to deal with the increasing number of patients and people requiring care.

One possible solution could be for industry to consider innovative solutions which could actually relieve the burden on medical staff. This could involve providing technical equipment to support users only when support is actually needed.

For many years, Bender has been supplying panels for use in medical locations which not only display insulation faults or overloaded transformers, but also incorporate air conditioning, blind and lighting controls as well as operating table controls and intercom systems. Electrical safety in group 2 rooms (operating theatres and intensive care units), one of Bender's core competencies, is always the top priority and is presented in compliance with the applicable standards.

Although they were extremely up-to-date in terms of technical and functional features, the standard TM1000 and TM800 panels often displayed excessive or over-technical information. This made it difficult for medical staff to obtain rapid targeted overviews and thus operate effectively. In order to place patient-centred care at the forefront, the technology used must be helpful and simple for end users according to their situation and not make their work any more difficult or complex.

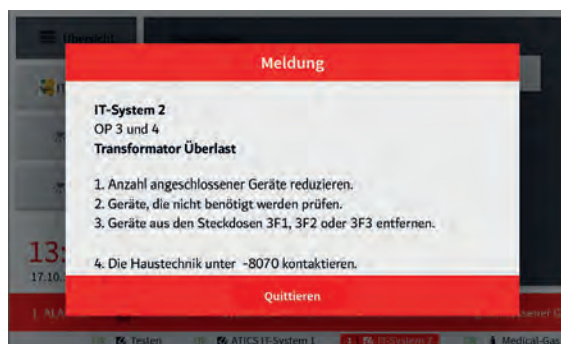
Overview of all relevant systems in the operating theatre

The most recent generation of alarm indicator and operator panels of the CP9xx series simplifies and supports working methods and creates a useful bridge between staff and installed technology. The monitor displays, specifically for medical staff, both the error-free system and the detected faults in a simplified way whilst still complying with DIN VDE 0100-710: 2012-10 requirements. The switching states of lights, operating lights and light colours are clearly presented in graphs indicating the actual status. The room temperature and current ventilation settings are presented in the form of animations and brief information. Even the current pressure ratios of medical gases can be displayed. Scene controls can also be saved. By means of the touch display it is possible, for example, to simultaneously close the blinds, switch off or dim lights and change the colour range of the room lighting. The staff can create and save a new scene in a few easy steps by amending an existing one.

If a fault occurs, a window containing the corresponding information opens immediately in the CP9xx alarm indicator and operator panel. The medical staff are also informed of the source of the fault and provided with handling instructions ranging from the telephone number of the building services to instructions on how to rectify the fault. If, for example, an insulation fault occurs due to the connection of a new medical device, the handling instructions may recommend checking the corresponding socket-outlet circuit and removing the connected device.



New! CP9xx series alarm indicator and operator panel



Example of a fault message on the CP9xx



NEWSWORTHY



Conventional TM800 alarm indicator and operator panel

Simple and clear without any unnecessary features

Thanks to this support, uncertainties in the operating theatre caused by various technical disruptions can be kept to a minimum. In an ideal case, faults can be rectified directly by medical staff without technical knowledge by means of the appropriate and clear handling instructions provided in the pop-up, without the need for lengthy manual searches and without having to wait for the building services technician.

If constructive support cannot be offered through the handling instructions, either the in-house technicians or the Bender service can remotely access a complete overview of the connected devices in the Bender system, including third-party devices. Technical details, measured values and alarms are displayed, which can then be checked down to the device level. This allows qualified technical staff to quickly assess the extent to which the workflow in the operating theatre or other group 2 rooms could be restricted.

By interconnecting different types of equipment in an alarm indicator and operator panel, the aim is to place the emphasis on supporting medical staff. Unnecessary technical information is not provided. Only information required by the particular situation will be displayed to the user. ■

*Daniel König M.Eng.
Business Unit Hospital Solutions, Product Management*



CP9x series alarm indicator and operator panel with colour range display to control the room lighting

INFO

More informations: <https://www.bender.de/en/cp9xx>



Smart sensors

- integrable
- multi-channel
- flexible
- retrofittable

Residual current monitoring up to the final circuit

In modern electrical systems, extensive monitoring by a wide range of sensors is often required in order to detect incipient insulation deterioration at an early stage and thus ensure both safety and high availability.

By analysing the recorded data from residual current sensors, for example, conclusions can be drawn about gradual insulation deterioration. These can then be used for targeted preventive maintenance.

At the same time, continuous monitoring of the residual currents of an electrical installation can ensure that there is no insulation fault in the installation. This way, the test intervals for the periodic insulation measurements required by the German Accident Prevention (DGUV) Regulation 3 can be adapted.

From the main distribution board to the final circuits

However, it must be noted that residual current measurement carried out exclusively in the main distribution board is not sufficient for meaningful, safe and DGUV-approved continuous monitoring of the entire system. Instead, a tight network of sensors right up to the final circuit is recommended.

The consistent application of residual current sensors from the main distribution board right to the final



INNOVATIVE PRODUCTS



circuit allows damage to be detected in good time. The closer the technology is installed to final circuits, the more accurately actual fault currents can be distinguished from leakage currents, and the easier it is to locate faults.

The extended Bender portfolio of residual current monitoring devices is designed for **system-wide application** and offers flexible solutions for any location. On the one hand, there are high-performance products with a high current-carrying capacity for use in main distribution boards, and on the other hand, there are compact and cost-effective sensors for monitoring the final circuits. These various devices and sensors are equipped with communication interfaces. They can be connected in the installation to form a system that is monitored from a central location.

The compact RCMB13x series and the modular RCMB300 series were launched on the market last year for such applications in final circuits. The portfolio has recently been updated with split-core sensors for AC/DC-sensitive residual current monitoring.

Integration into power distribution systems

The **RCMB13x series** offers AC/DC-sensitive residual current monitoring at nominal load currents of up to 32 A and, with a transformer internal diameter of 15 mm, is perfectly suited for the use of cables with a cross-section of 4 x 6 mm². This makes these devices ideal for final circuits. Evaluation electronics and measuring current transformers are combined into one enclosure and, due to their compact design, can also be used when space is limited.

This makes it easy to integrate them into power distribution systems such as PDUs (Power Distribution Units). The RCMB13x series is therefore ideal for standard installation by the respective manufacturers

(OEMs). There is also a version with solder pins for direct mounting on PCBs. The Modbus RTU interface can be easily used to connect the devices to a higher-level third-party system (e.g. PDU controller). This way, present measured values and states are permanently available.



RCMS150 residual current monitors in the installation

Multi-channel for many outgoing circuits

If a larger number of final circuit outputs is to be equipped with residual current systems, Bender offers the **RCMS150**, a six-channel solution that also combines measuring current transformers and evaluation electronics in one enclosure. The technical characteristics are essentially identical to those of the RCMB13x series, which means that the performance of the RCMS150 is also specifically designed for final circuits up to 32 A.

The RCMS150 will also be offered with a Modbus RTU interface in the future, so that all Bender sensors for final circuit applications can be connected to form one complete system. Since the six-channel solution uses sensors for the individual channels that are located together with the electronics in one enclosure, the device only needs to be connected to the interface once. The present values of all six channels can then be called up using this connection.

Flexible and direct use in individual loads

The powerful devices from the **RCMB300 series** are ideal for the industrial use of residual current technology in final circuits. Due to their modular design with different transformer sizes, these sensors can be used in a wide variety of final circuit applications with low to high load currents. Even applications with special requirements for measuring accuracy or insensitivity to external interference can be monitored with this series, as the measuring current transformers are optionally available with a full magnetic shield. In applications with very high and pulsed load currents, this shield ensures that the detection of residual currents is not affected by rapid load changes.

New features such as AC/DC-sensitive residual current measurement of up to 100 kHz, extended options for filtering and a Modbus RTU interface for reading measured values, turn the devices into smart sensors. For instance, they can be integrated directly into machines to monitor their final circuits. The standard interface enables them to connect to higher-level systems, such as a PLC, with which continuous monitoring can be implemented.

Split-core for retrofit applications

Retrofitting a residual current monitoring system in existing installations presents special challenges. On the one hand, there is often very little space for sensors and evaluators, and on the other hand, installation of the sensors is anything but simple. To disconnect the cables, the installation must be switched off. With the split-core devices of the **RCMB330 series**, Bender now offers smart, single-channel solutions that come with the huge advantage of simple installation in existing systems: open the current transformer, place it around the conductors, close it again and wire the interface – done! The installation does not need to be switched off for this. The RCMB330 also combines evaluator and measuring current transformer in one compact enclosure, so that this series can also be used in final circuits.



Residual current sensors RCMB301 with a converter inner diameter of 35 mm

As with the other sensors, the standard Modbus interface can also be used to connect to higher-level systems. Extensive frequency filter options for a wide frequency range of up to 100 kHz support the analysis of leakage and fault currents in the system, allowing better conclusions about fault sources to be drawn. ■

*Jan-Nils Lohrey, M.Sc.
Business Unit Industrial Solutions, Product Management*

Conclusion

In comparison to classic insulation measurement, Bender has a wide range of solutions for final circuits and is offering both continuous monitoring and the possibility of monitoring not only the cables but also the loads of an electrical system individually. Loads in particular are often sources of leakage and fault currents. Targeted monitoring of these loads is the only way to find and eliminate insulation faults quickly.

INFO

More informations: <https://www.bender.de/en/sensorpro>



INNOVATIVE PRODUCTS

CC613 charge controllers:

Safer charging

with the new generation



NEW
generation

Alternating current (AC) charging stations can often be found at home, in hotels, public parking areas or at the workplace. A great advantage of AC charging is that the conventional 230 V/400 V AC power supply can be used and the charging infrastructure itself can be connected quite easily by any electrician.

The choice of charge controller is a fundamental decision, as it is the heart of each charging station and thus has a significant influence on its function. With its intelligent charge controllers, Bender provides the basis for an AC charging station or AC wallbox that stands out for innovation, economic efficiency and safety. Customers can set up their own charging infrastructure solutions and create new business models without the need for expensive and time-consuming development.

Extended functions

After a successful launch of the CC612 charge controllers in 2015, we are now releasing the next generation of charge controllers. With the CC612, Bender has gained broad access to the market and received very positive feedback. It enables a charging infrastructure with an EMH meter and transparency software that complies with German calibration law. With the new generation of CC613 charge controllers, the functional range of the charge controllers has been extended even further. It was important here to retain the mechanical dimensions of the already familiar CC612 charge controller so that it could be used in existing charging stations or wallboxes. The benefit for the customers is: the CC613 fits into the existing space, making it easy to retrofit.

The enclosure has been modified and an Ethernet interface has been integrated so that the controllers can be directly connected to an Ethernet network. This offers customers a cost advantage, as additional USB Ethernet adapters are not required.

The CC613 charge controller is also based on the IEC 62955 standard, which describes the fault current sensor. According to the standard, AC residual currents may no longer be triggered, as this function must be performed by the upstream RCD type A.

Additional monitoring – increased electrical safety

The emergency opener has also been built into the existing enclosure. This means that, in the event of a power supply failure in the charging station, the plug can still be removed without having to install another component in the station. On the one hand, this reduces the amount of wiring and, on the other hand, it also reduces the space required, which is a major advantage in small, compact wallboxes.

Continuous PE monitoring, another new function, ensures that the PE connection is properly connected. This is an advantage that helps to increase electrical safety and reduces the risk of electric shock in the event of a fault.

Another advantage is the integrated weld check detection. This checks whether the contactor or the load switch is stuck. To do this, the voltages upstream and downstream of the contactor are monitored. If a voltage is present behind the contactor when the contactor is open, an error message is issued.

The already known PLC (Powerline Communication) with ISO 15118 for implementing plug & charge has been retained as has the DC residual current detection with externally connected current transformer and the regular software updates for feature enhancements.

The integrated DLM (dynamic load management) has been extended with further functions but can also be overwritten by higher-level systems. This gives the customer the possibility to control larger systems either locally using the controllers themselves or using an existing (building) management system.

Extension module AUX613

In addition to the controllers, the AUX613 extension module for the charge controller will be available to customers at the end of the 1st quarter of 2020. This device uses the same housing as the CC613 and is therefore just as compact. In the first step, the AUX613 will contain an Ethernet switch that is connected to the CC613 via the USB interface. This reduces the amount of wiring required for communication with the billing system, as star topology is no longer necessary, and the Ethernet cables can be set up as a ring.

The AUX613 series allows for extensions. It is conceivable, for example, that a Wi-Fi module or additional inputs or outputs could be integrated in the next step.

Bender is taking the next step and providing its customers with solutions that meet the requirements of a sustainable and intelligent charging infrastructure while taking into account the normative and legal requirements. With continuous further development of the controller platform and software updates, any changes to the applicable standards in the future will also be covered to the greatest possible extent. This allows customers to focus on developing their charging stations and their sales – Bender will continue to pave the way for electric mobility into the future. ■

*Dipl.-Ing. Frank Mehling
Business Unit E-Mobility*

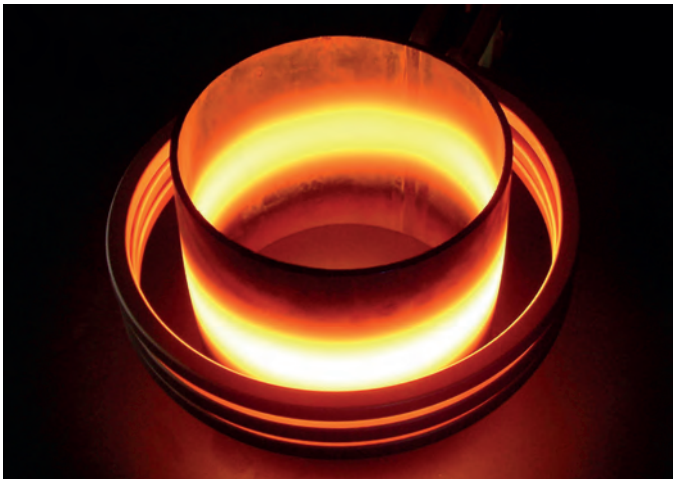


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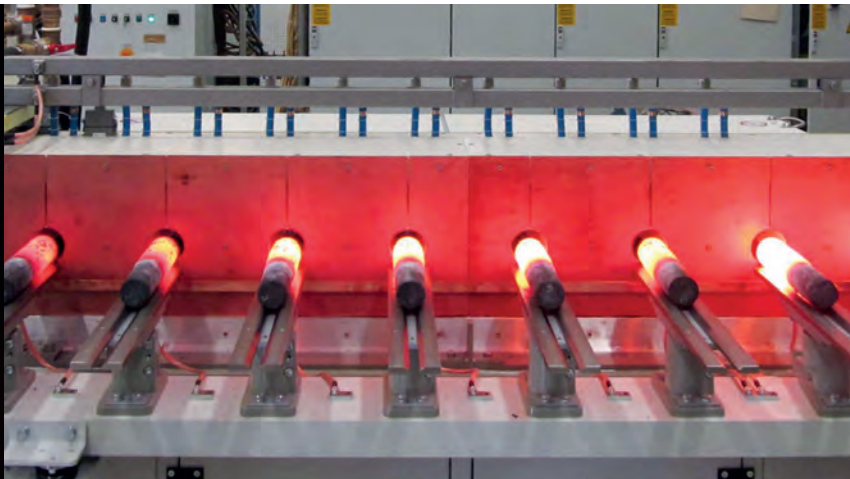
More information: <https://www.bender.de/en/products/charge-controller/cc613-charge-controller>



Insulation monitoring in installations with low insulation levels



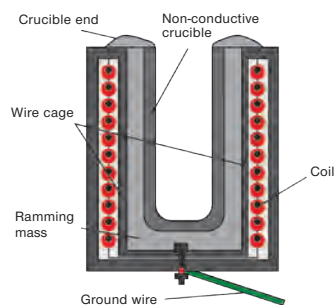
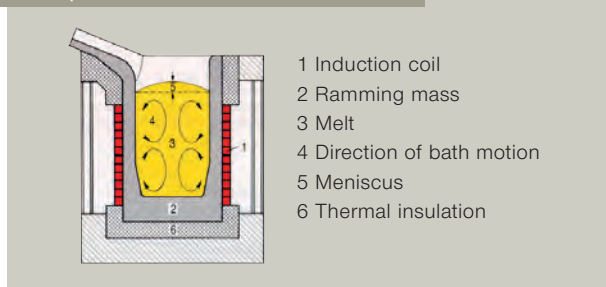
Inductive tube heating by an enclosing coil
©EMA-TEC GmbH



Inductive heating system (600 kW) for bar sections
(end product: M72 screw) ©EMA-TEC GmbH

Induction furnaces are devices and equipment used to heat and melt metals by inductive heating whereby energy is transmitted via a current-carrying coil. Heating is enabled by inducing an eddy current into a metallic conductor, i.e., the workpiece to be heated.

Principles of induction furnaces



Because energy is inducted directly into the workpiece, these furnaces are more efficient than other heating methods despite the losses from power supplies usually requiring inverters or frequency converters. Heat is generated only in the workpiece and requires no transfer via thermal conduction, thermal radiation or convection as with other methods. Hardening installations work in the same way with the workpiece being inserted into the coil and heated accordingly.

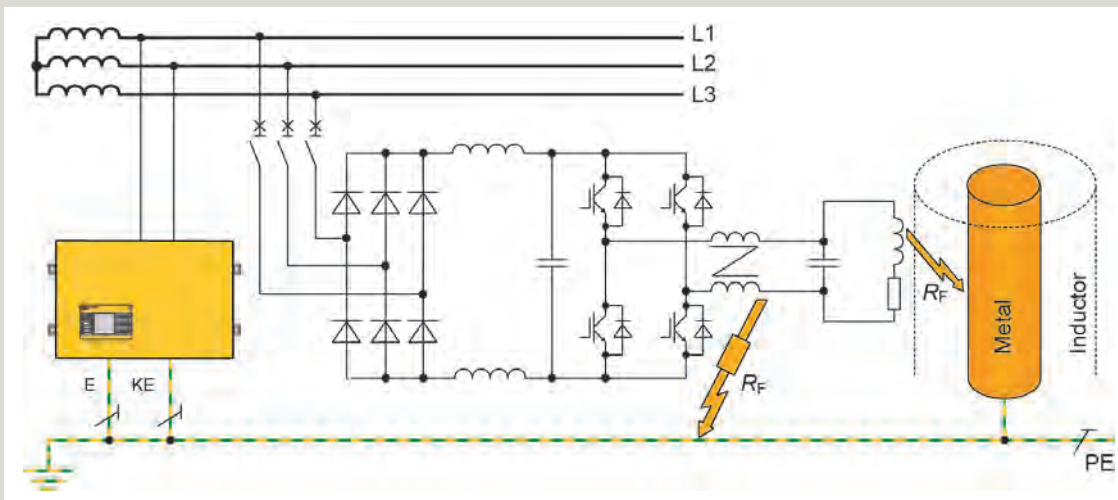
The heart of the induction furnace or hardening equipment is the induction coil, also known as the inductor. Inductors are available in many designs and variations and are usually manufactured and adapted specially for furnaces or workpieces. They are usually water-cooled because even in small installations high reactive currents can occur ($P > 5 \text{ kW}$). Alternating current flows through the inductors creating an alternating magnetic field, especially in its interior. The material to be heated or melted forms a kind of second, short-circuited coil in which a voltage is induced which results in eddy currents.

It is this current that results in the material being heated. Heat is therefore generated in the material rather than entering it from the surface. The inductor's form is similar to a coil, but is shaped according to requirements. It is usually comprised of a water-filled pipe.

The water cooling effect along with the inductor being embedded in mortar or concrete in induction furnaces generally results in very low insulation resistance ranging from several ohms (Ω) to several kilo-ohms ($k\Omega$). Operating voltages are applied from a low voltage range of $< 1,000 \text{ V}$ to a lower medium voltage range of several kilo-volts. Power supplies are generally from isolated IT systems (unearthed system) enabling very high levels of availability to be achieved for induction furnaces and hardening equipment. This is important because any sudden failure due to a cut in the power supply not only means an interruption in production, but can also damage the installation. In any event, high costs will be the result.



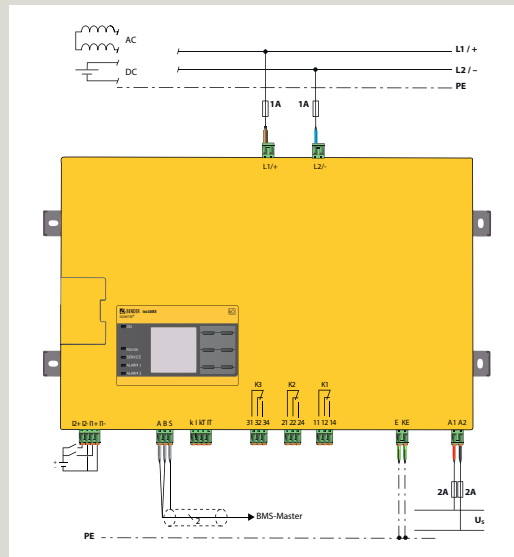
Basic electrical design



TECHNICAL APPLICATION



Inductor with ejector unit for bar sections ©EMA-TEC GmbH



Connecting the iso1685DB to an IT system



Normative requirements mean the IT systems are also monitored for insulation resistance to earth. However, low insulation resistance means an insulation value of 100 Ohm/Volt of the operating voltage cannot be maintained in these applications, as recommended for example in DIN VDE 0100-530. Equipment safety is the priority here. However, if a liquid melt comes into contact with the water-filled, current- and voltage-carrying pipe of the inductor, this is not only highly hazardous for the installation, but also for the life and limbs of persons nearby. The potential danger is that the inductor pipe

melts and the water flowing in it evaporates. The steam that develops can then lead to a serious explosion.

Reliable insulation monitoring is therefore very important and needs to be capable of measuring low insulation values at relatively high operating voltages. Since the inductor is usually fed by inverters or frequency converters, an insulation monitoring device must not be negatively affected by DC voltage faults. A further problem is that multiple inductors are usually fed from one power supply with basic insulation levels sinking in line with the number of inductors.



Insulation monitoring device
ISOMETER® type iso1685DP

The insulation monitoring devices types iso1685DP, isoLR1685DP and isoHV1685D have been developed for these applications. This makes it possible to measure insulation values from 20 Ω to 100 Ω in installations up to AC/DC 690 V and insulation values from 200 kΩ to 1,000 Ω in installations up to AC 0-2,000 V/DC 0-3,000 V. Users can then detect insulation deterioration at an early stage via two alarm values with relay messages and the BMS/Modbus interface. Hazardous operating situations as well as accidents can then be avoided. ■

Helmut Becker
Business Unit Industrial Solutions, Product Management



TECHNICAL APPLICATION



Residual current monitoring and system overview using Bender technology

Safe drive at SEW-Eurodrive

SEW-EURODRIVE is an owner-managed family business based in Bruchsal, Baden. It has more than 17,000 employees and is one of the world's market leaders in the field of drive technology/drive automation.

The SEW Group currently has 15 manufacturing plants and 77 Drive Technology Centres in 50 countries. These provide products, solutions and services for a multitude of customers in industries ranging from automotive and beverages through to transport, logistics and mining. Its motto: Driving the world.





One of SEW-Eurodrive's core competencies is manufacturing electric geared motors in the nominal output power range of 0.5 – 240 KW. Once finished, its listed motors (standard, electric monorail, variable speed, stainless steel, explosion-protected gear and servo motors) are extensively tested in the factory on motor test benches.

Test benches for geared motors

At the company's worldwide locations, different types of stationary test benches are used for a final inspection of the SEW speed drives. Function tests can be performed on different types of motor (asynchronous, synchronous, asynchronous servo) as well as on electric cylinders, gears, brakes and encoders. The diversity of the SEW product portfolio means the test benches need to be capable of carrying out a wide range of services.

Safe monitoring by Bender

Bender products assist in providing the operators with the maximum level of safety. Leakage currents are measured using RCMS460 residual current monitoring systems, giving additional protection to operating personnel as well as enhancing quality assurance. This necessitates monitoring to be set to the limit value required by the design of the test unit. SEW-Eurodrive uses the COMTRAXX® COM465IP to automate this configuration.

The COM465IP is a condition monitor with an integrated gateway. The intuitive COMTRAXX® user interface gives a perfect overview of the system, enabling parameters to be set simply and intuitively for all connected devices. It is based on HTML5 and is therefore future-proof and barrier-free.

COMTRAXX® COM465IP

Condition Monitor with integrated gateway for connecting Bender devices to Ethernet TCP/IP networks



"At the company's worldwide locations, **different types of stationary test benches** are used for a final inspection of the SEW speed drives."

Faster and more detailed

Function modules B and C are being used in the current project at SEW. This enables full communication and parameter setting via Modbus TCP. This will allow a uniform measuring standard on test benches to be implemented worldwide. Parameter settings for the residual current monitoring devices are made via the COMTRAXX® COM465IP using Modbus TCP. By using the Modbus control commands, reaction times (i.e. command sent from control station -> command implemented in RCMS460) far below 100 ms were achieved. This means considerable time savings compared to manual parameter setting via the device display. Furthermore, since parameter adjustment is very fast during a test, the individual phases of a test can be monitored in much more detail.

Outlook: Future added value

All standardised SEW motor test benches worldwide will be extended by a COM465IP with function modules B and C. The added value of the application can then be utilised everywhere, achieving uniformity across the test benches. All new test benches will also be equipped with this solution as standard in future. ■

Modules to extend functionality

The COM465IP functionality can be extended by six different modules. This enables the device to be individually adapted to requirements.

- **Function module A:** Individual texts for devices/channels, device failure monitoring, emails in the event of an alarm
- **Function module B:** Modbus TCP server to provide all device information in the system, SNMP server
- **Function module C:** Parameter settings for BMS devices as well as BCOM and universal measuring devices
- **Function module D:** Visualising Bender systems, system visualisation
- **Function module E:** Virtual devices
- **Function module F:** Third-party device integration.

*Dipl.-Wirt.-Ing. Thomas Frössinger
Technical Office Mannheim*

*Jan Hofmann
Program Management
Product Management*



TECHNICAL APPLICATION

Sampling of a deep-sea octopus coral (*Acanellaarbuscula*) in the North Atlantic at a depth of around 800 metres
©MARUM – Zentrum für Marine Umweltwissenschaften, Universität Bremen

Short measuring intervals for submersible robots

Research data in real time

ROVs (Remotely Operated Vehicles) are used in **marine research for underwater exploration**. The high-tech devices need to withstand immense pressures and perform their work reliably even at depths of several 1,000 metres. A stable power supply is therefore vital for success.

"Each team member must be able **to pilot and monitor** the ROV as well as perform their **key skill**, e.g. in **electrics, hydraulics or information technology**.
The ROV is operated by a pilot and co-pilot."



Zentrum für Marine
Umweltwissenschaften
Universität Bremen

Since 2012, the MARUM Center for Marine Environmental Sciences has been the University of Bremen's first and only faculty carrying out research.

Around 400 staff work there to improve understanding of the key processes in marine environments. With its research areas Ocean and Climate, Geosphere-Biosphere Interactions and Seafloor Dynamics, its scientists are involved in national and international research projects. The basic research it conducts has enormous potential because the ocean floor accounts for 71% of the Earth's solid surface and is located at depths of up to 11,000 metres below sea level. To understand interactions taking place at the seafloor/ocean confluence and to quantify their role in the Earth's geosystem, MARUM operates and develops a fleet of different submersible and measuring systems which are deployed at sea by research ships.

Bundled technology in the name of research: The ROV MARUM-SQUID

The MARUM-SQUID is a powerful, lightweight work class ROV with a maximum diving depth of 2,000 metres. All ROV systems such as the SQUID are connected to a ship via a supply cable and controlled remotely and supplied with power from onboard. The ROV is made of a plastic frame in which all the components needed for diving are installed. To prevent the vehicle from sinking like a stone, the frame has a large buoyancy block made of thousands of tiny air-filled glass balls offsetting the vehicle's weight. These give the ROV neutral buoyancy in water enabling it to freely manoeuvre underwater using its motors. The SQUID has three cameras for acquiring scientific data, a sonar and two line lasers for surveying objects on the seafloor. To acquire samples, there is a fully proportional manoeuvrable gripper with seven degrees of freedom.



View into the control room of the MARUM-SQUID
©MARUM – Zentrum für Marine Umweltwissenschaften, Universität Bremen

The ROV is equipped with sensor technology enabling the vehicle to be positioned above the seafloor with pinpoint accuracy as well as to manoeuvre it along specific routes. Powerful propulsion allows it to be operated in currents of up to three knots.

Extensive planning for deployment at sea

Dr. Nicolas Nowald, a research associate in the MARUM marine technology working group, explains the make-up of a ROV team at MARUM: "Each team member must be able to pilot and monitor the ROV as well as perform their key skill, e.g. in electrics, hydraulics or IT. The ROV is operated by a pilot and co-pilot. The pilot "flies" the ROV while the co-pilot monitors all the systems and operates the manipulator. A third team member monitors the winch on deck and unwinds the supply cable during the dive".





TECHNICAL APPLICATION

►►► Ideal onboard voltage

A transformer system supplies power to the ROV. The primary side is provided by the ship's system. On the secondary side, 3 kV is generated to keep the voltage loss in the supply cable low (3 x 4 mm² conductor + PE). To keep the transformer's size and weight to a minimum, frequency is increased beforehand to 800 Hz. A voltage filter levels out voltage peaks. Current is then fed through an electrical slip ring on the winch into the 2,200 m-long supply cable on the ROV with a diameter of 19 mm. The ROV's hydraulics and drive motors are supplied with DC 500 V and the cameras,

sensor technology and lighting with 24 V. The smaller the cross-section of the supply cable the lower the flow pressure underwater, the cable weight and, ultimately, the overall weight of the ROV system.

Improved insulation monitoring for the MARUM-SQUID

ROV insulation monitoring in the MARUM-SQUID was initially performed by a Bender type IRDH375 ISOMETER® insulation monitoring device and the AGH520S coupling device with measuring intervals of 6 to 12 seconds. However, it quickly became apparent during operations that the intervals were too long for the research applications. Bender was contacted to explore options for faster insulation fault detection. The original insulation monitoring device was therefore replaced by a type iso685W-S ISOMETER® with the FP200W display and control unit. With an on-site



Launching the ROV from the research ship Meteor
©MARUM – Zentrum für Marine Umweltwissenschaften, Universität Bremen

"In **operations**, the new ISOMETER® gives MARUM researchers the major **advantage of real-time monitoring** via Ethernet in addition to shorter measurement times."

adapted profile, Bender technicians were able to reduce the interval to 3 seconds. Hedda Precht Dipl. oceanographer, freelancer at the Bender, company added: "In operations, the new ISOMETER® gives MARUM researchers the major advantage of real-time monitoring via Ethernet in addition to shorter measurement times. Previously, insulation values could be read only from the IRDH375 installed into the 3 kV transformer system. This was impracticable during dives because the transformer is located far away from the ROV's actual control panels. Following replacement, insulation values can now be easily monitored by one of the navigation computers". ■

*Dr. Nicolas Nowald, Research Associate
MARUM Marine Technology Working Group*

*Oliver Schultz
Application Engineer, Application Sales*

*Dipl.-Ing. Benjamin Greiff
Industrial Solutions, Market Segment Manager Harbours & Vessels*



PEM353 universal measuring device for different measured parameters, energy and power measurement with storage, power quality monitoring, limit value monitoring with alert notification



PEM735 Class A power quality analyser

Info



Additional information for subsea operations:

Voltage fluctuations and transients in the onboard power supply system can damage the current transformer as well as the supply cable and are therefore a risk to the success of the research projects. In the event of an incident at sea, repairs can be made only with what is available onboard. In the worst case, a total system failure can mean that research projects that have been planned, applied for and financed for years cannot be performed. Power quality measuring devices enable such disturbances to be promptly detected and alerted before damage occurs.

**Unearthed power supply and insulation monitoring
to ensure electrical safety**



High availability for reliable paper production

Mitsubishi HiTec Paper Europe GmbH is one of the most prominent speciality paper manufacturers worldwide. Headquartered right on the A2 motorway in Bielefeld, East Westphalia, it has been making paper since 1799. With around 520 employees, two paper machines and five coating machines, it manufactures approximately 150,000 tonnes of speciality paper every year. Germany's entire national demand amounts to 185,000 tonnes. The product portfolio encompasses inkjet paper, thermal paper, non-carbon paper, label paper and barrier paper for the food industry. All products are marketed worldwide.



For a paper factory that produces such an impressive amount of paper, operational availability is of the highest importance. Any system failure would result in significant economic loss. As a result, the production equipment at the factory in Bielefeld has now been fitted with an unearthed power supply (IT system) and a Bender insulation monitoring device (IMD).

The advantage of the IT system is that there is no connection between power source (transformer) and earth. This means that the electrical installations still function in the event of a first insulation fault. In a classic earthed TN system, the first fault would already trip a protective device, shutting off the power supply and halting production. Insulation faults such as this can often be traced back to wet conditions, moisture or mechanical/electrical loads, all of which are high risk factors in a paper factory which uses a lot of water in its processes.

The iso685-D-P insulation monitoring devices from Bender identify and report insulation faults before they become critical so that they can be remedied in time to prevent production stoppages. Service personnel are notified of faults in advance by a pre-alarm feature. This prevents critical production interruptions, which are especially disastrous for the paper industry because of the time it takes to get the paper machines back up and running.

A complete solution for old problems

In 2018, Mitsubishi HiTec Paper made the decision to modernise its existing insulation monitoring devices. There were key reasons for doing so:

1. Over the years many electric drives were fitted with frequency converters with clocked semiconductor switches. In the event of a fault, these can give rise to AC and DC insulation faults with variable frequencies. Additionally, clocked frequency converters disrupt the measuring methods of older insulation measuring devices, which as a result might provide incorrect measuring values. In contrast modern insulation measuring devices with the Bender *AMP^{plus}* measurement method deliver reliable measuring values.
2. Finding insulation faults in complex electrical installations can, under certain circumstances, be very difficult, because several faults can sometimes exist parallel to one another. The usual approach would be to disconnect certain parts from the system one after the other to narrow down the source of the fault. However, this would mean production downtimes. The Bender EDS insulation fault location system offers the solution to this problem. It involves sending a locating current through the power supply system. This locating current also flows through the insulation fault and can thus be localised with the portable EDS3090 insulation fault location system or the fixed EDS44x components.





TECHNICAL APPLICATION



Both problems were solved with a single device: the latest iso685-D-P insulation measuring device. This device uses the high-precision AMP^{plus} measurement method for heavily “contaminated” industrial networks and features an integrated locating current injector for EDS systems, which can be used to reliably localise insulation faults in complex IT systems.



Figure1:
Insulation monitoring device (IMD)
ISOMETER® iso685-D-P

But that’s not all, the device also has other special features on offer:

- Integrated web server/Modbus TCP communication
- isoGraph function for displaying the device history
- Freely programmable analogue and digital interfaces
- Pre-defined measuring profiles
- Automatic adaptation to system leakage capacitances
- Automatic adaptation to disturbances thanks to frequency converters.

Portable version
with flexible measuring clamp

Mitsubishi HiTec Paper opted for the portable EDS3090 insulation fault location system. All necessary components including the EDS195PM insulation fault locator and the PSA3020 and PSA3052 measuring clamps are packaged in a stable case for ease of use and transportation.

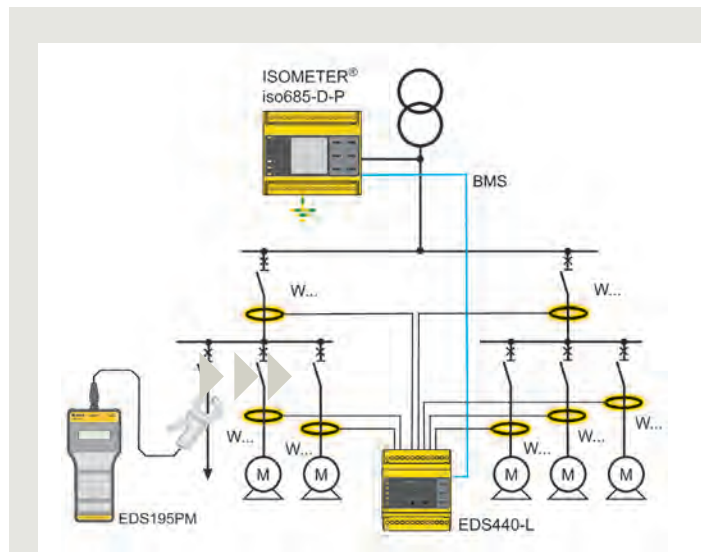


Figure 2: Basic installation of an EDS system with fixed EDS44x components in combination with the portable EDS3090 components

In conjunction with the PSA3052 measuring clamp, the EDS195PM portable insulation fault locator indicates insulation faults in a faulty outgoing circuit by giving an acoustic and visual warning. In addition to the rigid measuring clamps, a flexible CTAF-type clamp has also been available since June 2019. It features a flexible measuring strap which lets you perform measurements in electrical distribution systems under difficult conditions, for instance when there is not enough space to employ a rigid clamp.

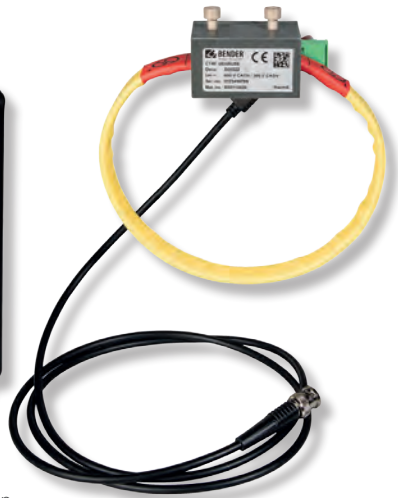


Figure 3:
CTAF-type flexible measuring clamp

The old insulation monitoring devices were replaced with new iso685-D-P devices by Mitsubishi HiTec Paper technicians. The Bender service team then took care of the commissioning.

Bender service technicians are available to assist customers wherever they are in Germany. Bender service is there to help for services such as commissioning complex systems or locating faults in electrical installations.

Employee training included

In order to ensure optimal use of the new insulation monitoring devices and insulation fault location system on site, Mitsubishi HiTec Paper maintenance technicians received intensive training in Bender's Grünberg headquarters. Michael Faust from the Bender Academy and Product Manager Jörg Irzinger gave participants both theoretical and practical training on the use of the measuring devices.

The Bender Academy also offers seminars and training sessions in fields such as insulation monitoring, residual current monitoring and maintenance, which take place as one- and two-day seminars or in-house training events. Additionally, regional half-day events covering various topics are held in individual states throughout Germany.

Recording all data

So that the insulation values can be monitored at all times, Mitsubishi HiTec Paper records the data using existing ICA equipment in the form of a PLC control system. The data is then displayed in a control room to keep employees informed about the status of the production equipment at all times. ■

*Wirt.-Ing. Sven Thiel
Techn. Büro NRW*

Conclusion

Thanks to the new iso685-D-P insulation monitoring device with an integrated locating current injector and the EDS insulation fault location system, insulation faults can now be identified earlier with a high degree of safety. This significantly lowers maintenance costs and improves equipment availability dramatically.

The Mitsubishi HiTec Paper factory in Bielefeld is an impressive testimony to the advantages and performance capabilities of an unearthed power supply (IT system) in conjunction with a modern insulation monitoring system from Bender.

TECHNICAL APPLICATION



Proven technology for electrical safety in the reconstruction and modernisation of Russian municipal hospitals

Modernising with safety

Russia continues to modernise its healthcare system while also raising the level of building protection technology. Safety is becoming increasingly standardised also at international levels and requires reliable, standardised safety solutions in the areas of systems and building technology. As part of the complex reconstruction and modernisation of a resuscitation department at Moscow's "Buyanov Municipal Clinical Hospital" (until 2015: Clinical City Hospital No. 12), state-of-the-art supply and system protection technology is therefore being used to provide reliable safety for people and machines, also in highly complex electronic environments.

For more than two decades, the Russian healthcare system has been in transition with impressive major modernisation projects. A government-run large-scale structural project "Health", begun in 2012 and running until 2020, is raising technical levels in Russia's medical institutes, hospitals and other medical locations to international standards. Safety standards for power supplies must therefore also be met as well as the needs of electronically highly complex medical equipment and devices.

Sustainable partnership

German companies have long been involved in modernising medical locations in Russia, also under the new, more difficult political situation since 2015. The good experience that Russia has had with German engineering, German planning skills and German know-how continues to be the determining factor for using German companies and German technology in modernisation projects in the Russian Federation's healthcare sector.

At the beginning of 2014 and with the involvement of the Bender Group, an ultra-modern surgical block with a total of 14 operating rooms was put into operation at "The Buyanov Municipal Clinical Hospital" in Moscow. At the end of August 2019, an ultra-modern resuscitation department with up to 24 beds was opened. The new department, built in just six months, adds state-of-the-art diagnostic and treatment facilities to the hospital.

Hospital history

"The Buyanov Municipal Clinical Hospital" has a total of 864 inpatient beds and can look back on an almost 40 year history while also now being the largest multi-clinical facility in Moscow. It houses numerous disciplines for high-tech medical patient care as well as other medical specialisms and highly qualified personnel.

Since its foundation, the hospital has also served as a chair for university clinics, cooperating with the best medical educational institutions in Russia.



The synergy of scientific potential and practical experience, the use of modern treatment and diagnostic equipment and the introduction of state-of-the-art treatment procedures have enabled 'The Buyanov Municipal Clinical Hospital', which now has a total of 1,250 staff, to provide highly qualified medical care to more than 55,000 patients annually.

Reconstruction and modernisation

Since 2007, the hospital has been undergoing reconstruction and modernisation, with the hospital's different units and services gradually being housed in new pleasant and comfortable rooms equipped with the latest diagnostic and treatment equipment. The operating rooms, intensive care units and resuscitation departments have also been equipped with the latest technology as part of the reconstruction and modernisation.

The new resuscitation department has general functional and inpatient rooms as well as a total of two resuscitation rooms with up to 24 resuscitation places for patients from neurosurgery.



►►► Strong together – Protection in sensitive environments

The Bender Group provides state-of-the-art medical technology as well as the following protection and monitoring systems for building technology:

- Supplies for Group 2, Group 1 and Group 0 rooms
- Isolated power supplies, equipped with IT systems, automatic switching devices for ATICS-DIO series safety power supplies, integrated isoMED427P-2 series insulation monitoring devices, EDS system from the EDS151 series and isolating transformers from the ES710/... GL (GreenLine) series
- Wall-mounted TN-S system distributor for safety lighting power supplies. All 12 outgoing circuits are monitored using type B (RCMS150 series) residual current monitoring systems with integrated measuring current transformers for earthed AC/DC systems (TN and TT systems)

- COMTRAXX® CP9xx alarm indicator and operator panels with touch screen in hygienic designs (7" and 24") which set new standards for user-friendly displays in resuscitation and intensive care areas
- Distribution board communication (DB-COM) for communication between the COMTRAXX® CP9xx touch screen and a controller (WAGO) via BCOM (network via Ethernet)
- Supplementary equipotential bonding, SEB30, for Group 1 and Group 2 rooms, according to IEC / HD 60364-7-710
- Installation of the tried and tested BMS bus
- Installation of a COM465IP gateway required for remote access.

All switchgears and panels were completed in the factory at Bender Solutions GmbH & Co.KG in Grünberg and delivered to Russia ready to connect.





Control Panel CP9xx – The technical monitoring centre

Bender's proven technology and the new COMTRAXX® CP9xx alarm indicator and operator panel with touch screen is seen as pioneering for Russia, especially in medical locations.

The panel has intuitive and simple operation via a touch screen and provides, visually and acoustically, all the information needed by operators and personnel. It has an optimal overview of all connected systems, issues alarms in the event of a fault and ensures easy control of the system. A buzzer, vital for alarm messages, is integrated into the main board. All functions and texts can be displayed in the local language. The project is unique by being the first to use Bender panels of the latest COMTRAXX® CP9xx series in Russia.

And to enable the Bender Group to keep on giving customers the highest level of service in the future, a COM465IP gateway in combination with a router from Phoenix has also been integrated. This means every installed Bender monitoring and switching device as well as all TM panels and BSV systems in a project section completed in 2015 (surgical block with a total of 14 operating rooms) can be monitored via the internet and accessed directly from Germany. 24-hour support, parameter settings for Bender devices, rapid assistance in the event of faults and the installation of software updates are then easy to perform.

Technical support can be provided without having to fly to Moscow thereby protecting the environment and significantly reducing follow-up costs for the customer.

The Buyanov Municipal Clinical Hospital in Moscow is a prime example of the complex requirements of building services that need to be met with modern electrical safety technology. By applying the BENDER Group's engineering expertise, always focusing on customer needs, solutions can be found for every challenge – and not just in the healthcare sector. ■

*Thomas Gans
Regional Management, Hospital Projects*

TECHNICAL APPLICATION

As the **world's first hybrid powered off-road truck in the history of the Dakar Rally**, the Renault C640 of the Riwald Dakar team from the Netherlands with driver Gert Huzink started in Saud Arabia.

A new chapter in rally sport begins

Bender on board at the first Hybrid Rally truck ever for Dakar 2020



In collaboration with Urban Mobility Systems (UMS.) and the Czech company MKR, the first Hybrid Dakar truck ever in the world is especially developed for the Dutch Riwald Dakar Team! The Dutch company UMS, founded in 2016, has taken care of the development of the complete power drive and battery systems for this amazing hybrid truck.

The Renault Truck C460 Hybrid Edition already won the pre-prologue in November 2019 convincing being by far the fastest of the rest during the day. The special thing about this truck is: The electrical engine provides the extra power of 205 hp with a torque of 1600 Nm besides of the already existing engine of 1040 hp and a torque of 4600 Nm.

Charging the battery system during the race is done by a power regenerating system in the truck during braking or driving downhill. This is done in a very fast way, so that the hybrid system is fully charged and available again when needed during the race. The development period of this Hybrid Rally truck was almost one year. With an ambitious team of engineers and dedication it was possible to do this within just a short time period.

The entire technical design of the truck is completely different from the regular rally truck. Air tanks are integrated in the chassis, the leaf springs are made of a composite material and weighs 2.5 tons lighter than the standard rally version.

Safety above everything

The latest battery management system (BMS) technologies has been used to keep the batteries in the best possible condition during the race. Safety systems are integrated to keep the whole powertrain under control in extreme environments, such as the Dakar rally. For monitoring the DC 400 V within the Hybrid system, the Bender insulation monitoring device (IMD) ISOMETER® IR155 was used. This IMD was able to fulfill the safety task within this extreme environment over a distance of more than 9000 km during the rally.



Mr Lars Kool, (CTO / CEO Urban Mobility Systems) comments: “safety above everything, there are no concessions to make in electrical power trains. That’s why we have chosen for the ISOMETER® IR155 of Bender”. As well as in our other Electric vehicles like the Mission, Vision, Zolution and other industrial vehicles we only work with high quality products and A-Brands like Bender. Our customers make big investments to fulfill the zero emission requirements in urban areas. Reliability and safety is everything within the e-mobility transition! Our clients do recognise that.

Mr. Lars Kool continues: The international interest in Urban Mobility Systems vehicles and solutions is growing. We have seen that again during our presence at the Consumer Electronics Show (CES)¹⁾ in Las Vegas and the rolling out in America and Canada has been started.

¹⁾ The CES, Consumer Electronics Show, took place in Las Vegas from 7 to 10 January 2020 and presented, among other things, numerous highlights of digitization around the car.



▶▶▶ Safety for all electrically propelled road vehicles

Is there is also a demand for clarity and safety of small industrial electrically propelled road vehicles allowed for driving on public roads? Mr. Kool: Additional safety is often not considered if the vehicle has a lower operating voltage of DC 48 V or DC 72 V, until a safety problem occurs and an investigation is started by the local authorities. Usually it is already too late and it could lead to the end of a company. Who is responsible? Indeed the manufacturer! For these small industrial vehicles allowed driving on public roads we have solutions available, safety for our customers is our top priority and the Bender IMD is mandatory for that! Local inspection authorities for admission electrically propelled vehicles on public roads and the government must be concerned about safety issues of what could happen.



Back to the Hybrid Rally truck for Dakar. The results of many testing days, being the first during the pre-prologue, using the best technologies to ensure the maximum truck performance, gave a particularly good feeling to succeed the Dakar rally!

Of 46 starters in the truck category, the only participant with the hybrid vehicle achieved the 24th place in overall ranking. Among different technical challenges and a burst tire after a jump in the dunes, they reached the finish.

During the 12 stages the hybrid rally truck finished 4 times within the top 10 with the highest classification on 4th place.

This Hybrid Rally truck is the first one of a smaller series production of 15 rally trucks in total. The experience and the results during the 9000 km track will be used for further improvements for the future vehicles. Sustainability driven by Urban Mobility Systems and the Dutch Riwald Dakar team – the new chapter has begun. ■

*Raymond Vergouwe
Bender Benelux*



Workshop

BENDER INHOUSE



Electrical installations at airports

Very high demands in terms of safety and reliability are placed on the infrastructure and electrical installations in airport operations.

In November 2019, the second joint seminar between TÜV SÜD Akademie GmbH and Bender GmbH & Co. KG took place with a total of 87 participants and speakers at Vienna's Lindner Hotel Belvedere.

Airport power supply operators, manufacturers, planners, official experts and maintenance companies discussed safety and other issues in connection with the operational needs of airport electrical installations.

Chairing the two-day conference were Michael Ulman, TÜV SÜD Industrie GmbH, Munich, and Helmut Muhm, Bender GmbH & Co. KG, Grünberg. Internationally renowned experts gave informative presentations on proven concepts for operating, maintaining and repairing electrical installations and also demonstrated relevant protective measures.



Workshop

BENDER INHOUSE

►►► Data, facts, figures the cost of electrical disturbances

Anna-Marlene Sauer, Lufthansa Consulting GmbH, in a presentation on technical disturbances in Germany during the chaotic summer of 2018, was able to demonstrate with real figures the massive impact electrical installation failure can have on airlines and passengers.

In 2018, there were 11 million flights in European airspace (3.8% more than in 2017). Each European flight had an average delay of 14.7 minutes upon departure. In June 2018, 2.5% of all European flights were cancelled, affecting 23 million passengers. Worldwide, the cost of delayed baggage amounted to EUR 2.1 billion and the annual cost of flight disruptions was EUR 58 billion. Delays, flight cancellations and lost luggage were among the consequences of technical problems in lighting and baggage handling systems.

Technical management at Vienna Airport

Josef Hillinger from Vienna Airport Technik GmbH gave an impressive presentation on Vienna International Airport and its various electrical installations and supply systems. During a tour of the airport in the afternoon, conference participants got to know the control and power supply system for the runway and taxiway systems, air traffic control systems and the 400 Hz power supplies for the aircraft. Insulation monitoring devices from Bender are being used in the high-availability IT systems (unearthed power supplies).

Electrification: requirements and opportunities

On day 2, the main topics included the planning, construction and operation of charging infrastructure for electrification as well as innovative supply structures. Rüdiger Dube, Goldhofer AG, reported on the challenges and opportunities of e-mobility in ground support equipment, trends in the airport sector, ion master technology, development and charging





Interested? – We look forward to seeing you at the next seminar.

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Conferences and Congresses

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infrastructure. Stefan Kovacs, Vienna Airport, Sina Volbrecht, Bender and Karl Edelmann, TÜV SÜD, reported on safe electrification of vehicles at airports. This represents a challenge for infrastructure for protective measures and load management, the organisation of charging infrastructure and insulation monitoring in vehicle/charging operations.

Christian Emrich from Munich's fire services, spoke about fire prevention and fire fighting of lithium-ion accumulators from a fire services perspective. In Mr Emrich's opinion, recent coverage in the press on fighting fires involving Li-ion storage media did not reflect the experience of the fire-fighting services: in the event of fire, electric vehicles should be extinguished with water.

Security, accident prevention and property protection at airports

Helmut Muhm, Bender, gave a presentation on performing recurring inspections without the need for shutdowns, and the normative principles of DIN VDE 0105-100, DIN VDE 0100-600, DGUV V3, describing the benefits of a concept of the continuous monitoring of electrical installations using residual current technology.

Markus Sellmeier from Flughafen München GmbH dealt with the conflict between safety and security in airport-specific systems. He spoke about the safety needs in electrical installations and security and crisis management at Munich Airport. In his opinion, the major challenges regarding safety, security and occupational safety could be met more effectively in future through digitalisation, improved processes and new innovative products.

The conference, organised by Aniko Jöckel and Karl Edelmann from TÜV Süd and Reinhard Piehl, Bender, concluded with a summary and final discussion. Participants commented very positively on the second TÜV/Bender seminar. everyone agreed that the event should be take place every two years. ■

*Reinhard Piehl
Regional Management South*

Here are some participant comments on the event:

"Very **professional** and very **well prepared.**"

"I **learned a lot** and am **taking a lot** home with me. Thank you"

"**Expert** and **pleasant speakers.**"

"I **got a lot** from the event."

"Great **event.**"



CUSTOMER PORTRAIT

Electrical installation – Switchgear construction – Automation

Zillmer control cabinet workshop

ZILLMER ELEKTROTECHNIK

Hamburg's partner for industry and commerce



Zillmer Elektrotechnik GmbH, based in the south of Hamburg, was founded in 1918 by Otto Karl Zillmer. Since 2004, the company has been part of the Hamburg-based nationwide Handwerksgruppe Mecklenburg (HPM). Top quality and a professional team characterise the successful group of companies. With around 100 employees, Zillmer Elektrotechnik generates a turnover of approx. 10 million euros per year. The customer base ranges from local medium-sized industries up to internationally leading industrial groups.

High quality from a single source

Zillmer offers a high-quality, wide range of products:

- **Electrical installation**
- **Electrical construction**
- **Switchgear construction**
- **Automation software**
- **Complete assembly**
- **Commissioning**
- **Services**

As a matter of course, Zillmer has important certifications according to ISO 9001, SCC, WHG and offers solutions for potentially explosive atmospheres. In addition to new plants, retrofit projects are often realised for the regional market.

Customers in many industries

Hamburg's industrial structure is very broad-based: mechanical engineering, steel and metal production, chemicals, foodstuffs, pharmaceuticals, petrochemicals, special shipbuilding, aircraft industry, vehicle construction, port handling, etc. There is hardly an industry that is not represented here, including many world market leaders. Zillmer supports companies in all these sectors with state-of-the-art electrical and automation equipment – whether it is electrical installations, switchgear construction or automation solutions. The company is not only active in its home port of Hamburg, however, but in the entire northern German region.

Diverse projects

During the conversion of a large Hamburg administration building into a student residence, Zillmer Elektrotechnik carried out the work relating to power distribution and electrical installation. The company took over the refurbishment of the exclusive wellness area of a senior citizens' retirement home in Hamburg. The company's engineers were called upon to retrofit the control and drive technology of the packaging machine of an international delicatessen company for gourmets. In the data centre of the University of Bremen, the Zillmer team established more than 600 connections in data cabinets. Zillmer was also responsible for the electrical engineering work in Europe's most modern ski facility in Bispingen, where it provided the desired cold snap with snow for indoor skiers. Together with Siemens AG, the Zillmer team provided chilly hours with the construction and delivery of the switch cabinets for the 600 Volt main supply as well as the control of the cooling units on numerous cruise ships of the AIDA fleet. The company is not only successful on land and water, however.



CUSTOMER PORTRAIT



Historical elevator in the "old" St. Pauli Elbe Tunnel with Zillmer project crew

▶▶▶ St. Pauli Elbe Tunnel retrofit project

Since 1911, the St. Pauli Elbe Tunnel, located directly next to the St. Pauli fish market, with its two tunnel tubes under the Elbe, has connected the landing stages of the city of Hamburg with the Elbe island of Steinwerder, located to the south. When it was built in 1907, the "old" Elbe tunnel was a sensation. Now it's getting on in years. Motor vehicles – formerly horse-drawn carriages – do not enter the tunnel via a ramp, but via four lift carriages (elevators) on each side of the tunnel. The entire lift technology is a special development, not simply "off the peg". A suitable retrofit solution is now to be provided here. The previous DC drive solution could not be replaced by a modern three-phase solution in order to avoid the expiry of the operating permit for this listed construction. Retrofit in a completely different way. The DC circuits are operated unearthed with insulation monitoring. Here, Bender has proven to be a capable partner with well-functioning solutions.

"The entire lift technology **is a special development**, not simply "off the peg". A suitable **retrofit solution** is now to be provided here."

In the course of the refurbishment of the St. Pauli Elbe Tunnel, Zillmer Elektrotechnik took over the planning and engineering of two new DC 470 V/2000 A rectifier power cabinets and the DC main distribution boards for supplying the total of eight freight lifts (lift carriages for cars). The company manufactured the new switch cabinets, dismantled the existing cabinets and took over installation, cabling and commissioning.

All in all: An out of the ordinary project at a historical landmark of civil engineering with many challenges, which was solved by Zillmer Elektrotechnik and its partners with flying colours. Incidentally, the renovation of the east tunnel has now been completed, and it was reopened to traffic in 2019. ■

Zillmer Elektrotechnik
Hamburg

EXHIBITIONS 2020



EXHIBITIONS INTERNATIONAL

CIPE Zhenwei Pipeline Exhibition

26. – 28.03.2020

Beijing, China

Medicall Hyderabad 2020

03. – 05.04.2020

Hyderabad, India

Expomin 2020

20. – 24.04.2020

Santiago, Chile

EV/EVSE Show 2020

27. – 30.04.2020

Mississauga, Ontario, Canada

IHEEM Dublin Exhibition

06. – 07.05.2020

Croke Park, Dublin

InfraRail 2020

12. – 14.05.2020

London, A46

CHCC

The 21th China Hospital Construction Conference

16. – 18.05.2020

Wuhan

Expo 2020 Eléctrica International

02. – 04.06.2020

Ciudad de Mexico, Mexico

CIM Show 2020

03. – 06.05.2020

Vancouver, British Columbia, Canada

Canadian Healthcare Engineering Society Chapter Conference 2020

07. – 09.06.2020

British Columbia, Canada

Rail Live 2020

17. – 18.06.2020

Wilmcote, W134

BADS British Association of Day Surgery Conference

25. – 26.06.2020

Cardiff City Hall, Cardiff

Stand 9

Metro Trans

02. – 04.07.2020

Beijing

evse

The Global Stage for Innovation of Charging tech

26. – 28.08.2020

Shanghai

LCV Cenex

09. – 10.09.2020

Millbrook Proving Ground

Stand C3406

Canadian Healthcare Engineering Society Conference 2020

20. – 22.09.2020

Halifax, Nova Scotia, Canada

MINExpo International

28. – 30.09.2020

Las Vegas, NV

Stand 27453

Healthcare Estates

06. – 07.10.2020

Manchester, D35

Power Bangladesh 2020

22. – 24.10.2020

Dhaka, Bangladesh

MATELEC

10. – 13.11.2020

Madrid, Spain

Intersolar India 2020

15. – 17.11.2020

Mumbai

Nepal Medical Show 2020

18. – 20.12.2020

Kathmandu, Nepal

EXHIBITIONS NATIONAL

Hannover Messe 2020

20. – 24.04.2020

Hanover

Hall 012, Stand E59

Electric & Hybrid Vehicle Technology Expo

28. – 30.04.2020

Stuttgart

SMM 2020

The world-leading fair of the maritime economy

08. – 11.09.2020

Hamburg

Hall B6, Stand 229

InnoTrans 2020

22. – 25.09.2020

Berlin



Jens Schäfer

Head of Quality, Bender GmbH & Co. KG

CAREER OUTLINE

Jens Schäfer is 39 years old, and lives with his family in Mücke not far from Grünberg. He studied industrial engineering and worked for several years as deputy quality manager at an electrical engineering company for safety switchgear and systems. He returned to Bender in 2009, first as Head of Product Validation and, since July 2018, as Head of Quality.

"A new challenge every day!"

The industrial world spins a little faster

Mr Schäfer, what experiences have you had so far and what goals did you have when you arrived at Bender ten years ago?

The truth is that my professional roots are at Bender. I began training at Bender back in 1999 and then worked as a qualified technician in inspection. Later I decided to undergo further training in the electrical engineering sector and left the company. My first job after that was at a company involved in the safety-based control of machines, initially in hardware development. I then moved into quality where I headed the test laboratory and supervised a range of different product certifications. I've been back at Bender since 2009, completing a part-time master's at the THM university alongside work, and have been Head of Quality since July 2018.

How should outsiders perceive the job you do as Head of Quality?

Quality at Bender has several elements. On the one hand, it's about conventional quality assurance, i.e., on an operational level in the production area. But we're also currently expanding our fault analysis activities. This is where defective products from production as well as external complaints are processed, error statistics kept and corrective measures initiated. The Product Validation department supports product development, and tests products prior to series production in accordance with the relevant technical standards and customer requirements.

We are also responsible for an integrated management system for quality, environment and energy, ensuring continuous improvement of products and processes via optimisation measures.

With my team (28 employees), I'm therefore responsible for the strategic, methodical, process-related and operative aspects of quality in the company, ranging from product



"We are clearly
on a **path of growth**.
Our products are becoming
increasingly complex and OEM
customers require especially
**high standards
of quality.**"

development, production and supplier quality through to customer services (audits, complaints, etc.). This is quality in a holistic sense and covers all processes.

What are your specific tasks?

As quality manager, I head all departments in this area. We have a common goal: to consistently make products of the highest standard of quality. We ensure quality is constantly monitored and improved along the value chain. Processes need to be validated, automated and standardised in line with requirements. As part of internationalisation, we also need to establish standards in Bender's globally operating locations.

What are the specifics in optimising processes, lowering costs and increasing customer satisfaction, in production for example?

Customer satisfaction is central to our daily work. We need to constantly react to changing customer needs to enable us to offer tailor-made solutions. We can only do this successfully by working together as a team. The quality team provides methodical support and tries to prevent errors from happening in the first place by implementing preventive measures. We don't always manage this. Mistakes will unfortunately happen, but they shouldn't be repeated! The results and measures from error analysis especially help us to reduce error rates, stabilise processes, reduce costs and improve product quality.

Are specific structures/strategies required within the company to ensure quality?

Quality starts in the mind and in the attitudes of each employee. It's important to me to fully involve employees and to make them very aware of Bender's quality standards. Every employee can contribute directly to improving quality by being aware of what they are doing.

What do you find particularly appealing about your job?

Every day represents a new challenge. No matter how well you plan, something unexpected always happens. This is our day-to-day business in quality – there might be a change in customer requirements or a quality problem that needs a quick response. In any event, it keeps us on our toes.

Is there pressure from outside to stay competitive?

Growing internationalisation and fast-changing technology with increasing digitalisation means the world spins a little faster these days. You have to stay on the ball to remain competitive, and you have to keep moving forward so that Bender remains the market leader in the field of electrical safety technology and can continue to pursue its international strategy. The competition never sleeps. Our products are renowned for their high standards of quality. And this should remain so in the future.

What are your ideas for the future and what can we expect from Bender in the coming years?

We are clearly on a path of growth. Our products are becoming increasingly complex and OEM customers require especially high standards of quality. In such a dynamic environment, we have to work not just on our methods and systems. The right mindset of every single employee, a holistic approach to processes and a culture of openness to errors are also key factors behind the continuous success of the company.

Complete the sentence: "For me Bender means..."

... an innovative company and nice colleagues, that I like working for.

Mr Schäfer, thank you very much for taking the time to talk to us. ■

Michaela Heck M.A., textwerk



○ Operating TT systems safely and with high availability

In everyday electrotechnical life it is often attributed to the TT system that it is old and outdated and inferior to the TN system. But this isn't the case. TT systems have a simple earthing design giving them a decisive advantage over TN systems, especially when supplying power to remote, stand-alone installations (e.g., remotely located farms and agricultural sites).

The challenge of TN systems

○ TN systems have a protective earth conductor routed from the main operating earth to the customer's installation. The conductor's potential to a remote earth (0V) must not exceed AC 50 V which could happen if there is an earth fault outside of the customer's installation due to a high-current cable experiencing an insulation fault from very low-ohmic earthing contact resistance (e.g. a power cable earth fault from the drinking-water supply system). In unfavourable circumstances, high residual currents may occur here which might (just) mean the overload protective device does not respond. If the total earthing resistance of the TN system is **higher** than that of the large-surface drinking-water supply system with earthing contact, a dangerous potential can occur at the PE.



The IEC 60364-4-41:2017-03 standard therefore states that:



411.4.1 In TN systems the integrity of the earthing of the electrical installation depends on the reliable and effective connection of the PEN or PE conductors to earth. [...]

- $R_B/R_E \leq 50 \text{ V}/(U_0 - 50 \text{ V})$

where

- R_B is the earth electrode resistance, in ohms, of all earth electrodes in parallel;
- R_E is the lowest contact resistance in ohms of extraneous-conductive-parts that are in contact with earth and are not connected to a protective conductor and where a fault can occur between the outer conductor and earth;
- U_0 is the nominal a.c. r.m.s. voltage to earth, in volts.

NOTE 2 In Germany compliance with condition $R_B/R_E \leq 50/(U_0 - 50)$ is compulsory for the supply network operator.

Practical Expertise

▶▶▶ In densely populated areas such as towns and villages, this is typically not a problem because the earth connection of each house and other installations contributes to keeping the overall earthing resistance low. However, problems could occur in the type of remote installations mentioned above.

A better choice: TT systems

Remotely located agricultural sites are often supplied by their own medium-voltage transformers. The low-voltage side then has only two earthing systems: one on the transformer and one on the building. To set up a 400 V/230 V TN system, these two earthing resistances in parallel connection would now have to be approximately three times lower than any external earthing contact resistance that may occur in the

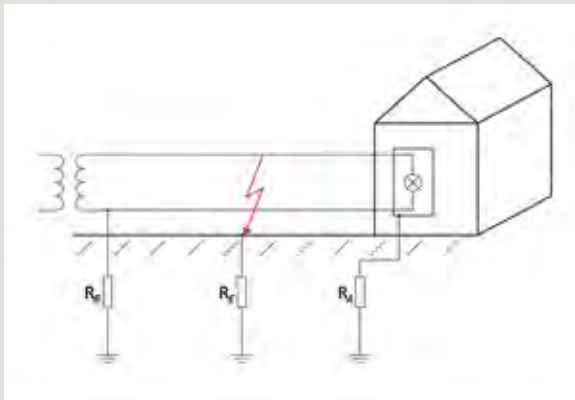
vicinity of the electrical system (see info box on IEC 60364-4-41:2017-03). This is generally unachievable in practice (e.g. because of the good earthing contact and expansion of drinking-water supply systems).

TT systems are then a better choice because an earth fault as described above does not lead to dangerous contact potentials at the PE.

However, in most cases TT systems require an RCD for fault protection. Agricultural sites often have their own generation plants, so an all-current sensitive, modular residual current device such as the MRCDB300 from Bender is the better alternative. ■

*Dipl.-Wirtsch.-Ing. Michael Faust
Bender Academy*

TT system with fault system



The AC/DC sensitive MRCDB300 series
for MRCD applications

Overview of the benefits
of an MRCD:

- **Adjustability of the response value (for fault protection)**
- **Additional display of the leakage current**
- **Also suitable for high load currents (e.g. for larger generation plants).**

More informations:
<https://www.bender.de/en/sensorpro#mrccd>



BENDER Group

The Bender Group with its main office in Gruenberg/Hesse has 70 representations and 16 subsidiaries with nearly 875 employees worldwide.

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