Electrical safety in "old medical facilities"

Nowadays, the power supply in medical locations is considered to be extremely safe and reliable. The safety of patients and medical staff is given the highest priority. This is mainly due to the standard-compliant design of the installation and the prioritisation of hospitals by the power supply companies. It goes without saying that new installations are planned and built in accordance with the currently valid standard.

The hospital standard

Since the first standard for medical locations, DIN VDE 107 from 1962, there have been regular adaptations to meet changing requirements.
This became necessary due to the use of ever more modern equipment in all areas of medical diagnostics and care. DIN VDE 0100-710:2012-10[1] now applies in Germany, as does HD 60364-7-710:2012[2] throughout Europe and IEC 60364-7-710:2021[3] worldwide.

In order to achieve the highest level of supply safety in critical medical locations (e.g. operating theatres and intensive care units), the current standard requires two special measures:

- Redundant design of the supply lines
- The use of an isolated power supply, the isolated power system

Switching between the two lines must be automatic. The devices used must be "one-fault-proof".

Continuous monitoring in the isolated power system must be designed in such a way that all faults that may occur in modern devices are detected. Monitoring devices must therefore be designed to be functionally safe and must be equipped with self-monitoring functions. The medical and technical staff must be informed of any faults. The standard prescribes periodic tests to verify functionality.

This addresses two causes of faults that cannot be ruled out in practice: malfunctions in the supply infrastructure and malfunctions caused by the devices used. Since 1962, Bender has been providing devices for monitoring medical power supplies as well as alarm indicator and test devices to ensure the safe operation of hospitals and clinics. In the late 1980s, automatic changeover devices were introduced and later on convenient insulation fault location systems (IFLS), which accelerated the search for faulty devices significantly. Interconnected Bender alarm indicator and operator panels are now standard in modern clinics.

Detail old and new installation

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Risks in old installations

The ongoing work of the standardisation committees takes into account the technical development of the devices used in medical locations. The work of the committees ensures that new installations meet current requirements. But what about existing installations?

There is no general obligation to upgrade the installations. The fact that existing installations do not comply with the current standard may be categorised as a formal flaw. However, if you look at the details, fundamental issues become apparent:

- Many devices were not one-fault-proof.
- Earlier measuring methods were only suitable for pure AC systems.
- Alarms were actively generated via contacts - due to the operating current principle, the signalling device had to be operational. A failure message could not be generated. Therefore, the failure of safety devices often went unnoticed.

If the installation is modified or extended, new tests are required anyway. But what about changes or extensions of use?

- In many cases, more and completely different ME devices (medical electrical devices) are used than originally intended.
- Areas are now often used differently than originally planned. This leads to a different categorisation, with different requirements for the electrical supply.
- The electronics installed in modern devices place a different demand on the power supply than was foreseeable at the time of installation.

All of this leads to repeated considerations as to whether the system still fulfils current requirements. There is also another aspect to consider: Decreasing operational reliability due to the ageing of technical products, initially in terms of mechanics:

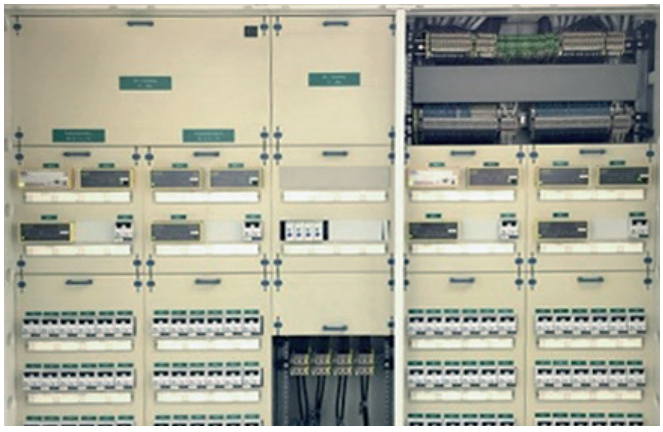
- Malfunctions are to be expected with aged mechanical components (e.g. microswitches).
- Embrittlement of mechanical components can lead to breakage upon activation.
- Resinification of lubricants makes the mechanism sluggish, possibly even non-operational.

The situation is similar for electronics:

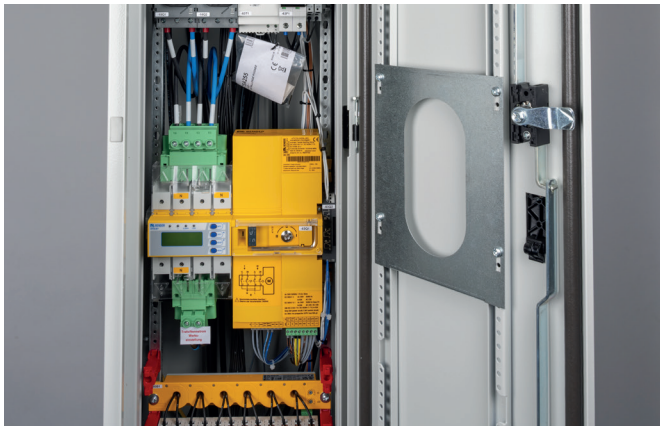
- The ageing of electronic components (e.g. capacitors) can lead to malfunctions or failure.
- The well-known "bathtub curve" shows the statistical distribution of component failure over time.

What to do?

For these reasons, the responsible installation operator is repeatedly confronted with one question: "Is my installation (still) safe?". At the latest when doubts arise, it is time to analyse the current requirements and the current status of the devices used.



Detail old installation



Detail new installation

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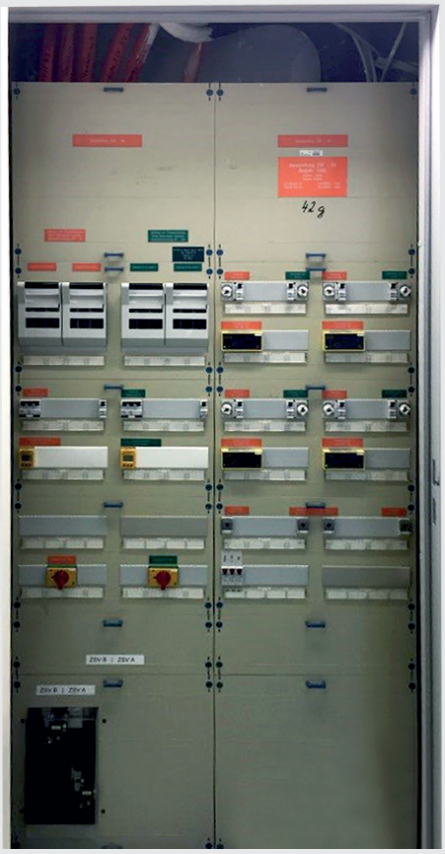
Functional safety comes first
Bender has set itself the goal of being able to offer a modern and, above all, reliable replacement for every installation in the field, so that hospital managers are back on the safe side before the ageing of electrical installations becomes a problem.

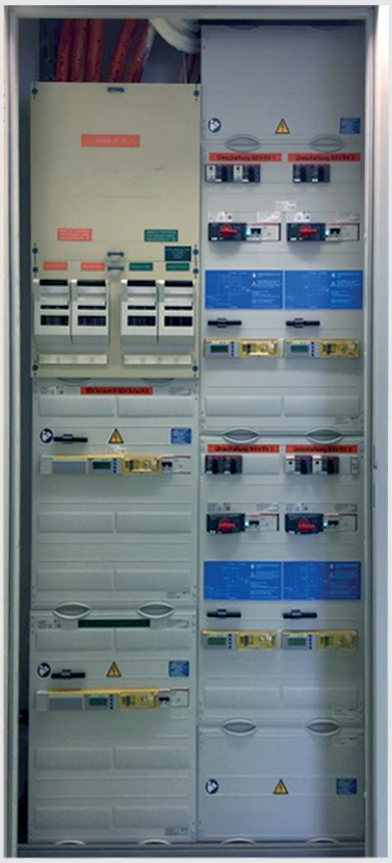
By providing expert advice and offering the latest standard-compliant, state-of-the-art solutions, Bender ensures that existing buildings are upgraded in terms of quality and safety without the need for extensive financial resources.

René Bülow
Vice President Business Unit Hospital Solutions

1) IEC 0100-710-710:2012 -10 Low voltage electrical installations – Part 7-710: Requirements for special installations or locations – Medical locations
2) HD 60364-7-710:2012 Low voltage electrical installations – Part 7-710: Requirements for special installations or locations – Medical locations Supplement 1: Explanation for application of the normative requirements of IEC 0100-710-710:2012 -10
3) IEC 60364-7-710:2021 Electrical installations of buildings - Part 7-710: Requirements for special installations or locations - Medical locations



Detail old installation



Detail new installation

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