MAGAZINE FOR ELECTRICAL SAFETY

MONITOR

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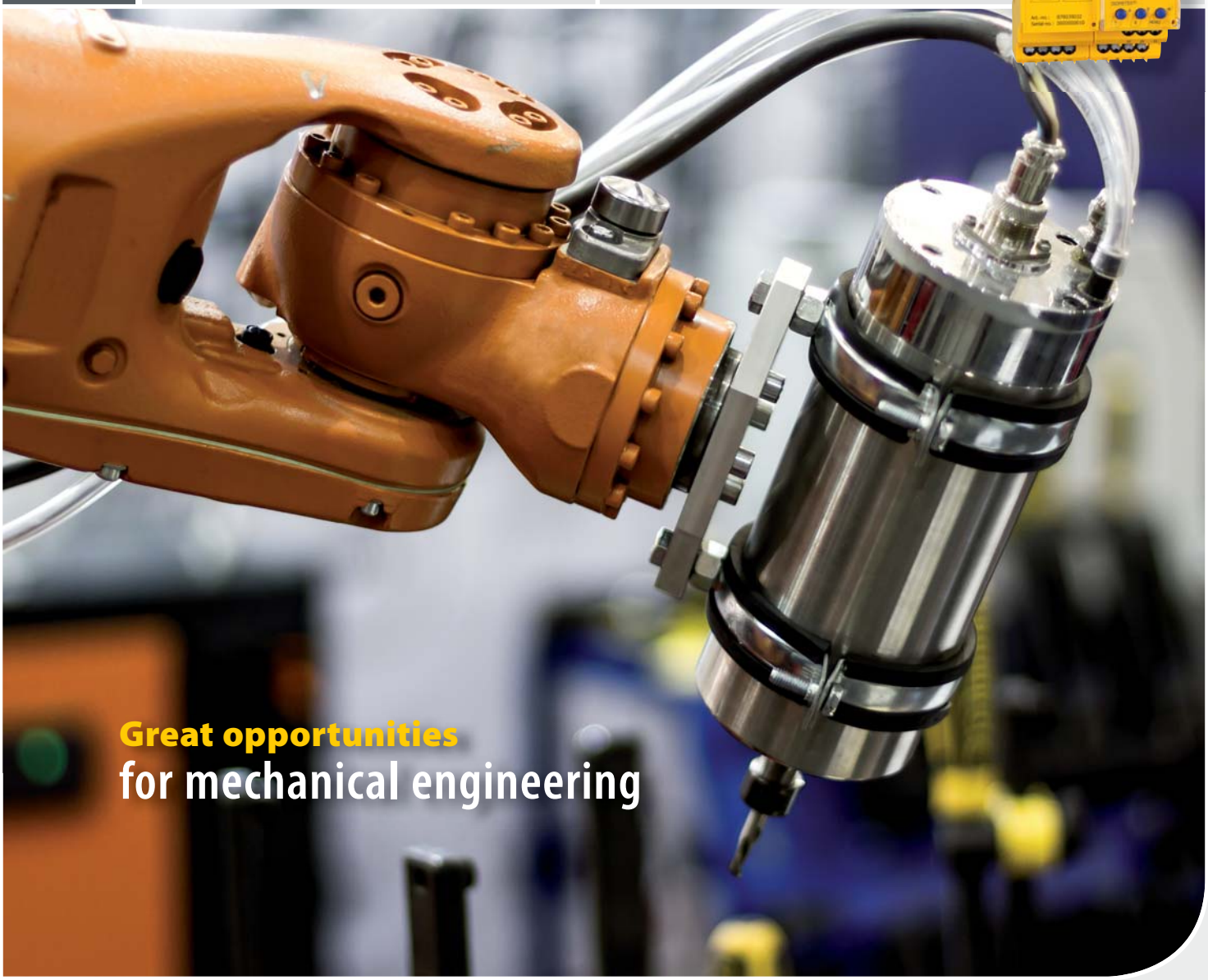
"Amanecer Solar CAP" in Chile:
The largest photovoltaic system in Latin America

ISOMETER® isoHV425 and isoHV525:
Compact devices for IT systems with high nominal AC voltage



Great opportunities
for mechanical engineering

Safety by means of insulation monitoring:
Fire safety in wind power stations

BENDER Group

editorial

EDITORIAL

Dear Readers,

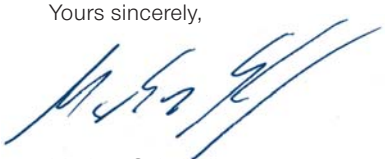
We have long since forgotten what life used to be like without electricity. When it comes to electrical safety, Bender has now been your trusted partner for over 80 years, ever since the invention of the ISOMETER®. In this era of increasing digitalisation, we can no longer imagine being without electricity, and therefore electrical safety, in our everyday lives.

In this issue, follow us into the world of mechanical engineering and discover the emerging trends for supplying power to machinery with the revised version of the IEC 60204:2016-10 standard. You can also judge our competence for yourself by reading about our insulation monitoring example in one of Chile's largest photovoltaic power plants. If you are more interested in the area of medicine and hospital technology, don't miss the latest developments and applications in the Ulster Hospital in Northern Ireland. All of these articles are merely a small section of our applications.

Of course, although we take great pleasure in technical developments and applications, the Bender tradition of investing in people and partnerships has not been forgotten in this issue. The report on our Brazilian partner RDI shows how successful and sustainable a long-term partnership can be, even and especially in challenging times. Our Asia-Pacific business has found a new home with the move into new premises in the centre of Bangkok. And – last but not least – we have now moved into the last construction section of the new building at our Grünberg headquarters. Yet another milestone in the history of the company, and proof of our belief in the creativity and innovativeness of our engineers.

This knowledge is an essential constituent of the cooperation with our partners. It is the basis for innovation, and can also be used during your training. You can find out more about this in the presentation of our Bender Academy. Just one example of the value we place on knowledge and the transfer thereof. If this isn't enough, you can round off this issue by reading a report on our funding for the endowed professorship at the Technical University of Middle Hesse.

Yours sincerely,



Markus Schyboll
CEO

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thyssenkrupp is a diversified industrial group for which innovations and technical progress are key factors for sustainable growth. It employs around 160,000 people in 80 countries ...

FEATURE

Proven power supply system helps to reduce machine stoppages and downtimes considerably

Great opportunities for mechanical engineering

Mechanical engineering, which is continually attempting to reduce machine stoppages and downtimes, can now make significant progress down this path, leading to considerable cost savings.

"If there is an insulation fault,
it can be located immediately during operation
without incurring any downtime."

Regardless of whether the reference is to a main or a control circuit of a machine: Provided no risk is present, a first insulation fault should not trip a protective device, thereby leading to the circuit being interrupted immediately. Especially in complex, interrelated processes, a shutdown can have disastrous consequences. It can also shut down the entire production and may even damage machinery. In some cases, this incurs high start-up costs in addition to the cost of repairing machinery. This is where the machinery planner or designer comes in. By selecting the right system type, potential hazards can be prevented and, as a result, maintenance can be rendered more predictable and cost-effective.

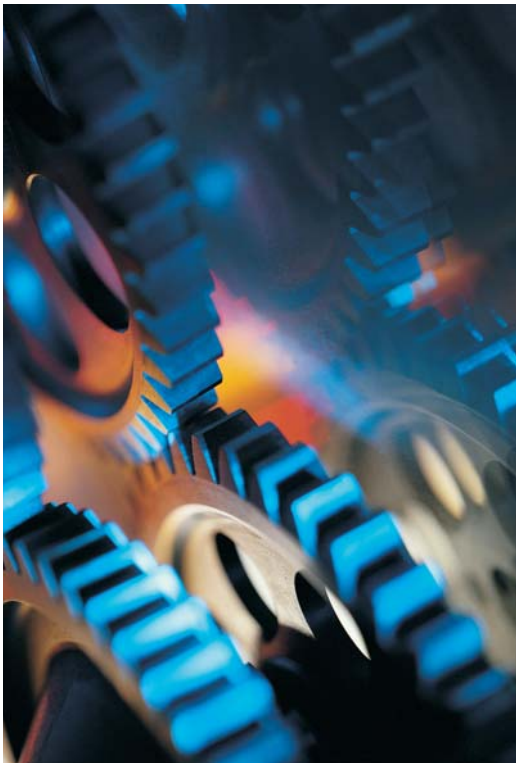
What does the standard say?

It is generally true that the basic safety standard DIN VDE 0100-410 (VDE 0100-410):2007-06 is relevant for protection against electric shocks. The IT system is the only one of the known system types for which shutdown is not required in the case of a first insulation fault. This also applies to electrical machines as the latest edition 6 of the international standard IEC 60204-1:2016[1)] refers to the requirements of IEC 60364-4-41:2005 or the German version DIN VDE 0100-410 (VDE 0100-410):2007-06 in the respective sections including changes from 2016.

The new significant change relates to the fact that control circuits on IT systems are to be equipped with a device which will interrupt the control circuit automatically in the event of an earth fault according to the previous version (German equivalent standard of IEC 60204-1) of DIN EN 60204-1 (VDE 0113-1):2007-06, according to section 9.4.3. In principle, this regulation continues to apply. However, according to section 9.4.3.1.2, it is now stated that it may be sufficient to use an insulation monitoring device (e.g. in compliance with IEC 61557-8) which triggers a visual and acoustic signal. The condition for this is the fact that unexpected shutdown may present a risk to the operation of the machine or the system or further operation may still be necessary in the case of an earth fault.

Alongside this significant amendment, the requirements for unearthed main circuits in IT systems were also defined more precisely. Section 6.3.3 requires that the relevant stipulations of IEC 60364-4-41 are taken into consideration. In practice, this means that an insulation monitoring device is required for IT systems in accordance with IEC 61557-8 or DIN EN 61557-8 (VDE 0413-8) to report the first insulation fault.

A subsequent explanatory note points out that with larger machinery an insulation fault location device (IFLS) in line with DIN EN 61557-9 (VDE 0413-9) can assist maintenance since it locates any insulation faults which may occur while operations are in progress, without the need to shut down the machinery.



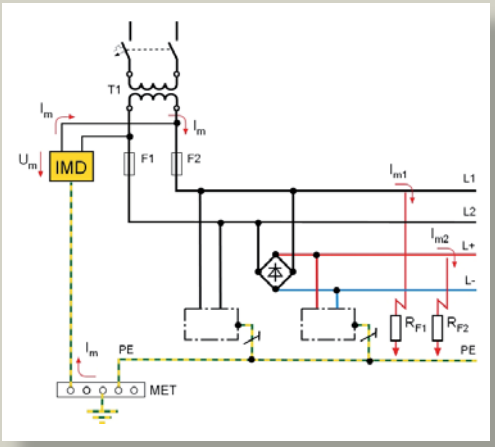
[1] The next German standard DIN EN 60204-1 (VDE 0113-1) is currently being prepared for publication

Furthermore, in section 6.3.3 for TN and TT systems the standard IEC 60204-1:2016 recommends the use of a residual current monitor (RCM) as per IEC 62020 in order to optimise preventive maintenance.

Following the new version of the international standard IEC 60204-1: 2016, it is expected that the German version edition 6 of the standard “Safety of machinery – part 1 General Requirements”, which is already in the draft phase, will soon appear.

Electrical safety – a MUST for every mechanical engineer

This represents a plus in terms of electrical safety for both the machine and the production process for the broad range of mechanical engineering.



Picture 1:
An example of control circuit with galvanically connected DC loads

At the same time, IT systems in line with standard series DIN VDE 0100 have proven to be particularly operationally reliable power supply systems which are preferably used where a failure of the power supply would have immeasurable consequences for humans, machines and systems plus the associated economic consequences.

Conventional power supply systems are based on earthed TN or TT systems. If a critical fault current should flow at the time of the first fault, an upstream fuse or residual current device (RCD) is normally tripped. This averts the danger. However, this also interrupts the power supply, shutting down the machine.

In a few applications attempts are made to increase system availability through the use of uninterruptible power supply units (UPS). This is also helpful in the event of a power failure. Simple insulation faults in machines do, however, much more frequently lead to automatic shutdown of the power supply. A UPS system in the TN system does not lead to an improvement as the circuit with the faulty load must be shut down once the first fault occurs.

Why an IT system?

For IT systems, no active conductor is connected to earth with all active parts being insulated against the earthing system. If an insulation fault should now occur, no high fault current will flow due to the missing low-resistance connection between the transformer neutral point and PE (Protective Earth). No protective device will be triggered as a result and the system can continue to be used without interruption. In order to make the insulation fault visible for maintenance staff, the system is monitored with an insulation monitoring

"Further costs may be incurred in addition to the pure downtime costs **in the event of any unscheduled downtime**."

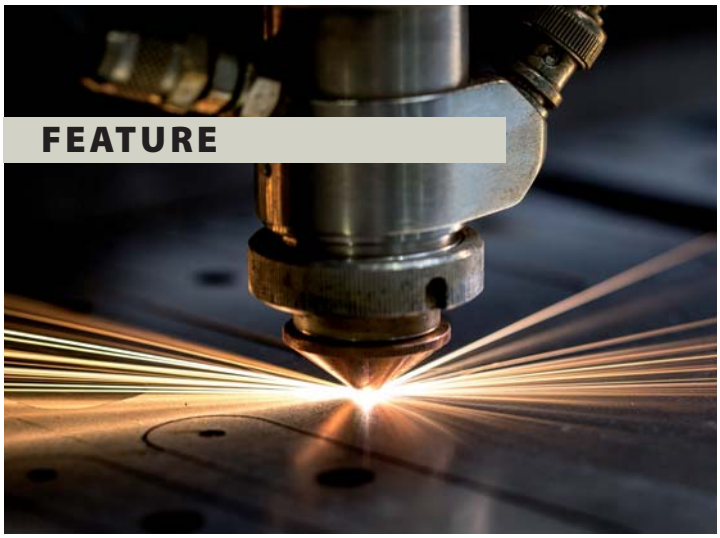
device which issues a visual/acoustic signal when a first fault occurs. As a whole, the IT system with insulation monitoring thus provides a high level of operational stability – particularly in sensitive areas such as e.g. the production of glass or foodstuffs and also other production areas with powerful, controlled drives.

Further costs may be incurred in addition to the pure downtime costs in the event of any unscheduled downtime. Two examples: In the event of an unscheduled machine or system shutdown for semi-conductor manufacture, the wafers which are being processed must be disposed of as the production process cannot be continued seamlessly. The consequences for production of foodstuffs are similar. In the event of an unscheduled shutdown, the product (such as a milk product) may spoil quickly. Additional costs for disposal may also incur. There may also be further costs due to a delay in delivery. This could all result in six-figure totals.

Status-based maintenance and servicing

Good and regular maintenance is at the heart of uninterrupted and optimum operational processes in mechanical engineering. There are rudiments for various maintenance concepts with which the machines are monitored via a great diversity of sensors. But how does the monitoring of electrical systems look in terms of optimised maintenance?

IT systems are proving to be the means of choice here. They lower the costs for maintenance and servicing. Thanks to the insulation monitoring device, the decline of the insulation level can be identified at an early stage and significantly earlier than would be the case via residual current measurement in an earthed system.



FEATURE

"**It must also taken into acount** that insulation faults are most frequent cause of fire in machines and electrical systems."

If an insulation fault is present, it can be located immediately while the system is still running, without any downtime. The operator thus has the great advantage that he can plan and carry out the necessary repair with it being tailored precisely to the operating procedure.

Periodic verification without shutdown

The insulation measurement as part of the periodic verification of electrical systems can only be carried out in a deenergised state. Switching off the power supply is often associated not only with an interruption to production but also with high downtime costs and with costly restarting of machines and systems, if indeed it is possible to do so. Standards and regulations do, however, provide an alternative for unearthed power supply systems – without shutdown:
– continuous monitoring of the insulation resistance.

According to the current standard IEC 60364-6: 2016, the use of an IT system with insulation monitoring thus saves the operator the prescribed insulation measurement as part of the periodic verification.

Preventive fire protection

It must also be taken into account that insulation faults are the most frequent cause of fire in machines and electrical systems since a high current flows in earthed systems in the event of an insulation fault. The probability of fire is very low in the IT system. First of all it is possible to identify and eliminate insulation faults at an early stage of development. Secondly, no current large enough to cause a fire in the event of an insulation fault flows due to the missing low-resistance return path. (However, the restriction applies to systems with a system leakage capacitance which is not too large). This means that IT systems with insulation monitoring also make a major contribution to preventive fire protection. Even the Association of Experts recommends the IT system as the best solution at present for insulation monitoring with reference to fire hazards in its directive VdS 3501:2008-10 (02).

Therefore, when assurance of the general availability of a machine or production system is involved, the electrical system must also be monitored equally in addition to the mechanically relevant components. After all, even the best machine cannot produce anything once the power supply has been interrupted. ■

Karl-Heinz Wierz, Wirtschaftskommunikation Stuttgart
Dipl.-Ing. Harald Sellner, S-N
Dipl.-Ing. Holger Potdevin, S-N
Ralf Muswieck, S-EMEA

Bender, 'co-founder' of the endowed professorship at THM

Stimulus for Industry 4.0

The Technical University of Middle Hesse (THM) and eight industrial companies from the region have committed to a new endowed professorship on the subject of "Industry 4.0/Digitisation". In this way, they want to generate important stimuli for the future of Middle Hesse. Bender is a benefactor of the professorship, which should be established by the turn of the year.

The "Industry 4.0" buzzword is on everyone's lips. The so-called fourth industrial revolution describes the integrated networking of digital information technology in the entire industrial value creation chain, from orders to production to delivery and service. This enables the efficient development and production of customised goods and the extensive incorporation of customers in all business processes.

Training students for Industry 4.0

By means of its support for the newly established professorship, Bender is hoping to stimulate the sustainable development of digital technology in Middle Hesse, and prepare students for the digital revolution in the best way possible. "For us, cooperating with THM on the subject of Industry 4.0 is also important to show students that we are an innovative and future-orientated employer. Indeed, digitisation is also playing an increasingly important role in electrical safety. We need highly qualified employees in order to master the challenges in this area," says Sabine Bender-Suhr, managing partner of Bender GmbH & Co. KG, explaining the company's commitment.

Funding for five years

The endowed professorship will be established in the Gießen department of Mathematics, Natural Sciences and IT. The industrial benefactors will fund the position, including facilities, for a total of five years to the sum of around EUR 800,000. Following this, THM will manage the professorship itself. An appeals committee is currently preparing a job advertisement in order to fill the professorship by no later than the turn of the year. ■

Marita Schwarz-Bierbach, S-COM
Marco Michels, txtconcept

INFO

As well as Bender, the benefactors include Carl Cloos Schweißtechnik, Elkamet Kunststofftechnik, Pfeiffer Vacuum, Rittal, Roth Industries, Schneider Optical Machines and the Schunk Group – **all of whom are based in Middle Hesse and operate worldwide.**

INNOVATIVE **PRODUCTS**

Compact devices ISOMETER®
isoHV425 and isoHV525:

For IT systems with high nominal AC voltage

The device variant isoHV425 expands the compact device series isoXX425 up to 3(N)AC, AC 1000 V, DC 1000 V and monitors the insulation resistances of unearthed AC, AC/DC and DC power supplies (IT systems) in accordance with DIN EN 61557-8 (VDE 0413-8) and IEC 61557-8. Measurements can be taken safely and reliably. The separate supply voltage also enables monitoring of a switched off, de-energised system.

"Two separately adjustable response values/alarm relays make early signalling possible **long before the system reaches a critical status**."

The devices can be operated using the voltages typically present in the control cabinets by using a wide-range power supply with 230 V alternating voltage or 24 V direct voltage.

Two separately adjustable response values/alarm relays make early signalling possible long before the system reaches a critical status. If the insulation resistance exceeds the release value (response value plus hysteresis), the alarm relays switch back to the initial position. Both the current measured values and the alarm messages can be shown on the LC display. Parameters are also assigned to the device via the display and the control buttons on the front panel as well as via the RS-485 interface.

The compact design makes it possible to achieve flexible and cost-effective insulation monitoring. In practice, this means:

- Insulation faults which occur are reported quickly and reliably
- The insulation resistance is shown on the LC display
- Two integrated alarm relays
- Permanently safe and quick wiring via push-wire terminals
- Password protection to prevent unauthorised parameter changes
- RS-485 interface for data transmission.

In connection with the **coupling device AGH422**, the **ISOMETER® isoHV425** is the right choice particularly when monitoring IT systems with up to AC 1000 V where system leakage capacitances of 150 µF are not to be exceeded and no considerable voltage portions with frequencies in the range of DC up to 15 Hz are expected. It must be noted that the configurable response range is limited in comparison to the higher-end insulation monitoring devices.

If, in addition to the high nominal system voltage, extreme, climatic or mechanical environmental conditions arise, then the use of an **ISOMETER® isoHV525** is recommended. Thanks to its sealed case, it combines the positive features of the isoHV425/AGH422 with great robustness against rough environmental conditions. This device is ideal for applications that may be subjected to a strong shock or vibration, where extreme (air) humidity/ice formation, high temperature fluctuations, large temperature ranges or strong contamination is present.

Alternatively, the **ISOMETER®s isoPV425** and **isoEV425** can also be used for insulation monitoring of systems up to DC 1000 V.

For applications where considerable portions of voltage can be expected in the frequency range of DC to 15 Hz, e.g. converter applications, the **ISOMETER®s** from the **iso685** series are recommended.

The isoHV425 also complies with the requirements of DIN EN 50155 that are relevant for railway applications. ■

Dipl.-Ing. Dieter Hackl, T-MIS
Dipl.-Ing. Frank Mehling, T-MIS

INFO

More information:
https://www.bender.de/produkte/isolationsueberwachung/isometer_isohv525

INNOVATIVE **PRODUCTS**

Bender has solutions for all power supply systems worldwide

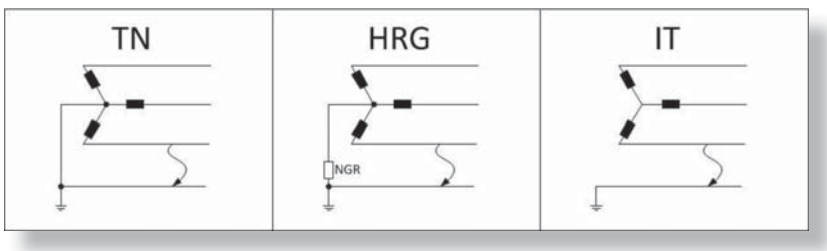
The ideal relay for protecting an HRG system:

LINETRAXX® NGRM700

Bender monitoring devices have been used in mining for nearly 80 years and promote electrical safety both in opencast and deep mines.

In addition to unearthed systems (IT systems), resistance-earthed systems (HRG systems) have established themselves in international industry, such as mining and refineries. Especially in territories where the American influence prevails and in Australia, HRG systems are very common.

The following comparison shows the schematic structure of the different system types:



TN Earthed system *(Solid Grounded system)*

HRG Resistance-earthed system *(High Resistance Grounded system)*

IT Unearthed system *(Ungrounded system)*

In the event of an earth fault, the residual current is limited to a predefined current by an earthing resistor (NRG, Neutral Grounding Resistor). This means that no shutdown is required after the first fault.

With the development of a monitoring device for resistance-earthed systems, Bender is now advancing into these system types more decisively. The NGRM700 (Neutral Grounding Resistor Monitor) expands the Bender portfolio in terms of resistance-earthed power supplies and their monitoring.

In modern installations, the use of converters of all types is growing. These converters can cause residual currents, which cannot be detected readily with the solutions available on the market. The NGRM700 incorporates the first measuring technology in the world that is sensitive to both AC and DC current, and is thus able to detect both DC fault currents and residual currents in the harmonic range, thereby enabling a comprehensive overview.

To ensure that the plant operators are able to meet their objectives, the NGRM700 monitors resistance actively and passively, as well as current and voltage on the NGR, reports limit value violations, and can shut down the plant if necessary.

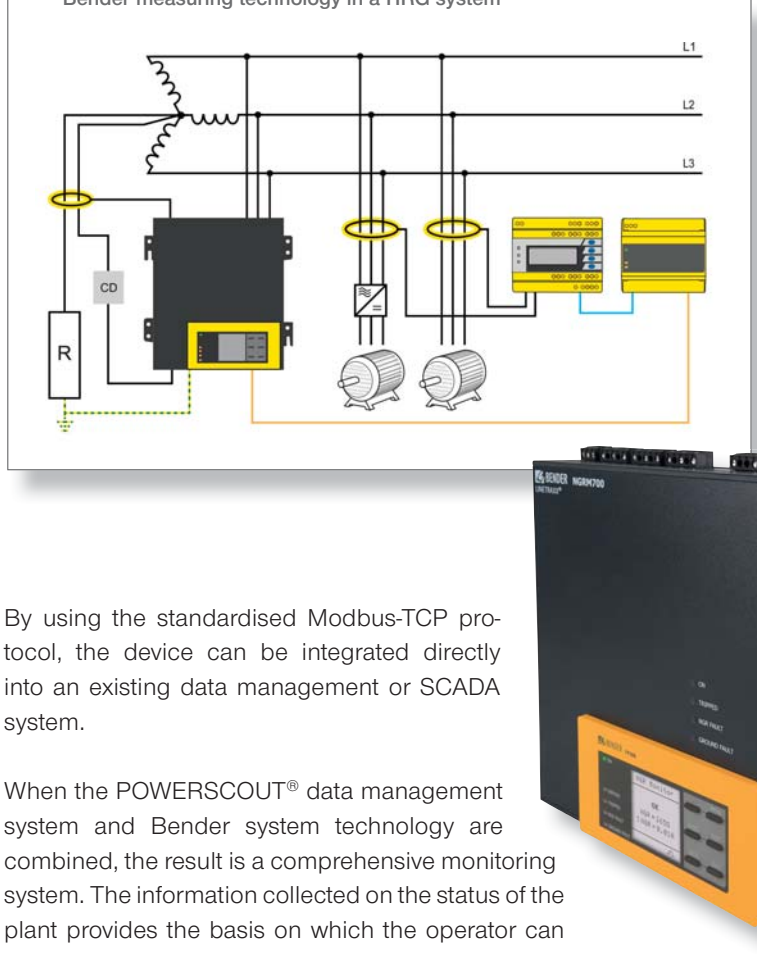
The limit values can be set according to customer-specific requirements and regional standards. A particularly user-friendly feature is that all settings and information can be parameterised and read both directly on the device and via the integrated web server.

A further advantage in the event of a fault is the integrated phase monitor, which shows the phase in which the earth fault occurred. This makes troubleshooting considerably easier, particularly in extensive plants. The proven Bender residual current measuring devices (RCMS technology) can also be used for troubleshooting in HRG systems without modifications (see Figure 1: Bender measuring technology in a HRG system).

The NGRM700 has been designed for use under harsh environmental conditions at high altitudes (up to 5,000 m above mean sea level) and extreme temperatures.

Fig. 1

Bender measuring technology in a HRG system



By using the standardised Modbus-TCP protocol, the device can be integrated directly into an existing data management or SCADA system.

When the POWERSCOUT® data management system and Bender system technology are combined, the result is a comprehensive monitoring system. The information collected on the status of the plant provides the basis on which the operator can ensure trouble-free operation at all times. This kind of permanent monitoring enables preventive maintenance through early reporting of gradual changes and defects in the system. The comprehensive database reduces the scope and cost of regularly scheduled test cycles.

With this product, Bender is now your professional partner for monitoring and guaranteeing electrical safety in HRG systems as well as IT and TN systems.

Dipl.-Ing. Torsten Epkes, T-MTS

INFO

More information:
https://www.bender.de/products/neutral-grounding-resistance-monitoring/linetraxx_ngrm700

Bender receives
'UL Functional Safety Mark'
for its isoPV1685 series
insulation monitoring devices

'UL Functional Safety Mark'

Safety is becoming more and more dependent upon the fault-free operation of electronic systems and the software that controls them. The number of companies which recognise the importance of functional safety is growing, and demand for certifications in the market is increasing accordingly.

When manufacturers deliver products with certification of their functional safety, they demonstrate that they treat safety as one of the most important requirements during the development and production of their devices and appliances, and that they actively seek to minimise risks.

UL (Underwriters Laboratories Inc.), a globally independent company that is dedicated to the study and improvement of safety, has been evaluating products for use in safety-critical applications since the 1990s. Since 2010, UL has offered certification of functional safety with marking in the form of the 'UL Functional Safety Mark'.

During the certification tests for functional safety, UL evaluates compliance with all the norms and standards applicable to a given product, with regard to the reliability and effectiveness of technical safety systems. As part of this process, all safety-related control systems and the safety software of the test object are taken into consideration. The evaluation process also includes an evaluation of software, hardware, environmental factors and the processes that are in place with a view to functional safety throughout the product life cycle.

Accordingly, the 'UL Functional Safety Mark' is not just a statement about the product. It is also a statement about the maturity level of the device or appliance manufacturer. With the UL test mark on a product, the manufacturer attests to its ongoing commitment to compliance with the applicable standards.

Besides typical applications in which functional safety requirements are expected, e.g. power station control systems, the supply of electrical power to operating

theatres or railway uses, the growing importance of photovoltaic power stations for power supply at a national level also increases the significance of functional safety for applications of this kind.

"**Any cost savings realised** by operating unreliable insulation monitoring devices can then become very expensive."

A faulty or failed insulation monitoring device can cause a huge photovoltaic power station to slip unnoticed into a critical operating condition. Experience shows that starting a central inverter on an existing double earth fault causes irreparable damage to the central inverter, which in turn leads to the failure of the entire photovoltaic power station. The greater the contribution of large PV arrays to the total supply of electrical power in a region, the more critical any spontaneous failure of those arrays inevitably becomes.

Any cost savings realised by operating unreliable insulation monitoring devices can then become very expensive.

FUNCTIONAL SAFETY
UL
LISTED

The Bender isoPV1685 series insulation monitoring devices for unearthed DC systems of up to 1500 V in photovoltaic installations have been awarded a Functional Safety Test Mark by UL. This certifies that these devices meet the requirements both for purposes of the UL Listed Test Mark and with regard to functional safety. ■

Dipl.-Ing. Dieter Hackl, T-MIS

INFO

More information:
https://www.bender.de/produkte/isolationsueberwachung/isometer_isopv1685rtuisopv1685pisopv1685pfr

MULTIVAC
BETTER PACKAGING

TECHNICAL **APPLICATION**

The perfect machine for every packaging

The MULTIVAC Group, with its headquarters in Wolfertschwenden in Bavaria, is a leading global manufacturer of holistic packaging solutions for all types of food products, life science and healthcare products as well as consumer goods and industrial goods. As a multinational company with more than 85 branches, the company sets standards as a global player with reference to technology, efficiency and reliability in the field of packaging solutions and it relies on Bender's electrical safety technology while doing so.

For MULTIVAC packaging solutions the protection of goods and the preservation of their quality have the highest priority. For this purpose it is necessary to guarantee that in-house production is entirely failsafe, also true of the associated electrical safety features, and these characteristics must be monitored.

MULTIVAC is supplied via nine transformer stations at the Wolfertschwenden location by the regional electricity supplier Lechwerke AG. In 2016, the peak load was approx. 2.7 MW.

The monitoring of the electrical supply at MULTIVAC for the production facilities, training building, robot-controlled high-bay warehouses and data centres has occurred with Bender's residual current technology, which is sensitive to all current types, since 2010. A dedicated IT system was also set up for the test centres in the laboratory area.

Monitoring of the currents via a CEP bridge

MULTIVAC's objective is to have no stray currents in the system. In order to achieve this for the new electrical supply networks, the monitoring starts in the low-voltage main distribution board (LVMD) on the central earthing point (CEP). The currents are monitored directly on the CEP bridge for limit values by means of a type W35 pulse current sensitive

"MULTIVAC provides **flexible and intelligent solutions** for packaging operations."

measuring current transformer from Bender. Continuous current monitoring of the foundation earth electrode to the main earthing busbar occurs at the same time.

It must be ensured that the earthing of all transformer star points occur centrally at just one earthing point (CEP) in the LVMD. The PEN conductors from the transformer star point must be insulated against earth over their complete course.

The PEN rail must be clearly marked as such and the PEN conductor may only be connected to the protective earth (PE) in the CEP. Only 3-pole switching devices may be used in the feed as the PEN conductor may not be switched. The outputs can be equipped with 4-pole switching devices.

Objective achieved

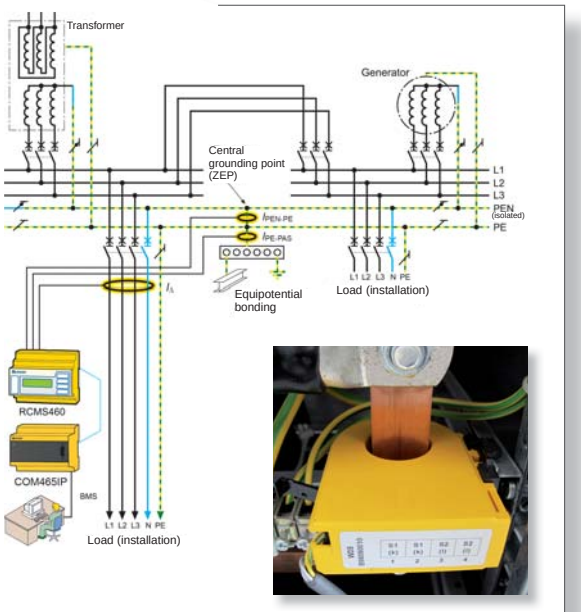
Undesirable N-PE bridges and stray currents in the electrical systems are identified immediately thanks to the continuous measurements of the CEP. Interference sources can be located by means of the timely documentation of limit value violations in the plus or minus range. A COM465IP type gateway transfers all measured values and alarm messages from an RCMS460 residual current monitor to the VDU work station.

Monitoring of electrical systems

At MULTIVAC, important electrical systems are measured directly at the outputs in the LVMD via AC/DC sensitive measuring current transformers of type W120AB. The measured values generated by the transformers are also passed on to the work station and recorded.

Fig. 1

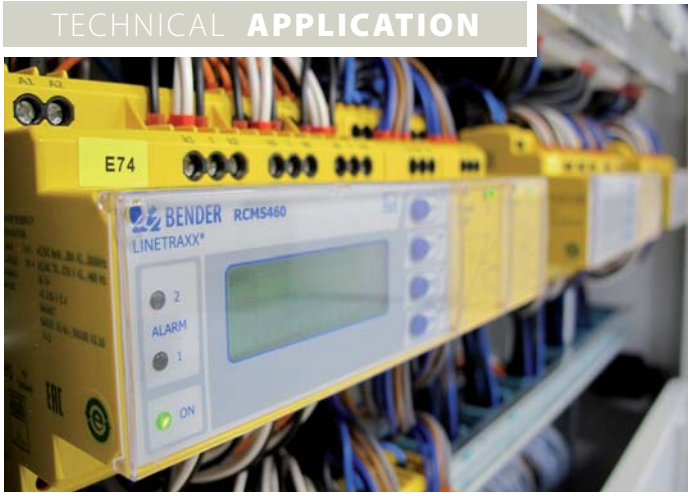
Measurement CEP



AC/DC sensitive measurement for load installations

MULTIVAC
BETTER PACKAGING

TECHNICAL **APPLICATION**



A-feed data centre

IT distributor with transformer 6.3 kVA

Monitoring of the final circuits in data centres

Each final circuit for the power supply of the racks in a data centre is continuously monitored for residual current. If the residual current in the final circuit exceeds 25 mA, the RCMS460 triggers a fault message in the data centre by switching a collector contact. The message is provided acoustically via a signal (horn) and also visually via an indicator light. The fault is also reported directly to the electrical staff.

The responsible master electrician at MULTIVAC summarises the criteria which are decisive for MULTIVAC for the installation of Bender residual current technology as follows:

- Electrical safety for man and machine
- High level of availability of the power supply
- Reduction of EMC interferences
- Transfer and visualisation of measured values at the work station.

IT system for the final circuits in the laboratory

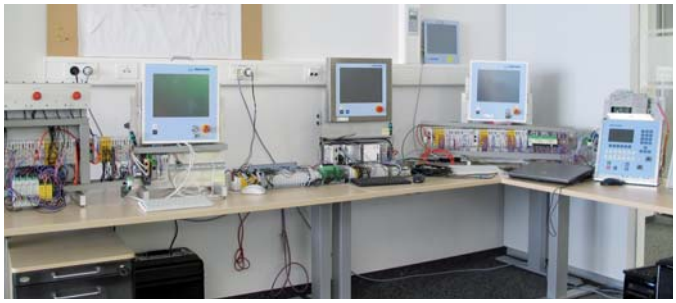
A small unearthed system (IT system) was constructed in the laboratory area for the supply of the 16 A final circuits with a transformer of 6.3 kVA. The installed insulation monitoring device ISOMETER® isoMED427 with integrated load and temperature monitoring reports to an MK2430 alarm indicator and test combination if the response values are exceeded.

One significant advantage of the IT system is the highest possible level of availability. For activity in the electrical laboratory this means:

- **No shutdown after the first fault**
- Improved operational reliability
- Greater economic efficiency
- Increased fire protection
- Higher earthing resistance
- Continuous monitoring of the power supply
- No system shutdown necessary in the event of periodic verification (R_{ISO}).

As MULTIVAC will be building a new company building in the near future, Bender residual current technology is also envisaged here on the basis of good experience. ■

Reinhard Piehl, TB Munich



Laboratory IT system supply and MK2430 indicator unit

INFO

The IT system: inherently safe – small difference, big impact

connection between earth and the star point of the transformer which supplies the system. This connection exists in the earthed system but not in the unearthed system.

What is the big difference regarding the impact, given that there is only a small difference in the implementation? If a person touches a live conductive enclosure in an intact unearthed system, nothing will happen. Why is this the case?

A current does indeed flow but it is very small as it is dependent on leakage capacitances and the enclosure is earthed. With an earthed system, a closed circuit is set up in advance and then, to a certain degree, we just wait for the fault to occur. If in this case a person touches a live conductive enclosure, a fault current would immediately flow through the person without a circuit breaker due to the low-resistance connection to the supply transformer. It is necessary to check the required protective technology on a regular basis in order to ensure it will work at a given moment. **– But how frequently is that actually done?**

Knowledge, help and hope

for people all over the world …

The Logos Hope is a ship owned by GBA Ships e.V., a private charitable organisation registered in Germany which has owned and operated ships to share education, help and hope with people worldwide since 1970. The Logos Hope is the fourth ship in the GBA Ships fleet, and since 2009 it has served as a floating event venue, a cultural exchange and encounter centre as well as a book market and an aid delivery vessel. In this time, it has already visited over 1,400 harbours in more than 150 countries and has welcomed more than 46 million visitors on board.

The international crew and staff of Logos Hope from over 50 nations

The arrival of the Logos Hope in Cape Town/South Africa

The floating book market and helper in times of need

At the moment, the Logos Hope is hard at work in the Caribbean. Visitors can choose from 5,000 non-fiction and technical books in English and the language of their country on a wide variety of topics including science, sport, hobbies, cookery, art, economics, medicine, reference works, languages, philosophy and faith. This large selection of books can be purchased inexpensively wherever the ship docks. This enables people to advance their personal and professional education, learn new skills and improve their quality of life.

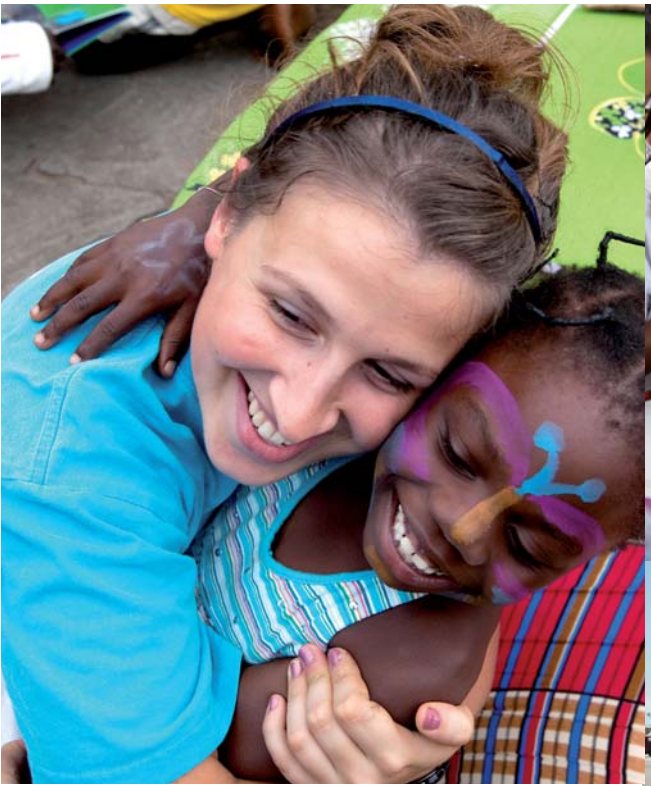
During their travels, the crew of the Logos Hope see the adversity facing the regions they visit at first hand. Small teams often go ashore at the ports where the ship is moored to help the residents directly with donations of materials or practical assistance.

Yet another essential part of their work is also to convey hope, by their actions and the many conversations these volunteers conduct with the people who live there.

Help

With more than 60 nationalities represented, the crew of the Logos Hope is a truly international community. All crew members work on a volunteer basis, often in their chosen profession, for example as sailors, engineers, electricians, nurses, teachers and cooks. The objective of the work on board is to serve humanity. At the same time, the staff also benefit personally from what they do. They attend training programmes, gain work experience, get to know other cultures and in so doing they increase their own knowledge and are personally enriched.

Education



Hope

Hundreds of schoolchildren visiting Logos Hope in Praia, Cape Verde

Ready-to-connect VG14 safety distributor

First-class power-up

The ship itself originally served as a car ferry and has undergone several conversions. In late 2014/early 2015, GBA Ships commissioned comprehensive modernisation measures to bring it up-to-date in compliance with rising technical requirements. These measures included replacing the generators and the main electrical switchboard. A heat recovery system was also fitted and the bow thruster was upgraded. The air conditioning system in particular, but also the current provisions of maritime law demanded significantly more energy than the generators at the time were able to supply.

For the necessary conversions to the electrical systems, GBA Ships engaged Littau GmbH, a company based in Kiebitzreihe, Schleswig Holstein, Germany which specialises in building shipboard switchgear.

Originally, electrical power aboard the Logos Hope was supplied by three diesel-driven generators, one of which has an output of 1.2 MW while each of the others can deliver 900 kW.

Andreas Röthgens, the Electrical Manager responsible for GBA Ships, reports that all of the generators were replaced during the refit of the Logos Hope, and the two small genset engines were replaced by more powerful units, each having an output of 1.4 MW. Now it is possible to supply all the electrical power needed for routine operation with just one generator. However, a second generator is needed for manoeuvring with the bow thruster, which has an output of 735 kW. The third generator serves as a backup, to ensure that manoeuvres can be executed in complete safety while still providing electrical power to the ship if one of the other generators should fail. This redundancy is a standard procedure in shipbuilding and is also stipulated by the classification society RINA.

Accordingly, it must also be possible for trained personnel to operate the switching systems. All outgoing feeder switches were routed through the switching cabinet doors to enable the individual outgoing load circuits to be connected or disconnected without having to open a cabinet door.

Safety first

Safety is the highest priority when anyone works on the electrical systems while they are in operation. Isolation monitoring is an important element of the unearthed system (IT system). The LR-certified ISOMETER® IRDH575 insulation monitoring device from Bender detects insulation faults in the electrical system immediately and reports them to the technical personnel. This does not lead to a stoppage, because the system is not shut down in response to the first fault.

Crowds on the quayside in front of Logos Hope in Anping, Taiwan on GBA Ships busiest day, with 28,931 visitors welcomed on board in one day

The insulation fault must then be located and eliminated quickly, since in case of a second insulation fault, the loads involved can no longer be used. The EDS460 insulation fault locator from Bender makes fault location significantly easier. Previously, loads had to be disconnected and reconnected manually in order to identify the fault, which was a very time-consuming and nerve-racking undertaking since not all loads can simply be switched off. Every outgoing feeder panel has been equipped with its own current transformer so that insulation fault location can be carried out online, panel by panel, without shutdown.

Once the EDS460 has located the fault automatically to a certain sub-distribution level, the EDS3090 portable insulation fault locator can then be used to identify the exact load which has caused the insulation fault. It can do this quickly and safely – without needing to switch it off.

Electrical safety not only at sea

Mobile generators are used in emergency assistance deployments ashore. When these are used, a ground spike is often not feasible or advisable. In order to still guarantee safety when using mobile generators, the protective measure defined in DIN VDE 0100-551 (VDE 0100-551):1997-08 "Protective separation with insulation monitoring and shutdown" is applied. As well as protective separation, an additionally installed safety distributor can also trigger a shutdown if undervoltage or overvoltage occurs. All of the components necessary for this are contained in the ready-to-connect VG14 safety distributors from Bender.

To guarantee safe operation, the mobile generators on the Logos Hope now have also been retrofitted with the VG14 safety distributors, a donation from Bender. ■

Roman Kinsel, Technical Office Stuttgart
Thomas Frössinger, Technical Office Mannheim

INFO

Logos Hope technical data:

Port of registry	Valletta, Malta
Categorisation	Passenger ship
Built in	1973, Rendsburg, Germany
Classification	REGISTRO ITALIANO NAVALE (RINA) Load Line marking – RI (Reg No. 95050)
Persons	442
Cargo space (books)	1100 m^3
Length	132.50 m
Beam	21.06 m
Draft	5.22 m
Main engine	4 X SWD 6TM 410 RR in-line 6 cyl. 4-stroke 11,768 kW (16,000 bhp) total IF80 light heavy oil Coupled to the propeller shaft KaMeWa 102 5/4 Pitch = 3540
Electrical installation	440 V 60 Hz 2 MAN diesel machines Type 7L21/31 1540 KW w/ AVK 1846 kVA generator 1 set Bergen KRG-8 1475 kW machine w/ ABB 1750 kVA generator

Source: http://gbaships.org/de/unsere-flotte/meet-logos-hope/logos-hope-technical-specifications

TECHNICAL **APPLICATION**

A turnkey package – Electrical safety solutions for group 2 rooms in medical locations

Isolated and uninterruptible Power Supplies

The importance of a safe power supply and bespoke surgical solutions solutions for operating theatres cannot be underestimated for new builds and refurbishments in the hospital sector, especially for Group 2 medical locations. Bender UK is exactly the right partner for this.

"**Bender offers** offers a **five-year warranty**, on parts serviced annually, and maintains both Bender and third-party equipment as part of its comprehensive service offering."

Isolated Power Supplies (IPS) and Uninterruptible Power Systems (UPS)

As a leading manufacturer of Isolated Power Supplies (IPS), fully automatic switching devices from the ATICS® series as well as Touch Control Panels (TCP), Bender provides a wide-range of products to ensure the electrical safety of newly constructed and refurbished medical locations.

Bender UK is a subsidiary of the German Bender Group and in Great Britain, besides Bender products, it also offers turnkey packages including planning, installation, project management and the delivery of components. The portfolio furthermore includes Uninterruptible Power Systems (UPS), surgical lights, pendant supply units for power supply and the supply of rooms with medical gases as well as ultra-clean air systems installations.

In Great Britain and Ireland, Bender equipment and Bender technologies are installed in more than 500 NHS and private hospitals. Bender UK not only attaches great importance to consulting and sales, but also to the service available to customers 365 days a year, 24 hours a day and the technical support provided. Bender UK also offers a five-year warranty, on parts serviced annually, and maintains both Bender and third-party equipment as part of its comprehensive service offering.

Bender UK worked on the Ulster Hospital project in Belfast together with the general contractor, the GRAHAM-BAM partnership, and the electrical contractor Blackbourne Integrated M&E.

Ulster Hospital's new inpatient ward block for treating patients has been equipped with a variety of Isolated Power Supplies and Uninterruptible Power Systems by Bender UK.

Based on country-specific standards and norms, IPS are supplied via a cable from a UPS. Whilst the UPS and the connected battery installation can ensure the security of supply in the event of power failure at the hospital, this system does not provide any protection against failure of the cable itself to the IPS.

For this reason, the failure safety of conventional IPS, is limited due to the existence of only one single supply cable between the hospital's power source and the IPS. Given the critical nature of this type of power supply, any failure of this cable could endanger patients' lives as well as result in considerable malfunctions and costs. This single point of failure was the catalyst for the development of ATICS®. This made it possible to supply the IPS via two independent cables from two independent power sources. The primary supply is the preferred power supply during normal operation of the IT system. In the event of failure, the ATICS® switches over to the secondary supply within 0.5 seconds. This complies with the requirements of HTM 06-01*.

It is important that the power supply system is fail-safe in all circumstances and the security of supply must be ensured at all times.

* HTM 06-01 Health technical memorandum 06-01: electrical services supply and distribution

"Bender is a **market leader** in the design of operating theatre control panel contemporary membrane technology."

TECHNICAL **APLICATION**

In order to fully guarantee electrical safety at Ulster Hospital for the Group 2 rooms (operating theatres and intensive care units) which is vital for patients and staff, the hospital decided to consistently use the ATICS® from Bender. Given its unique operating principle with patented changeover device, it ensures safe disconnection, provides maximum functional safety and greatly increases failure safety. In order to meet this highest level of reliability required in the hospital, ATICS® was consistently developed according to the guidelines of SIL Level 2 safety standard.

Bender UK has provided modern, hygiene-compliant control panels from the TCP series (Touch Control Panel) for a total of four high-tech operating theatres. These switching and control panels with a matted, anti-bacterial membrane technology, were designed in line with the hospital´s specific user requirements. A tailored specification was developed which also enables the integration of a mini iPad in order to control the surgical lights, for example. These panels additionally feature a range of options such as various monitor sizes, various acoustic alarms and operating elements, and can be completely equipped with DICOM-compliant PACS screen displays. The integration of both analogue as well digital clocks is possible.

It is also worth mentioning that even the operation and control of other services is facilitated by the panel's touch surface. It is possible for staff to safely operate the TCP even when wearing surgical gloves.

The wipe-clean and unique anti-bacterial surface (silver nitrate coating) of the control panel ensures maximum sterility. Alongside the four operating theatres, Bender's IPS also guarantee a safe power supply to an endoscopy suite, a catheterisation laboratory (with diagnostic and imaging equipment) and a coronary care unit.

Bender equipment systems such as IPS and UPS, in conjunction with the use of ATICS® switching devices, ensure the highest level of failure safety Group 2 locations within Ulster Hospital and particularly in very critical environments such as life-support and intensive care units.

Another important factor for the managers of Ulster Hospital was that all implemented systems, equipment and components are optimally coordinated with one another in order to guarantee the safety of patients and the hospital staff. ■

Lisa Hudson, Bender UK

"Amanecer Solar CAP" in Chile - monitored by Bender

The largest photovoltaic system in Latin America

The Atacama Desert, one of the driest landscapes on earth, runs approximately 1,200 km along the Pacific coast of South America. There are places here which do not register rain for decades. With so little rainfall, many places along this coastal desert remain completely uninhabited. Only the large deposits of lithium, copper, silver, gold, and platinum have led to industrial settlements, which form Chile's present economic backbone.

The most important producer of iron ore and pellets on the American Pacific coast and the largest steel producer in Chile is the CAP Group.

In order to ensure the electricity supply to their new "Cerro Negro Norte" plant, a mountain surface mine 42 km east of the city of Caldera, the CAP Group planned the construction of one of the largest photovoltaic power plants in Latin America in Copiapó, in the heart of the Atacama Desert. The North American company SunEdison was chosen as a partner for this project.

SunEdison is a world leader in the field of photovoltaic and semiconductor technology and is one of the largest suppliers of innovative solar energy solutions. With the development, financing, operation, and monitoring of solar plants in more than 35 countries on five continents, SunEdison runs over 1,000 photovoltaic power plants with a total production of 5 GW (as of 31 July 2015).

The "Amanecer Solar CAP" in Chile has more than 310,000 photovoltaic modules spread over an area of 250 hectares. It was constructed in just six months and was commissioned in May 2014. The energy generated runs into the largest integrated grid in Chile, the SIC (Sistema Interconectado Central).

With an investment of USD 250 million and an installed capacity of 100 MWp, the PV power plant produces 370 GWh of clean energy every year and reduces CO2 emissions by approx. 135,000 tonnes - enough energy to supply 125,000 households every year. The energy produced is approximately 15 % of the CAP Group's yearly consumption. This also means that the Group saves more than 71 million litres of fuel, which would be needed to create electrical energy if this plant did not exist.

This large photovoltaic power plant was built so that the minus pole of the PV battery was functionally earthed against ground. Functional earthing is preferred when degradation of PV modules via the PID effect[1)] is to be prevented. Functional earthing is achieved using a GFDI – a switch which breaks this earthing in the event of an overcurrent due to a first fault and subsequently leaves the PV battery unearthed. In the past, fires often occurred when using large, functionally earthed PV batteries despite the use of a GFDI. Therefore, the standard NEC 2014 now requires insulation monitoring for the direct current part of PV systems (PV batteries) in section 690.5 "Ground-Fault Protection".

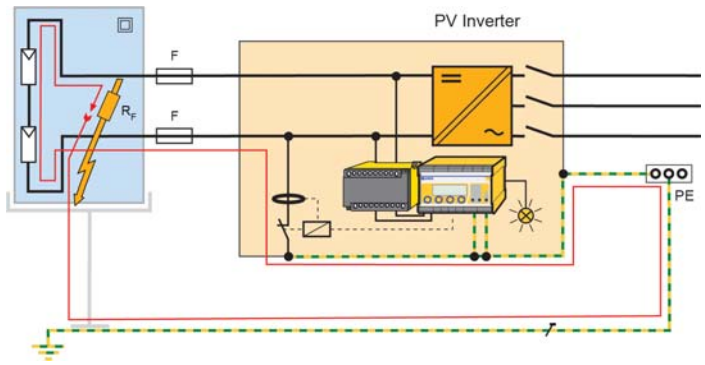
Insulation monitoring is performed periodically whenever functional earthing is not ensured by the GFDI. Frequently, insulation monitoring is performed in the morning before the PV system is started.

(Also see: Rebekah Hren, Brian Mehalic: Understanding the NEC 2014 and Its Impact on PV Systems: Page 3 of 12, Section 690.5 "Ground-Fault Protection". In SolarPro magazine Issue 7.3, Apr/May '14)

1) PID (Potential Induced Degradation) is an effect which affects PV modules and leads to creeping loss of performances over years

Fig. 1

Excerpt Section 690.5 "Ground-Fault Protection"



In order to monitor the insulation resistance of PV systems within the range of AC, AC/DC 0...793 V or DC 0...1100 V, isoPV series ISOMETER® insulation monitoring devices from Bender are used. And that is how the "Amanecer Solar CAP" solar park came to use the isoPV-3 with an AGH-PV3 coupling device. The measurement procedure which has been specifically adapted for slow voltage fluctuations, is ideal for satisfying the demands of modern PV plants.

Due to the extremely large dimensions of the "Amanecer Solar CAP" and the EMV interference suppression measures, leakage capacitances of up to 2000 µF against ground are to be expected, which are taken into account by the isoPV-3 through automatic adjustment to optimise the measuring time. In addition, the insulation monitoring device satisfies the voltage ranges required here and the simultaneously low insulation level.

At the same time, the isoPV3 series is approved as per UL508 and UL1998 and thus conforms to the strict US regulations. ■

Thomas Nuño, Bender Iberia

INFO

107 ISOMETER® isoPV-3s with an AGH-PV3 are used within the plant; one per frequency converter. This ensures not only the continuity of energy production but also protects both the personnel and the plant itself.

TECHNICAL **APPLICATION**

Safety by means of insulation monitoring

Fire safety in wind power stations

A fire in a wind energy plant can have devastating consequences. Usually it is beyond repair and must be written off to the tune of a few million. With regard to this topic, the well-known VdS guideline on fire safety [1] mentions "Insufficient electrical protection concept with regard to insulation fault detection and selectivity of shutdown" as a main cause of fire. This conceals a high savings potential for operators, industrial managers and insurers.

With the correct protection concept, which monitors the insulation properties of the electrical plant, faults can generally be detected and averted at an early stage. The insulation resistance gives some indication of the quality of the electrical plant and is an indication of potential faults. In this way, not only direct insulation faults, e.g. worn away cable insulation, can be discovered, but also other faults in the electrical system, which have an effect on the overall insulation resistance of the plant.

The structure of the electrical systems and the selected system type are decisive when choosing the right protection method. TN systems (earthed systems) [2] are common and widely spread in Germany, although the advantages of an IT system (unearthed system) [3] for wind power stations in particular are obvious: In an IT system, if the right dimensioning and low system leakage capacitances are used, when a fault first occurs there are neither high fault currents (high degree of fire safety) nor dangerous touch voltages for persons (protection against touching indirectly). Further operation is possible without any danger. Some German manufacturers of wind power stations have recognised these advantages and already operate their plants in an IT system.

Some standards, such as DIN EN 61400-1 (wind turbines – Part 1: Design requirements), also recommend sensible monitoring methods. This standard stipulates that the danger to people and animals has to be minimised, and that any possible damage during operation and maintenance of the WEA must be kept to a minimum. A suitable measurement concept must be available, regardless of whether the system is earthed or unearthed. In accordance with the requirements of IEC 61557-8 for IT systems with an insulation monitoring device, it is advisable to also install an insulation fault location system as well as fast and efficient fault localisation. In TN systems, monitoring with a residual current monitoring device (RCM) is a safe and economic alternative.

Bender provides globally proven, field-tested and operationally reliable equipment as well as integral solutions for detecting any potential electrical dangers at an early stage. The safety of persons and plants is thereby guaranteed, since critical operating and plant statuses can be detected and reported in good time. Preventive intervention provides a high degree of plant availability, and risks of failure and service interruptions are reduced to a minimum. ■

M. Sc. Michael Breuer, S-EMEA

[1] VdS: 3523 - Wind turbine guideline for fire safety, 2008, VdS Verlag
[2] In TN systems (earthed systems), the neutral point of the supplying transformer is connected to earth
[3] In IT systems (unearthed systems) the active lines have no conductive or low impedance connection to PE (earth)





Our Thai representative Saprang Wisuthipanich from Simplify Engineering Co. Ltd. and Mario Zerbe at the annual target setting meeting."

Move to new Bender office in Bangkok

Considerably larger office premises enable further growth at the Bangkok location

Bender Asia Pacific Co., Ltd. has moved into new premises at the same time as the current relaunch of the Bender Asia Pacific website www.bender-apac.com.

Our new office has been located right at the heart of Bangkok's inner city since 8 August 2017, on Sukhumvit Road, one of the busiest, best-known and also most important commercial streets of the Thai capital.

Although we are right in the centre of Bangkok, we can now be accessed without enduring any traffic jams via the Skytrain connections (Nana or Asoke stations) or via connections to MRT Sukhumvit (underground train). It is also possible to connect to MRT Sukhumvit from Suvarnabhumi Airport via the Airport Rail Link after changing at Makkasan station. There are also sufficient parking spaces in the building's car park for those who still wish to travel by car.

Moving into considerably larger office premises clearly demonstrates that Bender Asia Pacific Co., Ltd. is expanding its location in Bangkok, fulfilling the pre-requisites for further growth. The 9th floor of the Sukhumvit Suite Tower is home to the regional management team for the Asia-Pacific, Australia and New Zealand area. Both the calibration of the UNIMET® safety testers and professional services for customers in the APAC region will also be offered at the Bangkok location in future.

This means we are getting closer to our customers. ■

Dipl.-Wirt.-Ing. (FH) Mario Zerbe
Bender Asia Pacific Co., Ltd.

Building inauguration, international team event, Family & Friends Day

READY. GO.
WE BUILD FUTURE.

Bender inaugurated the new building complex at its headquarters in Grünberg in September**.** Employees from all over the world got to know the new building and each other better during the course of a team event. Employees and their families, guest speakers and other visitors from the region were present on the following day.

Ready for the digital workplace 4.0

The new Bender headquarters has an innovative office structure, which is tailored to modern working procedures in the best possible way. The compact building complex replaces the individual buildings that were previously spread out, and brings development, production, warehousing and material management, and office and administration together. This should strengthen the bonds between the departments and create the organisational prerequisites for working in the digitalised world.

Global Bender team event

All of our employees from across the globe were invited to the inauguration. About 600 of 700+ employees from twelve countries took part in the major team event under the motto of **“We turn customers into fans”**. Mixed teams took photographs highlighting important aspects of collaboration with customers and co-workers during the event.

Family & Friends Day

On the second day of the inauguration, Bender opened its doors to current and former employees of the Bender Group, their families and the company’s closest neighbours. Well-known representatives from commerce, politics and science were also present, including the Mayor of Grünberg Frank Ide, the Prime Minister of Hesse Volker Bouffier, the President of the THM University of Applied Sciences Prof. Dr. Matthias Willems, the Chief Administrative Officer of the District of Giessen Anita Schneider and Dr. Clemens Christmann from the German Electrical and Electronic Manufacturers' Association.

The main aspects for safeguarding the future of the company were explained in an open forum. This included digitalisation, the locational advantage of Grünberg and the promotion of up-and-coming talent, among other things. Then the visitors had the opportunity to look around the new building complex and enjoy the culinary treats and the wide variety of fringe events. ■

Anne Katrin Römer , S-COM
Marco Michels, txtconcept

KEY DATA

- **Ground-breaking ceremony: 2011**
- **Total investment 40 million euros**
- **7,500 m² of office space and 4,700 m2 of production area**
- **Integrated space, area and usage concept**
- **Sustainable energy supply**
- **Employee restaurant**

bimstore.co.uk

BENDER INHOUSE

Medical IT isolated power systems and surgeon's control panels manufactured by Bender are now **available in BIM** (Building Information Modelling) **format**.

Bender UK system detail available in BIM 3D modelling

BIM is a 3D modelling process that enable architects, designers and engineers to specify and design-in specific products from the outset. It uses manufacturer-specific content to help create accurate designs of new buildings and rooms, which is made available to stakeholders in more accurate interactive 3D format. It enables better engagement and feedback with the end-user and others throughout the entire building design process.

Improved planning reliability and simplified project managment

BIM designs brings together detailed information about every component of a building. This not only reduces time and cost of the design process, but it is more accurate, reducing the risks of costly design errors and speeds up the procurement and build process.

BIM data can be used to illustrate the entire building life-cycle, from inception, design and build to facilities management. When BIM is used to develop new healthcare facilities it enables long-term operational efficiency and more cost-effective maintenance regimes to be included from the outset. Hospital estates teams are better equipped with more accurate information about the whole building.

BIM modelled data is available directly from Bender UK, and is due to be hosted online in download format. For more information on Bender BIM format information please contact Bender UK. ■

Lisa Hudson, Bender UK

INFO

The UK Government's Construction 2025: Industrial Strategy for Construction says lower costs, faster delivery, lower emissions and improvements in exports and government-led BIM is set to play a vital role in the digital future of design and long term facility management, implementing change across all industries.

Our **seminars** are aimed at consultants, installers, switchgear manufacturers and operators of electrical systems as well as experts.

Bender Academy

The in-house training of our employees and sales partners in relation to applications and products helps us to ensure that you will continue receiving sound advice. The complete range of seminars offered by the Bender Academy is available in a new online portal from now onwards at **www.bender.de/akademie**.

Bender has been a technology leader in the field of electrical safety for 80 years. The sale of technical investment goods may place heavy demands on all employees in contact with customers but Bender has always attached particular value to offering a comprehensive, technical advice service. To choose Bender is to place your confidence in a partner with an extensive range of expertise:

- Protective measures for all customary system configurations in low-voltage installations
- Expert knowledge in a large number of specialist applications
- Compliant with national and international standards and directives.

Bender offered seminars before the Bender Academy was founded last year. Our own 'knowledge carriers' are all product managers, application engineers with many years of experience and specialists from the fields of sales, service or research and development. They have been employed as speakers at training events for many years and there is a strong demand for these events both in Germany and abroad. With immediate effect, in a modern portal on our homepage, you can find information about Bender's tried and tested seminars, and about more recently established events with new concepts. This portal gives you an overview of all events and allows you to filter the information by

topic, date or region. The portal also features simple online registration and seminar assessment procedures and also enables you to download the relevant documents.

Training of customer-facing employees

The success of the Bender Group is also reflected in the developments surrounding employee numbers and the number of sales partners. With around 720 employees, 14 subsidiaries and over 70 sales partners, the transfer of knowledge does present something of a challenge. The Bender Academy offers intensive training sessions in which employees from the technical sales and service/support fields are provided with targeted training for example. These intensive training courses are designed to provide in-depth education, or to refresh existing knowledge in relation to protective measures for low-voltage installations.

As the crow flies, Germany measures 886 km from top to bottom. Grünberg, where the Bender headquarters are situated, is right in the centre and therefore easily accessible for employees all over Germany. By way of contrast, the USA is a country with four different time zones, which means that the delivery of training courses involves considerable expense in terms of travel time and cost. The 20 or so Bender employees from different departments and different states accepted this travelling challenge in May this year and attended the three-day Technical Training event at Bender Inc. in Exton, Pennsylvania.

Exchange among experts

Spreading the knowledge of experts more widely is just one task of the Bender Academy. To encourage the exchange of knowledge between experts, the Academy offers an annual application engineer training event where experts from all over the world can discuss technical solutions. This three-day event continues to be held at the headquarters in Grünberg and it is supported by our own development engineers and product managers. The number of participants is restricted to retain the workshop nature of the event. The coveted places for the most recent events were fully booked very soon after the date was announced.

Activities during congresses and conferences

Bender's history and the history of the unearthed system (IT system) are inextricably linked. Nevertheless, the IT system is deemed to be exotic in many industrial branches or regions. Anyone who is well versed in the concept of the IT system is also aware of a few advantages of the unearthed system such as continued operation following the first insulation fault, for example. On the other hand, it is generally less well known that automatic insulation fault location can be achieved in the IT system - without any interruption to the power supply.

The Bender Academy is also tasked with raising greater awareness of these topics on the market. Bender speakers are in high demand at specialist congresses in Germany and abroad, since they provide manufacturer-neutral lectures which shine a light on technical and standards-related issues. They also make contributions which deal in a critical manner with the pros and cons of various system configurations or protective and monitoring devices.

An overview of the **focal points** in Bender seminars

The safe power supply for healthcare facilities and the standard-compliant pathway from the power source to the socket

This seminar owes its renown and popularity throughout Germany to one person in particular: Hans-Joachim Feigl. With this event he provided clarity concerning the comprehensive, standard-related requirements in healthcare facilities for many operators, consultants, inspectors and installers over many years. The DIN VDE 0100-710[1)] standard is one of the most comprehensive of the "Group 700".

Training in the field of inspection of medical electrical devices

Product manager Karl-Heinz Rein has been taking care of the UNIMET® product series for over 15 years and he carries out the training on standards and regulations and the practical seminars himself as a speaker

- Bender UNIMET® safety tester
- Medical Products Law
- DIN EN 62353
- DIN VDE 0701-0702

The safe power supply in the unearthed system / The safe power supply in the earthed system

These series of seminars are aimed at operators, consultants and inspectors in the industrial sector and also at qualified electricians from the field of building services engineering. The focus is on high-availability systems with a maximum security of supply. Bender thereby provides clarity concerning the normative possibilities of operating such systems safely and with a high level of availability. The practical part, in which experts use their know-how to answer questions in an open question and discussion session, is an important component of the seminars.

User training sessions

The practical training sessions for users with an emphasis on the installation and operation of the Bender measuring devices and connection to the system technology are also enjoying growing popularity and high numbers of participants. Rene Bülow, Service product manager, uses his many years of experience in field support to lead one or two-day practical seminars which are also often conducted in-house at the customer's premises.

Symposium "Safe power supply in hospitals"

In addition to the VDE standard, this two-day symposium also provides clarity concerning legal requirements of which consultants, operators, installers and inspectors in hospitals should be aware. From a technical perspective, topical issues from the field of electrical safety are examined as well as the power supply of the medical locations. (The use of protective devices such as AFDDs, RCDs etc. in hospitals). This event also includes numerous contributions from external speakers (manufacturers, lawyers and experts). ■

Dipl.-Wirt.-Ing. Michael Faust
Bender Academy

INFO

The Bender Academy is also pleased to receive suggestions for new seminar topics and it takes up current issues in the field of electrical safety.

Please contact us at:
akademie@bender.de

[1] DIN VDE 0100-710:2012-10 Requirements for special installations or locations – Medical locations

The MK2430 remote alarm indicator and test combination with LCD is used for the visual and acoustic signaling from Bender systems in the robotics surgery room.

Bender quality in Brazil

RDI BENDER in Brazil – successful for generations

RDI Bender Indústria Elétrica Ltda. was founded back in 1982 by an electrical engineer, Theodoro Bender, and his son Ricardo Bender, a graduate in business administration, originally as a representative and sales office for electronic components and electrical appliances. Today, the company comprises a team of 17 employees and 13 agents.

The subsidiary, with 940 square metres of floor space, is located in Osasco, a town about 40 kilometres from São Paulo. This strategically favourable location, directly beside the most important long-distance roads in the country, enables products featuring cutting-edge technology made in Germany to be supplied quickly to customers right across Brazil.

Two Benders build a bridge between two continents

When Otto Bender, Theodoro's father, moved from Dresden to Brazil in the early years of last century, he was on the lookout for new challenges. His capability and aptitude, and his passion for precision were his defining characteristics. He founded his first company in São Paulo. The product range included precision scales as well as the famous Wimshurst machine.

In 1956, when the first German companies settled in Brazil, the company of Otto Bender became part of Hartmann & Braun (H&B) - Bender Ltda. In that same year, his youngest son Theodoro Bender got married straight after his studies and then went on to complete a three-year work placement at the head office of H&B in Frankfurt. In that time, the business form changed in Brazil and H&B opened its own subsidiary in São Paulo. After his return to Brazil, Theodoro Bender was entrusted with the production management, and he remained loyal to the company for more than a decade. Given his experience, the engineer was appointed to seek contacts with American and German electronic component companies to build up the sale of these products in Brazil.

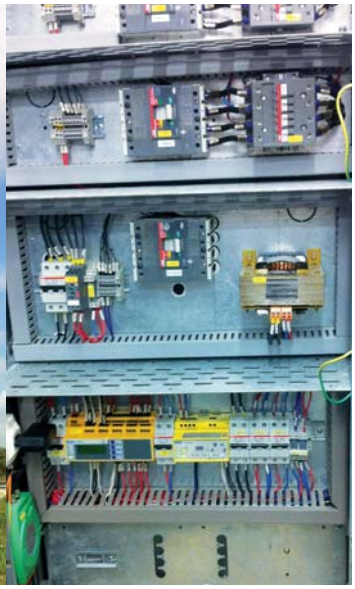
In 1979, Theodoro Bender visited the Hanover trade fair, where he got to know Dietrich Christian Bender from Grünberg, Germany. This was the beginning of a business partnership that was to last for many years. He was impressed by the technology exhibited at the trade fair stand of Bender GmbH & Co. KG and he immediately recognised its potential for the development of electrical safety solutions in Brazil.

The Eighties

After the founding of RDI Bender, the relationship with Bender GmbH & Co. KG became even closer. The concept of electrical safety involving the timely reporting of deterioration in electrical installations was introduced in Brazil. To date, this has prevented power failures from affecting hospitals and medical facilities as well as industrial processes. This, in turn, has prevented serious periods of operational downtime.

Since that time, the company has also participated on committees and bodies involved in the creation of standards and specifications.

Centro de Lançamento de Alcântara is a satellite launching base of the Brazilian Space Agency



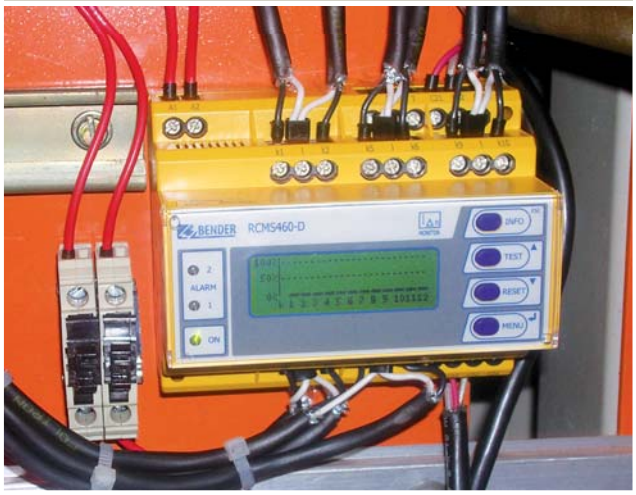
Installed Bender devices in Alcântara Launch Cente: insulation fault locator EDS490 and protocol converter FTC470XET

The Nineties

Publication of the first standard for electrical safety in clinics and hospitals went hand in hand with active attendance at the relevant trade fairs. Through these actions, general awareness was raised of the need for maximum safety for patients and personnel in hospitals. Every year, RDI Bender takes part in HOSPITALAR in São Paulo, the world's second largest trade fair for medical devices.

RDI Bender team at Hospitalar 2017

In the Nineties, when the country opened up for imports, the company imported insulation monitoring devices and associated accessories from Bender GmbH & Co. KG. The hospitals which played a pioneering role here, e.g., the Albert Einstein Hospital, the Sirio Libanês Hospital and many others were supplied with the first medical IT systems. This laid the groundwork for the market leadership position of RDI Bender in the electrical safety sector.



Residual current monitoring device RCMS460-D in a control cabinet at Usina Santa Adélia S.A.

Visit to Americas Medical City in Rio de Janeiro during IFHE 2017

To date, 15,000 systems have been installed right across Brazil. Recently, the company received enquiries for installation of the first medical IT systems in the federal state of Rondônia on the border with Bolivia, and in the federal state of Amapá in in the Brazilian Amazonas territory.

The new millennium

In 2000, an engineer by the name of Sérgio Castellari joined RDI Bender and was appointed in 2012 as an associate partner in the company. Together with the technical team, and with his great specialist expertise, he is able to deliver superlative service before and after each purchase, providing instruction and support during customer projects.

In 2009, Flora Bender joined the company's Board of Management. With her marketing expertise, she was aware of the need to make the technical language commonly used until this point easier to understand for people without a technical background who are nonetheless responsible for making purchasing decisions.

Thanks to the latest economic boom in Brazil, many sectors enjoyed rapid expansion and Bender's monitoring devices and insulation fault location systems were rolled out in those sectors with great success.

The company is also active in the mining sector: In the North of the country in the factories of Vale S.A., the world's largest manufacturer of iron ore, pellets and nickel, RDI Bender has installed residual current monitoring systems to monitor more than 500 channels.

FPSO Cidade de Vitoria (Floating Production Storage and Offloading Unit)

In the oil and gas sector, hundreds of platforms, refineries and oil tankers owned by Petrobras are now equipped with Bender monitoring devices and insulation fault locators in IT, TN and TT systems. This is due in large part to the efforts of RDI Bender's team of engineers who tirelessly provide the design engineers at Petrobras and its affiliated companies with advice.

Equipped for the future

RDI Bender board of directors

After the largest ever accident in the Brazilian space programme occurred 14 years ago, when its VLS-1 carrier rocket exploded and 21 people lost their lives, the engineering team was asked to present solutions for electrical safety at the highest level. Following an extensive investigative process, the decision was taken to install Bender's insulation monitoring devices at the Alcântara Launch Center.

Early in the new millennium, a modernisation process in the power generation, transmission and distribution sector was announced. This process has continued to build up pace to the present day. Right across the country, a large number of manual and stationary systems have been supplied for insulation monitoring and insulation fault location to the largest companies in this sector, such as Light, Chesf, Angra, Elektro, Tractebel and State Grid.

Over the last few years, a few strategic changes have been made. The associate partner Ricardo Bender deals primarily with the North East of Brazil where large investments are pending in renewable energies, in ports and airports, as well as in the modernisation of hospitals.

With this expansion into new markets, Caroline Bender Rodrigues was appointed as a new associate partner. Her tasks include dealing with the increasingly complex legislation governing relationships with customers and suppliers.

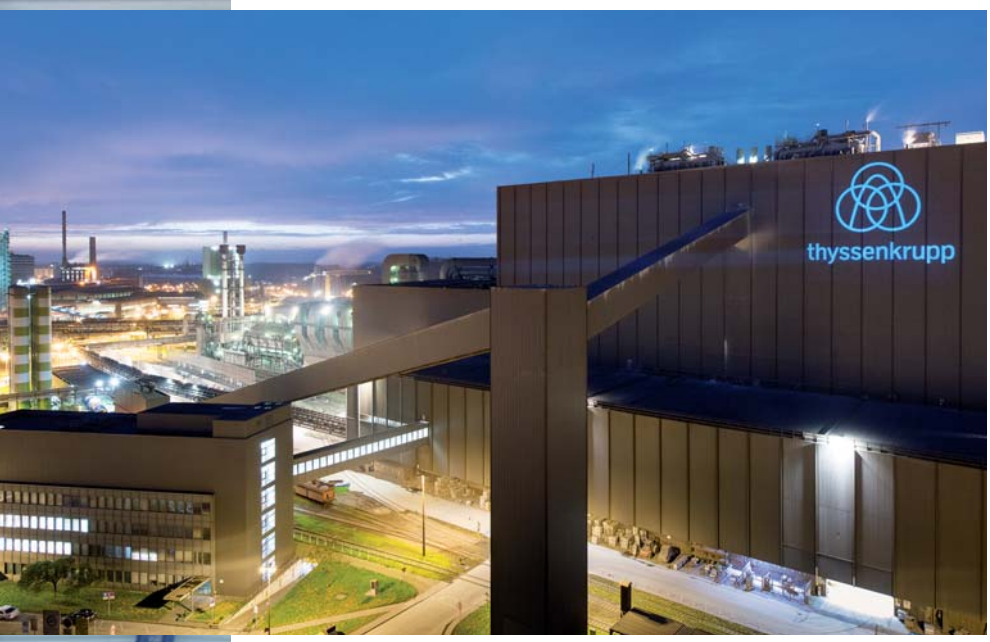
As a representative and sales company for Bender products in Brazil, RDI Bender constantly strives to keep pace with and follow current events on the Brazilian market. This explains its participation at very promising events such as the SAHE trade fair (South America Health Exhibition) or the exchange of information in monthly courses, seminars and workshops (offered by the company itself or by third parties), to name just a few of the options available to it.

This is how, in the industrial sector for example, RDI Bender was able to use the modernisation of Petrobras to update its customer base, integrate new products and secure its position as a supplier to this large Brazilian state-owned corporation. Through a sustained and intensive exchange of information, the company was also able to install products from the new iso685 series in the Belo Monte hydroelectric power plant, the third largest in the world.

Through our switchgear construction department, we are able to break into new markets, such as the events and leisure industry, tourism and shopping centres, and to obtain orders associated with the building of industrial and commercial properties. ■

Flora Bender
RDI Bender Indústria Elétrica Ltda
Brazil

"**Its capabilities** range from custom material solutions to steel-related services."



thyssenkrupp

thyssenkrupp Steel Europe

Steeled for the future in electrical safety

engineering.tomorrow.together

thyssenkrupp is a diversified industrial group for which innovations and technical progress are key factors for sustainable growth. It employs around 160,000 people in 80 countries working on a wide range of high-quality product solutions in a variety of applications. thyssenkrupp's activities are organized in six business areas: Components Technology, Elevator Technology, Industrial Solutions, Materials Services, Steel Americas and Steel Europe.

thyssenkrupp Steel Europe is one of the world's leading suppliers of carbon steel flat products. With some 27,000 employees and highly efficient facilities the company produces roughly 12 million metric tons of crude steel per year, making it Germany's biggest flat steel manufacturer. thyssenkrupp Steel Europe stands for innovations in steel and is focused on high-quality steel products for modern and demanding applications. Its capabilities range from custom material solutions to steel-related services. thyssenkrupp works with its customers to build on its long track record of success, shaping global markets, the region of North Rhine-Westphalia and numerous important industries including the automotive, engineering, packaging and energy sectors.

The Duisburg plant is the heart of the company. Since its establishment in 1891, the site's location on the Rhine has been a priceless advantage: The company has processing operations with state-of-the-art rolling and coating lines at plants in Bochum, Dortmund and Siegerland. Electrical Steel in Gelsenkirchen produces high-quality grain-oriented electrical steel, while another subsidiary in Andernach is one of the world's leading producers of packaging steel. Steel Europe also has a presence on the Chinese market through a joint venture producing high-quality hot-dip coated sheet for the auto industry.

As a modern company thyssenkrupp Steel Europe is also responding to the challenges of our changing society: The strategic, multiple award-winning HR program "ProFuture" combines activities in areas such as work-life balance, health and safety, talent management and knowledge transfer. ■

Communication Dept.
thyssenkrupp Steel Europe AG

EXHIBITIONS 2017/18

DATES

EXHIBITIONS INTERNATIONAL

MATELEC
International Exhibition of Electrical and Electronic Equipment
22. – 23.11.2017
Madrid, Spain

FISE
Electrical trade-show
27.11. – 01.12.2017
Medellin, Colombia

Intersolar India 2017
05. – 07.12.2017
Mumbai, India

Electric Networks
05. – 08.12.2017
Moscow, Russia

EL-MOTION
8th Austrian emobility convention
31.01. – 01.02.2018
Vienna, Austria

ECOBUILD Southeast Asia
27. – 29.03.2018
Kuala Lumpur, Malaysia

EV2018VÉ – Electric Mobility Canada Conference and Trade Show
24. – 27.04.2018
Ottawa, Canada

Canadian Institute of Mining, Metallurgy and Petroleum
06. – 09.05.2018
Vancouver, Canada

ELECTRO-TEC
Trade show days for communication, building, light and installation technology
22. – 24.05.2018
Bern, Switzerland

Gobal Electric Power Tech 2018
30.05. – 01.06.2018
COEX Seoul, South Korea

Canadian Mining Expo 2018
06. – 07.06.2018
Timmins, Canada

EXPO SOLAR 2018
13. – 15.06.2018
KINTEX Ilsan, South Korea

INFORMATION DAY for industrial electricians

of Electrosuisse – Association for Electrical Engineering, Power and Information Technologies

28.02.2018	Basel, Switzerland
07.03.2018	Bern, Switzerland
13.03.2018 and 14.03.2018	Pfäffikon SZ, Switzerland
20.03.2018 and 21.03.2018	Luzern, Switzerland
10.04.2018 and 11.04.2018 and 12.04.2018	Regensdorf, Switzerland
18.04.2018	Montreux, Switzerland
19.04.2018	Geneva, Switzerland
24.04.2018	Lausanne, Switzerland
26.04.2018	Fribourg, Switzerland

EXHIBITIONS NATIONAL

SPS/IPC/DRIVES
Elektrische Automatisierung – Systeme & Komponenten
28. – 30.11.2017
Nuremberg
Hall 4, booth 351

Light & Building
18. – 23.03.2018
Frankfurt/Main
Hall 11, booth B30

Hannover Messe
23. – 27.04.2018
Hanover

INTERVIEW

Markus Schyboll

CEO of Bender

CAREER OUTLINE

Markus Schyboll (47) took over the helm of the Bender Group as CEO at the start of April 2017.

Following completion of his management training at Bayer AG, Markus Schyboll was responsible for building up various mechanical and electrical engineering companies in Asia, the US and the Middle East. He gained comprehensive experience in the further development and internationalisation of foundation-owned and family companies during this period.

The world is becoming ever more electrified – Bender is in the thick of it

As CEO of the Bender Group you are now in charge of a company with a long tradition and more than 700 employees in over 70 countries all over the world. Is this a curse or a blessing for your daily work?
The global alignment of a company is something I am already familiar with. Of course this is a blessing for me, and not just because of my work on an international level to date. Ultimately Bender is extremely successful in Germany and Europe. I believe the next challenge involves driving Bender further forward internationally in the future. The family tradition and long-term orientation form a superb basis for this.

What is a typical day at work like for you at present? Which moments and tasks do you find particularly stimulating?
I spent a lot of time travelling in the first few months, visiting subsidiaries all over the world and enjoying many stimulating experiences in the process. The really exciting thing is that every day is different with a new focus. New applications for Bender products emerge every day. I am particularly excited about the creativity and enjoyment displayed by employees in the company and also by the wide range of applications for Bender products.

A change at the top always presents an opportunity for a new beginning. Which new features do you wish to emphasise in the future? What concrete objectives have you set?
Bender is a successful company and it has built excellent foundations in recent years. Therefore it is not a matter of a new beginning; it is much more a case of further development in terms of internationalisation and application. The aim is to continue to grow dynamically. Innovative Bender products and shaping the production processes even more securely and efficiently are the key to this. In view of the increased digitalisation of the economy and the society, the rapid change towards production with intelligent, digitally networked systems, I still see lots of opportunities and great growth potential for us.

"**Customers and business partners** are and remain our constant, enduring partners. This is how Bender grew."

Will customers or business partners notice any change?

Customers and business partners are and remain our constant, enduring partners. This is how Bender grew. I would also like to see more technical consultation on site, more discussions so that our customers also become development partners at the same time. Application-based development is possible in close cooperation with the aim of offering even more innovative and high-quality products and holistic solutions in the future. It is only through open and active communication that it will be possible to evaluate the areas in which Bender can improve in the future. This will allow new projects to be accomplished and products to be aligned more closely to customer requirements.

What do you regard as good management in a company?

I value skilled, decisive and eager employees, less control and an open error culture. Errors can always happen and they should be analysed when they do occur. I think it is, however, important that managers in particular have a belief in themselves and that they are able to make bold decisions independently. I have every confidence in the team.

"Once **people are together**, creativity can thrive and new approaches can be found."

What do you like best about your job and what do you like least?

What excites me most of all is the diversity of customers and employees all over the world and the active exchange between them. Even greater ideas can emerge if people from Asia, the USA and the Middle East, for example, get round a table together. Great things can happen when different cultures with different technical standards, different challenges or issues meet and work together creatively and operate internationally. That is the really exciting thing about my job. Once people are together, creativity can thrive and new approaches can be found.

In the private sphere: What do you enjoy doing most when you allow yourself a break from everyday business?

Sport is the main way in which I switch off. I run. I am also an enthusiastic and creative amateur cook and I enjoy cooking for friends at the weekend. I make full use of the barbecue in both summer and winter. 11 years in the USA have had an effect. The recipes are indeed primarily international – what else would you expect? My wife takes the lead in German cooking.

"**I value** skilled, decisive and eager employees, less control and an open error culture."

How do you see the sector developing?

As the world is becoming more and more electrified, I see lots of opportunities for Bender to develop further. In the Industry 4.0 age, it is essential that systems run permanently and they must do so securely. I see additional potential for growth for Bender in the field of e-mobility, for safeguarding against electrical shock in and around vehicles and in relation to the electrification of public transport. This can all be achieved without neglecting the existing core competencies of electrical safety in hospitals, mining and renewable energies.

Please complete the following sentence: For me Bender means ...

... being right at the heart of electrification of the world. ■

Mr Schyboll, thank you very much for the interview.

Michaela Heck M.A.
textwerk-heck

BENDER Group

The Bender Group with its main office in Gruenberg/Hesse has 70 representations and 14 subsidiaries with nearly 720 employees worldwide.

You can find your regional contacts at www.bender.de.

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BENDER Group

Power in Electrical Safety