


RETHINKING BUILDINGS

SAFE, MODULAR AND DIGITAL

The background of the entire page is an aerial photograph of a modern architectural complex. The buildings are multi-story with glass facades and green roofs. There are several courtyards with trees and walkways. The overall aesthetic is clean, modern, and sustainable.

Topics you will find in this issue:

Current Insights

**Networked Buildings –
Networked Risks?**

Requirements, Goals, Opportunities

The “Cyber Resilience Act”

Interview with Jens Kluge (BSI)

**Cybersecurity:
Risks, Regulations, Resilience**

For Adaptive Buildings

Modular Building



RETHINKING MEANS LOOKING AHEAD ESPECIALLY IN BUILDINGS

Dear Readers,

Buildings have long been more than just spaces: they are complex living and working environments, and they change with the demands of our time. Digitalization, networking and sustainability aren't mere buzz words; instead, they are shaping the reality of planning, construction and operation. Regulatory requirements, such as the revised EU Building Directive and the Building Energy Act, have drawn even greater focus to these issues. Anyone who builds or modernizes a building today must consider, not merely the next few years, but the next several decades. The question that remains before us is how to create solutions that remain flexible and can also adapt to new standards and requirements.

One topic in particular receives a great deal of focus here: **cybersecurity**. The number of attacks on networked systems has continued to increase, and the current status report from the BSI emphasizes just how critical the situation is. Cybersecurity is not an add-on, but a central foundation for every building automation system. In this issue, we speak with Jens Kluge from the Federal Office for Information Security (BSI) to shed light on why building technology can become an Achilles' heel, what risks operators often underestimate, and how holistic security concepts – from preventive measures to legal requirements – can effectively protect buildings.

At the same time, we are changing the way that we build.

Modular Construction is more than just a trend: it is an answer to the challenges posed by shortages in skilled labor, rising costs and ambitious sustainability goals. Flexibility and efficiency dovetail well with modular construction. Our solutions for modular electrical installations – from pluggable connection systems to pre-assembled installation components – lay the foundation for fast, scalable construction processes, leading to buildings that can be expanded or adapted to new requirements.

In this issue of **WAGOdirect Building**, you will discover how we can create buildings, using those techniques and technologies that are both efficient and safe today, and will also continue to meet the demands of tomorrow.

Martin Hardenfels

Head of System Sales Building at WAGO



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NEWS FROM WAGO



HAPPY BIRTHDAY, WAGO!



75 YEARS OF INNOVATION AND SUCCESS

In 2026, the WAGO Group will celebrate its 75th anniversary. Join us in looking back on an impressive success story! What began in 1951 with a few employees is now a global team of around 9,000 colleagues. Together with customers, partners and service providers, WAGO has driven innovation and shaped entire industries. An anniversary that deserves celebrating!

Numerous events are planned for employees, customers and partners – around the world and throughout the birthday year – to honor the company's success story.

This anniversary is also an occasion for looking forward: WAGO is using the momentum to set a course toward a successful future, and to prepare strategically and organizationally for the increasingly complex demands of the market. Our goals include: continuing to drive further innovation and contributing to our joint successes.

BACNET® 1.26 FOR WAGO CONTROLLERS

The current BACnet version 1.26 includes decisive innovations for building automation systems. The latest revisions ensure a high level of interoperability, as well as seamless IT/OT integration. A special focus is on secure communication via BACnet Secure Connect (BACnet/SC). Additional functions, such as BACnet/SC routing, TLS-V3 encryption, and hub and spoke topology, have been implemented for this purpose.

The WAGO PFC100, PFC200, PFC300 Controllers and the WAGO Compact Controller 100 are already certified according to the latest version. Users will benefit from increased security, sustainability and long-term investment protection.

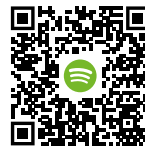




PODCAST TIP: ENERGY³

Energy infrastructures are undergoing significant changes – but what does a networked energy future actually look like? WAGO experts provide answers in the “Energy³ – Buildings, Industry, Networks” podcast, moderated by Ronald Heinze (VDE publishing house). You can listen to:

- Episode 2: Energy Management in Smart Buildings and Factories**
- Episode 3: Smart Buildings as Active Participants in the Microgrid**
- Episode 4: Pluggable Cabling for Sustainable Electrical Installations**
- Episode 5: Cybersecurity for Buildings and Industry**
- Episode 6: Digital Twins for Smart Buildings and Factories**



WAGO BUILDING ENERGY REPORTING EASY ENERGY AND ENVIRONMENTAL REPORTS

Our latest cloud service, WAGO Building Energy Reporting, enables automatic generation and scheduled email transmission of energy and environmental reports – for example, as part of an ESG report.

Report templates are created in Microsoft Office (Word, Excel, or PowerPoint) and provided with placeholders for data and

reports. After uploading to the WAGO Building Cloud, the information can be automatically added at the desired time, saved as a PDF file and optionally sent by email. For efficient and transparent sustainability documentation.





CYBERSECURITY IN BUILDING AUTOMATION

REAL THREATS FROM THE DIGITAL SPACE

Digitization continues its advances into the building sector – primarily driven by the need to optimize building resource use during operation. The more components that are networked and exchange data, the larger a target they offer to cyber criminals. It thus becomes ever more important to deploy preventative measures at an early stage.

Linking OT more closely with IT (also known as the “IT/OT convergence”) allows more efficient building operation and better remote monitoring, for example. But it also increases the risk of cyber attacks: building automation systems, once isolated and proprietary, now use IP-based communication standards, exposing them to threats that once only affected IT network infrastructure. Because automation systems often control critical or operational infrastructure, attacks can threaten not only data, but also physical processes. Therefore, cybersecurity is also becoming increasingly important for OT.

Hacker Attacks: Cheaper as a Bundle

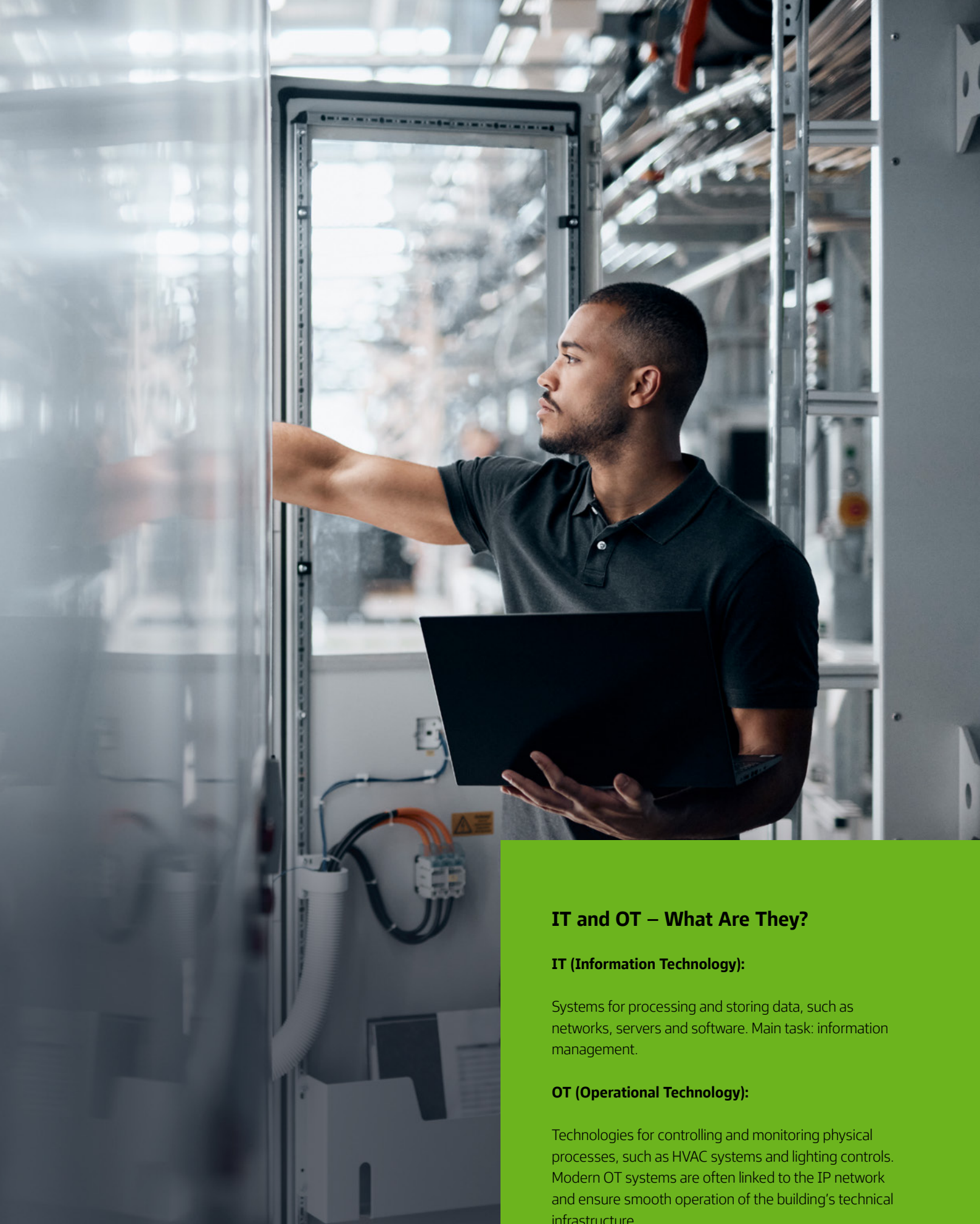
Did you know that hackers offer their expertise on the dark web as a service that can be easily ordered online? Cybercrime-as-a-service is the surprisingly innocent-sounding term for the professionalization of illegal transactions. It takes little imagination to imagine that hackers attract customers with offers like “3 for the price of 2.”

This frightening reality underscores how widespread and systematic digital attacks have become. This is no longer a niche topic! A look at various statistics confirms this: worldwide, around 8.15 trillion dollars in damage was caused by cyber attacks in 2023. Around one-third of the reported incidents took place in Europe. Within the European Union, critical infrastructure has been especially affected, accounting for 74% of the cases. Its failure could have led to supply bottlenecks or significant disruptions in public safety.

Private companies and even non-profit organizations have also long been targeted by cyber criminals. “A successful hacker attack can paralyze networks, cause data losses, or potentially interrupt operations for weeks,” reports Christopher Tebbe, WAGO Security Technology Manager. High economic losses and damaged reputations are the consequences. As risks continue to rise, it has become increasingly urgent that companies protect themselves against such professional cyber crime services and implement comprehensive protection measures.

»Automators are faced with the challenges of meeting both the CRA and the NIS 2 directive. If they have not yet begun the process, they should start now.«

Dr. Christopher Tebbe, Security Technology Manager at WAGO



IT and OT – What Are They?

IT (Information Technology):

Systems for processing and storing data, such as networks, servers and software. Main task: information management.

OT (Operational Technology):

Technologies for controlling and monitoring physical processes, such as HVAC systems and lighting controls. Modern OT systems are often linked to the IP network and ensure smooth operation of the building's technical infrastructure.



»A holistic approach is crucial for a coherent protection concept. In addition to technical solutions, this should also be factored into processes and legal requirements.«

Dr. Christopher Tebbe, Security Technology Manager at WAGO

Effective Protection with WAGO

The good news: suitable protection concepts provide an effective means to increase your building automation systems' resilience to cyber attacks – in both new buildings and existing ones. Implementing these measures crucially requires a thorough examination of technical OT and IT measures, legal requirements and organizational and/or procedural aspects.

As an established automation partner, WAGO provides multiple means of support along this path: WAGO Security Consulting forms the foundation, providing experts who will work with you to analyze your technical, legal and organizational requirements in order to derive concrete security measures. Tailored

hardware and software solutions from the WAGO portfolio supplement these consulting services.

Security through Expertise and Cooperation

An important component is the Product Security Incident Response Team (PSIRT), which proactively supports you in evaluating and managing security incidents. As soon as new threat potentials arise, our team will provide you with recommendations for action, patches and updates, as quickly as possible, to minimize risks and to protect your automation systems.

In addition, WAGO has partnered with Radiflow, a leading provider of cybersecurity and risk management solutions.

This collaboration enables WAGO to offer a comprehensive security framework aimed at minimizing cyberthreats, and protecting network infrastructure as an integral component of building automation.

Understanding and Implementation

New EU regulations such as the “Cyber Resilience Act” (CRA), the “Network and Information Security Directive 2” (NIS-2) and the “Critical Entities Resilience Directive” (CER Directive), create binding regulations that can pose new challenges for operators and manufacturers. WAGO helps you to understand and implement these specifications, so that you don't miss any conformity requirements. The NIS 2 Directive also applies to operators of buildings classified as critical or important – such as hospitals, energy suppliers or large office complexes. They must ensure that their building automation systems, such as HVAC and lighting controls, are protected against cyber attacks, and that they report incidents quickly to the relevant authorities.



Secure by Design: Product Development per IEC 62443

To help our customers meet high security standards, WAGO relies on secure development for its individual components and integrates security features into its products. The hardware and software development processes are certified in accordance with IEC 62443, which provides a firm foundation for compliance

with the “Cyber Resilience Act” (CRA). Following the principle of “security by design”, the aim is for products that do not create vulnerabilities in the customer's overall solution. By using these products, customers can implement equipment and systems with a corresponding level of security.

NIS-2 (Network and Information Security Directive 2)

- Obligates companies and organizations to maintain effective risk management.
- Reporting significant cyber incidents to national authorities is mandatory.
- Goal: early detection and proactive elimination of security vulnerabilities

Expansion vis-à-vis NIS-1:

The requirements now also apply, depending on the sector, to medium-sized companies with more than 50 employees and annual revenues exceeding €10 million, depending on the sector.

CER Directive (Critical Entities Resilience Directive)

- Obligates member states to identify critical entities.
- Supports operators in creating fail-safe operation through integrated resilience and risk management.
- Goal: strengthen physical resilience to threats, such as natural hazards, terrorist attacks and sabotage

Implementation in Germany:

The CER/RCE Directive is implemented by the KRITIS umbrella law (KRITIS).

CYBER RESILIENCE ACT

NEW OBLIGATIONS FOR MANUFACTURERS, GREATER SECURITY FOR USERS

In an increasingly networked world, companies are confronted every day with a flood of cyber attacks, that could seriously endanger their security and operations. A successful hacker attack can paralyze networks, lead to significant data loss, or interrupt operations for weeks – all with substantial economic damage. The European Union is responding with the pioneering “Cyber Resilience Act” (CRA), which aims to establish uniform cybersecurity standards for networked products within the EU in order to address the growing threats at the product level.

Greater Digital Security

As the first European regulation of its kind, the CRA sets a mandatory minimum level of cybersecurity for all networked products. Starting December 11, 2027, manufacturers will be required to comprehensively protect products with digital elements throughout their entire life cycle – from development to decommissioning. These measures aim to sustainably strengthen cybersecurity in the EU, improve consumer protection and minimize economic risks. To achieve these goals, the CRA Regulation defines five core requirements.

Impact on Users

The Cyber Resilience Act does not impose any direct obligations on end users. However, it, together with the NIS 2 Directive, underscores the importance of prioritizing protective measures and choosing compliant products for both new installations and retrofits. This proactive approach is essential to fully secure systems against cyber threats and ensure long-term protection.



CRA Objectives and Requirements at a Glance:

Cybersecurity across the entire product life cycle

Security measures are integrated into product development from the beginning. Principles like secure-by-design, secure-by-implementation, and secure-by-default ensure continuous protection over the entire life cycle.

Vulnerability management and reporting obligations

A central reporting platform is established to document actively exploited vulnerabilities and security incidents. This transparency improves user responsiveness to efficiently identify and close security gaps.

Security updates and support

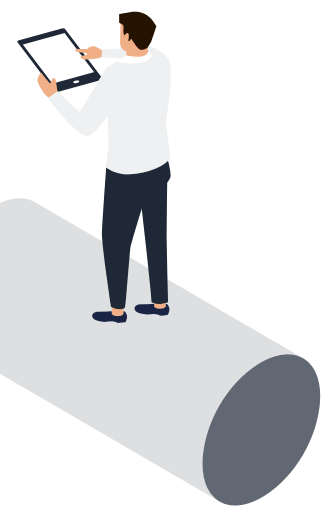
Manufacturers are obligated to provide free security updates throughout the product's life cycle. The support period typically spans five years and includes vulnerability management.

Conformity procedures and CE marking

Products must undergo risk-based conformity assessments and receive CE marking to gain EU-wide approval and guarantee necessary security standards.

Consumer protection and damage prevention

Manufacturers must proactively prevent vulnerabilities and manipulation to reduce cyber attack risks. EU standards and preventive measures protect users from unsafe devices and help reduce economic damage in the long term.



As a horizontal regulation, the CRA covers a wide range of product categories – from household appliances and industrial software to IoT devices – with a few exceptions such as medical technology and motor vehicles. Starting December 11, 2027, all hardware and software products must comply with CRA requirements to receive CE marking and be allowed on the EU market. Users, such as planners, operators, and integrators, should incorporate these requirements into their planning to ensure the conformity of newly deployed products.

Although implementation of the CRA may be particularly challenging for manufacturers, these standards significantly enhance the long-term security and reliability of systems and processes. A robust cybersecurity strategy enables rapid recovery in the event of an attack and ensures business continuity. Due to the manufacturers' obligation to disclose security features and potential risks, users can make informed decisions when selecting products, which in turn will help to protect systems from data breaches and outages.

FUTURE-PROOF BUILDING AUTOMATION

With the WAGO Building Ecosystem, you receive a modular system that intelligently combines security and interoperability. The open system architecture enables cross-system integration and maximum flexibility – tailored to your needs. At the same time, the Ecosystem meets the highest demands for IT/OT security and ensures that your building automation projects will be sustainable, successful and future-proof.



Management System – Secure. Smart. Cloud-Based.

With WAGO Building Cloud Services, you can rely on a modern, secure solution for operating buildings and properties. Due to the cloud-based approach (also known as software as a service), you benefit from high availability, automatic data backup, regular security updates and comprehensive user rights management – including 2-factor authentication and single sign-on. Your building automation systems remain protected and efficient at all times.



Resilient Automation Components

WAGO relies on robust automation components that specifically protect against manipulation and unauthorized access. Linux®-based controllers with TPM and Secure Boot, hardened firmware, and finely tuned user and password management ensure maximum security – even in critical infrastructure. WAGO Solution Builder enables a centralized and efficient implementation of security measures.



Secure Network Communication

Your building communication systems are excellently protected in the WAGO Building Ecosystem due to encrypted protocols, such as BACnet Secure Connect (BACnet/SC), and integrated firewalls. Certificate management, VPN connections and powerful network components ensure reliable data exchange – even when retrofitting existing systems.



Protection for Automation Applications

Comprehensive protection is essential, not just for a controller's firmware or operating system, but also for the automation application itself. In the WAGO Building Ecosystem, security and fast restoration – even in emergencies – are ensured by signed applications according to IEC 61131-3, user management at the application level, and central update distribution via the WAGO Solution Builder or the WAGO Device Sphere.



WAGO SECURITY CONSULTING

PROTECT YOUR OT NETWORKS

Increasing cyber attacks and stricter EU directives require holistic cybersecurity. For maximum security, WAGO offers consulting services in the area of OT security, supplemented by customized hardware and software solutions. What are you waiting for? Let's work together to strengthen your OT networks and create the cybersecurity of tomorrow!



www.wago.com/cybersecurity

RISKS, REGULATIONS AND RESILIENCE

Cybersecurity is no longer a niche topic. Every company – regardless of whether it's focus is industry, commerce or skilled trades – must now consider how they can protect themselves against attacks from cyberspace in light of current threat levels. Building automation is also affected. An interview with Jens Kluge from the Federal Office for Information Security (BSI).

Mr. Kluge, can you start with a brief rundown on what are the biggest drivers of these developments?

That's due to the threat levels, which have increased massively in recent years. Cyber attacks have become much more common since the 2014 annexation of Crimea. Cyber espionage has also significantly increased due to greater interest in obtaining sensitive information. The geopolitical situation and the conflict in Ukraine are thus also essential drivers.

At the same time, regulation is playing a major role: which, for us in Germany, is primarily the IT Security Act 2.0 and the NIS 2 at EU level. These requirements mandate that companies must address IT security much more intensively.

And what role does cybersecurity play in the context of building automation? Couldn't you simply claim that this has nothing to do with a company's IT security?

Yes, that's a nice assumption and also an obvious one for many, as the central IT of a company is considered to be the servers and clients, but not the building automation, i.e., the

OT*. The latter is less directly visible, because it usually runs in a separate network. In addition, it is often unclear who is responsible for this segment – especially in rental buildings. But that assumption is, of course, incorrect: the relevance of cybersecurity in terms of building automation is very high. Without a functioning building, people cannot work there.

Can an attack on the building automation systems also lead to threats to the IT infrastructure of a company or a government agency? A hacked ventilation system could be used as an entry point to other systems.

Definitely – depending on how the networks are connected. In terms of cybersecurity, they would ideally be completely isolated; however, there are almost always transitions: after all, there are reasons for controlling systems across departments or sharing data. If the transition is configured using a DMZ* and firewall, for example, the implications are usually rather low. However, in practice, networks are often connected directly to one another. This is quite often because the solution has to function easily, and the security aspect sometimes impedes this.

* OT = Operational Technology (see explanation on page 9).

Jens Kluge, expert at the BSI
for cybersecurity in building
automation

Image: German Federal Office for
Information Security (BSI)



The challenge increases when cloud solutions are involved, as this infrastructure lies outside of one's own control, yet the systems still have to interact with each other. In these cases, it is therefore crucial to define, clearly and contractually, which security standards apply, who is responsible for what, and how interfaces are regulated.

All of this illustrates one essential point: cybersecurity in buildings must always be considered holistically. The security concept must apply to the central IT and to the technical building automation. In the past, security was mostly focused

on the central IT infrastructure; however, building automation networks are just as critical as attack vectors.

References to "cyber warfare" often appear in the media. Is this term justified and does it also apply with regard to building automation systems?

The term is often used in the media to raise awareness about the issue. At BSI, we more commonly focus on a "hybrid threat," because attacks can have both physical and digital effects.

* A demilitarized zone (DMZ) is a subnetwork that serves as a buffer between a protected internal network and an unsafe external network, e.g., the internet.



It is true, however, that the situation is serious and should not be underestimated. In the context of Russia's war of aggression against Ukraine, the system being targeted has become almost irrelevant to the attackers. The main thing is that they can cause damage and publicize it on social networks like Telegram. And, because the internet respects no national borders, such attacks can have repercussions for Europe, Germany, and the world. This irrelevance of national borders is exactly why the threat level should not be underestimated – especially if you are responsible for a system. It would be careless to assume that one's own building is not of interest, just because it is located in Germany without any obvious connection to international conflicts.

Finally, there are also cases in which particular buildings are deliberately attacked, although the motives of the attackers vary: some want to cause specific damage, for example by paralyzing an airport; others have financial interests, such as blackmail. Officials report that attempts to penetrate digital systems are continuous – regardless of whether they are targeted or random.

security vulnerability concerns devices that are obsolete or poorly patched. Especially if they are security devices, such as VPN gateways or a firewall.

We must also not forget that building technology is alive and evolving. Over time, new systems or components are introduced that must be included when considering cybersecurity. And there are multiple actors supplying data into a network like this. Digital security for building automation systems is thus not merely a one-and-done project during construction: it is a continuous process encompassing building adaptations and the safe integration of new devices into the network. Another problem is that such changes are often poorly documented. This can lead to uncertainties with regard to responsibility and a lack of traceability. Especially if the employees or external service providers, who were involved, are potentially no longer available.

»It would be careless to assume that one's own building is not of interest to hackers, just because it is located in Germany without any obvious connection to international conflicts.«

What are the typical security vulnerabilities in building automation systems? Do you have specific examples?

A typical example would be controllers that are incorrectly connected directly to the internet; even though they were actually only intended for use in internal networks. This happens all the time – whether out of practicality or due to ignorance. The system works for the users, but it is extremely risky in terms of cybersecurity. Such controllers can be directly found using a search engine query – just by entering the specific manufacturer information and ports – which makes them an easy target for attackers. Another common

Which legal requirements of the EU and Germany are particularly relevant with regard to building automation?

Two directives deserve particular attention. One is the CER Directive*, which was implemented in Germany as part of the KRITIS umbrella law. The requirements are aimed at operators of critical infrastructure, which is already subject to special regulation and increased protection requirements under the IT Security Act 1.0. This Act addresses more than just digital attacks, as it also includes physical risks, such as earthquakes or floods. Still, the CER Directive also plays an important role in relation to cybersecurity.

* You can find more information on the EU requirements mentioned above in our reports on pages 11-13.

The NIS 2 Directive* will have an even greater impact; although it has yet to be implemented as a federal law in Germany. It stipulates that so-called important and particularly important entities must carry out a risk assessment of their entire IT network, which includes building automation systems. In addition, these entities are required to report security-related incidents to the national IT security authority. Here in Germany, that is the BSI.

What, according to NIS 2, are important or particularly important entities?

NIS 2 is based on two figures: the number of employees and an organization's or company's annual sales. Important entities are defined as having 50 employees and revenues of €10 million. For particularly important installations (editor's note: also known as "essential entities"), there are at least 249 employees and €50 million in sales revenue.

The CRA* is often mentioned in the debate; although it is primarily directed at the manufacturers. Are there aspects arising from this Act that users must take into account?

This is another major point of discussion. Among other things, the Cyber Resilience Act now obligates manufacturers to provide security patches, and to equip their devices with a function that can be used to import such security updates. It is still unclear whether this also entails something like a duty to patch for operators.

What obligations arise from the new EU Requirements for those involved in the building life cycle?

Initially, there are no changes for existing buildings, as the new security requirements will only be relevant for future devices and new construction. It will take some time before these new devices are actually introduced; however, this will increase the level of security over the long term. It is crucial, however, that all those involved in the building life cycle have cybersecurity actively on their radar, and incorporate it into individual security concepts. New security functions alone will not suffice if planners and other stakeholders do not continue to engage with the problem over the building's life cycle. Up to now, technical planners have had no mandatory role regarding cybersecurity in building automation. Although a lot of information on the importance of cybersecurity is already available, it is often

not sufficiently considered during the actual construction process. As the construction industry already faces many other requirements, the lack of clear specifications means that this topic is often neglected.

»We must also not forget that building technology is alive and evolving.«

In your view as an independent expert: are building operators, planners and executives sufficiently aware of the risk of cyber attacks? And are they able to implement security measures?

My answer is a classic "it depends". There are always trendsetters, who are already deeply involved with the topic – often at their own initiative or after their own security incidents. But there are also always others, for whom this topic is completely new, and even those, who will try to wait it out for as long as possible. Education and outreach, such as that carried out by associations and authorities, are therefore important. It is also difficult to assess the actual competence levels for implementation and the degree of implementation in the building sector – these also depend in part on the age of the building.

It is difficult to get started, as you are aware. What can you recommend as an access point, in order to learn more and to increase resiliency in existing automation systems?

I can highly recommend the AMEV** recommendation for building automation as a starting point. It offers a good overview of how building automation networks are structured in general, and also takes cybersecurity into account. It also provides many references for learning more – including the VDI 3814. The VDMA Specification 24774 for IT Security for Building Automation is additionally helpful, and also easy to understand for someone who has not yet engaged deeply with the topic. Finally, I would mention BSI baseline protection, which also explicitly addresses building automation in the BSI INF 13 and INF 14 modules. This is another good place to start reading, and to find specific recommendations for actions.

** Working Group for Machine and Electrical Engineering in State and Municipal Administrations (AMEV), Recommendation No. 169, "Instructions for Planning, Execution and Operation of Building Automation in Public Buildings"



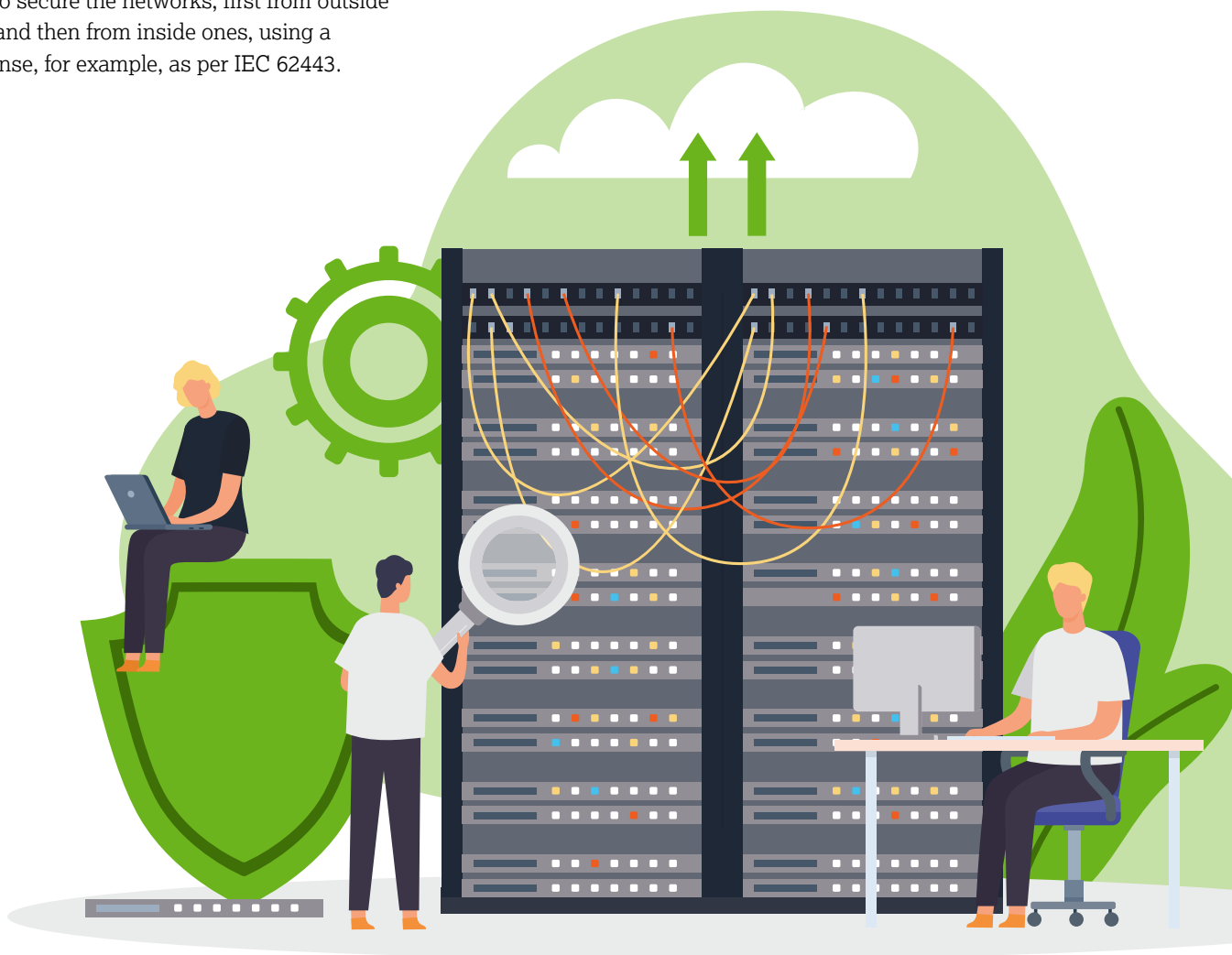
Are there any quick wins that everyone can implement?

It begins quite simply with specifying someone to be responsible for cybersecurity of technical building equipment, and on a full-time basis. This person must be competently skilled, empowered to ask other people questions, with the expectation that their questions will be answered.

In addition, a basic principle is that you can only protect what you know about. Responsible persons therefore need a current overview of relevant devices, including their important information: such as the status of the firmware or the network in which they are located. A network map may also be helpful for an overview. This is especially true for larger buildings, with multiple information networks, which converge on a central controller. Building from this, these responsible persons should identify the most important nodes and the transitions to other networks – be it to the internet, the office network or the cloud. It is then necessary to secure the networks, first from outside influences and then from inside ones, using a nested defense, for example, as per IEC 62443.

Still, despite all precautions, a successful hacker attack can never be completely prevented. What options do building operators have for quickly returning to normal operations in the event of an incident?

Off the top of my head, there are two aspects to start with: procedures and practice. You must have procedures in place for so-called “business continuity management.” This means preemptively thinking about how the individual systems react in certain crisis situations, and what to do during such an incident: be it a flood, or a power failure caused by a hacker attack. The correct procedure must then be practiced at regular intervals by the people involved, similar to an evacuation exercise for a building. In an emergency, the people responsible for operating the systems have to know what they need to do – and how to do it in detail. For example, the position of a specific manual switch or the emergency number of an important service provider.



The same applies to the control level. If the building automation fails due to a cyber attack, those responsible need clear knowledge about what to do. They need to know how to return affected controllers to their original factory condition, or how to request the backups from the server and download them to the controllers. Other topics that must be considered and practiced can include replacing compromised controllers and putting robust controllers with secured applications into operation. The BSI Standard 200-4, which deals with business content management, can be helpful in this regard.

As we know, the need for security must be balanced against other factors, such as functionality and cost-effectiveness. In such cases, who makes the decision and thus also bears the risk?

That is true. Many measures can be implemented at a modest budget in order to achieve an acceptable level of security. Of course, there are also systems or functions that are essential. It may be necessary to invest more in order to achieve an acceptable level of protection for these cases. This also makes a great deal of sense, because otherwise the entire profitability of the company or the well-being of people will be endangered. However, the availability and usability of the systems must also be retained along with the added security. A one-hundred-digit password to access a user interface, or three people for one login are not always the best solutions that one could select.

The risk in dealing with these types of questions ultimately lies with company management. They must weigh the risks and decide what is economically feasible, and which risks are acceptable. Of course, they are not alone; they can call on experts for assistance, and can have decision templates generated.

Finally, a look in the crystal ball: how will this topic develop over the next few years? Will artificial intelligence play a role in the future?

I expect that the issue will become even more important. One reason is that the attackers are becoming increasingly more professional, and the threat level is also rising. Secondly, improved monitoring and the new reporting obligations will increase the number of reported incidents. Attacks have often not been detected as such, for example, when a defective system simply causes a backup to be downloaded, so the incident is not investigated further. The visibility in the statistics will thus also rise.

Turning to artificial intelligence: it is impressive how powerful it already is today. In my view, it is therefore clear that AI will also play a role in the future in the area of cybersecurity. We can, of course, use it for our own goals, that is, naturally, for defensive purposes. I see potential applications here for the monitoring and operating of building automation systems. Users may then no longer need to be experts in every system, but can use AI tools to obtain the necessary support, and receive targeted, relevant information from them. Just think of all of the three-ring binders, which usually include documentation about automation systems – no one can read, understand and remember all of that. AI could offer useful support here: you could ask a specific question and then receive a relevant answer, tailored to that respective building automation system. Of course, there are major advantages to this. At the same time, let us not delude ourselves: the other side can and will use artificial intelligence for their attacks as well. AI can, for example, help hackers find relevant information for cyber attacks more quickly and without the need to extensive expertise, which will reduce the length of time required for complex familiarization periods. Artificial intelligence will thus become both a benefit and a risk.

Mr. Kluge, thank you for the conversation.



Photo: EDEKA Minden-Hannover/Christian Schwier

EDEKA CAMPUS MINDEN

A CAMPUS FOR THE WORKING WORLD OF TOMORROW

EDEKA Minden-Hannover has erected a new corporate headquarters in Minden – the EDEKA campus. Around 2,000 positions, which had previously been distributed across twelve locations, have been united here in a campus spanning 123,000 square meters. The goal was to strengthen internal cooperation, promote agile employment types and create a modern, flexible office space that would meet the demands of a changing working environment.

The new campus has set innovative standards, both in function, and in technology. EDEKA pursued a holistic approach in their design: in addition to architectural quality, the focus was on energy efficiency, sustainability and digital controls. The technical implementation was carried out in close partnership with WAGO and the system integrator, Lübbing Elektrotechnik.



Project Partner

EDEKA Minden-Hannover

EDEKA Minden-Hannover is the most profitable EDEKA regional company, headquartered in Minden. It operates around 1,500 markets in a geographic area of Germany that extends from the Dutch to the Polish border, and includes parts of East Westphalia-Lippe, Lower Saxony, Bremen, Saxony-Anhalt, Berlin and Brandenburg.

Lübbing Elektrotechnik GmbH

Lübbing Elektrotechnik GmbH, founded in 1991 in Porta Westfalica, specializes in customized solutions in building automation and control cabinet manufacturing. The company offers comprehensive services for projects of all sizes: from planning through design to maintenance. Lübbing is also a WAGO Solution Provider.



Photo: EDEKA Minden-Hannover/Christian Schwier

Challenges: Complexity, Adaptability and Sustainability

The demands on the project were high from the very beginning – both from a technical and organizational standpoint:

- Size and complexity: a central location for 2,000 employees with diverse requirements for workspaces and in technology
- Flexible use: open-space offices that can be converted into smaller units without constructional interventions
- Energy efficiency: building operation that goes beyond legal standards and achieves a DGNB gold certification
- ESG reporting: comprehensive detection of relevant emissions data
- Future-proof: integration of a digital twin for simulation and optimization of building performance

Method for resolution: Room Automation using the WAGO Application *flexROOM*®

To meet these requirements, EDEKA relied on the WAGO Application *flexROOM*® for integrating the room automation systems. This system enables intelligent control of lighting, shading and

indoor climate – centrally, flexibly and with no programming required. Operation is carried out via a browser-based interface, which can be used for customized configuration of individual room segments.

On the technical side, the system is based on the PFC200 Controller and suitable I/O modules. It is supplemented by DALI for lighting, EnOcean® radio technology for wireless operating elements, and SMI drives for blind control. The BACnet protocol is used for communication between the building systems. Of particular note is the potential for virtually restructuring rooms with a few mouse clicks, for example, by repositioning sensors or operating elements.

Building Management and Digital Services

Room automation is part of the modular WAGO Building Ecosystem, which extends from automation hardware, through applications, to building management. Primary systems, e.g., for ventilation, heating and air conditioning, are controlled via the WAGO I/O System 750.



Building management is operated locally, supplemented by the WAGO Building Alarming and Ticketing application, which enables efficient management of fault messages.

A digital twin, created by WAGO partner LEAFTECH, analyzes wind currents and simulates the annual shading in order to precisely model the interactions between buildings and the environment. Two weather stations provide real-time data, which is processed by the WAGO Weather Station application, which leads to an energy-optimized control of the 1,500 sun shades.

Construction Phases and Implementation in Partnership

The implementation took place over five construction phases. The cornerstone was laid in September 2021, in the middle of the coronavirus pandemic and under difficult delivery conditions. Despite these challenges, the project was completed on schedule. Two building sections went into operation at the beginning of 2024, while the remaining ones were completed in series over the course of the year.



A total of 51 switchgear units with around 120 controllers, 1,200 I/O cards and 24,000 rail-mount terminal blocks were installed. EDEKA's close collaboration with WAGO and Lübbing Elektrotechnik proved to be a decisive factor for success – both in technical terms and in the exchange of ideas based on partnership.

Conclusion: An exemplary campus

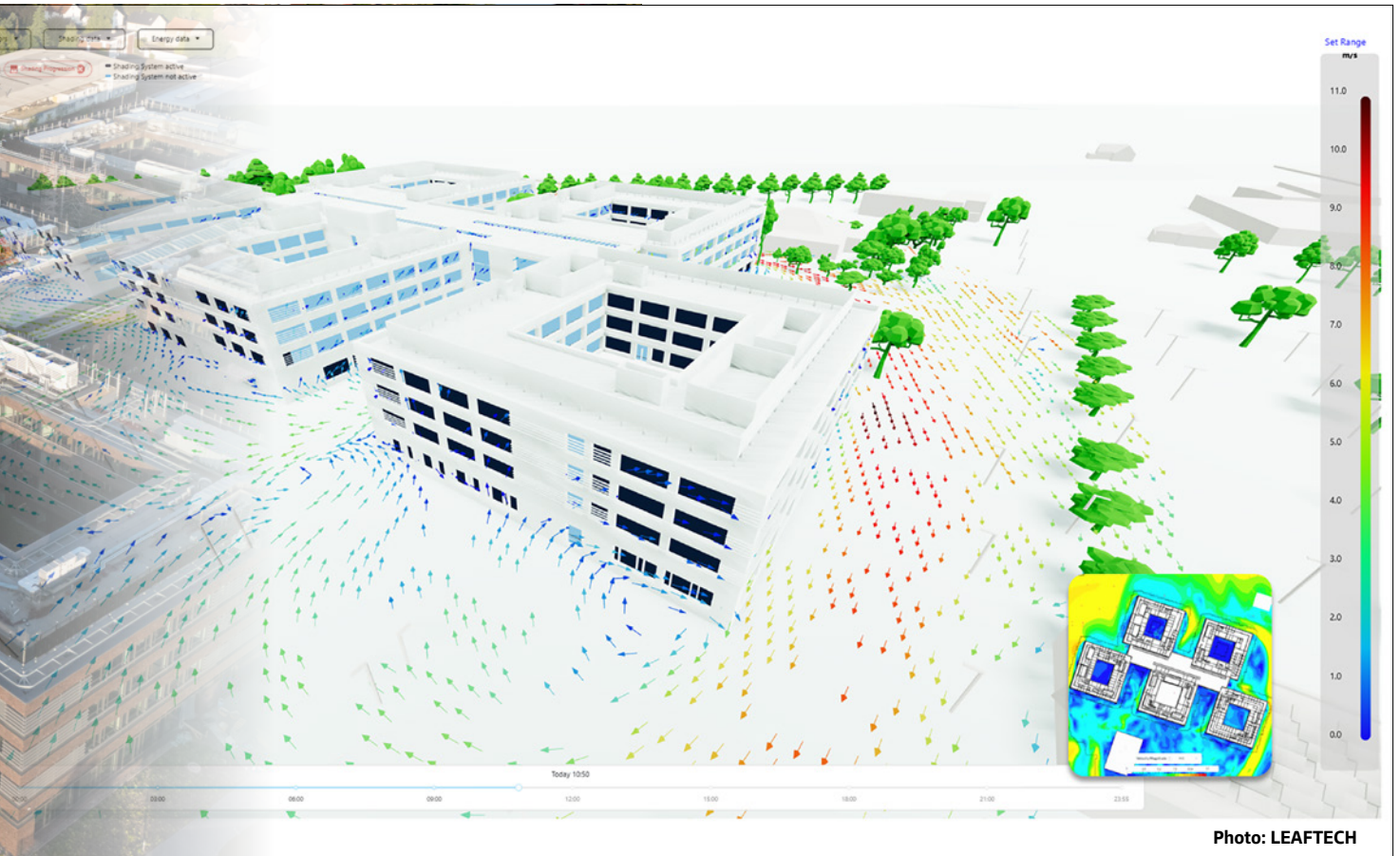
EDEKA Minden-Hannover's new campus has conveyed a strong signal about the working world of tomorrow. The advantages of the chosen solution are obvious:

- Energy-efficient operation through intelligent controllers and digital simulation
- High user comfort due to automated, individually-adjustable room functions
- Maximum flexibility in room use – with no constructional measures or external service providers
- Future-proof due to scalable, modular technology
- Efficient commissioning with a time savings of up to 30%

The EDEKA campus is thus more than just a functional new building; it is also a technological showcase project – networked, sustainable and ready for the requirements of the future.

The planners and operators had originally worked independently to develop solutions. However, an integrated approach offers major benefits for the operator:

On the one hand, the concept enables optimization of energy efficiency and comfort at the highest level. Such an approach, which creates an upgradable infrastructure for the entire life cycle of the building, will additionally allow the building to meet future requirements and adjust to changes in use. This provides maximum flexibility in building utilization. In addition, the seamless data integration of different systems supports consistent analysis and reporting that is ESG compliant.



DIGITAL INTELLIGENCE FOR REAL BUILDINGS

HOW VIRTUAL MODELS MAKE REAL BUILDINGS BETTER

The EDEKA campus in Minden demonstrates how modern building technology and digital planning interact. The core is the integrated room automation using the WAGO Application **flexROOM**®, which provides flexibility and efficiency throughout the entire life cycle of the building. However, another feature is decisive for optimal building operation: the building digital twin.

A digital twin is a dynamic model of a real building that is continuously enriched with real-time data. The digital replica, developed in this case by WAGO partner LEAFTECH, provides precise data and forecasts for all aspects of the building technology. It considers complex environmental factors when running targeted simulations to derive specific control strategies.



BIM vs. Digital Twin – What Exactly Are They?

BIM (Building Information Modeling)

- Digital method for designing and constructing buildings
- Creates a detailed, static 3D model with all construction information
- Focus: planning and construction phases
- Benefits: better collaboration, fewer errors, more efficient processes

Digital twin

- Can be created for a new building or retroactively for an existing building.
- Virtual image of the real building, linked to real-time data.
- Enables monitoring, analysis and optimization during operation, even with limited automation infrastructure.
- Focus: Use and maintenance phases.
- Advantages: predictive maintenance, energy optimization, intelligent control.

From a Digital Data Model to Smart Operation

While current new construction projects are often planned using “Building Information Modeling” (BIM) and sophisticated building automation concepts, operators of existing buildings, in particular, can benefit from a digital twin, which can be generated at any time. The reason is that existing systems often lack current planning data, and the building technology is complex and difficult to predict. The combination of a digital twin with intelligent sensors can create transparency and enable sustainable optimization.

This allows energy consumption to be optimized, comfort to be increased and maintenance measures to be planned in advance – without expensive modifications. WAGO technology allows automation solutions to be integrated directly into the model. This keeps the model up-to-date, enables well-informed decisions and prevents expensive errors, such as clashes between building systems. Material requirements are precisely calculated, and various planning alternatives can be easily implemented and adapted.

From Simulation to Decision – Tools for Operators and Planners

The LEAFTECH approach is modular and scalable. For large portfolios – with hundreds of buildings, for example – digital twins offer a means for quick initial evaluations: Which properties have critical energy use levels? Where does modernization pay off? What makes economic sense: sale or demolition? In the next stage, building optimization measures are simulated, e.g., facade replacement, PV potentials, heat pumps, use of daylight. The results are not only technically sound, but are also assessed in economic terms: including investment costs and savings forecasts. This creates a reliable timetable for the future.

The digital twin offers a robust foundation for sustainable building management, especially with regard to upcoming ESG reporting obligations. It also enables seamless documentation of energy consumption, CO₂ emissions and optimization potentials – and supports operators in efficiently meeting regulatory requirements.



Photo: LEAFTECH

»A true digital twin is an adaptive system that helps to save energy, increase comfort and plan investments in a targeted way.«

Michael Dittel, CEO LEAFTECH GmbH

Existing Building instead of New Construction – The Actual Challenge

While digital twins are often associated with new buildings, LEAFTECH focuses on existing ones. "The biggest challenge is not new construction, but the evaluation and optimization of existing buildings," says Dittel. "They often lack any digital foundation – and that's exactly where we start."

With the help of as-built plans, geodata and AI-supported analyses, a digital image is created that is gradually enriched. If needed, a fully fledged twin can be created, which includes control at the room level and a preliminary planning basis for renovations.

The digital twin also offers new possibilities for technical planners – for example, as a basis for robust renovation decisions. Instead of arriving at a late stage of the process, they can participate strategically in the pre-qualification phase and prepare well-founded recommendations for investments and operations.

Stronger Together: LEAFTECH and WAGO

The collaboration between LEAFTECH and WAGO shows how digital and physical worlds intermesh. While LEAFTECH handles simulation and analysis, WAGO provides the technical infrastructure for

Transparency and Efficiency in the EDEKA Campus Thanks to a Digital Twin

In order to maximize the energy efficiency at the new campus, EDEKA commissioned WAGO partner LEAFTECH to create a digital twin. Supplemented by wind current analysis and shading simulations, it precisely maps the interactions between the building and the environment. This enables predictions about the effects of the sun and wind on the building, so that appropriate adjustments can be made.

»We can both plan and also optimize it live – and with minimal effort for the operator.«

Michael Dittel, CEO LEAFTECH GmbH

implementation – from room automation to measuring point design. Data flows bidirectionally via API interfaces: simulation meets reality, predictions meet monitoring.

"The combination of a digital twin and flexible building automation creates a new level of quality in building operation," says Dittel. "We can both plan, and also optimize it, in real time – and with minimal effort for the operator." Another advantage is that the digital twin grows along with the building. New data, new requirements, new technologies – everything can be integrated. This keeps the model up to

date and usable: for operators, planners, facility managers and investors.

The EDEKA campus shows how reality and virtual simulation merge into an intelligent overall system. LEAFTECH's digital twin is not only a technical tool, but also a strategic instrument for the future. It creates transparency, enables informed decisions and combines planning, implementation and operation in a consistent process.



EUROPA-CENTER GATEWAY GARDENS

WHERE AUTOMATION AND ENERGY EFFICIENCY FIND A HOME

As environmental requirements become stricter and energy costs rise, building automation becomes increasingly important. Intelligent control systems to regulate lighting, air-conditioning and shading help increase comfort and lower energy consumption. One of the best examples can be seen in the “Flow” office building in Frankfurt’s Gateway Gardens district. In this project, WAGO’s scalable room automation solution, the WAGO Application **flexROOM**®. Ensures maximum flexibility and efficiency,

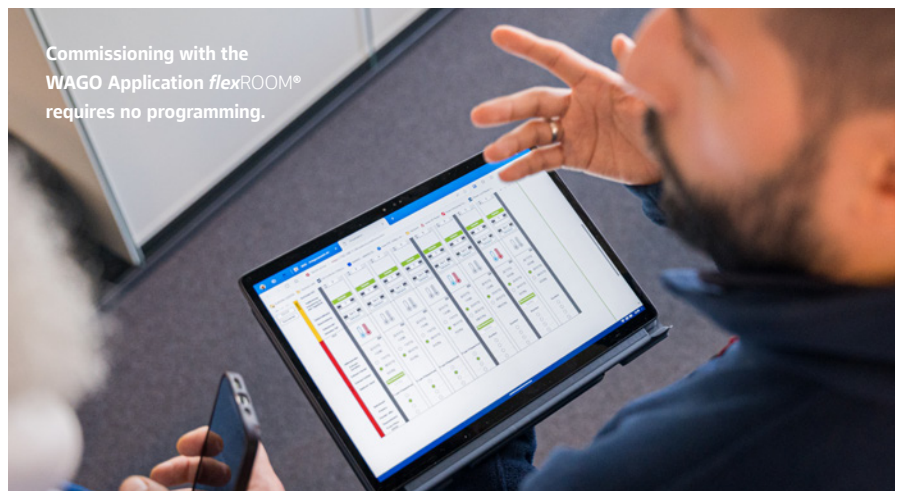
To achieve this, the building automation must act as a central unit, receiving information from the room automation. A number of elements were required in the “Flow” building complex: 121 Modbus® devices, e.g., controllers, chillers and weather stations. More than 16,000 data points. Eight integration and interface platforms in three building sections. These all work together, ensuring that over 100 **flexROOM**® room automation distributors correctly transmit the control



Project Partner

Kynast Elektroanlagen GmbH

Kynast Elektroanlagen GmbH is a family-run company, with more than 100 years of experience in electrical engineering and building automation. With a dedicated team of professionals, Kynast realizes ambitious projects in industrial, commercial and residential construction – always with a focus on quality, innovation and reliability.



signals – from lighting, sun protection and temperature control elements – to the building control system.

The Key to Flexibility

Each room automation distribution box can control up to 24 segments or eight special areas (such as hallways, kitchenettes and meeting rooms). They are designed for precisely this type of modular, room-based structure, and offer a ready-made, flexible solution for automating individual spaces.

“Since no programming is necessary, commissioning is 30% faster than for conventional systems. This makes planning, installation and commissioning significantly easier. Distribution boxes are also suited for use as a solution in new construction and energy modernization.” Kynast project manager Stumpf describes his experience with the WAGO Application **flexROOM**®. All the elements are connected into a network using the WAGO I/O System via ETHERNET for the primary system automation.

»From the beginning, the focus was on maintaining as much flexibility as possible. To support that, the WAGO I/O System for controlling building automation was the clear choice. However, the main focus was the WAGO Application flexROOM®, which made it easy to adapt functionalities on the go.«

Benjamin Stumpf, Project Manager for ICA, Kynast Elektroanlagen GmbH

MORE SUSTAINABLE ELECTRICAL INSTALLATIONS – FROM PLANNING TO OPERATION

HOW WELL-DEVELOPED ELECTRICAL PLANNING AND MORE SUSTAINABLE MATERIALS CAN PROTECT RESOURCES.

Legal requirements, such as the Building Energy Act (GEG) and the Energy Efficiency Act (EnEfG), require energy-efficient systems and more sustainable materials in buildings. In addition, there are regulations, like the Ecodesign for Sustainable Products Regulation (ESPR) and the EU Construction Products Regulation (CPR), which aim to improve the sustainability, security and transparency of construction products and align themselves with the goals of the EU Green Deal and the circular economy. For building owners and operators, this means that sustainability has become a central issue. Electrical installations play a decisive role in this, as they control lighting, heating and cooling, and thus directly influence energy consumption and CO₂ emissions.

Longevity as a Key to Sustainability

Durable and maintenance-free components, in addition to other aspects, like an efficient climate control system or energy-saving lighting, can also contribute to a more sustainable building. "Sustainable electrical installation is basically about durability. When I implement an electrical installation, it should have been designed so that it functions stably and error-free over the long term. Reliable and appropriate components should be used to fulfill this," explains

Meike Beimstroh, Product Manager Connectors at WAGO. Beimstroh contributed to the idea of a splicing connector made of partially recycled and bio-circular plastics, and helped develop this first, more sustainable connector from WAGO. "The more sustainable a building is, the more maintenance-free it is. There are, of course, regulatory maintenance tasks that must be carried out. However, resources are also consumed due to every maintenance call," continues Beimstroh.

Small Acts of Environmental Awareness

The materials used also influence the CO₂ footprint of a building. While construction materials, such as steel and concrete, account for the largest share in terms of quantity, sustainability begins in the details. "Our 221 Series Green Range can contribute to emission reductions from a building. The terminal blocks are made in part from bio-circular and recycled plastics. In this way, we reduced the use of new materials in production and also utilize secondary materials from other production lines," explains Beimstroh. In her opinion, this also includes operating buildings with the lowest possible energy consumption levels and using renewable energies. These may take the form of intelligent building automation, for example, which controls lighting, air-conditioning, heating and shading

CO₂-Footprint (PCF) Green Range

The Green Range reduces CO₂ emissions at the product level. Emissions in the PCF can be accessed in the digital product passport (Asset Administration Shell (AAS)).

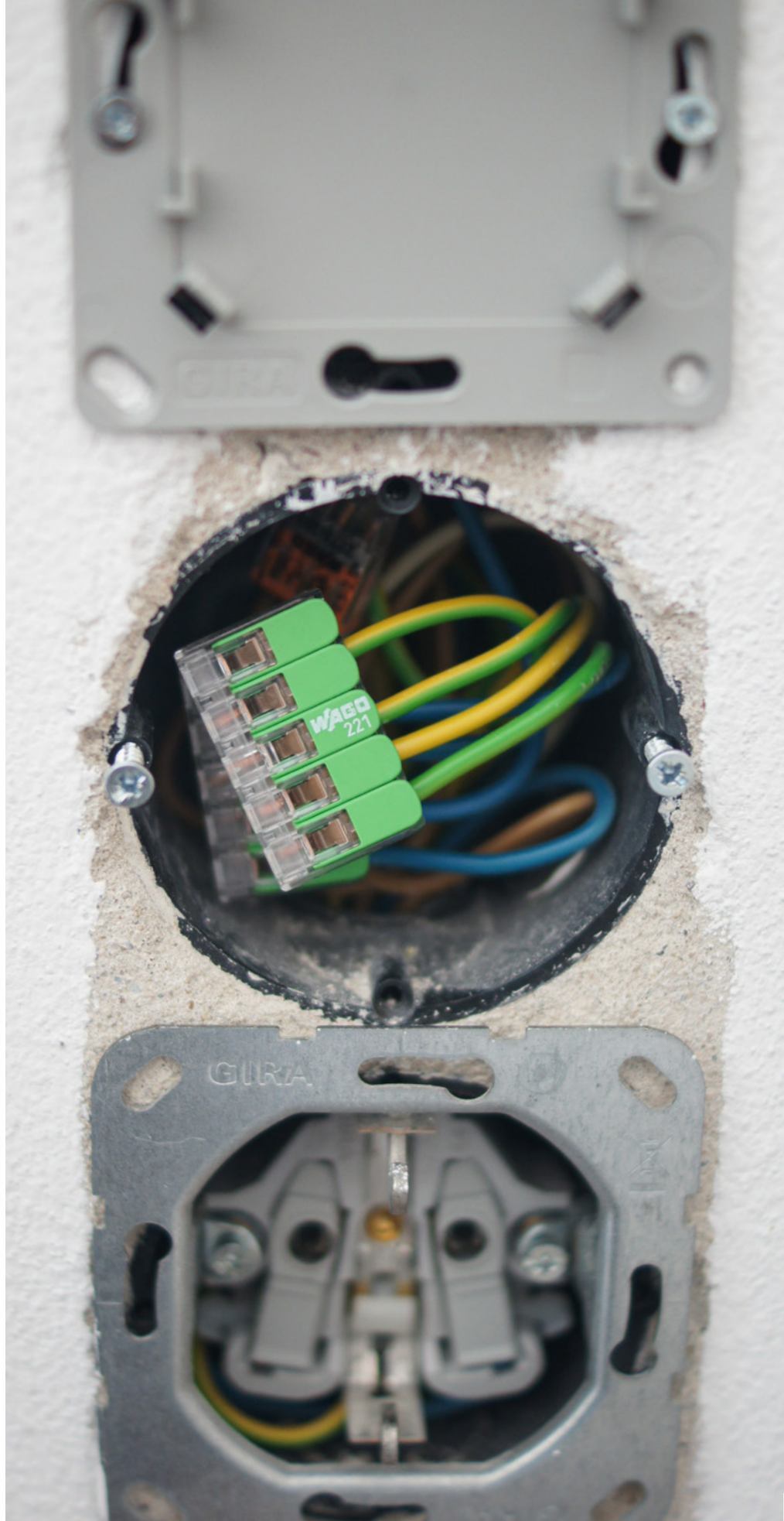


on an as needed basis.

Building Planning with Vision

Sustainable electrical installations mean conserving resources – from material selection through the entire service life of a building. The focus is on minimizing energy consumption and power losses. Future-proof electrical planning thus plays a decisive role in achieving environmental and economic goals, and in meeting legal requirements.

The lever and housing of the 221 Series Green Range are made in part from recycled and bio-circular materials.



The forecast for 2028:
there will be 425 million smart
homes around the world.



SMART HOME: WILL DESIRE FINALLY BECOME REALITY?

HOW MATTER® AND THREAD® ARE CHANGING THE FIELD OF HOME AUTOMATION.

Isolated solutions and incompatibilities have characterized the smart home market up to now. The Matter® and Thread® communication standards can change this, and offer the electrical trades a unique opportunity to again become a central player within smart building technology.

Smart Home – a buzzword, both positive and negative. It was coined by the American Association of Home Builders, notably in 1984! This founding vision promoted technologically advanced and networked residential environments. And here we are – more than 40 years later – and what has become of this concept?

The market for smart home products has been fragmented for years. Different devices compete side by side: many are proprietary, some are tied to the cloud, and others are only compatible to a limited extent. This results in time-consuming commissioning, insecure configurations and growing frustration on the user side, none of which sounds desirable. Yet the number of smart homes continues to grow.

30% More Smart Homes by 2028

According to an industry report by the market research and management consulting company, Global Market Insights Inc., the number of smart homes in 2023

was around 300 million globally. The forecast for 2028 is an additional 30%, i.e., 425 million smart homes. The electrical trades have also noticed this trend. Instead of the switches, outlets and wired systems that used to dominate, customers now expect networked, expandable, cross-platform solutions. These solutions will exist soon.

Two technologies make it possible: Matter® and Thread®. Matter® is a standard for communication between smart devices, while Thread® is an underlying wireless network. Both pursue the objective of redefining interoperability in building automation. They were developed under the leadership of the “Connectivity Standards Alliance” (CSA), whose celebrity participants include Apple, Google, Amazon, Samsung, IKEA and more than 500 other members. Together, they aim to create an open, stable and easy-to-use infrastructure, which is also attractive for specialized companies.

Vertical Integration as the Key

Manfred Lehmann, Marketing and Digitalization Manager and Strategic Product Manager at WAGO, understands why electrical installers, in particular, should engage with this development.



“If a building is to be intelligent from the basement to the roof, we have to learn how to integrate these systems vertically,” he says, referring to consistent communication between the different levels and zones within a building: from the technical infrastructure in the basement, through the permanently installed components, up to the mobile devices introduced by the user.

However, the smart home is currently shaped by diversity: lighting, voice assistants and adapters are often commissioned in an uncoordinated manner. Previously, vertical integration was almost impossible. Matter® connects these different worlds because it integrates appropriately-certified devices, regardless of manufacturer or platform. As a wireless protocol, Thread® ensures that these devices communicate securely with one another in an energy efficient way.

Central Controller Meets Dynamic Diversity

Matter® aims to establish a bridge between stable, yet immobile systems and vibrant, mobile, smart home environments. In practice, this means that devices – irrespective of manufacturer, design or function – are provided with a common language, regardless of whether they are part of the building technology or were introduced by the occupants. This opens up new possibilities for modular planning and later expandability, without requiring the replacement of entire systems.

The underlying idea is simple: buildings consist of three technical zones. First, the infrastructure, i.e., control cabinets, energy management, heat pumps or photovoltaic systems. Second, the permanently-installed building technology, which includes basic lighting, roller blinds or wall switches. Third, the mobile level, which is typically introduced by the user and transfers with the user during a relocation. Examples of these devices are lamps, socket adapters and voice assistants.

User Habits as Guidelines

In Lehmann’s depiction, Matter® assumes the function of an overarching protocol, which logically and securely connects these three zones. Thread® provides communication as an underlying mesh network: each mains-powered node functions as a repeater and expands the network. The connection to the outside world, e.g., for remote access, is established via a central master controller. In everyday operation, however, the system is locally autonomous and also functions without internet access.

The multi-admin capability is particularly exciting here: multiple users or platforms, such as iOS and Android™, can access the same Matter® network simultaneously. This makes for flexible control, while also enabling an easy coexistence of different user habits within the same household. The father controls the lights with Siri, the daughter uses Google Home, and the son operates the heating zones via a third-party app – and everyone accesses the same technical foundation.

From the point of view of the electrical trades, this creates new opportunities: instead of having to choose between proprietary, isolated solutions, installers can rely on a uniform standard in the future. Therefore, they can rest assured that future expansions, by the user or other building trade workers, are technically possible and can be safely integrated. Instead of selling control packages, electricians will become integrators of open, future-proof systems.

Market Development, Device Variety and New Tasks

Market dynamics confirm the trend: since the first Matter® specification was published in October 2022, the number of certified devices has constantly increased. Typical applications, such as lighting control, blinds, sockets or door locks, were initially supported. With version 1.4, which was released at the beginning of 2025, the standard now also covers energy management systems, inverters, e-charging stations and heat pumps – at least in theory. In practice, device construction lags behind. Manufacturers first have to adapt, develop and certify their products, which can take several years, depending on the product category.



»If Matter® delivers what it promises, installers will transform from connection professionals into architects of digital building intelligence.«

Manfred Lehmann, Marketing and Digitalization Manager and Strategic Product Manager at WAGO

Matter® and Thread®

Matter® is a manufacturer-independent standard for smart home devices, and was developed by the "Connectivity Standards Alliance". It enables secure, local communication between devices from different manufacturers – independently of cloud services. Thread® complements Matter® as the technological foundation for stable and energy-efficient communication.

Technologically, it is an IP-based, wireless network for smart devices based on the mesh principle, in which each mains-powered device functions as a repeater. The two technologies both reduce complexity and simultaneously increase compatibility. This will create new opportunities for electrical installers in consulting, planning and implementing smart buildings.

For this reason, Lehmann warns against excessive expectations, "The integration of infrastructure components, such as PV inverters, takes time because of the complexity and the high security requirements." That said, premier producers have already shown how this can work: actuators and switches with Matter® or Thread® certification are already available at wholesalers. Meanwhile, small specialized vendors are developing innovative intermediate solutions to provide conventional systems with Matter® compatibility. One stated goal: Matter® should not only be of interest for new construction, but can also be specifically used to retrofit existing buildings.

From Connection Professionals to Architects of Digital Building Intelligence

Electrical installers will thus gain influence, not least because they can become the central entity linking hardware, protocols and usage. The new standard frees them from the need to specialize in a single manufacturer. Instead, it offers an open ecosystem, one that they can actively shape through education, experience, and strategic consulting expertise.

"The devices may be getting smarter, but they need someone to integrate them sensibly. This is exactly where our industry will find great opportunities," emphasizes Lehmann. If Matter® delivers what it promises, installers will transform from connection professionals into architects of digital building intelligence. This will create a new self-image and clear, technical relevance.

Ensuring Competence, Shaping the Future

Continuing education will be a key factor in our success. The technical opportunity offered by Matter® and Thread® will also increase the demand for advice and implementation. The premier vendors are already conducting targeted training courses on Matter® systems. Other players are likely to follow as the market expands.

This opens up new technical ground for electrical contractors, providing an opportunity to position themselves as competent partners in digital building technology.

For the electrical trades, this means engaging early with the basics of the new standards; not least because many end customers already use Matter®-capable products in private settings. The classic path, in which systems are wired exclusively through the electrician, is over. Instead, they must establish themselves as the mediating entity between users, technology and logic systems, by having the necessary expertise, the right infrastructure and a clear understanding of comprehensive integration. One thing is certain: anyone who can integrate Matter®-capable systems will gain independence.

Bolstering the Role of the Electrical Trades

Decisions in favor of certain platforms, brands or manufacturers will recede into the background. The ability to create stable, secure and, most importantly, expandable solutions will become more essential in the future. This will bring a new professionalism to the market and strengthen the role of electrical installers in an area that has long been dominated by software vendors and gadget manufacturers.

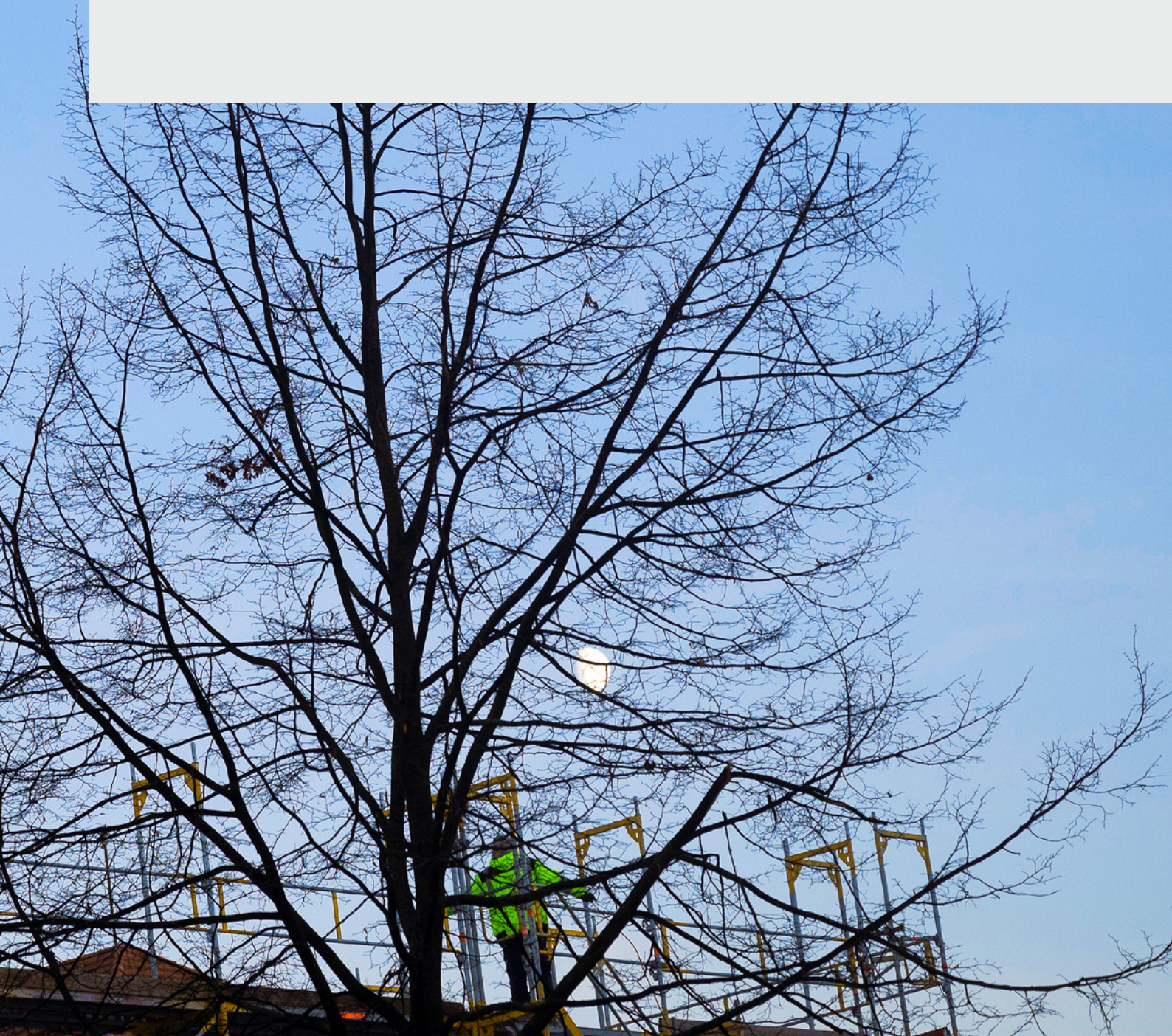
Some questions still require answers. How quickly will premier manufacturers adapt their infrastructure products? What role will national standards and security regulations play? How are building owners, architects and planners reacting to the possibilities? But one thing is clear: the technical foundation has been laid. Those who prepare now will play a decisive role in the coming years; not only in the implementation, but also in the design of the smart buildings of tomorrow.



RETHINKING MODULARITY IN BUILDINGS

FACTORY-MADE ROOM MODULES CREATE ADAPTIVE BUILDINGS.

The construction and real estate sector is facing new challenges: demands for flexibility, short construction times and sustainable solutions are increasing. In this context, the increasing relevance of modular construction makes sense. Instead of stick-built construction on site, complete room modules are created in industrial facilities and subsequently assembled at the construction site. This principle not only enables shorter construction times and minimizes costs, it also opens up new prospects for conserving resources in construction. Whether for housing, educational institutions or office buildings, modular concepts have become more than a mere niche solution.



Building life cycles are no longer static. Offices become co-working spaces; classrooms transition to digital learning spaces; hotels shift to residential housing. Building operators must remain flexible in order to act sustainably and cost-effectively. Adaptable buildings prevent demolition and new construction, save resources and reduce CO₂ emissions. In a world where demands change faster than ever, adaptability becomes a competitive advantage.

Flexibility in the Life Cycle: Expand, Convert, Repurpose

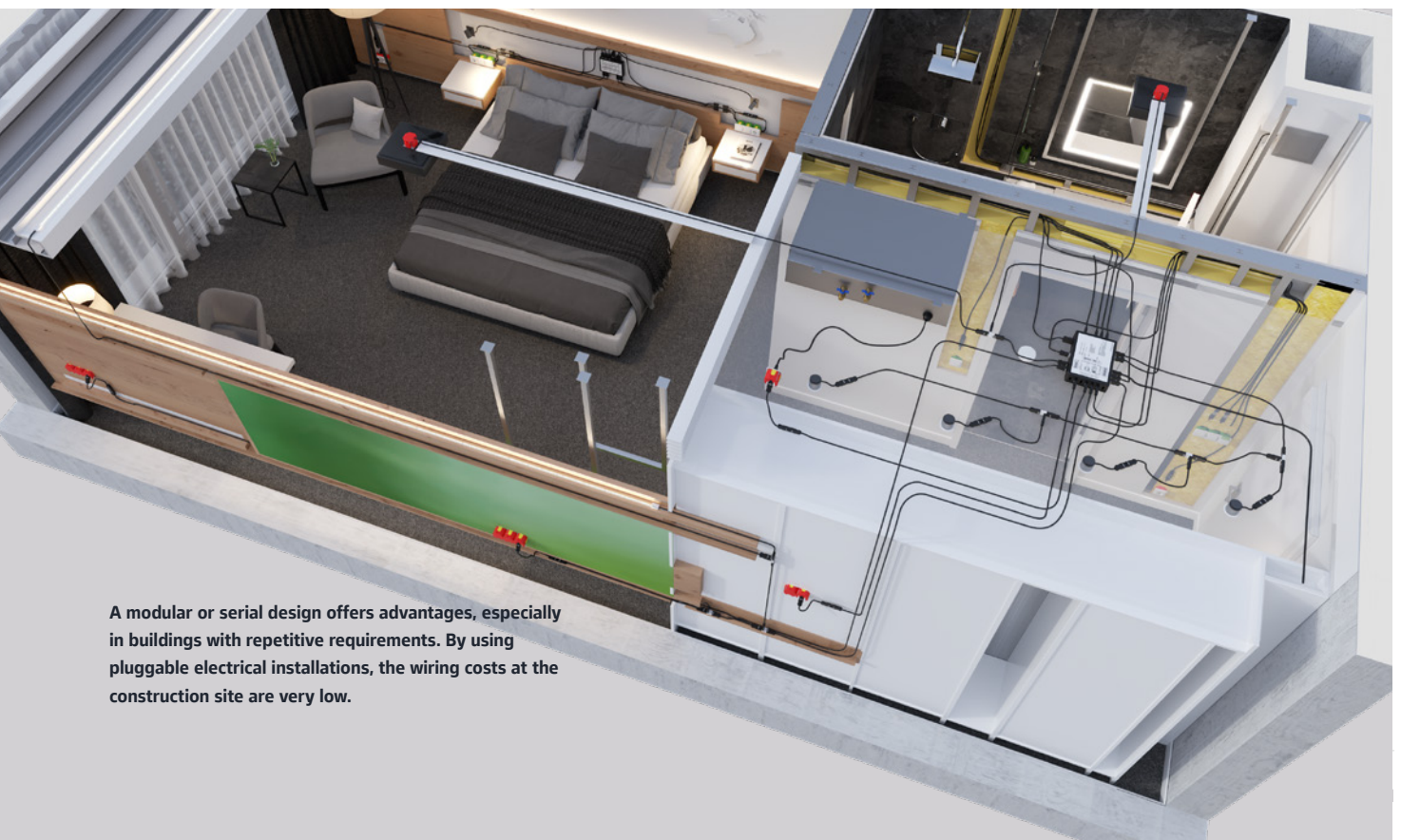
This is precisely a major advantage in modular buildings. They consist of ready-made, standardized units – the modules, which are produced in factories and then assembled at the construction site. Electrical and sanitary installations are also carried out in the factory. In contrast to classic construction, in which each element is created on site, the modular method allows for significantly shorter construction times and reduces material waste. In addition, modular structures are especially flexible: they can be easily expanded or reconfigured for another purpose. This means that they meet the

growing demands for adaptability in the construction industry.

Modular buildings are used in a wide variety of projects: from residential buildings through office buildings up to educational institutions. This construction method is especially attractive when the completed modules are standardized and produced in series, a method known as “serial construction.”

Politics Prioritizes Modular Construction

Politicians are promoting the development of modular and serial designs in a targeted way. In September 2023, the Federal Ministry of Housing, Urban Development and Construction initiated a round table on “Serial, Modular & Systemic Construction”, supported by an office at the Federal Foundation for the Building Academy. The initiative aims to increase prefabrication rates, reduce costs and provide affordable housing more quickly. This highlights the growing importance of modular construction methods, and provides a clear political impetus.



A modular or serial design offers advantages, especially in buildings with repetitive requirements. By using pluggable electrical installations, the wiring costs at the construction site are very low.



Modular construction **reduces construction times** by up to **60%** – decisive for quick adaptations. (Source: PRAMO)



The market volume for modular construction in Germany was around **43 billion** in 2025 and continues to grow. (Source: Businesswire)



26% of new residential buildings are already created at offsite facilities – a trend extending to non-residential buildings. (Source: BuiltOffsite)



The need for personnel at the construction site is reduced, alleviating the skills shortage.

Advantages of Pluggable Electrical Installations for Building Operators

- Rapid responsiveness to new requirements
- Planning and cost security through standardized processes
- Assembly times are reduced by up to 70% compared to conventional wiring.
- Total costs are lowered by up to 30%.
- Sustainability through reduced material consumption and lower emissions
- Flexibility during operation – conversions without interrupting operations, ideal for adaptive buildings

The practical effects of modular processes can already be observed: industrial prefabrication ensures consistently high quality and simultaneously reduces errors. Studies show that modular processes can reduce the need for skilled labor and cut construction time practically in half. Serial production offers significant cost advantages, especially for projects with repetitive requirements, such as schools, hotels or office buildings. Investors are counting on predictability: more than half expect higher returns through modular processes.

Rethinking Electrics in Modular Construction

It makes sense to also rethink the electrical installations in prefabricated buildings, for example, by switching to pluggable systems. Pluggable electrical installations are particularly advantageous when used in repetitive installations, as are common in modular construction. The pre-assembled connections are installed at the factory and simply plugged together on site, following the plug-and-play principle. This saves time at the construction site and

minimizes installation errors. In addition, this reduces the need for workers on site, which counteracts the skills shortage. The pluggable connections are installed, for example, in suspended ceilings or floor boxes. "Pluggable electrical installations reveal their strengths, especially in areas like lighting. After all, electricians didn't train for three and a half years to spend every day climbing up and down ladders to connect a light fixture. We can do this much more easily," Björn Ufer, Project Sales Manager at WAGO, describes the advantages with specifics. "Tall spaces are important. I need to have areas, where I can hide the finished cables and excess lengths, and which I can access again, if I plan to change the purpose of the room at some point," adds Christopher Thiele, Project Sales Manager at WAGO.

»Pluggable electrical installations reveal their strengths, especially in areas like lighting. After all, electricians didn't train for three and a half years to spend every day climbing up and down ladders to connect a light fixture.«

Björn Ufer, Project Sales Manager at WAGO



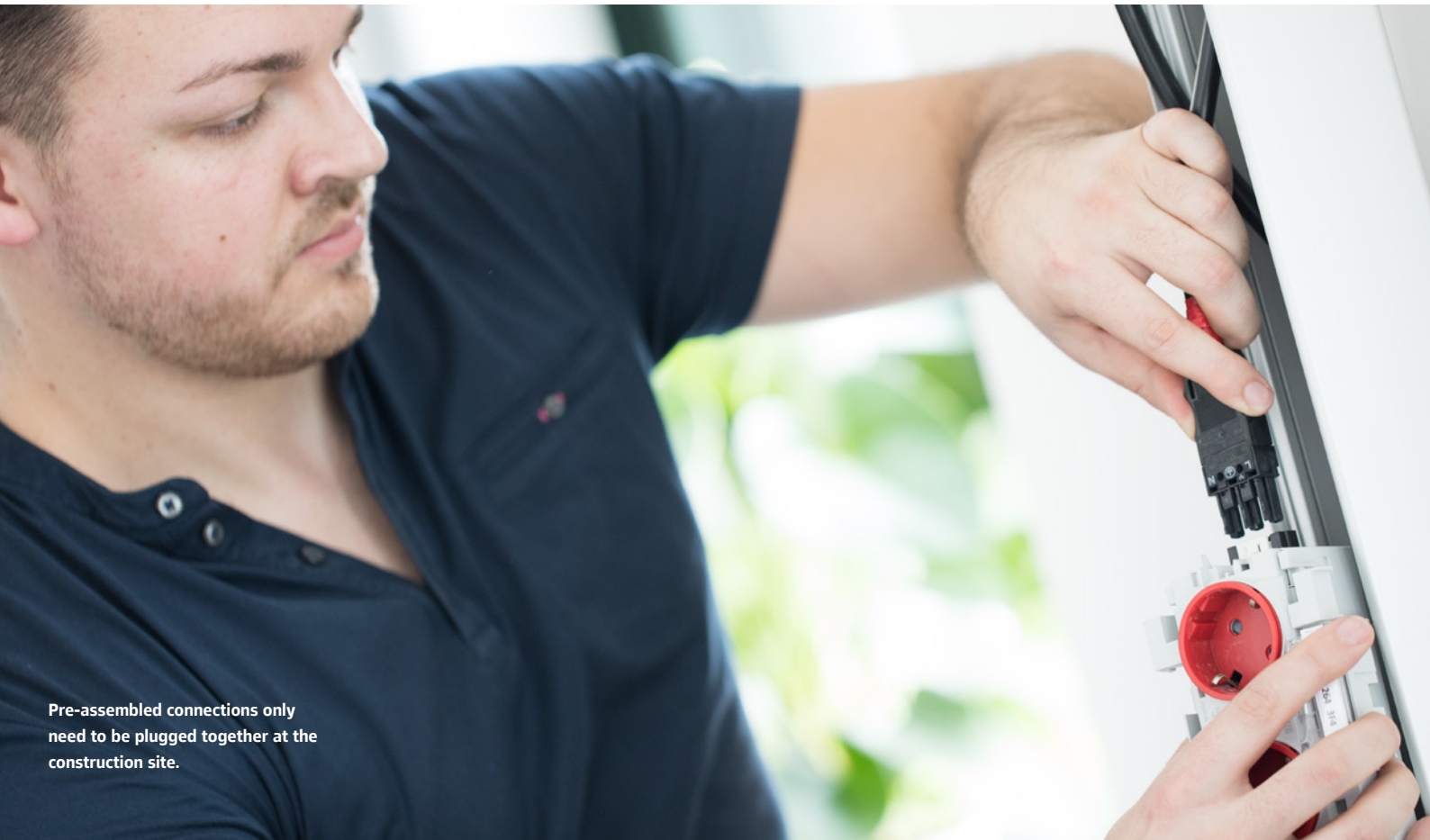
Pluggable Electrical Installation Facilitates Repurposing

When using pluggable electrical installations, it is crucial to comprehensively plan the installations in advance. Because they use pre-assembled connections, the planning effort must be shifted to an earlier construction phase. This is particularly useful in modular buildings with very similar room structures, like hotels or nursing homes, since the same electrical installation can be carried out as often as needed.

Pluggable electrical installations are also recommended for buildings that are subject to frequent changes. "It is hard to believe how often office buildings are converted," adds Thiele, providing one example. "With a pluggable electrical installation, I can rework things sequentially. I don't have to cut anything off, rip it out, dispose of it, and then figure out how to rebuild it. I can easily disassemble, modify or expand the installation by unplugging it and then reconnecting it," continues Thiele. The cables can also be repurposed: after the conversion, they can conduct the current for an outlet instead of for a light, for example.



The pluggable connectors can be accessed at any time in floor boxes. This is especially advantageous if the use of the space changes.



Pre-assembled connections only need to be plugged together at the construction site.

Resource-Saving Electrical Installations

Pluggable installations are more sustainable than conventional ones, especially in renovations, as the work generates no additional waste. "When an office is renovated, all of the cables are removed and often disposed of. These include important resources, as the supply of copper isn't infinite. Prefabricated conductors are handled differently. Whatever you don't repurpose during an expansion, you store in a warehouse and use it again later," explains Ufer. Due to a code engraved on the cables, it is possible to see at a glance how long the cables are and what their cross-section is, even years later.


Maintenance-Free Installation with WINSTA®

Because the same spring clamp terminal blocks are installed in connectors like WINSTA® as are in other WAGO terminal blocks, they are just as durable as other electrical connections and components. In addition, they are maintenance-free: in case there is no desire to change the room usage at some point, they can also be installed in a conduit in the wall, since this is a pluggable, fixed installation, and no inspection opening is required. Per building norms, plug-connected cables are usually only permitted in the ceiling, in cavities, raised floors or cable runs. "A spring clamp terminal block provides maintenance-free operation, since no screw has to be tightened. Screw connections must be checked annually. This is completely unnecessary here, and the pluggable installation is considered to be a fixed connection as per the standard," explains Ufer.

WINSTA® – Electrical Installations Made Pluggable

The WINSTA® Pluggable Connection System from WAGO is a solution for electrical building installations. It provides an alternative to conventional wiring. Pre-assembled cables and connectors, which can be easily plugged together, are used to simplify and expedite installations.





Building automation is also crucial for an adaptive building, by using *flexROOM*®, for example.

Holistic Approach: Flexible Room Automation

In addition to the electrical installations, the building automation plays a central role in ensuring flexibility and sustainability in modular buildings. If the room usage changes, then lighting, heating, air conditioning and shading should also be as easy to adjust as possible. Adaptability means more than just structural flexibility: intelligent and flexible control of the room automation is also necessary.

Using WAGO solutions for building automation, such as the WAGO Application *flexROOM*®, lighting, indoor climate, shading and energy flows can be controlled as needed, from central and decentralized locations. This supports modular building concepts, with controllers and I/O systems integrating seamlessly into modular electrical installations. The automation reduces

energy consumption and contributes to sustainability goals. New modules or rooms can be easily integrated into the existing structure. Open standards such as BACnet, KNX® and MQTT ensure sustainability and IoT connections.

Future Viability Begins Today

By linking modular construction to intelligent automation, new prospects are initiated for planning and using buildings. Modular construction has long been more than just an alternative to traditional construction – it is a strategic key for the future. The demands on buildings are changing rapidly: work models, types of use and sustainability goals are dynamic: as such, they demand solutions that function well today, and also remain flexible for tomorrow. Those who bank on modular concepts now are investing in adaptability, efficiency and cost-effectiveness.

Conventional or pluggable installations – Which pays for itself?

The choice between classic installations and pluggable systems significantly influences costs and time expenditures. Cost-effectiveness calculators are available for various applications in order to make the comparison transparent. They show how conventional installations can be compared to a pluggable solution using *WINSTA*®.



BERLINER VOLKSBANK HEADQUARTERS

**FOCUS ON
FLEXIBILITY**





The headquarters of the Berliner Volksbank signals a change in the corporate culture.

More than 14,000 square meters spread across 9 floors, more than 1,000 employees and 650 workstations in 113 rooms – key figures for the new headquarters of the Berliner Volksbank in the heart of the federal capital. From the beginning, sustainability and flexibility played a central role in the design of the building complex. The Berliner Volksbank chose to use innovative technologies, which enabled the building to achieve automation level A, as per DIN V 18599-11 of the Building Energy Act (GEG). Room automation, using the WAGO Application **flexROOM**®, was also essential to this achievement. They selected the **WINSTA**® Pluggable Connection System for the electrical installations, in order to make subsequent conversion of room usage as easy as possible.

“From the very beginning, it was clear that the building should be technically up to date, and simultaneously signal a clear change in the corporate culture. It is to be as sustainable as possible, so that we can use it for at least 30 years.” Frithjof Hornemann, Project Manager at Berliner Volksbank, describes the bank’s requirements for the new building. The building has three primary functions: it functions as an exchange, a workplace and as a representation.

Adapting Buildings to Purposes

It was important to the Berliner Volksbank that the purpose of individual rooms could be adapted multiple times, for example, open-plan offices could be converted back to smaller offices.

The WAGO Application **flexROOM**® for room automation and the **WINSTA**® Pluggable Connection System make this possible. The floors were planned in segments of 1.35 m. These segments can be connected together or decoupled every 2.70 m, providing maximum flexibility in the use of the spaces. “It was important for us that the technology be easy to control in the individual segments, which we achieved through these divisions. We can flexibly control lights, heating and shading, even as needs in the office spaces change,” explains Hornemann.

Synergies between Room Automation and Electrical Installations

In the new Headquarters for the Berliner Volksbank, synergies between room automation and conventional electrical installations were leveraged to reduce planning effort and minimize interface losses. BAUER Elektroanlagen was responsible for the implementation. “Because BAUER Elektroanlagen was awarded the contract for the electrical installations, and the measurement and control technology, we could use the cable pull collectively, and optimally coordinate interfaces between the building systems. For example, we did not have to transfer bus systems, like DALI and SMI, from separate control cabinets to the electrical distribution, or assemble them in the field. We were able to transfer all data directly from the controller to the rail-mount terminal block area of the distribution boxes. The coordination was also easier because we have worked closely with BAUER Elektroanlagen before.” Christopher Thiele, Project Sales Manager at WAGO, describes the process.

Room Automation with **flexROOM**®

To control room automation, BAUER Elektroanlagen decided to use the WAGO Application **flexROOM**®, as it is a scalable room automation solution. The software covers relevant room automation functions for lighting, shading and room climate control. The WAGO Application **flexROOM**® thus provides the basis for achieving energy efficiency class A as per DIN EN 15232 and supports the certification of the building as a sustainable green building, e.g., according to national and international systems such as DGNB or LEED.

This also applies to the headquarters of the Berliner Volksbank: the building achieves automation level A as per DIN V 18599-11. In addition, the new headquarters has received the LEED gold standard, which certifies high sustainability, in terms of energy and water efficiency, waste management and the quality of the interior rooms.

WAGO Application **flexROOM**® for Optimal Energy Consumption

The Berliner Volksbank exploits the full range of functions in the WAGO Application **flexROOM**®. These include lighting, heating, cooling, ventilation, shading, and also special functions, such as decorative facade lighting. These areas are maximally interlinked in order to achieve optimal energy usage in the building. "More specifically, our room automation uses the WAGO Application **flexROOM**® to automate everything on the individual floors that can be automated. Everything converges through one controller, from fire dampers up to the last presence detector. The room automation system even handles specialized tasks, like decorative facade lighting. This saved us another controller," reports Thiele. The Volksbank selected EnOcean® for the operating elements in the rooms, as it is distinguished by its flexibility. Whether the walls are glass, wood or drywall, these operating panels can be mounted anywhere.

Easily Configure Your Own Building Automation

However, the WAGO Application **flexROOM**® optimizes more than just energy consumption in rooms. Since the building technicians at the Berliner Volksbank can configure the system themselves, they also save on operating costs. "Normally, the building operator cannot change anything in the system. For example, if the blinds need to be regrouped, then an order must be initiated and a third-party company must be hired. Thanks to our software, the Volksbank building operators can do this themselves. They can react directly, without waiting,"

WINSTA® was installed in the sun protection, the valve connections for the heating and cooling ceilings, and in the workstation outlets. The system was routed through floor tanks for easy access.

says Thiele, as he describes advantages of the WAGO solution. Zana Diabate, Technical Project Manager for Building Automation at BAUER Elektroanlagen, sees this flexibility as the great advantage in WAGO's room automation, "All bus systems are integrated in the WAGO Application **flexROOM**®, and can be configured with just one click. No programming required. That was the reason why we decided to use the software."

Room Automation Integrated into the Electrical Installations

In the case of the Berliner Volksbank headquarters, room automation is part of the respective electrical subdistribution boards. "Normally, in classic office buildings, there is one control cabinet for room automation on each floor, and one for electrical subdistribution. An interface of cables connects them. Due to space reasons, we moved away from that, planning and locating everything in one control cabinet," explains Thiele. Lighting is controlled from the electrical subdistribution board via DALI, and sun protection via SMI. Room temperature control is provided by a cooling panels, whose valves have analog controllers.



“For us, this is precisely what makes the building special. We not only took over the building automation, but also the complete electrical installation, which is rare. This allowed us to take advantage of significant synergy effects, both during construction and also for the client, since they only have to deal with one contact person.” Diabate lists the contract advantages.

Making Electrical Installations Pluggable with WAGO

Zana Diabate relies on *WINSTA*® from WAGO in electrical installations, due to the Volksbank’s desire for maximum flexibility. *WINSTA*® Pluggable Connectors are pre-assembled cables that can be easily connected at the construction site using the plug-and-play principle. This saves time, prevents wiring errors and simplifies maintenance. And, as easy as it is to connect the pluggable connectors, they can also be rewired just as easily. “For us, the flexibility was not the only advantage, it is also the fact that *WINSTA*® counts as a fixed, pluggable electrical installation. This eliminates recurring inspections of workplace outlets that can interfere with workflows. This was a decisive point for us,” affirms Hornemann.

Flexible Technology: Pluggable Integration of Heating and Cooling Valves

WAGO, together with BAUER Elektroanlagen, have advanced this a step farther. They also connected heating and cooling valves using *WINSTA*®. Thus, WAGO and BAUER Elektroanlagen optimized the electrical installation, and also reduced cabling, thus saving raw materials. The valves and plugs were ordered pre-assembled, which prevents wiring errors and saves time on the construction site.

WAGO and BAUER Elektroanlagen have taken a similar approach to sun protection, with support from Leaftech. The latter company creates digital twins for buildings and uses them to control, optimize and analyze building functions. Leaftech has provided control data related to solar radiation and shading for the Berliner Volksbank headquarters. First, they created a 3D model and simulated the solar radiation to determine the optimal shading.

In addition, they determined wind speeds in order to be able to correctly position the sensors for shading.

WAGO “Complete Package” for Electrical Installations and Room Automation

In addition to the WAGO Application *flexROOM*® and *WINSTA*®, numerous other WAGO products are used in the building, such as WAGO TOPJOB S® Rail-Mount Terminal Blocks, various splicing connectors, 852 Series Switches, the WAGO Eco and Compact Power Supplies and electronic circuit breakers. WAGO panels and components from the WAGO I/O System are also incorporated into the building automation, in addition to the WAGO Application *flexROOM*®. This diversity from a single source ensures a consistent, reliable and future-proof infrastructure throughout the entire building.

A Building for the Future

“For me, the building is once in a lifetime project; for the bank, it is a manifestation of cultural change.” Frithjof Hornemann summarizes the project. The new headquarters represents cultural change and technical innovation. With the WAGO Application *flexROOM*® and *WINSTA*®, the Berliner Volksbank has chosen a solution that offers maximum flexibility and energy efficiency – today and in the coming decades. The building should be a living workplace for all employees over the next decades. Flexibility through the WAGO Application *flexROOM*® and *WINSTA*® Pluggable Connection System was especially important to the bank, because only a flexible building can adapt well to the conditions of the future.



»For us, this is precisely what makes the building special. We not only took over the building automation, but also the complete electrical installation, which is rare. This allowed us to take advantage of significant synergy effects.«

Zana Diabate was the Technical Project Manager for Building Automation at BAUER Elektroanlagen responsible for electrical installations and room automation.

GET TO KNOW

BJARNE SMED



What motivates us and what defines our work?
We introduce one of our colleagues from Building Technology in each issue of WAGOdirect Building. This time: Bjarne Smed, Vice President Pluggable Installation Technology/*WINSTA*®, who is passionate about modular construction methods and the intelligent pluggable solutions that are shaping the future of construction.

What inspires you most about your work at WAGO?

I am most excited about the opportunity to work at the interface between innovation and practical usage. At WAGO, we not only follow trends – we shape them. Being part of a team that provides the construction industry with reliable and future-proof solutions is incredibly fulfilling. I find the close collaboration with our customers, in which we transform their challenges into intelligent, scalable solutions, to be especially motivating.

In your opinion, why is modular construction gaining importance?

Modular construction offers answers to many current industry challenges: tight schedules, a shortage of skilled workers and demands for sustainability. By moving large parts of the construction process into controlled environments, modular methods increase efficiency, reduce waste and improve quality. It's a smarter way to build, and the market is starting to recognize that.

How does WAGO support modular construction projects?

WAGO supports modular construction with robust, flexible and scalable connection solutions designed for plug-and-play integration. Our products simplify installation, shorten commissioning times and ensure long-term reliability. Whether the issues are tight schedules or a shortage of skilled labor: our pre-assembled connection technology helps our partners build faster, safer and smarter.

Are plug-and-play solutions here to stay?

Absolutely. Plug-and-play solutions such as *WINSTA*® are no longer niche products: they are becoming the standard. As buildings become more complex and schedules tighter, the demand for maintenance-free, ready-to-use solutions has grown steadily.

If you had to describe the future of construction in one sentence, what would it be?

The future of construction is modular, digital and shaped by intelligent connectivity.

Thank you!

Legal Information:

WAGO DIRECTBUILDING, March 2026

Publisher:

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Hansastraße 27
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WAGO DIRECTBUILDING appears at irregular intervals.

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