

MONITOR

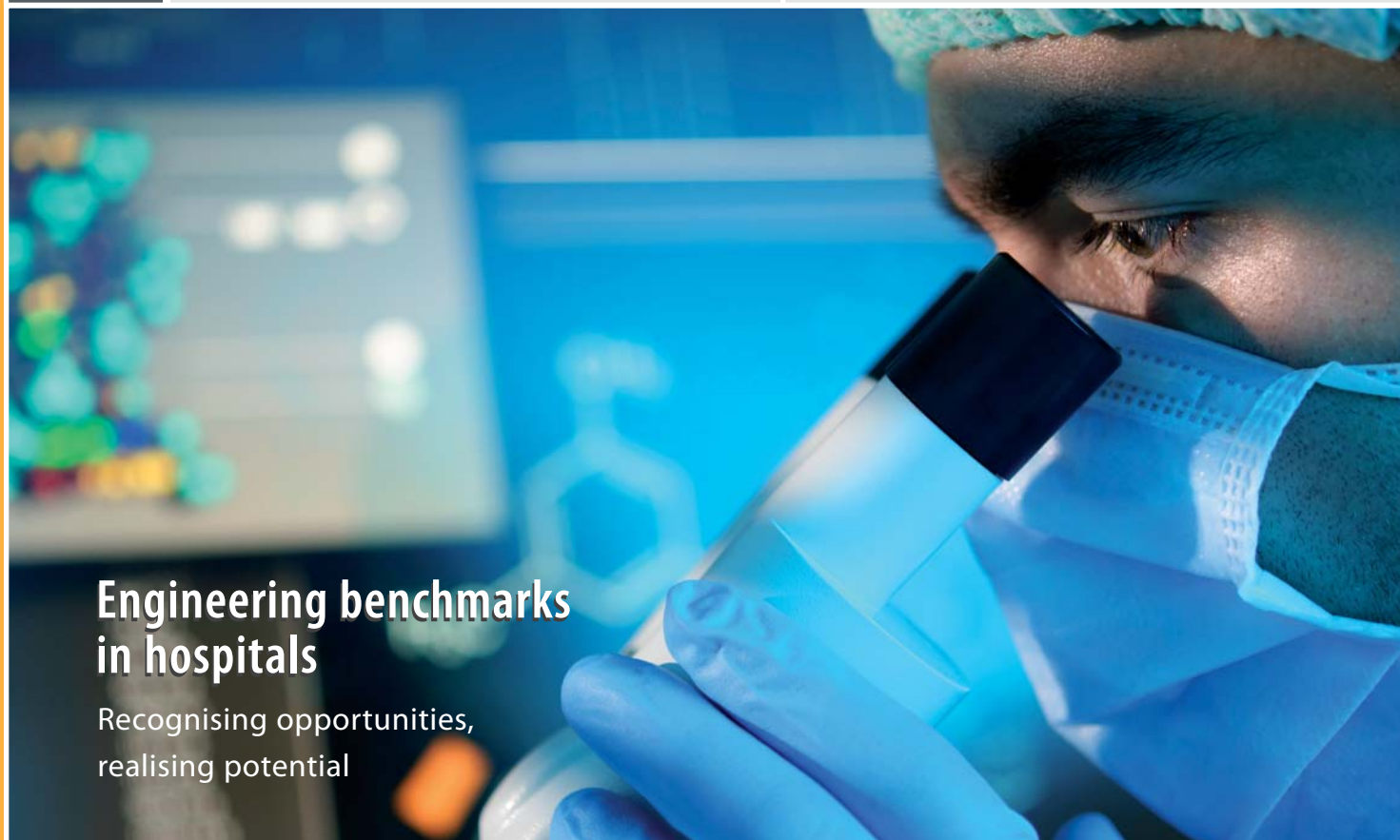
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Exacting demands in terms of hygiene and aesthetics

Heidelberg University Hospital refurbished the oral and maxillofacial surgery outpatients unit

Everything in motion – robot technology

RCM technology in the robotics laboratory at the University of Applied Sciences Amberg-Weiden



Engineering benchmarks in hospitals

Recognising opportunities, realising potential



Insulation monitoring device ISOMETER® isoPV1685

More safety for large-scale photovoltaic systems

BENDER Group



Dear Reader,

Once again, this issue of our Monitor gives you an overview of safety-related aspects of different industries, such as hospitals, industrial welding systems and photovoltaics, an industry which is currently facing real challenges but still reporting massive success: more efficient modules and significantly reduced module prices combined with improved inverters and a trend towards higher voltages are bringing photovoltaics ever closer to its aim of "grid parity".

Bender is supporting this development with the new ISOMETER® isoPV1685, which can be operated at up to 1.5 kV without a coupling device. More details are available below. We have also recently presented the perfect device for the medium sector inverters up to 500 kW, the isoPV425. The VMD640 from Bender is a device for NS (Network System) protection which has a very broad functional range but is still simple to use and operate and is now available worldwide. The award-winning EDS195 is another innovation which drastically improves fault location in PV systems. Fault location is easy, safe, quick and efficient - without all the unpopular downtime!

Bender has developed a special test environment where PV systems can be simulated in their various operating conditions. Only Bender devices which pass our stringent tests make it to the market. Our experience with testing external devices shows that this level of testing is not standard. In order to allow continuous improvement of our general test quality, we have developed our own EMC lab. This newsletter also features a report on the lab.

We are also pleased to profile a long-standing Bender representative in this edition, Fischmeister in Austria. In this respect, it gives me great pleasure to congratulate our subsidiary company in Russia on winning the "Russian Business Leader 2013" award. Our managing director, Mr Ismail Ahmadov, was also awarded the "Specialist of the Year 2013" title and honoured with the "Fame of Russia" award.

Yours,

Dirk Pieler
CEO

IMPRINT

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Engineering benchmarks in hospitals

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Recognising opportunities, realising potential

On 17 September 2013 the Wissenschaftliche Gesellschaft für Krankenhaustechnik (WGKT) in the Hamburg University of Applied Sciences organised the conference Engineering in the Hospital TK 2013 Update under the heading "The contribution of engineering to the success of hospitals" ...

Exacting demands in terms of hygiene and aesthetics

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Heidelberg University Hospital invested 3.5 million euros in the refurbishment of the oral and maxillofacial surgery outpatients unit

Anyone entering the oral and maxillofacial surgery (OMS) outpatients unit at the Heidelberg University Hospital could almost believe they were entering a different world ...

Everything in motion: Robot technology

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RCM technology in the robotics laboratory at the University of Applied Sciences Amberg-Weiden:

Many have probably failed the first time they tried it. The issue is the complex coordination task required on pouring a Weißbier (Bavarian wheat beer). Timing, a delicate touch and speed are necessary here ...



Recognising opportunities, realising potential



Engineering benchmarks in hospitals

On 17 September 2013 the Wissenschaftliche Gesellschaft für Krankenhaustechnik (WGKT) in the Hamburg University of Applied Sciences organised the conference Engineering in the Hospital TK 2013 Update under the heading "The contribution of engineering to the success of hospitals". The reason for the selection of this topic was the balancing act in the health sector between the usage of a high level of technology and often short innovation cycles on the one hand, and the enormous pressure on costs on the other. In their paper, Cord Brüning and Christoph Feldhaus presented approaches for engineering benchmarking in clinics with the objective of identifying potential for reducing costs and improving quality, as well as possible improvement processes for the enhancement of potential.

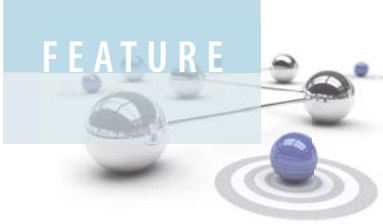
Benchmarking, that is the comparison of one's own figures with the data in a comparable group, is a management instrument often used for the analysis of organisations. During this process the intention is to use the comparison to identify optimisation potential that could result in cost reductions and/or improvements in quality in the processes considered and evaluated.

As a means in itself, benchmarking increases the effort and the costs for a process. Only if conclusions are drawn from the numerical comparison and specific actions derived does benchmarking make good business sense. The resulting

conclusions and actions can be very varied. Some examples are:

- The process/area evaluated is in a very good position in the benchmark comparison and only offers little potential for improvement. It is also possible to derive objectives from this result in an engineering benchmark: engineering is operating well and it is possible to concentrate on the processes in other areas. As the next action in relation to engineering, it can be agreed to repeat the benchmarking after a few years.





- ▶▶▶ • The process/area evaluated is not in the best practice field in the benchmark comparison and offers significant potential for improvement, for this reason clear objectives for the coming months are defined, improvement steps derived and a new numerical comparison agreed in a year's time.
- The process/area evaluated is not in the best practice field in the benchmark comparison and offers significant potential for improvement, for this reason the objective defined is to cease the usage of/shut down the related process/area within 12 months and no longer to provide the service internally.

The sustainability of the success of benchmarking depends, for example, on

- whether tangible systematic process improvement (cost situation, process quality) measures are introduced and implemented for the optimisation potential identified.
- whether the process improvements are continuously monitored.
- whether the findings obtained during the process are used for renewed optimisation.
- whether the comparison figures obtained after the introduction of the measures are evaluated in a renewed benchmarking and
- whether the findings obtained are also used for the renewed optimisation of the processes.

As such the sub-processes from the benchmarking

1. Data acquisition and analysis
2. Definition of objectives and derivation of measures
3. Check on success and repetition of the benchmarking
4. If necessary, correction of the objectives and measures



produce a control loop for the continuous improvement of an area or a department.

Start phase for a benchmarking project

At the start of every benchmarking project there are the questions: Which comparative figures from the health sector are relevant for the enhancement of the potential? How is data selected from the various sets of benchmark data published? Using which benchmarks can weak spots in the area of engineering, energy management, etc. be identified? Only if differentiated findings on engineering management, on maintenance, and on energy management beyond a plain and simple good-bad categorisation are obtained can the necessary objectives and approaches be derived from these findings.

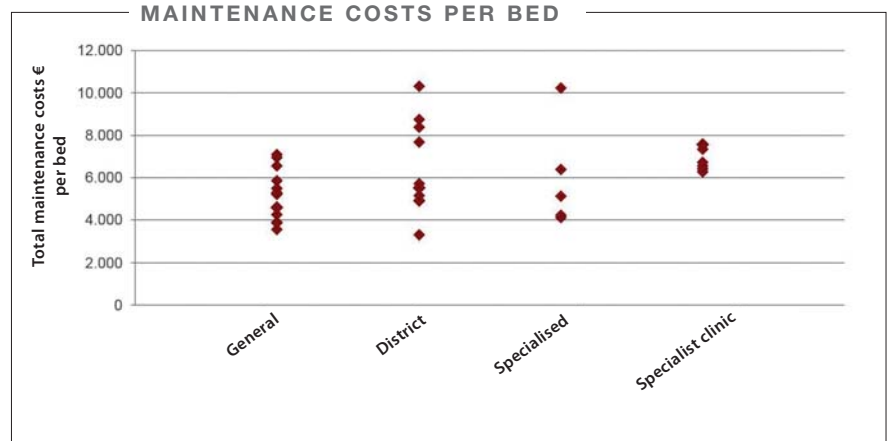
For each benchmark that is to be used for a project, the data on which this benchmark is based must be scrutinised.

- Who prepared the benchmark and for what purpose?
- What is the composition of the comparable group of hospitals?
- How many different clinics have made available data sets?
- Were the data provided complete?
- How old are the data? For which years are the figures?

In boundary cases in particular, statements can only be made based on a benchmark comparison if the basis of the data is adequately transparent and known.

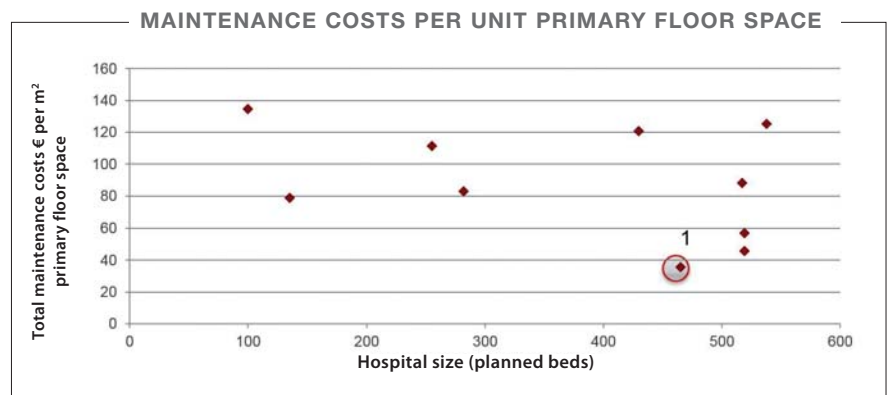
Graphic depiction of maintenance costs in benchmarking

An important, if not the most important criterion for the usability of benchmarks is the differentiation of the depiction of the information depending on the parameter used.



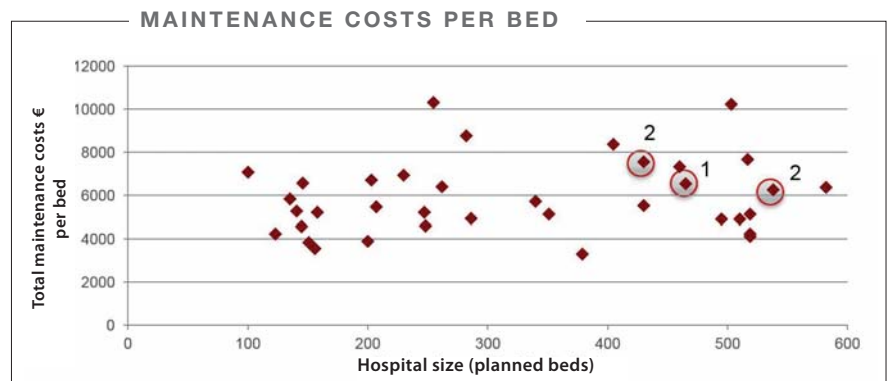
One form of depiction is the comparison of the total maintenance costs per bed by hospital type. This comparison is not so helpful, as it only roughly and therefore inadequately depicts the actual provision of service in the medical areas of the hospital. Accordingly, a hospital with lower maintenance costs than another hospital can, for example, nevertheless have the greater potential for savings.

The sector comparison as offered by hospital auditors is based on a similar comparison model. However, there can also be large variations here even with similar hospital operators. The comparison is only an indicator that does not explain the background.

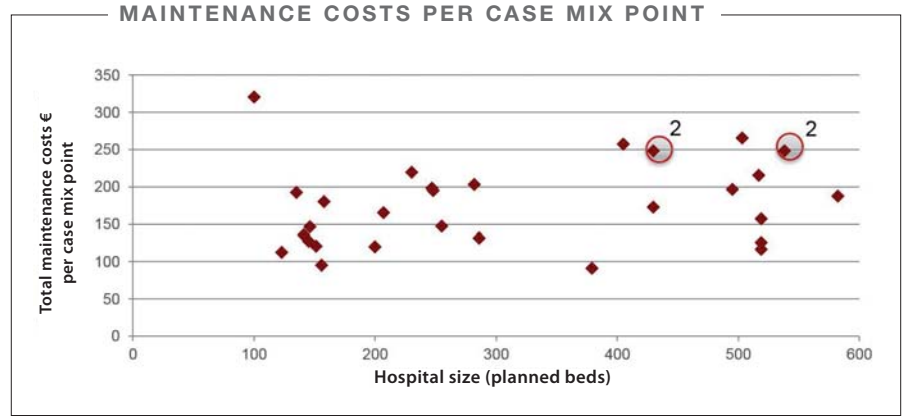


Another conceivable depiction would be a comparison by primary floor space. In the example marked a psychiatric clinic (1) of pavilion style construction with 85,000 m² of primary floor space looks very good. This depiction takes into account the different forms of construction of clinics, but again does not address the actual provision of medical services. It is not taken into account that in the clinic: a) there are no operating theatres and b) there is only very limited medical equipment. It is hardly possible for the benchmark reader to evaluate these figures as there is no information on usage, that is the cost intensity of the floor space.

For hospitals that provide a large portion of their medical services outside the Diagnosis Related Groups (DRGs) a depiction via the number of beds is an initial approach even though here the actual provision of service is not taken into account, as in the two previous examples. In this comparison it is clear that the psychiatric clinic (1) shown above is



►►► no longer "exemplary". The points marked with (2) relate to one and the same clinic: The variation is due to the unclear term "bed". The point on the left is produced by using the actual beds used as the divisor, the point on the right using the number of beds at the time the clinic was set up around 30 years ago (planned beds).



Close to the ideal is a form of depiction that also includes the case mix points in the evaluation as a parameter for the provision of medical services. This comparison takes into account the number as well as – via the case mix index – the seriousness of the cases handled and therefore the revenues of a hospital. Here it is irrelevant which cases or how many beds there are in a hospital. Based again on the points marked

with (2) it can clearly be seen that inaccuracies in the number of beds will not have any effect on the magnitude of the maintenance cost per case mix point.

Advantages of multidimensional analyses

As a rule an evaluation of the processes in the engineering area based on a single comparison is only of limited use. The usage of various items of comparison data on the other hand permits thorough consideration of the emerging questions during which the assessor can evaluate scenarios from various perspectives. A differentiated discussion on individual topics including their effect for example on

- The maintenance costs
- The staffing in engineering
- The structure and procedures in the area
- The investment planning

is then possible. Accordingly, objectives with clear priorities can be developed in a further step.



Along with the maintenance costs (represented in the bookkeeping in German clinics in the various 72-series accounts) and the gross staff costs, in particular

- The human resources in engineering
- The costs for energy and media
- The amounts of energy and media
- The times at which energy and media are drawn

should be considered in a benchmarking project.

Boundaries for the benchmarking

Benchmarks cannot provide information on the following points:

- The quality of the service provided in engineering,
- The level of compliance with statutory regulations, e.g. test intervals,
- The development of the staff, that is the ability of the engineering service provider to meet future requirements,
- The objective-orientated implementation of maintenance strategies,
- The structure and procedures in the engineering area.

It is essential for the reliable evaluation of an engineering area that the persons undertaking the evaluation obtain a comprehensive impression of the actual situation in the engineering area. Some aspects only become apparent on analysis in person the structures to be evaluated. As such, a tour of the engineering areas as well as direct conversations with the staff there are to be treated with great importance.

Obtaining know-how

For successful engineering benchmarking, above all special knowledge and extensive of experience are required, in addition to obtaining the comparative figures. It is also helpful if benchmarking projects are not controlled by persons who could be affected directly by possible changes.

In larger clinic groups, engineering benchmarking projects are therefore often undertaken by higher level departments. Individual hospitals and smaller clinic groups generally make use of external service providers and consultants who have particularly

- Profound knowledge of the processes in the engineering area and
- Have also demonstrated in comparable projects that they can successfully accompany the improvement of the engineering processes including the enhancement of the potential found.

CONCLUSION:

For successful engineering benchmarking, not only is good depiction of the results in a number of useful graphics necessary. Building on this information the partial findings should be validated from various points of view to eliminate misinterpretations and to find effective approaches. The crucial step is taken with the definition of the objectives derived from the results, which in turn represent the basis for process improvements, for instance. Engineering benchmarking should be repeated regularly to be able to identify undesirable developments in good time and take adequate corrective measures. ■

*Dipl.-Ing. (FH) Christoph Feldhaus
CoSolvia Betriebstechnik GmbH, Hasbergen*

Bender Russland awarded honorary title

"Russian business leader 2013"



On 29 August 2013, the 10th annual awards ceremony for the leading business in Russia, Kazakhstan, the Ukraine and Belarus was held in Astana, Kazakhstan. Business owners, top managers and specialists from the leading businesses in the Commonwealth of Independent States countries were invited to the event. Around 900 representatives from the 300 most successful companies in these four countries met up the evening before Kazakhstan's Constitution Day.

The invited companies included Bender Russland, a subsidiary of Bender GmbH & Co. KG based in Grünberg, represented by managing director Mr Ismail Ahmadov. The Russian branch was founded

on 19 February 2009 and started out with just two employees. The number of employees has now doubled.

The awards from the National Business Rating (NBR) are given to mark success within a company's industry. Bender Russland won first prize in the following categories based on the official statistics for social and economic key indices.



Specialist of the year 2013

Mr Ahmadov personally was awarded the "Specialist of the year 2013" for his professional success, his personal dedication to running the company, his rational approach to solving business problems and his commitment.



Russian business leaders 2013

The official "Russian business leader 2013" certificate proves that Bender Russland has been awarded the honorary title of "Russian business leader 2013" based on its position in the order of companies in the Russian Federation and its data recorded for the official statistics.



"Fame of Russia" award

The "Fame of Russia" award is given to individuals for their outstanding professional performance which demonstrates exemplary flexibility and social responsibility. Mr Ahmadov was given this award for his services to business development and reinforcing the international status of the Russian Federation.

We would like to congratulate Mr Ahmadov and his team for these awards and wish them continued success. ■

The management of Bender GmbH & Co. KG



The new generation of NS protection for improved network integration of power generation systems

The expansion of decentral power generation systems has increased significantly in recent years, not only in Germany due to the financial support via the Erneuerbare-Energien-Gesetz (EEG) (Renewable Energies Act), but also worldwide. Along with wind power, in particular the installed power available in photovoltaic and CHP installations has increased dramatically.

Due to the power produced by power generation systems in Europe that has in the meantime increased to more than 150 GW, these systems have significant

system relevance on the distribution network. In turn this aspect represents a risk for the stability of the integrated European network and has resulted in amendments to the standards. The target has long been defined:

Power generation systems must no longer disconnect from the distribution network on the first signs of a problem on the network, instead they must continue to operate through the fault with expanded frequency limits ($47.5 \text{ Hz} < f < 51.5 \text{ Hz}$). In this way large area, undesirable power shutdowns due to distant distribution network faults at higher voltages are to be avoided.

The 50.2 Hz problem: Systemstabilitätsverordnung (SysStaV) (System stability ordinance) imposes obligation to upgrade

The increasing number of decentral power generation systems installed is placing new challenges on the distribution network and system reliability. A specific problem is maintaining the frequency in the public low-voltage distribution network. Up to now a power generation system connected to the public distribution network would be shut down automatically by the network and system protection in case of an overfrequency of ≥ 50.2 Hz.

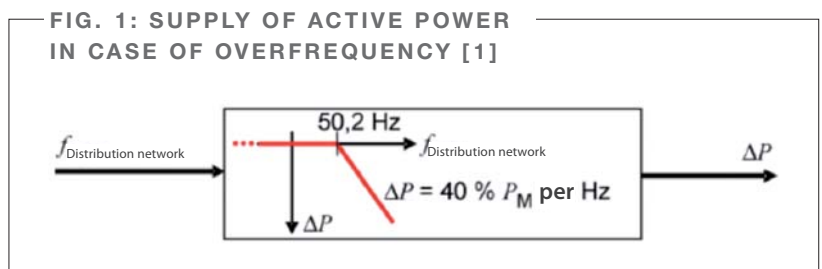
The resulting risks for reliable distribution network operation are no longer manageable. If the distribution network frequency of 50.2 Hz occurs during a period of high decentral supply, in the extreme case several Gigawatts of power will shut down. The situation can result in a serious problem for system stability if the related power step is significantly higher than the primary control power reserved. In this case the power frequency regulation can no longer stabilise the distribution network frequency. Furthermore, the approximately simultaneous reactivation of the shut down power generation systems as the frequency recovers could mean the threshold of 50.2 Hz is exceeded again. This situation could result in the repeated shut down of the power generation systems on the low-voltage distribution network ("yo-yo" effect).

Due to this problem, there is currently an obligation to upgrade existing systems in Germany in accordance with the Systemstabilitätsverordnung (System stability ordinance) based on the current regulations in VDE-AR-N 4105 [1]. The following deadlines have been defined:

- Power generation systems with a system power output of > 100 Kilowatt are to be upgraded by **31 August 2013**
- Power generation systems with a system power output of > 30 Kilowatt are to be upgraded by **31 May 2014**
- Power generation systems with a system power output of > 10 Kilowatt are to be upgraded by **31 December 2014**

The "50.2 Hz problem" is not just a national problem, it is international. For this reason standards, application rules and directives are currently under review across Europe to counter the "50.2 Hz problem", which can result in distribution network black-out. Adjustable power generation systems must actively participate in the distribution network management and are only allowed to be disconnected from the public low-voltage distribution network by the NS protection after the threshold of 51.5 Hz has been exceeded.

In the frequency range between 50.2 Hz and 51.5 Hz (see Fig. 1) a further mechanism for improved distribution network management by means of linear active power reduction with a gradient of 40 %/ Hz ("follow the characteristic") is defined. Excess power on the public low-voltage distribution network will cause the distribution network frequency to rise. However, this increase can be limited by the mechanism described.



To be noted here in particular are the power generation systems connected to the low-voltage distribution network application guide VDE-AR-N 4105 [1] applicable since 2012 and the BDEW technical guideline on Generating Plants Connected to the Medium-Voltage Network 2008 [2]. Innovative standards on connections to the distribution network area also available in Italy with CEI 0-21 (low voltage) [3] and with the directive C10/11 (Belgium) [4]. A common feature of these standards is that they require system services such as voltage and frequency stabilisation.





▶▶▶ Island operation/islanding

The current change in strategy away from "shut down on the first sign of a problem on the distribution network" to active distribution network support to ensure the stability of the distribution network in accordance with (BDEW, CEI0-21, VDE-AR-N 4105, C10/11) has, however, a negative connotation. Due to the expanded permissible frequency range (47.5 Hz – 51.5 Hz) the risk of undesirable islanding increases.

It can therefore be seen that the stabilisation of the integrated European network is of greater importance than the prevention of islanding. Despite this situation, the detection and case-by-case specific shut down of islands continues to be driven by two main motivation factors. On the one hand for health and safety reasons. On the other hand, decentral power generation systems are to be protected by islanding detection and subsequent deactivation.

Islanding can occur or form due to switching actions by the network operator, due to the tripping of protective devices or due to equipment failures. In these cases the term unintentional islanding operation is used. In such cases the network operator loses control over this section of the distribution network.

In addition to 3-phase voltage and frequency monitoring, the directive C10/11, among others, requires the "Rate of Change of Frequency" (ROCOF) method.

This provides additional protection for the detection of uncontrolled islanding. The ROCOF method evaluates the frequency change per unit time (df/dt).

Aspects related to personal safety

The key problem in the case of uncontrolled islanding after disconnection is that power supply units expected to be disconnected from the electrical supply are actually live. On working on the distribution network it can therefore no longer be assumed that a disconnected section of the distribution network is actually disconnected from the electrical supply. Compliance with the five safety rules in accordance with DIN VDE 0105-100 [5]

1. Disconnect
2. Secure against reconnection
3. Check for the absence of electrical power
4. Earth and short circuit
5. Cover neighbouring live parts or cordon off.

is imperative here to prevent serious accidents. This statement applies in particular to the check for the absence of electrical power prior to earthing and short circuiting.

Aspects on system safety

On the occurrence of islanding the distribution network voltages and distribution network frequency are no longer synchronised with the integrated network. On the simple connection of an undetected island to the integrated network this situation will result in high equalising currents. Voltage and phase steps that affect above all electrical machinery can damage driven and thermo-electric machinery for the generation of electrical energy.

The automatic switching point (NS protection)

The network and system protection (NS protection) has the task of disconnecting the power generation

system from the distribution network in the event of inadmissible voltage and frequency values. In this way it is intended to prevent the undesirable supply of power by the power generation system to an island.

The requirements on the NS protection have not only been further developed with the current standards, but also made significantly more severe. In combination with a switching device (coupling switch of redundant design) the NS protection forms a type-approved protective device with a certificate of conformity that is to be verified by an accredited certification body.

In addition, a trigger test is to be undertaken by the system installer to test the trigger circuit. The NS protection must therefore be equipped with a test button that triggers the coupling switch. This testing is undertaken based on BGV A3 (regulations on accident prevention). The organisation operating the installation must have the protective devices necessary for operation of the public low-voltage distribution network regularly checked for correct function by an electrician.

Condition for disconnection

The requirements in relation to the disconnection condition are defined by the dynamic distribution network monitoring:

- Voltage drop protection $U<$
- Voltage drop protection $U<<$
(only BDEW technical guideline)
- Rise-in-voltage protection $U>$
- Rise-in-voltage protection $U>>$
- Frequency decrease protection $f<$
- Frequency increase protection $f>$
- Islanding detection with df/dt (optional)
- "Remote trip" control input (optional).

In case of the infringement of the permissible voltage or frequency range, shutdown within a specific period of time is required. The time requirements are not identical across Europe.

The expansion of the permissible frequency range to 51.5 Hz actively contributes to an improvement in compatibility with DIN EN 50160. However, as already described, as a result of this expansion there is the risk of islanding.

DIN EN 50160 describes, among other issues, the quality of the voltage and frequency that can result due to specific situations such as load fluctuations, interference due to overvoltage and undervoltage, as well as flicker in the public low-voltage distribution network [6].

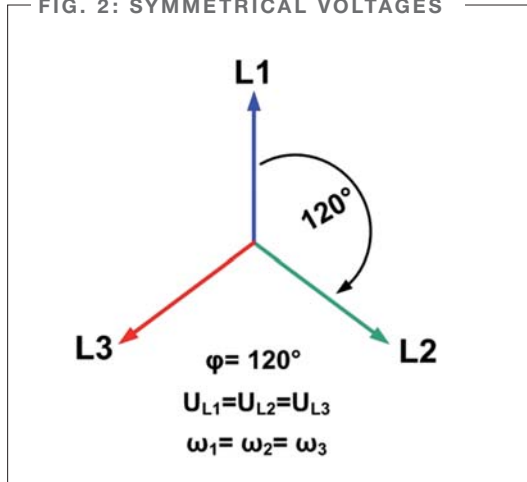
Condition for reconnection

To counteract the risk of an impending distribution network blackout, that is to counter the 50.2 Hz problem, VDE-AR-N 4105 [1] and C10/11 [4] define a condition for connecting to the distribution network. The power generation system is only allowed to connect to the public low-voltage distribution network if the tolerance ranges for both the distribution network voltage (85 % U_n to 110 % U_n) and the distribution network frequency (47.5 Hz to 50.05 Hz) have been met for a minimum period of 60 seconds. Compliance with this condition is generally required after every threshold infringement to ensure reliable connection to the distribution network. Similar requirements are also stated in the standard CEI 0-21 [3] and the BDEW technical guideline on Generating Plants Connected to the Medium-Voltage Network [2].

The consideration of the admissible frequency range in relation to the condition for reconnection is deemed extremely critical in VDE-AR-N 4105 [1], C10/11 [4] and the BDEW technical guideline [2]. Problems can arise and connection to the distribution network prevented especially due to the tightly defined frequency threshold of 50.05 Hz.



FIG. 2: SYMMETRICAL VOLTAGES



Monitoring of the phase voltage and line conductor voltage

The background to the line conductor monitoring is aimed at possible unbalanced load detection that cannot be realised with a simple phase voltage measurement.

Along with the phase voltage monitoring, the NS protection has the task of monitoring the feed side and networkside line conductors. In normal network conditions the phase voltages $L_1 - N$; $L_2 - N$; $L_3 - N$; $L_3 - N$ are ideally 230 V, with a resultant phase offset of 120° in each case. The line conductor voltages are then 398.4 V. However, if the phase angle changes due, e.g., to the highly asymmetrical supply of power or due to faults on the network side, this situation can be detected by a line conductor measurement.

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- [3] Standard CEI 0-21: Regola tecnica di riferimento per la connessione di Utenti attivi e passivi alle reti BT delle imprese distributrici di energia elettrica; Comitato Elettrotecnico Italiano, Milan, June 2012.
- [4] Standard C10/11: Prescriptions techniques spécifiques de raccordement d'installations de production décentralisée fonctionnant en parallèle sur le réseau de distribution; June 2012.
- [5] Standard VDE 0105-100: Operation of electrical installations - Part 100: General requirements; DKE German Commission for Electrical, Electronic & Information Technologies of DIN and VDE, Frankfurt am Main, October 2009.
- [6] Standard DIN EN 50160: Voltage characteristics of electricity supplied by public distribution networks; Beuth Verlag GmbH, Berlin, February 2011.

CONCLUSION

The current change in strategy away from "shut down on the first sign of a problem on the distribution network" to active distribution network support results in many improvements for ensuring the stability of the distribution network. However, a disadvantage is that islanding occurs more often and therefore causes an acute risk for personnel during maintenance work on the public distribution network.

Bender GmbH & Co. KG currently offers optimal monitoring with the latest network and system protection VMD460-NA. The VMD460-NA provides protection with its continuous measurement of the phase voltage and line conductor voltage, and reliably protects against the risk of islanding. In addition, the ROCOF method (df/dt) can be activated for the detection of islanding. The VMD460-NA meets the requirements of the following standards, application rules and guidelines.

- CEI 0-21
- VDE-AR-N 4105
- BDEW technical guideline
- C10/11

Other standards are in preparation:

- G83/2
- G59/2
- DIN V VDE V 0126-1-1



With the VMD460, multifunctional configurable NS protection is available that can be used in numerous applications based on national or plant-specific requirements.

The related parameters are saved in preset basic programs. The VMD460 combines safe function with a high degree of flexibility and straightforward configuration. ■

Dipl.-Ing. Marc Euker
T-MTS

COMTRAXX® COM462RTU for clear data

The gateway COM462RTU in the COMTRAXX® series is an improved successor to the protocol converter FTC470XMB. It makes measured values and messages from Bender measuring devices available for Modbus/RTU.



Despite the worldwide trend toward IP-based communication in all sectors, the serial Modbus protocol continues to have a justified existence due to its widespread deployment and ease of use. The Modbus RTU (Remote Terminal Unit) fieldbus was specified by Modicon and made available to the market license-free. The COM462RTU uses the Modbus RTU protocol based on a serial RS-485 interface.

The COM462RTU permits the monitoring and analysis of measured values and messages from Bender measuring devices, e.g. insulation and residual current monitoring. It makes available in a clear manner the data from up to 150 connected Bender measuring devices and uses the process image familiar from the gateways COM460IP and CP700 for this purpose.

In this way it is straightforward to integrate Bender measured values and messages in higher level systems, it is also possible to send various commands, e.g. a test, to a device from a controller or data display software.

All communication parameters, the date and time (the COM462RTU also offers time synchronisation for all measuring devices connected) can be set conveniently on the device using buttons and the LC display. For setting parameters and more advanced functions, the Ethernet Gateway COM460IP with its option packages or the Condition Monitor CP700 can be used in parallel. ■

Marcus Götz
T-SCT

Insulation monitoring device ISOMETER® isoPV1685
for unearthed AC, AC/DC and DC systems (IT systems)
up to AC 1000 V/DC 1500 V

More safety for large-scale photovoltaic systems

The devices isoPV1685 and isoPV1685PFR are two of the latest insulation monitoring devices for insulation monitoring on large-scale photovoltaic systems up to approx. 2 Megawatt, corresponding to 2000 μF system leakage capacitance, with symmetrical coupling up to DC 1500 V without an additional external coupling device. Very space-saving installation is possible due to the avoidance of the usage of an external coupling device and due to the usage of plug-in terminals.

At a supply voltage of DC 18...30 V the devices have a low power consumption of $\leq 7 \text{ W}$ or $\leq 7.5 \text{ VA}$.

By using the latest measuring technology it is possible, despite very high impedance coupling ($R_i \geq 70 \text{ k}\Omega$) and low coupled measuring current ($I_m \leq 1.5 \text{ mA}$), to realise an extremely wide range for the insulation fault response value ($R_{an} = 200 \Omega \dots 1 \text{ M}\Omega$).

The devices are also expected to be available in a version with UL 1998 approval from Q1/2014; they will then also be suitable for usage in large-scale PV systems on the US-American and Canadian market. An innovative new feature of the isoPV1685PFR variant is that, in addition to insulation monitoring, insulation fault location is also possible. Furthermore,

due to an integrated residual current measuring unit the same device can be used for residual current monitoring. On the isoPV1685PFR this unit can be configured both pure AC residual currents and, on request and given an adequate size order, also for universal AC/DC sensitive residual current measurement by means of the suitable selection of the external residual current transformers.

The insulation fault location feature provided in the isoPV1685PFR is a device feature that will pay for itself very quickly in large-scale PV systems. In the event that an insulation fault is signalled by the insulation monitoring, the internal locating current injector is activated manually or automatically without changes to the PV system; both the faulty string and also the faulty module in the large-scale PV system

can then be found very quickly with the aid of an already installed and/or portable fault locator (e.g. EDS195P), without the need to take parts of the installation out of operation to locate the fault. By using the integrated fault location function in the isoPV1685PFR variant, five-digit sums for fault location by electricians and the related downtimes can be saved.

Along with the three alarm relays, the device features the Bender-specific BMS bus as a digital interface and also a CAN bus.

A further innovative new feature of the isoPV 1685PFR variant is the data logger function for proactive installation maintenance along with a history memory for alarms on an integrated μ SD card, without the need for a digital network. By straightforwardly evaluating the text-based files, the data logger function can be used to optimise the uptime of the large-scale PV system monitored and to minimise maintenance costs by means of long-term planning. The history memory is saved in the common csv format. An Excel tool is available for straightforward evaluation. With a 2 GByte μ SD card it is possible to acquire all relevant measurement, alarm and state data from the device and the PV system for more than a year.

With the continuous, long-term monitoring and a combined regular graphical evaluation of the insulation resistance over time, the installation operator increases the probability that even dangerous design defects in the large-scale PV system can be detected. If, e.g., an unsuitable combination of PV connectors is used, it is very probable that the poor fit will result in the ingress of dirt and moisture into the connection. In turn it is highly probable



that it will be possible to detect this pollution due to the gradual reduction of the insulation resistance in the graphical trend evaluation, even with values above the required response values. As reported in the article "*Warum kompatible PV-Steckverbinder gefährlich sind*" (Why compatible PV connectors are dangerous) (ELEKTRONIKPRAXIS no. 16 date 26.8.2013), it is exactly these design errors that can result in fires in PV systems.

By using the data logger function on the isoPV1685PFR, there is therefore a high probability that system states involving "fire risks" on PV installations can be detected at an early stage. Preventive maintenance helps to prevent fires. ■

Dipl.-Ing. Dieter Hackl, T-MIS
Dipl.-Ing. Manfred Geiss, T-MIS

Heidelberg University Hospital invested 3.5 million euros in the refurbishment of the oral and maxillofacial surgery outpatients unit



Exacting demands in terms of hygiene and aesthetics

Short routes and optimised processes



Anyone entering the oral and maxillofacial surgery (OMS) outpatients unit at the Heidelberg University Hospital could almost believe they were entering a different world. The OMS outpatients unit was completely refurbished and, as part of the second stage of construction, three operating theatres and one recovery room have been set up and kitted out with state-of-the-art medical equipment and the latest technical findings.



Professor Jürgen Hoffmann, Medical Director of the Hospital and Outpatient Department for Oral and Maxillofacial Surgery, explains the reasons for the work:

"We wanted to keep the routes short and optimise processes."

In order to provide the best possible patient care, the experienced doctors and nursing staff were involved at the planning stage.

While the reception area is open plan, the 13 treatment rooms - all of which are also kitted out to the latest standards - are partitioned from one another. They contain only the most necessary equipment in order to keep things as manageable as possible.

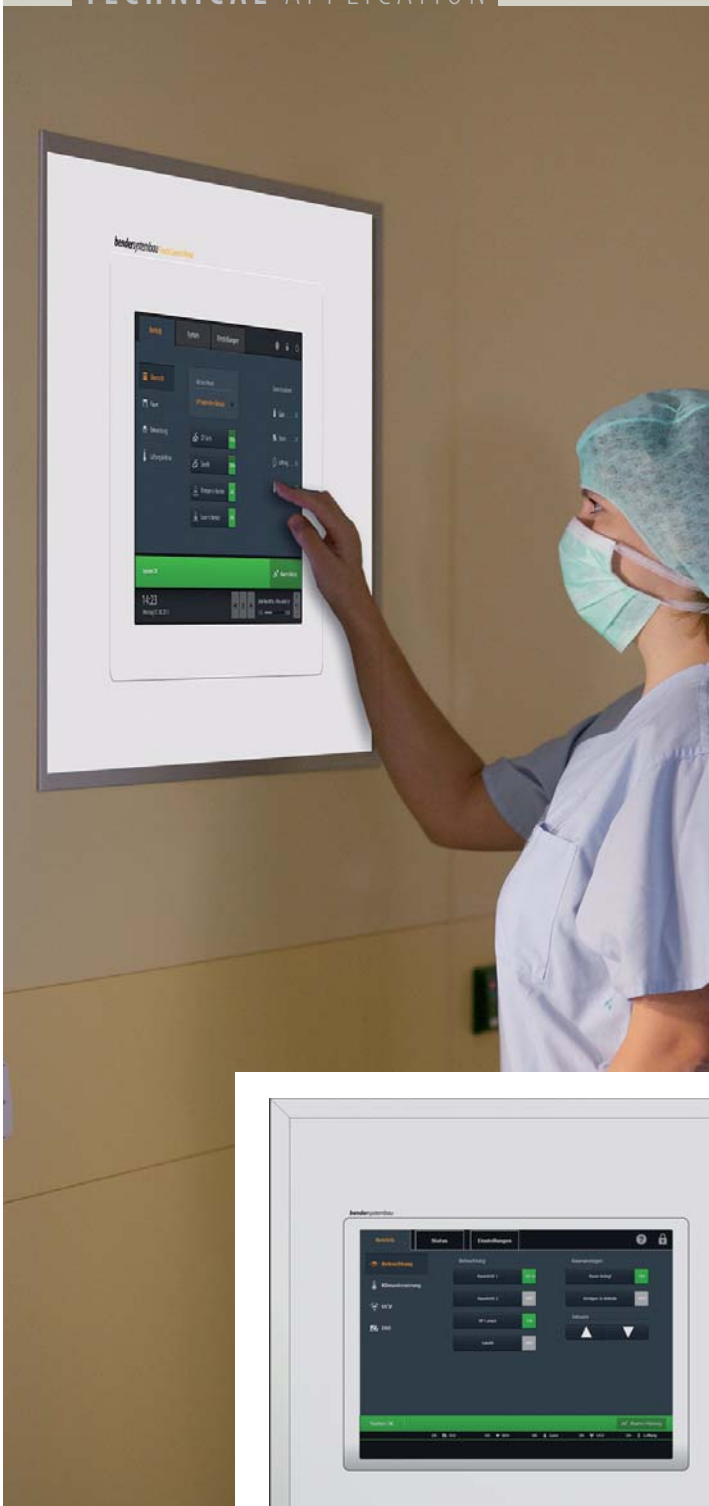
The operating theatres

The OMS clinic has more than 80 employees, of which 25 are doctors and dentists. Every year, the OMS clinic on the ground floor of the main hospital treats over 30,000 patients. Many of them are tumour patients, but there are also people suffering from osteoporosis who require dental implants or patients with severely deformed faces and jaws and accident victims. There is a specialist clinic for children born with cleft lips, jaws and palates. There are 40 beds in the main clinic for inpatients.

The operations carried out by Professor Hoffmann and his team can last up to twelve hours. All the structures need to be carefully reconstructed and the patients need to be happy with the results.



TECHNICAL APPLICATION



Exacting requirements for the operating theatres

The Heidelberg University Hospital was extremely demanding in its requirements for the equipment of the operating theatres.

In this area, they opted for Glass Touch Control Panels (TCP) from **bendersystembau**.

Glass-fronted panels allow solutions to meet the most demanding of hygienic and aesthetic requirements. The benefits are clear: smooth surfaces are easy to clean and resistant to detergents, disinfectants and scratches. There is also the user-friendliness: easy, intuitive use is among the TCP's key features. **bendersystembau** has developed a touch-sensitive "behind-glass touch" system for operation through a glass screen, this enables the unit to be operated through glass with a thickness of four to eight millimetres. "The medical staff are very happy with the specific, functional operation," confirms Friedrich Schneider, the Project Manager responsible at Klinik Technik GmbH. "The touch-sensitive surface makes operation and monitoring easier within a medical context."

The graphics interface of the Touch Control Panel from **bendersystembau** can represent all kinds of complex structures. The status and command information are shown clearly and in structured form.



The built-in I/O system provides numerous options for embedding digital and analogue systems with various operating voltages, outputs, measurement signals and special functions within a single alarm indicator and operator panel.

The planners and operators opted for a technical, good-looking design, which will set the example for similar setups. ■

*Dipl.-Ing. Thomas Frössinger, Ing.-Büro Frössinger
Andrea Gossel, bendersystembau*

THE BENEFITS of Touch Control Panels behind glass:

- Good aesthetics
- High transparency without flaws
- Not sensitive to scratches
- Free choice of background colours to match operating theatre design.

DEVICE FEATURES:

The glass front is a four millimetre pane of single-pane safety glass with circulating 0.5 mm becel and polished edges.

The surface is not sensitive to scratches. This is a benefit in terms of the printing on the reverse too. *bendersystembau's* specialist digital printing technique enables complex individual designs to be printed. The constant development of its own printing technology enables extremely high-quality print transparency.

The Touch Control Panels from *bendersystembau* are essentially free of interference patterns (smears).

RCM technology in the robotics laboratory at the University of Applied Sciences Amberg-Weiden

Everything in motion

robot technology clearly, realistically demonstrated with a Bavarian flavour

Many have probably failed the first time they tried it. The issue is the complex coordination task required on pouring a Weißbier (Bavarian wheat beer).



Timing, a delicate touch and speed are necessary here. A perfect application for demonstrating to students the interaction between the individual components of robot technology. To ensure trouble-free demonstrations, the university uses residual current monitoring technology from Bender.

Under the leadership of Prof. Dr.-Ing. Matthias Wenk, educational infrastructure has been setup in the faculty for mechanical engineering/environmental technology that goes way beyond the process of pouring a top-fermented beer. Image recognition, force and torque sensors may be part of everyday technical life, but they still need to be mastered in the specific application.

The equipment available

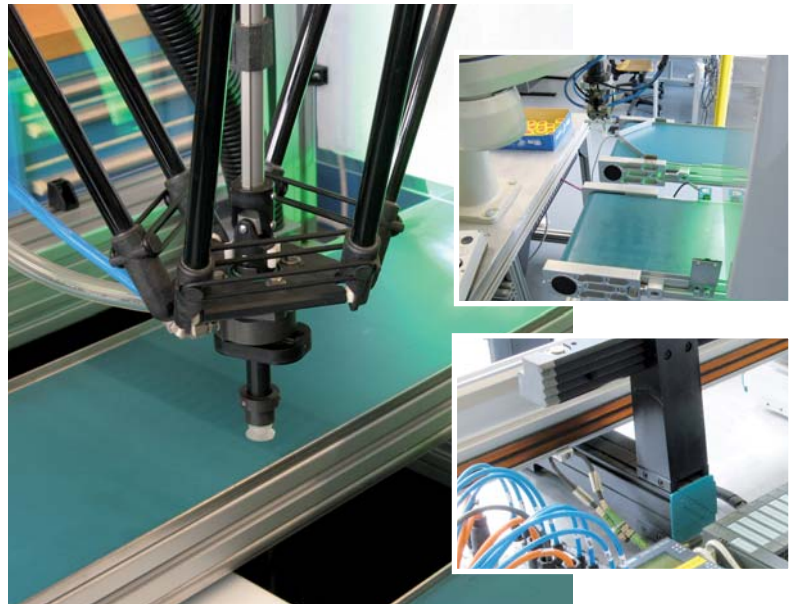
- 6-axis articulated arm robot KUKA KR15/2 with PC-based controller KRC2
- 6-axis articulated arm robot KUKA KR45/2 with PC-based controller KRC2
- 2 force/torque sensors manufactured by Schunk
- intelligent vision sensor manufactured by DVT
- Powerful image processing station with Stemmer VisionBlox
- Robot-sensor interface package RSI 2.1
- FTCTRL package for the integration of force/torque sensors in robot controllers
- RSI XML package for the integration of image processing systems in KUKA robot controllers based on an Ethernet connection and XML data formats
- Robot simulation system KUKA Simpro and KUKA OfficeLite.

Uncontrolled shutdowns ...

At the trade fair SPS Drives 2012 in Nuremberg, Bender was approached by Dipl.-Ing. (FH) Werner Hofmann (laboratory engineer at the university). He spoke of frequent but randomly occurring shutdowns of the distribution system in the laboratory. The problem was self-evident, but it still required more detailed investigation by the technical office at Bender.

... due to underestimated leakage currents

When the distribution system was installed, residual current circuit breakers of type 1, with a 30 mA trigger threshold were fitted. As these may trigger already at 15 mA, it was not even necessary to make a control measurement to identify that in this case the regulated drives in the systems supplied were causing the residual current circuit breaker to reach the trigger thresh-



old time and again simply due to the normal leakage current in operation. The phenomenon was verifiable and, as a constant fault, was of course annoying and a limiting factor.

Flexibility and safety ...

The solution was provided by the RCMS490 together with AC/DC sensitive measuring sensors of type W20AB from Bender. The persons responsible were impressed above all by the flexibility of this technology. Flexibility here refers to the possibility of expansion to up to 12 measuring points. The individual modification of trigger values to the specific system configuration was a further important argument for this technology. The latter point is particularly important, as in education the system configuration changes constantly.

... by means of AC/DC sensitive monitoring

It was therefore possible to combine the RCMS490, together with switchgear, to form a suitable monitoring and protection unit. The unsuitable RCDs could be discarded. Since the Bender technology has been in use, there have been no further unjustified shutdowns. This situation is all the more important, as the laboratory also offers seminars on drive technology for external participants. Undesirable shutdowns during these events must be avoided under all circumstances. ■

Bernd Häuslein, Tech. Office Nuremberg



IMB STROMVERSORGUNGS
SYSTEME GMBH

Bender Class(y) Reunion at IMB

Where residual current technology meets the IT system

The requirements for electrical systems are constantly becoming more demanding. In the process, the reliable power supply plays an especially central role in the field of energy supply in order to provide customers of power generators and suppliers with a continuous, reliable supply of power. For if a malfunction occurs, downtimes and production losses result in enormous costs. IMB Stromversorgungssysteme GmbH perfectly combines reliability and safety in its systems.



Founded more than 20 years ago by the managing director and owner, Mr Wilhelm Müller, IMB Stromversorgungssysteme GmbH focuses on the development and production of power supply units. This market requires precisely tailored, individually adapted power supplies for many tasks. Its well-engineered systems and user-friendly products that always offer innovative features have made the company one of the trend-setters on the market for power supply systems today.

Recognised know-how

IMB has succeeded in establishing a great reputation in a broad range of industries with its philosophy. Whether it's the manufacturing industry, power supply companies, the manufacturers of regenerative power generation systems or companies in transportation engineering and many others - IMB is considered a reliable, competent partner both at home and internationally.

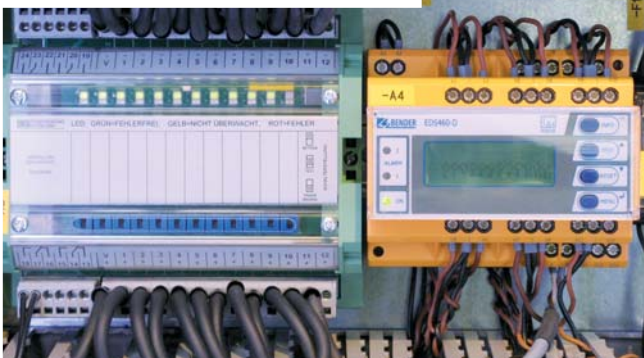
Its core business is the construction of extremely safe, highly available DC power supply systems and low-voltage systems. It is especially these power supply systems that hold a key position in the safety concept of every system.

A strong team...

The construction of DC power supplies is automatically linked to the use of an insulated system (IT system). And that's why IMB has trusted in products from Bender as an addition its product range for almost twenty years. IMB's customers not only value the reliable, exact monitoring and signalling of insulation faults, they also increasingly use the equipment for insulation fault location (EDS). The fast location of faults during ongoing operation guarantees rapid troubleshooting and fault-free operation.



TECHNICAL APPLICATION



Especially in the case of redundant DC power supply systems, the use of the EDS system represents consistently, carefully thought-through safety. Together with the EDS460, the ISOMETER® IRDH575 insulation monitoring device guarantees reliable, fast fault localisation and provides final customers with true added value.

... for increased safety at less expense

A DC system must always also be supplied by a grid connection. For this purpose, IMB offers complete NSHV* systems up to 6,300 A. Of course, here as well the focus is on the safety concept. The monitoring of the central earthing point is only the start of the use of differential current monitoring technology (RCM technology) from Bender. The monitoring of outputs for critical consumers also enables state-oriented maintenance and helps tackle the testing tasks required according to German standard BGV A3.

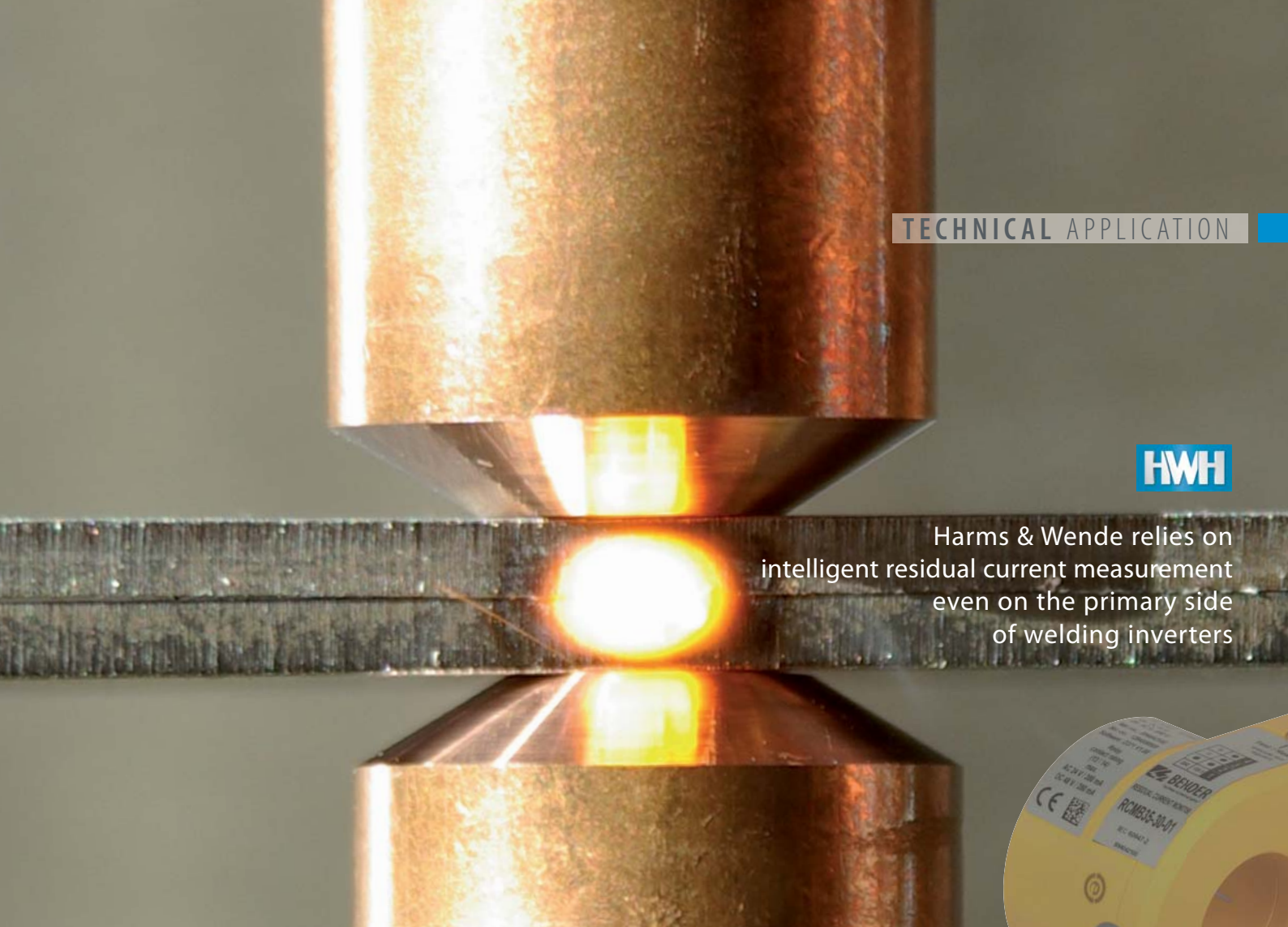
Here the EDS system and RCM measurement are combined with the BMS bus from Bender, while the data points are passed on via the COM460IP gateway. This enables all measured values to be visualised on any PC integrated in the data network in a structured, clearly laid out manner and recorded for evaluations.

A strong team

In 2012 the company relocated to a new building. IMB now exhibits the Bender technology as part of its solutions in a new, generously sized training room. The safety concept is explained at regularly conducted seminars for planners, operators and partners.

This example impressively demonstrates how systems can be operated more safely and efficiently by the combination of IMB know-how and the excellent cooperation with Bender. In addition, the increasingly demanding requirements for monitoring are also taken into account. The overall product stands for safety, reliability and user friendliness – teamwork at its best. ■

*Bernd Häuslein
Techn. Office in Nuremberg*



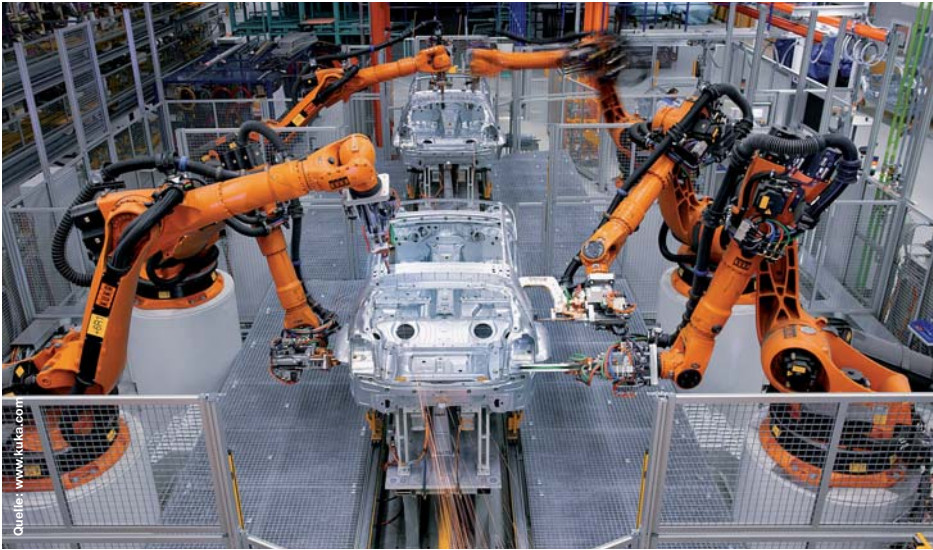
Harms & Wende relies on intelligent residual current measurement even on the primary side of welding inverters



Electrical safety and high availability in welding systems

Metal processing production systems are becoming more powerful to increase efficiency, the integrated robots and welding system are becoming more complex. A loss of production or damage due to the unscheduled shutdown of sections of the plant signifies a definite loss of turnover. High availability in welding systems is therefore an important competitive factor and the protection of personnel a key prerequisite for the operation of the plant. At Harms & Wende, electrical safety and high availability have the highest priority, for this reason the organisation relies on residual current monitoring technology from the technology leader Bender. ▶▶

TECHNICAL APPLICATION



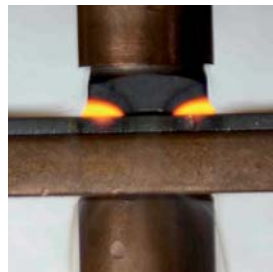
For more than 60 years Harms & Wendt has supplied welding system manufacturers with innovative and reliable product solutions, from control systems and switch cabinets, to complete custom systems. Particular attention is paid to welding control systems such as medium frequency inverters for resistance welding, which is widespread in highly automated plants; the Hanseatic business is also one of the world's leading manufacturers of solutions for friction welding.

Medium-frequency welding systems capable of straightforwardly setting several thousand spot welds are used in many production plants. These welds are mostly undertaken by welding robots equipped with the corresponding electrode holders. During medium-frequency welding the 3-phase 50 Hz AC voltage is converted into a pulsed AC voltage of up to 1,000 Hz by an inverter or frequency converter and rectified into DC after the welding transformer.

Frequency converters play an important role in welding systems. However, they can cause smooth DC fault currents in case of a fault. For this reason high requirements are placed on the operational safety of the inverters. To avoid unnecessary interruptions,

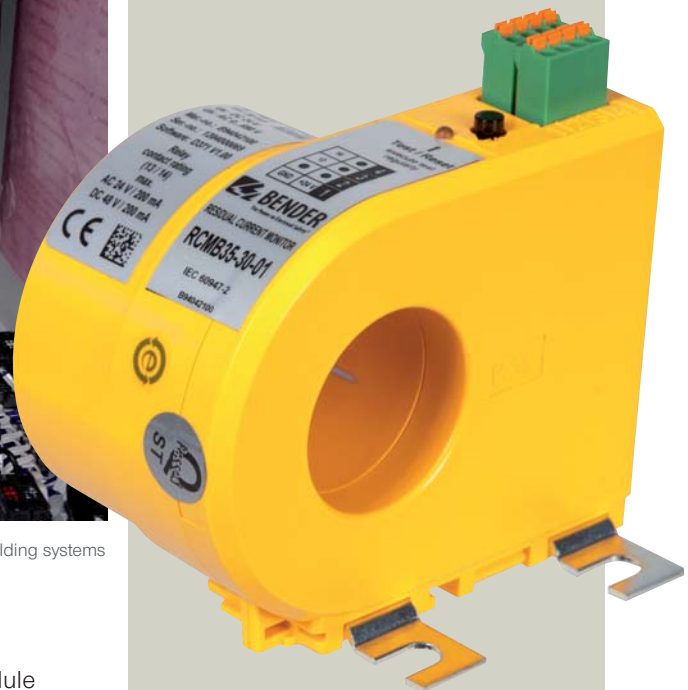
it is important to detect impending fault currents as early as possible and to be able to react proactively. On the usage of pulse current sensitive monitoring devices, the monitoring unit may be affected by smooth fault currents to the extent that the required protective effect is no longer ensured. As such, not least in accordance with DIN EN 26477-1 VDE 0558-477-1, it is imperative AC/DC sensitive residual current monitoring is used.

To comply with the requirements of this standard, Harms & Wendt relies on the best possible and therefore safest solution. They install, in the supply to the welding systems, AC/DC sensitive residual current monitors manufactured by Bender in Gruenberg.





COMPACT – EFFICIENT – SAFE



RCMB35-30 to enhance the electrical safety in welding systems

Since 2012 the AC/DC sensitive residual current monitoring module RCMB35-30-01 has been used at Harms & Wende in medium-frequency welding systems for monitoring the frequency converter. By using this device and a switching element with isolating characteristics, the device combination meets the requirements on an MRCD (Modular Residual Current Protective Device) in accordance with DIN EN 60947-2 Annex M.

This protective device, comprising an RCMB and a circuit breaker, is used in the medium-frequency welding area on the primary side for residual current monitoring. On reaching the fixed response value of 30 mA, the integrated switching contact is used to operate an undervoltage release. The switching element is designed so that the maximum shut-down time required in the standards is not exceeded.

Quite rightly, the welding systems from Harms & Wende protected using residual current monitoring technology enjoy an excellent reputation worldwide in relation to electrical safety and high availability. ■

THE ADVANTAGES:

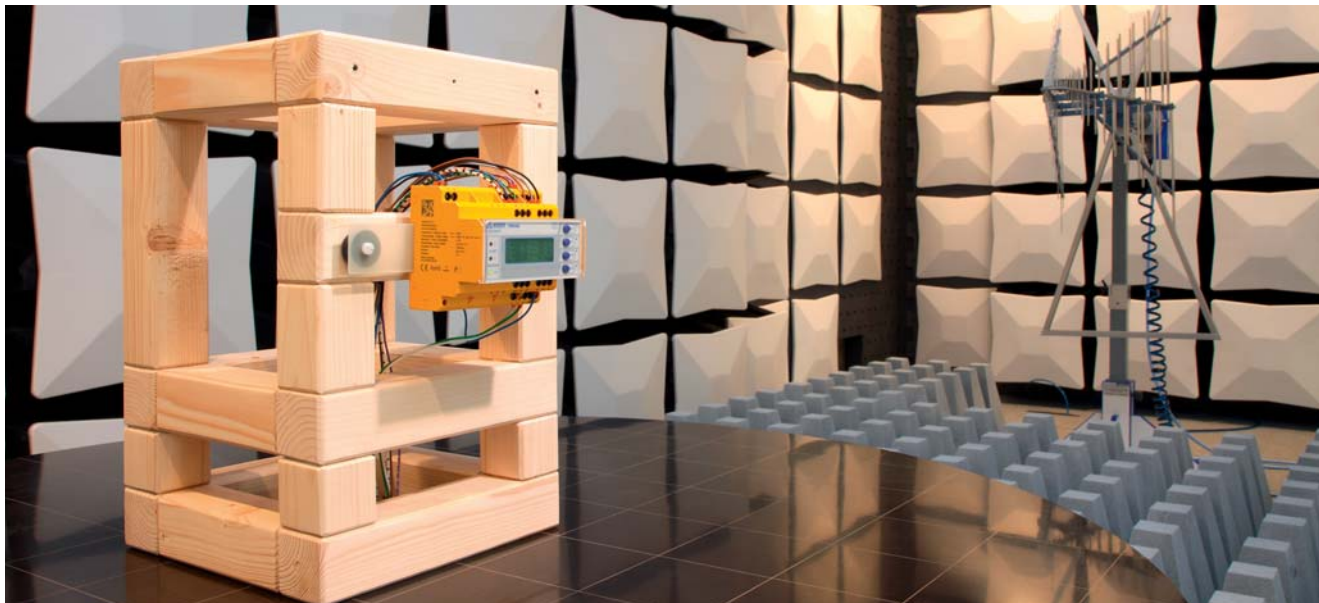
- Comprehensive electrical safety for man and machine
- Expanded area protected against indirect physical contact
- Prompt signalling and indication of the actual fault current
- Of universal application, independent of the power range

Dipl.-Wirt.-Ing. Jens Bickel
Techn. Büro Nord

New EMC test laboratory in the Bender Test Centre (BTZ) goes into operation

Fighting interference

electromagnetic compatibility
- a key performance characteristic at Bender



3 m measuring path in the EMC test chamber

A further milestone has been set by Bender in the Bender Test Centre with the new EMC test laboratory (**E**lectro**M**agnetic **C**ompatibility). The test laboratory has been installed based on the latest findings and requirements and has an EMC test chamber with a measuring path of 3 m. During planning and implementation the

focus was on compliance with standards, the highest possible degree of automation and test speed, expanded monitoring and efficient ergonomics. Set-up times have been reduced to a minimum to address the large amount of testing during product development and acceptance testing at Bender.

Applying basic standards, complying with product standards ...

Electrical energy and its loads unintentionally generate electrical, magnetic and electromagnetic fields and emit these to their surroundings; often the fields do not remain within the equipment or shielding. Mobile communication devices such as smartphones or WLAN access points also intentionally emit these electromagnetic fields. They can cause interference in other sensitive electrical components and, in extreme cases, cause malfunctions.

Harmless causes, fatal consequences

In sensitive installations such as operating theatres, aircraft or in modern production plants such malfunctions can have fatal consequences. In machinery and plant manufacture, powerful electromechanical actuators and sensitive sensors must often work together in a small space without interference. If equipment in office environments has an excessively low immunity to interference, serious failures may occur and as a consequence unplanned costs.

Electrical equipment must therefore comply with the EMC directive. On the application of this directive, on the one hand the emissions from the equipment must be kept as low as possible, on the other hand adequate immunity to interference must be ensured for protection against emissions from other equipment. In the EMC directive the verification of these two aspects is required; in the related standards applicable to Bender the usage and the related test are described. In product standards such as IEC 61326-2-4 it is defined how a device is to be tested and evaluated. The application of such a standard implies the presumption of a very high level of EMC and therefore very safe usage of the equipment in practice.

Interference immunity test in accordance
with IEC 61000-4-x

The basic standards for interference immunity tests are described in the IEC 61000-4-x series of standards. The stated series of standards includes, among others, the tests: burst, surge, ESD, power fail, ring wave, conducted/radiated immunity and power/pulsed magnetic field. Our equipment is subjected to these tests in the EMC laboratory and is subjected to extreme loads in the process. These tests have been standard for us for some time and form the basic framework for immunity to interference. The individual tests are housed in separate test compartments to minimise mutual interference between the separate tests. Test results are managed in the network and up to date results are therefore always available for documentation and test reports.

... and beyond

Special user standards such as Lloyds Register, the standards for road construction machinery or railway applications that go beyond the requirements in the product standards also imply the presumption of a high level of electromagnetic compatibility. As a rule in this case the device under test is referenced to the product standard and tested under the significantly more severe conditions in the special user standard. We also have suitable solutions for these tests so that we can adapt our technology exactly to customer needs.



▶▶▶ The fastest in the world

In the EMC test chamber, which is designed as a FAC (Fully Anechoic Chamber), the latest measuring technology is paired with powerful software. At the moment the fastest measuring receiver in the world is manufactured by Rohde & Schwarz with its ESR series; this receiver is a central element of our new EMC test laboratory. Here sub-ranges can be read 1000 times faster than using comparable competitor products. This almost unbelievable measuring speed is achieved using time domain scan, an FFT-based receiver technology and is currently unmatched. The measuring system also provides our developers with a comprehensive range of diagnostics tools such as spectrogram display, real-time spectrum analysis and IF analysis to identify emissions from the device under test so that corrective action can be taken.



Measuring receiver ESR7

A step ahead for our customers

The measured values are processed by this measuring receiver and converted into a meaningful test report in the powerful software application BAT-EMC produced by NEXIO. The software not only operates the measuring receiver, but also has a broad test and control spectrum for the interference immunity test. Currently all radiated

interference immunity tests are supported here; these tests are also undertaken in the EMC test chamber. Power amplifiers generate high test voltages at up to 3 GHz via the signal generators connected; these signals are then used to subject our devices under test to amplitude or pulse modulated stress up to 30 V/m via downstream antenna. The automatic polarisation of the antenna and a rotating test table are also managed by the software application BAT-EMC. With this performance we are always a step ahead of the competition also in relation to testing to standards.

EMC and CE marking are two topics firmly anchored in Bender development that directly affect both the design phase and also the finalisation of the products. As the products evolve the immunity to interference and the emissions from the equipment are tested time and again and optimised to series production maturity. This aspect is not a matter of course, EMC problems occur time and again even on expensive products from well-known manufacturers. With the investments in the new EMC laboratory, Bender has again demonstrated that compliance with standards and laws represents one of its most important goals during product development, and that since almost 20 years ago when it was decided:

"Yes, we will introduce EMC and actively address this issue."

Curious? Then come and take a look! ■

*Dipl.-Ing. Edmund Schneider
T-CF-TE*

In order to provide Bender customers with even better service, **two additional regional support points** Bender have been set up

BENDER IN-HOUSE

PRIORITY TO THE CUSTOMER

Bender Field Service gets to the customer *even quicker*

The reputation of a company is largely determined by the quality of its products and services. For the customers, characteristics such as reliability, flexibility, ease of use and value for money all play an important role. The issue of service is also getting more and more important. As well as capable advice, fast and flexible solutions to problems and even more services in the future, e.g. network monitoring, which relies on modern network technology, good all-round service also includes pro-active communication and action and customer proximity.

In order to provide Bender customers with even better service, two additional regional support points have been set up for North and South Germany alongside the existing service support point in Grünberg. Tom Weide in Hamburg will be available to support customers near the North Support Point Hamburg, while Ferdinand Möhrle will be the expert service technician heading the South Support Point in Nuremberg.

As the Bender service department's top priority is providing expert support to its customers with quick reaction and processing times, the setup of these two regional service support points guarantees real, fast-turnaround, customer-focussed support. At the same time, services can be provided a lot more cheaply because of reduced access times. ■

Dipl.-Ing. Klaus Böning
T-SERV



Support point north
Tom Weide



Support point south
Ferdinand Möhrle

CONTACT:

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support@bender-service.com

Repair service:

+49 (0)6401 807-780 (technics)
+49 (0)6401 807-784 u. -785 (commercial settlement)
repair@bender-service.com

Field service:

+49 (0)6401 807-752 (technics)
+49 (0)6401 807-753 (commercial settlement)
fieldservice@bender-service.com

General enquiries

info@bender-service.com

Bender solutions guarantee the high availability of internet servers where even a short power outage can have serious consequences. The company itself benefits from the reliability achieved - through its website bender-de.com!

Worldwide activity - worldwide presence

Bender on the World Wide Web

**Bender Group
Member Websites:**

Bender Latin America
www.bender-latinamerica.com

Bender Inc.
www.bender-inc.com

Bender Canada
www.bender-ca.com

Bender China
www.bender-cn.com

Bender Global Website:
www.bender.de

Bender on Social Media platforms:
Facebook, Youtube, Xing, Google+, LinkedIn

**Bender Group
Member Websites:**

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Bender Russia
www.bender-ru.com

Bender Benelux
www.benderbenelux.com

Bender Italy
www.bender-it.com

Bender Iberia
www.bender-es.com



The internet is an information medium which offers companies a wide range of benefits in all sorts of different areas. Up-to-the-minute information can be communicated in text and images on websites. The web makes it easier to pass on information (digital catalogues, datasheets, pictures, graphics, software, etc.). E-mail, online forms and social media simplify communication among bodies such as sales partners, business partners, suppliers, etc. And websites are the ideal platform for many corporate divisions - not only for advertising and sales, but also for purchasing and personnel planning.

Information is just a few clicks away

Bender has been using these benefits for years and has its comprehensive product range to view on its homepage, it also has catalogues and datasheets available for download and information on current seminars and trade fairs. As Bender offers its solutions on a worldwide basis, all customers need to do is click on the contact area to view the contact details for their regional contact.

Where can I find information about a specific product?

You can search for specific individual products or product ranges using the search function on the start page. The results are clearly broken down into products and full text search.

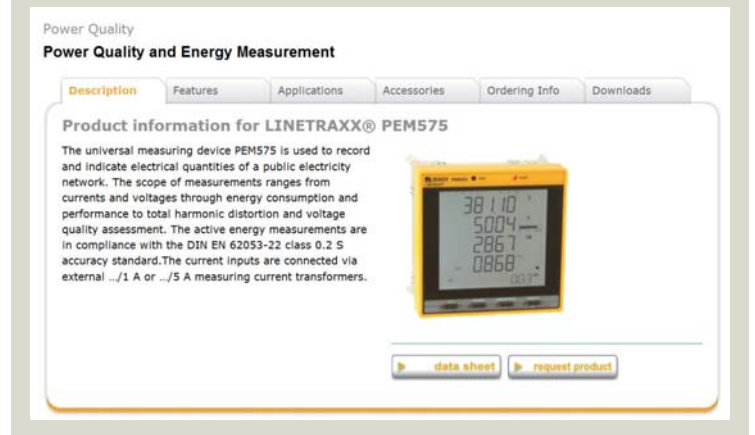
You can also navigate via the product area. It showcases the whole variety of Bender solutions for the user. Did you know, the Bender also offers Power Quality measuring devices?

I need documents in PDF format, updates, a licence file ...

The main catalogue in digitised form, operating instructions, brochures, current software updates or licenses - all these files can be found in the download area. In order to request a licence file, you need to register. Registration is quick and easy and can be done online.

Detailed product information:

Description of the devices with downloads and order information.



Is there even more information on the Bender solutions online?

Bender has Bender Regenerative and Bender Emobility microsites providing detailed information on these two growth areas: Electrical safety for electro-mobility and renewable energies.

Bender microsites

Electromobility www.bender-emobility.com

Regenerative: www.bender-regenerative.com

Where can I register my device for 5forU?

The three-language 5forU microsite allows Bender customers to register their devices as part of the "5forU" guarantee extension scheme which gives a 5-year guarantee on registered devices in the 5forU range.

5forU registration: www.bender-5forU.com

Where else can I find Bender on the internet?

Bender also has a presence on social media platforms. On Facebook, for example, the company primarily addresses a younger audience, reporting on the latest company activities, publishing job vacancies for school leavers, students and graduates and providing information on the company's latest awards. ■

Susanne Tröller, S-COM-ADV

bendersystembau

Step by step with retrofit

Whether it is declining operational reliability, changing statutory framework conditions, increasing energy costs or adapting systems to the current state-of-the-art technology - there are lots of good arguments for retrofit operations.

For existing systems, a retrofit can be more sensible than replacement with a new system.

By replacing older parts of the system or adding cutting-edge components, existing systems can be brought up-to-date in a cost-effective way. The benefit for the plant operator lies in the modernisation of the plant and the resulting increased productivity for considerably reduced costs compared to buying new. The stable foundations are preserved and the high costs of replacement investment avoided.

This is particularly important in the sensitive medical sector, which sets high standards in terms of safety and plant availability.

Standard DIN VDE 0100-710-2012, which has been valid since 01 October 2012 and will be binding as of 09 January 2015, shows how important it is to keep at the cutting edge of technology. The new standard considerably develops the safety requirements for electrical systems. This allows older systems to keep pace, as standard-compliant power supplies create safety for patients, staff and operators, whether in the hospital or in the doctors' surgery.



Before

After

Countering the signs of the times

The retrofit solutions from bendersystembau are an economically sensible alternative to a new system - either gradually or as an overall package.

The benefit lies in the combination of state-of-the-art system technology with capable service, for example, when fulfilling the requirements of the new standard. Replacing conventional switching systems with patented ATICS® switching technology is the first step in this direction. The use of standard-compliant alarm indicator and operator panels makes the retrofit project a sensible investment into the future. System operators using a bendersystembau "green transformer" with significantly improved output and reduced energy consumption can survive the energy revolution with ease.

The benefits of retrofit solutions are clear:

- System updated to the cutting edge of technology
- Standard-compliant standards
- Compliance with statutory regulations
- Increase in system availability
- Save costs
- Reduce energy costs
- Secure long-term spare parts supply
- Individual solutions.

The system solutions from **bendersystembau** are package of retrofit measures which are tailored to individual requirements. ■

Andrea Gossel, **bendersystembau**

INFO:

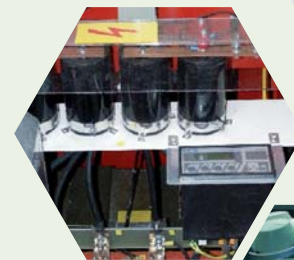
More info at www.bendersystembau.de

A sales partner with continuous growth

Fischmeister HandelsgebmbH

Fischmeister HandelsgebmbH started in 1949 as a regional representative for various Austrian cable businesses and since then has established a reputation as a successful and prestigious partner during the planning and implementation of solutions for increasing electrical safety in installations. Its customers include internationally renowned organisations. The continuous growth and the increasingly very wide range of sectors covered have been backed not least by the know-how and the quality of the Bender products marketed.

After we concentrated on the distribution of switch cabinet components in 1985, we were able to define the close co-operation with Bender contractually in 1990. At the start of the collaboration Herr Feigl, who was responsible for Austria at that time, provided us with very active support. Together we organised seminars on **"safe electrical supply in the medical sector"**.



▶▶▶ First proven ...

After we had been confronted with conventional technology from Siemens in many projects in the early years, the major breakthrough came with the market launch of the MEDICS system from Bender – a new standard in relation to the reliable supply of electrical power in hospitals. Shortly after market launch and presentation to planning offices and leading organisations, we received the first major order for the new district psychiatric clinic Linz, Austria Wagner Jauregg. Transfer switching and monitoring systems for over 40 application group 2 rooms (operating theatres, intensive care stations...) were ordered and delivered for this project. It was the start of a very gratifying and continuous sales trend in this business area.

... then growth

In the middle of 2005 we had to strengthen our team with two new engineers due to the positive business trend, as the service sector (commissioning, instruction, training courses) had also grown very strongly. Over the last ten years more than 700 transfer switching and monitoring systems of type UMC have been sold.

We have expanded our areas of business in search of new projects based on Bender's comprehensive product portfolio. We also exhibited at new trade fairs with various different focal points (industry, energy supply and distribution, automation, renewable energies, electric mobility, alpine technology), organised workshops at larger industrial organisations, increased our marketing activities with electronic media and reinforced our consulting activities at the planning organisations. We also organised seminars on "damage prevention in industrial installations and buildings".

Internationally renowned customers ...

The trend in the industrial applications was then similar to the hospital sector, we were able to achieve continuous success and grow sustainably. The turnover in the industrial sector is now even higher than in our original hospital technology sector. It is particularly gratifying that a very large number of successful Austrian organisations of worldwide renown rely on our competence, for example Rosenbauer International, Plasser Bahnbaumaschinen, Verbund Hydro Power, OMV, VOEST-Alpine Stahl, Magna Fahrzeugtechnik, Andritz Hydro, Hitzinger Generatoren and Banner Batterien.

... value installation safety and availability

During the long-term collaboration with Bender, a large number of projects in a very wide range of sectors have been realised. As an example we would like to present one project in detail. The battery manufacturer Banner based in Linz sells over four million starter batteries per year and, according to the organisation's figures, is number 4 in Europe. Currently Banner has approx. 15 subsidiaries abroad. Renowned automotive manufacturers such as Audi, BMW, Mercedes and Volvo rely on high quality products from Banner. The factory in Linz has been significantly extended in recent years.

As just-in-time delivery is usual in automotive supply, Banner designed the production installations as unearthed IT systems due to the higher operational safety and availability. Here there were high requirements on the insulation monitoring devices such as high system leakage capacitances, heavily

fluctuating insulation resistance values and high atmospheric humidity during charging (the starter batteries are charged in trays cooled with water). Since 2003 we have been able to deliver a total of 145 ISOMETERS® of type IRDH375-435 to Banner.

Together we are strong

In recent years the team has been further strengthened in the commercial and technical area. Currently we employ eleven staff, of whom five are involved in project management. For instance, more than 200 of the new transfer switching and monitoring devices of type ATICS® have been sold since 2011. The innovation, quality and reliability of Bender products were without doubt crucial for these successes.

In 2012 a quality management system was introduced and the organisation certified by TÜV Süddeutschland in accordance with ÖNORM EN ISO 9001. It is our intention to be a dependable and efficient partner based on fair, partnership-based collaboration with our customers and suppliers.

The continuous expansion of our organisation, the growing number of employees and the related necessary office space, as well as new requirements in relation to inventory capacity forced us to move at the end of June 2013. The new business premises meet our current and future requirements. They also increase our logistics capacity so that in future we will be able to supply our customers even more professionally and efficiently with products and solutions for a very wide range of applications.



Mathias Fürst
Project Manager,
Quality Assurance
Manager



Günther Fürst
Director, Sharehold Member



Alessandro Gaspar
Technical support,
Project Assistant



Daniel Feichtmair
Product Manager

We are very optimistic that we can further expand this successful collaboration with Bender and look forward to new tasks and new challenges. In this context we would like to thank all the staff at Bender for the excellent support over the years and the professional training courses in Gruenberg, without this support it would not have been possible to achieve these successes. ■

*Ing. Günther Fürst
Fischmeister HandelsgesmbH*



B. Braun Melsungen AG – Sharing Expertise

Expert in the health sector

B. Braun Melsungen AG stands for expertise in the health sector. For almost 175 years, the company has been developing, producing and distributing products for the medical industry and has utilised its modernity and innovation to become a global conglomerate and a leading supplier to the health industry. B. Braun has achieved this market position and the high level of respect it commands from its partners through exacting requirements in terms of quality and constant implementation of new findings for products and services.

“EinsteinVision makes laparoscopic operations faster and more accurate.”



B. Braun not only exports all over the world, it is also active in many countries. The group headquarters in Melsungen in north Hesse oversees nearly 50,000 employees in 60 countries. B. Braun turned over a total of 5.05 billion euros in 2012.

The target group: hospitals, medical practices, chemists and nursing and emergency services. The product range extends from infusion solutions through spray pumps and accessories for infusion treatment, intensive care and anaesthesia to surgical instruments, sterile containers, sutures, hip and knee endo-prostheses, devices and accessories for extra-corporal blood treatment and products for wound care. The range covers over 30,000 products. Added to this are consultancy services which both help hospitals to optimise their processes and guarantee quality and help patients and their families prepare for care at home, complete the formalities and support them during the transition period.

B. Braun's innovation is based on a company philosophy of "Sharing Expertise" which promotes the exchange of information and experience within the company and with people working in hospitals all over the world. Dialogue with those using B. Braun products on a daily basis makes it possible to gain new findings and incorporate

them into the product development process. This is B. Braun's way of helping to optimise working processes in hospitals and surgeries and improving safety both for patients and for doctors and nursing staff.

Software solutions B. Braun Space OneView and B. Braun Space OnlineSuite are excellent examples of its expertise in terms of safety. They make using infusion pumps easier and thus improve patient safety. The new EinsteinVision 3D camera system from the Aesculap division is an example of safety and state-of-the-art technology in the surgical sector. EinsteinVision makes laparoscopic operations faster and more accurate.

The Nexadia data management system available from B. Braun Avitum records relevant data from dialysis patients, giving staff more time for the patients. The Askina Calgitron range of products from B. Braun promotes the healing process for



CUSTOMER PORTRAIT



B. BRAUN
SHARING EXPERTISE

►►► wounds by means of the controlled release of silver ions. Calgitrol Paste allows efficient treatment of infected wounds, even in deep wound cavities.

B. Braun sets standards not only on the product side, but also when it comes to production processes and production sites. The Benchmark Factory in Tuttlingen and L.I.F.E. (Leading Infusion Factory Europe) are examples of state-of-the-art production technology. At the Benchmark Factory, B. Braun is leading the field in the production of knee, hip and spinal column implants. B. Braun's L.I.F.E., the largest European infusion solution factory in Melsungen, features latest-technology production. Infusion solutions are produced in handy Ecoflac Plus containers, allowing production levels to triple.

The fact that this level of investment is possible in Germany is thanks in no small part to the real commitment of the employees who have agreed to up to 120 hours of overtime a year - depending on the

site - as part of site preservation contracts. A large percentage of this additional working time can be used for training measures. In return, the employees are protected from redundancy and can take part in the profit-share scheme. These contracts are in place at the Melsungen, Tuttlingen and Berlin sites.

B. Braun is also investing in production sites in other countries, e.g. in Malaysia, Indonesia, Russia, France and the USA. These investments are more proof of how committed B. Braun feels towards its sites. This also includes taking social responsibility and promoting local diversity by means of cultural engagement. There are numerous models: B. Braun provides financial and organisational support to art, cultural and sporting projects, is a partner in private public partnerships and supports universities, doctors and students by providing bursaries and arranging scientific events. Since 2004, every subsidiary of the B. Braun group has been supporting a children's project as part of the "B. Braun for Children" initiative, helping to secure the future of the next generation and make it more worth living.

The social commitment, the dialogue with experts, the development of new and improved products and production methods serve the overall aim to which B. Braun is dedicated: health. ■

*B. Braun Melsungen AG,
Melsungen*



2013/14 EXHIBITIONS

EXHIBITIONS INTERNATIONAL

2013:

IEL light + building BUENOS

05.11. - 09.11.2013

Location: Buenos Aires, Argentina

Booth: 2C 10, Hall 2

www.biel.com.ar



ATEXPO

12.11. - 15.11.2013

Location: Chile

Booth: 321-1



2014:

Data Centre World

26.02 - 27.02.2014

Location: London - United Kingdom

www.datacentreworld.com



Elektro

26.05 - 29.05.2014

Location: Moskau - Russia

www.elektro-expo.ru



Electric Networks

21.04 - 25.04.2014

Location: Santiago, Chile



Expomina

10.09. - 12.09.2014

Location: Lima - Peru



CHES 2014

28.09 - 30.09.2014

Location: St. John, New Brunswick

Electric Networks

December 2014

Location: Moskau - Russia

www.expoelectroseti.ru



EXHIBITIONS NATIONAL

Professional training for Building services engineering Rostock

28.01. - 30.01.2014

Location: Rostock



WÜMEK

Congress for medical technologies and energy efficiency in clinics

27.03. - 28.03.2014

Location: Würzburg



Light & Building

The world's largest Exhibition for light and building technology

30.03.2014 - 04.04.2014

Location: Frankfurt/Main



Hannover Messe

07.04.2014 - 11.04.2014

Location: Hannover



Intersolar

The world's largest Exhibition for the Solar Industry

05.06.2014 - 06.06.2014

Location: Munich





Anne Katrin Römer

Head of Communication at Bender

QUICK CV / PROFESSIONAL CAREER

1987	General university entrance qualification
1/1988 – 6/1988	Anglo Continental School, Bournemouth, Great Britain ("Certificate of Proficiency")
1988 – 1993	Training and work as European secretary
1993 – 1994	School of Commerce and Finance, Villanova International University, Philadelphia
1994 – 1995	Schiller International University, Heidelberg May 1995, Bachelor of Business Administration, Major in Marketing Recipient of the "International Student Award" 1995
1996 – 2001	Initially trainee, then Account Manager at Dorfer Dialog, Frankfurt
2001	Responsible for the marketing division at Bender
Ab 2009	Responsible for the communication division at Bender

Ms Römer, the collapse of Lehmann and the associated global financial crash are still resonating and their negative effects on the finance and commercial sector can still be felt today. One of the major causes was a focus on short-term profit maximisation. You could say that the idea of a "respectable businessman" was sacrificed at the altar of pure profiteering. How do you view these developments?

I think we should look at it differently. The financial sector has hit the headlines - and of course there are exceptions - because all the business processes were oriented towards short-term gain. Downright greed led to more and more dubious financial products which, by the end of the development, could not be taken seriously.

But this development cannot be generalised. There are some exemplary German medium-sized companies (betapharm Arzneimittel, Heraeus, Eckes, among others) who honour the tradition of respectable business, who aim for long-term, sustainable growth while preserving jobs and making social commitment a fixed part of their company philosophy.

As a general rule, solid company management should be based on long-term, sustainable decisions and strategies - especially in reaction to the crisis. The Federal Government is facing the same issues with the "CSR Action Plan" formulated in 2010, which is defined as a "national strategy on corporate social responsibility". CSR stands for corporate social responsibility, which is defined in the European Commission green paper as a "concept which serves the company as a basis for the voluntary integration of social and environmental issues into their corporate activity and in the interactions with the different interest groups." As a traditional family company, does Bender have a CSR strategy?

I would like to avoid the term CSR. For us, it is and always has been important and natural that we engage with the region and the community and play our part in protecting resources and nature. We set this out in our principles as long ago as 2006, long before CSR became a talking point in Germany ("we have social responsibility for our employees and our region").

The expression Corporate Social Responsibility has unfortunately suffered a little in recent years and has been "misused" in places. There are negative examples who only operate social commitment for economic reasons and not based on the depth of their conviction. Reasons can include improving their own image or avoiding follow-up costs (for example, the Exxon Valdez tanker accident or toy recall campaigns). Once again, I would like to stress how exemplary some medium-sized family companies are, as for many of these companies social commitment is a matter of course - and has been for a long time.

Of course, companies' primary obligation is not to society, it is to their own continued existence and therefore making money. Combined with CSR, this means a sustainable direction for economic strategy. There are three main pillars: social, ecological and economic company targets which are defined with sustainability in mind. What is Bender's view on these issues?

Our aim is to run our business sustainably and profitably. Long-term company prospects are more important to use than quick bucks. Long-term business means focusing on quality and stability. For our customers, this means: Absolute reliability in terms of availability and quality - even into the future. It also means: Securing the future of the economic location, i.e. jobs and awareness of social responsibility.

We also feel a natural responsibility towards the people of our region (and beyond) and aim to support our employees in all sorts of different areas. The subjects of sport, social, health and education.

We support performance and mass sports at various local clubs, we are the main sponsors of the Bender Baskets, a women's basketball league team and we also sponsor the part-time residential basketball school (BTI). We operate our own fitness studio for our employees with individual personal training and nutrition advice. "Sportclub Bender" (SCB) was founded back in 1980 and puts forward teams for marathons, triathlons and many other events.

We define binding environmental targets every year in order to meet our ecological responsibilities. This year's targets include, for example, setting up a waste management system, converting to more environmentally-friendly packaging materials and defining binding environmental parameters for new product developments.

If you see our wide range of commitments, you can see that we take our responsibility very seriously. Even for the company founders, my grandfather Walter Bender and his wife Kathrin, it was always natural to look ahead and to give help where it was needed. It is a view we still share today in the third generation and continue to pursue it with conviction.

Many companies are complaining about a shortage of junior staff. How is Bender coping with the situation?

We have fitted out a whole technical teaching room at the Theo-Koch-Schule (largest secondary school in the Gießen region) and our trainees are also offering a primary workgroup on electrical engineering at the primary school at Diebsturm. We are also cooperating with the Technical University in Mid-Hesse (THM) based in Giessen and supporting projects to encourage girls which go far beyond the "Girls Day" which is now an established date for the calendar.

„Our aim is to run our business sustainably and profitably.

Long-term company prospects are more important to use than quick bucks.”

Our aim is also to promote the basis for a good, well-founded education in engineering or business. We offer various training courses and support students working on projects and work placement, we also offer Studium Plus and promote "free study", among other things.

We have also published our own Pixi book for our youngest fans: "Mia, Tim and electricity".

There is an increasing demand from the market for products which can be produced in a socially and economically sustainable way. At the same time, employees are increasingly seeing their work not merely as a source of income, but also as a channel for responsible, meaningful action. How can you offer this to young candidates applying to work at Bender?

On the one hand, we make products which clearly make life safer. Especially in hospitals, our devices can save lives as power outages simply cannot happen during surgery while life-supporting equipment, such as respirators, is being used.

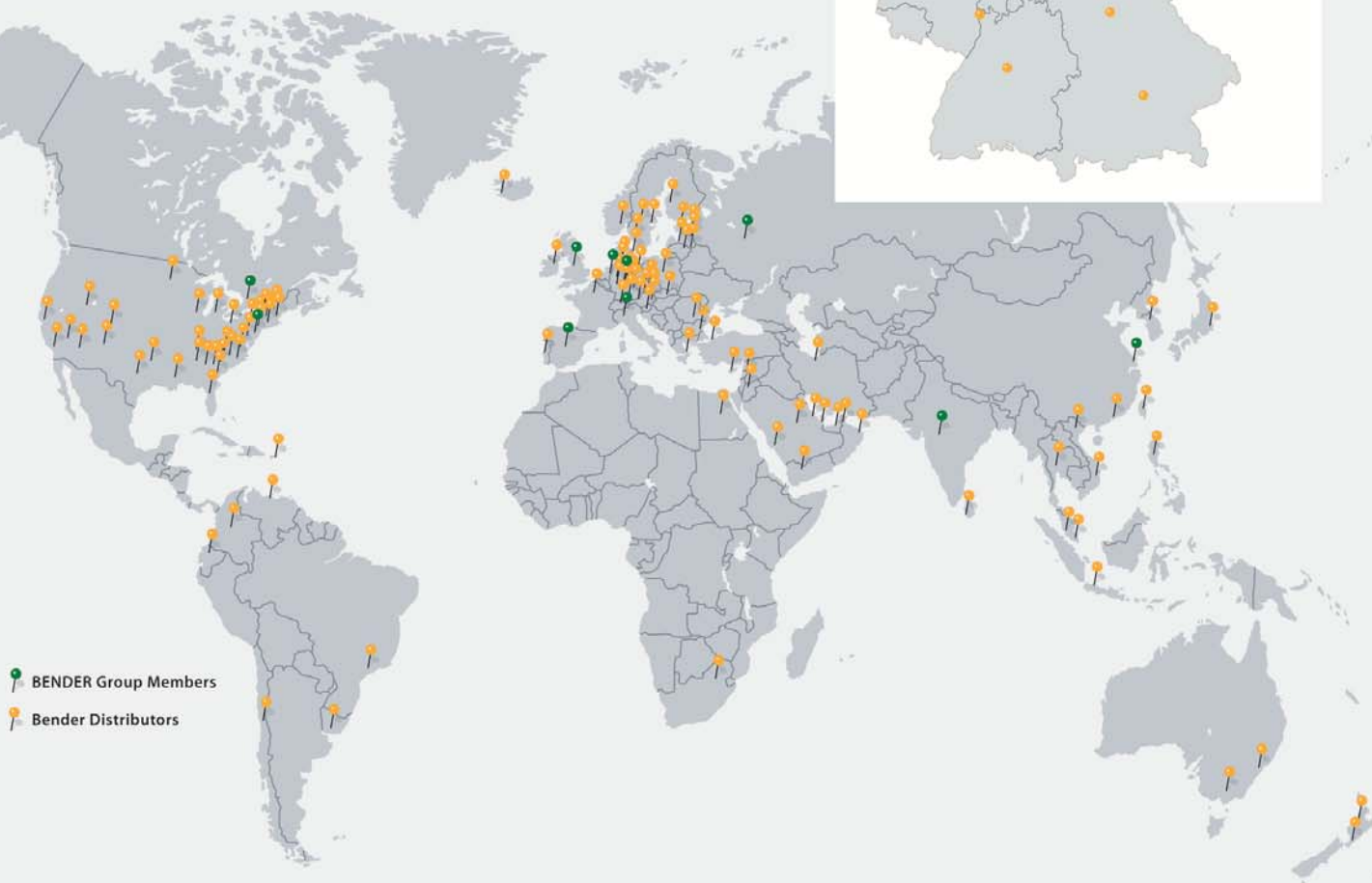
We are also sticking to production in German. Our state-of-the-art SMD production system is in Siersleben (Sachsen-Anhalt) and last year we set up a new, modern final assembly works (with its own combined heat and power plant) at our headquarters in Grünberg where we now manufacture to the very latest standards. We see ourselves in a pioneering role and have introduced a range of things, including toxin-free production, traceability and lean management, that others are not even thinking about yet. We are also ahead of time when it comes to the new industry standard 4.0 and fulfil some parts of it already. Working with Bender means being a part of a leading company in terms of technology and expertise which is not afraid of innovation and gives responsibility to all its employees.

Ms Römer, thank you for the interview! ■

Timothy Hörl

BENDER Group

The Bender Group with its main office in Gruenberg/Hesse has 60 agencies with nearly 600 employees worldwide.



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Power in Electrical Safety